Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring

SECOND ANNUAL REPORT

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March 2016

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RTI Project Number
0212790.010.002.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

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Background

In 2012, the Centers for Medicare & Medicaid Services (CMS) awarded $162,622,080 to 24 health care organizations to demonstrate impacts on health care quality, cost, and outcomes over a 3-year period. Established as part of the Health Care Innovation Awards (HCIA) (https://innovation.cms.gov/initiatives/Health-Care-Innovation-Awards/) for Community Resource Planning, Prevention, and Monitoring, these awardees are diverse both in the type of organizations represented and the focus and scale of their interventions. Some tested processes and tools to improve the coordination of care across multiple health care settings, while others tried to improve patient care through innovative health information technology, decision support tools, or changes to the composition of the health care workforce.

In an effort to identify and understand the models that can be replicated on a broader scale, the Center for Medicare & Medicaid Innovation (CMMI) contracted with RTI International to evaluate the 24 HCIA Community Resource awardees (HCIA awardees). The evaluation draws upon qualitative and quantitative methods to assess the impact of the awardees' interventions on three overarching goals of the Affordable Care Act of 2010 (ACA): smarter spending, better care, and healthier people. This executive summary of the second annual report presents the awardees' progress into their third year, which for most, is their final year of HCIA-supported operations. We provide an overview of the HCIA awardees, evaluation design, and key findings organized by our evaluation questions.

List of HCIA Community Resource Awardees

- Altarum Institute (Altarum), MI
- Asian Americans for Community Involvement (AACI), CA
- Ben Archer Health Center (BAHC), NM
- Bronx Regional Health Information Organization (Bronx RHIO), NY
- Children's Hospital and Health System (Children's Hospital), WI
- Curators of the University of Missouri (Curators), MO
- Delta Dental Plan of South Dakota (Delta Dental), SD
- Eau Claire Cooperative Health Centers (ECCHC), SC
- Finity Communications (Finity), PA
- Imaging Advantage (IA), IL
- Intermountain Health Care Services, Inc. (Intermountain), UT
- Mary's Center for Maternal & Child Care (Mary's Center), DC
- Michigan Public Health Institute (MPHI), MI
- Mineral Regional Health Center (Mineral Regional), MT
- National Health Care for the Homeless Council (NHCHC), multiple states
- Northeastern University (NEU), MA
- Prosser Public Hospital District (Prosser), WA
- Regional Emergency Medical Services Authority (REMSA), NV
- South County Community Health Center (South County), CA
- Southeast Mental Health Services (SEMHS), CO
- University of Chicago (U-Chicago), IL
- University of Miami (U-Miami), FL
- Women and Infants Hospital of Rhode Island (W&I), RI
- YMCA of the USA (Y-USA), multiple states

Awardees

The HCIA awardees include five federally qualified health centers (FQHCs), three academic institutions, two health plans, two integrated health systems, two hospitals, and ten other health care organizations. Each awardee received on average

$6,743,861 to implement their interventions. We characterize the components of the interventions as follows:

- **Coordination of care**: Three-fourths of awardees aim to improve the coordination of care across health care settings. Most use community health workers (CHWs) or patient navigators to provide patients with personalized education, coaching, referrals, and follow-up to achieve their goals.
- **Health information technology:** Nearly half of awardees use health information technology (HIT) to facilitate the exchange of information among providers and organizations, enhance provider or patient decision making, or support analysis of population-level data.
- **Health care workforce**: Seven awardees have interventions that train and develop new kinds of health care workers, including CHWs, data analysts, quality improvement specialists, and health systems engineers.
- **Process of care**: Six interventions change the workflow and processes of care to increase efficiency, reduce waste and duplication, and/or improve safety.
- **Decision support**: Six awardees use tools or strategies to support provider decision making.

The HCIA awardees address the needs of vulnerable populations: more than half of awardees target patients covered by Medicare and nearly all enroll patients covered by Medicaid. Some awardees also target racial/ethnic minorities, children, families, patients with special health conditions, or those living in rural regions.

Evaluation Design

The evaluation of the HCIA awardees includes individual evaluations of each awardee's intervention and a cross-cutting evaluation that synthesizes findings across the 24 awardees. The findings presented in the report and this executive summary draw from **five key data sources**:

- **Awardee documents**, including their quarterly progress and performance reports documenting their activities, accomplishments, expenditures, staffing, and other organizational information.
- **Interviews** with the project staff leading and participating in the interventions.
- **Claims data** submitted to CMS, including the health care spending and utilization for each beneficiary.
- **Secondary data from awardees**, such as administrative or electronic health record data they use to monitor their interventions.
- **Provider survey** of providers who were affected by the intervention directly through a new tool or process.

Overarching Evaluation Questions

- To what extent have HCIA Community Resource awardee innovations affected each goal of the ACA: **smarter spending, better care, and healthier people**?
- What are the **workforce issues** of each awardee and across similar awardees?
- What is the **implementation effectiveness** of each innovation and across similar innovations?

Key Findings

Smarter Spending

Using claims data from the 14 awardees who targeted Medicare patients and enrolled enough patients for difference-in-difference analyses, we assessed the extent to which the awardees achieved the goal of smarter spending. We present the key results from statistical analyses of the core spending measure: total health care spending per patient. Based on our analyses thus far, the majority of the awardees do not show significant health care savings.

A key finding is that **two of 14 awardees, Bronx RHIO and Y-USA, showed statistically significant savings (p-value < 0.10).** Nine awardees showed significant losses. The remaining (3) demonstrate neither statistically significant savings nor losses thus far.

These findings are preliminary and reflect the limited number of patients enrolled in the interventions. Awardees enrolled patients in their interventions on a rolling basis, which means that we are still receiving and analyzing data from those who enrolled at a later point during the 3-year period. As we obtain additional data, the number of enrollees in each intervention will increase, which will affect our findings in subsequent reports.

Better Care

Using measures of clinical effectiveness and health care utilization, we assessed the extent to which the awardees impacted the goal of better care. Clinical effectiveness is measured by assessing the process of care, such as the percentage of patients receiving the recommended care and treatment for a specific disease. In particular, we assessed whether awardees delivered the recommended vaccinations to all eligible patients, and whether they delivered the recommended services to patients with diabetes, hypertension, or coronary artery disease (CAD). To calculate the measures of clinical effectiveness, we collected and analyzed patient-level data from the electronic health records and administrative databases of 10 awardees. Because of variations in the awardees' interventions, we present key findings from subsets of awardees with similar clinical effectiveness measures.

To assess health care utilization, we analyzed claims data on inpatient admissions to the hospital and on emergency department (ED) visits not leading to a hospitalization from 14 awardees who targeted Medicare patients and enrolled enough patients for difference-in-difference analyses. Our findings suggest that many interventions are providing recommended clinical services to enrollees. However, successful delivery varies among the awardees and across disease conditions. Additionally, there is limited evidence that the interventions decrease the likelihood of inpatient admissions or ED visits, with a few exceptions.

Key findings include:

- **Two of six awardees**, **BAHC and ECCHC, provided the recommended care to the majority of enrolled patients with diabetes**. Recommended services include lab work to assess hemoglobin and lipids, a foot exam, and an eye exam.
- **One of two awardees, ECCHC, provided recommended care to the majority of enrollees with hypertension**. The recommended services include a blood pressure screening and body mass index (BMI) assessment.
- **One of two awardees, BAHC, provided the recommended influenza and pneumococcal vaccines to the majority of enrollees.**
- **Three of five awardees, BAHC, ECCHC, and Y-USA, provided the recommended BMI assessments to the majority of enrollees as part of weight control care.**
- **Three of 14 awardees, Bronx RHIO, Mineral Regional, and Y-USA, significantly decreased their rates of inpatient hospitalization (p-value < 0.10).** Nine awardees *increased* their rates of inpatient hospitalization. For the remaining two, we find no significant change.
- **Two of 14 awardees, Bronx RHIO and Curators, significantly decreased the rate of ED visits (p-value < 0.10).** Seven awardees *increased* their rates of ED visits**.** The remaining awardees (5) demonstrated no significant change.

Healthier People

Using measures of health outcomes, we assessed the extent to which the awardees impacted the goal of healthier people. To calculate these measures, we analyzed patient-level data from the awardees' electronic health records and administrative databases on clinical results, such as reduced mortality. Because the awardees targeted a range of populations and health conditions, we present key findings from comparative analyses across subsets of awardees with similar health outcome measures. Overall, the findings suggest that the interventions may be having a greater impact on outcomes for diabetic patients and worse outcomes for patients with CAD or hypertension.

Key findings include:

- **One of three awardees, Curators, improved CAD outcomes.**
- **Four of eight awardees, BAHC, ECCHC, MPHI, and U-Chicago, improved hemoglobin A1c control among enrollees with diabetes.**
- **Three of four awardees, BAHC, Curators, and South County, improved low-density lipoprotein cholesterol (LDL-C) control among enrollees with diabetes.**
- **Innovations had little impact on blood pressure control for patients with hypertension.**

These findings are merely descriptive for now, since we have not compared the outcomes among the enrolled patients to those who did *not* receive the intervention (called a control group). In future analyses, we will have data from more individuals and will conduct statistical tests to determine if changes are a result of the interventions rather than chance or other causes.

Workforce Issues

Workforce development is an integral component in the process of testing and disseminating service delivery models in the HCIA program. In this report, we present findings on two key themes that emerged from the data of awardees implementing CHW and HIT innovations: (1) hiring and retention and (2) skills, knowledge, and training.

Among the 18 awardees implementing CHW innovations:

- **Four reported low numbers of staff.**
- **Six reported high staff turnover.**
- **Five faced staff attrition problems due to decreased funding.**
- **Two reported success with hiring CHWs from the local community.**
- **Two reported issues with burnout among CHWs serving high-need populations.**
- **Three partnered with local community colleges or other certified collaborating agencies to establish CHW curriculum and certification programs.**

In contrast to the various staffing and retention challenges encountered by the CHW interventions, only two of the nine HIT interventions reported problems hiring staff. The complexity and diversity of the workforce innovations limit our capacity to directly compare implementation processes across awardees. Nonetheless, we identified themes that highlight the challenges of implementing complex, multifaceted innovations in dynamic health care settings. In **Table ES.1,** we summarize the overarching facilitators and barriers for the two specific workforce development domains presented in this report.

Table ES.1. Facilitators and Barriers to Workforce Development

Domain	Barriers	Facilitators
Hiring and Retention	CHW workforce: • Subjected to restrictive hiring procedures • Lacked suitable recruits • Required additional clinical supervision HIT workforce: • Required a mix of technical staff including programmers, data managers, and developers	CHW workforce—CHWs were hired from the local community
Skills, Knowledge, and Training	Needed specialized technical skills to integrate applications into EHRs	External partners were used to conduct staff training

CHW = community health worker; EHRs = electronic health records; HIT = health information technology.

Provider Satisfaction

For many HCIA awardees, health care providers—including physicians, nurses, physician's assistants, nurse practitioners, and clinical social workers—played a critical role in successfully

implementing these innovations. To understand the significance and role of provider engagement, we conducted a provider survey that assessed providers' buy-in, perceived impact on patient care, and integration of the innovation into their workflow.[1] Ten awardees participated in the survey. To facilitate analyses across awardees, we separately analyzed provider survey responses from (1) awardees whose innovations focused on reducing inappropriate imaging, and (2) awardees that included a CHW service.

Key findings include:

- **The majority of providers believed the HCIA innovation, particularly CHW services, impacted patient care.**
- **Providers who were the most involved were more likely to perceive an impact on patient care and report satisfaction than those who were less involved.**
- **Providers generally were not very satisfied with imaging innovations, which they found burdensome.**
- **Overall, providers working with CHWs were very satisfied, reporting that the CHWs were easy to work with, improved efficiency, and were a worthwhile investment.**
- **Providers reported the innovations had little impact on clinical workflow.**

Implementation Effectiveness

Effective implementation of health care innovations depends on multiple organizational characteristics, such as organizational readiness for change, alignment of the innovation with the organizational values, and resources for change. RTI examined the different combinations of organizational characteristics across the awardees that contributed to effective implementation of their innovations (see ***Table ES.2***).

- **Thirteen awardees achieved implementation effectiveness.** Ratings of implementation effectiveness were based on awardees' ability to deliver their innovation as planned or produce substantial outcomes among their target population as well as other contextual factors.
- **Some combination of two of the following characteristics appear to contribute to effective implementation: (1) strong leadership engagement; (2) history of implementing interventions; and (3) high organizational priority for the intervention.** Examining these organizational characteristics before and during the award period may identify which innovations are more likely to succeed and highlight priority areas for technical assistance and monitoring.

[1] The survey did not include community health workers; we surveyed only providers who worked in practices where CHW innovations were implemented.

Table ES.2. Organizational Characteristics Contributing to Effective Implementation

Organizational Characteristic	Definition
Strong leadership engagement	Leadership engagement refers to the commitment, involvement, and accountability of leaders for implementation.
History of implementing interventions	History refers to whether the awardee organization had experience implementing the intervention or a similar intervention, or was scaling up an existing intervention.
High organizational priority for the intervention	Organizational priority refers to individuals' shared perception of the importance of the intervention within the awardee's organization and the degree to which competing programs or initiatives distract or compete with the intervention. To capture this, we assessed whether the implementation team was (1) responsive to requests and (2) shared data with the RTI team.

Effective implementation varies based on how well awardees reach the target population, as well as the intensity and frequency of the services or treatments provided. As such, we examined secondary data on the *reach* and *dose* of the awardees to assess their implementation effectiveness. Because each awardee has a unique definition of reach and dose for its innovation, direct comparisons across awardees are not appropriate for this evaluation. However, a high-level examination of the data shows that nearly half of the awardees reached the majority of their target population with 2 to 12 different types of services. Finally, the data suggest that having a smaller ratio of CHWs to patients may increase the efficiency of services provided to those patients.

Sustainability

The ability of the 24 HCIA Community Resource awardees to sustain their specific intervention is based on the ability to put in place funding and partnerships. Four awardees are pursuing plans to continue their interventions, but funding has not been secured or key positions have been dropped. Nineteen awardees have funding and partnerships in place or close to finalization. One awardee does not plan to continue their innovation.

Conclusion

Overall, it is too early to tell if the HCIA Community Resource awardees are meeting the goals of smarter spending, better care, and healthier people. However, selected awardees exhibit promising trends and it is important to evaluate the full period of the innovation before making definitive conclusions. Providers in organizations that are implementing CHW services are highly satisfied with the innovations and the extension role that CHWs play to maximize their efficiency. Many patients enrolled in the innovations received recommended care, which is an indication of more evidence-based care or better care. Finally, the overall effect on health outcomes are inconclusive at this time because minimal health outcomes data are available and the absence of a comparison group with available data. Future reports will add additional data to our analyses to provide more evidence on the efficacy of the HCIA Community Resources awardees.

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Section 1

Introduction

The Centers for Medicare & Medicaid Services (CMS), through its Center for Medicare & Medicaid Innovation (CMMI) is tasked with testing innovative health care payment and service delivery models that have the potential to improve health care in accord with the aims of the three overarching aims of the Patient Protection and Affordable Care Act of 2010 (ACA): *smarter spending, better care, and healthier people*. To implement this directive, CMMI established in 2012 the Community Resource Planning, Prevention, and Monitoring Models (Community Resource) of the Health Care Innovation Awards (HCIA). This initiative funds innovations that have the potential to drive system transformation and deliver better outcomes for Medicare, Medicaid, and Children's Health Insurance Program (CHIP) beneficiaries, have promising models for health care workforce development, and have models that can be rapidly deployed or scaled to new populations.

CMMI seeks to better understand those models that can be replicated on a broader scale, in multiple types of settings, and to address health care issues for the overall population and for specific subgroups (e.g., underserved, low-income populations). To meet these objectives, CMMI contracted with RTI International to conduct a rapid-cycle evaluation the HCIA Community Resource awardees to assess the impact of the innovations on health care spending, utilization, and health outcomes on a quarterly and annual basis. RTI's approach to the evaluation of this complex set of interventions is to use multiple sources of data to integrate and synthesize findings across programs. This approach incorporates qualitative and quantitative data to assess outcomes at the system, organizational, program, and participant (or patient) levels and to address the following evaluation questions.

HCIA Overarching Evaluation Questions

- To what extent have HCIA Community Resource awardee interventions affected each goal of the ACA: smarter spending, better care, healthier people?
- What are the workforce issues of each awardee and across similar awardees?
- What is the implementation effectiveness of each intervention and across similar interventions?

This section presents an overview of the awardees included in our evaluation, the data and methods used to conduct the evaluation, and the evaluation's challenges and limitations.

1.1 Overview of HCIA Community Resource Awardees

The HCIA Community Resource awardees include 24 diverse organizations funded for a total of $162,622,080 over a 3-year period (July 2012–June 2015). Diversity is a defining feature of the HCIA Community Resource awardees, both in the type of organizations represented and the type and scale of their interventions. Details on the 24 awardees are provided in ***Table 1-1***. HCIA Community Resource awardees include several federally qualified health centers (FQHC; n= 5), academic institutions (n=3), health plans (n=2), integrated health systems (n=2), hospitals (n=2), and an emergency services provider (n=1). Awards range from $1,270,845 (Ben Archer Health Center) to $14,991,005 (Mary's Center for Maternal and Child Care). The mean award across all 24 awardees is $6,743,861 and the median is

$5,919,916. Participants in the innovation include persons of all ages from newborns to the elderly. A few innovations target specific ethnic populations such as Hispanics, Asians, and Native Americans.

Table 1-1. Summary of HCIA Community Resource Awardees

Awardee	State	Funding Amount	Organization Type	Participants
Altarum Institute (Altarum)	MI	$8,366,178	Research organization	Provider-level innovation
Asian Americans for Community Involvement (AACI)	CA	$2,684,545	Community health center/ FQHC	Asian or Hispanic Medicare beneficiaries
Ben Archer Health Center (BAHC)	NM	$1,270,845	Community health center/ FQHC	Residents in Dona Ana County, NM, with specific chronic diseases
Bronx Regional Health Information Organization (Bronx RHIO)	NY	$12,689,157	Regional health information organization	Patients in the RHIO who consented to share information
Children's Hospital and Health System (Children's Hospital)	WI	$2,796,255	Health plan	Members of the Medicaid HMO who have 2 or more ED visits in past 6 months
Curators of the University of Missouri (Curators)	MO	$13,265,444	Integrated health system	Adults with a PCP in their system
Delta Dental Plan of South Dakota (Delta Dental)	SD	$3,364,528	Health plan	South Dakota American Indian children for dental care (≤9 years)
Eau Claire Cooperative Health Centers (ECCHC)	SC	$2,330,000	Community health center/ FQHC	Residents of zip code 29203 with a chronic disease
Finity Communications (Finity)	PA	$4,967,962	Health technology solution	Medicaid beneficiaries in the Philadelphia area
Imaging Advantage (IA)	IL	$5,977,805	Health technology solution	Provider-level innovation (126 ED providers)
Intermountain Health Care Services, Inc. (Intermountain)	UT	$9,724,142	Integrated health system	Provider-level innovation (83 practices)
Mary's Center for Maternal & Child Care (Mary's Center)	DC	$14,991,005	Community health center/ FQHC	Medicaid FFS who are high cost/ high users of the health system
Michigan Public Health Institute (MPHI)	MI	$14,145,784	Public health institute	Patients age 18+ eligible or enrolled in Medicare/ Medicaid with 2+ chronic conditions living in select counties in Michigan
Mineral Regional Health Center (Mineral Regional)	MT	$10,499,889	Hospital collaborative	Providers at 25 critical access hospitals
National Health Care for the Homeless Council (NHCHC)	Multi	$2,681,877	National nonprofit organization	Homeless high users of EDs living in 1 of 11 participating cities

(continued)

Table 1-1. Summary of HCIA Community Resource Awardees (continued)

Awardee	State	Funding Amount	Organization Type	Participants
Northeastern University (NEU)	MA	$8,000,002	Academic/ university	11 health systems
Prosser Public Hospital District (Prosser)	WA	$1,470,017	Critical access hospital	Patients with high medical system usage or a specific health condition
Regional Emergency Medical Services Authority (REMSA)	NV	$10,824,025	Emergency medical services provider	Patients who are at high risk for readmission, users of emergency services located in Washoe County
South County Community Health Center (South County)	CA	$7,060,843	Community health center/ FQHC	Current patients covered by Health Plan of San Mateo insurance plan
Southeast Mental Health Services (SEMHS)	CO	$1,405,924	Mental health/ substance abuse provider	Residents of Prowers County, CO
University of Chicago (U-Chicago)	IL	$5,862,027	Academic/ university	Residents of Chicago's South Side who are patients of participating community health center
University of Miami (U-Miami)	FL	$4,097,198	Academic/ university	Students in schools with school-based health centers
Women and Infants Hospital of Rhode Island (W&I)	RI	$3,261,494	Acute care hospital	Infants who spend at least 5 days in the neonatal intensive care unit
YMCA of the USA (Y-USA)	Multi	$11,885,134	National nonprofit organization	Medicare beneficiaries with prediabetes in a focus community

ED = emergency department; FFS = fee for service; FQHC = federally qualified health center; HCIA = Health Care Innovation Award; HMO = health management organization; PCP = primary care provider.

1.1.1 Innovation Components

In the first year of the HCIA Community Resource evaluation, we examined the components of each awardee's innovation through an extensive review of awardee documents and qualitative data collected during site visits. We applied a taxonomy shown in ***Table 1-2*** to characterize the components of the innovation and to promote the consistent use of terminology across HCIA evaluations. However, summarizing these components was challenging because the innovations are diverse, have multiple parts that vary in complexity, and may be embedded in programs or initiatives that predate HCIA or operate concurrently with other funding.

Table 1-2. Summary of HCIA Community Resource Awardees' Innovation Components

Awardee	Component Type						
	Care Coordination	Process of Care	Health IT	Decision Support	Provider Payment Reform	Direct Health/ Dental Care	Healthcare Workforce
Altarum Institute (Altarum)	—	✓	✓	✓	—	—	—
Asian Americans for Community Involvement (AACI)	✓	—	—	—	—	—	✓
Ben Archer Health Center (BAHC)	✓	—	—	—	—	—	—
Bronx Regional Health Information Organization (Bronx RHIO)	—	—	✓	—	—	—	✓
Children's Hospital and Health System (Children's Hospital)	✓	—	—	—	—	—	—
Curators of the University of Missouri (Curators)	✓	—	✓	✓	—	—	—
Delta Dental Plan of South Dakota (Delta Dental)	✓	—	—	—	—	✓	—
Eau Claire Cooperative Health Centers (ECCHC)	✓	—	—	—	—	✓	—
Finity Communications (Finity)	✓	—	✓	✓	—	—	—
Imaging Advantage (IA)	—	✓	✓	✓	—	—	—
Intermountain Health Care Services, Inc. (Intermountain)	—	—	✓	✓	✓	—	—
Mary's Center for Maternal & Child Care (Mary's Center)	✓	—	✓	—	✓	—	—
Michigan Public Health Institute (MPHI)	✓	—	—	—	✓	✓	✓
Mineral Regional Health Center (Mineral Regional)	—	✓	✓	—	✓	—	✓
National Health Care for the Homeless Council (NHCHC)	✓	—	—	—	—	✓	—
Northeastern University (NEU)	—	✓	—	—	—	—	✓
Prosser Public Hospital District (Prosser)	✓	—	—	—	—	—	—
Regional Emergency Medical Services Authority (REMSA)	✓	✓	—	✓	—	—	—
South County Community Health Center (South County)	✓	✓	—	—	—	✓	✓
Southeast Mental Health Services (SEMHS)	✓	—	—	—	—	—	✓
University of Chicago (U-Chicago)	✓	—	✓	✓	—	—	—
University of Miami (U-Miami)	✓	—	✓	—	✓	✓	—
Women and Infants Hospital of Rhode Island (W&I)	✓	—	—	—	—	—	—
YMCA of the USA (Y-USA)	✓	—	—	—	—	—	✓
Total	18	6	10	6	5	6	7

Source: 2014 & 2015 Site Visits, *Q8-Q10 Narrative Progress Report*.
— Not applicable.

Using a taxonomy developed for the HCIA evaluation, we can summarize the components of the innovations as follows:

- **Coordination of care**: More than two-thirds of awardees (18) have components designed to improve the coordination of care largely through community health workers (CHWs) or patient navigators to provide patients with personalized education, coaching, referrals, and follow-up needed to achieve health care goals. Two awardees seek to link patients from vulnerable populations to a medical home to achieve care coordination.

- **Process of care**: Six innovations change the workflow and processes of care to increase efficiency, reduce waste and duplication, or improve safety.

- **Health information technology:** Nearly half (10) of awardees facilitate the exchange of information among providers and organizations, enhance provider or patient decision making, or support data analytics as part of population management through health information technology (HIT). Examples of HIT include: electronic health records, electronic health information exchange among hospitals and providers within a network or region.

- **Provider payment reform.** Five of the innovations are piloting new payment models to improve the efficiency and quality of health care and make components of the innovation, such as CHWs, self-sustaining.

- **Direct health care/dental care** Six innovations provide health care or dental services in combination with care coordination or as a stand-alone intervention

- **Decision support**: Six awardees use to provide person-specific information, intelligently filtered and presented at appropriate times, to enhance health care decision making by patients or providers. Information is presented with contextually relevant information in tools-paper, electronic 'decision aids' or computerized alerts.

- **Health care workforce**: Seven awardees have innovations that train and develop new kinds of health care workers: CHWs data analysts, quality improvement specialists, and health systems engineers.

Although some commonalities exist across many HCIA Community Resource awardees (e.g., care coordination, HIT), their dissimilarities are much more evident. Few innovations target similar enough populations for outcomes to be comparable across awardees. Also, few awardees focus on the same health conditions (e.g., asthma, diabetes) or types of patients (e.g., Medicaid beneficiaries, infants). These innovations will likely affect different health outcomes (e.g., adults with diabetes or children with asthma), making it difficult to present findings across all awardees or even subsets of awardees.

1.1.2 Participant Characteristics

Like the diverse innovation components, HCIA Community Resource awardees address the needs of a diverse mix of participants. Only two awardees focus on enrolling participants from specific racial or ethnic groups: Native Americans (Delta Dental) and Asians and Hispanics (AACI). Nearly all awardees enroll participants covered by Medicaid (22) and Medicare (21). Three awardees target children—for high emergency department (ED) use (Children's Hospital), dental care (Delta Dental), or all disease conditions (U-Miami)—and one targets infants and their families (W&I). Eleven awardees deliver

innovations at multiple locations that serve populations with similar characteristics, and five focus on providing services to local residents in rural or frontier regions (BAHC, Delta Dental, Mineral Regional, Prosser, SEMHS). In terms of medical history, some awardees focus on reducing ED visits among frequent users (Children's Hospital, MPHI, NHCHC, Prosser), or on those with chronic conditions (BAHC, Delta Dental, Finity, Mary's Center, SEMHS), or other specific health-related criteria (i.e., pregnant women, newborns in neonatal intensive care units, prediabetes patients). More specific details about participants are presented in the individual awardee report sections.

1.2 Overview of Evaluation Design

This HCIA evaluation includes individual evaluations of each awardee's innovation and a cross-cutting evaluation that synthesizes to the extent possible findings across the 24 awardees. We use multiple qualitative and quantitative data sources to compile detailed information for each awardee to assess the impact of each individual innovation on the key outcomes of patient spending, hospitalizations, readmissions, ED visits and health status.

An evaluation framework ***(Appendix A)***, described in detail in the first annual report, operationally defines the relationship between the activities of the innovation and HCIA outcomes accounting for the context and the effectiveness of implementation. The framework serves as a tool to identify, prioritize, and refine over time the methods and measures for the evaluation.

1.2.1 Data Sources and Methods

The findings presented in the second annual report draw from four key sources: awardee documents, key informant interviews, provider survey, claims data, and awardee secondary data. We describe these sources in ***Table 1-3.***

Table 1-3. Data Sources for the HCIA Community Resource Evaluation

Data Source	Brief Description and Use in the Evaluation
Quarterly Awardee Performance Report	An extensive inventory of categorical and numerical data that awardees submit quarterly; includes organizational characteristics (e.g., services provided, location of innovation, number of clinical sites), direct and indirect expenditures, staffing, training, and program participant characteristics
Awardee Narrative Progress Report	The progress report summarizes the past quarter's activities; describes the project's accomplishments, lessons learned to date, and planned activities; and presents the results of self-monitoring.
Claims Data	The information that providers submit to CMS when a claim is submitted for payment will be obtained from CMS' Chronic Conditions Data Warehouse for both Medicare and Medicaid covered beneficiaries. Claims data include payer type, diagnosis and procedure codes, payment amounts, and health care utilization.
Awardee-Specific Data	Data maintained by the awardee that track the client's health care utilization, health status, services received through the innovation, and client characteristics; these may be administrative or case management systems developed by the awardee, and may also include an electronic medical record.
Interview Data	Qualitative data were collected during virtual site visits and closeout interviews with key project leaders in the 11th and 12 quarters of awardee operations. The interviews were follow-ups to site visits conducted a year earlier and covered topics such as: partnerships, organizational capacity, implementation processes and effectiveness, workforce development.
Provider Survey	Survey of physicians from a subset of HCIA awardees affected by the innovation either directly through a new tool or process. Survey topics measure the changes in practice, workflow, and burden resulting from the innovation, and barriers to adoption.

CMMI = Center for Medicare and & Medication Innovation; ED = emergency department; Q = quarter.

1.2.2 Evaluation Measures

Collectively, CMMI programs are anticipated to slow the increase in health care spending and lead to better care and healthier people. We collect and present four core common measures for awardees so that the collective impact of the awards can be assessed on these aims. In addition, to assess the impact of each individual innovation, we collect, construct, and analyze measures from other awardee-specific data.

Core Measures from Medicare and Medicaid Claims

The measures calculated through analysis of Medicare and Medicaid fee-for-service claims using definitions specified by CMMI include:

- total health care spending per patient,
- all cause hospital admissions,
- hospital unplanned readmissions, and
- ED visits not leading to a hospitalization.

As described in individual awardee sections, some innovations (e.g., dental care for children) may not directly target these measures. Other awardees' innovations target specific conditions (e.g., imaging,

diabetes, etc.) and may have significant impacts on spending, admissions, readmissions, and ED visits for the targeted conditions but may not have a statistically detectable impact on the measures at the aggregate level because the targeted conditions represent only a small fraction of total spending, inpatient admissions, hospital unplanned readmissions, and ED visits.

Awardee-Specific Health Outcomes

In addition to Medicare and/or Medicaid claims, RTI collects and analyzes administrative or utilization data that awardees use as part of their self-monitoring plan. These data (hereafter labeled as "other awardee-specific data" reflecting the variability of the types of data elements available across awardees) are abstracted from electronic health records or administrative databases. These are patient-level data of clinical effectiveness (e.g., adherence to standards of care) or health outcomes of specific disease conditions.

All awardees specified clinical effectiveness and/or health outcome measures in their self-monitoring plan as a requirement of their award; however, only a subset provided RTI with data that could be analyzed for this report or the evaluation overall. These issues are discussed in more detail in the individual awardee sections. As shown in ***Table 1-4,*** this report presents outcomes for 17 awardees with one or more measures related to diabetes, hypertension, asthma, weight control or mental health. The most commonly reported measures are for diabetes (11) and hypertension (10). Smaller subsets of awardees have measures related to asthma (5), weight control (5), and mental health (3).

Table 1-4. Awardee-Specific Measures of Clinical Effectiveness and Health Outcomes Presented in the Second Annual Report

Awardee	Diabetes	Hypertension	Asthma Control	Weight Control	Mental Health
BAHC	•	•	•	—	—
Bronx RHIO	•	—	—	—	—
Children's Hospital	—	—	•	—	—
Curators	•	•	•	—	—
ECCHC	•	•	—	•	•
Intermountain	•	•	—	•	•
Mary's Center	•	•	•	—	—
MPHI	•	•	—	•	—
NHCHC	•	•	•	—	•
South County	•	•	—	—	—
U-Chicago	•	•	—	•	—
Y-USA	•	•	—	•	—

— Data not available.

1.3 Data Availability

To construct the described claims-based measures, RTI had to be able to access patient identifiers for people served by each awardee. We secured identifiers for 23 of the 24 awardees and present their linked claims-based measures in this second annual report. Currently, complete Medicare claims, with a 6 month run out period, are available through the end of 2014. We present Medicare claims findings for 17 awardees and regression findings for 14 awardees that provided patient identifiers we could use and match with existing data in the Chronic Conditions Data Warehouse *and* that also provided a sample of at least 20 beneficiaries for descriptive analyses and 100 beneficiaries for regression analyses. Availability of Medicaid claims varies by the state where awardees are located. The most recent data available are through fourth quarter 2013 in the Alpha-MAX system, although some states have data that is less recent. In addition to the Alpha-MAX system, four awardees submitted their own Medicaid claims data. In total, we present Medicaid claims findings for 12 awardees who met the same criteria for descriptive analyses (patient identifiers and a sample of 20 beneficiaries or more) and five who met the criteria for regression analyses (patient identifiers and a sample of 100 beneficiaries or more).

RTI requires awardee-specific data to assess the demographic characteristics of the patients exposed to the innovation. In addition, awardee-specific data are used not only to evaluate the clinical effectiveness and health outcomes described above, but also to assess the total number of persons reached by the innovation relative to those targeted (reach) and where appropriate the number and frequency of services provided to participants (dose). Obtaining these data has been challenging as discussed in the next section, but we worked closely with awardees throughout the second year of the evaluation to ensure we had some patient–level data for nearly all the innovations. The only exception was Mineral Regional, whose innovation is system improvement and has no feasible means to acquire patient-level data or patient identifiers.

1.4 Data Challenges and Limitations

The data for this evaluation presented a number of challenges that are important to explain. First, awardees vary in their level of experience with data and capacity to meet our data requests. In an effort to reduce the burden to awardees, we accepted data in various file formats including portable document format (PDF) that cannot be directly manipulated or transformed. Even with relatively experienced awardees, we encountered delays in receiving data. Second, awardees send RTI data files with patient identifiers that may contain the following inconsistencies:

- Some awardees provided only Medicare or Medicaid identifiers (e.g., no names, dates of birth, gender, etc.) and we had no other data with which to link the identifiers.
- Some awardees provided only patient identification numbers without payer type, so we assumed that the identified matches correspond with the matched identifiers (e.g., Medicare or Medicaid). However, it is possible that a privately insured individual could have the same identifier as a Medicare ID, though highly unlikely.

- Some awardees sent data that were not readily usable or did not match claims data. Such issues included: identifiers with only 8 digits (9 are expected), data points that correspond to an observation rather than a patient, missing data, or otherwise unusable identifiers. We worked with the awardees to obtain the proper identifiers in these instances.

Third, the number of individuals that awardees reported as enrolled in the *Quarterly Performance Progress Report* often do not match the number of patient identifiers provided to RTI. The primary reason for this discrepancy is that awardees may report their eligible or target population as direct or indirect participants. For the purposes of assessing reach and dose, however, we distinguish between those eligible for the innovation from those who actually receive it.

In assessing the evidence for the value and impact of the innovation, we consider in our evaluation of each awardee the following:

1. the degree to which the innovation is designed to *directly* impact the measures and outcomes reported;
2. whether the innovation has achieved sufficient reach and dose to achieve an effect;
3. whether the data are sufficiently robust to demonstrate an effect (e.g., sample size); and
4. whether the data are representative of the participants and the services/treatment provided.

Any specific limitations related to these four considerations or any given data source are explained in the individual awardee sections

1.5 Overview of the Report

The remainder of this report is organized into two chapters. Section 2 presents a cross-awardee analysis of the claims and awardee-specific data, qualitative data as well as the findings of our Qualitative Comparative Analysis (QCA), and provider survey. Section 3 includes the individual awardee reports summarizing progress and results to date based on the all key sources of data described above. To ease the readability of the report, highly technical discussions regarding the methods of data collection and analysis are provided in separate appendices.

Section 2
Cross-Awardee Findings

The goal of the cross-awardee or group-level quantitative and qualitative analyses is to combine similar quantitative and qualitative data to assess overall trends across the 24 HCIA Community Resource awardees. The results presented in this section are based mostly on claims and performance reporting data obtained through December 2014, awardee secondary data obtained through March 2015, and key informant data obtained through June, 2015.

Section 2.1 provides an overview of cross-awardee spending and utilization results from the claims analysis. ***Section 2.2*** presents a descriptive analysis of the clinical effectiveness measures and health outcomes for selected chronic conditions. The results of a provider survey conducted with 10 awardees are presented in ***Section 2.3***. Assessments of implementation progress, implementation effectiveness (reach and dose), and models of implementation effectiveness are presented in ***Sections 2.4*** to ***2.6***. This chapter ends with our overarching conclusions in ***Section 2.7***.

2.1 Spending and Utilization

The goal of the cross-site spending and utilization analysis is to document similar quantitative data across sites to assess overall trends. For this annual report, we report multivariate regression analysis results derived from Medicare and Medicaid claims data for specific awardees. The inclusion of an awardee (or its sites) in these analyses is predicated on the awardee having an adequate sample size as well as a comparison group. In this section, we provide an overall update on the status of the awardees and any impacts of the innovations on spending, inpatient admission rates, and emergency department (ED) visit rates. We present Medicare claims data through December 31, 2014.

2.1.1 Status of Claims Data

RTI focused on two general sources of claims data for each awardee: Medicare or Medicaid claims data (as relevant to each innovation). This section describes the status of the key data as well as the new comparison groups that were implemented in this quarterly report.

Claims Data Analysis

Accessing Patient Information

Access to patient or provider identifying information is a necessary and critical step in creating usable secondary data analytic files. Without this information, we have no way to identify—and therefore analyze—care provided under intervention sites. RTI received identifiers from 23 awardees as of December 31, 2014. NHCHC was not required to provide patient identifiers. Eight awardees and/or their affiliates (Finity and Finity Health Partners; Intermountain; MPHI; NEU-Cambridge Health Alliance; REMSA; SEMHS (Integrated Community Health Partners); and U-Chicago) required business associate agreements, and Y-USA required a data use agreement. We will continue to request updated patient identifiers from the awardees throughout their innovation period.

Claims Data Summary

Most innovation sites focus on both Medicare and Medicaid beneficiaries. However, some sites, such as Delta Dental and Finity, focus only on Medicaid, and others (Intermountain, Y-USA) focus exclusively on Medicare beneficiaries. We matched patient identifiers with claims eligibility files for all eligible awardees with Medicare beneficiaries (17) and all awardees with available Medicaid data (12).

In this report, we analyze Medicare claims through December 31, 2014. In selecting this cutoff, we assume that nearly all claims were submitted and processed within 6 months after services were provided. For this report, we perform descriptive Medicare analyses for the 17 eligible awardees: Altarum, AACI, BAHC, Bronx RHIO, Curators, ECCHC, IA, Intermountain, MPHI, Mineral Regional, NEU, Prosser, REMSA, South County, SEMHS, U-Chicago, and Y-USA.

Availability of Medicaid claims in the Chronic Conditions Data Warehouse depends on when a state submits its Alpha-MAX files. As shown in ***Table 2.1-1***, the availability of Alpha-MAX data varies widely among awardees depending upon the state in which they operate. Timing and acceptance of state submission of Medicaid data are complex issues largely beyond the control of the individual sites. Since timing and availability of Medicaid data are also beyond RTI's control, we are inherently limited in our analyses by the data available in the Chronic Conditions Data Warehouse. The lack of availability of up-to-date Alpha-MAX data slowed analysis of Medicaid claims, although many awardees' innovations target Medicaid beneficiaries. In a few cases where Alpha-MAX data were not available, awardees provided Medicaid claims data directly to RTI. These data overcome the availability challenge, but lack the detail and uniformity of Alpha-MAX data. For this report, we were able to perform descriptive Medicaid analyses for 12 awardees: BAHC, Children's Hospital, Curators, Delta Dental, Finity, IA, Mary's Center, MPHI, Mineral Regional, Prosser, SEMHS, and U-Chicago.

We calculate all four priority measures for the awardees that provided patient or provider identifiers: spending per patient, all-cause admissions, unplanned readmissions, and ED visit rates. RTI relies on utilization and payment data from claims data for Medicare and Medicaid beneficiaries to independently calculate these rates.

Table 2.1-1. Payer Shares for Program Participants: Up to Q11

Awardee	Number of Unique Patients in Data File Received	Percentage of Participants Insured by Medicare[1]	Percentage of Participants Insured by Medicaid[1]	Number of Unique Patients in Medicare Claims Analysis for AR2	Number of Unique Patients in Medicaid Claims Analyses for AR2	Medicaid Data in Alpha-MAX
Altarum	N/A-NPIs	—	—	25,250[2]	—	13Q3
AACI	2,837	28.4	41.1	492	—	12Q3
BAHC	601	64.3	29.0	160	52	13Q2
Bronx RHIO	22,999	34.4	21.3	5,793	—	13Q4
Children's Hospital	30,561	0.0	100.0	N/A	514	12Q1
Curators	9,932	72.2	18.1	6,551	2,589	13Q3
Delta Dental	7,319	0.0	73.5	N/A	736	13Q2
ECCHC	1,468	2.8	20.7	68	—	12Q3
Finity	12,497	0.0	100.0	N/A	3,521	13Q3
IA	115,082	—	—	4,116[2]	2,030[2]	13Q3
Intermountain	219,464	99.4	0.6	12,252	—	12Q1
Mary's Center	2,585	2.0	79.2	N/A	2,419	11Q3
MPHI	9,580	28.8	44.6	1,625	132	13Q3
Mineral Regional	N/A-NPIs	—	—	13,578[2]	13,851[2]	13Q2
NHCHC	N/A	—	—	N/A	N/A	N/A
NEU	14,153	7.4	58.0	1,119	—	11Q3
Prosser	1,308	31.1	29.5	157	56	13Q4
REMSA	16,501	0.1	0.1	209	—	13Q1
SEMHS	596	6.2	85.6	33	121	12Q2
South County	6,180	4.3	84.9	49	—	12Q3

(continued)

Table 2.1-1. Payer Shares for Program Participants: Up to Q11 (continued)

Awardee	Number of Unique Patients in Data File Received	Percentage of Participants Insured by Medicare[1]	Percentage of Participants Insured by Medicaid[1]	Number of Unique Patients in Medicare Claims Analysis for AR2	Number of Unique Patients in Medicaid Claims Analyses for AR2	Medicaid Data in Alpha-MAX
U-Chicago	59,069	10.1	45.7	7,105	2,419	13Q3
U-Miami	9,267	3.2	55.1	N/A	—	11Q5
W&I	1,251	0.0	53.7	N/A	—	11Q7
Y-USA	5,696	100.0	0.0	1,679	N/A	N/A

[1] As reported in patient identifiers uploaded by the awardees.
[2] Number of patients is derived from provider identifiers.
— Data not available.
N/A = not applicable; NPI = National Provider Identifier; Q = quarter.
Notes:
Percentage of participants insured by Medicare includes those beneficiaries identified by the site as being covered by Medicare fee-for-service or both Medicare and Medicaid.
Percentage of participants insured by Medicaid only includes those beneficiaries identified by the site as being covered by Medicaid alone (does not include Medicare/Medicaid (e.g., dual eligible beneficiaries) to avoid double counting).
The percentage of participants insured by Medicaid and Medicare will not add up to 100 percent in those cases where the innovation site submitted identifiers for beneficiaries who are covered by commercial or another type of insurance, including uninsured.

2.1.2 Strategy for Comparison Groups and Regression Analyses

Details on the comparison groups for all awardees are described in the individual awardee sections. Sixteen Medicare and 11 Medicaid comparison groups are presented in this annual report and are summarized in ***Appendix B.2***. We also present multivariate regression analyses for 14 Medicare sites and 5 Medicaid sites (Children's Hospital, Curators, Delta Dental, Finity, and MPHI). These sites had at least 100 treatment observations in the innovation period. We will add comparison groups and multivariate regression analyses for other awardees in subsequent reports as the data become available. Appendix B.2 provides a detailed description of the refined comparison group selection process overall and for each awardee who has a comparison group to date.

We constructed relevant comparison groups of Medicare and Medicaid fee-for-service beneficiaries who are similar to the patients in each intervention group but not participating in the innovations. These data were drawn from within-state geographic locations similar to the intervention, and we used propensity score matching, where appropriate, to create a comparison group with similar characteristics to participating beneficiaries, such as age, risk score, and other characteristics relevant to the innovation site. For awardees with direct program participants or with explicit eligibility criteria (e.g., five ED visits in the past 6 months), we identified the type of patient they are targeting, and we used this information to select similar nonparticipating patients for comparison. For awardees serving participants indirectly through providers, we identified similar providers who are not part of the intervention. Descriptive and multivariate regression results on the variables of interest are presented quarterly. In addition, we also present visual depictions of the probability of savings or losses for those sites with comparison groups and at least 100 treatment observations. More details are provided in Appendix B.2.

In the awardee sections of this annual report, we present claims-based descriptive Medicare data for 17 awardees and claims-based descriptive Medicaid data for 12 awardees. This section provides an overview of the multivariate difference-in-differences analyses for 14 Medicare awardees. We also performed regression analyses for five Medicaid sites, presented in the awardee sections. Regressions were not performed if sample size was not adequate or if claims data were not available in the intervention period. Because the sample size of the readmissions measure is limited, we do not present multivariate results of readmissions at this time. All regressions include an indicator variable for the treatment group, an indicator variable for each quarter, and quarterly indicators interacted with the treatment group variable in the post-intervention periods. We control for an array of factors such as age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual-eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The regression specification assumes the same quarterly fixed effect for treatment and comparison individuals in the pre-innovation period and allows for a separate quarterly effect for treatment individuals after enrolling in the innovation. We also present the weighted average treatment effect during the intervention period for beneficiaries enrolled in the awardee-specific innovation compared to their matched comparison group. Full results are presented in the awardee sections.

2.1.3 Claims Data Findings

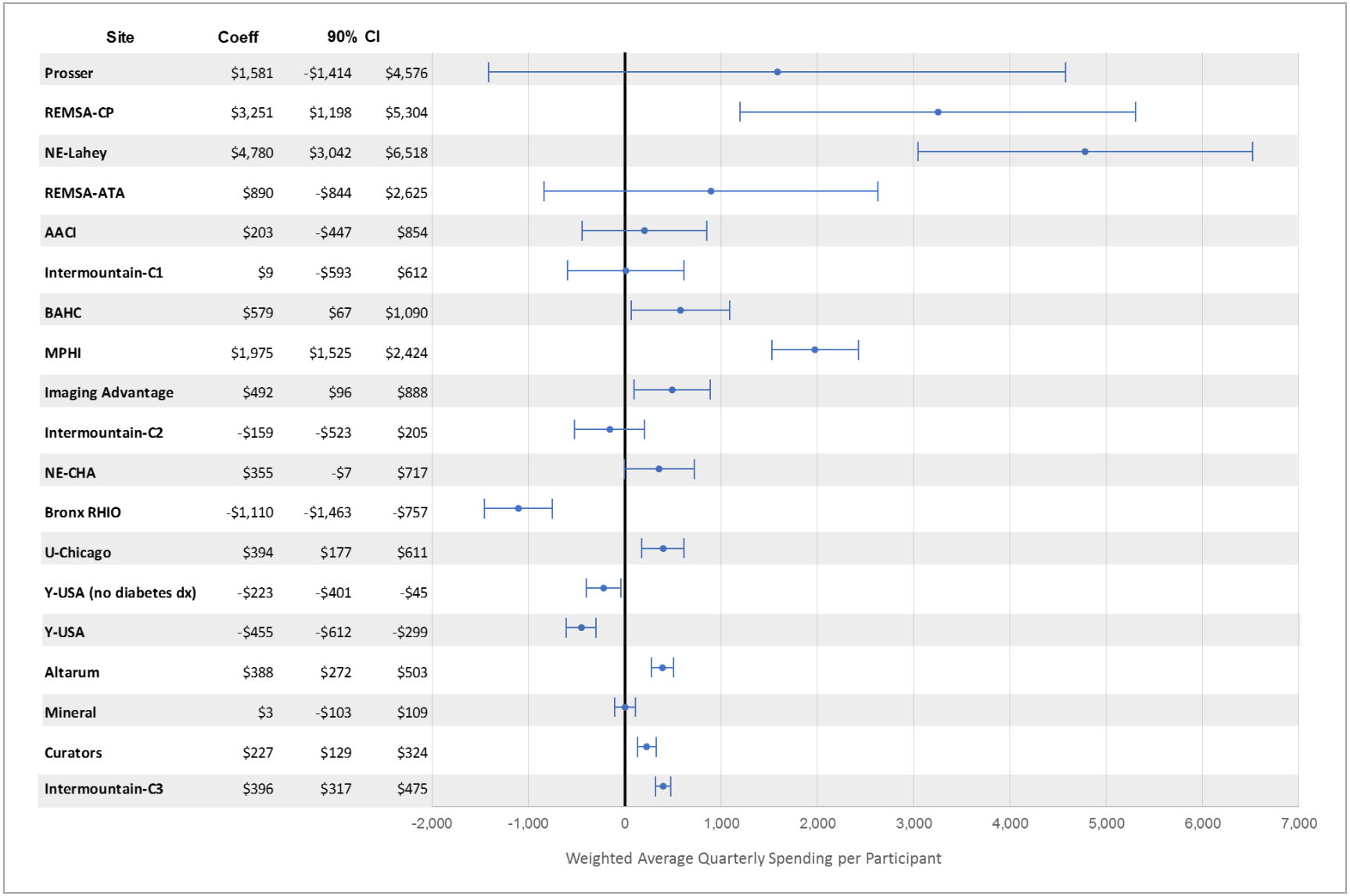
This section provides a high-level summary of the quantitative regression analysis findings across all awardees with Medicare beneficiaries. Only five awardees with Medicaid beneficiaries had regression analyses and these were often for only one or two innovation quarters. We present these results in the awardee-specific sections. The claims-based measures in this report include spending per patient, all-cause admissions, readmissions, and ED visits.

Figure 2.1-1 presents the weighted average spending coefficients in the post-innovation period. The coefficients in Figure 2.1-1 represent the differential spending per quarter in the post-intervention period between individuals enrolled in the innovation and comparison group individuals, on average, weighted by the number of intervention beneficiaries in each quarter. The 90 percent confidence interval, shown by the lines extending from the point estimate, is the range in which the true parameter estimate falls, with 90 percent confidence. In some cases, the range falls outside of the viewable area because of wide confidence intervals. If this range is both greater than and less than 0, we conclude that the innovation did not significantly impact spending. However, if the point estimate and the range are less than 0, we conclude that the innovation yields savings. Finally, if the point estimate and range are greater than 0, we conclude that the innovation yields negative savings or losses.

Two innovations (Bronx RHIO and Y-USA) show statistically significant savings in the intervention period. Nine awardees show statistically significant losses during the intervention period (REMSA-CP, NEU-Lahey, BAHC, MPHI, IA, U-Chicago, Altarum, Curators, and Intermountain-C3). The remainder (3) show neither statistically significant savings nor statistically significant losses. However, the weighted average treatment effect may obscure important changes that are happening over time. For example, many interventions showed large losses in their first innovation quarter. However, this finding is likely due to selection into the innovation based on health care utilization or high levels of utilization subsequent to enrollment, which may be the intended goal of the innovation. Therefore, we also present the quarterly difference-in-differences estimates for several selected awardees in ***Figure 2.1-2***. Quarterly estimates for all awardees are presented in the awardee-specific sections.

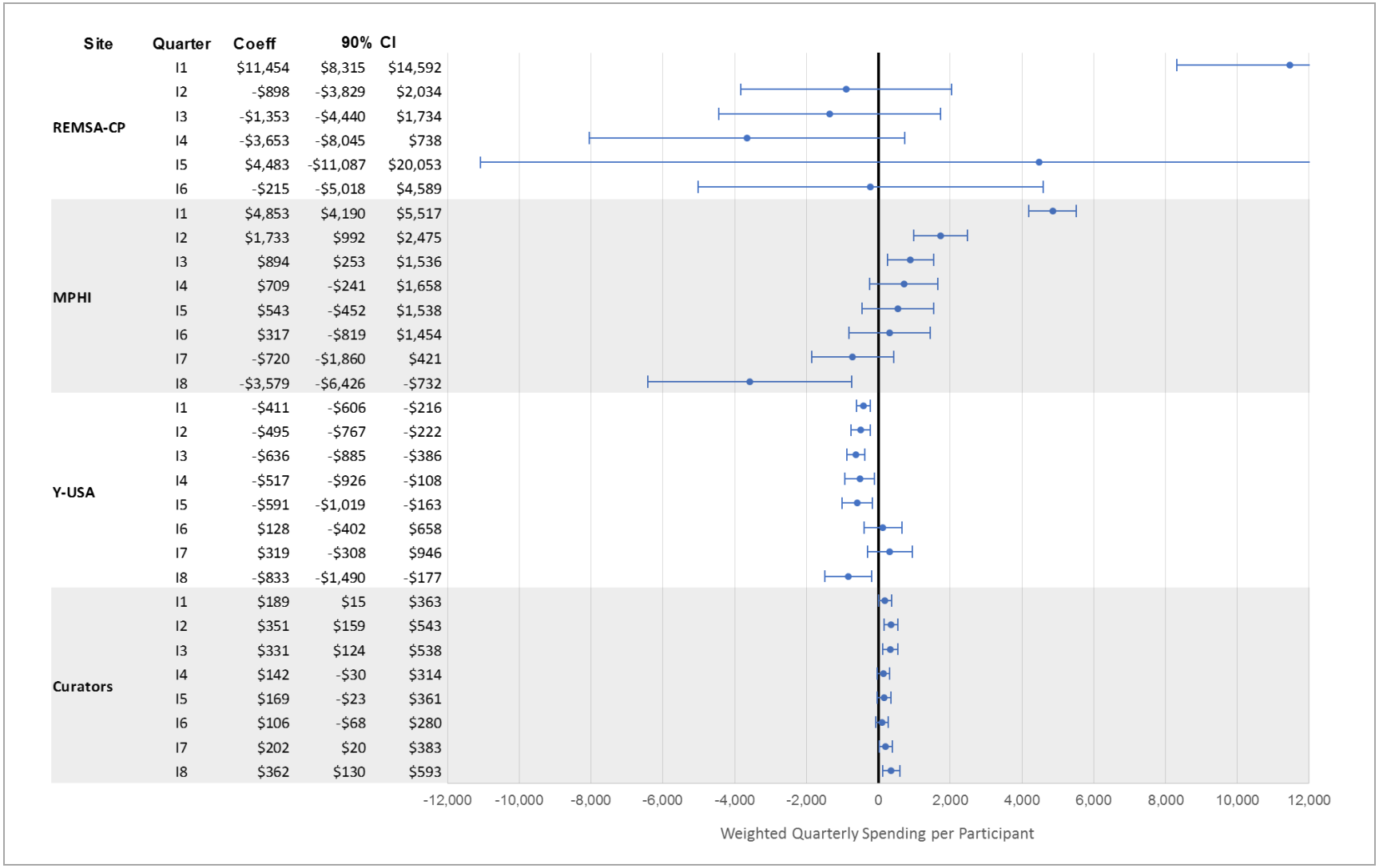
REMSA-CP shows losses in Figure 2.1-1. However, in Figure 2.1-2, one can see that REMSA-CP has both positive and negative results and that REMSA-CP has very wide confidence intervals. The small sample size results in wide confidence intervals and hinders determining if the innovation yielded savings or losses over the intervention period. MPHI shows significant losses in the weighted average treatment effect in Figure 2.1-1, but further examination of the quarterly effects in Figure 2.1-2 reveals a large loss in the first intervention quarter with subsequent progress toward savings, in the final three intervention quarters. The final intervention quarter shows statistically significant savings. MPHI illustrates the importance of examining the quarterly specific effects of the intervention over time. Y-USA shows statistically significant savings in Figure 2.1-1, and examination of the quarterly effects (Figure 2.1-2) shows that the effect of the intervention likely falls after the first five innovation quarters. Additional sample size in the later quarters may reverse this trend in later reports. Finally, Curators consistently demonstrates losses in both the overall estimates (Figure 2.1-1) and the quarterly estimates (Figure 2.1-2). Curators has a very large sample size, which leads to very tight confidence intervals.

Figure 2.1-1. Difference-in-Differences OLS Regression Estimates for Weighted Average Medicare Spending per Participant



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
OLS = ordinary least squares.

Figure 2.1-2. Difference-in-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant for Selected Awardees

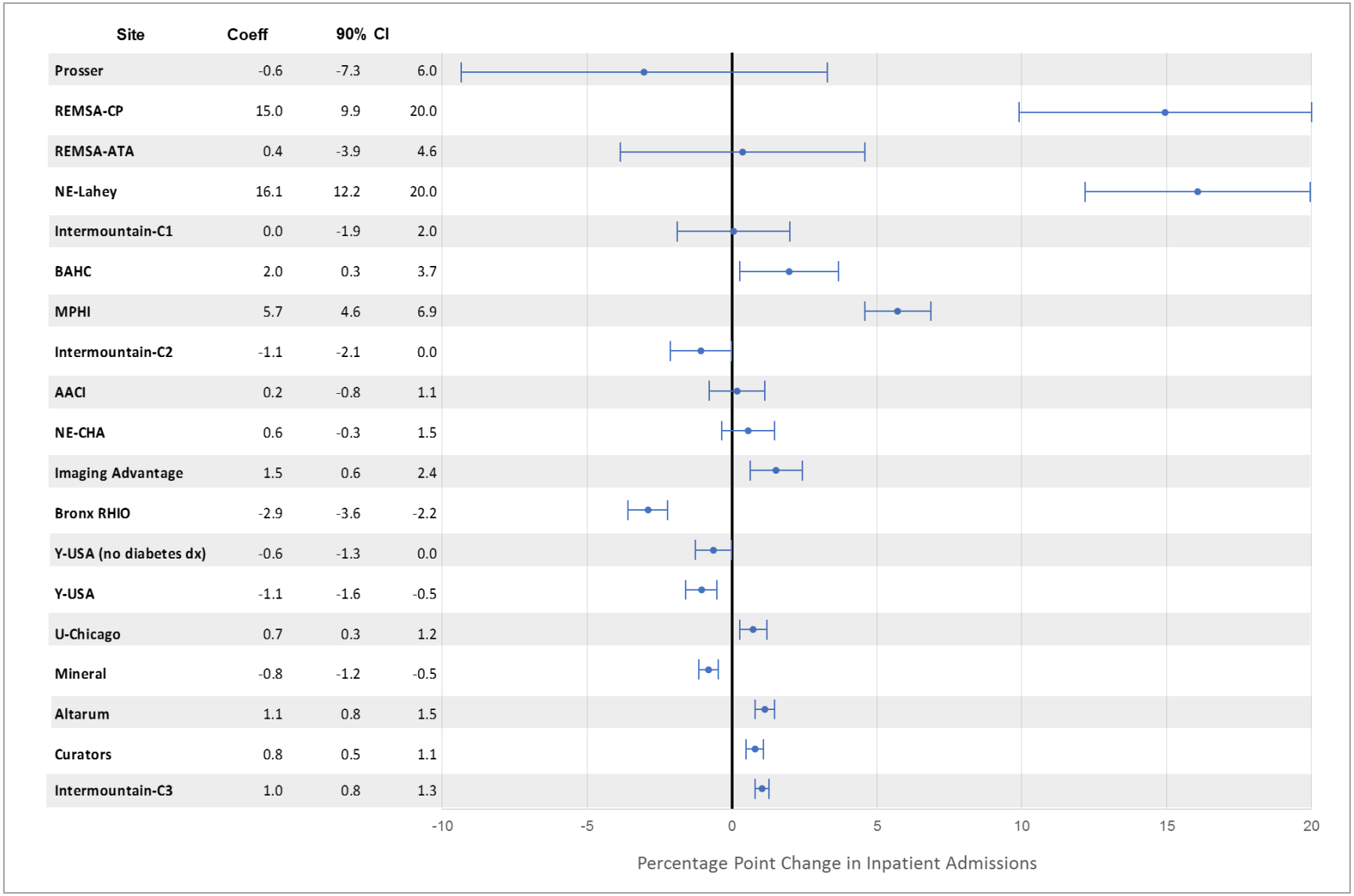


Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
OLS = ordinary least squares.

Figure 2.1-3 presents the findings for the weighted average difference-in-differences estimate for inpatient admissions in the post-innovation period from the linear probability regression models. A positive coefficient indicates a statistically significant increased rate of inpatient hospitalizations compared to the comparison group in the intervention period. A negative coefficient indicates a statistically significant decreased rate of inpatient hospitalizations in the intervention period. A zero coefficient indicates the results are not significant at the 90 percent confidence level.

For inpatient admissions (Figure 2.1-3), the rates of inpatient hospitalization in the intervention period significantly increased for nine awardees (REMSA-CP, NEU-Lahey, BAHC, MPHI, IA, U-Chicago, Altarum, Curators, and Intermountain-C3). The rates of inpatient hospitalization in the intervention period significantly decreased for three awardees (Bronx RHIO, Y-USA, and Mineral Regional). For the remainder (2), we find no significant change.

Figure 2.1-3. Difference-in-Differences Linear Probability Estimates for Weighted Average Inpatient Admissions per Participant

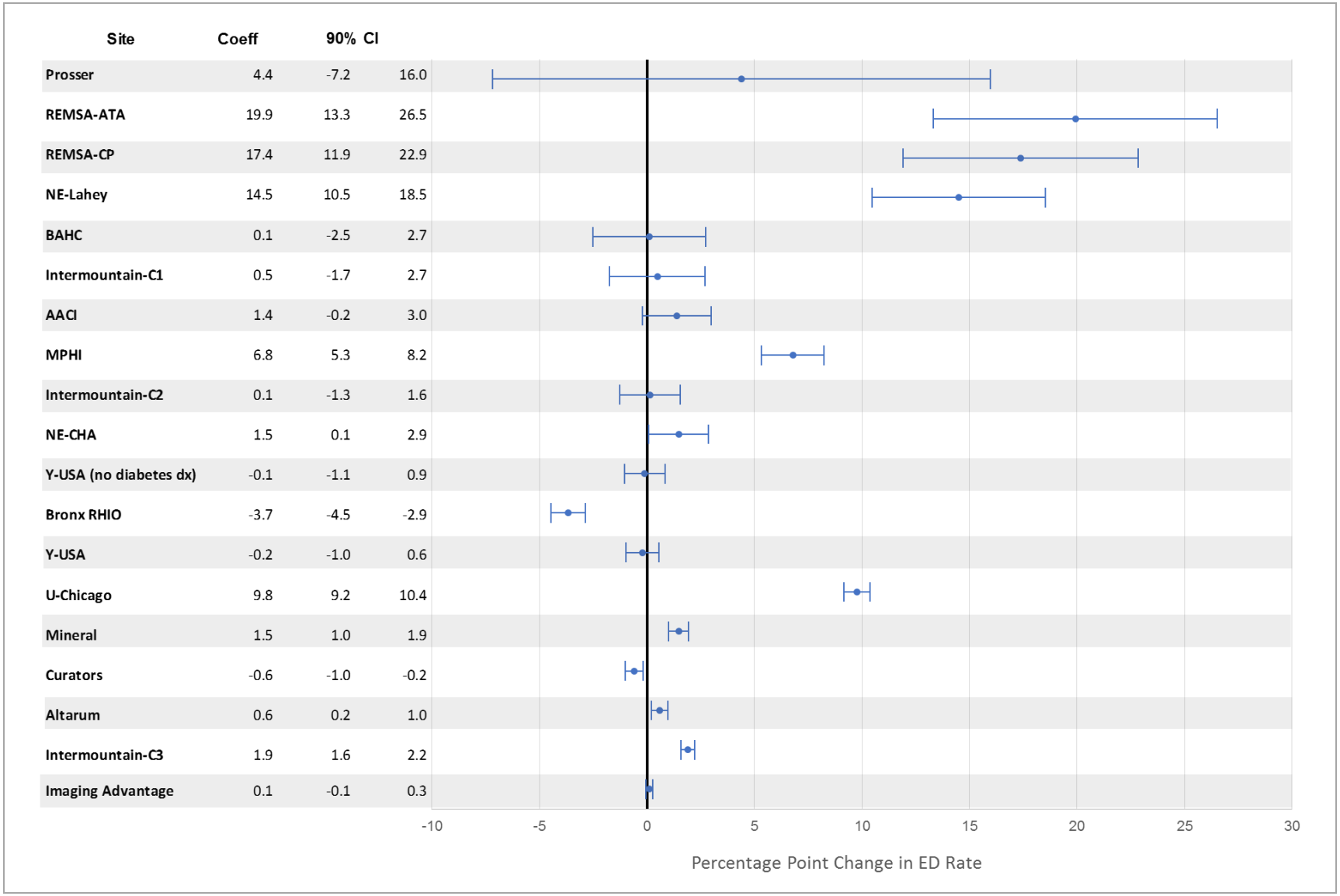


Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims

Figure 2.1-4 presents the findings for the weighted average difference-in-differences estimate for ED visits in the post-innovation period from the linear probability regression models. A positive coefficient indicates a statistically significant increased rate of ED visits compared to the comparison group in the intervention period. A negative coefficient indicates a statistically significant decreased rate of ED visits in the intervention period. A zero coefficient indicates the results are not significant at the 90 percent confidence level.

For ED visits (Figure 2.1-4), the rates of inpatient hospitalization in the intervention period increased significantly for seven awardees (REMSA-ATA, REMSA-CP, NEU-Lahey, MPHI, NEU-CHA, U-Chicago, Mineral Regional, Altarum, and Intermountain-C3). For two awardees the rates of ED visits in the intervention period significantly decreased (Bronx RHIO and Curators). For the remainder (5), we find no significant change.

Figure 2.1-4. Difference-in-Differences Linear Probability Estimates for Weighted Average ED Visits per Participant



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims

The majority of the innovation awardees do not show savings in the innovation period. Additionally, there is limited evidence that the innovations decrease the likelihood of inpatient admissions or ED visits, with several exceptions. These findings may be due to the limited intervention periods, which cover only part of the award period. As we obtain additional data, the sample size of the intervention group in the intervention quarters will increase, due to rolling treatment quarters. These results are preliminary; the additional sample size may change the findings in subsequent reports, and we may further refine the comparison groups for some awardees. Future reports will examine more innovation periods, as data become available, and will examine the impact on spending, inpatient admissions, ED visits, and hospital unplanned readmissions over time.

2.2 Clinical Effectiveness and Health Outcomes

We received patient-level secondary data through Q11 from 23 awardees as of May 31, 2015. We did not receive any usable secondary data through Q11 from REMSA and did not receive any secondary data through Q11 from U-Miami; therefore, we include data through Q10 in this annual report for REMSA and U-Miami. Of those that provided secondary data, we report clinical effectiveness measures for 10 awardees and health or health utilization outcomes for 15 awardees in this annual report. Four awardees that provided secondary data—AACI, IA, NEU, and SEMHS—did not provide the clinical effectiveness or health outcomes data requested (for more details, see individual awardee sections in ***Section 3***). Two awardees, Delta Dental and Mineral Regional, do not collect clinical effectiveness or health outcome data. For additional information on the types of data collected, see ***Appendix B.3***.

Table 2.2-1. Secondary Data through Q11 Received and Reported, by Awardee

Awardee	Received Secondary Data through Q11	Clinical Effectiveness Outcomes Reported	Health Outcomes Reported
Altarum	•	N/A	•
AACI	•	—	—
BAHC	•	•	•
Bronx RHIO	•	N/A	•
Children's Hospital	•	—	N/A
Curators	•	•	•
Delta Dental	•	N/A	N/A
ECCHC	•	•	•
Finity	•	•	•
IA	•	N/A	—
Intermountain	•	•	•
Mary's Center	•	N/A	•
MPHI	•	•	•
Mineral Regional	•	N/A	N/A
NHCHC	•	•	•
NEU	•	—	—
Prosser	•	•	N/A
REMSA	•	N/A	•
South County	•	•	•
SEMHS	•	—	N/A
U-Chicago	•	N/A	•
U-Miami	—	—	—

(continued)

Table 2.2-1. Secondary Data through Q11 Received and Reported, by Awardee (continued)

Awardee	Received Secondary Data through Q11	Clinical Effectiveness Outcomes Reported	Health Outcomes Reported
W&I	•	N/A	•
Y-USA	•	•	•
Total number	23	10	15

N/A = not applicable; Q = quarter.
— Data not available.

The following subsections summarize the clinical effectiveness and health outcome findings reported across awardees, by health focus (i.e., coronary artery disease [CAD], diabetes, hypertension, immunization/vaccination, mental health, and weight control) for all patients enrolled in the innovations, regardless of payer category. Clinical effectiveness measures assess the process of care (e.g., percentage of diabetes patients receiving an HbA1c test) and health outcomes measures represent true clinical outcomes (e.g., reduced HbA1c). More specifically, we include the percentage of all patients, as well as those with diabetes, hypertension, and CAD, who received relevant clinical effectiveness services. This summary also includes the percentages of all patients, as well as those with diabetes, hypertension, and CAD, with desired health outcomes over time, including the percentage point change between the first and last intervention quarter, and the average percentage point change over time.

2.2.1 Clinical Effectiveness

Diabetes

Table 2.2-2 provides the percentage of patients with diabetes who received an HbA1c and lipid profile assessment, foot exam, and eye exam. As shown in the table, a majority of patients with diabetes enrolled in BAHC's and ECCHC's innovations received an HbA1c and lipid profile assessment (78.2% and 85.2%, respectively) and a foot exam (91.1% and 77.7%, respectively). More than half of those with diabetes enrolled in BAHC's innovation also received an eye exam (65.5%). More than half of those enrolled in South County's innovation received a foot exam (66.5%), and a much smaller percentage of Intermountain's and NHCHC's enrollees did so (11.3% and 14.4%, respectively).

Less than one-third of patients with diabetes enrolled in the Intermountain, MPHI, and NHCHC innovations received an HbA1c and lipid profile assessment. MPHI and NHCHC do not provide direct services to the enrollees, while the other awardees provide direct clinical services (i.e., BAHC, ECCHC, Intermountain, and South County), and thus, rely on clinical-based data systems such as electronic health records (EHRs) to capture and report these data. MPHI and NHCHC focus on coordinating the care provided by other entities. The resulting clinical data from these awardees are provided to them via health care entities in their respective communities. Intermountain's patients are part of a practice-based initiative to demonstrate shared savings. Thus, there is less of a focus on chronic condition management than those patients who are eligible for IndiGO (more details provided in awardee report). As more

IndiGO data are available, we will report HbA1c and lipid profile assessments among patients with diabetes as well.

Table 2.2-2. Percentage of Patients with Diabetes Who Received Clinical Services

Awardee	Percentage of Patients with Diabetes who Received an HbA1c and Lipid Profile Assessment	Percentage of Patients with Diabetes who Received a Foot Exam	Percentage of Patients with Diabetes who Received an Eye Exam
BAHC (n=371)	78.2	91.1	65.5
ECCHC (n=243)	85.2	77.7	N/A
Intermountain (n=4,568)	11.3	N/A	N/A
MPHI (1,678)	30.5	N/A	N/A
NHCHC (n=111)	14.4	14.4	N/A
South County (n=475)	N/A	66.5	N/A

Source: Patient-level data provided to RTI by the awardee.

Hypertension

Two awardees provided data on hypertension; rates of patients receiving blood pressure screening varied substantially. The percentage of patients with hypertension who received a blood pressure screening and/or a body mass index (BMI) assessment are provided in ***Table 2.2-3***. Nearly all of ECCHC's patients with hypertension received a blood pressure screening (99.3%) and a BMI assessment (93.9%), and less than half of MPHI's patients with hypertension received a blood pressure screening. Again, ECCHC provides direct care to enrollees whereas MPHI coordinates care provided by other entities.

Table 2.2-3. Percentage of Patients with Hypertension Who Received Clinical Services

Awardee	Percentage of Patients with Hypertension who Received a BP Screening	Percentage of Patients with Hypertension who Received a BMI Assessment
ECCHC (n=482)	99.3	93.9
MPHI (n=2,757)	39.9	N/A

Source: Patient-level data provided to RTI by the awardee.
BMI = body mass index; BP = blood pressure.

Immunization/Vaccination

Two awardees reported secondary data related to immunizations. Rates of immunization varied substantially between the two awardees. ***Table 2.2-4*** provides the percentage of enrolled patients who received an influenza and/or pneumococcal vaccination. As shown in the table, nearly all of BAHC's intensive case management patients received an influenza immunization (92.0%), and more than half received a pneumococcal vaccination (59.4%). Only a small percentage of ECCHC's enrollees received an influenza immunization or pneumococcal vaccination (12.0% and 1.2%, respectively). BAHC's

enrollees need more intensive care and, therefore, would be more likely to require immunization and vaccination compared to ECCHC's enrollees.

Table 2.2-4. Percentage of Patients Who Received Vaccination Clinical Services

Awardee	Percentage of Patients who Received an Influenza Immunization	Percentage of Patients who Received a Pneumococcal Vaccination
BAHC (n=601)	92.0	59.4
ECCHC (n=1,468)	12.0	1.2

Source: Patient-level data provided to RTI by the awardee.

Mental Health

The percentage of enrolled patients who received screening for depression and/or received or remained on appropriate medications for mental illness is provided in ***Table 2.2-5***. As shown in the table, nearly one-third of ECCHC's patients were screened for depression (30.8%). More than 10 percent of NHCHC's enrollees were prescribed appropriate medications for mental illness.

Table 2.2-5. Percentage of Patients Who Received Mental Health Clinical Services

Awardee	Percentage of Patients Screened for Depression	Percentage of Patients who Received Appropriate Mental Illness Medications
ECCHC (n=1,468)	30.8	N/A
NHCHC (n=414)	N/A	11.8

Source: Patient-level data provided to RTI by the awardee.

Weight Control

Five awardees conducted BMI assessments; the overall rate of patients receiving a BMI assessment ranged from 27 to 100 percent. ***Table 2.2-6*** provides the percentage of enrolled patients who received a BMI assessment. Since the innovation was focused on weight control, all of Y-USA's enrollees received a BMI assessment. More than three-quarters of ECCHC's and U-Chicago's patients received a BMI assessment (80.0% and 83.2%, respectively). Less than one-third of Intermountain's enrollees and MPHI's Pathways enrollees received a BMI assessment (i.e., 26.8% and 32.4%, respectively).

Table 2.2-6. Percentage of Patients Who Received Clinical Services

Awardee	Percentage of Patients who Received a BMI Assessment
ECCHC (n=1,468)	80.0
Intermountain (n=31,502)	26.8
MPHI (n=5,778)	32.4
U-Chicago (n=89,273)	83.2
Y-USA (n=5,696)	100.0

Source: Patient-level data provided to RTI by the awardee.
BMI = body mass index.

Summary

Overall, the findings among awardees in which similar clinical effectiveness outcomes are reported in this annual report suggest that many innovations are providing clinical services to enrollees. More specifically, a majority of patients with diabetes enrolled in BAHC's and ECCHC's innovations have received an HbA1c and lipid profile assessment and a foot exam. More than half of those enrolled in South County's innovation have received a foot exam. Among those with hypertension, a majority of ECCHC's patients received a blood pressure screening and a BMI assessment. Nearly all of BAHC's intensive case management patients have received an influenza immunization, and more than half received a pneumococcal vaccination as well. About one-third of ECCHC's patients were screened for depression. At least three-fourths of patients enrolled in ECCHC's, U-Chicago's, and Y-USA's innovations received a BMI assessment.

Based on the data provided to RTI, only a small percentage of patients enrolled in Intermountain's, MPHI's, and NHCHC's innovations received clinical services. More specifically, less than one-third of patients with diabetes enrolled in these innovations received an HbA1c and lipid profile assessment. Less than half of MPHI's patients with hypertension received a blood pressure screening, and less than one-third of Intermountain's and MPHI's patients overall received a BMI assessment.

2.2.2 Health Outcomes

The following subsections include the percentages of all patients, as well as those with diabetes, hypertension, and CAD, with desired health outcomes over time, including the percentage point change between the first and last intervention quarter, and the average percentage point change over time.

Coronary Artery Disease

Table 2.2-7 provides the percentage of patients with CAD with low-density lipoprotein cholesterol (LDL-C) control over time, including the percentage point change between the first and last intervention quarter reported, and the average percentage point change over time. Since the number of quarters of data available varies across awardees, we include the number of quarters of data reported in parentheses after the awardee name. As shown in the table, the percentage point increase in CAD patients with LDL-C control was between approximately 9 and 16, suggesting the innovations improved LDL-C control over time. However, since the denominator drops by at least 50 percent between those two time points, we calculated the average percentage point change over all intervention quarters. As shown in the table, the percentage of patients with LDL-C control decreased on average over time for ECCHC and Intermountain, and increased slightly for Curators. This finding could be due to small sample size, but it suggests the innovations may be having little impact on LDL-C control among CAD patients.

Table 2.2-7. Percentage of Patients with CAD with LDL-C Control over Time

Awardee (# Quarters)	Percentage of Patients with CAD with LDL-C Control at First Intervention Quarter (n)	Percentage of Patients with CAD with LDL-C Control at Last Intervention Quarter (n)	Percentage Point Change between First and Last Intervention Quarter	Average Percentage Point Change Over Time[1]
Curators (9 Qs)	74.3 (n=254)	88.0 (n=50)	13.7	1.7
ECCHC (6 Qs)[2]	22.4 (n=67)	38.5 (n=26)	16.1	−3.7
Intermountain (6 Qs)	17.6 (n=1,060)	26.3 (n=38)	8.7	−2.9

Source: Patient-level data provided to RTI by the awardee.
[1] The difference in percentage between each quarter and the prior quarter averaged across all quarters.
[2] Includes patients with CAD and/or hyperlipidemia.
CAD = coronary artery disease; LDL-C = low-density lipoprotein cholesterol.

Diabetes

The percentage of patients with diabetes with poor HbA1c control over time, including the percentage point change between the first and last intervention quarter reported, and the average percentage point change over time are provided in ***Table 2.2-8***. As shown in the table, the percentage point increase in patients with diabetes with poor HbA1c control for awardees who saw a decrease between the first and last intervention quarters (i.e., BAHC, ECCHC, MPHI, and U-Chicago) ranged from approximately 5 (U-Chicago) to 22 (ECCHC). The decrease was greater than 14 percent for BAHC, ECCHC, and MPHI, suggesting the innovation improved HbA1c control over time for those with diabetes. However, as noted above for CAD, the denominators drop substantially between the first and last intervention quarter. Therefore, we calculated the average percentage point change between each intervention quarter and the previous intervention quarter. For those awardees showing a large change between the first and last intervention quarter, the average percentage point change was 5 percent or less. The average percentage point change for Bronx RHIO and South County suggests that the percentage of those with poor HbA1c control increased, rather than decreased, over time. Overall, the evidence is mixed regarding improvements in HbA1c control over time.

Table 2.2-8. Percentage of Patients with Diabetes with Poor HbA1c Control over Time

Awardee (# Quarters)	Percentage of Patients with Diabetes with Poor HbA1c at First Intervention Quarter (n)	Percentage of Patients with Diabetes with Poor HbA1c at Last Intervention Quarter (n)	Percentage Point Change between First and Last Intervention Quarter	Average Percentage Point Change Over Time[1]
BAHC (11 Qs)	35.9 (n=223)	20.8 (n=24)	15.1	1.5
Bronx RHIO (3 Qs)	50.3 (n=447)	58.0 (n=112)	−7.7	−3.9
Curators (9 Qs)	17.2 (n=663)	17.1 (n=194)	0.1	0.0
ECCHC (8 Qs)	40.7 (n=108)	16.7 (n=24)	24.0	5.1
Intermountain (7 Qs)	4.0 (n=4,568)	6.9 (n=420)	−2.9	0.5
MPHI (5 Qs)	29.1 (n=368)	15.0 (n=20)	14.1	3.6
South County (9 Qs)	24.6 (n=648)	31.1 (n=195)	−6.5	−0.8
U-Chicago (9 Qs)	25.3 (n=1,469)	20.0 (n=35)	5.3	0.7

Source: Patient-level data provided to RTI by the awardee.
[1] The difference in percentage between each quarter and the prior quarter averaged across all quarters.

Table 2.2-9 provides the percentage of patients with diabetes with LDL-C control over time, including percentage point change between the first and last intervention quarter reported, and average percentage point change over time. The percentage point increase in patients with diabetes with LDL-C control for awardees with an increase between first and last intervention quarters (i.e., BAHC, Curators, and South County) ranged from approximately 2 (South County) to 33 (ECCHC). This finding suggests that those innovations improved LDL-C control over time for those with diabetes. However, as noted above for HbA1c, denominators drop substantially between the first and last intervention quarters. Thus, we calculated the average percentage point change between each intervention quarter and the previous intervention quarter. For awardees with a change between the first and last intervention quarter, the average percentage point change was 5 percent or less. The average percentage point change for MPHI suggests that the percentage of those with LDL-C control decreased, rather than increased, over time.

Table 2.2-9. Percentage of Patients with Diabetes with LDL-C Control over Time

Awardee (# Quarters)	Percentage of Patients with Diabetes with LDL-C Control at First Intervention Quarter (n)	Percentage of Patients with Diabetes with LDL-C Control at Last Intervention Quarter (n)	Percentage Point Change between First and Last Intervention Quarter	Average Percentage Point Change Over Time
BAHC (9 Qs)	54.1 (n=109)	87.0 (n=23)	32.9	4.1
Curators (9 Qs)	63.7 (n=340)	72.8 (n=181)	9.1	1.1
MPHI (4 Qs)	59.2 (n=228)	56.0 (n=25)	−3.2	−1.1
South County (9 Qs)	44.7 (n=179)	46.6 (n=88)	1.9	0.2

Source: Patient-level data provided to RTI by the awardee.
[1] The difference in percentage between each quarter and the prior quarter averaged across all quarters.
LDL-C = low-density lipoprotein cholesterol.

Hypertension

Table 2.2-10 provides the percentage of patients with hypertension with blood pressure control over time, including the percentage point change between the first and last intervention quarter reported, and the average percentage point change over time. The increase in patients with hypertension with blood pressure control for ECCHC and MPHI was approximately 15 percentage points. This finding suggests that those innovations improved blood pressure control over time for those with hypertension. However, as noted above for HbA1c and LDL-C, the denominators dropped substantially between the first and last intervention quarters. Examination of the average percentage point change between each intervention quarter and the previous intervention quarter shows that the percentage of patients with hypertension with blood pressure control decreased, rather than increased, similar to the other four awardees. The average percentage change ranged from -0.5 to -9.7 points. Overall, the findings suggest little impact of the innovations on blood pressure control for those with hypertension over time.

Table 2.2-10. Percentage of Patients with Hypertension with Blood Pressure Control over Time

Awardee (# Quarters)	Percentage of Patients with Hypertension with Blood Pressure Control at First Intervention Quarter (n)	Percentage of Patients with Hypertension with Blood Pressure Control at Last Intervention Quarter (n)	Percentage Point Change Between First and Last Intervention Quarter	Average Percentage Point Change Over Time[1]
BAHC (10 Qs)	74.8 (n=314)	70.8 (n=48)	−4.0	−0.5
Curators (9 Qs)	37.1 (n=808)	19.7 (n=770)	−17.4	−4.4
ECCHC (9 Qs)	66.2 (n=402)	81.5 (n=54)	15.3	−8.1
MPHI (6 Qs)	53.7 (n=794)	66.7 (n=24)	13.0	−7.3
NHCHC (3 Qs)	28.6 (n=28)	14.3 (n=20)	−14.3	−2.7
South County (5 Qs)	70.8 (n=106)	57.1 (n=28)	−13.7	−9.7

Source: Patient-level data provided to RTI by the awardee.
[1] The difference in percentage between each quarter and the prior quarter averaged across all quarters.

Limitations

The health outcome data and the findings as presented have several limitations. The sample sizes included for some awardee analyses are limited. More importantly, the findings are descriptive; we have not conducted significance tests to determine if any changes over time are statistically significant.

Furthermore, the run charts presented in the awardee sections take into account rolling enrollment. That is, the intervention quarters (Is) are based on individual enrollment date, and reflect the number of quarters in which a patient is enrolled or exposed to the innovation. For example, I1 is equal to the first quarter of enrollment for all participants. We present findings when at least 20 patients have a test or reading within the quarter. Since patients do not have test results for every quarter in which they are enrolled over time, the patients included in each quarter vary (although all patients are included in I1). For instance, a patient may be included in I1, I5, and I9. Finally, since fewer patients are enrolled over longer periods of time, the denominators used in the run charts decrease substantially between the first and last intervention quarters in many instances. And, those enrolled in the innovation for a longer period of time may be those who were in worse health when they were enrolled. For instance, MPHI patients with a greater number of conditions to be addressed may be enrolled longer because they are more likely to need a variety of services.

Summary

Overall, the findings among awardees in which similar health outcomes were reported suggest that the innovations are having more impact on outcomes for diabetic patients and worse outcomes for patients with CAD or hypertension. The sample sizes included in some of the awardees' analyses are limited. More importantly, the findings are descriptive; we have not conducted significance tests to determine if any changes over time are statistically significant.

In the next annual report, we will look further into the data to assess whether the differences between the first and last intervention quarters are significant by conducting t-tests among those with a result in both quarters. This testing will substantially reduce the sample size included in the analysis but will allow us to determine if the changes are valid.

The results presented reflect percentages of patients in the sample achieving each health outcome using categorical health outcomes (e.g., patients have poor HbA1c control or not), and do not capture changes in the test results at the individual-level using continuous health outcomes. On average patients may be improving, but not necessarily at the level indicating they have achieved a health outcome (or not) as a result of enrollment in the innovation. Therefore, it may be useful to conduct analyses to determine if improvements in health outcomes have been made on average across individuals. We will explore those possibilities in the next annual report by examining change over time in continuous health outcome data.

2.3 Provider Survey

2.3.1 Overview of Survey Development and Administration

For many of the 24 HCIA Community Resource awardees, health care providers, including physicians, nurses, physician's assistants (PAs), nurse practitioners (NPs) and clinical social workers, play a critical role in successfully implementing the innovation within their target communities. RTI developed a provider survey to understand the significance and role of provider engagement. Specifically, we sought to examine (1) providers' buy-in to the innovation, (2) providers' role in and perceived impact on patient care, and (3) integration of the innovation into the provider's patient encounters. To be eligible for the survey, an awardee must have had at least 10 providers total across all implementation sites who were able to comment on a change resulting from implementation of the HCIA innovation. Based on these criteria, 11 awardees were eligible to participate in the survey. One awardee was not able to provide relevant information within the required timeframe; thus, a total of 10 awardees participated in the final survey. See ***Appendix B.5*** for a more detailed discussion of the survey development, data collection and administration protocols, and data analysis methodologies.

The following section provides the results from the provider survey across the 10 awardees that received the provider survey. We provide the response rates and demographics overall as well as the weighted responses for all 10 awardees for three key areas: perceived impact on patient care, provider satisfaction, and clinical care workflow. We also examine weighted responses in these three key areas by innovation focus. Because innovations focused on reducing inappropriate imaging—Altarum and IA—were distinct from and not comparable to those innovations that included a community health worker or patient navigator service—MPHI , REMSA, South County, W&I, Curators, and Mary's Center—we examined and report the findings separately for these two groups.

Individual results for awardees from whom we received more than 20 responses (i.e., Altarum, Curators, IA, MPHI, Mary's Center, W&I, U-Chicago) are provided in the awardee-specific chapters and all responses overall and by awardee are provided in ***Appendix C***.

2.3.2 Descriptive Results

Response Rates

We received responses from 453 of the 1,242 surveyed providers, resulting in a cumulative response rate of 42.5 percent. Response rates across awardees ranged from 23.6 percent (n=89) at Altarum to 84.9 percent (n=45) at W&I. We achieved more than a 50 percent response rate from 6 of the 10 awardees. Responses rates by awardee are provided in ***Table 2.3-1***. More details on how the response rates were calculated are provided in Appendix B.5.

Table 2.3-1. Response Rates by Awardee

Innovation Name	Total Number Surveyed	Total Completed	Not Eligible	Response Rate (Percentage)
Altarum	460	95	57	23.6
Bronx RHIO	11	8	0	72.7
Curators	79	40	6	54.8
IA	64	18	8	32.1
Mary's Center	142	49	17	39.2
MPHI	297	167	15	59.2
REMSA	23	10	5	55.6
South County	10	8	0	80.0
U-Chicago	103	32	23	40.0
W&I	53	45	0	84.9
Cumulative	**1,242**	**472**	**131**	**42.5**

Respondent Demographics

Overall, across all awardees, the majority of responding providers were female (64%), white (76%), between the ages of 30 and 49 (51%), and had been at their current practice longer than 20 years (64%). Over a third of these providers (39%) were physicians and almost half (46%) indicated their primary specialty was family medicine. In addition, 30 percent indicated they practiced at a group practice, 23 percent were hospital-based, and 25 percent practiced at a Federally Qualified Health Center. The vast majority of responding providers treated patients with chronic conditions all or most of the time (75%), and 37 percent spent the majority of their time providing patient care. Demographics by awardee and for the overall sample are provided in ***Appendix C.***

Patient Care

This section of the survey included questions on the respective innovations' overall impact on patient care, including, provider perceptions on provider-patient communication, access to care, and quality of patient care (see ***Table 2.3-2***).

The majority of providers, across all three groups of respondents believed the innovation impacted patient care. Among those that indicating that the innovation did impact patient care, however, approximately 72 percent of respondents from imaging innovations noted a very or somewhat positive impact while 98 percent of respondents from CHW innovations noted a very or somewhat positive impact on patient care.

In general for the respondents from imaging innovations, there was no consensus among providers (i.e., no responses over 50 percent) as to whether they believed the innovation impacted patient care; for example, 33.3 percent either strongly or somewhat agreed the innovation improved communication with patients while 24.4 percent either strongly or somewhat disagreed it improved communication. In addition, 21.4 percent indicated they strongly or somewhat believed the innovation improved access to care for patients while 27.9 percent either strongly or somewhat disagreed it

improved access. In contrast, the respondents from CHW innovations noted much more positive impacts on patient care. For example, the majority of CHW providers strongly or somewhat agreed that their innovation helped them provide better patient care (73.7%), led to more effective provider-patient communication (61.8%), facilitated improved patient access to care (72.3%), and was beneficial for patients in their practice (82.9%).

Table 2.3-2. Summary of Patient Care[1]

Question	Percentage of Respondents from Imaging Innovations (n=113)	Percentage of Respondents from CHW Innovations (n=319)	Percentage Among All Respondents (n=472)
Overall, has the way you care for patients been impacted by the implementation of the innovation?			
Yes	51.7	76.1	62.9
No	47.4	23.3	36.2
Missing	0.9	0.6	0.9
Total	100.0	100.0	100.0
If yes, has the innovation had a positive or negative impact on the care of your patients?			
Very positive/somewhat positive	71.7	98.0	93.3
Neither positive nor negative	21.7	2.0	5.5
Very negative/ somewhat negative	6.6	0.0	1.2
Total	100.0	100.0	100.0
Innovation helps provide better patient care.			
Strongly agree/somewhat agree	44.1	73.7	58.8
Neither agree nor disagree	23.3	12.4	17.6
Strongly disagree/somewhat disagree	18.0	4.3	11.0
Not applicable	8.3	7.2	8.3
Missing	6.4	2.4	4.3
Total	100.0	100.0	100.0
Innovation leads to more effective communication during patient visits.			
Strongly agree/somewhat agree	33.2	61.8	47.9
Neither agree nor disagree	21.2	19.6	19.9
Strongly disagree/somewhat disagree	24.4	5.3	14.4
Not applicable	14.7	10.3	13.3
Missing	6.4	2.9	4.6
Total	100.0	100.0	100.0
Innovation has improved my patients' access to care.			
Strongly agree/somewhat agree	21.4	72.3	48.5
Neither agree nor disagree	24.7	13.9	18.8
Strongly disagree/somewhat disagree	27.9	4.5	15.1
Not applicable	19.6	6.8	13.2
Missing	6.4	2.4	4.3
Total	100.0	100.0	100.0

(continued)

Table 2.3-2. Summary of Patient Care[1] (continued)

Question	Percentage of Respondents from Imaging Innovations (n=113)	Percentage of Respondents from CHW Innovations (n=319)	Percentage Among All Respondents (n=472)
Innovation has increased the time I am able to spend with patients during office visits.			
Strongly agree/somewhat agree	11.8	34.4	23.5
Neither agree nor disagree	26.5	28.8	27.5
Strongly disagree/somewhat disagree	40.1	14.3	25.9
Not applicable	15.2	20.1	18.8
Missing	6.4	2.4	4.3
Total	100.0	100.0	100.0
Innovation helps me develop good relationships with my patients.			
Strongly agree/somewhat agree	18.2	54.2	37.2
Neither agree nor disagree	32.7	25.6	28.8
Strongly disagree/somewhat disagree	28.1	7.5	16.5
Not applicable	14.5	10.3	13.2
Missing	6.4	2.4	4.3
Total	100.0	100.0	100.0
Innovation has improved perceived patient satisfaction with care.			
Strongly agree/somewhat agree	16.4	59.7	39.6
Neither agree nor disagree	34.1	22.6	27.4
Strongly disagree/somewhat disagree	28.3	5.2	15.7
Not applicable	14.7	9.7	12.9
Missing	6.4	2.7	4.5
Total	100.0	100.0	100.0
Innovation has been beneficial for patients in my practice.			
Strongly agree/somewhat agree	34.6	82.9	60.6
Neither agree nor disagree	30.6	7.0	17.7
Strongly disagree/somewhat disagree	16.3	2.5	8.9
Not applicable	10.1	4.1	6.7
Missing	8.3	3.5	6.1
Total	100.0	100.0	100.0
Among my patients that are aware of Innovation, the majority of patients would say it has been beneficial in the care they receive.			
Strongly agree/somewhat agree	27.2	75.1	53.3
Neither agree nor disagree	27.6	11.1	18.8
Strongly disagree/somewhat disagree	16.1	3.7	9.2
Not applicable	20.7	6.6	12.5
Missing	8.3	3.5	6.1
Total	100.0	100.0	100.0

(continued)

Table 2.3-2. Summary of Patient Care[1] (continued)

Question	Percentage of Respondents from Imaging Innovations (n=113)	Percentage of Respondents from CHW Innovations (n=319)	Percentage Among All Respondents (n=472)
Among my patients that are not aware of Innovation, if I told them about it, the majority of patients would say it has been beneficial in the care they receive.			
Strongly agree/somewhat agree	24.3	63.7	45.4
Neither agree nor disagree	34.8	17.8	25.9
Strongly disagree/somewhat disagree	14.7	5.9	10.0
Not applicable	18.0	8.1	12.2
Missing	8.3	4.4	6.6
Total	100.0	100.0	100.0

[1] Responses are weighted using respondent weights provided in Appendix B.5.
CHW = community health worker.

Provider Satisfaction

This section of the survey included questions to determine provider satisfaction with their respective innovations, including, the usability of the innovation, the availability of training and technical support, any financial benefits the innovation might have had for practices, the impacts of the innovation on efficiency, and whether the innovation is a worthwhile investment for providers (see ***Table 2.3-3***).

Regarding overall satisfaction with imaging-focused innovations, the majority of providers (53.0%) reported being either moderately or slightly satisfied with the innovation while only 27.7 percent reported being extremely or very satisfied with the innovation. In contrast, almost two-thirds of respondents from CHW innovations reported being extremely or very satisfied with the innovation (63.7%) and only 32.1 percent reported being moderately or slightly satisfied.

In addition, a significant proportion of respondents from imaging innovations either strongly or somewhat disagreed that the innovation saved them time (42.1%) and strongly or somewhat agreed that the logistics of the innovation were a burden on them and their staff (44.2%). In contrast, the majority of respondents from CHW innovations indicated that their CHW was either very or somewhat easy to work with (70.5%). A majority of providers also strongly or somewhat agreed that that the CHW was a worthwhile investment (75.6%), that their practice functioned more efficiently with the CHW (62.8%), and that the inclusion of the CHW saved them time (57.0%). Overall, for CHW-focused innovations, provider responses were much more positive, generally indicating that their innovation is easy to use, improves efficiency, and is a worthwhile investment.

Table 2.3-3. Summary of Provider Satisfaction[1]

Question	Percentage of Respondents from Imaging Innovations (n=113)	Percentage of Respondents from CHW Innovations (n=319)	Percentage Among All Respondents (n=472)
Overall satisfaction			
Extremely/very satisfied	27.7	63.7	46.1
Moderately/slightly satisfied	53.0	32.1	42.3
Not at all satisfied	12.0	2.0	7.0
Missing	7.4	2.1	4.6
Total	100.0	100.0	100.0
Innovation ease of use			
Very/somewhat easy to work with	41.1	70.5	56.4
Neither easy nor hard	17.5	15.0	17.2
Very/somewhat hard to work with	27.6	6.7	15.5
Missing/not applicable	13.8	7.8	10.9
Total	100.0	100.0	100.0
Sufficient resources (e.g., support staff, time, training) have been provided for me to use/interact the innovation.			
Strongly agree/somewhat agree	27.2	58.4	43.5
Neither agree nor disagree	19.6	17.4	18.8
Strongly disagree/somewhat disagree	33.9	14.7	23.5
Not applicable	12.9	7.1	9.8
Missing	6.4	2.4	4.3
Total	100.0	100.0	100.0
Innovation produces financial benefits for my clinic or practice.			
Strongly agree/somewhat agree	15.2	29.0	21.9
Neither agree nor disagree	27.0	34.3	31.8
Strongly disagree/somewhat disagree	34.1	10.2	20.8
Not applicable	17.3	23.3	20.8
Missing	6.4	3.2	4.7
Total	100.0	100.0	100.0
Investing in the innovation is worthwhile in terms of time, energy, and resources.			
Strongly agree/somewhat agree	28.6	75.6	52.9
Neither agree nor disagree	20.7	11.5	16.5
Strongly disagree/somewhat disagree	33.2	3.5	16.7
Not applicable	11.0	6.7	9.4
Missing	6.4	2.7	4.5
Total	100.0	100.0	100.0

(continued)

Table 2.3-3. Summary of Provider Satisfaction[1] (continued)

Question	Percentage of Respondents from Imaging Innovations (n=113)	Percentage of Respondents from CHW Innovations (n=319)	Percentage Among All Respondents (n=472)
Sufficient technical IT support is available to operate the innovation.			
Strongly agree/somewhat agree	27.0	28.7	27.7
Neither agree nor disagree	29.5	28.6	28.1
Strongly disagree/somewhat disagree	23.3	14.0	18.9
Not applicable	13.8	25.7	20.5
Missing	6.4	3.0	4.9
Total	100.0	100.0	100.0
Overall, my practice functions more efficiently with the innovation.			
Strongly agree/somewhat agree	31.2	62.8	46.7
Neither agree nor disagree	18.9	19.2	19.0
Strongly disagree/somewhat disagree	31.5	5.8	18.0
Not applicable	12.0	9.8	12.0
Missing	6.4	2.4	4.3
Total	100.0	100.0	100.0
Innovation saves me time.			
Strongly agree/somewhat agree	18.3	57.0	37.6
Neither agree nor disagree	22.1	21.1	22.2
Strongly disagree/somewhat disagree	42.1	9.0	23.9
Not applicable	10.1	9.9	11.3
Missing	7.4	2.9	4.9
Total	100.0	100.0	100.0
The added logistics required by the innovation is a burden on me and/or my staff.			
Strongly agree/somewhat agree	44.2	13.3	26.7
Neither agree nor disagree	25.4	23.1	23.4
Strongly disagree/somewhat disagree	12.3	52.4	34.5
Not applicable	11.7	8.7	11.1
Missing	6.4	2.4	4.3
Total	100.0	100.0	100.0

[1] Responses are weighted using respondent weights provided in Appendix B.5.
CHW = community health worker.

Clinical Care Workflow

This section of the survey included questions regarding the impact of the innovation on the time spent on patient care, communication with patients, retrieving patient information, referrals and care coordination activities, identifying patient needs, and planning practice-based interventions.

For the majority of questions, respondents from both imaging and CHW innovations indicated no change in the amount of time they spent on activities, such as providing direct patient care,

communicating with patients, and meeting/consulting with either internal staff or external clinicians. However, among CHW-respondents, almost 42 percent indicated they spent less time arranging social service referrals for patients and 31 percent spent less time engaging in other care coordination activities. Therefore, overall for the respondents from imaging innovations, implementation of the respective innovations does not appear to negatively impact workflow (i.e., require more time to perform activities), nor does implementation appear to significantly improve workflow (i.e., require less time to perform activities). However, for CHW respondents, although implementation of the innovation does not appear to negatively or positively impact workflow of many activities listed in ***Table 2.3-4***, it appears to positively impact workflow for arranging social service referrals and engaging in care coordination activities.

Table 2.3-4. Summary of Clinical Care Workflow[1]

Question	Percentage of Respondents from Imaging Innovations (n=113)	Percentage of Respondents from CHW Innovations (n=319)	Percentage Among All Respondents (n=472)
Providing direct patient care			
More time	11.1	12.0	11.9
No change	59.0	65.3	61.8
Less time	10.8	6.8	8.1
Missing/not applicable	19.1	15.8	18.2
Total	100.0	100.0	100.0
Communicating with patients by phone, e-mail			
More time	9.0	13.9	11.2
No change	54.6	50.2	51.6
Less time	7.1	19.3	13.4
Missing/not applicable	29.3	16.5	23.8
Total	100.0	100.0	100.0
Looking up patient information in paper-based medical charts			
More time	9.2	2.5	5.2
No change	33.2	34.5	34.0
Less time	24.7	11.8	16.9
Missing/not applicable	32.9	51.2	43.9
Total	100.0	100.0	100.0
Looking up patient information in EMRs or other health information systems			
More time	24.0	12.9	17.4
No change	39.9	58.7	50.2
Less time	11.8	12.2	11.6
Missing/not applicable	24.4	16.2	20.8
Total	100.0	100.0	100.0

(continued)

Table 2.3-4. Summary of Clinical Care Workflow[1] (continued)

Question	Percentage of Respondents from Imaging Innovations (n=113)	Percentage of Respondents from CHW Innovations (n=319)	Percentage Among All Respondents (n=472)
Arranging clinical referrals and follow-up for patients			
More time	7.4	6.6	7.5
No change	56.7	44.8	49.4
Less time	6.0	30.4	18.3
Missing/not applicable	30.0	18.2	24.8
Total	100.0	100.0	100.0
Arranging social service referrals for patients			
More time	3.7	5.9	5.3
No change	54.8	34.7	43.9
Less time	2.8	41.9	23.0
Missing/not applicable	38.7	17.5	27.8
Total	100.0	100.0	100.0
Meeting with staff and clinicians in my practice			
More time	6.2	10.7	8.2
No change	59.4	60.7	60.2
Less time	1.8	5.3	3.6
Missing/not applicable	32.5	23.3	27.9
Total	100.0	100.0	100.0
Consulting with clinicians outside of my practice			
More time	6.2	6.3	6.6
No change	57.6	63.3	59.7
Less time	6.2	8.7	7.2
Missing/not applicable	30.0	21.7	26.6
Total	100.0	100.0	100.0
Engaging in other care coordination activities			
More time	12.2	13.0	12.6
No change	52.3	39.7	45.4
Less time	2.8	30.5	16.7
Missing/not applicable	32.7	16.9	25.3
Total	100.0	100.0	100.0
Reviewing data on my clinic or practice population in order to identify individuals needing additional services			
More time	10.8	14.1	12.8
No change	47.9	46.8	46.2
Less time	5.5	16.9	11.1
Missing/not applicable	35.7	22.2	29.9
Total	100.0	100.0	100.0

(continued)

Table 2.3-4. Summary of Clinical Care Workflow[1] (continued)

Question	Percentage of Respondents from Imaging Innovations (n=113)	Percentage of Respondents from CHW Innovations (n=319)	Percentage Among All Respondents (n=472)
Planning practice-based (or community-based) interventions to address issues common to my practice population			
More time	6.2	11.6	9.6
No change	51.6	47.5	48.7
Less time	6.0	14.2	9.8
Missing/not applicable	36.2	26.7	31.9
Total	100.0	100.0	100.0

[1] Responses are weighted using respondent weights provided in Appendix B.5.
CHW = community health worker.

2.3.3 Multivariate Analyses

We also analyzed the provider survey among all respondents using multivariate logistic regression to examine two outcomes: (1) overall provider satisfaction with the innovation and (2) whether providers believed the innovation had any impact on patient care. Both models included demographic covariates such as age, sex, number of years in practice, provider type (i.e., physician, nurse or physician assistants (PA), other), primary medical specialty (i.e., primary care versus specialist), and practice type (i.e., group practice, federally qualified health center, hospital, other). We also included in both models innovation type (i.e., imaging or CHW focused), how involved providers were in the innovation (i.e., no involvement, indirect, direct, leader), if they had any plans to relocate, retire, or reduce time treating patients, and whether they had ever been involved with any other innovative payment or care delivery models such as accountable care organizations, medical homes, and/or experience implementing electronic health records.

The first model examined overall satisfaction with the innovation. The results indicate that the odds of being extremely satisfied with the innovation were greater for (1) nurses/PAs and other staff compared to physicians, (2) specialists compared to primary care physicians, and (3) providers that practiced in a group setting compared to solo practices. In addition, involvement in the innovation significantly impacted the odds of being extremely satisfied with the innovation. For example, those that indicated they were not involved had lower odds of being extremely satisfied (0.45) while those that indicated they were the leader had significantly higher odds (8.84) of indicating they were extremely satisfied with the innovation. Finally, those that were part of a CHW-based innovation had significantly higher odds (4.06) of being extremely satisfied with the innovation compared to those that were not part of an imaging-based or CHW-based innovation, which is consistent with our descriptive analyses of provider satisfaction for respondents from CHW innovations (***Table 2.3-5***).

Table 2.3-5. Logistic Regression Estimates for Overall Satisfaction with Innovation

Variable	Odds Ratio	Robust Standard Error	P-Values
Sample Size = 397[1]			
Female	1.12	0.22	0.57
Age	0.99	0.02	0.41
Years Practicing	1.01	0.01	0.47
Provider Type			
Nurse	1.75	0.33	<0.01
Other	2.31	0.40	<0.01
Primary Medical Specialty			
Specialist	2.12	0.42	0.01
Practice Type			
Group	1.75	0.47	0.04
FQHC	0.53	0.24	0.16
Hospital	1.25	0.48	0.56
Other	1.26	0.44	0.50
Innovation Type			
Imaging focused	0.69	0.29	0.37
CHW focused	4.06	1.49	0.01
Involvement Type			
No involvement	0.45	0.15	0.02
Indirect	1.88	0.47	0.01
Direct	3.02	1.14	0.01
Leader	8.84	7.15	0.01
Plans to relocate	1.03	0.33	0.93
Involved in other innovative initiatives	1.29	0.39	0.39

[1] Sample included all respondents (n=472) but is smaller due to missing data.
CHW = community health worker; FQHC = federally qualified health center.

We obtained similar results for the second model in which we examined whether providers indicated they thought the innovation had any impact on patient care (***Table 2.3-6***). For this model we included the percentage of time providers spent proving patient care. We found that providers' involvement in the innovation impacted perceived impact on patient care. For example, the odds that leaders indicated an impact on patient care for the innovation was 13.55 times greater than nonleaders. In addition, the odds that providers affiliated with a CHW-based innovation indicated an impact on patient care was over 4 times greater than respondents from non-CHW or non-imaging innovations.

Table 2.3-6. Logistic Regression Estimates for Perceived Impact of Innovation on Patient Care

Variable	Odds Ratio	Robust Standard Error	P-Values
Sample Size = 400[1]			
Female	0.70	0.20	0.21
Age	0.98	0.02	0.25
Years Practicing	1.04	0.02	0.08
Provider Type			
Nurse	2.65	0.45	<0.01*
Other	0.90	0.25	0.69
Primary Medical Specialty			
Specialist	0.94	0.30	0.85
Practice Type			
Group	1.04	0.47	0.92
FQHC	0.36	0.25	0.15
Hospital	0.75	0.36	0.55
Other	0.97	0.49	0.94
Innovation Type			
Imaging focused	1.11	0.76	0.88
CHW focused	4.44	2.26	<0.01*
Involvement Type			
No involvement	0.26	0.11	<0.01*
Indirect	2.58	1.01	0.02*
Direct	6.43	1.96	0.00*
Leader	13.55	17.82	0.04*
Plans to relocate	1.58	0.81	0.37
Involved in other innovative initiatives	0.75	0.25	0.39
Time spent on patient care	1.00	<0.01	0.18

* p<0.05
[1] Sample included all respondents (n=472) but is smaller due to missing data.
CHW = community health worker; FQHC = federally qualified health center.

2.3.4 Discussion and Conclusions

Overall, the respondents from CHW innovations appear to be more positive regarding their perceptions on the overall impact of the innovation on patient care and satisfied with the innovation than the respondents from imaging innovations. In considering these different type of innovations, the results are not surprising because CHW-based innovations include both providers and patients interacting with the CHWs themselves. Thus, changes can be made more easily mid-implementation and direct benefits to patients may be perceived as higher by providers because patients are directly interacting with the CHW rather than the provider. In addition, providers may be more satisfied with the CHW innovations because CHWs are likely assisting them by helping to coordinate social service referrals and follow-up care, as noted in the reduced time providers spent engaging in these activities post-innovation

implementation. The results are further corroborated in the multivariate analyses given the respondents from CHW innovations had significantly higher odds of noting they were extremely satisfied with the innovation and believed the innovation impacted patient care compared to respondents from nonimaging or CHW innovations. Thus, the respondents from CHW innovations appear to have some positive impacts on provider workflow, which in turn may impact overall provider satisfaction with the innovation and perceived benefits to patient care.

In contrast, with imaging-based innovations, where new technologies were implemented for providers, they may perceive fewer direct benefits to patients. In addition, providers noted they were less satisfied with the innovation overall, perhaps because they perceived the innovation was not as beneficial for patients. Interestingly, however, providers do not appear to be less satisfied because innovation implementation significantly changed clinical workflow, as the majority of imaging respondents did not note any increase or decrease in the amount of time it took to engage in patient activities. Although being a part of an imaging-based innovation was associated with lower odds of being extremely satisfied or noting an impact on patient-care compared to respondents from non-CHW or imaging-based innovations, the results were not significant.

For the multivariate analyses, provider involvement in the innovation was an important predictor of overall satisfaction with the innovation and of indicating the innovation had an impact on patient care. More specifically, innovation leaders and those directly involved with the innovation had higher odds of being extremely satisfied with the innovation and noting an impact on patient care compared to those not involved the innovation. These findings highlight the importance of engaging a provider champion to encourage and support implementation as well as the importance of directly involving providers in the implementation process.

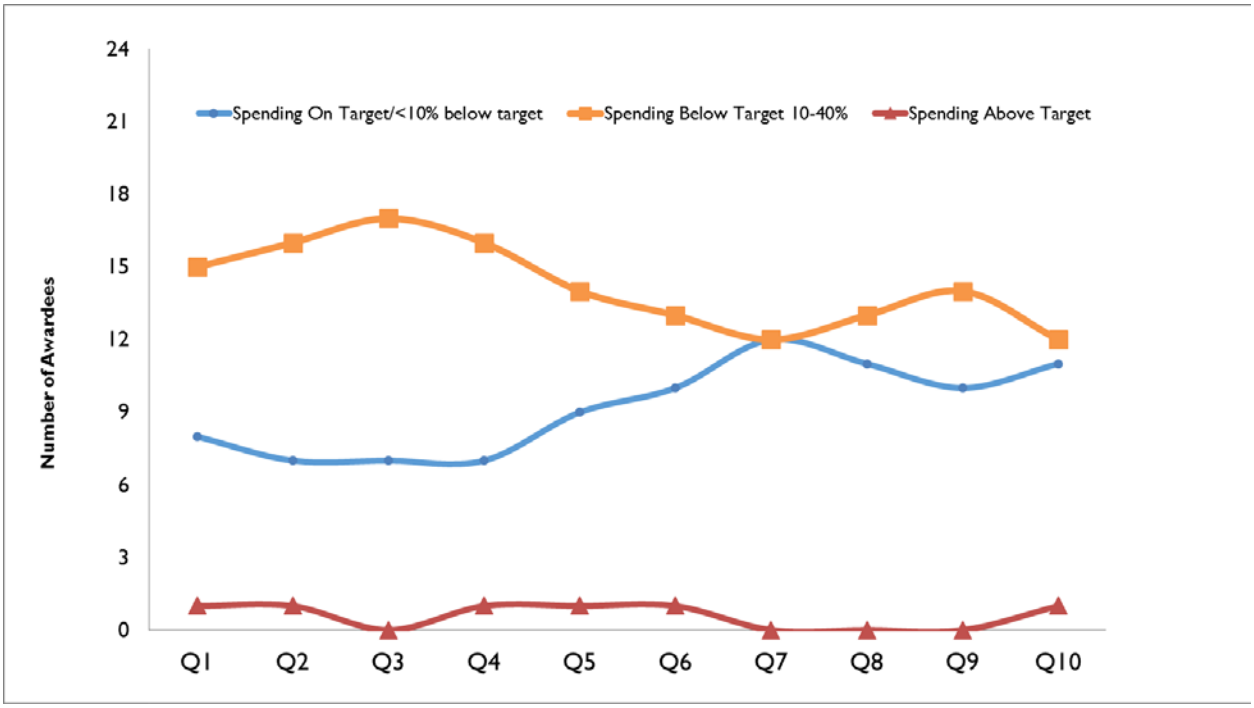
2.4 Process of Implementation

A key focus of this evaluation is the extent to which awardees are able to implement their innovation as planned and reach a sufficient number of patients. The implementation process for this subset of awardees is being evaluated through a combination of data variables, including execution of implementation, organizational capacity, leadership support and engagement of key staff and partners, and innovation adoption/workflow integration. In this section, we present cross-awardee findings for these components of implementation process as well as an overall summary of implementation challenges and facilitators. The findings presented here are distilled from a thorough review and analysis of awardees' Narrative Progress Reports, Quarterly Awardee Performance Reports, and qualitative interviews with key staff (including in-person site visits and telephone interviews) through June 30, 2014.

2.4.1 Execution

Execution refers to the process by which awardees implement an intervention, what delays and barriers they encounter, and what strategies they use to circumvent delays. One proxy for assessing program execution is the rate at which awardees expend funds and enroll patients, compared with projections. Project expenditure rates can signal problems with executing key subcontracts with partners and with hiring and training staff, which can lead to serious (and potentially irreversible) delays in project activities. Serious delays can subsequently affect enrollment targets and ultimately any possible impacts on costs and health outcomes. ***Figure 2.4-1*** depicts cumulative expenditures from Q1 to Q10 across all HCIA awardees. In this section, we describe awardee spending trends to date and influencing factors.

Figure 2.4-1. Cumulative HCIA Community Resource Awardee Expenditures by Quarter



The graph highlights the number of awardees per quarter spending on target, below target, or above target. The plot lines for awardees spending below target (orange) and those spending on target (blue) are to be expected during the normal course of program implementation (i.e., the number of awardees spending below target trends downward over time whereas the number of awardees spending on target trends upward over time). Accordingly, the graph shows that for the first two quarters of implementation, more than half of the awardees (n=15) spent *below* budget. This trend is expected with program start-up for some awardees because their innovations were new and required staff to operationalize the innovation concept into practice and adjust to the new system of care. Additionally, some awardees faced challenges such as being understaffed and needing more time to recruit and train new staff, enrolling providers, or requiring additional time to implement or adapt electronic medical records for their innovations. Other factors that could also explain this initial spending trend are that awardees over-projected their project needs and/or the likelihood that the more costly implementation efforts had not yet occurred (e.g., patient outreach/recruitment, implementation of health IT systems, etc.)

The trends are in line with the expectation that during the course of an innovation, awardees gained a better understanding of their budget needs and, therefore, adjusted their spending accordingly after a few quarters' experience. Over time, this adjustment would mean that more awardees were on target with their budget rather than below it. However, some awardees experienced delays and setbacks in implementation that may explain the dip in on-target trajectory between Q7 and Q9. In observing the current trends of the two lines, one would expect an intersection of the two lines to occur around Q11 and continue with the expectation that spending below target will continue to trend downward as spending on target approaches a value equal to the number of awardees in the innovation.

2.4.2 Organizational Capacity

Horton et al., defines organizational capacity as an organization's "potential to perform—its ability to successfully apply its skills and resources to accomplish its goals and satisfy its stakeholders' expectations." [1] In our analysis, we find that organizational capacity varied greatly across HCIA awardees; and an awardee's capacity for program implementation was influenced by having dedicated and adequate staffing, and technological and physical resources. In this section, we describe these factors as well as key facilitators and challenges experienced by awardees to address organizational capacity.

Staffing

Having adequate staffing resources continued to be a major factor for awardee program implementation. Overall, most awardees (n=19) reported having adequate staffing while 5 reported having inadequate staffing resources. The novelty of the HCIA program required awardees to hire and train new staff to carry out the innovation including a range of roles and responsibilities such as project leadership, physicians, CHWs and health IT staff. With regards to improving capacity in this area, one awardee noted, "The advantage we have is the onboarding [of] care coordination staff, and their understanding of the risk segmentation of the population. Coupled with the analytic capabilities that we've put on top of that, we have a great advantage that wouldn't exist if not for the grant." Still, several awardees did not adequately anticipate staff turnover and the amount of staffing resources needed to carry out the innovation.

Technology/Data

A review of awardee data revealed that data collection and tracking systems were critical to organizational capacity. Multiple awardees reported that the technology used in the innovation (EHR systems, etc.) was not developed specifically for the innovation and, therefore, was not efficient. These systems failed to give outside providers all the information needed about the innovation activities and did not align with the physician workflow. Some awardees, such as Mary's Center and Bronx RHIO, relied on information sharing across organizations. In these cases, the infrastructure to support information exchange, including technical capabilities, was an important resource.

Physical Space

For several awardees, having the necessary physical space was an important factor in program implementation. Altarum, Mary's Center, and Curators described difficulty securing space in which staff members could conduct their work. Program staff at Curators stated that the clinics were not designed with the nurse care managers in mind, so the "NCMs worked in whatever space was available in a given clinic." Sometimes the NCMs did not have a private space in which to speak to patients, NCMs were not visible, or they were separated from clinical workflow, impeding the incorporation of their activities into the

[1] Horton, D. Alexaki, A., Bennett-Lartey, S., Noële Brice, K., Campilan, D., Carden, F., and Watts, J.: Evaluating Capacity Development: Experiences from Research and Development Organizations around the World. Chapter 2. 2003. Retrieved November 4, 2010, from http://www.idrc.ca/en/ev-31556-201-1-DO_TOPIC.html.

clinic. South County addressed space issues by dedicating a new building to house all program staff. According to staff, the new space greatly increased efficiencies and coordination around patient care.

Prior Experience/History with Similar Innovations

Having prior experience or history of working with similar innovations and/or patient populations was a key driver in increasing organizational capacity. Both Y-USA and BAHC built on their existing infrastructure and capacity for implementing their respective innovations. For example, BAHC has over 2 decades of experience working with CHWs and, therefore, required minimal staffing resources to get underway. Additionally, Y-USA leveraged its network of 75 YMCAs, who already had experience implementing the evidence-based diabetes prevention model to recruit and provide services to its Medicare population.

Partnership Collaborations

For most awardees, collaborative partnerships are a crucial aspect of the organization's capacity for program implementation. These partnerships are drawn from different sectors including community-based organizations, hospitals, local clinics, and health maintenance organizations (HMOs) and afforded awardees increased opportunities and capacity for participant enrollment, enhanced use of data, identification of potential new staff and improved coordination of patient care. For example, innovations at Bronx RHIO and Mary's Center take place within a community context and involve other entities not funded by HCIA such as referring physicians, patient educators, external service providers, and technology providers. These partnerships are critical to implementation because they expand the capacity for IT services and training. Both Bronx RHIO and Mary's Center also leveraged patient data to help external partners such as local clinics manage patients who overuse the ED or have chronic diseases. Additionally, through partnerships, several awardees expanded their ability to recruit and enroll more patients into their programs. For MPHI, partners were instrumental in coordinating the care of eligible program participants by referring them to a care coordination agency that, in turn, assigns the participant to a CHW. MPHI's partnership with a local ambulance service also resulted in increased referrals of high users of the ED.

Nevertheless, some awardees faced administrative/bureaucratic and logistical challenges in establishing these partnerships. A recurring barrier among awardees was the length of time to finalize legal agreements for key partnerships. Finalizing legal agreements such as data use agreements (DUAs) and memoranda of understanding (MOUs) was a lengthy process and delayed implementation of the innovations' various components. These agreements impeded partnerships from being executed and often affected the data needed to begin key tasks. For example, Mary's Center encountered difficulty finalizing agreements with payers whose data contained lists of patients needed for recruitment and NHCHC (with no direct access to patient identifiers) described challenges establishing memoranda of agreements (MOAs) with public hospitals across their various sites.

2.4.3 Leadership Support

Leadership support was a key factor cited in awardees' ability to implement their innovations. We define leadership support as the commitment, involvement, and accountability of the awardee organization's leaders. Since the first annual report, the level of leadership support varied across awardees. Several awardees managed to retain a high level of leadership support for their innovations, while others still struggle due to key leadership changes (e.g., loss of program coordinators, project directors, etc.) and/or lack of organizational priority. In this section, we present key examples of leadership support at the organizational and program level across awardees as well as key facilitators and challenges awardees cited about leadership support.

Organizational Leadership Support

Since the first annual report, most awardees felt supported by senior leadership (e.g., CEOs, COOs, executive boards) within their organizations. These leaders were described as avid champions and visionaries for the awardee innovations and supported awardee innovations in three key areas:

- ongoing communication with program staff,
- acquisition of program resources (e.g. data system upgrades/serves, laptops for CHWs), and
- engagement of external stakeholders/partners to obtain buy-in and support for the innovation.

As one interviewee described, "Leadership doesn't get involved with day-to-day but does with the big picture. He brings the ability to say 'hey, we can do that.' He brings the authority and ideas, he deals with the big stuff." Organizational leadership was instrumental in communicating the project vision to stakeholders. For example, MPHI not only secured partners at its implementation sites, but also garnered statewide support of reimbursement mechanisms for CHWs.

Several sites, however, encountered challenges sustaining organizational leadership support. For example, academic leaders at U-Miami were not initially engaged in the innovation, but have worked more closely with innovation staff over the course of the program to support program goals. Through similar efforts, organizational leaders increased their awareness of the program's ongoing communication with program staff who are positioned to address any of their concerns.

In addition to organizational leaders, physician champions were also imperative to implementation for multiple awardees. Physician champions helped to engage other providers and served as liaisons to ensure providers' concerns are heard. To engage providers, some awardees conducted interviews with providers directly and obtained feedback from provider trade organizations. Other awardees, such as Altarum and Intermountain, leveraged regular meetings with leadership councils, working groups, and other representative boards to ensure innovation components aligned with physician expectations. Provider engagement was used to inform the design of the various health IT innovations in Altarum, Intermountain, Bronx RHIO, Mary's Center, Finity, and IA.

Program Leadership Support

The overall support of program leaders or innovation staff (project directors, managers, etc.) across HCIA awardees remained strong. "Champions, major players, and dedicated" are some of the words awardees used to describe these individuals. Program leaders provided support in four major areas:

- administrative and clinical oversight (e.g., providing overall day-to-day program management and reporting, staff hiring)
- partner engagement (i.e., identifying internal champions)
- acquisition of non-HCIA funding to support program implementation, and
- program development (i.e., soliciting ongoing feedback from staff to improve program operations.)

As described earlier, adequate staffing resources was a major facilitator to program implementation across sites. Program leadership played a key role in hiring implementation staff and ensuring they received the necessary resources and skills. For example, program leadership at U-Miami and ECCHC were instrumental in securing laptops for CHW staff. According to interviewees, this equipment improved staff efficiency as well as workflow and team cohesion.

Furthermore, to support these efforts, program leaders identified key partners to support various aspects of the innovation. Working with the various site locations and establishing those relationships were critical to the early success of sites such as Bronx RHIO and Children's Hospital. Leadership quickly saw the benefit of identifying internal champions early on at these sites.

2.4.4 Innovation Adoption and Workflow Integration

Many awardees consider innovation adoption to be a key factor influencing their implementation efforts. Adoption refers to the *decision* of any individual or organization to use an innovation; the innovation process can only be considered a success to the extent that the innovation is accepted and integrated into the organization and utilized over time (Rogers, 1995).[2] [3] [4] [5] Factors that influenced the extent to which HCIA awardees adopted their innovations and subsequently integrated them into their overall workflow varied. In this section, we describe some of the strategies CHW and HIT awardees used in adopting and integrating their innovations to enhance program implementation.

[2] Gopalakrishnan, S., and Damanpour, F.: A review of innovation research in economics, sociology and technology management, Omega, 25,1, 15-28, 1997.
[3] Zaltman, G., Duncan, R., and Holbek, J.: Innovations and Organizations. New York: Wiley, 1973.
[4] Bhattacherjee, A.: Managerial influences on intra-organizational information technology use: A principal-agent model, Decision Sciences, 29, 1, 139-162, 1998.
[5] Rogers, E. M.: Diffusion of Innovations (4th ed.). New York. Free Press, 1995.

CHW Innovations

More than two-thirds of awardees (18) have innovation components designed to improve the coordination of care by deploying CHWs or patient navigators to provide patients with personalized education, coaching, referrals, and follow-up needed to achieve health care goals. Adoption and integration of the CHW roles into the workflow of these awardees was important to the success of the innovations. Particularly important were the work environments in which CHWs worked alongside physicians or other providers. Several awardees involved on-site nurses and other staff (e.g., health coaches) in a patient's care to connect patients with primary care services and improve coordination of care. Those working in a clinic setting reported that the workflow often varied by clinic because each team of care providers works differently. One provider commented, "Some may be more engaged in the process. I wouldn't say each clinic does it exactly the same." When asked about the most important factor in engaging the target population another awardee remarked,

> *"It's definitely the workflow, having navigators as part of the workflow. If they are in the back waiting for physicians to call them that a patient needs services, we saw fewer services being provided, and when we put them out in front as the first point of contact, that's when we started seeing people appreciating someone being there to say hi when they arrived and help with paperwork. Often that will translate to having a referral appointment and asking if the PN would come the next week. That has been the difference."*

The CHW role provides continuity of care to patients as exemplified in this statement from a CHW during an interview, "We're the constant in the patients' lives that nobody else really knows about. We have residents that leave, attendings that retire, but patients ask if they can keep us. That reassures them that they have a constant."

Integrating CHWs with the clinical staff was a challenging process for some awardees. To improve the coordination and workflow between clinical and nonclinical staff, one site hired a licensed clinical social worker so clinical staff could focus on direct patient care. The social worker first hired in June 2014 supervised the CHWs and served as the liaison between the CHWs and clinical staff, bridging the clinical (NP, RN, CMA) and nonclinical (CHW, PSR) components of the community health team.

In particular, several awardees cited two barriers to CHW integration with nurse practitioners and registered nurses: no prior experience working with CHWs and no established functions and roles for the CHWs. Currently, no nationally recognized guidelines or regulations exist for the educational level or skills needed for the CHW role; therefore, awardees established job descriptions and qualifications based on what they thought was needed for the position. One awardee stated, "I'm not sure if we ever arrived at having a strong program. Personalities didn't mesh; they didn't have the correct skill set and that made it challenging for us and the program."

For many awardees, however, navigators served as the "eyes of the clinicians" during specific referrals and helped providers to streamline access to heavily used clinics by working out a daily flow

process. As one awardee reiterated, "Patients appreciate when there is someone who speaks their language, so it's the extra bridge to fill in the gap with some nonclinical things that patients need, so having the language is good." Furthermore, one awardee credited the HCIA project with helping their organization to regulate the workflow of the CHWs stating that, "The innovation really helped standardize the care coordination role of the NCMs. Before, each clinic did things much differently." Other awardees mentioned creating workflow checklists and in one innovation, the project manager assigns the CHWs with their workflow, i.e., they assign the number of patients for each CHW and track how long it takes to resolve each case.

HIT Innovations

Of the 24 HCIA awardees, one-third (9) had innovation components involving health technology (HIT) designed for both patient and provider use. HIT innovations spanned a number of technical areas: mobile Health solutions (mHealth), patient portals, analytical capabilities, and documentation systems for paraprofessionals.[6] The majority of sites incorporated multiple components. HIT solutions were often supplemented by additional care coordination activities performed by staff who varied from registered nurses to community workers trained by the sites.

With HIT innovations, workflow integration is critical to innovation adoption. To ensure innovation components were integrated with provider and staff workflows, some awardees assessed the current workflows before implementation and engaged providers in the development of applications. Awardees completed their assessments on-site or by engaging providers and their staff in various planning committees and development activities. As one interviewee noted, "We seek to understand what they are getting at –sometimes what folks say they want and what they actually need is different. Then we make product decision with product manager and how we want to make those changes and how quickly to make them."

In addition to integrating HIT applications into the workflow, Altarum, Curators, U-Chicago, and Intermountain sought to integrate their applications and data with EHRs. These applications included clinical decision support tools, patient flags, and patient-reported measures to aid in care decisions. As one interviewee recalled,

> *"It was a manual process and there was a notification using direct messaging but it was largely a process that was manual and didn't fit well with the workflow of providers while it gave additional information and it really did add value because it was a way for people to know that their patients were admitted to a hospital, it created a workflow issue with the provider…We're now taking the next step to make it available within the electronic health record and create a workflow."*

EHR integration ensured end users could efficiently view relevant patient data when providing care. For example, Intermountain worked with an EHR vendor to integrate its IndiGO tool into the EHR

[6] mHealth refers to health technologies developed for mobile devices, such as smartphones, tablets, and activity trackers (e.g., FitBit).

system, which will allow providers to access the tool and patient records from one central location once integration is complete. As one interviewee recalled, "We have done a lot of work to account for EHR workflow, really streamline the usability, and the feedback we've had from our partners. We go through a design process and receive feedback from all of our partners, make modifications if necessary to the design and continue on with development." Mary's Center facilitated shared access to patient information among the clinics' EHRs and allowing providers to access key information in one central location (the health information exchange).

Workflow and EHR integration was a challenge for some awardees, partly due to the technical constraints. For example, Altarum reported the lack of single sign-on was a barrier to application use. The lack of single sign-on required providers to access their application outside of the EHR, adding more time to their workflow. Additionally, Curators reported that providers did not know where to find documentation from the care coordinators, also adding time to their workflow. Other awardees serving various health systems encountered the challenge of integrating into multiple EHRs. This integration required significant time and technical resources.

2.4.5 Workforce Development

Workforce development is an integral component in the process of testing and disseminating service delivery models in the HCIA program. As illustrated in the HCIA Community Resource evaluation framework, implementation effectiveness is measured at the workforce level of change through the following proximal outcomes: (1) clear understanding of roles and responsibilities (deployment); (2) adequate education and training of workforce (education and training); (3) recruitment of sufficient program staff (staff recruitment); (4) adequate infrastructure to support and train staff (infrastructure); and (5) staff satisfaction. Here we present findings for CHW and HIT awardees on two key workforce development themes that emerged from the data: (1) hiring and retention and (2) skills, knowledge, and training.

CHW Workforce

Hiring and Retention

For workforce development, we define hiring and retention as the extent to which the awardee hired and retained an adequate number of staff to implement the innovation. Among the 18 CHW awardees, four reported low numbers of staff, six reported high staff turnover, and one reported delayed processes of institutional approvals for hiring. Overall, each awardee determined the minimum qualifications required for hiring a CHW (or similar role) based on their innovation needs. Therefore, the hiring process among the CHW awardees is unique to each innovation. Since the first annual report, several awardees reported additional challenges with hiring. Internal issues included onerous organizational hiring processes and highly specialized qualifications of the position that yielded a limited number of candidates (e.g., W&I). External factors included the requirements of the Affordable Care Act

(ACA) that made credentialing of providers more complicated. One awardee relied on the community in which it was working to conduct the hiring process, which often took longer than anticipated.

Five awardees encountered problems with staff attrition in the final performance year; due to decreased funding, many CHWs did not feel secure in their employment status. U-Miami and Curators lost a significant number of their CHWs. U-Miami had 10 CHWs initially but dropped to 5, and Curators declined from 24 to 16. These positions were not filled and the work was redistributed among the remaining CHWs, which created additional burdens. One informant described the domino effect on patient care caused by CHW attrition as follows, "With the overall decrease in the number of nurse care managers, it made a big difference in what we were able to accomplish. You can't have a panel of like 670 patients and make a huge impact on the patients because you're always working on the ones who are the sickest." REMSA also reported that one of the main challenges in this last year of the grant was job security for the grant-funded staff, especially the clinical staff.

Two awardees reported success with hiring CHWs (or a similar role) from the local community versus candidates that might live elsewhere (e.g., BAHC and AACI). For example, AACI specifically hired people who received their patient navigator certificate from a partner community college stating that, "the nice thing is we have the pipeline of students graduating from the program, so we get our pick. The thing has been to find navigators with the language ability that we need. We have had speakers of Mandarin, Vietnamese, Spanish, Arabic." Three additional awardees noted language capabilities, particularly Spanish and Mandarin, as beneficial because CHWs who are fluent in these languages facilitate implementation.

Children's Hospital and NHCHC both reported ongoing issues with burnout among their CHWs serving high-need populations. One interviewee noted, "You can't talk about compassion fatigue and vicarious trauma and burnout enough because it is just unbelievably difficult work." Children's Hospital additionally reported a number of resignations and staff members on short- and long-term family and medical leave. Both of these awardees tried to mitigate issues with burnout by allowing their staff to attend self-care sessions in a conference setting (e.g., NHCHC) or ongoing sessions with a therapist (e.g., Children's Hospital). During the U-Chicago interview we learned that texting, phone calls, and in-person communications were used, as part of a pilot in one of the awardee sites, to provide professional support to the CHW on how to work with patients in an effort to avoid burnout. As one interviewee noted, "We put processes in place when she is on the streets so that we communicate where we are going and when we are leaving. I make sure to support our CHIS and other team members through communication on a regular basis." A key informant from BAHC reported minimal attrition, but noted that she found more turnover among staff hired from outside of the community versus those who live in the community, thereby making them seek people from the community when hiring.

Skills, Knowledge and Training

Providing the necessary skills, knowledge and training for their CHW workforce was important for program implementation across all awardees. These factors of workforce development are categorized by

awardees' programs and efforts to provide staff with the education and requisite skills to effectively execute their specific roles and responsibilities.

Training the CHW workforce, in particular, was an essential aspect of the implementation process for these awardees, mainly because of the need to hire new staff specifically for the HCIA innovation. Trainings were conducted in various settings across the awardees: one-one-one, classrooms, local community colleges, conferences, shadowing, and online trainings. Three awardees partnered with local community colleges or other certified collaborating agencies to establish CHW curriculum and certification programs within their community or medical assistant programs. However, as reported by one interviewee, having no experience with implementing this type of innovation and new partnerships also comes with challenges: "We didn't know health culture, so we hired a staff development director who created the curriculum for health coaches. So training has been a challenge. We continued to improve the curriculum."

The state of Florida has a CHW certification process, in which the CHWs working with U-Miami are currently becoming certified CHWs. A program leader informed us that they could be grandfathered into certification because of their extensive experience and hours worked. Some awardees continue to refine their training curriculum for CHWs as part of workforce development plans. For example, South County hired a curriculum specialist to help create the tools and curriculum necessary for their health coaches and panel managers. At this stage of program implementation, awardees completed extensive initial trainings; therefore, any trainings currently offered are mainly refreshers or new staff trainings. Routine program meetings that incorporated training topics were often cited as a good time and place for updates and refresher trainings. During these meetings staff can ask questions and express needs for additional training. Often program leaders provide requested information at the following meeting or plan for in-person or group trainings as needed. Online trainings were also used for refresher trainings or with new staff as they can easily be individually navigated.

HIT Workforce

Hiring and Retention

The nine awardees implementing HIT innovations were supported by various types of HIT workers: technical staff, such as application developers, data managers, and clinicians to advise awardee teams. Care managers and CHWs also served as key team members. U-Miami and Intermountain reported problems in hiring due to hiring processes and the inability to pay competitive salaries. Several awardees successfully leveraged their relationships with local universities for recruiting efforts. IA recruited and hired through networking events and coordination with local universities. Bronx RHIO used its partnership with Bronx Community College to identify and hire staff with health analytics training. Curators hired health information analysts from the University of Missouri for analytics. Some awardees hired external vendors to assist with technical implementation and workflow assessments. Generally, few HIT awardees reported issues with retention.

Skills, Knowledge and Training

Those HIT awardees who discussed hiring, did so in the context of hiring IT resources and care extenders, such as CHWs and care managers. As previously discussed, technical capabilities and skills were needed to integrate applications into existing EHRs and these skills were in short supply for some awardees. Altarum and Intermountain reported delays in getting technologies integrated with their EHRs because their vendors were focused on federal HIT initiatives such as Meaningful Use.

Training for the HIT innovations encompassed two major themes: general training and system training. Training for staff included general onboarding, orientation, and innovation-specific training. Trainings were delivered via multiple media, including online learning platforms, such as Blackboard, and instructor-led and on-site training. Awardees also partnered with other organizations to develop and deliver training curriculum.

System training—how to use the system—was cited as an integral factor across sites. End users were provided training about logging on, using system functions, and performing other activities associated with system use. This training typically was conducted in a laboratory or operational setting. Although most awardees identified end users and trained them in system use, the implications of use were not as well defined. For example, HIT implementation could change workflow, information availability, or other processes organizationally. In addition, HIT implementation was rarely conducted alone, but in concert with other activities such as hiring new staff or changing care management.

2.4.6 Summary of Implementation Process Challenges and Facilitators

The complexity and diversity of the HCIA innovations limits our capacity to directly compare implementation processes across awardees. Nonetheless, we identified themes that highlight the challenges associated with implementing complex, multifaceted innovations in dynamic settings. These themes, which we discussed in this section, are summarized in ***Table 2.4-1***.

Table 2.4-1. Implementation Challenges and Facilitators by Domain and Subdomain

Domain	Subdomain	Facilitators	Barriers
Execution (Project Expenditures)			• Spending below target in first two quarters due to: – Program start-up and adjusting to a new program – Additional start-up time for hiring staff, training staff, and adapting data systems
Organizational Capacity	Staffing		• Having insufficient number of staff and staff time for implementation
	Technology/Data		• Underestimating time and resources to adapt/integrate HCIA innovation to current data systems • Having inadequate IT capacity to meet reporting requirements
	Physical Space		• Lacking physical space to accommodate staff needs
	History	• Having prior history/experience with similar innovations	
	Partnerships	• Using partners to recruit participants, obtain data use agreements, and coordinate care	• Having administrative and contractual issues that delayed MOUs and DUAs with partners
Leadership Support	Organizational Leadership Support	• Engaging providers and gaining their support • Educating and engaging organizational leaders on program goals • Communicating routinely with program staff • Securing resources • Engaging external stakeholders	

(continued)

Table 2.4-1. Implementation Challenges and Facilitators by Domain and Subdomain (continued)

Domain	Subdomain	Facilitators	Barriers
Leadership Support (continued)	Program Leadership Support	• Supervising administrative and clinical activities • Identifying champions and partners • Securing additional funding • Soliciting feedback from staff • Assuming new duties as needed	
Innovation Adoption and Workflow Integration		• Having CHWs who: – Recruit patients – Provide continuity of care and patient referrals – Provide education and coaching	• Dealing with technical issues that impeded EHR and data integration • Expending significant time and expertise to develop algorithms and programming code.
Workforce Development	Hiring and Retention		• Having CHWs who: – Are subject to restrictive hiring procedures – Lack suitable recruits – Require more clinical supervision • Dealing with HIT workforce issues: – A mix of technical staff, including programmers, data managers, and developers, is required
	Skills, Knowledge, and Training	• Using external partners to conduct staff training	• Needing specialized technical skills to integrate applications into EHRs

DUA = data use agreement; EHR = electronic health record; HIT = health information technology; MOU = memorandum of understanding.

2.5 Measures of Implementation Effectiveness

2.5.1 Participant Enrollment and Reach

A key evaluation measure of program success is the degree to which the awardee enrolled or engaged the participants in the innovation (reach). Defining reach requires an in-depth understanding of the goals of the innovation, its target population(s) and its recruitment and enrollment protocols. Each innovation has a unique reach definition and therefore, direct comparisons across awardees are not appropriate. However, reach is a useful metric by which to evaluate implementation effectiveness

Table 2.5-1 shows the overall reach for all 24 awardees based on secondary data received for Q11 reporting. The number of patients in the target population ranges from 500 (NHCHC) to 170,000 (U-Chicago); the cumulative proportion reached ranges from 2.5 percent (Intermountain) to 100.0 percent (Curators). Two awardees' reach targets included physicians (IA and Altarum), and one included critical access hospitals (Mineral Regional). Ten awardees reached 70 percent or more of their patient population while four awardees reached fewer than 30 percent. Those awardees who could identify a specific, static target population based on the number of patients they expected to reach (e.g., Curators, NHCHC) tended to have higher reach percentages. Awardees whose target population reflects the number recruited each quarter (e.g., Children's Hospital, Mary's Center) tended to have lower reach percentages. Thus, having a specific population to which to target the innovation tends result in greater reach.

Table 2.5-1. Participant Enrollment and Reach across All HCIA Community Resource Awardees since Project Launch through Q11

Awardee	Cumulative Target Population	Cumulative Number of Participants Enrolled	Total Reach (Percentage)	Notes
AACI	4,166	2,837	68.1	Number enrolled as a percentage of target population
Altarum	43	40	93.0	Includes McLaren physician practice users as a percentage of McLaren practices trained
	147	109	74.1	Includes UP physician practice users as a percentage of UP practices trained
BAHC	1,461	601	41.1	Includes intensive case management component only
Bronx RHIO	55,215	22,999	41.7	Includes patients in at least 1 BRIC report
Children's Hospital	5,103	1,522	29.8	Includes all enrolled participants as a percentage of participants contacted and located
Curators	9,932	9,932	100.0	Includes charter members enrolled prior to July 1, 2013, minus those deceased prior to the innovation start and those whose deceased date is prior to their enrollment start date

(continued)

Table 2.5-1. Participant Enrollment and Reach across All HCIA Community Resource Awardees since Project Launch through Q11 (continued)

Awardee	Cumulative Target Population	Cumulative Number of Participants Enrolled	Total Reach (%)	Notes
Delta Dental	6,022	4,698	78.0	Includes Medicaid-eligible children aged 0 to 8 who received prophylaxis treatment as a percentage of both Medicaid-eligible and ineligible students from the school sites aged 0 to 8 enrolled in the Circle of Smiles program
ECCHC	2,361	1,468	62.2	Number enrolled as a percentage of 3-year projection of enrollment
Finity	10,445	11,388	109.0	Number of Baby Partners participants enrolled as a percentage of target number of participants
	1935	558	28.8	Number of diabetes participants enrolled as a percentage of target number of participants
	1,201	551	45.9	Number of heart health participants enrolled as a percentage of target number of participants
IA	—	151,596	—	Includes number of patients who received an imaging study
Intermountain	24,669	367	1.5	Includes patients viewed in IndiGO during an appointment as a percentage of eligible IndiGO patients
	415	280	68.0	Includes number of SSM physicians enrolled as a percentage of the number of SSM physicians targeted
Mary's Center	17,362	2,857	16.5	Includes number of participants enrolled as a percentage of the number targeted for enrollment
Mineral Regional	25	25	100.0	Includes critical access hospitals
MPHI	9,154	6,597	72.1	Includes enrolled participants (i.e., signed ROI only) as a percentage of those referred to Pathways innovation
NHCHC	500	414	82.8	Includes enrolled participants as a percentage of target population. NHCHC stopped enrolling new patients in Q9.
NEU	—	14,153	—	Includes the total number of enrolled participants in Cambridge Health Alliance, Lahey Health System, Hallmark Health, and Boston Medical Center projects
Prosser	1,244	911	73.2	Includes enrolled patients across all three cohorts as a percentage of those eligible

(continued)

Table 2.5-1. Participant Enrollment and Reach across All HCIA Community Resource Awardees since Project Launch through Q11 (continued)

Awardee	Cumulative Target Population	Cumulative Number of Participants Enrolled	Total Reach (%)	Notes
REMSA	6,315	773	12.2	Includes number of ATA encounters as a percentage of eligible encounters
	1,050	579	55.1	Includes total number of CP Enrollment Program patients enrolled as a percentage of patients referred to the program
	108	102	94.4	Includes total number of CP Evaluate and Refer patients as a percentage of patient referred to the program
	163,198	17,810	10.9	Includes number of NHL encounters as a percentage of target population (i.e., households in Washoe County)
SEMHS	—	596	—	SEMHS does not provide cumulative data on the target population
South County	6,180	3,222	52.1	Includes enrolled participants as a percentage of the number of participants anticipated to have started the intervention and to have complete documentation in its EHR by June 2015
U-Chicago	170,000	90,386	53.2	Includes enrolled participants across U-Chicago and 3 clinical sites as a percentage of people living in one of the 11 high-poverty, high-risk zip codes on Chicago's south side
U-Miami	11,063	9,548	86.3	Includes those enrolled (i.e., the number of students in the school-based health clinics receiving services) as a percentage of the number of children attending the target schools
W&I	1,708	1,250	73.2	Includes early, moderate, and late preterm and full-term infants enrolled as a percentage of those eligible
Y-USA	6,874	5,696	82.9	Includes participants attending at least 4 core sessions as a percentage of those recruited (i.e., attending at least 1 core session)

ATA = ambulance transport alternative; BRIC = Bronx Regional Informatics Center; CP = community paramedic; EHR = electronic health record; NHL = nurse health line; ROI = release of information; SSM = Shared Savings Model; UP= United Physicians.
— Awardee did not specify a target population. Therefore, reach could not be calculated.

2.5.2 Dose

Reach alone, is not an adequate measure to evaluate the effectiveness of awardee implementation. Therefore, the evaluation also seeks to understand the varying intensity and frequency of the services or treatment provided to the reached population. Each awardee has a unique definition of dose based on the attributes of the innovation and the data available. The number and percentage of participants receiving services through Q11 are provided in ***Table 2.5-2***. We received dose data for 18 of the 24 awardees. As the table shows, enrolled participants received between 2 and 12 different types of services. Half of the awardees with dose reported providing health education (e.g., AACI, MPHI, NHCHC,

U-Miami), including coaching (e.g., ECCHC, South County), peer health mentoring (e.g., Finity), self-management support (e.g., Curators), and individual and group skills training (e.g., SEMHS). For nearly one-half of awardees, dose included health care visits (e.g., AACI, BAHC, Children's Hospital, ECCHC, Finity, REMSA, and W&I) and/or home care visits (e.g., BAHC, ECCHC, Prosser, REMSA, and W&I). For some awardees (e.g., Mary's Center) visits are reported as health outcomes rather than as dose in the individual awardee sections.

Other dose services included contacts/communication (e.g., Curators, Finity, South County, and W&I), appointment assistance or reminders (e.g., AACI, Prosser, SEMHS), assistance with obtaining health insurance (e.g., MPHI, U-Miami), language or interpretation assistance (e.g., AACI, NHCHC), transportation (e.g., AACI, NHCHC), and referrals (e.g., MPHI, South County).

Table 2.5-2. Number and Percentage of Participants Receiving Services through Q11, by Awardee

Awardee	Number of Participants Receiving Services	Percentage of Enrolled Participants Receiving Services
AACI		
Appointment assistance or reminders	26	1.0
Assistance with filling out forms	2,150	75.8
Health education	18	0.6
In-person visit	669	23.6
Language assistance	4	0.1
Transportation assistance	36	1.3
Other service	71	2.5
Altarum	—	—
BAHC		
Primary care visits	544	90.5
IC management home visits	531	88.4
Bronx RHIO	—	—
Children's Hospital		
No visits	615	40.4
One visit	234	15.4
Two visits	87	5.7
Three visits	586	38.5
Curators		
Assess needs and goals	6,270	63.1
Communication	6,487	65.3
Community resources link	4,066	40.9
Facilitate transitions	4,344	43.7
Plan of care	4,885	49.2
Self-management support	4,292	43.2
Delta Dental	—	—

(continued)

Table 2.5-2. Number and Percentage of Participants Receiving Services through Q11, by Awardee (continued)

Awardee	Number of Participants Receiving Services	Percentage of Enrolled Participants Receiving Services
ECCHC		
Visits	1,429	97.3
Asthma health coaching	40	2.7
Diabetes health coaching	211	14.4
Hypertension coaching	367	25.0
Finity		
Baby Partners: one type of visit only (e.g. prenatal visit, dental visit, or postpartum visit)	4,347	38.2
Baby Partners: two type of visits (e.g., prenatal visit, dental visit, and/or postpartum visit)	3,522	30.9
Baby Partners: Completed all three types of visits and received bonus payment	1,740	15.3
Diabetes: LDL-C test	442	79.2
Diabetes: HbA1c assessment	502	90.0
Diabetes: Provider visit	512	91.8
Diabetes: Monthly contact with peer health mentor	51	9.1
Heart Health: LDL-C test	371	67.3
Heart Health: Primary care visit	493	89.5
Heart Health: Improved blood pressure	85	15.4
Heart Health: Medication adherence	206	37.4
Heart Health: Monthly contact with peer health mentor	35	6.4
IA	—	—
Intermountain	—	—
Mary's Center		
Care plans completed	2,226	93.2
Phone calls answered	2,751	96.3
Mineral Regional		
Completed a BHIP	17	68.0
Hired a BHIS	23	92.0
Completed a CNA	22	88.0
Established a community collaborative	12	48.0
Participated in formulary management	21	84.0
Participated in end-of-life registry	11	44.0
Participated in swing-bed research study	5	20.0
MPHI[1]		
Medical referral	3,289	56.9
Social service referral	4,249	73.5
Medication assessment	2,672	46.2

(continued)

Table 2.5-2. Number and Percentage of Participants Receiving Services through Q11, by Awardee (continued)

Awardee	Number of Participants Receiving Services	Percentage of Enrolled Participants Receiving Services
MPHI[1] (continued)		
Education	2,016	34.9
Health insurance	921	15.9
Medical home	920	15.9
PHQ-9 Screening Tool	1,361	23.6
Fall Prevention Tool	1,116	19.3
NHCHC		
Transportation	119	28.7
Health education/supportive counseling	110	26.6
Eligibility assistance/financial counseling	29	7.0
Interpretation services	11	2.7
NEU	—	—
Prosser		
Assisting with one specific service only (i.e., PCP appointment, fill prescription, review discharge instructions)	233	22.1
Assisting with two specific services (i.e., PCP appointment, fill prescription, review discharge instructions)	48	4.6
Assisting with all three services (i.e., PCP appointment, fill prescription, review discharge instructions)	27	2.6
REMSA[2]		
Home visits made by CPs	579	100.0
SEMHS		
Outreach	393	65.9
Case management	123	20.6
Individual skills training	12	2.0
Group skills training	26	4.4
Transportation	63	10.6
Nonbillable (scheduling, reminders)	280	47.0
Other	86	14.4
South County		
Comprehensive assessment completed	3,027	92.7
Care plan initiated	2,967	92.8
Contact with health coaches	1,296	40.2
Referred to IBHS	393	12.2

(continued)

Table 2.5-2. Number and Percentage of Participants Receiving Services through Q11, by Awardee (continued)

Awardee	Number of Participants Receiving Services	Percentage of Enrolled Participants Receiving Services
U-Chicago		
1 Healthe*Rx* report	51,241	57.1
2 Healthe*Rx* reports	18,155	20.2
3+ Healthe*Rx* reports	20,405	22.7
U-Miami		
Dental services	551	5.8
Assistance with ACA, Kidcare, or Medicaid application	409	4.3
Behavioral health/counseling	3	0.1
Community health resources	9	0.1
Food stamps/SNAP/WIC assistance	184	1.9
Health education	38	0.4
Other (e.g., legal, housing, fraud, financial assistance)	14	0.1
Mental health	7	0.1
W&I[3]		
Receive 1-month assessment	974	84.0
Receive 3-month assessment	819	77.6
Complete Edinburgh Depression Scale	765	83.3
Receive additional calls during first month after discharge	967	83.4
Receive additional calls during 3 months after discharge	972	92.1
Receive a post-discharge phone call	1239	99.0
Receive a nurse practitioner home visit	412	92.4
Y-USA		
1–3 sessions	1,178	17.2
4–8 sessions	1,370	19.9
9–16 sessions	2,578	37.5
17+ sessions	1,748	25.4

[1] Only includes Pathways completed by at least 10 percent of participants
[2] Dose only relevant for CP component
[3] Across early preterm, moderate preterm, late preterm, and full-term infants
ACA = Affordable Care Act; BHIP = Better Health Improvement Plan; BHIS = better health improvement specialist; CNA = community needs assessment; CP = community paramedic; IBHS = integrated behavioral health services; IC = intensive case; PCP = primary care provider; SNAP = Supplemental Nutrition Assistance Program; WIC = Special Supplemental Nutrition Program for Women, Infants and Children.
— Dose data not available or not relevant to the innovation.

2.5.3 Dose Based on Ratio of CHWs to Patients Enrolled

To assess whether the ratio of CHWs to patients enrolled influenced the extent to which dose services were provided to participants, we calculated the average number of participants enrolled per CHW per quarter and the percentage of participants enrolled who received some dose over the course of the innovation (***Table 2.5-3***). As shown in *Table 2.5-3*, 12 of the 18 awardees with CHWs provided some dose to at least three-quarters of enrolled participants. Among those, the average number of participants per CHW per quarter ranged from approximately 9 (e.g., BAHC, REMSA, SEMHS) to 417 (e.g., Finity).

In general, awardees with an average of less than 100 participants enrolled per CHW per quarter provided services to at least half of their enrollees. The exception to this generalization is AACI, with an average CHW caseload per quarter at approximately 135; the majority of participants (75.8%) received assistance with filling out forms.

Finity, U-Chicago, and U-Miami provided CHW services to approximately 16 percent or fewer of enrolled participants. For Finity, the majority of services listed in the dose section above are not provided by the peer health mentors. For instance, we report the number of incentives received for the Baby Partners component based on prenatal, postpartum, and dental visits—services not provided by the peer health mentors. In U-Chicago, the focus of the community health information specialist (CHIS) was not necessarily to follow up with enrollees, but to be available for enrollees if they made contact. Therefore, services provided were based on the initiative of the enrollees rather than at the initiative of the CHIS. Considering dose services provided in general (not just those provided by CHIS), Healthe*Rx* prints were provided to 100 percent of enrollees. For U-Miami, the patient-level data we received from U-Miami likely includes much missing data. Thus, U-Miami likely provided services to more participants than the data reflect.

Table 2.5-3. Dose as a Function of Average CHW Caseload per Quarter

Awardee	Average Number of Participants per CHW per Quarter	Percentage of Participants who Received Some Dose Service Provided by CHW[1]	Notes
U-Chicago	5,649.2	0.1	
AACI	135.1	86.6	
U-Miami	108.5	10.4	
Finity	52.8	15.5	Diabetes and Heart Health components
Curators	50.2	73.6	
Delta Dental	40.2	N/A	
W&I	20.9	99.2	
Children's Hospital	18.8	59.6	
Prosser	16.9	100.0	
ECCHC	16.3	97.3	
YUSA	14.7	100.0	

(continued)

Table 2.5-3. Dose as Function of Average CHW Caseload per Quarter (continued)

Awardee	Average Number of Participants per CHW per Quarter	Percentage of Participants who Received Some Dose Service Provided by CHW[1]	Notes
Mary's Center	13.2	96.3	
MPHI	12.9	87.6	
South County	12.8	92.7	
BAHC	9.1	90.5	
REMSA	9.1	100.0	CP patients only
SEMHS	9.0	100.0	
NHCHC	3.3	65.0	

Source: Patient-level data provided by to RTI.
[1] Numerator is number of participants for whom we have data indicating they received at least 1 innovation service. The denominator is the number of participants enrolled.
CHW = community health worker; CP = community paramedic.

Thus, the ratio of CHWs to patients enrolled seemed to influence the extent to which dose services were provided to participants. In general, awardees with an average of less than 100 participants enrolled per CHW per quarter provided services to at least half of their enrollees. Awardees with an average of more than 100 participants enrolled per CHW provided services to approximately 10 percent or less of those participants. The exception was AACI, who with approximately 135 participants per CHW, provided at least one service to more than 85 percent of participants enrolled.

2.6 Models of Implementation Effectiveness

2.6.1 Overview of Qualitative Comparative Analyses

We used qualitative comparative analysis (QCA) to examine combinations of organizational characteristics that contribute to implementation effectiveness. Organizational theories of implementation posit the characteristics that contribute to effective implementation of an innovation. Effective implementation refers to delivering the innovation as planned, or with purposive modifications, to an appropriate audience and with consistency.[7] Achieving implementation effectiveness depends on multiple organizational characteristics, such as organizational readiness for change, alignment of the innovation with the organizational values, and resources for change. Although these factors can support implementation effectiveness, an organization may not have all of these characteristics at high levels, but still manage to implement the innovation effectively. Because we were interested in the different combinations of organizational characteristics that facilitated implementation effectiveness, we used QCA to capture the multiple pathways to achieving implementation effectiveness.

Methods

Drawing from mathematical set theory, QCA examines which condition sets (similar to variables)—individually or in combination—are necessary or sufficient for producing an outcome.[8] An analysis using QCA assesses the combinations of all condition sets at high or low levels and uses formal logic and Boolean algebra to reduce solutions. A finding of a necessary condition set or combination of condition sets indicates that the condition set (or combination) must be present for the outcome to occur, but does not guarantee that the outcome will occur. A finding of a sufficient condition set or combination of condition sets means that if the condition set (or combination of condition sets) is present, then the outcome is also present.[9] QCA differs from probabilistic methods, which employ linear algebra and assess what factors (holding all other factors constant) maximize the likelihood of an outcome.[10]

Analysis

After site visits and close out interviews, site visit teams completed a QCA summary form to assess awardees on several domains—awardee leadership engagement, history of implementing similar innovations, organizational priority of the innovation, and achieving implementation effectiveness. We selected these dimensions based on organizational-theories of implementation (e.g., Damschoder and

[7] Weiner, B.J., Lewis, M.A., and Linnan, L.A.: Using organization theory to understand the determinants of effective implementation of worksite health promotion programs. Health Ed Res, 24(2), 292-305, 2009. doi:10.1093/her/cyn019

[8] Schneider, C.Q., and Wagemann, C.: Set-Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis. Cambridge: Cambridge University Press; 2012.

[9] Ragin, C.C.: Fuzzy-Set Social Science. Chicago: University of Chicago Press, 2000.

[10] Longest, K.C., and Thoits, P.A. (2012). Gender, the stress process, and health: a configurational approach. Soc Ment Hlth, *2*(3), 187-206, 2012.

colleagues,[11] Weiner and colleagues[12]); also because we had 24 awardees, we has a limited number of conditions we could include to avoid creating too much "limited diversity," i.e., having no empirical cases for combinations. (Because QCA examines all combinations of conditions at high and low levels, the number of possible combinations increases exponentially with each additional condition in the model.) ***Table 2.6-1*** provides the definition of each condition and how it was calibrated. We compiled the values into a single dataset and used the dataset to develop a truth table (provided in ***Appendix B.6***), the central analytic tool in QCA analyses.[13] Using best practices outlined by Schneider and Wagemann,[14] we conducted a conventional QCA and employed R's QCA and SetMethods packages to implement these analyses.[15] A complete description of the analysis appears in Appendix B.6.

Table 2.6-1. Conditions, Definitions, and Calibration Decision

Condition Set	Definition	Calibration
Strong leadership engagement	Leadership engagement refers to the commitment, involvement, and accountability of leaders for implementation.	If the awardee had 5 (of 7) or more leadership attributes in the form, it was scored as 1, fully in the set of having strong leadership engagement. Awardee leadership attributes: • Understands the innovation well and can articulate their direct involvement • Attends staff meetings involving the innovation • Provides in-kind resources • Provides for staff resources (i.e., created at least .5 FTE jobs that are not funded by HCIA), • Ensures adequate space and/or equipment is allocated for the innovation • Serves as a liaison to external partners for the innovation.
		If the awardee had fewer than 5 attributes, it was scored as 0, fully out of the set.
History of implementing innovations* **(This item came from the 2014 QCA form)**	History refers to whether the awardee organization had experience implementing the innovation (or a similar innovation) or was scaling up an existing innovation.	If the awardee had implemented the innovation or a similar innovation or was scaling up an existing innovation, it was scored as 1, fully in the set of having a history of implementing the innovation.
		If the awardee had no experience implementing the innovation (i.e., the innovation was completely new), it was scored as 0, fully out of the set of having a history.

(continued)

[11] Damschroder, L.J., and Lowery, J.C.: Evaluation of a large-scale weight management program using the consolidated framework for implementation research (CFIR). Imple Science, 8, 2013.
[12] Weiner, B.J., Lewis, M.A., and Linnan, L.A.: Using organization theory to understand the determinants of effective implementation of worksite health promotion programs. Health Ed Res, 24(2), 292-305, 2009. doi:10.1093/her/cyn019
[13] Ragin, C.C.: Fuzzy-Set Social Science. Chicago: University of Chicago Press, 2000.
[14] Schneider, C.Q., and Wagemann, C.: Set-Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis. Cambridge: Cambridge University Press; 2012.
[15] Dusa, A., and Theim, A.: Qualitative Comparative Analysis. R Package Version 1.1-4, 2014. Retrieved March 19, 2015, from http://cran.r-project.org/package=QCA

Table 2.6-1. Conditions, Definitions, and Calibration Decision (continued)

Condition Set	Definition	Calibration
High organizational priority for the innovation	This condition refers to individuals' shared perception of the importance of the implementation of the innovation within the organization and whether competing programs or initiatives distract or compete with the innovation. To capture this, we assessed whether the implementation team was (1) responsive to requests, and (2) shared data with the RTI team.	If the awardee scored high or mostly high on responsiveness to requests and sharing data (or was rated as high on one of the items and somewhat low on the second item), it is scored as 1, fully in the set.
		If the awardee scored low or somewhat low on both items (or low on one item and high on a second item), then it is scored as 0, fully out of the set.
OUTCOME: Achieving implementation effectiveness	Effective implementation (also known as "implementation success") refers to delivering the innovation as planned or with purposive changes to a substantial proportion of the targeted population in doses associated with effectiveness. RTI analysts rated the awardee as to whether awardee was very successful, successful, somewhat successful, or not at all successful.	If the awardee was rated as either very successful or successful, it was scored as 1, fully in the set of achieving implementation effectiveness.
		If the awardee was rated as either somewhat successful or not at all successful, it was scored as 0, fully out of the set of achieving implementation effectiveness.

CEO = chief executive officer; HCIA = Health Care Innovation Award; PD = project director; PI = principal investigator.

2.6.2 *What Organizational Characteristics Lead to Implementation Effectiveness?*

Thirteen awardees were scored as achieving implementation effectiveness; the remaining 11 respondents did not achieve implementation effectiveness. None of the individual condition sets were necessary or sufficient for achieving implementation effectiveness; no necessary combinations occurred.

Analysis of the sufficient combinations for the outcome showed three highly consistent combinations:

1. Having strong leadership engagement and having a high organizational priority
2. Having strong leadership engagement and having a history of implementing the innovation
3. Having a high organizational priority and having a history of implementing the innovation

Table 2.6-2 displays the solutions, their individual consistency and coverage values, and the total solution consistency and coverage. ***Figure 2.6-1*** depicts the solutions in a Venn diagram. All three solutions had high consistency, ranging from 0.833 (83.3 percent) to 0.889 (88.9 percent). Consistency indicates the proportion of cases with a given combination that also exhibit the outcome; high consistency shows that a combination works all (or most) of the time (i.e., sufficient to produce the outcome). Total coverage assesses how many (or the proportion of) cases that exhibit the outcome are accounted for across all combinations (i.e., necessity). High coverage indicates whether combinations are common enough to be useful in the field. In this analysis with crisp sets, raw coverage identifies the proportion of cases that fall into a solution that also exhibit the outcome; unique coverage refers to the proportion of

cases that fall into a single solution and into the outcome. For example, combination 2 below (strong leadership engagement and a history of implementing the innovation) has a raw coverage of 0.385. It accounts for 5 of the 13 awardees that achieved implementation effectiveness (i.e., 5 divided by 13), but a very low unique coverage (0.077, or 1 divided by 13) because it uniquely accounts for S19. All the other awardees in that solution can be represented by one of the other two combinations.

The third combination (high organizational priority and having a history of implementing the innovation) accounted for the most awardees who achieved implementation effectiveness (0.615 or 61.5% raw coverage, or 8 of the 13 awardees achieving implementation effectiveness). The third combination accounted for S3, S6, S7, S9, S13, S21, S23, and S24; although S11 is within this combination, it did not achieve the outcome; thus, it falls outside the large blue circle in ***Figure 2.6-1***.

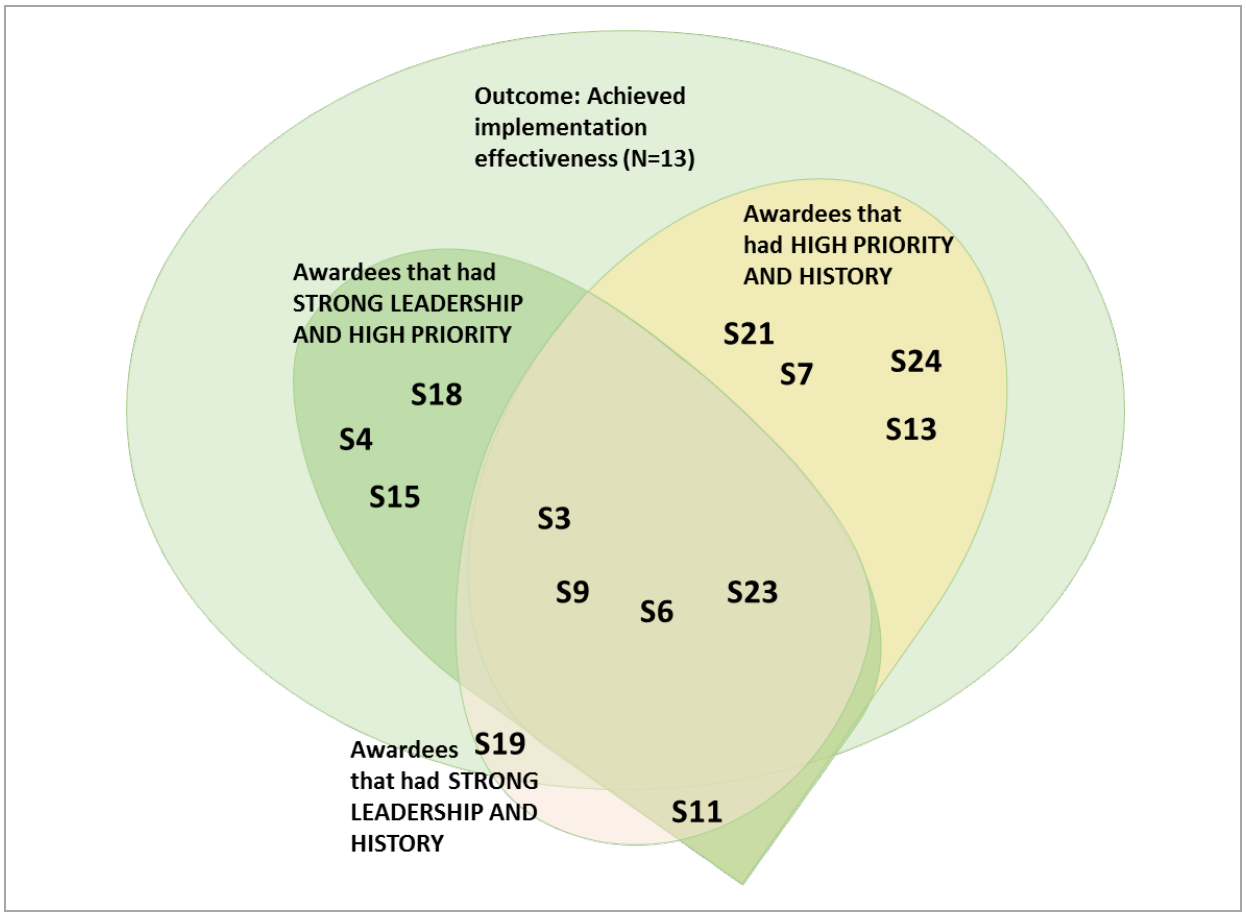
The first combination (strong leadership engagement and a high organizational priority) accounted for 7 of the 13 awardees (0.538, or 53.8% raw coverage); this solution covers S3, S4, S6, S9, S15, S18, and S23. (Like the third combination, S11 is within this combination.) The second combination (strong leadership engagement and a history of implementing the innovation) accounted for 5 of 13 awardees (0.385, or 38.5% raw coverage); this combination included S3, S6, S9, S19 and S23. Also within this combination was S11 but, it did not achieve implementation effectiveness.

Four awardees that achieved implementation effectiveness (S3, S6, S9, and S23) appeared in all three solutions, which resulted in lower unique coverage. Taken together, these solutions meant that 12 of the 13 awardees achieved implementation effectives (92.3% total coverage), and together had a 92.3 percent total consistency.

Table 2.6-2. Sufficient Combinations for Achieving Implementation Effectiveness

Sufficient Combination	Raw Coverage	Unique Coverage	Consistency
1. Strong leadership engagement and having a high organizational priority	0.538	0.231	0.875
2. Strong leadership engagement and having a history of implementing the innovation	0.385	0.077	0.833
3. High organizational priority and having a history of implementing the innovation	0.615	0.308	0.889
Total solution consistency=0.923			
Total solution coverage=0.923			

Figure 2.6-1. Sufficient Combinations for Achieving Implementation Effectiveness



Note: Not drawn to scale. One awardee that achieved implementation effectiveness fell into a combination that was not successful at a .80 consistency threshold.
S# indicates an awardee. S1 = AACI; S2 = Altarum; S3 = BAHC; S4 = Bronx RHIO; S5 = Children's Hospital; S6 = Curators; S7 = Delta Dental; S8 = ECCHC; S9 = Finity; S10 = IA; S11 = Intermountain; S12 = Mary's Center; S13 = MPHI; S14 = Mineral Regional; S15 = NHCHC; S16 = NEU; S17 = Prosser; S18 = REMSA; S19 = South County; S20 = SEMHS; S21 = U-Chicago; S22 = U-Miami; S23 = W&I; S24 = Y-USA.

Combination 1: Strong Leadership and Organizational Priority

Awardees in the first solution (strong leadership engagement and a high organizational priority) tended to have leaders who directly engaged in some aspects of implementation, were responsive to the innovation's emerging needs, and had expertise or experience with the aspects of the innovation (e.g., experience working with community health centers or knowledge of pediatrics). Additionally, these awardees also had organizational mandates to support implementation and defined HCIA activities as part of a longer-term change for their organizations. The combination of these factors highlights how these organizational factors are mutually reinforcing. Having high-level leadership and organizational priority for innovations can help staff see that the innovation is important to the organization and may also encourage longer-term changes in practice among staff. For example, the CEO of one awardee reached out to partner organizations to discuss ways to adapt protocols and workflows for the innovation; prior to completing the contract negotiations with CMS, this CEO also provided financial support for the

innovation so that implementation would not be delayed. This awardee also aligned the innovation with longer-term organizational goals to enhance services to patients, thus integrating the innovation into existing priorities.

Combination 2: Strong Leadership and History

Like awardees in the first solution, awardees in the second solution (strong leadership engagement a history of implementing the innovation) had high-level leaders who were directly involved in implementation, provided significant resources for the innovation, and had knowledge and expertise. Awardees in this solution, however, had either expanded or scaled up an existing innovation or had implemented an innovation similar to one they had implemented before. The combination of leadership support and history meant that the implementation team had high-level endorsement, existing resources, and the knowledge to implement the innovation. The combination of leader and implementation team knowledge and experience facilitated implementation effectiveness by giving the awardee critical capacity and human resources for the innovation. For instance, in one awardee, the CEO had extensive experience in establishing community health centers and enhancing workflows; she provided conceptual guidance for the implementation team. Because the implementation team had attempted a similar innovation prior to HCIA, they knew the key partners to include in this innovation.

Combination 3: Organizational Priority and History

Awardees in the last solution (high organizational priority and history of implementing the innovation) implemented innovations that aligned with their organizational mission or were consistent with ongoing activities and strategic plans. This situated the HCIA innovation into existing organizational commitments. The history with implementing similar innovations also meant that awardees had resources and partners in place to implement the HCIA innovation. Like the awardees in the first solution, this group of awardees' innovations matched well with long-term organizational commitments and priorities, making the innovation a part of existing priorities. Aligning innovation activities with existing organizational priorities also meant that implementation leaders did not need to generate new organizational support or create a culture change, but could rely on established missions and goals. Similarly, building on previous work meant that the awardee could rely on proven relationships and resources. For example, one awardee had previously worked on HIT projects, knew the HIT vendor well, understood the staffing needs and rollout process, and had key staff in place because those staff had been involved in previous implementations. Additionally, implementing the innovation was such a priority that an associate dean oversaw the implementation process.

Limitations

As with any study, several limitations are worthy of mention: (1) the results are not statistically generalizable because of the population size, (2) our assessments of these awardees are based on key informant interviews, and (3) our proxy measure for priority focuses on awardee staff's responsiveness and ability to provide data. Although the results of this study are not statistically generalizable, they do shed light on common pathways to implementation effectives across multiple awardees, which provides

useful information about important conditions for practitioners interested in implementing similar innovations and demonstrates that programs can have varied models and resources and still achieve implementation effectiveness.

Second, our assessments of the leadership, history, organizational priority, and implementation effectiveness rely on what key informants reported. Because key informants may have a vested interest in inflating the success of their innovations, they may overstate their background and accomplishments. However, our evaluation team created a structured QCA form (see Appendix B.6) and interview protocol for identifying very specific benchmarks for scoring awardees. Thus, key informants need to provide examples to receive a higher rating, and across the awardees, only slightly more than half achieved implementation effectiveness, which suggests that our QCA form and interview protocol could help us to distinguish between more and less successful awardees.

Last, few measures of priority exist within the implementation literature, with few exceptions (e.g., Helfrich et al., 2009).[16] To assess measures of organizational readiness to change, such as relative priority, researchers typically administer organizational surveys of many staff, which was not feasible in this evaluation. In 2014, we tested a measure of priority involving the definition of priority alone and asking site visit teams to assess the extent to which staff identified the innovation as a priority. Unfortunately, this measure produced no variation and proved unhelpful. As a result, we attempted to develop a proxy measure to capture whether staff responded efficiently to our evaluation team's requests. Responsiveness could indicate that the awardee staff saw this project as important enough to reply in a timely fashion and had the capacity to do so. This method is not an ideal assessment of priority; we will explore alternate assessments in future reports.

[16] Helfrich, C.D., Li, Y.F., Sharp, N.D. et al.: Organizational readiness to change assessment (ORCA): development of an instrument based on the Promoting Action on Research in Health Services (PARIHS) framework. Implement Sci. Jul 14; 4:38, 2009. doi: 10.1186/1748-5908-4-38.

2.7 Conclusions

2.7.1 To What Extent Have the HCIA Community Resource Innovations Resulted in Smarter Spending?

Overall, our findings indicate the innovations are not having a significant effect on Medicare beneficiary spending. Only two innovations (Bronx RHIO and Y-USA) show statistically significant savings in the intervention period. Seven interventions show statistically significant losses during the intervention period (NEU-Lahey, MPHI, NEU-CHA, U-Chicago, Altarum, Curators, Intermountain-C3). However, an examination of the quarterly effects for MPHI reveals a large loss in the first intervention quarter with subsequent progress toward savings, though not significant, in the final three intervention quarters. MPHI illustrates the importance of examining the quarterly specific effects of the intervention over time. When we examined quarterly effects for Y-USA, we noted that the effect of the intervention is highest in the first five innovation quarters. Additional sample size in the later quarters may reverse this trend in later reports. Finally, Curators consistently demonstrates losses in both the overall estimates and the quarterly estimates. We have a high degree of confidence in these results because Curators has a very large sample size.

2.7.2 To What Extent Have the HCIA Community Resource Innovations Resulted in Better Care?

Inpatient Admissions and Emergency Department Visits

Medicare regression analyses for 14 awardees indicate that most innovations are having no or limited effect on inpatient hospital admissions. The majority of innovation quarters show neither increased nor decreased probabilities of inpatient admissions or ED visits. However, for many of the awardees, we are limited by very small sample size. For inpatient admissions, the rates of inpatient hospitalization in the intervention period significantly decreased for three awardees (Bronx RHIO, Y-USA, and Mineral Regional). We found similar results for ED visits; the rates of ED visits in the intervention period significantly decreased for one awardee (Curators).

Clinical Effectiveness Measures

Overall, the findings among awardees in which similar clinical effectiveness outcomes are reported in this annual report, suggest that many innovations are providing clinical services to enrollees. More specifically, the majority (over 80%) of patients enrolled in ECCHC receive the clinical services recommended for their condition (i.e., HbA1c and lipid assessment, a foot exam, blood pressure screening). Nearly all of BAHC's intensive case management patients have received an influenza

immunization, and more than half received a pneumococcal vaccination as well. At least three-fourths of patients enrolled in ECCHC's, U-Chicago's, and Y-USA's innovations received a BMI assessment.

Based on the data provided to RTI, only a small percentage of patients enrolled in Intermountain's, MPHI's, and NHCHC's innovations received clinical services. More specifically, less than one-third of patients with diabetes enrolled in these innovations received an HbA1c and lipid profile assessment. Less than half of MPHI's patients with hypertension received a blood pressure screening, and less than one-third of Intermountain's and MPHI's patients overall received a BMI assessment.

Provider Satisfaction and Perceptions of Impact on Patient Care

Better care for patients involves not only ensuring access to clinically effective services but also promoting a better practice environment for providers. The findings from the HCIA Provider Survey suggest that CHW innovations are making a positive impact on clinical workflow and, by extension, increasing the satisfaction of those involved with the innovation. Over two-thirds of the providers in the CHW innovations perceived them as being a worthwhile investment and improving efficiency. We also found that the innovation does not appear to either negatively or positively impact workflow of many specific clinical activities (i.e., communicating with patients, providing direct patient care); however, it does appear to positively impact workflow for arranging social service referrals and engaging in care coordination activities. Furthermore, findings from our qualitative analyses suggest that co-locating CHWs in clinic settings may promote efficiency of effort and positive interactions with providers and clinic staff.

In contrast, providers in the imaging innovations reported less satisfaction with the innovation. Interestingly, providers do not appear to be less satisfied because innovation implementation significantly changed clinical workflow because the majority of imaging respondents did not note any increase or decrease in the amount of time needed to engage in patient activities.

Perceptions of overall impact of the innovation on patient care were more positive for providers in CHW innovations than in imaging innovation. These results are not surprising because CHW-based innovations involve both providers and CHWs interacting with the patient. In the imaging innovations where new technologies were implemented for providers, they may perceive fewer direct benefits to patients.

Our findings also suggest that provider involvement in the innovation was an important predictor of overall satisfaction with the innovation and of indicating the innovation had an impact on patient care. These findings highlight the importance of engaging a provider champion to encourage and support implementation as well as the importance of directly involving providers in the implementation process.

2.7.3 To What Extent Have the HCIA Community Resource Innovations Resulted in Healthier People?

Overall, the findings among awardees in which similar health outcomes were reported suggest that the innovations are having more impact on outcomes for diabetic patients and declining health

outcomes for patients with CAD or hypertension. The sample sizes included in some of the awardees' analyses are limited and comparison groups are not available. These findings are descriptive; we have not conducted significance tests to determine if any changes over time are statistically significant and we can only measure the change in the pre-post period for the intervention group.

Nonetheless, both BAHC and ECCHC exhibited positive trends for HbA1c and LDL-C control. Incidentally, the majority of their patients with diabetes received an HbA1c/lipid profile assessment and a food exam, which further suggests the innovation may be having a positive impact.

2.7.4 Conclusions

Overall, it is too early to tell if the HCIA Community Resource awardees are meeting the CMMI goals of smarter spending, better care, and healthier people. However, these interim findings seem to suggest limited impacts on reducing health care spending and utilization. However, selected awardees exhibit promising trends and it is important to evaluate the full period of the innovation before drawing definitive conclusions. Providers in the CHW innovations are highly satisfied with the innovations and the extension role that CHWs play to maximize their efficiency. Many innovation participants received recommended care, which is an indication of more evidence-based care or better care. Finally, whether HCIA awardees are improving health outcomes among their participants is inconclusive on the basis of the minimal health outcomes data and in the absence of a control group. Future reports will add additional data to our analyses to provide more evidence on the efficacy of the HCIA Community Resources awardees.

Section 3

Awardee-Level Findings

- Altarum Institute (Altarum)
- Asian Americans for Community Involvement (AACI)
- Ben Archer Health Center (BAHC)
- Bronx Regional Health Information Organization (Bronx RHIO)
- Children's Hospital and Health System (Children's Hospital)
- Curators of the University of Missouri (Curators)
- Delta Dental Plan of South Dakota (Delta Dental)
- Eau Claire Cooperative Health Centers (ECCHC)
- Finity Communications (Finity)
- Imaging Advantage (IA)
- Intermountain Health Care Services, Inc. (Intermountain)
- Mary's Center for Maternal & Child Care (Mary's Center)
- Michigan Public Health Institute (MPHI)
- Mineral Regional Health Center (Mineral Regional)
- National Health Care for the Homeless Council (NHCHC)
- Northeastern University (NEU)
- Prosser Public Hospital District (Prosser)
- Regional Emergency Medical Services Authority (REMSA)
- South County Community Health Center (South County)
- Southeast Mental Health Services (SEMHS)
- University of Chicago (U-Chicago)
- University of Miami (U-Miami)
- Women and Infants Hospital of Rhode Island (W&I)
- YMCA of the USA (Y-USA)

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Altarum Institute

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

Altarum Institute

1.1 Introduction

Altarum Institute, a research organization in southeast Michigan, received an award of $8,366,178 beginning on April 30, 2013. The innovation seeks to achieve the following HCIA goals:

1. **Smarter spending.** Reduce spending by 10 percent through eliminating unnecessary and inappropriate image studies and associated unnecessary care. Altarum expects net savings of $32 million over 3 years.

2. **Better care.** Improve care by providing radiology decision support, access to prior image study reports, patient education, and provider education that promotes use of radiology guidelines and alternative care pathways.

3. **Healthier people**. Improve health by reducing patient radiation exposure, misdiagnosis, and unnecessary treatment and providing patient and provider education.

Table 2 provides a summary of changes that occurred with Altarum during the third year of operations. These updates are based on a review of the Quarter 8 (Q8) to Q10 *Narrative Progress Reports*; Quarterly Awardee Performance Reports; secondary data submitted by Altarum through March 31, 2015; and key informant interviews with Altarum's leaders and staff conducted in April 2015.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	Deployed additional content related to cardiac imaging
	Deployed APIs to identify unique patients from Master Patient Index (MPI) in United Physicians (UP) portal
	McLaren Physician Partners (MPP) was added as a partner.
Program Participant Characteristics	Continued to focus on the Organized System of Care (OSC) nonpediatric primary care physicians (PCPs); however, emphasis shifted to include high-volume specialty care UP providers.
Implementation Process	
Execution	With the exception of Q5, quarterly expenditures were at or below target amounts.
	Integration with Beaumont EPIC continues to be delayed until the health system evaluates security risks.
	Allscripts integration is on track to be completed in 2015.
	Based on user feedback, Altarum improved dynamic search capabilities and investigated other sources of content to supplement those currently in place.
	Engaged in sustainability conversations with UP and MPP. Altarum made enhancements to ImageSmart to better integrate it within physician workflow.
	Altarum expanded reach to ImageSmart for UP through the UP portal (health information exchange).

(continued)

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Implementation Process (continued)	
Leadership	Leadership remained stable over the reporting period.
Organizational capacity	Several new hires at Altarum provided needed support for innovation sites and evaluation.
Innovation adoption and workflow	Significant effort was made to address workflow and usability concerns.
Workforce Development	
Hiring/retention	An Allscripts developer, project manager, quality improvement analyst, and internal medicine-trained physician were hired.
Training	Between Q8 and Q10, Altarum provided 411.25 hours of training to 718 high-volume speciality care UP physicians and MPP physicians.
Implementation Effectiveness	
Reach	Since the first annual report, 54 additional UP practices and 40 MPP practices used the CDS.
	Through Q11, 147 UP practices and 43 MPP practices were trained.
	As a result of discussions with Altarum, RTI measured reach at the practice level, rather than the provider level.
Dose	No change; dose is not a relevant construct for the Altarum innovation.

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by Altarum.
Key informant interviews conducted Feb–June 2015.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

API = application programming interface; CDS = clinical decision support; Q = quarter.

1.1.1 Innovation Components

This innovation consists of two components: web-based and mobile versions of the ImageSmart application—a radiology clinical decision support (CDS) tool, and a web-based portal (United Physicians) that offers access to ImageSmart, supports electronic exchange of existing study results and provides education materials related to radiology exams. Since we provided details on these components in the first annual report, no changes to these components were made.[1]

The partners for this innovation have changed; MPP joined the innovation team in 2014 (***Table 3***). Altarum decided not to partner with Detroit Medical Center Physician Hospital Organization in light of ownership and management changes subsequent to the recent purchase of Vanguard by Tenet.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

Table 3. HCIA Partners, Role, and Location

Partner Name	Role in HCIA Project	Location
United Physicians (UP)	Training, CDS tool users	Bingham Farms, MI
McLaren Physician Partners (MPP) (new)	Training, CDS tool users	Flint, MI

Source: *Q10 Quarterly Awardee Performance Report*.
CDS = clinical decision support; HCIA = Health Care Innovation Award.

1.1.2 Program Participant Characteristics

Altarum initially focused on nonpediatric primary care physicians (PCPs) with United Physicians (UP) as recipients of the decision support and health information exchange (HIE) components of the intervention; emphasis in Q9 shifted to high-volume specialty care UP providers. There was also a limited introduction of the intervention to MPP providers in Q9. In Q10, Altarum enlarged the intervention target with increased activity at MPP practices. Other provider types from UP and MPP practices—nurses and physician assistants—as well as administrative office staff continue to use ImageSmart and, therefore, are also considered program participants. Patients seen by UP PCPs and specialists, and MPP providers, are indirect targets of the intervention.

Altarum was unable to provide characteristics of patients whose PCP participated in the intervention. However, RTI used information on participating physicians provided by Altarum to link participating physicians to fee-for-service Medicare patients in the Chronic Conditions Data Warehouse.

Table 4. Characteristics of Medicare Fee-For-Service Beneficiaries Enrolled in the Innovation through December 2014

Characteristic	Number of Participants	Percent of Participants
Total	16,077	100
Age		
<18	0	0.0
18-24	14	0.1
25-44	310	1.9
45-64	1,448	9.0
65-74	6,812	42.4
75-84	4,881	30.4
85+	2,612	16.2
Sex		
Female	9,823	61.1
Male	6,254	38.9
Missing	0	0.0

(continued)

Table 4. Characteristics of Medicare Fee-For-Service Beneficiaries Enrolled in the Innovation through December 2014 (continued)

Characteristic	Number of Participants	Percent of Participants
Race/Ethnicity		
White	22,703	89.8
Black	1,616	6.4
Hispanic	36	0.1
Asian	292	1.2
American Indian or Alaska Native	32	0.1
Native Hawaiian or Other Pacific Islander	—	—
Other	349	1.4
Unknown	255	1.0
Payer Category		
Dual	1,891	11.8
Medicaid	0	0.0
Medicare	16,077	100.0
Medicare Advantage	0	0.0
Other	0	0.0
Uninsured	0	0.0
Missing	0	0.0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
— Data not available.

1.2 Implementation Progress

The first annual report (2014) described Altarum's implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area. ***Table 5*** lists these measures and their status as of May 31, 2015. The results of analyses for some of these measures are included in this annual report. We dropped several measures over time as we learned from Altarum what data were and were not available.

Table 5. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Workforce development	Education and training	Number and rate of UP providers and office staff receiving ImageSmart and provider portal technical support (UP provider support requests and providers accessing ImageSmart)	Dropped; data unavailable

(continued)

Table 5. Quantitative Explanatory Measures (continued)

Evaluation Domains	Subdomains	Measures	Status
Implementation process	HIT Workflow	Rate of ImageSmart uptime (unplanned system downtime/total planned uptime)	Data received from Altarum
		Number of times providers and office staff access community folder to view images online (proxy for use of HIE to view image reports)	Dropped; data unavailable
		Number of provider reviews of image study reports through ImageSmart during intervention time frame (reports reviewed/total reports available)	Dropped; data unavailable
		Physician action rates by low, marginal, and high utility recommendation	Dropped; data unavailable
Implementation Process	Workflow Integration	HCIA Provider Survey	Collected by RTI
	Provider Satisfaction	HCIA Provider Survey	Collected by RTI
Implementation effectiveness	Reach	Number of UP and MPP practices trained on ImageSmart	Data received from Altarum
		Number of UP and MPP practices using ImageSmart	Data received from Altarum
		Number of southeast Michigan patients accessing image study educational materials though ImageSmart public Website	Dropped; data unavailable
	Dose	Number of providers using ImageSmart (actual) relative to applicable visits (potential, or visits in which ImageSmart could be used)	Dropped; data unavailable

HCIA = Health Care Innovation Awards; HIT = health information technology; MPP = McLaren Physician Partners; UP = United Physicians.

This section presents Altarum's process measures and a qualitative analysis of the factors that determined Altarum's implementation progress. This analysis draws on patient-level data provided to RTI by Altarum as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through Altarum's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include Altarum's reports from Q8 through Q10 and interviews conducted April 14–17, 2015.

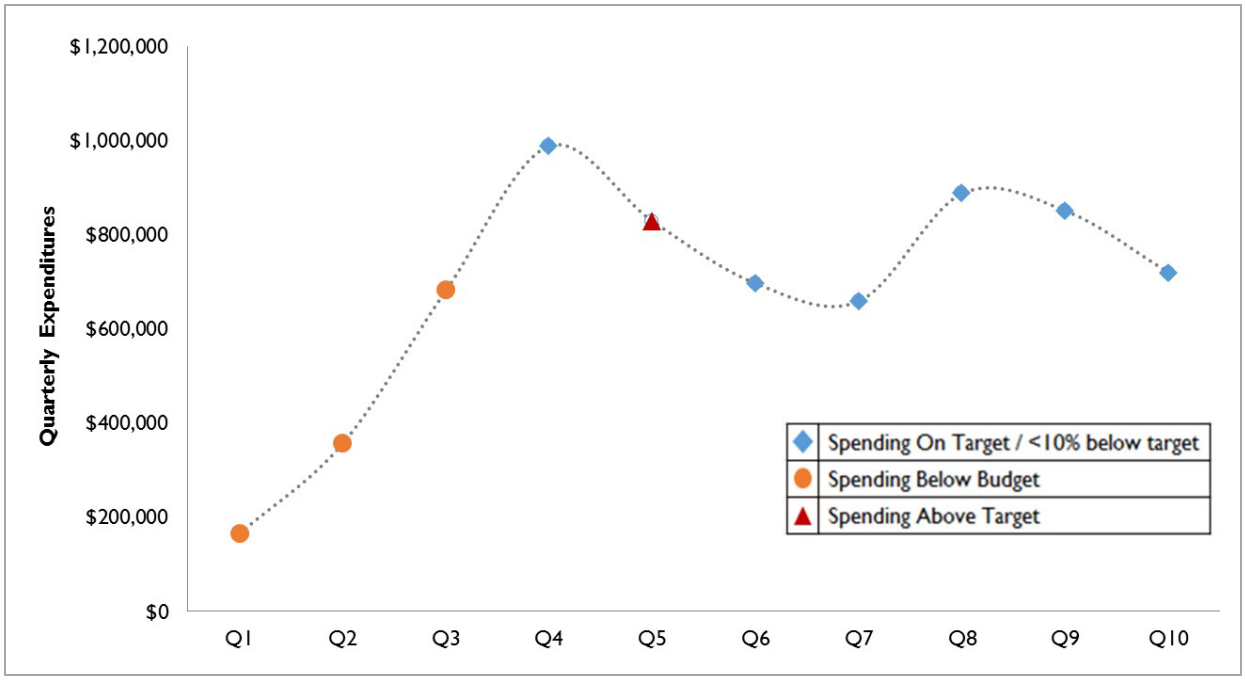
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?
- How has implementation of the innovation impacted provider workflow?
- How has implementation of the innovation impacted provider satisfaction?

Execution of Implementation

The annual report highlights the significance of Altarum's expenditure rates on implementation. As of December 2014 (Q10), Altarum spent 49.2 percent of its Year 3 budget, which is at the projected target.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Health Information Technology (HIT) Process

All servers continued to have excellent uptime. In Q9, the most recent data available, the UP server had no unscheduled downtime. The American College of Radiology (ACR) server and Altarum server uptime for Q9 were 99.8 percent and 98.7 percent, respectively. Server downtime was minimal and did not contribute negatively to adoption of the ImageSmart tool.

ImageSmart™

During Q8-Q10, Altarum continued to expand ImageSmart capabilities and make enhancements. For example, Altarum added features to ImageSmart to allow providers to order images through paper order forms or computerized physician order entry (CPOE). Using CPOE technology, physicians can send

radiology orders securely from ImageSmart to radiology facilities. Adoption of this tool was low; therefore, Altarum gathered additional user feedback on functionality and provider readiness before continuing with development efforts. Furthermore, a series of enhancements were completed in Q9, such as the creation of an ImageSmart environment for MPP (including a separate training environment), incorporation of cost data for low-tech imaging services (e.g., x-ray, ultrasound), and capture of the physician's reason for ordering tests deemed to be of marginal or low appropriateness levels.

Altarum also worked to integrate ImageSmart into UP and MPP workflow and into electronic health record (EHR) processes. After assessing the more than 30 different EHR systems in place, Altarum decided to focus on Allscripts and EPIC. Allscripts and EPIC are used by a large portion of the UP practices.

- EPIC: Altarum completed an initial integration of ImageSmart with the Beaumont EPIC EHR system. As of September 2014, physicians can access ImageSmart through EPIC without having to provide additional login credentials. Further integration efforts, including transmission of patient information into the ImageSmart, were delayed and on hold in the months of November and December until Beaumont evaluated security risks.

- Allscripts: Altarum completed all required documentation for a partnership application with Allscripts. In Q10, Altarum concentrated development efforts on Allscripts integration, to be completed early in Q11.

Altarum also finalized an agreement with the American College of Cardiology to license their clinical appropriateness content for cardiac imaging and fully integrated the content into ImageSmart. This content includes the appropriate use criteria for the detection and risk assessment of coronary artery disease in adults. In addition, in collaboration with cardiologists on the Clinical Steering Committee, mindmaps were created to ensure the methods were consistent with ordering practices. This work resulted in revisions to the algorithms.

Lastly, in Q9, due to the low uptake of ImageSmart on iPads, Altarum deprioritized development efforts for the iPad and shifted to development of ImageSmart for Android.

Health Information Exchange (HIE)

Altarum continued to expand HIE and integrate radiology reports from hospital provider systems into the UP provider portal to allow provider access to historical radiology reports. Integration of radiology reports from St. Joseph Hospital-Oakland began in March. Crittenton hospital integration began in June, but was delayed due to significant changes in management personnel in its IT department. Altarum is exploring expansion of its programs to the Botsford and Detroit Medical Center hospital systems.

The APIs to identify unique patients from the Master Patient Index (MPI) in the UP portal were deployed by the UP vendor (Covisint) in Q10. The Altarum team designed the user interface to accommodate patient search and, after a review by the security team, the enhancement was deployed on February 5, 2015.

Leadership

In discussions with leaders at Altarum and their partners, several key elements of leadership success emerged. The Altarum leaders were considered to be strong; one interviewee noted, "I think Altarum has been a great partner and [is] committed." Partners were deeply involved in recruitment, training, and soliciting feedback. Another partner indicated, "They are great partners to work with and [open to] new ideas." These qualities were especially important in working through the steps toward EHR integration of ImageSmart. One partner indicated it "had to employ our upper management, to meet with a [partner] health system to help them see this is important. We let them know that ImageSmart is something that United Physicians is committed to."

Organizational Capacity

Organizational capacity at Altarum increased substantially over the year with the addition of key staff including an Allscripts developer, a project manager, a quality improvement analyst, and an internal medicine-trained physician. In particular, the experience Altarum gained in working with its partner organizations to refine and revise guidelines for ImageSmart helped establish their expertise. In the words of one key staff member, "I think we, Altarum, could play a strong role, with what we know, in shaping the legislation for 2017." Longstanding issues working with payors remain but usability concerns and content refinement and the addition of new content areas were challenges more easily addressed by Altarum. EHR integration issues significantly slowed adoption of the innovation. The initial integration of ImageSmart required users to logon to a separate environment to use the tool. Then, despite making progress with the Epic integration, it stalled. At this point, there is a lot of promise in the Allscripts EHR integration and it may significantly impact utilization.

Innovation Adoption and Workflow Integration

The primary obstacle for Altarum was in recruitment (i.e., adoption). Even after reaching out to practices with training, many never really came online and used the tool. This was partially due to poor integration with the EHR but there was also no clear evidence to support use and no clear mandate to use the tool. One partner said, "From a contractual standpoint, we have never met a quarterly goal of usage." This problem is compounded because, without integration into the EHR, there is really no workflow integration from the practitioner's standpoint. In addition, insurers do not recognize (or compensate for) use of the tool, so providers see no clear direct benefit to using the tool."

When MPP providers came online, they specifically requested an Android version of the application. This addition was a huge success; many providers adopted the Android application. In response to increased use after the Android application was released, one interviewee noted, "I see usage might really increase significantly in next 6 months, but the primary care docs told me that they only use the application 4 times per month."

Provider Perceptions of Clinical Workflow and Satisfaction

Data on workflow integration and provider satisfaction with the innovation came from the RTI HCIA Provider Survey administered in spring 2015. Ninety-five (23.6%) of Altarum's eligible providers responded to the HCIA Provider Survey. The majority (86.3%) of providers were doctors of medicine (MD) or osteopathy (DO) and had been in practice an average of 21 years. The majority of responding providers specialized in family or internal medicine (81.1%) and practiced in either a group practice (69.5%) or solo practice (22.1%). The full set of survey questions and answers summarized by awardee is available in ***Appendix C***.

For eight of the 11 items regarding integrating ImageSmart™ into clinical workflow, the majority of Altarum providers indicated that the innovation resulted in no change in the amount of time spent on specific activities, such as providing patient care, communicating with patients, arranging clinical referrals, follow up care or social services for patients, and meeting with clinical staff (***Table 6***). About a quarter (24.2%) of providers indicated, however, that they spent more time looking up patient information now than they did before ImageSmart was implemented, and about a fifth (21.1%) of providers indicated that they spent less time looking up patient information in paper-based medical charts than they had before implementation.

Table 6. Summary of Clinical Care Workflow

Question	Percentage of Altarum Providers Indicating More Time	Percentage of Altarum Providers Indicating Less Time	Percentage of Altarum Providers Indicating No Change	Percentage of Altarum Providers Indicating Not Applicable/ Missing
Providing direct patient care	9.5 N=9	11.6 N=11	57.9 N=55	21.1 N=20
Communicating with patients by phone, email	9.5 N=9	7.4 N=7	56.8 N=54	26.3 N=25
Looking up patient information in EMRs or other health information systems	24.2 N=23	9.5 N=9	40.0 N=38	26.3 N=25
Looking up patient information in paper-based medical charts	10.5 N=10	21.1 N=20	34.7 N=33	33.7 N=32
Arranging clinical referrals and follow-up for patients	8.4 N=8	5.3 N=5	56.8 N=54	29.5 N=28
Arranging social service referrals for patients	4.2 N=4	3.2 N=3	54.7 N=52	37.9 N=36
Meeting with staff and clinicians in my practice	6.3 N=6	2.1 N=2	60.0 N=57	31.6 N=30
Consulting with clinicians outside of my practice	6.3 N=6	6.3 N=6	57.9 N=55	29.5 N=28
Engaging in other care coordination activities	11.6 N=11	3.2 N=3	52.6 N=50	32.6 N=31
Reviewing data on clinic practice population to identify individuals needing additional services	11.6 N=11	6.3 N=6	48.4 N=46	33.7 N=32
Planning practice-based (or community-based) interventions to address issues common to my practice population	6.3 N=6	5.3 N=5	52.6 N=50	35.8 N=34

EMR = electronic medical record.

Regarding provider satisfaction, overall we found that almost half of providers either indicated they were very satisfied with ImageSmart (24.2%) or were moderately satisfied with ImageSmart (22.1%) while just under a third indicated they were only slightly satisfied with the innovation (30.5%). Regarding ease of use, the responses were mixed. Approximately half of providers indicated that they either found ImageSmart somewhat easy to use (27.4%) or found ImageSmart somewhat hard to use (27.4%). Only 8.4 percent found ImageSmart very easy to use and 4.2 percent found it very hard to use.

For the specific questions regarding provider satisfaction with ImageSmart, about a third of providers either strongly or somewhat disagreed that they had been provided with specific resources to use/interact with the tool (34.7%), ImageSmart produced financial benefits (35.8%), investing in

ImageSmart was a worthwhile investment (34.7%), and the practice functions more efficiently after implementation (33.7%). Overall, 44.2 percent strongly or somewhat disagreed that the innovation saves time and almost half (47.4%) strongly or somewhat agreed the added logistics of ImageSmart is a burden on the practice (***Table 7***).

Table 7. Summary of Provider Satisfaction Measures

Question	Percentage of Altarum Providers Indicating Strongly Agree/ Somewhat Agree	Percentage of Altarum Providers Indicating Strongly Disagree/ Somewhat Disagree	Percentage of Altarum Providers Indicating Neither Agree nor Disagree	Percentage of Altarum Providers Indicating Not Applicable/ Missing
Sufficient resources (e.g., support staff, time, training) have been provided for me to use/interact the innovation.	23.2 N=22	34.7 N=33	20.0 N=19	22.1 N=21
Innovation produces financial benefits for my clinic or practice.	12.6 N=12	35.8 N=34	25.3 N=24	26.3 N=25
Investing in the innovation is worthwhile in terms of time, energy, and resources.	23.2 N=22	34.7 N=33	22.1 N=21	20.0 N=19
Sufficient technical it support is available to operate the innovation.	22.1 N=21	24.2 N=23	30.5 N=29	23.2 N=22
Overall, my practice functions more efficiently with the innovation.	25.3 N=24	33.7 N=32	20.0 N=19	21.1 N=20
Innovation saves me time.	13.7 N=13	44.2 N=42	22.1 N=21	20.0 N=19
The added logistics required by the innovation is a burden on me and/or my staff.	47.4 N=45	8.4 N=8	24.2 N=23	20.0 N=19

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with 12.27 full-time equivalent (FTE) staff members. Between Q8 (June, 2014) and Q10 the number of FTEs increased by 1.57. Interview respondents noted several staffing changes, but they did not impact the innovation significantly. In Q10, Altarum expanded the innovation team by adding an Allscripts developer, a project manager, and an internal medicine physician. Their staff retention rate is 90.9 percent.

Skills, Knowledge, and Training

Between Q8 and Q10, Altarum provided 411.25 hours of training to 718 individuals. The trainings included a train-the-trainer course on ImageSmart for administrative and nonclinical personnel, as well as courses on the HIE and CDS tools for clinical and nonclinical personnel. Interview respondents reported that the trainings were brief and effective. In addition, respondents said that ImageSmart is "…[a] very simple tool and was easy to use. […] If you can order something on Amazon you can use ImageSmart."

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach); and (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

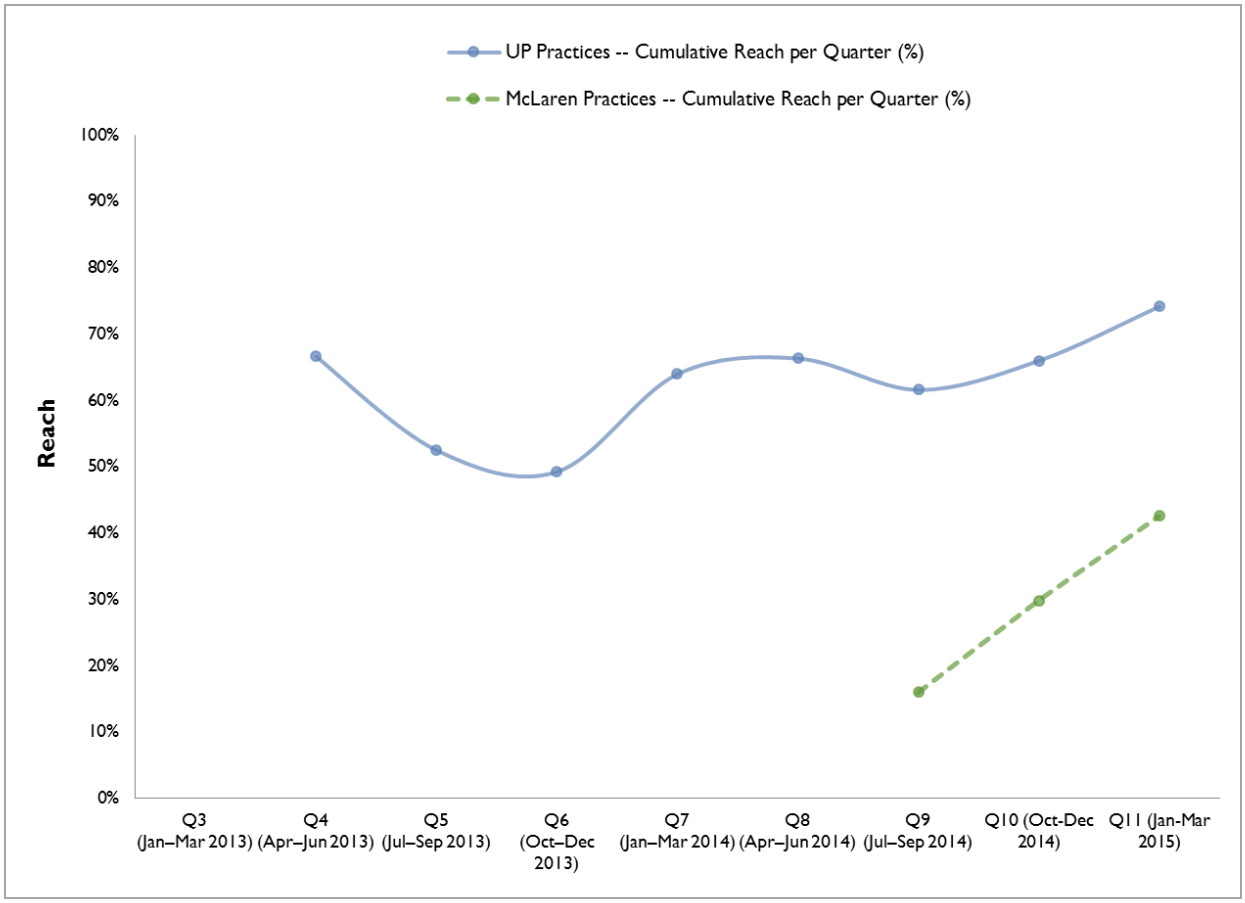
Reach

Figure 2 shows reach by quarter since the launch of the innovation. RTI assesses practice training and user reach as the number of trained practices who are using the CDS. In the figure we apply this measure of reach to UP physicians (PCP and specialists) and to MPP physicians. We first reported

reach for UP physicians in the first annual report based on data through Q7. Since that time, Altarum enrolled an additional 54 UP practices, increasing reach from 64 percent to 74.1 percent. For MPP providers, we began reporting reach in Q5 report based on data through Q9. Since that time, Altarum enrolled an additional 36 practices in the innovation, increasing reach from 16 percent to 93 percent. Through Q11, 147 UP practices and 43 MPP practices were trained.

As noted in prior reports, given that we assess reach at the practice level, we do not expect the same findings as the *Quarterly Awardee Performance Reports*, which estimate the total number of instances of CDS use.

Figure 2. Participant Reach for Each Quarter since Project Launch



	Quarter	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct-Dec 2014)	Q11 (Jan-Mar 2015)
●	UP practices—cumulative reach per quarter (%)	66.7	52.5	49.2	64.0	66.3	61.6	66.0	74.1
	UP physicians—cumulative # enrolled	4	21	32	55	65	77	97	109
●	MPP practices—cumulative reach per quarter (%)	0.0	0.0	0.0	0.0	0.0	16.0	65.1	93.0
	MPP physicians—cumulative # enrolled	0	0	0	0	0	4	28	40

Dose

RTI anticipated measuring dose for Altarum providers at the practice level by assessing the number of providers using ImageSmart (actual) relative to applicable visits (potential or visits in which ImageSmart could be used). However, Altarum noted these data were not available and, therefore, dose will not be reported in this or any future reports.

Sustainability

The single most important element to sustainability of the innovation beyond the grant period is successful integration into the EHRs of the current partner organizations UP and MPP. In the case of the Allscripts integration, plans were under way to market the ImageSmart application to other Allscripts users. According to one interviewee, one challenge is "that takes a research company into a [crowded] commercial vendor space." Since the complement to this solution, ongoing use of the tool, is also critical, establishing efficacy and incentivizing use are key elements to sustainability. Some interviewees felt that mandating use in the future will make it a habit.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of Altarum's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data [Awardee] collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers essential to the evaluation of Altarum's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 8 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of the status of the data requested and whether the data are presented in this annual report.

Table 8. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measures	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	No
		Hospital unplanned readmissions rate	Yes	No
		ED visit rate	Yes	No
	Cost	Spending per patient	Yes	No
		Estimated cost savings	Yes	No

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis

We include patients who were enrolled prior to December 31, 2014 and we present Medicare claims data through December 31, 2014.

Comparison Groups

The Altarum innovation is directed at changing physician behavior; therefore, we compare the patients of physicians who participated in the innovation to the patients of physicians who have not.

We use propensity score matching (PSM) to select comparison group physicians with similar characteristics as innovation physicians. The innovation group includes physicians who received ImageSmart training. The set of potential comparison group physicians included physicians who were not targeted for training by Altarum. Innovation and comparison physicians were matched using a logit model predicting the likelihood that a physician was enrolled in the innovation as a function of the number of Medicare patients a physician had, average patient spending, the average number of chronic conditions per patient, the age distribution of patients, patient gender, patient race, end-stage renal disease and disability status of patients, and practice specialty. Physicians were matched 1:1 with replacement using a caliper.

After completing PSM, we selected Medicare fee-for-service patients who saw an innovation or matched comparison physician after the physician received ImageSmart training.[2] The sample contains 25,250 innovation patients and 28,688 comparison patients. The first intervention quarter (I1) for innovation and comparison patients is determined by the first date that the patient saw a physician after that physician/practice had received ImageSmart training.

In previous reports, the innovation group consisted of physicians who received training and used the ImageSmart system and the comparison group included physicians who received training but not used the ImageSmart system. However, some physicians in the comparison group may have had an employee proxy using the system on their behalf. We requested information linking proxy users to trained physicians from Altarum, but Altarum does not collect this data. Thus, for this report we refined the innovation group to include all physicians who received training and the comparison group to contain physicians who have not received ImageSmart training. Because some physicians in the treatment group have not used the ImageSmart system, the results should have an intent-to-treat interpretation.

Table 9 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. ***Figure 3*** shows the distribution of the propensity scores for both the comparison and intervention groups. ***Appendix B.2*** provides technical details on the propensity score methodology. Twenty-one physicians were dropped from the subsequent analyses due to the lack of an appropriately matched comparison physician.

[2] Comparison group physicians did not receive ImageSmart training. Each comparison physician was assigned the same training date as their matched treatment group physician.

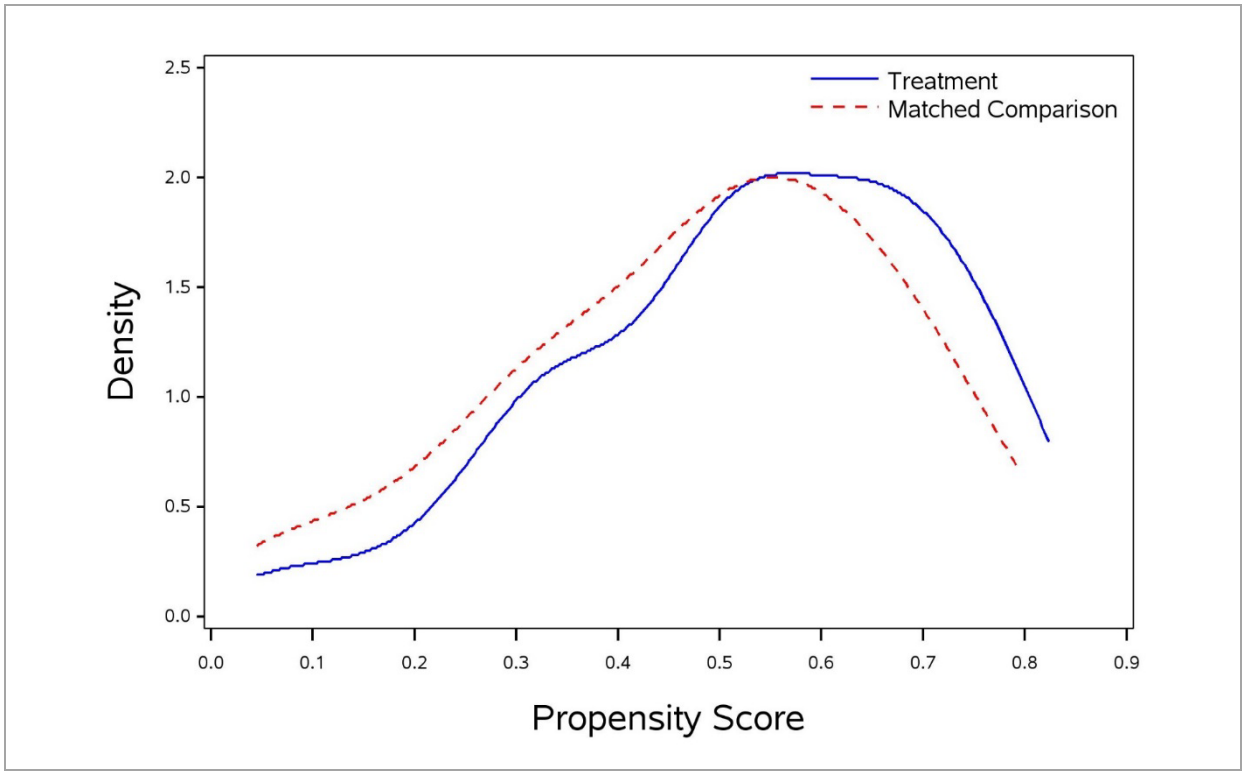
Table 9. Mean Values and Standardized Differences of Variables in Propensity Score Model: Altarum

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Number of patients	339	294	322	202	0.07	326	235	306	188	0.10
Average spending per patient from physician	$920	$1,081	$2,034	$2,170	0.65	$995	$1,120	$942	$1,290	0.04
Average spending per patient	$16,311	$9,281	$28,530	$21,619	0.73	$16,857	$9,626	$15,830	$11,314	0.10
Average number of chronic conditions per patient	7.65	1.35	8.95	1.89	0.79	7.77	1.34	7.76	1.45	0.01
Percentage of patients younger than 65	16.83	37.42	15.70	36.38	0.03	15.64	36.32	14.92	35.63	0.02
Percentage of patients between ages 65 and 74	41.70	49.31	36.88	48.25	0.10	41.80	49.32	42.39	49.42	0.01
Percentage of patients older than age 75	41.46	49.27	47.57	49.94	0.12	42.56	49.44	42.69	49.46	0.00
Percentage of patients that are male	38.95	48.76	38.72	48.71	0.00	39.42	48.87	38.69	48.70	0.01
Percentage of patients that are white	88.40	32.02	80.85	39.35	0.21	88.22	32.24	88.86	31.47	0.02
Percentage of patients that are black/African American	6.90	25.35	14.56	35.27	0.25	7.19	25.83	6.93	25.39	0.01
Percentage of patients that have ESRD	1.12	10.51	2.34	15.13	0.09	1.14	10.60	1.02	10.05	0.01
Percentage of patients that are disabled	24.54	43.03	23.31	42.28	0.03	22.74	41.92	21.82	41.30	0.02
Family practice	50.26	50.00	31.05	46.27	0.40	48.26	49.97	44.19	49.66	0.08
General practice	1.55	12.37	1.21	10.93	0.03	1.16	10.72	1.74	13.09	0.05
Internal medicine	48.19	49.97	67.74	46.75	0.40	50.58	50.00	54.07	49.83	0.07
N	193		248			172		91		

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
ESRD = end-stage renal disease; SD = standard deviation.

Standardized differences in the matching variables fell after PSM, indicating that PSM improved the similarity between the treatment and comparison groups.

Figure 3. Distribution of Propensity Scores for Comparison and Intervention Groups: Altarum



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

The propensity score distributions for the treatment and matched comparison groups were similar, indicating that matched comparison beneficiaries had similar propensity scores to treatment beneficiaries.

Descriptive Analysis

This report includes claims through December 31, 2014. ***Table 10*** reports Medicare spending per patient in the eight quarters before and the seven quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 10. Medicare Spending per Patient: Altarum

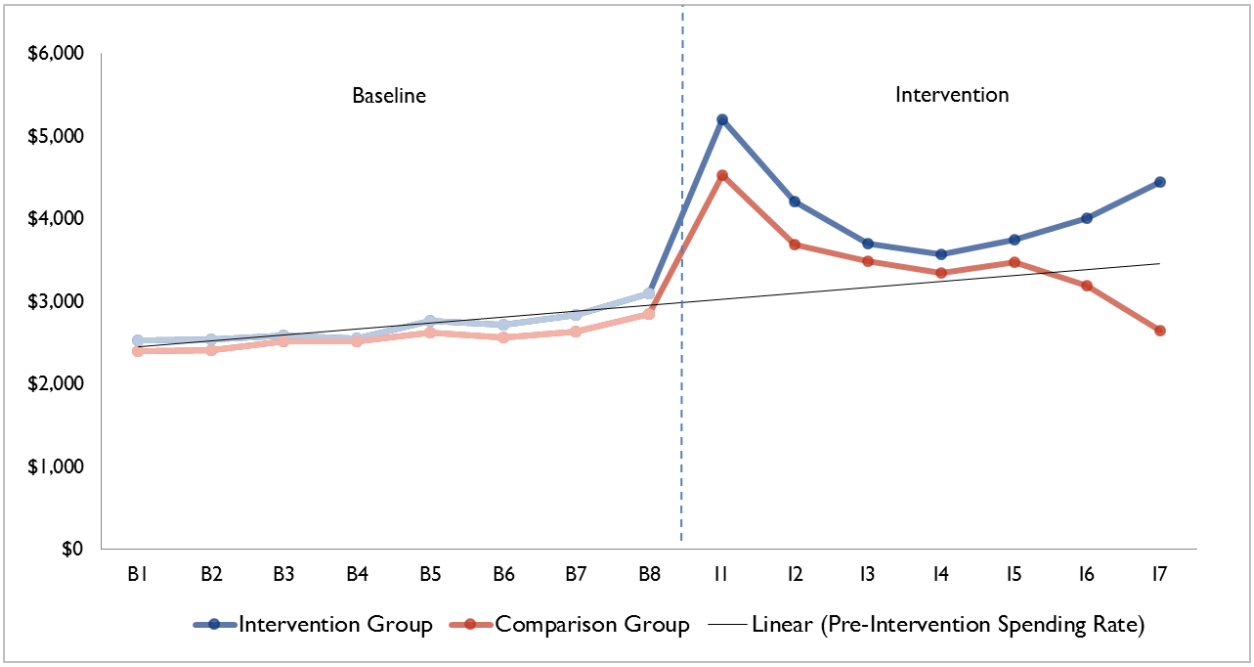
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group																
1C1CMS 330976	Altarum															
	Spending rate	$2,535	$2,543	$2,596	$2,556	$2,770	$2,720	$2,841	$3,099	$5,207	$4,208	$3,705	$3,578	$3,754	$4,006	$4,449
	Std dev	$7,184	$7,315	$7,204	$7,437	$7,714	$7,563	$8,094	$8,869	$11,407	$10,787	$9,655	$9,171	$9,302	$11,391	$10,448
	Unique patients	21,684	22,082	22,447	22,842	23,226	23,665	24,111	24,730	25,250	21,522	17,531	12,763	8,292	2,929	467
Comparison Group																
1C1CMS 330976	Altarum															
	Spending rate	$2,403	$2,416	$2,526	$2,523	$2,630	$2,571	$2,644	$2,848	$4,528	$3,688	$3,485	$3,350	$3,478	$3,198	$2,650
	Std dev	$8,728	$9,437	$9,708	$9,397	$9,562	$9,598	$9,821	$11,476	$14,599	$13,378	$12,892	$11,830	$12,885	$11,772	$9,488
	Unique patients	23,820	24,368	24,795	25,337	25,844	26,431	27,078	27,999	28,688	26,370	22,478	17,373	12,187	4,608	915
Savings per Patient		−$132	−$127	−$70	−$33	−$140	−$149	−$197	−$251	−$680	−$520	−$220	−$228	−$276	−$808	−$1,799

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 4 illustrates the Medicare spending per beneficiary in Table 10 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 4. Medicare Spending per Patient: Altarum



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Spending for the innovation and comparison group is very similar during the baseline period. The peak in spending during the first quarter of the innovation occurs because beneficiaries were assigned I1 based on their receipt of services. All beneficiaries' I1 are set based on the date that they visited their physician; therefore, every beneficiary has a positive value for spending in I1 and spending peaks during that period. Average spending is lower in other quarters because not all patients generate claims in every quarter.

During the intervention period, spending by innovation beneficiaries is higher than spending by comparison group beneficiaries. In I6 and I7, the innovation group's spending turns upward while the comparison group's spending turns downward. Spending levels during I6 and I7 should be considered preliminary because the number of beneficiaries decreases during those quarters. As more claims data become available, the number of patients will increase and the results in later quarters will become more reliable. Because technology adoption takes time, physicians may begin to use the system more intensely over time and outcomes that were not initially impacted will begin to be affected.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 11*** and ***Figure 5***.

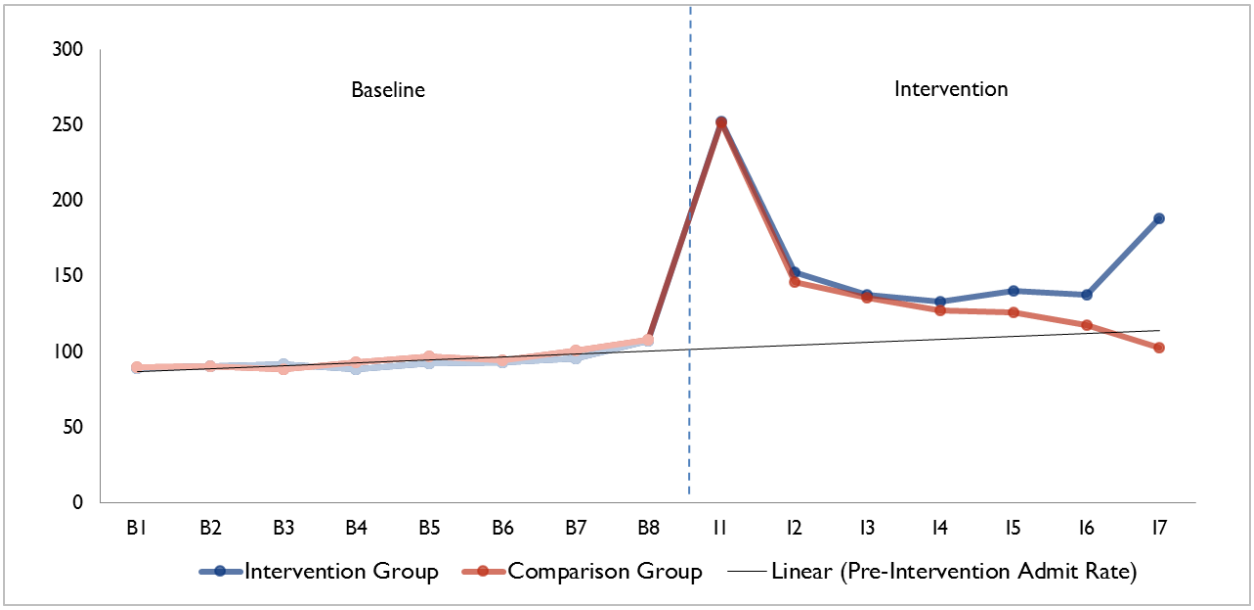
Table 11. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Altarum

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group																
1C1CMS 330976	Altarum															
	Admit rate	89	90	92	88	93	93	96	108	253	153	138	133	140	138	188
	Std dev	369	360	364	363	368	365	383	413	617	492	466	465	474	492	570
	Unique patients	21,684	22,082	22,447	22,842	23,226	23,665	24,111	24,730	25,250	21,522	17,531	12,763	8,292	2,929	467
Comparison Group																
1C1CMS 330976	Altarum															
	Admit rate	90	90	88	93	97	95	101	108	252	146	136	127	126	118	103
	Std dev	474	465	453	478	476	466	485	505	742	600	597	585	596	547	500
	Unique patients	23,820	24,368	24,795	25,337	25,844	26,431	27,078	27,999	28,688	26,370	22,478	17,373	12,187	4,608	915
Intervention − Comparison Rate		0	0	3	−4	−4	−1	−5	0	1	7	2	6	14	20	85

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 5. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Altarum



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

During the baseline period, innovation and comparison beneficiaries' all-cause inpatient admissions are very similar. All-cause admissions peak during the first quarter of the innovation because I1 is assigned based on receipt of services. The all-cause admissions rate is very similar for innovation and comparison beneficiaries from I1 to I4 and begins to separate during subsequent quarters. As previously mentioned, the sample size gets smaller in later quarters and results for these quarters should be considered preliminary and subject to change.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 12*** and ***Figure 6***.

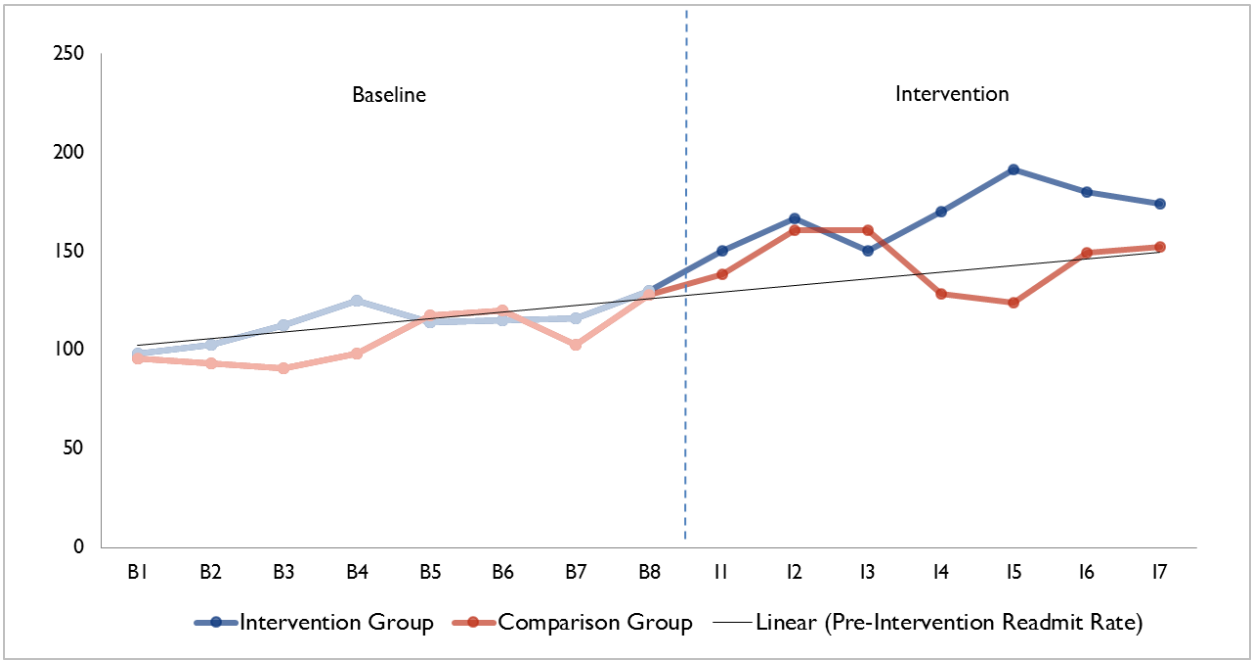
Table 12. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Altarum

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group																
1C1CMS 330976	Altarum															
	Readmit rate	98	103	113	125	114	115	116	130	150	167	150	170	191	180	174
	Std dev	298	303	316	331	318	319	320	336	357	373	357	376	393	384	379
	Total admissions	1,504	1,570	1,642	1,544	1,684	1,707	1,787	2,080	4,811	2,389	1,729	1,153	716	239	46
Comparison Group																
1C1CMS 330976	Altarum															
	Readmit rate	96	93	91	98	118	120	103	128	138	161	160	128	124	149	152
	Std dev	294	291	287	298	322	325	303	334	345	367	367	334	329	356	359
	Total admissions	1,600	1,589	1,599	1,742	1,853	1,853	1,941	2,157	4,435	2,682	1,989	1,349	880	275	46
Intervention − Comparison Rate		3	9	22	27	−4	−5	13	2	12	6	−10	42	67	31	22

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Altarum



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Altarum = Altarum Institute.

Hospital unplanned readmissions rates are very similar for the innovation and comparison group patients in the pre-intervention period and remain similar until I3, after which readmissions for innovation patients rise relative to comparison group patients. However, the sample size falls over time and may cause the deviation in intervention and comparison group readmissions rates. The sample size in post-intervention quarters will increase as more claims data become available. Because Altarum's innovation is focused on imaging services, it is not expected to affect hospital readmissions.

ED visits per 1,000 participants are shown in ***Table 13*** and ***Figure 7***.

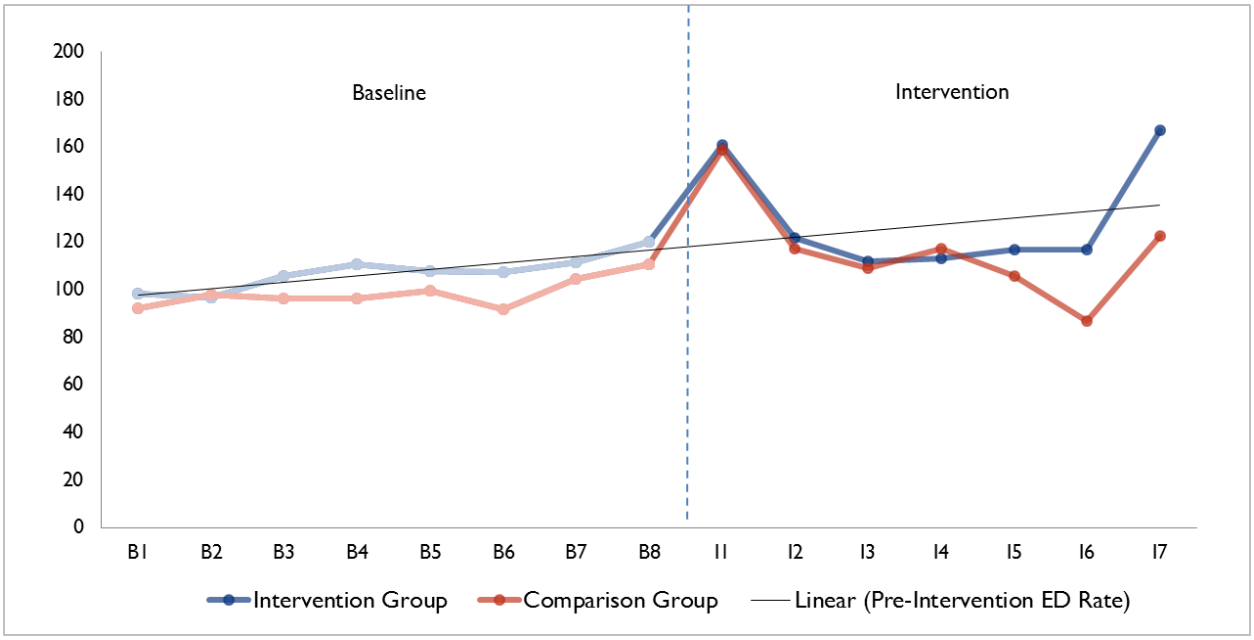
Table 13. ED Visits per 1,000 Participants: Altarum

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group																
1C1CMS 330976	Altarum															
	ED rate	98	97	106	111	108	107	112	120	161	122	112	113	117	117	167
	Std dev	456	420	457	499	444	466	481	518	658	575	531	499	581	576	909
	Unique patients	21,684	22,082	22,447	22,842	23,226	23,665	24,111	24,730	25,250	21,522	17,531	12,763	8,292	2,929	467
Comparison Group																
1C1CMS 330976	Altarum															
	ED rate	92	98	96	96	100	92	105	111	159	117	109	117	106	87	122
	Std dev	652	545	602	568	610	640	641	674	976	849	694	749	755	518	586
	Unique patients	23,820	24,368	24,795	25,337	25,844	26,431	27,078	27,999	28,688	26,370	22,478	17,373	12,187	4,608	915
Intervention − Comparison Rate		6	−1	9	14	8	15	7	9	2	4	3	−4	11	30	45

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 7. ED Visits per 1,000 Participants: Altarum



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

The ED visit rate has a very slight upward trend in the pre-intervention period. The Altarum innovation is not expected to be directly related to ED visits, so care should be taken in making any association between ED visit rates post-innovation and the innovation.

Outpatient imaging spending per patient is shown in ***Table 14*** and ***Figure 8***. For the patients enrolled in the innovation, we select non-institutional imaging claims in non-institutional claims using Berenson-Eggers Type of Service (BETOS) codes for imaging services. BETOS codes for imaging services are I1A, I1B, I1C, I1D, I1E, I1F, I2A, I2B, I2C, I2D, I3A, I3B, I3C, I3D, I3E, I3F, I4A, and I4B. BETOS codes are not available in institutional claims; therefore, outpatient imaging claims from institutional providers are selected using Healthcare Common Procedure Coding System (HCPCS) codes for imaging services. HCPCS codes for imaging services were identified using the BETOS-HCPCS code crosswalks provided on the CMS website. Imaging spending in the inpatient setting is not separable from spending for other services because of the diagnosis-related group (DRG) payment system; therefore, we report outpatient imaging spending only.

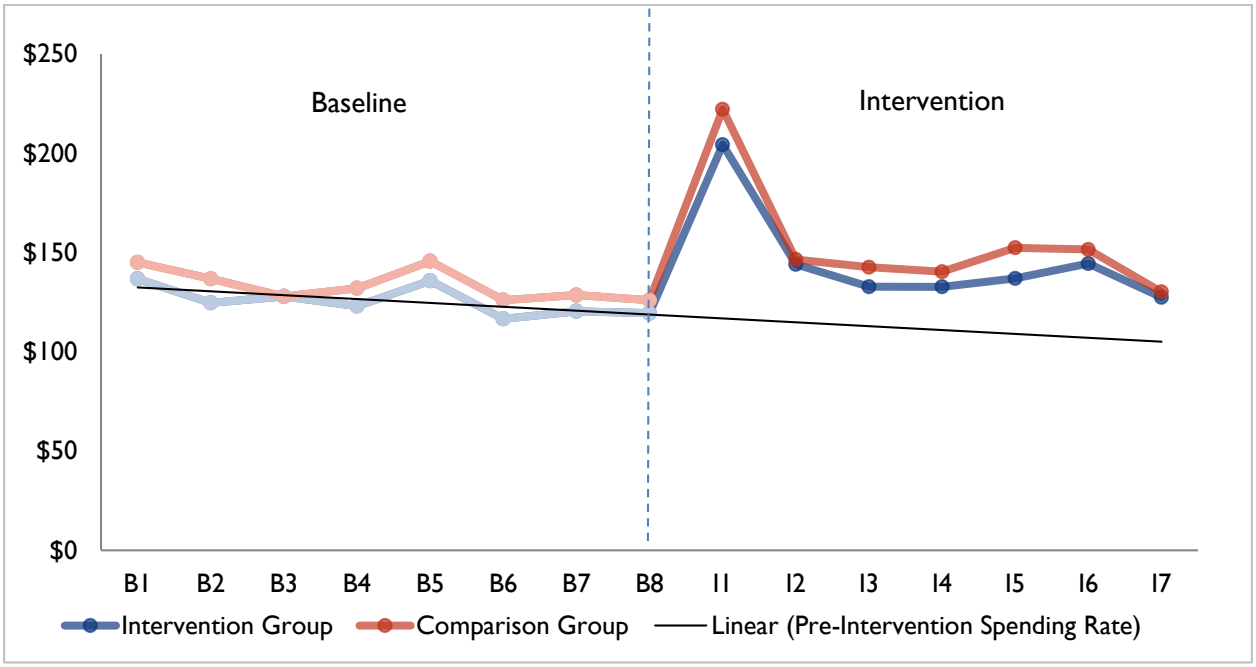
Table 14. Outpatient Imaging Spending per Patient: Altarum

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group																
1C1CM S330976	Altarum															
	Spending rate	$137	$125	$128	$123	$136	$117	$120	$119	$204	$144	$133	$133	$137	$144	$127
	Std dev	$291	$294	$295	$269	$294	$267	$288	$281	$344	$405	$300	$300	$282	$324	$346
	Unique patients	3,072	3,273	3,233	3,464	3,606	3,778	3,839	3,947	4,116	4,335	4,349	4,282	4,212	4,044	3,818
Comparison Group																
1C1CMS 330976	Altarum															
	Spending rate	$145	$137	$128	$132	$146	$126	$129	$126	$222	$146	$143	$140	$152	$152	$130
	Std dev	$313	$332	$271	$298	$294	$275	$283	$312	$394	$311	$422	$291	$301	$483	$296
	Unique patients	3,624	3,810	4,037	4,121	4,237	4,538	4,787	4,991	5,079	5,256	5,409	3,619	3,681	3,429	3,580
Savings per Patient		$8	$12	$0	$9	$10	$9	$8	$7	$18	$2	$10	$8	$15	$7	$3

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments for imaging services/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 8. Outpatient Imaging Spending per Patient: Altarum



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Altarum = Altarum Institute.

Outpatient imaging spending is very similar for the treatment and comparison group during both the baseline and intervention period. In future reports, we will complete statistical tests for changes in imaging spending during the intervention period.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit.

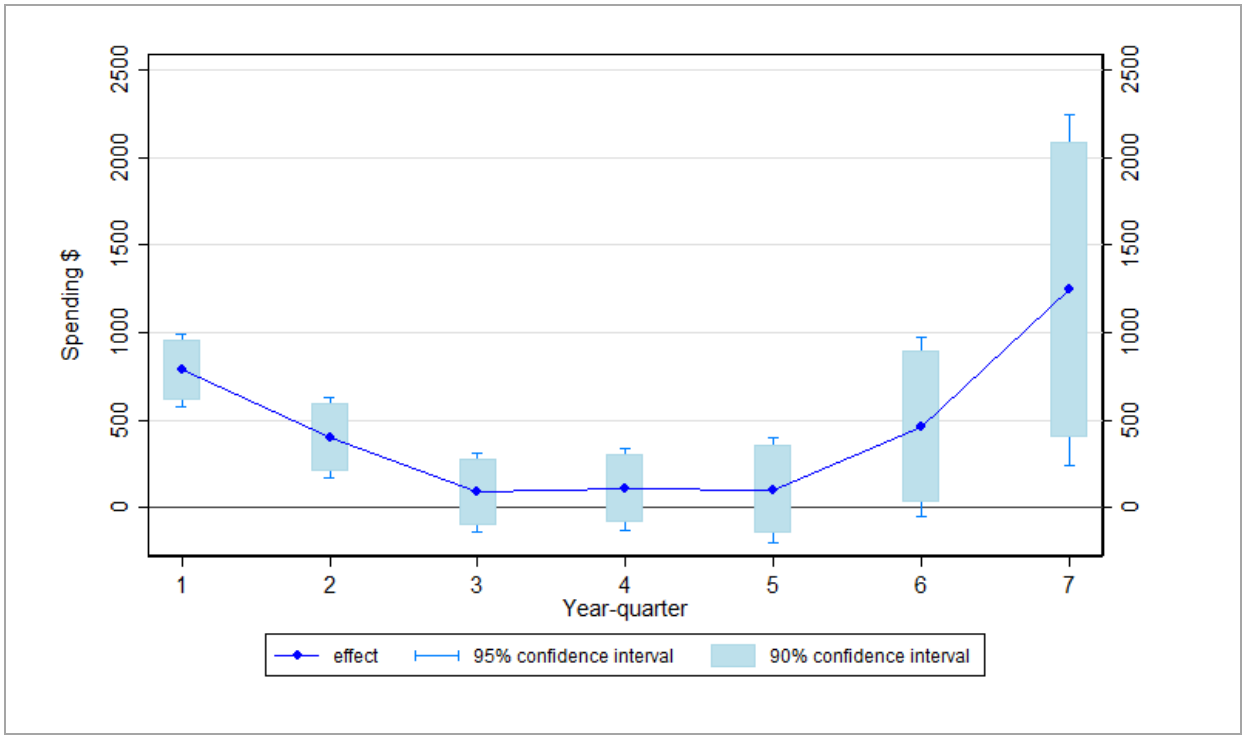
Table 15 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. ***Figure 9*** illustrates these quarterly difference-in-differences estimates.

Table 15. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Altarum

Quarter	Coefficient	Standard Error	P-Values
I1	785	107	0.000
I2	401	118	0.001
I3	88	114	0.441
I4	109	120	0.361
I5	104	154	0.499
I6	464	261	0.075
I7	1,245	511	0.015

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
Altarum = Altarum Institute; OLS = ordinary least squares.

Figure 9. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Altarum

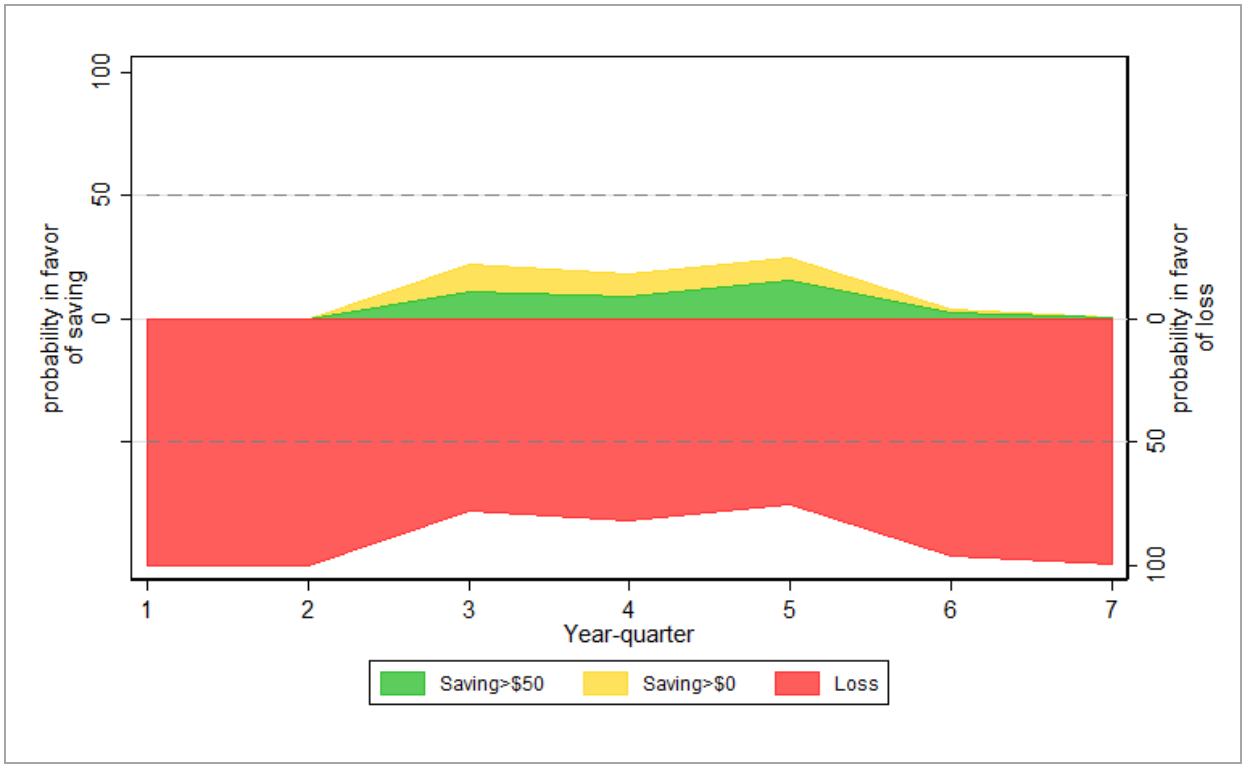


Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Altarum = Altarum Institute; OLS = ordinary least squares.

In I1 and I2, spending among treatment group individuals was significantly higher than spending among comparison group individuals. Differences in spending between the intervention and comparison group are not statistically significant in I3, I4, or I5. In I6 and I7; though spending is higher among intervention group beneficiaries. The estimates in later quarters reflect health care spending among patients whose physicians were targeted early for training, and therefore may be different from other physicians. The results of excess spending among treatment group beneficiaries during later quarters should be considered preliminary because the sample size decreases during later quarters.

Figure 10 presents the strength of evidence in favor of a saving or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis.

Figure 10. Quarterly Strength of Evidence in Favor of Saving/Loss: Altarum



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Altarum= Altarum Institute.

Figure 10 supports the conclusion that the intervention generated a loss in each quarter. We also present the overall weighted average treatment effect per member per quarter during the intervention period for beneficiaries enrolled in the innovation as compared to their matched comparison. The weighted average quarterly spending differential in the post-innovation period, indicating a loss, is −$388 (90% CI: −$503, $272) per member per quarter. This figure represents the differential spending per quarter in the post-intervention period between individuals enrolled in the innovation and comparison

group individuals, on average, weighted by the number of intervention beneficiaries in each quarter. The 90 percent confidence interval is the range in which the true parameter estimate falls, with 90 percent confidence.

We also present linear probability model coefficients for inpatient admissions, and outpatient ED visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the estimated effect.[3] Linear probability models have the advantage that the magnitude of the coefficients can be interpreted directly, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, linear probability model coefficients have often been empirically demonstrated to be consistent with marginal effects generated from nonlinear models.[4] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention), not just the direction of the effect (***Tables 16*** and ***17***).

Table 16. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: Altarum

Quarter	Coefficient	Standard Error	P-Values
I1	0.04	0.00	0.000
I2	0.01	0.00	0.077
I3	0.00	0.00	0.296
I4	0.01	0.00	0.207
I5	0.01	0.01	0.083
I6	0.00	0.01	0.900
I7	0.04	0.02	0.032

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
Altarum = Altarum Institute.

Innovation patients have inpatient hospitalization rates that are higher than and statistically different from comparison patients in I1 and I7. The increase probability of an inpatient admission ranges from 1 to 4 percentage points for the innovation beneficiaries. The average quarterly difference-in-differences estimate for inpatient admissions is 1 percentage point, indicating that the treatment-control difference is 1 percentage point higher during the intervention period. This is the average difference in

[3] To obtain the correct effect, it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run even when not competing with other users for computer resources.
[4] Angrist, J.D., and Pischke J.-S. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton. Princeton University Press, 2008.

inpatient admissions probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: .008, .014).

Table 17. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: Altarum

Quarter	Coefficient	Standard Error	P-Values
I1	0.04	0.00	0.000
I2	0.00	0.00	0.693
I3	0.00	0.00	0.401
I4	0.00	0.01	0.363
I5	0.01	0.01	0.349
I6	0.00	0.01	0.705
I7	0.01	0.03	0.772

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
Altarum = Altarum Institute.

Innovation patients were more likely to have an outpatient ED visit than comparison patients during I1. In subsequent quarters, differences in the ED visit rate between intervention and comparison patients were not statistically significant. The average quarterly difference-in-differences estimate for ED visits is 1 percentage point, indicating that the treatment-control difference is 1 percentage point higher during the intervention period. This is the average difference in ED visit probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: .002, .010).

Discussion

Spending among the patients of physicians participating in the innovation was higher than comparison group spending in quarters immediately after the innovation and in the 6th and 7th quarters after patients visited participating physicians. Innovation group participants were also more likely to have had an inpatient stay or ED visit immediately after the intervention. However, these results should be interpreted with caution. Altarum focuses on imaging services, which is not likely to have an impact on total spending, inpatient admissions, or ED visits.

Medicaid Claims Analysis

We are not including an analysis of Medicaid fee-for-service patients in this report because there are not enough physicians with Alpha-MAX data available in the Chronic Conditions Data Warehouse to conduct an analysis that would be representative of the physicians participating in the innovation.

Michigan's Alpha-MAX data are available through October 2013 and only 7 physicians who were enrolled in the innovation prior to October 2013 appear in the Alpha-MAX data, resulting in a sample size of 175 patients. Two factors contribute to the small number of physicians available for the Medicaid analysis: (1) Altarum did not train many physicians prior to October 2013 and (2) only physicians who serve Medicaid patients will appear in the Alpha-MAX data. Because a small fraction of innovation physicians and their patients would be included in the analysis, results would not be representative of the innovation as a whole. RTI will include Medicaid analyses in future reports when more Alpha-MAX data become available.

1.3.3 Other Awardee-Specific Data

Table 18 lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. We have received provider-level data used to generate each measure listed in Tables 5 and 17 for each quarter through Q11 (March 31, 2015).

Table 18. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Clinical effectiveness	Patient Care	HCIA Provider Survey	Collected by RTI
Health outcomes		Reductions in patient exposure to radiation	Data received from Altarum
		Positive impact rate	Data received from Altarum
		ImageSmart utilization	Data received from Altarum

Clinical Effectiveness

Evaluation Question

- How has implementation of the innovation impacted provider perceptions of patient care?

Data on the impact on patient care came from the HCIA Provider Survey. Overall we found that about half indicated that the implementation of ImageSmart had an impact on patient care (46.3%). Among those that indicated that the innovation had an impact on patient care, the majority indicated that the impact on patients was somewhat positive (50.0%) and about a third (27.3%) indicated the impact on patient was neither positive nor negative.

Provider views on specific impacts of ImageSmart on patient care varied (***Table 19***). Forty percent of providers strongly or somewhat agreed that the innovation helps them provider better patient care; about a third indicated ImageSmart leads to more effective communication during patient visits (31.6%) and that the innovation was beneficial for patients (28.4%). However, 41.1 percent strongly or somewhat disagreed that the innovation increased the amount of time they can spend with patients.

Table 19. Summary of Perceptions Regarding the Impact on Patient Care

Question	Percentage of Altarum Providers Indicating Strongly Agree/ Somewhat Agree	Percentage of Altarum Providers Indicating Strongly Disagree/ Somewhat Disagree	Percentage of Altarum Providers Indicating Neither Agree nor Disagree	Percentage of Altarum Providers Indicating Not Applicable/ Missing
Innovation helps provide better patient care.	40.0 N=38	19.0 N=18	24.21 N=23	16.8 N=16
Innovation leads to more effective communication during patient visits.	31.6 N=30	26.3 N=25	17.9 N=17	24.2 N=23
Innovation has improved my patients' access to care.	22.1 N=21	26.3 N=25	24.2 N=23	27.4 N=26
Innovation has increased the time I am able to spend with patients during office visits.	9.5 N=9	41.1 N=39	26.3 N=25	23.2 N=22
Innovation helps me develop good relationships with my patients.	16.8 N=16	27.4 N=26	32.6 N=31	23.2 N=22
Innovation has improved perceived patient satisfaction with care.	14.7 N=14	28.4 N=27	32.6 N=31	24.2 N=23
Innovation has been beneficial for patients in my practice.	28.4 N=27	17.9 N=17	32.6 N=31	21.1 N=20
Among my patients that *are aware* of Innovation, the majority of patients would say it has been beneficial in the care they receive.	23.2 N=22	16.8 N=16	28.4 N=27	31.6 N=30
Among my patients that *are not aware* of Innovation, if I told them about it, the majority of patients would say it has been beneficial in the care they receive.	19.0 N=18	16.8 N=16	35.8 N=34	28.4 N=27

Health Outcomes

Evaluation Question

- Have patients levels of radiation exposure relative to imaging changed as a result of the Altarum innovation?
- How has radiology utilization changed as a result of the Altarum innovation?
- What is the positive impact rate over time?

ImageSmart Utilization

To assess the impact of the ImageSmart tool, the question, we evaluated the outpatient provider's clinical decision making relative to image ordering. ***Table 20*** shows the total count of attested sessions based upon modality of the requested procedure. Because selection of a requested procedure is optional for the ImageSmart user, the table includes 177 attested sessions for which no procedure was requested. It should be noted that since the first annual report, guidelines for cardiac imaging procedures were added to the ImageSmart application; however, since cardiology use constitutes only 1 percent of the total, we do not report these results. ***Table 21*** provides a breakout of the attested procedures by modality of the procedures attested, or alternate care which is counted as an attested choice.

Table 20. Distribution of Attested Sessions by Modality Requested through March 2015

Modality Requested	Attested Sessions
CT	567
CTA	15
MR/MRI/MRA	741
No modality requested	177
Total sessions	1,500

CT = computed tomography, CTA = computed angiography, MR = magnetic resonance scans, MRI = magnetic resonance imaging, MRA = magnetic resonance angiogram.

Table 21. Distribution of Attested Sessions by Procedure Selected through March 2015

Modality	Procedure Selected
CT	590
CTA	19
MR/MRI/MRA	763
XRAY	68
Ultrasound	45
Other	15
Alternate care	91
Unknown	20
Total sessions	1,611

CT = computed tomography, CTA = computed angiography, MR = magnetic resonance scans, MRI = magnetic resonance imaging, MRA = magnetic resonance angiogramy.

Table 22 shows a detailed breakdown of the requested and attested modalities. Of the 586 requested CT exams that were attested, 11 percent were diverted to MR/MRI/MRA, other modalities (FLUOR, MAM, NUC, PET-CT, US-XRAY) or alternate care. Of the 794 requested MR/MRI/MRA procedures that were attested, 7.7 percent of these were diverted to other imaging modalities or alternate care.

Table 22. Overall Number of Requested and Attested Procedures by Modality through March 2015

		Attested Procedure						
Requested Procedure	Total Attested Procedures	CT	CTA	MR/MRI/ MRA	XRAY	US	Other (incl. FLUOR, MAM, NUC, PET-CT, US-XRAY)	Alternate Care1
CT	586	495	5	43	7	14	3	19
CTA	17	5	9	0	0	0	1	2
MR/MRI/MRA	794	31	1	675	19	7	8	53
No procedure requested	194	59	4	45	42	24	3	17
Total attested procedures	1,591	590	19	763	68	45	15	91

Source: ImageSmart data provided to RTI by Altarum

[1] Alternate care was suggested by the ImageSmart application when the use of an imaging study was inappropriate.

CT = computed tomography, CTA = computed angiography, MR = magnetic resonance scans, MRI = magnetic resonance imaging, MRA = magnetic resonance angiogram, US = ultrasounds, FLUOR = fluoroscopy, MAM = mammography, NUC = nuclear imaging, PET-CT = positron emission tomography – computed tomography, US-XRAY = ultrasound-x-ray.

As shown in the following graphs (***Figures 11*** and ***12***), requested and attested CTs have fluctuated somewhat since Q6, however over that period of time CTs were being attested at a relatively lower rate than they were being requested. By comparison attested MRIs increased, rising from 30.4 percent in Q5 to 49.4 percent in Q11.

Figure 11. Imaging Modality as Requested

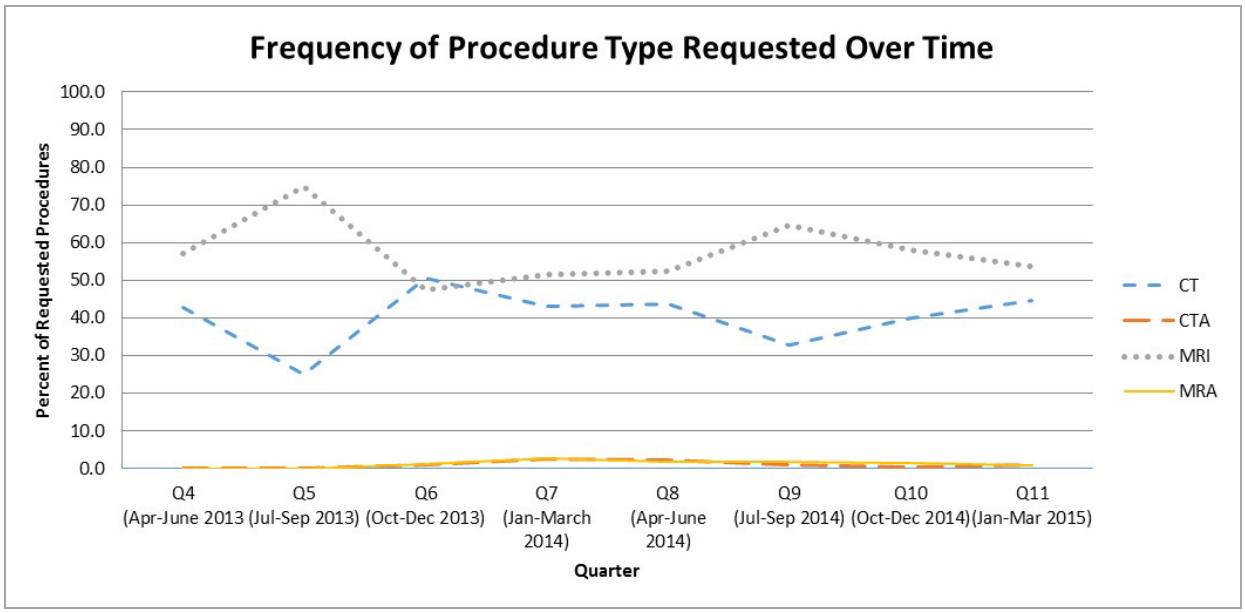
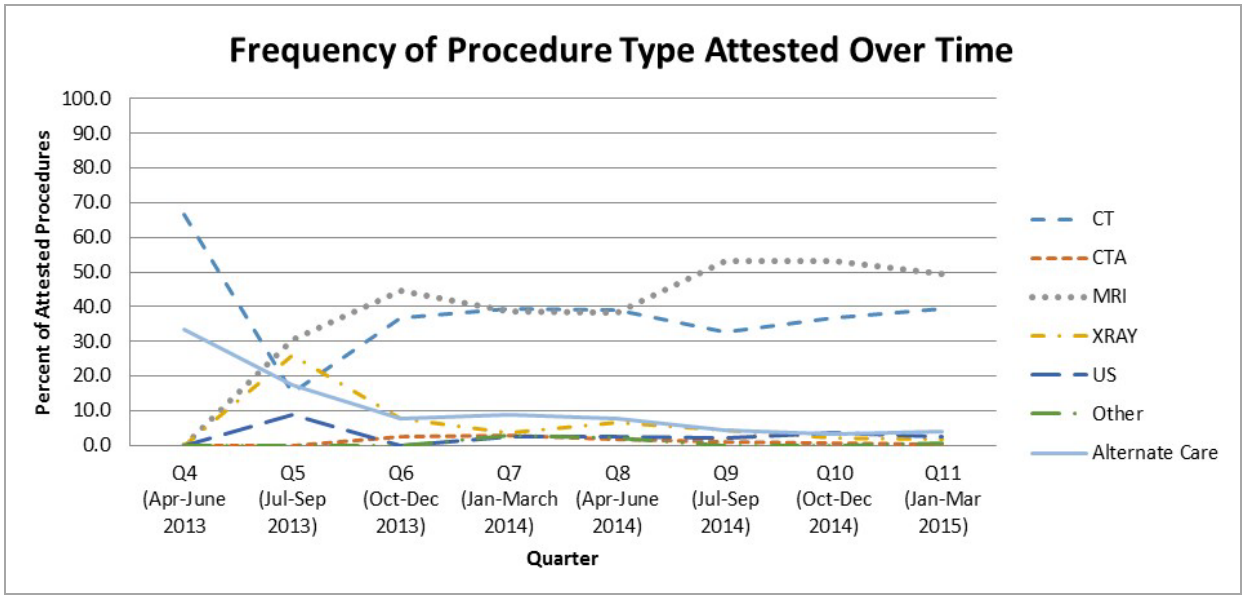
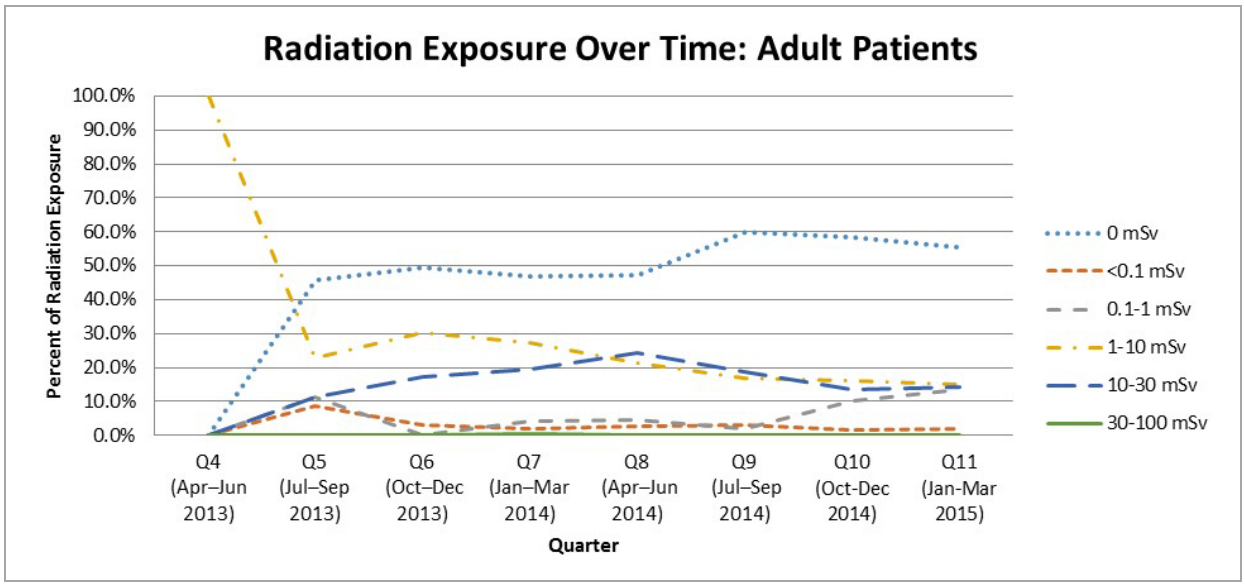


Figure 12. Imaging Modality as Attested



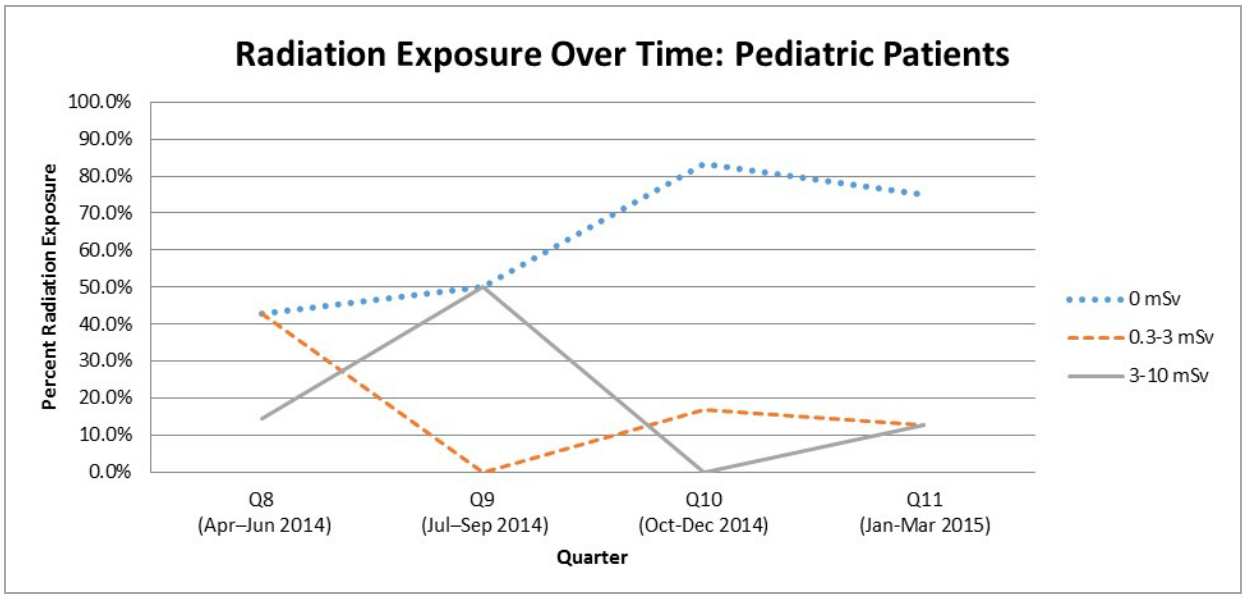
Additional content has been included in the ImageSmart usage reports of UP and MPP providers and staff activity. For each imaging modality and body area, the imaging record includes a standardized range of patient radiation exposure, which enables RTI to evaluate whether radiation exposure changed over the term of the innovation (***Figures 13*** and ***14***).

Figure 13. Reduction in Adult Patient Exposure to Radiation



Radiation dosage for medical imaging is measured in milliSieverts (mSv.) It is RTI's understanding that the source of these standardized ranges has been the American College of Radiology (ACR). Within the realm of imaging modalities requested and attested to, the CT procedures in general have the highest levels of radiation exposure, while MRI and ultrasound (US) tests have no (0.0) radiation exposure. Alternate care does not involve radiation, and conventional X-rays fall somewhere in the middle depending on what body area is being studied. For adult patients, the proportion of higher radiation exposure (1-10mSv) fell from 30.4 percent in Q6 to 15 percent in Q11. At the same time, the frequency of imaging procedures with zero radiation increased from 46.7 percent in Q7 to 55.4 percent in Q11.

Figure 14. Reduction in Pediatric Patient Exposure to Radiation



Positive Impact Rate

Table 23 provides an analysis of the positive impact rate. This rate measures the influence on clinical decision making and tabulates instances where providers initially chose a procedure with a low or marginal score but using the ImageSmart application attested a procedure with a high score option The scoring is geared to the appropriateness criteria that was devised under ACR leadership. The numerator for this rate consists of those who requested a procedure with a low or marginal score and attested a procedure with a high score or for whom alternate care was suggested. The denominator for the rate consists of providers who requested and attested a procedure with any score or for whom alternate care was suggested. In essence, the expectation is that low radiation exposure equates to a high score which is reflected in improvements in the positive impact rate. The trend in positive shows a small increase in those procedures attested which have a higher ACR rating than what was initially requested. According to the Altarum Q10 Progress Report, the reduction in the impact rate over time is a result of UP specialists and MPP PCPs being less likely to select alternate care. As can be seen in Figure 13 above, in 2014 (Q7) higher radiation procedures (1-100 mSv.) made up more than 47 percent of all attested procedures, in 2015 (Q11), the lower radiation procedures (< 1 mSv.) constitute more than 70 percent of all those attested.

Table 23. Positive Impact Rate over Time among Providers Using ImageSmart Application

	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Positive impact rate (%)	N/A	5.6	8.2	8.4	10.9	7.1	6.9	9.0

Discussion of Other Awardee-Specific Findings

Nearly half of the practices using ImageSmart are new users who were introduced to the tools in Q10 or Q11, so the process is relatively new. There are, however, indications that the modality choices are moving slowly away from high-radiation exposure procedures (CT) and toward lower / no radiation alternatives including alternate care.

The provider survey for Altarum indicates mixed experiences with the ImageSmart tools. Many providers neither agreed nor disagreed that the innovation produced tangible patients for the practice or impacted patient care. Interestingly, the majority of respondents were primary care physicians even though specialists were surveyed as well. Also of note, we included both UP and MPP physicians which may account for some of the variation in responses.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing Altarum as well as accomplishments to date. In this section we assess Altarum's progress on achieving HCIA goals to date:

- **Smarter spending.** Spending among innovation participants is higher immediately after the start of the intervention, is not statistically different from the comparison group during the third through fifth quarters after the intervention, and then increases relative to the comparison group in the sixth quarter after the intervention. Results for later intervention quarters are based on a subsample of patients whose physicians were trained early, and therefore should be considered preliminary. As more claims data become available, the sample size will increase and estimated impacts on spending in later quarters will become more reliable.

- **Better care.** Innovation beneficiaries have a higher average probability of inpatient or ED admissions, but it is unlikely that an imaging intervention would impact these rates. Although no new UP or MPP practices were trained on ImageSmart for this reporting period, 12 new MPP practices and 12 additional UP practices began to use the CDS tools in Q11.

- **Healthier people**. The addition of radiation exposure data allows an evaluation of how the CDS may be impacting patients. One year ago, (Q7) higher radiation procedures (1-100 mSv.) made up more than 47 percent of all attested procedures. In the latest reporting period (Q11), the lower radiation procedures (< 1 mSv.) constitute more than 70 percent of all those attested, a relative increase of 34 percent.

Altarum project management staff played a key role in the implementation of this complex innovation and were instrumental in bringing together stakeholders at UP and MPP and their practitioner sites. The relationship with the ACR was key to implementing the guidelines contained in ImageSmart but when putting this tool into practice, Altarum discovered many inconsistencies in the guidelines that had to be addressed for clinical application. Altarum recognized early on that integration into the EHR would be key to adoption and use and to long term sustainability but struggled to develop a solution for its UP physicians (Epic) and was making better progress on this for its MPP physicians (Allscripts).

RTI maintained strong communication with Altarum staff throughout this evaluation and the key Altarum staff focused on evaluation were well versed in the methods of data collection and analysis. Although no data were available at the individual provider level and the data expected at the patient level were also hard to obtain, the data on training and use of the tool at the practice level were easy to obtain. The data on imaging selection, radiation exposure, and positive impact rate have been available more recently through Altarum and have provided an important part of the picture.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Asian Americans for Community Involvement

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year (EOY) interviews in Asian Americans for Community Involvement (AACI) 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. **Table 1** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

Asian Americans for Community Involvement (AACI)

1.1 Introduction

Asian Americans for Community Involvement (AACI), a federally qualified health center in San Jose, CA, received an award of $2,684,545 to implement a patient navigation center (PNC) innovation. AACI began enrolling participants on October 30, 2013. The innovation seeks to achieve the following HCIA goals:

1. **Smarter spending.** Reduce unnecessary ED visits, saving $3,373,602 in gross medical expenditures.

2. **Better care.** Become a patient-centered medical home and establish a PNC to improve patient access to health and social services for 5,000 unique beneficiaries across nine primary care and mental/behavioral health services.

3. **Healthier people.** Improve cancer and diabetes prevention and early treatment in part by creating 29 nonclinical health worker jobs and training 165 young adults.

Table 2 provides a summary of changes that occurred with AACI during the third year of operations. These updates are based on a review of the Quarter 8 (Q8) to Q10 *Narrative Progress Reports*; Quarterly Awardee Performance Reports; secondary data submitted by AACI through March 31, 2015; and key informant interviews with AACI's leaders and staff conducted on June 4, 2015.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	AACI contracted with a new partner, Zero Divide, to create the PNC mobile app.
Program Participant Characteristics	Most (85.5%) innovation participants were Asian; 41.1% had Medicaid, 4.8% had Medicare, and 23.6% were eligible for both Medicare and Medicaid.
Implementation Process	
Execution	As of December 2014 (Q10), AACI spent 28.55% of its Year 3 budget, which is below the projected target.
Leadership	No change since the first annual report.[1] AACI retained key staff since project inception and reported receiving a high level of support from AACI leadership, particularly AACI's chief executive officer (CEO) and chief operating officer (COO), who is also the PNC project director.
Organizational capacity	AACI has not yet implemented the PNC mobile app. AACI used a portion of the HCIA funding to contract with Zero Divide, a technology consulting company that is developing a PNC app based on existing platforms

(continued)

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Implementation Process (continued)	
Organizational capacity (continued)	AACI recently collaborated with the state Health Services Advisory Group to obtain utilization data for participants with Medicaid and Medicare, but noted that data collection and analyses related to total cost of care have been challenging.
Innovation adoption and workflow	AACI's new integrated front desk is operational, which positions PNs to assist patients with check-in and related paperwork.
Workforce Development	
Hiring/retention	One PN cohort mentor resigned in Q10, and the advice nurse is resigning.
	AACI hired two graduates of PNC certificate programs—one part-time Cantonese/English-speaking PN and a new cohort mentor. AACI also hired a Mandarin-speaking PN student as a PN assistant.
Training	AACI aims to train 96 young adults as PNs; in May 2015 more than 60 PNs graduated from training.
Implementation Effectiveness	
Reach	As of Q11, AACI had a cumulative enrolment of 2,837 patients, increasing its reach from 48% to 57%. AACI's total patient population numbers have were lower than expected, which limited PNC reach.
Dose	Dose is reported for the first time in this annual report. Each participant may receive multiple PN services. Most participants (75.8%) received assistance with filling out forms; approximately one-quarter (23.6%) received assistance during their in-person visits. Fewer than 5% of participants received appointment scheduling assistance or reminders, health education, language assistance, or transportation assistance.

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by AACI.
Key informant interviews conducted Feb–June 2015.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

AACI = Asian Americans for Community Involvement; PN = patient navigator.

1.1.1 Innovation Components

AACI's PNC innovation consists of two major components: (1) working with community college partners to train Asian and Hispanic young adults as nonclinical health workers, and (2) providing PN services to AACI patients. Since we provided details on these components in the first annual report, no changes to these components occurred.[1] Supporting these major innovation components are health information technology elements, including a PNC portal, an updated electronic health records system, and a call center.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

During the EOY interviews, AACI reported contracting with a new partner, Zero Divide, to develop the PNC mobile app. Other than the new partnership with Zero Divide, the partners for this innovation remain unchanged from those reported in the first annual report.[1] These partners include four community colleges to support training: San Jose City College (San Jose), Cañada College (Redwood), Evergreen Valley College (San Jose), and Skyline College (San Bruno). The Career Ladders Project (Oakland) also provides training as well as project administration and management.

1.1.2 Program Participant Characteristics

Table 3 provides the demographic characteristics of all participants ever enrolled in the innovation. The distributions of age, gender, race/ethnicity, and insurance type are similar to that in the Q6 report, the earliest report in which patient characteristics based on secondary data were reported. More specifically, more than one-third of participants (38.6%) were between 25 and 64 years of age, and more than half (63.7%) were female. Most (85.5%) participants were Asian. More than one-third (41.1%) had Medicaid, less than 5 percent had Medicare, and almost one-quarter were eligible for both Medicare and Medicaid.

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Number of Participants	Percentage of Participants
Total	2,837	100.0
Age		
< 18	73	2.6
18–24	49	1.7
25–64	1,097	38.6
65–74	776	27.4
75–84	781	27.5
85+	54	1.9
Missing	7	0.3
Sex		
Female	1,809	63.7
Male	1,026	36.2
Missing	2	0.1
Race/ethnicity		
White	226	8.0
Black	69	2.4
Hispanic	89	3.1
Asian	2,424	85.5
American Indian or Alaska Native	12	0.4
Native Hawaiian or Other Pacific Islander	2	0.1
Other	3	0.1
Missing/refused	12	0.4

(continued)

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015 (continued)

Characteristic	Number of Participants	Percentage of Participants
Payer Category		
Dual	670	23.6
Medicaid	1,165	41.1
Medicare	137	4.8
Medicare Advantage	12	0.4
Other	676	23.8
Uninsured	172	6.1
Missing	5	0.2

Source: Patient-level data provided to RTI by AACI.

1.2 Implementation Progress

The first annual report (2014) described AACI's implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area. ***Table 4*** lists these measures and their status as of May 31, 2015. The results of analyses for all of these measures are included in this annual report.

This section presents AACI's process measures and a qualitative analysis of the factors that determined AACI's implementation progress. This analysis draws on patient-level data provided to RTI by AACI as of May 31, 2015, performance documents, and key informant interviews conducted in the 12th quarter of operations.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Workforce development	Education and training	Number of young adults trained as PNs during the intervention	Data received from AACI
Implementation effectiveness	Reach	Number/percentage of patients receiving navigation services	Data received from AACI
	Dose	Number of PN services provided to each participant	Data received from AACI
		Appointment scheduling assistance or appointment reminders	Data received from AACI
		Language assistance	Data received from AACI
		Assistance finding social services and other community resources	Data received from AACI
		Transportation assistance	Data received from AACI
		Health education (mental/behavioral health PN)	Data received from AACI

AACI = Asian Americans for Community Involvement; PN = patient navigator.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through AACI's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include AACI's reports from Q8 through Q10 and interviews conducted on June 4, 2015.

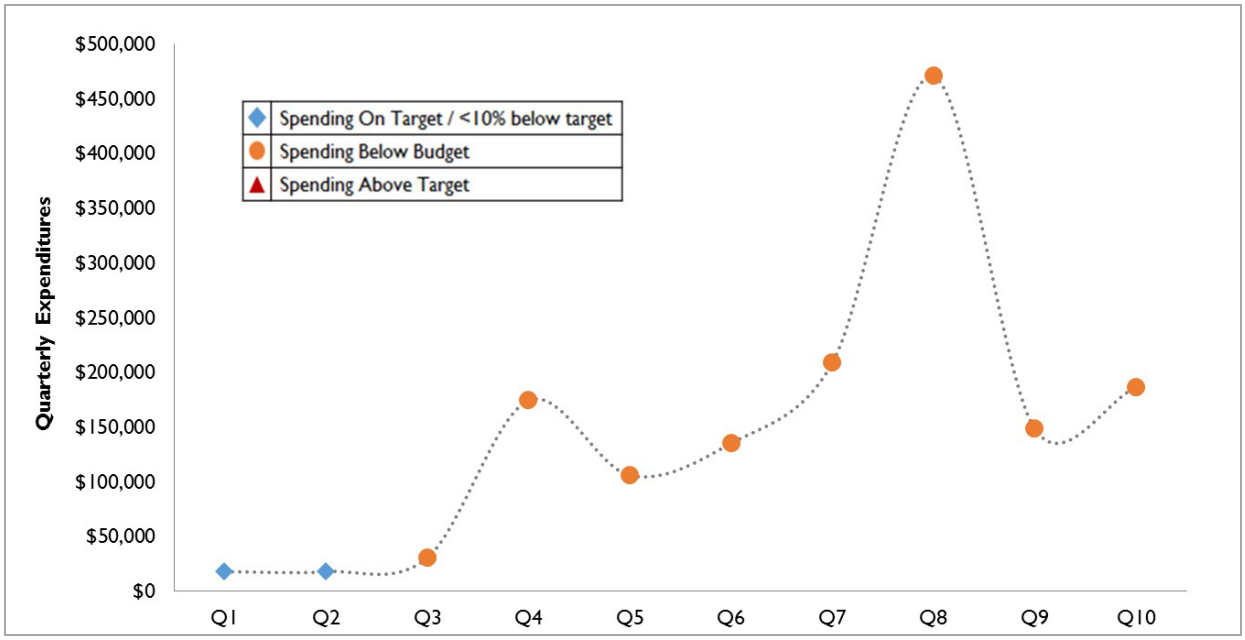
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

Execution of Implementation

The annual report highlights the significance of AACI's expenditure rates on implementation. As of December 2014 (Q10), AACI spent 28.55 percent of its Year 3 budget, which is below the projected target. AACI reported that the expenditure rate is below target in part due to the time required to obtain carryover approval and the timing of approvals. For example, AACI reported receiving approvals "well over half the way through the fiscal year" when it was no longer feasible to spend the carryover funds. Figure 1 shows that expenditures peaked in Q8; this peak may reflect investments reported during that quarter related to improving data management and partnering with an additional community college.

Figure 1. Spend Rate from Q1 (June 1, 2012) to Q10 (December, 31, 2014)



Leadership

AACI retained key staff since project inception and reported receiving a high level of support from AACI leadership, particularly AACI's chief executive officer (CEO). For example, the CEO featured the PNC innovation in reports to AACI's board of directors and to outside funders.

AACI's chief operating officer's (COO) is the PNC project director; and the PNC project administrator commented that this COO was a strong champion for the innovation. The COO incorporated the PNC into AACI's broader practice transformation and improvement efforts and promoted the PNC to local community health agencies.

Organizational Capacity

Through its partnership with Career Ladders Project (CLP), AACI supported the development and implementation of PN certificate programs at four community colleges. AACI experienced some setbacks in launching and maintaining the certificate programs because of turnover in leadership at partnering community colleges, but reported that "bringing funding to the table" and CLP's technical assistance helped them overcome these challenges.

AACI has not yet implemented the PNC mobile app. Initial efforts to develop an app with a University of California–Berkley volunteer club took longer than expected. AACI used a portion of the HCIA and funding from Kaiser Permanente to contract with Zero Divide, a technology consulting company that is developing a PNC app based on existing platforms. AACI noted that the number of insurers the clinic has may complicate app development, because insurers have different restrictions regarding the types of information that can be included in patient portals.

AACI does not have in-house capacity to assess its innovation based on total cost of care, which may limit their ability to obtain funding from sources, or fulfill funding requirements, that include this level of evaluation. AACI recently collaborated with the state Health Services Advisory Group to obtain utilization data for participants with Medicaid and Medicare, but noted that data collection and analyses related to total cost of care were challenging.

Innovation Adoption and Workflow Integration

During EOY interviews, PNC leadership reported that PNs' involvement as part of the workflow was critical to reach patients. An integrated front desk was created, which gives all patients an opportunity to receive services from a PN when they enter a clinic. AACI reported that this capability contributed to a rise in navigation services. This workflow positions PNs to assist patients with appointment check-ins, intake paperwork, and related services.

AACI acknowledged that, initially, primary care and mental health clinic staff did not understand the role of PNs and were concerned that the time patients spend with PNs may cause workflow delays. However, over time clinic staff gained a better understanding of the ways in which PNs could provide additional supports to patients. AACI reported that PNs helped patients with insurance sign-ups and

primary care physician reassignments, which AACI cited as a key factor in retaining some patients affected by primary care provider turnover.

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with nine full-time equivalent (FTE) staff members. Between Q8 (June 2014) and Q10 AACI hired two FTEs. Since launching the PNC, AACI hired eight PN certificate program graduates/students, although two resigned. AACI PNs speak several languages, including Mandarin, Spanish, and Arabic. During EOY interviews AACI noted that "patients appreciate when there is someone who speaks their language."

Skills, Knowledge, and Training

Between Q8 and Q10, AACI provided 12,600 hours of training to 42 individuals. Training was provided to students through PN certificate programs at four local community colleges. In addition to classroom training, PN students completed internships. AACI reported that the majority of Evergreen Valley College's (EVC) first student cohort completed their internships in Q10, but the exact number of EVC students completing internships was not specified in the *Q10 Narrative Progress Report*. In AACI's experience, the greatest challenge in developing the PN training program curriculum was defining the role and responsibilities of PNs. There are no professional standards for PNs, and the peer-reviewed literature notes wide variation in PN roles. In order to develop a training curriculum and coordinate certificate programs across community colleges, innovation partners first had to agree on the role and responsibilities of PNs. Under CLP's leadership, a Competency to Career work group, including community college consultants and health care employers, was developing PN competencies.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach) and (2) patients or participants were exposed to the services provided

(dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

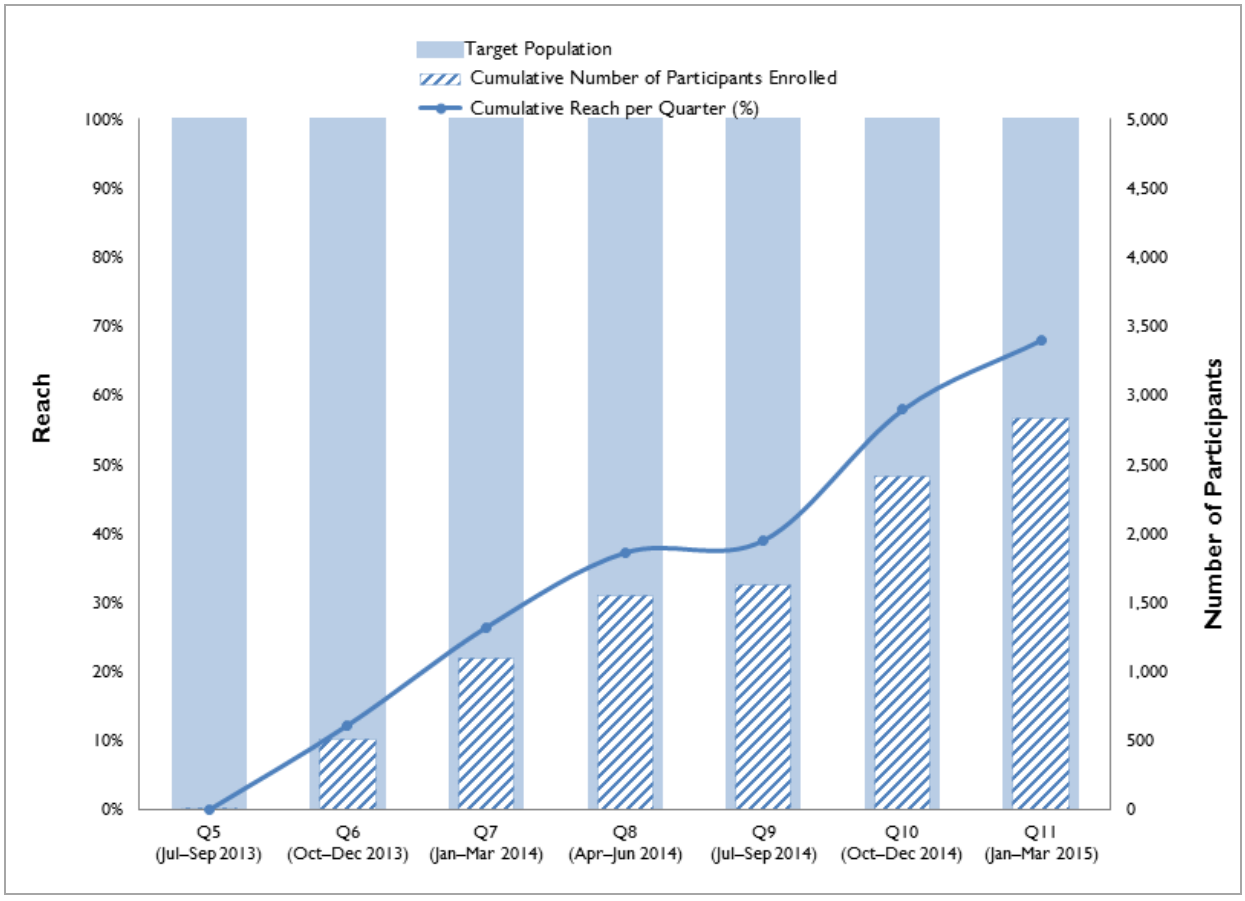
Evaluation Question

- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

Reach

Figure 2 shows reach by quarter for AACI since the launch of the innovation. We first reported reach in the Q6 report based on data through Q10. Since that time, AACI enrolled an additional 422 patients in the innovation, increasing reach from approximately 48 percent to approximately 57 percent. The number of cumulative unique participants served since program inception reported in the *Quarterly Awardee Performance Reports* (3,323) is greater than the number of participants reported in the RTI quarterly and annual reports (2,837). The reason for this discrepancy, according to AACI, is that participants were enrolled before AACI began tracking enrollees in an Excel spreadsheet, and patient information collected by interns was not recorded. Thus, these patients were not included in the patient-level data that AACI provided to RTI.

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch



(continued)

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch (continued)

	Quarter	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan–Mar 2015)
●	Cumulative reach per quarter (%)	0.0	10.2	22.0	31.1	32.6	48.3	56.7
	Target population	5,000	5,000	5,000	5,000	5,000	5,000	5,000
	Cumulative number of participants enrolled	2	511	1102	1555	1,630	2,415	2,837

Source: Patient-level data provided to RTI by AACI.

During EOY interviews, AACI reported that PNC reach was below target because AACI's overall patient enrollment was lower than expected. AACI's close proximity to other primary care organizations and providers, medical staff vacancies, and a decline in county referrals to AACI's mental health clinic all impacted patient enrollment.

Dose

Table 5 provides the number of selected services provided across participants, the number of participants receiving services, and the average number of services per participant through Q11. We include dose for the first time in this annual report. AACI provided patient-level data on the number and types of PN services provided for 2,457 participants (participants received at least one PN service). Most participants (75.8%) received assistance with filling out forms, and almost one-quarter (23.6%) received assistance during their in-person visits. Fewer than 5 percent of participants received appointment scheduling assistance or reminders, health education, language assistance, or transportation assistance.

Table 5. Number and Types of Services Provided to Participants

Services	Number of Services Provided Across Participants	Number (Percentage) of Participants Receiving Service	Average Number of Services per Participant
Appointment scheduling assistance or reminders	31	26 (1.0)	1.2
Assistance with filling out forms	3,617	2,150 (75.8)	1.7
Health education (mental/ behavioral health patient navigation)	23	18 (0.6)	1.3
In-person visit	771	669 (23.6)	1.2
Language assistance	4	4 (0.1)	1.0
Transportation assistance	45	36 (1.3)	1.3
Other service	76	71 (2.5)	1.1
Total	4,567	2,457 (86.6)	1.9

Source: Patient-level data provided to RTI by AACI.

Sustainability

During EOY interviews, AACI reported that three or four of the community colleges will continue the PN certificate programs beyond HCIA funding. Additionally, AACI's workforce development manager may continue to support San Jose City College and EVC by providing orientation for new PN students and monthly professional development workshops.

AACI received some funding from Kaiser Permanente that will help sustain PNC efforts, along with "small pots of funding" from the county. AACI will have to decrease hours of the six PNs currently employed, but would like to keep them all on staff. The project director and project administrator positions will be covered under AACI's operational budget. In the long term, AACI hopes to work toward a capitated payment system under which PNs could be covered, but described this strategy as "still up in the air."

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of AACI's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data AACI collects and submits to RTI (labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers essential to the evaluation of AACI's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported vary by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 6 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of whether payer-specific data are presented in this annual report.

Table 6. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	No
		Hospital unplanned readmissions rate	Yes	No
		ED visit rate	Yes	No
	Cost	Spending per patient	Yes	No
		Estimated cost savings	Yes	No

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis

We include patients who were enrolled prior to December 31, 2014 and we present Medicare claims data through December 31, 2014. The analysis uses data from the CMS Chronic Conditions Data Warehouse. Measures are presented for these beneficiaries in the quarters before and after enrolling in the innovation.

Comparison Groups

In addition to comparing beneficiaries pre- and post-innovation, for each claims outcome measure, we compare beneficiaries enrolled in the innovation to beneficiaries not enrolled in the innovation. The comparison group comprised fee-for-service Medicare beneficiaries living near AACI. Patients who visited AACI since the innovation started enrolling patients in October 2013 were excluded. Comparison beneficiaries must have lived in California from 2010 to December 2014, and lived in Santa Clara County for at least 1 month while the intervention enrolled beneficiaries.

Because individuals were not randomly assigned to the intervention, the probability of treatment may be correlated with the outcome variables of interest. Thus, simply comparing the mean value of the outcome variables for the treated and untreated groups may be biased by the existence of confounding factors. Propensity score matching (PSM) was used to select a comparison group of Medicare beneficiaries similar in observable characteristics to intervention Medicare beneficiaries. The PSM model adjusted for the following potentially confounding factors: age, number of chronic conditions, percentage

disabled, percentage end-stage renal disease, percentage male, percentage white, payments in calendar quarter prior to enrollment, number of dual eligible months in the previous calendar year, and total payments in the second, third, fourth, and fifth calendar quarters prior to enrollment. ***Appendix B.2*** provides technical details on the propensity score methodology.

After performing PSM, we calculated absolute standardized differences between the treatment group and the unmatched and matched comparison groups and checked whether matching decreased the absolute standardized differences and achieved acceptable balance. ***Table 7*** describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching.

Many researchers consider that an absolute standardized difference ≤ 0.10 indicates acceptable balance.[2] Researchers have also pointed out that critical variables in determining selection into treatment (e.g., those with significant effects in the propensity score equation) should have greater balance. In contrast, optimal balance is less critical for those indicators with minor importance in determining treatment selection. The results in Table 7 show that matching reduced the absolute standardized differences and achieved adequate balance for most variables. Percentage disabled, percentage white, and total payments in the second, third, fourth, and fifth calendar quarters had higher standardized differences before matching, and they reduced to 0.18, 0.16, and 0.16, respectively, after matching, although they still exceed the benchmark. These variables were significant in the PSM model. However, relative to differences before matching, the standardized differences after matching those variables were considerably smaller.

[2] Austin, P.C. Balance diagnostics for comparing the distribution of baseline covariates between treatment groups in propensity-score matched samples. Statist. Med. 28:3083–3107, 2009.

Table 7. Mean Values and Standardized Differences of Variables in Propensity Score Model: AACI

Variable	Before Matching				Standardized Difference	After Matching				Standardized Difference
	Treatment Group		Comparison Group			Treatment Group		Comparison Group		
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Age	72.88	10.36	71.82	12.67	0.09	72.88	10.36	73.75	7.10	0.10
Number of chronic conditions	5.71	2.98	6.32	3.95	0.17	5.71	2.98	5.48	2.09	0.09
Percentage disabled	12.60	33.22	23.29	42.27	0.40	12.60	33.22	8.76	19.90	0.18
Percentage ESRD	0.61	7.79	1.47	12.05	0.12	0.61	7.79	0.23	3.38	0.08
Percentage male	40.85	49.21	42.95	49.50	0.06	40.85	49.21	38.25	34.21	0.08
Percentage white	8.33	27.67	60.10	48.97	1.84	8.33	27.67	5.49	16.03	0.16
Payments in calendar quarter prior to enrollment	1,518	7,673	2,845	10,648	0.14	1,518	7,673	1,123	3,228	0.07
Number of dual eligible months in the previous calendar year	11.32	2.67	4.31	5.68	1.58	11.32	2.67	11.45	1.66	0.06
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	4,545	9,898	9,793	23,993	0.29	4,545	9,898	3,239	5,362	0.16
Number of beneficiaries	492	—	47,777	—	—	492	—	1,460	—	—
Number of unique beneficiaries[1]	492	—	10,374	—	—	492	—	1,195	—	—
Number of weighted beneficiaries	—	—	—	—	—	492	—	484	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

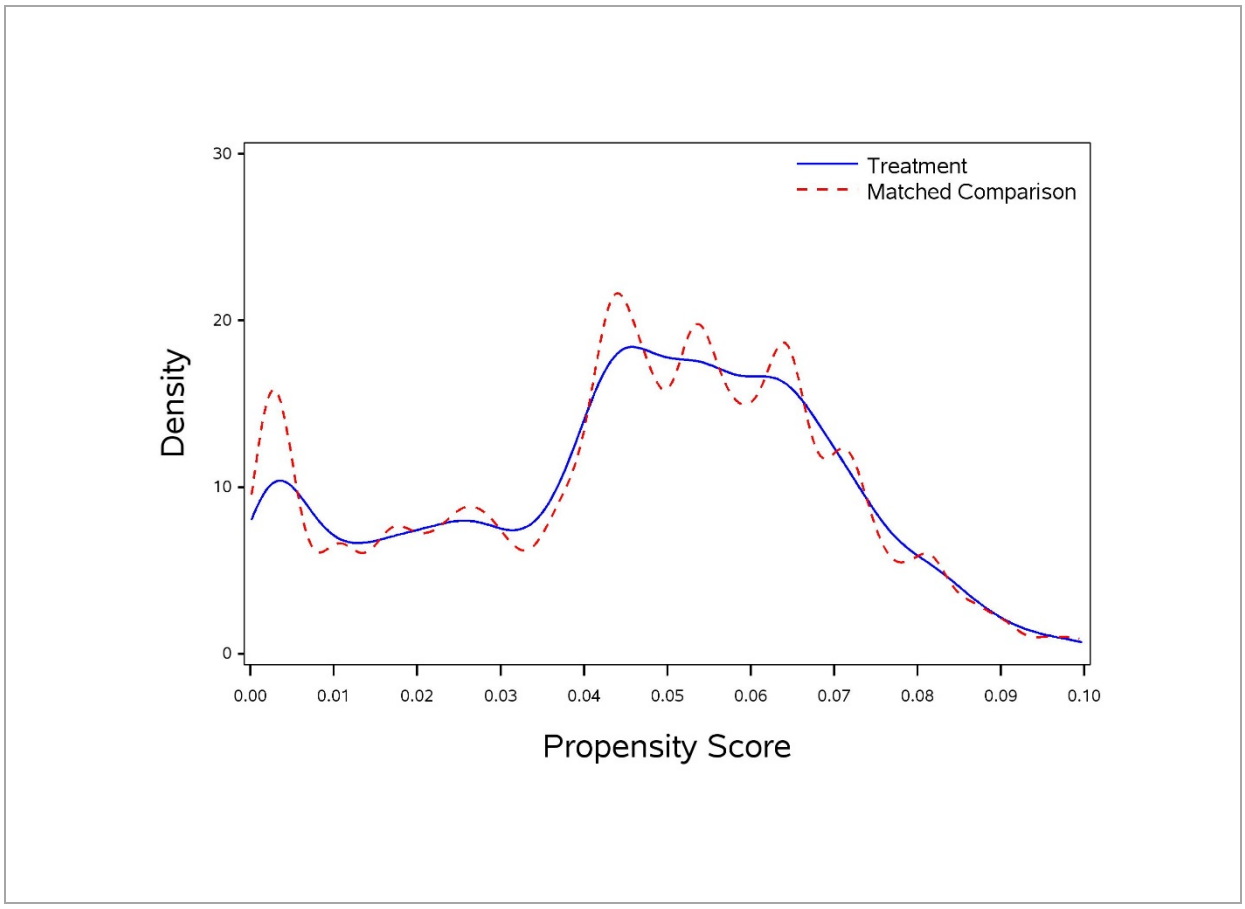
[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B for discussion of weights).

ESRD = end-stage renal disease; SD = standard deviation.

— Data not available.

Figure 3 shows the distribution of the propensity scores for both the comparison and intervention groups. No treatment beneficiaries were dropped from subsequent analyses due to the lack of an appropriately matched comparison beneficiary. On the basis of observable characteristics, we conclude that the two distributions overlap substantially, indicating that matched comparison beneficiaries had close propensity scores to treatment beneficiaries.

Figure 3. Distribution of Propensity Scores for Comparison and Intervention Groups: AACI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
AACI = Asian Americans for Community Involvement.

Descriptive Analysis

This report includes claims through December 31, 2014. ***Table 8*** reports Medicare spending per patient in the eight quarters before and the five quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 8. Medicare Spending per Patient: AACI

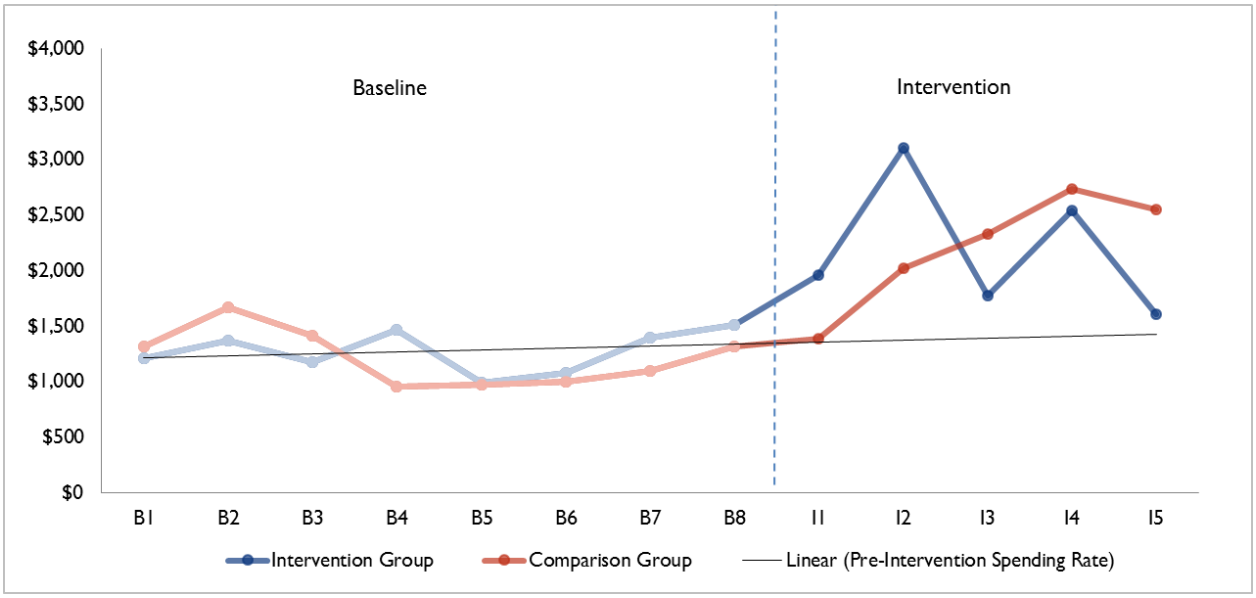
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters				
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5
Intervention Group														
1C1CMS 331035	AACI													
	Spending rate	$1,213	$1,372	$1,178	$1,471	$997	$1,085	$1,397	$1,512	$1,959	$3,111	$1,776	$2,543	$1,611
	Std dev	$4,165	$7,315	$3,613	$6,445	$2,936	$2,918	$5,667	$7,665	$6,715	$17,503	$5,683	$13,778	$3,477
	Unique patients	402	417	426	449	460	474	482	492	492	359	341	225	89
Comparison Group														
1C1CMS 331035	AACI													
	Spending rate	$1,315	$1,674	$1,417	$955	$975	$1,003	$1,096	$1,323	$1,390	$2,026	$2,336	$2,736	$2,554
	Std dev	$4,623	$6,791	$5,131	$2,856	$3,315	$3,948	$4,356	$5,188	$5,044	$9,368	$11,868	$14,488	$9,685
	Unique patients	409	419	429	441	459	471	480	484	484	356	333	220	88
Savings per Patient		$102	$302	$239	−$516	−$22	−$82	−$301	−$189	−$569	−$1,084	$560	$193	$943

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 4 illustrates the Medicare spending per beneficiary in Table 8 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 4. Medicare Spending per Patient: AACI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
AACI = Asian Americans for Community Involvement.

As shown by the pre-innovation trend line for innovation enrollees, spending slightly increases in the pre-intervention quarters. Both groups' spending remain above the pre-intervention trend line for all quarters after the innovation and spike in intervention quarters (I) 2 and 4. Intervention group spending shows a decreasing pattern after I2, but remains above the trend line, possibly because patients received more services when PNs helped them gain better access to those services. Comparison group spending is above the intervention group spending for all quarters after I3. However, the standard deviation in spending is high among both groups as shown in Table 8. The regression analysis in the next section assesses the impact of the innovation in the difference in spending between the treatment and comparison groups.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 9*** and ***Figure 5***.

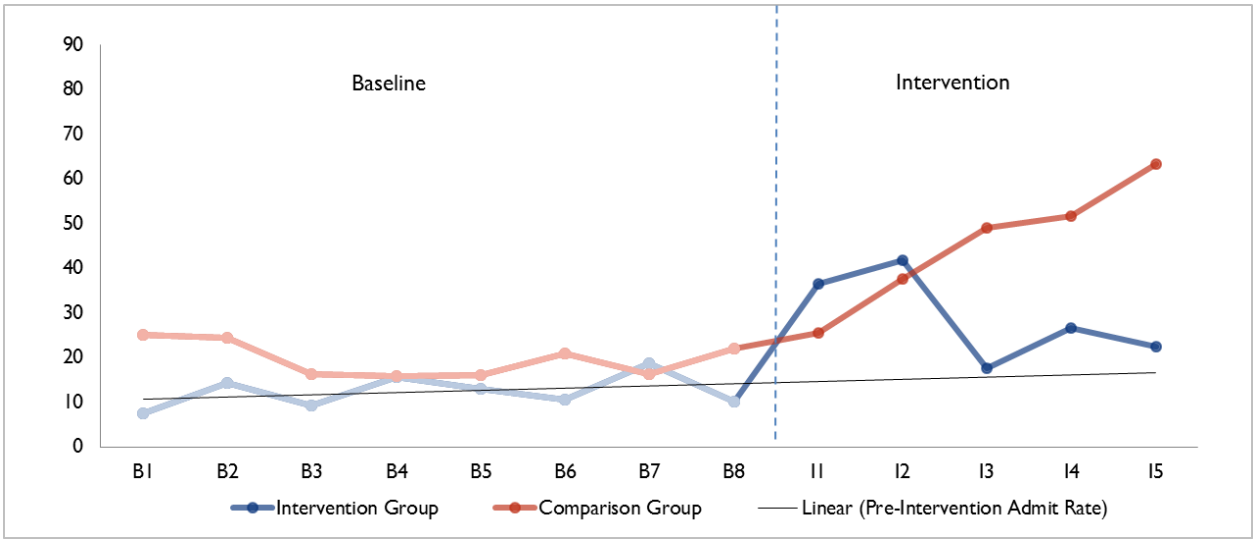
Table 9. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: AACI

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters				
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5
Intervention Group														
1C1CMS 331035	AACI													
	Admit rate	7	14	9	16	13	11	19	10	37	42	18	27	22
	Std dev	86	119	96	141	131	102	163	100	208	271	131	209	148
	Unique patients	402	417	426	449	460	474	482	492	492	359	341	225	89
Comparison Group														
1C1CMS 331035	AACI													
	Admit rate	25	24	16	16	16	21	16	22	25	38	49	52	63
	Std dev	174	162	131	116	120	147	131	144	162	216	259	233	296
	Unique patients	409	419	429	441	459	471	480	484	484	356	333	220	88
Intervention − Comparison Rate		−18	−10	−7	0	−3	−10	2	−12	11	4	−31	−25	−41

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 5. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: AACI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
AACI = Asian Americans for Community Involvement.

Inpatient admissions rates trend slightly upward during the pre-intervention period. After the intervention began, inpatient admissions rates for both groups are above the pre-intervention trend line. The comparison group shows an increasing trend in inpatient admission rates for all intervention quarters. After I3, the treatment group shows a decreasing trend and a lower number of inpatient admissions than the comparison group. However, as presented in Table 9 above, the standard deviation is high for all periods. The next section describes the regression analysis we conducted to assess the impact of the innovation on inpatient admissions.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 10*** and ***Figure 6***.

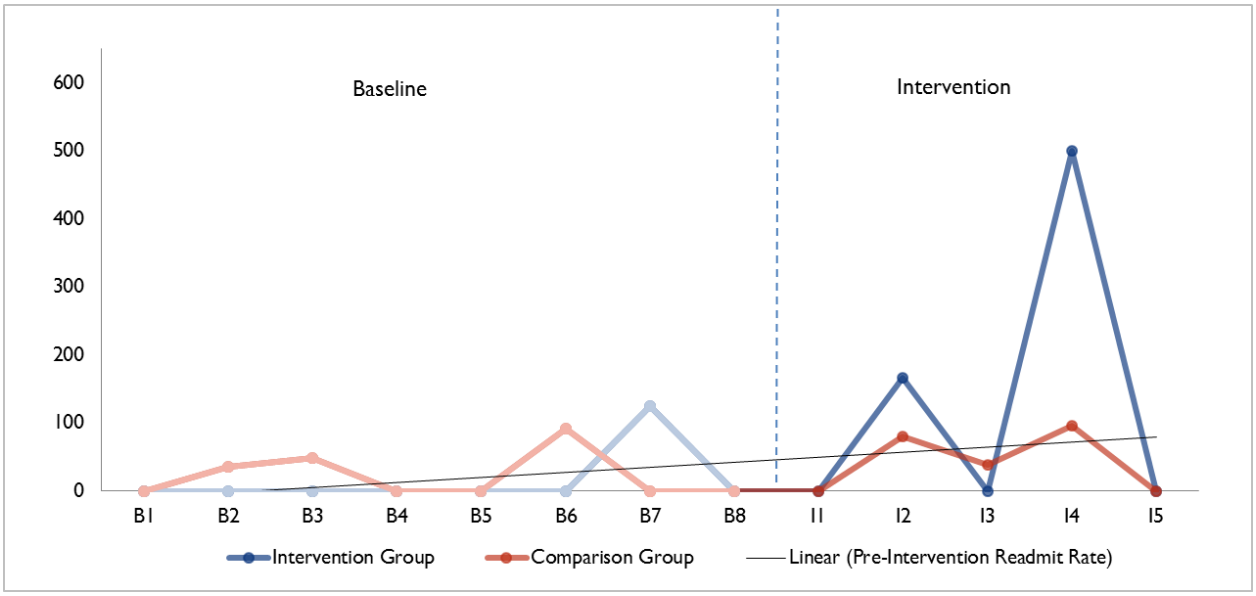
Table 10. Hospital Unplanned Readmissions Rates per 1,000 Admissions: AACI

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters				
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5
Intervention Group														
1C1CMS 331035	AACI													
	Readmit rate	0	0	0	0	0	0	125	0	0	167	0	500	0
	Std dev	0	0	0	0	0	0	331	0	0	373	0	500	0
	Total admissions	3	6	3	6	4	4	8	5	14	12	6	2	1
Comparison Group														
1C1CMS 331035	AACI													
	Readmit rate	0	36	49	0	0	91	0	0	0	80	38	95	0
	Std dev	0	186	215	0	0	288	0	0	0	271	192	294	0
	Total admissions	7	9	7	5	4	7	7	6	8	8	9	7	1
Intervention − Comparison Rate		0	−36	−49	0	0	−91	125	0	0	87	−38	405	0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6. Hospital Unplanned Readmissions Rates per 1,000 Admissions: AACI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
AACI = Asian Americans for Community Involvement.

Readmissions rates are highly variable before and after enrollment, reflecting the relatively small number of hospital admissions for both groups during each quarter. With few admissions (the denominator in the readmission rate) and a relatively low underlying percentage of readmissions, the readmissions rate varies widely over time. As more beneficiaries enroll in the innovation and more claims data become available, the sample size will increase and the readmissions measure may be reported with more precision.

ED visits per 1,000 participants are shown in ***Table 11*** and ***Figure 7***.

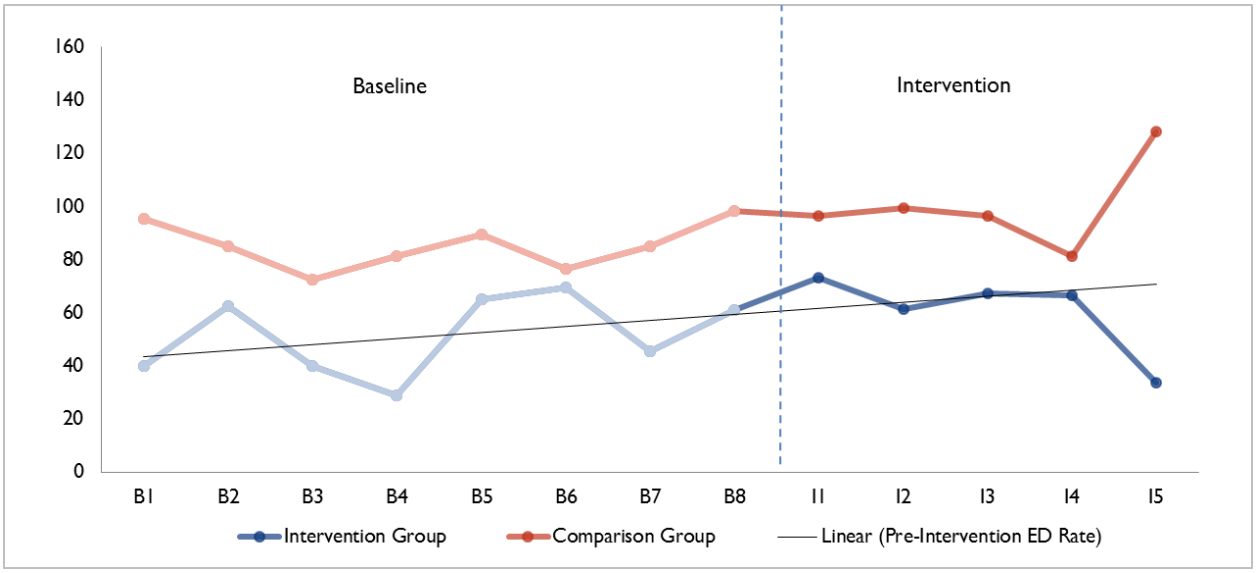
Table 11. ED Visits per 1,000 Participants: AACI

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters				
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5
Intervention Group														
1C1CMS 331035	AACI													
	ED rate	40	62	40	29	65	70	46	61	73	61	67	67	34
	Std dev	252	261	258	181	385	327	237	271	297	273	294	267	182
	Unique patients	402	417	426	449	460	474	482	492	492	359	341	225	89
Comparison Group														
1C1CMS 331035	AACI													
	ED rate	95	85	72	81	89	76	85	98	96	99	97	81	128
	Std dev	276	228	207	243	234	218	249	254	299	299	249	240	347
	Unique patients	409	419	429	441	459	471	480	484	484	356	333	220	88
Intervention − Comparison Rate		−56	−23	−32	−52	−24	−7	−39	−37	−23	−38	−29	−15	−95

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 7. ED Visits per 1,000 Participants: AACI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
AACI = Asian Americans for Community Involvement.

Intervention group ED visits trend upward during the pre-intervention period and fluctuate around the upward trend line after the intervention. ED visits for the intervention group are lower than the comparison group for all quarters. Regression results in the next section assess whether quarterly differences in ED visit rates between the treatment and comparison groups were impacted by the intervention.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit.

All regressions included an indicator variable for the treatment group, an indicator variable for each quarter, and quarterly indicators that interacted with the treatment group variable in the post-intervention period. We controlled for age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The regression specification assumes the same quarterly fixed effect for treatment and comparison individuals in the pre-innovation period and allows for a separate quarterly effect for treatment individuals after enrolling in the innovation.

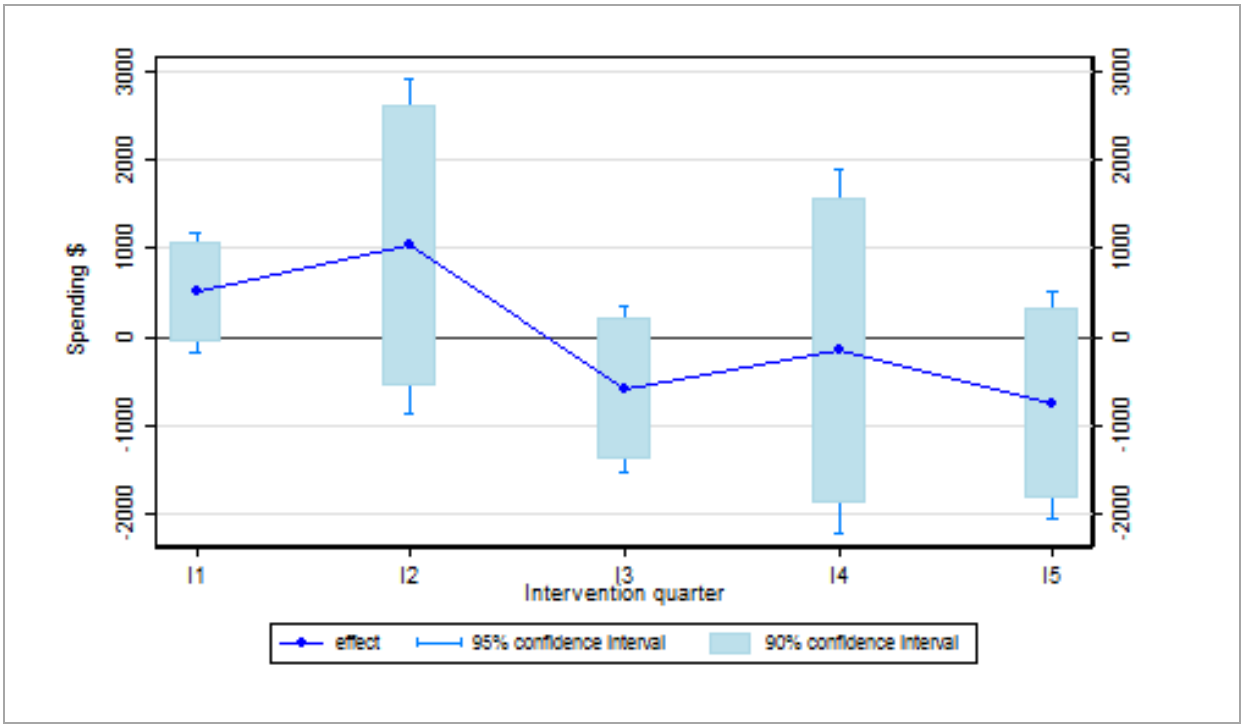
Table 12 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. ***Figure 8*** illustrates these quarterly difference-in-differences estimates.

Table 12. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: AACI

Quarter	Coefficient	Standard Error	P-Values
I1	502	340	0.140
I2	1025	964	0.288
I3	-589	478	0.218
I4	-163	1046	0.877
I5	-764	650	0.241

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
NOTES: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
AACI = Asian Americans for Community Involvement; OLS = ordinary least squares.

Figure 8. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: AACI



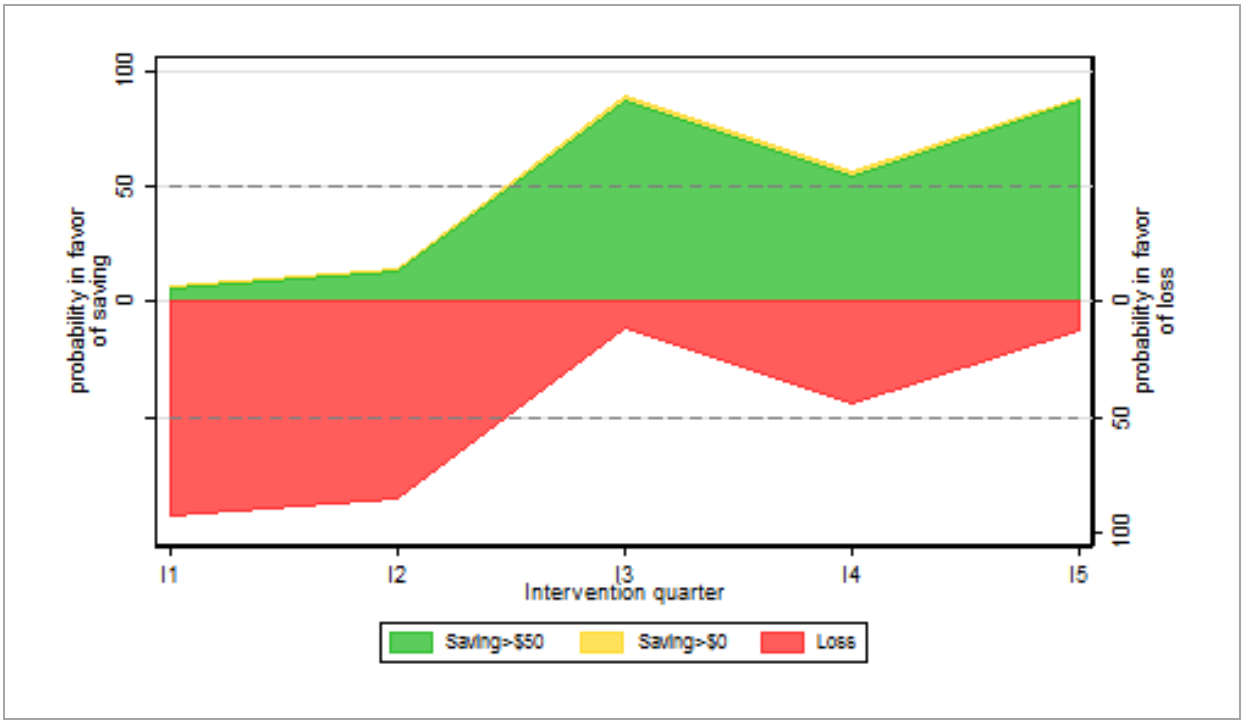
Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
AACI = Asian Americans for Community Involvement; OLS = ordinary least squares.

Figure 8 shows that, with the exception of I1 and I2, change in spending among the treatment group is lower than the change in spending for comparison group individuals. The largest difference is in I5, where the change in spending is on average $764 lower in the treatment group. However, differences in spending estimates are not statistically significant at conventional levels. As more beneficiaries enroll in

the program and more claims data become available, the sample size will increase in each quarter and the precision of the estimated quarterly spending effects will improve. Even though the lower spending among treatment group individuals is not statistically significant, the trend in the estimated quarterly spending differences is promising, suggesting that the intervention might lead to long-term savings.

Figure 9 presents the strength of evidence in favor of a saving or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis.

Figure 9. Quarterly Strength of Evidence in Favor of Saving/Loss: AACI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
AACI = Asian Americans for Community Involvement.

Figure 9 illustrates that in I1 and I2 the intervention has a lower probability of generating savings rather than losses. After I3, the intervention has a higher probability of generating savings. In I4 probabilities of savings and loss are very close, showing that the potential savings generated by the innovation are more uncertain.

We also present the overall weighted average treatment effect per member per quarter during the intervention period for beneficiaries enrolled in the innovation compared to their matched comparison group. The weighted average quarterly spending differential in the post-innovation period, indicating a loss, is −$203 (90% CI: −$854, $447) per member per quarter. This number represents the differential spending per quarter in the post-intervention period between individuals enrolled in the innovation and comparison group individuals, on average, weighted by the number of intervention beneficiaries in each

quarter. The 90 percent confidence interval is the range in which the true parameter estimate falls, with 90 percent confidence. The estimated loss is not statistically significant at the 0.1 confidence level.

To estimate the impact of the innovation on inpatient admissions and outpatient emergency department visits, we chose between logistic regressions and a linear probability model. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the estimated effect.[3] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, empirical demonstrations have shown that linear probability model coefficients are often consistent with marginal effects generated from nonlinear models.[4] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention) and not just the direction of the effect.

Table 13. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: AACI

Quarter	Coefficient	Standard Error	P-Values
I1	0.02	0.01	0.075
I2	0.01	0.01	0.603
I3	-0.01	0.01	0.369
I4	-0.02	0.01	0.168
I5	-0.01	0.02	0.660

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
AACI = Asian Americans for Community Involvement.

In I1 and I2, the intervention group has 2 and 1 percentage point higher inpatient admissions than the comparison group, whereas in I3, I4, and I5, the intervention group has, on average, between 1 and 2 percentage points fewer inpatient hospital admissions than the comparison group Even though differences are not statistically significant, they suggest a pattern of lower inpatient admissions for the intervention group after I3. The average quarterly difference-in-differences estimate for inpatient admissions is 0.2 percentage points, indicating that the treatment-control difference is 0.2 percentage points higher during the intervention period. This is the average difference in inpatient admissions

[3] To obtain the correct effect, simulations must be performed because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run, even when not competing with other users for computer resources.

[4] Angrist, J.D., and Pischke J.-S: Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is not statistically significant (90% CI: −0 .008, 0.01).

Table 14. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: AACI

Quarter	Coefficient	Standard Error	P-Values
I1	0.03	0.01	0.081
I2	0.01	0.02	0.729
I3	0.01	0.02	0.564
I4	0.02	0.02	0.374
I5	−0.02	0.03	0.563

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
AACI = Asian Americans for Community Involvement; ED = emergency department.

With the exception of I5, treatment group patients have a higher number of ED visits than comparison group patients. Those participating in the innovation during I1, I2, I3, and I4 have more ED visits (3, 1, 1, and 2 percentage points, respectively) than those not participating in the innovation. However, none of those differences are statistically significant. In future reports and as more claims data become available, we will estimate the impact on number of ED visits in later innovation quarters. The average quarterly difference-in-differences estimate for ED visits is 1.3 percentage points, indicating that the treatment-control difference is 1.3 percentage points higher during the intervention period. This is the average difference in ED visit probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is not statistically significant (90% CI: −.002, .03).

Discussion

The results may not be fully representative of the overall population served by the innovation for three reasons. First, the results presented here are only for Medicare beneficiaries whom we could match with the identifiers provided by the site. These results represents 17 percent of the overall population reached by the innovation. Second, the small sample size can hinder the ability to find statistically significant evidence that the innovation affected spending and health care utilization among individuals enrolled in the innovation. For all four measures we found high standard deviations accompanied by a small sample size, particularly for the last quarter for which we have data.

Medicaid Claims Analysis

Currently, Alpha-MAX claims are only available through Q3 2012. Because the AACI innovation was launched on October 1, 2013, and claims after the intervention launch are not yet available, we do not present measures for Medicaid patients in this report. We will provide Alpha-MAX Medicaid analyses in subsequent reports if Alpha-MAX data become available. However, Santa Clara County Medicaid

beneficiaries are enrolled in managed care rather than fee-for-service Medicaid, and claims data in the CMS Alpha-MAX files may not be available for all managed care enrollees.

1.3.3 Other Awardee-Specific Data

Table 15 lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. AACI was unable to provide data for the requested measures, so no secondary data outcomes are included in this annual report. We do not anticipate receiving these data to include in subsequent reports.

Table 15. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Clinical effectiveness	Patient satisfaction	Experience of patients with physicians and physician office staff	Dropped; data unavailable
	Diabetes	Percentage of patients with diabetes who received a hemoglobin A1c and lipid profile assessment	Dropped; data unavailable
	Cancer screening	Percentage of members 50–75 years old who had appropriate screening for colorectal cancer	Dropped; data unavailable
		Percentage of members 50–75 years old who had appropriate screening for breast cancer	Dropped; data unavailable
	Vaccination	Percentage of patients who received pneumovax	Dropped; data unavailable
Health outcomes	Diabetes	Percentage of patients with diabetes who had hemoglobin A1c > 9.0%	Dropped; data unavailable
	Weight	Percentage of patients who are overweight (BMI 25.0–29.9) or obese (BMI >30)	Dropped; data unavailable

BMI = body mass index.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing AACI as well as accomplishments to date. In this section we assess AACI's progress on achieving HCIA goals to date:

- **Smarter spending.** We found evidence of decreased expenditures in the last three innovation quarters, but these findings were not statistically significant.

- **Better care.** A total of 2,837 participants were enrolled; reach is at 57 percent. Nearly 90 percent of participants received at least one PN service. Most participants (75.8%) received assistance with filling out forms, and approximately one-quarter (23.6%) received assistance during their in-person visits. Fewer than 5 percent received appointment scheduling assistance or reminders, health education, language assistance, or transportation assistance.

  A new integrated front desk facilitated provision of PN services. However, the patient panels for

AACI's primary care and mental health clinics were smaller than expected due to competing health providers in the area, medical staff turnover, and a drop in county referrals. AACI's lower than expected patient enrollment posed challenges for achieving PNC reach targets.

We found no statistically significant changes in inpatient admissions or ED visit rates.

- **Healthier people**. AACI is unable to provide health outcomes data. Therefore, we are unable to assess health outcomes for those enrolled in the innovation.

AACI retained key PNC staff throughout the HCIA period and received a high level of support for the innovation from AACI's CEO and COO (the COO is also the PNC project director). Beyond HCIA funding, the PNC project director and administrator positions will be covered under AACI's operational budget. Funding from other grants will cover AACI's existing six PN positions; however, due to limited resources, PNs' hours will be decreased. AACI plans to continue supporting PN certificate programs at San Jose City College and EVC by leading orientations and workshops for new students. Three or four community colleges are expected to continue the PNC certificate programs with their own funds. In the long term, AACI hopes that a transition to a capitated payment system will lead to the coverage of PN services.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Ben Archer Health Center

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Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-Specific Data	Launch date–March 2015

Ben Archer Health Center

1.1 Introduction

The Ben Archer Health Center (BAHC) is a federally qualified health center (FQHC) in rural New Mexico that received an award of $1,270,845 to implement its innovation, which launched on September 5, 2012. The innovation seeks to achieve the following HCIA goals for 4,600 enrollees in northern Doña Ana County:

1. **Smarter spending.** Reduce total spending in northern Doña Ana County by 10 percent.
2. **Better care.** Improve care for individuals through a home-based health care model that provides promotion of healthy lifestyles and the delivery of quality health care education and increase the number of people in the service area who have a primary medical care home to 80 percent.
3. **Healthier people.** Improve health for the population of northern Doña Ana County through improved HbA1c, LDL-C, and hypertension control.

Table 2 provides a summary of changes that occurred with BAHC during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data submitted by BAHC through March 31, 2015; and key informant interviews with BAHC's leaders and staff conducted June 4–5, 2015.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	No change since the first annual report.[1]
Program Participant Characteristics	Majority of participants (69.7%) were aged 45 to 74 years. More than half were Hispanic (59.7%), and less than half were white (39.5%). More than one-third were covered by Medicare (38.3%), almost one-third covered by Medicaid (29.0%), and one-quarter covered by both Medicare and Medicaid (26.0%).
Implementation Process	
Execution	As of Q10, spent 54.7% of its Year 3 budget, on target.
	Increased the accessibility of eye exams in cooperation with a local optometrist during Q9.
Leadership	No change since the first annual report. BAHC's organizational and innovation leadership continued to provide resources and guidance in support of implementation.
Organizational capacity	BAHC largely resolved early challenges with self-monitoring by fine tuning data collection processes in Year 3.
Innovation adoption and workflow	Clinical and nonclinical staff continued to work well together and earn client trust.

(continued)

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Workforce Development	
Hiring/retention	Total staffing of 7.5 FTE at the end of Q10, an increase of 0.5 FTE since Q8 without any new hires.
Training	BAHC provided training to 9 staff in Q8, 21 staff in Q9, and 9 staff in Q10, for a total of 273 hours. Trainings focused on diabetes, chronic disease prevention, tobacco and smoking cessation, ethics, self-defense, and Medicaid. CHWs also participated in the Southern New Mexico Promotora Committee, a National Rural Health Association CHW training, and the Annual Diabetes Conference.
Implementation Effectiveness	
Reach	601 participants, 41.1% of the target population enrolled.
Dose	Participants received greater number of primary care and intensive case management visits on average in Q11 (5 and 10, respectively) compared to Q8 (3 and 9, respectively).

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by BAHC.
Key informant interviews conducted Feb–June 2015.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

BAHC = Ben Archer Health Center; CHW = community health worker; FTE = full-time equivalent; Q = quarter.

1.1.1 Innovation Components

This innovation consists of two components carried out by community health workers (CHWs) and nurse health educators (NHEs): (1) preventive care services, including immunization campaigns and participation in community events, and (2) intensive case management to support effective chronic disease management, including home visits. BAHC has a long-standing history of working with CHWs to connect individuals in the community who need medical services. CHWs and NHEs travel throughout rural northern Doña Ana County, NM, to link residents to preventive and primary care. They host community events, immunization campaigns, and in-home health education sessions. Patients with complicated medical conditions receive home visits to help them manage their medications and establish a safe home environment. When CHWs and NHEs identify patients who lack access to care, they link them to traditional providers, usually housed in BAHC's existing clinics. Since we provided details on these components in the first annual report, no changes to these components w made.[1]

BAHC did not report any formal partners for the innovation, though they have actively sought referrals from local organizations to meet patients' complex medical and social needs. For instance, BAHC increased the accessibility of eye exams in cooperation with a local optometrist during Q9. BAHC

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

collaborates with other organizations as appropriate, but it is the only health care provider in the targeted rural area.

1.1.2 Program Participant Characteristics

Table 3 provides the demographic characteristics of all participants ever enrolled in the innovation. We first reported patient demographic characteristics in the Q4 report, based on data through Q8. The distribution of patient characteristics is similar to that in the Q4 report. More specifically, a majority of participants (69.7%) were aged 45 to 74 years old and more than half (53.6%) were female. More than half of participants (59.7%) were Hispanic, and less than half (39.5%) were white. More than one-third (38.3%) were covered by Medicare and less than one-third (29.0%) were covered by Medicaid, while approximately one-quarter (26.0%) were eligible for both Medicare and Medicaid.

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Number of Participants	Percentage of Participants
Total	601	100
Age		
<18	9	1.5
18–24	4	0.7
25–44	36	6.0
45–64	234	38.9
65–74	185	30.8
75–84	104	17.3
85+	29	4.8
Missing	0	0.0
Sex		
Female	322	53.6
Male	279	46.4
Missing	0	0.0
Race/ethnicity		
White	238	39.5
Black	1	0.2
Hispanic	359	59.7
Asian	1	0.2
American Indian or Alaska Native	1	0.2
Native Hawaiian or Other Pacific Islander	0	0.0
Other	1	0.2
Missing/refused	0	0.0

(continued)

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015 (continued)

Characteristic	Number of Participants	Percentage of Participants
Payer Category		
Dual	156	26.0
Medicaid	174	29.0
Medicare	231	38.3
Other	31	5.2
Uninsured	8	1.3
Missing	1	0.2

Source: Patient-level data provided to RTI by BAHC.

1.2 Implementation Progress

The first annual report (2014) described BAHC's implementation process, workforce development, and progress toward effectiveness, and detailed the quantifiable measures to assess each area. This section presents BAHC's process measures and a qualitative analysis of the factors that determined BAHC's implementation progress. This analysis draws on patient-level data that BAHC provided to RTI as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 4 lists these measures and their status as of May 31, 2015. The results of analyses for all of these measures are included in this annual report.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation effectiveness	Reach	Number/percentage of participants eligible for services	Data received from BAHC
		Number/percentage of participants in the intensive case management component	Data received from BAHC
	Dose	Number of intensive case management home visits completed	Data received from BAHC

BAHC = Ben Archer Health Center.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through BAHC's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include BAHC's reports from Q8 through Q10 and interviews conducted June 4–5, 2015.

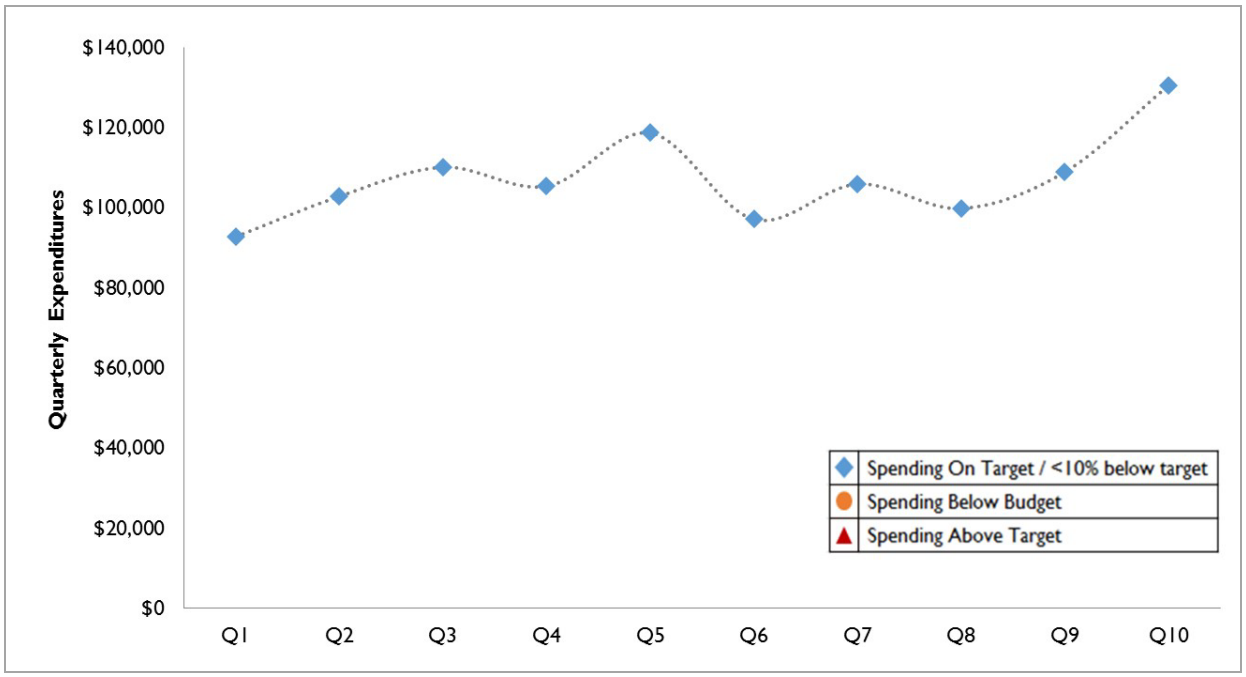
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

Execution of Implementation

The annual report highlights the significance of BAHC's expenditure rates on implementation. As of December 2014 (Q10), BAHC spent 54.72 percent of its Year 2 budget, which is at the projected target. As ***Figure 1*** shows, BAHC has consistently spent at the projected rate throughout Years 1 and 2.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Leadership

BAHC maintained leadership involvement in the innovation since the first annual report, and reported no changes to the core innovation team since beginning implementation. The operations manager participated in monthly project management calls, submits quarterly invoices, and reviews financial statements. BAHC leadership provided resources to upgrade an existing database, maintain company cars, and procure computers for CHWs. One end-of-year (EOY) interviewee described BAHC's executive team as small, which facilitated passing information up the organizational hierarchy and kept leaders engaged in the innovation process.

Organizational Capacity

BAHC began its innovation with over 20 years of experience employing CHWs and conducting program-related outreach to northern Doña Ana County. The HCIA project did not require many additional

material resources, as BAHC already had the necessary tools (e.g., electronic health record [EHR] system), infrastructure (e.g., technical support), and staff (i.e., existing CHWs) in place to implement the innovation. Center for Medicare & Medicaid Innovation funding enabled BAHC to expand its community- and home-based services and also augment training opportunities.

BAHC staff faced few challenges throughout the implementation process, except that they struggled with self-monitoring throughout the first 2 years of the project. They did not have clear data collection processes and measures identified early on, in part because they originally expected that CMMI would provide external evaluators to assist with monitoring. EOY interviewees described data collection processes as evolving and requiring negotiation with the evaluators and CMS. Both leaders suggested that data collection issues were resolved by the end of Year 2, but if BAHC could do it over, they would establish procedures for capturing evaluation metrics earlier in the implementation process.

Innovation Adoption and Workflow Integration

In the first annual report, we described how providers initially were somewhat hesitant about CHWs' involvement in their patients' care. At the end of Year 2, EOY interviewees suggested that BAHC's innovation ultimately strengthened relationships between their nonclinical and clinical staff. One interviewee explained that CHWs previously worked in the community, and rarely interacted with clinicians except when making referrals. The innovation changed this dynamic by increasing CHWs' presence and involvement in the clinic, which helped clinicians to see CHWs' expertise in conducting outreach, finding hard-to-reach patients in the community, and establishing linkages to nonclinical services. CHWs, in turn, benefitted from working more closely with providers and NHEs, as the clinical training of these staff helped CHWs address complicated medical concerns that exceeded the CHWs' knowledge. As one interviewee put it, "The nurses and CHWs had a symbiotic relationship and could see the benefits of the relationship."

BAHC's innovation not only helped staff increase their connectedness with each other, but also their connectedness with the community. BAHC's leaders reported that using the Promotora Model (i.e., hiring bilingual CHWs who lived within the targeted community) was essential to program success and to reaching high-risk patients. CHWs quickly gained the trust of patients, given that they were part of the communities they served. When NHEs were introduced as part of the care team, several came from outside the community, which could have created barriers to establishing rapport. CHWs helped ease this transition by vouching for the NHEs, which ultimately increased the range of services that CHWs and NHEs could provide in community and home settings.

1.2.2 Workforce Development

HCIA innovations seek to improve quality of care by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their roles in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with 7.5 full-time equivalent (FTE) staff members. Between Q8 (June 2014) and Q10, BAHC maintained steady CHW staff, primarily by filling vacancies with experienced CHWs from within the BAHC organization. As the EOY interviewees explained, CHWs exhibited strong retention because they were part of and committed to the communities they served. In many cases, CHWs acted as informal caregivers and community leaders before they joined the innovation team. One interviewee explained, "At times, we have to hire outside of the community, which is typically when we have turnover, because the CHWs aren't as invested in the [patients'] outcomes." When CHWs from within the community did leave their roles, it was typically because they received promotions within the BAHC organization.

Skills, Knowledge, and Training

Between Q8 and Q10, BAHC provided 273 hours of training to HCIA-employed administrative personnel, including 9 staff in Q8, 21 staff in Q9, and 9 staff in Q10. CHWs participated in training focused on diabetes, chronic disease prevention, tobacco and smoking cessation, ethics, self-defense, and Medicaid. CHWs also attended meetings of the Southern New Mexico Promotora Committee, a National Rural Health Association CHW training, and the Annual Diabetes Conference. The BAHC trainings generally enhanced CHWs' skills to conduct intensive in-home case management.

As one EOY interviewee explained, serving the target population in northern Doña Ana County requires more than formal training. She stated, "If we hired community college students who weren't from the community, we would have failed. The work requires staff whom the patients can trust." BAHC's CHWs are well-suited to reach remote, elderly patients most in need of care because they know the people they serve and understand the obstacles that their patients face.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which (1) the innovation reached the number of targeted patients or participants (reach) and (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

- What is the implementation effectiveness, including reach and dose, of the innovation thus far?

Reach

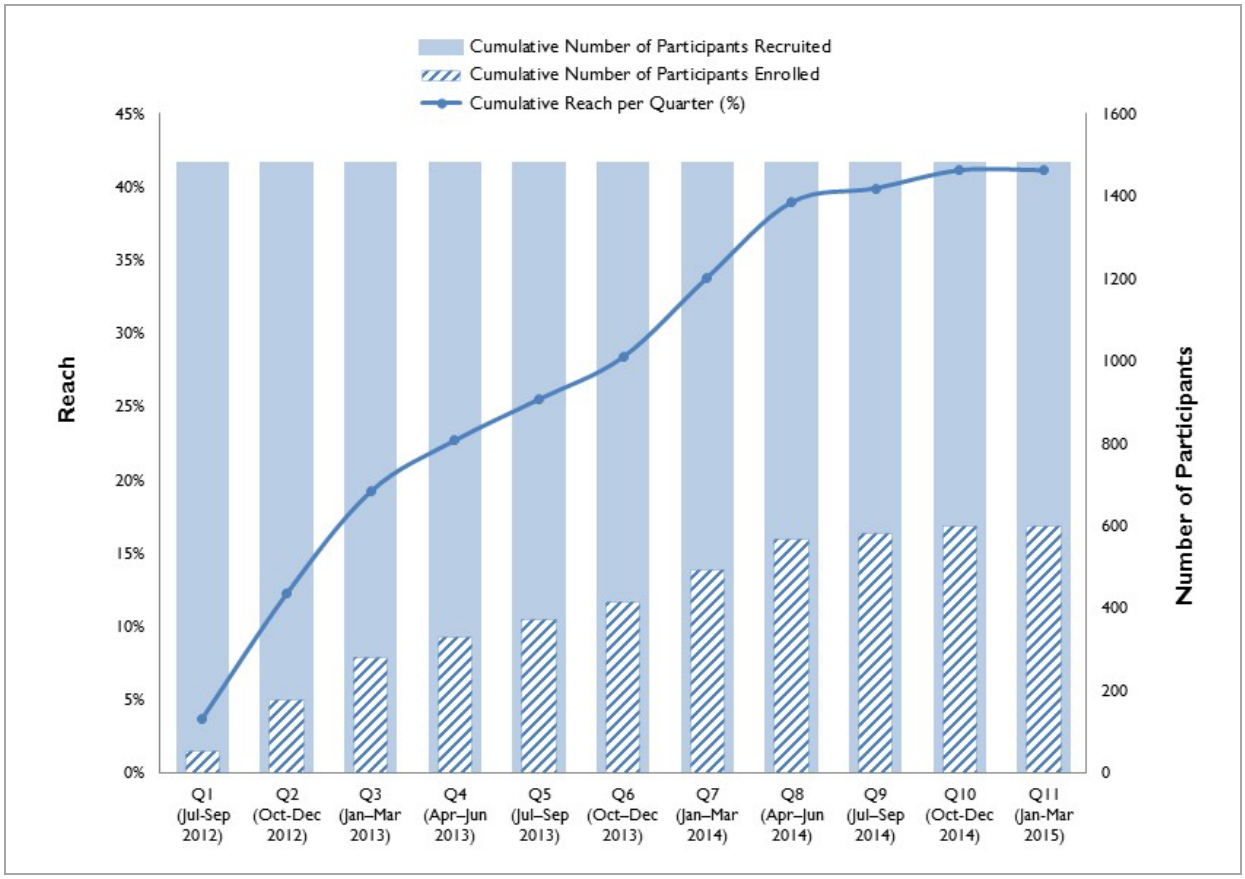
Figure 2 shows reach by quarter since the launch of the innovation. We first reported reach in the Q4 report, based on data through Q8. Since that time, BAHC enrolled an additional 32 patients in the innovation, increasing reach from 38.9 percent to 41.1 percent.

As explained in previous reports, the number of participants reported in the *Quarterly Awardee Performance Reports* differs from the number of participants reported in the RTI quarterly and annual reports because BAHC includes the number of participants in the preventive care services component. However, BAHC does not collect data on those participants. As such, RTI can only report the number of patients in the intensive case management component of the innovation. In Q8, RTI updated the target population from 4,656, which included both case management and preventive care service target patient populations to 1,461, which includes only the intensive case management patient population. BAHC provided the revised denominator for calculating reach for the intensive case management component alone, with the understanding that RTI's calculation of reach would consequently look very different from the BAHC's own calculation. BAHC's Q11 *Awardee Performance Report* identifies reach at 95.9 percent, in stark contrast to the 41.1 percent reported here. Project leaders' remarks in EOY interviews indicate that BAHC believes it met enrollment targets, despite this difference.

EOY interviewees reported that the complex social and medical needs of the rural and elderly populations receiving intensive case management services required significant resources and time to manage appropriately. Interviewees suggested that the innovation may have been more effective if BAHC had been more selective about the types of patients that they enrolled in the innovation. Targeting the highest risk-patients required that BAHC address fundamental social needs (e.g., running water) before helping patients manage their medical conditions. The complexity of services required lengthy interventions, and many patients may have been at such high risk that their conditions could not really be affected during the evaluation period. Both interviewees suggested that enrolling both high- and moderate-risk patients may have been a better strategy for demonstrating the program's effectiveness.

BAHC began the innovation before the Affordable Care Act (ACA) expanded Medicaid, which incentivized BAHC to begin the project focusing on enrolling elderly Medicare patients. One EOY interviewee explained that if the Medicaid expansion had happened sooner, BAHC could have enrolled younger Medicaid-only patients from the start of the project. She suggested that this strategy could have resulted in more moderate-risk enrollees, with the implication that younger patients typically have less complicated health care needs than older patients.

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch*



	Quarter	Q1 (Jul-Sep 2012)	Q2 (Oct-Dec 2012)	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct-Dec 2014)	Q11 (Jan-Mar 2015)
●	Cumulative reach per quarter (%)	3.8	12.3	19.2	22.7	25.5	28.4	33.8	38.9	39.9	41.1	41.1
	Target population	1,461	1,461	1,461	1,461	1,461	1,461	1,461	1,461	1,461	1,461	1,461
	Cumulative number of participants enrolled	55	179	281	332	373	415	494	569	583	601	601

Source: Patient-level data provided to RTI by BAHC.
* Based on RTI's definition of participants described in the text above.

Dose

Table 5 provides the number of services provided across participants, the number of participants receiving services, and the average number of services per participant through Q11. We first reported dose in the Q4 report, based on data through Q8. As expected, the number of services provided and the percentage of participants receiving those services increased between Q8 and Q11. As shown in

Table 5, close to 91 percent of participants received an average of approximately 5 primary care visits, and nearly 88 percent received an average of approximately 10 intensive case management home visits (versus 87.3% and 84.0%, respectively, in Q8).

Our EOY interviews with innovation leaders suggest that patients required a greater frequency and intensity of services than expected. One participant indicated that BAHC initially envisioned that patients receiving intensive case management would require a visit every week or every other week, but this frequency was not enough to improve the health outcomes of many patients. For instance, patients who required medication management sometimes had to be seen three to four times a week to effectively treat their conditions. Other patients seemed incapable of managing their health no matter how often innovation staff visited or simply wanted staff to visit them for social reasons. BAHC responded to these challenges by establishing guidelines for how often and for what reason home visits should occur.

Table 5. Number and Types of Services Provided to Participants

Services	Number of Services Provided Across Participants	Number (Percentage) of Participants Receiving Services	Average Number of Services per Participant
Case Management Visits			
Primary care visits	2,534	544 (90.5)	4.7
IC management home visits	5,207	531 (88.4)	9.8

Source: Patient-level data provided to RTI by BAHC.
IC = intensive case.

Sustainability

BAHC plans to sustain all nurses and CHWs hired for the innovation through another funded project, which focuses on maternal care as opposed to diabetes case management and chronic disease prevention. Home-based care delivery will become less common, though CHWs will still meet with the nurses to discuss patient care. BAHC also reported that the immunization campaign and community events will be sustained through support from community partners and the New Mexico Coalition.

EOY interviews suggest that the HCIA initiative was valuable to BAHC because the skills and relationships developed during the project will be folded into the organization. For instance, the knowledge that CHWs gleaned from HCIA-funded training will support the maternal care initiative. The rapport between CHWs and physicians will continue to facilitate patient treatment and linkage to community services.

When asked whether BAHC's innovation would have benefitted from other partnerships, one EOY interviewee remarked that she wished the organization could have partnered with managed care organizations as a strategy for reimbursing for CHW services. Program leaders remain hopeful that the state may develop a certification process for CHWs, which they believe would facilitate payment.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of the BAHC innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data BAHC collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers essential to the evaluation of BAHC's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee. As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 6 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of whether the payer-specific data are presented in this annual report.

Table 6. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	Yes
		Hospital unplanned readmissions rate	Yes	Yes
		ED visit rate	Yes	Yes
	Cost	Spending per patient	Yes	Yes
		Estimated cost savings	Yes	No

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis

We include patients who were enrolled prior to December 31, 2014, and we present Medicare claims data through December 31, 2014.

Comparison Groups

The analysis focuses on Medicare beneficiaries enrolled in fee-for-service Medicare Parts A and B living in northern Doña Ana County during the innovation launch. We present measures for beneficiaries enrolled in the innovation as well as a group of statistically-matched comparison beneficiaries with fee-for-service Medicare living in southern Doña Ana County (excluding the city of Las Cruces) and the counties surrounding Doña Ana County (Luna, Sierra, and Otero Counties). The analysis uses data for claims through June 30, 2014, from the CMS Chronic Conditions Data Warehouse via the Virtual Research Data Center.

We used propensity score matching (PSM) to select comparison group beneficiaries with similar characteristics as treatment group beneficiaries. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, disability, end-stage renal disease status, Medicare-Medicaid status, diabetes, asthma, hypertension, number of chronic conditions, and total Medicare payments in the calendar year prior to the innovation. We matched each treatment beneficiary with up to three comparison beneficiaries whose propensity scores were within a predefined distance.

Table 7 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. ***Figure 3*** shows the distribution of the propensity scores for both the comparison and intervention groups. ***Appendix B.2*** provides technical details on the propensity score methodology. No treatment beneficiaries were dropped from the subsequent analyses due to the lack of an appropriately matched comparison beneficiary.

Table 7. Mean Values and Standardized Differences of Variables in Propensity Score Model: BAHC

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrollment	1509	3635	1787	6137	0.06	1509	3635	1253	2147	0.09
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	5087	14191	6270	15042	0.08	5087	14191	5440	8390	0.03
Age	69.55	11.77	71.23	11.22	0.15	69.55	11.77	70.55	6.90	0.10
Percentage male	53.13	50.06	48.69	49.98	0.13	53.13	50.06	54.67	29.13	0.04
Percentage white	32.50	46.98	74.48	43.60	1.31	32.50	46.98	33.33	27.58	0.03
Percentage disabled	32.50	46.98	22.75	41.92	0.31	32.50	46.98	29.07	26.57	0.11
Percentage ESRD	3.13	17.45	0.79	8.84	0.24	3.13	17.45	2.44	9.03	0.06
Number of dual eligible months in the previous calendar year	6.14	5.72	2.18	4.53	0.77	6.14	5.72	6.43	3.42	0.06
Number of chronic conditions	5.83	3.8	6.32	3.96	0.13	5.83	3.80	5.50	2.10	0.11
Percentage with hypertension ever	72.5	44.79	70.71	45.51	0.06	72.50	44.79	71.75	26.34	0.02
Percentage with diabetes ever	51.25	50.14	32.1	46.69	0.56	51.25	50.14	48.78	29.25	0.07
Percentage with asthma ever	13.75	34.55	14.68	35.39	0.04	13.75	34.55	9.55	17.20	0.19
Number of beneficiaries	160	—	115,100	—	—	160	—	480	—	—
Number of unique beneficiaries[1]	160	—	14,849	—	—	160	—	474	—	—
Number of weighted beneficiaries	—	—	—	—	—	160	—	160	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

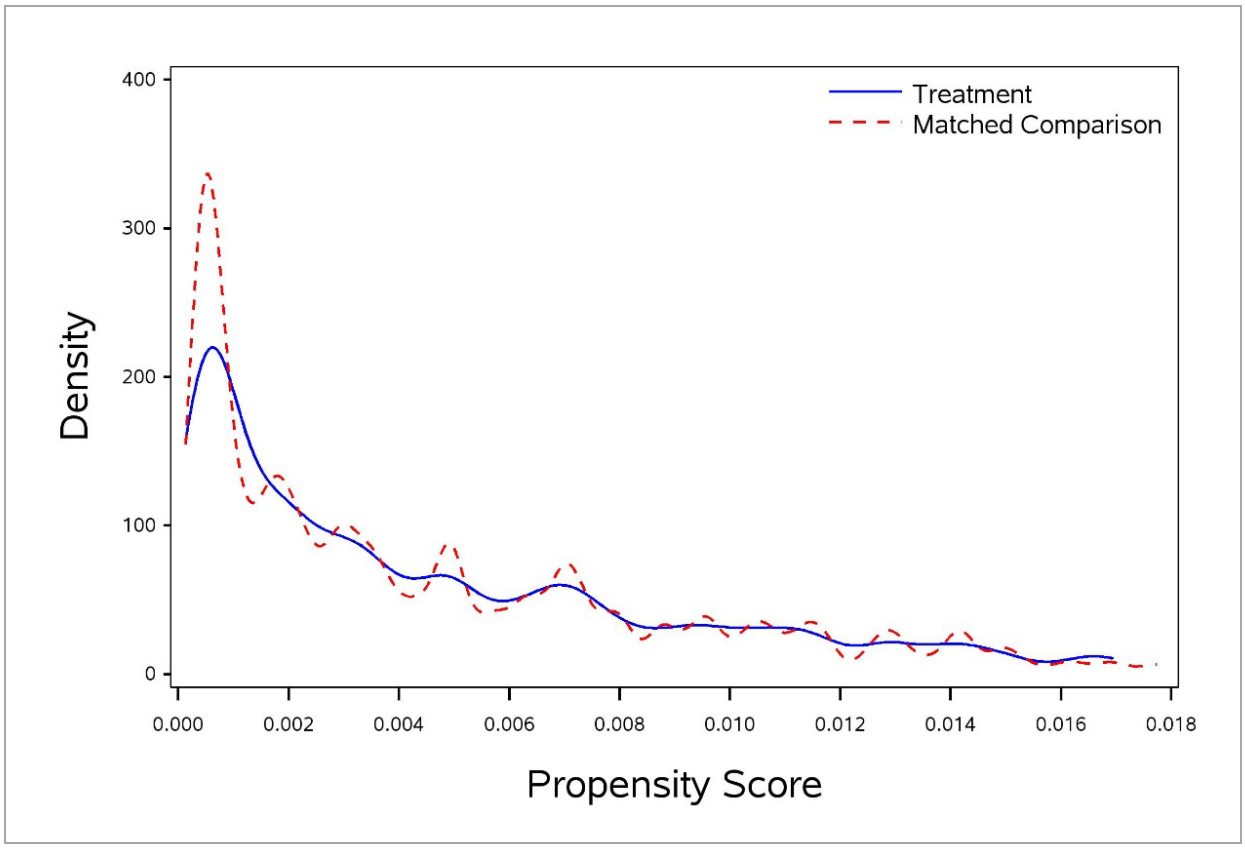
[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B for discussion of weights).

BAHC = Ben Archer Health Center; ESRD = end-stage renal disease.

— Data not available.

After performing PSM, we calculate absolute standardized differences between the treatment group and both of the unmatched and matched comparison groups and checked whether matching decreased the absolute standardized differences and achieved acceptable balance (***Table 7***). Coincidentally, the mean and standard deviations of the percentage of white and disabled treatment group beneficiaries are the same. Many researchers consider that an absolute standardized difference ≤0.10 indicates acceptable balance.[2] Researchers also point out that critical variables in determining selection into treatment (e.g., those with significant effects in the propensity score equation) should have greater balance, while indicators with minor importance in determining treatment selection do not require optimal balance. The results in Table 7 show that matching reduced the absolute standardized differences and achieved adequate balance for most variables. After matching, the treatment group had a higher percentage of disabled beneficiaries than the matched comparison group (32.50% versus 29.07%, standardized difference 0.11), a higher number of chronic conditions (5.83 versus 5.50, standardized difference 0.11), and a higher percentage of beneficiaries with asthma (13.75 percent versus 9.55 percent, standardized difference 0.19).

Figure 3. Distribution of Propensity Scores for Comparison and Intervention Groups: BAHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
BAHC = Ben Archer Health Center.

[2] Austin, P.C. An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research. 46.3: 399–424, 2011. *PMC*. Web. 2 June 2015.

The propensity score distributions for the treatment and matched comparison groups overlap substantially, indicating that matched comparison beneficiaries have similar propensity scores to treatment beneficiaries.

Descriptive Analysis

This report includes claims through December 31, 2014. ***Table 8*** reports Medicare spending per patient in the eight quarters before and the eight quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 8. Medicare Spending per Patient: BAHC

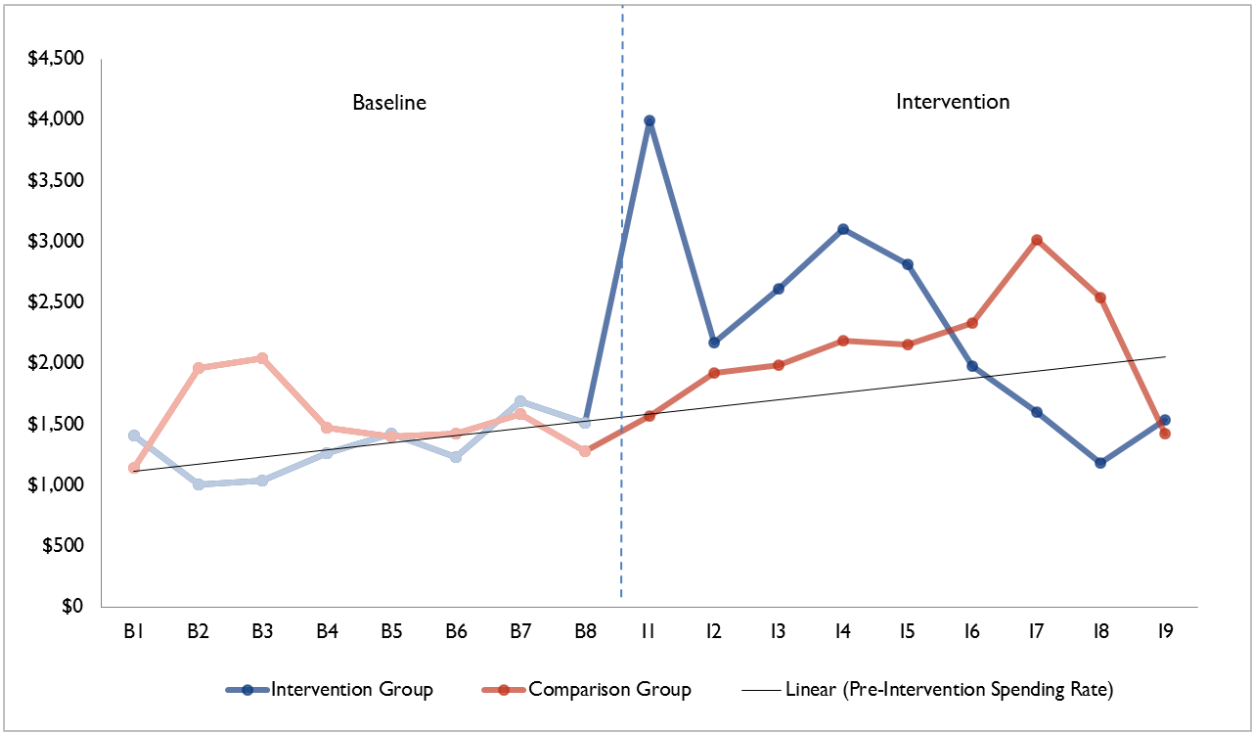
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters								
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8	I9
Intervention Group																		
1C1CMS 331013	BAHC																	
	Spending rate	$1,404	$1,004	$1,036	$1,265	$1,426	$1,233	$1,692	$1,509	$3,992	$2,173	$2,609	$3,106	$2,810	$1,978	$1,603	$1,179	$1,539
	Std dev	$2,902	$2,525	$3,291	$4,116	$4,415	$2,667	$7,569	$3,624	$12,440	$5,048	$6,748	$13,986	$5,179	$4,792	$4,070	$2,691	$4,143
	Unique patients	122	131	134	138	142	147	151	160	160	152	149	138	127	105	89	71	36
Comparison Group																		
1C1CMS 331013	BAHC																	
	Spending rate	$1,139	$1,962	$2,039	$1,474	$1,397	$1,422	$1,582	$1,276	$1,565	$1,925	$1,983	$2,190	$2,151	$2,328	$3,017	$2,538	$1,423
	Std dev	$4,069	$6,185	$6,724	$6,000	$4,184	$4,063	$6,176	$3,718	$4,526	$6,350	$5,827	$6,533	$6,249	$6,814	$11,138	$9,567	$5,529
	Unique patients	136	141	142	146	148	153	156	159	159	158	150	140	128	109	93	76	37
Savings per Patient		−$265	$958	$1,003	$209	−$29	$188	−$111	−$233	−$2,427	−$248	−$626	−$916	−$659	$350	$1,414	$1,359	−$116

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 4 illustrates the Medicare spending per beneficiary in Table 8 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 4. Medicare Spending per Patient: BAHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
BAHC = Ben Archer Health Center.

Spending among treatment group beneficiaries trends upward and is similar to comparison group spending during pre-intervention quarters. During I1, the treatment group's spending spikes. The spending spike could be explained by a medical event during the quarter in which the beneficiary enrolled in the innovation, which caused the need for case management. Additionally, beneficiaries may experience an increase in spending immediately after enrolling in the innovation because CHWs connect them with services. Initially, the treatment group's spending is higher than the comparison group's but then begins to trend downward.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 9*** and ***Figure 5***.

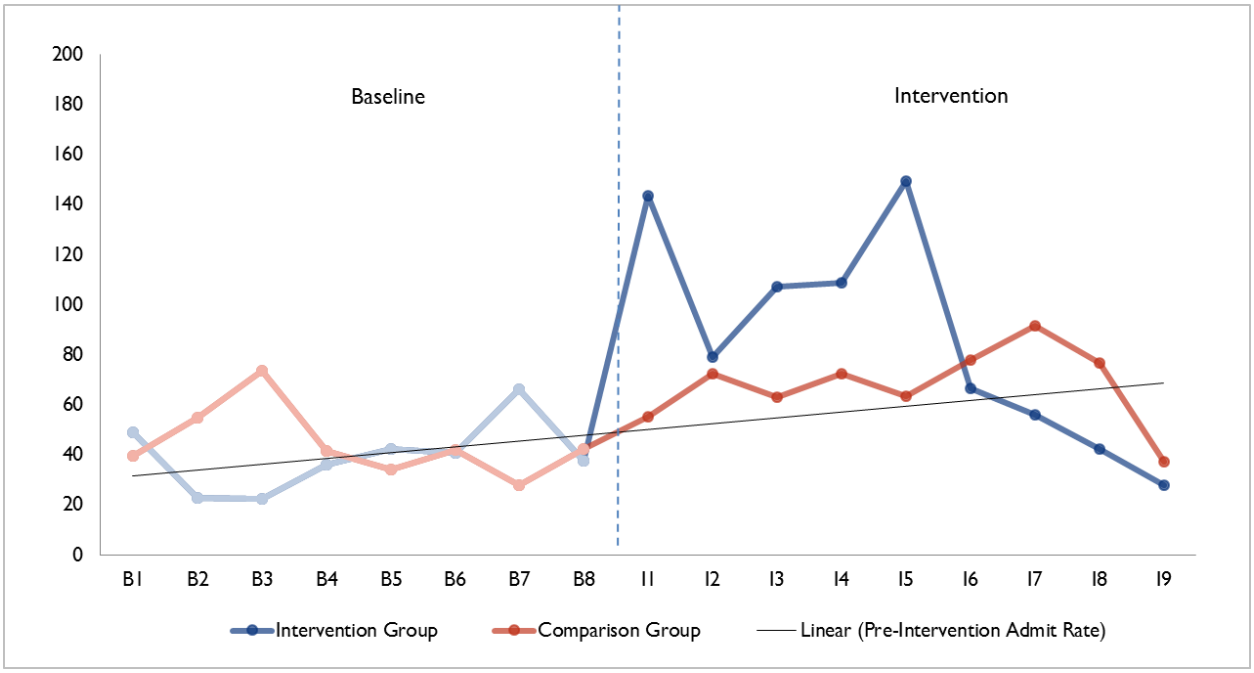
Table 9. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: BAHC

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters								
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8	I9
Intervention Group																		
1C1CMS 331013	BAHC																	
	Admit rate	49	23	22	36	42	41	66	38	144	79	107	109	150	67	56	42	28
	Std dev	216	150	148	187	234	198	484	190	557	315	387	492	398	317	230	201	164
	Unique patients	122	131	134	138	142	147	151	160	160	152	149	138	127	105	89	71	36
Comparison Group																		
1C1CMS 331013	BAHC																	
	Admit rate	40	55	73	42	34	42	28	42	55	72	63	73	63	78	92	77	37
	Std dev	218	265	309	249	180	199	188	220	253	316	284	308	317	346	373	337	231
	Unique patients	136	141	142	146	148	153	156	159	159	158	150	140	128	109	93	76	37
Intervention − Comparison Rate		9	−32	−51	−5	8	−1	38	−5	89	6	44	36	86	−11	−35	−35	−10

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions/unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 5. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: BAHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
BAHC = Ben Archer Health Center.

The inpatient admissions rate is similar for the treatment and comparison groups during the pre-intervention period. During I1 through I5, the treatment group's inpatient admission rate is higher than the comparison group's. During I6 through I9, the comparison group's inpatient admission rate is higher than the treatment group's; however, the regression analysis in the next section demonstrates that the quarterly differences in inpatient admission rates are generally not statistically different between the two groups.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 10*** and ***Figure 6***.

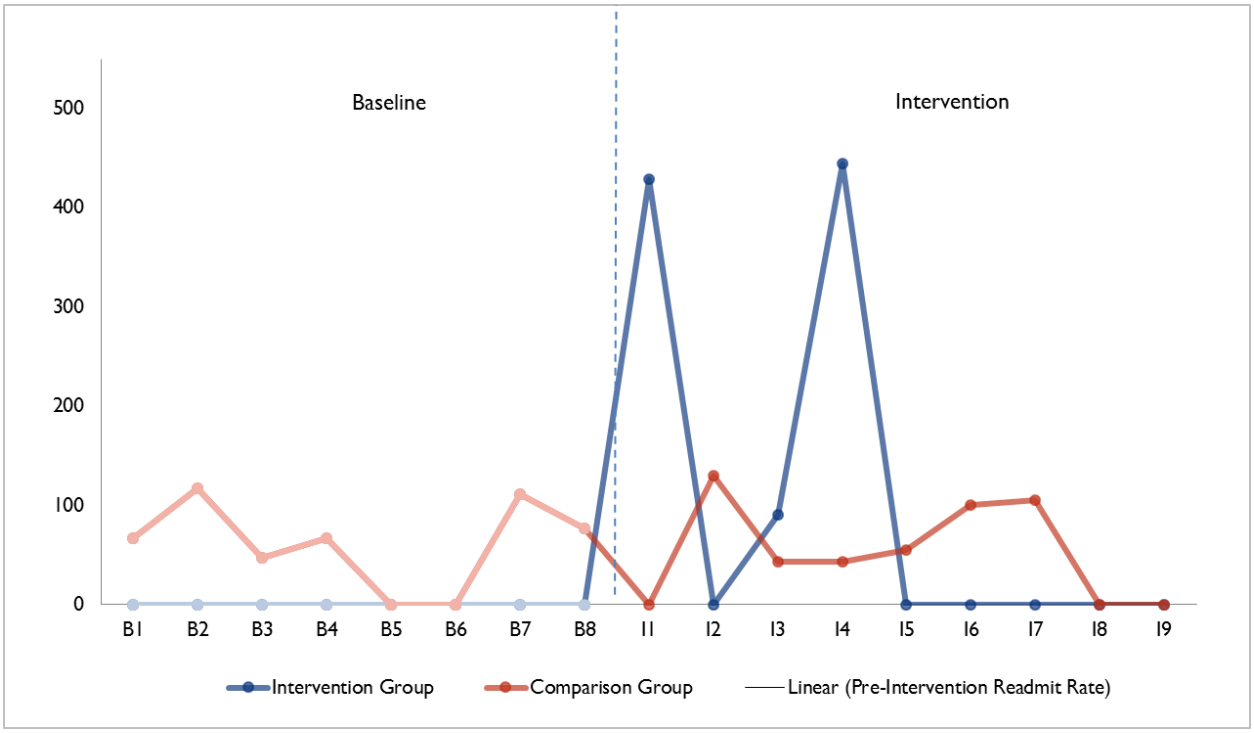
Table 10. Hospital Unplanned Readmissions Rates per 1,000 Admissions: BAHC

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters								
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8	I9
Intervention Group																		
1C1CMS 331013	BAHC																	
	Readmit rate	0	0	0	0	0	0	0	0	429	0	91	444	0	0	0	0	0
	Std dev	0	0	0	0	0	0	0	0	495	0	288	497	0	0	0	0	0
	Total admissions	4	2	1	5	5	5	5	4	14	8	11	9	9	3	4	2	1
Comparison Group																		
1C1CMS 331013	BAHC																	
	Readmit rate	67	118	48	67	0	0	111	77	0	130	43	43	56	100	105	0	0
	Std dev	249	322	213	249	0	0	314	267	0	337	204	204	229	300	307	0	0
	Total admissions	5	6	7	5	4	5	3	4	7	8	8	8	6	7	6	4	1
Intervention − Comparison Rate		−67	−118	−48	−67	0	0	−111	−77	429	−130	47	401	−56	−100	−105	0	0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6. Hospital Unplanned Readmissions Rates per 1,000 Admissions: BAHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
BAHC = Ben Archer Health Center.

Due to the low number of index admissions (the denominator in the readmissions measure), the unplanned readmissions rate is highly variable.

ED visits per 1,000 participants are shown in ***Table 11*** and ***Figure 7***.

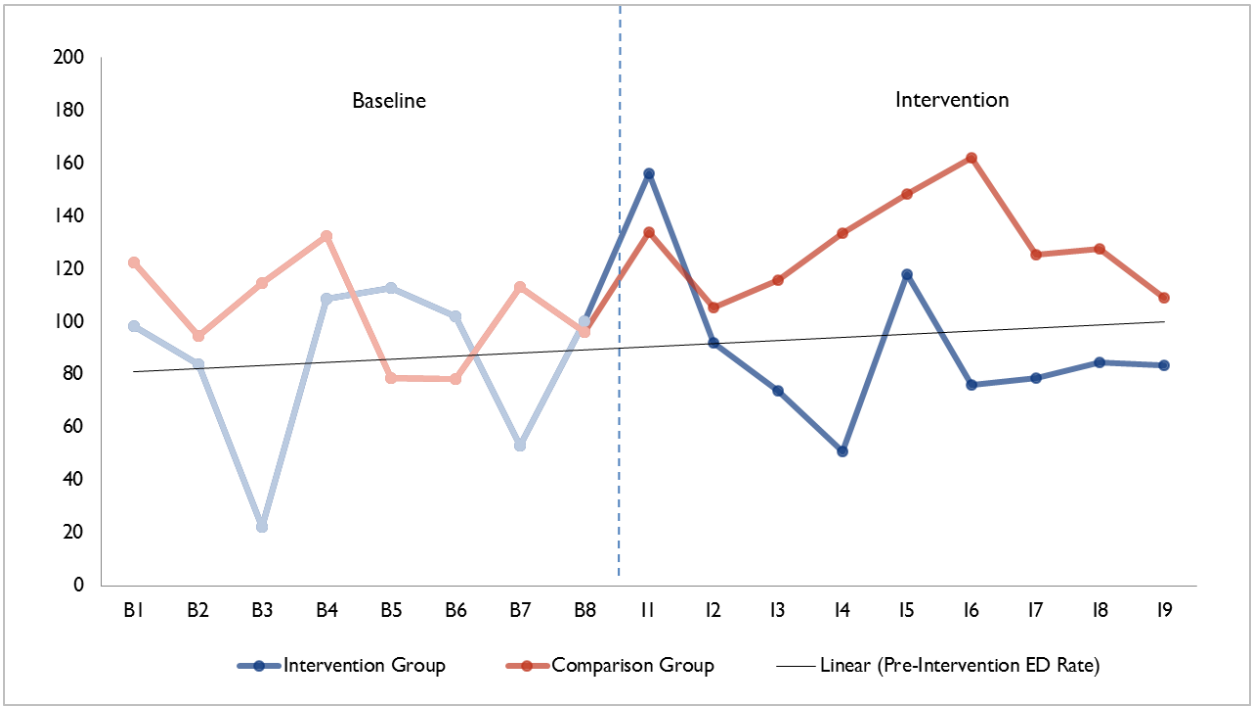
Table 11. ED Visits per 1,000 Participants: BAHC

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters								
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8	I9
Intervention Group																		
1C1CMS 331013	BAHC																	
	ED rate	98	84	22	109	113	102	53	100	156	92	74	51	118	76	79	85	83
	Std dev	326	305	149	395	463	365	301	340	496	405	310	220	514	267	310	327	280
	Unique patients	122	131	134	138	142	147	151	160	160	152	149	138	127	105	89	71	36
Comparison Group																		
1C1CMS 331013	BAHC																	
	ED rate	123	95	115	132	79	78	113	96	134	105	116	134	148	162	125	128	109
	Std dev	241	196	231	258	203	219	233	249	263	237	272	246	289	314	273	231	183
	Unique patients	136	141	142	146	148	153	156	159	159	158	150	140	128	109	93	76	37
Intervention − Comparison Rate		−24	−11	−92	−24	34	24	−60	4	22	−13	−42	−83	−30	−86	−47	−43	−26

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays/unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 7. ED Visits per 1,000 Participants: BAHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
BAHC = Ben Archer Health Center; ED = emergency department.

During the pre-intervention period, the ED visit rate is similar in the treatment and comparison groups. Starting in I2, the comparison group's ED visit rate is higher than the treatment group's rate. Regression results in the next section demonstrate that quarterly differences in ED visit rates between the treatment and comparison group are not statistically different during the intervention period.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit.

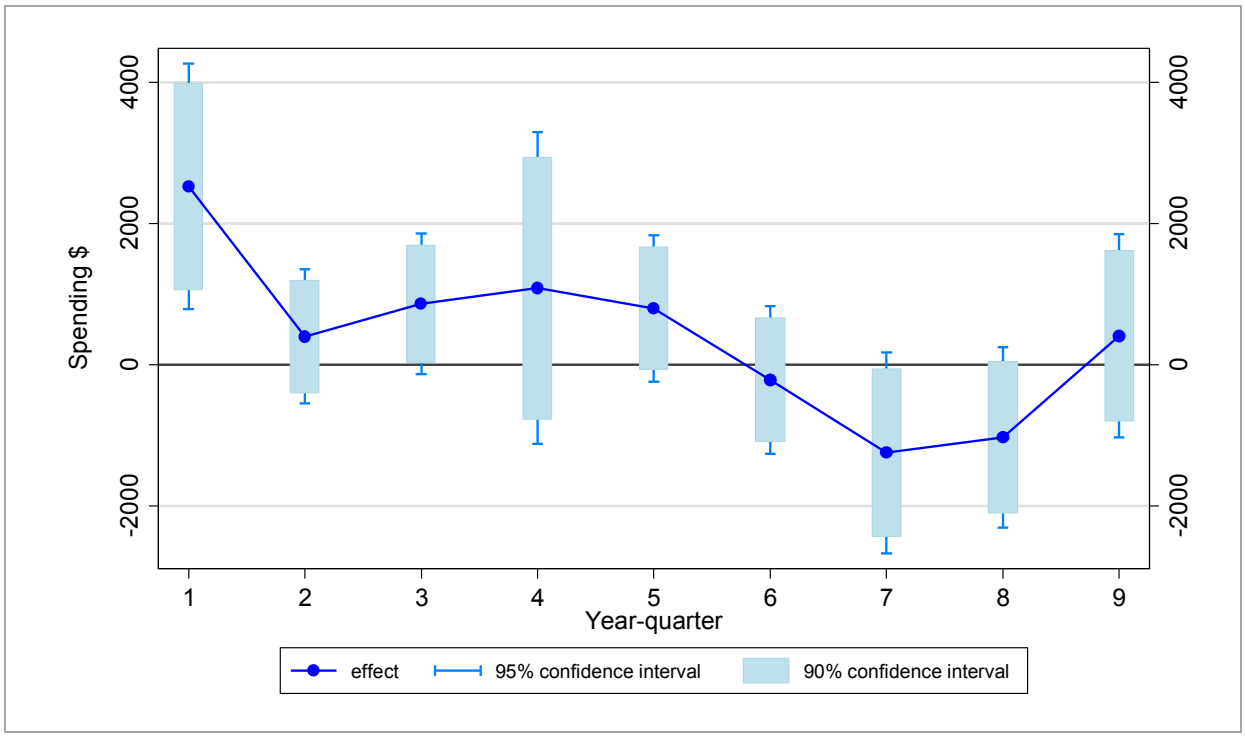
Table 12 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. ***Figure 8*** illustrates these quarterly difference-in-differences estimates.

Table 12. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: BAHC

Quarter	Coefficient	Standard Error	P-Values
I1	2,525	887	0.005
I2	402	484	0.407
I3	859	508	0.091
I4	1,086	1,128	0.336
I5	795	530	0.134
I6	−216	534	0.686
I7	−1,249	725	0.085
I8	−1,030	653	0.115
I9	409	736	0.579

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
BAHC = Ben Archer Health Center; OLS = ordinary least squares.

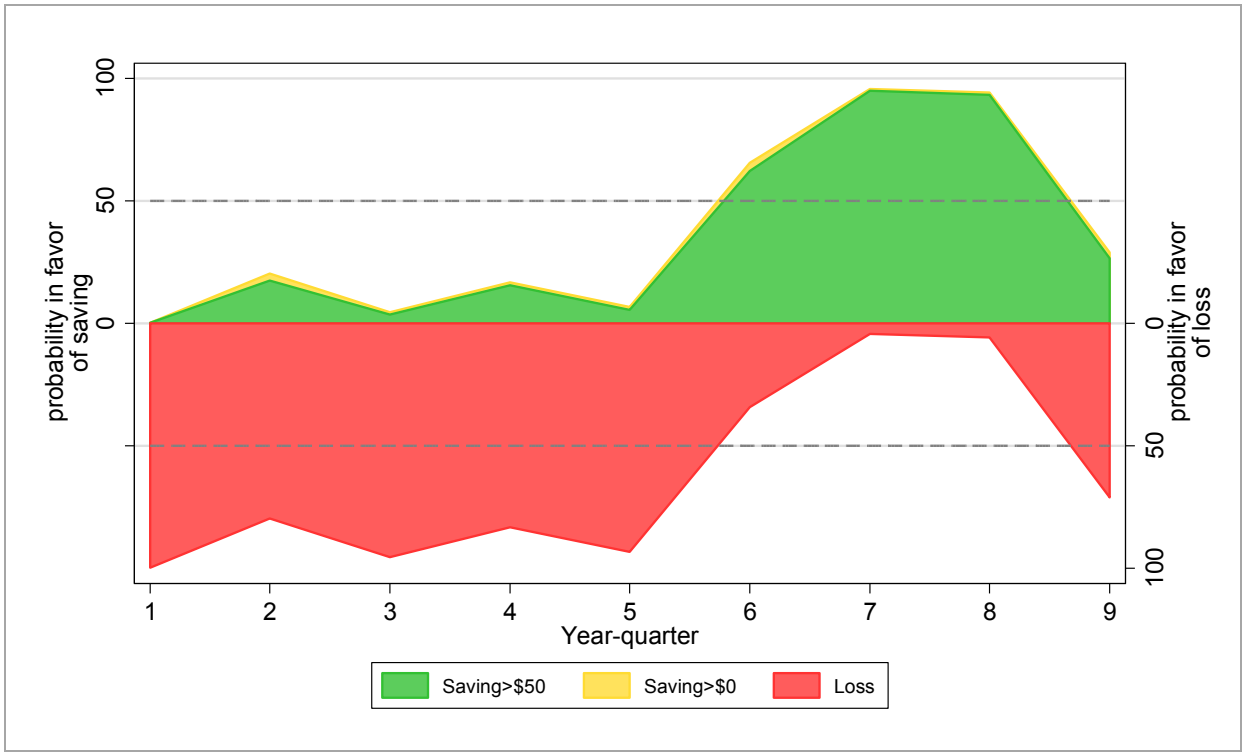
Figure 8. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: BAHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
BAHC = Ben Archer Health Center; OLS = ordinary least squares.

In I1, spending among treatment group individuals was $2,545 higher than spending among comparison group individuals. The additional spending by treatment group individuals during I1 is likely due to the nature of the intervention, as individuals enrolled at the time they received services and connected to services after enrollment by CHWs. The treatment effect is statistically significant in I1. Spending is higher in the treatment group in I1 through I5; however, spending is higher in the comparison group in I6 through I8. The point estimates suggest that the intervention started to generate savings in I6; however, no strong conclusions can be drawn because the coefficients are only statistically significant in I1. ***Figure 9*** presents the strength of evidence in favor of a saving or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis.

Figure 9. Quarterly Strength of Evidence in Favor of Saving/Loss: BAHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
BAHC = Ben Archer Health Center.

Figure 9 supports the conclusion that the intervention generated a loss in I1 through I5 and a savings in I6 through I8. During I9, the evidence favors a loss; however, the sample size decreases in later quarters and results may change for later quarters as more claims data become available. Because BAHC's innovation focuses on increasing preventive care and improving chronic disease management, excess spending among treatment group individuals in the short term does not necessarily imply that the program will result in higher long-term costs.

We also present the overall weighted average treatment effect per member per quarter during the intervention period for beneficiaries enrolled in the innovation as compared to their matched comparison groups. The weighted average quarterly spending differential in the post-innovation period, indicating a loss, is −$579 (90% CI: −$1,090, -$67) per member per quarter. This effect is statistically significant. This figure represents the differential spending per quarter in the post-intervention period between individuals enrolled in the innovation and comparison group individuals, on average, weighted by the number of intervention beneficiaries in each quarter. The 90 percent confidence interval is the range in which the true parameter estimate falls, with 90 percent confidence.

We also present linear probability model coefficients for inpatient admissions, and outpatient ED visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the estimated effect.[3] Linear probability models have the advantage that the magnitude of the coefficients can be interpreted directly, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, it has been demonstrated empirically that linear probability model coefficients are often consistent with marginal effects generated from nonlinear models.[4] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention) and not just the direction of the effect.

In I1, the probability of a hospitalization is 4 percentage points higher in the treatment group than in the comparison group although the coefficient is not quite significant. The probability of hospitalization in I5 is 9 percentage points higher in the treatment group and the estimate is statistically significant. In all other quarters, estimates are not statistically different from zero. The average quarterly difference-in-differences estimate for inpatient admissions is 2.0 percentage points, indicating that the treatment-control difference is 2.0 percentage points higher during the intervention period. This is the average difference in inpatient admissions probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: .002, .036).

[3] To obtain the correct effect it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run even when not competing with other users for computer resources.

[4] Angrist, J.D., and Pischke J.-S. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton. Princeton University Press, 2008.

Table 13. Difference-In-Differences Linear Probability Model Regression Estimates for Probability That Participant Had Inpatient Hospital Admission: BAHC

Quarter	Coefficient	Standard Error	P-Values
I1	0.04	0.02	0.104
I2	0.01	0.02	0.606
I3	0.03	0.02	0.189
I4	0.00	0.02	0.858
I5	0.09	0.03	0.004
I6	−0.01	0.02	0.754
I7	−0.01	0.03	0.683
I8	−0.01	0.03	0.626
I9	0.00	0.03	0.918

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
BAHC = Ben Archer Health Center.

Table 14 presents the results of a linear probability model with the dependent variable set to 1 if the beneficiary had at least one outpatient ED visit during the quarter. The estimated quarterly coefficients have large standard errors and are not statistically different from zero, making it difficult to draw conclusions about the relative probability of an ED visit between treatment and comparison patients. The average quarterly difference-in-differences estimate for ED visits is zero, indicating that the treatment-control difference is the same during the baseline and intervention period. The effect is not statistically significant (90% CI: −.025, .027).

Table 14. Difference-In-Differences Linear Probability Model Regression Estimates for Probability That Participant Had ED Visit: BAHC

Quarter	Coefficient	Standard Error	P-Values
I1	0.05	0.03	0.141
I2	0.01	0.03	0.667
I3	0.01	0.03	0.746
I4	−0.03	0.03	0.252
I5	0.06	0.04	0.097
I6	−0.03	0.03	0.380
I7	−0.03	0.03	0.397
I8	−0.05	0.03	0.173
I9	0.00	0.05	0.932

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
BAHC = Ben Archer Health Center; ED = emergency department.

Discussion

Overall, the evidence supports higher Medicare spending and utilization during the first five quarters of the intervention. Starting in I6, the treatment group's spending falls relative to the comparison group's spending. In the short run, the BAHC innovation created a loss; however, because the BAHC innovation focuses on chronically ill patients, increases in spending in the short run may translate to long-term cost savings and there is some evidence of this in later quarters.

The results may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicare beneficiaries whom we were able to match with the identifiers provided by the site. This represents approximately 27 percent of the overall population reached by the innovation and 69 percent of the Medicare population reached by the innovation. In addition, we have a small sample size that hinders detection of statistically significant changes in spending and utilization.

Medicaid Claims Analysis

We include patients who were enrolled prior to December 31, 2013, which is the most recently available Medicaid claims data.

Comparison Groups

Table 15 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. One limitation of PSM is that the number of matching variables in the propensity score model is directly proportional to the number of

treatment beneficiaries. If the number of treatment beneficiaries is small, then the number of matching variables must also be small for the logistic model to converge (i.e., approximately one matching variable for every 10 treatment beneficiaries). BAHC has 52 Medicaid enrollees participating in the intervention and we include six variables in the propensity model. ***Figure 10*** shows the distribution of the propensity scores for both the comparison and intervention groups. ***Appendix B*** provides technical details on the propensity score methodology. No treatment beneficiaries were dropped from the subsequent analyses due to the lack of an appropriately matched comparison beneficiary.

Table 15. Mean Values and Standardized Differences of Variables in Propensity Score Model: BAHC

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrollment	711	3,205	1,504	3,840	0.224	711	3,205	1,559	4,311	0.223
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	2,806	13,087	5,828	14,781	0.217	2,806	13,087	5,449	17,841	0.169
Age	68.06	11.24	35.28	15.08	2.465	68.06	11.24	69.8	16.06	0.125
Percentage female	46.15	50.34	84.24	36.47	1.233	46.15	50.34	55.77	51.69	0.273
Percentage Hispanic	88.46	32.26	29.39	45.59	2.123	88.46	32.26	89.1	32.43	0.029
Percentage dual	90.38	29.77	16.58	37.22	3.110	90.38	29.77	96.15	20.02	0.328
Number of unique beneficiaries	52	—	609	—	—	52	—	49	—	—
Number of weighted beneficiaries[1]	—	—	—	—	—	52	—	52	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

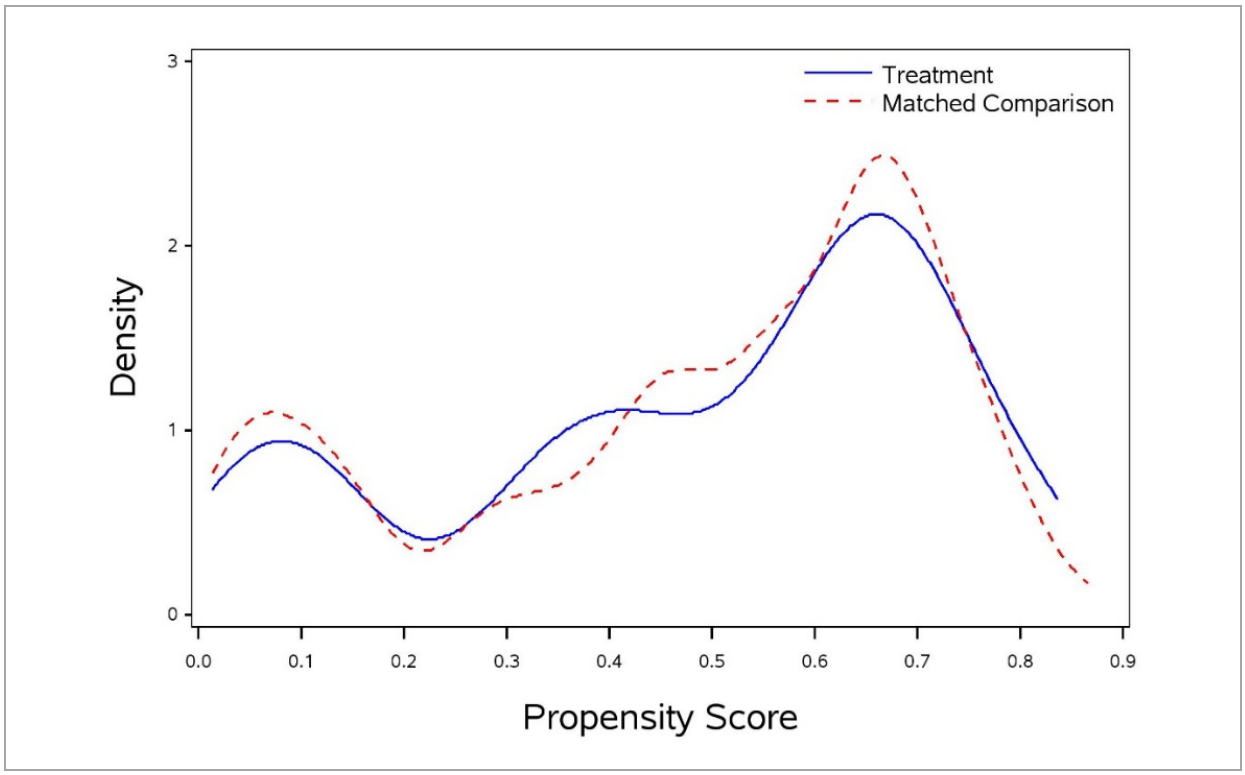
[1] After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to matching with replacement (see Appendix B for discussion of weights).

BAHC = Ben Archer Health Center.

— Data not available.

Standardized differences in the matching variables fell after PSM, indicating that PSM improved the similarity between the treatment and comparison groups. In the BAHC Medicaid propensity score model, the three variables that were most predictive of participation in the innovation were age, gender, and Hispanic ethnicity. Before matching, differences in these variables were very large in the BAHC sample. Before matching, average age was 68 versus 35, percentage female was 46 versus 84, and percentage Hispanic was 88 versus 29 in the treatment and comparison samples, respectively. Variables that were most influential in the propensity score model are also most influential in the matching process. After matching, the standardized differences between the treatment and comparison group improved dramatically for these variables. However, the standardized differences for several variables remained over the 0.10 threshold. With a small pool of comparison beneficiaries from which to draw, comparison beneficiaries that match treatment beneficiaries along every dimension may not exist. BAHC's innovation is located in rural New Mexico; thus, the set of potential comparison beneficiaries is small (609) and it is unsurprising that the matched comparison group has standardized differences that fall above the 0.10 threshold.

Figure 10. Distribution of Propensity Scores for Comparison and Intervention Groups: BAHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
BAHC = Ben Archer Health Center.

The propensity score distributions for the treatment and matched comparison groups are alike, indicating that matched comparison beneficiaries have similar propensity scores to treatment beneficiaries.

Descriptive Analysis

Table 16 reports Medicaid spending per patient in the eight quarters before and the three quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 16. Medicaid Spending per Patient: BAHC

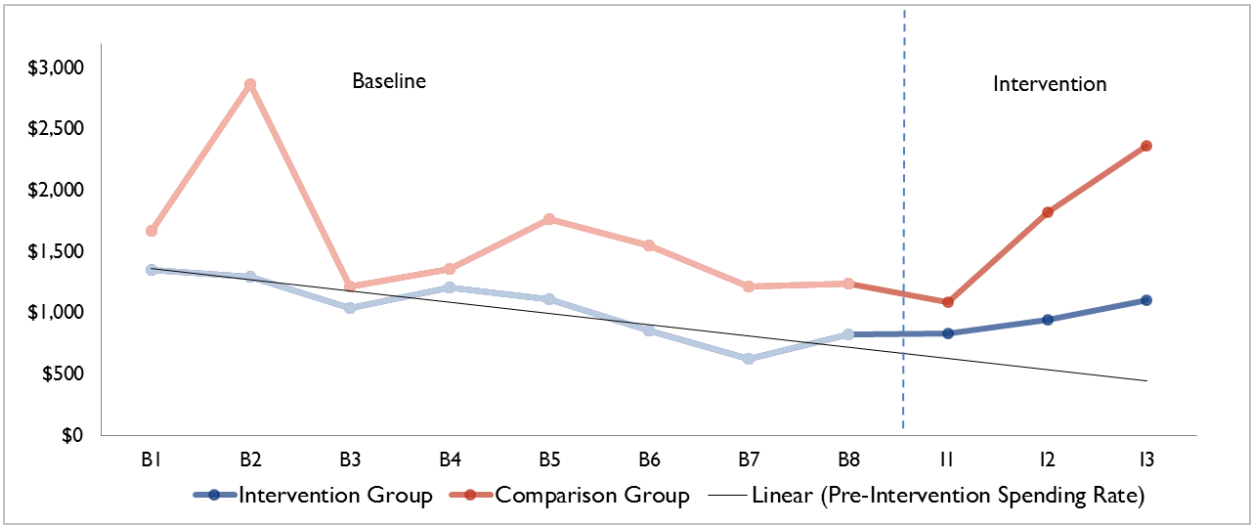
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 331013	BAHC											
	Spending rate	$1,355	$1,300	$1,043	$1,210	$1,113	$858	$629	$828	$834	$942	$1,103
	Std dev	$4,970	$4,911	$3,808	$4,662	$4,154	$3,608	$2,741	$3,477	$3,873	$3,679	$3,016
	Unique patients	32	33	33	34	35	43	46	44	52	36	23
Comparison Group												
1C1CMS 331013	BAHC											
	Spending rate	$1,673	$2,870	$1,215	$1,358	$1,765	$1,555	$1,218	$1,239	$1,092	$1,820	$2,362
	Std dev	$4,951	$8,764	$4,254	$4,717	$4,948	$4,123	$4,207	$4,302	$3,785	$4,767	$5,726
	Unique patients	51	49	52	51	52	52	52	52	52	31	23
Savings per Patient		$317	$1,569	$172	$149	$653	$698	$588	$411	$258	$878	$1,259

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 11 illustrates the Medicare spending per beneficiary in Table 16 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 11. Medicaid Spending per Patient: BAHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
BAHC = Ben Archer Health Center.

During the baseline period, the spending data series for the treatment and comparison group are roughly parallel. During the intervention period, spending for the comparison group rises at a steeper rate than the treatment group's spending. However, it would be premature to conclude that the intervention averted the spending increase experienced by the comparison group because the sample size is small and statistical tests for differences in spending between the two groups have not been completed.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 17*** and ***Figure 12***.

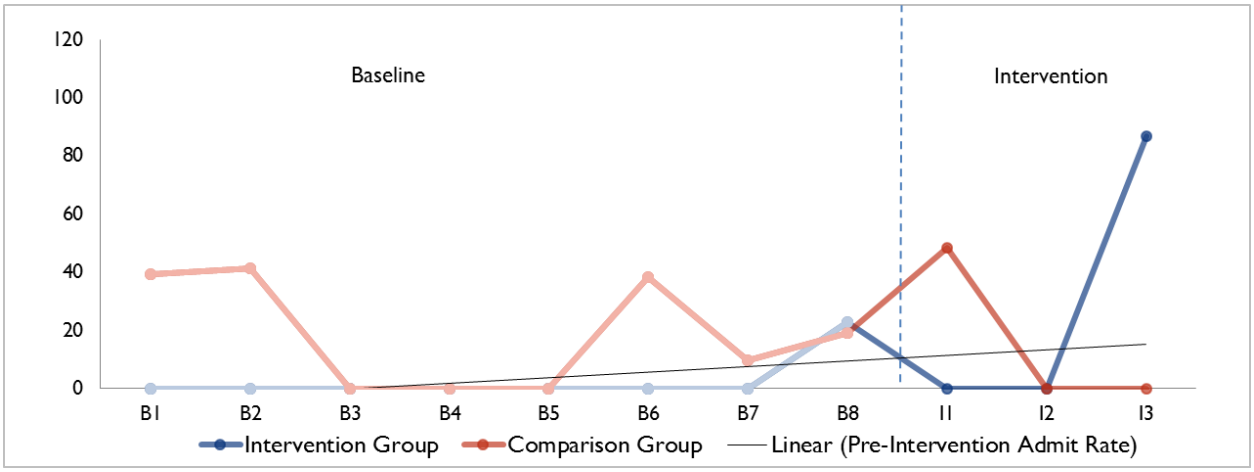
Table 17. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: BAHC

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 331013	BAHC											
	Admit rate	0	0	0	0	0	0	0	23	0	0	87
	Std dev	0	0	0	0	0	0	0	151	0	0	288
	Unique patients	32	33	33	34	35	43	46	44	52	36	23
Comparison Group												
1C1CMS 331013	BAHC											
	Admit rate	39	41	0	0	0	38	10	19	48	0	0
	Std dev	209	209	0	0	0	200	102	143	225	0	0
	Unique patients	51	49	52	51	52	52	52	52	52	31	23
Intervention − Comparison Rate		−39	−41	0	0	0	−38	−10	3	−48	0	87

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions/unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 12. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: BAHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
BAHC = Ben Archer Health Center.

Due to the small sample size and the infrequent nature of inpatient admissions, the inpatient admission rate is low or zero during baseline and intervention quarters. Because insufficient beneficiaries were enrolled in the innovation to generate a trend in inpatient admissions, we cannot draw conclusions about the innovation's impact on admissions for Medicaid beneficiaries.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 18*** and ***Figure 13***.

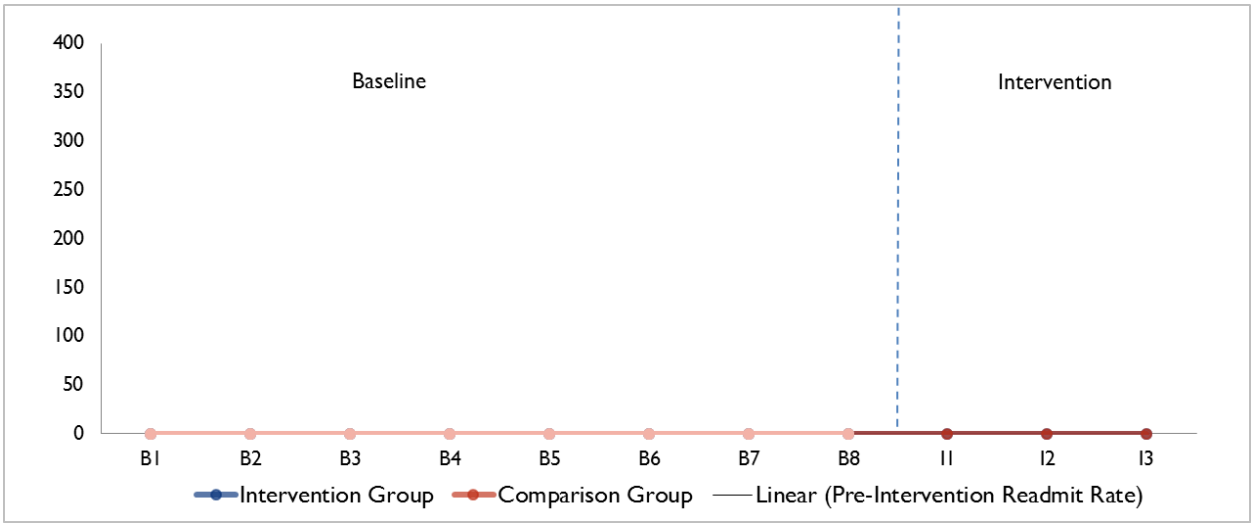
Table 18. Hospital Unplanned Readmissions Rates per 1,000 Admissions: BAHC

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 331013	BAHC											
	Readmit rate	0	0	0	0	0	0	0	0	0	0	0
	Std dev	0	0	0	0	0	0	0	0	0	0	0
	Total admissions	0	0	0	0	0	0	0	1	0	0	2
Comparison Group												
1C1CMS 331013	BAHC											
	Readmit rate	0	0	0	0	0	0	0	0	0	0	0
	Std dev	0	0	0	0	0	0	0	0	0	0	0
	Total admissions	2	0	0	0	0	2	1	1	3	0	0
Intervention − Comparison Rate		0	0	0	0	0	0	0	0	0	0	0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 13. Hospital Unplanned Readmissions Rates per 1,000 Admissions: BAHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
BAHC = Ben Archer Health Center.

For both the treatment and the comparison groups, the number of index admissions (the denominator in the readmissions measure) are between zero and two during all quarters. Because there are a small number of index admissions and readmissions are relatively rare, the readmissions rate is zero for all quarters.

ED visits per 1,000 participants are shown in ***Table 19*** and ***Figure 14***.

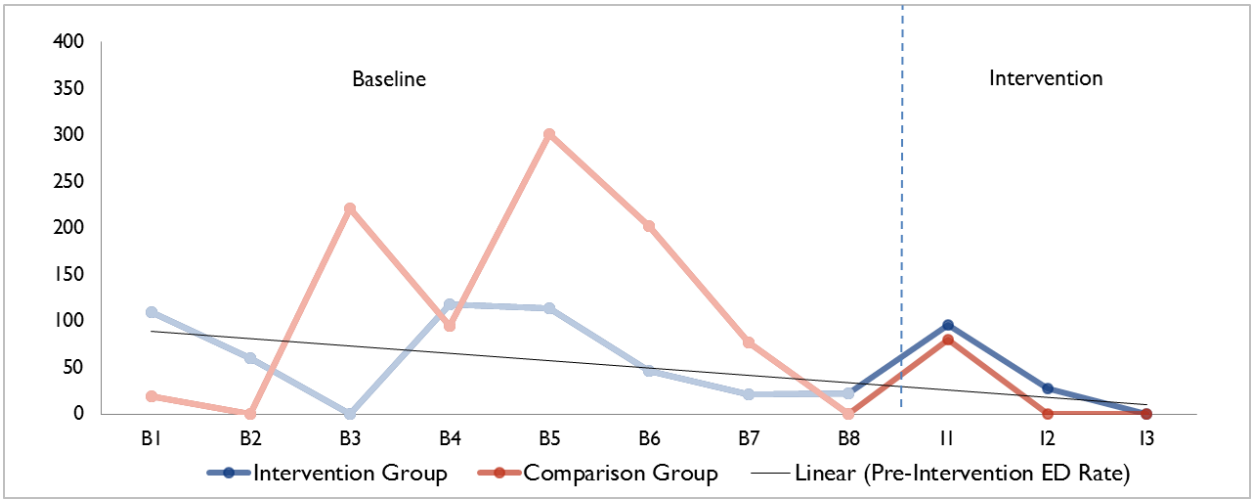
Table 19. ED Visits per 1,000 Participants: BAHC

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 331013	BAHC											
	ED rate	109	61	0	118	114	47	22	23	96	28	0
	Std dev	353	242	0	327	323	305	147	151	495	167	0
	Unique patients	32	33	33	34	35	43	46	44	52	36	23
Comparison Group												
1C1CMS 331013	BAHC											
	ED rate	20	0	221	95	301	202	77	0	81	0	0
	Std dev	193	0	479	308	780	418	277	0	309	0	0
	Unique patients	51	49	52	51	52	52	52	52	52	31	23
Intervention − Comparison Rate		90	61	−221	23	−187	−155	−55	23	16	28	0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 14. ED Visits per 1,000 Participants: BAHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
BAHC = Ben Archer Health Center; ED = emergency department.

The ED visit rate is highly variable during the baseline period for the treatment and comparison groups. During the intervention period, the ED visit rate is similar for both groups; however, the number of Medicaid fee-for-service beneficiaries enrolled in the innovation is too small to draw reliable conclusions about the innovation's impact on ED visits.

Discussion

In summary, an insufficient number of fee-for-service Medicaid beneficiaries enrolled in the innovation to draw conclusions about the innovation's impact on Medicaid spending, inpatient admissions, readmissions, and ED visits. Additionally, this lack of results may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicaid beneficiaries who we were able to match with the identifiers provided by the site. This figure represents less than 10 percent of the overall population reached by the innovation.

1.3.3 Other Awardee-Specific Data

Table 20 lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. The data we present in this section are current through March 2015. The results of analyses for all of these measures are included in this annual report.

Table 20. Quantitative Outcome Measures

Evaluation Domains	Subdomains	Measures	Status	Reported in AR2
Clinical effectiveness	Diabetes	Percentage of patients with diabetes who received an eye screening for diabetic retinal disease	Data received	Yes
		Percentage of patients with diabetes who received a foot exam	Data received	Yes
		Percentage of individuals with diabetes who had a HbA1c test	Data received	Yes
	Vaccination	Percentage of patients who received an influenza immunization	Data received	Yes
		Percentage of patients who received a pneumococcal vaccination	Data received	Yes
Health outcomes	Diabetes	Percentage of patients with diabetes who had HbA1c >9.0%	Data received	Yes
		Percentage of patients with diabetes with LDL <100 mg/dL	Data received	Yes
	Hypertension	Percentage of patients with a diagnosis of hypertension with last BP <140/90 mm Hg	Data received	Yes

AR2 = second annual report; BP = blood pressure; LDL = low-density lipoprotein.

Overview of Data Requested and Received

We received patient-level data used to generate each measure listed in Tables 4 and 15 for each quarter through Q11 (March 31, 2015). The results of analyses of all of these measures are included in this annual report.

Clinical Effectiveness

Evaluation Question:

- How have clinical effectiveness outcomes been affected by the innovation?

Table 21 shows the percentage of patients who received clinical services. As shown in the table, a large percentage of patients with diabetes (91.1%) received a foot exam and nearly two-thirds received an eye exam (65.5%). Nearly all patients (92%) received an influenza immunization, and more than half (59.4%) received a pneumococcal vaccination.

Table 21. Percentage of Patients Who Received Clinical Services

Measure	Percentage of Patients Receiving Clinical Services
Diabetes (n=371)	
Percentage of patients with diabetes who received a foot exam	91.1
Percentage of patients with diabetes who received an eye exam	65.5
Vaccination[1]	
Influenza immunization	92.0
Pneumococcal vaccination	59.4

Source: Patient-level data provided to RTI by BAHC.
[1] Denominator is all enrollees.

Health Outcomes

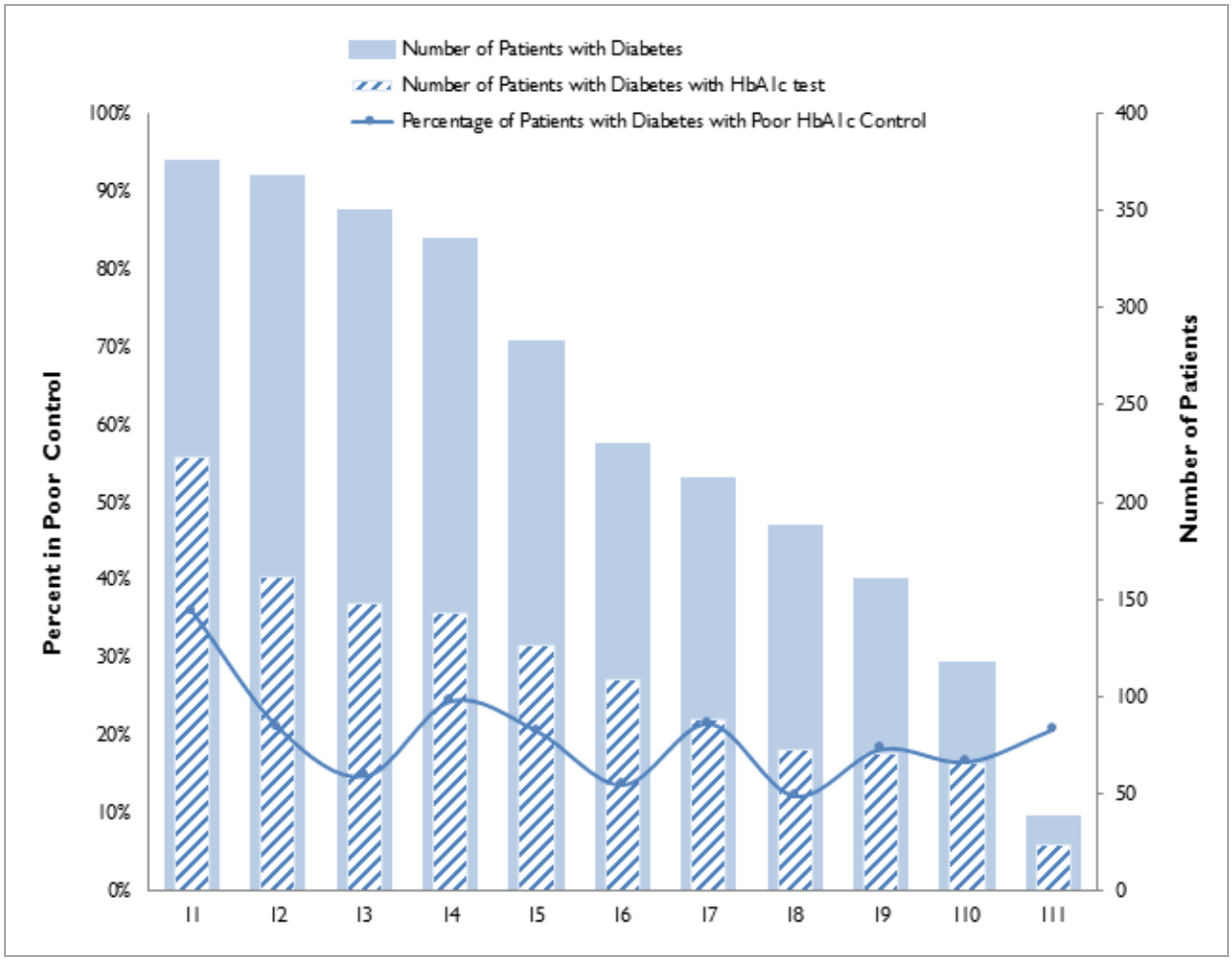
We examined health outcomes among patients with diabetes and hypertension. The following run charts take into account rolling enrollment. The intervention quarters (Is) are based on individual enrollment dates. For example, I1 is equal to the first quarter of enrollment for all participants who received a specific test. We provide data when at least 20 patients had a test or reading within the quarter.

Evaluation Question

- Has the percentage of diabetes patients with poor HbA1c control decreased over time among those enrolled in the innovation?

Figure 15 presents the percentage of patients with diabetes with an HbA1c test indicating poor control (i.e., HbA1c >9%) over time. The denominator represents the number of diabetes patients who received an HbA1c test for each quarter. The numerator represents the number of diabetes patients who received an HbA1c test that was greater than 9.0 percent. As shown in the figure, the percentage of patients with poor HbA1c control fluctuated, but in general decreased over time. More specifically, the percentage of patients with poor HbA1c control decreased from 35.9 percent in I1 to 20.8 percent in I11. It is also important to note the sharp decrease from I1 (35.9%) to I3 (14.9%). That is, the percentage of those with poor HbA1c control dropped 21 percentage points among those enrolled in the innovation for at least three quarters. This suggests that the innovation was effective in reducing the percentage of patients with poor HbA1c control over time. However, the decrease in the denominator over time limits our ability to make strong conclusions.

Figure 15. Percentage of Patients with Diabetes with Poor HbA1c Control over Time



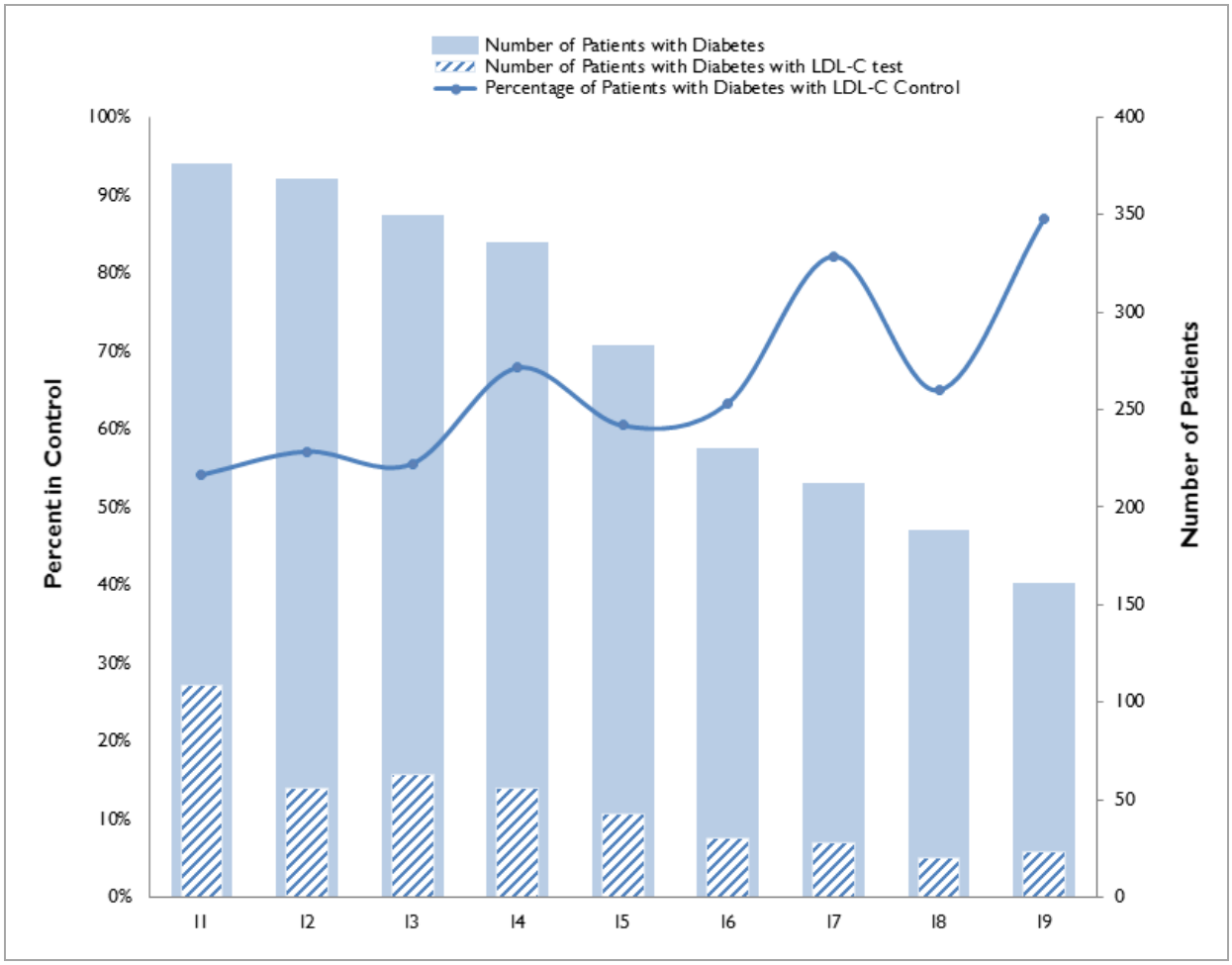
	Quarter	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11
●	Percentage of patients with diabetes with poor HbA1c control	35.9	21.0	14.9	24.5	20.6	13.8	21.6	12.3	18.3	16.7	20.8
	Number of patients with diabetes	371	363	345	331	278	225	207	183	156	113	34
	Number of patients with diabetes with HbA1c test	223	162	148	143	126	109	88	73	71	66	24

Source: Patient-level data provided to RTI by BAHC.

Figure 16 presents the percentage of patients with diabetes who had an LDL-C test indicating good control (i.e., <100 mg/dL) over time. The denominator represents the number of patients with diabetes who received an LDL-C test for each quarter. The numerator represents the number of patients with diabetes who received an LDL-C test that was <100 mg/dL. As shown in the figure, the percentage of patients with LDL-C control fluctuated, but in general increased over time. More specifically, the percentage of patients with poor HbA1c control decreased from 54.1 percent in I1 to 87 percent in I9. This finding suggests that the innovation may have been effective in increasing the percentage of patients with

LDL-C control over time. However, similar to the findings for HbA1c control noted above, the decrease in the denominator over time limits our ability to make strong conclusions.

Figure 16. Percentage of Patients with Diabetes with LDL-C Control over Time



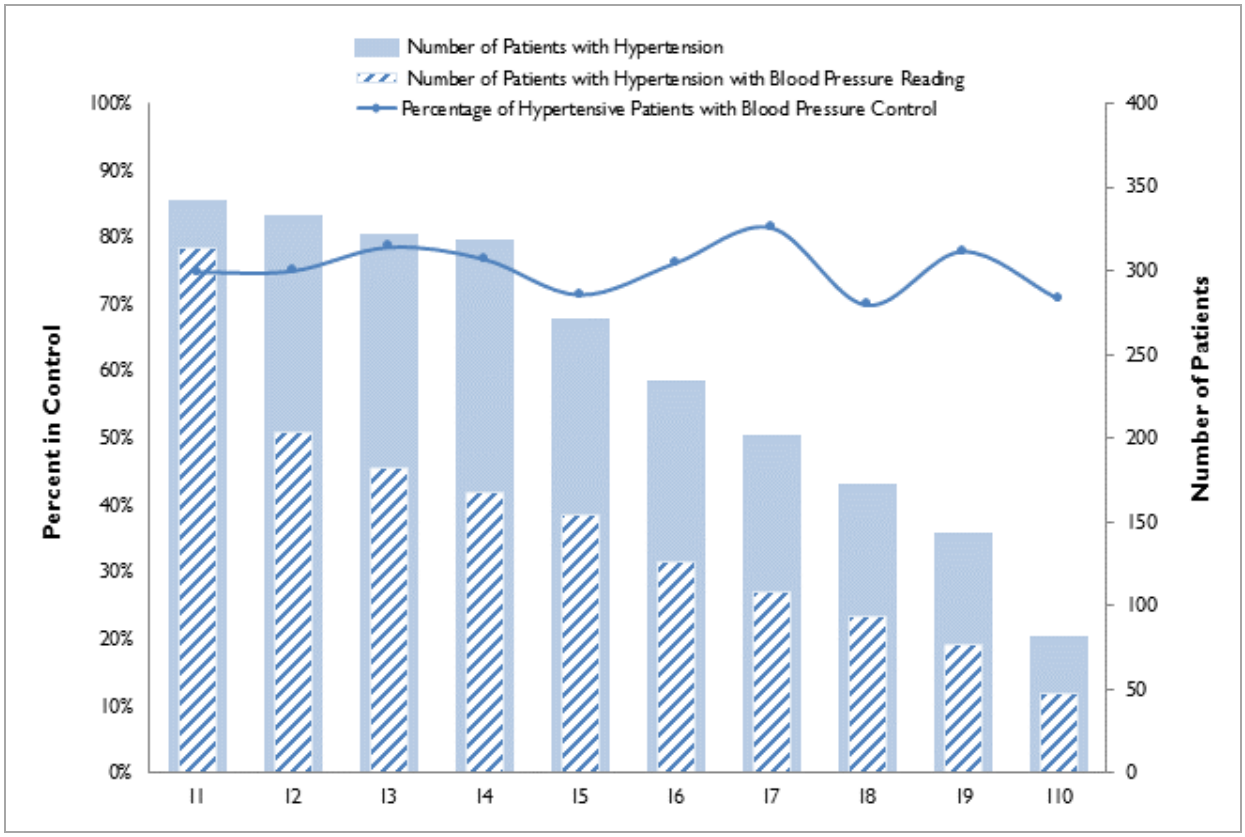
	Quarter	I1	I2	I3	I4	I5	I6	I7	I8	I9
●	Percentage of patients with diabetes with LDL-C control	54.1	57.1	55.6	67.9	60.5	63.3	82.1	65.0	87.0
	Number of patients with diabetes	371	363	345	331	278	225	207	183	156
	Number of patients with diabetes with LDL-C test	109	56	63	56	43	30	28	20	23

Source: Patient-level data provided to RTI by BAHC.

Figure 17 presents the percentage of patients with hypertension who have had a blood pressure reading indicating good control (i.e., <140/90 mm Hg), over time. The denominator represents the number of hypertension patients who received a blood pressure reading for each quarter. The numerator represents the number of hypertension patients who received a blood pressure reading that was lower

than 140/90 mm Hg. As shown in the figure, 70.8 percent of patients had blood pressure control in I10, and the percentage of patients with blood pressure control remained relatively consistent over time.

Figure 17. Percentage of Patients with Hypertension with Blood Pressure Control over Time



	Quarter	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10
●	Percentage of patients with hypertension with blood pressure control	74.8	75.0	78.6	76.8	71.4	76.2	81.5	69.9	77.9	70.8
	Number of patients with hypertension	336	327	316	312	265	228	196	167	137	76
	Number of patients with hypertension with blood pressure reading	314	204	182	168	154	126	108	93	77	48

Source: Patient-level data provided to RTI by BAHC.

Discussion of Other Awardee-Specific Findings

We reported findings for health outcomes among patients with diabetes and hypertension. The percentage of diabetes patients with HbA1c poor control decreased over time, as did the percentage with LDL-C control. The findings for blood pressure control among patients with hypertension revealed little change over time. Thus, the innovation seems to be effective in improving HbA1c and LDL-C among patients with diabetes. However, as noted above, conclusions should be drawn with caution, as the denominators decreased substantially over time among those with diabetes who received HbA1c and

LDL-C tests. The innovation could have had a positive impact on health outcomes, or it is possible that less-controlled patients may have dropped out of the innovation or failed to have an Hb1Ac or LDL-C reading in later quarters, leaving a greater proportion of patients with HbA1c and LDL-C control in the sample.

1.4 Overall Program Effectiveness to Date

This annual report describes various implementation challenges and issues facing BAHC as well as accomplishments to date. In this section we assess BAHC's progress on achieving HCIA goals to date:

- **Smarter spending.** Medicare beneficiaries enrolled in the BAHC innovation incurred higher costs than the comparison group in the quarter that they enrolled in the innovation. In subsequent quarters, spending among the treatment group was higher than the comparison group; however, the difference was generally not statistically significant. Because the BAHC innovation is focused on chronic condition management, initial increases in spending do not imply that the innovation was not effective because costs may decrease in the long run. There are not enough Medicaid beneficiaries enrolled in the innovation to draw conclusions about the innovation's impact on spending by Medicaid beneficiaries.

- **Better care.** The total number of patients enrolled in the intensive case management component through Q11 was 601, approximately 41.1 percent of the target population. It does not appear that BAHC will reach its target by the end of the final performance year. BAHC cannot provide reach data for the preventive services component of the innovation. The complexity of the target population's needs appears to have affected BAHC's ability to meet its reach target for the intensive case management component.

  BAHC provided primary care visits to approximately 91 percent and intensive care management home visits to 88 percent of patients enrolled in the innovation. In addition, BAHC provided immunization services to 92 percent (influenza) and about 59 percent (pneumococcal) of patients enrolled in the innovation.

  Among those with diabetes, approximately 91 percent received an eye exam, and 66 percent received a foot exam.

  BAHC Medicare treatment group beneficiaries had significantly higher rates of inpatient admissions in the post-intervention period. We cannot draw conclusions about changes in hospital admissions for Medicaid, readmissions, and ED visits due to lack of statistical power resulting from the infrequency of these events and the small number of Medicare and Medicaid patients enrolled in the innovation. BAHC reports that high-risk patients are challenging to reach and treat, which interferes with their ability to demonstrate program effectiveness within a short time frame.

- **Healthier people.** The innovation seems to be correlated with improving HbA1c and LDL-C control among patients with diabetes. However, it has not had an effect on blood pressure control among patients with hypertension.

BAHC has a long history of experience employing CHWs in Northern Doña Ana County. Innovation leaders were able to recruit experienced CHWs to deliver patient care, and supplemented innovation staff within BAHC's existing staff as needed. The organization had an existing infrastructure for

coordinating, directing, and training CHWs. This history, coupled with staff's investment in the Promotora model, facilitated innovation implementation.

Pairing CHWs with NHEs to provide case management activities was an effective team approach. Nurses provide clinical expertise and communicate clinical information to physicians, while CHWs track hard-to-reach patients, conduct outreach to onboard new patients, and have knowledge about additional community resources. CHWs facilitate trust between clinical providers and members of the local community, benefitting both the care team and patients enrolled in the program.

BAHC indicates that the high-risk population enrolled in the innovation required more home visits than initially anticipated, which may have caused delays with enrolling new patients. Innovation leaders believe that increasing their selectivity with respect to patient risk and readiness for change could have helped BAHC better handle the innovation population and more easily demonstrate the impact of their program.

BAHC will be able to sustain all innovation staff through alternate funding mechanisms, but its clinical focus will shift to maternal health, and BAHC will deliver less home-based care than during the innovation. BAHC built the capacity of its health system by integrating innovation staff and their knowledge into new programs. BAHC hopes that their services will become even more sustainable over time, as the state considers developing a certification process for CHWs.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Bronx Regional Health Information Organization

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

Bronx Regional Health Information Organization

1.1 Introduction

The Bronx Regional Health Information Organization (Bronx RHIO) located in New York City, NY received an award of $12,689,157 beginning on July 1, 2012 and launched the Bronx Regional Informatics Center (BRIC) innovation on February 20, 2014. The innovation seeks to achieve the following HCIA goals:

1. **Smarter spending.** Reduce spending by improving clinical quality in the member RHIO sites; Bronx RHIO expects net savings of $15 million over 3 years.

2. **Better care.** Provide countywide data that will focus care managers' patient work lists on target patients. Increase the rates of Bronx residents receiving preventive services at the appropriate times (to avoid preventable admissions), preventing 30-day readmissions, and reducing preventable ED visits

3. **Healthier people.** Improve health by increasing the rates of Bronx residents receiving preventive services.

Table 2 provides a summary of changes that occurred with Bronx RHIO during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data submitted by Bronx RHIO through March 31, 2015; and key informant interviews with Bronx RHIO's leaders and staff conducted in March 2015.

Table 2 Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	Progress was made to enhance the Bronx Regional Analytic Database (BRAD) by designing the claims module and adding data elements to the Population Health model.
	SBH Health System joined the innovation as a new partner.
Program Participant Characteristics	More than half of participants (57.7%) were between 45 and 74 years of age, and approximately half (50.4%) were female. Among participants for whom RTI received data, more than one-third (35.8%) were black, approximately one quarter (23.8%) were white, and approximately 14 percent were Hispanic. Approximately one-third (32.2%) had Medicaid, and approximately half (48.2%) had Medicare.

(continued)

Table 2 Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Implementation Process	
Execution	Spending rates were 10% to 20% below projection.
Leadership	Leadership initially underestimated the program's complexity, which required a longer planning period. Additional planning resulted in the establishment of realistic goals and achievable milestones.
	Leadership continued to maintain embedded staff at site locations, ensuring strong engagement and communication.
Organizational capacity	Significant progress was made on the development of the Spectrum population health tool, which will allow site locations to generate their own reports on performance using patient-level data (provided by Bronx RHIO).
	The Bronx RHIO continued to develop and implement predictive models to identify patients who are at high risk for readmission.
	Secure server space was established for quantitative analysis, ensuring protection of data.
Innovation adoption and workflow	Site locations subscribe to receive alerts, which allow staff to receive updates on discharged patients. Through targeted follow-up, sites learned why patients were seen and provided education where appropriate.
	Member sites received detailed reports that include patient visit history, lab results, and demographic data. Site staff used this information to design and track interventions for populations of interest.
Workforce Development	
Hiring/retention	24.2 total FTEs (at projection)
Training	13,441 cumulative training hours for 369 trainees
Implementation Effectiveness	
Reach	13,257 patients, 41.7% of the target population, were enrolled in the innovation, up from 17.6% in Q9
Dose	No data available for this report.

Source: *Q8-Q10 Narrative Progress Report*.
Q8-Q10 Quarterly Awardee Performance Report.
Patient-level data provided to RTI by Bronx RHIO.
Key informant interviews conducted Feb–June 2015.
FTE = full-time equivalent; Q = quarter.

1.1.1 Innovation Components

This innovation consists of two components: (1) data analytics to produce aggregate reporting for Bronx RHIO providers, and (2) a trained workforce to conduct data analytics to target the care of patients living in the Bronx. These components aim to set in place the infrastructure to use data from Bronx RHIO member records to generate information that providers can use in their daily practice to improve patient care and health. To that end, provider end users work with the analysts to identify the key data elements

that will be tracked and reported and inform clinical decision making. Since we provided details on these components in the first annual report, no changes were made.[1]

The partners for this innovation changed: SBH Health System joined the innovation team to provide additional health information technology expertise in addition to its existing role as a pilot site. Becoming a partner signaled an expansion of services—SBH now offers reports to more locations.

Table 3. HCIA Partners, Role, and Location

Partner Name	Role in HCIA Project	Location
Research Foundation of the City University of New York/ Bronx Community College	Vocational training services	New York City, NY
Streamline Health	Health IT expertise	New York City, NY
Weill Cornell Medical College, Center for Healthcare Informatics and Policy	Awardee evaluation and monitoring	New York City, NY
OptumInsight	Health IT expertise	San Jose, CA
Streamline Health	Health IT expertise	New York City, NY
SBH Health System (new)	Health IT expertise	New York City, NY

Source: *Q10 Narrative Progress Report*.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

HCIA = Health Care Innovation Award, IT = information technology.

1.1.2 Program Participant Characteristics

Table 4 provides the demographic characteristics of participants included in at least one BRIC report with patient-level data that Bronx RHIO provided to RTI. We first reported patient age and sex in the Q5 report, based on data through Q9. The distribution of age and sex is similar to the Q9 data. More specifically, more than half of participants (57.7%) were between 45 and 74 years of age, and approximately half (50.4%) were female. We first reported race/ethnicity and payer category in the Q6 report, based on data through Q10. Less than half of participants were missing data for race/ethnicity in this report, down from approximately 70 percent with missing data in Q10. Among those participants with data, similar to Q10, more than one-third (35.8%) were black, approximately one quarter (23.8%) were white, and approximately 14 percent were Hispanic. Also similar to Q10, approximately one-third (32.2%) had Medicaid, and approximately half (48.2%) had Medicare.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

Table 4. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Number of Participants	Percentage of Participants
Total	22,999	100.0
Age		
< 18	2	0.0
18–24	358	1.6
25–44	2,492	10.8
45–64	8,473	36.8
65–74	4,813	20.9
75–84	3,168	13.8
85+	2,160	9.4
Missing	1,533	6.7
Sex		
Female	11,582	50.4
Male	9,133	39.7
Missing	2,284	9.9
Race/ethnicity		
White	3,139	13.6
Black	4,713	20.5
Hispanic	1,783	7.7
Asian	141	0.6
American Indian or Alaska Native	33	0.1
Native Hawaiian or Other Pacific Islander	15	0.1
Other	3,355	14.7
Missing/refused	9,820	42.7
Payer Category		
Dual	598	2.6
Medicaid	4,883	21.3
Medicare	7,316	31.8
Medicare Advantage	0	0.0
Other	98	0.4
Uninsured	2,285	9.8
Missing	7,819	34.1

Source: Patient-level data provided to RTI by Bronx RHIO.

1.2 Implementation Progress

The first annual report (2014) described Bronx RHIO's implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area. ***Table 5*** lists these measures and their status as of May 31, 2015. The results of analyses for two of these three measures are included in this annual report. Bronx RHIO is tracking health system follow-up

with patients included in the BRIC reports. We anticipate receiving these data to include in the next annual report.

This section presents Bronx RHIO's process measures and a qualitative analysis of the factors that determined Bronx RHIO's implementation progress. This analysis draws on patient-level data that Bronx RHIO provided to RTI as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 5. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation process	HIT workflow	Number of reports requested and generated for providers using BRIC	Data received from Bronx RHIO
Implementation effectiveness	Reach	Number/percentage of unique participants included in at least 1 BRIC report	Data received from Bronx RHIO
	Dose	Number/percentage of participants with which the health system followed up after receiving a BRIC report	Data anticipated from Bronx RHIO

Bronx RHIO = Bronx Regional Health Information Organization; HIT = health information technology.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through Bronx RHIO's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include Bronx RHIO's reports from Q8 through Q10 and interviews conducted in March 2015.

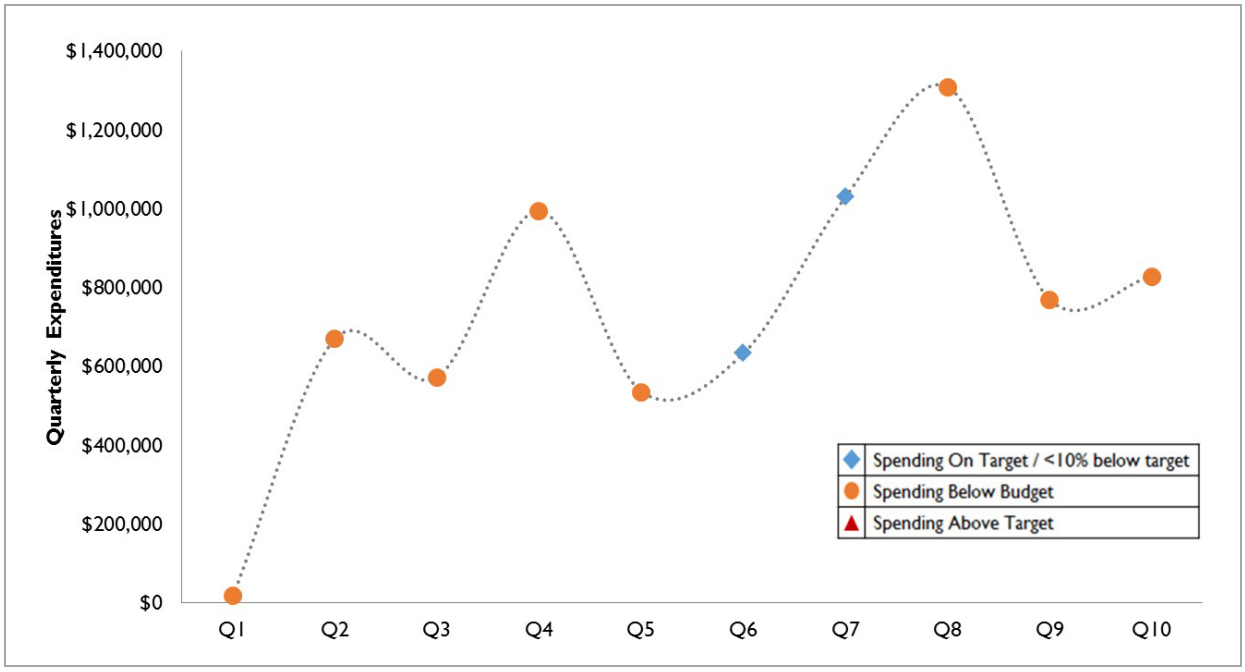
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

Execution of Implementation

The annual report highlights the significance of Bronx RHIO's expenditure rates on implementation. As of December 2014 (Q10), Bronx RHIO spent 21.4 percent of its Year 3 budget, which is below the projected target. Funds were primarily spent on electronic health records (EHR) vendors, technical consulting, software expenses and hosting, and personnel. The project has historically underspent due to delays in implementation of database and interventions. Bronx RHIO management plans to increase spending on recruiting additional participating sites, especially physician practices. During the site visit in March 2015, Bronx leadership noted, "We are lagging behind connecting with the various individual physician practices. We need to spend more on outreach and adoption personnel to bring in new sites."

Figure 1. Spend Rate from Q8 (July 1, 2012) to Q10 (December, 31, 2014)



Leadership

Project leadership remained constant since the last annual report. An executive committee, which exercises all functions and powers of the board of directors, oversees Bronx RHIO, and Dr. Erik Langhoff is the chairperson. The committee meets monthly to review all aspects of the project including implementation progress, site intervention design, and analytic modeling approaches. Membership consists of leaders of organizational partners, patient and member representatives, and physicians. Charles Scaglione continues as executive director, his role since project inception. Mr. Scaglione oversees all daily aspects of the Bronx RHIO.

Initially, leadership admittedly underestimated the program's complexity, which resulted in a longer start-up period than originally planned. However, leadership feels that this extended planning period benefitted the project by ensuring that the interventions were well conceived and could achieve the desired results. Another challenge Bronx RHIO leadership reported is that health data they have for their market are incomplete. Cleaning and standardizing data from each site also presented challenges. As a result, leadership had to convince members that the Bronx RHIO did indeed have a rich database, as well as the staff and knowledge to leverage that information properly. After complete and useful data were flowing consistently, "it took time for the community to learn to trust the data" according to Bronx leadership.

Leadership effectively managed the few staffing issues that arose. Working with the various site locations and establishing those relationships were critical to the early success of the Bronx RHIO. Leadership quickly saw the benefit of identifying internal champions at each site location. When necessary, the Bronx RHIO funded champions at each site, embedding staff at locations to fill this role.

The champions ensured a strong connection and steady flow of information and data between the RHIO and the participating sites. One challenge was the difficulty of maintaining these relationships despite staff turnover in embedded positions. Another issue was the Bronx RHIO's data manager's decision to reduce her hours, which required hiring and training a new data manager and also filling her role as a Clinical Looking Glass (CLG) instructor on the Bronx Community College (BCC) faculty within the workforce development program.

Organizational Capacity

The major activity intended to increase the Bronx RHIO's organizational capacity was the creation of Spectrum, a Web-based analysis and reporting system featuring dashboard reporting and registry management tools. Spectrum provides Bronx RHIO with the flexibility to adapt to anticipated market demands and support providers participating in other initiatives such as New York State's Delivery System Reform Incentive Payment (DSRIP). During the March 2015 site visit, leadership noted, "We knew that we needed to advance the front end to allow users independent access." Developed with Optum, Spectrum can track the progress of population health projects and site intervention initiatives and generate reports on performance. It features an array of useful graphics and offers the ability to drill down to patient-level data by filtering on disease condition, facility, and provider. Patient lists can be created by identifying inclusion/exclusion criteria or by upload, and can be exported for provider/care manager use offline. The system includes an algorithm for de-identifying protected health information (PHI), which enables de-identified aggregate reporting on all patients with data in the Bronx Regional Analytic Database (BRAD). Reports identifying specific patients can be generated to support intervention with patients who consented to sharing their data. Spectrum demonstration and feedback sessions were held for a number of audiences, and feedback is currently being incorporated into the application design.

The Bronx RHIO continues to develop and implement predictive models to identify patients in the BRAD who, at discharge, are at high risk for readmission. The Bronx RHIO is also partnering with Optum's predictive analytics group to build on this work and develop tailored predictive models for SBH Health System and Bronx Lebanon Hospital to generate risk scores on a weekly basis. Secure server space was recently established for the quantitative analysis, which was necessary to ensure that both BRAD and CMS Medicare data are securely stored and analyzed.

The Bronx RHIO was also frustrated in its efforts to connect with other RHIOs in the greater New York City area. For the past 5 years, the Bronx RHIO made multiple attempts to connect and share data with other RHIOs. However, these RHIOs were focused on building their own data networks, had concerns about the complexity of data-sharing agreements and were sensitive to the political implications of choosing to connect to one RHIO versus another. Recently, New York mandated that its RHIOs connect to form a statewide network. As these barriers to connecting New York RHIOs are resolved, the comprehensiveness and utility of Bronx RHIO data will be enhanced. The Bronx RHIO is also unique among New York RHIOs in that it developed the capacity to transform, aggregate, analyze and report on data and facilitate data use. The state uses Bronx RHIO as an example that other RHIOs should emulate and, if possible, leverage existing tools and resources rather than build this capacity separately.

Innovation Adoption and Workflow Integration

The Bronx RHIO periodically sends analytic BRIC reports to participating sites to identify patients for intervention. Member sites can also subscribe to receive alerts on specific patients. E-mail alerts sent through a secure messaging system contain notifications about ED admissions and discharges and inpatient usage. Alerts inform site staff in a timely manner about patient visits and enable staff to provide education or alternative care as needed. While they function only as notifications because they do not contain clinical information, alerts offer value because they are received within 24 hours of a patient event, enabling timely delivery of preventive services, rather than waiting for the next cycle of BRIC reports to trigger intervention. Only a subset of sites subscribe to these alerts.

Member sites typically receive reports from the Bronx RHIO indicating which patients were recently seen at a particular site, such as a hospital, ED, or care center. The reports contain additional information such as outpatient usage, lab results, and demographic data. Site staff indicated that receiving these reports gave them a better understanding of patients' decisions regarding their own health care utilization. Site staff can then begin to determine how to better engage these patients. The reports allow sites to identify patient problems, attempt an intervention, and measure outcomes. Unfortunately, missed appointments create clutter or "noise" in reports, causing additional work for the site staff who work with them. Site staff reported that while reports are excellent in quality, staff are not always available to review and process the information. By the time staff are available, the information may be out of date and unusable. To manage their limited resources, some sites indicated they may reduce the number of reports they receive and focus instead on specific conditions. With limited success, the Bronx RHIO has also offered to hire, train, and place CHW staff on site at these locations to address workflow issues and request patient consent to share data.

Although providers at Bronx RHIO were included in the HCIA Provider Survey, we do not report results among Bronx RHIO providers because we do not report at the individual awardee level if there were fewer than 20 respondents; and we received responses from 8 of the 11 (72.7%) eligible providers surveyed. The data from Bronx RHIO providers are, however, included in the cross-site analysis of the Provider Survey in Section 2.3.

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with 24.2 full-time equivalent (FTE) staff members. Between Q8 (June, 2014) and Q10, the innovation increased from 22.2 to 24.2 FTEs. In Q8, the Bronx RHIO was below projection by six FTEs. At that time, hiring was slower than planned due to delays in database implementation and site interventions. In addition, several sites did not want or need some of the planned positions, so those were delayed or eliminated. Staff at these sites indicated that they did not need the additional coordination/staff at that point in their interventions. The need for coordination at the sites increased with time, and the Bronx RHIO subsequently hired two additional staff, enabling them to be at projection for Q9 and Q10.

Skills, Knowledge, and Training

Between Q8 and Q10, Bronx RHIO provided 6,140 hours of training to 163 students at the BCC as part of the workforce development program. Training consisted of enhanced health IT analyst modules that trained students to use CLG software. Student feedback was solicited at the end of every module, and was reviewed and incorporated into adjustments to the curriculum and faculty composition. Students felt the training needed improvement in the areas of quality improvement and CLG instruction; students gave high ratings to all other areas. To address this feedback, a physician replaced the nonclinician as the instructor for quality improvement course sessions. The BRIC data manager was added to the faculty for the CLG module as a knowledgeable user with practical, day-to-day experience. Upon implementation of these changes, student feedback significantly improved in both curriculum areas. The Bronx RHIO continues to revise the CLG training based on student feedback and greater understanding of the skill set needed for population health analysis.

Training was behind schedule in Year 1 because of the innovation's late start; however, the Bronx RHIO increased its targets for Years 2 and 3 accordingly and got back on plan. Due to project staffing needs for analysts, community health worker (CHW) trainings were delayed. CHW trainings will be held throughout Year 3 to support project activities now that interventions are in place.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach) and; (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

Reach

The data reported in this annual report were based on patients included in at least one of the 143 BRIC reports that included patient-level data through Q11 that Bronx RHIO provided to RTI. ***Table 6*** provides a summary of BRIC report topics and the number of patients in each report. As shown in the table, the largest percentages of patients were in BRIC reports related to Hepatitis C and other diseases (e.g., BRIC report with patient demographic data generated). Approximately 10 percent of patients were included in BRIC reports related to asthma, diabetes, and geriatrics.

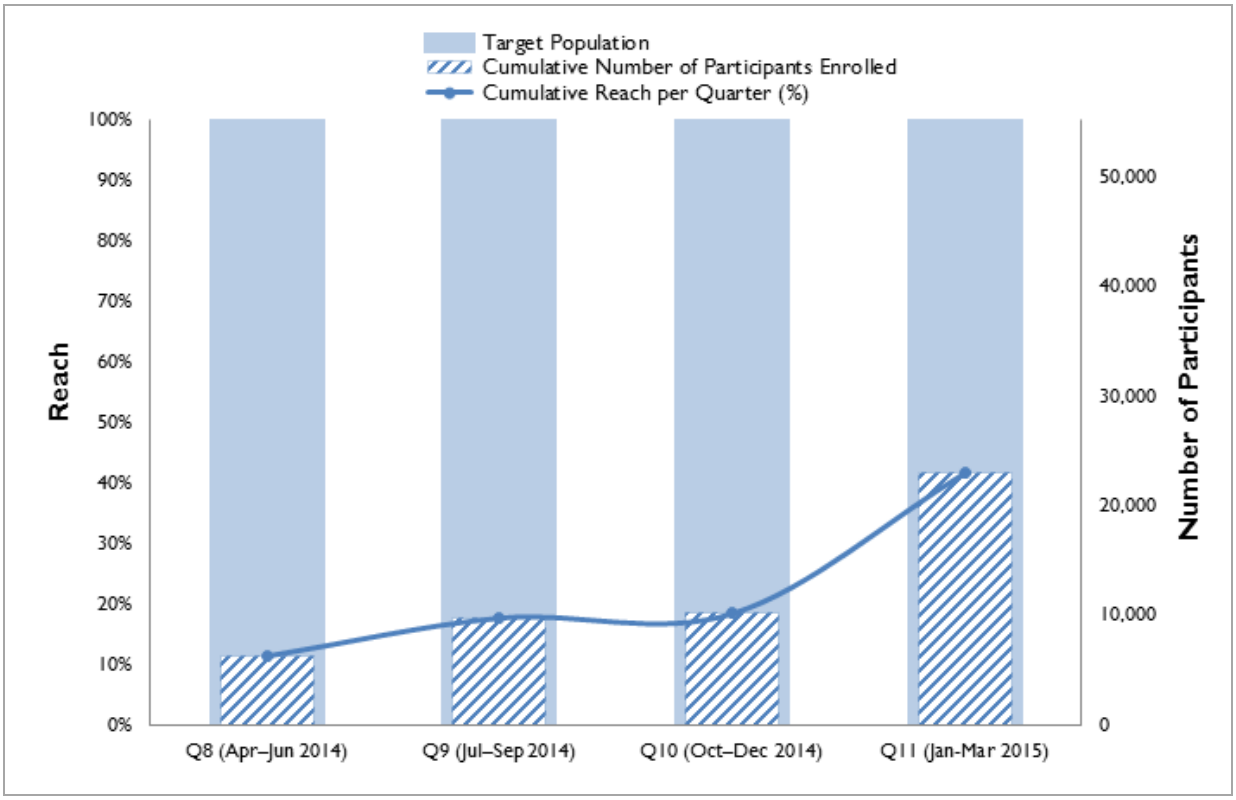
Table 6. BRIC Report Topics by Number and Percentage of Patients

BRIC Report Topic (n=143)	Number of Patients (Percentage) (n=22,999)
Hepatitis C	7,881 (34.3)
Other	7,545 (32.8)
Geriatric	2,735 (11.9)
Asthma	2,474 (10.8)
Diabetes	2,397 (10.4)
Ambulatory intervention	1,721 (7.5)
Four or more diseases	805 (3.5)
Nursing/home health	563 (2.4)
Congestive heart failure	37 (0.2)

Source: Patient-level data provided to RTI by Bronx RHIO.

Figure 2 shows reach by quarter since the launch of the innovation based on the 143 BRIC reports with patient-level data that Bronx RHIO provided to RTI through Q11. We worked with Bronx RHIO to determine that 55,215 is an appropriate target population for the innovation. We first reported reach in the Q5 report, based on data through Q9. Since that time, Bronx RHIO provided an additional 99 BRIC reports with data, which include an additional 13,257 unique patients in the innovation, increasing reach to 22,999— from 17.6 percent to 41.7 percent.

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch



	Quarter	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan-Mar 2015)
●	Cumulative reach per quarter (%)	11.3	17.6	18.4	41.7
	Target population	55,215	55,215	55,215	55,215
	Cumulative number of participants enrolled	6,262	9,742	10,153	22,999

Source: Patient-level data provided to RTI by Bronx RHIO.

As noted in previous reports, the number of participants reported in the *Quarterly Awardee Performance Reports* differs from the number of participants reported in the RTI quarterly and annual reports. The *Quarterly Awardee Performance Reports* reflect the number of patients who received follow-up or intervention from the health care delivery participant that requested the BRIC report, whereas RTI quarterly and annual reports reflect unique patients included in reports, regardless of subsequent follow-up or intervention. We requested, but have not yet received the data that support the *Quarterly Awardee Performance Reports*. We anticipate receiving these data to include in future reports.

Cumulative patient enrollment increased slowly over the last several quarters and continues to lag significantly behind the targeted population. Bronx RHIO did not reach its target population because of implementation delays early in the project timeline and difficulty getting patients' consent to share their data. BRIC reports could potentially include many more patients whose data are held by the RHIO, but these data will continue to be excluded from reporting until consent is received. In an attempt to resolve

this, the Bronx RHIO is working with the pilot sites by providing assistance with recruitment and funding for CHWs; these staff will assist sites in improving work flow and staff training to increase consent rates.

Dose

As noted above, we have not yet received the data for dose. We anticipate receiving those data to include in the next annual report.

Sustainability

The Bronx RHIO has multiple revenue streams and is pursuing several options for achieving sustainability. The sustainability plan is based on providing ongoing services to RHIO member sites, similar to those provided to the pilot sites, supported by fees from the sites. The RHIO is partially sustained by these member funds, which are dues paid annually to enable access to the RHIO. Bronx RHIO can also charge customers per service for joining the RHIO. Bronx RHIO membership has steadily increased every quarter since late 2010.

The Bronx RHIO intends to implement a new fee structure, currently under development, for its analytic services. This strategy is aligned with and poised to benefit from a Medicaid payment reform initiative being implemented by the New York State Department of Health, known as the Delivery System Reform Incentive Payment Program (DSRIP). Under this program, 5-year contracts are being given to both SBH Health System and Bronx Lebanon to create Performing Provider Systems (PPS) of health care delivery and health-related community based organizations to implement 10 projects (each) aimed at reducing hospitalization and ED utilization while improving quality and reducing cost. These PPSs will require substantial countywide data and analytic and reporting services, both of which the Bronx RHIO will provide. This 5-year grant will allow the Bronx RHIO to build and expand to the new state health information exchange, and become the essential data provider for various facilities in New York state.

The Spectrum population health tool will also support the Bronx RHIO's current intervention projects, and the Bronx RHIO is sharing it with the PPSs currently being set up as part of the Medicaid care and payment reform initiatives. In part, Spectrum was created because Bronx RHIO management realized that giving these tools to users would enable independent and timelier access to the data. Last, the Bronx RHIO benefitted from a highly successful workforce development program that it intends to market. The Bronx RHIO was profitable in every year of operation and anticipates profitability to continue.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of Bronx RHIO's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data Bronx RHIO collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers

essential to the evaluation of Bronx RHIO's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 7 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of the status of the data requested and whether the data are presented in this annual report. Medicaid data analysis will use data from the CMS Alpha-MAX data files. Currently, Medicaid claims for Bronx RHIO are only available in Alpha-MAX through Q4 2013, and claims for that final quarter may not be complete. Because the Bronx RHIO innovation did not launch until February 20, 2014, we are not presenting measures for Medicaid patients in this report. We will provide Medicaid analyses in subsequent reports as post-intervention data become available.

Table 7. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	No
		Hospital unplanned readmissions rate	Yes	No
		ED visit rate	Yes	No
	Cost	Spending per patient	Yes	No
		Estimated cost savings	Yes	No

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization in future reports. At this time, the Centers for Medicare & Medicaid Services Alpha-MAX data files are not available in the period after the innovation was launched. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis

We include patients who were enrolled prior to December 31, 2014 and we present Medicare claims data through December 31, 2014.

Comparison Groups

We received 143 BRIC reports requested by partners of the RHIO: Bronx Lebanon Hospital Center (BLHC), the New York City Department of Health and Mental Hygiene (DOHMH), Morris Heights Health Center (MHHC), Montefiore Medical Center (MMC), St. Barnabas Health System (SBH System), and Visiting Nurse Service of New York (VNSNY). Each BRIC report focuses on a specific group of patients requested by the provider from a member site.

Because information on enrollment dates is missing, we used the BRIC report extraction date as the innovation enrollment date for patients. For example, the first report on MMC was extracted April 28, 2014, whereas a report on MHHC patients was extracted August 7, 2014. The 143 BRIC report extraction dates range from April 18, 2014 to March 31, 2015. Since all dates are very recent, the claims data in the Chronic Conditions Data Warehouse are not yet complete for the post-innovation time period. We used information from 44 BRIC reports that had an enrollment start date before December 31, 2014.

We matched 5,796 Medicare beneficiaries from the BRIC reports who were enrolled in fee-for-service Medicare Parts A and B during the innovation launch to the Medicare claims data. We present measures for Medicare beneficiaries enrolled in the innovation and a group of statistically matched adult comparison beneficiaries with fee-for-service Medicare Parts A and B, who live in or near the Bronx of New York City and gave consent for use of their patient information to RHIO.

We used propensity score matching to select comparison group beneficiaries with similar characteristics as intervention treatment group beneficiaries. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, disability, end-stage renal disease status, dual Medicare-Medicaid status, number of chronic conditions, number of ED visits and inpatient stays in the calendar quarter prior to the innovation, and total Medicare payments in the calendar quarter and calendar year prior to the innovation. We used one-to-variable matching with replacement, matching each intervention treatment beneficiary with up to three comparison group beneficiaries with the closest propensity score.

Table 8 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. ***Figure 3*** shows the distribution of the propensity scores for both the comparison and intervention groups. ***Appendix B.2*** provides technical details on the propensity score methodology. Three treatment beneficiaries were dropped from the subsequent analyses due to the lack of an appropriately matched comparison beneficiary.

Table 8. Mean Values and Standardized Differences of Variables in Propensity Score Model: Bronx RHIO

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrollment	5,166	13,410	5,692	14,750	0.04	5,127	13,283	5,328	15,381	0.01
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	17,339	32,869	19,078	36,492	0.05	17,336	32,870	18,803	26,441	0.05
Age	71.98	13.91	66.41	15.82	0.37	71.98	13.92	74.47	11.13	0.20
Percentage male	33.09	47.06	39.22	48.82	0.18	33.11	47.06	30.88	40.31	0.07
Percentage white	30.95	46.23	35.30	47.79	0.13	30.97	46.24	29.27	39.70	0.05
Percentage disabled	33.06	47.05	44.11	49.65	0.32	33.06	47.05	29.10	39.64	0.12
Percentage ESRD	6.06	23.85	5.01	21.83	0.06	6.02	23.80	6.65	21.74	0.04
Number of dual eligible months in the previous calendar year	5.86	5.84	6.70	5.80	0.14	5.86	5.84	5.83	5.06	0.01
Number of chronic conditions	9.57	3.87	7.87	4.42	0.41	9.56	3.87	10.78	3.63	0.32
Number of ED visits in calendar quarter prior to enrollment	0.10	0.66	0.21	0.84	0.15	0.10	0.66	0.09	0.35	0.04
Number of inpatient stays in calendar quarter prior to enrollment	0.10	0.39	0.17	0.54	0.14	0.10	0.39	0.09	0.30	0.03
Number of beneficiaries	5,796	—	73,364	—	—	5,793	—	17,373	—	—
Number of unique beneficiaries[1]	5,796	—	23,480	—	—	5,793	—	10,787	—	—
Number of weighted beneficiaries	—	—	—	—	—	5,793	—	5,793	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B for discussion of weights).

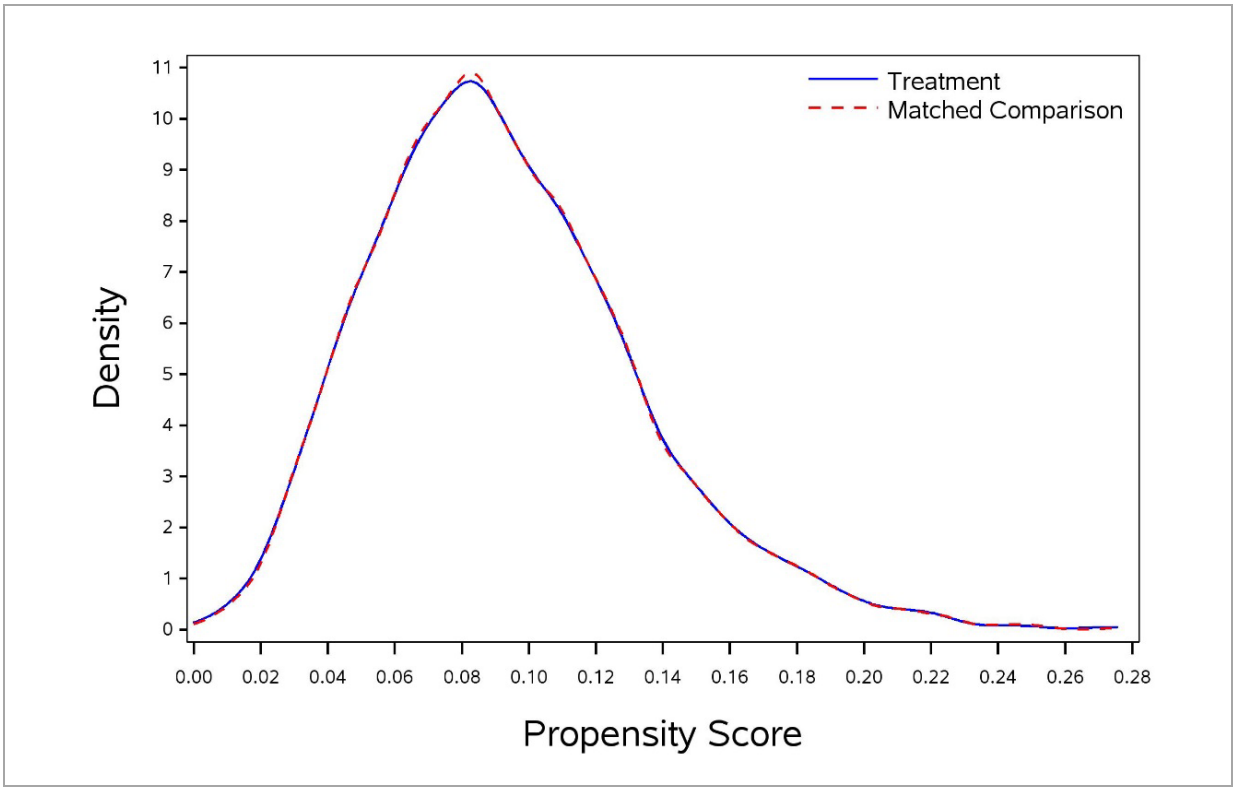
ED = emergency department; ESRD = end-stage renal disease; SD = standard deviation.

— Data not yet available

After performing propensity score matching, we calculate absolute standardized differences between the treatment group and both the unmatched and matched comparison groups and check whether matching decreases the absolute standardized differences and achieves acceptable balance (Table 8). Many researchers consider that an absolute standardized difference ≤ 0.10 indicates acceptable balance.[2] Researchers also pointed out that critical variables in determining selection into treatment (those with significant effects in the propensity score equation) should have greater balance, while indicators with minor importance in determining treatment selection do not require optimal balance. The results in Table 8 show that matching generally reduced the absolute standardized differences and achieved adequate balance for most variables. The absolute standardized differences for age, percentage disabled, and number of chronic conditions remained above 0.10.

Figure 3 shows the distribution of the propensity scores for both the intervention and comparison groups. The figure demonstrates a very close overlap between the treatment and comparison groups' propensity scores. Therefore, we present the Medicare claims analysis using both the treatment group and the matched comparison group.

Figure 3. Distribution of Propensity Scores for Comparison and Intervention Groups: Bronx RHIO



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Bronx RHIO = Bronx Regional Health Information Organization.

[2] Austin, P.C. An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research. 46.3: 399–424, 2011. *PMC*. Web. 2 June 2015.

Descriptive Analysis

This report includes claims through December 31, 2014. ***Table 9*** reports Medicare spending per patient in the eight quarters before and the three quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 9. Medicare Spending per Patient: Bronx RHIO

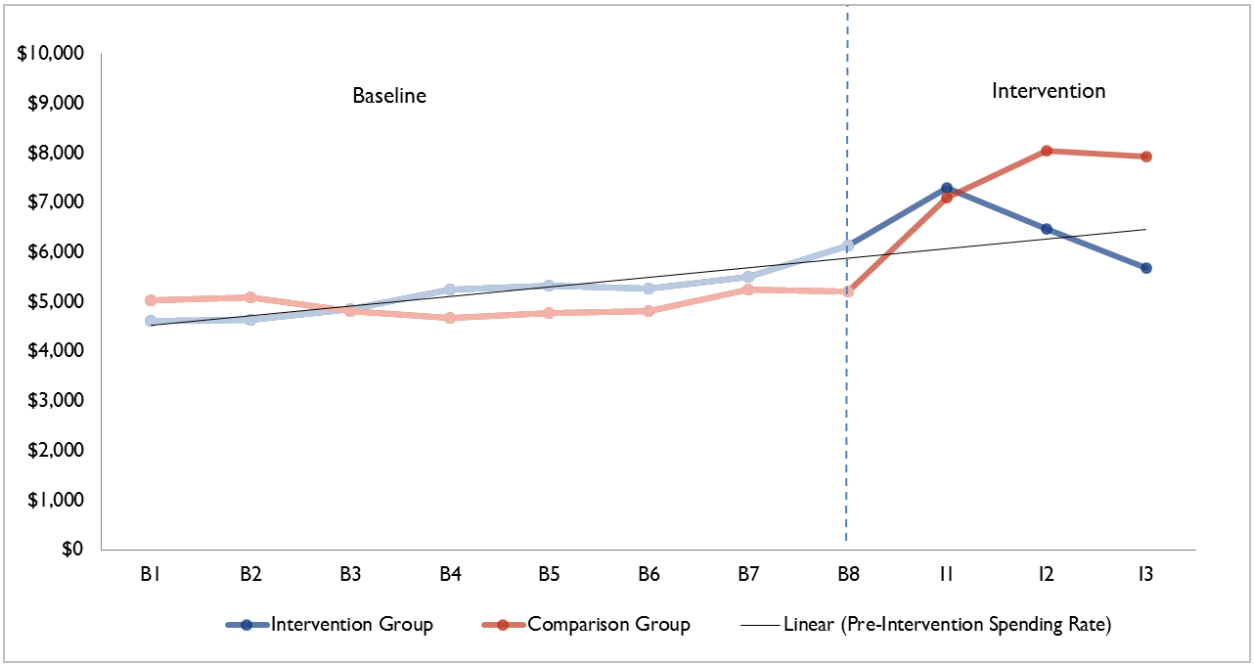
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 331065	Bronx RHIO											
	Spending rate	$4,619	$4,644	$4,851	$5,246	$5,317	$5,272	$5,508	$6,143	$7,303	$6,467	$5,673
	Std dev	$11,760	$13,125	$12,363	$15,237	$13,376	$13,009	$13,503	$15,166	$19,590	$16,619	$14,556
	Unique patients	5,682	5,696	5,699	5,711	5,717	5,738	5,758	5,793	5,793	5,589	5,064
Comparison Group												
1C1CMS 331065	Bronx RHIO											
	Spending rate	$5,030	$5,090	$4,805	$4,668	$4,774	$4,808	$5,240	$5,208	$7,103	$8,046	$7,932
	Std dev	$12,850	$13,918	$12,315	$12,084	$11,555	$11,543	$12,981	$15,624	$16,758	$19,131	$18,550
	Unique patients	4,967	5,058	5,161	5,295	5,417	5,545	5,693	5,792	5,792	5,664	5,023
Savings per Patient		$411	$447	−$46	−$577	−$543	−$464	−$268	−$935	−$200	$1,580	$2,259

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 4 illustrates the Medicare spending per beneficiary in Table 9 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 4. Medicare Spending per Patient: Bronx RHIO



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Bronx RHIO = Bronx Regional Health Information Organization.

As shown by the pre-intervention trend line for innovation enrollees, spending has a slight upward trend in the pre-intervention quarters for the innovation beneficiaries. Post-intervention spending increases above the upward trend in the first quarter for both intervention and comparison groups, although the intervention group incurs less spending than the comparison group in the second and third post-intervention quarters. It is premature to conclude any impact of the innovation on spending among enrolled beneficiaries. As shown in Table 4, the standard deviation for spending is very high, representing the skewed nature of expenditures. We will estimate the statistical impact of the innovation in the difference-in-differences regression analyses that follow.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 10*** and ***Figure 5***.

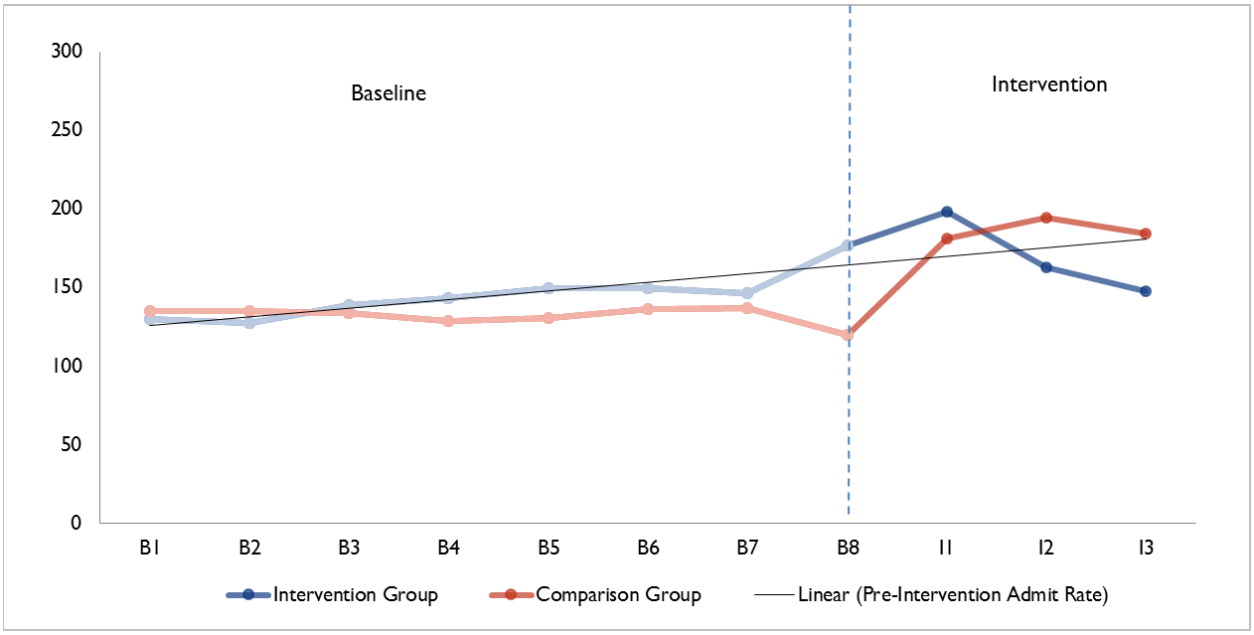
Table 10. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Bronx RHIO

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 331065	Bronx RHIO											
	Admit rate	130	128	139	144	150	150	147	177	198	163	148
	Std dev	440	441	457	453	477	465	468	515	599	520	485
	Unique patients	5,682	5,696	5,699	5,711	5,717	5,738	5,758	5,793	5,793	5,589	5,064
Comparison Group												
1C1CMS 331065	Bronx RHIO											
	Admit rate	135	135	134	129	130	136	137	120	181	195	184
	Std dev	467	456	450	408	422	440	451	379	525	570	548
	Unique patients	4,967	5,058	5,161	5,295	5,417	5,545	5,693	5,792	5,792	5,664	5,023
Intervention − Comparison Rate		−5	−8	5	15	19	13	9	57	17	−32	−36

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 5. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Bronx RHIO



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Bronx RHIO = Bronx Regional Health Information Organization.

Inpatient admissions remains fairly stable around the pre-intervention trend line but trends slightly upward in the pre-intervention period for the innovation beneficiaries. Inpatient admissions for the intervention group rises during the first post-intervention quarter and falls during the second and third post-intervention quarters—rates fall below the comparison group. Without statistical testing, it is premature to conclude that the innovation caused the change; we will examine this question in the difference-in-differences regression analyses that follow.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 11*** and ***Figure 6***.

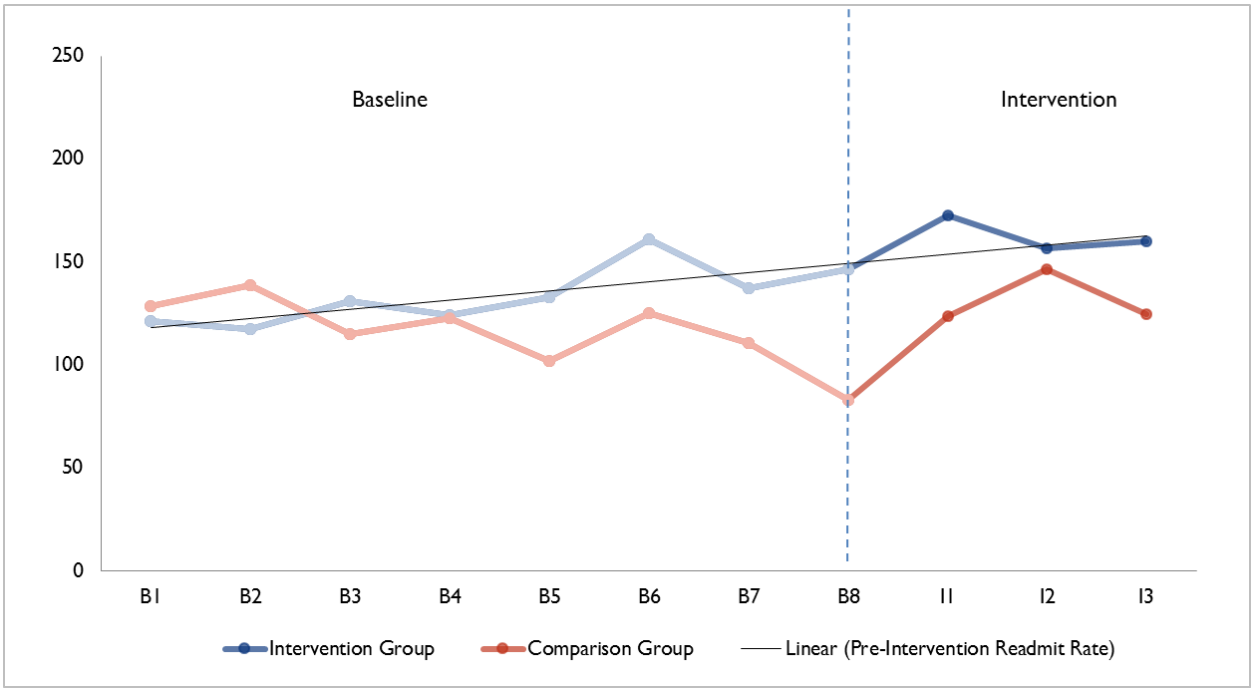
Table 11. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Bronx RHIO

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 331065	Bronx RHIO											
	Readmit rate	121	118	131	124	133	161	137	146	172	157	160
	Std dev	326	322	337	330	340	367	344	354	378	364	366
	Total admissions	462	468	550	564	586	597	598	731	789	574	338
Comparison Group												
1C1CMS 331065	Bronx RHIO											
	Readmit rate	129	139	115	123	102	125	111	83	124	146	125
	Std dev	335	345	319	328	302	331	314	276	329	354	330
	Total admissions	495	493	504	510	505	554	575	470	837	824	481
Intervention − Comparison Rate		−7	−21	16	1	31	36	26	63	49	10	35

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Bronx RHIO



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Bronx RHIO = Bronx Regional Health Information Organization.

Hospital unplanned readmissions rates fluctuate slightly around the trend line prior to the innovation's launch, although the trend is slightly upward. The readmissions rates jump in the first quarter after innovation launch for both the intervention and comparison group—rates for the intervention group remain above the comparison group. In the second and third post-intervention quarters, the readmissions rates for the comparison group remain below those of the intervention group. As with the other variables, we will include statistical tests on the readmissions rate in the difference-in-differences regression analyses that follow.

ED visits per 1,000 participants are shown in ***Table 12*** and ***Figure 7***.

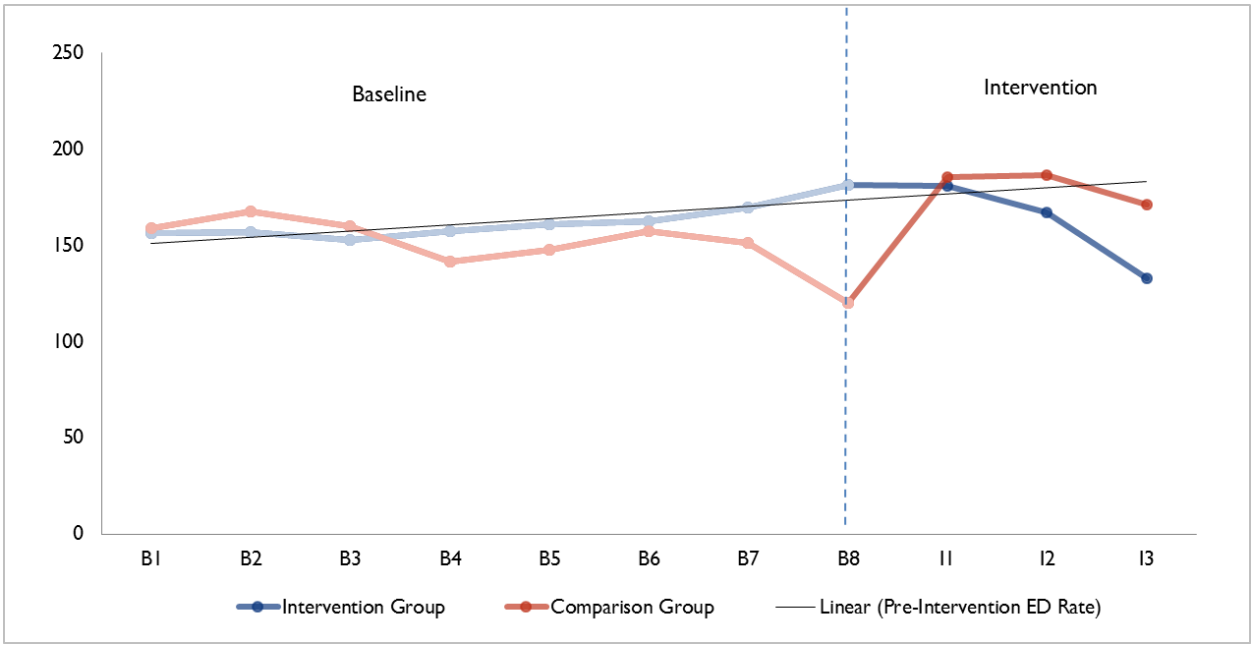
Table 12. ED Visits per 1,000 Participants: Bronx RHIO

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 331065	Bronx RHIO											
	ED rate	157	157	153	157	161	162	170	182	181	167	133
	Std dev	509	540	492	773	689	565	642	744	880	648	454
	Unique patients	5,682	5,696	5,699	5,711	5,717	5,738	5,758	5,793	5,793	5,589	5,064
Comparison Group												
1C1CMS 331065	Bronx RHIO											
	ED rate	159	167	160	141	148	157	151	120	186	187	171
	Std dev	422	410	386	365	375	397	493	412	433	531	445
	Unique patients	4,967	5,058	5,161	5,295	5,417	5,545	5,693	5,792	5,792	5,664	5,023
Intervention − Comparison Rate		−2	−10	−8	16	13	5	19	62	−5	−20	−38

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 7. ED Visits per 1,000 Participants: Bronx RHIO



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Bronx RHIO = Bronx Regional Health Information Organization.

The ED visit rate for the intervention group closely parallels the trend line prior to launch, then rises slightly above the trend line in the first post-intervention quarter before it dips below the trend line in the second and third post-intervention quarters. The ED visit rate for the comparison group stays close to the intervention group throughout the pre-intervention period except for the quarter before the innovation launch. The gap between the intervention and comparison group remains small. As with the other variables, we will include statistical tests on the ED visit rate in the following section.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit.

All regressions include an indicator variable for the treatment group, an indicator variable for each quarter, and quarterly indicators that interacted with the treatment group variable in the post-intervention period. We controlled for age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The regression specification assumes the same quarterly fixed effect for treatment and comparison individuals in the pre-innovation period and allows for a separate quarterly effect for treatment individuals after enrolling in the innovation.

Table 13 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in

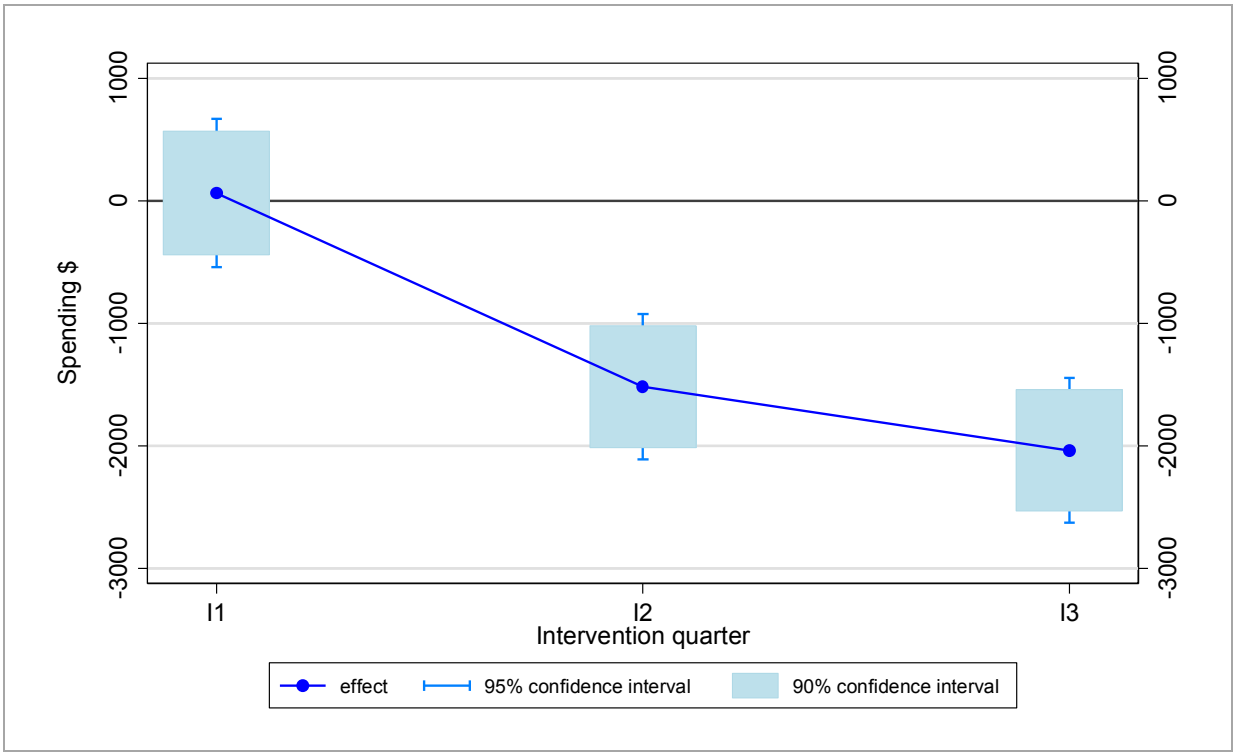
post-intervention quarters between the treatment and comparison groups. ***Figure 8*** illustrates these quarterly difference-in-differences estimates.

Table 13. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Bronx RHIO

Quarter	Coefficient	Standard Error	P-Values
I1	64	309	0.836
I2	−1,518	304	<0.01
I3	−2,038	301	<0.01

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
Bronx RHIO = Bronx Regional Health Information Organization; OLS = ordinary least squares.

Figure 8. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Bronx RHIO

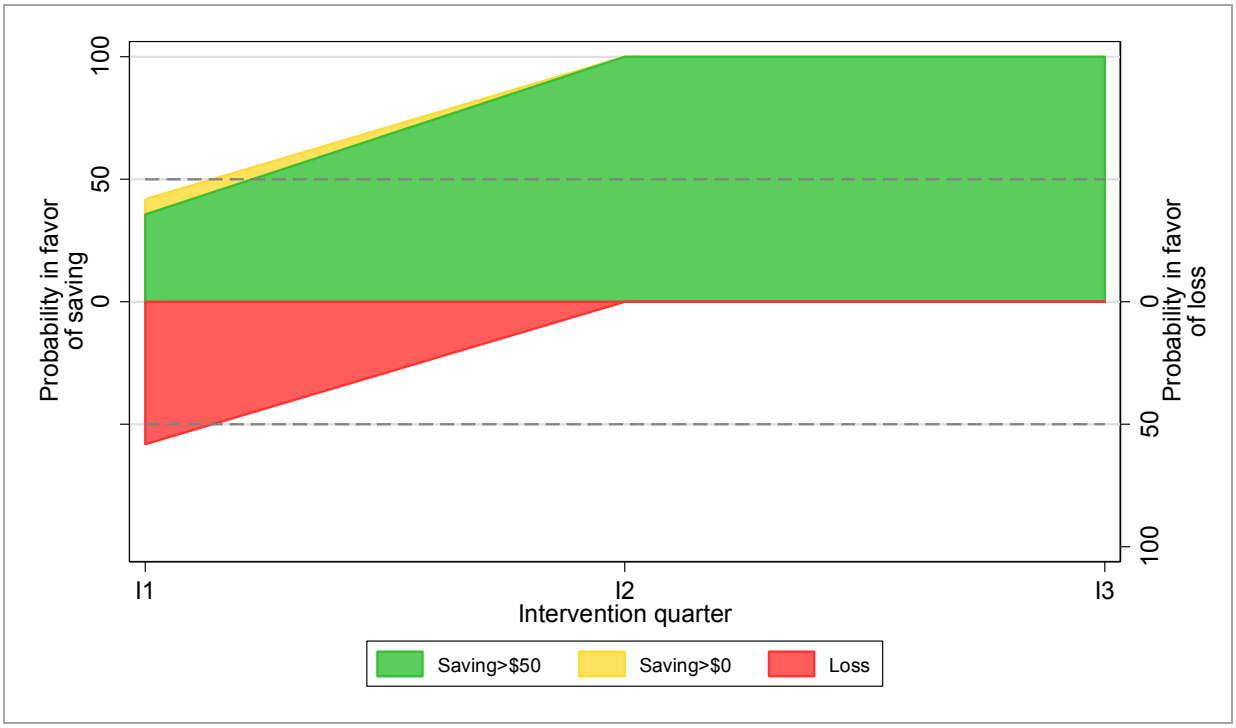


Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Bronx RHIO = Bronx Regional Health Information Organization; OLS = ordinary least squares.

In the first quarter after intervention (I1), spending among treatment group individuals was $64 higher than spending among comparison group individuals, although the estimate is not statistically significant. In the second and third quarters after intervention, however, the magnitude of the savings was over $1,500 and the estimates are statistically significant. Additional post-intervention quarters are needed to make a more definitive conclusion, but the innovation appears to be producing savings.

Figure 9 presents the strength of evidence in favor of savings or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis.

Figure 9. Quarterly Strength of Evidence in Favor of Savings/Loss: Bronx RHIO



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Bronx RHIO = Bronx Regional Health Information Organization.

Because the quarterly spending estimates were lower for the treatment group than the comparison group in the second and third post-intervention quarters, the current result suggests that the innovation has a high probability of generating savings. However, more post-intervention data are needed to draw a definitive conclusion.

We also present the weighted average treatment effect per quarter during the intervention period for beneficiaries enrolled in the innovation as compared to their matched comparison group. The weighted average quarterly spending differential in the post-innovation period, indicating savings, is $1,110 (90% CI: $757, $1,462). This estimate is statistically significant. This number represents the differential spending per quarter in the post-intervention period between individuals enrolled in the

innovation and comparison group individuals, on average, weighted by the number of intervention beneficiaries in each quarter. The 90 percent confidence interval is the range in which the true parameter estimate falls, with 90 percent confidence.

We also present linear probability model coefficients for inpatient admissions and outpatient ED visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the estimated effect.[3] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, linear probability model coefficients have often been empirically demonstrated to be consistent with marginal effects generated from nonlinear models.[4] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention), not just the direction of the effect.

Table 14 presents the results of a linear probability model with the dependent variable set to one for patients who had a hospital visit during the quarter.

Table 14. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: Bronx RHIO

Quarter	Coefficient	Standard Error	P-Values
I1	−0.01	0.01	0.071
I2	−0.04	0.01	<0.001
I3	−0.04	0.01	<0.001

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
Bronx RHIO = Bronx Regional Health Information Organization.

In the first intervention quarter, treatment group patients were 1 percentage point less likely to have an inpatient visit. In the second and third quarters after starting the innovation, treatment group patients were approximately 4 percentage points less likely than the comparison group to be hospitalized. This finding is reflected by the negative regression coefficients, all of which are statistically significant. The average quarterly difference-in-differences estimate for inpatient admissions is −2.9 percentage points, indicating that the treatment-control difference is 2.9 percentage points lower during the intervention period. This is the average difference in inpatient admissions probability for all intervention

[3] To obtain the correct effect, simulations must be performed because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run, even when not competing with other users for computer resources.
[4] Angrist, J.D., and Pischke J.-S. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: −.022, −.036).

Table 15 presents the results of a linear probability model with the dependent variable set to one for patients who had an ED visit during the quarter.

Table 15. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: Bronx RHIO

Quarter	Coefficient	Standard Error	P−Values
I1	−0.02	0.01	0.018
I2	−0.04	0.01	<0.001
I3	−0.05	0.01	<0.001

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
Bronx RHIO = Bronx Regional Health Information Organization; ED = emergency department.

In all three quarters after starting the innovation, treatment group patients were approximately 2 to 5 percentage points less likely than the comparison group to visit an ED compared to the comparison group. The difference-in-differences estimate is statistically significant in all three post-intervention quarters. The average quarterly difference-in-differences estimate for ED visits is −3.7 percentage points, indicating that the treatment-control difference is 3.7 percentage points lower during the intervention period. This is the average difference in ED visit probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: −.045, −.029).

Discussion

The four measures provide descriptive data on patients enrolled in the Bronx RHIO innovation before, during, and after the launch of the innovation. These measures may not provide a complete evaluation picture of the Bronx RHIO innovation for several reasons. First, the innovation was only launched on February 20, 2014. The impact of a health IT innovation may not be immediate because providers need time to incorporate new sources of information and for patient management need time to achieve changes in health care utilization. The regression results so far, however, suggest that the intervention succeeded in reducing total spending, hospital admissions, and ED visits in the early quarters of the innovation. However, the patients identified in the BRIC reports do not necessarily indicate subsequent contact or treatment. In later reports, we will explore spending and utilization data for those patients who were contacted or treated after the BRIC report. Finally, the results may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicare beneficiaries whom we were able to match with the identifiers provided by the site. This group represents 42 percent of the overall population reached by the innovation.

Medicaid Claims Analysis

Medicaid data analysis will use data from the CMS Alpha-MAX data files. Currently, Medicaid claims for Bronx RHIO are only available in Alpha-MAX through Q4 2013, and claims for that final quarter may not be complete. Because the Bronx RHIO innovation did not launch until February 20, 2014, we are not presenting measures for Medicaid patients in this report. We will provide Medicaid analyses in subsequent reports as post-intervention data become available.

1.3.3 Other Awardee-Specific Data

Table 16 lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. The data we present in this section are current through March 2015. The results of analyses for one of these measures (i.e., HbA1c poor control) are included in this annual report. Approximately 10 percent of patients were included in at least one asthma-related BRIC report. However, FEV1 data are not available. Although we received HbA1c data on patients with diabetes, data on LDL-C control are not available from the Bronx RHIO.

Table 16. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Health outcomes	Asthma	Percentage of patients with asthma who have FEV1≥ 80% predicted/personal best	Dropped; data unavailable from Bronx RHIO
	Diabetes	Percentage of patients with diabetes who had hemoglobin A1c > 9.0 %	Data received from Bronx RHIO
		Percentage of patients with diabetes who had LDL-C < 100 mg/dL	Dropped; data unavailable from Bronx RHIO

Bronx RHIO = Bronx Regional Health Information Organization; FEV = forced expiratory volume in 1 second; LCL-C = low-density lipoprotein cholesterol.

Health Outcomes

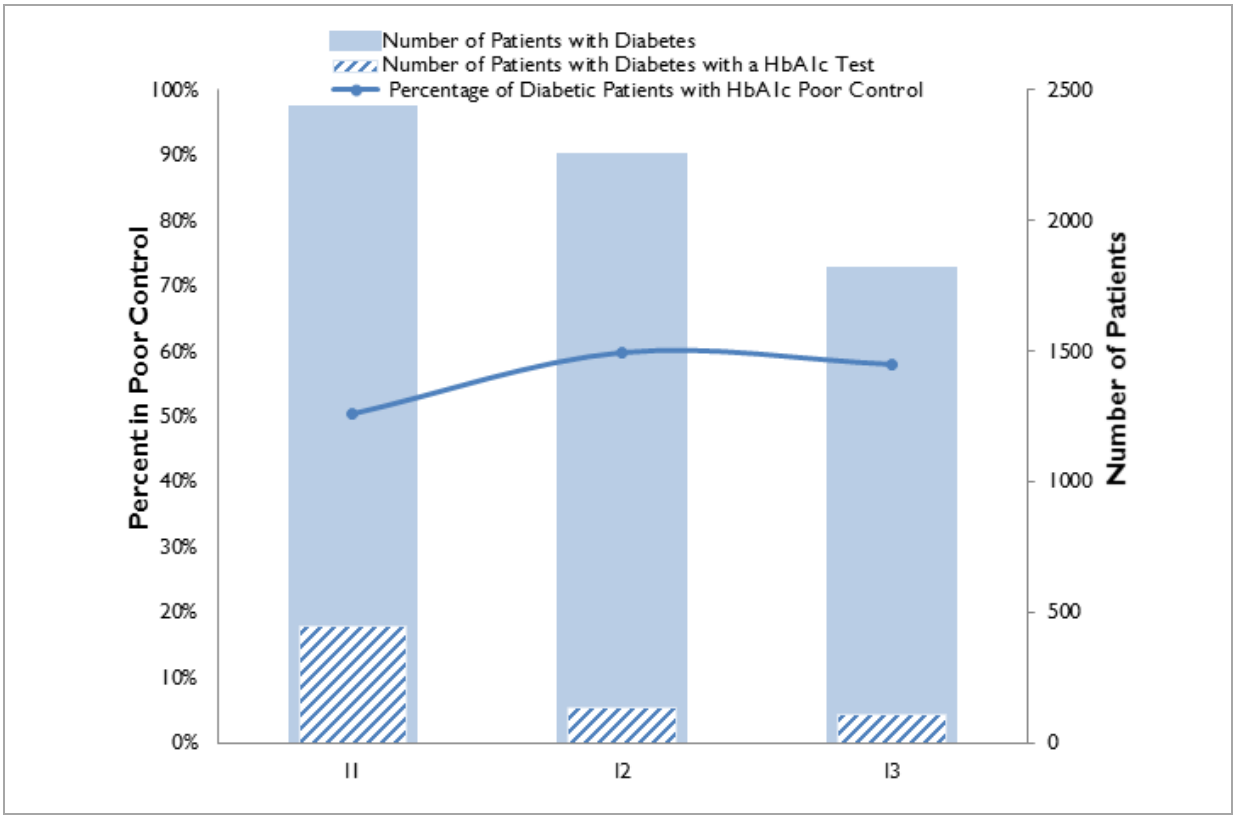
Evaluation Question

- Has the percentage of diabetes patients with poor HbA1c control decreased over time among those enrolled in the innovation?

Figure 10 presents the percentage of patients with diabetes with an HbA1c test indicating poor control (i.e., HbA1c >9%) over time. The figures account for rolling enrollment, and include intervention quarters (Is), which are based on individual enrollment date. For example, I1 is equal to the first quarter of enrollment for all participants who received an HbA1c test. We present data when at least 20 patients had a test or reading within the quarter. The numerator represents the number of diabetes patients who received an HbA1c test that was more than 9.0 percent. As shown in the figure, the percentage of patients with poor HbA1c control remained fairly consistent over time. More specifically, the percentage of

patients with poor HbA1c control was approximately 50 percent in I1 and increased slightly to 58 percent by I3. This finding suggests that the innovation has not reduced the percentage of patients with poor HbA1c control over time. However, lab results were provided in a file separate from the diabetes-related BRIC report data, and only a small percentage of patients with diabetes had HbA1c test results available.

Figure 10. Percentage of Patients with Diabetes with Poor HbA1c Control over Time



	Quarter	I1	I2	I3
●	Percentage of patients with diabetes with poor HbA1c control	50.3	59.9	58.0
	Number of patients with diabetes	2,397	2,220	1,783
	Number of patients with diabetes and a HbA1c test	447	137	112

Source: Patient-level data provided to RTI by Bronx RHIO.

Discussion of Other Awardee-Specific Findings

We reported findings for HbA1c poor control among patients with diabetes. The percentage of patients included in a diabetes-related BRIC report remained about the same between baseline and I3. This result suggests that the innovation was not effective in improving outcomes for those with diabetes. However, the innovation does not directly impact patient care, and the data reported are those included in at least one BRIC report, regardless of whether the health system that requested the report provided follow-up care to listed patients. We expect to receive data indicating which patients included in BRIC reports received follow-up care. Patients with diabetes who received follow-up care may have

experienced improvement in HbA1c control. We expect to be able to examine this possibility in the next annual report.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing Bronx RHIO as well as accomplishments to date. In this section we assess Bronx RHIO's progress on achieving HCIA goals to date:

- **Smarter spending.** The regression results suggest that the intervention successfully reduced total spending in the early quarters of the innovation.
- **Better care.** The regression results suggest that the intervention succeeded in reducing the likelihood of hospital admissions and ED visits in the early quarters of the innovation. Bronx RHIO generated 143 BRIC reports that included 13,257 patients, which is 41.7 percent of the target population, up from 17.6 percent in Q9.
- **Healthier people**. The ability to assess health outcomes for Bronx RHIO's innovation is limited because we have not received health outcomes data. We report poor HbA1c control over time for those with diabetes. The percentage of those with poor HbA1c control remained consistent over time; therefore, no improvements in HbA1c control were evident for those included in a diabetes-related BRIC report.

The Bronx RHIO is a well-led, properly executed program, with a strong sustainability plan for the future. The appropriate level of staff has been maintained, with adequate training and an exemplary workforce development program. The Spectrum population health tool and the development of predictive modeling analytics are noteworthy recent breakthroughs. By providing alerts and reports to the site locations, site staff have gained a better understanding of their patients' visit history and thought process for deciding when and how they seek care. Finally, the Bronx RHIO has several options for sustainability including charging fees for membership and services provided, acting as the region's analytic service for other RHIOs under the DSRIP contract, and marketing the highly successful workforce development program.

Nevertheless, the Bronx RHIO faced several challenges and was forced to change plans. These challenged led to several lessons learned. Because of the slow implementation and additional planning required early in the project timeline, the Bronx RHIO is still working to reach its target population, persuade members that the data are trustworthy, and increase spending to projected levels. Some delays occurred in completing the data, securing participation of local physician practices, and ensuring that received data are standardized across all sites. In addition, the Bronx RHIO tried for several years to establish a connection with neighboring RHIOs in New York state. However, due to a recent change in state policy, these connections are expected to be made soon. From these experiences, the Bronx RHIO management learned that they must try to understand the collection and entry of data at the source sites, the current use of data, the potential to improve site interventions through additional data, and the importance of tools that accommodate bidirectional information flow and seamless dissemination of analytic reports.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Children's Hospital and Health System

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and key informant interviews in the 11th and 12th quarter of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report[1]

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

Children's Hospital and Health System

1.1 Introduction

Children's Hospital and Health System (Children's Hospital), Inc., an integrated health system in Milwaukee, WI, received an award of $2,796,255 and began enrolling patients in November 2012. Children's Hospital includes a nonprofit health maintenance organization (HMO) called the Children's Community Health Plan (CCHP); the plan includes members who ranged in age from newborn to 64 years of age, and more than two-thirds of members were younger than 18 years of age. CCHP created the Care Links innovation (formerly named Advanced Wrap Network[1] Model) that includes provision of support services from community health navigators (CHNs) and nurse navigators (NNs) to CCHP members who meet specific criteria. The Children's Hospital innovation, called Care Links, seeks to achieve the following HCIA goals:

1. **Smarter spending.** Decrease annual ED visits by a total of 2,030 for CCHP members (for a savings of $406,000).
2. **Better care.** Educate and empower members to navigate the health care system so that ED visits are avoided when possible.
3. **Healthier people**. Promote preventive care and improving associated health outcomes.

Table 2 provides a summary of changes that occurred with Children's Hospital during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data that Children's Hospital submitted through March 31, 2015; and key informant interviews with Children's Hospital program staff.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	The innovation included a community health navigator (CHN) component for which patients with a history of high ED use are offered resources in hopes of decreasing ED visits. A nurse navigator (NN) component was also initially included to provide high-need members (or participants) access to clinical care. This component was transitioned into a supporting role for the CHNs; the NN no longer carries an independent load.
Program Participant Characteristics	Over one-quarter of participants (27.7%) were under 18 years old and 21.2% were 25 to 44 years old; 100% were covered by Medicaid.

(continued)

[1] In the Quarter (Q) 7 report, this name was changed to Care Links.

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Implementation Process	
Execution	40.2% of Year 3 budget expended as of December 2014, below the projected target
Leadership	Program leadership (the project manager) was very committed and involved. There is limited involvement of organizational leadership in the day-to-day implementation.
Organizational capacity	The currently appointed CMS PO helped Children's Hospital to streamline its self-monitoring measures and increased capacity to meet its goals.
Innovation adoption and workflow	The innovation was adopted into the CCHP and the current staff will remain employed by the health plan after June 30, 2015. Workflow changed slightly since the NN now supports the CHNs and does not have her own separate caseload.
Workforce Development	
Hiring/retention	Last year, CCHP had challenges with retaining newly hired staff. One part-time NN and one CHN resigned, and three staff members were on family and medical leave for part of the year.
Training	Three training courses were presented for a total of 15 hours of training.
Implementation Effectiveness	
Reach	Two calculations of reach are included in the evaluation: 10.5% of the eligible patients for which attempts were made to contact (1,522/14,441) and 29.8% of those who were contacted and interviewed regarding the program (1,522/5,103).
Dose	Over 40% of participants who enrolled initially in the program did not receive a home visit. Among those initiating the program, 15.4% of participants received 1 visit, 5.7% received 2 visits and 38.5% received all 3 visits, as prescribed by the innovation.

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by Children's Hospital.
Key informant interviews conducted Feb–June 2015.
CMS = Center for Medicare & Medicaid Services; PO = project officer.

1.1.1 Innovation Components

The Children's Hospital innovation, Care Links, initially consisted of two program components (i.e., CHNs and NNs) that provide support services to members of the CCHP who are at high risk for ED use (i.e., used the ED at least twice in the prior 6 months). These services include home visits, health education and counseling, and referral to follow-up care. Since we provided details on these components in the first annual report, a significant change occurred in the NN's role.[2] She now supports the caseload

[2] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

of the CHNs; she does not have her own separate caseload of members and is no longer considered a separate component of the innovation.

1.1.2 Program Participant Characteristics

Table 3 provides the demographic characteristics of all participants ever enrolled in the innovation. We first reported patient demographic characteristics in the Q5 report, based on data through Q9. The distribution of patient age and payer category was similar to that in the Q5 report. More specifically, overall, over one-quarter of participants (27.7%) were under 18 years old, 21 percent (21.2%) were 25-44 years old, and 100 percent were covered by Medicaid. Among those with age reported (n=903), however, 46.6 percent were under 18 years old, 13.6 percent were 18-24, 35.8 percent were 25-44, and 4.0 percent were 45-64 years old. However, because additional demographic data were available for this annual report, the distribution of sex and race differ in this report compared to figures in the Q5 report. More than half of participants (53.1%) were female, although we were missing data for a quarter of participants. Among those with data reported for sex (n=1,142), however, 70.8 percent were female and 29.2 percent were male. Although we are also missing data for race for 46.3 percent of all respondents, at least one-quarter (26.2%) were black, 16.8 percent were Hispanic, and approximately 10 percent were white. Among those with data reported for race (nsss=817), almost half were black (48.8%), 31.2 percent were Hispanic, and 18.5 percent were white.

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through Q11

Characteristic	Number of Participants	Percentage of Participants
Total	1,522	100.0
Age		
<18	421	27.7
18–24	123	8.0
25–44	323	21.2
45–64	36	2.4
65–74	0	0.0
75–84	0	0.0
85+	0	0.0
Missing	619	40.7
Sex		
Female	809	53.1
Male	333	21.9
Missing	380	25.0
Race/ethnicity[2]		
White	151	9.9
Black	399	26.2
Hispanic	255	16.8
Asian	6	0.4

(continued)

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through Q11 (continued)

Characteristic	Number of Participants	Percentage of Participants
Race/ethnicity[2] (continued)		
American Indian or Alaska Native	6	0.4
Native Hawaiian or Other Pacific Islander	0	0.0
Other	0	0.0
Missing/refused	705	46.3
Payer Category		
Dual	0	0
Medicaid	1,522	100.0
Medicare	0	0
Medicare Advantage	0	0
Other	0	0
Uninsured	0	0
Missing	0	0

Source: Patient-level data provided to RTI by Children's Hospital.

1.2 Implementation Progress

The first annual report (2014) described Children's Hospital implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area. ***Table 4*** lists these measures and their status as of May 31, 2015. The result of analyses for most of these measures are included in this annual report. The measure for number and types of services provided by the CHN are unavailable because Children's does not track these data.

This section presents Children's Hospital's process measures and a qualitative analysis of the factors that determined Children's Hospital's implementation progress. This analysis draws on patient-level data provided to RTI by Children's Hospital as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation effectiveness	Reach	Number/percentage of members on the 2+ list/month contacted to participate in Care Links	Data received from Children's Hospital
		Number/percentage of members who agreed to participate in Care Links	Data received from Children's Hospital
	Dose	Number of completed visits per member	Data received from Children's Hospital
		Number and types of services provided by CHN	Dropped, data unavailable

Children's Hospital = Children's Hospital and Health System; CHN = community health navigator.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through Children's Hospital's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include Children's Hospital reports from Q8 through Q10 and key informants' interview(s).

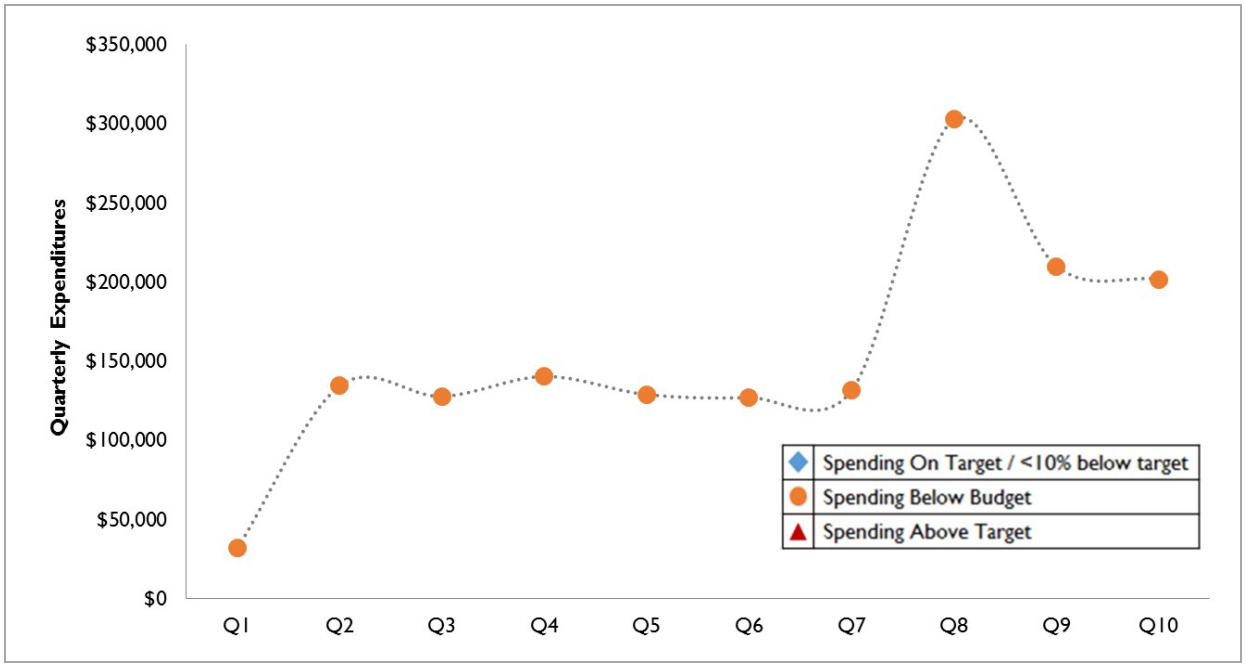
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

Execution of Implementation

Children's Hospital faced multiple challenges in implementing the innovation. From the start, with the expansion of beneficiaries, they had far fewer staff than needed in place to handle the number of members who were eligible for the intervention. Since the start of the innovation, Children's Hospital had challenges in staffing. With more beneficiaries to serve, Children's Hospital had far fewer staff than necessary to meet the demands of the influx of new members eligible for the innovation. Staffing shortages were further intensified when numerous CHNs took FMLA leave at various times during the innovation implementation. As discussed in the first annual report, understaffing was the primary reason for underspending. As of December 2014 (Q10), Children's Hospital spent 40.2 percent of its Year 3 budget, which is below the projected target. Children's Hospital received approval for carryover funds in March 2014 to use unspent funds to hire additional CHNs. In Q10, Children's Hospital reported that two additional staff were hired and project management was working on hiring three temporary CHNs for the remainder of the grant period.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Leadership

The Children's Hospital program manager (PM) worked with the organization before this innovation began, and her dedication as a program leader was evident during the Year 1 site visits. She continued to be a strong champion of the innovation to date. She maintains responsibility for all management, implementation, and reporting aspects of the innovation. The CCHP vice president is technically the project director (PD); however, neither he nor other organizational leaders were involved in the day-to-day implementation of the innovation.

One main lesson learned emerged in the Children's Hospital key informant interview regarding leadership support from CMS; this insight could have been provided to the innovation in its infancy to help better prepare them for implementation:

> *"It would have been helpful to have our current project officer [CMS PO] the whole time or had RTI onboard from the time we were awarded the grant because both parties offered us valuable insight related to evaluation of health-related programs and interventions. So I almost feel like we were the blind leading the blind and while there may have been threads of commonality among HCIA awardees, they were all very different and it didn't work to clump us all together. Having RTI on board would have increased efficiency."*

Children's Hospital would have liked the opportunity to refine self-monitoring measures, which were continually rejected by the previous CMS PO. The PO assigned to Children's Hospital in Year 3 has a better understanding of the project and helped establish self-monitoring measures to better evaluate the work they are doing. The Children's Hospital team valued the PO's systematic guidance and technical assistance; one interviewee stated:

"It would have been beneficial to have project officer site visit within the first 6 months because it was hard to work over the phone with CMS and Rand and RTI and Lewin. It's not the same as in person. We would have accomplished more and been more efficient if we had worked with a seasoned project officer from the start. But round two awardees are benefitting from that learning."

Organizational Capacity

From the start, Children's Hospital did not anticipate the extent of effort it would need to devote to this innovation. It only allocated one staff member to lead the project and had no data support specific to the program because it did not anticipate the amount of support, supervision, and flexibility required to manage the CHNs' daily activities. The CHNs' jobs were new in this structure, and it took time to recruit and orient new staff after new positions were approved. Those who were hired tended to represent the target population of Medicaid recipients and many had never held a position like the CHN role (e.g., working regular work hours, working at desk). Therefore, they required more daily supervision and more feedback than expected from the PM to conduct their work efficiently—and as stated in the first annual report, the CHNs were moved from various locations to the main office so that the PM could work with them directly.

The PM was the only project staff member responsible for working with (1) external stakeholders to define self-monitoring measures and reporting, (2) front-line staff management, and (3) implementation of program activities. These capacity shortfalls affected Children's Hospital's ability to respond to requests from both CMS and the evaluator. In addition to understaffing, CCHP grew immensely as a health insurer after one Medicaid HMO left the local market. Most notably, the upsurge in membership affected the number of potential members who could be served each month, yet the number of staff allocated for the innovation could not change. Quarterly reports from Children's Hospital cited many members on the 2+ED list that Children's Hospital was either unable to locate or simply did not have the capacity to contact. In Q10 more than half of the 29,969 members on the 2+ED list were not contacted. Another capacity issue was managing their data for the program. The program used the existing data specialist (who did analyses for this innovation in addition to her other responsibilities)—so she had very limited time to focus on these data and provide them to RTI for the evaluation.

Inadequate CHN capabilities and the resignation of the first NN undermined the capacity of Children's Hospital to execute the innovation. The care management outreach coordinator (CMOC) position was created in Q8 to increase capacity to engage health plan members and families. Subsequently, the numbers of members located and initiated into the program steadily increased from the 834 enrolled since inception to 1,425.

In the *Q10 Narrative Progress Report* and key informant interview, Children's Hospital reported a significant change that impacted the organization's capacity. The CMS-appointed PO for Children's Hospital changed two times in Year 3 of the innovation. Children's Hospital stated that the current PO has a great understanding of the innovation; she helped the PM update the self-monitoring measures and make changes to increase recruitment success. In the Q10 report, Children's Hospital noted that the

guidance of the CMS PO was a welcome relief and helped increase capacity to meet the innovation's goals.

Innovation Adoption and Workflow Integration

In Q10 Children's Hospital reported that the innovation was adopted into the CCHP and the current staff will remain employed by the health plan after June 30, 2015. They further noted that the health plan adjusted its finances to incorporate the cost for maintaining the staff into its administrative budget [facilitated by changes in the capitation and administration rates calculated in collaboration with DHS (State of Wisconsin Department of Health Services)]. Children's Hospital stated that the criteria for program inclusion will be revised because, as noted in the Q10 narrative report, "As a result of our expansive growth, the criteria of 2 or more ED visits in a 6-month look back is far more than we have the FTE [full-time equivalent] to reach."

As discussed in ***Section 1.1.1***, the workflow of the CHNs and NN changed slightly because the NN no longer had her own separate caseload but works in support of the CHNs. Based on the needs of the member, the NN will accompany the CHNs on their home visits to provide care coordination and health education services. Interviewees mentioned a persistent challenge: Children's Hospital is an insurance company, not a health care provider, which greatly impacts workflow in ensuring that its members are ultimately seen by a health care provider. In the Q10 Awardee Performance Report Children's Hospital states:

> "*The final barrier we face is that we are a health insurer, and not a health care provider. Despite our best efforts to educate families about alternatives to utilizing the ED, if families can't access alternatives to the ED, our efforts to empower and educate members about alternatives to the ED are in vain. We are at the mercy of the health care delivery in our community. In the past month, we've seen two urgent care clinics close and another reduce their hours. We would be naive to think these realities won't affect our outcomes as we strive to reduce ED utilization."*

Furthermore, when asked about additional stakeholders who would have been beneficial for implementation, the key informant responded:

> *"It would have been nice to have some of our providers… and it's hard to say who, because we deal with provider agents… but an important component is accessibility to appointments at primary care so having someone from the provider's side and health care access side would have been helpful. That was a flaw that we didn't have resources or even a part-time dedicated person to work on that side, because everything we do is on the member/consumer side."*

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

In Year 3 of the innovation Children's Hospital continues to struggle with a shortage of staff by one to two FTEs. This shortage was further exacerbated by a number of staff who have taken extended family or medical leave or resigned to pursue other opportunities. Since the first annual report, two NNs (one full-time and one part-time) were hired and began work; however, the part-time NN resigned in the same quarter (Q8). Because Children's Hospital had such difficulty retaining NN positions, it evaluated the NN role and repositioned the NN as a supportive role for the CHNs. Q10 also included Thanksgiving and Christmas holidays when schools are out and staff traditionally take vacation, which added further to the staffing deficiencies.

Since the first annual report, no additional staff were hired until Q10, during which Children's Hospital reported that 1.0 FTE was hired and started work in late November 2014. Training was conducted for the rest of the quarter and the staff member participated in some home visits by the end of December. An additional 1.0 FTE was hired started work mid-January, which is technically Q11.

Staff stress and burnout were additional challenges. Children's Hospital explained that the CHNs had engaged more families; those on the monthly 2+ ER list (the call sheet CHNs use to reach out to members) were prioritized so that families with the highest need were placed at the top. Because the CHNs are not explicitly trained and do not have the skills to provide services to individuals with issues such as chronic mental health conditions and substance abuse histories, this capability may have added increased burden to a job that was already very demanding. When asked about plans to mitigate burnout among the CHNs, a key informant said that the HCIA summit was a resource in helping awardees learn methods used by others:

> *"One thing that I took away from the HCIA summit was the concept of providing support to community health workers or navigators. There's another awardee who recruits CHNs who are formerly homeless to do outreach to homeless populations and they do a monthly self-care or support group for the community health workers and we have tried to implement that here. I've used existing children's health care resources for staff, but everyone in health care is spread pretty thin these days. We are contracting with a PhD-level clinical therapist who works with staff providing home visits to vulnerable populations who will do monthly sessions with the community health workers."*

Skills, Knowledge, and Training

Between Q8 and Q10, Children's Hospital provided 15 hours of training to three administrative personnel. These training courses were provided in either an online or classroom format and covered the following topics: (1) reducing environmental triggers of asthma in the home; (2) healthy homes for community health workers; and (3) immunization

As noted during the site visit, no formal training was provided to the CHNs so they have no standardized way for offering services or approaching members during home visits. The initial set of CHNs hired had a 10-week training, which they reported during site visit interviews did not prepare them for field experience and conducting home visits. Likewise, CHNs hired since the first annual report (between Q8 and Q10) were not provided systematic training to develop the skills, knowledge, and training to carry out all of the demands of working with this high-need population. During a key informant interview RTI was informed that, "The staff has also grown in skill with letting the family lead with their needs and priorities. That's not something we can train them on, we can lay the groundwork but they have to learn that the families drive where the program takes them." If CHNs were trained systematically to work with this population that often has issues with drug abuse, domestic violence, food insecurity, and a range of chronic health issues, the CHNs could perhaps provide more effective services to clients while ensuring their own personal safety.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach) and (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

Reach

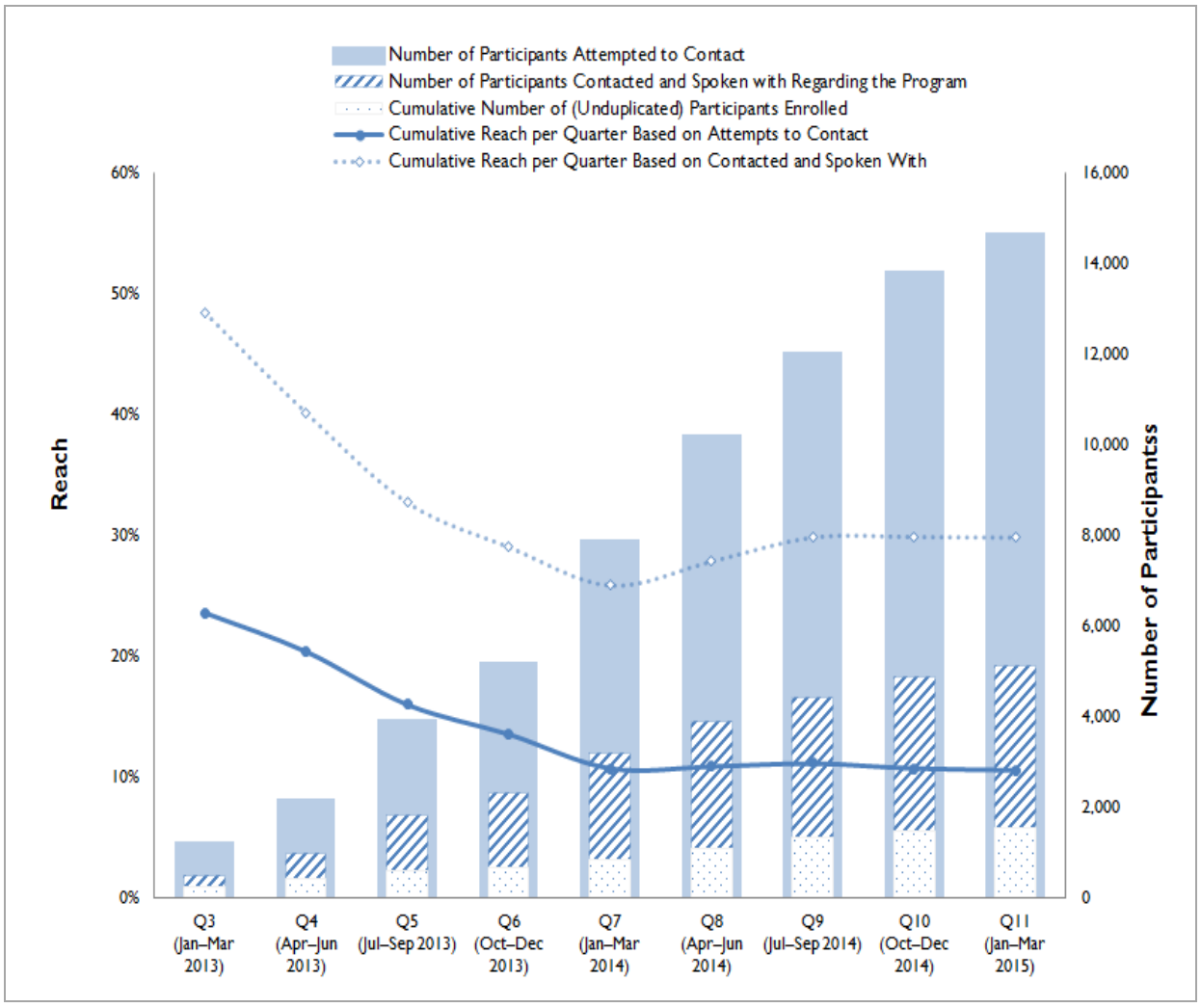
Figure 2 shows reach by quarter since the launch of the innovation, with reach as a percentage of the total number of members that the CHNs contacted and spoke to about the program (5,103). We included all participants who agreed to enroll in the program (1,522). We first reported reach in the Q4 report, based on data through Q8. Since that time, Children's Hospital enrolled an additional 437 patients in the innovation, increasing reach (based on participants contacted and spoken with) from 27.9 percent in Q8 to 29.8 percent in Q11.Reach among this target population declined from its highest level in Q3

(48.3%).We also reported reach (based on attempts to contact), which was fairly consistent from 10.6 percent in Q8 to 10.5 percent in Q11.

Reaching a large proportion of the population was difficult not only because of the staffing capacity but also because the Medicaid population is somewhat transient and their phone numbers change often. Patients that CHNs visited often had ongoing problems in their lives that were more important to address than the visit from the CHN. One CHN shared that she visited a home for the first time and found a single mother with three teenage boys and no food in the pantry. Food was their immediate need so she helped the mother to obtain food from a local charitable organization. Since so many potential patients were dealing with major challenges each day (e.g., unemployment, unstable housing), CHNs often had difficulty enlisting peoples' engagement in the innovation. As noted in the Q10 report, "One ongoing challenge is our ability to reach our members. Since we are not a health care provider, members don't come to us for care. We reach out to them initially via phone, and mail and drop-ins where we leave basic program information at the address we have on file for them in hopes they will contact us."

As noted in previous reports, the number of participants reported in the *Quarterly Awardee Performance Reports* differs from the number of participants reported in this annual report. This difference is because (1) Children's Hospital counts all patients as indirect participants because the hospital does not provide direct clinical care services; and (2) Children's Hospital counts patients served as all the family members in the household at the time of the first home visit and includes household members for all visits that occurred during the program. Therefore, the counts they provide in the *Quarterly Awardee Performance Report* and other data sources include household members for all visits that occurred during the program. RTI's calculation of reach includes only the qualifying members who actually enrolled in the innovation.

Figure 2. RTI's Estimate of Participant Enrollment and Reach (i.e., Contacted and Located) since Project Launch



(continued)

Figure 2. RTI's Estimate of Participant Enrollment and Reach (i.e., Contacted and Located) since Project Launch (continued)

	Quarter	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan–Mar 2015)
●	Cumulative reach per quarter based on attempts to contact	23.6	20.3	16.0	13.5	10.7	10.8	11.1	10.7	10.5
◊	Cumulative reach per quarter based on contacted and spoken with	48.3	40.1	32.7	29.0	25.9	27.9	29.8	29.9	29.8
	Number of participants attempted to contact	993	1,946	3,716	4,960	7,690	10,005	11,829	1,3591	1,4441
	Number of participants contacted and spoken with regarding the program	484	988	1815	2,308	3,177	3,895	4,398	4,860	5,103
	Cumulative number of (unduplicated) participants enrolled	234	396	593	670	822	1,085	1,312	1,452	1,522

Dose

For Care Links, members who could be located were first exposed to the program by a phone call from the CHN or CMOC inviting them to participate in the program. Many members could either not be located or the CHNs did not have time to call all those on the list. Once they contacted a member, s/he could decline to participate or agree to an initial home visit. Once they agreed to a home visit, they enrolled in the CHN program and would then be followed for three home visits. ***Table 5*** provides the number and percentage of participants enrolled by number of visits received through Q11. Among those initiating the program, through Q11, 15.4 percent of participants received one visit, 5.7 percent received two visits, and 38.5 percent received all three visits, as prescribed by the innovation.

We first reported dose in the Q4 report, based on data through Q8. As expected, the number of services provided increased from 834 in Q8 to 1,522 in Q11. As shown, more than 40 percent of the respondents who enrolled initially in the program did not receive a home visit. This may be because although they agree to participate in the program, they could not be located or were not present for the scheduled first visit. A barrier to follow-up is that patients move and cannot be located, lose interest in the program, or have other issues that take priority over their participation. An interviewee expounded about how the members' transitory life situations can impact the reach and dose numbers: "Their lives can change so quickly. We may be there today and they may acknowledge that this time next week is good, but if they get an eviction notice, we aren't a priority."

Table 5. Number and Percentage of Participants by Number of Home Visits Received

Number of Home Visits	Number of Participants	Percentage of Total Enrolled Participants[1] (n=1,522)
0 visit (lost to follow-up)	615	40.4
1 visit	234	15.4
2 visits	87	5.7
3 visits	586	38.5
Total	1,522	100.0

Source: Patient-level data provided to RTI by Children's Hospital.
[1] Enrolled = those contacted who agreed to participate.

Sustainability

In terms of sustainability, Children's Hospital reported in Q10 that it intended to maintain the current staff of the innovation as employees of the health plan after June 30, 2015.Children's Hospital reported that it will likely revise the criteria for program inclusion after the funding period because the current 2+ ED visit is no longer feasible since the health plan had an unexpected growth of more than three times the members it had prior to the start of the HCIA project. "We are in the process of looking at the needs of our health plan and revamping the work that the staff does. Primarily because we have identified the barriers," reported a key informant.

The main barrier in identifying the target population was the state's change of vendors for the electronic health information exchange across all health care providers. Children's Hospital relied on each hospital to provide daily ED reports, which came in various formats (faxed, electronic) and had to be manually entered into the CCHP's utilization management software. In the future they intend to do this through claims records, stating, "The HNs' target population may change, but they will still have the same role in patient outreach and education… I'm still hopeful that something that tells us that our efforts have yielded some value in dollars and cents but I know it's not as simple. But maybe someday we can calculate how much money we saved, even if it's a small group of individuals."

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of Children's Hospital's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data Children's Hospital collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers essential to the evaluation of Children's Hospital's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 6 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of whether the payer specific data are presented in this annual report. The innovation only serves Medicaid patients; therefore, we do not present Medicare claims analyses.

Table 6. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	No	Yes
		Hospital unplanned readmissions rate	No	Yes
		ED visit rate	No	Yes
	Cost	Spending per patient	No	Yes
		Estimated cost savings	No	Yes

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions:

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?
- Do patients who receive all three homes visits have lower health care spending and utilization than those who receive one or two home visits?

Medicare Claims Analysis

The Children's Hospital innovation does not serve Medicare beneficiaries. Therefore, no Medicare claims analyses are included in this report.

Medicaid Claims Analysis

The primary source of Medicaid data for evaluating HCIA awardees is the Centers for Medicare & Medicaid Services Alpha-MAX data files. However, Alpha-MAX data are not yet available from Wisconsin during the innovation period. In addition, Children's Hospital includes only CCHP Medicaid managed care

recipients, and Medicaid Alpha-MAX data usually do not include claims information for Medicaid managed care enrollees. Therefore, claims analysis reported here use data directly provided by Children's Hospital. The innovation was launched in November 2012, and claims received represent data from first quarter 2011 to first quarter 2015. Children's Hospital provided data on total amount paid, encounter type, national place of service, and date of intake and discharge for each patient. We use those variables to construct the core four measures.

The claims analysis in this report includes the additional 902 patient identifiers provided by Children's Hospital on June 2015. The analysis focuses on patients who were in the 2+ ED list, and who were contacted and located (n=5,103). Of those, 3,581 declined services, and 1,522 initiated the program, i.e., were enrolled in Care Links. However, not all patients enrolled are receiving home visits. The claims analysis defines participants as those who received at least one home visit (n=907), and nonparticipants as those who declined services (n=3,581) or, despite agreeing to participate in Care Links, did not receive any home visit (n=615). It should be noted that we could not link all patient identifiers to the claims files provided. For the claims analysis, 531 patients are receiving at least one home visit, 283 patients are not receiving any home visit, and 1,788 patients have declined services. In addition to comparing Children's Hospital's innovation participants before and after implementation of the innovation, the claims analysis compares the four measures between groups of participants (treatment group) and nonparticipants (comparison group).

Comparison Groups

In the previous Q6 report, we defined the comparison group as those who did not receive any home visit. For this annual report we expand the comparison group to also include those who declined services. The reason for this expansion is fourfold. First, those who did not receive any visits were similar in observable characteristics (age, gender, race, and spending and health care utilization for the quarter when patients are selected into the 2+ ED list) to those who declined services. In addition, the full comparison group was similar in those observable characteristics to the treatment group. This approach might suffer from selection bias issues that are not controlled for in the analysis if the probability of declining services is correlated with the outcome variables of interest. However, similarly, the probability of not receiving any home visit could also be correlated with the outcome measures.

Second, the fact that those who declined services were originally selected as part of the prioritization process created by the awardee, which defines those in greatest need of CHN support, is also reassuring that those who declined services are clinically similar to those who received no home visit. Third, even though those who did not receive any home visit had initially agreed to participate in the intervention, the reasons for which they were never reached might be similar to those who declined services when the navigator first called. Members who agreed to participate but did not receive any home visit may not have been at home at the agreed appointment time or simply did not answer the door. This is very similar to declining services. Lastly, by also including those who declined services, we increase the comparison group sample size considerably (1,788 vs. 283).Therefore, the claim analysis compares

those who received at least one home visit to those who declined or accepted but did not receive any visit.

Descriptive Analysis

In this section we present summary statistics for the four core measures. Note that claims data were missing in several quarters for some beneficiaries. Missing claims can occur because patients were not enrolled in Medicaid or no spending occurred for those enrolled. To partially address this issue, we assume that a missing claim has a zero payment if the patient had a non-missing claim before and after the quarter where the claim is missing. For other quarters, we assumed a missing value (e.g., not enrolled). This approach can underestimate spending if the patient used services that were paid through other means, such as out-of-pocket or other insurance. To fully address this point, we would need information on Medicaid enrollment for each quarter from Children's Hospital or the state Medicaid program.

Table 7 reports Medicaid spending per patient in the eight quarters before and the eight quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 7. Medicaid Spending per Patient: Children's Hospital

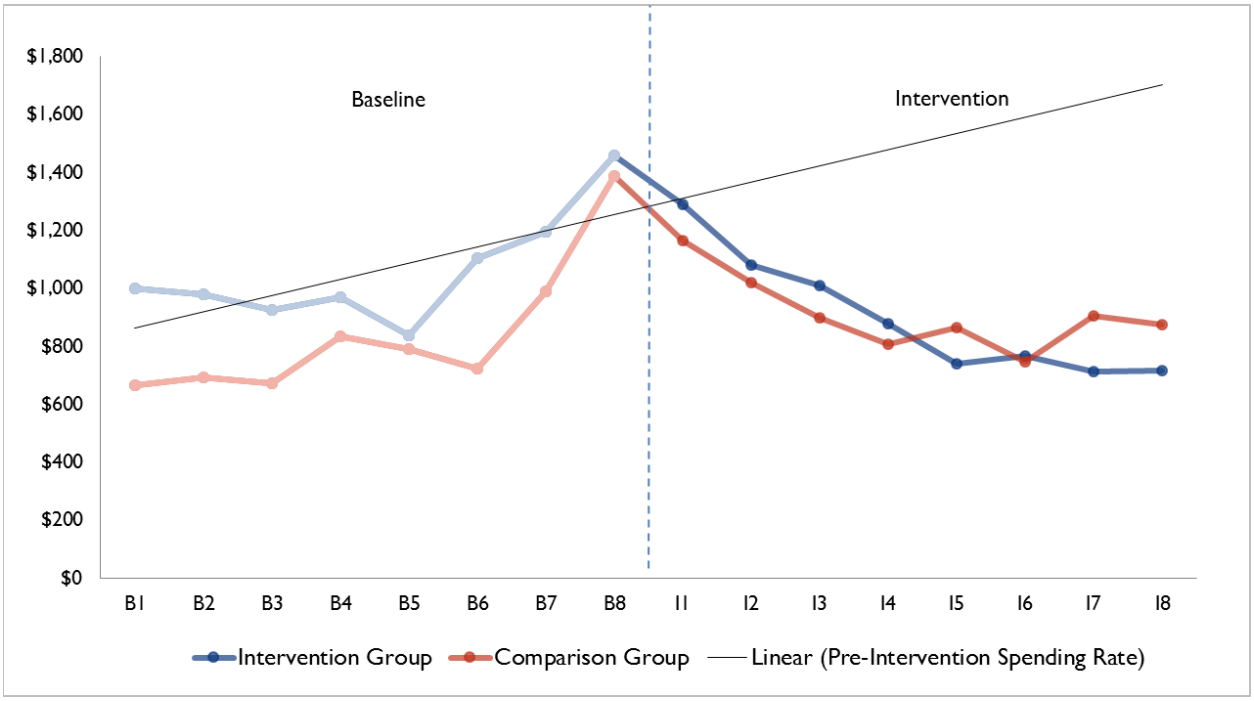
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 330974	Children's Hospital																
	Spending rate	$999	$981	$925	$972	$839	$1,103	$1,196	$1,460	$1,289	$1,082	$1,009	$880	$740	$767	$713	$718
	Std dev	$3,533	$2,032	$1,730	$2,008	$1,370	$2,379	$2,722	$3,325	$2,609	$2,066	$2,330	$1,621	$1,415	$1,294	$973	$1,093
	Unique patients	163	192	246	313	376	441	500	531	514	439	311	217	149	110	69	40
Comparison Groups																	
1C1CMS 330974	Children's Hospital																
	Spending rate	$668	$694	$672	$835	$792	$725	$991	$1,389	$1,166	$1,020	$900	$807	$867	$748	$908	$877
	Std dev	$1,483	$1,767	$1,538	$2,699	$1,883	$1,652	$3,409	$4,445	$4,299	$4,335	$3,678	$1,978	$2,582	$2,004	$5,590	$2,427
	Unique patients	564	671	825	1,042	1,334	1,647	1,924	2,071	1,943	1,711	1,400	1,065	623	376	187	74
Savings per Patient		−$332	−$287	−$253	−$137	−$47	−$379	−$206	−$70	−$123	−$62	−$109	−$73	$127	−$19	$194	$159

Source: RTI analysis of managed care claims data provided by Children's Hospital.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 3 illustrates the Medicaid spending per beneficiary in Table 7 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 3. Medicaid Spending per Patient: Children's Hospital



Source: RTI analysis of managed care claims data provided by Children's Hospital.

As shown by the pre-innovation trend line for participants, health care spending increases prior to enrollment. Spending patterns for both groups are similar before the intervention. Both groups' spending spikes at baseline quarter 8 (B8). This spike occurred because, to be eligible for the intervention, patients must have had two ED visits in the prior 6 months. In addition to the ED visit, patients might have had other health care expenses related to the condition that led them to the ED, which contributed to the spike. After intervention quarter 1 (I1), both groups' spending rate decreases to levels below the pre-intervention trend line: the comparison group has lower spending up to I4, and higher spending afterward. However, the standard deviation in spending is high for both groups, as shown in Table 7. The regression analysis in the next section assesses the impact of the innovation on the difference in spending between the treatment and comparison groups.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 8*** and ***Figure 4***.

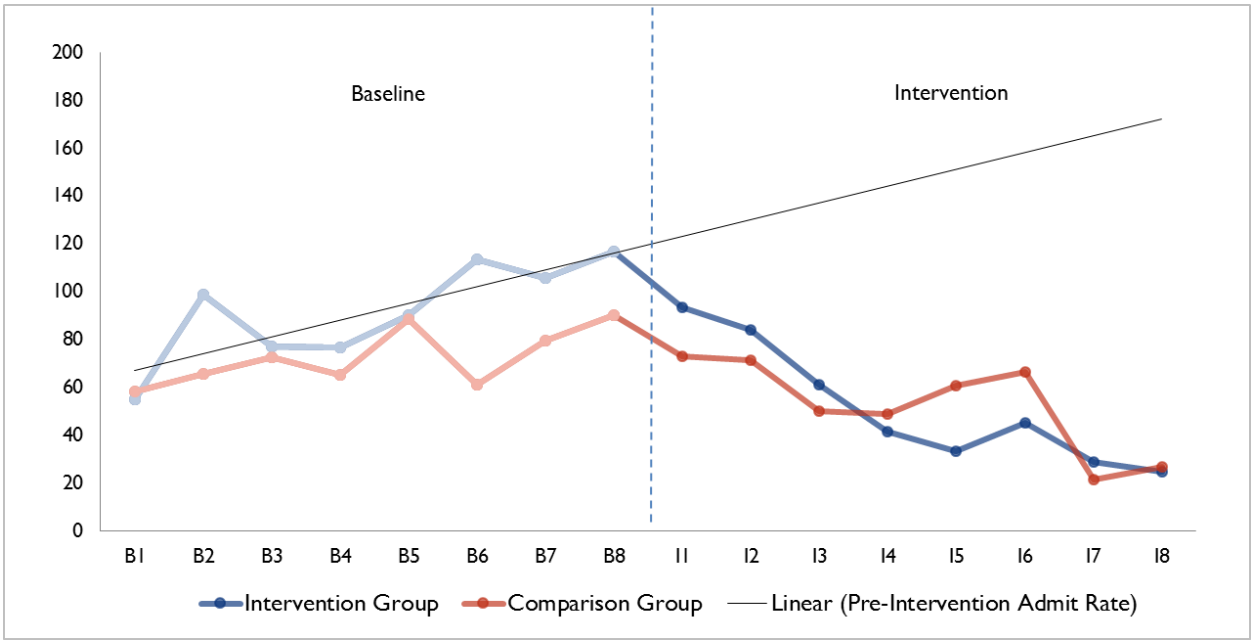
Table 8. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Children's Hospital

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 330974	Children's Hospital																
	Admit rate	55	99	77	77	90	113	106	117	93	84	61	41	34	45	29	25
	Std dev	278	363	310	300	305	382	414	497	368	294	289	222	181	209	169	158
	Unique patients	163	192	246	313	376	441	500	531	514	439	311	217	149	110	69	40
Comparison Group																	
1C1CMS 330974	Children's Hospital																
	Admit rate	59	66	73	65	88	61	80	90	73	71	50	49	61	66	21	27
	Std dev	257	282	278	303	319	271	322	407	325	350	296	259	310	377	145	163
	Unique patients	564	671	825	1,042	1,334	1,647	1,924	2,071	1,943	1,711	1,400	1,065	623	376	187	74
Intervention − Comparison Rate		−3	33	5	11	2	52	26	26	20	13	11	−7	−27	−21	8	−2

Source: RTI analysis of managed care claims data provided by Children's Hospital.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 4. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Children's Hospital



Source: RTI analysis of managed care claims data provided by Children's Hospital.

Inpatient admissions trend upward during the pre-intervention period. After the intervention began and up to I3, inpatient admissions decrease in a similar pattern for both groups. After I3, inpatient admissions fluctuates for both groups. However, they always remain below the pre-intervention trend. These results have a high degree of variability. We conducted a regression analysis to assess the impact of the innovation on inpatient admissions, discussed next.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 9*** and ***Figure 5***.

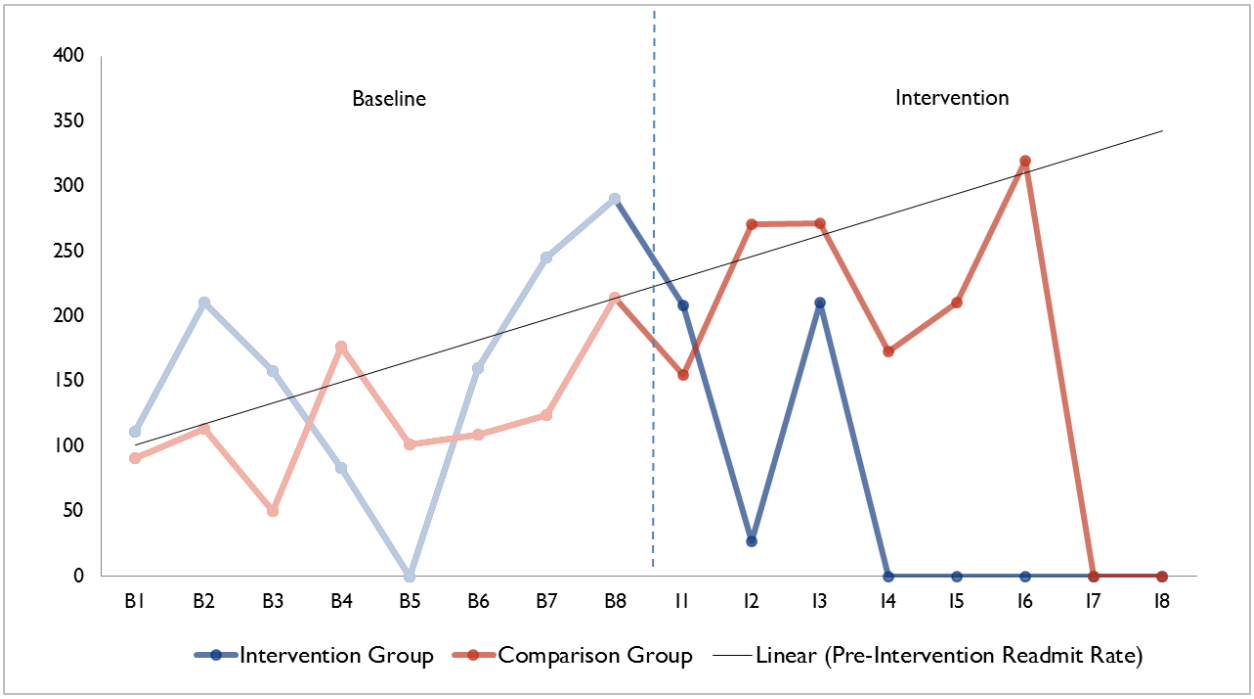
Table 9. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Children's Hospital

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 330974	Children's Hospital																
	Readmit rate	111	211	158	83	0	160	245	290	208	27	211	0	0	0	0	0
	Std dev	314	408	365	276	0	367	430	454	406	162	408	0	0	0	0	0
	Total admissions	9	19	19	24	34	50	53	62	48	37	19	9	5	5	2	1
Comparison Group																	
1C1CMS 330974	Children's Hospital																
	Readmit rate	91	114	50	176	102	109	124	214	155	270	271	173	211	320	0	0
	Std dev	287	317	218	381	302	312	330	410	362	444	445	378	408	466	0	0
	Total admissions	33	44	60	68	118	101	153	187	142	122	70	52	38	25	4	2
Intervention − Comparison Rate		20	97	108	−93	−102	51	121	76	53	−243	−61	−173	−211	−320	0	0

Source: RTI analysis of managed care claims data provided by Children's Hospital.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 5. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Children's Hospital



Source: RTI analysis of managed care claims data provided by Children's Hospital.

Readmissions rates are highly variable before and after enrollment. With few admissions (the denominator in the readmission rate) and a relatively low underlying percentage of readmissions, the readmission rate exhibits a high variance over time. After the intervention, readmissions for the intervention group appear to decrease to values below the comparison group and always below the pre-intervention trend line. As more beneficiaries enroll in the innovation and more claims data become available, the sample size will increase and the readmissions measure may be reported with more precision.

ED visits per 1,000 participants are shown in ***Table 10*** and ***Figure 6***.

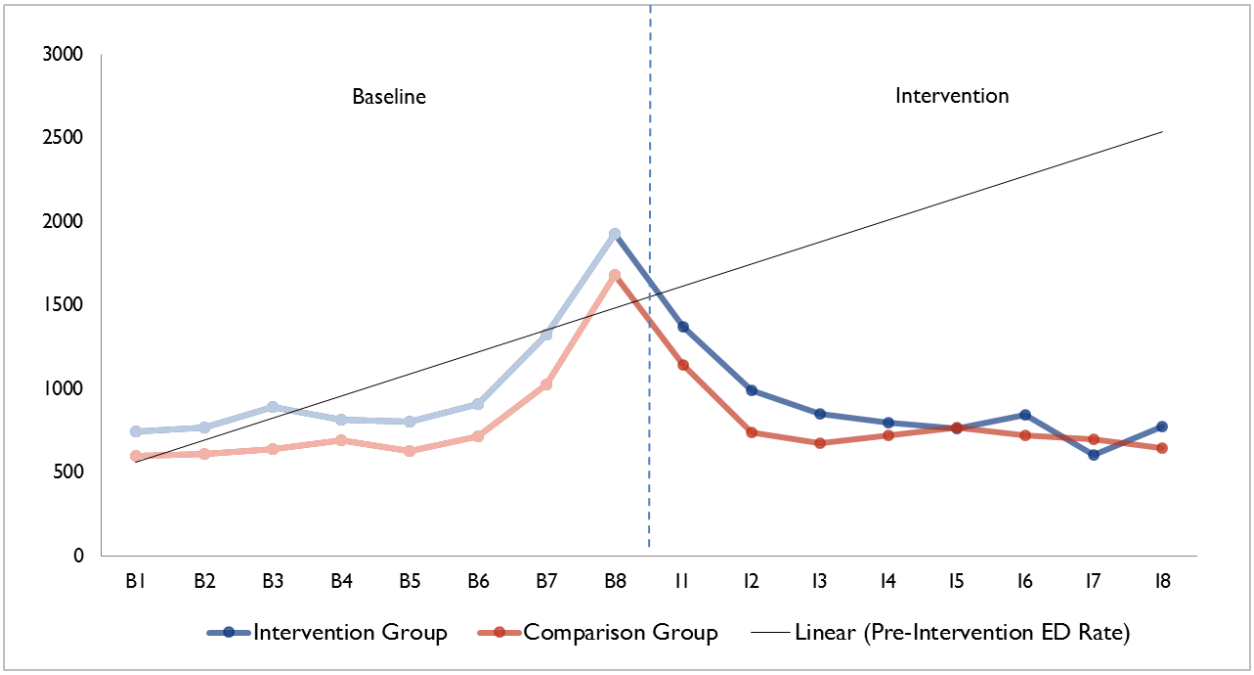
Table 10. ED Visits per 1,000 Participants: Children's Hospital

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 330974	Children's Hospital																
	ED rate	748	771	890	815	803	909	1,326	1,927	1,374	991	852	797	765	845	609	775
	Std dev	1,254	1,092	1,376	1,221	1,215	1,302	1,506	1,569	1,801	1,688	1,329	1,157	1,561	1,687	826	1,310
	Unique patients	163	192	246	313	376	441	500	531	514	439	311	217	149	110	69	40
Comparison Group																	
1C1CMS 330974	Children's Hospital																
	ED rate	599	610	642	697	629	720	1028	1683	1147	739	674	726	772	721	701	649
	Std dev	1,148	1,178	1,198	1,190	1,053	1,101	1,230	1,345	1,429	1,206	1,118	1,232	1,392	1,364	1,050	957
	Unique patients	564	671	825	1,042	1,334	1,647	1,924	2,071	1,943	1,711	1,400	1,065	623	376	187	74
Intervention − Comparison Rate		149	161	248	118	174	189	298	243	226	252	178	71	−7	125	−92	126

Source: RTI analysis of managed care claims data provided by Children's Hospital.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6. ED Visits per 1,000 Participants: Children's Hospital



Source: RTI analysis of managed care claims data provided by Children's Hospital.

Outpatient ED visits trend upward during the pre-intervention period mainly due to the high peak of ED visits in B8 for both intervention and comparison groups. To be part of the innovation, a patient must have had two ED visits in the 6 months prior to the intervention, which explains the spike in B8. After I1, both intervention and comparison groups show a decrease in the number of ED visits to values below the pre-intervention trend line. The less stable pattern after I6 for the intervention group is related to a reduced sample size. Regression results in the next section assess whether quarterly differences in ED visit rates between the treatment and comparison groups are impacted by the intervention.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit. We also estimated the impact of completing the intervention versus partially completing the intervention on those three measures. We defined treatment completers as those who received all three home visits, and partial completers as those who received one or two home visits. Of the 531 patients in the treatment group, 314 received all three home visits and 217 received one or two home visits. Although the CHN identifies the patient's most critical needs in the first visit, the second, and particularly, the third visits are more targeted at the patient's needs. This analysis assesses whether receiving all three visits has a "dose effect," whereby those who have more support better manage their health conditions, which can then impact spending, hospitalization, and ED visits.

Table 11 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in

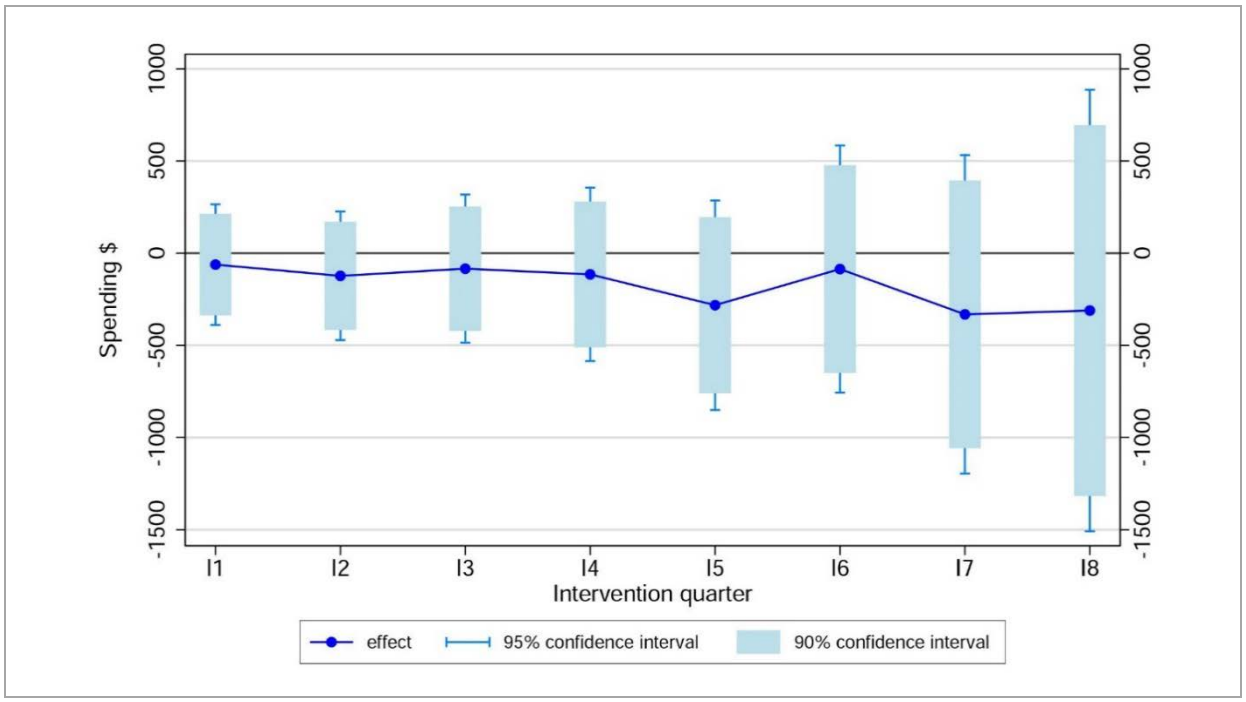
post-intervention quarters between the treatment and comparison groups. ***Figure 7*** illustrates these quarterly difference-in-differences estimates.

Table 11. Difference-In-Differences OLS Regression Estimates for Quarterly Medicaid Spending per Participant: Children's Hospital

Quarter	Coefficient	Standard Error	P-Values
I1	−62	167	0.711
I2	−123	178	0.489
I3	−84	205	0.681
I4	−115	240	0.632
I5	−282	290	0.331
I6	−86	342	0.802
I7	−332	441	0.452
I8	−311	611	0.611

Source: RTI analysis of managed care claims data provided by Children's Hospital.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for age, gender and race. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
OLS = ordinary least squares.

Figure 7. Difference-In-Differences OLS Regression Estimates for Quarterly Medicaid Spending per Participant: Children's Hospital

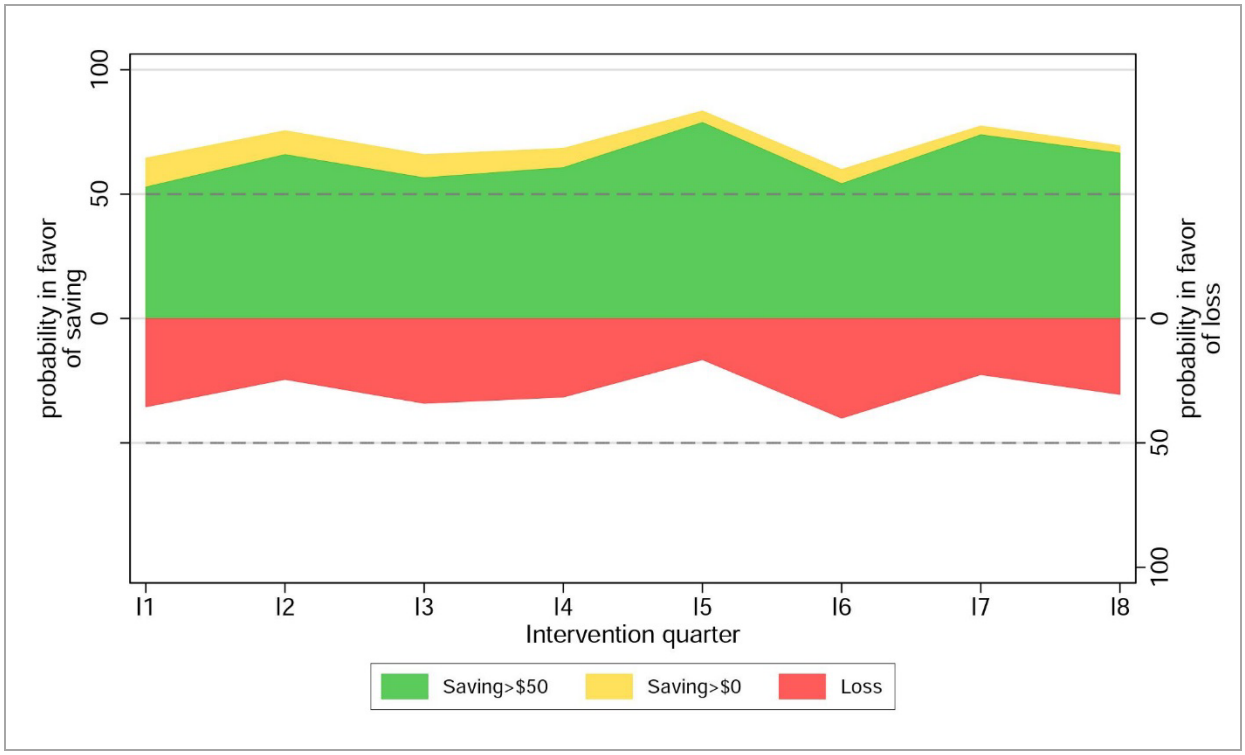


Source: RTI analysis of managed care claims data provided by Children's Hospital.
OLS = ordinary least squares.

Figure 7 shows that the change in spending among the treatment group was lower than the change in spending for comparison group individuals, for all intervention quarters. The largest difference was for intervention periods I4, I7, and I8, where the change in spending was on average $300 lower in the treatment group. However, differences in spending estimates were not statistically significant at conventional levels. Even though the lower spending among treatment group individuals was not statistically significant, the trend in the estimated quarterly spending differences suggests that the intervention might lead to long-term savings.

Figure 8 presents the strength of evidence in favor of a saving or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis. Figure 8 shows that there is a considerably higher probability that the intervention generates savings rather than losses throughout all intervention periods.

Figure 8. Quarterly Strength of Evidence in Favor of Savings/Loss: Children's Hospital



Source: RTI analysis of managed care claims data provided by Children's Hospital.

Table 12 presents the results of an OLS regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between treatment completers and the comparison group (panel A), and partial completers and the comparison group (panel B). The last column tests whether there is a statistically significant difference between the coefficients for each treatment group within each quarter.

Table 12. Difference-In-Differences OLS Regression Estimates for Quarterly Medicaid Spending per Participant—Treatment Completers and Partial Completers: Children's Hospital

	A—Three Home Visits (Completers)			B— One or Two Home Visits (Partial Completers)			A vs B
Quarter	Coefficient	Standard Error	P-Values	Coefficient	Standard Error	P-Values	P-Values
I1	−142	209	0.495	51	244	0.834	0.522
I2	−259	222	0.242	73	262	0.782	0.305
I3	−165	260	0.526	26	297	0.929	0.610
I4	−250	299	0.403	83	358	0.818	0.455
I5	−434	359	0.226	−56	433	0.897	0.477
I6	−175	414	0.672	50	518	0.923	0.717
I7	−507	521	0.330	−25	678	0.970	0.543
I8	−297	721	0.681	−349	882	0.692	0.959

Source: RTI analysis of managed care claims data provided by Children's Hospital.
Notes: The regression coefficients are the quarterly difference-in-differences estimates for each treatment group (completers and partial completers). Besides the intervention quarters, the regression controls for age, gender and race. The difference-in-differences specification also controls for fixed differences between the two treatment groups and control group, and for quarterly effects that have the same impact on treatment completers, partial completers, and control groups.
OLS = ordinary least squares.

The results in Table 12 show that the change in spending among those who completed the intervention is much lower than for partial completers. Although the trend for completers shows consistent savings, that trend does not occur for partial completers. The quarterly changes are not statistically significant for both groups, and the coefficients of the two treatment groups are not significantly different from each other for all quarters. Despite the lack of statistical significance, the results suggest that the downward trend on spending was driven by those who completed the intervention.

Table 13 presents the overall weighted average treatment effect on spending per member per quarter during the intervention period for the full treatment group, completers only, and partial completers only, as compared to their matched comparison group. The table shows the differential spending per quarter in the post-intervention period between each treatment group and comparison group individuals, on average, weighted by the number of intervention beneficiaries in each quarter.

Table 13. Weighted average spending differential per member per quarter-Full Treatment, Treatment Completers and Partial Completers: Children's Hospital

Treatment group	Average	Standard Error	P-Values
Full treatment	−121	105	0.247
Treatment completers	−231	130	0.077
Partial completers	37	153	0.811

Source: RTI analysis of managed care claims data provided by Children's Hospital.
Notes: The average is the sum of the weighted quarterly difference-in-differences estimates in the intervention period.

The weighted average quarterly spending differential in the post-innovation period indicates savings of $121 (90% CI: −$294, $52) and $231 (90% CI: −$445, -$17) for the full treatment and treatment completers groups, respectively. This result is statistically significant at the 10% percent significance level for treatment completers. Partial completers show a loss of −$37 (90% CI: −$215, $289). The lack of savings for those who do not receive all home visits might be related to unobserved characteristics correlated with higher health care expenditures rather than not completing the intervention. Our results show that the innovation generates savings overall (although this effect is not statistically significant), and particularly when all three home visits are delivered (and this effect is statistically significant).

To estimate the impact of the innovation on inpatient admissions and outpatient emergency department visits, we chose between logistic regressions and a linear probability model. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the estimated effect.[3] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, linear probability model coefficients have often been empirically demonstrated to be consistent with marginal effects generated from nonlinear models.[4] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention), not just the direction of the effect.

Table 14. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: Children's Hospital

Quarter	Coefficient	Standard Error	P-Values
I1	0.00	0.01	0.790
I2	0.01	0.01	0.526
I3	−0.01	0.02	0.706
I4	−0.02	0.02	0.287
I5	−0.03	0.02	0.215
I6	−0.02	0.03	0.471
I7	0.00	0.03	0.896
I8	−0.02	0.05	0.740

Source: RTI analysis of managed care claims data provided by Children's Hospital.
NOTES: The linear probability model coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for age, gender and race. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.

[3]To obtain the correct effect, it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run, even when not competing with other users for computer resources.

[4]Angrist, J.D., and Pischke J.-S. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

In I3-I6 and I8, the intervention group has, on average, a 1 to 3 percentage point lower probability of inpatient hospital admissions than the comparison group (**Table 15**). There are no differences in hospital admissions for I1 and I7. None of the differences were statistically significant.

Table 15. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission—Treatment Completers and Partial Completers: Children's Hospital

	A—Three Home Visits (Completers)			B— One or Two Home Visits (Partial Completers)			A vs B
Quarter	Coefficient	Standard Error	P-Values	Coefficient	Standard Error	P-Values	P-Values
I1	−0.02	0.02	0.317	0.03	0.02	0.098	0.043
I2	−0.02	0.02	0.154	0.06	0.02	0.005	0.001
I3	−0.01	0.02	0.603	0.00	0.02	0.986	0.707
I4	−0.04	0.23	0.075	0.01	0.03	0.677	0.126
I5	−0.04	0.03	0.201	−0.02	0.03	0.611	0.653
I6	−0.01	0.03	0.681	−0.03	0.04	0.438	0.709
I7	−0.02	0.04	0.669	0.02	0.05	0.761	0.588
I8	0.00	0.06	0.937	−0.04	0.07	0.593	0.684

Source: RTI analysis of managed care claims data provided by Children's Hospital.
NOTES: The linear probability model coefficients are the quarterly difference-in-differences estimates for each treatment group (completers and partial completers). Besides the intervention quarters, the regression controls for age, gender and race. The difference-in-differences specification also controls for fixed differences between the two treatment groups and control group, and for quarterly effects that have the same impact on treatment completers, partial completers, and control groups.

Treatment completers have up to a 4 percentage point lower probability of inpatient hospital admissions than the comparison group, a difference that is statistically significant at the 10 percent significance level for I4. Partial completers show no evidence of a pattern of reduction in inpatient hospital admissions. Partial completers have a 6 percentage point higher probability of inpatient admissions at I2, a result that is statistically significant. When we compared the coefficients of the two treatment groups, we found the reduction in the number of inpatient admissions for completers is statistically different from the increase in the number of admissions for partial completers for I1 and I2.

Table 16. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: Children's Hospital

Quarter	Coefficient	Standard Error	P-Values
I1	−0.02	0.03	0.534
I2	−0.02	0.03	0.476
I3	−0.02	0.03	0.526
I4	−0.02	0.04	0.515
I5	−0.08	0.04	0.065
I6	0.01	0.05	0.790
I7	−0.04	0.07	0.572
I8	−0.02	0.09	0.796

Source: RTI analysis of managed care claims data provided by Children's Hospital.
NOTES: The linear probability model coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for age, gender and race. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.

With the exception of intervention period I6, treatment group patients have a lower probability of ED visits than comparison group patients (***Table 16***). Those participating in the innovation have a 2 to 8 percentage point lower probability of ED visits than those not participating in the innovation. However, none of those differences are statistically significant. We will estimate the impact on number of ED visits in later innovation quarters in future reports as more claims data become available.

Table 17. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit—Treatment Completers vs. Partial Completers: Children's Hospital

	A—Three Home Visits (Completers)			B— One or Two Home Visits (Partial Completers)			A vs B
Quarter	Coefficient	Standard Error	P-Values	Coefficient	Standard Error	P-Values	P-Values
I1	0.00	0.03	0.951	−0.04	0.04	0.341	0.468
I2	−0.02	0.03	0.504	−0.01	0.04	0.731	0.857
I3	0.02	0.04	0.496	−0.08	0.05	0.066	0.054
I4	−0.04	0.05	0.358	0.00	0.05	0.931	0.491
I5	−0.06	0.05	0.292	−0.12	0.07	0.078	0.469
I6	−0.02	0.06	0.735	0.08	0.08	0.331	0.300
I7	−0.07	0.08	0.410	0.02	0.10	0.847	0.479
I8	0.02	0.11	0.856	−0.09	0.13	0.487	0.465

Source: RTI analysis of managed care claims data provided by Children's Hospital.
NOTES: The linear probability model coefficients are the quarterly difference-in-differences estimates for each treatment group (completers and partial completers). Besides the intervention quarters, the regression controls for age, gender and race. The difference-in-differences specification also controls for fixed differences between the two treatment groups and control group, and for quarterly effects that have the same impact on treatment completers, partial completers, and control groups.

The decreasing trend in the number of ED visits for the full treatment group cannot be attributed to completers or noncompleters only. Treatment completers have 2, 4, 6, 2, and 7 percentage point lower probabilities of ED visits than the comparison group for I2, I4, I5, I6, and I7, respectively. A 2 percentage point increase occurs in the probability of ED visits for I3 and I8. However, no difference is statistically significant. Partial completers have 4, 1, 8, 12, and 9 percentage point lower probabilities of ED visits than the comparison group for I1, I2, I3, I5, and I8, respectively. An 8 and a 2 percentage point higher probabilities of ED visits occur for I6 and I7. The reduction in ED visits is statistically significant at the 10 percent significance level for I3 and I5, but not statistically significant for all the other quarters. When we compared the coefficients of the two treatment groups, we found that the reduction in the probability of ED visits for partial completers is statistically different from the increase in the probability of ED visits for completers for I3.

Discussion

The trend in the estimated quarterly spending differences for innovation participants suggests that the intervention might lead to long-term savings; however, this result was not statistically significant at conventional significance levels. Our results show that the downward spending trend was driven by those who received all three home visits. We found nonstatistically significant savings of $121 per member per quarter for all members, and statistically significant savings of $231 per member per quarter for those who received all home visits. For health care utilization, our results suggest a weak pattern of lower inpatient admissions and ED visits for participants; however, results were not statistically significant. We observed a dose effect for inpatient admissions: those who received all three home visits had a reduced probability of admissions, while those who received only one or two visits did not have reduced probability of inpatient hospital admissions. This dose effect was not observed for ED visits.

These results may not be fully representative of the overall population served by the innovation. The results presented here are only for patients whose ID could be matched to the claims file, which represents 59 percent of the overall population reached by the innovation.

1.3.3 Other Awardee-Specific Data

We received limited patient-level data (from Children's Hospital) used to generate each measure listed in Tables 4 and 18 for each quarter through Q11 (March 31, 2015). ***Table 18*** lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. Given the very small number of enrolled participants for which each respective measure was applicable (range n=3 to n=29), we decided not to include these data in this report because we would not be able to draw any conclusions regarding the clinical effectiveness of care provided to participants based on such a small number.

Table 18. Awardee-Specific Outcome Measure

Evaluation Domains	Subdomains	Measure	Status
Clinical Effectiveness	Timeliness of care	At least one primary care visit completed each year (HEDIS)	Data received from Children's Hospital
		Six well-child visits in the first 15 months of life (HEDIS)	Data received from Children's Hospital
		Well-child visits in the third, fourth, fifth, and sixth years of life (HEDIS)	Data received from Children's Hospital
	Vaccines	Childhood immunization status (HEDIS)	Data received from Children's Hospital
	Asthma	Use of appropriate medications for people with asthma (HEDIS)	Data received from Children's Hospital
	Efficiency	Referrals to community organizations/service agencies	Dropped; data unavailable

Children's Hospital = Children's Hospital and Health System; HEDIS = Healthcare Effectiveness Data and Information Set; Q = quarter.

Discussion of Other Awardee-Specific Findings

Given the limited amount of data provided regarding the clinical effectiveness measures, no data are presented. Therefore, we cannot make any conclusions regarding the impact of the innovation on the type of quality of health care services participants received.

1.4 Overall Program Effectiveness to Date

This annual report describes various implementation challenges and issues facing Children's Hospital as well as accomplishments to date. In this section we assess Children's Hospital's progress on achieving HCIA goals to date:

- **Smarter spending.** The results showed a downward trend in total health care spending. We found nonstatistically significant savings of $121 per member per quarter for all members, and statistically significant savings of $231 per member per quarter for those who received all home visits.

- **Better care.** We found a pattern of slightly lower inpatient admissions and ED visits for innovation participants, but the pattern was not statistically significant. A dose effect was observed for inpatient admissions: those who received all three home visits had a reduced probability of admissions, while those who received only one or two visits did not have a reduced probability of inpatient hospital admissions. This dose effect was not observed for ED visits.

  Reach (based on the number contacted and spoken with about the program) was 29.8 percent; a total of 1,522 participants enrolled in the innovation as of Q11.The number of services provided increased to 1,522 in Q11 from 834 in Q8. Among those initiating the program, through Q11, 15.5 percent of participants received one visit, 5.7 percent received two visits and 38.5 percent receiving the prescribed three visits.

- **Healthier people.** Given the small sample size of patients with health outcomes measures, no data are presented.

Children's Hospital encountered multiple challenges in implementing its innovation. Initial estimates of reach were calculated on the beneficiary population at the time of the application, which more than tripled within a year of the award because of circumstances outside Children's Hospital's control. The staffing plan was based on serving fewer patients and reaching a larger proportion of eligible patients than was possible with this unprecedented growth. The primary staff involved in the innovation had no experience implementing a patient navigation program so they had a steep learning curve in setting up the intervention. Throughout the innovation, Children's Hospital had challenges with hiring and retaining sufficient staff in both the CHN or NN roles. Children's Hospital provided initial training for the CHNs and NNs; however, no established continuing education or systematic method of training was put in place, which likely influenced the extent to which they could provide the best resources to patients. In the future, Children's Hospital plans to work with the National Community Health Worker Training Center at the Center for Community Health Development (within Texas A&M's Health Science Center) to provide a CHW 101 training In addition, the state of Wisconsin is developing a CHW apprenticeship program, which may provide additional training opportunities for staff.

In serving its population, Children's Hospital experienced challenges; for example, some people that the CHNs contacted were cautious or skeptical and did not believe their insurance company was calling to help them. The transient nature of the Medicaid population along with ongoing staffing shortages in the organization made the task of reaching a large population very difficult. However, initial findings show promising trends in that more home visits may impact health care utilization. As Children's Hospital continues to sustain its efforts, perhaps it will be able to demonstrate impacts on medical spending and ED visits based on CHNs' efforts.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

The Curators of the University of Missouri

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

The Curators of the University of Missouri

1.1 Introduction

The Curators of the University of Missouri (Curators) is an integrated health system in Columbia, Missouri. Curators was awarded $13,265,444 to support the Leveraging Information Technology to Guide High Tech, High Touch Care (LIGHT2) innovation. The innovation encompasses health information technology (health IT) implementation for providers and patients, analytics conducted by health information analysts (HIAs), and the use of nurse case managers (NCMs) to facilitate care coordination. Curators began enrolling patients into its innovation in February 2013 to achieve the following goals:

1. **Smarter spending.** Achieve a net savings of $17.7 million over the 3 years of the project.
2. **Better care.** Provide better care to patients through improved coordination and patient engagement.
3. **Healthier people**. Improve health through improved coordination processes to better manage chronic disease and provide appropriate preventive care services.

Table 2 provides a summary of changes that occurred with Curators during the third year of operations. These updates are based on a review of the Quarter 8 (Q8) to Q10 *Narrative Progress Reports; Quarterly Awardee Performance Reports*; secondary data submitted by Curators through March 31, 2015; and key informant interviews with Curators' leaders and staff conducted in April 2015.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	No major changes took place in the innovation components since the descriptions provided in the first annual report.[1]
Program Participant Characteristics	The distribution of patient characteristics remains the same as that reported in the first annual report. The majority (77.7%) were aged 45 or above; more than half (60.1%) were female. Most (85.8%) were white; approximately 11% were black. More than half (79.1%) were covered by Medicare or Medicare Advantage or were dually eligible; approximately one-fifth (18.1%) were covered by Medicaid.
Implementation Process	
Execution	Spending rates were less than 10% below projection, The innovation was also below capacity on staffing which may account for the lower spend rate.
Leadership	No changes occurred in leadership from descriptions provided in the first annual report. Curators has strong innovation and organizational leadership that support the innovation.

(continued)

Table 2 Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Implementation Process (continued)	
Organizational capacity	Curators lost some NCMs and did not replace them, which led to larger patient panels for the NCMs.
Innovation adoption and workflow	No changes occurred in the innovation adoption and workflow provided in the first annual report. The innovation was adopted and implemented in the Internal Medicine and Family Practice clinics at the University of Missouri.
Workforce Development	
Hiring/retention	Curators currently employs 22.27 total full-time equivalents (FTEs), which is below projection by 2.68 FTEs.
Training	As per the *Q10 Quarterly Awardee Performance Report,* Curators provided 1,225 cumulative trainees; 4,289 cumulative training hours.
Implementation Effectiveness	
Reach	No new patients enrolled in the innovation since Q4 (when a cohort of patients was enrolled), so cumulative reach remains at 100%.
	The percentage of patients registered to use the LIGHT[2] patient portal increased from 12.1% in Q7 to 23.1% in Q11.
Dose	Overall, approximately 73% of patients received at least one NCM service. A greater percentage of patients in Tiers 3 and 4 (96.6%) received services than did patients in Tiers 1 and 2 (69.2%).

Sources: *Q8-Q10 Narrative Progress Report*.
Q8-Q10 Quarterly Awardee Performance Report.
Patient-level data provided to RTI by Curators.
Key informant interviews conducted Feb–June 2015.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

FTE = full-time equivalent; NCM = nurse case manager; Q = quarter.

1.1.1 Innovation Components

This innovation consists of four components: (1) the LIGHT[2] suite of tools to aggregate electronic health record (EHR) data to generate and display population-based metrics and custom reports; (2) data analytics conducted by HIAs to monitor aggregate metrics and produce custom reports; (3) a patient portal that offers access to educational materials and allows patients to communicate with providers and NCMs for prescription refills and other needs; and (4) care coordination provided by the NCMs supported by the LIGHT[2] tools and data analytics. Since we provided details on these components in the first annual report, some system updates were put in place, but no major changes to these components were made.

The partner for this innovation, Cerner Corporation of North Kansas City, MO, and its role in the innovation, system management, administration, and health IT support remain unchanged.[1]

1.1.2 Program Participant Characteristics

Table 3 provides the demographic characteristics of all participants ever enrolled in the innovation. The program is a cohort study with recruitment frozen at 9,932 participants with the intent of tracking the progress of the innovation over time. Therefore, the distribution of patient characteristics is the same as that in the first annual report and will remain unchanged in subsequent reports. As shown in the table, half of participants (50.5%) were 45 to 74 years old, and more than half (60.1%) were female. A majority of participants (85.8%) were white, and approximately 11 percent were black. Most (79.1%) were covered by Medicare or Medicare Advantage or were eligible for both Medicare and Medicaid, and less than 20 percent were covered by Medicaid.

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Number of Participants	Percentage of Participants
Total	9,932	100.0
Age		
< 18	0	0.0
18–24	467	4.7
25–44	1,749	17.6
45–64	2,119	21.3
65–74	2,903	29.2
75–84	1,759	17.7
85+	934	9.4
Missing	1	0.1
Sex		
Female	5,966	60.1
Male	3,966	39.9
Missing	0	0.0
Race/ethnicity		
White	8,523	85.8
Black	1,092	11.0
Hispanic	35	0.4
Asian	87	0.9
American Indian or Alaska Native	35	0.4
Native Hawaiian or Other Pacific Islander	0	0.0

(continued)

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015 (continued)

Characteristic	Number of Participants	Percentage of Participants
Race/ethnicity (continued)		
Other	113	1.0
Missing/refused	47	0.5
Payer Category		
Dual	1,739	17.5
Medicaid	1,798	18.1
Medicare	5,433	54.7
Medicare Advantage	687	6.9
Other	0	0.0
Uninsured	0	0.0
Missing	275	2.8

Source: Patient-level data provided to RTI by Curators.

1.2 Implementation Progress

The first annual report (2014) described Curators' implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area. ***Table 4*** lists these measures and their status as of May 31, 2015.

This section presents Curators' process measures and a qualitative analysis of the factors that determined Curators' implementation progress. This analysis draws on patient-level data that Curators provided to RTI as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation Process	Workflow Integration	HCIA Provider Survey	Collected by RTI
	Provider satisfaction	HCIA Provider Survey	Collected by RTI
	Reach	Number/percentage of patients enrolled in the innovation	Data received from Curators
		Number/percentage of patients who enrolled in the patient portal	Data received from Curators
	Dose	Number and type of NCM services provided to patients	Data received from Curators

Curators = The Curators of the University of Missouri; HCIA = Health Care Innovation Awards; NCM = nurse case manager.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through Curators' *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include Curators' reports from Q8 through Q10 and interviews conducted in April 2015.

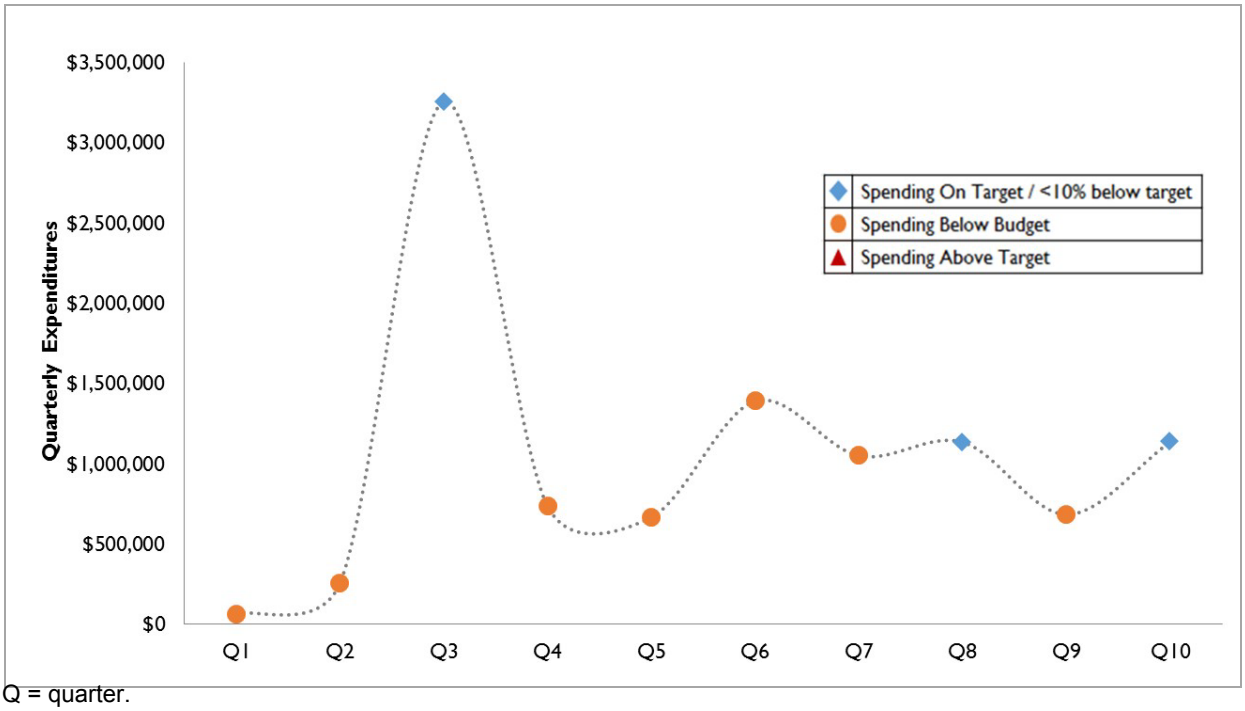
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?
- How has implementation of the innovation impacted provider workflow?
- How has implementation of the innovation impacted provider satisfaction?

Execution of Implementation

The annual report highlights the significance of Curators' expenditure rates on implementation. As of December 2014 (Q10), Curators spent 44.28 percent of its Year 3 budget, which is below the projected target. This slight underspending is likely because Curators is just below their projected staffing level (***Table 2***).

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Q = quarter.

Leadership

Project leadership remained constant since the first annual report. The project director developed a management structure that incorporated multiple stakeholders within the project team and at the University of Missouri Health System. The project director indicated that the University of Missouri health system "was very accommodating and invested in the project", as evidenced by the involvement of the chief clinical information officer in project activities. As more data became available, leadership focus shifted from implementation to sustainability and data analytics. Throughout the lifecycle of the project, there has been a growing organizational emphasis on integrating population health into operations, making LIGHT^2 a very high priority. University of Missouri and project leadership met to develop strategies and identify funding opportunities to continue innovation activities. Both project and University leadership found that LIGHT^2 was very informative in understanding how analytics and NCMs can influence care coordination practices. The University of Missouri's goal is now to integrate LIGHT^2 into the structure of their 10 clinics permanently.

Organizational Capacity

The organization experienced some structural changes since the first annual report. Three family medicine clinics were consolidated into one at the same time as the project experienced NCM turnover. Because of concerns about sustainability and the time and effort required for training, departing NCMs were not replaced, which led to larger patient panels for the remaining NCMs. One NCM indicated that, as a result of turnover, "They [innovation leadership] redistribute the work within the team because it's kind of hard to bring in someone new." Another noted that, "The majority of us have at least 500 patients. For the high acuity of all these patients, it's way too many for one person to manage and manage effectively."

As noted in the first annual report, each clinic uses the NCMs and incorporates them in the workflow differently. Efforts are under way for some standardization, but it has not yet occurred. Implementation varied across the 10 clinics due to previous experience with NCM, location of the clinic (urban versus rural), specialty (internal medicine versus family practice) and use of residents. During implementation, Curators divided patients into risk Tiers 1-4: Tier 1 was healthy patients and Tier 4 was the most medically complex. As NCM panels increased, Curators focused resources on higher-risk patients (Tiers 3 and 4) rather than the healthier Tier 1 and 2 patients. This change in patient focus was to help alleviate some of the burden on NCMs and to focus resources on the patients who would benefit the most from NCM services. The innovation's Hi-Touch leadership feels that this approach was beneficial, saying, "The NCMs are good at working with physicians to identify patients that need attention—actually seeing patients for the right reasons, patients with needs." However, they indicated they did not have a good way to measure whether patients in the lower tiers were using fewer resources.

Innovation Adoption and Workflow Integration

In last year's and this year's site visits, participants indicated that using reports, integrating NCMs, and signing people up for the portal varied across clinics. The organization and staffing of each clinic

varied, some focusing on internal medicine, while others on family medicine. Family medicine clinics have resident physicians who maintain their own patient panels while internal medicine clinics primarily have resident physicians who shadow attending physicians. Internal medicine clinics had experience with NCMs prior to the innovation and family medicine clinics did not. Where experience with NCMs was lacking, adoption was challenging. As one NCM explained, "When we first got there, nobody knew what to do with us. I think there needed to be more preparation of the doctors for our arrivals, and explanation of our role, etc. The first 6 months were rough. They didn't know what a RN v LPN is or they think we're going to take up their time or step on their toes. The control factor was big too. It took about a year before we were accepted and now it's taken off like wildfire."

The clinics also varied in setting and resources. Some clinics were located in urban settings closer to the hospital and tended to have more access to resources, such as social workers. Other clinics were in rural settings with fewer resources and patients with different health care needs. In these cases, NCMs took on more social service and financial planning tasks. NCMs indicated they would have benefitted from integration with these resources. As one NCM explained, "We're nurses and nurses know how to do tasks and be creative and be critical thinkers. But social workers are trained differently and financial people know different things." Thus, while the innovation promoted some clinical quality improvements, incorporating other related areas would have been useful. These factors all had implications for workflow and integration of the innovation into daily operations.

Provider Perceptions of Clinical Workflow and Satisfaction

Data on workflow integration and provider satisfaction with the innovation came from the RTI HCIA Provider Survey administered in spring 2015. Forty, or 54.8 percent, of Curators' eligible providers responded to the HCIA Provider Survey. The majority (95.0%) of providers were doctors of medicine (MD), while 5.0 percent were doctors of osteopathy, and they had been in practice an average of 11 years. The majority of responding providers specialized in family or internal medicine (92.5%) and practiced in an academic medical center (75.0%), a hospital-based practice (12.5%), or a group practice (10.0%). The full set of survey questions and answers summarized by awardee is available in ***Appendix C***.

For 6 of the 11 items regarding integrating LIGHT^2 into clinical workflow, the majority of Curators' providers indicated that the innovation resulted in no change in the amount of time spent on specific activities, including consulting with outside clinicians (85.0%), providing direct patient care (65.0%), planning practice-based interventions (57.5%), meeting with clinical staff (52.5%), looking up patient information in EHRs or other HIT systems (55.0%), and reviewing data on their practice population to identify additional needs (50.0%) (***Table 5***). For the remaining clinical workflow measures, the majority of providers indicated that implementing LIGHT^2 resulted less time spent on activities, such as communicating with patients via phone or email (42.5%), arranging clinical referrals and follow-up care (52.5%), arranging social service referrals (60.0%), and engaging in other care coordination activities (50.0%). Therefore, while some of the time spent coordinating services, referrals, and follow-up care was reduced due to the implementation of LIGHT^2, most providers did not note a change workflow in the time

spent providing patient care or reviewing patient data. These results are in line with site visit reports indicating that physician workflows largely did not change, except to delegate care coordination to the NCMs. In that sense, the physicians perceived a positive impact in workflow as they could devote more time to clinical activities. Physician and nonphysician stakeholders' perceptions were that the physician was not the central player in the innovation: the NCM was.

Regarding provider satisfaction, overall we found that almost all providers indicated they were satisfied with the innovation—over a third of providers indicated they were very satisfied with LIGHT^2 (35.0%) and a quarter indicated they were extremely satisfied with the innovation (25.0%). Only 2.5 percent of providers indicated that they were not at all satisfied with LIGHT^2. Regarding ease of use, approximately half of providers indicated that they found LIGHT^2 either very easy to use (20.0%) or somewhat easy to use (32.5%). Just under a third, or 30.0 percent, of providers indicated that LIGHT^2 was neither easy nor hard to use, and 7.5 percent found it somewhat hard to use.

Table 5. Summary of Clinical Care Workflow

Question	Percentage of Curators' Providers Indicating More Time	Percentage of Curators' Providers Indicating Less Time	Percentage of Curators' Providers Indicating No Change	Percentage of Curators' Providers Indicating Not Applicable/ Missing
Providing direct patient care	17.5 N=7	15.0 N=6	65.0 N=26	2.5 N=1
Communicating with patients by phone, email	32.5 N=13	42.5 N=17	22.5 N=9	2.5 N=1
Looking up patient information in EHRs or other health information systems	20.0 N=8	22.5 N=9	55.0 N=22	2.5 N=1
Looking up patient information in paper-based medical charts	5.0 N=2	32.5 N=13	15.0 N=6	47.5 N=19
Arranging clinical referrals and follow-up for patients	5.0 N=2	52.5 N=21	40.0 N=16	2.5 N=1
Arranging social service referrals for patients	5.0 N=2	60.0 N=24	27.5 N=11	7.5 N=3
Meeting with staff and clinicians in my practice	27.5 N=11	10.0 N=4	52.5 N=21	10.0 N=4
Consulting with clinicians outside of my practice	0.0 N=0	7.5 N=3	85.0 N=34	7.5 N=3
Engaging in other care coordination activities	12.5 N=5	50.0 N=20	32.5 N=13	5.0 N=2
Reviewing data on clinic practice population to identify individuals needing additional services	15.0 N=6	27.5 N=11	50.0 N=20	7.5 N=3
Planning practice-based (or community-based) interventions to address issues common to my practice population	10.0 N=4	20.0 N=8	57.5 N=23	12.5 N=5

EHR = electronic health record; N = number.

For the specific questions regarding provider satisfaction with LIGHT[2], the majority of providers either strongly agreed or somewhat agreed that they had been provided sufficient resources to interact with the innovation (70.0%), it was worthwhile to invest in the innovation (70.0%), their practice functions more efficiently with the innovation (65.0%), and the innovation saves them time (70.0%). In addition, 47.5 percent of providers strongly disagreed or somewhat disagreed that the added logistics required by the innovation was a burden (***Table 6***).

Table 6. Summary of Provider Satisfaction Measures

Question	Percentage of Curators' Providers Indicating Strongly Agree/Somewhat Agree	Percentage of Curators' Providers Indicating Strongly Disagree/ Somewhat Disagree	Percentage of Curators' Providers Indicating Neither Agree nor Disagree	Percentage of Curators' Providers Indicating Not Applicable/ Missing
Sufficient resources (e.g., support staff, time, training) have been provided for me to use/interact with the innovation.	70.0 N=28	17.5 N=7	10.0 N=4	2.5 N=1
Innovation produces financial benefits for my clinic or practice.	32.5 N=13	15.0 N=6	32.5 N=13	20.0 N=8
Investing in the innovation is worthwhile in terms of time, energy, and resources.	70.0 N=28	2.5 N=1	22.5 N=9	5.0 N=2
Sufficient technical IT support is available to operate the innovation.	37.5 N=15	12.5 N=5	42.5 N=17	7.5 N=3
Overall, my practice functions more efficiently with the innovation.	65.0 N=26	7.5 N=3	22.5 N=9	5.0 N=2
Innovation saves me time.	70.0 N=28	12.5 N=5	15.0 N=6	2.5 N=1
The added logistics required by the innovation is a burden on me and/or my staff.	22.5 N=9	47.5 N=19	27.5 N=11	2.5 N=1

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was understaffed with 22.27 full-time equivalent (FTE) staff members. Between Q8 (June 2014) and Q10, the number of FTEs decreased from 26.09 to 22.27, likely because of the decrease in number of NCMs. NCMs were hired with the understanding that this was a term position, and as the end of the funding period approached, they left for more stable employment opportunities. They were not replaced by project management because of the

uncertainty of the program past the end of the grant. Thus, NCMs currently handle larger patient panels. HIAs were also hired as term positions. Curators hired graduate students into these positions, most of whom left upon graduation to pursue full-time employment. This turnover impacted continuity of analytic work.

Skills, Knowledge, and Training

Between Q8 and Q10, Curators provided 1,257.25 hours of training to 418 individuals. The NCMs were the primary recipients of the training, which included adoption of LIGHT^2 tools, the ethics and future of health reform, dietary education, geriatric care management, and quality improvement (QI). The Tiger Institute also provided some training on SQL, Excel, and PowerInsight servers for the HIAs. Qualitative feedback from the site visit interviews indicates that, for the most part, training was helpful. Staff felt they had good resources such as email reminders and access to training opportunities and made suggestions and provided user feedback through team meetings. However, staff did identify some areas for improvement. Training focused on the mechanics of using tools and not on how to incorporate NCMs and the tools into clinical and administrative workflows. As one NCM said, “It would have been nice to have the doctors know about what we were there for. In the beginning we spent a lot of time educating them on our role. Now they find us but before we had to explain [what our role was]. Now the grant is almost over and I am concerned about the transition.” The physicians felt they had support with the EHR and provider dashboard. However, they were not trained to use the tools; the training was primarily informative and did not go into details. The NCMs felt they had to take on social work and mental health responsibilities but were not trained to provide them. The majority of the training was intended to familiarize staff with the tools and resources they would be required to use as part of their role on the innovation team.

Although HIAs received some in-person and online training through Blackboard, their ability to use the training was impacted by turnover. Because the position was new and the work largely focused on analytics, much of their training was on the job. In addition, innovation leadership indicated that they learned the importance of HIAs with clinical knowledge while working with the second group of HIAs and updated their hiring processes accordingly. Thus, the training needs changed slightly because the first HIAs were more technical whereas the second group, while still technical, had more clinical background. Curators developed system guides and documentation after the first wave of HIAs left, which assisted the second group.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation’s impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach); and (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

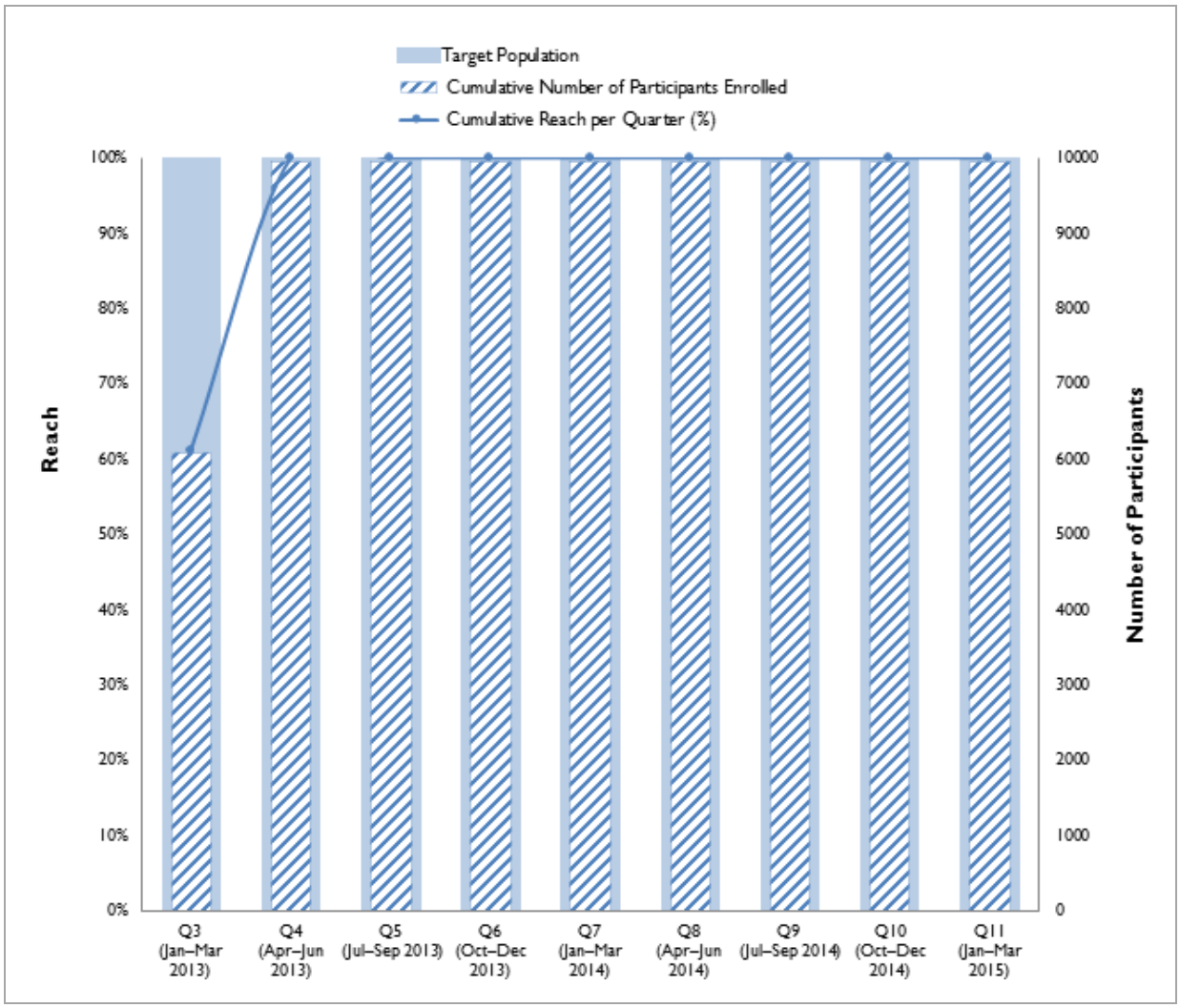
- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

Reach

Figure 2 shows reach by quarter since the launch of the innovation. We first reported reach in the first annual report, based on data through Q7. Since Curators enrolled a cohort by Q4, no additional patients enrolled in the innovation, so cumulative reach remains at 100 percent. Although not reflected in the figure, less than 5 percent of the cohort died or left the area.

The total number of enrolled participants reported in the *Quarterly Awardee Performance Reports* is consistent with the number of participants reported by RTI.

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch



(continued)

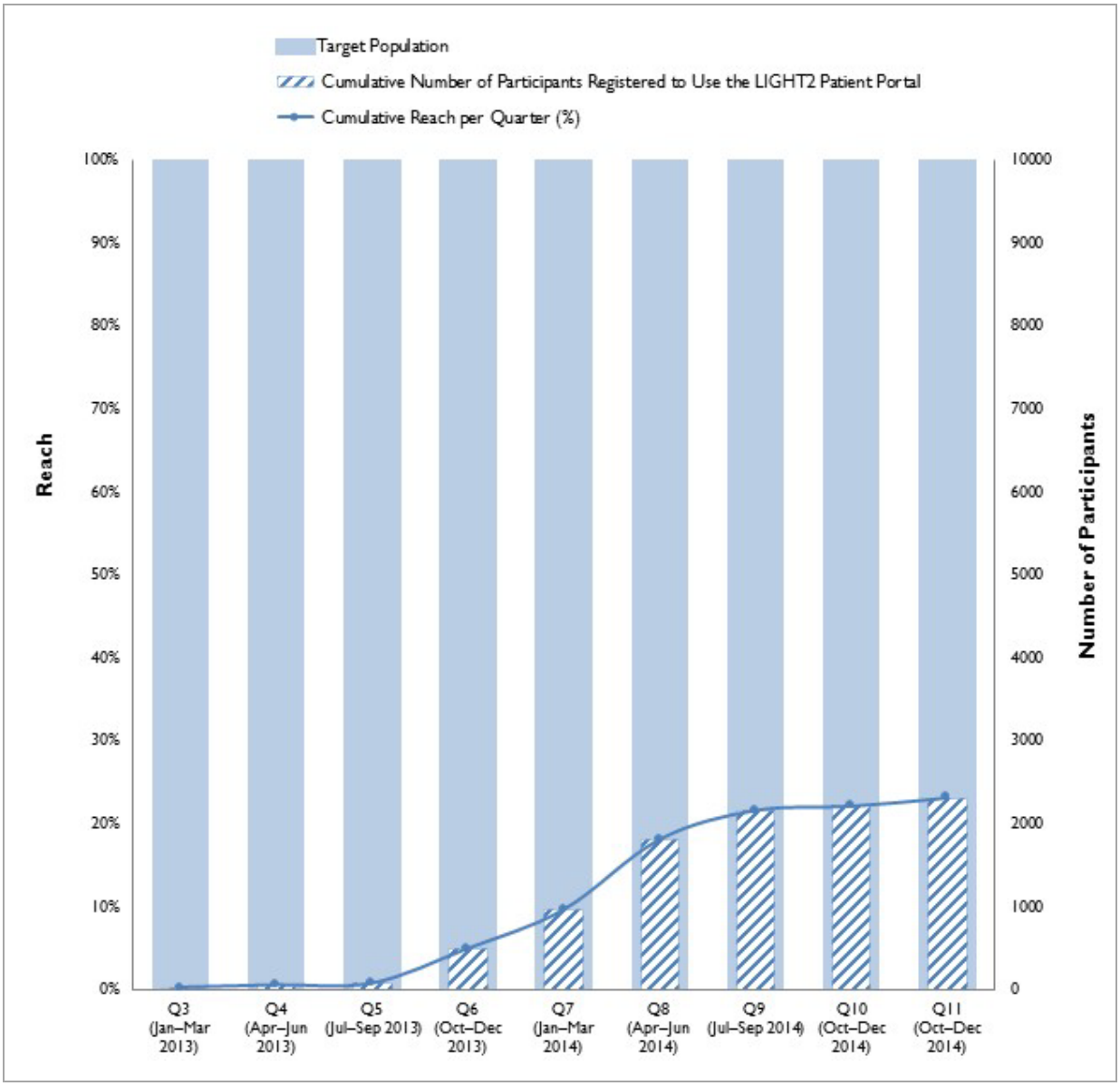
Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch (continued)

	Quarter	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan–Mar 2015)
•	Cumulative reach per quarter (%)	61.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Target population	9,932	9,932	9,932	9,932	9,932	9,932	9,932	9,932	9,932
	Cumulative number of participants enrolled	6,087	9,932	9,932	9,932	9,932	9,932	9,932	9,932	9,932

Source: Patient-level data provided to RTI by Curators.
Q = quarter.

Reach can also be assessed by the number of patients registered to use the LIGHT^2 patient portal. ***Figure 3*** shows reach as the number of patients registered for the patient portal by quarter since the launch of the innovation. We reported reach for patients registered for the patient portal in the first annual report, based on data through Q7. At that point, 12.2 percent of patients had registered to use the patient portal. That percentage nearly doubled to 23.1 percent by Q11. Although a relatively large increase took place over the past four quarters, registration in the portal is still relatively low. One reason is that, as staff indicated during the site visit, marketing the portal was less of a focus than building rapport and explaining the NCM function of the innovation. RTI previously requested information regarding portal usage such as login information and usage statistics, but were informed that these data were not available. Learning more about usage trends and statistics would provide a richer understanding of Curators' reach.

Figure 3. Participant Enrollment and Reach in Patient Portal Each Quarter since Project Launch



	Quarter	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan–Mar 2015)
•	Cumulative reach per quarter (%)	0.2	0.5	0.7	4.9	9.6	18.1	21.6	22.4	23.1
	Target population	9,932	9,932	9,932	9,932	9,932	9,932	9,932	9,932	9,932
	Cumulative number of participants registered to use the LIGHT2 patient portal	23	45	68	486	954	1,797	2,150	2,220	2,298

Source: Patient-level data provided to RTI by Curators.
Q = quarter.

Dose

Patients are divided into risk tiers: Tiers 1 and 2 include healthy patients without a chronic condition and patients with a stable chronic condition. Tiers 3 and 4 include the most complex patients, including those who had at least one hospitalization or multiple outpatient visits to ambulatory care. ***Table 7*** provides a list of NCM services and the number and percentage of patients who received each type of service for all patients, as well as for those in baseline risk Tiers 1 and 2 and those in baseline risk Tiers 3 and 4. As shown in the table, a greater percentage of patients in Tiers 3 and 4 (96.6%) received services than did patients in Tiers 1 and 2 (69.2%). The types of services received by a majority of those in Tiers 3 and 4 included assessment of their needs and goals, assistance with transitions, and a plan of care (i.e., 86.1%, 78%, and 74.4%, respectively).

As time passes, more patients within the cohort will be exposed to services as part of the innovation. Services have been prioritized for patients with more serious health care needs, which is why Tiers 3 and 4 have higher numbers. Services for lower tiers are primarily preventive, which means the outcomes may not be seen in the short term.

Table 7. Number and Types of Services Provided to Participants

	Number of Services Provided Across Patients					
	All Patients (N=9,932)		Tiers 1 and 2 (n=8,338)		Tiers 3 and 4 (n=1,588)	
Services	Number	Percent	Number	Percent	Number	Percent
Assess needs and goals	6,270	63.1	4,897	58.7	1,373	86.1
Communication between patients and NCMs	6,487	65.3	5,086	61.0	1,401	87.9
Community resources link	4,066	40.9	2,974	35.7	1,092	68.5
Facilitate transitions	4,344	43.7	3,101	37.2	1,243	78.0
Plan of care	4,885	49.2	3,699	44.4	1,186	74.4
Self-management support	4,292	43.2	3,155	37.8	1,137	71.3
Total	7,307	73.6	5,767	69.2	1,540	96.6

Source: Patient-level data provided to RTI by Curators.

Sustainability

Curators started focusing on sustainability in the midterm of the project cycle. There is no indication of a formal sustainability plan, but both project and organizational leadership indicated that discussions occurred about integrating the remaining NCMs in the organization in the future. The topics of discussion included financial, administrative, clinical, and administrative aspects of the transaction. Discussions included University of Missouri Health System (UMHS) leaders, LIGHT[2] representatives, the University Physicians Group (UP), and the General Internal Medicine (GIM) and Family and Community Medicine (FCM) departments. Details are still being finalized and will be addressed in the final report as

more information becomes available. Financial support will involve funding through (a) the University of Missouri Hospital, (b) GIM and FCM, (c) UP, (d) Medicare and Medicaid reimbursement, and (e) private payers.

In addition, leadership worked with Cerner to determine how to maintain the LIGHT^2 analysis tools used to support the NCMs' work. This is important because the NCMs use these tools to support their work. A transition plan is being developed so that an organizational team focused on population health management will maintain the tools.

The claims data analyses are also critically important in informing sustainability plans and evaluating the cost savings of the LIGHT^2 intervention. Thus, Curators is looking into developing additional partnerships to provide comprehensive claims data analyses, including customized queries.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of Curators' innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data Curators collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers essential to the evaluation of Curators' innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 8 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of whether the payer specific data are presented in this annual report.

Table 8. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	Yes
		Hospital unplanned readmissions rate	Yes	Yes
		ED visit rate	Yes	Yes
	Cost	Spending per patient	Yes	Yes
		Estimated cost savings	Yes	Yes

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions:

Evaluation Questions
- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis

We include patients who were enrolled prior to December 31, 2014, and we present Medicare claims data through December 31, 2014.

Comparison Groups

The Medicare claims analysis focuses on 6,552 Medicare beneficiaries enrolled in fee-for-service Medicare Parts A and B during the innovation launch. We present measures for beneficiaries enrolled in the innovation as well as a group of statistically matched comparison beneficiaries with fee-for-service Medicare living in the 23 innovation counties in central Missouri.

We use propensity score matching (PSM) to select comparison group beneficiaries with similar characteristics as treatment group beneficiaries. Innovation and comparison beneficiaries are matched using a logit model predicting the likelihood that a beneficiary is enrolled in the innovation as a function of age, gender, race, disability, end-stage renal disease status, dual Medicare-Medicaid status, number of chronic conditions, number of ED visits and inpatient stays in the calendar quarter prior to the innovation, and total Medicare payments in the calendar quarter and calendar year prior to the innovation. We use one-to-variable matching with replacement, matching each treatment beneficiary with up to three comparison group beneficiaries with the closest propensity score.

Table 9 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. ***Figure 4*** shows the distribution of the propensity scores for both the comparison and intervention groups. ***Appendix B.2*** provides technical details on the propensity score methodology. One treatment beneficiary was dropped from the subsequent analyses due to the lack of an appropriately matched comparison beneficiary.

Table 9. Mean Values and Standardized Differences of Variables in Propensity Score Model: Curators

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrollment	2,279	7,046	2,042	6,435	0.035	2,277	7,046	2,398	5,051	0.020
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	7,875	18,515	7,479	15,386	0.023	7,868	18,508	7,699	11,552	0.011
Age	66.91	15.33	70.97	12.29	0.292	66.92	15.32	65.37	9.86	0.120
Percentage male	42.93	49.5	43.34	49.55	0.012	42.94	49.5	43.22	31.79	0.008
Percentage white	89.22	31.01	95.66	20.37	0.347	89.24	30.99	85.63	22.51	0.154
Percentage disabled	35.13	47.74	26.11	43.92	0.278	35.12	47.74	39.6	31.38	0.131
Percentage ESRD	0.6	7.69	0.66	8.07	0.011	0.6	7.69	0.71	5.38	0.020
Number of dual eligible months in the previous calendar year	2.56	4.76	1.89	4.26	0.149	2.56	4.76	2.98	3.23	0.104
Number of chronic conditions	5.73	3.65	6.61	3.68	0.240	5.73	3.65	5.57	2.35	0.052
Number of ED visits in calendar quarter prior to enrollment	0.19	0.69	0.13	0.5	0.096	0.18	0.62	0.19	0.4	0.008
Number of inpatient stays in calendar quarter prior to enrollment	0.09	0.36	0.08	0.34	0.026	0.09	0.36	0.09	0.26	0.018
Number of beneficiaries	6,552	—	171,151	—	—	6,551	—	19,653	—	—
Number of unique beneficiaries[1]	6,552	—	86,439	—	—	6,551	—	17,645	—	—
Number of weighted beneficiaries	—	—	—	—	—	6,551	—	6,551	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

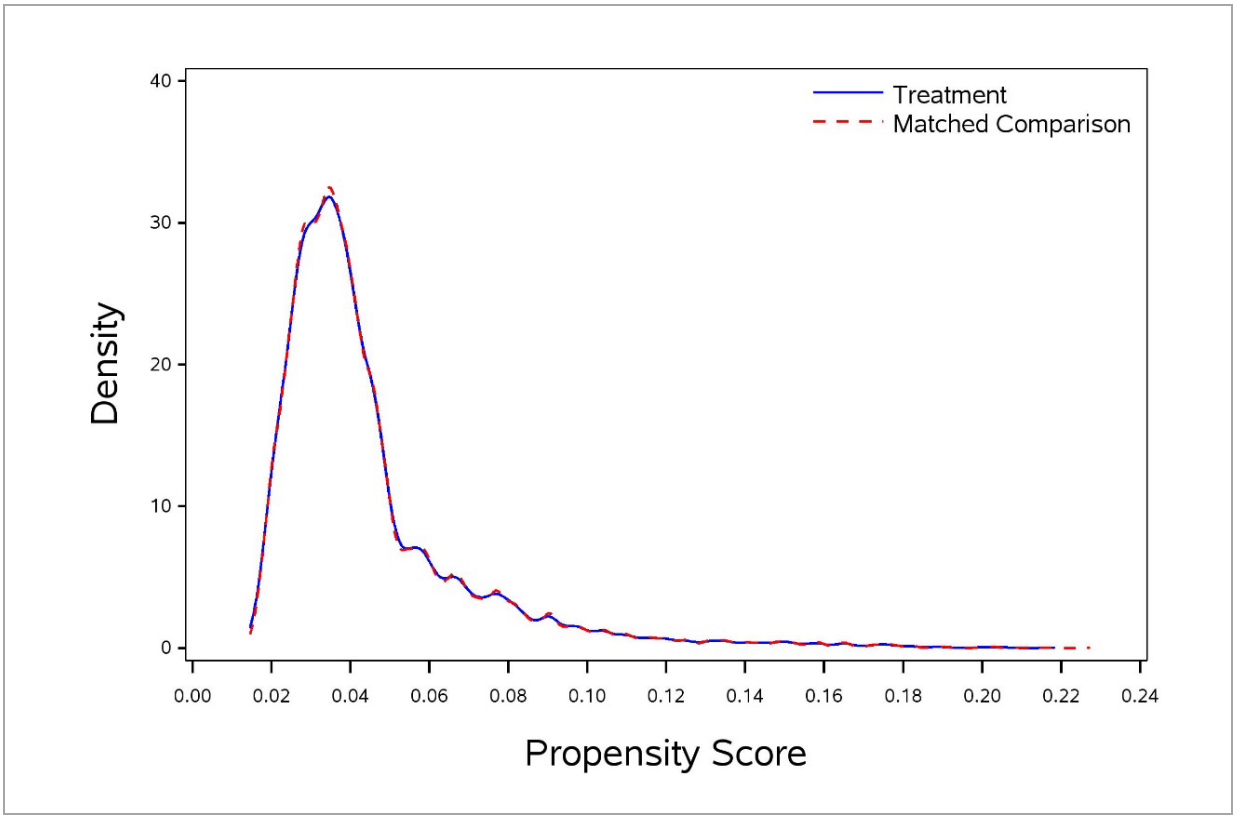
[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B for discussion of weights).

ED = emergency department; ESRD = end-stage renal disease; SD = standard deviation.

After performing PSM, we calculate absolute standardized differences between the treatment group and both the unmatched and matched comparison groups and check whether matching decreases the absolute standardized differences and achieves acceptable balance (Table 9). Many researchers consider that an absolute standardized difference ≤ 0.10 indicates acceptable balance.[2] Researchers also point out that critical variables in determining selection into treatment (e.g., those with significant effects in the propensity score equation) should have greater balance, while indicators with minor importance in determining treatment selection do not require optimal balance. The results in Table 9 show that matching reduced the absolute standardized differences and achieved adequate balance for most variables. The standardized differences for age, the percentage of white beneficiaries, the percentage of disabled beneficiaries, and number of dual eligible months in the previous calendar year improved significantly after matching, although the statistics exceed the 0.10 threshold.

Figure 4 shows the distribution of the propensity scores for both the intervention and comparison groups. The figure demonstrates a very close overlap between the treatment and comparison groups' propensity scores. Therefore, we present the Medicare claims analysis using both the treatment group and the matched comparison group.

Figure 4. Distribution of Propensity Scores for Comparison and Intervention Groups: Curators



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

[2] Austin, P.C.: An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behav Res. 46(3):399-424, 2011.

Descriptive Analysis

This report includes claims through December 31, 2014. ***Table 10*** reports Medicare spending per patient in the eight quarters before and the eight quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 10. Medicare Spending per Patient: Curators

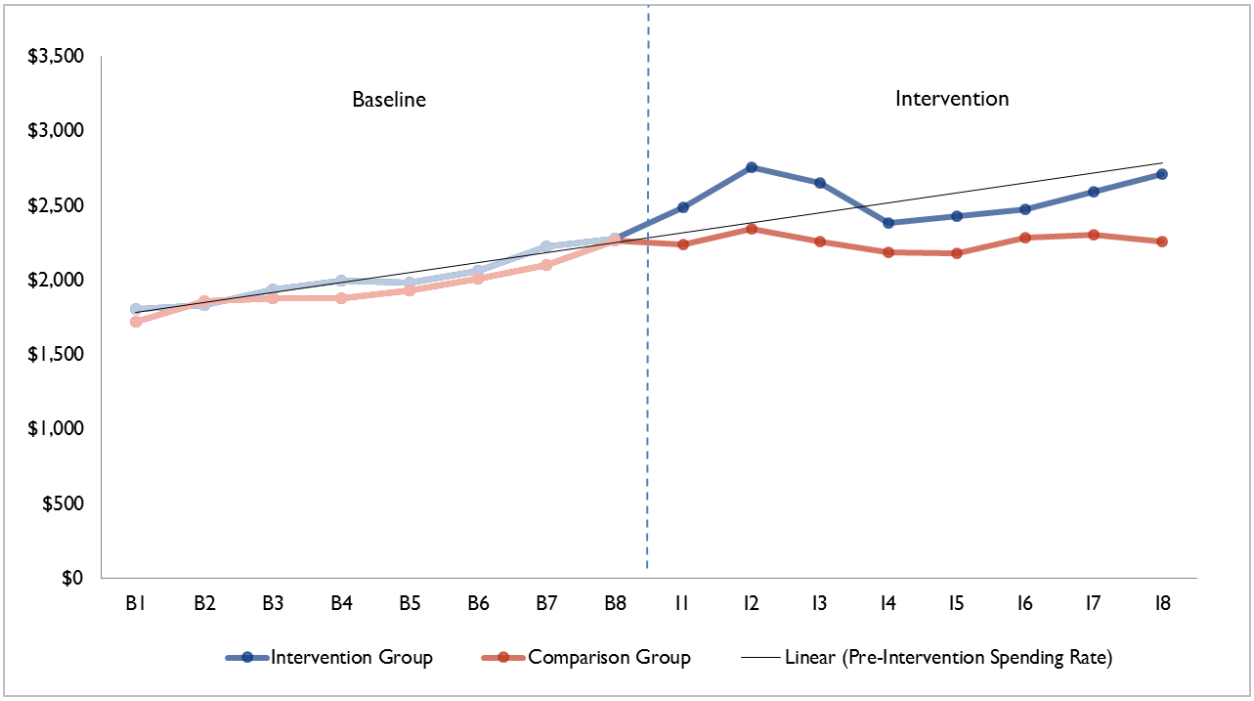
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331001	Curators																
	Spending rate	$1,809	$1,832	$1,940	$1,999	$1,987	$2,067	$2,229	$2,277	$2,493	$2,757	$2,654	$2,387	$2,428	$2,479	$2,598	$2,714
	Std dev	$6,158	$6,734	$6,394	$6,303	$6,923	$7,334	$7,288	$7,045	$8,005	$8,766	$9,537	$7,569	$8,365	$7,414	$7,688	$8,242
	Unique patients	5,617	5,729	5,863	6,011	6,135	6,284	6,440	6,551	6,551	6,496	6,407	6,289	6,149	6,056	5,980	4,077
Comparison Group																	
1C1CMS 331001	Curators																
	Spending rate	$1,722	$1,857	$1,881	$1,883	$1,932	$2,014	$2,105	$2,269	$2,239	$2,344	$2,257	$2,188	$2,184	$2,288	$2,305	$2,263
	Std dev	$5,886	$5,844	$6,187	$6,007	$6,851	$6,326	$6,799	$7,156	$7,146	$7,383	$7,436	$7,309	$7,084	$6,732	$6,901	$7,108
	Unique patients	5,675	5,804	5,948	6,099	6,260	6,396	6,526	6,550	6,550	6,540	6,450	6,346	6,198	6,099	6,020	4,060
Savings per Patient		−$87	$25	−$58	−$117	−$54	−$52	−$124	−$9	−$253	−$413	−$397	−$199	−$244	−$191	−$293	−$451

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
B1 = Baseline Q1; I1 = Intervention Q1

Figure 5 illustrates the Medicare spending per beneficiary in Table 10 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 5. Medicare Spending per Patient: Curators



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

As shown by the pre-innovation trend line for innovation enrollees, spending has an upward trend in the pre-intervention quarters for both the innovation and comparison beneficiaries. Post-intervention, spending remains stable for the comparison group, whereas it increases for the treatment group. The spending gap between the two groups remains in the $200 to $450 range throughout post-intervention quarters. However, it is premature to conclude any impact of the innovation on spending on this basis. As shown in Table 10, the standard deviation for spending is very high, representing the skewed nature of expenditures. We will estimate the statistical impact of the innovation in the difference-in-differences analyses that follow. It should be noted that any relationship between increased spending and quality of care is not addressed by this data.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 11*** and ***Figure 6***.

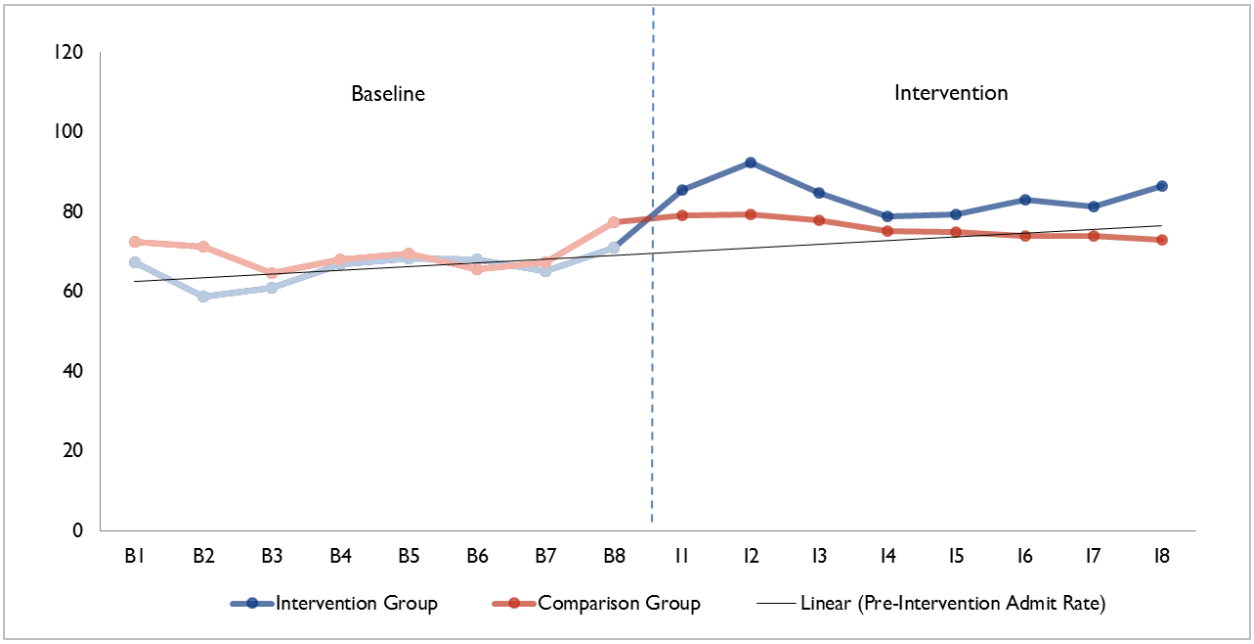
Table 11. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Curators

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331001	Curators																
	Admit rate	67	59	61	67	68	68	65	71	86	93	85	79	80	83	81	87
	Std dev	320	291	303	322	321	306	304	310	372	374	360	340	339	354	352	389
	Unique patients	5,617	5,729	5,863	6,011	6,135	6,284	6,440	6,551	6,551	6,496	6,407	6,289	6,149	6,056	5,980	4,077
Comparison Group																	
1C1CMS 331001	Curators																
	Admit rate	72	71	65	68	70	66	67	77	79	80	78	75	75	74	74	73
	Std dev	328	327	311	316	323	306	321	350	355	341	346	328	330	327	327	328
	Unique patients	5,675	5,804	5,948	6,099	6,260	6,396	6,526	6,550	6,550	6,540	6,450	6,346	6,198	6,099	6,020	4,060
Intervention − Comparison Rate		−5	−13	−4	−1	−1	2	−2	−6	6	13	7	4	5	9	7	13

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Curators



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Inpatient admissions trend slightly upward, and the admissions rates from the comparison group are slightly higher than those from the intervention group. However, after the innovation start, inpatient admissions rise for beneficiaries enrolled in the innovation and are consistently higher than those from the comparison group. Without statistical testing, it is premature to conclude that the innovation caused the increase; we examine this question in the difference-in-differences analyses that follow.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 12*** and ***Figure 7***.

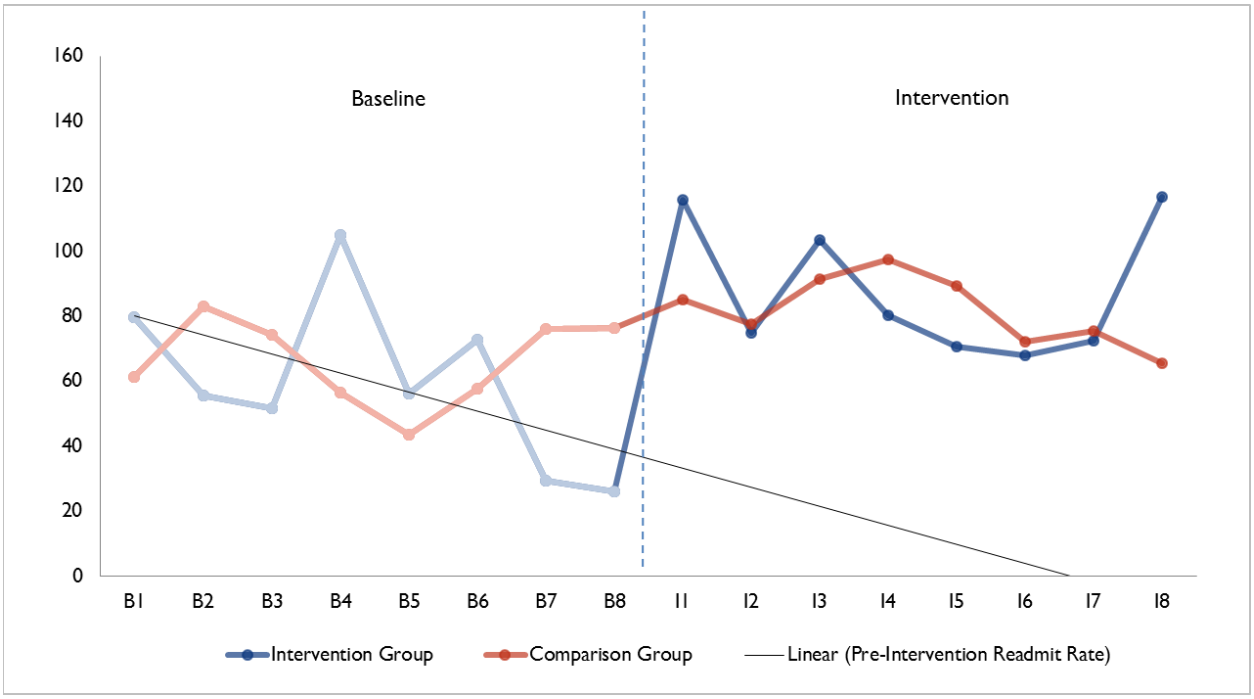
Table 12. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Curators

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331001	Curators																
	Readmit rate	80	56	52	105	56	73	29	26	116	75	103	80	71	68	73	117
	Std dev	271	229	221	307	231	260	169	159	320	263	304	272	256	252	259	321
	Total admissions	226	198	194	238	231	247	239	269	328	348	329	299	312	309	262	137
Comparison Group																	
1C1CMS 331001	Curators																
	Readmit rate	61	83	74	57	43	58	76	77	85	78	91	97	89	72	75	65
	Std dev	240	276	262	231	204	233	265	266	279	268	288	297	285	259	264	247
	Total admissions	251	249	220	254	261	249	259	309	314	314	307	301	295	278	239	112
Intervention − Comparison Rate		18	−28	−23	49	13	15	−47	−50	31	−3	12	−17	−19	−4	−3	51

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 7. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Curators



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Hospital unplanned readmissions rates fluctuate around the trend line prior to the innovation's launch, and the trend line slopes down. The unplanned readmissions rates increase sharply during the first post-intervention quarter for the intervention group and deviate from the trend line. The unplanned readmissions rates for the comparison group are higher than the intervention group in the fourth through the seventh post-intervention quarters, until the intervention group experiences a sharp increase in the last post-intervention quarter.

ED visits per 1,000 participants are shown in ***Table 13*** and ***Figure 8***.

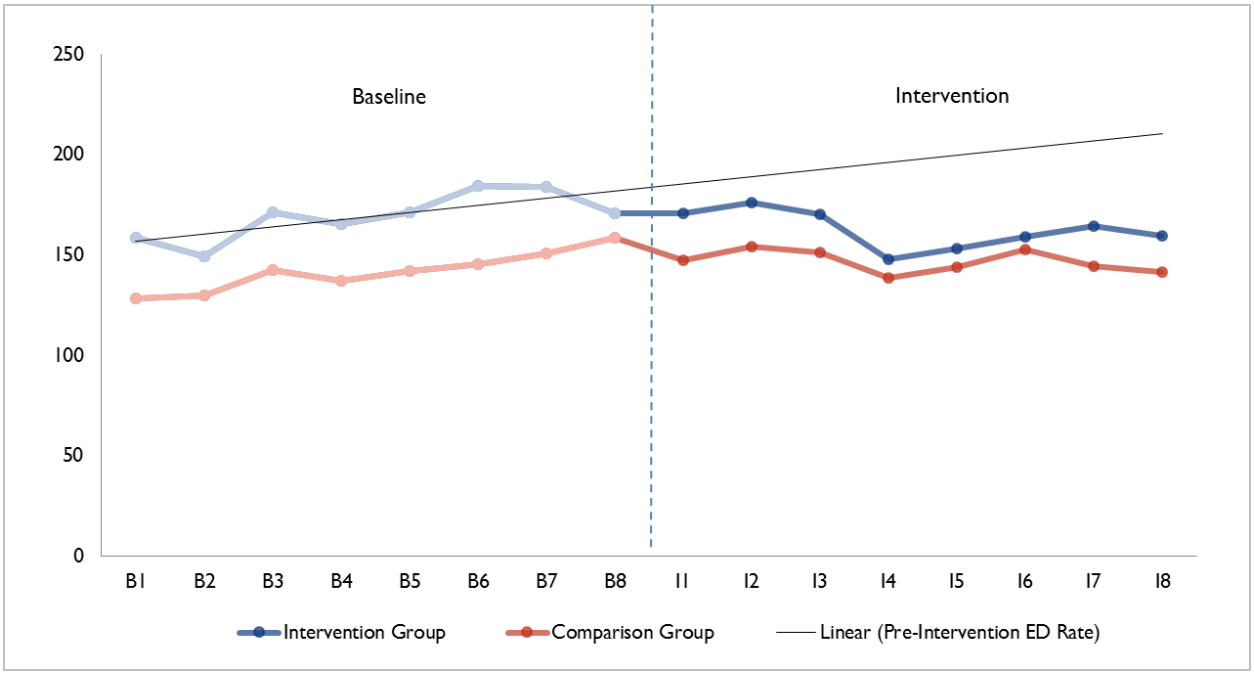
Table 13. ED Visits per 1,000 Participants: Curators

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331001	Curators																
	ED rate	159	149	171	165	171	184	184	171	171	176	170	148	154	159	164	160
	Std dev	560	523	551	555	557	616	608	567	600	623	596	586	562	602	594	649
	Unique patients	5,617	5,729	5,863	6,011	6,135	6,284	6,440	6,551	6,551	6,496	6,407	6,289	6,149	6,056	5,980	4,077
Comparison Group																	
1C1CMS 331001	Curators																
	ED rate	129	130	143	138	142	145	151	159	147	154	152	139	144	153	144	141
	Std dev	315	291	341	338	343	346	372	341	333	343	341	341	338	344	326	309
	Unique patients	5,675	5,804	5,948	6,099	6,260	6,396	6,526	6,550	6,550	6,540	6,450	6,346	6,198	6,099	6,020	4,060
Intervention − Comparison rate		30	20	29	28	29	39	33	12	23	22	19	9	10	6	20	18

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 8. ED Visits per 1,000 Participants: Curators



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
ED = emergency department.

The ED visit rate follows a fairly stable increasing trend prior to innovation launch for both the intervention and comparison groups. The rate is below the trend line during all post-intervention quarters for both the intervention and comparison groups, but the gap between the two groups narrows. We include statistical tests on the ED visit rate in the following section.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit.

All regressions include an indicator variable for the treatment group, an indicator variable for each quarter, and quarterly indicators interacted with the treatment group variable in the post-intervention period. We controlled for age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The regression specification assumes the same quarterly fixed effect for treatment and comparison individuals in the pre-innovation period and allows for a separate quarterly effect for treatment individuals after enrolling in the innovation.

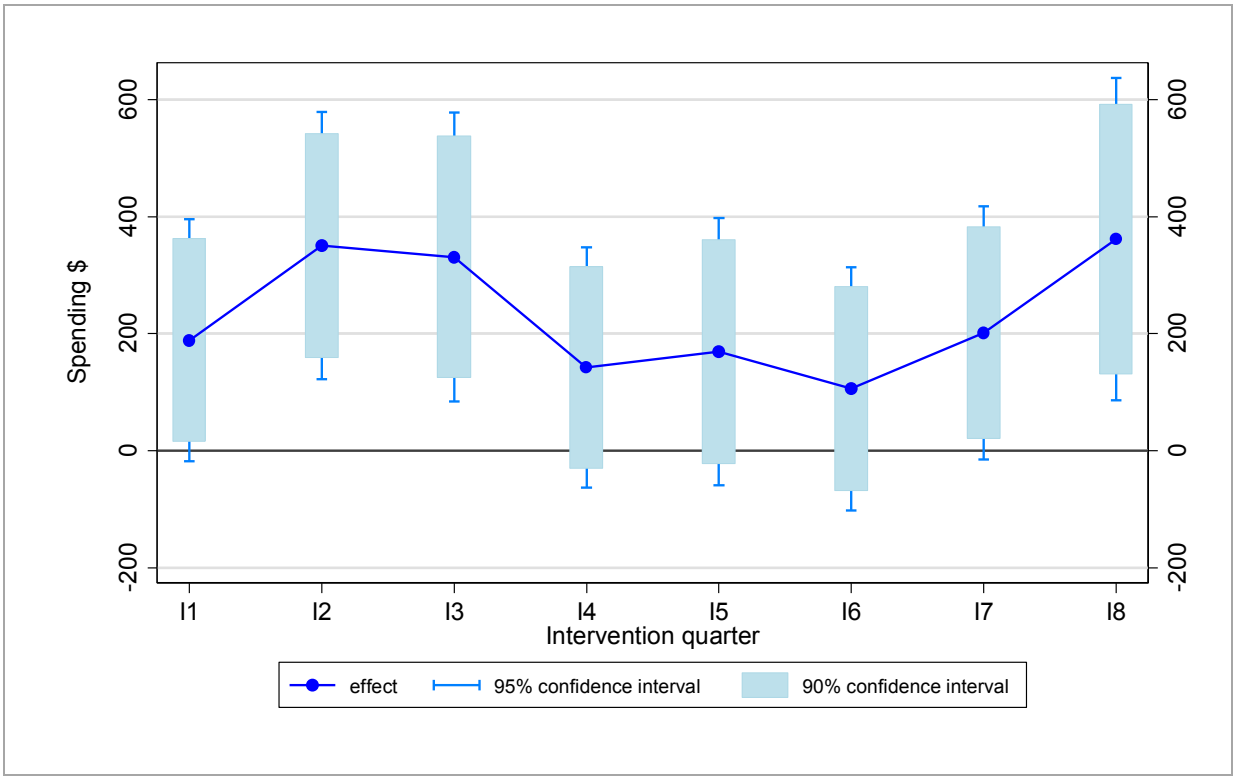
Table 14 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. ***Figure 9*** illustrates these quarterly difference-in-differences estimates.

Table 14. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Curators

Quarter	Coefficient	Standard Error	P-Values
I1	189	106	0.074
I2	351	117	0.003
I3	331	126	0.009
I4	142	105	0.175
I5	169	117	0.147
I6	106	106	0.318
I7	202	110	0.068
I8	362	141	0.010

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control groups and for quarterly effects that have the same impact on the treatment and control groups.
Curators = The Curators of the University of Missouri. OLS = ordinary least squares.

Figure 9. Difference-in-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Curators

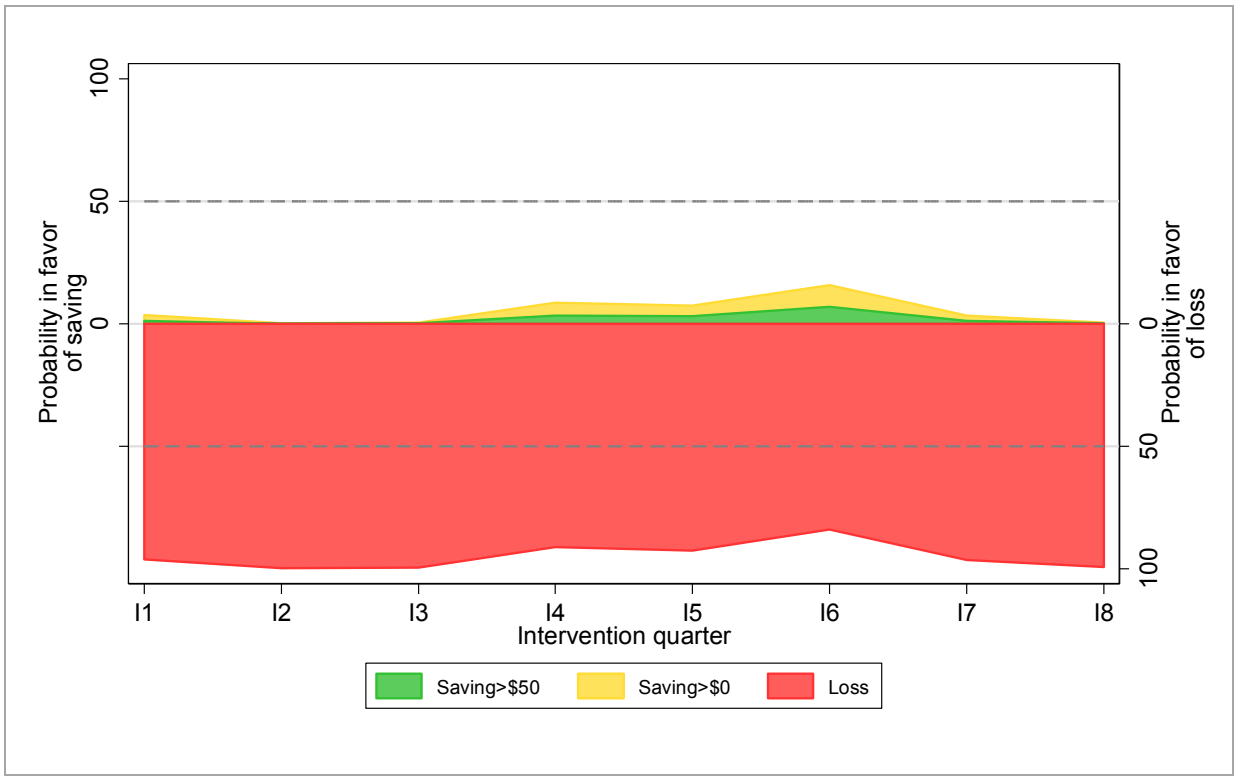


Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Curators = The Curators of the University of Missouri. OLS = ordinary least squares.

In the first quarter after intervention (I1), spending among treatment group individuals is $189 higher than spending among comparison group individuals, but the estimate is not statistically significant. In the remaining quarters, positive differences still remain in spending between the two groups, and the magnitude of the difference remains stable over time, with statistical significance (at the 5% level) in the second, third, and eighth post-intervention quarters.

Figure 10 presents the strength of evidence in favor of a saving or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis.

Figure 10. Quarterly Strength of Evidence in Favor of Saving/Loss: Curators



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Curators = The Curators of the University of Missouri.

Because the quarterly spending estimates are higher for the treatment group than the comparison group in all post-intervention quarters, the current result suggests that the innovation has a high probability of generating a loss.

We also present the weighted average treatment effect per quarter during the intervention period for beneficiaries enrolled in the innovation as compared with their matched comparison group. The weighted average quarterly spending differential in the post-innovation period, indicating a loss, is –$227 (90% CI: –$324, -$129). This represents the differential spending per quarter in the post-intervention period between individuals enrolled in the innovation and comparison group individuals, on average,

weighted by the number of intervention beneficiaries in each quarter. The 90 percent confidence interval is the range in which the true parameter estimate falls, with 90 percent confidence.

We also present linear probability model coefficients for inpatient admissions and outpatient emergency department visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the estimated effect.[3] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, linear probability model coefficients have often been demonstrated to be consistent with marginal effects generated from nonlinear models.[4] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention), not just the direction of the effect.

Table 15 presents the results of a linear probability model with the dependent variable set to one for patients who had a hospital visit during the quarter. In all quarters after the start of the innovation, treatment group patients are more likely than comparison group patients to have an inpatient hospitalization, although the magnitudes of the marginal effects are small, mostly below 1 percentage point. This finding is reflected by the positive linear probability model regression coefficients in all periods, most of which are statistically significant. The average quarterly difference-in-differences estimate for inpatient admissions is 0.8 percentage points, indicating that the treatment-control difference is 0.8 percentage points higher during the intervention period. This is the average difference in inpatient admissions probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: .005, .011).

[3] To obtain the correct effect, it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run even when not competing with other users for computer resources.

[4] Angrist, J.D., and Pischke J.-S. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

Table 15. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: Curators

Quarter	Coefficient	Standard Error	P-Values
I1	0.01	0.00	0.064
I2	0.01	0.00	0.004
I3	0.01	0.00	0.032
I4	0.01	0.00	0.033
I5	0.01	0.00	0.069
I6	0.01	0.00	0.007
I7	0.01	0.00	0.097
I8	0.01	0.00	0.056

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control groups and for quarterly effects that have the same impact on the treatment and control groups.
Curators = The Curators of the University of Missouri.

Table 16 presents results of a linear probability model with the dependent variable set to one for patients who had an ED visit during the quarter. Treatment group beneficiaries have a mixed combination of zero and negative linear probability model regression coefficients in the post-intervention quarters, and some of them are statistically significant. The result suggests that treatment patients have a slightly lower likelihood of visiting an ED as the comparison group patients. The average quarterly difference-in-differences estimate for ED visits is −0.6 percentage points, indicating that the treatment-control difference is 0.6 percentage points lower during the intervention period. This is the average difference in ED visit probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: −.010, −.002).

Table 16. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: Curators

Quarter	Coefficient	Standard Error	P-Values
I1	0.00	0.00	0.548
I2	0.00	0.00	0.992
I3	0.00	0.01	0.664
I4	-0.01	0.00	0.083
I5	-0.01	0.01	0.054
I6	-0.01	0.00	0.006
I7	-0.01	0.01	0.213
I8	0.00	0.01	0.419

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control groups and for quarterly effects that have the same impact on the treatment and control groups.
Curators = The Curators of the University of Missouri; ED = emergency department.

Discussion

The four measures provide descriptive data and regression results on patients enrolled in the Curators innovation before, during, and after the launch of the innovation. These measures may not provide a complete evaluation picture of the Curators innovation for several reasons. The innovation was launched on February 18, 2013, with a focus on preventive care and chronic conditions. The impact of an HIT and NCM innovation on long-term conditions may not be immediate because smaller, incremental changes take time to develop. In addition, there was a learning curve for providers and NCMs to integrate the role and reporting into their workflow. Although all Curators beneficiaries may potentially benefit from the LIGHT^2 innovation, the benefits may be most pronounced for the more complex patients in Tiers 3 and 4. Curators shifted focus to providing more services to Tiers 3 and 4 patients midstream, so it may take some time to realize the benefits. We will perform subsample analyses in future reports. The four measures listed above are reported at the aggregate level for all tiers of Medicare patients. Finally, the regression results suggest that the treatment group performs similarly to the comparison group in the ED visit measure but underperforms in Medicare spending and all-cause inpatient admissions rates.

The results may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicare beneficiaries we were able to match with the identifiers provided by the site. These results represent 66 percent of the overall population reached by the innovation.

Medicaid Claims Analysis

The Medicaid data analysis uses data from the CMS Alpha-MAX data files. Currently, Medicaid claims for Curators are available in Alpha-MAX through Q3 2013. Because the Curators innovation was

launched on February 18, 2013, and claims after the intervention launch are limited, we present the four core measures for Medicaid patients who enrolled before July 31, 2013, in this report.

Comparison Groups

The Alpha-MAX Medicaid claims analysis focuses on 2,598 Medicaid beneficiaries enrolled in fee-for-service Medicaid during the innovation launch. We present measures for beneficiaries enrolled in the innovation as well as a group of statistically matched comparison beneficiaries with fee-for-service Medicaid living in the 23 innovation counties in central Missouri.

We use PSM to select comparison group beneficiaries with similar characteristics as treatment group beneficiaries. Innovation and comparison beneficiaries are matched using a logit model predicting the likelihood that a beneficiary is enrolled in the innovation as a function of age, gender, race, disability, dual Medicare-Medicaid status, new enrollee status, number of months of Medicaid eligibility during the calendar year prior to the innovation, number of ED visits and inpatient stays in the calendar quarter prior to the innovation, and total Medicare payments in the calendar quarter and calendar year prior to the innovation. We use one-to-variable matching with replacement, matching each treatment beneficiary with up to three comparison group beneficiaries with the closest propensity score.

Table 17 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. ***Figure 11*** shows the distribution of the propensity scores for both the comparison and intervention groups. Appendix B.2 provides technical details on the propensity score methodology. Nine treatment beneficiaries were dropped from the subsequent analyses due to the lack of an appropriately matched comparison beneficiary.

Table 17. Mean Values and Standardized Differences of Variables in Propensity Score Model: Curators

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrollment	4,148	8,924	2,932	6,394	0.157	4,155	8,937	4,060	5,920	0.013
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	15,352	30,173	11,505	23,107	0.143	15,404	30,212	15,365	21,664	0.002
Age	45.59	16.4	51.23	17.86	0.329	45.61	16.42	44.85	12.34	0.052
Percentage female	61.59	48.65	65.16	47.65	0.105	61.65	48.63	61.04	35.19	0.018
Percentage blind, disabled, or aged	77.21	41.95	84.17	36.51	0.250	77.17	41.98	76.3	30.69	0.029
Percentage black	19.21	39.4	9.12	28.8	0.413	18.93	39.18	19.43	28.55	0.018
Percentage less than 1 year on Medicaid	17.28	37.82	6.84	25.24	0.460	17.03	37.6	17.55	27.45	0.019
Percentage dual eligible in the previous calendar year	52.27	49.96	56	49.64	0.106	52.14	49.96	51.72	36.06	0.012
Number of months of Medicaid eligibility in in second, third, fourth, and fifth calendar quarters prior to enrollment	9.9	3.84	11.41	2.03	0.492	9.93	3.8	10	2.72	0.020
Number of ED visits in calendar quarter prior to enrollment	0.2	0.83	0.14	0.63	0.082	0.2	0.83	0.19	0.57	0.012
Number of inpatient stays in calendar quarter prior to enrollment	0.04	0.2	0.02	0.15	0.100	0.04	0.2	0.04	0.13	0.023
Number of unique beneficiaries[1]	2,598	—	12,670	—	—	2,589	—	4,973	—	—
Number of weighted beneficiaries	—	—	—	—	—	2,589	—	2,589	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Alpha-MAX Medicaid fee-for-service claims.

[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B for discussion of weights).

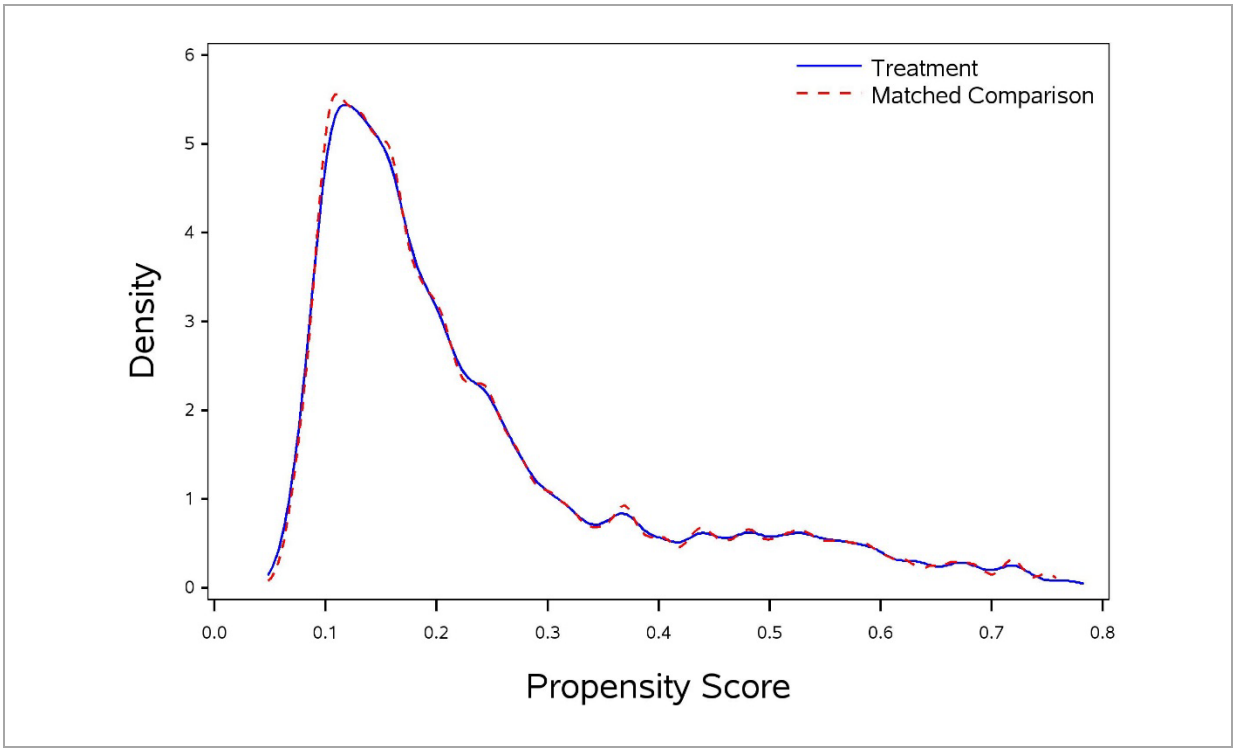
ED = emergency department; SD = standard deviation.

— Data not yet available.

After performing PSM, we calculate absolute standardized differences between the treatment group and both the unmatched and matched comparison groups and check whether matching decreases the absolute standardized differences and achieves acceptable balance (Table 17). Many researchers consider that an absolute standardized difference ≤ 0.10 indicates acceptable balance.[5] Researchers also point out that critical variables in determining selection into treatment (e.g., those with significant effects in the propensity score equation) should have greater balance, while indicators with minor importance in determining treatment selection do not require optimal balance. The results in Table 17 show that matching reduced the absolute standardized differences and achieved adequate balance for all variables.

Figure 11 shows the distribution of the propensity scores for both the intervention and comparison groups. The figure demonstrates a very close overlap between the treatment and comparison groups' propensity scores. Therefore, we present the Medicaid claims analysis using both the treatment group and the matched comparison group.

Figure 11. Distribution of Propensity Scores for Comparison and Intervention Groups: Curators



Source: RTI analysis of Chronic Conditions Data Warehouse Alpha-MAX Medicaid fee-for-service claims.

Descriptive Analysis

The tables and figures presented in this section are descriptive. Without statistical testing, it is premature to conclude that the innovation had any effect on outcomes; we will examine this question as the evaluation continues.

[5] Austin, P.C.: An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behav Res. 46(3):399-424, 2011.

Table 18 reports Medicaid spending per patient in the eight quarters before and the three quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 18. Medicaid Spending per Patient: Curators

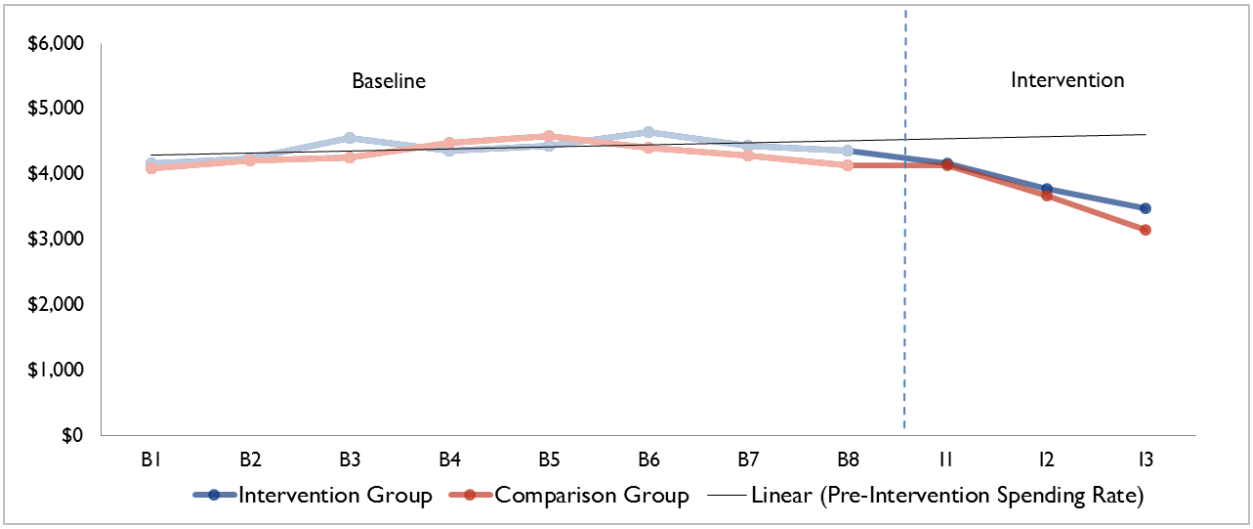
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 331001	Curators											
	Spending rate	$4,160	$4,247	$4,553	$4,366	$4,440	$4,641	$4,438	$4,361	$4,165	$3,782	$3,485
	Std dev	$7,787	$8,006	$9,726	$8,428	$8,392	$9,256	$8,780	$9,143	$8,488	$7,661	$7,116
	Unique patients	1,918	1,969	1,986	2,078	2,215	2,277	2,345	2,438	2,589	2,404	1,302
Comparison Group												
1C1CMS 331001	Curators											
	Spending rate	$4,099	$4,211	$4,254	$4,481	$4,588	$4,400	$4,284	$4,132	$4,135	$3,674	$3,142
	Std dev	$5,693	$5,661	$5,615	$5,719	$5,752	$5,893	$6,026	$5,808	$5,860	$5,403	$4,372
	Unique patients	2,243	2,235	2,194	2,161	2,174	2,288	2,460	2,533	2,493	2,431	1,387
Savings per Patient		−$62	−$35	−$300	$115	$147	−$241	−$153	−$229	−$30	−$108	−$342

Source: RTI analysis of Alpha-MAX Medicaid claims.
Notes:
Spending rate: Total quarter quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 is “Intervention Q1”; B1 is “Baseline Q1.”

Figure 12 illustrates the Medicaid spending per beneficiary in Table 18 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 12. Medicaid Spending per Patient: Curators



Source: RTI analysis of Alpha-MAX Medicaid claims.

As shown by the pre-intervention trend line for innovation enrollees, spending has a slight upward trend in the pre-intervention quarters for the innovation beneficiaries. Post-intervention spending decreases below the trend line in all quarters for both intervention and comparison groups. It is premature to conclude any impact of the innovation on spending among enrolled beneficiaries. As shown in Table 18, the standard deviation for spending is very high, representing the skewed nature of expenditures. We will estimate the statistical impact of the innovation in the difference-in-differences regression analyses that follow.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 19*** and ***Figure 13***.

Table 19. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Curators

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 331001	Curators											
	Admit rate	53	47	45	43	55	59	55	55	42	46	48
	Std dev	303	285	287	270	358	383	342	315	251	274	310
	Unique patients	1,918	1,969	1,986	2,078	2,215	2,277	2,345	2,438	2,589	2,404	1,302
Comparison Group												
1C1CMS 331001	Curators											
	Admit rate	41	39	36	41	40	39	47	41	34	23	35
	Std dev	171	170	163	181	188	171	211	185	193	127	162
	Unique patients	2,243	2,235	2,194	2,161	2,174	2,288	2,460	2,533	2,493	2,431	1,387
Intervention − Comparison Rate		12	8	10	2	15	20	8	13	8	23	12

Source: RTI analysis of Alpha-MAX Medicaid claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 is “Intervention Q1”; B1 is “Baseline Q1.”

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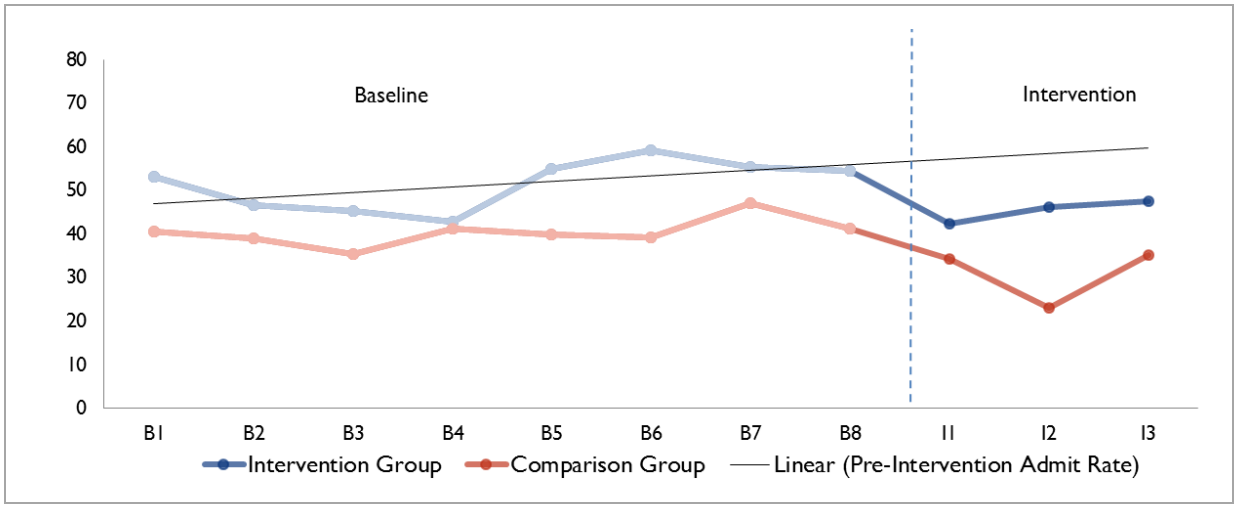
Figure 13. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Curators



Source: RTI analysis of Alpha-MAX Medicaid claims.

Inpatient admissions remain fairly stable around the pre-intervention trend line but trend slightly upward in the pre-intervention period for the innovation beneficiaries. Inpatient admissions for the intervention group fall during the first post-intervention quarter and rise slightly during the second and third post-intervention quarters—with rates still above the comparison group. Without statistical testing, it is premature to conclude that the innovation caused the change; we will examine this question in the difference-in-differences regression analyses that follow.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 20*** and ***Figure 14***.

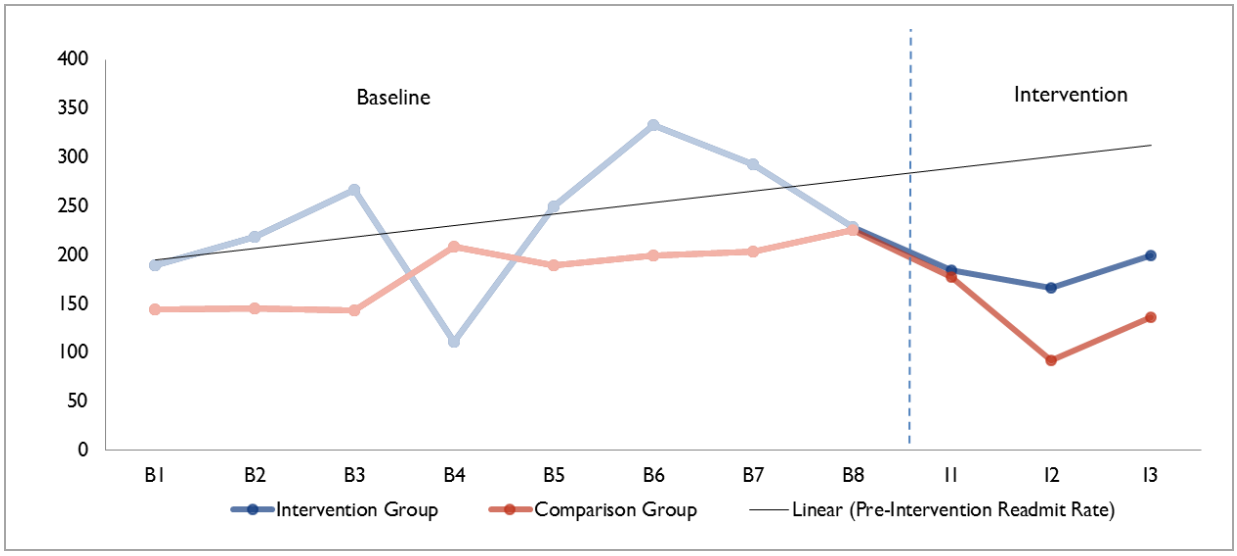
Table 20. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Curators

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 331001	Curators											
	Readmit rate	190	218	267	111	250	333	293	228	184	167	200
	Std dev	392	413	442	314	433	471	455	420	388	373	400
	Total admissions	100	87	90	81	112	129	123	127	103	90	40
Comparison Group												
1C1CMS 331001	Curators											
	Readmit rate	145	146	143	208	189	199	204	226	178	92	137
	Std dev	352	353	351	406	392	399	403	418	382	289	344
	Total admissions	85	85	74	88	81	87	106	96	81	51	32
Intervention − Comparison Rate		235	291	390	14	311	467	382	231	191	241	263

Source: RTI analysis of Alpha-MAX Medicaid claims.
Notes:
Readmit rate: (Sum all readmits to eligible hospital within 30 days/all admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = “Intervention Q1”; B1 = “Baseline Q1.”

Figure 14. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Curators



Source: RTI analysis of Alpha-MAX Medicaid claims.

Hospital unplanned readmissions rates fluctuate around the trend line prior to the innovation's launch, although the trend is slightly upward. The readmissions rates fall in the first two quarters after innovation launch for both the intervention and comparison group—rates for the intervention group remain above the comparison group. As with the other variables, we will include statistical tests on the readmissions rates in the difference-in-differences regression analyses that follow.

ED visits per 1,000 participants are shown in ***Table 21*** and ***Figure 15***.

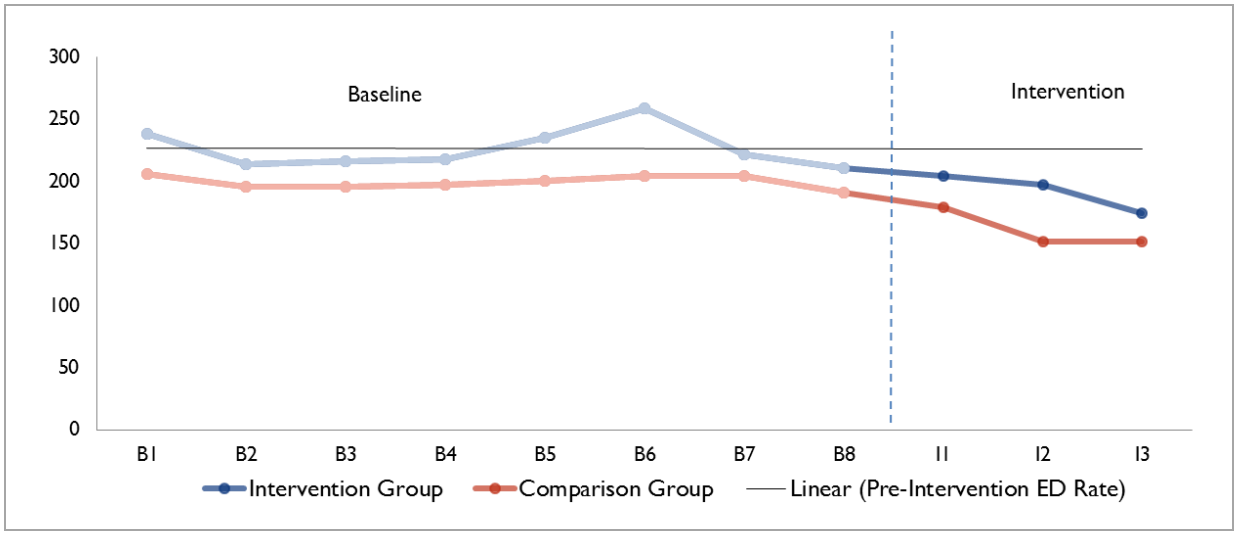
Table 21. ED Visits per 1,000 Participants: Curators

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 331001	Curators											
	ED rate	238	214	216	218	235	259	222	211	205	198	175
	Std dev	846	828	733	805	929	963	839	853	795	789	704
	Unique patients	1,918	1,969	1,986	2,078	2,215	2,277	2,345	2,438	2,589	2,404	1,302
Comparison Group												
1C1CMS 331001	Curators											
	ED rate	206	196	196	198	201	205	204	191	179	152	152
	Std dev	537	529	569	543	558	556	587	552	538	445	456
	Unique patients	2,243	2,235	2,194	2,161	2,174	2,288	2,460	2,533	2,493	2,431	1,387
Intervention − Comparison Rate		32	18	20	20	35	54	18	20	25	46	23

Source: RTI analysis of Alpha-MAX Medicaid claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 is “Intervention Q1”; B1 is “Baseline Q1.”
ED = emergency department.

Figure 15. ED Visits per 1,000 Participants: Curators



Source: RTI analysis of Alpha-MAX Medicaid claims.
ED = emergency department.

The ED visit rate for the intervention group fluctuates around the flat trend line prior to launch, then falls slightly below the trend line in the post-intervention quarters. The ED visit rate for the comparison group stays close to the intervention group throughout the data period and decreases along with the intervention group in the post-intervention quarters. The gap between the intervention and comparison group persists. As with the other variables, we will include statistical tests on the ED visit rate in the following section.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit.

All regressions include an indicator variable for the treatment group, an indicator variable for each quarter, and quarterly indicators interacted with the treatment group variable in the post-intervention period. We controlled for age, gender, race, disability, dual eligibility, number of months of Medicaid eligibility status during the calendar year prior to the intervention, and new enrollee status. The regression specification assumes the same quarterly fixed effect for treatment and comparison individuals in the pre-innovation period and allows for a separate quarterly effect for treatment individuals after enrolling in the innovation.

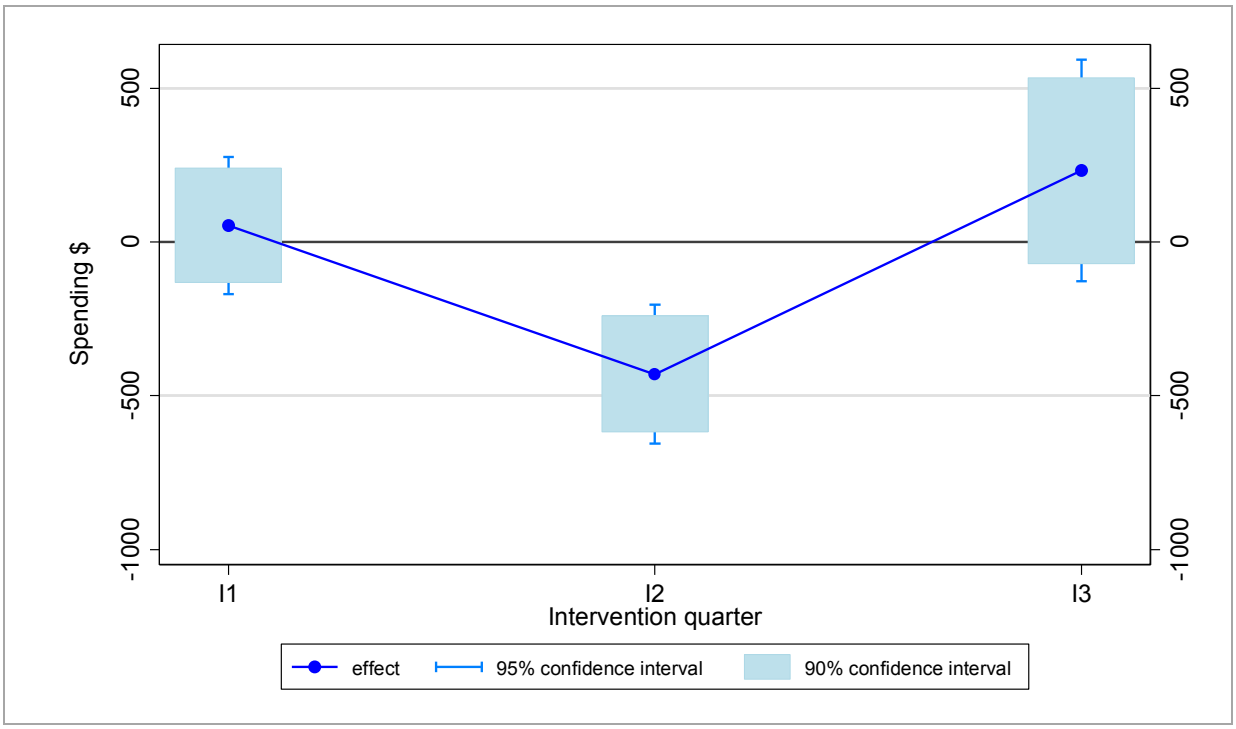
Table 22 presents the results of an OLS regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. ***Figure 16*** illustrates these quarterly difference-in-differences estimates.

Table 22. Difference-In-Differences OLS Regression Estimates for Quarterly Medicaid Spending per Participant: Curators

Quarter	Coefficient	Standard Error	P-Values
I1	54	114	0.636
I2	−430	115	<0.001
I3	232	184	0.207

Source: RTI analysis of Chronic Conditions Data Warehouse Alpha-MAX Medicaid fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, dual eligibility, number of months of Medicaid eligibility status during the calendar year prior to the intervention, and new enrollee status. The difference-in-differences specification also controls for fixed differences between the treatment and control groups and for quarterly effects that have the same impact on the treatment and control groups.
Curators = The Curators of the University of Missouri; OLS = ordinary least squares.

Figure 16. Difference-in-Differences OLS Regression Estimates for Quarterly Medicaid Spending per Participant: Curators

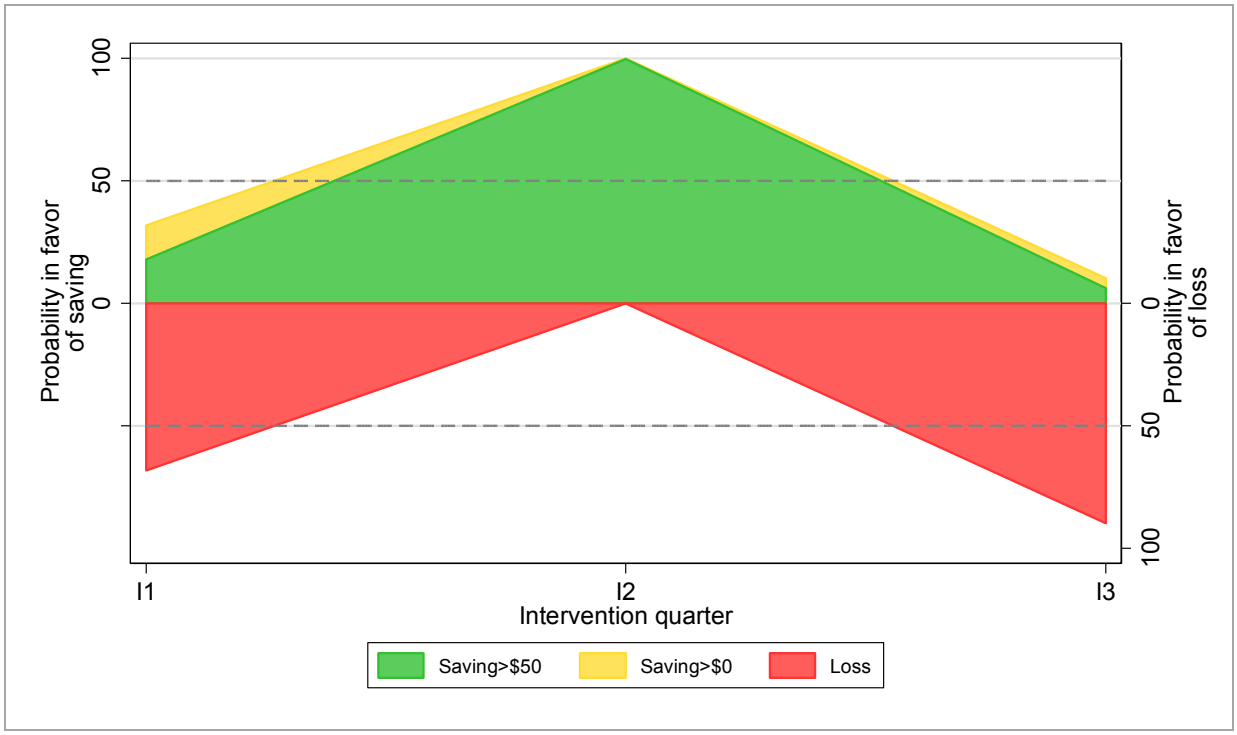


Source: RTI analysis of Chronic Conditions Data Warehouse Alpha-MAX Medicaid fee-for-service claims.
Curators = The Curators of the University of Missouri; OLS = ordinary least squares.

In the first quarter after intervention (I1), spending among treatment group individuals is $54 higher than spending among comparison group individuals, although the estimate is not statistically significant. In the second quarter post-intervention, however, spending among the treatment group is $430 lower than the comparison group, and estimate is statistically significant. The estimate in the final quarter is no longer significant.

Figure 17 presents the strength of evidence in favor of a saving or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis.

Figure 17. Quarterly Strength of Evidence in Favor of Saving/Loss: Curators



Source: RTI analysis of Chronic Conditions Data Warehouse Alpha-MAX Medicaid fee-for-service claims.
Curators = The Curators of the University of Missouri.

Because the quarterly spending estimates are lower for the treatment group than the comparison group in the second post-intervention quarter, we see a higher probability of savings in the second quarter compared to the other two quarters.

We also present the weighted average treatment effect per quarter during the intervention period for beneficiaries enrolled in the innovation as compared with their matched comparison group. The weighted average quarterly spending differential in the post-innovation period, indicating savings, is $94 (90% CI: –$68, $256). This figure represents the differential spending per quarter in the post-intervention period between individuals enrolled in the innovation and comparison group individuals, on average, weighted by the number of intervention beneficiaries in each quarter. The 90 percent confidence interval is the range in which the true parameter estimate falls, with 90 percent confidence.

We also present linear probability model coefficients for inpatient admissions and outpatient ED visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the

estimated effect.[6] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, linear probability model coefficients have often been demonstrated to be consistent with marginal effects generated from nonlinear models.[7] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention), not just the direction of the effect.

Table 23 presents the results of a linear probability model with the dependent variable set to one for patients who had a hospital visit during the quarter.

Table 23. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: Curators

Quarter	Coefficient	Standard Error	P-Values
I1	0.00	0.00	0.581
I2	0.00	0.00	0.343
I3	0.01	0.01	0.136

Source: RTI analysis of Chronic Conditions Data Warehouse Alpha-MAX Medicaid fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, dual eligibility, number of months of Medicaid eligibility status during the calendar year prior to the intervention, and new enrollee status. The difference-in-differences specification also controls for fixed differences between the treatment and control groups and for quarterly effects that have the same impact on the treatment and control groups.
Curators = The Curators of the University of Missouri.

In all quarters after the start of the innovation, treatment group patients are as likely as comparison group patients to have been hospitalized, given the marginal effects are all close to zero and not statistically significant.

Table 24 presents results of a linear probability model with the dependent variable set to one for patients who had an ED visit during the quarter.

[6] To obtain the correct effect, it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run even when not competing with other users for computer resources.

[7] Angrist, J.D., and Pischke J.-S. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

Table 24. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: Curators

Quarter	Coefficient	Standard Error	P-Values
I1	−0.00	0.01	0.494
I2	−0.00	0.01	0.755
I3	0.01	0.01	0.330

Source: RTI analysis of Chronic Conditions Data Warehouse Alpha-MAX Medicaid fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, dual eligibility, number of months of Medicaid eligibility status during the calendar year prior to the intervention, and new enrollee status. The difference-in-differences specification also controls for fixed differences between the treatment and control groups and for quarterly effects that have the same impact on the treatment and control groups.
Curators = The Curators of the University of Missouri; ED = emergency department.

Treatment group beneficiaries have a mixed combination of positive and negative linear probability model regression coefficients in the post-intervention quarters, but none of them are statistically significant. The result suggests treatment patients have approximately the same likelihood of visiting an ED as the comparison group patients.

Discussion

The four measures provide descriptive data and regression results on patients enrolled in the Curators innovation before, during, and after the launch of the innovation. These measures may not provide a complete evaluation picture of the Curators innovation for several reasons as discussed earlier in the Medicare claims section. Moreover, the Medicaid population is different from the Medicare population in that beneficiaries are younger and healthier in general. Therefore, we may not see a pronounced innovation effect for more complex Medicaid patients in Tiers 3 and 4, although we will perform subsample analyses in future reports. The four measures listed above are reported at the aggregate level for all tiers of Medicaid patients. The regression results suggest that the treatment group performs similarly to the comparison group in the all-cause inpatient admissions and ED visit rates but outperforms in Medicaid spending.

The results may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicaid beneficiaries we were able to match with the identifiers provided by the site. This represents 26 percent of the overall population reached by the innovation.

1.3.3 Other Awardee-Specific Data

Table 25 lists awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. We received patient-level data from Curators used to generate each measure listed in Tables 4 and 25 for each quarter through Q11 (March 31, 2015).

Table 25. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Clinical effectiveness	Patient care	HCIA Provider Survey	Collected by RTI
	Cardiovascular disease	Percentage of patients with coronary artery disease (CAD) who were prescribed aspirin or clopidogrel	Data received from Curators
	Chronic obstructive pulmonary disease (COPD)	Percentage of patients with COPD who were prescribed an inhaled bronchodilator	Data received from Curators
		Percentage of patients with COPD who had spirometry results documented	Data received from Curators
Health outcomes	Asthma	Percentage of patients with asthma who have FEV1≥ 80% predicted/personal best	Data received from Curators
	Diabetes	Percentage of patients with diabetes who had hemoglobin A1c>9.0%	Data received from Curators
		Percentage of patients with diabetes with an LDL-C control<100 mg/dL	Data received from Curators
	Hypertension	Percentage of patients with hypertension with blood pressure <140/90 mm Hg	Data received from Curators
	Cardiovascular disease	Percentage of patients with CAD who have a LDL-C result <100 mg/dL	Data received from Curators

CAD = coronary artery disease; COPD = chronic obstructive pulmonary disease; Curators = The Curators of the University of Missouri; FEV1 = forced expiratory volume in 1 second; LDL-C = low-density lipoprotein cholesterol.

Clinical Effectiveness

We looked at clinical effectiveness measures among patients with coronary artery disease (CAD) and chronic obstructive pulmonary disease (COPD).

CAD/COPD

Evaluation Questions

- To what extent have participants with CAD enrolled in the innovation received care in line with clinical guidelines?
- To what extent have participants with COPD enrolled in the innovation received care in line with clinical guidelines?

Of the 1,283 patients with CAD, approximately 79 percent were appropriately prescribed aspirin or clopidrogel during their enrollment period. Of the 1,096 patients with COPD, more than three-fourths (80.8%) were appropriately prescribed an inhaled bronchodilator and less than half (41.3%) had their spirometry results documented during their enrollment.

Provider Perceptions of Patient Care

Evaluation Question

- How has implementation of the innovation impacted provider perceptions of patient care?

Data on the impact on patient care came from the HCIA Provider Survey (***Table 26***). The majority of providers (87.5%) indicated that the innovation had an impact on patient care. Of those that indicated that LIGHT^2 had an impact on patient care, all providers indicated the impact was positive—48.5 percent indicated the impact was very positive and 51.5 percent indicated the impact was somewhat positive.

Provider views on the specific impacts of LIGHT^2 on patient care were consistently positive (Table 26). The majority of providers either strongly or somewhat agreed with all questions in this area. Most notably, almost all providers agreed that LIGHT^2 helps them provide better patient care (82.5%), improved patients' access to care (82.5%), and has been beneficial for patients in their practice (92.5%).

Table 26. Summary of Perceptions Regarding the Impact on Patient Care

Question	Percentage of Curators' Providers Indicating Strongly Agree/Somewhat Agree	Percentage of Curators' Providers Indicating Strongly Disagree/ Somewhat Disagree	Percentage of Curators' Providers Indicating Neither Agree nor Disagree	Percentage of Curators' Providers Indicating Not Applicable/ Missing
Innovation helps provide better patient care.	82.5 N=33	2.5 N=1	12.5 N=5	2.5 N=1
Innovation leads to more effective communication during patient visits.	67.5 N=27	2.5 N=1	27.5 N=11	2.5 N=1
Innovation improved my patients' access to care.	82.5 N=33	2.5 N=1	12.5 N=5	2.5 N=1
Innovation increased the time I am able to spend with patients during office visits.	42.5 N=17	22.5 N=9	32.5 N=13	2.5 N=1
Innovation helps me develop good relationships with my patients.	65.0 N=26	7.5 N=3	25.0 N=10	2.5 N=1
Innovation improved perceived patient satisfaction with care.	65.0 N=26	7.5 N=3	20.0 N=8	7.5 N=3
Innovation has been beneficial for patients in my practice.	92.5 N=37	0.0 N=0	7.5 N=3	0.0 N=0

(continued)

Table 26. Summary of Perceptions Regarding the Impact on Patient Care (continued)

Question	Percentage of Curators' Providers Indicating Strongly Agree/Somewhat Agree	Percentage of Curators' Providers Indicating Strongly Disagree/ Somewhat Disagree	Percentage of Curators' Providers Indicating Neither Agree nor Disagree	Percentage of Curators' Providers Indicating Not Applicable/ Missing
Among my patients that *are aware* of Innovation, the majority of patients would say it has been beneficial in the care they receive.	75.0 N=30	0.0 N=0	25.0 N=10	0.0 N=0
Among my patients that *are not aware* of Innovation, if I told them about it, the majority of patients would say it has been beneficial in the care they receive.	55.0 N=22	7.5 N=3	37.5 N=15	0.0 N=0

Health Outcomes

We examined health outcomes among patients with asthma, diabetes, hypertension, and cardiovascular disease. The following run charts take into account rolling enrollment. The baseline quarters (Bs) represent data prior to enrollment. The intervention quarters (Is) are based on individual enrollment date. For example, I1 is equal to the first quarter of enrollment for all participants who received a specific test. We provide B and I data when at least 20 patients have a test or reading within the quarter. When possible, we also present the linear trend line based on the pre-intervention or baseline data.

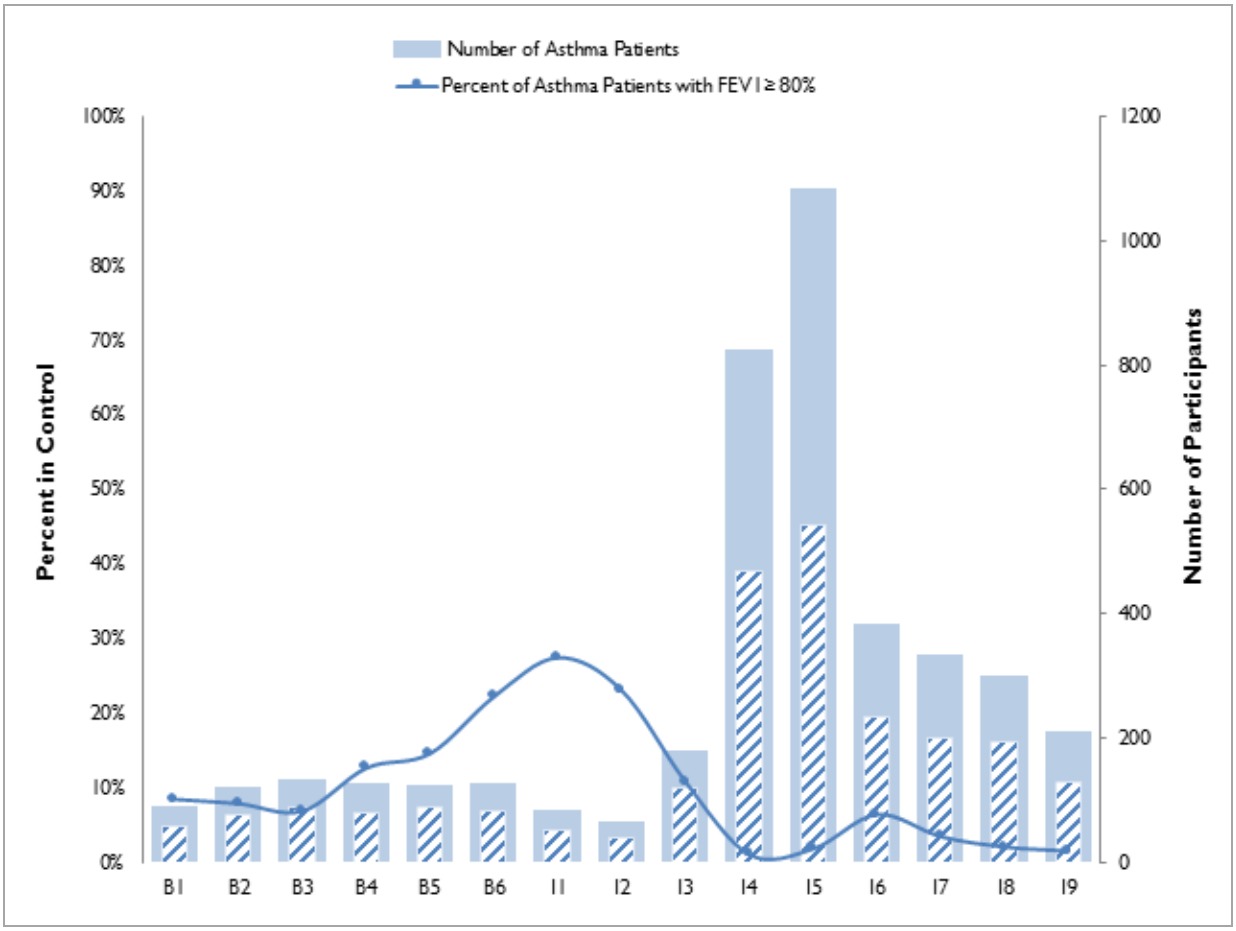
Asthma

Evaluation Question

- Has the percentage of asthma patients with FEV1 ≥ 80 percent increased over time among those enrolled in the innovation?

Figure 18 presents the percentage of participants with asthma with a FEV1 pre-percentage ≥ 80 over time. As shown in the figure, the percentage of asthma patients with normal FEV1 was at its peak at approximately 28 percent in I1 and then dropped to approximately 1 percent in I4. By I9, only 2 percent of asthma patients had normal FEV1. It is unclear why the percentage of patients with normal FEV1 dropped in I4. These findings suggests that FEV1 among patients with asthma enrolled in the innovation did not improve over time.

Figure 18. Percentage of Patients with Asthma with FEV1 Control over Time



	Quarter	B1	B2	B3	B4	B5	B6	I1	I2	I3	I4	I5	I6	I7	I8	I9
●	Percentage of patients with asthma with FEV1control	8.5	7.9	6.9	12.7	14.6	22.2	27.5	23.1	10.8	1.1	1.8	6.4	3.5	2.1	1.5
	Number of patients with asthma	72	103	115	109	108	111	68	47	164	808	1067	367	316	283	194
	Number of patients with asthma with FEV1 test	59	76	87	79	89	81	51	39	120	467	544	233	201	192	130

Source: Patient-level data provided to RTI by Curators.
FEV1 = forced expiratory volume in 1 second.

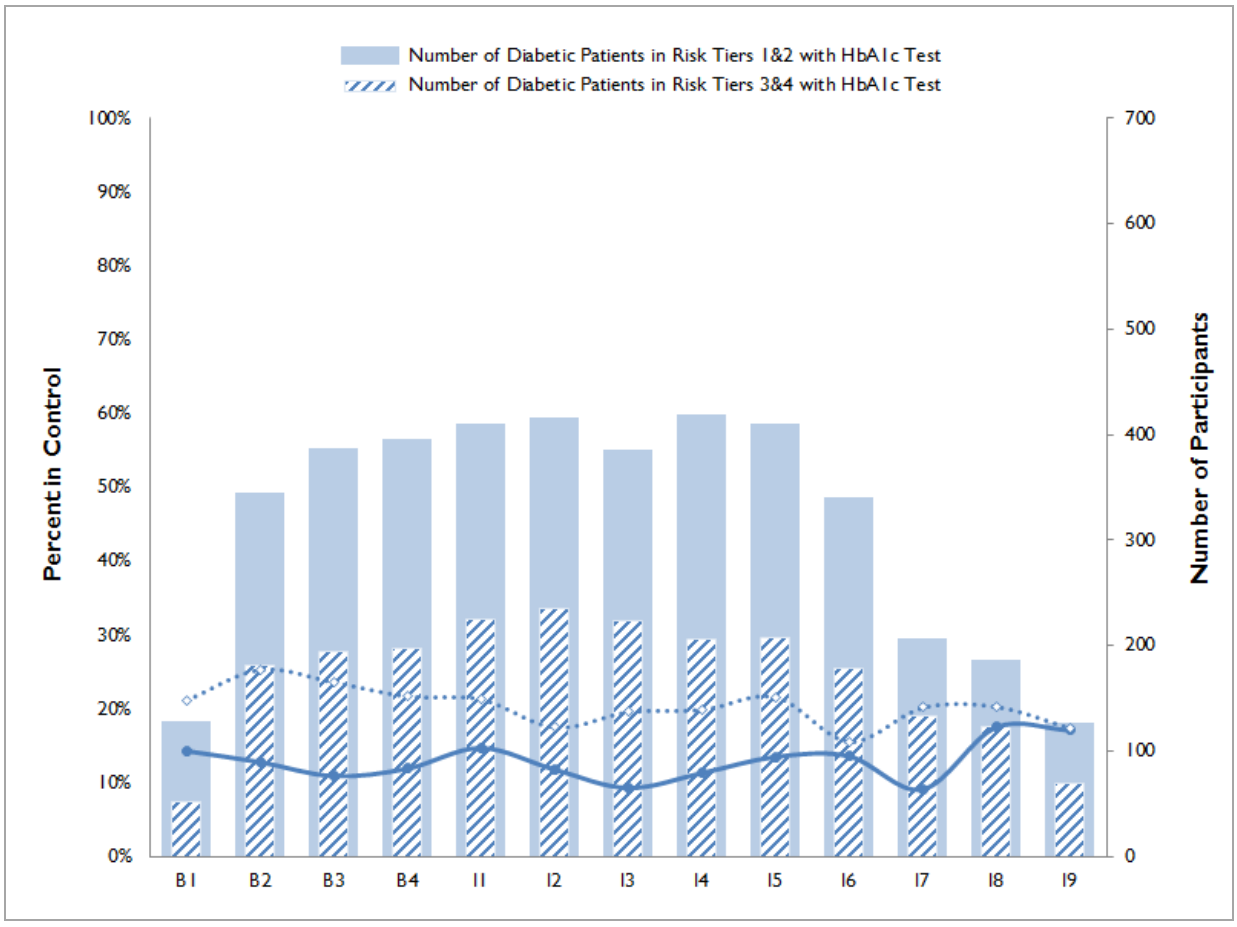
Diabetes

Evaluation Question

- Has the percentage of diabetes patients with poor HbA1c control decreased over time among those enrolled in the innovation?

Figure 19 presents the percentage of patients with diabetes, by baseline risk tier, who have an HbA1c test indicating poor control (i.e., HbA1c > 9%) over time. The denominator represents the number of diabetes patients who received an HbA1c test for each quarter. The numerator represents the number of diabetes patients who received an HbA1c test that was > 9.0 percent. As shown in the figure, the percentage of patients with poor HbA1c control remains relatively consistent over time for patients in both sets of risk tiers. However, as would be expected, there are greater percentages of patients in the higher-risk tiers with poor HbA1c control than in the lower-risk tiers. Among those in the higher-risk tiers, the percentage with poor HbA1c control decreases slightly over time, from approximately 25 percent in the baseline quarters, to approximately 17 percent by I9. The reverse is true for those in the lower-risk tiers, where the percentage went from approximately 13 percent in the baseline quarters to approximately 17 percent by I9. This suggests that the innovation may have a greater effect on those in the higher-risk tiers over time than on those in the lower-risk tiers.

Figure 19. Percentage of Patients with Diabetes with Poor HbA1c Control over Time by Risk Tier



(continued)

Figure 19. Percentage of Patients with Diabetes with Poor HbA1c Control over Time by Risk Tier (continued)

	Quarter	B1	B2	B3	B4	I1	I2	I3	I4	I5	I6	I7	I8	I9
●	Percentage of risk Tiers 1 and 2 patients with diabetes with HbA1c control	14.3	12.8	10.9	11.9	14.7	11.8	9.3	11.3	13.5	13.6	9.1	17.5	17.1
◊	Percentage of risk Tiers 3 and 4 patients with diabetes with HbA1c control	21.2	25.3	23.6	21.7	21.3	17.5	19.6	19.9	21.6	15.6	20.2	20.3	17.4
	Number of risk Tiers 1 and 2 patients with diabetes with HbA1c test	119	335	378	387	401	406	376	409	401	331	197	177	117
	Number of risk Tiers 3 and 4 patients with diabetes with HbA1c test	52	182	195	198	225	235	224	206	208	179	134	123	69

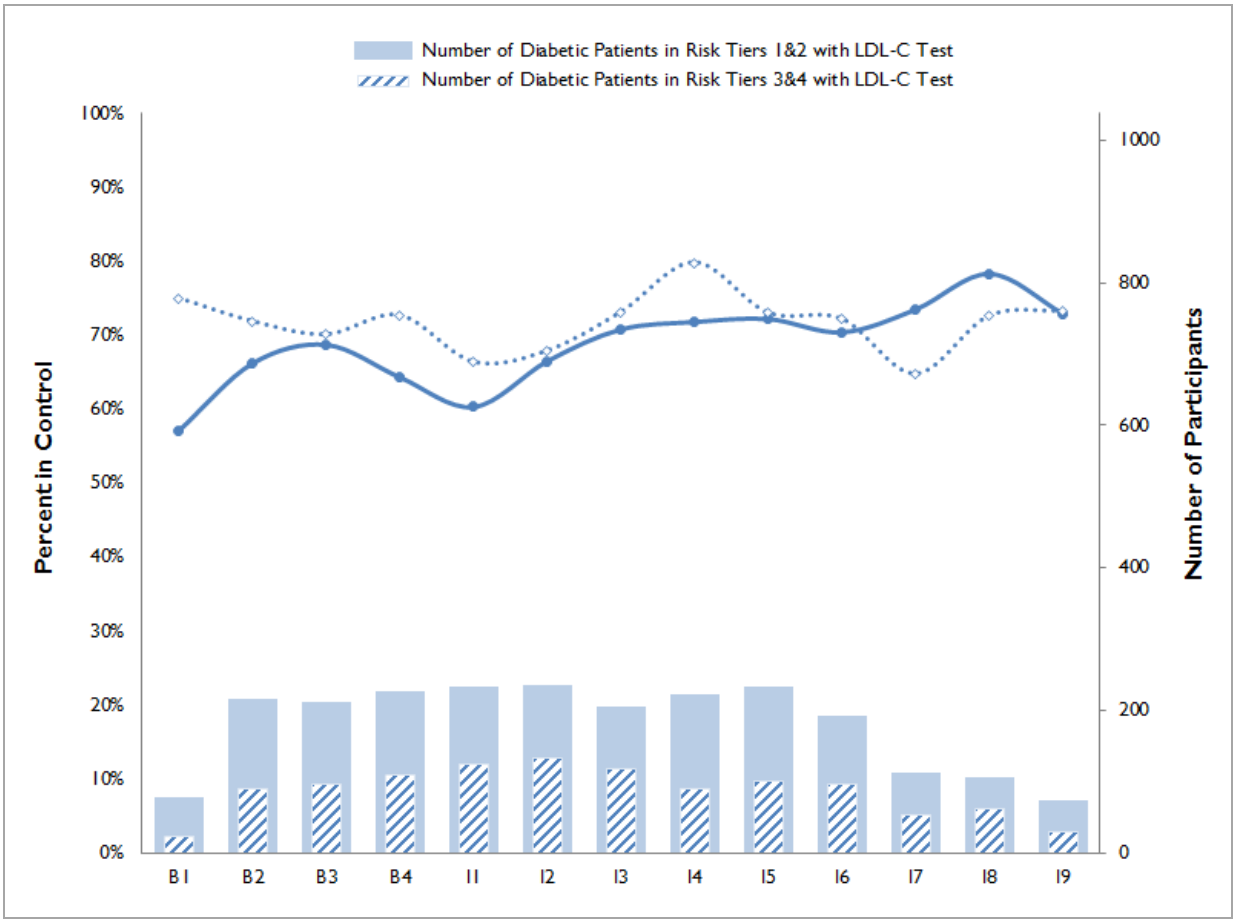
Source: Patient-level data provided to RTI by Curators.

Evaluation Question

- Has the percentage of diabetes patients with LDL-C control increased over time among those enrolled in the innovation?

Figure 20 presents the percentage of patients with diabetes, by baseline risk tier, who have an LDL-C test indicating good control (i.e., <100) over time. The denominator represents the number of diabetes patients who received an LDL-C test for each quarter. The numerator represents the number of diabetes patients who received an LDL-C test that was <100. As shown in the figure, the percentage of patients with LDL-C control fluctuates somewhat over time for patients in both sets of risk tiers. Interestingly, however, there are greater percentages of patients in the higher-risk tiers with LDL-C control than in the lower-risk tiers. Although, among those in the higher-risk tiers, the percentage with LDL-C control changes little when comparing the baseline quarters to the last quarter for which data are presented. More specifically, approximately 73 percent of higher-risk tier patients have LDL-C control in the baseline quarters, which is the same as that in I9 (i.e., approximately 73%). The reverse is true for those in the lower-risk tiers, where the percentage increases from 64 percent in the baseline quarters to approximately 73 percent by I9. This suggests that the innovation may have a greater effect on those in the lower-risk tiers over time than on those in the higher-risk tiers.

Figure 20. Percentage of Patients with Diabetes with LDL-C Control over Time by Risk Tier



	Quarter	B1	B2	B3	B4	I1	I2	I3	I4	I5	I6	I7	I8	I9
●	Percentage of risk Tiers 1 and 2 patients with diabetes with LDL-C control	57.1	66.2	68.7	64.3	60.3	66.5	70.8	71.8	72.2	70.4	73.5	78.3	72.9
◊	Percentage of risk Tiers 3 and 4 patients with diabetes with LDL-C control	75.0	71.9	70.1	72.7	66.4	67.9	73.1	79.8	73.0	72.2	64.8	72.6	73.3
	Number of in risk Tiers 1 and 2 patients with diabetes with LDL-C test	63	201	198	213	219	221	192	209	219	179	98	92	59
	Number of in risk Tiers 3 and 4 patients with diabetes with LDL-C test	24	89	97	110	125	134	119	89	100	97	54	62	30

Source: Patient-level data provided to RTI by Curators.
LDL-C = low-density lipoprotein cholesterol.

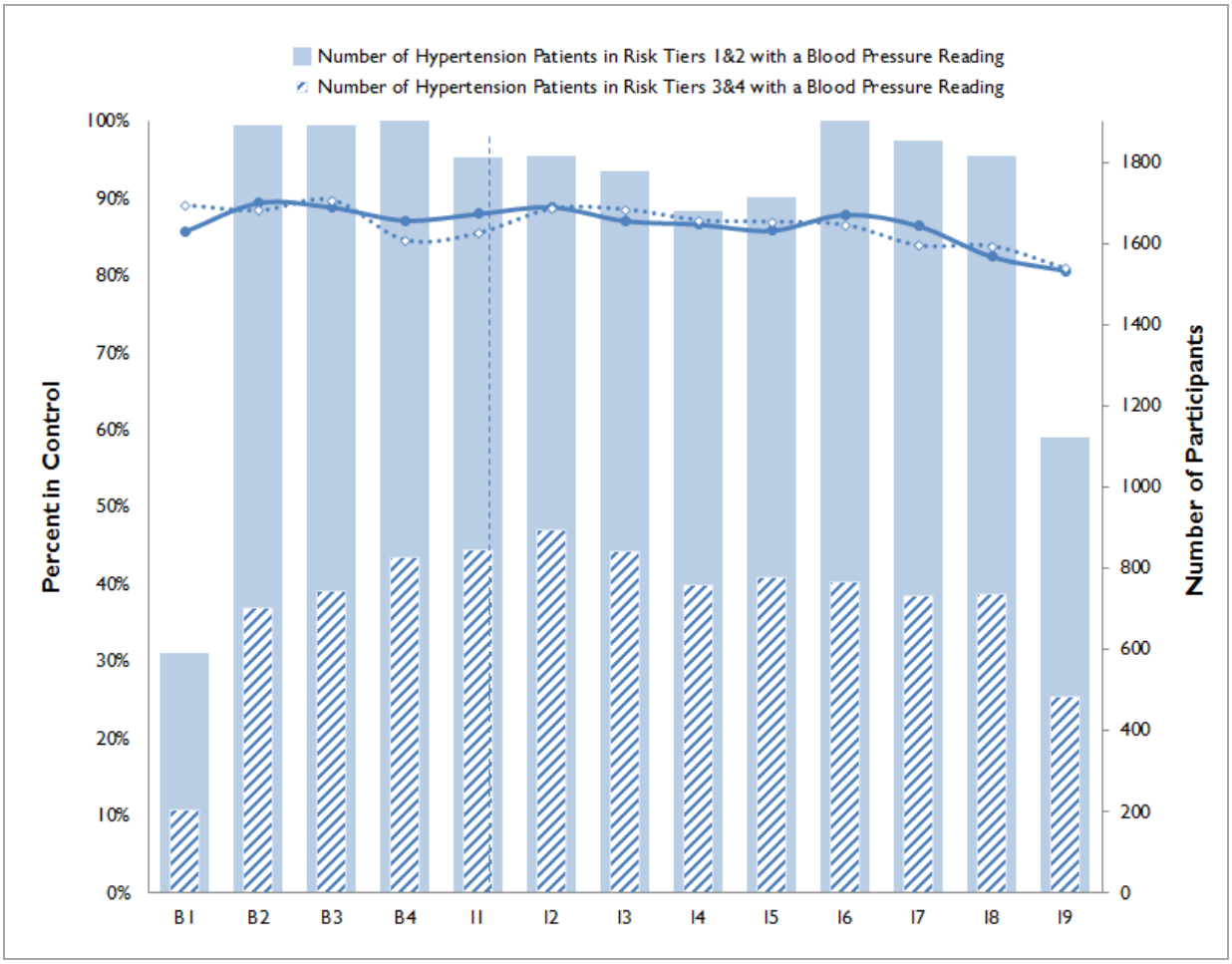
Hypertension

Evaluation Question

- Has the percentage of hypertension patients with blood pressure control increased over time among those enrolled in the innovation?

Figure 21 presents the percentage of participants with hypertension, by baseline risk tier, who have a blood pressure reading within the quarter indicating good control (i.e., <140/90 mm Hg) over time. The denominator represents the number of hypertension patients who received a blood pressure reading for each quarter. The numerator represents the number of hypertension patients who received a blood pressure reading that was <140/90 mm Hg. The percentage of patients with blood pressure control fluctuates over time. As shown in the figure, the percentage of hypertension patients with blood pressure control fluctuated somewhat over time for patients in both sets of risk tiers. For both sets of groups, the percentage with blood pressure control decreases slightly over time. More specifically, approximately 88 percent of both higher and lower risk tier patients have blood pressure control in the baseline quarters, but approximately 80 percent do in I9. Thus, blood pressure did not improve over time among hypertensive patients enrolled in the innovation, regardless of risk tier.

Figure 21. Percentage of Patients with Hypertension with Blood Pressure Control over Time by Risk Tier



	Quarter	B1	B2	B3	B4	I1	I2	I3	I4	I5	I6	I7	I8	I9
●	Percentage of risk Tiers 1 and 2 patients with hypertension with blood pressure control	85.7	89.4	88.9	87.2	88.0	88.9	87.1	86.7	85.9	87.9	86.4	82.5	80.7
◊	Percentage of risk Tiers 3 and 4 patients with hypertension with blood pressure control	89.2	88.5	89.8	84.6	85.5	88.7	88.6	87.2	87.0	86.6	83.9	83.8	80.9
	Number of risk Tiers 1 and 2 patients with hypertension with blood pressure reading	567	1865	1868	1934	1788	1792	1754	1657	1691	1912	1830	1791	1097
	Number of risk Tiers 3 and 4 patients with hypertension with blood pressure reading	203	702	745	825	844	894	842	758	777	767	734	736	482

Source: Patient-level data provided to RTI by Curators.

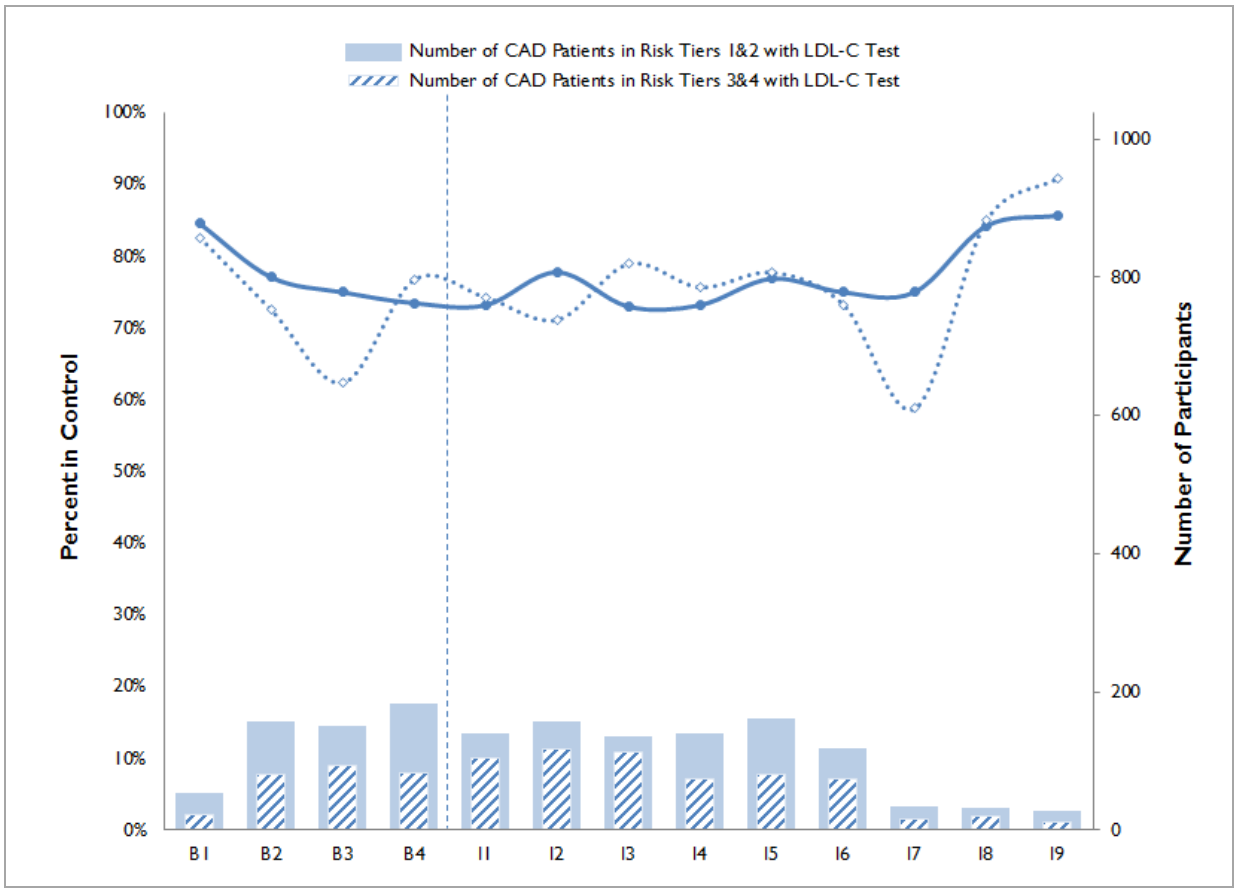
LDL Control among CAD Patients

Evaluation Question

- Has the percentage of CAD patients with LDL-C control increased over time among those enrolled in the innovation?

Figure 22 presents the percentage of patients with CAD, by baseline risk tier, who have an LDL-C test indicating good control (i.e., <100) over time. The denominator represents the number of CAD patients who received an LDL-C test for each quarter. The numerator represents the number of CAD patients who received an LDL-C test that was <100. As shown in the figure, the percentage of patients with LDL-C control fluctuates somewhat over time for patients in both sets of risk tiers, but more so for those in the higher-risk tiers. Among those in the higher-risk tiers, the percentage with LDL-C control increases when comparing the baseline quarters to the last quarter for which data are presented. More specifically, approximately 74 percent of higher-risk tier patients have LDL-C control in the baseline quarters, but more than 90 percent do in I9. The increase is less pronounced among those in the lower-risk tiers, where the percentage increases from 77 percent in the baseline quarters to approximately 86 percent in I9. This suggests that LDL-C improved over time for CAD patients, especially those in the higher-risk tiers, enrolled in the innovation.

Figure 22. Percentage of Patients with CAD with LDL-C Control over Time by Risk Tier



(continued)

Figure 22. Percentage of Patients with CAD with LDL-C Control over Time by Risk Tier (continued)

	Quarter	B1	B2	B3	B4	I1	I2	I3	I4	I5	I6	I7	I8	I9
●	Percentage of risk Tiers 1 and 2 patients with CAD with LDL-C control	84.6	77.1	75.0	73.5	73.2	77.8	73.0	73.2	76.9	75.0	75.0	84.2	85.7
◊	Percentage of risk Tiers 3 and 4 patients with CAD with LDL-C control	82.6	72.5	62.4	76.8	74.3	71.2	79.0	75.7	77.8	73.3	58.8	85.0	90.9
	Number of risk Tiers 1 and 2 patients with CAD with LDL-C test	39	144	136	170	127	144	122	127	147	104	20	19	14
	Number of risk Tiers 3 and 4 patients with CAD with LDL-C test	23	80	93	82	105	118	114	74	81	75	17	20	11

Source: Patient-level data provided to RTI by Curators.
CAD = coronary artery disease; LDL-C = low-density lipoprotein cholesterol.

Discussion of Other Awardee-Specific Findings

The findings for clinical and health outcomes among patients with asthma, diabetes, hypertension, CAD, and COPD enrolled in the innovation are mixed. The percentage of asthma patients with normal FEV1 decreased, rather than increased, over time. Among those in the higher-risk tiers, the percentage of diabetes patients with HbA1c control and LDL-C control increases over time. The percentage of hypertensive patients with blood pressure control decreases over time, whereas the percentage of CAD patients with LDL-C control increases over time. Thus, the findings among those in the higher-risk tiers are mixed, with positive results among those with diabetes and CAD, and negative results among those with hypertension.

Among those in the lower-risk tiers, the percentage of diabetes patients with HbA1c control and LDL-C control decreases over time. Similar to those in the higher risk tiers, the percentage of hypertensive patients with blood pressure control decreases over time, whereas the percentage of CAD patients with LDL-C control increases over time. Thus, the findings among those in the lower-risk tiers are mostly negative; the only positive finding is the increase in the percentage of patients with CAD with LDL-C control over time. Overall, findings suggest patients enrolled at higher-risk tiers show some improvements over time, whereas those in the lower risk tiers show little improvement over time.

Overall, providers at Curators were satisfied with LIGHT[2] and agreed it has had a positive impact on patient care. Physicians did not necessarily use the tools themselves, since the NCMs primarily interacted with the tools but were positive about the benefits for patients.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing Curators as well as accomplishments to date. In this section we assess Curators' progress on achieving HCIA goals to date:

- **Smarter spending.** The Medicare regression results suggest that the innovation has incurred more total spending for the intervention group than the comparison group. Increases in spending may be due to an emphasis on primary care services for the sickest patients which is expected to result in short-term increases with the possibility of long-term decreases in spending. We will continue to examine the trend, as better prevention could lead to overall lower spending over time. The Medicaid regression results suggest that the innovation has accrued some possible savings, although more data periods are needed to draw a definitive conclusion.

- **Better care.** Curators reached 100 percent of its target population by July 2012. Approximately 74 percent of patients received at least one NCM service as of Q11, approximately a 20 percentage point increase from Q8.

  A majority of patients with CAD were prescribed aspirin or clopidrogel during their enrollment period. Similarly, a majority of patients with COPD were prescribed an inhaled bronchodilator. In addition, more asthmatic patients were identified and given appropriate testing during the innovation.

  Medicare beneficiaries were more likely to have an inpatient hospitalization than their matched control group but were less likely to have an ED visit than their matched control group. Medicaid beneficiaries were neither more nor less likely to be hospitalized or go to the ED.

- **Healthier people**. For diabetes health outcomes, the percentage of patients in the higher risk tiers with HbA1c control increased, but there was no change in the percentage with LDL-C control. The percentage of patients in the lower-risk tiers with HbA1c control decreased, while the percentage with LDL-C control increased over time.

  For hypertension, blood pressure control decreased slightly over time for both the lower- and higher-risk tier groups.

  For CAD, LDL-C control increased over time for both the lower- and higher-risk tier groups and was more pronounced for the higher-risk tier group.

While the initial signs do not necessarily point to lower costs and improved outcomes, the innovation is focused on prevention and long-term change. Thus, it is premature to conclude whether or not Curators has achieved its goals of smarter spending, better care and healthier people in the long-term. Curators has begun to use aggregate data to support additional analytics. This includes seeking a comparison group for study and seeking additional expertise for claims analysis. These efforts will help to identify long-term impacts of the innovation.

Project Leadership is currently working with the University of Missouri to incorporate the NCMs into operations long-term, which will occur by converting them into permanent hospital employees rather than term employees paid through the innovation. There is also a growing organizational emphasis about the integration of population health with operations. Thus, Curators is planning to maintain and expand the LIGHT^2 analysis tools to support the work of the NCMs. While work must be done to continue to integrate the NCMs and use of tools into the clinical workflow, the work that has taken place helped expand care coordination services. In addition, the tools facilitated population-level analytics and quality improvement projects.

Overall, Curators has made solid progress toward reaching its implementation goals through development and implementation of components to support health of the cohort population. Areas of opportunity include streamlining processes, standardizing workflow and improving physician engagement.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Delta Dental Plan of South Dakota

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in Delta Dental Plan of South Dakota's 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

Delta Dental Plan of South Dakota

1.1 Introduction

Located in Pierre, South Dakota, Delta Dental Plan of South Dakota (Delta Dental) received a total award of $3,364,528 and launched the innovation on January 7, 2013. Its innovation, Circle of Smiles: Improving Oral Health in Indian Country, primarily targets oral/dental health of American Indian children under age 9 living on South Dakota reservations. The innovation seeks to achieve the following HCIA goals:

1. **Smarter spending.** Reduce spending by 11 percent by improving oral health care through preventive interventions.
2. **Better care.** Provide direct dental services and oral health care coordination to American Indian children under age 9 living on South Dakota reservations.
3. **Healthier people.** Provide better oral health.

Table 2 provides a summary of changes that occurred with Delta Dental during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data received from Delta Dental as of May 31, 2015; and key informant interviews with Delta Dental's leaders and staff conducted on June 11 and 12, 2015.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	Initiated Early Childhood Caries (ECC) Collaborative disease management protocol with children aged 0 to 5 seen in Head Start clinics.
	The innovation attempted to increase reach to Medicaid enrollees aged 0 to 9 through a program by offering parents a $20 gift card for each visit.
Program Participant Characteristics	Since the fifth quarterly report (earliest time period for which we have Delta Dental data), no change occurred in the age distribution of participant characteristics with the addition of 7,319 participants. The percentage of Medicaid participants, however, decreased since Q9.
Implementation Process	
Execution	Spending rates are at projection.
Leadership	No change since the first annual report.[1]
Organizational capacity	No change since the first annual report. Since the first annual report (2014), Delta Dental maintained the involvement of the CEO, project director, and project manager. Delta Dental had mobile dental chairs and sufficient transportation to successfully implement the innovation.

(continued)

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Workforce Development	
Hiring/retention	No change since the first annual report. Fully staffed at 24 FTEs.
Training	1,322 hours of training provided to 97 individuals: OHC orientation, Circle of Smiles quarterly training, motivational interviewing, and ECC training. Circle of Smiles hygienists completed the U.S. Department of Health and Human Services Office of Minority Health's Cultural Competency Program for Oral Health Professionals. Eight of Delta Dental's OHCs completed an online training program by taking three Rio Salado College CDHC courses.
Implementation Effectiveness	
Reach	A total of 5, 460 Medicaid-eligible children, 90.7.0% of the target population, enrolled through Q11.[2]
Dose	No update

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by Delta Dental.
Key informant interviews conducted Feb–June 2015.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

[2] Delta Dental altered its patient reach from patients with diabetes and pregnant women and new mothers to Medicaid-enrolled American Indian children aged 0 to 9 living in/on a South Dakota Reservation county who received at least one diagnostic or preventive dental service.

CDHC = Community Dental Health Coordination; FTE = full-time equivalent; OHC = oral health coordinator.

1.1.1 Innovation Components

This innovation consists of two components: direct dental services and oral health care coordination. As part of the innovation, Delta Dental hygienists travel throughout the reservations, provide prophylaxis dental cleanings to children in schools and day cares, and refer children who need restorative care to partnering pediatric dentists. Oral health coordinators (OHCs) support hygienists by facilitating the care transition from the hygienist to the pediatric dentist, following up with children's parents or guardians to ensure the children visit the pediatric dentist, and helping parents or guardians overcome barriers to seeking care (e.g., lack of transportation). Since we provided details on these components in the first annual report, no changes to these components were made.[1]

Since it originally launched, the innovation scaled back to focus on patients with diabetes, pregnant women, and new mothers because of the challenges in recruiting these individuals. Delta Dental continues to serve patients with diabetes and pregnant women on a limited basis. Delta Dental modified its target population to focus on Medicaid-enrolled American Indian children aged 0 to 9 living in/on a South Dakota Reservation county who received at least one diagnostic or preventive dental service. Delta Dental continue to provide services for patients with diabetes at two Indian Health Services (IHS) sites

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

that allowed Delta Dental staff to work in their clinics. However, because of the shift in target population focus, we do not report on this former intended population. To attempt to increase reach to Medicaid enrollees aged 0 to 9, Delta Dental implemented an incentive program in which parents were offered a $20 gift card for each visit.

Delta Dental partnered with 18 organizations to implement the innovation, including providing training or other support to dental hygienists and OHCs. Delta Dental partnered with each of the nine tribes in South Dakota; those partnerships facilitate the hiring of OHCs. The partners for this innovation remain unchanged since project launch.

1.1.2 Program Participant Characteristics

Table 3 provides the demographic characteristics of all participants ever enrolled in the innovation through Q11. As shown in the table, a majority of participants (64.2%) were under 9 years old and more than half (52.4%) were female. Most participants (88.1%) were American Indian or Alaska Native, and 4.9 percent were white. A majority (73.5%) were covered by Medicaid and approximately 25 percent were uninsured.

Compared to Q9 data reported in the fifth quarterly report (earliest time period for which we have data from Delta Dental), the age distribution remained similar. In Q9, RTI reported 69.4 percent of Delta Dental participants were under the age of 9 compared to 64.2 percent in Q11. The percentage of Medicaid participants decreased since Q9. Delta Dental reported that 92.7 percent of the participant population in Q9 was covered by Medicaid compared to 73.5 percent in Q11. This change likely occurred because Delta Dental is now serving more uninsured participants. In Q9 only 6.8 percent of participants were uninsured compared to 24.6 percent of participants in Q11.

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Number of Participants	Percentage of Participants
Total	7,319	—
Age		
0–2	473	6.5
3–5	1,798	24.6
6–8	2,427	33.2
9–11	1,506	20.6
12–15	287	3.9
16–18	78	1.1
19–24	89	1.2
25–44	201	2.7
45–64	334	4.6
65–74	76	1.0
75–84	28	0.4

(continued)

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015 (continued)

Characteristic	Number of Participants	Percentage of Participants
Age (continued)		
85+	3	0.0
Missing	19	0.2
Sex		
Female	3,833	52.4
Male	3,462	47.3
Missing	24	0.3
Race/ethnicity		
White	359	4.9
Black	23	0.3
Hispanic	26	0.4
Asian	9	0.1
American Indian or Alaska Native	6,449	88.1
Native Hawaiian or Other Pacific Islander	1	0.0
Other	83	1.1
Missing/refused	369	5.1
Payer Category		
Dual	0	0.0
Medicaid	5,382	73.5
Medicare	0	0.0
Medicare Advantage	0	0.0
Other	136	1.9
Uninsured	1,797	24.5
Missing	4	0.1

Source: Patient-level data provided to RTI by Delta Dental.

1.2 Implementation Progress

The first annual report (2014) described Delta Dental's implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area. ***Table 4*** lists these measures and their status as of May 31, 2015. Early in the implementation process, Delta Dental experienced barriers to reaching a portion of its original target population: patients with diabetes and pregnant women and new mothers. Delta Dental since modified its target population to focus only on Medicaid enrolled children ages 0 to 9, as reflected in ***Table 4***

This section presents Delta Dental's process measures and a qualitative analysis of the factors that determined Delta Dental's implementation progress. This analysis draws on patient-level data provided to RTI by Delta Dental as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 4 lists the explanatory measures determined as most relevant for our evaluation, with an indication of the status of the data requested and whether the data are presented in this annual report. The results of analyses for all of these measures are included in this annual report.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation effectiveness	Reach	Number of Medicaid-enrolled AIC aged 0 to 9 living in/on a South Dakota Reservation County who received at least one diagnostic or preventive dental service	Data received from Delta Dental

AIC = American Indian children. Delta Dental = Delta Dental Plan of South Dakota.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through Delta Dental's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include Delta Dental's reports from Q8 through Q10 and interviews conducted on June 11 and 12, 2015.

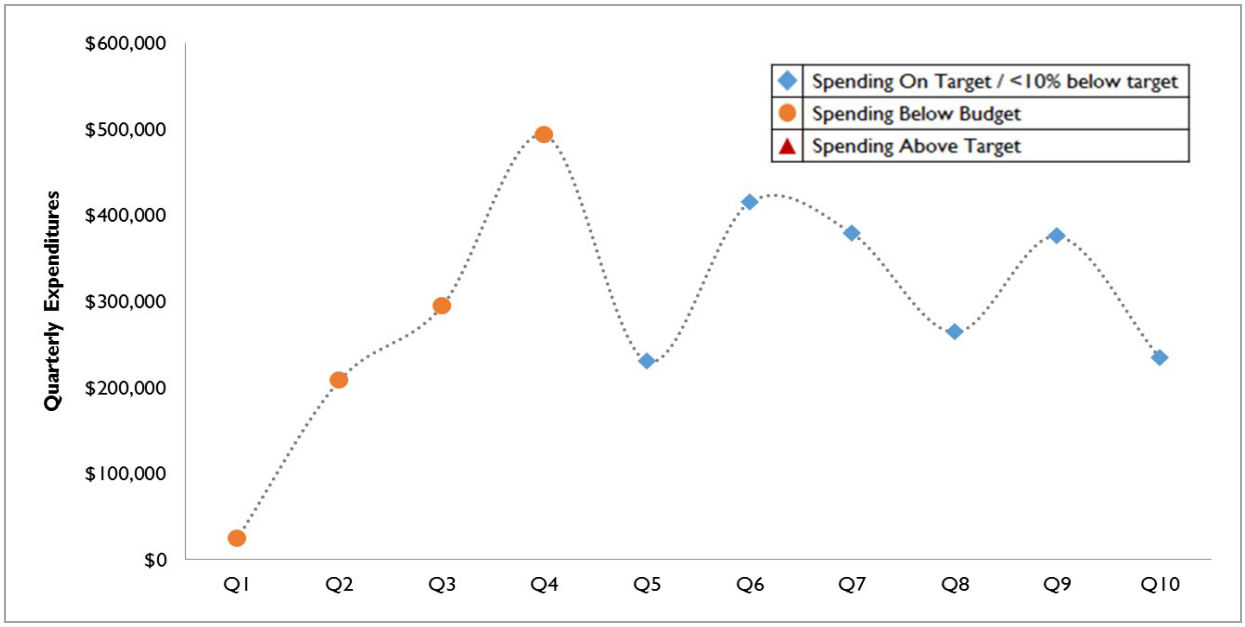
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

Execution of Implementation

The annual report highlights the significance of Delta Dental's expenditure rates on implementation. As of December 2014 (Q10), Delta Dental spent 60.77 percent of its Year 3 budget, which is at the projected target.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Leadership

Since the first annual report (2014), Delta Dental has maintained the involvement of the CEO, project director, and project manager. Delta Dental's CEO provides resources, participates in high-level meetings with the Medicaid director, meets with the board of directors to obtain additional funding, meets with external partners (i.e., IHS dental director) on behalf of the program, and works with the South Dakota Collaborative, which included members of the South Dakota Dental Hygienists' Association and other stakeholders, to implement a law that allows hygienists to perform cleanings without a dentist present.

Organizational Capacity

Delta Dental maintained adequate organizational resources and capacity. The Q8-10 *Narrative Progress Reports* and corresponding site visit interviews indicated Delta Dental had low turnover as well as mobile dental chairs and sufficient transportation to successfully implement the innovation. Delta Dental also had an existing mobile oral health care program, which gave its implementation team knowledge of and experience with providing on-site dental services in a range of locations (e.g., schools, churches, etc.).

As discussed in the first annual report, Delta Dental experienced several barriers to implementation; as a result, the team changed the innovation to focus on children aged 0 to 9. They initially planned to work with IHS—and an IHS liaison served as an early partner in their effort. This individual retired, however, and the new interim liaison did not have the time to commit to the innovation. In addition, each IHS facility and dental unit had a unique organizational culture; staff in most IHS dental clinics did not value external hygienists working in the IHS clinic and, according to program staff, saw the hygienists as competitors rather than as collaborators. We provide additional background and description

of Delta Dental's partnership with IHS in the first annual report. Since the last annual report, Delta Dental had no changes in organizational capacity over the course of the innovation.

1.2.2 Workforce Development

HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with 24 full-time equivalent (FTE) staff members. Between Q8 (June, 2014) and Q10, Delta Dental maintained the same number of FTE staff members. Although Delta Dental had minimal turnover, it recognized that subcontracting the OHC positions through tribes limited Delta Dental's ability to oversee job requirements, supervise OHCs directly, and terminate OHCs whose performance was not adequate. Job requirements, such as level of education, varied across tribes, and when a particular OHC's work did not fit well with the innovation, Delta Dental could not terminate individuals whose performance was not adequate.

Skills, Knowledge, and Training

Between Q8 and Q10, Delta Dental provided 1,322 hours of training to 97 individuals. The training included OHC orientation, cultural competency, Circle of Smiles quarterly meetings, motivational interviewing, and ECC training. In one 2015 end-of-year interview, a staff member indicated that the OHC training did not yield intended results: "Thinking back to the OHC's training, if we could do it differently, we'd train them differently. The training we used didn't work out as well as we thought it would. It may be just as good to train them internally. It was a lot of time wasted and the curriculum was really expensive. It was not a very good use of the money."

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach) and; (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

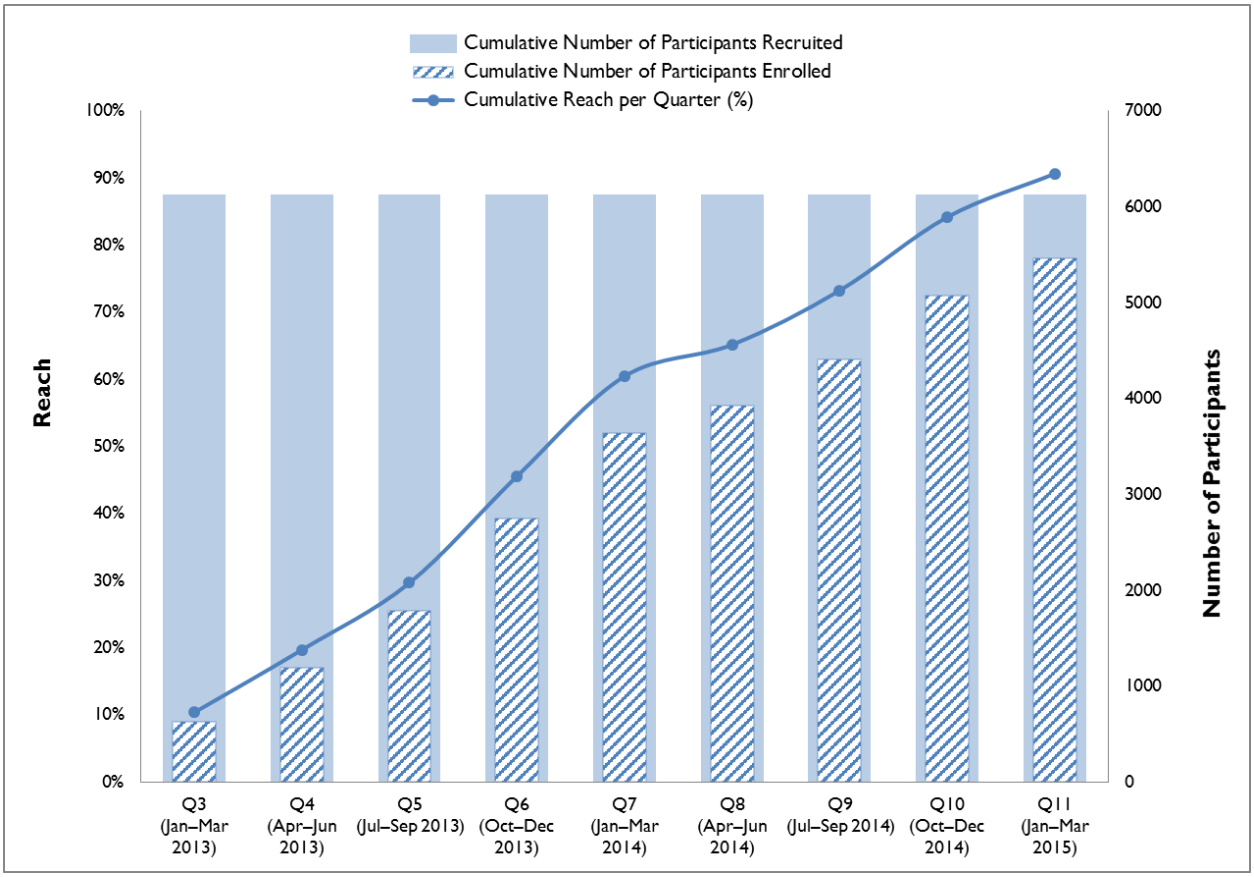
- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

Reach

Delta Dental provided cumulative data through Q11 on the target population, which includes children from the school sites aged 0 to 9 enrolled in the Circle of Smiles program. Delta Dental targeted 6,022 students at Circle of Smiles Schools. This population includes both Medicaid-eligible and ineligible students. To better align with the denominator, the reach calculations were limited to Medicaid-eligible children aged 0 to 9 who received prophylaxis treatment.

Figure 2 shows reach by quarter for Delta Dental. Although we received participant enrollment data in Q9, we did not receive target population data to calculate reach until Q10. Cumulative reach for Q10 reported in the sixth quarterly report was 71.2 percent. Delta Dental included additional participants who were enrolled in Q10 in the Q11 data upload, which increased reach to 84.2 percent in Q10. Since the beginning of the innovation, reach increased continuously, perhaps because children are a captive audience in the school setting and because hygienists and OHCs built relationships with community members during the innovation. As of Q11, Delta Dental reached 90.7percent of its target population.

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch



(continued)

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch (continued)

	Quarter	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan–Mar 2015)
●	Cumulative reach per quarter (%)	10.4	19.7	29.7	45.6	60.5	65.2	73.3	84.2	90.7
	Target population[1]	6,022	6,022	6,022	6,022	6,022	6,022	6,022	6,022	6,022
	Cumulative number of participants enrolled[2]	626	1187	1788	2745	3642	3926	4412	5071	5460

Source: Patient-level data provided to RTI by Delta Dental.
[1] Medicaid-eligible children aged 0 to 9 receiving prophylaxis treatment on the reservation.
[2] Children at the school sites aged 0 to 9 enrolled in Circle of Smiles.
Note: Participant enrollment reported differs from Q10 because Delta Dental sent additional data from previous quarters.

The number of participants enrolled based on the data that Delta Dental provided (reported in the quarterly and annual reports) differs from the number of enrollees reported in the *Quarterly Awardee Performance Reports* because our calculations only use Medicaid-eligible participants receiving prophylaxis treatment on the reservation whereas the quarterly awardee performance data (presented in the *Quarterly Awardee Performance Reports*) capture every patient receiving a treatment (i.e., non-Medicaid participants).

Dose

Delta Dental's innovation seeks to ensure that: (1) infants visit a dentist before their first birthday; (2) children aged 0 to 9 receive one dental prophylaxis; and (3) children aged 6 to 8 receive necessary sealants and fluoride varnishes once per year, which are included in the dental prophylaxis. Thus, dose, in this case, can be considered synonymous with participant enrollment (presented as Reach).

Sustainability

During the HCIA innovation period, Delta Dental also participated in an ECC Collaborative pilot program to find a better way to treat children aged 0 to 5 in clinic while they were awaiting surgical care. During the pilot, Delta Dental participated in trainings, conducted a risk assessment to stratify patients into risk categories, and examined patient data to determine patient treatment frequency and type. Delta Dental conducted motivational interviews and self-management goal setting with children's parents. Delta Dental used the ECC Collaborative pilot to apply for Health Resources and Services Administration (HRSA) grant funding, which will allow expansion of this pilot program into seven other Head Start sites.

Using HRSA grant funding and the existing Delta Dental Philanthropic Fund (DDPF), Delta Dental plans to sustain some aspects of the innovation. Delta Dental intends to align the hygienists' work into their extant mobile dental service and intends to maintain four OHCs. Hygienists will continue to serve their regions and will work in the mobile unit alongside dentists and dental assistants when the mobile units are in region. Delta Dental will hire several of the OHCs, who originally worked directly for the partnering tribes via a subcontract. OHCs will also continue in their existing roles, but will serve regions of

the state, rather than individual tribes, and will work alongside the mobile unit team while in region. This approach will allow Delta Dental to ensure consistent job requirements and have direct oversight over the OHCs' work and progress, while increasing overall staffing capacity in each region. For sustained efforts, Delta Dental plans to expand the target innovation age group to include children from early Head Start ages up to 8th grade.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of Delta Dental innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data Delta Dental collects and submits to RTI (labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers essential to the evaluation of Delta Dental's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 5 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of whether the payer-specific data are presented in this annual report. Since Delta Dental's innovation is not serving Medicare patients, the claims-based outcome measures for Medicare are not presented in this annual report and will not be included in future reports.

Table 5. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	No	Yes
		Hospital unplanned readmissions rate	No	Yes
		ED visit rate	No	Yes
	Cost	Spending per patient	No	Yes
		Estimated cost savings	No	Yes

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. These measures are described in more detail in ***Appendix B***. As noted in previous reports, this innovation is less likely to have an impact on hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. Spending per patient might be the only core measure potentially impacted by the innovation. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis

Delta Dental's innovation is not serving Medicare patients; therefore, we will not conduct Medicare claims analysis for this awardee.

Medicaid Claims Analysis

The analysis focuses on Medicaid fee-for-service beneficiaries enrolled in the innovation and a comparison group of beneficiaries with similar characteristics identified using propensity score methods. The Medicaid data analysis uses claims data from the CMS Alpha-MAX that are currently available through June 30, 2013. We only have one quarter of post-intervention claims data to analyze in this report; hence, it is premature to conclude whether the innovation had any effect on the claims-based outcome measures.

Comparison Groups

To construct the comparison group, we used propensity score matching to identify Medicaid fee-for-service patients living in counties in South Dakota (sites of Indian reservations) who have not participated in the Delta Dental innovation. We selected comparison group members from the same counties (sites of Indian reservations) to minimize variation in sociodemographic characteristics that may influence service use and expenditures. Program participants and comparison group members were matched using a logit model predicting the likelihood of program participation as a function of demographics (gender, age, and ethnicity), months of Medicaid eligibility and total spending during the year prior to program participation. ***Appendix B*** provides technical details on the propensity score methodology.

Table 6 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. Five treatment beneficiaries were dropped from the propensity score model since they did not have Alpha-MAX data on months of Medicaid eligibility and total spending during the year prior to program participation.

Table 6. Mean Values and Standardized Differences of Variables in Propensity Score Model: Delta Dental

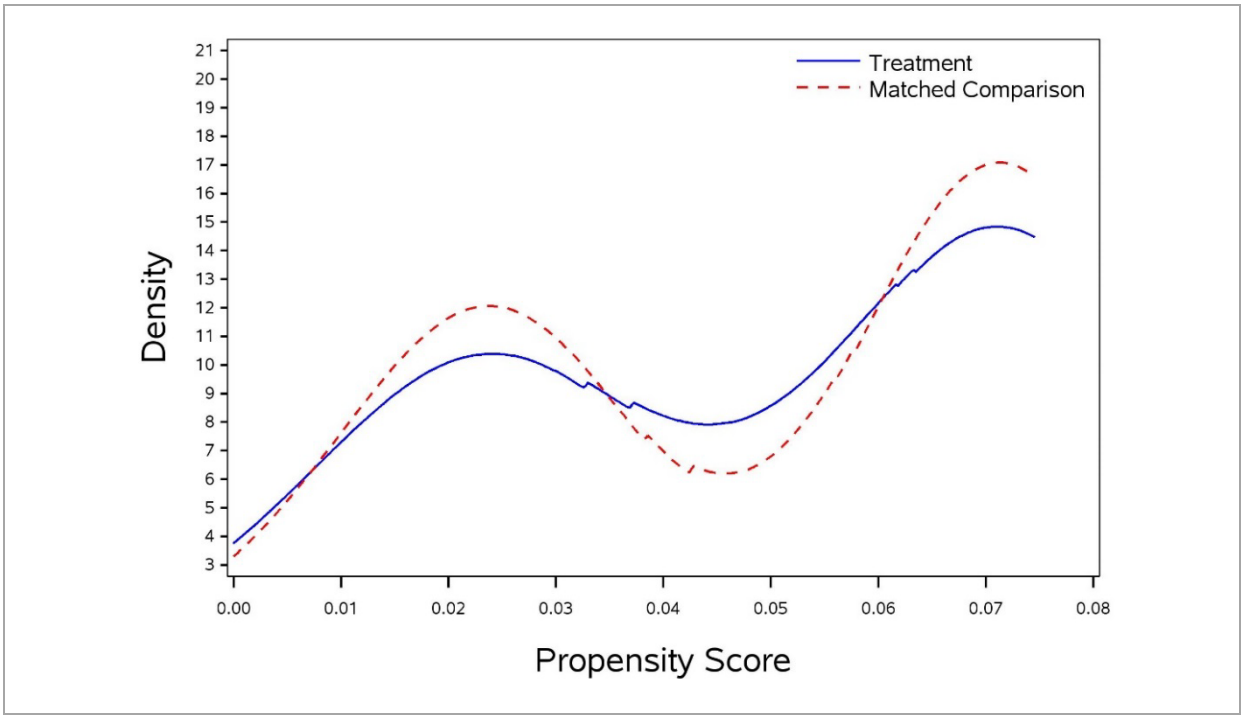
Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Total payments in calendar year prior to enrollment	2,991	6,658	3,866	15,619	0.05	2,991	6,658	3,043	4,964	0.01
Age										
Percentage under 1	3.83	19.21	4.04	19.69	0.01	3.83	19.21	5.30	22.41	0.05
Percentage aged 1-5	63.20	48.26	19.93	39.95	0.69	63.20	48.26	61.13	48.76	0.03
Percentage aged 6-14	32.28	46.79	29.49	45.60	0.04	32.28	46.79	32.80	46.96	0.01
Percentage aged 15 and above	0.68	8.25	46.54	49.88	0.91	0.68	8.25	0.77	8.72	0.01
Percentage male	51.98	49.99	44.50	49.70	0.11	51.98	49.99	52.41	49.96	0.01
Percentage white	2.87	16.72	23.86	42.62	0.46	2.87	16.72	2.94	16.91	0.00
Medicaid eligible months in calendar year prior to enrollment	11.15	2.14	9.89	3.30	0.32	11.15	2.14	11.28	1.92	0.05
Number of unique beneficiaries	731	N/A	41,450	N/A	N/A	731	N/A	1,698	N/A	N/A

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
N/A = not applicable; SD = standard deviation.

After performing propensity score matching, we calculate absolute standardized differences between the treatment group and both the unmatched and matched comparison groups and check whether matching decreases the absolute standardized differences and achieves acceptable balance (Table 6). Many researchers consider that an absolute standardized difference ≤ 0.10 indicates acceptable balance.[2] Researchers also point out that critical variables in determining selection into treatment (e.g., those with significant effects in the propensity score equation) should have greater balance, while indicators with minor importance in determining treatment selection do not require optimal balance. The results in Table 6 show that matching achieved adequate balance (≤ 0.10) for all variables.

Figure 3 shows the distribution of the propensity scores for both the comparison and intervention groups. The figure demonstrates a very close overlap between the treatment and comparison groups' propensity scores. Therefore, we present the Medicaid claims analysis using both the treatment group and the matched comparison group.

Figure 3. Distribution of Propensity Scores for Comparison and Intervention Groups: Delta Dental



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Delta Dental = Delta Dental Plan of South Dakota.

[2] Austin, P.C. An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research. 46.3: 399–424, 2011. *PMC*. Web. 2 June 2015.

Descriptive Analysis

Table 7 reports Medicaid spending per patient in the eight quarters before and the one quarter after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 7. Medicaid Spending per Patient: Delta Dental

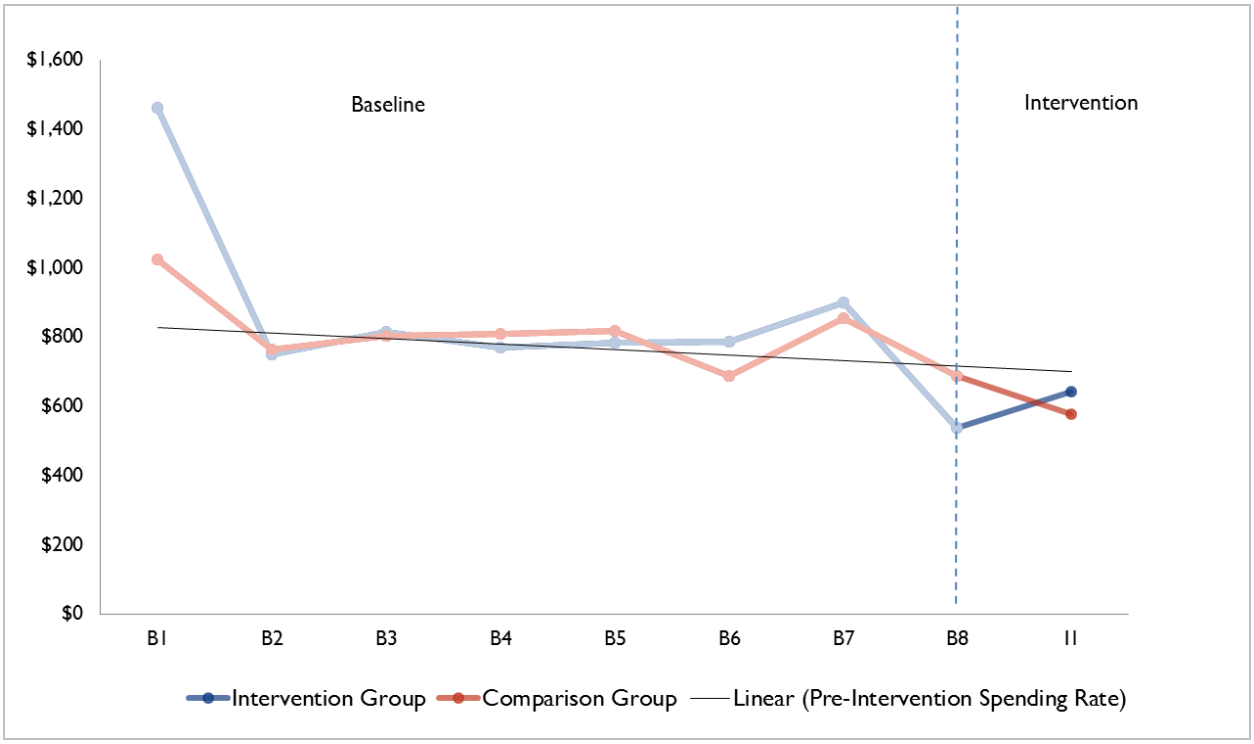
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters
		B1	B2	B3	B4	B5	B6	B7	B8	I1
Intervention Group										
1C1CMS 330980	Delta Dental									
	Spending rate	$1,462	$749	$816	$769	$783	$785	$900	$538	$643
	Std dev	$13,456	$3,197	$1,977	$1,896	$1,780	$4,240	$3,410	$855	$1,169
	Unique patients	646	662	672	681	695	703	722	724	736
Comparison Group										
1C1CMS 330980	Delta Dental									
	Spending rate	$1,024	$764	$804	$808	$816	$689	$854	$687	$578
	Std dev	$3,096	$3,430	$2,533	$2,649	$2,514	$1,317	$2,633	$1,395	$1,299
	Unique patients	1,447	1,521	1,603	1,667	1,719	1,738	1,738	1,723	1,698
Savings per Patient		−$438	$15	−$12	$39	$34	−$97	−$46	$149	−$65

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 4 illustrates the Medicaid spending per beneficiary in Table 7 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters. We exclude the first baseline quarter, B1, from the trend line because this quarter includes several outlier observations with an unexpectedly high number of hospitalizations and total spending, which increases the mean in that quarter significantly.

Figure 4. Medicaid Spending per Patient: Delta Dental



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Delta Dental = Delta Dental Plan of South Dakota.

Trends in spending per person were very similar between the intervention and comparison groups in the pre-intervention quarters. They follow a relatively flat trend that slopes slightly downward. In I1, the spending rate for the intervention group rises slightly above the comparison group rate. This trend is not surprising since Delta Dental anticipated an initial increase in spending because of the innovation as more children receive the dental services they need and are referred to pediatric dentists for restorative care. Because the standard deviation of spending per person is quite high across all quarters (**Table 7**), and we only have one quarter of post-intervention data it is premature to conclude whether the innovation had any effect on the spending rate. We will explore this question further in later reports as the evaluation continues and more data become available.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 8*** and ***Figure 5.***

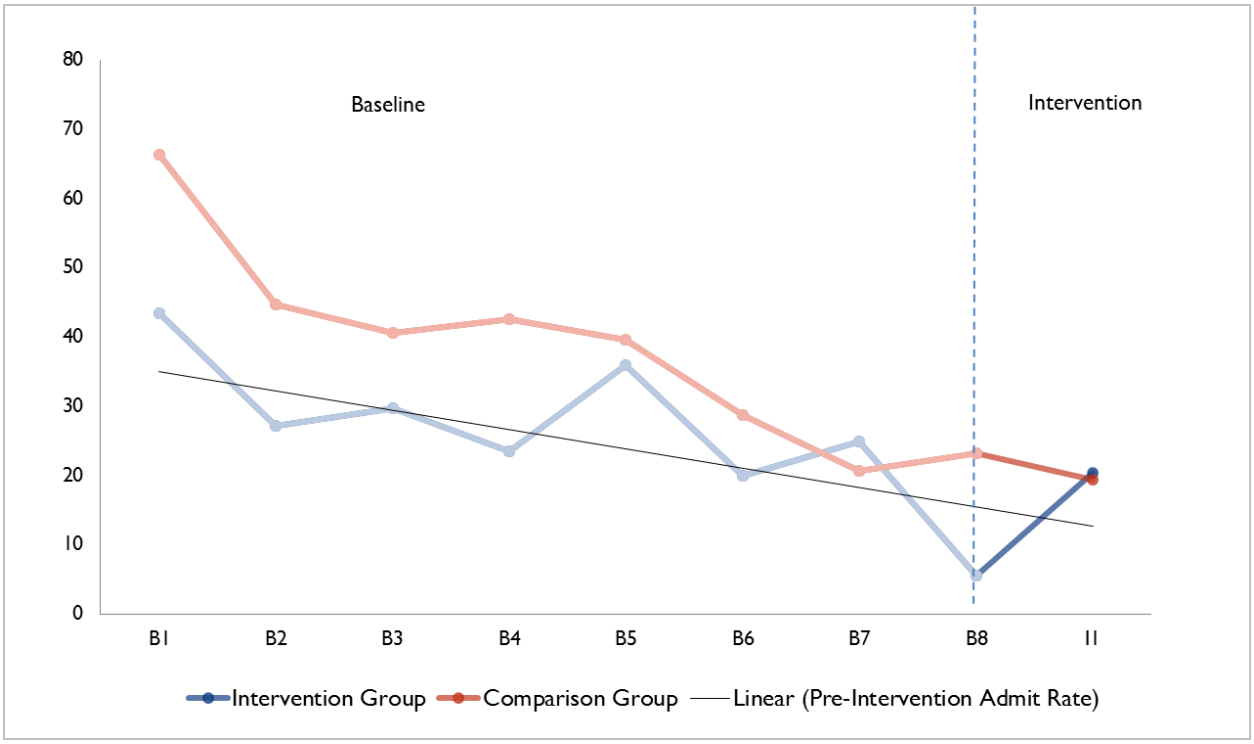
Table 8. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Delta Dental

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters
		B1	B2	B3	B4	B5	B6	B7	B8	I1
Intervention Group										
1C1CMS 330980	Delta Dental									
	Admit rate	43	27	30	23	36	20	25	6	20
	Std dev	225	180	170	152	208	140	156	74	141
	Unique patients	646	662	672	681	695	703	722	724	736
Comparison Group										
1C1CMS 330980	Delta Dental									
	Admit rate	66	45	41	43	40	29	21	23	19
	Std dev	262	219	207	214	218	177	154	172	146
	Unique patients	1,447	1,521	1,603	1,667	1,719	1,738	1,738	1,723	1,698
Intervention − Comparison Rate		−23	−18	−11	−19	−4	−9	4	−18	1

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 5. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Delta Dental



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Delta Dental = Delta Dental Plan of South Dakota.

The inpatient admissions rate for the intervention group fluctuated throughout the sample period with deviations above and below the trend line, which slopes downward. The comparison group had more stable admissions rates, which were slightly above the intervention group rates in most of the sample period. In I1, the admissions rate of the intervention group increased slightly. Overall, these admissions rates were very low, which is expected from a healthy population of children. Given the limited post-intervention data and high standard deviation for the inpatient admission rate (**Table 8**), it is premature to state whether the innovation had any effect on the admission rate. We will explore this question further in later reports as more data become available.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 9*** and ***Figure 6.***

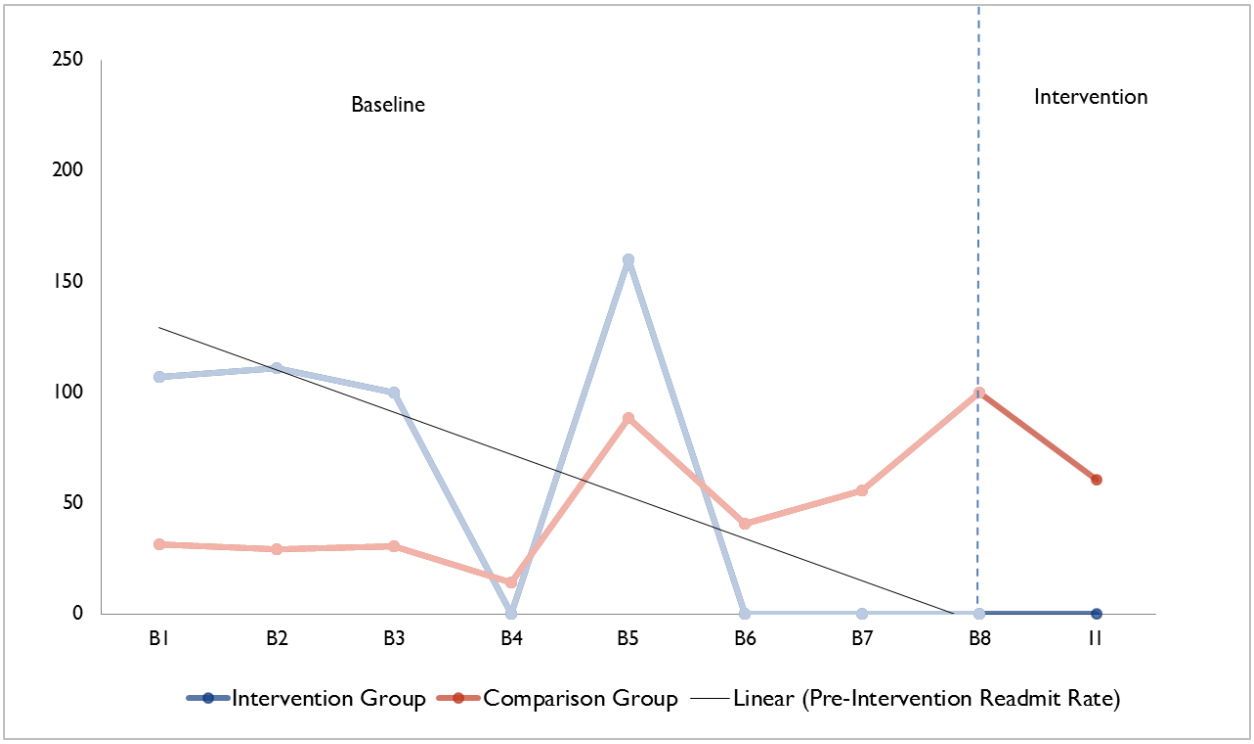
Table 9. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Delta Dental

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters
		B1	B2	B3	B4	B5	B6	B7	B8	I1
Intervention Group										
1C1CMS 330980	Delta Dental									
	Admit rate	107	111	100	0	160	0	0	0	0
	Std dev	309	314	300	0	367	0	0	0	0
	Unique patients	28	18	20	16	25	14	18	4	15
Comparison Group										
1C1CMS 330980	Delta Dental									
	Admit rate	31	29	31	14	88	41	56	100	61
	Std dev	544	526	544	580	561	526	568	558	509
	Unique patients	96	68	65	71	68	49	36	40	33
Intervention − Comparison Rate		76	82	69	−14	72	−41	−56	−100	−61

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Delta Dental



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Delta Dental = Delta Dental Plan of South Dakota.

The readmissions rate trend line slopes downward for the intervention group, and we observe no readmissions in five quarters (B4, B6, B7, B8, and I1) due to the limited number of admissions in these quarters. The frequency of zero readmissions is not surprising because capturing the incidence of rare events such as readmissions is difficult in small samples in which healthy children make up the majority of the sample. Because we observed so many quarters with zero readmissions, the figure associated with readmissions rate comparing the two groups does not have a meaningful interpretation.

ED visits per 1,000 participants are shown in ***Table 10*** and ***Figure 7***.

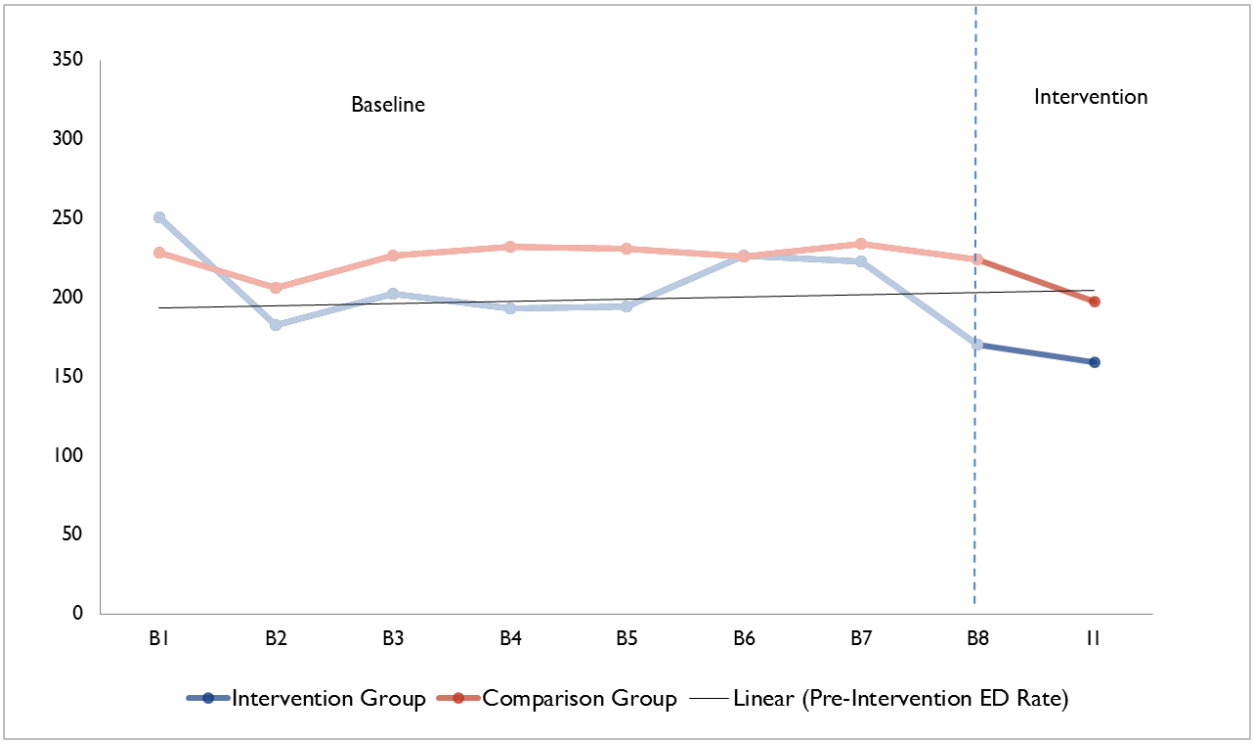
Table 10. ED Visits per 1,000 Participants: Delta Dental

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters
		B1	B2	B3	B4	B5	B6	B7	B8	I1
Intervention Group										
1C1CMS 330980	Delta Dental									
	Admit rate	251	183	202	193	195	227	223	170	159
	Std dev	573	488	493	548	493	547	502	472	488
	Unique patients	646	662	672	681	695	703	722	724	736
Comparison Group										
1C1CMS 330980	Delta Dental									
	Admit rate	228	206	226	232	231	226	234	224	197
	Std dev	174	169	173	118	284	198	229	300	239
	Unique patients	1,447	1,521	1,603	1,667	1,719	1,738	1,738	1,723	1,698
Intervention − Comparison Rate		23	−23	−24	−39	−36	1	−11	−54	−38

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 7. ED Visits per 1,000 Participants: Delta Dental



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Delta Dental = Delta Dental Plan of South Dakota.

The ED visit rate per 1,000 participants was relatively flat for the intervention group and the comparison group had a very similar trend. The rate decreased slightly in the first intervention quarter for both groups and falls below the trend line. In I1, the ED visit rate was lower for the treatment group compared to the comparison group. We will continue to analyze whether the innovation had any effect on the ED rate as more post-intervention data become available.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit. All regressions controlled for age, gender, race, and number of months of Medicaid eligibility during the calendar year prior to the intervention. The regression specification assumes the same quarterly fixed effect for treatment and comparison individuals in the pre-innovation period and allows for a separate quarterly effect for treatment individuals after enrolling in the innovation.

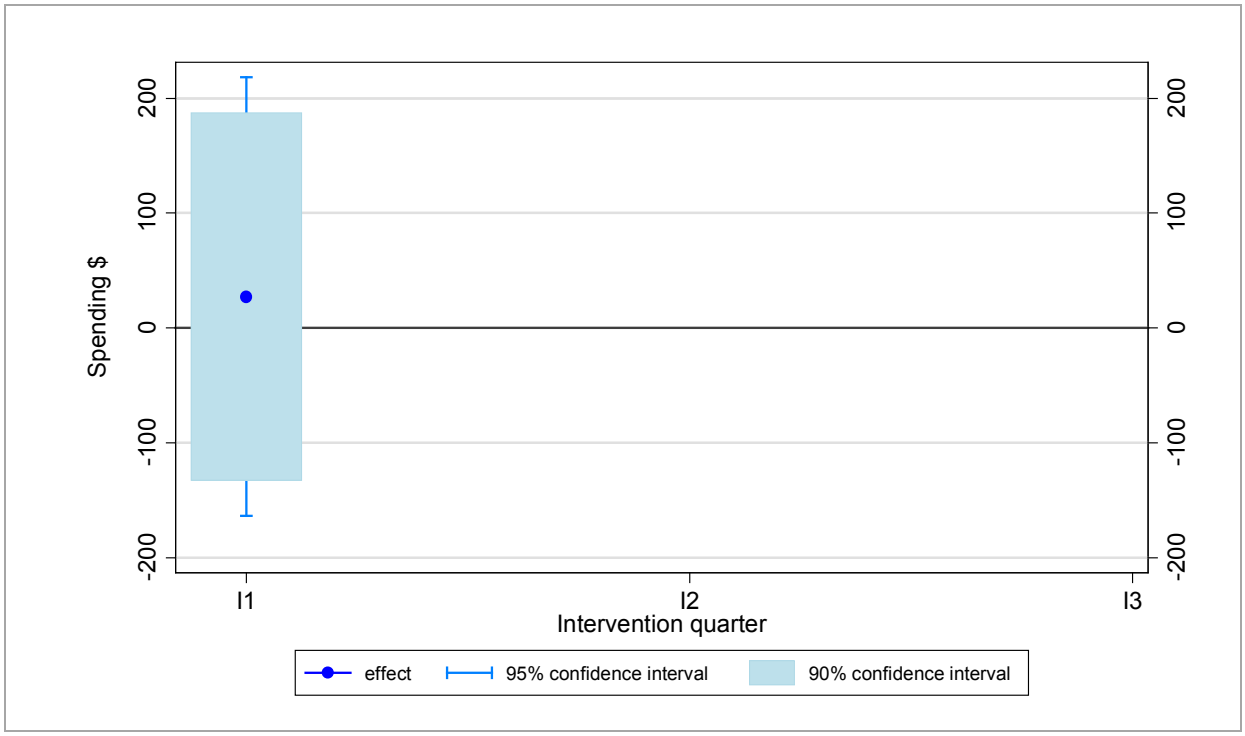
Table 11 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. ***Figure 8*** illustrates these quarterly difference-in-differences estimates.

Table 11. Difference-In-Differences OLS Regression Estimates for Quarterly Medicaid Spending per Participant: Delta Dental

Quarter	Coefficient	Standard Error	P-Values
I1	27	97	0.779

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, and the number of months of Medicaid eligibility during the calendar year prior to the intervention. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
OLS = ordinary least squares.

Figure 8. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Delta Dental



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Delta Dental = Delta Dental Plan of South Dakota; OLS = ordinary least squares.

In I1, change in spending among treatment group individuals was $27 higher than the change in spending among comparison group individuals, but the difference was not statistically significant. More post-intervention claims data are needed to determine whether the innovation led to long-term savings in the spending rate.

Because we have data for only one post-intervention quarter, we are not able to produce and present the figure that shows the strength of evidence in favor of a saving or loss.

We also present linear probability model coefficients for inpatient admissions and outpatient ED visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the estimated effect.[3] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, linear probability model coefficients have often been empirically demonstrated to be consistent with marginal effects generated from nonlinear models.[4] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention), not just the direction of the effect.

Table 12 presents the results of a linear probability model where the dependent variable is an indicator denoting whether the patient had an inpatient hospital visit during the quarter. The estimated coefficient in I1 is positive, indicating that treatment group patients were more likely to be hospitalized in that quarter by 1 percentage point. We will estimate the impact on hospitalizations in later innovation quarters as more claims data become available.

Table 12. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: Delta Dental

Quarter	Coefficient	Standard Error	P-Values
I1	0.01	0.01	0.030

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes: The logistic regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, and the number of months of Medicaid eligibility during the calendar year prior to the intervention. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.

Table 13 presents results of a linear probability model where the dependent variable is an indicator denoting whether the patient had an ED visit during the quarter.

[3] To obtain the correct effect, it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run even when not competing with other users for computer resources.

[4] Angrist, J.D., and Pischke J.-S.: Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

Table 13. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: Delta Dental

Quarter	Coefficient	Standard Error	P-Values
I1	-0.02	0.02	0.272

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes: The logistic regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, and the number of months of Medicaid eligibility during the calendar year prior to the intervention. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.

Treatment group patients are 2 percentage points less likely to have visited the ED in I1, but this estimate is not statistically significant. We will estimate the impact on the probability of ED visits in later innovation quarters as more claims data become available.

Discussion

Because claims data were available for only one quarter in the post-innovation period, we cannot definitively conclude whether the innovation had a significant impact on per patient spending. We will add additional post-intervention quarters to the analysis as more Alpha-MAX data become available to determine if the innovation had a long-term impact on spending. The Circle of Smiles innovation is not designed to have an impact on hospital admissions, readmissions, or ED visits. Changes in those trends appear to be similar across the intervention and comparison groups, and they are likely due to factors external to the innovation as equivalent trends are observed in both groups.

In addition, the results may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicaid fee-for-service beneficiaries whom we could match to claims data using the identifiers provided by the site and who had at least one quarter of post-innovation claims. These results represent 16 percent of the overall population reached by the innovation.

1.3.3 Other Awardee-Specific Data

Table 14 lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. The data in this section are current through March 2015. This annual report does not include any analysis for these measures because Delta Dental indicated these measures had to be extracted from dental claims data. Although Delta Dental provided patient identifiers to RTI, Medicaid claims data through Alpha-Max does not include access to dental claims. Therefore, we do not anticipate reporting on these measures in subsequent reports.

Table 14. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Clinical effectiveness	Oral health	Percentage (number) of infants having a preventive dental visit before their first birthday	Data unavailable
		Percentage (number) of children aged 2 to 9 with a dental sealant on a primary tooth	Data unavailable
		Percentage (number) of children aged 6 to 9 with dental sealants	Data unavailable
		Percentage (number) of children under age 10 receiving fluoride varnish treatment	Data unavailable

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing Delta Dental as well as accomplishments to date. In this section we assess Delta Dental's progress on achieving HCIA goals to date:

- **Smarter spending.** The spending rate for the intervention group is slightly higher than the comparison group rate in the first post-innovation quarter. This finding is not surprising since an initial increase in spending among the intervention group might occur when more children receive dental services and referrals to pediatric dentists for restorative care. Because claims data were available only for one quarter in the post-innovation period, we cannot definitively conclude whether the innovation had a significant impact on per patient spending.

- **Better care.** The Circle of Smiles innovation is not expected to have an impact on hospital admissions, readmissions, or ED visits because it focuses on improving children's oral and dental health. Accordingly, the changes in those trends are similar in the intervention and comparison groups. These similar trends are likely due to factors external to the innovation.

  For the purposes of this innovation, Delta Dental's reach and dose are the same measure: number of Medicaid-eligible children aged 0 to 9 who received prophylaxis treatment. As of Q11, Delta Dental reached 90.7 percent of its target population. The reasons for Delta Dental's high reach may be that the population is captive (i.e., students in schools) and fairly homogenous, which may have increased accessibility. Delta Dental modified its original reach target population, which may have contributed to the overall success of the innovation. RTI did not receive clinical effectiveness data from Delta Dental, so those data were not presented in this report. RTI received only one post-innovation quarter of data; thus, trends over time cannot be described.

- **Healthier people**. Delta Dental did not provide health outcome data to RTI; thus, no results on this goal are presented in this report.

Delta Dental experienced barriers to reaching a portion of its original target population: patients with diabetes and pregnant women and new mothers. Delta Dental modified its target population to focus on Medicaid-enrolled American Indian children aged 0 to 9 living in/on a South Dakota Reservation county who received at least one diagnostic or preventive dental service.

Delta Dental is currently developing a sustainability plan to maintain dental hygienists and a smaller number of OHCs and to include hygienists in its mobile dental programs. Delta Dental plans to

use funding from its newly obtained HRSA grant and DDPF monies to sustain the hygienists and OHCs and expand the target innovation age group to include children from early Head Start ages up to 8th grade.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Eau Claire Cooperative Health Centers, Inc.

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the 11th and 12th quarter of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

Eau Claire Cooperative Health Centers, Inc.

1.1 Introduction

Eau Claire Cooperative Health Centers, Inc. (ECCHC), a federally qualified health center (FQHC) in Columbia, SC, received an award of $2,330,000 and began enrolling patients into its Innovations Health program on December 1, 2012. This innovation consists of three components: establishing microclinics in high-risk neighborhoods, establishing community health teams, and enrolling frequent ED users into the program. The Innovations Health program established three microclinics in three neighborhoods within the targeted 29203 zip code areas identified as "hot spots" for their high ED utilization rates, poverty, limited access to primary care, and overall health disparities. The innovation seeks to achieve the following HCIA goals:

1. **Smarter spending.** Reduce spending by $3,000 per participant per year, or $14,817,600 over 3 years.

2. **Better care.** Provide comprehensive primary care in microclinics and integrate high-utilizing patients into traditional primary care homes. Reduce inappropriate ED use by 20 percent over 3 years.

3. **Healthier people.** Improve health literacy and outcomes, including management of chronic disease (e.g., asthma, diabetes and hypertension), family planning, and preventive services and screenings for physical and mental health.

Table 2 provides a summary of changes that occurred with ECCHC's Innovations Health program during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data that ECCHC submitted as of May 31, 2015; and key informant interviews with ECCHC's leaders conducted June 12 and June 18, 2015.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	Partnered with Absolute Total Care for shared savings and reimbursement for CHW and RN services and New Morning Foundation for pregnancy prevention services.
	In Q8, partnered with Welvista to gain free mail-order prescription drugs for uninsured patients.
Program Participant Characteristics	About two-thirds (65.9%) of participants were 25 to 64 years of age; more than half (62.5%) were female. Most (92%) were black. Most (70.2%) were uninsured; 20.7% were covered by Medicaid.

(continued)

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Implementation Process	
Execution	Cumulative Year 3 expenditures were 42%, which is 10% to 20% below projection.
Leadership	The Community Advisory Board met once in Q8.
	ECCHC's organizational leadership were minimally involved in implementation throughout Year 3.
	NPs were reluctant leaders of the community health team.
Organizational capacity	Ran only two fully functioning microclinics in Year 3, one short of target, due to insufficient staffing.
	Increased patient access to care by offering extended hours 1 day per week and establishing an agreement to obtain free bus passes.
	NPs treated more patients in the office setting than at homes because of staffing shortages and inefficiencies.
	Integrated CHW services in three other ECCHC practices within the same zip code: behavioral medicine, adult medicine, and pediatrics.
	Encountered problems with usability, connectivity, and limited contents of EHR system.
Innovation adoption and workflow	LISW hired in Q8 created or modified templates for optimizing staff productivity, including care plans, CHW workflow checklists, and other data-tracking tools.
	LISW signed off on CHW notes so the clinical team can focus on patient care.
Workforce Development	
Hiring/retention	Employed 17.68 FTE staff at the end of Q10; below projection by 5.50 FTE due to ongoing challenges filling CMA, NP, and RN vacancies. Staff had one internal transfer; and overall staff hours were reduced.
	Lost two CHWs (location unspecified) in Q8 and replaced both of them by the end of the quarter.
	Lost one CMA in Q8.
	Hired a LISW in Q8 to serve as project coordinator.
Training	No new formal training was provided in Q8, Q9, or Q10.
	CHWs, RNs, and NPs received ongoing informal training on conducting and improving program tasks.
	Planning discussion held with Association of Asthma Educators during Q10 to implement asthma management education training.
	Innovation leaders suggest need for more qualified staff in the NP and CHW roles.
Implementation Effectiveness	
Reach	62.2% of the target population (N=1,468) was enrolled, up from 47.5% in Q7.
	Struggled to identify eligible beneficiaries with health insurance coverage who were not already connected to primary care.

(continued)

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Implementation Effectiveness (continued)	
Dose	Nearly all participants (97.3%) received a home or microclinic visit. Less than 5% (2.7%) received asthma coaching, more than 10% received diabetes coaching, and a quarter (25.0%) received hypertension coaching.
	"Touched" patients less than originally planned, driven by lack of reimbursement and limited staffing.

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by ECCHC.
Key informant interviews conducted Feb–June 2015.
CHW = community health worker; CMA = certified medical assistant; ECCHC = Eau Claire Cooperative Health Centers, Inc.; EHR = electronic health record; FTE = full-time equivalent; LISW = licensed independent social worker; NP = nurse practitioner; RN = registered nurse.

1.1.1 Innovation Components

This innovation consists of three components: (1) establishing three new microclinics in high-risk neighborhoods identified as having high ED utilization, poverty, limited access to primary care, and overall health disparities, with the aim of increasing patients' access to primary care; (2) establishing five-member community health teams to staff each microclinic including both clinical staff such as nurse practitioners (NPs), registered nurses (RNs), and certified medical assistant (CMA), and nonclinical staff such as community health workers (CHWs) and patient service representatives (PSRs); and (3) enrolling frequent ED users into the program. Since RTI's first annual report, details on these components have not changed.[1]

As shown in ***Table 3***, three new partners joined the innovation team since the partners were listed in the first annual report. ECCHC entered into a memorandum of agreement (MOA) with Absolute Total Care, a managed care organization (MCO), for shared savings and reimbursement for CHW and RN services. ECCHC also renewed an old relationship with New Morning Foundation to provide pregnancy prevention services to high school students. During Q10, ECCHC partnered with Welvista to obtain free mail-order prescription drugs for uninsured patients.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

Table 3. HCIA Partners, Role, and Location

Partner Name	Role in HCIA Project	Location
BlueChoice Health Plan of South Carolina Medicaid (MCO)	Sharing of ED and hospital utilization data for cost savings	Columbia, SC
Select Health Managed Care Organization (MCO)	Sharing of ED and hospital utilization data for cost savings	Charleston, SC
Palmetto Health Richland and Palmetto Health Baptist Hospitals	Patient referral for specialty care through Palmetto Cares Referral of uninsured patients to Innovations Health	Columbia, SC
Midlands Technical College and the South Carolina Department of Health and Environmental Control	Workforce development (community health workers)	Columbia, SC
Absolute Total Care (MCO) (new)	Sharing of ED and hospital utilization data for cost savings	Columbia, SC
New Morning Foundation (new)	Family planning services	Columbia, SC
Welvista (new)	Provide free mail-order prescription services for uninsured patients	Columbia, SC

ED = emergency department.

1.1.2 Program Participant Characteristics

Table 4 provides demographic characteristics of all participants ever enrolled in the innovation. The distribution of patient characteristics for age, sex, and race/ethnicity is similar to that in the Q4 report, the earliest report in which RTI reported patient characteristics based on secondary data. Specifically, about two-thirds of participants (65.9%) were 25 to 64 years of age, and more than half (62.5%) were female. Most participants (92%) were black. Data regarding payer type were not available for the Q4 report, but as of Q11, most participants (70.2%) were uninsured, and 20.7% were covered by Medicaid.

As we reported in the first annual report, ECCHC initially assumed that South Carolina would expand Medicaid, which would dramatically increase the number of services eligible for reimbursement within its target community. Instead, South Carolina implemented the Healthy Outcomes Plan (HOP), which encouraged hospitals to reduce ED utilization and readmissions or else risk losing up to 5 percent of funding for Medicaid patients. As a result of HOP, hospitals became less willing to refer their insured patients to Innovations Health. The loss of these referrals and failure of South Carolina to expand Medicaid left ECCHC with a large proportion of uninsured patients enrolled in the innovation.

Table 4. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Number of Participants	Percentage of Participants
Total	1,468	100.0
Age		
<18	253	17.2
18–24	120	8.3
25–44	408	27.8
45–64	559	38.1

(continued)

Table 4. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015 (continued)

Characteristic	Number of Participants	Percentage of Participants
Age (continued)		
65–74	81	5.5
75–84	29	1.9
85+	18	1.2
Missing	0	0.0
Sex		
Female	917	62.5
Male	551	37.5
Missing	0	0.0
Race/ethnicity		
White	30	2.0
Black	1,351	92.0
Hispanic	56	3.8
Asian	5	0.3
American Indian or Alaska Native	10	0.8
Native Hawaiian or Other Pacific Islander	3	0.2
Other	6	0.4
Missing/refused	7	0.5
Payer Category		
Dual	0	0.0
Medicaid	302	20.7
Medicare	41	2.8
Medicare Advantage	46	3.2
Other	28	1.9
Uninsured	1,030	70.2
Missing	21	1.2

Source: Patient-level data provided to RTI by ECCHC.

1.2 Implementation Progress

The first annual report (2014) described ECCHC's implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area. ***Table 5*** lists these measures and their status as of May 31, 2015. In this annual report, we provide the number of home and microclinic visits. In the Q5 report, we presented the number of visits by provider type (i.e., RN, NP, or CHW) and the type of visit (i.e., home visit or microclinic visit). However, the data received through Q11 did not include visits by type or by provider. Therefore, ***Table 5*** shows the combined measures for home visits, microclinic visits and all types of providers.

This section presents ECCHC's process measures and a qualitative analysis of the factors that determined ECCHC's implementation progress. This analysis draws on patient-level data that ECCHC

provided to RTI as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 5. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation effectiveness	Reach	Number/percentage of participants receiving services	Data received from ECCHC
	Dose	Number of home and microclinic visits by RNs, NPs, and CHWs per patient[1]	Data received from ECCHC
		Number of disease-specific (i.e., asthma, diabetes, hypertension)coaching sessions with CHWs per patient	Data received from ECCHC

[1] Although previous data provided to RTI included visits by type (microclinic or home) and by provider (i.e., CHW, NP, or RN), the data received for this annual report included just the number of visits across types and providers.
CHW = community health worker; ECCHC = Eau Claire Cooperative Health Centers, Inc.; NP = nurse practitioner; RN = registered nurse.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through ECCHC's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include ECCHC's reports from Q8 through Q10 and interviews conducted on June 12 and June 18, 2015.

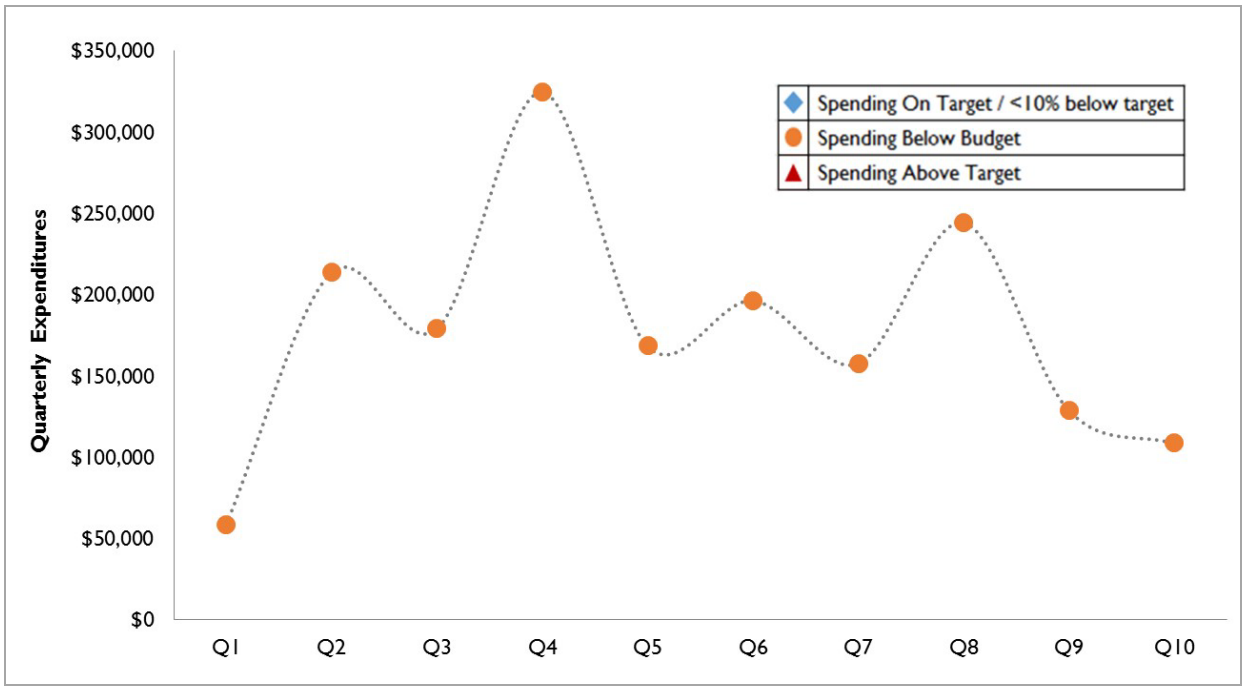
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

Execution of Implementation

The annual report highlights the significance of ECCHC's expenditure rates on implementation. As of December 2014 (Q10), ECCHC's Innovations Health program spent 42.4 percent of its Year 3 budget, which is 10 to 20 percent below the projected target. Health Innovations has continued to be understaffed and has operated in Year 3 with only two of the three planned fully functioning microclinics. As an innovation leader explained during our end-of-year (EOY) interviews, the process of credentialing new providers has become extremely complex as a result of reporting rules associated with the Affordable Care Act (ACA). The Hiring and Retention section provides additional information.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Leadership

The Innovations Health program is led by a project coordinator (PC) with support from ECCHC's chief medical officer (CMO) and other clinical staff. An external community advisory board, including patients, community leaders, and members from the Columbia Police Department, met in Q8 to help innovation leadership assess successes and challenges in the implementation process and to respond to community needs.

RTI's EOY interviews suggest that, aside from the CMO, ECCHC's executive board was not very involved in the innovation throughout Year 3. The CMO joined the innovation team late, just as he was beginning a new position, and even his efforts to support project staff were limited by competing obligations. EOY interviews suggested that the project largely stopped with the PC.

Despite limited involvement from the executive board, innovation leaders suggested that they had necessary staff support and resources throughout implementation during Year 3. In addition to the CMO, the PC worked with a nursing administrator and ECCHC's information technology (IT) and human resources (HR) departments. Providers throughout ECCHC's network in a wide range of specialties offer their expertise in improving patient care, and consult on an as-needed basis. An EOY interviewee reported that the goals of the innovation were widely understood, and that staff joined monthly meetings when relevant topics arise.

Consistent with RTI's first annual report, leadership within the community health teams continued to be an obstacle throughout Year 3. Relatively inexperienced NPs did not want the responsibility of managing the community health teams, as NP professionalization focuses on care delivery in a traditional clinical context, and the innovation requires interaction in the community and patients' homes. We provide

more information on ECCHC's efforts to improve team leadership and workflow below, in the Innovation Adoption and Workflow Integration section.

Organizational Capacity

ECCHC operated two fully functioning microclinics in Year 3 (Greenview and Ridgewood) and one partially functioning microclinic (Eau Claire). ECCHC was unable to provide a full range of services at the Eau Claire clinic because of problems recruiting NPs. To help improve patient access to care, ECCHC offered expanded clinic hours 1 day per week starting in Q10, and partnered with the local bus system to obtain free day passes, improving patients' transportation to the microclinics, starting in Q8.

Staffing shortages and a lack of organizational capacity in the larger ECCHC network, described in more detail in the Reach section, led ECCHC to change its method of deploying members of the community health team. First, NPs delivered a greater proportion of care in clinical settings than was originally planned to help increase the number of patients who could be seen. RNs, in turn, assumed responsibility for NP's community-based services, including independent clinical assessments and follow-up visits. CHWs began working out of ECCHC's traditional (i.e., non-innovation) sites to increase enrollment in the innovation and facilitate linkages with primary care.

Between Q8 and Q10, ECCHC identified a number of problems in the innovation data stored in its EHR system. In Q8, ECCHC reported that it could not distinguish between CHW home visits and office visits. In Q9, ECCHC reported missing data elements associated with pneumococcal immunizations. Data collection improvements were made by a newly hired licensed independent social worker (LISW), discussed in the following section, and after an evaluation of project data undertaken by ECCHC's project officer and data specialists during Q10.

Innovation Adoption and Workflow Integration

Community care team functioning continued to represent a significant challenge throughout ECCHC's final year of funding, and an LISW was hired in June 2014 to improve coordination between the clinical (NP, RN, and CMA) and nonclinical (CHW and PSR) staff. The LISW assumed responsibility for supervising the CHWs and developed templates, protocols, and other materials to help clarify team members' roles and improve workflow. The LISW's efforts to supervise the CHWs freed up time for clinical staff to focus on providing patient care.

The awardee's narrative progress reports indicate that the LISW helped address disagreement between CHWs and providers on how to standardize care with respect to case management and care plan development. Our EOY interviews suggest that the addition of the LISW came too late or only partially addressed problems in the care team. One interviewee reported, "…we didn't have any expertise and we didn't bring in anyone who came in with a lot of experience integrating medical staff. I'm not sure if we ever arrived at having a strong program." The interviewee went on to say, "If we came in with a clearer understanding of what everyone's role was and a clearer understanding of how everyone was supposed to work together, that would have made a big difference from the very beginning."

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was staffed with 17.68 full-time equivalent (FTE) staff members, below projection by 5.50 FTEs. Between Q8 (June, 2014) and Q10, ECCHC hired an LISW to supervise community health workers and serve as a liaison between them and the clinical staff; however, ECCHC also lost a CMA during this timeframe and continued to face challenges recruiting and staffing an RN and NP through the end of December.

During the EOY interviews, innovation leaders reported that clinician credentialing rules associated with the ACA contributed to hiring delays for the innovation. New guidelines required that organizations more carefully document relationships between providers, insurance companies, and patients, and this made it difficult for ECCHC to onboard new staff or move existing staff within the organization. Under ACA, ECCHC had to distinguish among its clinical sites and could no longer provide records that represented ECCHC as a single organization. The interviewee explained that in a health system as large as ECCHC, with 26 sites, 50 providers, and 20 insurance companies, thousands of reportable linkages are possible. The unintended consequence of the reporting change was a tremendous increase in burden associated with the hiring or movement of providers. This change in policy affected the organization as a whole and the Innovations Health program.

Skills, Knowledge, and Training

Between Q8 and Q10, ECCHC did not provide any formal training programs or courses, although the centers continued to provide ongoing informal training in areas necessary for program reporting, including enrolling patients, verifying insurance, coding procedures, scheduling patients, creating care plans, medication tracking, and other project tasks. During Q8, ECCHC developed workflow and electronic medical record templates for care plans, CHW workflow checklists, and other data tracking tools. The templates were reviewed and modified to separate nonclinical data from clinical data and designed to optimize staff productivity. ECCHC also began planning discussions with the Association of Asthma Educators to implement asthma management education training during Q10.

Thinking back on Year 3, an innovation leader said he would have preferred to bring more experienced NPs and CHWs into the innovation. The NPs that ECCHC selected had not worked in the community and felt uncomfortable delivering care in nonclinical settings. He also questioned the quality of the CHWs that were recruited. He explained, "The community health worker was always a challenge in terms of their role and what they can and can't do. We never quite had the right people on the team in a

way that we would have liked." Because ECCHC had not used CHWs in the past, new hires seemed to lack the appropriate skill set, and personalities did not mesh. Hiring and training this new role thus represented a significant challenge.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach) and; (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

Reach

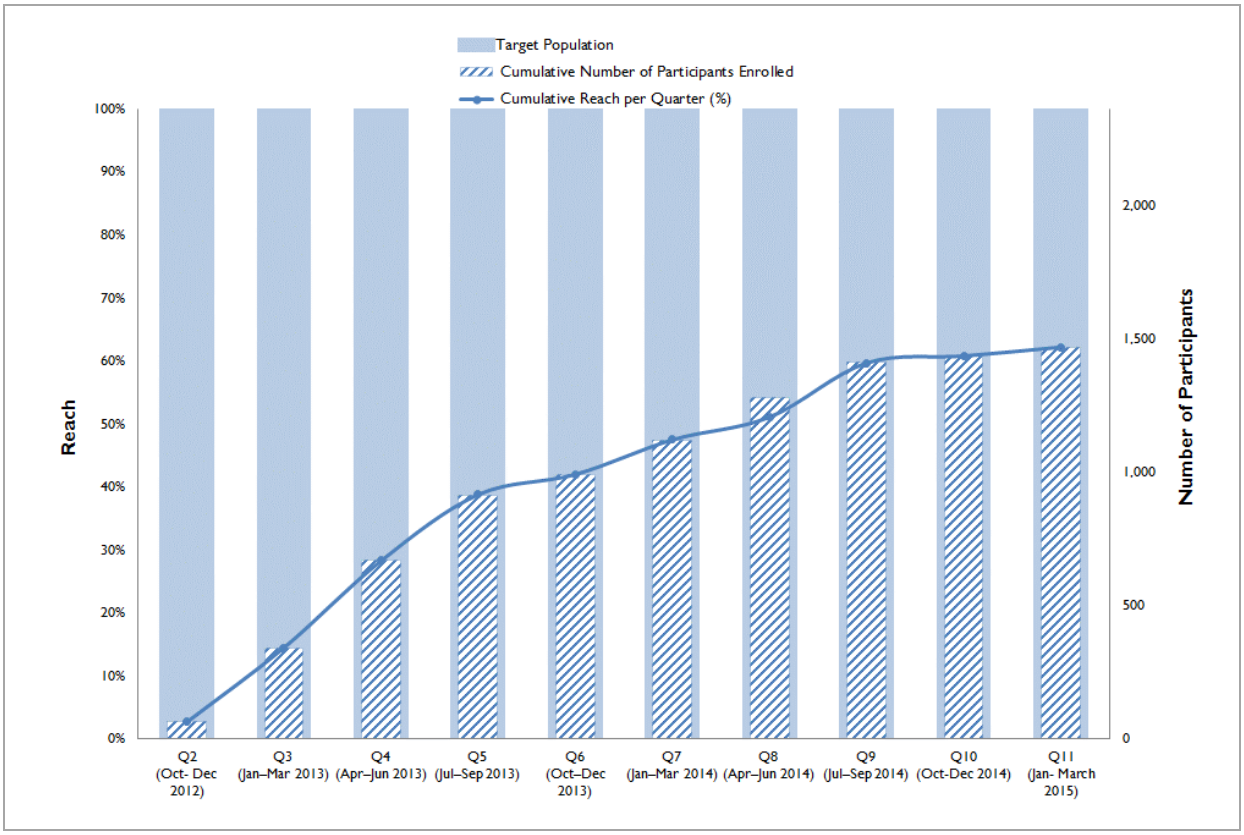
Figure 2 shows reach by quarter since the launch of the innovation. We first reported reach in the Q5 report, based on data through Q9. Since that time, ECCHC enrolled an additional 58 patients in the innovation, increasing reach from 59.7 to 62.2 percent.

As noted in previous reports, the number of participants reported in the *Quarterly Awardee Performance Reports* is greater than the number of participants reported in the RTI quarterly and annual reports. This discrepancy is due to the inclusion by ECCHC of patients who started, but did not complete, the enrollment process in the *Quarterly Awardee Performance Reports*. The data provided to RTI includes only those patients who completed the enrollment process.

ECCHC failed to hit its reach targets for several reasons. First, ECCHC was unable to provide consistent staffing for the innovation, particularly at the Eau Claire microclinic, which undermined the ability to enroll patients in the innovation. Instability in CHW staffing during Q8 may have been especially detrimental, given that patient enrollment is one of its primary responsibilities. Second, ECCHC made several poor assumptions about the target population going into the innovation. ECCHC initially believed that South Carolina would approve Medicaid expansion, dramatically increasing the number of patients who could enroll in the program and receive reimbursable care. South Carolina's failure to approve the expansion left ECCHC with a large number of uninsured patients who were more expensive to treat than anticipated. ECCHC tried to adapt by requiring that new enrollees have Medicare or Medicaid coverage, but failed to realize that the insured members of its target population were already affiliated with ECCHC's traditional (non-innovation) primary care sites. Despite their linkage to the ECCHC network, eligible patients frequently visited the ED due to capacity issues at the traditional sites. When innovation leaders identified capacity problems at the beginning of Year 3, they pursued a new strategy of enrolling patients in the innovation directly from the primary care clinics. ECCHC said that the transition took more time than

anticipated, but CHWs began providing services at ECCHC's Behavioral Medicine, Adult Medicine, and Pediatrics clinics during Q10.

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch



	Quarter	Q2 (Oct-Dec 2012)	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct-Dec 2014)	Q11 (Jan-March 2015)
●	Cumulative reach per quarter (%)	2.7	14.5	28.3	38.8	42.0	47.5	51.1	59.7	60.8	62.2
	Target population	2,361	2,361	2,361	2,361	2,361	2,361	2,361	2,361	2,361	2,361
	Cumulative number of participants enrolled	64	342	669	915	992	1,121	1,278	1,410	1,436	1,468

Source: Patient-level data provided to RTI by ECCHC.

Dose

Table 6 provides the number of services provided across participants, the number of participants receiving services, and the average number of services per participant through Q11. We first reported dose in the Q5 report, based on data through Q9. As expected, the number of each type of service provided increased between Q9 and Q11. As shown in the table, nearly all participants (97.3%) received an average of approximately nine home and/or microclinic visits. Less than 5 percent of participants (2.7%) received an average of three asthma coaching sessions, more than 10 percent (14.4%) received

an average of 14 diabetes coaching sessions, and a quarter of participants (25.0%) received an average of five hypertension coaching sessions.

EOY interviews with innovation leadership suggest a few different reasons why Innovations Health did not deliver as many services as originally planned. First, the large proportion of uninsured beneficiaries enrolled in the Innovations Health program limited the number of services that ECCHC could provide. According to one interviewee, uninsured patients tended to require more services than those with coverage, and providing those services became cost prohibitive when South Carolina did not expand Medicaid. ECCHC ultimately saved money due to their inability to fill the NP vacancy and by being strategic about its deployment of existing staff. We did not learn of any efforts to limit the number of services delivered to any single patient. Second, another interviewee reported that the innovation team could not provide the planned dose of one touch per quarter after the initial assessment because of understaffing: "Our ability to provide that volume of care was affected because of our limited provider capacity."

Table 6. Number and Types of Services Provided to Participants

Services	Number of Services Provided to Patients	Number (Percentage) of Participants Receiving Service	Average Number of Services per Participant
Visits	12,155	1,429 (97.3)	8.5
Coaching			
Asthma	108	40 (2.7)	2.7
Diabetes	2,947	211 (14.4)	14.0
Hypertension	1,868	367 (25.0)	5.1

Source: Patient-level data provided to RTI by ECCHC.

Sustainability

ECCHC does not have a sustainability plan on file, and it seems unlikely that ECCHC will continue innovation services after the award period ends. South Carolina's decision to implement the HOP in place of Medicaid expansion makes it difficult for ECCHC and similar organizations to receive payment for the health services they provide to low-income patients. Services delivered by nonclinical staff, in particular, are generally not reimbursable even among patients with health coverage.

Internal challenges create additional barriers to the sustainability of Innovations Health. Several innovation leaders will retire soon, leaving few experienced staff to serve as program champions. EOY interviewees noted that some CHWs will continue working out of ECCHC's traditional primary care clinics, although they will no longer be approved to provide care in the community or patients' homes. The community health team configuration—with both clinical and nonclinical staff—will not be sustained after the award period ends.

1.3 Evaluation Outcomes

RTI uses two types of quantitative data to assess the impact of ECCHC's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data that ECCHC collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures that RTI considers essential to the evaluation of ECCHC's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 7 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation (CMMI) as most relevant for the HCIA evaluation, with an indication of the status of the data requested and whether the data are presented in this annual report.

This report includes an analysis of Medicare beneficiaries enrolled in ECCHC's innovation. We report on impacts on health care outcomes including all-cause inpatient admissions, hospital unplanned readmissions, ED visits, and spending per patient. We do not estimate cost savings because there are too few beneficiaries enrolled in the intervention (<100). We are not able to report on the impact of the innovation on Medicaid beneficiaries at this time. The Medicaid data analysis will use data from the CMS Alpha-MAX data files. Currently, Medicaid claims for ECCHC are only available in Alpha-MAX through Q3 2012. Because the earliest enrolled person joined the innovation after Q3 2012, we do not present measures for Medicaid patients at this time. We will provide Medicaid analyses in subsequent reports as Alpha-MAX data become available.

Table 7. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	No
		Hospital unplanned readmissions rate	Yes	No
		ED visit rate	Yes	No
	Cost	Spending per patient	Yes	No
		Estimated cost savings	No	No

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis

We include patients who were enrolled prior to December 31, 2014, and we present Medicare claims data through December 31, 2014.

Comparison Groups

The analysis focuses on Medicare beneficiaries enrolled in fee-for-service Medicare Parts A and B living in Richland County, South Carolina, during the innovation launch. We present measures for beneficiaries enrolled in the innovation as well as a group of statistically matched comparison beneficiaries with fee-for-service Medicare also living in Richland County who were not enrolled in the innovation.

We used propensity score matching (PSM) to select comparison group beneficiaries with similar characteristics as treatment group beneficiaries. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, disability, end-stage renal disease status, dual Medicare-Medicaid status, number of chronic conditions, total payments in second, third, fourth, and fifth calendar quarter prior to enrollment, number of ED visits in calendar quarter prior to enrollment, number of inpatient stays in calendar quarter prior to enrollment, and total Medicare payments in the calendar quarter prior to the innovation. We matched each treatment beneficiary with up to three comparison beneficiaries whose propensity scores were within a predefined distance.

Table 8 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. ***Figure 3*** shows the distribution of the propensity scores for both the comparison and intervention groups. ***Appendix B.2*** provides technical details on the propensity score methodology. No treatment beneficiaries were dropped from the subsequent analyses due to the lack of an appropriately matched comparison beneficiary.

Table 8. Mean Values and Standardized Differences of Variables in Propensity Score Model: ECCHC

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrollment	$1,666.98	$3,175.81	$2,127.45	$6,892.82	0.09	$1,666.98	$3,175.81	$1,377.85	$1,410.06	0.12
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	$11,052.18	$21,133.21	$7,504.59	$17,249.11	0.18	$11,052.18	$21,133.21	$8,382.90	$9,035.54	0.16
Age	62.91	14.98	70.45	12.00	0.56	62.91	14.98	62.08	8.61	0.07
Percentage male	36.76	48.57	41.62	49.29	0.14	36.76	48.57	36.27	27.83	0.01
Percentage white	8.82	28.57	61.24	48.72	1.86	8.82	28.57	5.88	13.62	0.16
Percentage disabled	66.18	47.66	25.11	43.37	1.28	66.18	47.66	66.18	27.38	0.00
Percentage ESRD	1.47	12.13	1.92	13.72	0.05	1.47	12.13	1.47	6.97	0.00
Number of dual eligible months in the previous calendar year	5.81	5.82	1.78	4.20	0.79	5.81	5.82	5.64	3.38	0.04
Number of chronic conditions	6.28	4.09	6.26	3.53	0.00	6.28	4.09	6.01	2.16	0.08
Number of ED visits in calendar quarter prior to enrollment	0.56	1.65	0.12	0.56	0.36	0.56	1.65	0.26	0.39	0.25
Number of inpatient stays in calendar quarter prior to enrollment	0.07	0.26	0.06	0.30	0.03	0.07	0.26	0.05	0.14	0.12
Number of beneficiaries	68	—	245,716	—	—	68	—	204	—	—
Number of unique beneficiaries[1]	68	—	39,603	—	—	68	—	204	—	—
Number of weighted beneficiaries	—	—	—	—	—	68	—	68	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B for discussion of weights).

ED = emergency department; ESRD = end-stage renal disease; SD = standard deviation.

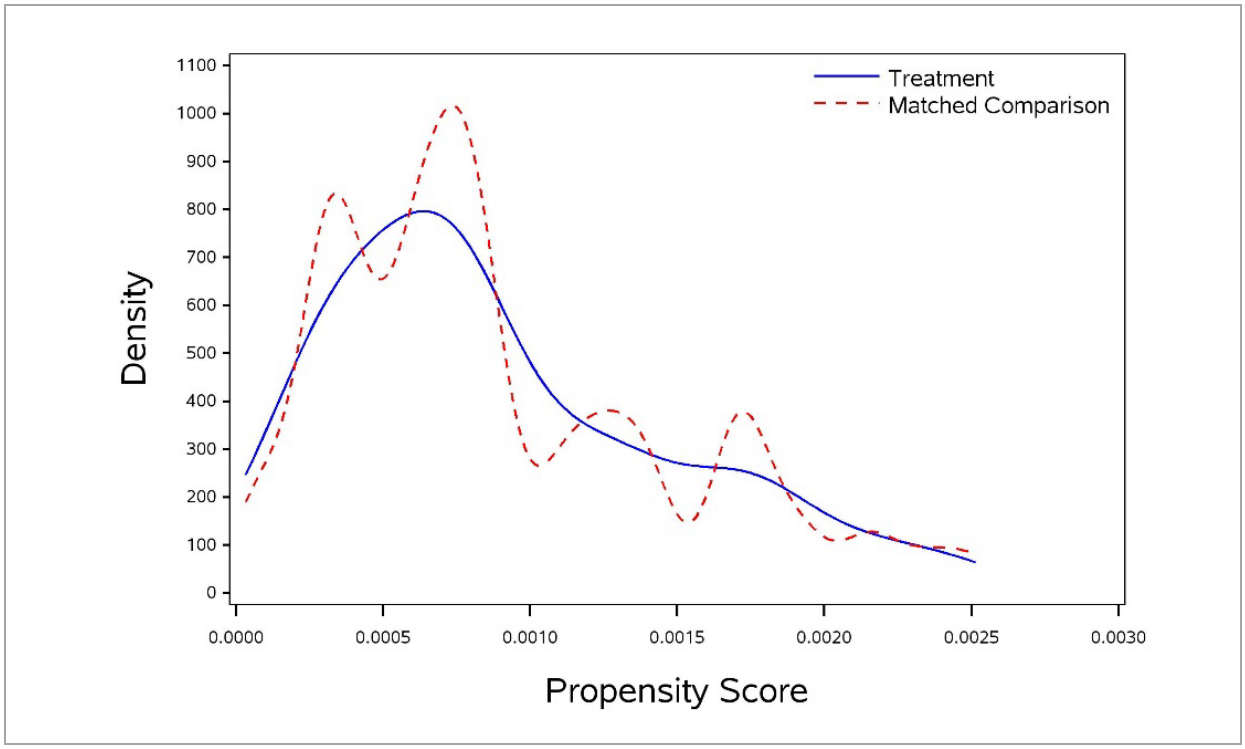
— Not applicable

After performing PSM, we calculate absolute standardized differences between the treatment group and both the unmatched and matched comparison groups, and check whether matching decreases the absolute standardized differences and achieves acceptable balance (Table 8). Many researchers consider that an absolute standardized difference ≤0.10 indicates acceptable balance.[2] Researchers also point out that critical variables in determining selection into treatment (e.g., those with significant effects in the propensity score equation) should have greater balance, while indicators with minor importance in determining treatment selection do not require optimal balance. The results in Table 8 show that matching reduced the absolute standardized differences and achieved adequate balance for most variables. Five variables, however, did not meet the 0.10 criteria. The variables are payments in calendar quarter prior to enrollment; total payments in second, third, fourth, and fifth calendar quarters prior to enrollment; percentage white; number of ED visits in calendar quarter prior to enrollment; and number of inpatient stays in calendar quarter prior to enrollment. The corresponding standardized differences after matching are slightly higher than 0.10 (0.12, 0.16, 0.16, 0.25, and 0.12, respectively). This slight rise is likely due to ECCHC's very small sample size.

In addition to comparing the means and standard deviations of variables in the propensity score model in Table 8, we check for overlap in the distribution of propensity scores for the treatment and matched comparison beneficiaries in Figure 3. The propensity scores in Figure 3 are low because the cloning methodology increases the number of comparison beneficiaries in the propensity score model, which mechanically lowers the propensity score. The two distributions overlap substantially, indicating that matched comparison beneficiaries have similar propensity scores to treatment beneficiaries.

[2] Austin, P.C.: An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research. 46.3:399-424, 2011. *PMC*. Web.2 June 2015.

Figure 3. Distribution of Propensity Scores for Comparison and Intervention Groups: ECCHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Descriptive Analysis

This report includes claims through December 31, 2014. ***Table 9*** reports Medicare spending per patient in the eight quarters before and the eight quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 9. Medicare Spending per Patient: ECCHC

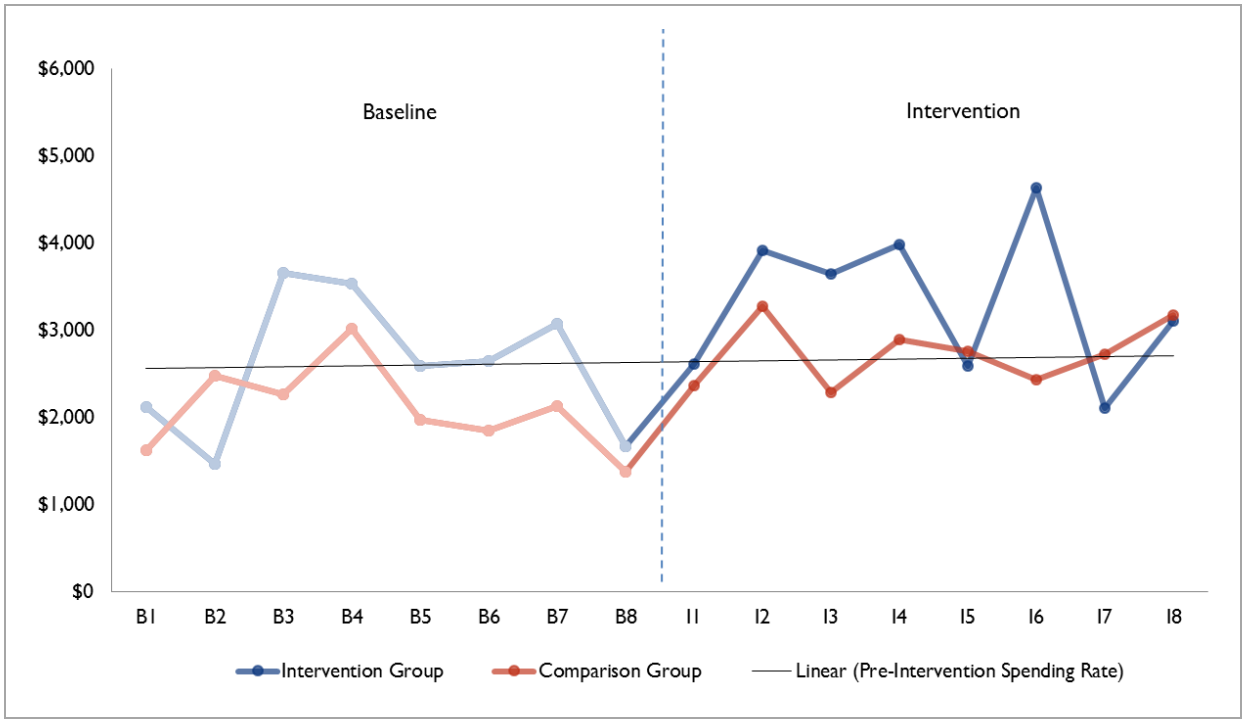
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331045	ECCHC																
	Spending rate	$2,117	$1,473	$3,661	$3,538	$2,594	$2,645	$3,076	$1,667	$2,617	$3,918	$3,648	$3,988	$2,596	$4,638	$2,110	$3,115
	Std dev	$7,279	$2,702	$9,352	$8,277	$5,082	$6,254	$6,423	$3,152	$5,889	$10,736	$8,782	$7,445	$4,928	$9,102	$4,140	$4,419
	Unique patients	58	59	61	61	63	64	66	68	68	67	61	57	50	47	39	21
Comparison Group																	
1C1CMS 331045	ECCHC																
	Spending rate	$1,621	$2,479	$2,270	$3,015	$1,971	$1,849	$2,134	$1,376	$2,371	$3,281	$2,291	$2,896	$2,763	$2,440	$2,728	$3,176
	Std dev	$4,952	$6,707	$8,335	$9,759	$5,085	$5,212	$6,522	$2,442	$6,632	$9,710	$5,547	$8,790	$6,708	$6,391	$6,700	$6,791
	Unique patients	56	59	60	61	63	65	67	68	68	67	65	62	56	49	40	24
Savings per Patient		−$496	$1,006	−$1,391	−$523	−$623	−$796	−$941	−$291	−$245	−$637	−$1,358	−$1,092	$166	−$2,197	$618	$61

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 4 illustrates the Medicare spending per beneficiary in Table 9 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 4. Medicare Spending per Patient: ECCHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Although the time series vary widely, the pre-intervention trend line for spending increases slowly over time. In post-enrollment quarters, average spending appears to increase relative to the trend line in intervention quarter 1 (I1) through I4 before returning to the trend line in I5. As shown in Table 9, the standard deviation for spending is very high. A similar trend in spending is also observed among comparison group individuals. Although the levels of spending were different between the treatment and comparison group, the standard deviation in spending is high in both groups, as shown in Table 9.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 10*** and ***Figure 5***.

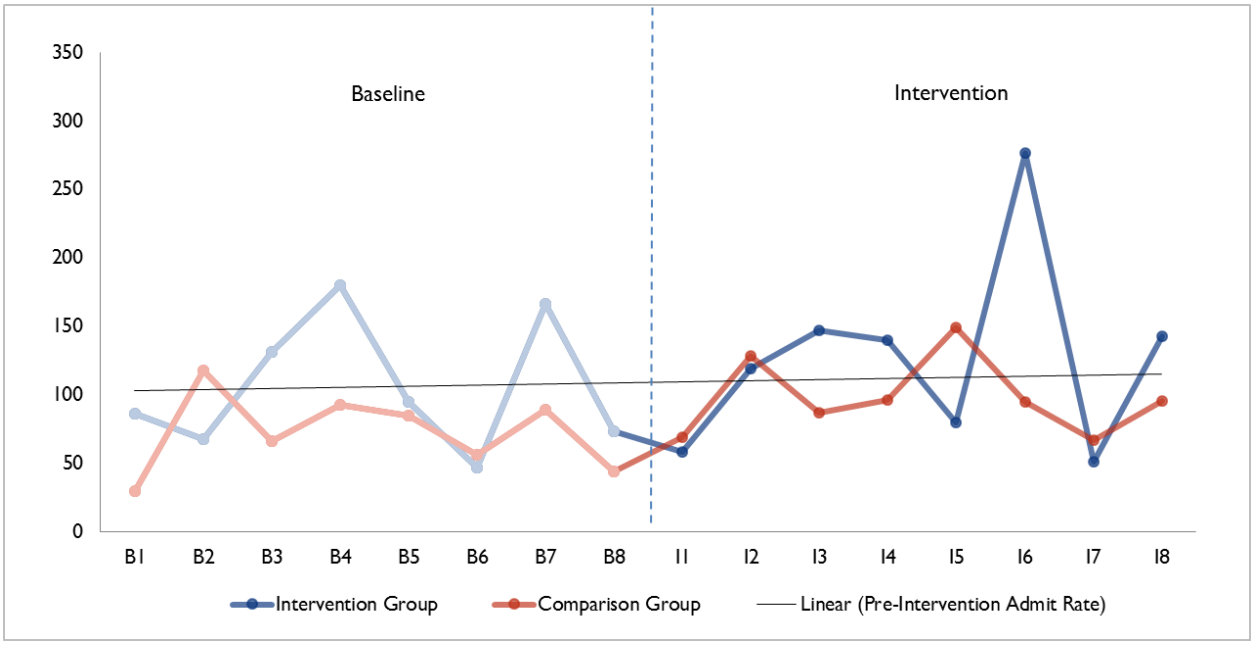
Table 10. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: ECCHC

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331045	ECCHC																
	Admit rate	86	68	131	180	95	47	167	74	59	119	148	140	80	277	51	143
	Std dev	427	251	495	528	387	211	642	261	291	474	437	347	271	609	221	350
	Unique patients	58	59	61	61	63	64	66	68	68	67	61	57	50	47	39	21
Comparison Group																	
1C1CMS 331045	ECCHC																
	Admit rate	30	118	66	93	85	57	90	44	69	129	87	96	150	95	67	96
	Std dev	202	427	326	358	347	231	401	229	290	449	389	402	433	375	282	411
	Unique patients	56	59	60	61	63	65	67	68	68	67	65	62	56	49	40	24
Intervention − Comparison Rate		56	−50	65	87	10	−10	77	29	−10	−9	60	44	−70	181	−16	47

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 5. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: ECCHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

During the pre-intervention period, the inpatient admission rate is similar for the treatment and comparison groups. However, the small sample size results in a high degree of variability in inpatient admissions. Inpatient admissions for the treatment group in the quarters after the innovation are highly variable and similar to the comparison group in most quarters.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 11*** and ***Figure 6***.

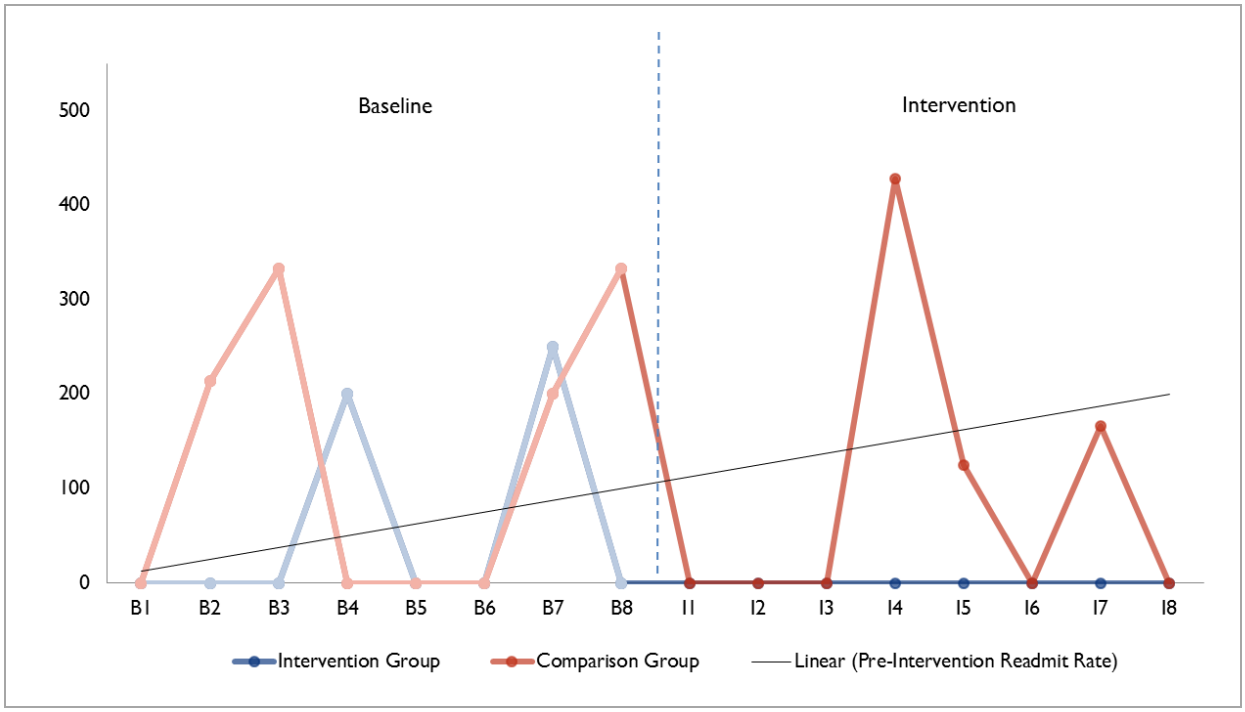
Table 11. Hospital Unplanned Readmissions Rates per 1,000 Admissions: ECCHC

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331045	ECCHC																
	Readmit rate	0	0	0	200	0	0	250	0	0	0	0	0	0	0	0	0
	Std dev	0	0	0	400	0	0	433	0	0	0	0	0	0	0	0	0
	Total admissions	0	2	1	5	1	1	4	1	0	4	4	5	0	3	0	1
Comparison Group																	
1C1CMS 331045	ECCHC																
	Readmit rate	0	214	333	0	0	0	200	333	0	0	0	429	125	0	167	0
	Std dev	0	410	471	0	0	0	400	471	0	0	0	495	331	0	373	0
	Total admissions	1	5	2	2	2	2	2	1	1	3	1	2	3	2	2	0
Intervention − Comparison Rate		0	−214	−333	200	0	0	50	−333	0	0	0	−429	−125	0	−167	0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6. Hospital Unplanned Readmissions Rates per 1,000 Admissions: ECCHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Readmission rates are highly variable before and after enrollment, reflecting the relatively small number of hospital admissions for participants during each quarter. With few admissions (the denominator in the readmission rate) and a relatively low underlying percentage of readmissions, the readmission rate varies widely over time. As more beneficiaries enroll in the innovation and more claims data become available, the sample size will increase and the readmissions measure can be reported with more precision.

ED visits per 1,000 participants are shown in ***Table 12*** and ***Figure 7***.

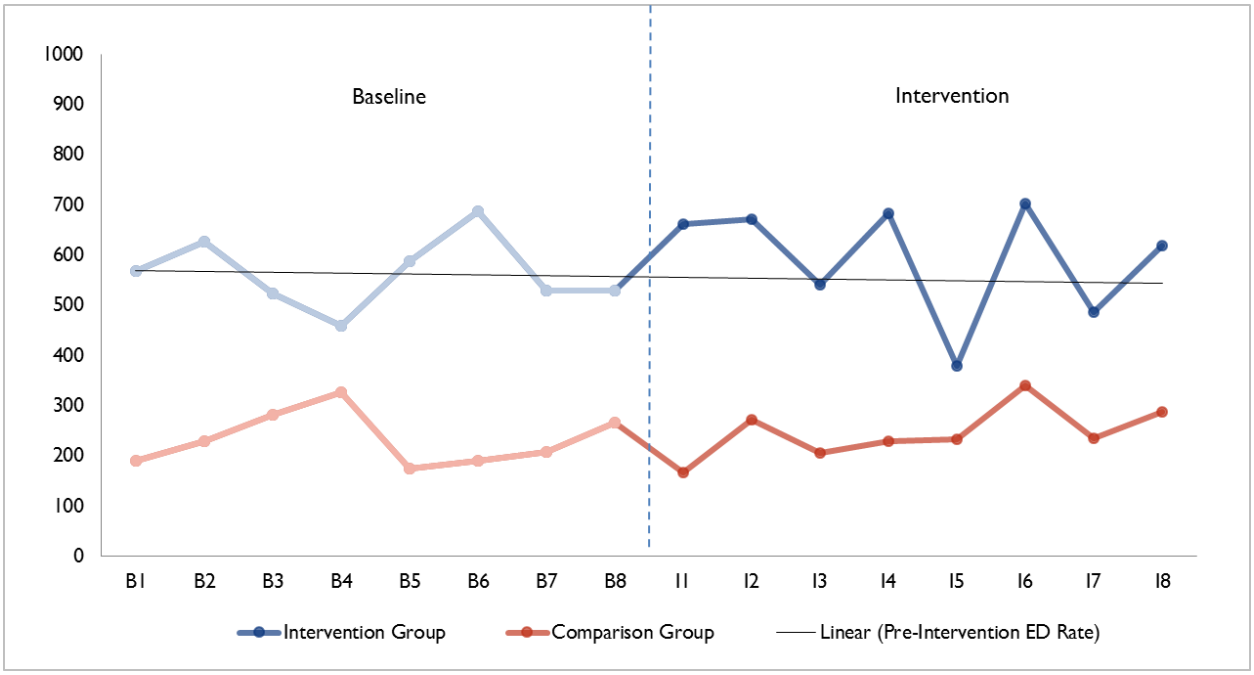
Table 12. ED Visits per 1,000 Participants: ECCHC

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331045	ECCHC																
	ED rate	569	627	525	459	587	688	530	529	662	672	541	684	380	702	487	569
	Std dev	627	525	459	587	688	530	529	662	672	541	684	380	702	487	619	627
	Unique patients	525	459	587	688	530	529	662	672	541	684	380	702	487	619	-	525
Comparison Group																	
1C1CMS 331045	ECCHC																
	ED rate	190	230	282	328	176	191	209	266	167	272	205	230	234	340	235	288
	Std dev	334	585	628	581	421	294	335	380	423	593	379	381	358	707	396	414
	Unique patients	56	59	60	61	63	65	67	68	68	67	65	62	56	49	40	24
Intervention − Comparison Rate		378	397	243	131	412	497	321	263	494	399	336	454	146	362	252	378

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.
ED = emergency department.

Figure 7. ED Visits per 1,000 Participants: ECCHC



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

The ED visit rate line reflects a slight downward trend before and after enrollment for both the treatment and comparison groups. Although the time series continues to follow the trend in the four post-enrollment quarters, it drops considerably in the fifth quarter but increases in the sixth quarter. The ED visit rate is consistently higher in the treatment group; however, the gap between the treatment and comparison groups remains constant or slightly decreases over time. Further statistical testing with multivariate analyses and a larger sample size is required to determine whether the innovation impacts ED visits.

Discussion

The relatively small number of Medicare beneficiaries enrolled in the ECCHC innovation hinders the ability to obtain statistically significant evidence that the innovation affected spending and health care utilization among individuals enrolled in the innovation. A longer post-intervention time period and a larger sample size are required to draw firm conclusions about the impact of the ECCHC innovation.

The results may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicare beneficiaries who we were able to match with the identifiers provided by the site. This represents 5 percent of the overall population reached by the innovation. Most ECCHC participants are uninsured or enrolled in Medicaid. No claims data are available for uninsured patients, and Medicaid claims data for ECCHC are not yet available.

1.3.3 Other Awardee-Specific Data

Table 13 lists the awardee-specific outcome measures selected for the innovation's evaluation, with an indication of the status of the data requested and whether the data are presented in this annual report. The data we present in this section are current through March 2015. This annual report includes the results of the analyses of all of these measures.

Table 13. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Clinical effectiveness	Diabetes	Percentage of patients with diabetes who received a foot exam	Data received from ECCHC
		Percentage of patients with diabetes who received a hemoglobin A1c test	Data received from ECCHC
	Hypertension	Percentage of patients with hypertension who received BMI assessment	Data received from ECCHC
		Percentage of patients with hypertension who received a blood pressure screening	Data received from ECCHC
	Vaccination	Percentage of patients who received an influenza vaccination	Data received from ECCHC
		Percentage of patients who received a pneumococcal vaccination	Data received from ECCHC
	Mental health	Percentage of patients screened for clinical depression using PQ9	Data received from ECCHC
	Self-management knowledge and skills	PAM 13-item measure	Data received from ECCHC
Health outcomes	Diabetes	Percentage of patients with diabetes who had hemoglobin A1c >9.0 %	Data received from ECCHC
	Hypertension	Percentage of patients who had a diagnosis of hypertension with blood pressure <140/90 mm Hg	Data received from ECCHC
		Percentage of patients who were overweight (BMI 25.0–29.9) or obese (BMI >30)	Data received from ECCHC
	Cardiovascular Disease	Percentage of patients with CAD/hyperlipidemia who had an LDL-C result <100 mg/dL	Data received from ECCHC

BMI = body mass index; CAD = coronary artery disease; ECCHC = Eau Claire Cooperative Health Centers, Inc.; FQHC = federally qualified health center; LDL-C = low-density lipoprotein cholesterol; PAM = patient activation measure; PQ9 = patient questionnaire.

Clinical Effectiveness

Evaluation Question

- How have clinical effectiveness outcomes been affected by the innovation?

Table 14 shows the percentage of patients by health condition receiving clinical services. As shown in the table, a large percentage of patients with diabetes received an HbA1c test and a foot exam (89.3% and 80.8%, respectively). Among those with hypertension, 100 percent received a blood pressure screening, and more than 90 percent received a body mass index (BMI) assessment. About 15 percent of

patients completed the patient activation measure, but we have average scores only for approximately 6 percent of patients. About 12 percent of patients received an influenza immunization, and only about 1 percent received a pneumococcal vaccination. Almost one-third of participants (30.8%) were screened for depression.

Table 14. Percentage of Patients Who Received Clinical Services

Measure	Percentage of Patients Receiving Clinical Services
Diabetes (n=243)	
Percentage of adult patients with diabetes from 18 to 75 years of age who received an HbA1c test	85.2
Percentage of patients with diabetes who received a foot exam	77.7
Hypertension (n=482)	
Percentage of patients with hypertension who received a blood pressure screening	99.3
Percentage of patients with hypertension who received BMI assessment	93.9
Self-management knowledge and skills[1]	
Percentage of patients who completed the PAM 13-item measure	14.6
Vaccination[1]	
Influenza immunization	12.0
Pneumococcal vaccination	1.2
Mental Health[1]	
Percentage of patients screened for clinical depression using PQ9	30.8

Source: Patient-level data provided to RTI by ECCHC.
[1] Denominator is all enrollees.
BMI = body mass index; PAM = patient activation measure; PQ9 = patient questionnaire.

Health Outcomes

We examined outcomes among patients with diabetes, hypertension, and coronary artery disease (CAD)/hyperlipidemia. The following run charts take into account rolling enrollment. The baseline quarters (Bs) represent data prior to enrollment. The intervention quarters (Is) are based on individual enrollment date. For example, I1 is equal to the first quarter of enrollment for all participants who received a specific test. We provide B and I data when at least 20 patients had a test or reading within the quarter. When possible, we also present the linear trend line based on the pre-intervention or baseline data.

Diabetes

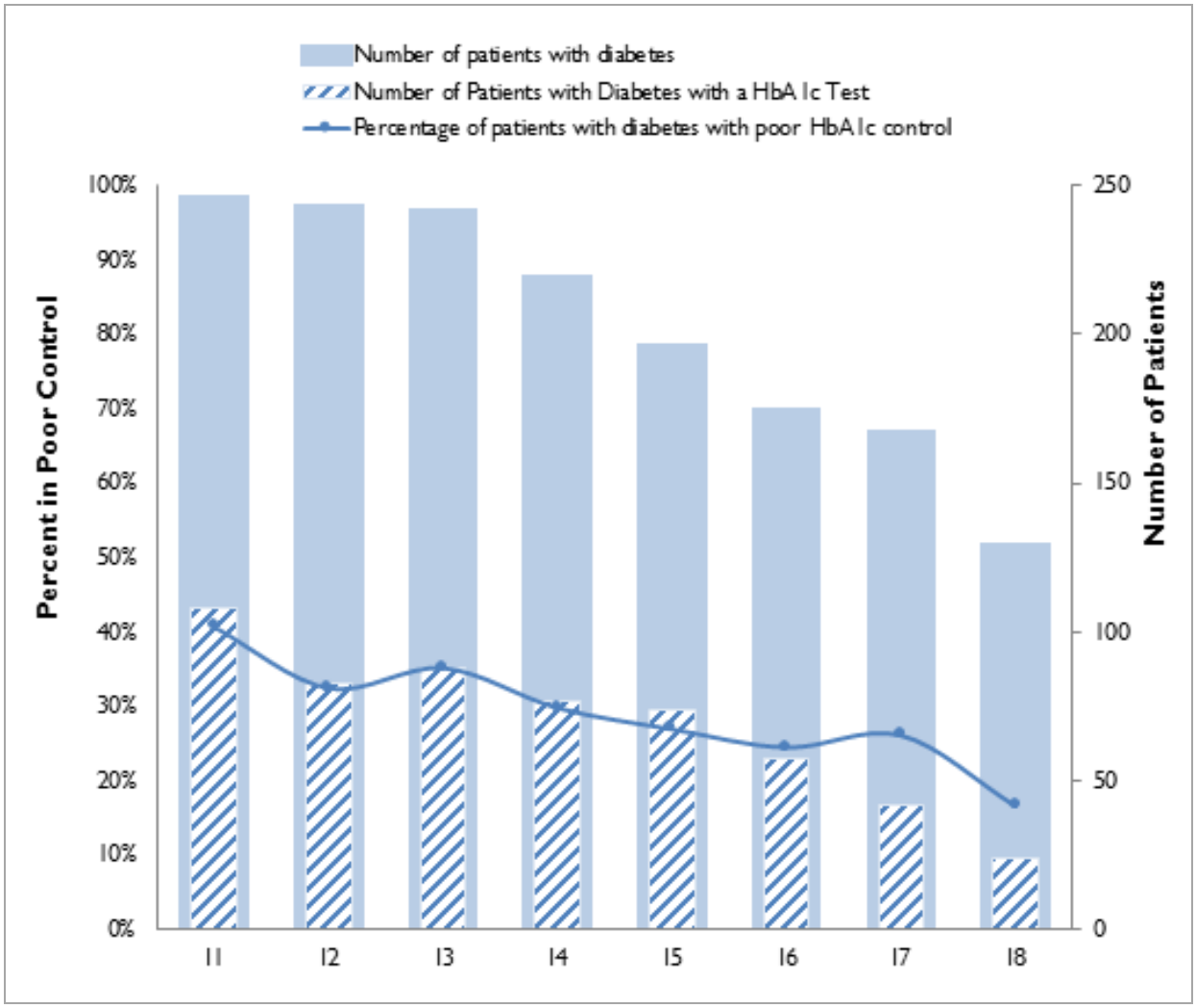
Evaluation Question

- Has the percentage of diabetes patients with poor HbA1c control decreased over time among those enrolled in the innovation?

Figure 8 presents the percentage of patients with diabetes who had an HbA1c test indicating poor control (HbA1c >9%) over time. The denominator represents the number of diabetes patients who received an HbA1c test for each quarter. The numerator represents the number of diabetes patients who

received an HbA1c test that was >9.0%. As shown in the figure, the percentage of patients with poor HbA1c control decreased from approximately 41 percent in I1 to 16 percent by I8. This drop suggests that the innovation may be helping to reduce poor HbA1c control among its enrollees, though the denominator for calculating percentages declines across the intervention quarters.

Figure 8. Percentage of Patients with Diabetes with Poor HbA1c Control over Time



	Quarter	I1	I2	I3	I4	I5	I6	I7	I8
•	Percentage of patients with diabetes with poor HbA1c control	40.7	32.5	35.2	29.9	27.0	24.6	26.2	16.7
	Number of patients with diabetes	243	240	238	216	193	171	164	126
	Number of patients with diabetes with HbA1c test	108	83	88	77	74	57	42	24

Source: Patient-level data provided to RTI by ECCHC.

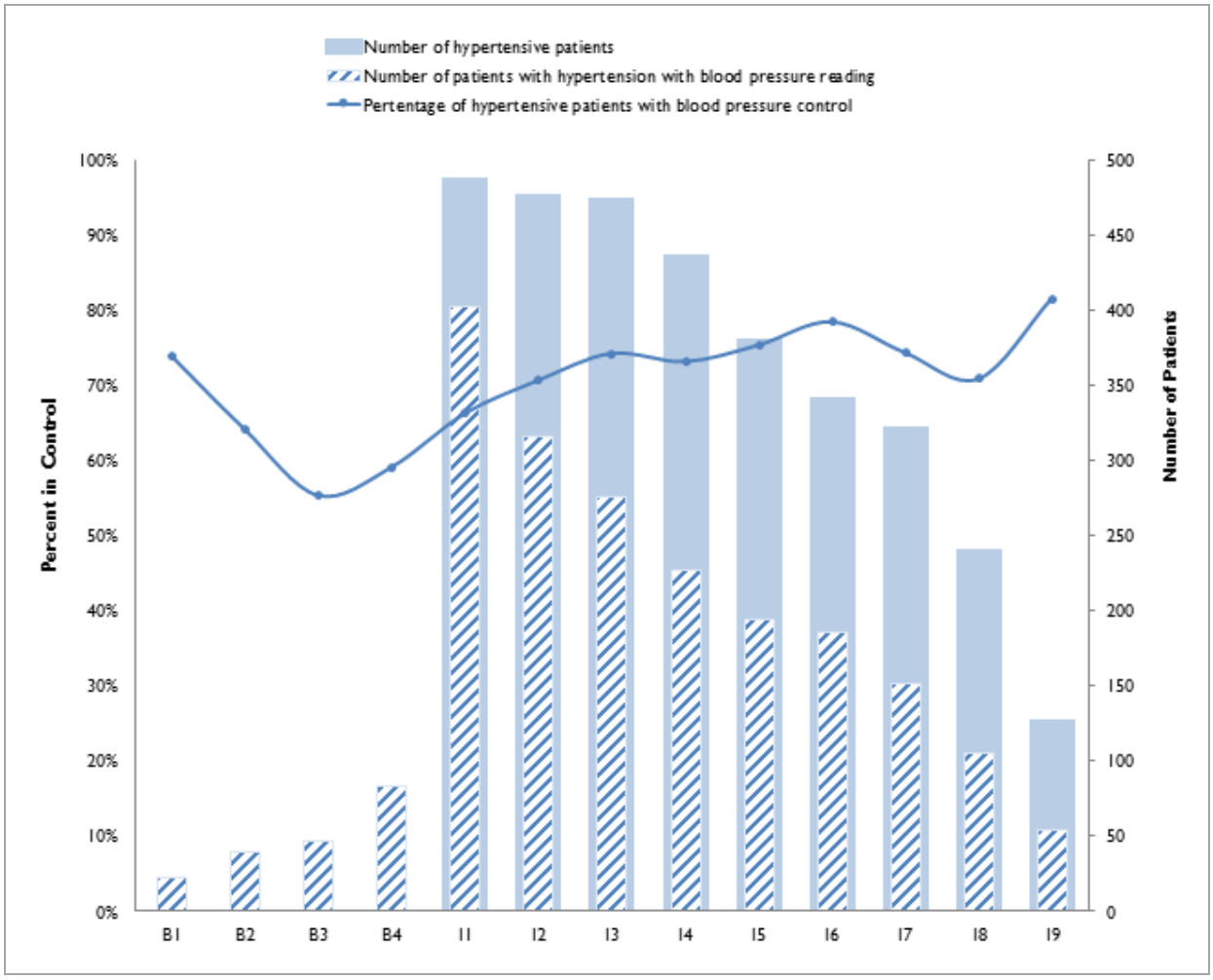
Hypertension

Evaluation Question

- Has the percentage of hypertension patients with blood pressure control increased over time among those enrolled in the innovation?

Figure 9 presents the percentage of participants with hypertension who had a blood pressure reading within the quarter indicating good control (<140/90 mm Hg) over time. The denominator represents the number of hypertension patients who received a blood pressure reading for each quarter. The numerator represents the number of hypertension patients who received a blood pressure reading that was <140/90 mm Hg. As shown in the figure, the percentage of hypertension patients with blood pressure control fluctuated over time, but increased overall between baseline and I9. More specifically, the percentage of patients with blood pressure control was approximately 64 percent in the baseline quarters, and rose to around 82 percent in I9. Thus, the percentage of patients with hypertension with blood pressure control increased during the innovation period. Note, however, that the denominator decreased across the intervention quarters, making any interpretation of the findings tentative.

Figure 9. Percentage of Patients with Hypertension with Blood Pressure Control over Time



(continued)

Figure 9. Percentage of Patients with Hypertension with Blood Pressure Control over Time (continued)

	Quarter	B1	B2	B3	B4	I1	I2	I3	I4	I5	I6	I7	I8	I9
●	Percentage of hypertensive patients with blood pressure control	73.9	64.1	55.3	59	66.2	70.6	74.2	73.1	75.2	78.4	74.3	70.8	81.5
	Number of hypertensive patients	—	—	—	—	482	472	469	431	375	336	317	235	122
	Number of patients with hypertension with blood pressure reading	23	39	47	83	402	316	275	227	194	185	152	106	54

Source: Patient-level data provided to RTI by ECCHC.
— Data not available.

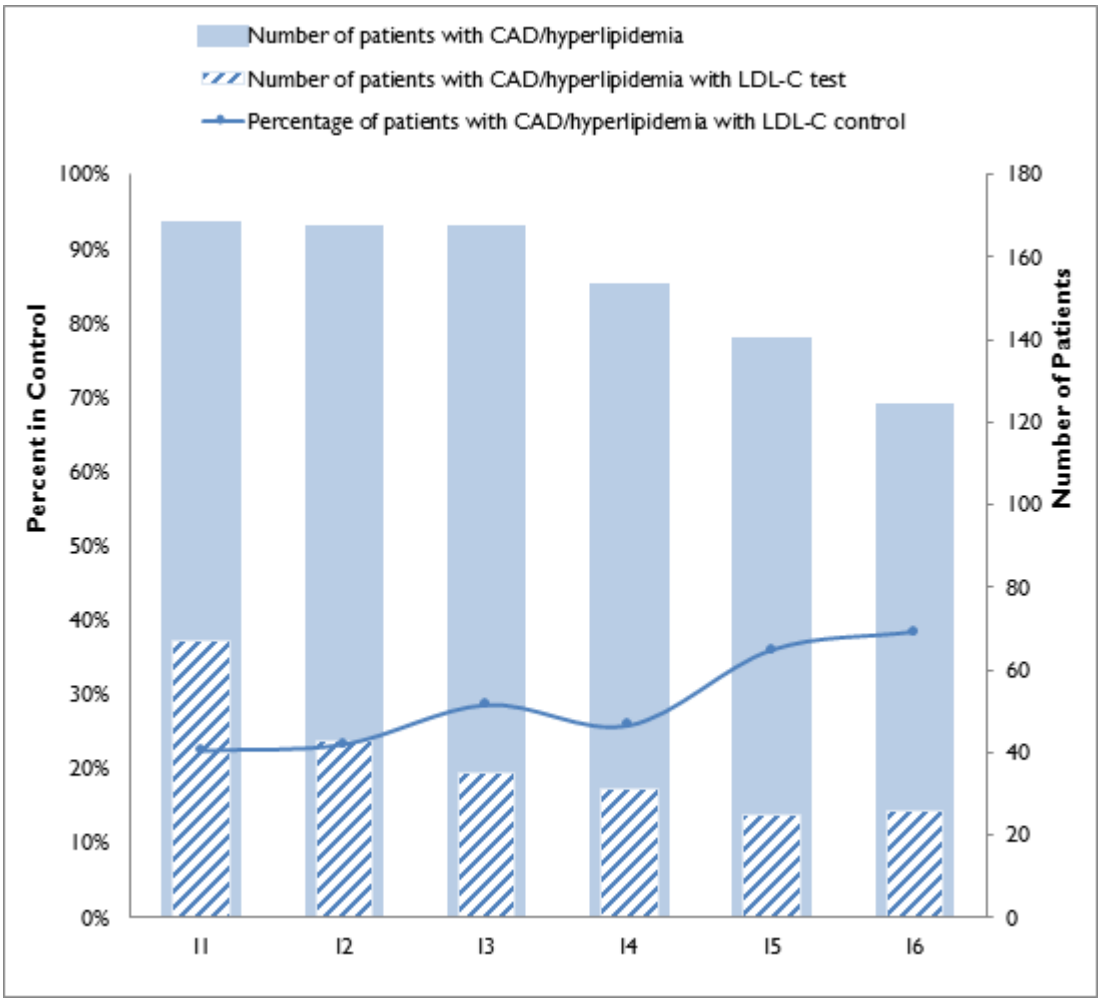
Coronary Artery Disease/Hyperlipidemia

Evaluation Question:

- Has the percentage of coronary artery disease (CAD)/hyperlipidemia patients with low-density lipoprotein cholesterol (LDL-C) control increased over time among those enrolled in the innovation?

Figure 10 presents the percentage of patients with CAD/hyperlipidemia who had an LDL-C test indicating good control (<100) over time. The denominator represents the number of CAD/hyperlipidemia patients who received an LDL-C test for each quarter. The numerator represents the number of CAD/hyperlipidemia patients who received an LDL-C test that was <100. As shown in the figure, the percentage of patients with LDL-C control increased slowly over time, from approximately 22 percent in I1 to almost 40 percent by I6. This increase suggests that LDL-C control improved over time for CAD/hyperlipidemia patients enrolled in the innovation. Again, the denominator changes dramatically over time, making any interpretation of the findings tentative.

Figure 10. Percentage of Patients with CAD/Hyperlipidemia with LDL-C Control over Time



	Quarter	I1	I2	I3	I4	I5	I6
●	Percentage of patients with CAD/hyperlipidemia with LDL-C control	22.4	23.3	28.6	25.8	36.0	38.5
	Number of patients with CAD/hyperlipidemia	166	165	165	151	138	122
	Number of patients with CAD/hyperlipidemia with LDL-C test	67	43	35	31	25	26

Source: Patient-level data provided to RTI by ECCHC.
CAD = coronary artery disease; LDL-C = low-density lipoprotein cholesterol.

Discussion of Other Awardee-Specific Findings

Overall, it appears as though ECCHC provided enrollees who have diabetes and hypertension with necessary clinical services. Most patients with diabetes had a foot exam and an HbA1c test. All patients with hypertension received a blood pressure screening and almost all received a BMI

assessment. Few patients received a flu or pneumonia vaccination. Approximately 30 percent were screened for depression.

The percentage of patients with improved health outcomes has increased over time. The percentage of patients with diabetes with HbA1c control increased, the percentage of patients with hypertension with blood pressure control increased, and the percentage of patients with CAD/hyperlipidemia with LDL-C increased over time. This finding suggests that those enrolled in ECCHC's innovation are achieving better health outcomes. However, findings must be interpreted with caution, given that the number of patients varies considerably over the intervention quarters. It is possible that patients who attrite could have different health outcomes than those who are retained in the innovation.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing ECCHC as well as accomplishments to date. In this section we assess ECCHC's progress on achieving HCIA goals to date.

- **Smarter spending.** Trends in Medicare spending per patient for innovation beneficiaries are highly variable and similar to comparison beneficiaries.

- **Better care.** The inpatient admission rate is very similar for the treatment and comparison groups. The small sample size results in a high degree of variability in the inpatient admissions and readmissions rate. ED visit rates are decreasing over time but are generally higher than in the comparison group.

  ECCHC enrolled more than 60 percent of its target population as of Q11. Most participants received a home or microclinic visit. More than one-third of patients received asthma, diabetes, or hypertension coaching. Understaffing adversely affected both reach and dose.

  The majority of patients with diabetes and hypertension received clinical services. Most patients with diabetes had a foot exam and an HbA1c test. All patients with hypertension received a blood pressure screening and nearly all received a BMI assessment. However, few patients received a flu or pneumonia vaccination. Approximately 30 percent were screened for depression.

- **Healthier people.** Over time, the percentage of patients with diabetes with HbA1c control increased, he percentage of patients with hypertension with blood pressure control increased, and the percentage of patients with CAD/hyperlipidemia with LDL-C increased. This finding suggests that those enrolled in ECCHC's innovation are achieving better health outcomes. Findings should be interpreted with caution, however, given that the differential attrition of sick patients could also explain these results.

ECCHC's Innovations Health program team faced many challenges throughout Year 3, including several noted in the first annual report. Only two of the three planned microclinics functioned at full capacity due to ECCHC's inability to hire a third NP. ECCHC also ended Year 3 with RN and CMA vacancies. The divide between clinical and nonclinical staff continued to cause problems, which ECCHC partially addressed by hiring an LISW to more clearly define staff roles, standardize care, and supervise nonclinical staff.

Understaffing and South Carolina's failure to pass Medicaid expansion limited ECCHC's ability to enroll new patients and provide as many "touches" as planned. ECCHC attempted to increase the enrollment of reimbursable beneficiaries, only to discover that few patients with coverage lacked primary care affiliations in the target population. This forced ECCHC to change its enrollment strategy yet again—shifting CHWs into their traditional (non-innovation) clinical sites.

Despite the obstacles with staffing and enrollment, ECCHC seems to have improved participants' health. Patients enrolled in the innovation demonstrate better chronic disease management than patients in a matched comparison group. Additional time and claims data are needed to assess whether the Innovations Health program has an impact on cost and service utilization. ECCHC's own reports indicate that cost savings were achieved.

Key components of the Innovations Health program will not continue after the award period ends. The community health team will be dissolved, and CHWs will no longer be as active in the community and patients' homes. Leaders responsible for the project are leaving the organization, and those who remain have not been heavily involved in overseeing the project.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Finity Communications Inc.

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

Finity Communications Inc.

1.1 Introduction

Finity Communications, Inc., a technology vendor in Portland, OR, received an award of $4,967,962 that launched on November 15, 2012. Finity partnered with a Medicaid managed care organization (MCO), Health Plan Partners (HPP), located in Philadelphia, Pennsylvania, and SCIO Health Analytics, to provide disease management and wellness programs to HPP beneficiaries beginning in November 2012. Finity also partnered with Duke University to develop and implement a customized training course for peer health mentors. The innovation seeks to achieve the following HCIA goals:

1. **Smarter spending.** Reduce total cost of care by $8,744,407.
2. **Better care.** Improve care by implementing a closed-loop disease management program that will result in a reduction of ED services by an average of 0.1 percent from the baseline for disease management program participants.
3. **Healthier people.** Improve health by improving targeted health outcomes by an average of 0.1 percent from the baseline for disease management program participants.

Table 2 provides a summary of changes that occurred with Finity during the third year of operations. These updates are based on a review of the *Q8–Q10 Narrative Progress Reports*; *Quarterly Awardee Performance Reports*; secondary data submitted by Finity through March 31, 2015; and key informant interviews conducted during the second (virtual) site visit with Finity's leaders and staff in April 2015.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	
Program Participant Characteristics	Similar to AR1, 86.3% of Baby Partners participants were aged 18 to 44 years and all participants were female. For diabetes and heart health, a majority of participants were aged 45 to 64 years old (82.6% and 80.4%, respectively) and most participants were also female (72.6% and 75.5%, respectively). All participants were covered by Medicaid.
Implementation Process	
Execution	40.44% of Year 3 budget; which is 10% or less under target.
Leadership	Leadership remained strong throughout the innovation.
Organizational capacity	Finity used its own call center employees to expand capacity and help conduct member engagement.
Innovation adoption and workflow	Finity's closed-loop tracking innovation was integrated into three existing HPP disease management programs.

(continued)

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Workforce Development	
Hiring/retention	No new hires were made between Q8–Q10. Staffing remained at 11.5 FTEs.
Training	Three staff had a total of 432 hours of training, consisting of HIPAA compliance and peer health mentor certification.
Implementation Effectiveness	
Reach	Since the first annual report, Finity enrolled an additional 4,060 Baby Partners participants, increasing reach from 70.2% to 109%. For diabetes, Finity enrolled an additional 489 participants, increasing reach from 3.6% to 28.8%, and for heart health, Finity enrolled an additional 515 participants, increasing reach from 3.0% to 45.9%.
Dose	For Baby Partners, 38.2% of participants completed just one activity, approximately 30% completed two of the three required activities, and 15.3% completed all three activities and earned bonus payments. For diabetes, the vast majority of participants completed an HbA1c assessment (90.0%), a provider visit (91.8%), and an LDL-C test (79.2%) and less than 10% had monthly interactions with their peer mentors. For heart health, the majority of participants received a primary care visit (89.5%) and an LDL-C test (67.3%), although less than half completed any of the remaining activities.

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by Finity.
Key informant interviews conducted Feb–June 2015.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

FTE = full-time equivalent; HbA1c = hemoglobin A1c test; HIPAA = Health Insurance Portability and Accountability Act; HPP = Health Partners Plans; LDL-C = low-density lipoprotein cholesterol; Q = quarter.

1.1.1 Innovation Components

This innovation consists of three components: (1) Condition Management LifeTracks, (2) EveryBODY Get Healthy Patient Portal, and (3) Health Alerts. The central innovation component, LifeTracks, consists of condition management interventions that target specific populations—such as pregnant Medicaid beneficiaries, or those with diabetes or heart conditions—and uses Finity's closed-loop tracking technology to deliver, assess, and adapt these interventions according to participant behaviors. LifeTracks also provides HPP Medicaid beneficiaries with education, financial incentives, and access to peer health mentors to support and encourage participants to better manage their conditions. Since the first annual report, Finity added three additional LifeTracks interventions: weight loss, tobacco cessation, and asthma management.[1] These three new LifeTracks do not include financial incentives, but complete

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

the full set of LifeTracks planned for this award. The incentives for the three main LifeTracks—Baby Partners, diabetes, and heart health—are as follows:

- For Baby Partners, an incentive of $25 is awarded for a prenatal visit, $25 for a dental visit, and $25 for a postpartum visit. An additional $25 is awarded if the first three goals are completed, for a total incentive of $100 per participant.
- The LifeTracks program incentives for participants with diabetes include $25 for completing a low-density lipoprotein (LDL) test, $25 for an HbA1c assessment, $25 for monthly contact with a peer health mentor, and $25 for a checkup with their provider, for a total incentive of $100.
- Heart health participants may receive up to $100 in incentives as well: $20 for an LDL test, $20 for primary care visit, $20 to improve blood pressure, $20 for medication adherence, and $20 for monthly contact with a peer health mentor.

The second component, the online Web-based portal, EveryBODY Get Healthy, provides general health and wellness education (https://www.everybodygethealthy.com/hpp/login/) for HPP members. The content is from Finity's database, which has been in development since Finity's inception in 2004.

Finally, the third innovation component includes health alerts via text messages and other media, including the LifeTrack portal and print. The health alert messages include reminders to members for activities such as obtaining preventive screenings, visiting their providers, and taking their medications. They are available for both LifeTracks and general wellness participants.

The partners for this innovation—HPP, SCIO Analytics, and Duke University—remain unchanged since the first annual report.

1.1.2 Program Participant Characteristics

Table 3 provides the demographic characteristics of all participants who ever enrolled in the innovation for Baby Partners, for diabetes, and for heart health. Participants are defined as those enrolled in the innovation regardless of whether they received an incentive. We first reported patient demographic characteristics in the AR1 report, based on data through Q7 for Baby Partners and Q5 for diabetes and heart health (the most recent data available at that time). The distribution of patient characteristics was similar to that in the first annual report. More specifically, a majority of Baby Partners participants (86.3%) were aged 18 to 44 years. For diabetes and heart health, a majority of participants were aged 45 to 64 years (82.6% and 80.4%, respectively) and most participants were also female (72.6% and 75.5%, respectively). Most participants across all three programs (44.4% for Baby Partners; 66.1% for diabetes; and 76.8% for heart health) were black. All participants were covered by Medicaid since Finity is partnered with HPP, a Medicaid MCO, and all participants were HPP members.

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Baby Partners		Diabetes		Heart Health	
	Number of Participants	Percentage of Baby Partners Participants	Number of Participants	Percentage of Diabetes Participants	Number of Participants	Percentage of Heart Health Participants
Total	11,388	100.0	558	100.0	551	100.0
Age						
<18	402	3.5	0	0.0	0	0.0
18–24	4,662	40.9	8	1.4	2	0.4
25–44	5,167	45.4	82	14.7	102	18.5
45–64	7	0.1	461	82.6	443	80.4
65–74	0	0.0	5	0.9	3	0.5
75–84	0	0.0	1	0.2	0	0.0
85+	0	0.0	0	0.0	0	0.0
Missing	1,150	10.1	1	0.2	1	0.2
Sex						
Female	11,388	89.9	405	72.6	416	75.5
Male	0	0.0	152	27.2	134	24.3
Missing	0	10.1	1	0.2	1	0.2
Race/ethnicity						
White	2,128	18.7	77	13.8	53	9.6
Black	5,059	44.4	369	66.1	423	76.8
Hispanic	655	5.8	9	1.6	8	1.5
Asian	290	2.5	4	0.8	1	0.2
American Indian or Alaska Native	11	0.1	0	0.0	0	0.0
Native Hawaiian or Other Pacific Islander	0	0.0	0	0.0	0	0.0
Other	0	0.0	0	0.0	0	0.0
Missing/ Refused	3,245	28.5	99	17.7	66	12.0
Payer Category						
Dual	0	0	0	0	0	0.0
Medicaid	11,388	100	558	100	551	100.0
Medicare	0	0	0	0	0	0.0
Medicare Advantage	0	0	0	0	0	0.0
Other	0	0	0	0	0	0.0
Uninsured	0	0	0	0	0	0.0
Missing	0	0	0	0	0	0.0

Source: Patient-level data provided to RTI by Finity.

1.2 Implementation Progress

The first annual report (2014) described Finity's implementation process, workforce development, and progress toward effectiveness, and detailed the quantifiable measures to assess each area. ***Table 4*** lists these measures and their status as of May 31, 2015. The results of analyses for all of these measures are included in this annual report. This section presents Finity's process measures and a qualitative analysis of the factors that determined Finity's implementation progress. This analysis draws on patient-level data Finity provided to RTI as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation effectiveness	Reach	Patients enrolled in Baby Partners incentive component	Data received from Finity
		Patients enrolled in diabetes incentive component	Data received from Finity
		Patients enrolled in heart health incentive component	Data received from Finity
	Dose	Baby Partners: incentive received by specific activity completed (e.g., prenatal visit, postnatal visit, or dental visit)	Data received from Finity
		Diabetes: incentive received by specific activity completed (e.g., LDL-C test, hemoglobin A1c test, peer mentor contact)	Data received from Finity
		Heart health: incentive received by specific activity completed (e.g., LDL-C test, PCP visit, improve blood pressure)	Data received from Finity

Finity = Finity Communications, Inc.; LDL-C = low-density lipoprotein cholesterol; PCP = primary care provider.

1.2.1 Implementation Process

The evaluation focuses on the components of the implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through Finity's *Narrative Progress Reports*, *Quarterly Awardee Performance Reports*, and qualitative interviews with Finity's key staff who provide additional context and detail. The findings presented here include Finity's reports from Q8 through Q10 and interviews conducted in April 2015.

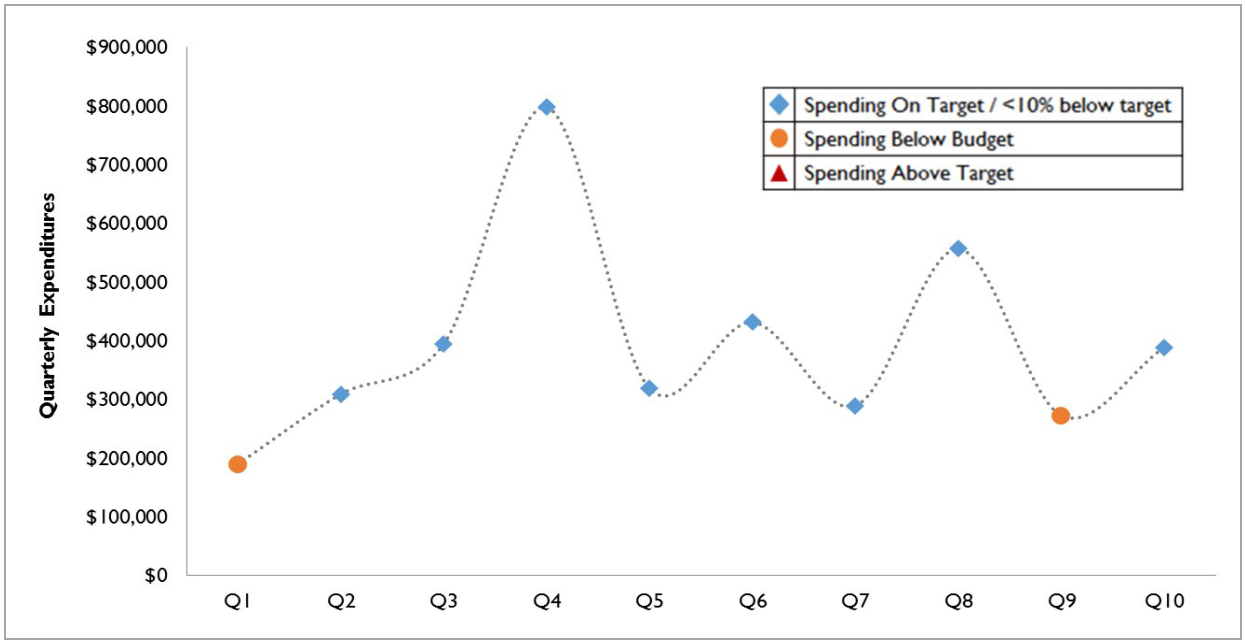
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

Execution of Implementation

The annual report highlights the significance of Finity's expenditure rates on implementation. As of December 2014 (Q10), Finity spent 40.44 percent of its Year 3 budget, which is 10 percent or less under projected target. Finity cited barriers that impacted execution and delayed implementation such as changes in personnel at HPP, difficulty collecting certain condition-specific data from providers (i.e., blood pressure readings), and the state's lengthy approval process for beneficiary communications. In addition, Finity and partners noted that they had to educate new partner leadership on the innovation.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Leadership

Finity had strong, engaged leadership support throughout the duration of the award. This strong support was complemented by partner organizations. For example, one partner organization noted the positive impact of innovation leadership, stating: "I already touched on this, but the people that were involved directly in the Finity program, the peer mentors, the CEOs, etc. have been hugely supportive of it and I think it has a huge impact." The Finity project director remained the same throughout the innovation, providing continuity and consistent support in spite of the turnover at partner organizations.

Finity reported some challenges in leadership support among their partners. They noted that, "Change in leadership at the partner organizations has also been a struggle. Finity has had to educate the new leaders." Similarly, HPP notes that, "There is a lot of turnover at SCIO Health Analytics and we have spent a lot of time bringing people up to speed." HPP also reported competing internal projects focused on cost-saving initiatives and external policies, such as Medicaid expansion, that competed for priority amongst leadership HPP. To ensure the program remains stable post-HCIA in spite of changing leadership at the partner organizations, Finity began establishing long-term plans with HPP and other payers. For instance, they worked directly with the state of New Mexico Medicaid program to offer their

beneficiaries the same types of closed-loop condition management communication and services as HPP. Despite challenges, leaders at HPP fully supported Finity's efforts and endorsed a media strategy to highlight the cost-saving results of the innovation.

Organizational Capacity

Finity was successful in enhancing the Baby Partners component and increasing membership engagement for diabetes and hypertension. Finity initially used three peer health mentors who were already on staff at HPP to conduct the outreach. However, over the past year, Finity added an additional three of its own call center representatives to expand peer health mentor outreach capacity. Finity cited having dedicated full-time equivalent (FTE) staff members to conduct the outbound calls to members as a lesson learned.

Analytics and reporting proved to be a challenge for both Finity and partner organizations. A SCIO Health Analytics staff member noted:

"We went in under the assumption of the amount and types of resources we would need and we underestimated how much it would take. Building the data, validating the information with HPP took longer than we thought. Building the methodology for the maternity postlaunch was tricky. When you are building these types of outputs, it is best to build it upfront, prelaunch and get everyone to agree upfront. Communicating the data management and methodology with the key players that may not have the research experience took more time than we had expected."

The payer, HPP, also mentioned the amount of competing priorities within the current health care environment and cited that it had to focus its efforts more in the future.

Innovation Adoption and Workflow Integration

The central innovation component, LifeTracks, was built upon existing HPP disease management programs. For instance, the Baby Partners LifeTracks—a program that offered prenatal care and support services for pregnant Medicaid beneficiaries—operated at HPP prior to the award. Finity enhanced this program with multiple forms of communication (mail, phone, e-mail, text, etc.), financial incentives, and a closed-loop tracking platform to help better analyze and engage the population. HPP cited some challenges in engaging the Medicaid population, including their limited access to certain types of technology (more smartphones, fewer personal computers) and other social determinants of health. In addition, while incentives were beneficial, participants had to wait 6-8 weeks to receive payments. Furthermore, at times, peer health mentors were challenged by incorrect contact information for participants. To overcome these challenges, leadership support at Finity and partner organizations, frequent communication and coordination among partner organizations, and a flexible approach to staffing were key to innovation adoption. As evidence of its success, the innovation will expand to HPP's Medicare and Children's Health Insurance Program (CHIP) populations, according to the *Q10 Narrative Progress Reports*.

The Web-based portal, EveryBODY Get Healthy, supports general wellness and prevention activities. This component continues to be offered to HPP members, but is not the main focus of the innovation. As the technical platform for supporting LifeTracks and Health Alerts, the adoption and integration of this component is more related to these other two components.

Since the first annual report, the Health Alerts component of Finity's innovation was fully launched, with approximately 150 total alerts. If innovation participants log in to the LifeTracks portal, they can access more information about a specific health alert as well as review information about any other alerts they may have received. According to key informant interviews, the initial number of alerts was overwhelming for the patient population. In order to aid in implementation of the Health Alerts, Finity reduced the number of alerts. As a lesson learned, Finity also allocated sufficient time for review of the alerts both internally and externally.

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with 11.5FTEs. Between Q8 (June 2014) and Q10, FTEs remained at 11.5 and no new hires were made. Finity did not report any issues with hiring; however, it used its own call center employees to supplement the peer health mentors conducting outbound calls.

Skills, Knowledge, and Training

Between Q8 and Q10, Finity provided 432 hours of training to three HCIA administrative personnel. This training consisted of Health Insurance Portability and Accountability Act (HIPAA) compliance and peer health mentor certification, which proved to be beneficial in conducting the outbound calls and outreach to members. This training was relevant as Finity used their own call center staff to supplement the peer health mentors. Because staff were reaching out to HPP members, they needed HIPAA training to ensure patients' health information was accessed and used properly. The peer health mentor certification was also needed to ensure consistent processes across all staff.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which (1) the innovation reached the number of targeted patients or participants (reach) and (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

- What is the implementation effectiveness, including reach and dose, of the innovation thus far?

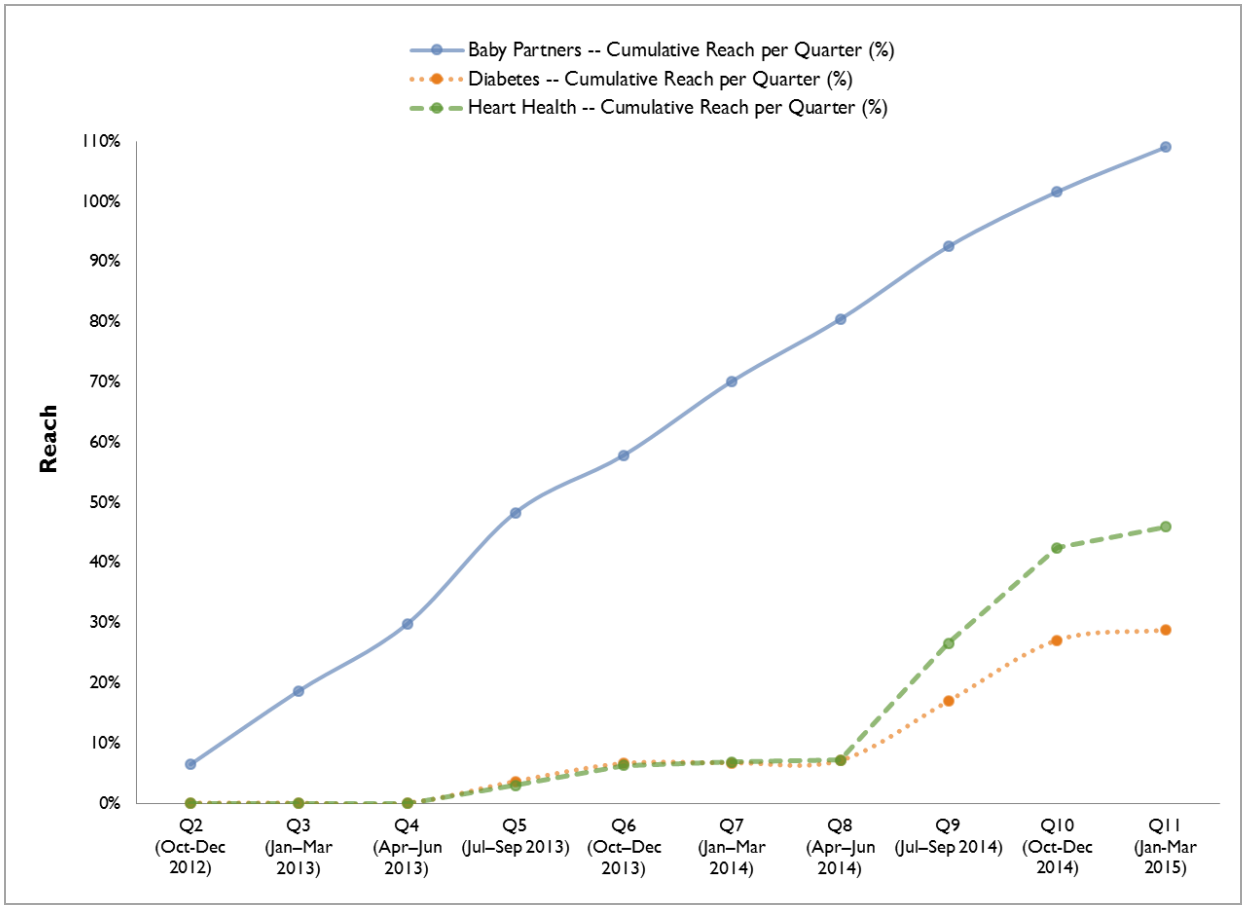
Reach

Figure 2 shows reach by quarter since the launch of the innovation. Finity provided the target population for each of the three LifeTracks to RTI. We first reported reach in the first annual report, based on data through Q7 for Baby Partners and Q5 for diabetes and heart health. Since that time, Finity enrolled an additional 4,060 Baby Partners participants in the innovation, increasing reach to a total of 11,388. Given the target population was 10,445 HPP members, the reach increased from 70.2 percent in the first annual report to 109 percent through Q11. For diabetes, Finity enrolled an additional 489 participants, increasing reach from 3.6 percent to 28.8 percent (target population 1,935 HPP members); and for heart health, an additional 515 participants enrolled, increasing reach from 3.0 percent to 45.9 percent (target population 1,201 HPP members).

As noted in previous reports, the number of participants reported in the *Quarterly Awardee Performance Reports* differs from the number of participants reported in the RTI quarterly and annual reports. The estimates provided in the *Quarterly Awardee Performance Reports* are much higher than these reports because Finity informed us during the site visit that it reported both indirect encounters (e.g., email, flyer in the mail) and direct encounters (e.g., contact with peer health mentors) in its estimates; whereas RTI is presenting only the number of direct participants in the incentive programs because we received only those data.

Reach for the diabetes and heart health LifeTracks was impacted by The Pennsylvania Department of Public Welfare's approval time for the new text messaging content. HPP had already piloted Baby Partners; therefore, less startup time was needed for this LifeTracks program. In addition, pregnancy is a shorter term condition thus it was easier for Finity to recruit and retain HPP members for the entire duration of the program whereas diabetes and hypertension are long-term chronic conditions and Finity noted it was difficult to recruit and engage members with these conditions in the LifeTracks programs.

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch



	Quarter	Q2 (Oct–Dec 2012)	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan–Mar 2015)
●	Baby Partners—Cumulative reach per quarter (%)	6.5	18.7	29.8	48.3	57.9	70.2	80.5	92.6	101.6	109.0
	Baby Partners—Cumulative # enrolled[1]	677	1,953	3,113	5,047	6,043	7,328	8,405	9,667	10,613	11,388
●	Diabetes—Cumulative reach per quarter (%)	0.0	0.0	0.0	3.6	6.6	6.7	7.1	17.0	27.1	28.8
	Diabetes—Cumulative # enrolled	0	0	0	69	127	130	138	328	524	558
●	Heart Health—Cumulative reach per quarter (%)	0.0	0.0	0.0	3.0	6.3	6.9	7.2	26.6	42.5	45.9
	Heart Health—Cumulative # enrolled	0	0	0	36	76	83	87	319	511	551

Source: Patient-level data provided to RTI by Finity.
[1] Includes 355 participants with missing enrollment dates.

Dose

Dose is captured in the condition-specific LifeTracks incentive programs as the number and type of incentive received for specific activities. Baby Partners, for example, requires a prenatal, postnatal, and dental visit to achieve the full incentive. The diabetes incentive program requires completing a low-density lipoprotein cholesterol (LDL-C) test, an HbA1c test, monthly contact with a peer health mentor, and a visit with the provider. The heart health incentive program requires an LDL-C test, a primary care visit, improved blood pressure (although it is unclear how this is assessed), medication adherence (which appears to be assessed as filling relevant prescriptions), and monthly contact with a peer health mentor.

We first reported dose in the AR1 report, based on data through Q7 for Baby Partners and Q5 for diabetes and heart health. As expected, the number of services provided and the percentage of participants who received those services increased in Q11. ***Tables 5***, ***6***, and ***7*** provide the number of incentives rewarded for each of the condition management programs.

For Baby Partners, over one-third of participants completed just one activity and received an incentive payment for either a prenatal visit (12.5%), a dental visit (8.1%), or a postpartum visit (17.6%); and approximately 30 percent completed two of the three required activities, such as a prenatal visit and a dental visit (8.8%), a prenatal visit and a postpartum visit (10.1%), or a dental visit and a postpartum visit (12.0%). In addition, only 15.3 percent received a bonus payment for completing all three activities. Lastly, 15.6 percent of those enrolled did not complete any of the required activities and thus did not earn an incentive.

Table 5. Number and Types of Incentives Provided to Baby Partners Participants

Incentive Activities	Number of Incentives Provided	Percentage of Total Enrolled Participants
Prenatal visit only	1,421	12.5
Dental visit only	927	8.1
Postpartum visit only	1,999	17.6
Prenatal visit and dental visit	999	8.8
Prenatal visit and postpartum visit	1,155	10.1
Dental visit and postpartum visit	1,368	12.0
Bonus received for all three activities completed	1,740	15.3
Enrolled but no incentives received	1,779	15.6
Total	11,388	100.0

Source: Patient-level data provided to RTI by Finity.

For the diabetes incentive program, the vast majority of participants completed an HbA1c assessment (90.0%), a provider visit (91.8%), and an LDL-C test (79.2%); and less than 10 percent had monthly interactions with their peer mentors. This result was expected because completing an HbA1c assessment or LDL-C test was a one-time activity and contact with the peer health mentor required an ongoing monthly commitment.

Table 6. Number and Types of Incentives Provided to Diabetes Participants

Incentive Activities	Number of Incentives Provided	Percentage of Total Enrolled Participants
LDL-C test	442	79.2
HbA1c assessment	502	90.0
Provider visit	512	91.8
Monthly contact with peer health mentor	51	9.1

Source: Patient-level data provided to RTI by Finity.
HbA1c = hemoglobin A1c test; LDL-C = low-density lipoprotein cholesterol.

Lastly, for the heart health incentive program, the majority of participants received a primary care visit (89.5%) and an LDL-C test (67.3%). These activities can be assessed via claims data and, thus, may be easier for HPP and Finity to track and report. The remaining activities such as improved blood pressure, in which only 15.4 percent of participants received an incentive for completing, medication adherence (completed by 37.4%), and monthly contact with their peer health mentors (completed by 6.4%) require health care providers to share additional information to HPP and Finity.

Table 7. Number and Types of Incentives Provided to Heart Health Participants

Incentive Activities	Number of Incentives Provided	Percentage of Total Enrolled Participants
LDL-C test	371	67.3
Primary care visit	493	89.5
Improved blood pressure	85	15.4
Medication adherence	206	37.4
Monthly contact with peer health mentor	35	6.4

Source: Patient-level data provided to RTI by Finity.
LDL-C = low-density lipoprotein cholesterol.

Sustainability

The innovation will continue with HPP and expand to the Medicare and CHIP populations. Finity intends to implement a 5-year plan post-HCIA with HPP, according to the Q10 Narrative Progress Report. Additionally, Finity is expanding its innovation to other Medicaid and commercial payers across other states, including New Mexico's Medicaid program. Importantly, the lessons learned through this innovation award—the use of targeted communications, closed-loop tracking, and incentives to support behavior change in Medicaid populations, the design of key reports, the need for more peer health mentor staff and leadership commitment—will be applied in other states and with other payers and beneficiaries moving forward. As one HPP staff member noted during the second year (virtual) site visit: "We've seen this play out in New Mexico already. Learn from what you've done so you can do the design phase a lot quicker so you can get to utilize the program. Get the appropriate resources that you need and assume things will take longer than you think." Finally, HPP provided guidance to other sites attempting similar innovations important for sustainability: "I think 3 years is a minimum for this type of program because it

does take time to build a program, especially like us who need state approval for everything. We want to run with it and see the benefits."

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of Finity's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data Finity collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers essential to the evaluation of Finity's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 8 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of whether the payer-specific data are presented in this annual report. Finity participants are enrolled in Medicaid; therefore, we do not present Medicare results.

Table 8. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measures	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	No	Yes
		Hospital unplanned readmissions rate	No	Yes
		ED visit rate	No	Yes
	Cost	Spending per patient	No	Yes
		Estimated cost savings	No	Yes

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis

Finity's Baby Partners innovation focuses on Medicaid managed care patients and is not expected to have an impact on Medicare beneficiaries.

Medicaid Claims Analysis

The claims data analysis focuses on the Baby Partners LifeTracks program. RTI received the most recent claims data in March 2015, which were previously reported in Q6. The managed care data on Baby Partners covers July 2012 to June 2014 and includes both participants and nonparticipants. For the claims analysis, participants are defined as eligible mothers who agreed to participate and earned incentives from the Baby Partners program. Nonparticipants include eligible mothers who agreed to participate but did not receive incentives from the program. This definition is different from the explanation of participants and nonparticipants in other sections of the report.

Finity provided information on total expenditures, inpatient and ED spending, number of hospital admissions and readmissions, and number of ED visits, separately for mothers and babies. Finity will provide data on other programs when the programs have sufficient enrollment numbers.

Finity provided data on 11,792 babies and 11,197 mothers. Of these, 6,776 babies and 6,518 mothers were eligible for Baby Partners and were included in this analysis. To be eligible for the analysis, babies had to be enrolled in the HPP's Medicaid managed care plan after delivery and their mothers must have been enrollees of the same plan for a minimum of 6 months prior to delivery and 3 months after delivery. Participants were also excluded if they had any of the following comorbidities: HIV, end-stage renal disease, transplant, or nonskin cancer. If a mother had two births within the 12-month period, only the first birth was eligible for inclusion in the analysis.

Comparison Groups

For each claims outcome measure, we compared eligible participants to eligible nonparticipants in the Baby Partners LifeTracks program. However, because individuals were not randomly assigned to participation, the probability of treatment assignment may be correlated with the outcome variables of interest. Thus, simply comparing the mean value of the outcome variables for the treated and untreated groups may be biased by the existence of confounding factors. To ensure validity of comparisons between participant and nonparticipant groups, we used a propensity score matching (PSM) approach to adjust for the following potentially confounding factors: mother's age, number of children, substance abuse, and mother's preexisting conditions (e.g., cerebrovascular or cardiovascular disease; central-nervous-system–related or gastrological disease; or genital, infectious, metabolic, psychiatric, pulmonary, skeletal, or skin-related disease). ***Appendix B.2*** provides technical details on the updated propensity score methodology.

After performing PSM, we calculate absolute standardized differences between the treatment group and the unmatched and matched comparison groups and check whether matching decreases the absolute standardized differences and achieves acceptable balance (***Table 9***). Many researchers consider that an absolute standardized difference ≤0.10 indicates acceptable balance.[2] Researchers have also pointed out that critical variables in determining selection into treatment (e.g., those with significant effects in the propensity score equation), should have greater balance, while those indicators with minor importance in determining treatment selection are less critical to attain optimal balance. Table 9 describes the mean values and the standardized differences of the variables included in the propensity score model. All of the absolute standardized differences for the variables included in the participation equation are below 0.10 for both the matched and unmatched samples. The standardized difference between the treatment and the matched groups improved considerably relative to the unmatched comparison group. Table 9 describes the mean values and the standardized differences of the variables included in the propensity score model.

[2] Austin, P.C. An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research. 46(3):399-424, 2011. *PMC*. Web. 2 June 2015.

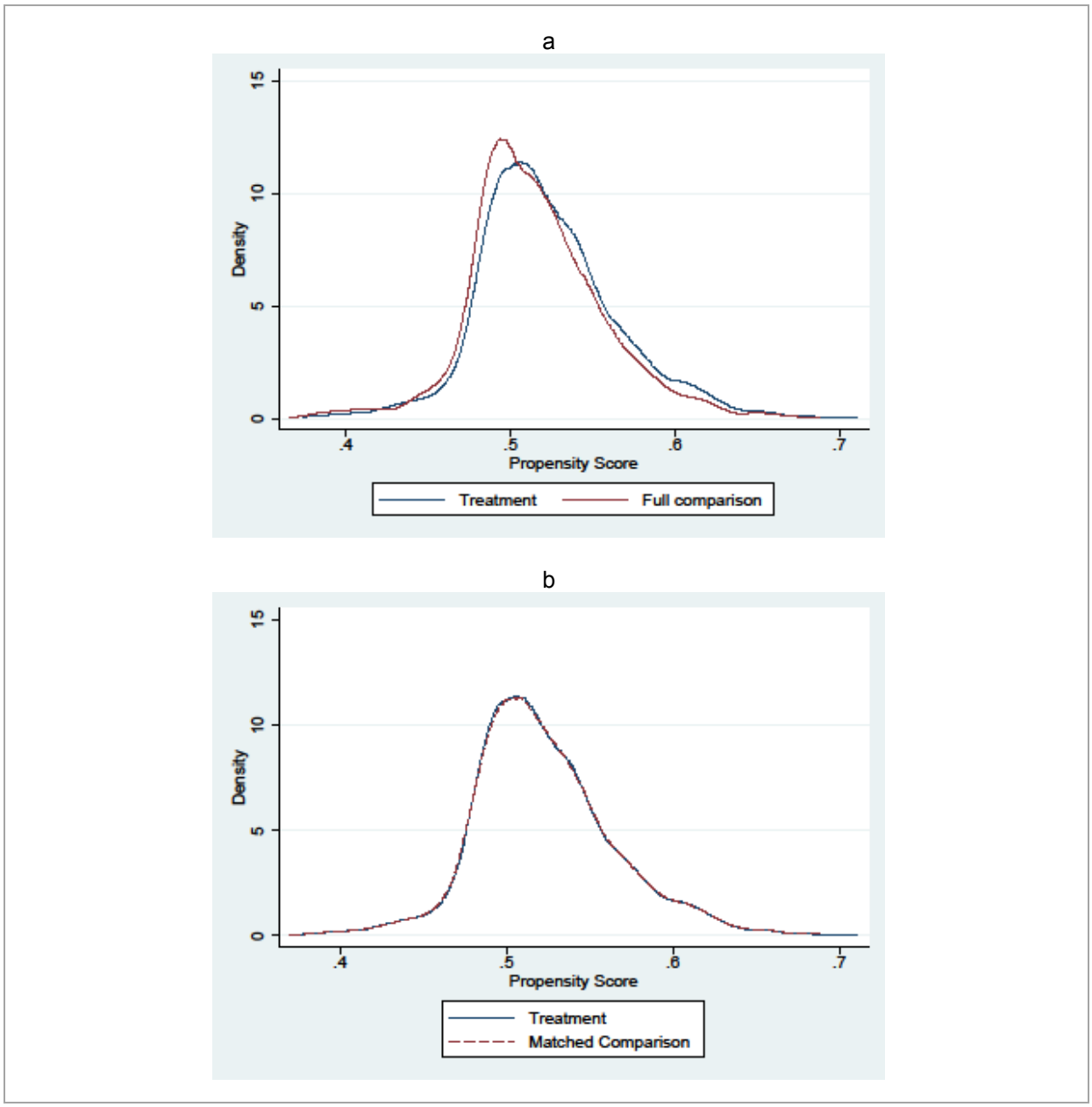
Table 9. Mean Values and Standardized Differences of Variables in Propensity Score Model: Finity Baby Partners

Variable	Treatment Group (n=3,521)		Full Comparison Group (n=3,255)		Matched Comparison Group (n=1,503)		Standardized Difference (Treatment vs. Comparison)	Standardized Difference (Treatment vs. Matched Comparison)
	Mean	SD	Mean	SD	Mean	SD		
Mother age	26.12	5.49	25.60	5.48	26.30	5.56	0.09	0.03
Number of children	1.03	0.17	1.02	0.14	1.03	0.17	0.05	0.00
Mother with cerebrovascular disease	0.45%	6.73%	0.34%	5.80%	0.40%	6.30%	0.02	0.01
Mother with genital disease	7.36%	26.11%	6.05%	23.85%	6.37%	24.43%	0.05	0.04
Mother with cardiovascular disease	18.72%	39.01%	18.00%	38.43%	18.32%	38.69%	0.02	0.01
Mother with CNS-related disease	11.10%	31.42%	9.49%	29.32%	10.21%	30.29%	0.05	0.03
Mother with gastrological disease	15.73	36.42%	14.56%	35.28%	14.15%	34.87%	0.03	0.04
Mother with infectious disease	2.75%	16.37%	2.98%	17.01%	1.86%	13.50%	0.01	0.06
Mother with metabolic disease	5.79%	23.37%	4.73%	21.23%	5.22%	22.24%	0.05	0.03
Mother with psychiatric disease	15.22%	35.93%	14.44%	35.15%	13.85%	34.55%	0.02	0.04
Mother with pulmonary disease	24.17%	42.82%	24.02%	42.73%	23.74%	42.57%	0.00	0.01
Mother with skeletal disease	8.35%	27.67%	6.94%	25.42%	8.10%	27.30%	0.05	0.01
Mother with skin-related disease	6.82%	25.21%	7.96%	27.07%	6.54%	24.73%	0.04	0.01
Mother with substance abuse	2.39%	15.26%	3.35%	17.99%	2.03%	14.09%	0.06	0.02

Source: RTI analysis of managed care data provided by the awardee.
CNS = central nervous system; SD = standard deviation.

Figure 3 shows the distribution of the propensity scores for both the intervention and comparison groups. The first panel (a) shows the intervention group and the unmatched comparison group, and the second panel (b) shows the intervention group and the matched comparison group. The second panel demonstrates an extremely close overlap between the treatment and matched comparison groups' propensity scores: the curves of the treated and untreated groups are nearly indistinguishable.

Figure 3. Distribution of Propensity Scores for Treatment and Unmatched and Matched Comparison Groups: Finity Baby Partners



a. Treatment vs. unmatched comparison group
b. Treatment vs. matched comparison group

Below we present health care spending per patient, followed by utilization rates for all-cause inpatient admissions, readmissions, and ED visits. To be consistent with reports for other awardees, outcomes are presented for a 3-month period for mothers and babies separately. This was achieved by first obtaining monthly averages and multiplying these by 3. However, because we only received aggregate data from the awardee, we are not able to present quarterly trends based on time of enrollment. Descriptive and regression analyses are presented for 3-month periods for mothers and babies separately. Regression analyses for mothers and babies combined are presented for the full enrollment period. Descriptive and regression analyses compare participant and statistically matched nonparticipant groups.

Descriptive Analysis

Participating mothers and babies had higher overall and ED health care spending than the matched group of nonparticipating mothers (***Table 10***). Although participating mothers had lower inpatient spending, participating babies had higher inpatient spending. Total health care spending for participating mothers was on average $128 more per mother per quarter (P-value=0.003) than for nonparticipant mothers. No other difference was statistically significant. It is possible that participating mothers received more preventive or prenatal care that increased total spending.

Table 10. Total, Inpatient, and ED Spending for All Eligible Mothers and Babies, Quarterly Average: Finity Baby Partners

	(1) Nonparticipant N=1,503 (Mothers)		(2) Participant N=3,521 (Mothers)		Difference (2)-(1)
	Mean	SD	Mean	SD	
Total costs	$2,472	$1,540	$2,600	$1,484	$128[1]
Inpatient costs	$1,307	$991	$1,286	$783	-$21
ED costs	$71	$91	$76	$110	$5
	(1) Nonparticipant N=1,503 (Babies)		(2) Participant N=3,521 (Babies)		Difference (2)-(1)
	Mean	SD	Mean	SD	
Total costs	$3,270	$8,183	$3,950	$26,068	$681
Inpatient costs	$2,344	$6,025	$2,859	$23,568	$515
ED costs	$58	$104	$61	$122	$3

Source: RTI analysis of managed care claims data provided by awardee.
Note: numbers might not add up exactly because of rounding.
[1] Statistically significant at 95% confidence level.
ED = emergency department; N = number; SD = standard deviation.

Total all-cause inpatient admissions per 1,000 patients per quarter are reported in ***Table 11***. When compared to nonparticipants, participants' inpatient visits were slightly lower for mothers and higher for babies, both differences were statistically significant. Although participant mothers had higher total costs, inpatient admissions were lower, which might indicate avoidance of preventable admissions.

Table 11. All-Cause Inpatient Utilization (per 1,000 Members per Quarter): Finity Baby Partners

	(1) Nonparticipant N=1,503 (Mothers)		(2) Participant N=3,521 (Mothers)		Difference (2)-(1)
	Mean	SD	Mean	SD	
All-cause inpatient utilization per 1,000	266.47	144.58	251.54	131.64	−14.93[1]
	(1) Nonparticipant N=1,503 (Babies)		(2) Participant N=3,521 (Babies)		Difference (2)-(1)
	Mean	SD	Mean	SD	
All-cause inpatient utilization per 1,000	567.18	291.63	586.57	292.76	19.38[1]

Source: RTI analysis of managed care claims data provided by awardee.
Note: numbers might not add up because of rounding.
[1] Statistically significant at 95% confidence level.
SD = standard deviation.

Hospital readmissions add to the costs of a prior hospitalization, and they often reflect a problem in the care provided during the first admission. We report the number of readmissions per 1,000 patients for babies and mothers separately. Although for other awardees we present readmissions per 1,000 inpatient admissions, because Finity provided the readmission variable for each member, we present readmission per 1000 members who had an inpatient admission. We found higher rates of readmissions for participating mothers and babies (***Table 12***). However, no difference was statistically significant.

Table 12. Hospital Readmissions (per 1,000 Members per Quarter): Finity Baby Partners

	(1) Nonparticipant N=1,483 (Mothers)		(2) Participant N=3,451 (Mothers)		Difference (2)-(1)
	Mean	SD	Mean	SD	
Hospital readmissions per 1,000	0.73	16.91	1.03	26.92	0.29
	(1) Nonparticipant N=1,424 (Babies)		(2) Participant N=3,384 (Babies)		
	Mean	SD	Mean	SD	Difference
Hospital readmissions per 1,000	5.76	79.63	6.28	60.00	0.52

Source: RTI analysis of managed care claims data provided by awardee.
Note: numbers might not add up because of rounding.
SD = standard deviation.

ED visits are sometimes viewed as a symptom of the inability of the community's health care system to provide adequate preventive and ambulatory care visits. The innovation might reduce ED visits by reinforcing the use of prenatal and postnatal care to decrease pregnancy-related complications and promote babies' health. We found lower rates of ED utilization for participant mothers (***Table 13***). Babies' ED utilization was higher for participants than nonparticipants. However, no difference was statistically significant.

Table 13. All-Cause Emergency Department Utilization (per 1,000 Members per Quarter): Finity Baby Partners

	(1) Nonparticipant N=1,503 (Mothers)		(2) Participant N=3,521 (Mothers)		Difference (2)-(1)
	Mean	SD	Mean	SD	
All-cause ED utilization per 1,000	433.15	513.29	412.60	494.90	–20.54
	(1) Nonparticipant N=1,503 (Babies)		**(2) Participant N=3,521 (Babies)**		**Difference (2)-(1)**
	Mean	**SD**	**Mean**	**SD**	
All-cause ED utilization per 1,000	344.92	531.43	353.45	610.98	8.53

Source: RTI analysis of managed care claims data provided by awardee.
Note: numbers might not add up because of rounding.
ED = emergency department; SD=standard deviation.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, the likelihood that a patient had an unplanned readmission, and the likelihood that a patient had an ED visit.

Table 14 summarizes the differences in expenditures for mothers and babies per quarter and combined for mothers and babies over the whole intervention period, using the propensity score weighted comparison group. The regression specification adjusts for the number of months that mothers and babies were observed in the sample. Participants had higher total costs than nonparticipants. In the case of mothers only, this difference was statistically significant at the 5 percent significance level. No other difference was statistically significant.

Table 14. Difference-In-Differences OLS Regression Estimates for Quarterly Medicaid Spending per Participant: Finity Baby Partners

N=5,024	Difference in Expenditures per Quarter (Mothers) (SE; P-value)	Difference in Expenditures per Quarter (Babies) (SE; P-value)	Aggregated Difference in Mothers and Babies Over Enrollment Period (P-value)
Total costs	$87 (44; 0.050)	$810 (491; 0.099)	$1,410 (737; 0.056)
Inpatient costs	$−26 (28; 0.358)	$667 (425; 0.117)	$521 (589; 0.376)
ED costs	$5 ($4; 0.260)	$4 (6; 0.500)	$34 (28; 0.224)

Source: RTI analysis of managed care claims data provided by Finity.
Notes: The regression coefficients are difference-in-differences estimates. Covariates used: treatment indicator (reported), mother's age, number of children, cerebrovascular disease, genital disease, cardiovascular disease, CNS-related disease, gastrological disease, infectious disease, metabolic disease, psychiatric disease, pulmonary disease, skeletal disease, skin-related disease, substance abuse, and months in the sample.
ED = emergency department; SE= standard error.

We also present linear probability model coefficients for inpatient admissions, readmissions, and ED visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the estimated effect.[3] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, linear probability model coefficients have often been empirically demonstrated to be consistent with marginal effects generated from nonlinear models.[4] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention) and not just the direction of the effect.

Table 15 shows the results of a linear regression with the dependent variable set to 1 for patients who had at least one hospital visit during each quarter. When compared to nonparticipants, participant mothers had 1 percentage point fewer inpatient hospital admissions, and participant babies had 1 percentage point more inpatient admissions, per quarter. On average, there was no difference in the number of hospitalizations for mothers and babies combined over the entire period under observation. No result was statistically significant.

Table 15. Comparison of the Difference in All-Cause Inpatient Admissions Using a Propensity Score Matched Comparison Group: Finity Baby Partners

N=5,024	Difference in Inpatient Admissions per Quarter (Mothers) (SE; P-value)	Difference in Inpatient Admissions per Quarter (Babies) (SE; P-value)	Aggregated Difference in Mothers and Babies Over Enrollment Period (SE; P-value)
All-cause inpatient utilization	−0.01 (0.01; 0.269)	0.01 (0.01; 0.329)	0.00 (0.00; 0.617)

Source: RTI analysis of managed care claims data provided by Finity.
Notes: Linear Probability Model. The linear probability model regression coefficients are difference-in-differences estimates. Covariates used: treatment indicator (reported), mother's age, number of children, cerebrovascular disease, genital disease, cardiovascular disease, CNS-related disease, gastrological disease, infectious disease, metabolic disease, psychiatric disease, pulmonary disease, skeletal disease, skin-related disease, substance abuse, and months in the sample.
SE= standard error.

Table 16 presents the results of a linear regression constrained to those who had an inpatient admission with the dependent variable set to 1 for patients who had at least one hospital readmission during each quarter. On average, no difference was evident in the number of hospital readmissions for mothers and babies per quarter and mothers and babies combined throughout the enrollment period.

[3] To obtain the correct effect, it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run even when not competing with other users for computer resources.
[4] Angrist, J.D., and Pischke J.-S. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton. Princeton University Press, 2008.

Table 16. Comparison of the Difference in Hospital Readmissions Using a Propensity Score Matched Comparison Group: Finity Baby Partners

N=5,024	Difference in Hospital Readmissions per Quarter (Mothers) (SE; P-value)	Difference in Hospital Readmissions per Quarter (Babies) (SE; P-value)	Aggregated Difference in Mothers and Babies Over Enrollment Period (SE; P-value)
Hospital readmissions	0.00 (0.00;0.317)	0.00 (0.00; 0.440)	0.00 (0.00; 0.454)

Source: RTI analysis of managed care claims data provided by Finity.
Notes: Linear probability model. The linear probability model regression coefficients are difference-in-differences estimates. Covariates used: treatment indicator (reported), mother's age, number of children, cerebrovascular disease, genital disease, cardiovascular disease, CNS-related disease, gastrological disease, infectious disease, metabolic disease, psychiatric disease, pulmonary disease, skeletal disease, skin-related disease, substance abuse, and months in the sample.
SE= standard error.

Table 17 presents the results of a linear regression with the dependent variable set to 1 for patients who had at least one ED visit during each quarter. On average, participant mothers and babies had 1 and 3 percentage-point more ED visits than nonparticipants, respectively. For mothers and babies combined throughout the observation period, there were 1 percentage-point higher ED visits overall. However, no result was statistically significant.

Table 17. Comparison of the Difference in All-Cause ED Utilization Using a Propensity Score Matched Comparison Group: Finity Baby Partners

N=5,004	Difference in ED Utilization per Quarter (Mothers) (SE; P-value)	Difference in ED Utilization per Quarter (Babies) (SE; P-value)	Aggregated Difference in Mothers and Babies Over Enrollment Period (SE; P-value)
All-cause ED utilization	0.01 (0.01; 0.433)	0.03 (0.02; 0.100)	0.01 (0.02; 0.756)

Source: RTI analysis of managed care claims data provided by Finity.
Notes: Linear probability model. The linear probability model regression coefficients are difference-in-differences estimates. Covariates used: treatment indicator (reported), mother's age, number of children, cerebrovascular disease, genital disease, cardiovascular disease, CNS-related disease, gastrological disease, infectious disease, metabolic disease, psychiatric disease, pulmonary disease, skeletal disease, skin-related disease, substance abuse, and months in the sample.
ED = emergency department; SE= standard error.

Discussion

The current results do not support cost savings. We found that total spending was higher for mothers and higher—but not statistically significant—for babies per quarter and for the mother and baby combined during the entire pregnancy and postnatal period. Perhaps participants in the innovation may be more prone to higher expenditures due to unmeasured health and socioeconomic characteristics. Or perhaps the innovation is creating higher demand for health services because incentives are provided when participants attend prenatal and postnatal visits—and this increase in preventive care is not fully offset by reductions in complications. When we focused on combined costs for mothers and babies over the entire period, the regression analysis did not find significant results for spending, hospital inpatient

admissions, hospital readmissions, or ED visits. Because this analysis focuses on pregnancies during the prenatal and postnatal periods, it better captures the impact of the innovation on the period around each pregnancy. In the long run, however, the innovation may be associated with lower spending and health care utilization if its impact lasts beyond the postnatal period. In addition, gains from the intervention may be accrued through nonmonetary outcomes (e.g., baby weight).

1.3.3 Other Awardee-Specific Data

We received patient-level data from Finity that we used to generate each measure listed in Tables 4 and 18 for each quarter through Q11 (March 31, 2015). ***Table 18*** lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. The data we present in this section are current through March 2015. The results of analyses for some of these measures are included in this annual report. Many of the outcome measures to assess diabetes and heart health were not made available to RTI in time to include in this report. They will be included in subsequent reports. We did, however, receive data on pregnancies and on birth weight. We examine pregnancy-related measures below.

Table 18. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measures	Status
Clinical effectiveness	Cancer Screening	Percentage of targeted members who received appropriate screening for:	
		Colorectal cancer	Dropped; data unavailable
		Breast cancer	Dropped; data unavailable
		Cervical cancer	Dropped; data unavailable
	Cardiovascular Disease	Percentage of targeted members with CHF or CAD who received beta-blocker therapy	Data received from Finity
		Percentage of targeted members with CAD who were prescribed ACE inhibitor or ARB therapy	Data received from Finity
	Diabetes	Percentage of targeted members with diabetes who received a HbA1c test	Data received from Finity
		Percentage of targeted members with diabetes who received LDL-C screening	Data received from Finity
		Percentage of targeted members with diabetes who received an eye screening	Data received from Finity

(continued)

Table 18. Awardee-Specific Outcome Measures (continued)

Evaluation Domains	Subdomains	Measures	Status
Clinical effectiveness (continued)	Pregnancy	Ultrasounds received	Data received from Finity
		Percentage who received an influenza immunization	Data received from Finity
		Office visits	Data received from Finity
		Patients who received a glucose test (if applicable)	Data received from Finity
Health outcomes	Pregnancy	Birth weight	Data received from Finity

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blockers; CAD = coronary artery disease; CHF = congestive heart failure; Finity = Finity Communications, Inc.

Clinical Effectiveness

Evaluation Question

- What percentage of Baby Partners are receiving prenatal and postpartum care not specifically incentivized as part of the innovation?

Table 19 demonstrates that the vast majority of Baby Partners participants for whom we had additional clinical effectiveness data for completed at least one office visit during pregnancy (97.1%) and obtained at least one ultrasound (92.9%). Only slightly more than one-third, however, completed a postpartum visit (36.2%) and less than one-fourth obtained a flu vaccine (23.3%). On average, participants completed 9.6 office visits during pregnancy and received eight ultrasounds. Office visits may specifically include prenatal visits, but may be for other clinical reasons as well. These data are consistent with the data presented in dose, although we only have clinical effectiveness data for about half of all Baby Partners participants.

Table 19. Clinical Effectiveness Measures Among Baby Partners Participants with Claims Data Available

	Number of Participants with Any Visits/ Services	Percent of Participants with Any Visits/ Services	Mean Number	Median Number	Range
Baby Partner Participants N=5,868					
Office visit during pregnancy[1]	5,697	97.1	9.60	9.0	0 to 40
Ultrasounds received	5,453	92.9	8.39	6.0	0 to 66
Glucose test received	123	2.1	0.03	0.0	0 to 4
Flu vaccine received	1,369	23.3	0.24	0.0	0 to 3
Postpartum office visit[2]	2,127	36.2	0.37	0.0	0 to 2

Source: Patient-level data provided to RTI by Finity.
[1] Office visit during pregnancy defined by CPT code 99201-99205 99211-99215.
[2] Postpartum office visit defined by CPT code 59430.

Evaluation Question

- How does the birth weight of Baby Partners participants compare to that of nonparticipants?

Table 20 demonstrates that babies of participating mothers are on average 37.4 grams heavier than babies of nonparticipating mothers (p-value 0.01). This positive health outcome might be due to the impact of prenatal care on the health of mothers and their babies.

Table 20. Birth Weight: Finity Baby Partners

	(1) Nonparticipant N=3,244		(2) Participant N=3509		Difference (p-value)
	Mean	SD	Mean	SD	
Birth weight (grams)	3116	587	3153	604	37.4 (0.010)

Source: RTI analysis of managed care data provided by awardee.
N = number; SD = standard deviation.

Discussion of Other Awardee-Specific Findings

Overall, we received limited clinical effectiveness and health outcomes data from Finity. The data we did receive was for about half of all Baby Partners participants. Based on the data received, however, we determined that the vast majority of women received at least one office visit and one ultrasound during pregnancy, with women on average receiving 9.6 office visits and 8 ultrasounds. While the average number of ultrasounds is higher than the number recommended by the Institute for Clinical Systems Improvement Routine Prenatal Care Guidelines,[5] women appear to be receiving the appropriate number of office visits. The guidelines, however, suggest that all women receive a flu vaccine and glucose test, which were provided to a much smaller percentage of Baby Partners participants, 23.6 percent and 2.1 percent, respectively.

1.4 Overall Program Effectiveness to Date

This annual report describes various implementation challenges and issues facing Finity as well as accomplishments to date. In this section we assess Finity's progress on achieving HCIA goals to date:

- **Smarter spending.** For Baby Partners, costs were significantly higher for participating mothers and higher—but not statistically significant—for babies. The entire pregnancy and postnatal period for both participating mothers and babies combined also indicates higher but not statistically significant costs compared to nonparticipating mothers and babies.

- **Better care.** Hospital inpatient admissions, hospital unplanned readmissions, and ED visits for Baby Partners participants were not statistically different from nonparticipants. Reach for all three incentive programs—Baby Partners, diabetes, and heart health—steadily increased over time. Specifically, Finity exceeded its goal for enrollment into Baby Partners. Regarding dose, the majority of participants in each program completed at least one of the incentive activities. For diabetes and heart health, participants often elected to complete the one-time activities, such as LDL-C tests or primary care visits, versus sustained contact with a peer health mentor.

  For other awardee-specific outcomes measures, the limited data we received from Finity only allowed assessment of pregnancy-related process measures. In terms of clinical effectiveness, RTI's analysis found high percentages of Baby Partners participants who had at least one office

[5] Akkerman D, Cleland L, Croft G, Eskuchen K, Heim C, Levine A, Setterlund L, Stark C, Vickers J, Westby E. Institute for Clinical Systems Improvement. Routine Prenatal Care. Updated July 2012.

visit during pregnancy (97.1%) and who received at least one ultrasound (92.9%). On average, participants completed 9.6 office visits during pregnancy and received 8 ultrasounds.

- **Healthier people.** Finity provides very limited data on health outcomes; the majority of outcomes data comes from HPP claims. Our analyses found that babies of participating mothers on average are 37.4 grams heavier at birth than babies of nonparticipating mothers (P-value=0.01).

RTI's analyses in this second annual report were limited by the lag in claims data. Claims data did not align with enrollment dates of the innovation, and often reduced the amount of data available to assess innovation impact. This reduction meant that RTI could not analyze the effect of dose on cost, care, quality, and utilization. For example, we could not assess the extent to which Baby Partner participants who received incentives for only the prenatal visit had better or worse evaluation outcomes than participants who received an incentive for attending both prenatal and dental visits, or than those who received an incentive for all three visits. As more claims data become available, RTI will aim to conduct more granular analyses of the effects of dose on claims-related measures.

Since the first annual report, Finity and partners, HPP and SCIO Health Analytics, have continued to implement innovation components effectively. Finity improved reach on the Baby Partners, diabetes, and heart health LifeTracks, and expanded the innovation by launching three new LifeTracks and the Health Alerts component. Of any LifeTracks, Baby Partners appears most effective. HPP leadership note: "The Baby Partners program shows that frequent touches with the patient and the incentive(s) work" and "We talked about the *Baby Partners* program. It is a classic example. We have encouraged them to be more active. And the program has shown that the mom's medical care is more because they are going to the doctor more, but the baby's care is less which more than offsets the additional cost of the mom's care."

Finity's innovation has faced challenges, however, with educating new leadership in the midst of staff turnover, and the need to commit more resources than planned to the support innovation adoption and workflow integration. Other challenges included agreeing upon analytic methods and developing data sources for closed-loop tracking, collecting certain condition-specific data from providers (i.e., blood pressure readings), dealing with the state's lengthy approval process for beneficiary communications, keeping Medicaid beneficiaries engaged over time, waiting for long periods of time for incentive payments, and, at times, dealing with incorrect beneficiary contact information. To overcome these challenges, Finity ensured continuity in its leadership, and all innovation participants provided substantial additional in-kind staff to support the innovation. Frequent, open communication and coordination among Finity and partners helped to educate innovation participants and support the iteration needed to address these implementation challenges as well.

Overall, Finity cited three lessons learned for replication: incentives should be used as a driver for behavioral change; partner organizations should agree on metrics and analytics before launching this type of innovation; and closed-loop systems should be created to track and analyze consumer/beneficiary engagement. Innovation partners noted similar lessons, particularly in providing more resources and in agreeing on metrics and analytics prior to innovation launch. These lessons were already being applied to a follow-on project in New Mexico, for instance, indicating that Finity's initiative would be sustained in

other state Medicaid programs. For the current initiative, HPP planned to support and expand the Finity innovation after the end of the award, which reflects a consistent theme heard in several interviews: time is needed—at least 3 years—to develop and implement innovations such as Finity's and a longer period is necessary to fully address challenges and realize benefits.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Imaging Advantage

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8-Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8-Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

Imaging Advantage

1.1 Introduction

Imaging Advantage (IA), a for-profit provider of hospital-based and telemedicine solutions for medical imaging located in Phoenix, AZ, received an award of $5,977,805 and began rollout in partner hospitals in Chicago, IL, in October 2012. The IA innovation seeks to achieve the following HCIA goals:

1. **Smarter spending.** Reduce spending by reducing or eliminating duplicative or clinically unnecessary radiology exams and decreasing final report turnaround time (TAT).
2. **Better care.** Improve care by implementing a comprehensive total quality management program that applies a double-blind reading of high-difficulty radiology exams.
3. **Healthier people.** Improve health by reducing patient exposure to radiation.

Table 2 provides a summary of changes that occurred with IA during the third year of operations. These updates are based on a review of the *Q8* to *Q10 Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data received from IA as of May 31, 2015; and key informant interviews with IA's leaders and staff conducted March 11–12, 2015.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	Radiology Advisor (RA) was modified to highlight prompted areas of patient charts.
	IA developed the Better Tech program, a quality assurance (QA) program for radiology technologists. IA conducted continuing medication education (CME) seminars for radiology technicians and standardized QA measures for technicians.
Program Participant Characteristics	In Q10 IA began expanding RA to all in-patient populations and any ordering physician on the Chicago Tenet market.
Implementation Process	
Execution	Expended 50% of Year 3 budget, on target.
	IA eliminated preliminary reads for the Tenet system.
	RA was implemented in four Tenet hospitals.
	RealTime QA started beta testing in Q8, but was halted due to bugs and workflow concerns.
Leadership	Project management leadership remained consistent and actively brought teams together at each of the Tenet hospitals
Organizational capacity	Capacity remained stable for the reporting period
Innovation adoption and workflow	As new components of the innovation rolled out, some issues with adoption and workflow were encountered and for existing components, some issues with workflow were addressed.

(continued)

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Workforce Development	
Hiring/retention	Some new hires for IA improved the ability to provide support to each of the Tenet hospitals.
Training	661 hours of training between Q8 and Q10
Implementation Effectiveness	
Reach	A total of 151,596 patients received an imaging study through Q11.
Dose	No change; dose is not relevant for the IA innovation.

Source: *Q8-Q10 Narrative Progress Report*.
Q8-Q10 Quarterly Awardee Performance Report.
Patient-level data provided to RTI by IA.
Key informant interviews conducted Feb–June 2015.
IA = Imaging Advantage; Q = quarter.

1.1.1 Innovation Components

This innovation consists of four components: (1) radiology outsourcing and workflow reengineering and teleradiology services (RO); (2) Radiology Advisor (RA), a radiology clinical decision support tool; (3) radiology dashboards/reports (RD); and (4) RealTime™ imaging quality assurance (QA). Since we provided details on these components in the first annual report, IA added a new component called Better Tech targeted to radiology technicians.[1] Better Tech aims to provide continuing medical education, standardize protocols, and implement a QA scorecard to be used across the Tenet hospitals. These components use different means—changes in provider workflow, optimization of radiology staff availability and access, radiology decision support, and access to radiology utilization data—to target improving appropriate use of radiology services as well as reviews of image studies. The innovation aims to:

- Reduce final report turnaround time, regarded as a significant factor in hospital efficiency and cost control, at Vanguard Health Chicago (now Tenet Health).
- Eliminate suboptimal wet or preliminary readings in Tenet Health EDs, including readings by nonradiologists.
- Develop and deploy RA, a proprietary front-end decision support tool for referring physicians, to reduce or eliminate duplicative or clinically unnecessary radiology exams.
- Implement a comprehensive total quality management program, including IA's proprietary RealTime QA® program, which applies double-blind readings to high-difficulty radiology exams before the patient is treated.

IA works with two organizational partners, Tenet Health (Chicago) and MedCPU (Israel), as well as an advisory board and consultants to develop and implement the innovation. Tenet Health, a for-profit

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

hospital system, operates the four hospitals where IA is implementing the innovation: West Suburban Medical Center, Westlake Hospital, Weiss Memorial Hospital, and MacNeal Hospital. MedCPU developed RA. The advisory board of stakeholders from multiple organizations includes providers and radiologists from IA and MedCPU, and a consultant, Dr. Steve Smith, a radiologist in Chicago. The partners for this innovation remain unchanged since RTI's first annual report.

1.1.2 Program Participant Characteristics

As reported in Q6, IA expanded the RA's primary target beyond EDs to include any ordering physician in the four Chicago-area Tenet Health hospitals. Through the end of Q11, 260,451 secondary participants (patients) received imaging studies in one of the Tenet facilities.

Table 3 provides the demographic characteristics of all patients who received an imaging study at one of the four Chicago-area Tenet Health hospitals. The distribution of patient characteristics is similar to that in the Q6 report, the earliest report in which patient characteristics based on secondary data were reported. More specifically, a majority of patients (59.4%) were 25 to 64 years old and more than half (64.2%) were female. Race/ethnicity and payer category data are not available from IA.

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Number of Participants	Percentage of Participants
Total	151,596	100.0
Age		
<18	17,461	11.5
18–24	10,169	6.7
25–44	38,713	25.5
45–64	51,322	33.9
65–74	18,585	12.3
75–84	10,309	6.8
85+	5,037	3.3
Missing	0	0.0
Sex		
Female	97,360	64.2
Male	54.233	35.8
Missing	3	0.0
Race/ethnicity		
White	—	—
Black	—	—
Hispanic	—	—
Asian	—	—
American Indian or Alaska Native	—	—

(continued)

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015 (continued)

Characteristic	Number of Participants	Percentage of Participants
Race/ethnicity (continued)		
Other	—	—
Missing/refused	—	—
Payer Category		
Dual	—	—
Medicaid	—	—
Medicare	—	—
Medicare Advantage	—	—
Other	—	—
Uninsured	—	—
Missing	—	—

Source: Patient-level data provided to RTI by IA.
IA = Imaging Advantage.
— Data not available.

1.2 Implementation Progress

The first annual report (2014) described IA's implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area. ***Table 4*** lists these measures and their status as of May 31, 2015. The results of analyses for some of these measures are included in this annual report. The data received were from the Chicago-area EDs and did not include inpatient or outpatient reports. The latter two measures will, therefore, be dropped. System availability was never an issue and was removed.

This section presents IA's process measures and a qualitative analysis of the factors that determined implementation progress. This analysis draws on patient-level data that IA provided to RTI as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Workforce development	Staffing	Current all-staff count	Data received from IA
	Education and training	Training hours, type, and attendees	Data received from IA
Implementation process	HIT workflow	Emergent final report TAT	Data received from IA
		Inpatient final report TAT	Dropped; data unavailable
		Outpatient final report TAT	Dropped; data unavailable
		System usage (total usage/total radiology orders)	Data anticipated
Implementation process	Workflow integration	HCIA Provider Survey	Collected by RTI
	Provider Satisfaction	HCIA Provider Survey	Collected by RTI
Implementation effectiveness	Reach	Number of patients who received an imaging study	Data received from IA
		Proportion and number of providers using RA	Dropped; data unavailable

HCIA = Health Care Innovation Award; HIT = health information technology; IA = Imaging Advantage; RA = Radiology Advisor; TAT = turnaround time.

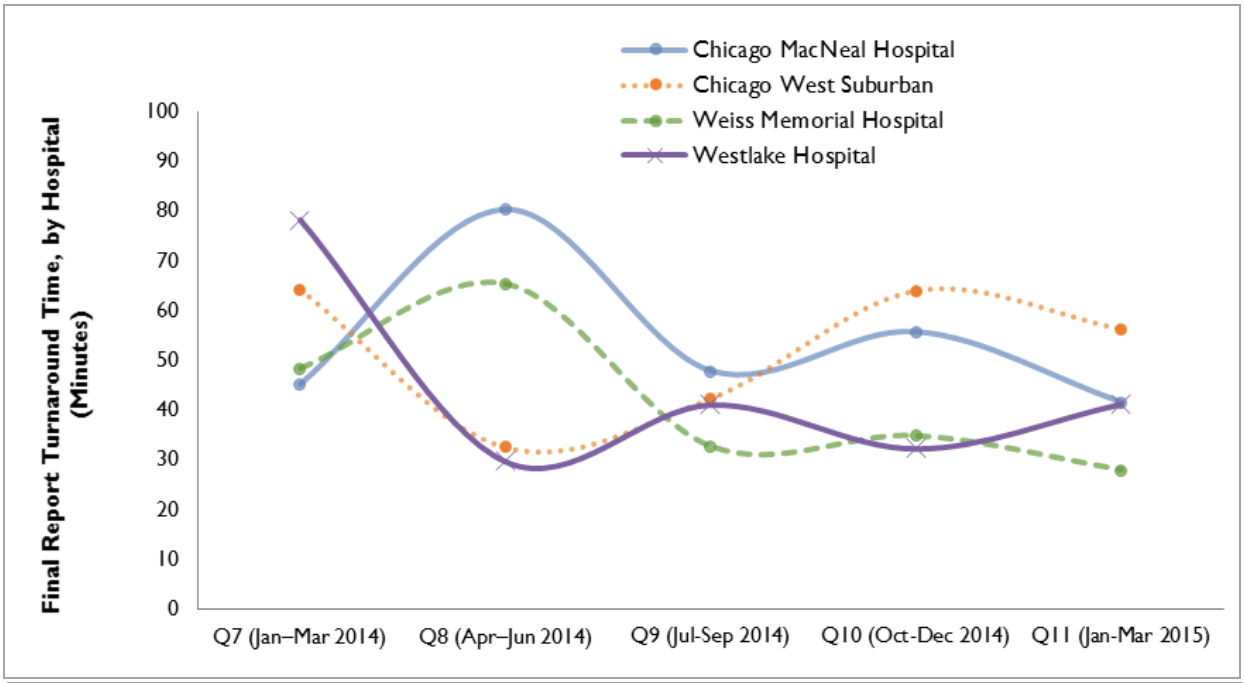
1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through IA's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include IA's reports from Q8 through Q10 and interviews conducted March 11–12, 2015.

Health Information Technology (HIT) Workflow

RTI received data from IA that tracked imaging report turnaround time (TAT) for all imaging studies conducted in the ED of all four Chicago-area hospitals. The data for Q3 in three of the hospitals reflect a TAT approximately triple the system average in the final quarter (Q11) of data. The change in the Weiss Hospital ED usage from Q3-Q4 to the last three quarters (Q9-Q11) was extremely steep, plummeting from over 600 minutes to approximately 30 minutes. Within each hospital there was an upward spike in TAT that roughly corresponded with the RA go-live. The Westlake and West Suburban hospitals went through go-live first, and TAT in those two facilities peaked in Q7. Weiss Memorial and MacNeal Hospitals had go-live late in Q7 and their TAT data peaked in Q8. For all four hospitals, the TAT returned to the norm and continued a downward trend. RTI has no data indicating which radiologists or other providers adhered to advice from RA Clinical Decision Support (CDS), so we cannot evaluate the role of the tool in achieving the TAT reduction.

Figure 1. Mean Final Report Turnaround Time, by Quarter and Hospital



	Quarter	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct-Dec 2014)	Q11 (Jan-Mar 2015)
●	Chicago MacNeal Hospital	45.2	80.4	47.9	55.8	41.5
●	Chicago West Suburban	64.1	32.6	42.4	63.9	56.3
●	Weiss Memorial Hospital	48.4	65.5	32.7	34.8	28.0
●	Westlake Hospital	78.2	29.7	41.1	32.3	41.3

Q = quarter; TAT = turnaround time.

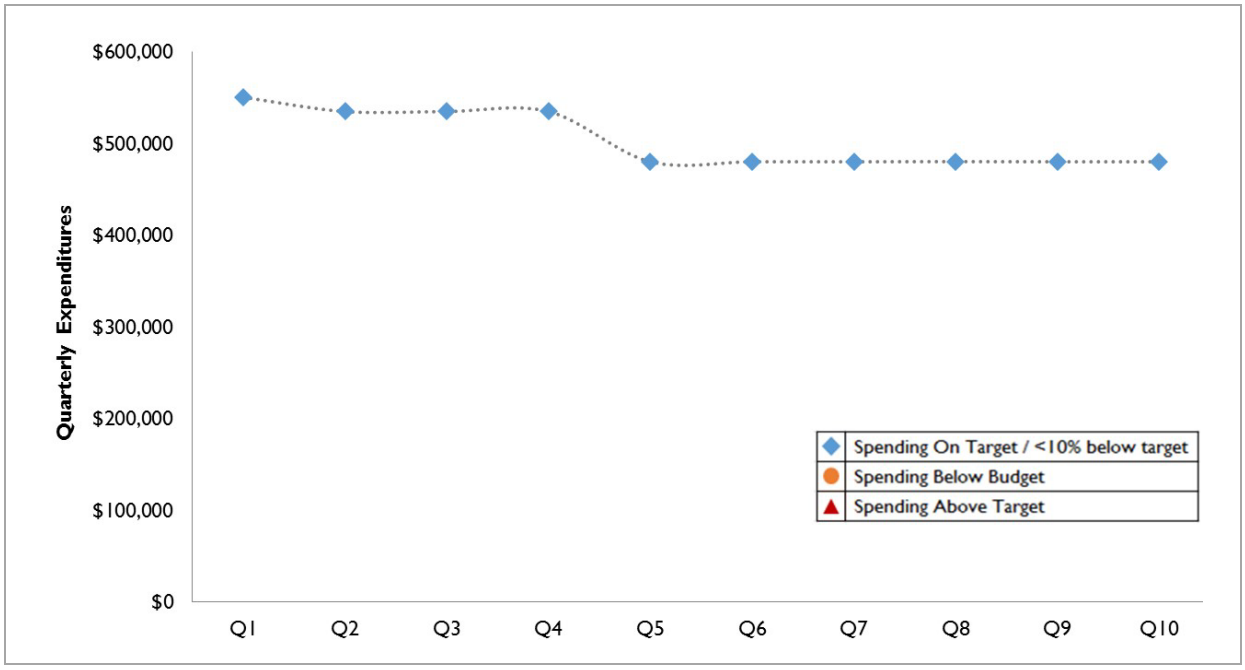
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?
- How has implementation of the innovation impacted provider workflow?
- How has implementation of the innovation impacted provider satisfaction?

Execution of Implementation

The annual report highlights the significance of IA's expenditure rates on implementation. As of December 2014 (Q10), IA spent 50 percent of its Year 3 budget, which is at the projected target. IA was consistently on target with spending from Q8 to Q10 (***Figure 2***).

Figure 2. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Radiology Outsourcing and Workflow Reengineering

IA now provides all radiology services to all four Tenet hospitals. IA employs radiologists on site at the four hospitals, as well as teleradiologists who work in control centers in Phoenix and Detroit or work remotely from home. In the Chicago market, teleradiology services are primarily used after hours (after 5 p.m. and before 8 a.m.); each evening, the system automatically switches from sending exams to on-site radiologists to teleradiologists. In addition, teleradiologists can be accessed by Tenet providers when daytime image study volume exceeds on-site radiologist capacity. This workflow reengineering has eliminated "wet" or preliminary reads for the Tenet system, which resulted in reduced TAT.

Radiology Advisor

As of Q9, RA was live at all four Tenet hospitals and, according to the IA progress report, inappropriate image studies declined. IA was in discussion with the Tenet system about expanding RA to all inpatient care and any ordering physician on the Tenet market network. In Q10, IA also released a version of RA that highlights prompted areas of patient charts. This modification reduces the clinician time required to look for pertinent past-patient histories. Implementing incremental updates to RA requested by users improved both the product overall but also the connection with the partner, resulting in better adherence for users.

Better Tech Program

In Q7 and Q8, IA began to develop the Better Tech program, a QA program for radiology technologists. Between Q9 and Q10 IA provided five continuing medical education seminars for Tenet radiology technicians, in addition to standardizing QA measures for technicians across the four Tenet hospitals. IA also worked with radiology directors to establish standardized protocols for X-ray,

fluoroscopy, nuclear medicine, mammography, ultrasound, computed tomography (CT) scan, and magnetic resonance imaging (MRI), which were completed by December 2014.

The Better Tech program was being implemented during the site visit in the spring, and IA decided to implement a low-fidelity approach (a paper-based system), which seemed to be a prudent, cost-effective choice for initial implementation in an already complex innovation.

RealTime QA

During Q8, IA went live in beta testing with after-hours ED chest-pulmonary embolism exams; however, beta testing was halted after bugs were discovered in the presentation to reading radiologists, in addition to workflow issues that arose.

Workflow challenges with RealTime QA are due to the limited number of physicians credentialed at each site and the short (10-minute) window to conduct a double-blind review of high-risk cases. Additionally, IA has faced challenges ensuring the review is double blind. Currently, double reads are marked as RealTime QA, which alerts radiologists that the image is being read twice, potentially resulting in reporting bias. IA made revisions to the workflow and software and corrected the bugs mentioned above. As of Q10, IA planned to resume beta testing in mid-February 2015, but did not receive a no-cost extension (NCE), which may halt further beta testing of RealTime QA.

Overall, the false start with RealTime QA forced IA back to the drawing board and underscored the need to begin with a low-fidelity approach that canvassed users widely prior to planning and implementation.

Leadership

Several interview respondents recognized the IA project director as a champion and strong innovation leader. Before the innovation, the four Tenet hospitals did not have regular meetings, but the IA project director initiated monthly meetings with the ED and radiology directors that were key to the success of this innovation. Respondents also indicated they felt supported and were provided the information they needed from the IA project director.

IA project management staff played a key role in the implementation of this complex innovation (or set of innovations) by bringing together stakeholders at each site (four Tenet hospitals), as well as across the sites. The relationship with a key partner for RA appeared to be strained at the management level but worked functionally at each of the sites where representatives onsite were able to troubleshoot, answer questions, and gather feedback. Both the RO component for IA and the RA application for MedCPU garnered users outside of the Tenet system, a key factor in sustainability.

Organizational Capacity

Interview respondents noted that the time they spent on the innovation decreased over time. Reflecting back on the beginning of the innovation, one ED director said it would have been better to have

dedicated time to help develop RA to make it more robust. He provided feedback as he could, but felt that he could have contributed more if some of his time were dedicated to the innovation. He noted:

> *"I'm very interested in IT and saw the potential for this program. For it to be [a] robust [program] you need constant feedback to investigate the prompts and why there were certain fallouts. I didn't have time for that, which was frustrating for both parties. I did what I could and when I saw errors I would fire them on [sic], but I would have needed more dedicated time to make it more robust."*

Innovation Adoption and Workflow Integration

According to interview respondents, RA did not significantly impact providers' workflow; however, several providers noted that the way they chart patients' hospital visits changed as a result of RA (e.g., they included more detail in the chart, changed the timing of when they include specific details in the chart, and/or changed when/how they signed the chart). Respondents reported that the biggest impact on workflow was RO. This outsourcing of images after-hours eliminated the backlog of images for radiologists would have to read each morning, and allowed them to immediately start reviewing the most recent images.

Provider Perceptions of Clinical Workflow and Satisfaction

Data on workflow integration and provider satisfaction with the innovation came from the RTI HCIA Provider Survey administered in spring 2015 are also reported here. Eighteen (32.1%) of IA's eligible providers responded to the HCIA Provider Survey. Over half of the responding providers were either doctors of medicine (50.0%) or doctors of osteopathic medicine (5.6%) and approximately one-quarter (22.2%) were physician's assistants (PA). Responding providers had been in practice an average of 8.4 years. Almost all providers worked in emergency medicine (94.4%), except for one provider that listed their specialty as family medicine. Over one-half (55.6%) were hospital-based and over one-quarter (27.8%) practiced in a group practice. The full set of survey questions and answers summarized by awardee is available in ***Appendix C***.

For 6 of the 11 survey items regarding integrating The Right Exam, at the Right Time, Read by the Right Radiologist into clinical workflow, the majority of IA providers indicated that the innovation has resulted in no change in the amount of time spent on specific activities, such as providing patient care (66.7%), arranging clinical referrals and follow-up care (55.6%) or social services for patients (55.6%), meeting with clinical staff (55.6%), consulting with outside clinicians (55.6%), and engaging in other care coordination activities (50.0%) (***Table 5***). Also, half (50.0%) of responding providers indicated that they spent less time looking up patient information in paper-based medical charts, and almost one-third (27.8%) indicated they spent less time looking up patient information in EMR or other HIT systems.

Table 5. Summary of Clinical Care Workflow

Question	Percentage of IA Providers Indicating More Time	Percentage of IA Providers Indicating Less Time	Percentage of IA Providers Indicating No Change	Percentage of IA Providers Indicating Not Applicable/ Missing
Providing direct patient care	22.2 N=4	5.6 N=1	66.7 N=12	5.6 N=1
Communicating with patients by phone, email	5.6 N=1	5.6 N=1	38.9 N=7	50.0 N=9
Looking up patient information in EMR or other HIT	22.2 N=4	27.8 N=5	38.9 N=7	11.1 N=2
Looking up patient information in paper-based medical charts	0.0 N=0	50.0 N=9	22.2 N=4	27.8 N=5
Arranging clinical referrals and follow-up for patients	0.0 N=0	11.1 N=2	55.6 N=10	33.3 N=6
Arranging social service referrals for patients	0.0 N=0	0.0 N=0	55.6 N=10	44.4 N=8
Meeting with staff and clinicians in my practice	5.6 N=1	0.0 N=0	55.6 N=10	38.9 N=7
Consulting with clinicians outside of my practice	5.6 N=1	5.6 N=1	55.6 N=10	33.3 N=6
Engaging in other care coordination activities	16.7 N=3	0.0 N=0	50.0 N=9	33.3 N=6
Reviewing data on clinic practice population to identify individuals needing additional services	5.6 N=1	0.0 N=0	44.4 N=8	50.0 N=9
Planning practice-based (or community-based) interventions to address issues common to my practice population	5.6 N=1	11.1 N=2	44.4 N=8	38.9 N=7

EMR = electronic medical records; HIT = health information technology; IA = Imaging Advantage.

Regarding provider satisfaction, overall we found that the majority of providers (83.3%) were either moderately satisfied with The Right Exam, at the Right Time, Read by the Right Radiologist (44.4%) or very satisfied with it (38.9%)—only 11.1 percent were only slightly satisfied. Regarding ease of use, the majority of providers (55.6%) found the innovation somewhat easy to use, and the rest found it either very easy to use (22.2%) or thought it was neither easy nor hard to use (22.2%).

For the specific questions regarding provider satisfaction with The Right Exam, at the Right Time, Read by the Right Radiologist, the majority of providers indicated that they strongly agreed or somewhat agreed with five of the seven measures (***Table 6***). Most notably, providers agreed that investing in the innovation was worthwhile (66.7%), that there was sufficient technical support (61.1%), and that their practices functioned more efficiently with the innovation (72.2%).

Table 6. Summary of Provider Satisfaction Measures

Question	Percentage of IA Providers Indicating Strongly Agree/ Somewhat Agree	Percentage of IA Providers Indicating Strongly Disagree/ Somewhat Disagree	Percentage of IA Providers Indicating Neither Agree nor Disagree	Percentage of IA Providers Indicating Not Applicable/ Missing
Sufficient resources (e.g., support staff, time, training) have been provided for me to use/interact with the innovation.	55.6 N=10	27.8 N=5	16.7 N=3	0.0 N=0
Innovation produces financial benefits for my clinic or practice.	33.3 N=6	22.2 N=4	38.9 N=7	5.6 N=1
Investing in the innovation is worthwhile in terms of time, energy, and resources.	66.7 N=12	22.2 N=4	11.1 N=2	0.0 N=0
Sufficient technical IT support is available to operate the innovation	61.1 N=11	16.7 N=3	22.2 N=4	0.0 N=0
Overall, my practice functions more efficiently with the innovation.	72.2 N=13	16.7 N=3	11.1 N=2	0.0 N=0
Innovation saves me time.	50.0 N=9	27.8 N=5	22.2 N=4	0.0 N=0
The added logistics required by the innovation is a burden on me and/or my staff.	22.2 N=4	38.9 N=7	33.3 N=6	5.6 N=1

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with 24 full-time equivalent (FTE) staff members. Between Q8 (June 2014) and Q10 there were no changes in FTEs.

Skills, Knowledge, and Training

Between Q8 and Q10, IA provided hours of training to 56 individuals. Training was provided to physicians and clinical support staff on operating front-end decision support tools, in addition to training with physicians and hospital executives on total quality management and the overall HCIA innovation. Interview respondents indicated that training on the decision support tool was quick and easy to understand.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach) and (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

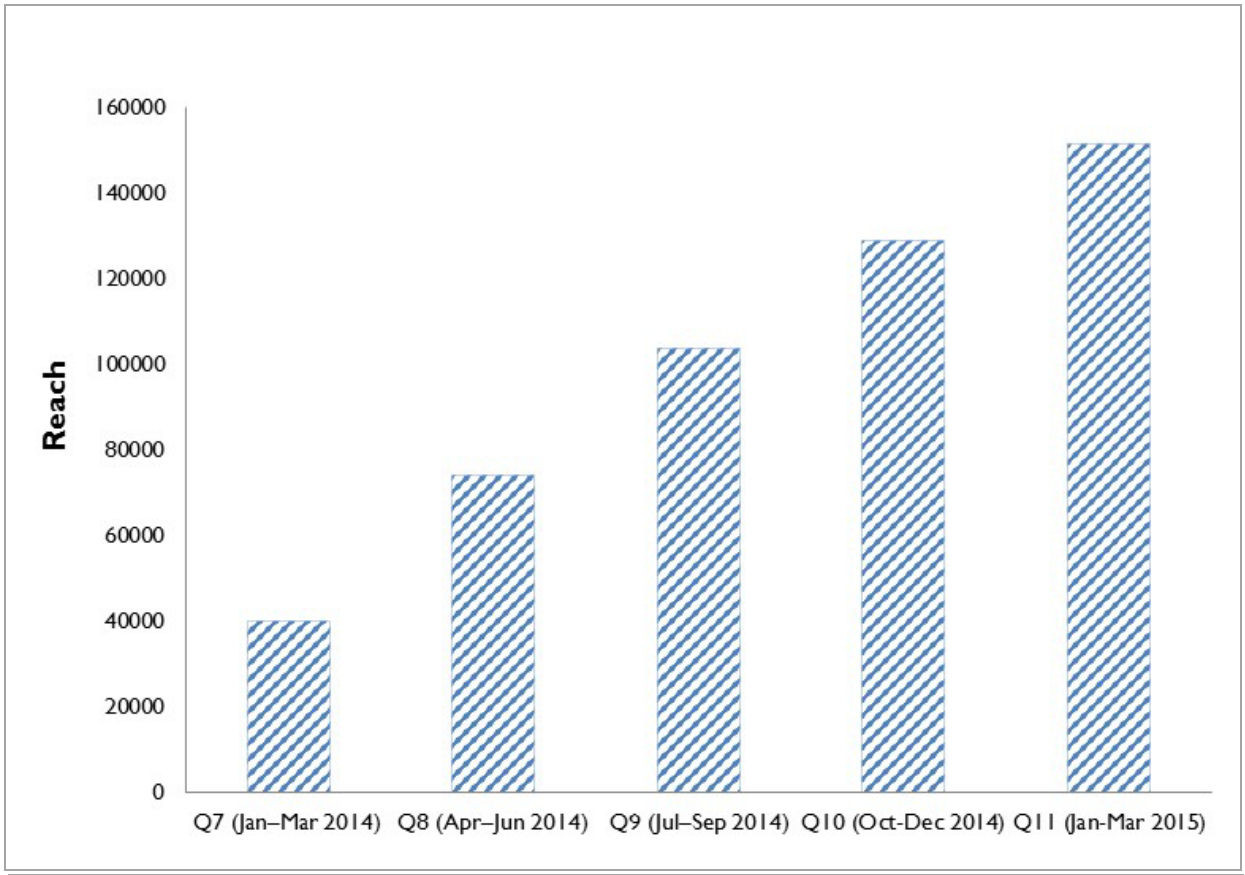
Evaluation Question

- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

Reach

Figure 3 shows cumulative participant enrollment by quarter since the launch of the innovation based on data provided by IA. Enrolled patients are defined as those who received at least one imaging study during the innovation period. This annual report is the first in which participant enrollment is reported. As shown in the figure, 151,596 patients have received an imaging study across the four hospitals as of Q11, nearly a fourfold increase since Q7.

Figure 3. Participant Enrollment for Each Quarter since Project Launch



Quarter	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct-Dec 2014)	Q11 (Jan-Mar 2015)
Cumulative number of participants enrolled	39,899	73,881	103,526	128,701	151,596

Sustainability

IA has several key components in place to ensure sustainability of this innovation including a robust business model associated with the RO component; a key partnership to provide continued access, support, and refinements to the RA program; and additional customers to acquire in the Tenet hospital community and beyond. In addition, the working relationship IA established with its clients and users appeared to be robust, with some serving in a research and development capacity for new tools such as the Better Tech program. RTI recently learned of the dismissal of the project manager (after the NCE was not granted), which was not discussed during the spring site visit. As mentioned, this role was central to implementation success, providing critical onsite expertise and guidance at the various Tenet hospitals. Loss of this position could have severe adverse effects on the sustainability of the innovation.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of IA's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data IA collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers essential to the evaluation of IA's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 7 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of the status of the data requested and whether the data are presented in this annual report. We present all-cause inpatient admissions, hospital unplanned readmissions, ED visits, spending per patient, and estimated cost savings for Medicare beneficiaries who visited the ED at hospitals participating in the innovation.

Table 7. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	Yes
		Hospital unplanned readmissions rate	Yes	Yes
		ED visit rate	Yes	Yes
	Cost	Spending per patient	Yes	Yes
		Estimated cost savings	Yes	No

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to hospitalization. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis

We include patients who entered the ED prior to December 31, 2014, and we present Medicare claims data through December 31, 2014. The sample for the claims analysis is different than the sample presented in Section 1.1.2 *Table 3*, which includes all patients who received an imaging study at one of the four Chicago-area Tenet Health hospitals. Because IA's innovation is focused on the ED, the claims analysis focuses on ED patients at the four participating hospitals and four comparison hospitals. For each treatment and comparison hospital, we generated a list of all patients who entered the ED during the quarter. In each quarter, the sample size is the number of unique patients who visited a treatment or comparison hospital ED. Costs and utilization for patients visiting the comparison hospital EDs were then compared with the corresponding variables for patients who visited the ED in the treatment hospitals.

Comparison Groups

We used propensity score matching to select Chicago-area comparison hospitals with characteristics similar to hospitals enrolled in the innovation. Treatment and comparison hospitals were matched using a logit model predicting the likelihood that a hospital participated in the innovation as a function of number of beds, race composition of patients, total patient days, fraction of hospital revenue from Medicaid, the fraction of hospital revenue from Medicare, and the resident-to-bed ratio. Each treatment hospital was matched with the comparison hospital with the nearest propensity score. ***Table 8*** describes the mean values of the variables of interest included in the propensity score model before and after matching.

Table 8. Mean Values of Variables in Propensity Score Model: IA

Variable	Treatment Hospitals		Full Comparison Group Hospitals		Matched Comparison Hospitals	
	Mean	SD	Mean	SD	Mean	SD
Patient beds	267.00	70.83	414.16	222.30	244.75	111.53
Percentage of patient days, white patients	46.13	23.10	39.33	28.06	55.68	37.57
Percentage of patient days, black patients	39.12	23.40	41.78	29.11	32.07	42.96
Percentage of patient days, Hispanic patients	12.54	7.46	11.13	9.60	8.30	11.99
Number of patient days	48,540	21,725	91,962	61,492	45,117	19,105
Percentage of payments from Medicaid	25.86	4.79	24.69	14.26	24.06	24.76
Percentage of payments from Medicare	24.05	11.48	24.41	8.97	28.55	13.49
Resident-to-bed ratio	32.40	7.17	37.98	34.58	24.93	32.17
N	4		19		4	

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B for discussion of weights).
ESRD = end-stage renal disease; IA = Imaging Advantage; SD = standard deviation.

Appendix B.2 provides technical details on the propensity score methodology. Propensity score matching improved the similarity between the treatment and control group hospitals in terms of patient beds and number of patient days. With only 4 treatment hospitals and 19 potential comparison hospitals in the Chicago area, it was difficult to find a close match on every variable in the propensity score model.

Descriptive Analysis

This report includes claims through December 31, 2014. ***Table 9*** reports Medicare spending per patient in the eight quarters before and the eight quarters after enrollment in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 9. Medicare Spending per Patient: IA

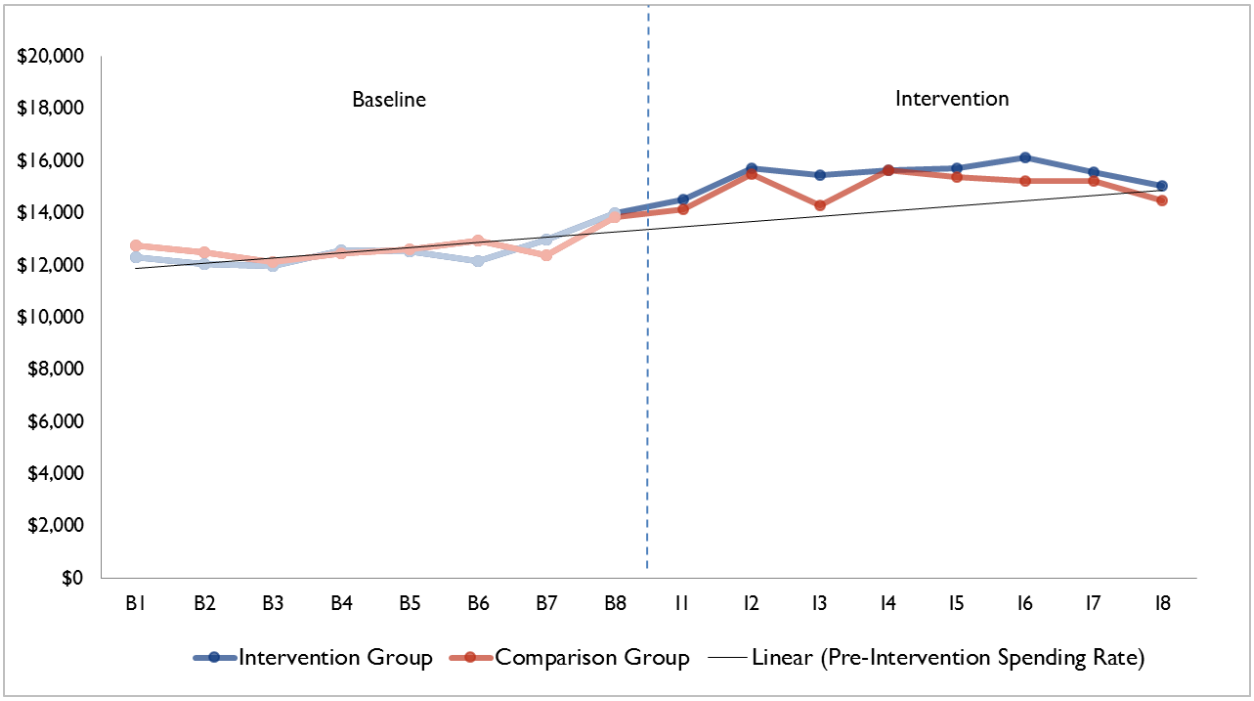
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331066	IA																
	Spending rate	$12,314	$12,058	$11,995	$12,591	$12,538	$12,149	$12,993	$14,000	$14,513	$15,730	$15,454	$15,651	$15,721	$16,152	$15,565	$15,053
	Std Dev	$17,590	$18,579	$19,007	$19,651	$18,865	$18,122	$18,622	$20,731	$21,219	$23,289	$21,978	$22,513	$22,746	$23,543	$22,113	$21,023
	Unique patients	3,072	3,273	3,233	3,464	3,606	3,778	3,839	3,947	4,116	4,335	4,349	4,282	4,212	4,044	3,818	2,778
Comparison Group																	
1C1CMS 331066	IA																
	Spending rate	$12,774	$12,510	$12,122	$12,466	$12,619	$12,960	$12,388	$13,834	$14,143	$15,515	$14,309	$15,633	$15,399	$15,249	$15,224	$14,504
	Std dev	$18,154	$17,432	$16,642	$16,582	$18,039	$17,868	$17,593	$19,927	$19,572	$20,875	$19,560	$21,061	$20,950	$19,480	$21,145	$19,878
	Unique patients	3,624	3,810	4,037	4,121	4,237	4,538	4,787	4,991	5,079	5,256	5,409	3,619	3,681	3,429	3,580	2,761
Savings per Patient		$460	$452	$127	−$125	$81	$811	−$605	−$166	−$370	−$215	−$1,145	−$18	−$322	−$903	−$341	−$549

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 4 illustrates the Medicare spending per beneficiary in Table 9 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 4. Medicare Spending per Patient: IA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
IA = Imaging Advantage.

Spending trends slightly upward for both the treatment and comparison groups in pre-intervention quarters. For both groups, spending deviates above the pre-intervention trend in post-intervention quarters. Because spending by the treatment group closely mirrors the comparison group's spending, the intervention appears to have no impact on spending. The IA intervention is unlikely to have a detectable effect on total health care spending because it is focused on imaging services.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 10*** and ***Figure 5***.

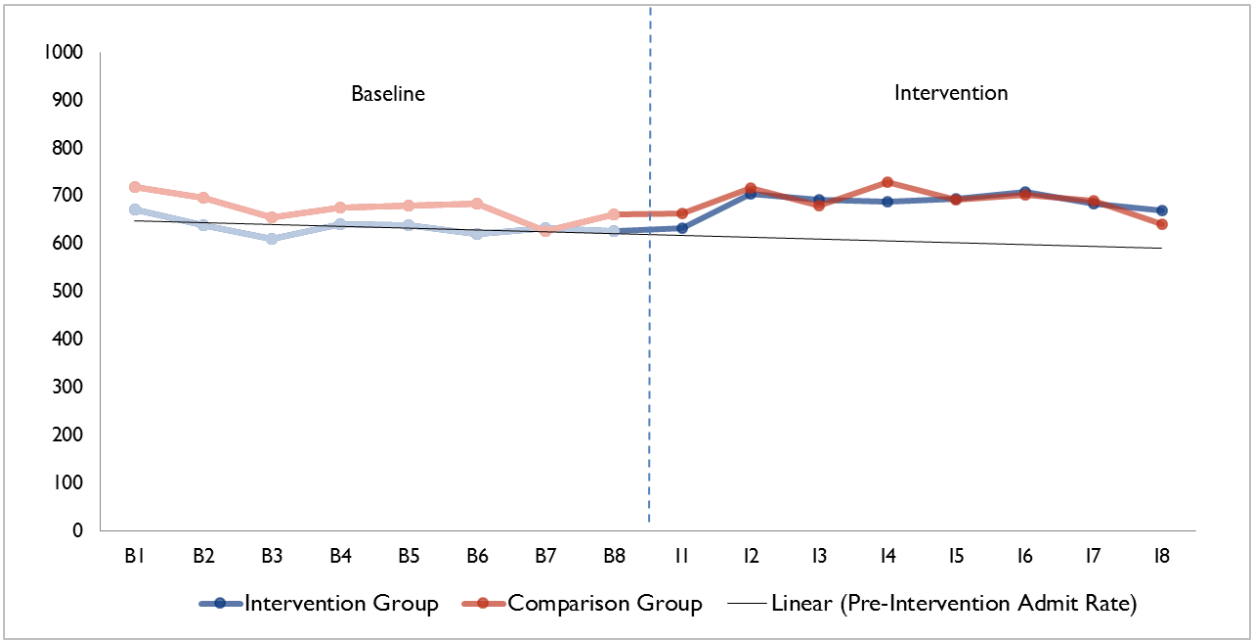
Table 10. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: IA

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331066	IA																
	Admit rate	672	640	611	641	639	620	634	627	633	704	693	688	694	708	685	669
	Std dev	975	979	1016	1030	961	956	961	912	940	1010	970	989	989	1003	1021	901
	Unique patients	3,072	3,273	3,233	3,464	3,606	3,778	3,839	3,947	4,116	4,335	4,349	4,282	4,212	4,044	3,818	2,778
Comparison Group																	
1C1CMS 331066	IA																
	Admit rate	719	697	656	675	680	685	626	662	664	716	680	729	692	703	690	641
	Std dev	973	948	897	943	996	941	952	899	886	913	945	1052	1016	935	982	861
	Unique patients	3,624	3,810	4,037	4,121	4,237	4,538	4,787	4,991	5,079	5,256	5,409	3,619	3,681	3,429	3,580	2,761
Intervention − Comparison Rate		−47	−57	−45	−34	−41	−65	8	−35	−31	−12	13	−41	2	5	−5	28

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 5. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: IA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
IA = Imaging Advantage.

In both the treatment and comparison groups, inpatient admissions in the intervention period increase relative to the pre-intervention trend. Because the treatment and comparison group data series are similar in the pre- and post-intervention periods, the innovation does not appear to have an impact on inpatient admissions. The IA innovation is unlikely to have a direct impact on inpatient admissions because it is focused on imaging services. In the next section, we discuss a regression analysis that statistically tests for effects of the intervention on the probability of a hospital admission.

Hospital unplanned readmission rates per 1,000 admissions are shown in ***Table 11*** and ***Figure 6.***

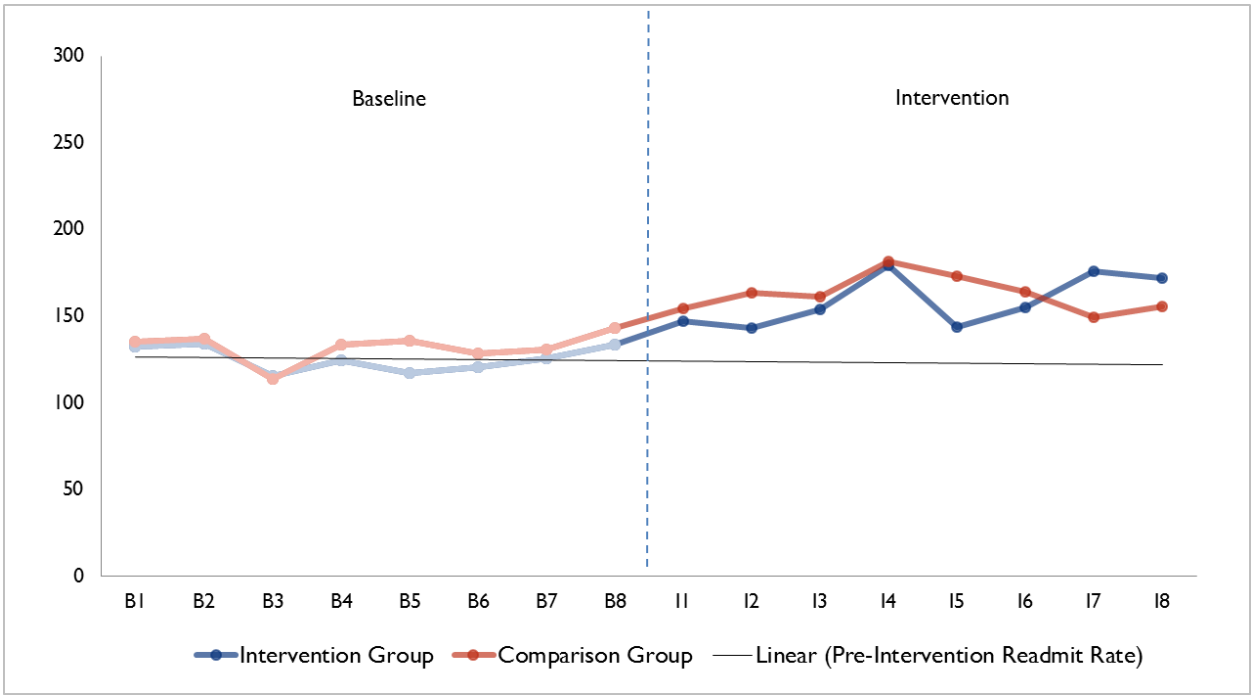
Table 11. Hospital Unplanned Readmissions Rates per 1,000 Admissions: IA

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331066	IA																
	Readmit rate	132	134	116	124	117	121	126	134	147	143	154	179	144	155	176	172
	Std dev	339	341	320	330	321	326	332	340	354	350	361	383	351	362	381	377
	Total admissions	1,217	1,254	1,082	1,215	1,274	1,301	1,494	1,528	1,591	1,803	1,794	1,647	1,696	1,645	1,419	931
Comparison Group																	
1C1CMS 331066	IA																
	Readmit rate	136	137	114	134	136	128	131	143	155	164	161	182	173	164	149	155
	Std dev	342	344	318	340	343	335	337	351	362	370	368	386	378	370	356	362
	Total admissions	1,682	1,843	1,780	1,871	1,969	2,088	1,996	2,357	2,445	2,697	2,545	1,672	1,589	1,592	1,547	1,294
Intervention − Comparison Rate		−3	−3	1	−9	−19	−8	−5	−10	−8	−20	−8	−3	−29	−9	27	17

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6. Hospital Unplanned Readmission Rates per 1,000 Admissions: IA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
IA = Imaging Advantage.

As with the other measures, unplanned readmissions in both the treatment and comparison groups are similar and increase during intervention quarters. The intervention appears to have no impact on unplanned readmissions.

ED visits per 1,000 participants are shown in ***Table 12*** and ***Figure 7***.

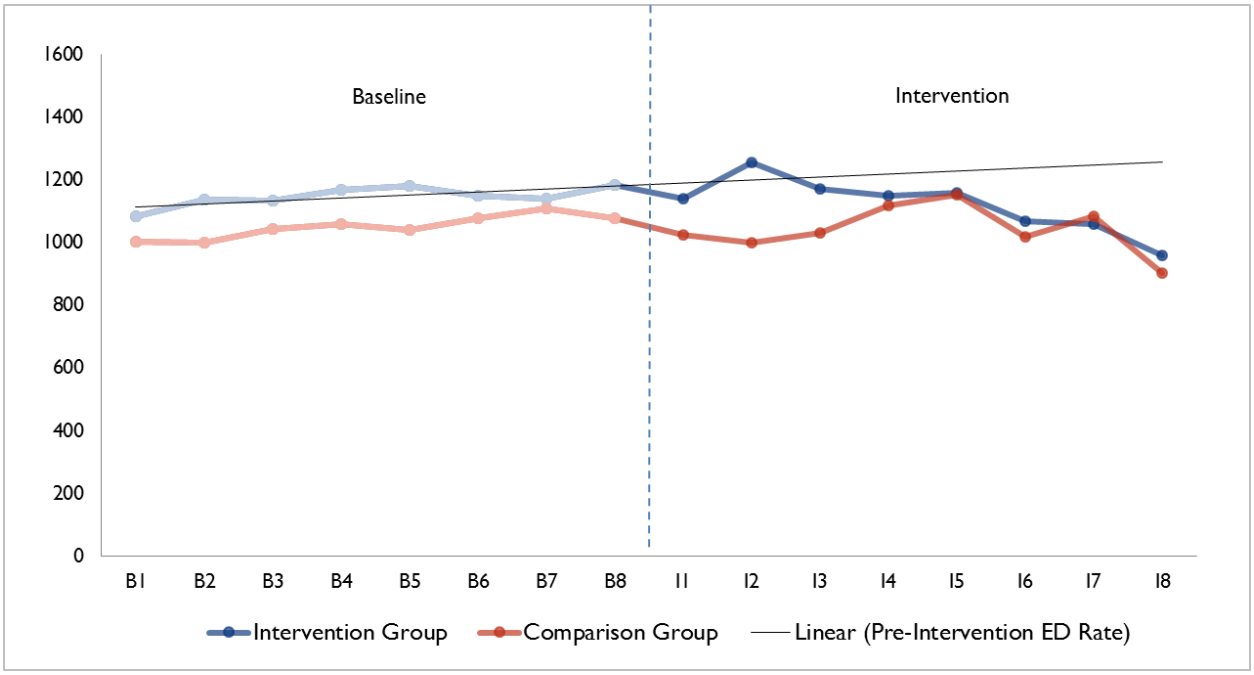
Table 12. ED Visits per 1,000 Participants: IA

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331066	IA																
	ED rate	1,085	1,137	1,135	1,167	1,181	1,150	1,141	1,186	1,141	1,255	1,171	1,148	1,161	1,070	1,060	960
	Std dev	1,917	3,152	1,618	1,946	2,671	1,874	1,662	2,461	1,952	3,392	2,441	2,397	2,820	1,601	1,592	1,611
	Unique patients	3,072	3,273	3,233	3,464	3,606	3,778	3,839	3,947	4,116	4,335	4,349	4,282	4,212	4,044	3,818	2,778
Comparison Group																	
1C1CMS 331066	IA																
	ED rate	1,002	999	1,044	1,058	1,041	1,078	1,110	1,077	1,024	999	1,030	1,120	1,154	1,020	1,084	903
	Std dev	2,328	2,197	2,475	2,135	2,380	2,289	2,073	1,780	1,632	1,689	2,494	1,782	2,589	1,585	1,790	1,097
	Unique patients	3,624	3,810	4,037	4,121	4,237	4,538	4,787	4,991	5,079	5,256	5,409	3,619	3,681	3,429	3,580	2,761
Intervention − Comparison Rate		82	138	91	109	140	72	31	109	117	256	141	28	7	49	-24	57

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 7. ED Visits per 1,000 Participants: IA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
IA = Imaging Advantage.

Each quarter, the sample includes all patients that visited the ED. As a result, the outpatient ED visit rate is near 1,000 because every patient either had an inpatient or outpatient ED event during the quarter. The outpatient ED visit rates among the treatment and comparison groups are parallel in quarters prior to the intervention. In the third intervention quarter, the treatment group's ED visit rate turns downward and meet the comparison group's data series. In the next section, we discuss a regression analysis that tests for the effect of the intervention on the probability of ED visits in the treatment group relative to the comparison group.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit.

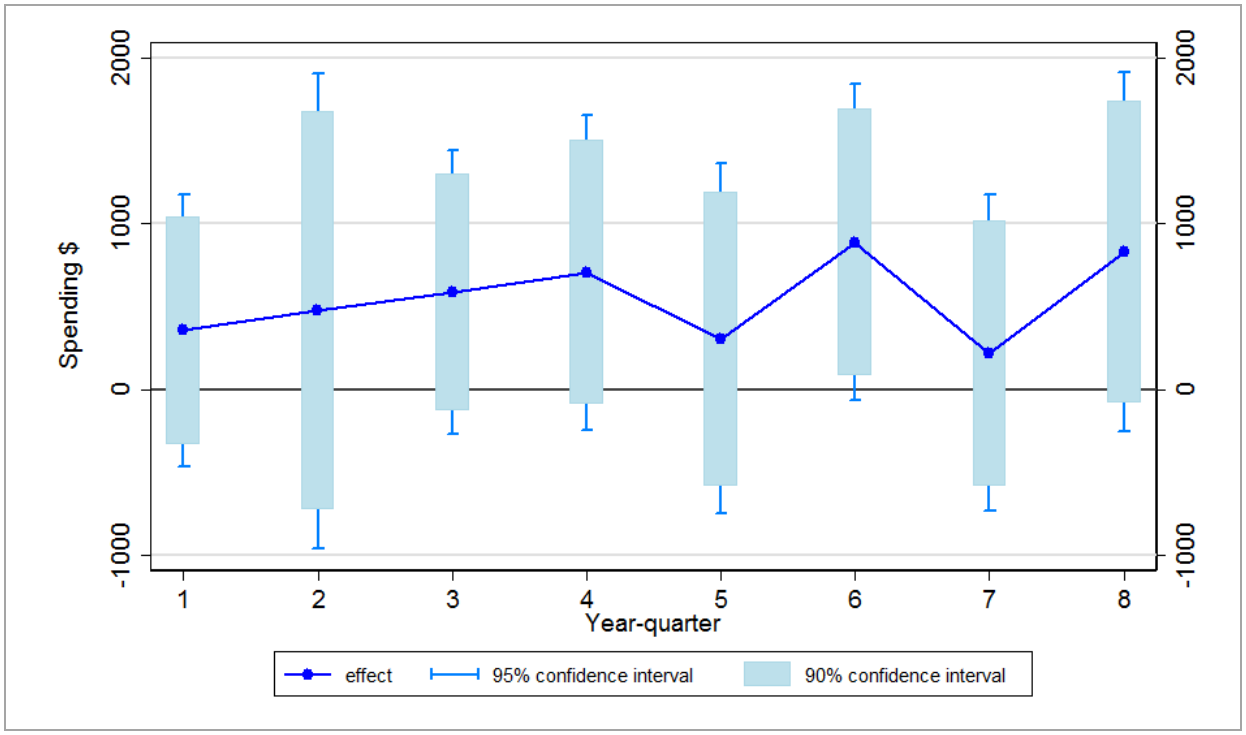
Table 13 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. ***Figure 8*** illustrates these quarterly difference-in-differences estimates.

Table 13. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: IA

Quarter	Coefficient	Standard Error	P-Values
I1	356	417	0.394
I2	476	731	0.515
I3	588	436	0.177
I4	707	485	0.145
I5	306	540	0.571
I6	890	489	0.069
I7	221	488	0.650
I8	829	553	0.134

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
IA = Imaging Advantage; OLS = ordinary least squares.

Figure 8. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: IA

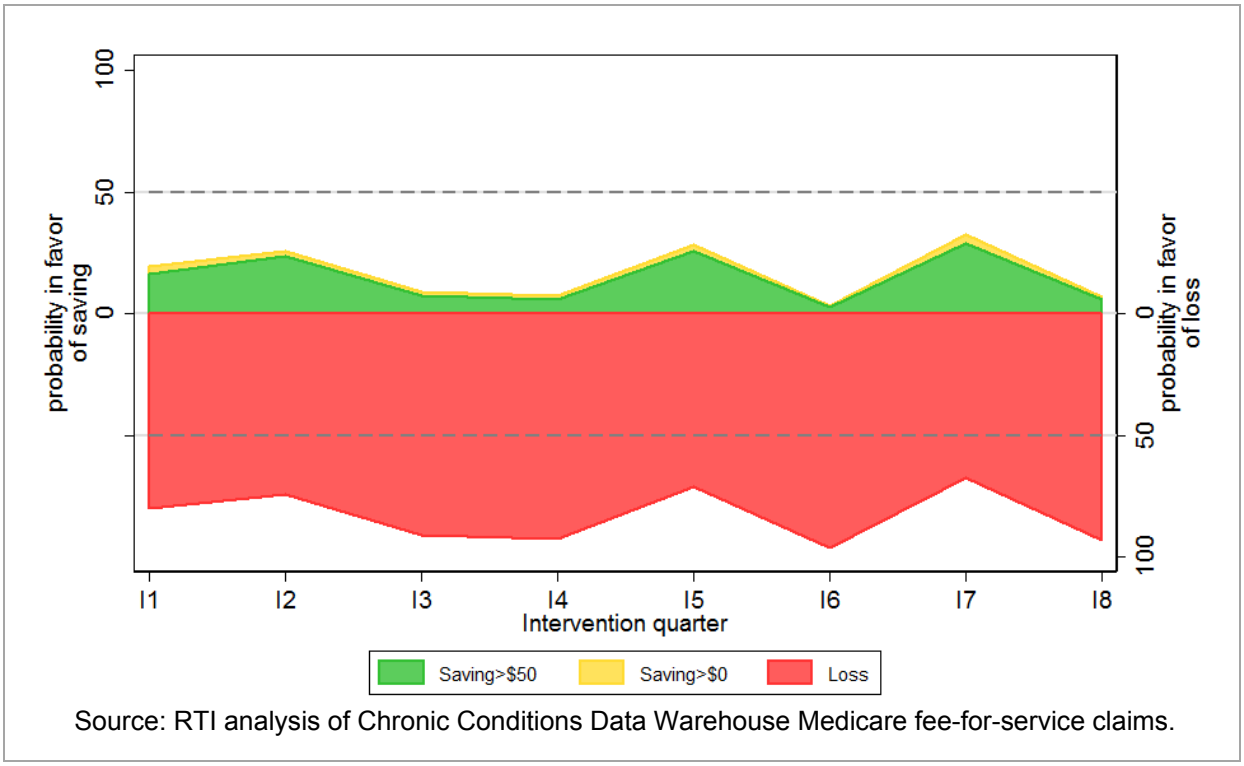


Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
IA = Imaging Advantage; OLS = ordinary least squares.

After controlling for patient characteristics using an OLS regression, patients entering the ED in treatment group hospitals have higher quarterly spending than patients who enter comparison group hospitals during the innovation quarters.

Figure 9 presents the strength of evidence in favor of a saving or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis.

Figure 9. Quarterly Strength of Evidence in Favor of Saving/Loss: IA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

IA= Imaging Advantage.

Because spending in the treatment group is higher than in the comparison group, the evidence initially supports the finding that the innovation generated a loss. Because the IA innovation is focused on imaging services, it may not have a statistically detectable impact on overall health care spending.

We also present the overall weighted average treatment effect per member per quarter during the intervention period for beneficiaries enrolled in the innovation as compared to their matched comparison groups. The weighted average quarterly spending differential in the post-innovation period, indicating a loss, is −$492 (−$96, −$888) per member per quarter. This figure represents the differential spending per quarter in the post-intervention period between individuals enrolled in the innovation and comparison groups, on average, weighted by the number of intervention beneficiaries in each quarter. The 90 percent confidence interval is the range in which the true parameter estimate falls, with 90 percent confidence.

We also present linear probability model coefficients for inpatient admissions and outpatient ED visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the estimated effect.[2] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, their coefficients have often been empirically demonstrated to be consistent with marginal effects generated from nonlinear models.[3] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention), not just the direction of the effect (***Tables 14*** and ***15***).

Table 14. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: IA

Quarter	Coefficient	Standard Error	P-Values
I1	0.01	0.01	0.572
I2	0.01	0.01	0.482
I3	0.02	0.01	0.046
I4	0.01	0.01	0.276
I5	0.02	0.01	0.047
I6	0.01	0.01	0.343
I7	0.01	0.01	0.605
I8	0.05	0.01	0.572

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
IA = Imaging Advantage.

The quarterly coefficients estimating the impact of the innovation on the probability of hospitalization are all positive, indicating that treatment group individuals are more likely to be hospitalized in each quarter. However, the coefficients are also close to zero and—with the exception of I3 and I5—are not statistically different from zero. The average quarterly difference-in-differences estimate for inpatient admissions is 2 percentage points, indicating that the treatment-control difference is 2 percentage points higher during the intervention period. This is the average difference in inpatient admission probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: .006, .024). Although the regression estimates show that the

[2] To obtain the correct effect it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run even when not competing with other users for computer resources.
[3] Angrist, J.D., and Pischke J.-S. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

treatment group has a slightly higher hospitalization rate than the comparison group during the intervention period, the IA innovation is not expected to directly impact hospitalizations.

Table 15. Difference-In-Differences Linear Probability Model Regression Estimates for Probability That Participant Had ED Visit: IA

Quarter	Coefficient	Standard Error	P-Values
I1	0.00	0.00	0.217
I2	0.00	0.00	0.058
I3	0.00	0.00	0.043
I4	0.00	0.00	0.853
I5	0.00	0.00	0.363
I6	0.01	0.00	0.045
I7	0.00	0.00	0.935
I8	0.00	0.00	0.230

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
IA = Imaging Advantage.

In most intervention quarters, the estimated differences between treatment and control individuals are very close to zero and not statistically different. In the quarters with statistically significant differences between the two groups (I3 and I6), the estimated difference in the probability of an ED visit is always less than one-tenth of a percent. The average quarterly difference-in-differences estimate for ED visits is 0 percentage points, indicating that the treatment-control difference is 0 percentage points higher during the intervention period. This is the average difference in ED visit probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is not statistically significant (90% CI: −.001, .003). Every person in the sample visited the ED visit (either inpatient or outpatient); thus, there is not enough variation in the sample to estimate changes in outpatient ED visits. Because the IA innovation is focused on imaging services, it is unlikely to impact the probability of an ED visit.

Discussion

The majority of quarterly differences in spending, hospitalizations, and ED visits between the treatment and control groups are not statistically different in a regression analysis that controls for patient characteristics and time effects. The IA innovation is unlikely to have a short-term impact on the measures of total spending per patient, hospitalizations, and ED visits because it is focused on imaging services in the ED. Moreover, imaging services account for only a small share of total spending and utilization. In future reports we will estimate the innovation's impact on imaging services.

The sample for the Medicare claims analysis includes Medicare fee-for-service beneficiaries that entered a participating ED and could potentially benefit from the innovation by receiving fewer clinically unnecessary or duplicative imaging studies. A subset of the Medicare claims sample received an imaging

service because not all patients who enter the ED receive an imaging exam and some patients who otherwise would have received an exam did not, because the innovation reduced clinically unnecessary exams.

Medicaid Claims Analysis

The Medicaid claims analysis includes CMS Alpha-MAX data from July 1, 2010 to September 30, 2013. Because IA's innovation is focused on the ED, the Medicaid claims analysis focuses on ED patients at the four participating hospitals and four comparison hospitals. For each treatment and comparison hospital, we generated a list of all patients who entered the ED during the quarter. In each quarter, the sample size is the number of unique patients who had an inpatient or outpatient ED visit at a treatment or comparison hospital. Costs and utilization for patients visiting the comparison hospital EDs were then compared with the corresponding variables for patients who visited the ED in the treatment hospitals. We present results for quarterly spending per patient, inpatient admissions, hospital unplanned readmissions, and outpatient ED visits.

Comparison Groups

We used propensity score matching to select Chicago-area comparison hospitals with characteristics similar to hospitals enrolled in the innovation. Treatment and comparison hospitals were matched using a logit model predicting the likelihood that a hospital participated in the innovation as a function of number of beds, race composition of patients, total patient days, fraction of hospital revenue from Medicaid, the fraction of hospital revenue from Medicare, and the resident-to-bed ratio. Each treatment hospital was matched with the comparison hospital with the nearest propensity score. We have the same set of comparison hospitals for the Medicaid analysis as Medicare analysis. Refer to ***Table 8*** for the mean values of the variables of interest included in the propensity score model before and after matching. ***Appendix B.2*** provides technical details on the propensity score methodology.

Descriptive Analysis

During the time period of the innovation, the state of Illinois was transitioning Medicaid fee-for-service beneficiaries to managed care. As a result, the number of fee-for-service Medicaid beneficiaries included in the analysis falls over time. Selection of beneficiaries into Medicaid managed care may cause the slight downward trends in spending, inpatient admissions, and readmissions shown in the descriptive analysis.

Table 16 reports Medicaid spending per patient in the eight quarters before and the four quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 16. Medicaid Spending per Patient: IA

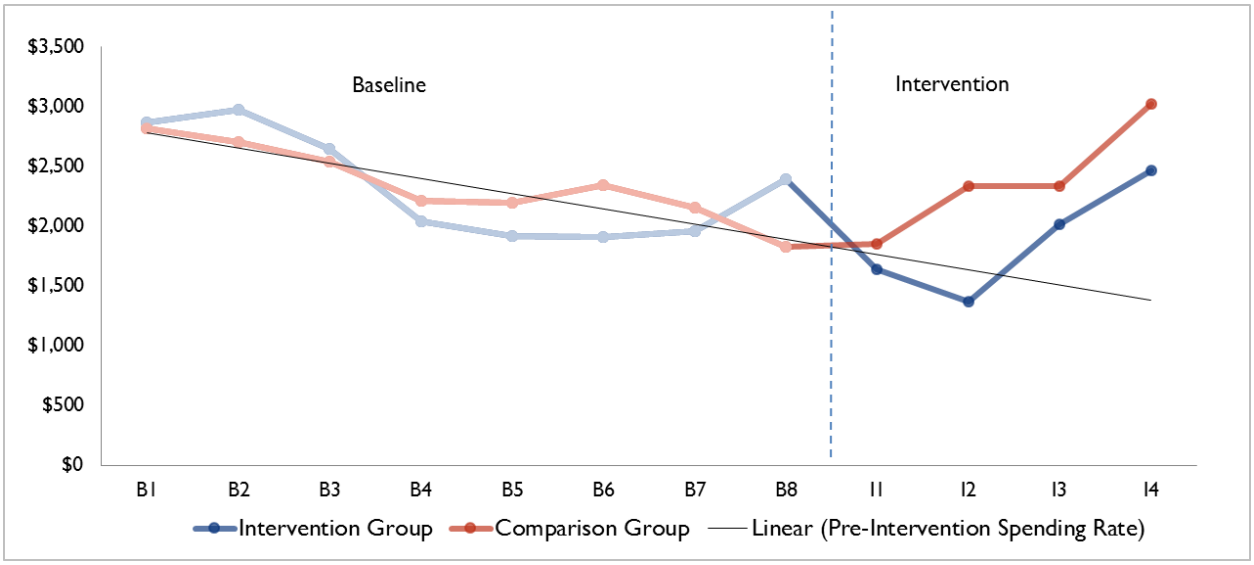
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters			
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4
Intervention Group													
1C1CMS 331066	Imaging Advantage												
	Spending rate	$2,863	$2,971	$2,644	$2,041	$1,919	$1,907	$1,960	$2,391	$1,638	$1,370	$2,014	$2,464
	Std dev	$10,439	$11,826	$10,099	$7,327	$6,334	$5,950	$7,438	$13,943	$5,786	$3,823	$8,795	$9,998
	Unique patients	3,532	3,526	3,507	3,183	2,975	3,061	2,685	2,199	2,030	2,721	1,967	619
Comparison Group													
1C1CMS 331066	Imaging Advantage												
	Spending rate	$2,817	$2,702	$2,535	$2,214	$2,192	$2,339	$2,150	$1,823	$1,848	$2,333	$2,332	$3,025
	Std dev	$8,799	$6,554	$6,421	$5,520	$5,330	$7,014	$5,043	$5,061	$4,524	$5,695	$5,684	$12,587
	Unique patients	1,947	1,906	1,758	2,083	1,833	1,809	1,371	1,752	1,365	1,393	809	304
Savings per Patient		−$46	−$269	−$109	$173	$273	$432	$191	−$568	$211	$963	$318	$561

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 10 illustrates the Medicaid spending per beneficiary in Table 16. The red line represents values for beneficiaries during pre-intervention quarters and the blue line represents values during post-intervention quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 10. Medicaid Spending per Patient: IA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
IA = Imaging Advantage.

Spending trends downward in the pre-intervention quarters and turns upward during post-intervention quarters for both the treatment and comparison group. Because the trends in spending are similar in the treatment and comparison group, the innovation is unlikely to have a statistically significant effect on spending. In future reports, we will include regressions that statistically test for quarterly differences in spending between the treatment and comparison group. Additionally, the IA intervention is unlikely to cause a detectable effect on total health care spending because it is focused on imaging services, which comprise a small fraction of total spending. In future reports, we will test the intervention's impact on imaging spending.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 17*** and ***Figure 11***.

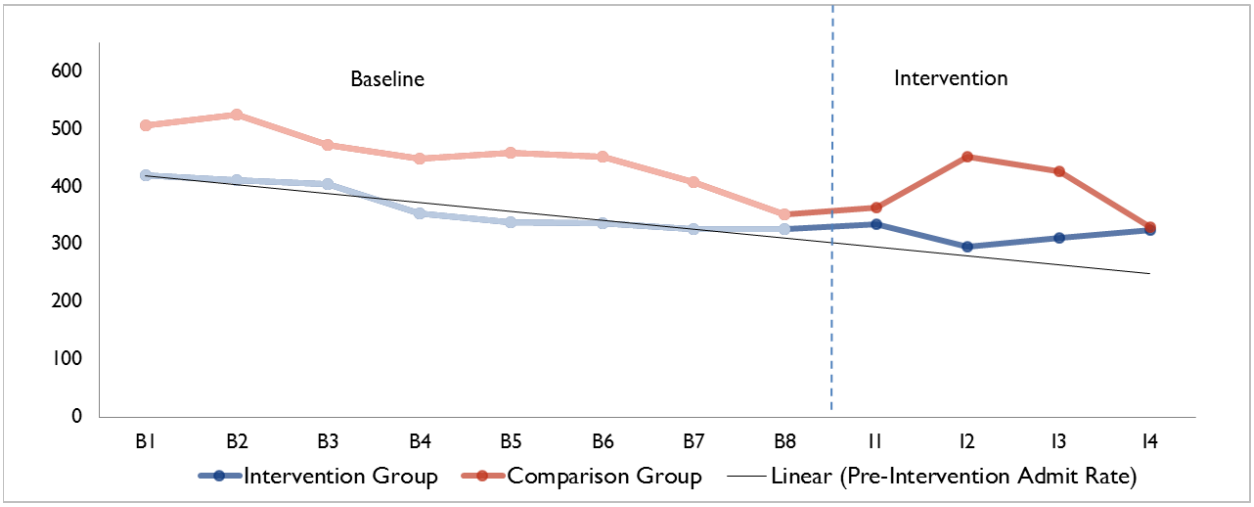
Table 17. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: IA

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters			
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4
Intervention Group													
1C1CMS 331066	Imaging Advantage												
	Admit rate	420	410	403	353	338	336	326	326	334	295	310	325
	Std dev	659	655	695	657	620	607	617	592	576	578	602	554
	Unique patients	3,532	3,526	3,507	3,183	2,975	3,061	2,685	2,199	2,030	2,721	1,967	619
Comparison Group													
1C1CMS 331066	Imaging Advantage												
	Admit rate	506	525	472	448	459	451	408	351	363	452	426	329
	Std dev	121	124	133	122	97	97	90	145	162	168	181	174
	Unique patients	1,947	1,906	1,758	2,083	1,833	1,809	1,371	1,752	1,365	1,393	809	304
Intervention − Comparison rate		−87	−115	−69	−95	−121	−115	−82	−25	−29	−157	−116	−4

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 11. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: IA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
IA = Imaging Advantage.

The trend in inpatient admissions is roughly parallel for the treatment and comparison group during the baseline and intervention period. As with spending, the IA innovation is not expected to affect inpatient admissions because it focuses on imaging services.

Unplanned readmission rates per 1,000 participants are shown in ***Table 18*** and ***Figure 12***.

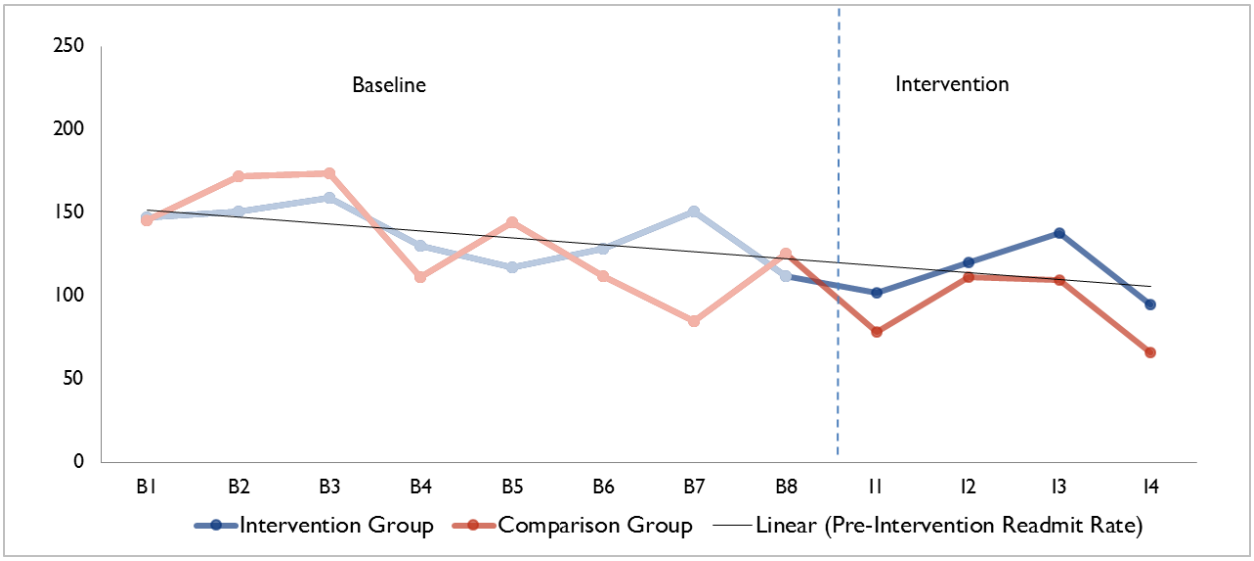
Table 18. Unplanned Readmission Rates per 1,000 Participants: IA

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters			
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4
Intervention Group													
1C1CMS 331066	Imaging Advantage												
	Readmit rate	147	151	159	130	117	128	151	112	102	120	138	95
	Std dev	354	358	366	336	322	334	358	315	303	325	345	293
	Total admissions	1,021	1,076	1,005	785	741	726	624	501	460	609	486	190
Comparison Group													
1C1CMS 331066	Imaging Advantage												
	Readmit rate	145	172	174	111	144	112	85	126	78	111	110	66
	Std dev	352	377	379	314	351	315	279	331	269	314	313	248
	Total admissions	654	681	576	657	582	537	389	430	344	459	255	91
Intervention − Comparison rate		2	−21	−14	19	−27	16	66	−14	24	9	28	29

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 12. Unplanned Readmission Rate per 1,000 Enrollees: IA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
IA = Imaging Advantage.

Unplanned readmission rates for the treatment and comparison group are overlapping during the baseline period. The trends for both groups remain similar during the intervention period; however, the unplanned readmission rate for the treatment group is slightly above the comparison group's rate. The IA innovation is not expected to impact unplanned readmissions because it focuses on imaging services. In future reports, we will include statistical tests for differences between the treatment and comparison group's readmission rates.

ED visits per 1,000 participants are shown in ***Table 19*** and ***Figure 13***.

Table 19. ED Visits per 1,000 Participants: IA

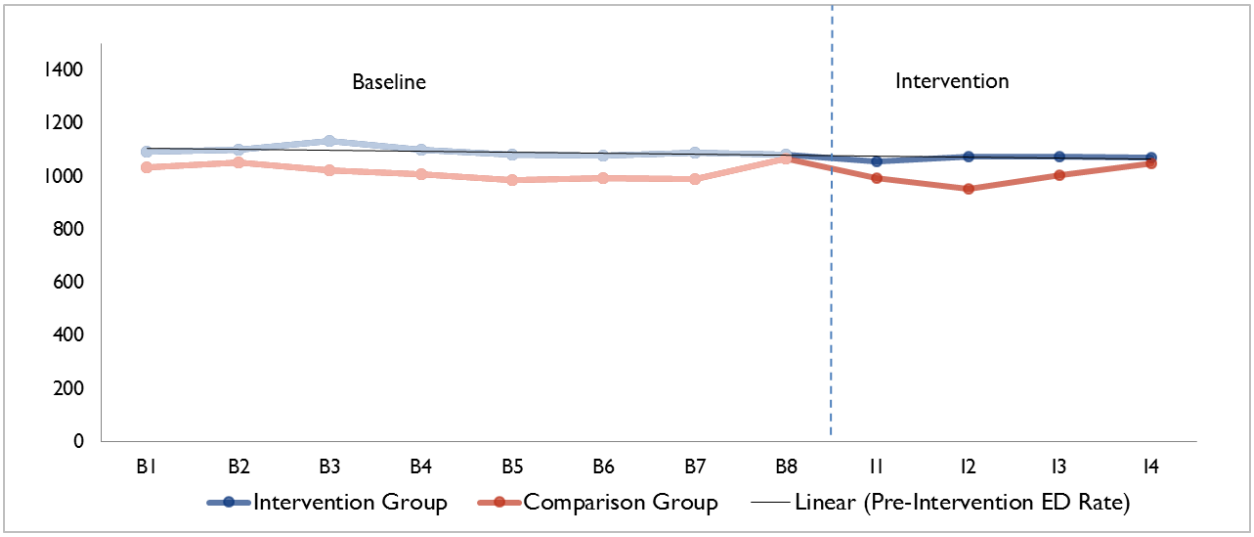
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters			
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4
Intervention Group													
1C1CMS 331066	Imaging Advantage												
	ED rate	1,094	1,100	1,133	1,100	1,083	1,080	1,089	1,083	1,056	1,075	1,078	1,072
	Std dev	519	529	602	570	492	450	460	483	451	423	416	354
	Unique patients	3,532	3,526	3,507	3,183	2,975	3,061	2,685	2,199	2,030	2,721	1,967	619
Comparison Group													
1C1CMS 331066	Imaging Advantage												
	ED rate	1,036	1,053	1,025	1,008	989	993	992	1,069	995	956	1,005	1,049
	Std dev	615	609	586	688	593	613	1006	623	541	476	505	384
	Unique patients	1,947	1,906	1,758	2,083	1,833	1,809	1,371	1,752	1,365	1,393	809	304
Intervention − Comparison rate		58	47	108	92	94	87	97	13	61	119	73	23

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.

Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 13. ED Visits per 1,000 Participants: IA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
IA = Imaging Advantage.

Each quarter, the sample includes patients who had an inpatient or outpatient ED visit at a participating or comparison hospital. As a result, outpatient ED visits per 1,000 beneficiaries are near 1,000 in each quarter. The trend in ED visits is flat during both the baseline and intervention period. The IA intervention is not expected to affect ED visits because it focuses on imaging services.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending and the likelihood that a patient was hospitalized. The sample was selected based on patients had an ED visit to a participating or comparison hospital; therefore, we did not analyze the likelihood that a patient had an ED visit.

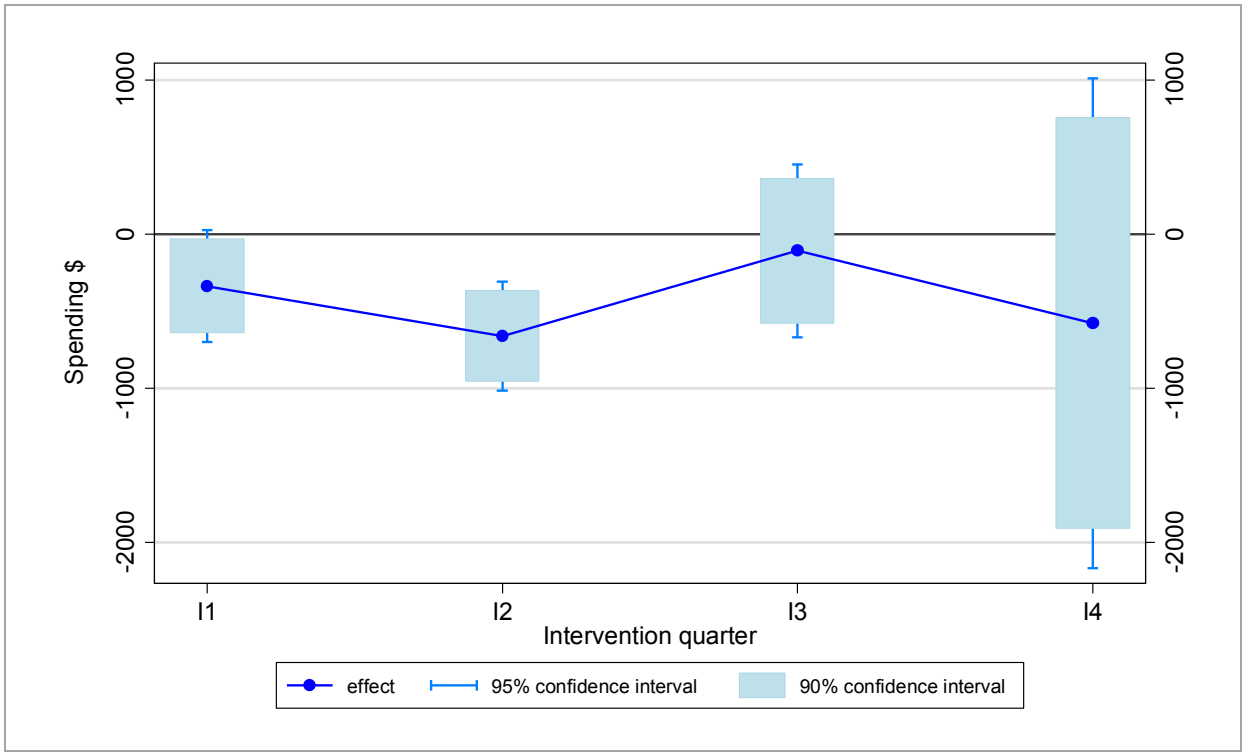
Table 20 presents the results of an OLS regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. ***Figure 14*** illustrates these quarterly difference-in-differences estimates.

Table 20. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: IA

Quarter	Coefficient	Standard Error	P-Values
I1	−336	185	0.070
I2	−660	180	0.000
I3	−107	286	0.708
I4	−577	810	0.477

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
IA = Imaging Advantage; OLS = ordinary least squares.

Figure 14. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: IA

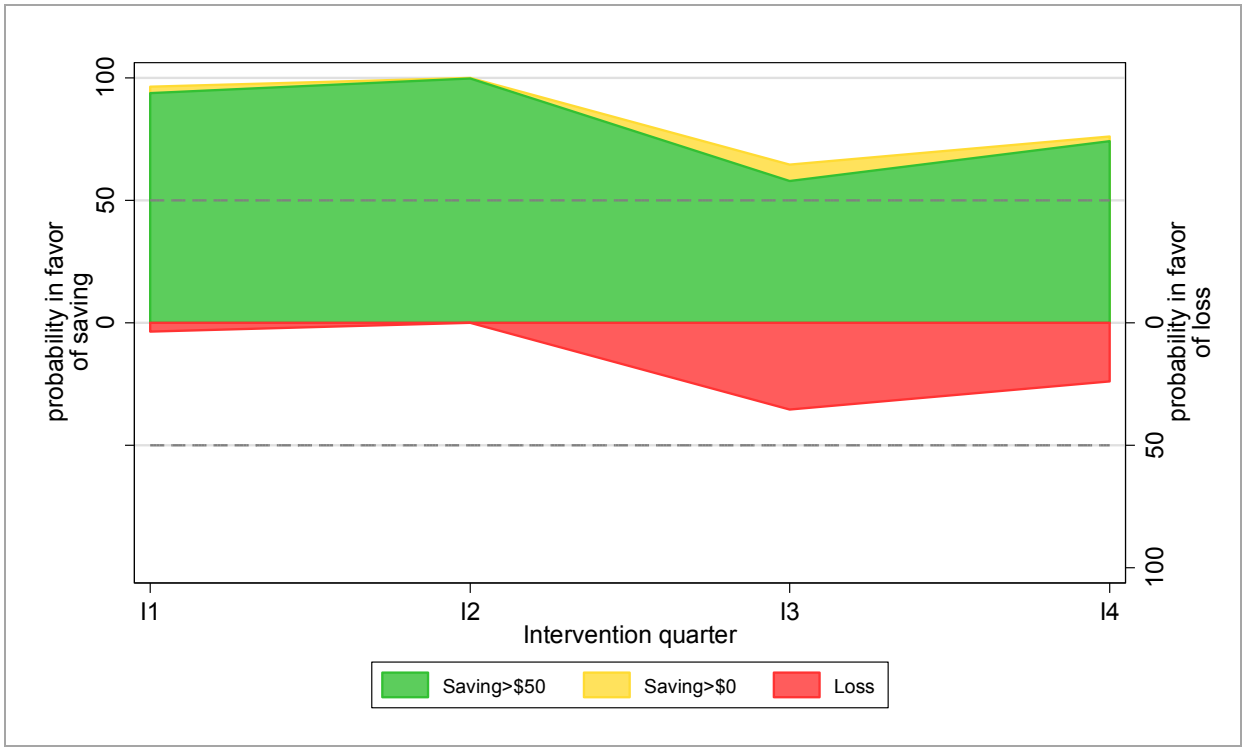


Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
IA = Imaging Advantage; OLS = ordinary least squares.

After controlling for patient characteristics using an OLS regression, we found that patients entering the ED in treatment group hospitals have lower quarterly spending than patients who enter comparison group hospitals during the innovation quarters. The difference in spending is significant in I1 and I2 and not significant in I3 and I4.

Figure 15 presents the strength of evidence in favor of a saving or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis.

Figure 15. Quarterly Strength of Evidence in Favor of Saving/Loss: IA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
IA= Imaging Advantage.

Because spending in the treatment group is lower than in the comparison group, the evidence initially supports the finding that the innovation generated a savings.

We also present linear probability model coefficients for inpatient admissions and outpatient ED visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the estimated effect.[4] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, their coefficients have often been empirically demonstrated to be consistent with marginal effects generated from nonlinear models.[5] We present linear probability model coefficients

[4] To obtain the correct effect it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run even when not competing with other users for computer resources.

[5] Angrist, J.D., and Pischke J.-S. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention), not just the direction of the effect (***Table 21***).

Table 21. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: IA

Quarter	Coefficient	Standard Error	P-Values
I1	0.01	0.01	0.280
I2	−0.04	0.01	0.004
I3	−0.03	0.02	0.089
I4	0.05	0.03	0.055

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, hospital, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
IA = Imaging Advantage.

The treatment group is significantly less likely to be hospitalized than the comparison group during I2 and I3, but more likely to be hospitalized during I4. The conflicting direction of the coefficients between the quarters could be due to the fall in sample size among the comparison group during I4. As more data become available, the sample size will increase and the estimated effects will stabilize.

Discussion

Medicaid beneficiaries entering a participating ED had lower spending during the first two intervention quarters and lower inpatient hospitalizations during the second and third intervention quarters. However, hospitalizations among the treatment group rose relative to the comparison group during the fourth intervention quarter. Because the Altarum innovation is focused on imaging services in the ED, it is unlikely to directly impact total spending per patient, hospitalizations, and unplanned readmissions. Significant differences between the treatment and comparison group may be due to the small number of clusters in the data, an issue we will explore in future reports.

1.3.3 Other Awardee-Specific Data

Table 22 lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. We received patient-level data from IA used to generate each measure listed in Tables 4 and 22 for each quarter through Q11 (March 31, 2015).

Table 22. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Clinical effectiveness	Patient Care	HCIA Provider Survey	Collected by RTI
Health outcomes		Patient exposure to radiation	Dropped; data unavailable
Health care outcomes	Utilization	CT exams	Data received from IA
		MRI exams	Data received from IA

HCIA = Health Care Innovation Award; IA = Imaging Advantage.

Clinical Effectiveness

Evaluation Question

- How has implementation of the innovation impacted provider perceptions of patient care?

Data on the impact on patient care came from the HCIA Provider Survey. Overall the vast majority of providers (88.9%) indicated that The Right Exam, at the Right Time, Read by the Right Radiologist had an impact on patient care. Of those who indicated that the innovation had an impact on patient care, most providers (81.3%) found that impact to be somewhat positive and 12.5 percent found it to be very positive.

Provider views on the specific impacts of The Right Exam, at the Right Time, Read by the Right Radiologist on patient care varied (***Table 23***). Approximately three-quarters of providers either strongly agreed or somewhat agreed that the innovation helped them provide better patient care (72.2%) and that the innovation has been beneficial for patients in their practices (77.8%). The majority of providers also indicated that they agreed that among patients aware of the innovation (55.6%) and not aware of the innovation (61.1%), those patients would say the innovation has been beneficial to their care.

Table 23. Summary of Perceptions Regarding the Impact on Patient Care

Question	Percentage of IA Providers Indicating Strongly Agree/ Somewhat Agree	Percentage of IA Providers Indicating Strongly Disagree/ Somewhat Disagree	Percentage of IA Providers Indicating Neither Agree nor Disagree	Percentage of IA Providers Indicating Not Applicable/ Missing
Innovation helps provide better patient care.	72.2 N=13	11.1 N=2	16.7 N=3	0.0 N=0
Innovation leads to more effective communication during patient visits.	44.4 N=8	11.1 N=2	44.4 N=8	0.0 N=0
Innovation has improved my patients' access to care.	38.9 N=7	16.7 N=3	27.8 N=5	16.7 N=3
Innovation has increased the time I am able to spend with patients during office visits.	27.8 N=5	33.3 N=6	27.8 N=5	11.1 N=2
Innovation helps me develop good relationships with my patients.	27.8 N=5	33.3 N=6	33.3 N=6	5.6 N=1
Innovation has improved perceived patient satisfaction with care.	27.8 N=5	27.8 N=5	44.4 N=8	0.0 N=0
Innovation has been beneficial for patients in my practice.	77.8 N=14	5.6 N=1	16.7 N=3	0.0 N=0
Among my patients that *are aware* of innovation, the majority of patients would say it has been beneficial in the care they receive.	55.6 N=10	11.1 N=2	22.2 N=4	11.1 N=2
Among my patients that *are not aware* of innovation, if I told them about it, the majority of patients would say it has been beneficial in the care they receive.	61.1 N=11	0.0 N=0	27.8 N=5	11.1 N=2

IA = Imaging Advantage

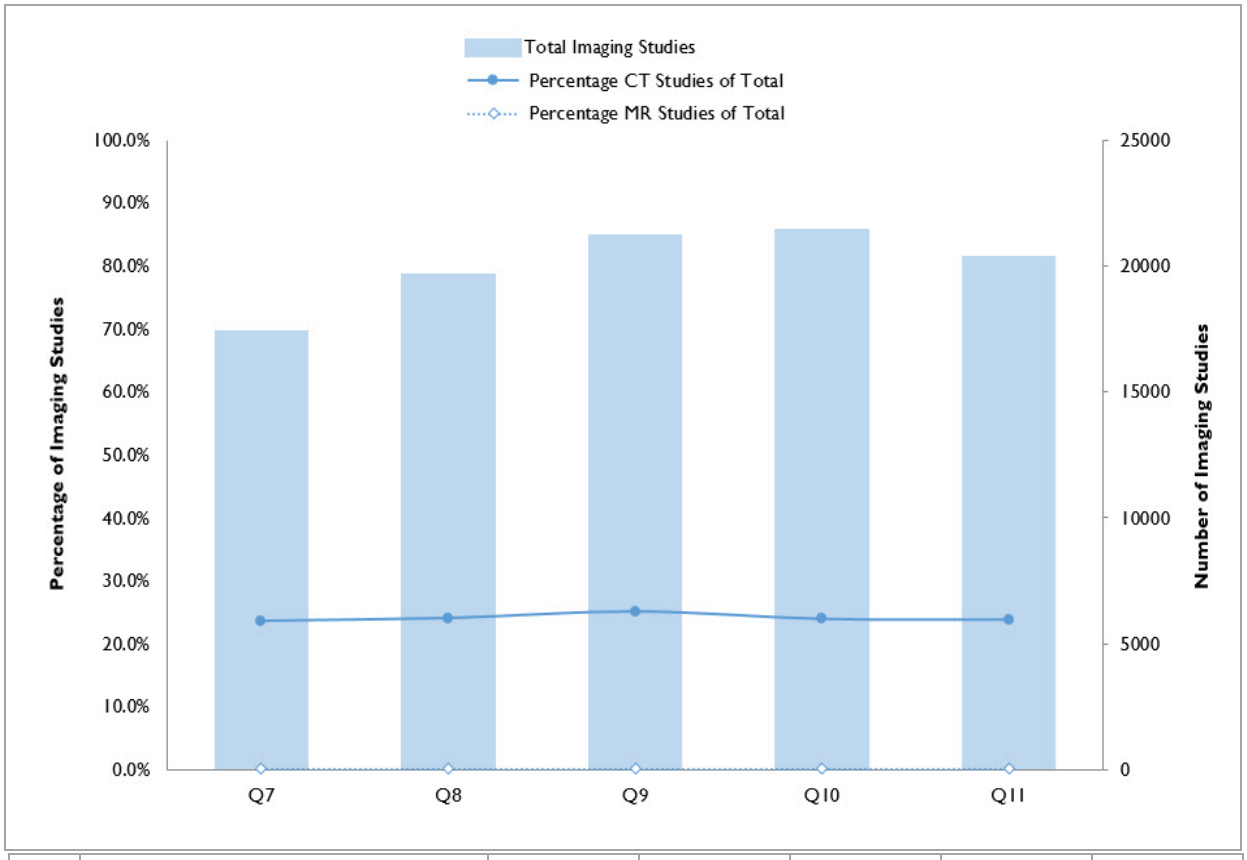
Health Care Outcomes

Evaluation Question

- Has utilization of CT and MR imaging modalities changed over the course of the innovation?

In ***Figure 16***, we sought to gauge the impact of the RA innovation on the proportion of higher radiation imaging modalities that transitioned to lower radiation procedures over the course of the innovation. As shown below, the percentage of higher radiation CT procedures was essentially unchanged at approximately 24 percent of all imaging over time. Similarly, the proportion of MR procedures remained unchanged at approximately 0.2 percent of all imaging studies across the four Tenet hospitals. Based on our understanding of the IA innovation, we planned to report on health outcomes directly associated with the elimination of incorrect and duplicative imaging exams, and to provide details on reduction in patient radiation dosage. Lacking access to the RD, we do not have the data to report on these outcomes. In the next report, we will estimate the health outcome by using an industry standard average radiation range for each procedure.

Figure 16. Percentage of CT and MR Imaging Studies over Time



	Quarter	I7	I8	I9	I10	I11
●	Percentage CT studies of total	23.6	24.1	25.2	23.9	23.8
◊	Percentage MR studies of total	0.1	0.2	0.2	0.2	0.1
	Total imaging studies	17,025	19,288	20,859	21,054	20,009

From an evaluation standpoint, the IA innovation was a complex indirect component from which to capture accurate information and data. The dashboard application that IA uses to capture data on use in real time was under development, contained erroneous information when tested, and/or was not accessible (due to privacy concerns) to RTI.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing IA as well as accomplishments to date. In this section we assess IA's progress on achieving HCIA goals to date:

- **Smarter spending.** Despite spending of the awardee funds as planned, the overall trend in predicted effects on Medicare savings are unclear. Examination of a refined spending value, such as imaging-specific spending, might be more meaningful and is planned for future reports. Spending among Medicare patients visiting EDs that participated in the innovation is higher than spending by comparison group patients; however, the difference is not statistically significant. Again, this measure may not be the best indicator for this particular innovation. Spending among Medicaid beneficiaries who entered participating hospitals was lower than comparison beneficiaries; however, the estimated differences between the treatment and comparison group should be interpreted with caution due to clustering of patients within hospitals that may overstate the significance level in the differences between the treatment and comparison group.

- **Better care.** The innovation did not have an impact on ED visits or readmissions and showed a higher probability of inpatient admissions for Medicare patients; however, IA is not focused on these measures and the innovation is unlikely to affect them. Because IA did not provide data on reduction in unnecessary or duplicative imaging studies, it was not possible to assess this measure. An investigation of potential reductions in radiation exposure based on imaging modality is being undertaken.

- **Healthier people.** Data received through Q11 do not indicate a trend toward imaging with lower patient radiation exposure. Making a connection to health outcomes data for IA was difficult for two reasons: (1) the innovation does not have a direct impact on patient care and is not a large fraction of total utilization and (2) IA did not provide patient-level data on impact of its innovations. In our investigation of the incidence of ED visits, while beneficiaries in both the intervention and comparison groups have below-average pre-intervention rates, they also have above-average readmission rates—and the two groups differ very little overall on these two measures. A focus more closely on imaging services might provide better information on any potential effect.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Intermountain Healthcare

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

Intermountain Healthcare

1.1 Introduction

Intermountain Healthcare, Inc. (Intermountain), is a nonprofit integrated health care system headquartered in Salt Lake City, UT. As an integrated health care system, it encompasses 22 hospitals, more than 150 clinics, and the SelectHealth plan that insures 750,000 people in the state (about one-third of the population). Intermountain was awarded $9,724,142 (and began enrolling participants in June 2013) to develop and pilot its unique "disruptive innovation." The innovation seeks to achieve the following HCIA goals:

1. **Smarter spending**. Reduce spending through a shared savings model (SSM) for both employed and affiliated physicians. Intermountain estimates that its innovation will achieve a potential savings of $1.7 million in Year 1 and $37 million by the end of the award period.

2. **Better care.** Improve care by implementing a shared decision-making model that engages Intermountain patients in a dialog with their physicians to better manage their chronic illnesses. A key aspect of innovation is shared decision making and patient activation/engagement using the Archimedes IndiGO tool.

3. **Healthier people**. Improve health through population management (e.g., "hot spotting") by first identifying and then targeting interventions to high-risk or high-cost patient populations.

Table 2 provides a summary of changes that occurred with Intermountain during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data submitted by Intermountain through March 31, 2015; and key informant interviews with Intermountain's leaders and staff conducted March 15, 2015.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	The innovation has three components: patient engagement (IndiGO), population management (hot spotting), and SSM.
Program Participant Characteristics	In both IndiGO and SSM, a majority of participants, 97% and 88.2%, respectively were age 65 and older and were female (51.5% and 56.7%, respectively). Almost all participants for whom we received data were covered by Medicare.
Implementation Process	
Execution	9.59% of Year 3 funding was spent, which is below expectation.
Leadership	Strong leadership and support were maintained throughout the duration of the award.
Organizational capacity	Organizational capacity was strained due to competing priorities: EHR implementation, Meaningful Use, and medical home implementation.
Innovation adoption and workflow	Intermountain is conducting more outreach to increase IndiGO adoption, which some clinicians viewed as a valuable tool for risk assessment and patient engagement at the point of care.

(continued)

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Workforce Development	
Hiring/retention	Innovation was fully staffed with 9 FTEs at the end of Q10.
Training	65 hours of training were delivered to 65 individuals from Q8 to Q10.
Implementation Effectiveness	
Reach	Less than 20% (17.3%) of activated physicians had at least one qualified IndiGO view; 1.5% of IndiGO patients had a qualified view. Innovation reached 68.0% of target number of physicians for SSM. We did not receive sufficient data to report reach for the hot-spotting component.
Dose	No change; dose is not a relevant construct.

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by Intermountain.
Key informant interviews conducted Feb–June 2015.
EHR = electronic health record; FTE = full-time equivalent; q = quarter; SSM = shared savings model.

1.1.1 Innovation Components

The Intermountain innovation is part of a broader organization-wide transformation of how care is paid for and delivered through a strategic initiative known as a shared accountability organization (SAO). Intermountain's HCIA innovation consists of three components:

1. The SSM is a physician compensation plan that replaces traditional fee for service (FFS) with a risk-adjusted global budget that compensates care through a combination of FFS and partially performance-based methods. The SSM component will remain in beta testing throughout 2015 and will include other payers (besides Intermountain) in the future.

2. Population management (hot spotting) identifies high-cost/high-utilizing patients using advanced analytics and then uses this evidence to develop interventions that address the needs of these patients. Patients whose costs are in the top 10 percent highest-cost population in 2 of the last 3 years, live within 30 miles of the clinic, and are older than 18 years are targeted for population management. Patients meeting these criteria are referred to either a Comprehensive Care Clinic or to a Community Care Management program for further intervention and support.

3. Patient engagement is conducted via the IndiGO tool and tracking patient-centered measures of care. Unlike risk calculators that base algorithms on population risk, IndiGO uses the patient's own family and medical history, laboratory results, and behaviors to calculate individualized risk. The tool is beneficial for adult patients for whom a change in behavior will result in significant clinical improvement. An IndiGO benefit score of 8 or greater indicates use of the tool. The Patient Reported Outcomes Measurement Information System (PROMIS measure) subcomponent aims to harmonize the disparate patient-centered measures currently used throughout the Intermountain system. The PROMIS measure implementation was being piloted at the time of the site visit due to competing priorities.

These three components are part of the Intermountain-wide SAO initiative and support one or more of its three aims: (1) alignment of financial incentives to pay for quality at the lowest necessary cost, (2) patient engagement, and (3) evidence-based care.

Since we provided details on these components in the first annual report, the name of the Personalized Care Clinic was changed to the Comprehensive Care Clinic.[1] Patients identified using the hot-spotting component were treated using the Comprehensive Care Clinic or the Community Care Management programs, which are not HCIA-funded interventions.

For the innovation, Intermountain contracted with Archimedes, Inc., a technology vendor based in San Francisco, CA, to implement and refine the IndiGO tool into the Intermountain system. Archimedes was contracted early in the project and remains the only partner.

1.1.2 Program Participant Characteristics

Table 3 provides the demographic characteristics of all participants ever enrolled in the innovation, which includes both IndiGO participants for whom there was a qualified IndiGO view in connection with an "eligible visit" and for patients affiliated with an SSM practice. We first reported patient demographic characteristics in the Q5 report, based on data through Q9. The distribution of patient characteristics was similar to that in the Q5 report. More specifically, almost all participants (97% IndiGO/ 88.3% SSM) were aged 65 and older, and more than half (51.5% IndiGO / 56.7% SSM) were female. The age distribution is not surprising because almost all (99.4%) participants for whom we received data were covered by Medicare. We did not receive sufficient data to report participant characteristics for the population management component (i.e., hot spotting) of Intermountain's innovation.

Table 3. Characteristics of Medicare and Medicaid Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Number of Participants (IndiGO patients with Qualified IndiGO view)	Percentage of Participants	SSM	Percentage of Participants
Total	**367**	**100.0**	**31,502**	**100.0**
Age				
< 18	0	0.0	4	0.0
18–24	0	0.0	26	0.1
25–44	1	0.3	928	2.9
45–64	10	2.7	2,754	8.7
65–74	143	39.0	11,873	37.7
75–84	195	53.1	10,332	32.8
85+	18	4.9	5,563	17.7
Missing	0	0.0	22	0.1

(continued)

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

Table 3. Characteristics of Medicare and Medicaid Participants Ever Enrolled in the Innovation through March 2015 (continued)

Characteristic	Number of Participants (IndiGO patients with Qualified IndiGO view)	Percentage of Participants	SSM	Percentage of Participants
Sex				
Female	189	51.5	17,856	56.7
Male	178	48.5	13,624	43.2
Missing	0	0.0	22	0.1
Race				
White	—	—	—	—
Black	—	—	—	—
Hispanic	—	—	—	—
Asian	—	—	—	—
American Indian or Alaska Native	—	—	—	—
Native Hawaiian or Other Pacific Islander	—	—	—	—
Other	—	—	—	—
Missing	367	100.0	31,502	100.0
Payer Category				
Dual	0	0.0	0	0.0
Medicaid	1	0.3	178	0.6
Medicare	366	99.7	31,324	99.4
Medicare Advantage	0	0.0	0	0.0
Other	0	0.0	0	0.0
Uninsured	0	0.0	0	0.0
Missing	0	0.0	0	0.0

Source: Patient-level data provided to RTI by Intermountain.
SSM = Shared Savings Model.
— Data not yet available.

1.2 Implementation Progress

The first annual report (2014) described Intermountain's implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area. ***Table 4*** lists these measures and their status as of May 31, 2015. The results of analyses for most of these measures are included in this annual report. If we receive sufficient data for the population management component of Intermountain's innovation, we will include these measures in subsequent reports.

This section presents Intermountain's process measures and a qualitative analysis of the factors that determined Intermountain's implementation progress. This analysis draws on patient-level data that

Intermountain provided to RTI as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation effectiveness	Reach	Number/percentage of providers/physicians participating in the SSM	Data received from Intermountain
		Number/percentage of physician practices using IndiGO	Data received from Intermountain
		Number/percentage of eligible patients viewed in IndiGO during appointment for diabetes, hypertension, cardiovascular disease, and depression and in total	Data received from Intermountain
		Number/percentage of hot-spotting patients seen at the Comprehensive Care Clinic for diabetes, hypertension, cardiovascular disease, and depression and in total	Data received from Intermountain
		Number/percentage of hot-spotting patients receiving Community Care Management for diabetes, hypertension, cardiovascular disease, and depression and in total	Data received from Intermountain

Intermountain = Intermountain Healthcare; SSM = shared savings model.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through Intermountain's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include Intermountain's reports from Q8 through Q10 and interviews conducted March 15 through May 13, 2015.

Evaluation Questions

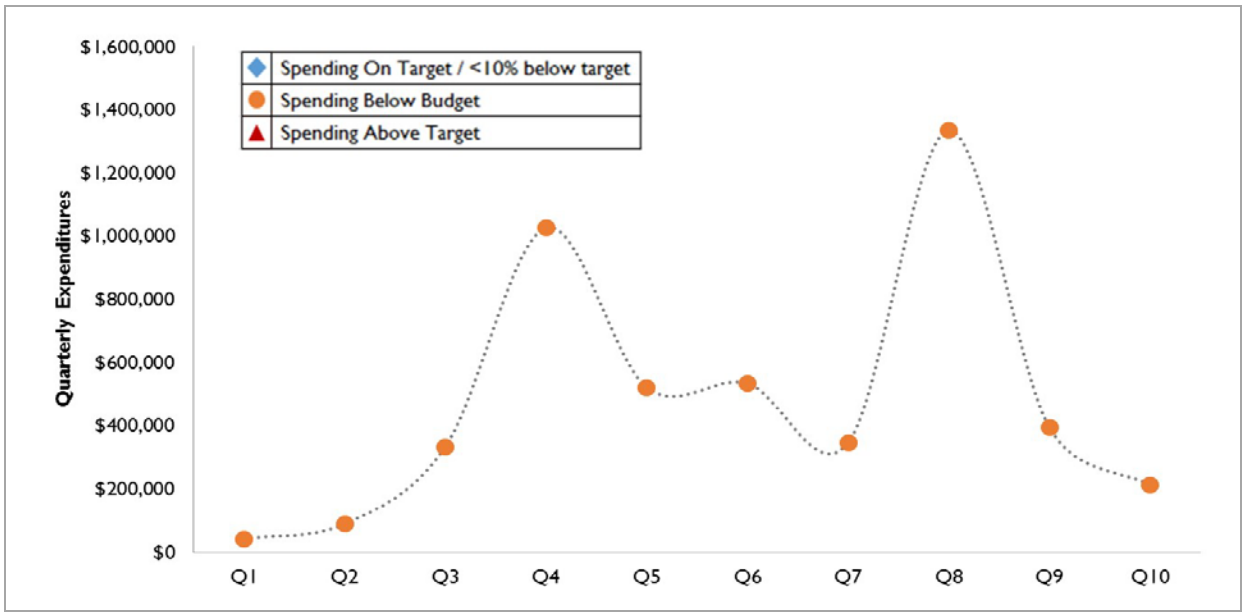
- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

Execution of Implementation

The annual report highlights the significance of Intermountain's expenditure rates on implementation. As of December 2014 (Q10), Intermountain spent 9.59 percent of its Year 3 budget, which is below the projected target. Low spending was due to multiple, concurrent projects that competed for resources at Intermountain. Specifically, Intermountain's electronic health record (EHR) implementation, Meaningful Use attestation, and medical home implementation impacted IT resources and support available to implement IndiGO. Intermountain reported that tying project resources to the EHR implementation resulted in slower spending. To mitigate these competing priorities, Intermountain established relationships with the EHR vendor and hired additional IT staff.

In addition, regarding the pace of execution of Intermountain's innovation, one staff person noted, "(We) had a bit of a slow start overall. Once the funding period started, a lot of work went into working at the organizational level to integrate/embed the innovation. Much of the work was aligned with the SAO." Intermountain also attributed low spending to the delays in the Year 2 carry-forward request approval and the delay of the no-cost extension approval by CMS.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Leadership

Leadership support for the innovation was strong throughout the award, according to key informant interviews. Organizational leaders worked to embed and align the innovation with other existing initiatives across the organization. For example, for the population management component, Intermountain created a Population Management Steering Committee, and the HCIA project director and a senior analyst were invited to join that group.

Regarding the SSM component, the HCIA project director worked frequently with the existing SAO to help refine measures for the SSM and educate providers on those measures. This support was displayed by both HCIA's project leadership and Intermountain's leadership. One key informant noted, "Organizational support and culture around value recognition have been facilitators in moving from fee for service." The steering committee for the SSM includes the medical group's CEO; providers at the pilot sites for the payment model also provide their feedback.

Finally, leadership also supported the patient engagement component of the innovation, in spite of reported bureaucracy in the approval process for the PROMIS measure. According to key informants, Intermountain decided to integrate the patient engagement tools into operations. As confirmation of their support, the chief medical and chief nursing officers who manage clinical programs have included IndiGO in their budgets moving forward.

Organizational Capacity

Intermountain has a longstanding culture of quality improvement and innovation. As a result, Intermountain's award was integrated into existing operations from its inception. Naturally, this integration benefitted sustainability; however, Intermountain cited competing demands for organizational resources as a key challenge to implementation.

These resource constraints were particularly challenging to the patient engagement component of the innovation. The competing priorities of EHR implementation and other initiatives, such as Meaningful Use attestation and implementation of medical home models, constrained IT staff support and implementation resources. One key informant noted, "Intermountain chose a vendor-based EMR …It has impacted the HCIA project because it has taken the employed IT expertise and resources. [We] had to move money out of personnel into vendor-based purchasing and then the HCIA team had to work with a vendor to get the patient-reported measures." The resource constraints impacted the implementation of the PROMIS measure because Intermountain chose a vendor to develop the platform for the PROMIS measure rather than use internal staff.

In addition, Intermountain described the strained capacity of primary care that affected the SSM and patient engagement components: "Primary care is overwhelmed by all the things they're asked to do (medical homes, diabetes interventions, etc.). [We] constantly have to think of ways to make new initiatives fresh." Further illustrating these capacity challenges, an Intermountain key informant noted, "The bandwidth/workload issues with providers are also challenging. There's a general level of fatigue to keep up with all of the federal/payer programs." Because of the competing priorities among primary care providers, Intermountain cited provider education as key to both the SSM and patient engagement components; however, we infer that the lack of resources may have delayed educating providers about these components, and possibly slowed adoption.

Innovation Adoption and Workflow Integration

Workflow integration is particularly relevant for the patient engagement component. According to one key informant, the IndiGO tool was very beneficial and provided patients and physicians with an easy-to-use risk calculator.

> *"I don't know how I would do my job without the tool...In my practice, I see a patient every 20 minutes versus some other primary care practices. This IndiGO tool is the key to success. It's quick and gives the (benefit) score immediately. It allows me to make quick decisions. Previously, I used time-consuming risk calculators; it was really hard on me time-wise."*

During patient visits, the tool allows providers to discuss risk scores with their patients and, subsequently, any interventions that would improve or lower a patient's risk. Some challenges with integrating IndiGO into provider's workflow included logistics with the logins in the exam room; access to the tool outside of the local Intermountain network; and the need for more frequent updates on lab and medication data. To ease workflow integration, the IndiGO icon is prominently featured in Intermountain's

EHR, helping providers to identify qualified IndiGO patients on the schedule, even when the patient comes in for a sick visit, unrelated to any follow-up for an existing chronic disease. RTI attempted to survey provider users of IndiGO and other innovation participants, but were unable to secure the appropriate approvals despite substantial effort.

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with 9 full-time equivalent (FTE) staff members. Between Q8 (June, 2014) and Q10, Intermountain added 3.5 FTEs, which were IT support staff to ease resource constraints.

Skills, Knowledge, and Training

Between Q8 and Q10, Intermountain provided 65 hours of training to 65 trainees on IndiGO tool use. According to the *Narrative Progress Report*, one of Intermountain's goals is to increase the uptake of IndiGO. Intermountain expressed the need to further educate providers and their staff on the IndiGO tool, and reported allocating time for an "IndiGO superuser" for clinics. Additionally, according to the *Narrative Progress Report*, Intermountain is working to produce a video for wide dissemination on the IndiGO tool.

In addition to the IndiGO tool, Intermountain also cited provider education as a key driver for participation in the SSM component. However, no training courses on the payment model were offered from Q8 to Q10. Intermountain reported that implementation was accelerated by conducting trainings at existing meetings rather than requiring clinicians and staff to attend extra meetings about innovation components.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach); and (2) patients or participants were exposed to the services provided

(dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question:

Evaluation Question

- What is the implementation effectiveness, including reach and dose, of the innovation thus far?

Reach

As noted in previous reports, the number of participants reported in the *Quarterly Awardee Performance Reports* differs from the number of participants reported in the RTI quarterly and annual reports because Intermountain reports indirect participants across all components, so there is no basis for comparison with the each individual component reported.

Figure 2 shows reach by quarter based on the number of physicians who had at least one qualified IndiGO view since the launch of the innovation. We consider the target population to be all physicians who treated IndiGO patients during a clinical encounter. We first reported reach in the Q5 report, based on data through Q9. Since that time, an additional 57 physicians became involved in the innovation, increasing reach from 14.4 percent to 17.3 percent.

Figure 2. IndiGO Provider Reach since Project Launch

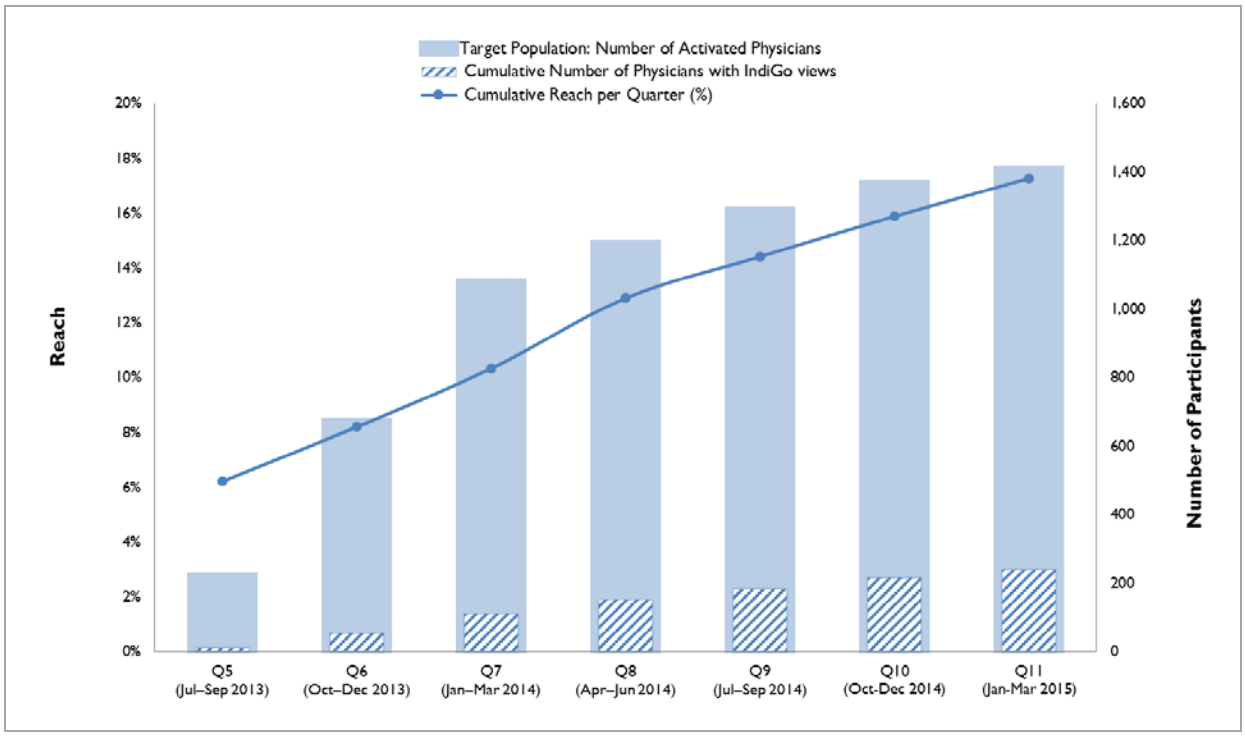


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Figure 2. IndiGO Provider Reach since Project Launch (continued)

	Quarter	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct-Dec 2014)	Q11 (Jan-Mar 2015
●	Cumulative reach per quarter (%)	6.2	8.2	10.3	12.9	14.4	15.9	17.3
	Target population: number of activated physicians	209	658	1,064	1,178	1,276	1,353	1,395
	Cumulative number of physicians with IndiGO views	13	54	110	152	184	215	241

In ***Figure 3*** the number of IndiGO patients eligible for a physician view—those with a benefit score of 8 or greater—increased each quarter. On average, the number of eligible IndiGO patients was about 15 percent of the clinics' volume. Despite this increase in eligible patients, however, the percentage of patients who ever had an IndiGO view (i.e., participants) ranged between 1 and approximately 3 percent based on data from Q5 report through Q9. Since Q9, an additional 142 patients had an eligible IndiGO view.

Figure 3. IndiGO Participant Reach since Project Launch

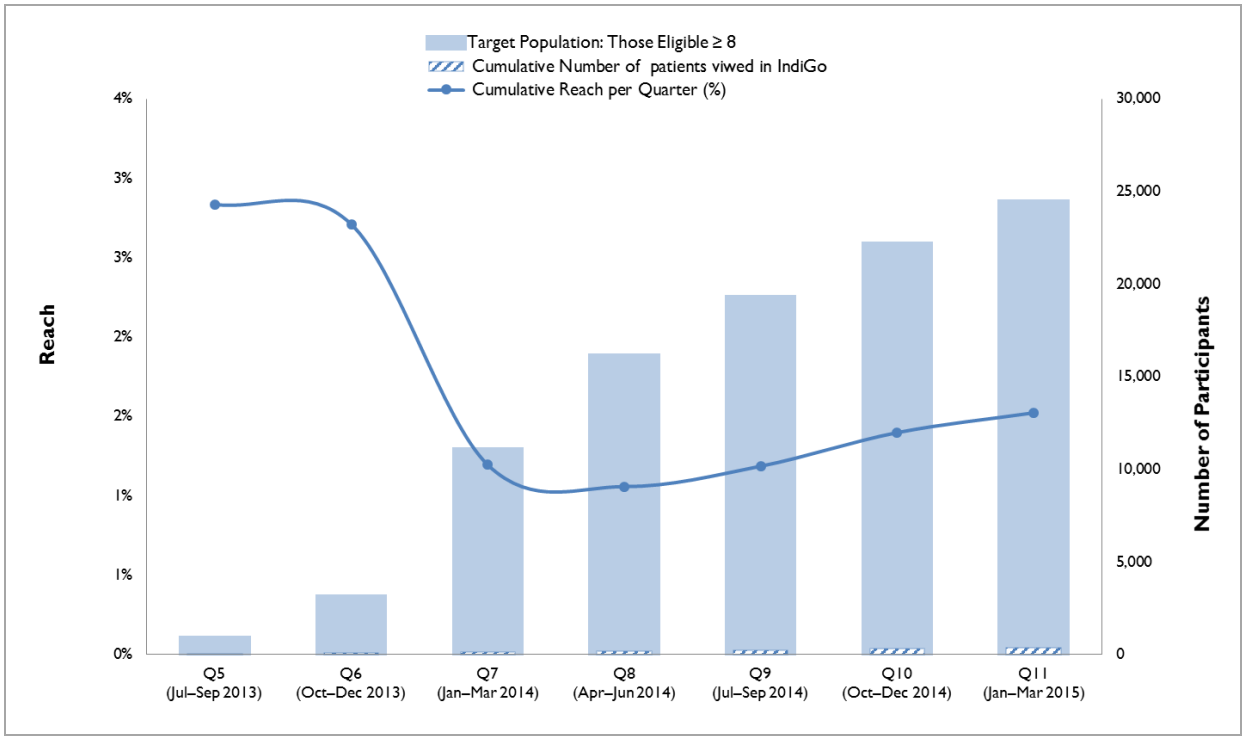

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Figure 3. IndiGO Participant Reach since Project Launch (continued)

	Quarter	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan–Mar 2015)
●	Cumulative reach per quarter (%)	2.8	2.7	1.2	1.1	1.2	1.4	1.5
	Target population: those eligible ≥ 8	529	2,768	10,714	15,781	18,961	21,815	24,102
	Cumulative number of patients viewed in IndiGO	15	75	128	167	225	305	367

This apparent discrepancy—the steady increase in activated IndiGO physicians, physician IndiGO views, and patients eligible for an IndiGO view (benefit score ≥ 8) compared to the flat trend of patients receiving views—may be due to limited physician training on IndiGO. According to the *Awardee Narrative Progress Report*, Intermountain cited the need to ramp up IndiGO use among physicians as a challenge. To mitigate this challenge, Intermountain is exploring the addition of a physician IndiGO super-user and champion for the clinics in the future. Intermountain is also working to produce and disseminate a physician-patient video for the IndiGO tool. These strategies are intended to lead to an increase in provider reach for IndiGO and, concomitantly, an increase in patients viewed in IndiGO

In ***Figure 4,*** we examine the number of physicians in the SSM compared with the number of targeted physicians. Intermountain reached two-thirds (68.0%) of its target number of physicians for the SSM component of the innovation, more than a 3 percentage point increase since we first reported reach in the Q5 report (which reported data through Q9).

Figure 4. Shared Savings Model Provider Enrollment and Reach since Project Launch

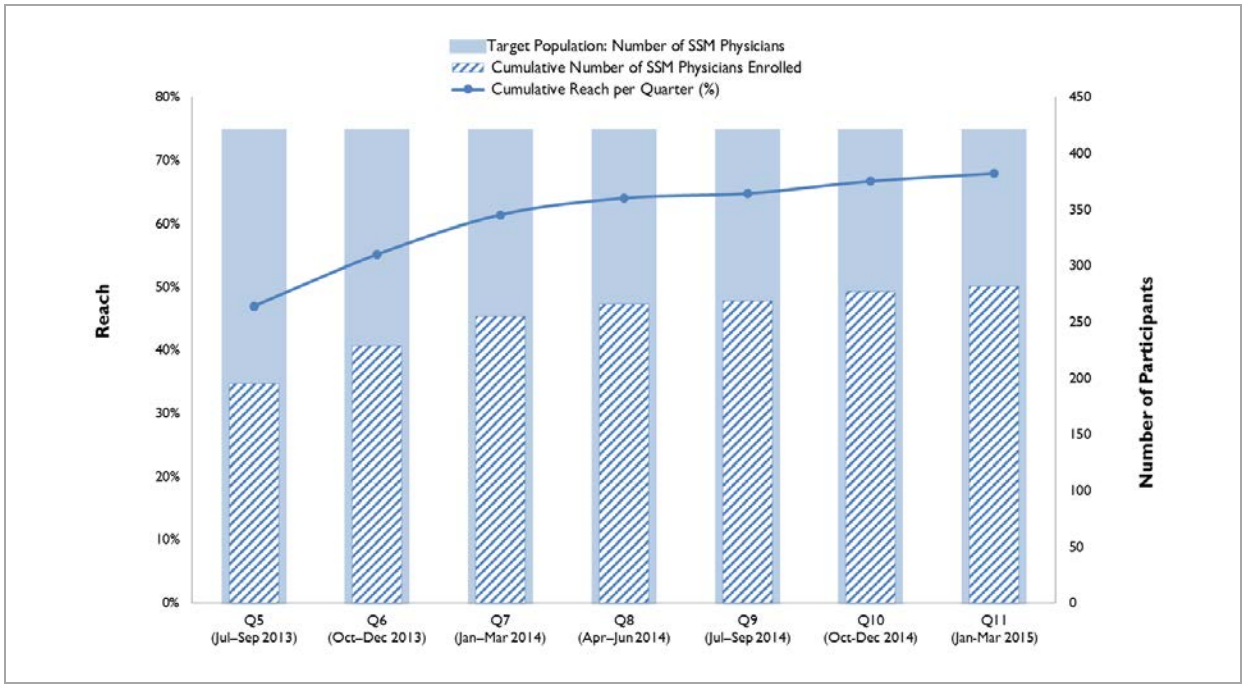

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Figure 4. Shared Savings Model Provider Enrollment and Reach since Project Launch (continued)

	Quarter	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan–Mar 2015)
●	Cumulative reach per quarter (%)	47.0	55.2	61.4	64.1	64.8	66.7	68.0
	Target population: number of SSM physicians	415	415	415	415	415	415	415
	Cumulative number of SSM physicians enrolled	195	229	255	266	269	277	282

The SSM component will remain in beta testing throughout 2015 and will include other payers in the future. Intermountain cited educating physicians on the SSM as a key driver to their participation, noting, "It's a different way of thinking for providers as they move from the FFS model into more quality-based reimbursement. Providers are always interested in how they actually impact…quality outcomes. It's challenging to help providers understand that." Intermountain also reported that the EHR implementation strained the resources of their shared accountability organization, and, thus, implementation of the SSM component.

For the population management component, the inclusion criteria are being refined based on feedback from the clinic directors to further identify the best patients for targeted services. Additionally, Intermountain's plans to expand the pilot clinic and care management will expand the capacity of the clinic and potential reach of the hot-spotting component.

Dose

Dose is only captured for the IndiGO component. As reported previously, patients who had an IndiGO view within the past year were excluded from additional views because the quality of the conversations and insights did not appear to improve with additional exposure to the tool. However, we received limited reports of some providers using IndiGO repeatedly with the same patients to assess and manage their risk profiles over time. Nonetheless, without consistent data on IndiGO exposures per patient over time (i.e., how many times providers discussed IndiGO scores with eligible patients), we do not consider dose a relevant construct for the evaluation of this innovation component.

Sustainability

The innovation was integrated into the organization's existing programs from its inception, making the various components more sustainable. Leveraging existing organizational infrastructure, such as its SAO and other quality improvement initiatives, is a major component of Intermountain's sustainability plan. Not many changes in specific roles were made as a result of this organizational integration. CMS approved a 6-month no-cost extension for Intermountain's award, which will provide additional time and support to more fully implement and evaluate their innovation. Furthermore, senior Intermountain leaders

also included IndiGO in Intermountain's 2015 operating budget to continue this component, after the HCIA funding ends.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of Intermountain's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data Intermountain collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers essential to the evaluation of Intermountain's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 5 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of whether the payer specific data are presented in this annual report.

This report includes an analysis of Medicare beneficiaries enrolled in the Intermountain innovation. We report on impacts on health care outcomes including all-cause inpatient admissions, hospital unplanned readmissions, ED visits, spending per patient and estimated cost savings. We are not able to report on the impact of the innovation on Medicaid beneficiaries at this time. The Medicaid data analysis will use data from the CMS Alpha-MAX data files. Currently, Medicaid claims for Intermountain are only available in Alpha-MAX through Q1 2012. Because the earliest enrolled person joined the innovation after Q2 2013, we cannot present measures for Medicaid patients at this time. We will provide Medicaid analyses in subsequent reports as Alpha-MAX data become available.

Table 5. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	No
		Hospital unplanned readmissions rate	Yes	No
		ED visit rate	Yes	No
	Cost	Spending per patient	Yes	No
		Estimated cost savings	Yes	No

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization in future reports. At this time, the CMS Alpha-MAX data files are not available in the period after the innovation was launched. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis

We include patients who were enrolled prior to December 31, 2014 and we present Medicare claims data through December 31, 2014. The analysis focuses on Medicare beneficiaries enrolled in fee-for-service Medicare Parts A and B living in the state of Utah during the innovation launch. We present measures for beneficiaries enrolled in the innovation as well as a group of statistically matched comparison beneficiaries with fee-for-service Medicare also living in Utah that were not enrolled in the innovation. We present the measures for these beneficiaries in the quarters before and after each beneficiary's enrollment in each innovation program: IndiGO was launched in June 2013, and SSM was launched in November 2013.

The primary focus of the claims analysis is on patients participating in the IndiGO, SSM, and population management (hot spotting) components of Intermountain's innovation. Because the IndiGO and SSM components are complementary, we divided the innovation beneficiaries into four groups for analysis: those who had an IndiGO view and enrolled in SSM practices (Cohort 1), those who had an IndiGO view only (Cohort 2), those enrolled in SSM practices only (Cohort 3), and those enrolled in hot spotting (Cohort 4). In this report, we changed the definition for IndiGO enrollment to include only those patients who ever had an IndiGO view. Previously, we reported those who were eligible for an IndiGO view.

Comparison Groups

We used propensity score matching (PSM) to select comparison group beneficiaries with similar characteristics as treatment group beneficiaries for Cohorts 1, 2, and 3. Because few patients were enrolled in hot spotting at the time of this report, we were not able to construct a comparison group for this cohort. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, disability, end-stage renal disease status, dual Medicare-Medicaid status, number of chronic conditions, total payments in second, third, fourth, and fifth calendar quarters prior to enrollment, number of ED visits in calendar quarter prior to enrollment, number of inpatient stays in calendar quarter prior to enrollment, and total Medicare payments in the calendar quarter prior to the innovation. We matched each treatment

beneficiary with up to three comparison beneficiaries whose propensity scores were within a predefined distance.

Table 6 describes the mean values and standardized differences of the variables of interest that are included in the propensity score models before and after matching. ***Figure 5*** shows the distribution of the propensity scores for both the comparison and intervention groups. ***Appendix B.2*** provides technical details on the propensity score methodology.

Table 6. Mean Values and Standardized Differences of Variables in Propensity Score Model: Intermountain Intervention Group — Cohort 1 (IndiGO and SSM)

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrollment	$2,276	$5,613	$1,908	$6,279	0.06	$2,276	$5,613	$1,942	$3,116	0.07
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	$9,763	$20,692	$6,619	$16,527	0.17	$9,763	$20,692	$7,422	$8,025	0.15
Age	72.44	7.22	71.40	12.07	0.10	72.44	7.22	73.33	6.02	0.14
Percentage male	42.95	49.66	45.54	49.80	0.07	42.95	49.66	46.15	28.81	0.09
Percentage white	94.87	22.13	92.15	26.90	0.16	94.87	22.13	95.94	11.41	0.07
Percentage disabled	12.18	32.81	19.43	39.56	0.28	12.18	32.81	9.62	17.04	0.12
Percentage ESRD	—	—	0.87	9.26	0.19	—	—	—	—	—
Number of dual eligible months in the previous calendar year	0.99	3.29	1.15	3.43	0.05	0.99	3.29	0.71	1.58	0.11
Number of chronic conditions	6.74	3.16	5.62	3.66	0.33	6.74	3.16	6.74	2.14	0.00
Number of ED visits in calendar quarter prior to enrollment	0.15	0.61	0.10	0.44	0.10	0.15	0.61	0.14	0.37	0.03
Number of inpatient stays in calendar quarter prior to enrollment	0.09	0.49	0.05	0.27	0.09	0.09	0.49	0.09	0.24	0.01
Number of beneficiaries	156	—	967,985	—	—	156	—	468	—	—
Number of unique beneficiaries[1]	156	—	182,180	—	—	156	—	468	—	—
Number of weighted beneficiaries	—	—	-	—	—	156	—	156	—	—

(continued)

Table 6. Mean Values and Standardized Differences of Variables in Propensity Score Model: Intermountain (continued)
Intervention Group — Cohort 2 (IndiGO only)

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrollment	$1,876	$5,305	$1,914	$6,444	0.01	$1,875	$5,305	$1,499	$2,339	0.09
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	$7,448	$15,463	$6,624	$16,563	0.05	$7,448	$15,463	$6,715	$7,611	0.06
Age	70.61	8.13	71.40	12.08	0.08	70.61	8.13	70.65	6.52	0.01
Percentage male	40.58	49.17	45.54	49.80	0.14	40.58	49.17	42.65	28.69	0.06
Percentage white	96.07	19.45	92.14	26.92	0.24	96.07	19.45	94.46	13.27	0.11
Percentage disabled	15.71	36.43	19.43	39.56	0.14	15.71	36.43	15.05	20.74	0.03
Percentage ESRD	0.52	7.23	0.86	9.25	0.06	0.52	7.23	0.35	3.41	0.04
Number of dual eligible months in the previous calendar year	0.70	2.70	1.15	3.43	0.15	0.70	2.70	0.76	1.63	0.03
Number of chronic conditions	5.96	3.35	5.58	3.66	0.11	5.96	3.35	6.18	2.19	0.08
Number of ED visits in calendar quarter prior to enrollment	0.07	0.34	0.10	0.44	0.08	0.07	0.34	0.08	0.22	0.04
Number of inpatient stays in calendar quarter prior to enrollment	0.04	0.22	0.05	0.27	0.04	0.04	0.22	0.04	0.14	0.02
Number of beneficiaries	382	—	1,125,817	—	—	382	—	1,146	—	—
Number of unique beneficiaries[1]	382	—	182,032	—	—	382	—	1,141	—	—
Number of weighted beneficiaries	—	—	-	—	—	382	—	382	—	—

(continued)

Table 6. Mean Values and Standardized Differences of Variables in Propensity Score Model: Intermountain (continued)
Intervention Group — Cohort 3 (SSM only)

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrollment	$2,382	$7,184	$1,864	$6,359	0.08	$2,377	$7,173	$2,387	$4,903	0.00
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	$7,998	$15,775	$6,526	$16,665	0.09	$7,989	$15,752	$8,158	$14,292	0.01
Age	71.09	10.16	71.36	12.19	0.02	71.09	10.15	71.22	8.28	0.01
Percentage male	41.21	49.22	45.93	49.83	0.13	41.22	49.22	39.85	32.76	0.04
Percentage white	93.07	25.40	91.95	27.21	0.06	93.08	25.39	93.59	16.39	0.03
Percentage disabled	17.54	38.03	19.59	39.69	0.07	17.54	38.03	16.71	24.96	0.03
Percentage ESRD	1.03	10.11	0.82	9.04	0.03	1.03	10.11	1.18	7.13	0.02
Number of dual eligible months in the previous calendar year	1.07	3.31	1.15	3.42	0.02	1.07	3.31	1.03	2.17	0.02
Number of chronic conditions	6.16	3.50	5.48	3.67	0.19	6.16	3.50	6.26	2.56	0.03
Number of ED visits in calendar quarter prior to enrollment	0.13	0.52	0.10	0.43	0.07	0.13	0.51	0.13	0.35	0.00
Number of inpatient stays in calendar quarter prior to enrollment	0.07	0.33	0.05	0.26	0.08	0.07	0.33	0.08	0.23	0.02
Number of beneficiaries	13,072	—	748,538	—	—	13,070	—	39,207	—	—
Number of unique beneficiaries[1]	13,072	—	164,518	—	—	13,070	—	33,637	—	—
Number of weighted beneficiaries	—	—	—	—	—	13,070	—	13,070	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to matching with replacement (see Appendix B for discussion of weights).
COPD = chronic obstructive pulmonary disease; ED = emergency department; ESRD = end stage renal disease; SD = standard deviation.
— Data not available.

After performing PSM, we calculate absolute standardized differences between the treatment group and both the unmatched and matched comparison groups and check whether matching decreases the absolute standardized differences and achieves acceptable balance (Table 6). Many researchers consider that an absolute standardized difference ≤ 0.10 indicates acceptable balance.[2] Researchers also point out that critical variables in determining selection into treatment (e.g., those with significant effects in the propensity score equation) should have greater balance, while indicators with minor importance in determining treatment selection do not require optimal balance. The results in Table 6 show that matching reduced the absolute standardized differences and achieved adequate balance for most variables. Four variables in Cohort 1 and one variable for Cohort 2 did not meet the 0.10 criteria. The four variables for Cohort 1 are: total payments in second, third, fourth, and fifth calendar quarters prior to enrollment; age; percentage disabled; number of dual eligible months in the previous calendar year—and the corresponding standardized differences after matching are slightly higher than 0.10 (0.15, 0.14, 0.12 and 0.11, respectively). The variable for Cohort 2 is percentage white, and the corresponding standardized difference after matching is marginally higher than 0.10 (0.11).

In addition to comparing the means and standard deviations of variables in the propensity score model in Table 6, we check for overlap in the distribution of propensity scores for the treatment and matched comparison beneficiaries in Figure 5. The two distributions overlap substantially, indicating that matched comparison beneficiaries have similar propensity scores to treatment beneficiaries.

[2] Austin, P.C. An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research. 46.3: 399–424, 2011. *PMC*. Web. 2 June 2015.

Figure 5. Distribution of Propensity Scores for Comparison and Intervention Groups: Intermountain

Intervention Group — Cohort 1 (IndiGO and SSM)

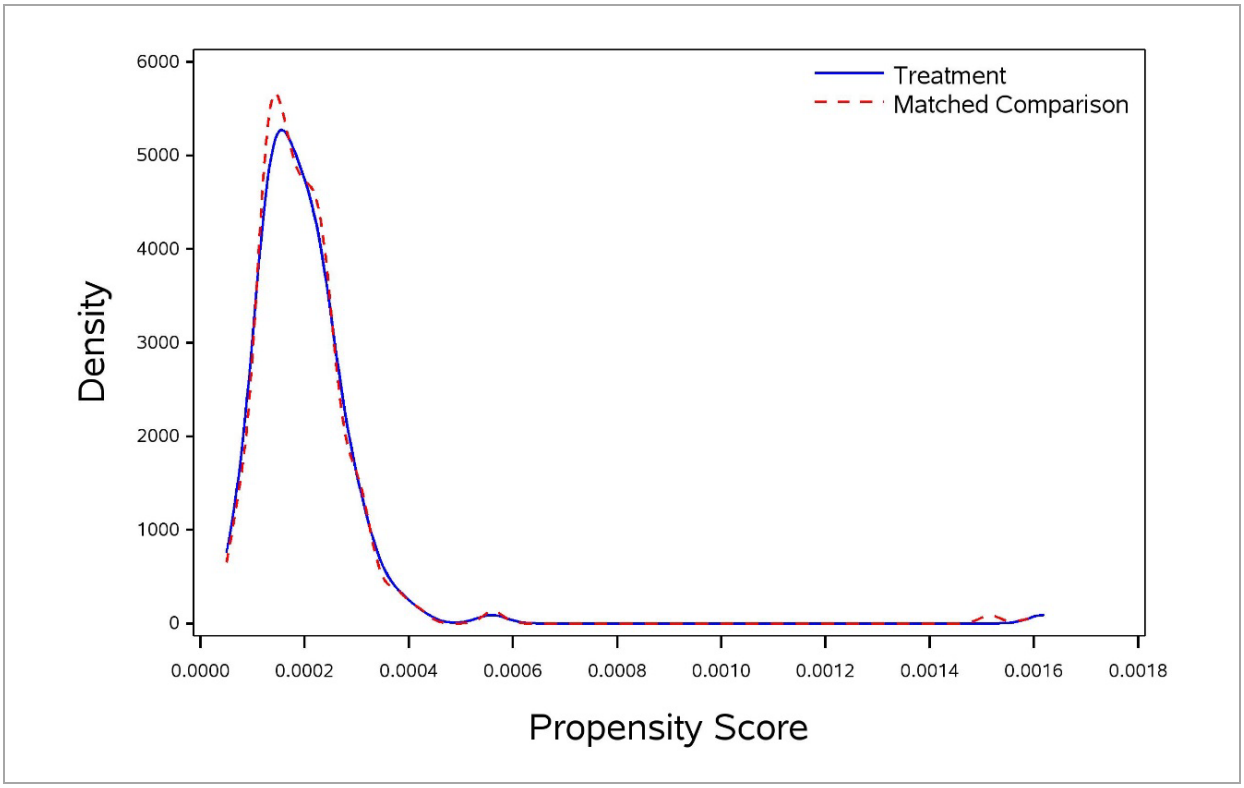
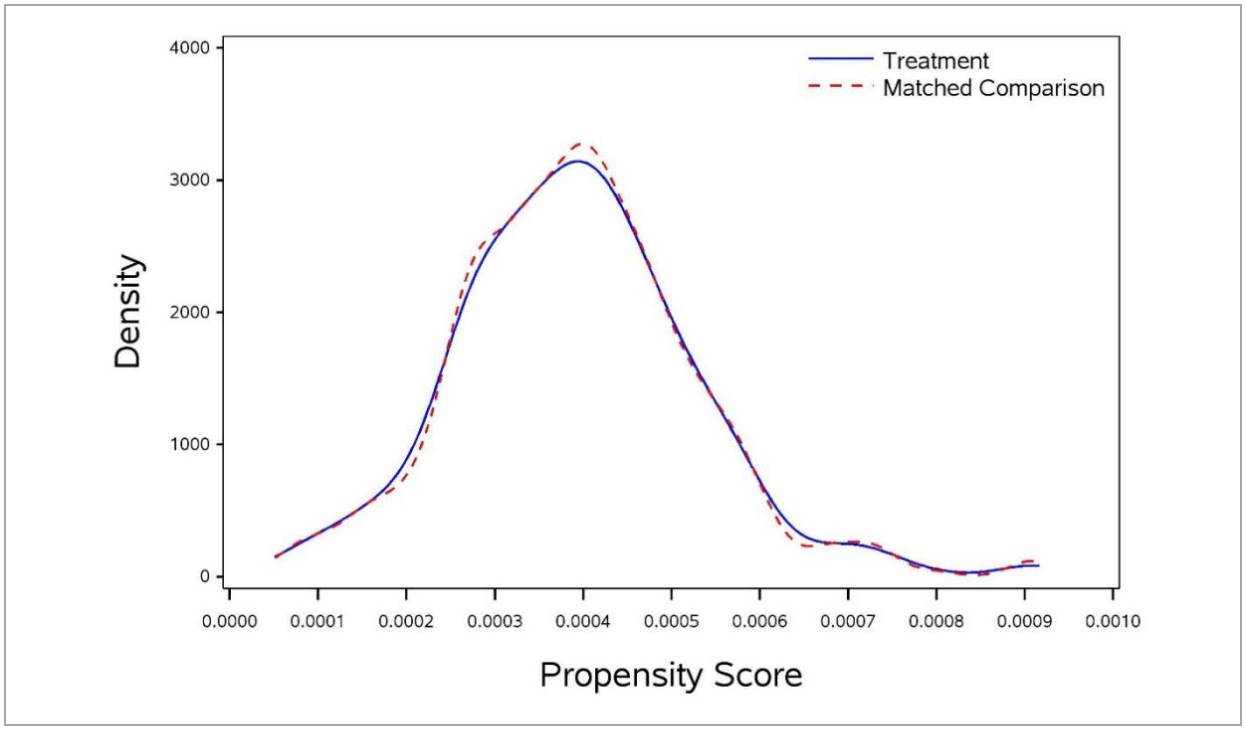
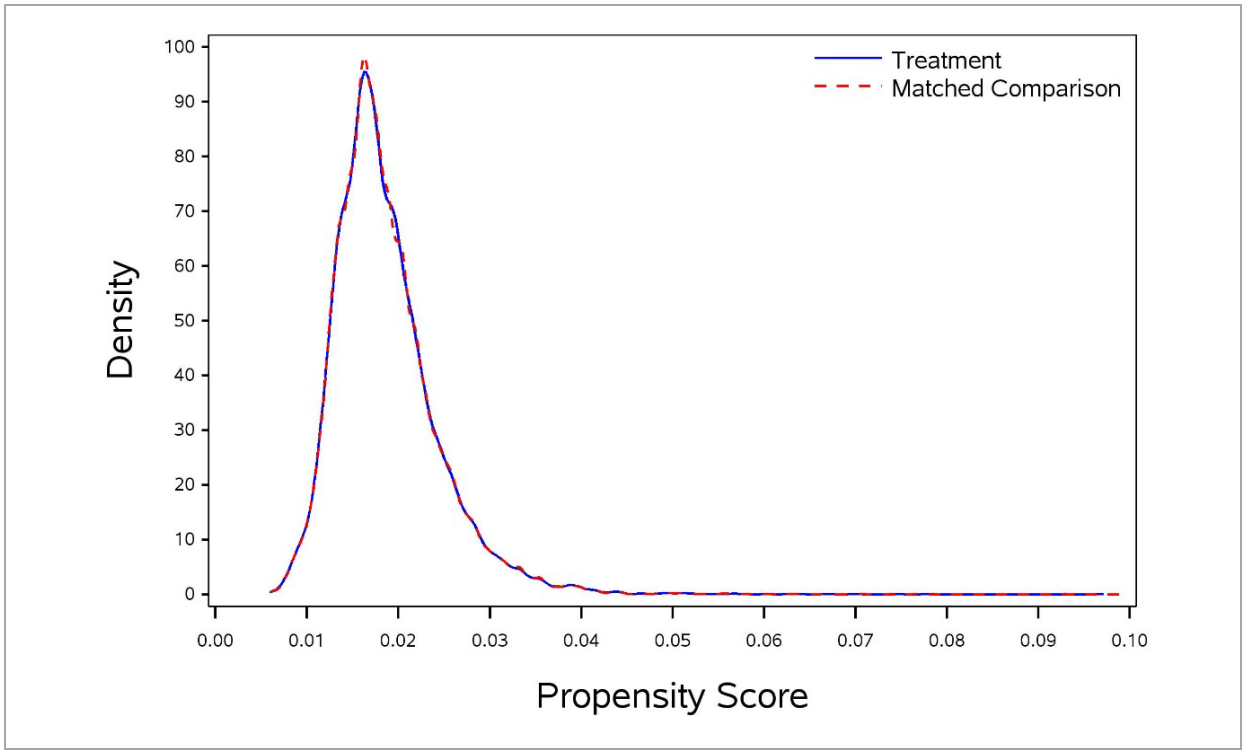


Figure 5. Distribution of Propensity Scores for Comparison and Intervention Groups: Intermountain (continued)

Intervention Group — Cohort 2 (IndiGO only)



Intervention Group — Cohort 3 (SSM only)



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Descriptive Analysis

This report includes claims through December 31, 2014. ***Table 7*** reports Medicare spending per patient in the eight quarters before and the seven quarters after enrolling in the innovation for Cohorts 1 and 2. It also reports Medicare spending per patient in the eight quarters before and the five quarters after enrolling in the innovation for Cohorts 3 and 4. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 7. Medicare Spending per Patient: Intermountain

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group – Cohort 1 (IndiGO and SSM)																
1C1CMS 330978	Intermountain															
	Spending rate	$2,319	$3,188	$2,169	$1,969	$2,964	$2,904	$2,965	$2,276	$2,091	$2,773	$3,399	$1,985	$2,906	$3,003	$5,220
	Std dev	$5,316	$8,208	$5,100	$3,913	$5,861	$9,328	$9,152	$5,595	$5,349	$6,356	$9,986	$4,644	$6,163	$6,427	$13,447
	Unique patients	120	123	125	132	140	144	145	156	156	155	151	148	148	139	136
Comparison Group – Cohort 1 (IndiGO and SSM)																
1C1CMS 330978	Intermountain															
	Spending rate	$2,582	$2,228	$2,150	$2,306	$2,139	$1,980	$1,829	$1,942	$2,257	$2,596	$2,517	$2,520	$2,398	$2,699	$2,529
	Std dev	$13,503	$6,952	$5,733	$5,604	$5,731	$5,873	$5,349	$5,391	$5,369	$6,676	$6,623	$10,857	$6,844	$7,435	$6,110
	Unique patients	124	126	130	135	139	143	145	156	156	155	149	141	140	131	127
Savings per Patient		$264	−$959	−$19	$337	−$825	−$924	−$1,136	−$334	$166	−$177	−$882	$535	−$508	−$304	−$2,691
Intervention Group – Cohort 2 (IndiGO only)																
1C1CMS 330978	Intermountain															
	Spending rate	$2,290	$1,776	$1,617	$2,009	$2,080	$2,430	$1,718	$1,875	$2,685	$2,209	$2,396	$2,717	$2,554	$2,779	$2,840
	Std dev	$6,333	$4,890	$4,407	$6,415	$5,555	$6,970	$5,360	$5,298	$8,392	$7,301	$5,939	$7,425	$6,818	$9,782	$7,019
	Unique patients	300	311	322	333	340	350	360	382	382	371	369	357	341	332	313
Comparison Group – Cohort 2 (IndiGO only)																
1C1CMS 330978	Intermountain															
	Spending rate	$1,879	$1,869	$1,625	$1,637	$2,090	$1,730	$1,903	$1,508	$1,864	$2,169	$2,533	$2,619	$2,486	$2,622	$2,373
	Std dev	$5,804	$5,516	$5,337	$4,932	$6,525	$4,990	$5,655	$4,047	$5,439	$5,816	$7,634	$7,782	$6,971	$7,166	$6,665
	Unique patients	293	306	315	334	344	354	363	382	382	371	364	349	330	318	296
Savings per Patient		−$411	$92	$8	−$372	$10	−$700	$185	−$367	−$821	−$40	$137	−$98	−$68	−$157	−$467

(continued)

Table 7. Medicare Spending per Patient: Intermountain (continued)

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group – Cohort 3 (SSM only)																
1C1CMS 330978	Intermountain															
	Spending rate	$1,986	$1,995	$2,129	$2,132	$2,171	$2,142	$2,391	$2,377	$2,703	$2,856	$3,094	$3,095	$3,154	—	—
	Std dev	$5,584	$5,383	$6,021	$6,144	$5,978	$6,399	$6,953	$7,173	$7,651	$8,595	$8,336	$8,574	$8,185	—	—
	Unique patients	9,858	10,347	10,569	10,858	11,039	12,496	12,766	13,070	13,070	12,904	12,637	12,340	11,960	—	—
Comparison Group – Cohort 3 (SSM only)																
1C1CMS 330978	Intermountain															
	Spending rate	$1,991	$1,954	$2,029	$1,977	$2,153	$2,072	$2,244	$2,300	$2,525	$2,433	$2,435	$2,517	$2,580	—	—
	Std dev	$8,320	$6,810	$6,143	$6,325	$9,342	$7,634	$7,424	$7,345	$10,820	$7,274	$7,061	$7,453	$7,510	—	—
	Unique patients	10,504	10,968	11,208	11,545	11,774	12,697	12,920	13,069	13,069	12,717	12,283	11,843	11,398	—	—
Savings per Patient		$4	−$41	−$101	−$155	−$18	−$70	−$147	−$78	−$178	−$423	−$659	−$579	−$573	—	—
Intervention Group – Cohort 4 (Hot spotting)																
1C1CMS 330978	Intermountain															
	Spending rate	$6,068	$8,660	$8,962	$6,022	$6,875	$8,564	$5,788	$9,166	$12,490	$7,763	$6,620	$6,791	$6,136	—	—
	Std dev	$9,616	$11,791	$13,566	$12,770	$9,330	$10,046	$7,674	$11,076	$19,903	$10,312	$9,032	$11,708	$9,603	—	—
	Unique patients	28	29	30	29	31	31	31	34	36	38	40	38	37	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.
— Data not yet available.

Figure 6 illustrates the Medicare spending per beneficiary in Table 7 for innovation and comparison group beneficiaries. Figure 6 illustrates the Medicare spending per beneficiary in Table 7 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 6. Medicare Spending per Patient: Intermountain

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

As shown by the pre-intervention trend line for innovation enrollees, spending trends are flat and turn slightly upward in the pre-intervention quarters for all innovation beneficiary cohorts. Post-intervention spending increases above the linear trend line in all quarters after the innovation for Cohorts 2 and 3, but not Cohorts 1 and 4. A similar trend in spending is also observed among comparison group individuals. As shown in Table 7, the standard deviation for spending is high, representing the skewed nature of expenditures.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 8*** and ***Figure 7***.

Table 8. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Intermountain

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group – Cohort 1 (IndiGO and SSM)																
1C1CMS 330978	Intermountain															
	Admit rate	58	130	80	68	100	104	110	90	51	97	79	61	88	58	162
	Std dev	297	402	349	252	344	496	514	485	295	390	294	266	283	233	488
	Unique patients	120	123	125	132	140	144	145	156	156	155	151	148	148	139	136
Comparison Group – Cohort 1 (IndiGO and SSM)																
1C1CMS 330978	Intermountain															
	Admit rate	73	56	80	89	58	37	58	83	68	84	58	50	60	82	68
	Std dev	307	240	315	340	271	212	286	402	292	334	261	217	291	376	272
	Unique patients	124	126	130	135	139	143	145	156	156	155	149	141	140	131	127
Intervention − Comparison Rate		−14	75	0	−20	42	67	53	6	−17	13	21	11	28	−24	94
Intervention Group – Cohort 2 (IndiGO only)																
1C1CMS 330978	Intermountain															
	Admit rate	60	42	47	75	71	43	28	45	81	59	49	87	70	63	67
	Std dev	264	200	225	306	289	203	164	219	453	384	228	291	335	346	286
	Unique patients	300	311	322	333	340	350	360	382	382	371	369	357	341	332	313
Comparison Group – Cohort 2 (IndiGO only)																
1C1CMS 330978	Intermountain															
	Admit rate	42	58	39	50	59	47	43	39	48	71	74	68	62	68	59
	Std dev	212	337	247	222	299	245	220	226	273	305	322	313	296	288	275
	Unique patients	293	306	315	334	344	354	363	382	382	371	364	349	330	318	296
Intervention − Comparison Rate		18	−16	7	25	11	−4	−16	6	33	−12	−26	19	9	−5	8

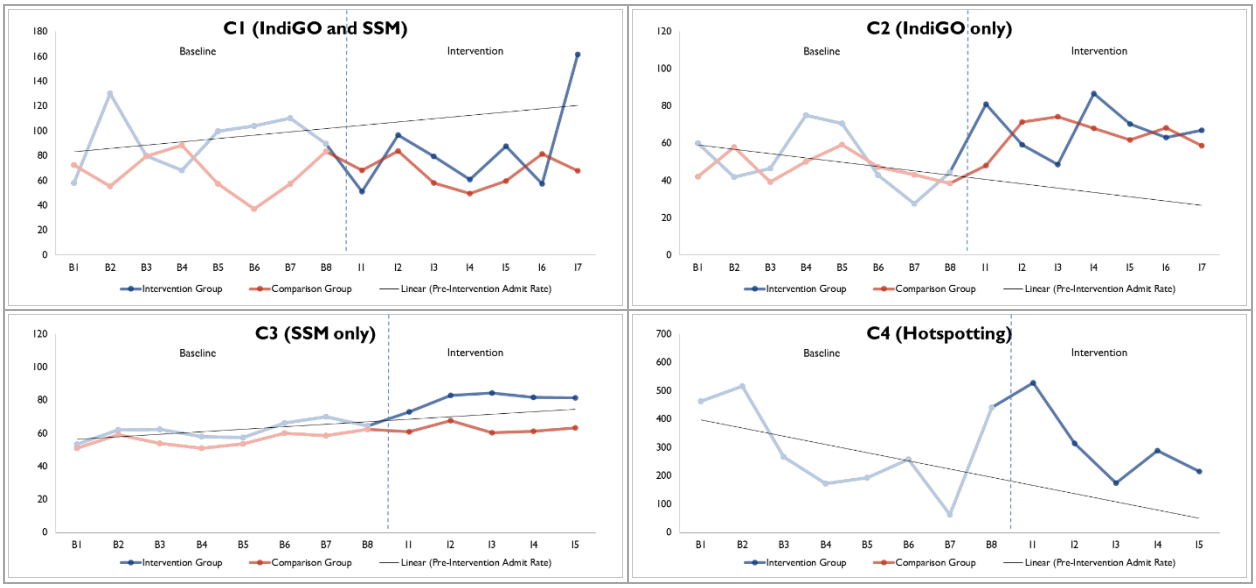
(continued)

Table 8. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Intermountain (continued)

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group – Cohort 3 (SSM only)																
1C1CMS 330978	Intermountain															
	Admit rate	53	62	63	58	58	66	70	65	73	83	84	82	82	—	—
	Std dev	270	277	288	282	275	291	310	297	317	341	339	334	325	—	—
	Unique patients	9,858	10,347	10,569	10,858	11,039	12,496	12,766	13,070	13,070	12,904	12,637	12,340	11,960	—	—
Comparison Group – Cohort 3 (SSM only)																
1C1CMS 330978	Intermountain															
	Admit rate	51	59	54	51	54	60	59	63	61	68	60	61	63	—	—
	Std dev	271	285	269	270	271	286	283	297	294	302	283	294	288	—	—
	Unique patients	10,504	10,968	11,208	11,545	11,774	12,697	12,920	13,069	13,069	12,717	12,283	11,843	11,398	—	—
Intervention − Comparison Rate		2	3	9	7	4	6	11	2	12	15	24	20	18	—	—
Intervention Group – Cohort 4 (Hot spotting)																
1C1CMS 330978	Intermountain															
	Admit rate	464	517	267	172	194	258	65	441	528	316	175	289	216	—	—
	Std dev	1085	856	442	591	395	566	246	650	897	518	441	685	527	—	—
	Unique patients	28	29	30	29	31	31	31	34	36	38	40	38	37	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.
— Data not yet available.

Figure 7. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Intermountain



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Inpatient admissions fluctuate slightly around the pre-intervention trend line but trend downward in the pre-intervention period for the innovation beneficiaries for Cohorts 2 and 4. During the post-intervention period, the treatment group's inpatient admissions rate is higher than the comparison group's for Cohort 3, but fluctuates both higher and lower than the comparison group for Cohorts 1 and 2.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 9*** and ***Figure 8***.

Table 9. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Intermountain

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group – Cohort 1 (IndiGO and SSM)																
1C1CMS 330978	Intermountain															
	Readmit rate	0	83	0	0	0	333	125	125	0	0	0	0	0	0	91
	Std dev	0	276	0	0	0	471	331	331	0	0	0	0	0	0	288
	Total admissions	4	12	7	8	11	9	8	8	4	10	10	7	10	6	11
Comparison Group – Cohort 1 (IndiGO and SSM)																
1C1CMS 330978	Intermountain															
	Readmit rate	45	0	0	0	45	0	42	156	0	56	50	0	0	125	0
	Std dev	208	0	0	0	208	0	200	363	0	229	218	0	0	331	0
	Total admissions	7	6	8	11	7	5	8	11	9	12	7	6	7	8	5
Intervention − Comparison Rate		−45	83	0	0	−45	333	83	−31	0	−56	−50	0	0	−125	91
Intervention Group – Cohort 2 (IndiGO only)																
1C1CMS 330978	Intermountain															
	Readmit rate	0	0	0	0	0	0	0	0	160	158	77	0	227	0	154
	Std dev	0	0	0	0	0	0	0	0	367	365	267	0	419	0	361
	Total admissions	14	10	13	21	18	12	9	16	25	19	13	24	22	16	13
Comparison Group – Cohort 2 (IndiGO only)																
1C1CMS 330978	Intermountain															
	Readmit rate	0	196	125	0	20	26	24	73	91	109	75	103	77	39	0
	Std dev	0	397	331	0	140	158	154	260	288	312	263	305	267	194	0
	Total admissions	10	17	11	14	17	13	14	14	15	21	22	19	17	17	9
Intervention − Comparison Rate		0	−196	−125	0	−20	−26	−24	−73	69	49	2	−103	150	−39	154

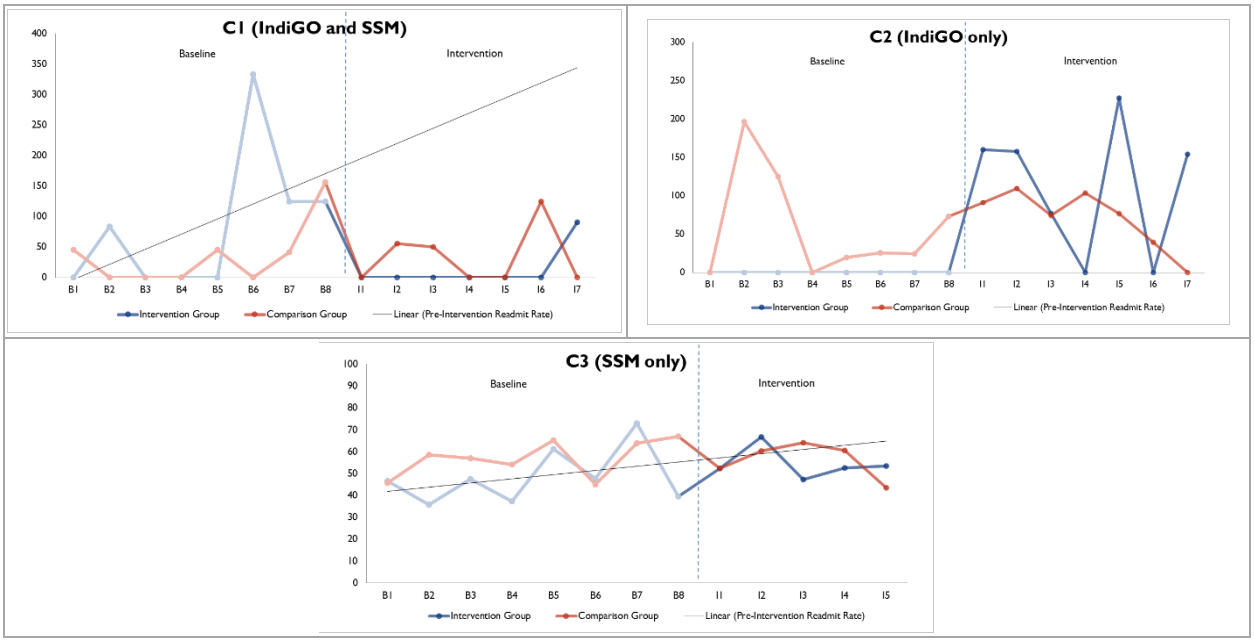
(continued)

Table 9. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Intermountain (continued)

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group – Cohort 3 (SSM only)																
1C1CMS 330978	Intermountain															
	Readmit rate	47	36	48	37	61	48	73	40	52	67	47	53	54	—	—
	Std dev	211	186	213	189	240	213	260	195	223	250	212	223	225	—	—
	Total admissions	407	502	504	483	490	670	712	658	724	809	803	742	504	—	—
Comparison Group – Cohort 3 (SSM only)																
1C1CMS 330978	Intermountain															
	Readmit rate	46	59	57	54	65	45	64	67	52	60	64	61	44	—	—
	Std dev	209	235	232	226	247	207	244	250	223	238	245	239	204	—	—
	Total admissions	430	512	497	449	502	615	622	676	643	657	577	578	375	—	—
Intervention − Comparison Rate		1	−23	−9	−17	−4	3	9	−28	0	6	−17	−8	10	—	—
Intervention Group – Cohort 4 (Hot spotting)																
1C1CMS 330978	Intermountain															
	Readmit rate	0	0	250	0	0	667	0	0	0	0	0	0	0	—	—
	Std dev	0	0	433	0	0	471	0	0	0	0	0	0	0	—	—
	Total admissions	1	5	4	4	3	3	1	4	6	2	2	0	1	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.
— Data not yet available.

Figure 8. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Intermountain



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Unplanned readmissions rates fluctuate around the trend lines prior to the innovation's launch as shown by the large standard deviation of the measure, although the overall trend is slightly upward for Cohorts 1 and 3. Unplanned readmissions rates are similar to the comparison group for Cohorts 1 and 3. Due to the low number of index admissions (the denominator in the readmissions measure) in Cohort 4 (not shown), the unplanned readmissions rate is highly variable. As more beneficiaries enroll in the innovation and more claims data become available, the sample size will increase and the readmissions measure may be reported with more precision.

ED visits per 1,000 participants are shown in ***Table 10*** and ***Figure 9***.

Table 10. ED Visits per 1,000 Participants: Intermountain

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group – Cohort 1 (IndiGO and SSM)																
1C1CMS 330978	Intermountain															
	ED rate	133	122	104	68	229	188	145	167	141	226	152	149	135	151	228
	Std dev	579	417	418	308	1416	908	677	680	791	1332	661	883	517	537	1047
	Unique patients	120	123	125	132	140	144	145	156	156	155	151	148	148	139	136
Comparison Group – Cohort 1 (IndiGO and SSM)																
1C1CMS 330978	Intermountain															
	ED rate	102	122	100	103	122	153	92	130	120	125	141	116	126	145	110
	Std dev	199	242	214	278	287	348	255	365	294	247	386	436	294	313	292
	Unique patients	124	126	130	135	139	143	145	156	156	155	149	141	140	131	127
Intervention − Comparison Rate		31	0	4	−35	106	34	53	36	21	101	12	33	9	6	118
Intervention Group – Cohort 2 (IndiGO only)																
1C1CMS 330978	Intermountain															
	ED rate	73	84	50	78	94	74	64	73	79	86	73	92	114	75	86
	Std dev	297	330	280	329	339	339	267	369	306	342	281	359	378	286	352
	Unique patients	300	311	322	333	340	350	360	382	382	371	369	357	341	332	313
Comparison Group – Cohort 2 (IndiGO only)																
1C1CMS 330978	Intermountain															
	ED rate	109	100	86	96	106	100	94	81	99	131	113	99	114	95	118
	Std dev	253	244	192	225	225	227	241	224	248	307	279	258	256	217	270
	Unique patients	293	306	315	334	344	354	363	382	382	371	364	349	330	318	296
Intervention − Comparison Rate		−36	−17	−36	−18	−12	−26	−31	−8	−20	−45	−40	−7	0	−20	−32

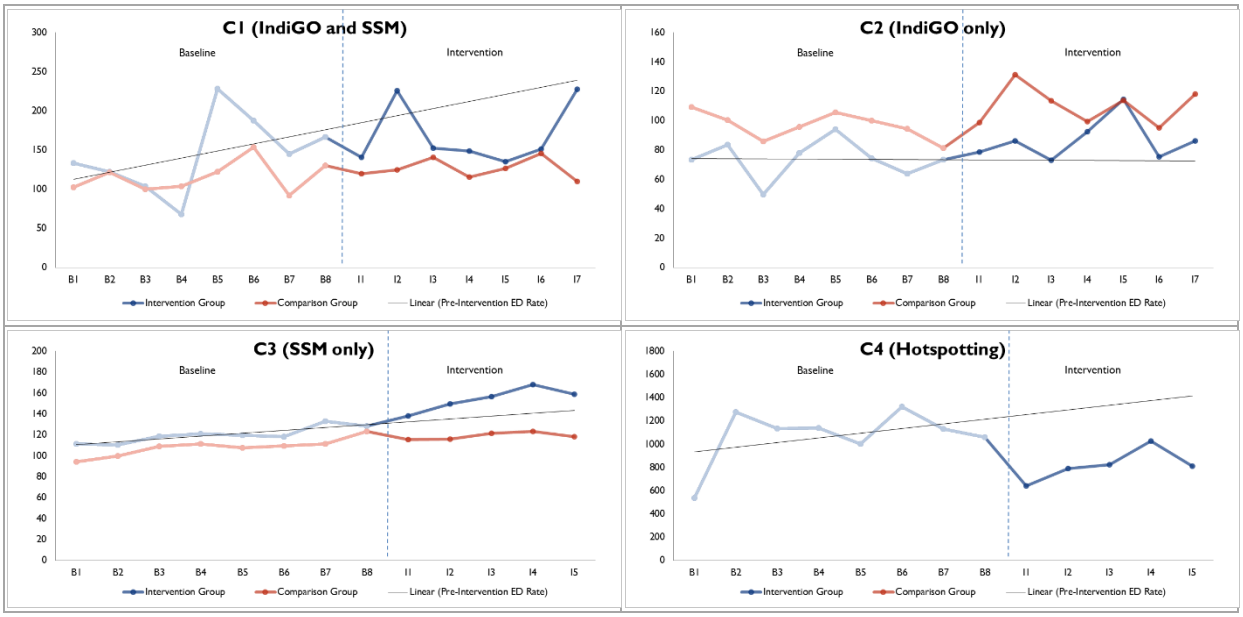
(continued)

Table 10. ED Visits per 1,000 Participants: Intermountain (continued)

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group – Cohort 3 (SSM only)																
1C1CMS 330978	Intermountain															
	ED rate	111	111	119	121	120	118	133	128	138	150	156	168	159	—	—
	Std dev	462	452	505	503	466	483	526	505	524	623	631	680	576	—	—
	Unique patients	9,858	10,347	10,569	10,858	11,039	12,496	12,766	13,070	13,070	12,904	12,637	12,340	11,960	—	—
Comparison Group – Cohort 3 (SSM only)																
1C1CMS 330978	Intermountain															
	ED rate	94	100	109	111	108	109	111	123	116	116	121	123	118	—	—
	Std dev	258	272	321	325	291	325	294	311	318	303	314	326	308	—	—
	Unique patients	10,504	10,968	11,208	11,545	11,774	12,697	12,920	13,069	13,069	12,717	12,283	11,843	11,398	—	—
Intervention − Comparison Rate		17	11	10	9	12	9	22	5	23	34	35	45	41	—	—
Intervention Group – Cohort 4 (Hot spotting)																
1C1CMS 330978	Intermountain															
	ED rate	536	1,276	1,133	1,138	1,000	1,323	1,129	1,059	639	789	825	1,026	811	—	—
	Std dev	1,291	3,127	3,235	3,067	2,206	2,833	3,284	2,486	1,046	1,727	2,147	2,137	1,613	—	—
	Unique patients	28	29	30	29	31	31	31	34	36	38	40	38	37	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.
— Data not yet available.

Figure 9. ED Visits per 1,000 Participants: Intermountain



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

During both the pre-intervention and post-intervention period, the ED visit rate was similar in the treatment and comparison groups. Regression results in the next section demonstrate that quarterly differences in ED visit rates between the treatment and comparison group were not impacted by the intervention for Cohorts 1 and 2.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit.

Table 11 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. ***Figure 10*** illustrates these quarterly difference-in-differences estimates.

Table 11. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Intermountain

Cohort 1 (IndiGO and SSM)

Quarter	Coefficient	Standard Error	P-Values
I1	−581	460	0.208
I2	−244	560	0.664
I3	453	869	0.603
I4	−1,074	694	0.122
I5	−49	641	0.939
I6	−300	686	0.662
I7	2,041	1,139	0.074

Cohort 2 (IndiGO only)

Quarter	Coefficient	Standard Error	P-Values
I1	550	390	0.160
I2	−259	358	0.470
I3	−448	383	0.242
I4	−306	432	0.479
I5	−373	409	0.362
I6	−290	541	0.593
I7	−23	406	0.956

Cohort 3 (SSM only)

Quarter	Coefficient	Standard Error	P-Values
I1	148	79	0.061
I2	336	83	<.0001
I3	560	83	<.0001
I4	477	86	<.0001
I5	475	85	<.0001

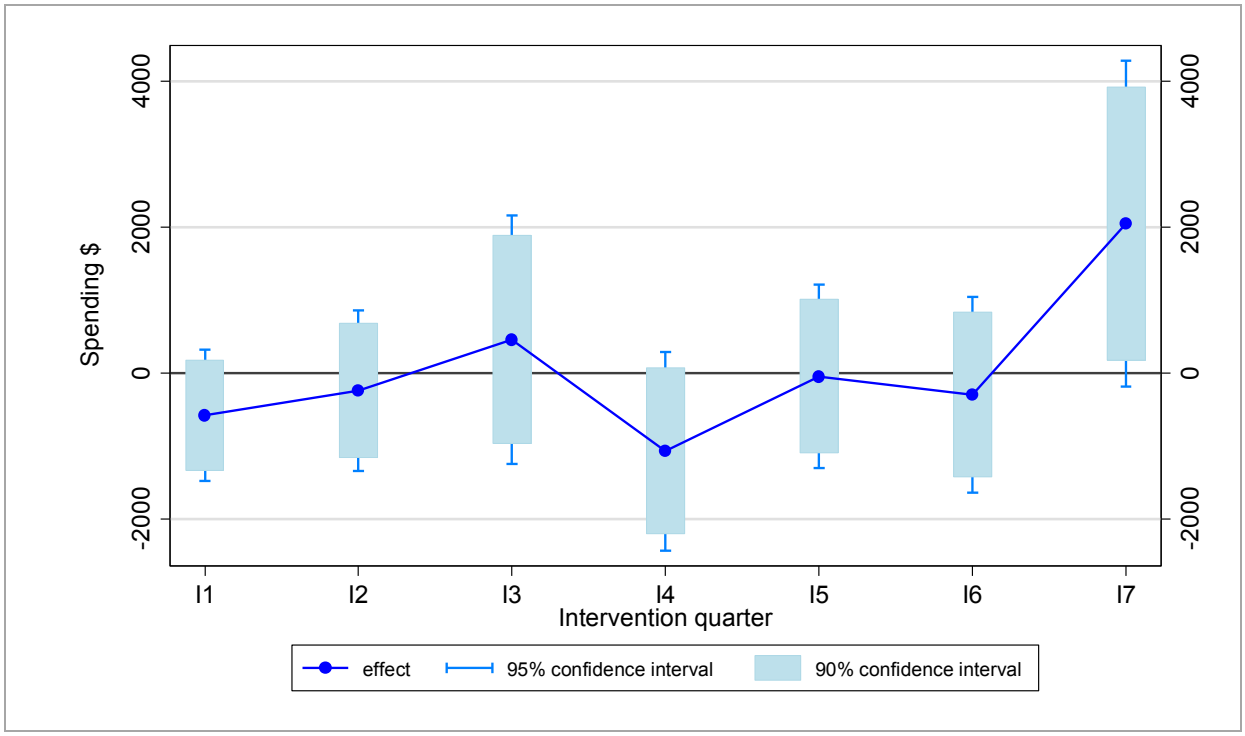
Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.

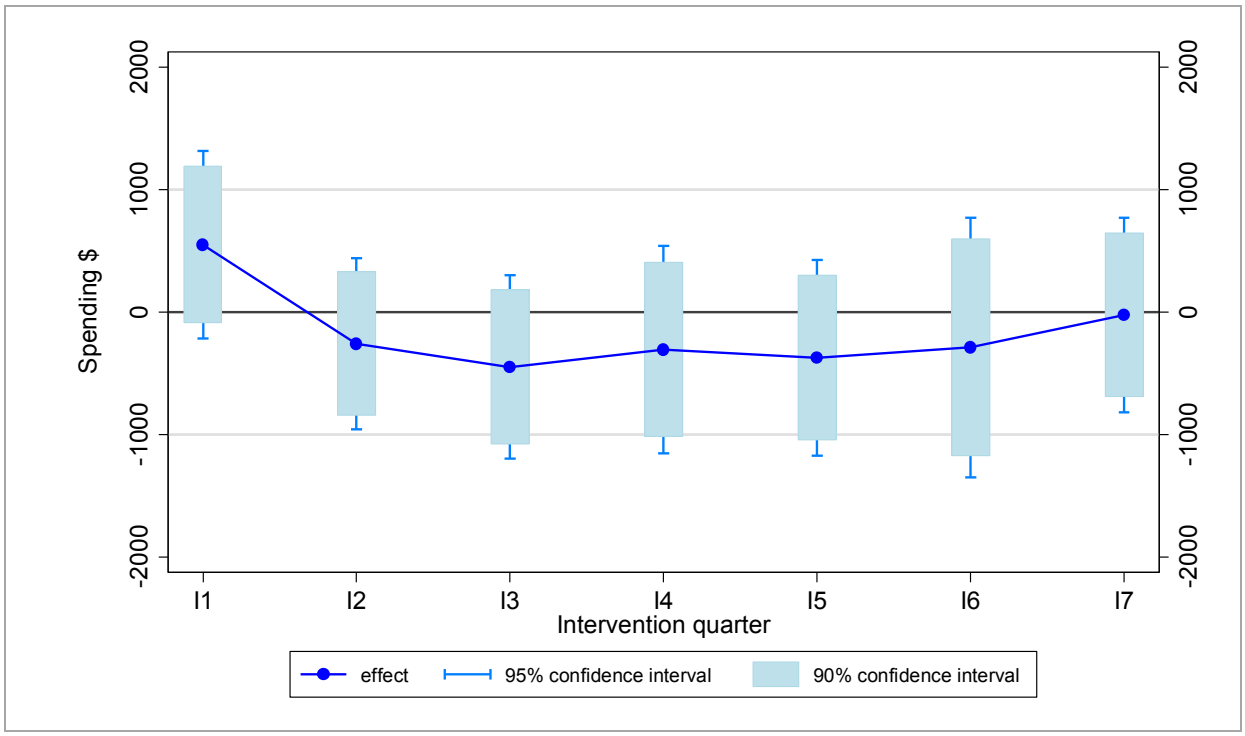
OLS = ordinary least squares.

Figure 10. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Intermountain

Cohort 1 (IndiGO and SSM)



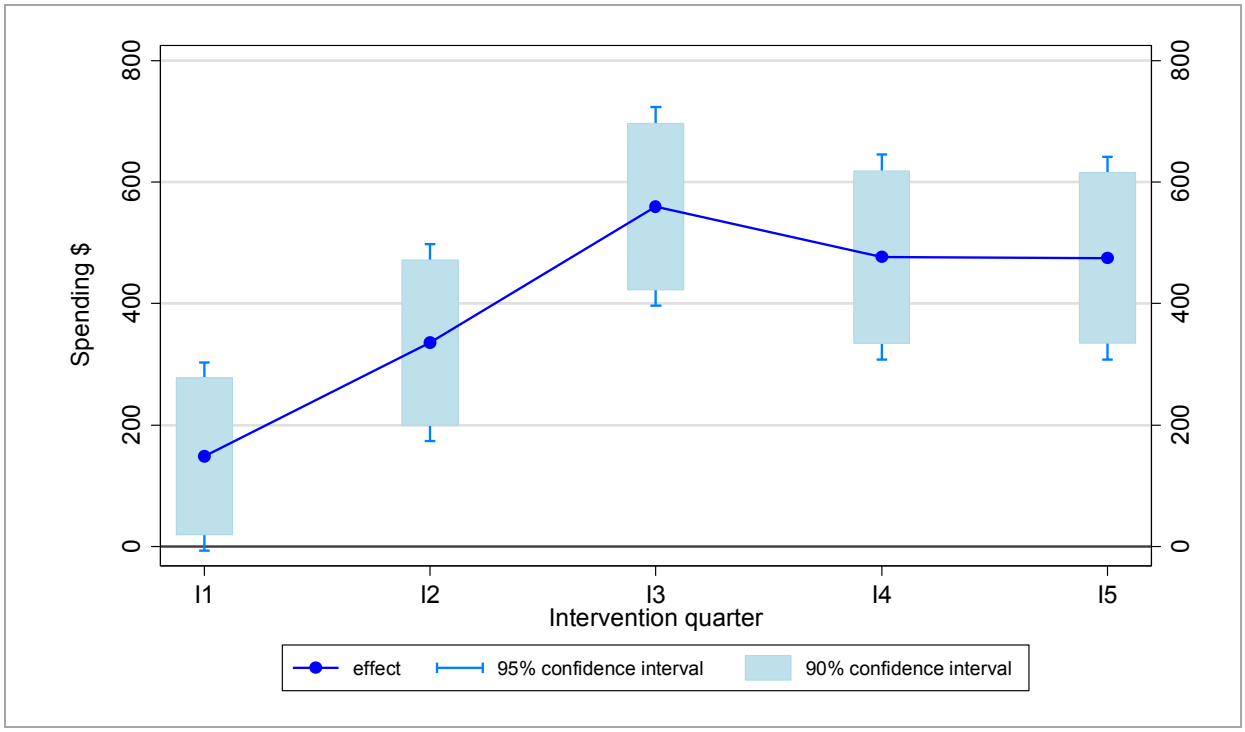
Cohort 2 (IndiGO only)



(continued)

Figure 10. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Intermountain (continued)

Cohort 3 (SSM only)



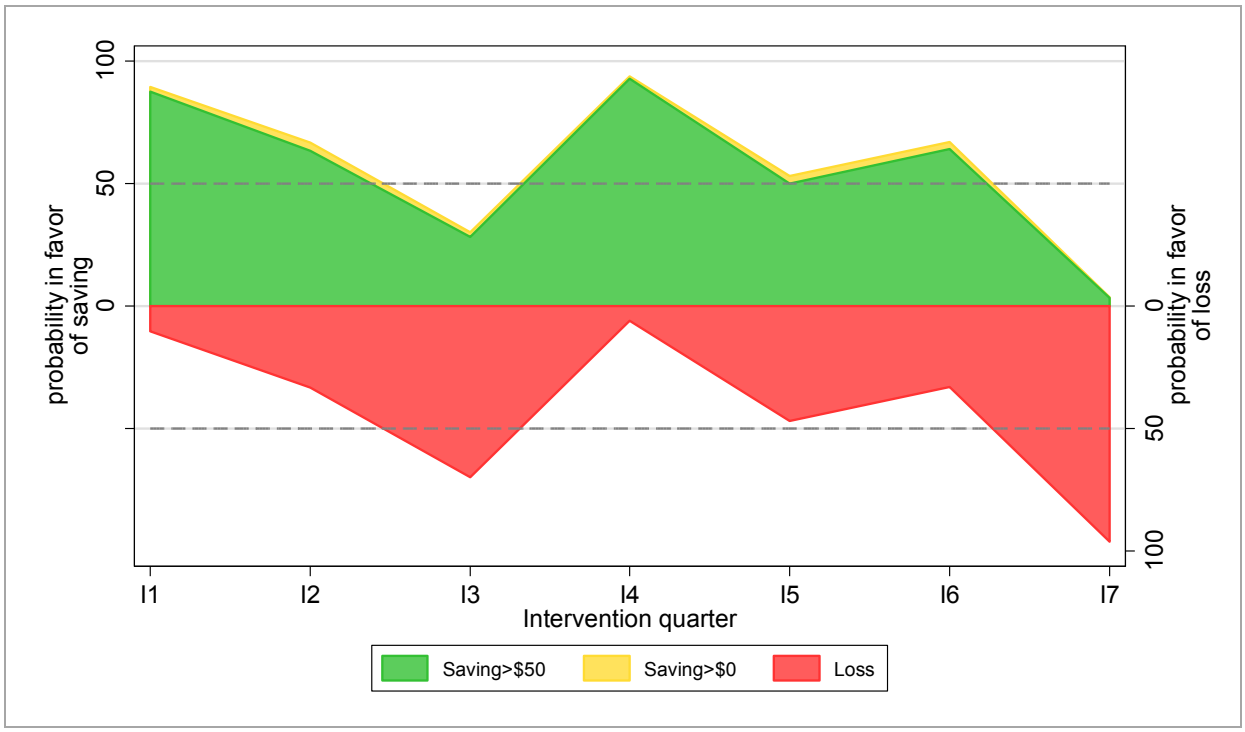
Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
OLS = ordinary least squares.

Results for Cohort 1 show that in intervention Q1 (I1), spending among treatment group individuals is $581 lower than spending among comparison group individuals, but the spending estimate is not statistically significant at conventional levels. In remaining quarters, the point estimates for spending are negative in five of the six remaining quarters and approach statistical significance in two quarters. Results for Cohort 2 show that in I1, spending among treatment group individuals is $550 higher than spending among comparison group individuals, and the spending estimate is not statistically significant at conventional levels. In the remaining quarters, the point estimates for spending become negative and are not statistically different from zero. Results for Cohort 3 show that in I1, spending among treatment group individuals is $148 higher than spending among comparison group individuals, and the spending estimate is not statistically significant at conventional levels. In the remaining quarters, the point estimates increase and are statistically significant at conventional levels, indicating higher spending in the intervention group.

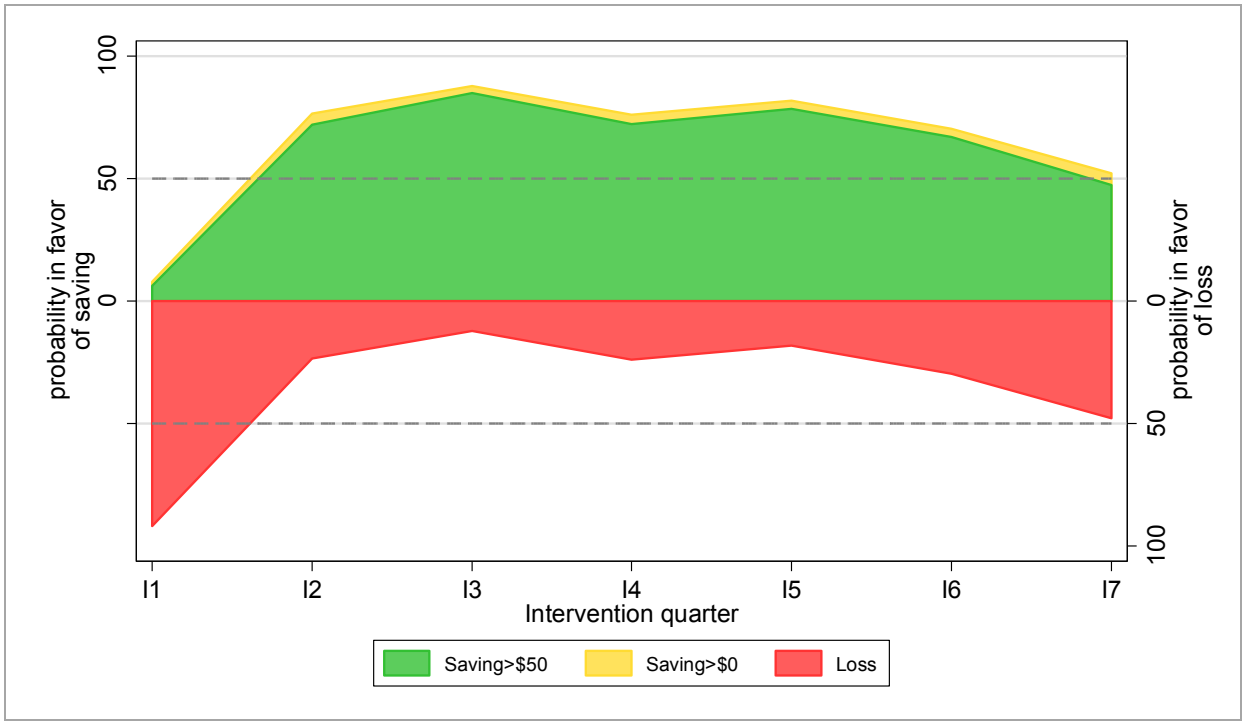
Figure 11 presents the strength of evidence in favor of a saving or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis.

Figure 11. Quarterly Strength of Evidence in Favor of Saving/Loss: Intermountain

Cohort 1 (IndiGO and SSM)



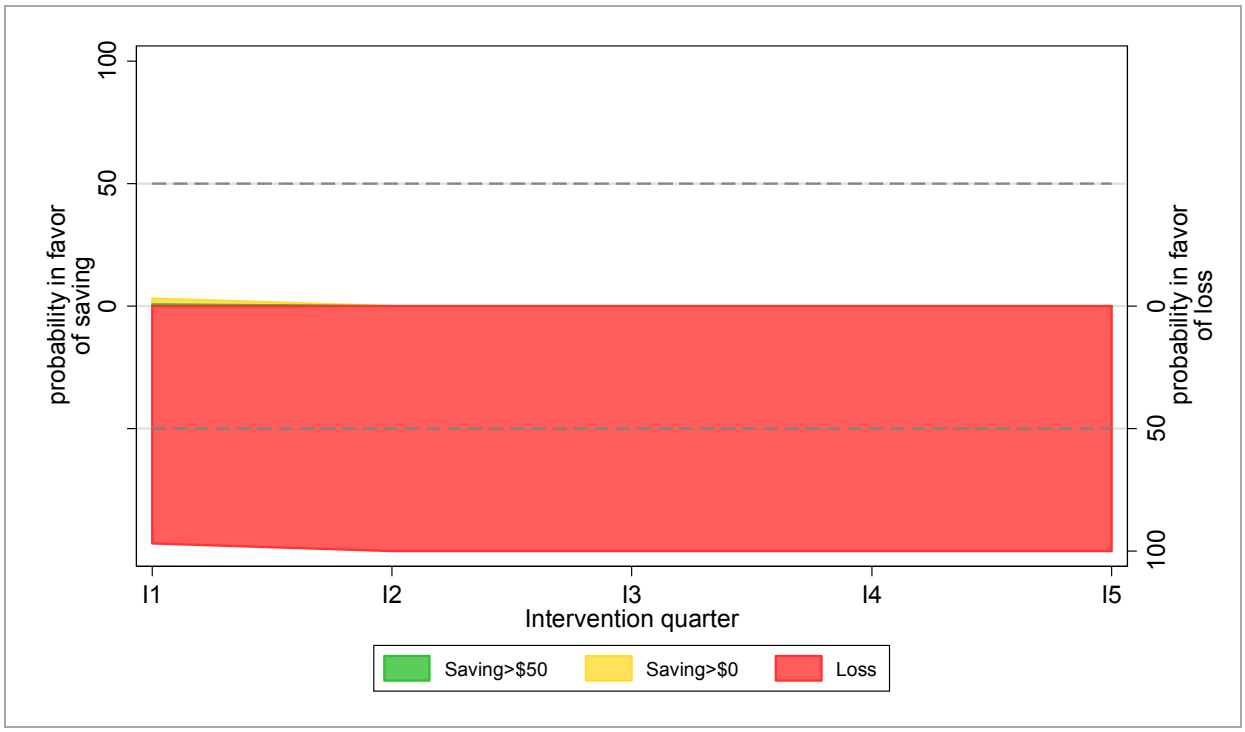
Cohort 2 (IndiGO only)



(continued)

Figure 11. Quarterly Strength of Evidence in Favor of Savings/Loss: Intermountain (continued)

Cohort 3 (SSM only)



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

For Cohort 1 in I1, spending is lower in the treatment group than the comparison group and Figure 10 supports the conclusion that the innovation generated savings. During post-innovation quarters 1, 2, 4, and 6, the probability of a savings is high. For Cohort 2 in I1, Figure 10 shows the probability of a loss is higher than the probability of savings. During post-innovation quarters 2 through 7, lower spending in the treatment group generated a higher probability of savings during those quarters. For Cohort 3 in I1, spending is higher in the treatment group than the comparison group and Figure 10 supports the conclusion that the innovation generated losses. During all post-innovation quarters, the probability of a loss is very high.

We also present the overall weighted average treatment effect per member per quarter during the intervention period for beneficiaries enrolled in the innovation as compared to their matched comparison group. The weighted average quarterly spending differential in the post-innovation period, indicating loss, is $−9 (90% CI: −$612, $593) per member per quarter for Cohort 1. This estimate is not statistically significant. The weighted average quarterly spending differential in the post-innovation period, indicating savings, $159 (90% CI: −$205, $523) for Cohort 2. This estimate is not statistically significant. The weighted average quarterly spending differential in the post-innovation period, indicating losses, is −$396 (90% CI: -$475, -$317) for Cohort 3. This estimate is statistically significant. These figures represent the differential spending per quarter in the post-intervention period between individuals enrolled in the innovation and comparison group individuals, on average, weighted by the number of intervention

beneficiaries in each quarter. The 90 percent confidence interval is the range in which the true parameter estimate falls, with 90 percent confidence.

We also present linear probability model coefficients for inpatient admissions and outpatient emergency department visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the estimated effect.[3] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, empirical demonstrations have shown that linear probability model coefficients are often consistent with marginal effects generated from nonlinear models.[4] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention), not just the direction of the effect.

Results for Cohort 1 show that in all intervention quarters, the estimated coefficients are not statistically significant. The average quarterly difference-in-differences estimate for inpatient admissions in Cohort 1 is 0 percentage points, indicating that the treatment-control difference is no different during the intervention period. This is the average difference in inpatient admissions probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is not statistically significant (90% CI: −0.019, 0.020).

Results for Cohort 2 show that for all but three intervention quarters, the estimated coefficients are not statistically significant, making it difficult to draw conclusions about the relative probability of an inpatient hospital admission between treatment and comparison individuals. The average quarterly difference-in-differences estimate for inpatient admissions in Cohort 2 is −1.1 percentage points, indicating that the treatment-control difference is 1.1 percentage points lower during the intervention period. This is the average difference in inpatient admissions probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: −0.021, -0.000).

Results for Cohort 3 are all statistically significant in all quarters and indicate an increase in the inpatient hospitalization rate among the treatment group. The average quarterly difference-in-differences estimate for inpatient admissions in Cohort 3 is 1.0 percentage points, indicating that the treatment-control difference is 1.0 percentage points higher during the intervention period. This is the average difference in inpatient admissions probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: 0.008, 0.013).

[3] To obtain the correct effect it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run even when not competing with other users for computer resources.

[4] Angrist, J.D., and Pischke J.-S. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

Table 12. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: Intermountain

Cohort 1 (Indigo and SSM)

Quarter	Coefficient	Standard Error	P-Values
I1	−0.03	0.02	0.117
I2	−0.01	0.02	0.747
I3	0.01	0.02	0.608
I4	−0.01	0.02	0.701
I5	0.03	0.02	0.280
I6	−0.02	0.02	0.352
I7	0.04	0.03	0.193

Cohort 2 (Indigo only)

Quarter	Coefficient	Standard Error	P-Values
I1	0.00	0.01	0.775
I2	−0.03	0.01	0.012
I3	−0.02	0.01	0.076
I4	0.02	0.02	0.218
I5	−0.01	0.01	0.479
I6	−0.03	0.01	0.039
I7	−0.01	0.01	0.700

Cohort 3 (SSM only)

Quarter	Coefficient	Standard Error	P-Values
I1	0.01	0.00	0.018
I2	0.01	0.00	0.004
I3	0.02	0.00	<.0001
I4	0.01	0.00	<.0001
I5	0.01	0.00	<.0001

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.

For Cohort 1, patients have a lower probability of an ED visit in I1 and I4 and a higher probability in the remaining quarters. Results for other intervention quarters are not significant. The average quarterly difference-in-differences estimate for ED visits in Cohort 1 is 0.5 percentage points, indicating that the treatment-control difference is 0.5 percentage points larger during the intervention period. This is the average difference in ED visit probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is not statistically significant (90% CI: −0,017, 0.027).

For Cohort 2, results bounce from positive to negative and no quarters are statistically significant. The average quarterly difference-in-differences estimate for ED visits in Cohort 2 is 0.1 percentage points, indicating that the treatment-control difference is 0.1 percentage points larger during the intervention period. This is the average difference in ED visit probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is not statistically significant (90% CI: −0.0128, 0.016).

For Cohort 3, the probability of an ED visit in all intervention quarters is statistically significantly higher, ranging from 1 to 3 percentage points higher. The average quarterly difference-in-differences estimate for ED visits in Cohort 3 is 1.9 percentage points, indicating that the treatment-control difference is 1.9 percentage point higher during the intervention period. This is the average difference in ED visit probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: 0.016, 0.022).

Table 13. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: Intermountain

Cohort 1 (Indigo and SSM)

Quarter	Coefficient	Standard Error	P−Values
I1	−0.04	0.02	0.083
I2	0.01	0.03	0.839
I3	0.00	0.03	0.881
I4	−0.02	0.03	0.505
I5	0.02	0.03	0.431
I6	0.00	0.03	0.878
I7	0.07	0.04	0.067

Cohort 2 (Indigo only)

Quarter	Coefficient	Standard Error	P-Values
I1	0.01	0.02	0.483
I2	−0.01	0.02	0.446
I3	−0.01	0.02	0.428
I4	0.03	0.02	0.132
I5	0.02	0.02	0.372
I6	−0.01	0.02	0.482
I7	−0.01	0.02	0.553

(continued)

Table 13. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: Intermountain (continued) Cohort 3 (SSM only)

Quarter	Coefficient	Standard Error	P-Values
I1	0.01	0.00	<.0001
I2	0.01	0.00	<.0001
I3	0.02	0.00	<.0001
I4	0.03	0.00	<.0001
I5	0.02	0.00	<.0001

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.

Discussion

The results indicate the probability of savings is high in Cohort 1, the group that includes both the IndiGO and SSM intervention beneficiaries. This result is likely being driven by the IndiGO intervention since the probability of savings is also high for that group (Cohort 2). The probability of loss is high for SSM (Cohort 3), and this group is more likely to have hospital inpatient admissions and ED visits in the post-intervention quarters.

The results may not be fully representative of the overall population served by the innovation. The results presented here are only for fee-for-service Medicare beneficiaries whom we were able to match with the identifiers provided by the site. This number represents 42.7 percent of the overall population reached by the SSM and IndiGO innovations.

1.3.3 Other Awardee-Specific Data

Table 14 lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. We received patient-level data from Intermountain used to generate each measure listed in Tables 4 and 14 for each quarter through Q11 (March 31, 2015). The results of analyses for most of these measures are included in this annual report. Data for some of the originally requested measures were not available.

Table 14. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Clinical effectiveness	Cardiovascular disease	Percentage of cardiovascular patients with CAD with LDL-C screening	Data received from Intermountain
		Percentage of patients with CAD who were prescribed beta-blocker therapy	Data received from Intermountain
		Percentage of patients with CAD who had a left ventricular ejection fraction assessment	Dropped; data unavailable
	Diabetes	Percentage of patients with diabetes who received a hemoglobin A1c and lipid profile assessment	Data received from Intermountain
	Mental health	Percentage of patients with major depression who remained on an antidepressant medication treatment	Data received from Intermountain
	Weight Management	Percentage of patients with a BMI assessment	Data received from Intermountain
Health outcomes	Cardiovascular disease	Percentage of patients with CAD with BP < 130/80 mm/Hg	Data received from Intermountain
		Percentage of patients with CAD with LDL-C < 100 mg/dL	Data received from Intermountain
		Percentage of patients with CAD who had a left ventricular ejection fraction assessment	Dropped; data unavailable
	Diabetes	Percentage of patients with diabetes with hemoglobin A1c > 8.0 %	Data received from Intermountain
	Mental health	Number and percentage of patients with an improvement in PHQ-9 scores	Data received from Intermountain
	Weight management	Number and percentage of patients with BMI (25 < BMI <30 = overweight) or (BMI > 30 = obese)	Data received from Intermountain

BP = blood pressure; BMI = body mass index; CAD = coronary artery disease; Intermountain = Intermountain Healthcare; LDL-C = low density lipoprotein cholesterol; PHQ = Patient Health Questionnaire.

Clinical Effectiveness

Table 15 shows five clinical effectiveness measures for SSM patients tabulated by intervention quarters. These measures focus on chronic disease management, which while important, is not the primary focus of the SSM component of the innovation. The intervention quarters (Is) are based on individual enrollment date (i.e., date of first clinic visit). For example, I1 is equal to the first quarter of enrollment, or the first quarter a patient was seen in the clinic, for all participants who received a specific test. We provide I data when at least 20 patients had a test or reading in the quarter. The sample size for the number of IndiGO patients with a qualified view was too small to report. Assuming an increase in sample size as Intermountain continues its innovation, we will report these measures for IndiGO patients in subsequent quarterly and annual reports.

As noted in the table, the number of patients receiving various types of care remained fairly stable or decreased slightly over time. Depending on the frequency of visits to the clinic, it may not be appropriate to assess all of these measures at each visit. The percentage of SSM patients who received antidepressant medication management, however, increased steadily over time to almost 30 percent. Overall, no distinct trends indicate that patients in a SSM practice received an increased number of services and/or tests over time.

Evaluation Question

- Has the percentage of patients in a SSM practice with diabetes who received an HbA1c test increased over time among those enrolled in the innovation?
- Has the percentage of patients in a SSM practice with cardiovascular disease who received LDL-C testing and/or beta blocker therapy, increased over time among those enrolled in the innovation?
- Has the percentage of patients in a SSM practice with depression who received antidepressant medication therapy, increased over time among those enrolled in the innovation?
- Has the percentage of patients in a SSM practice who received weight screening, increased over time among those enrolled in the innovation?

Table 15. Clinical Effectiveness Measures for SSM Patients

Clinical Effectiveness Measure	I1	I2	I3	I4	I5	I6	I7
Percentage of (SSM) diabetic patients who receive a lipid profile and HbA1c assessment	11.3 N=4,568	6.5 N=2,637	9.6 N=2,479	8.1 N=2,196	8.7 N=1,817	8.6 N=964	10.5 N=420
Percentage of (SSM) cardiovascular patients who receive LDL-C screening	9.7 N=1,060	3.8 N=4,71	7.2 N=321	4.1 N=196	4.1 N=121	2.6 N=38	0.0 N=14
Percentage of (SSM) cardiovascular patients on beta-blocker therapy	20.4 N=1,060	18.3 N=471	23.1 N=321	24.0 N=196	24.8 N=121	15.8 N=38	7.1 N=14
Percentage of depressed (SSM) patients who receive antidepressant medication management (i.e., treated with antidepressant medication and remained on an antidepressant treatment)	8.0 N=15,531	14.8 N=7,896	21.4 N=7,124	28.3 N=6,100	29.1 N=5,056	30.4 N=2,700	29.9 N=1,145
Percentage of (SSM) patients who had weight screening completed using BMI	54.3 N=15,531	50.0 N=7,896	54.3 N=7,124	53.3 N=6,100	54.0 N=5,056	51.0 N=2,700	48.8 N=1,145

BMI = body mass index; LDL-C = low density lipoprotein cholesterol; SSM = shared savings model.

Health Outcomes

We examined health outcomes among patients in an SSM practice with diabetes, depression, and cardiovascular diseases. The following run charts take into account rolling enrollment. The *Is* are based on individual enrollment date. For example, I1 is equal to the first quarter of enrollment for all

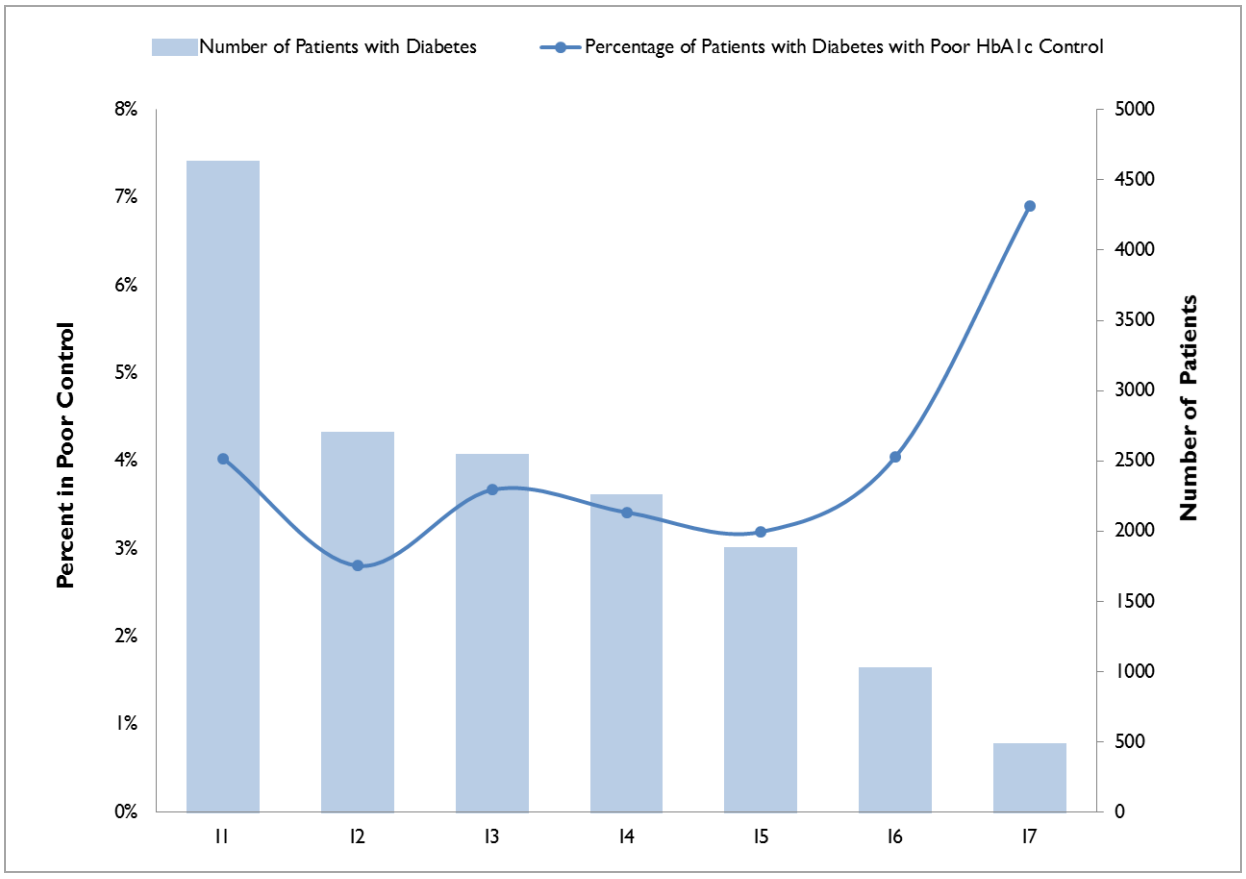
participants who received a specific test. We provide I data when at least 20 patients have a test or reading within the quarter.

Evaluation Question

- Has the percentage of diabetes patients with poor HbA1c control decreased over time among those enrolled in the innovation?
- Has the percentage of patients with cardiovascular diseases with blood pressure control increased over time among those enrolled in the innovation?
- Has the percentage of patients with cardiovascular diseases with LDL-C control increased over time among those enrolled in the innovation?
- Has the percentage of patients with depression with PHQ-9>10 decreased over time among those enrolled in the innovation?
- Has the percentage of patients considered overweight and/or obese decreased over time among those enrolled in the innovation?

In ***Figure 12*** we show the percentage of diabetic SSM patients with poorly controlled blood glucose (HbA1c > 8.0) measured by intervention quarters. For six intervention quarters, the percentage of patients with poorly controlled blood sugar remains in a narrow range of 2.8 percent to 4.0 percent. The gradual downward trend shown in I3 through I5 reversed and turns sharply upward in I6 and I7. The sample size, however, is significantly smaller in I7 than in earlier quarters.

Figure 12. Percentage of Patients with Diabetes with Poor HbA1c Control over Time



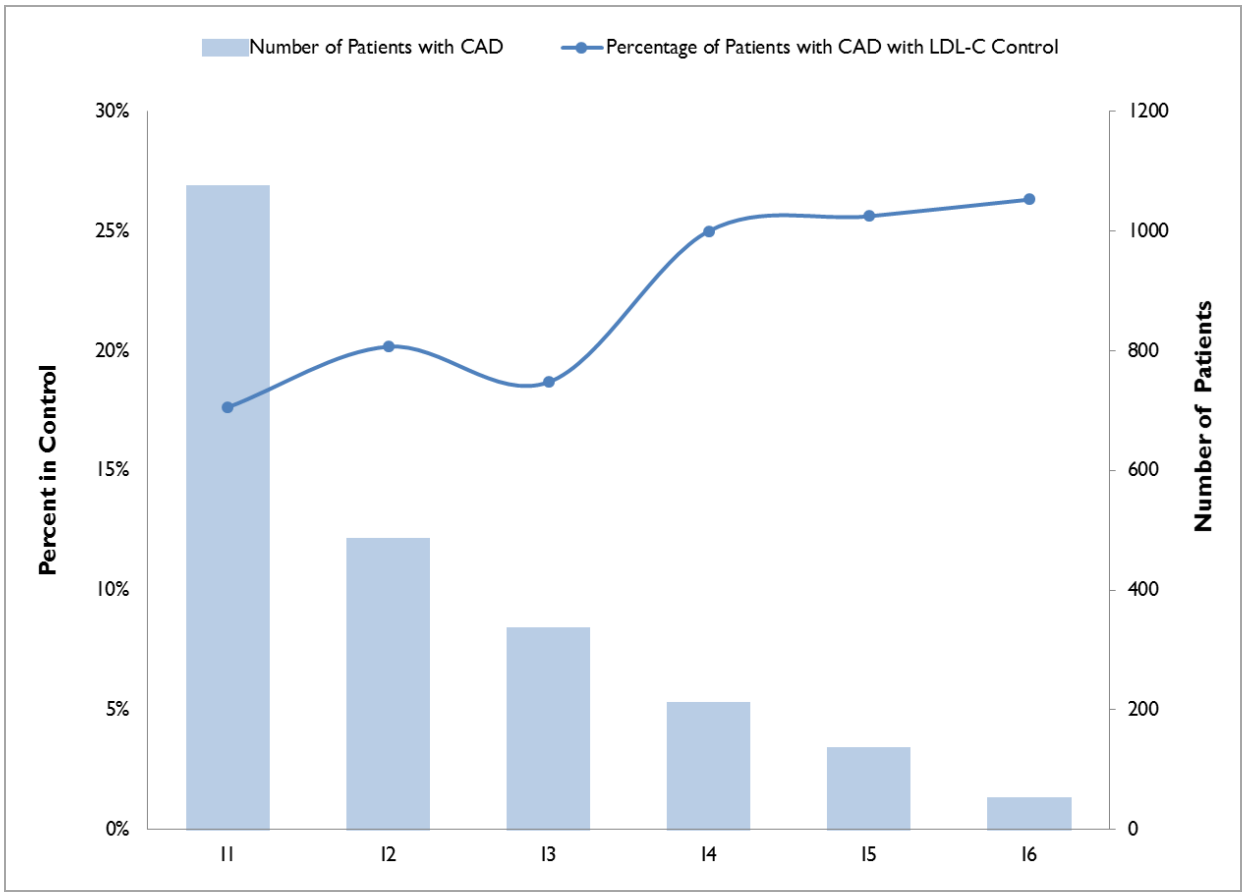
(continued)

Figure 12. Percentage of Patients with Diabetes with Poor HbA1c Control over Time (continued)

		I1	I2	I3	I4	I5	I6	I7
●	Percentage of patients with diabetes with poor HbA1c control	4.0	2.8	3.7	3.4	3.2	4.0	6.9
	Number of patients with diabetes	4,568	2,637	2,479	2,196	1,817	964	420

Figure 13 displays the percentage of SSM CAD patients' low-density lipoprotein (LDL) cholesterol control by intervention quarter. LDL-C control appears to increase in the latter three intervention quarters (I4-I6), rising 5-8 percent above the earlier IQs. We do not provide this measure for IQ7 because the sample was less than 20.

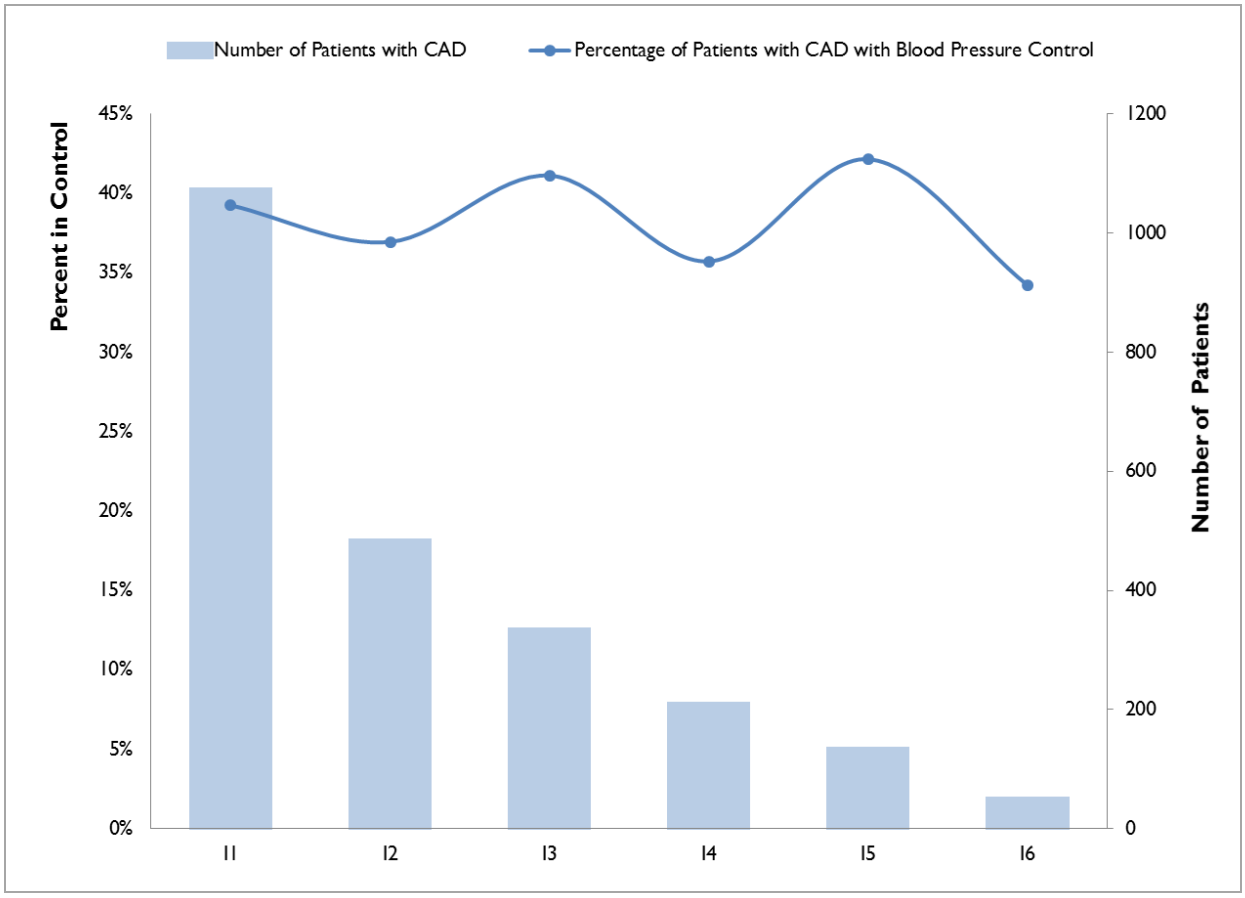
Figure 13. Percentage of Patients with CAD with LDL-C Control over Time



		I1	I2	I3	I4	I5	I6
●	Percentage of patients with CAD with LDL-C control	17.6	20.2	18.7	25.0	25.6	26.3
	Number of patients with CAD	1,060	471	321	196	121	38

Figure 14 provides the percentage of SSM CAD patients with blood pressure controlled (< 140/90 mm Hg) across intervention quarters. The control shows no identifiable trend with control oscillating between 34 percent and 42 percent over six intervention quarters.

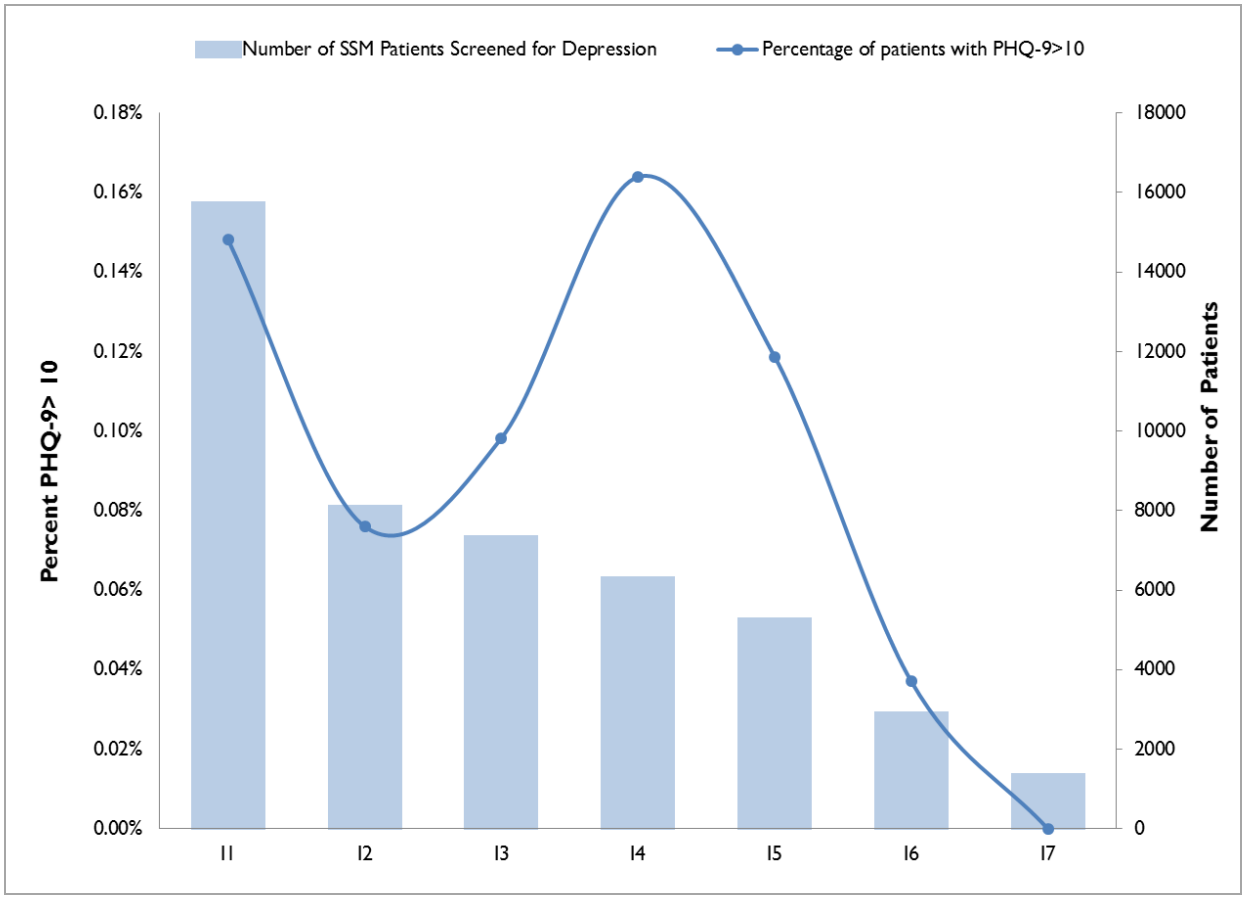
Figure 14. Percentage of Patients with CAD with Blood Pressure Control over Time



		I1	I2	I3	I4	I5	I6
●	Percentage of patients with CAD with blood pressure control	39.2	36.9	41.1	35.7	42.1	34.2
	Number of patients with CAD	1,060	471	321	196	121	38

Figure 15 displays the percentage of SSM patients over the course of the intervention quarters with depression with a depression screening score above 10, indicating a moderate level of depression. Based upon the data received through Q11, the low percentage (0.2%) of patients with a high depression screen value decline sharply over the latest three intervention quarters.

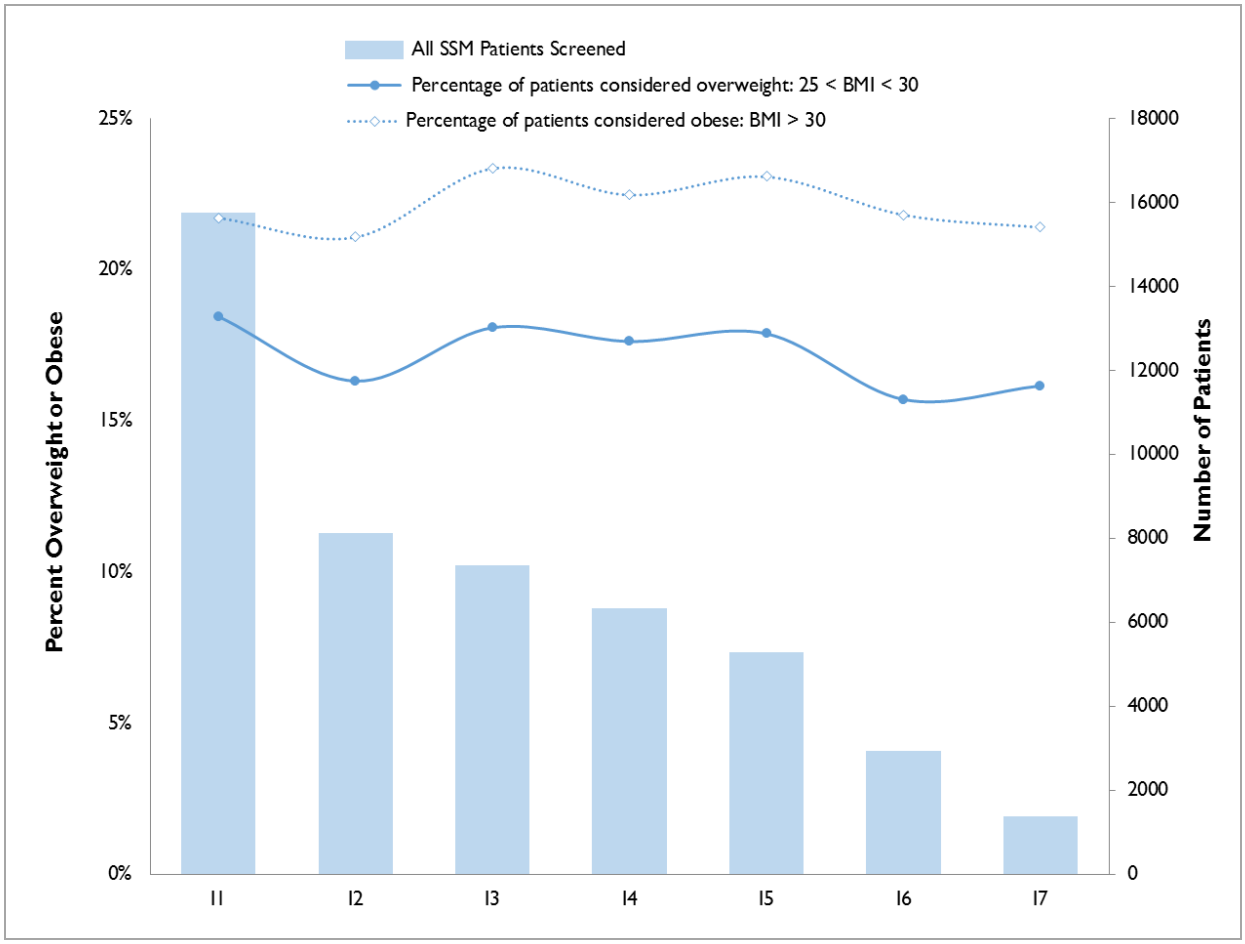
Figure 15. Percentage of Patients with Depression with PHQ-9 >10 Over Time



		I1	I2	I3	I4	I5	I6	I7
●	Percentage of patients with PHQ-9 >10	0.1	0.1	0.1	0.2	0.1	0.0	0.0
	Number of SSM patients screened for depression	15,531	7,896	7,124	6,100	5,056	2,700	1,145

Figure 16 shows the percentage of overweight and obese SSM patients as measured over the intervention quarters. While the proportion of obese patients after seven intervention quarters is essentially the same as it was after one intervention quarter, the percentage of overweight patients has decreased slightly over time.

Figure 16. Percentage of Patients Obese or Overweight over Time



		I1	I2	I3	I4	I5	I6	I7
●	Percentage of patients considered overweight: 25 < BMI < 30	18.4	16.3	18.1	17.6	17.9	15.7	16.2
◊	Percentage of patients considered obese: BMI > 30	21.7	21.1	23.4	22.5	23.1	21.8	21.4
	All SSM patients screened	15,531	7,896	7,124	6,100	5,056	2,700	1,145

Discussion of Other Awardee-Specific Findings

As noted above, RTI is reporting on all measures of interest for which we received data through Q11. Some measures discussed here appear significantly changed from the Q5 report. After discussion with Intermountain, RTI now understands that Intermountain modified how a patient's condition was determined to be poorly controlled, and these changes applied to HbA1c for diabetes patients, high blood pressure, depression status, and obesity status. Intermountain believes that the prior methodology was overestimating these measures because it often relied on historical data that no longer reflected current conditions.

Given the very low numbers of IndiGO patients, however, we do not report measures for this population. As discussed above, chronic disease management is not the main focus of the SSM

component of the innovation. In addition, these measures are assessed only during clinic visits for patients. Given the variance in the type of measures, it may not be clinically appropriate to assess these measures at every patient visit. Nonetheless, for the SSM patients, several measures exhibit trends across the intervention quarters, some positive, others negative. The proportion of SSM patients with LDL-C control increased, and the number of patients with PHQ9> 10 declined—both positive trends. In contrast, the number of SSM patients with poor HbA1c increased, which is a negative trend. The SSM overweight population has shown a positive trend declining by 10 percent (relatively) over the course of the intervention. While obesity in the SSM patients is essentially unchanged, at 21-23 percent, that proportion is far below the U.S. adult national average: "more than one-third (34.9% or 78.6 million) of U.S. adults are obese".[5]

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing Intermountain as well as accomplishments to date. In this section we assess Intermountain's progress on achieving HCIA goals to date:

- **Smarter spending.** The probability of savings is high for Cohorts 1 (IndiGO and SSM) and 2 (IndiGO only). The probability of loss is high for Cohort 3 (SSM only). Spending decreased in the post-intervention quarters for Cohort 4, but we cannot evaluate the significance of this change without a comparison group.

- **Better care.** There are no consistent trends in ED visits r Cohorts 1 (IndiGO and SSM) and 2 (IndiGO only). Hospital admissions significantly decline in Cohort 2. Post-intervention trends generally show a greater likelihood of hospital admission and ED visits over time for Cohort 3 (SSM only). In addition, although the percentage of patients in an SSM practice on antidepressant medication increased over time, the majority of measures remained stable or decreased slightly.

- **Healthier people**. Two outcome measures trended in a positive direction for SSM patients. About 18 percent of cardiovascular patients maintained lipid control in their initial intervention quarter, but nearly 26 percent had control by IQs 5/6. We observe a similarly positive direction for obesity: 18.4 percent of patients were reported as obese in IQ1, dropping to below 16 percent for IQs 6/7.

Intermountain cited three lessons learned from project implementation: Significant upfront resources are needed; more time is needed to measure the impact of the intervention; and the clinical benefits also require more time to determine their impact on utilization. While integrating the award into existing organizational infrastructure benefits sustainability, it also impacted execution and slowed spending. Limited IT and other resources needed to support the innovation at Intermountain were dedicated to other, competing initiatives (Meaningful Use, medical home, EHR implementation), which delayed implementation of intervention components.

Additionally, based upon the innovation components, such as the IndiGO tool and population management, more time is needed to fully determine the long-term impact of cost savings and improved

[5] Ogden, C. L, Carroll, M. D., Kit, B.K., and Flegal, K. M.: Prevalence of Childhood and Adult Obesity in the United States, 2011-2012. JAMA, 311(8):806-814. 2014. doi:10.1001/jama.2014.732.

outcomes among the targeted chronic disease patients. Expanding the capacity of the Community Care Management and Comprehensive Care Clinic programs will allow more patients to be identified via hot spotting to receive targeted services and potentially control high utilization.

In the next annual report, we aim to explore the net savings/loss across innovation components. Current spending trends suggest an overall net increase in spending, mostly stemming from the large number of Medicare beneficiaries enrolled in the SSM Cohort 3. Cost trends may continue to be higher for this cohort, and therefore for the entire intervention. Should data be available, we will more fully analyze and compare utilization across intervention and treatment groups to help explain any differences in cost.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Mary's Center for Maternal and Child Care

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

Mary's Center for Maternal and Child Care (Mary's Center)

1.1 Introduction

Mary's Center for Maternal and Child Care (Mary's Center) is a federally qualified health center (FQHC) in Washington, DC, that provides health care, social services, and family literacy programs, and is the fiduciary agent (awarded $14,991,005, began enrolling in February 2013) to establish the Capital Clinical Integrated Network (CCIN). CCIN is a new entity with 501(c)(3) status that uses community health workers (CHWs) and a combination of high-touch and high-tech strategies to improve access to and coordination of primary care, primarily for Medicaid beneficiaries. We refer to the awardee as CCIN throughout this report. CCIN's innovation seeks to achieve the following HCIA goals.

1. **Smarter spending.** Reduce spending related to hospitalization, ED use, prescription drug use, primary care visits, and specialty visits by $17,712,000.
2. **Better care.** Increase patient enrollment in primary care with timely, coordinated access to relevant health care information.
3. **Healthier people.** Improve control of asthma through appropriate medication use and reduce blood pressure below 140/90 mm Hg in patients with hypertension.

Table 2 provides a summary of changes that occurred with CCIN during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data submitted by CCIN through March 31, 2015; and key informant interviews with CCIN leaders and staff conducted February 25 and 26, 2015.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	George Washington University (GWU) School of Medicine joined the innovation team as a new partner. CHWs continue to visit high-utilization patients to improve health behaviors and reduce utilization and cost, but the shared savings model has not been implemented.
Program Participant Characteristics	Majority of participants (66.4%) were from 25 to 64 years of age. More than half (61.1%) were female. Among those with data for race/ethnicity and payer category, most were black and were covered by Medicaid (i.e., 82.8% and 81.1%, respectively).
Implementation Process	
Execution	Spending rates for Year 3 budget are 38.15% below projection.
Leadership	No change since the first annual report.[1] CCIN maintained its internal leadership. Because CCIN was created as a separate entity, specifically for this innovation, leadership buy-in remains high.
Organizational capacity	CCIN received 501(c)(3) status. The CPC-HIE received accreditation by the Electronic Healthcare Network Accreditation Commission
Innovation adoption and workflow	The CPC-HIE has gone live, connecting the original five clinics and Providence Hospital.

(continued)

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Workforce Development	
Hiring/retention	Retention rate was 88.10% resulting from five separations since the first annual report.
Training	165 trainees; 1,980 training hours.
Implementation Effectiveness	
Reach	16.5% of the target population (2,857) was enrolled.
	Of the 593 providers reported to have access to the HIE through Q11, 96 used the HIE in some way to assist with patient care.
Dose	Participants received more phone calls through Q11 than through Q8, on average (as reported in the first annual report): 7.5 versus 6.5 calls per patient. Ninety-three percent of participants completed a care plan with a CHW as of Q11.

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by CCIN.
Key informant interviews conducted Feb–June 2015.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

CCIN = Capital Clinical Integrated Network; CHW = community health worker; CPC-HIE = Capital Partners in Care–Health Information Exchange; HIE = health information exchange.

1.1.1 Innovation Components

This innovation consists of three components first described in RTI's first annual report (2014).[1] In the first component, trained CHWs facilitate behavior changes among high ED utilizers with one or more chronic diseases in the greater Washington, DC, area through a series of home visits. The CHW provides health education, creates a care plan, and helps participants set goals, manage medications, and coordinate services. CCIN also utilized and customized SyntraNet, its care management technology platform, to support this component. SyntraNet captures CHW report information and allows CCIN to manage CHW staff and track patient progress toward achieving care plan goals in addition to supporting analysis of claims data.

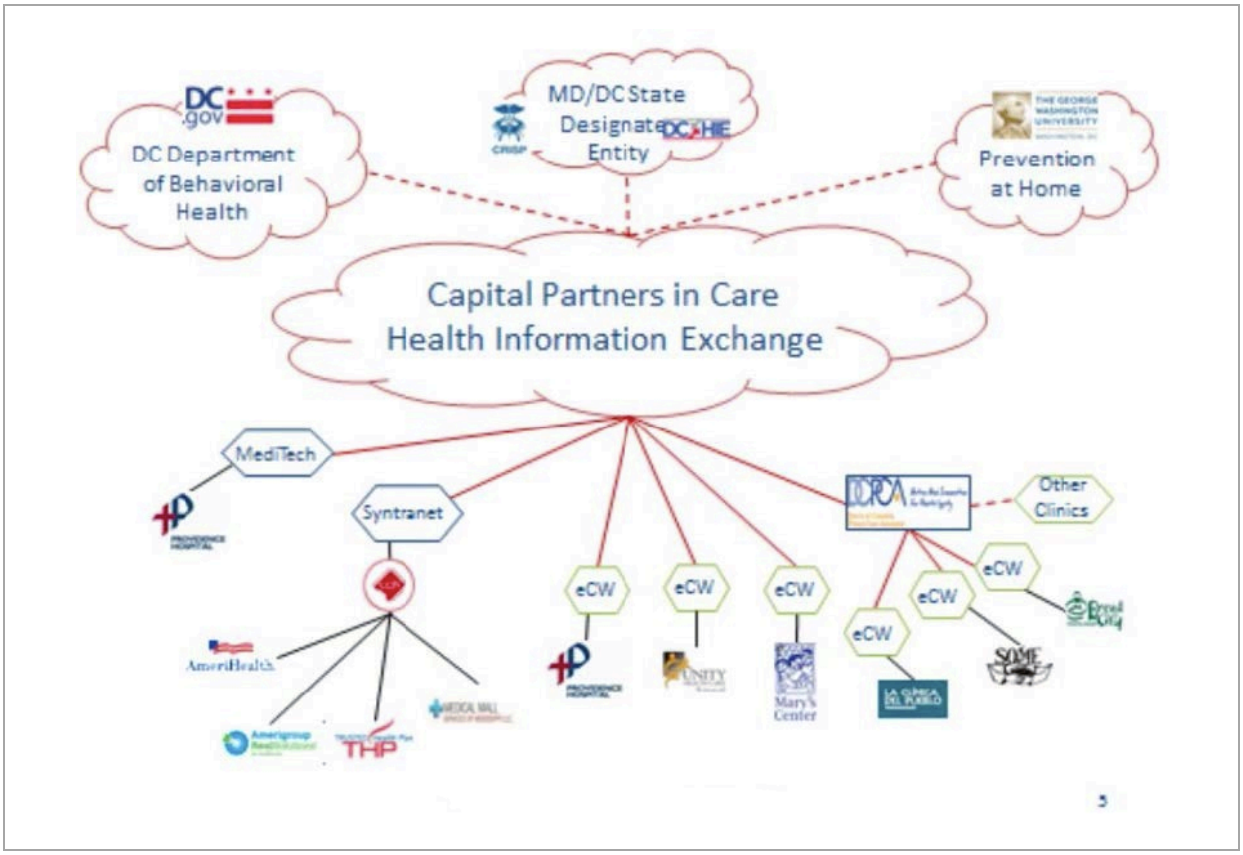
The second component, CPC–HIE (Capital Partners in Care–Health Information Exchange, developed by CCIN), connects the electronic health records (EHRs) of subscribing clinics and hospitals. The HIE provides a single login Web portal to access participant health information. ***Figure 1***, updated by CCIN in February 2015, illustrates the vision for the CPC system. Since the first annual report, the CPC–HIE connected the initial five subscribing clinics and Providence Hospital's ambulatory care clinic,

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

outpatient hospital services, and laboratory and radiology departments to the HIE. SyntraNet is also connected to CPC–HIE.

The third component, a shared savings model intended to sustain the innovation after the funding period ends, has not been implemented. After deducting the cost of the grant, cost savings would be divided 50/50 between the payer and providers based on quality and savings benchmarks. Savings would derive from reduced ED utilization as a result of care coordination provided by CHWs. This model and the Mary's Center HCIA grant application were developed with input from local managed care organizations (MCOs) operating in Washington, DC, which were committed to participating in the project. Medicaid terminated contracts with these MCOs at the start of the project period and instead contracted with different MCOs. Despite ongoing effort, little progress has been made since the first annual report in engaging the current MCOs.

Figure 1. Capital Partners in Care Vision



Source: CCIN Health Information Technology Team, Site Visit February 2015.

CCIN has numerous partners and three new partners have joined the innovation, as shown in ***Table 3***. George Washington University (GWU) School of Medicine joined the innovation team. GWU is an HCIA round two awardee. GWU will coordinate care for HIV+ individuals living in Washington, DC. CCIN will work with GWU to build on and enhance the technology and workforce infrastructure

established by CCIN for GWU's innovation. Medical Mall, a transition-of-care service, joined the innovation as a source of patient referrals to CCIN for care coordination services.

Table 3. HCIA Partners, Roles, and Location

Partner Name	Role in HCIA Project	Location
Thrasys, Inc.	Health information technology vendor	San Francisco, CA
Mary's Center for Maternal and Child Care	Fiduciary agent, medical provider, and HUB partner that helped create and is a close partner to CCIN	Washington, DC
District of Columbia Department of Health Care Finance	District Medicaid/Medicare agency/claims data provider	Washington, DC
Unity Health Care	Partner medical provider, HUB partner	Washington, DC
AmeriHealth DC	District Medicaid MCO, HUB partner	Washington, DC
Trusted Health Plan	District Medicaid MCO, HUB partner	Washington, DC
La Clinica del Pueblo	Care partner, partner on the technology committee	Washington, DC
So Others Might Eat	Care partner, partner on the technology committee	Washington, DC
Bread for the City	Care partner, partner on the technology committee	Washington, DC
Providence Hospital and Physician Enterprise	Care partner, partner on the technology committee	Washington, DC
DC Primary Care Association	HUB implementation and governance	Washington, DC
Street Calls	Transportation partner	Washington, DC
MTM, Inc.	Transportation partner	Washington, DC
Battle's Transportation	Transportation partner	Washington, DC
George Washington University School of Medicine, Department of Research and Evaluation (new)	New HCIA round two awardee works with CCIN to enhance technology and workforce infrastructure	Washington, DC
Medical Mall (new)	Transition of care service	Washington, DC
Sirona (new)	Nurse triage phone service	Portland, ME

CCIN = Capital Clinical Integrated Network; MCO = managed care organization.

1.1.2 Program Participant Characteristics

Table 4 provides the demographic characteristics of all participants ever enrolled in the innovation. We first reported patient demographic characteristics in the first annual report, based on data through Q8. The distribution of patient characteristics is similar to that in the first annual report. More specifically, at enrollment, a majority of participants (66.4%) were between 25 and 64 years of age and more than half (61.1%) were female. Race/ethnicity was missing for more than half of participants (55.2%), but for those with data, most (82.8%) were black. Among those with data for the payer category, most (81.1%) were covered by Medicaid.

Table 4. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Number of Participants	Percentage of Participants
Total	2,857	100.0
Age		
< 18	569	19.9
18–24	168	5.9
25–44	714	25.0
45–64	1,182	41.4
65–74	142	5.0
75–84	42	1.5
85+	24	0.8
Missing	16	0.5
Sex		
Female	1,746	61.1
Male	1,075	37.6
Missing	36	1.3
Race/ethnicity		
White	7	0.2
Black	1,060	37.2
Hispanic	189	6.6
Asian	0	0.0
American Indian or Alaska Native	7	0.2
Native Hawaiian or Other Pacific Islander	0	0.0
Race/ethnicity (continued)		
Other	17	0.6
Missing/refused	1,577	55.2
Payer Category		
Dual	0	0.0
Medicaid	2,262	79.2
Medicare	56	2.0
Medicare Advantage	0	0.0
Other	0	0.0
Uninsured	0	0.0
Missing	539	18.8

Source: Patient-level data provided to RTI by Capital Clinical Integrated Network.

1.2 Implementation Progress

The first annual report (2014) described CCIN's implementation process, workforce development, and progress toward effectiveness, and detailed the quantifiable measures to assess each area. ***Table 5*** lists these measures and their status as of May 31, 2015. The results of analyses for most of these measures are included in this annual report. We anticipated reporting the rate of technology use. However, we were unable to determine an appropriate denominator for this measure based on the data available from the awardee. This section presents CCIN's process measures and a qualitative analysis of the factors that determined CCIN's implementation progress. This analysis draws on patient-level data

provided to RTI by CCIN as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 5. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation process	Care coordination	Rate of technology use (blood pressure/glucometer devices)	Dropped; data unavailable
	Patient characteristics	Primary diagnosis (asthma, diabetes, hypertension, or none of these conditions)	Data received from CCIN
	Workflow Integration	HCIA Provider Survey	Collected by RTI
	Provider satisfaction	HCIA Provider Survey	Collected by RTI
Implementation effectiveness	Reach	Number/percentage of people recruited who were enrolled	Data received from CCIN
		Percentage of providers using HIE for patient care	Data received from CCIN
	Dose	Number of care plans completed by participants	Data received from CCIN
		Number and types of CHW contacts per participant	Data received from CCIN

CCIN = Capital Clinical Integrated Network; CHW = community health worker; HIE = health information exchange.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through CCIN's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include CCIN's reports from Q8 through Q10 and interviews conducted February 25 and 26, 2015.

Evaluation Questions

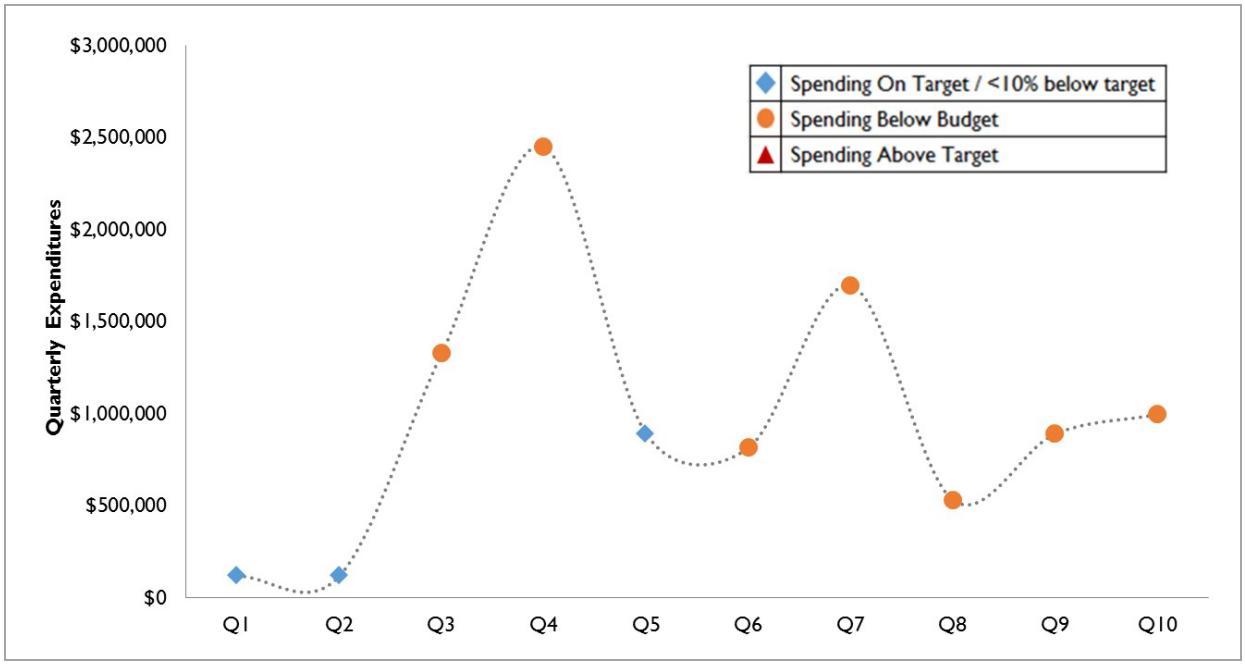
- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?
- How has implementation of the innovation impacted provider workflow?
- How has implementation of the innovation impacted provider satisfaction?

Execution of Implementation

The annual report highlights the significance of CCIN's expenditure rates on implementation. As of December 2014 (Q10), CCIN spent 38.15 percent of its Year 3 budget, which is below the projected target (see ***Figure 2***). Spending for Year 3 is below projection because of a lower number of staff members than expected. However, CCIN is fully staffed to meet the current number of clients and referrals.

The CPC–HIE has gone live connecting five clinics and Providence Hospital. CCIN is expanding the HIE to other clinics in Washington, DC, and Maryland's Chesapeake Regional Information System (CRISP) HIE.

Figure 2. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Leadership

CCIN is a newly formed entity with 501(c)(3) status created with HCIA funds awarded to Mary's Center for this innovation. Therefore, CCIN leadership has no competing priorities and dedicates all efforts to successfully implementing and sustaining the innovation.

CCIN leadership established a participatory approach to HIE governance. A governance body representing CCIN, the DC Primary Care Association (DCPCA), and subscribing organizations meets weekly to discuss implementation and policy issues for HIE operation. The goal of the weekly meeting is to ensure that each organization subscribing to the HIE has input into implementation and operations. CCIN aims to ensure that all concerns of the subscribing clinics and hospitals are addressed and, in doing so, facilitate the adoption of the HIE by the providers at these clinics and hospitals. CPC-HIE differs from previous attempts to establish an HIE in DC. The majority of participating providers use eClinicalWorks as their EHR, which reduced technical challenges to integrating numerous sources of health data. This more manageable, lower cost build enabled CCIN to demonstrate the benefit of participation to local providers and increase their enthusiasm for and acceptance of HIE.

CCIN leaders recognized an opportunity to obtain additional financial support for the CPC-HIE by adding GWU as a partner. CPC-HIE is an essential component of GWU's HCIA round two initiative. This partnership improves the sustainability of the HIE component, although it is not expected to affect the other components of CCIN's innovation.

CCIN continued to work with the DC Department of Health Care Finance (DHCF) to engage the DC MCOs in the shared savings model this year but was unable to achieve significant progress. The challenge, according to CCIN, is that there is no incentive for the MCOs to work with CCIN because (1) the MCOs already receive a care management fee and (2) the risk of joining the innovation outweighs the benefit (the shared savings) that might be achieved. As newly contracted MCOs, being part of a project that might not succeed could have a detrimental effect on perceptions of their capability to manage care and possibly on contract renewal.

Organizational Capacity

During innovation design, CCIN worked with both DC managed care organizations (MCOs) who agreed to participate in the shared savings component and provide CCIN with lists of high-cost clients to receive additional care management from CHWs. As discussed in the first annual report (2014), after grant award, the existing MCO contracts were dissolved and new contracts with different MCOs were executed. This situation became an intractable political issue; despite repeated attempts, CCIN had little success working with DHCF to engage these MCOs and obtain patient lists. As a result, recruitment of participants is much lower than planned. The yield from other avenues for recruitment, such as door-to-door efforts and clinic referrals, was not sufficient to reach CCIN's original projections. CCIN has the capacity to provide care coordination for a number of additional participants, but enrolling participants into the program is a major ongoing challenge.

CCIN's perspective is that this issue could be easily resolved by a directive from CMS instructing the MCOs to participate. In the absence of such a directive, DHCF and the MCOs view it as voluntary participation in an experiment that has more negative potential than positive. Potential shared savings are seen as time delayed and might not materialize. The greater the savings through cost reduction, the greater the likelihood these new-to-market MCOs will appear ineffective by comparison, which might jeopardize their ability to secure future contracts. From their perspective, Medicaid should develop a sustainable way to pay for care coordination sustainability rather than endorse CCIN's approach and then seek a sustainable funding mechanism.

The CCIN information technology (IT) staff has successfully established the CPC–HIE. This system connects participating clinics and hospitals to the care management database (SyntraNet) with a single login screen. As of Q10, CCIN received accreditation by the Electronic Healthcare Network Accreditation Commission (EHNAC). The EHNAC is a voluntary self-governing organization established to develop standard criteria and accredit organizations that electronically exchange health care data. The HIE is considered to be the most sustainable piece of the intervention because of its value to participating organizations as a long-term asset and the minimal change in workflow using a single login screen. As of February 2015, the system has connected Providence Hospital, Unity Health Care, Mary's Center, La Clinica del Pueblo, So Others Might Eat, and Bread for the City.

Innovation Adoption and Workflow Integration

The CPC–HIE was successfully implemented and adopted by subscribing clinics and hospitals. CCIN is now moving toward expanding the HIE to other clinics and hospitals in DC as well as connecting to Maryland's CRISP HIE. CCIN worked with eClincalWorks, an EHR provider for many of the subscribing clinics, to develop a single login in screen for the CPC–HIE. The single login screen has been key to successful implementation, and has substantially reduced changes in workflow needed to implement the HIE. This facilitated adoption and buy-in from providers using the HIE and increased interoperability among the existing EHRs and the HIE.

During our site visit in February 2015, we spoke with representatives of three provider partners in the innovation. Two noted that initial time lags between patients receiving CHW assistance and providers receiving feedback about the event had closed. This change is likely the result of additional training and assistance provided by CHWs IIs to improve the timeliness of SyntraNet recordkeeping. Two reported that the innovation simplified workflow. One noted that access to information was "easy; just open another section of the EMR." These observations confirm the value provided by the CPC-HIE with integrated SyntraNet case management information. The innovation features few on-site CHWs and little CHW interaction with providers. CCIN recently tested an on-site approach with positive results. One provider representative reported that having an on-site CHW was particularly helpful at small clinics because "it reminds clinicians that this new valuable resources exists." Another representative noted the challenge of trying to add resources without additionally complicating an already complex system: "The idea of having a member of the care team who can help address these challenges is great. But physically removing CHWs from where you are working creates new communication barriers. Lack of a "warm hand-off" is a big problem." One member of the CCIN leadership team conceded that the lack of on-site CHWs "might not have been the best approach."

Provider Perceptions of Clinical Workflow and Satisfaction

Data on workflow integration and provider satisfaction with the innovation came from the RTI HCIA Provider Survey administered in spring 2015. Forty-nine (39%) of Mary's Center's eligible providers responded to the HCIA Provider Survey. The majority of responding providers were physicians (61.2%) and almost a fifth (18.4%) were registered nurse practitioners (RNPs). Responding providers had been in practice an average of 9.1 years. Over half (51.0%) of providers were in family medicine, while 16.3 percent were in pediatrics and 14.3 percent were in internal medicine. Almost all providers (85.7%) worked in a federally qualified health center (FQHC). The full set of survey questions and answers summarized by awardee is available in ***Appendix C.***

For most items regarding integrating CCIN into clinical workflow, the majority of Mary's Center providers indicated that the innovation resulted in no change in time spent on practice activities, such as providing direct patient care (65.3%), communicating with patients by phone or email (55.1%), arranging social service referrals (57.1%), engaging in other care coordination activities (55.1%), and meeting with or consulting with internal (65.3%) or external clinicians (59.2%) (***Table 6***).

Table 6. Summary of Clinical Care Workflow

Question	Percentage of Mary's Center Providers Indicating More Time	Percentage of Mary's Center Providers Indicating Less Time	Percentage of Mary's Center Providers Indicating No Change	Percentage of Mary's Center Providers Indicating Not Applicable/ Missing
Providing direct patient care	8.2% N=4	4.1% N=2	65.3% N=32	22.4% N=11
Communicating with patients by phone, email	12.2% N=6	8.2% N=4	55.1% N=27	24.5% N=12
Looking up patient information in EMRs or other health information systems	14.3% N=7	14.3% N=7	49.0% N=24	22.4% N=11
Looking up patient information in paper-based medical charts	0.0% N=0	10.2% N=5	36.7% N=18	53.1% N=26
Arranging clinical referrals and follow-up for patients	4.1% N=2	18.4% N=9	53.1% N=26	24.5% N=12
Arranging social service referrals for patients	4.1% N=2	12.2% N=6	57.1% N=28	26.5% N=13
Meeting with staff and clinicians in my practice	4.1% N=2	0.0% N=0	65.3% N=32	30.6% N=15
Consulting with clinicians outside of my practice	4.1% N=2	10.2% N=5	59.2% N=29	26.5% N=13
Engaging in other care coordination activities	4.1% N=2	10.2% N=5	55.1% N=27	30.6% N=15
Reviewing data on clinic practice population to identify individuals needing additional services	10.2% N=5	6.1% N=3	46.9% N=23	36.7% N=18
Planning practice-based (or community-based) interventions to address issues common to my practice population	6.1% N=3	2.0% N=1	53.1% N=26	38.8% N=19

EMRs = electronic medical records.

Regarding provider satisfaction, overall we found that the majority of providers were either moderately satisfied (46.9%) or very satisfied (22.5%) with CCIN—only 6.1 percent of providers indicated that they were not at all satisfied with the innovation. Regarding ease of use, over a quarter (28.6%) found the innovation neither easy nor hard to use, slightly more (34.7%) found it somewhat easy to use, and 14.3 percent found it somewhat hard to use. Only 10.2 percent of providers found CCIN very easy to use, and 2.0 percent found it very hard to use.

For the specific questions regarding provider satisfaction with CCIN, although provider responses varied, almost 40 percent indicated they strongly or somewhat agreed sufficient resources were provided to use/interact with the innovation, over 65 percent indicated they strongly or somewhat agreed that

investing in the innovation was worthwhile, and almost 45 percent strongly or somewhat agreed their practice functions more efficiently with CCIN (***Table 7***). In addition, 45 percent neither agreed nor disagreed that the innovation produced financial benefits and almost 41 percent neither agreed nor disagreed that the added logistics required by the innovation were a burden.

Table 7. Summary of Provider Satisfaction Measures

Question	Percentage of Mary's Center Providers Indicating Strongly Agree/ Somewhat Agree	Percentage of Mary's Center Providers Indicating Strongly Disagree/ Somewhat Disagree	Percentage of Mary's Center Providers Indicating Neither Agree nor Disagree	Percentage of Mary's Center Providers Indicating Not Applicable/ Missing
Sufficient resources (e.g., support staff, time, training) have been provided for me to use/interact the innovation.	38.8 N=19	30.6 N=15	24.5 N=12	6.1 N=3
Innovation produces financial benefits for my clinic or practice.	20.4 N=10	10.2 N=5	44.9 N=22	24.5 N=12
Investing In the innovation Is worthwhile In terms of time, energy, and resources.	65.3 N=32	8.2 N=4	16.3 N=8	10.2 N=5
Sufficient technical it support is available to operate the innovation.	24.5 N=12	26.5 N=13	26.5 N=13	22.4 N=11
Overall, my practice functions more efficiently with the innovation.	44.9 N=22	8.2 N=4	36.7 N=18	10.2 N=5
Innovation saves me time.	30.6 N=15	16.3 N=8	36.7 N=18	16.3 N=8
The added logistics required by the innovation is a burden on me and/or my staff	12.2 N=6	36.7 N=18	40.8 N=20	10.2 N=5

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with 33.3 full-time equivalent (FTE) staff members. Since the first annual report, CCIN has been able to retain the majority of its staff. CCIN hired an additional IT staff member with a background in health informatics to fill the position of implementation specialist. CCIN conducted a staff satisfaction survey that prompted the creation of a new position, CHW II, which allows CCIN to take better advantage of available skills and promote staff when appropriate. CHW IIs mentor and review visit records with CHWs, interview CHW candidates, and contribute to hiring decisions. CHW IIs also lead CHW meetings and act as liaisons between the administrative staff and the CHWs to better understand the needs and concerns of the CHWs.

Five separations occurred during Q10. One interviewee said, "We've learned the characteristics of successful CHWs; we've learned how to interview and hire them. Selecting people with managing experience didn't work." Since the first annual report, retention of CHWs improved. CCIN reassessed its CHW hiring process by identifying successful qualities of existing staff. Successful CHWs are "self-starters, gregarious, [and] not shy in a hospital setting." After adopting a new approach that attracts candidates with these qualities and includes input from CHW IIs and nurse supervisors, CCIN improved the quality and retention of the CHWs. After this new method was introduced, no issues with retention of CHW staff occurred. However, as the funding period ended, staff retention was expected to drop. CCIN is discussing incentive strategies with the board of directors for retaining key employees during the final months of the funding period.

Skills, Knowledge, and Training

Between Q8 and Q10, CCIN provided 1,980 hours of training to 165 individuals. Since the first annual report, CHW training was offered, including training on the SyntraNet care coordination system and health education topics. The focus of the training was to orient newly hired CHW supervisors and CHWs to SyntraNet, the innovation, recruitment strategies, and their responsibilities. CCIN views training as key to staff retention and satisfaction. The success of this approach is confirmed by one CCIN leader, who noted, "The cohort hired 9 months to a year ago was entirely successful."

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach) and; (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

- What is the implementation effectiveness, including reach and dose of the innovation thus far?

Reach

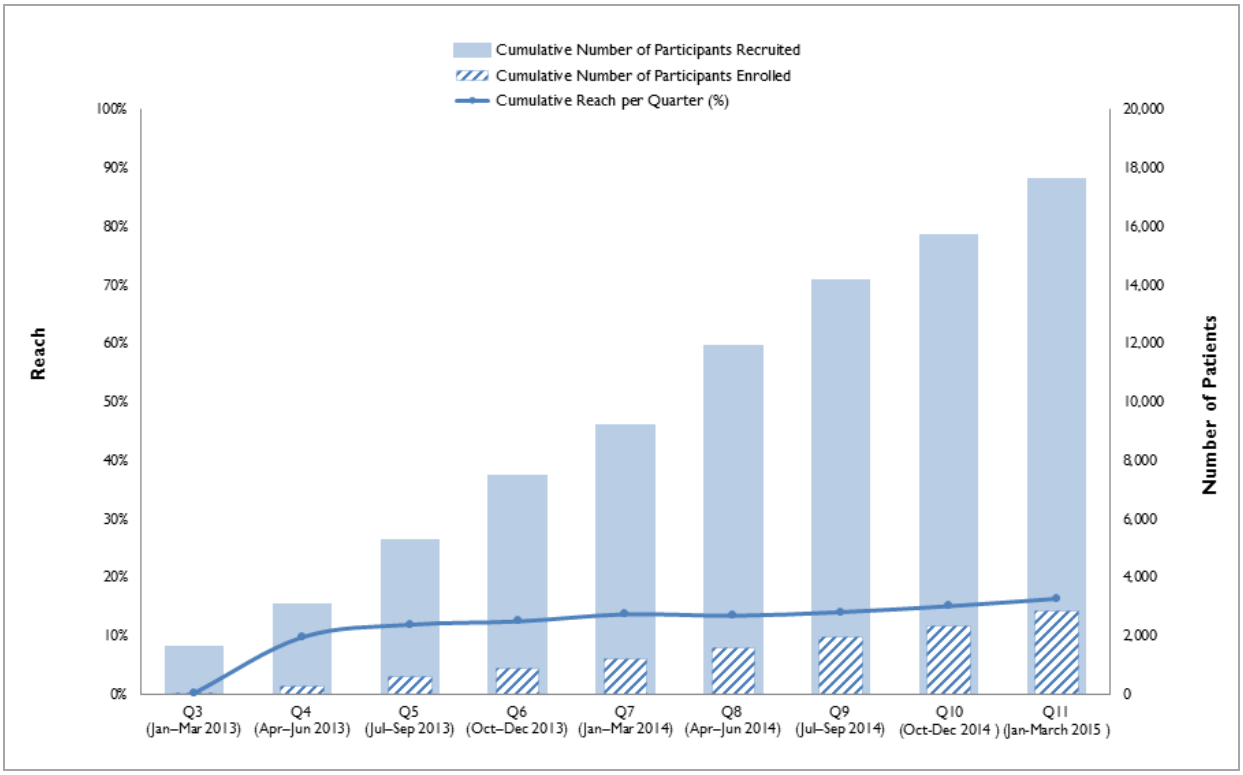
Participant recruitment continues to be challenging. The new partnership with Medical Mall increased the number of participants recruited through "warm handoffs" from provider directly to CHW. AmeriHealth will also provide deidentified patient data of high-cost clients who are eligible for CCIN services, potentially expanding the source of recruits and grow the target population.

Figure 3 shows reach by quarter since the launch of the innovation. Reach was first reported in the first annual report, based on data through Q8. Since that time, CCIN enrolled an additional 667 patients in the innovation, increasing reach from 13.5 percent to 16.5 percent.

As noted in previous reports, the number of participants reported in the *Quarterly Awardee Performance Reports* differs from the number of participants reported in the RTI quarterly and annual reports. CCIN considers all clients and recipients to be indirect participants, so all of those enrolled in the program, as well as those indirectly affected by the innovation, are included in the total number. RTI reports only clients who officially enrolled in the program.

CCIN continues to struggle reaching (enrolling) patients from the target population. However, incremental progress was made since the first annual report because of CHW recruitment efforts, a partnership with Medical Mall, and the acquisition of deidentified data from the AmeriHealth MCO.

Figure 3. Participant Enrollment and Reach for Each Quarter since Project Launch



(continued)

Figure 3. Participant Enrollment and Reach for Each Quarter since Project Launch (continued)

Quarter	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct-Dec 2014)	Q11 (Jan-March 2015)
Cumulative reach per quarter (%)	0.2	9.8	12.0	12.6	13.8	13.5	14.2	15.2	16.5
Cumulative number of participants recruited	1,375	2,850	5,013	7,250	8,954	11,666	13,914	15,447	17,362
Cumulative number of participants enrolled	3	280	601	910	1,234	1,577	1,969	2,345	2,857

Source: Patient-level data provided to RTI by Capital Clinical Integrated Network.

Table 8 provides the reach for the HIE component of the innovation. We received data for Q9 and Q11, but not for Q10. Out of 593 providers reported to have access to the HIE through Q11, 96 providers used the HIE in some way to assist with patient care.

Table 8. Provider Reach by Quarter since Launch of the CPC–HIE

Quarter	Number of Providers with Access to HIE	Number of New Providers Utilizing HIE (Any Contact)	Number of Cumulative Providers Utilizing HIE (Any Contact)	Cumulative Reach per Quarter (%)
Q9 (Jul–Sep 2014)	486	31	31	6.4
Q10 (Oct–Dec 2014)	—	—	—	—
Q11 (Jan–Mar 2015)	577	61	89	10.6
Total through Q11	577	89	89	15.4

Source: Data provided to RTI.
— Data not available.

Dose

Table 9 shows the number of services provided across participants, the number of participants receiving services, and the average number of services per participant through Q11. We first reported dose for phone calls answered in the first annual report based on data through Q8. On average among all enrolled patients, nearly eight phone calls were made as of Q11, up from about seven in Q8. Half of patients had a care plan completed.

Table 9. Number and Types of Services Provided to Participants

Services	Number of Services Provided	Number (Percentage) of Participants Receiving Service	Average Number of Services
Care plan completed	2,662	2,226 (93.2)	1.0
Phone calls completed	20,645	2,751 (96.3)	7.2

Source: Patient-level data provided to RTI by Capital Clinical Integrated Network.

Table 10 shows that the HIE was used 1,320 times since going online during Q9. As noted above, of the 577 providers granted access to the system, 89 providers used the HIE at least once for patient lookups (n=1,316), and e-mail sent (n=2) and received (n=2).

Table 10. Number and Types of Services Provided to Providers as Part of the CPC HIE

Service	Number of Services	Number (Percentage) of Providers Utilizing Service
Referrals incoming	0	0(0)
Referrals outgoing	0	0(0)
Patient lookup count	1316	88 (15.3)
eMessages received	2	2(0.0)
eMessages sent	2	2(0.0)

Sustainability

The shared savings model instrumental to sustainability of the innovation has not been implemented. CCIN is exploring alternate strategies for sustainability following the end of the HCIA funding. These strategies include establishing contracts with Amerigroup Maryland and other MCOs to provide care coordination services, a contract to work with Medical Mall Health Services to provide care coordination services, a partnership with GWU for the Prevention at Home Project and working with the (DHCF) to advocate for reimbursements amendments within the State Plan Amendments for telehealth and encounters by other health care workers such as registered nurses and CHWs. Since CCIN received 501(c)(3) nonprofit status, plans to apply for other private and public funding sources are also under way; however, no specific details about these plans were made available.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of CCIN's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data CCIN collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures that RTI considers essential to the evaluation of CCIN's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, RTI will incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 11 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of whether the payer-specific data are presented in this annual report.

Table 11. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	No	No
		Hospital unplanned readmissions rate	No	No
		ED visit rate	No	Yes
	Cost	Spending per patient	No	Yes
		Estimated cost savings	No	No

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient and ED visit rates. We were unable to calculate inpatient admission or readmission rates due to limitations in the claims data, as described below. These measures will be calculated in future reports if the appropriate data is obtained. These measures are described in more detail in ***Appendix B.1***.

At this time, the Centers for Medicare & Medicaid Services Alpha-MAX data files are not available in the period after the innovation was launched. However, we were able to analyze Medicaid fee-for-service and managed care claims data obtained directly from Mary's Center on patients enrolled in the innovation. Because we do not have data on periods of Medicaid enrollment, we assume patients were enrolled in Medicaid from their first observable Medicaid fee-for-service or managed care claim with positive expenditures though the last observable Medicaid fee-for-service or managed care claim with positive expenditures. Since the Medicaid population has been shown to have high rates of churning in and out of Medicaid, the number of Medicaid beneficiaries included for analyses may be under- or overstated. Beneficiaries may have been enrolled prior to (or after) the earliest (or last) positive expenditure. On the other hand, patients may have unenrolled and reenrolled in Medicaid between visits with positive Medicaid expenditures. However, our approach represents the best possible estimate of enrolled Medicaid beneficiaries given the available information. Because many of the enrolled patients are high utilizers with one or more chronic conditions, periods of positive Medicaid expenditures likely represent periods of Medicaid eligibility. Further, impacts of the assumption of the number of enrolled Medicaid beneficiaries should be similar for both pre- and post-intervention trends and, thus, trends over time should not be greatly affected by Medicaid enrollment periods. Our evaluation focuses on the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced ED visits?
- Has the innovation reduced spending per patient?

Medicaid Claims Analysis

Descriptive Analysis

This report includes claims through March 31, 2015. Due to the lack of claims data for non-intervention beneficiaries, we were not able to construct a comparison group.

Table 12 reports Medicaid spending per patient in the eight quarters before and the nine quarters after enrolling in the innovation. It includes both fee-for-service and managed care claims. For fee-for–service claims, it represents the amount Medicaid paid to the provider, and for managed care claims, it represents the fee-for-service equivalent amount the MCO would have paid for an encounter claim (amount used only for statistical purposes to represent the amount that Medicaid would have paid in the absence of capitation rates).

Table 12. Medicaid Spending per Patient: Mary's Center

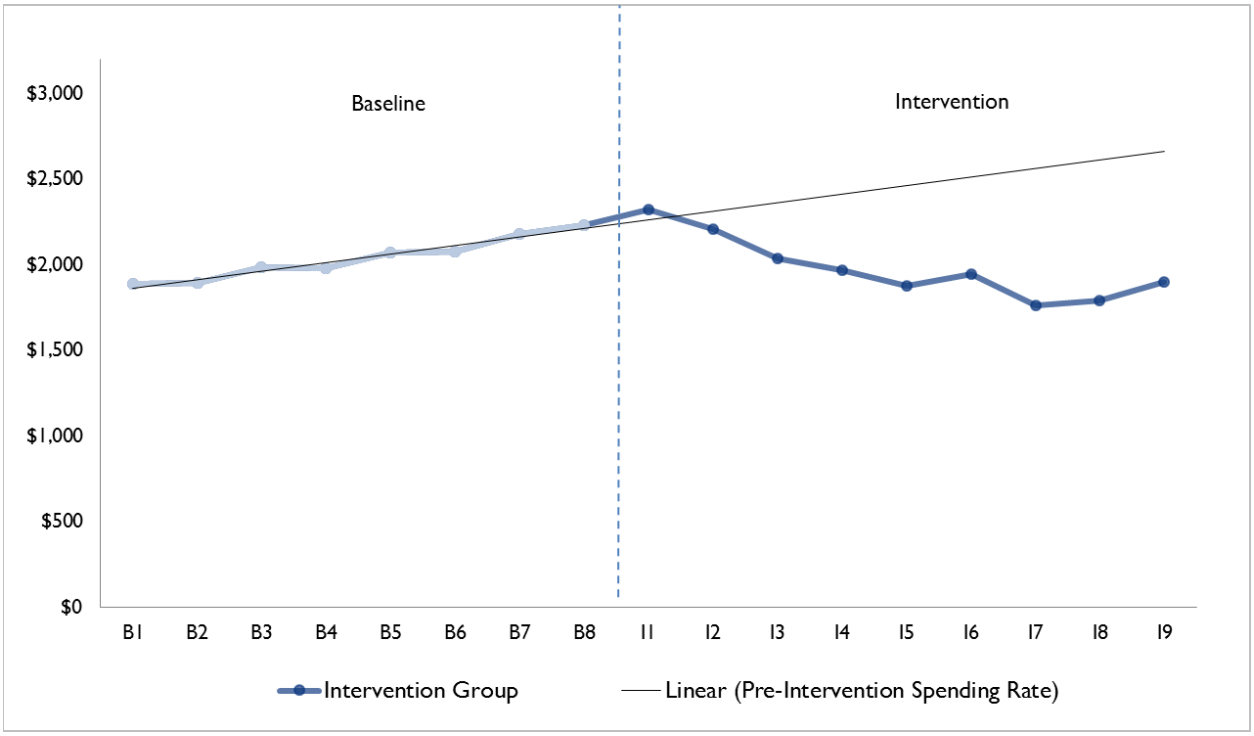
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters								
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8	I9
Intervention Group																		
1C1CMS 331074	Mary's Center																	
	Spending rate	$1,886	$1,893	$1,984	$1,980	$2,069	$2,080	$2,178	$2,228	$2,324	$2,206	$2,040	$1,970	$1,874	$1,943	$1,761	$1,794	$1,898
	Std dev	$2,505	$2,639	$2,852	$2,588	$2,925	$2,723	$5,457	$3,342	$4,335	$3,013	$2,494	$2,604	$3,511	$4,408	$2,152	$2,064	$2,667
	Unique patients	2,256	2,294	2,335	2,368	2,391	2,411	2,423	2,424	2,419	2,267	2,094	1,784	1,395	1,092	811	533	253
Comparison Group																		
1C1CMS 331074	Mary's Center																	
	Spending rate	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Std dev	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Unique patients	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Savings per Patient		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Source: Source: RTI analysis of Medicaid fee-for-service and managed care claims data provided by Mary's Center.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.
— Data not yet available.

Figure 4 illustrates the Medicaid spending per beneficiary in Table 12 for innovation group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 4. Medicaid Spending per Patient: Mary's Center



Source: RTI analysis of Medicaid fee-for-service and managed care claims data provided by Mary's Center.

Although the time series exhibits a high degree of variability, the pre-intervention trend line for spending is increasing over time. In post-enrollment quarters, average spending decreases relative to the trend line in intervention quarter 1 (I1) through I9. As shown in Table 12, the standard deviation for spending is very high.

ED visits per 1,000 participants are shown in ***Table 13*** and ***Figure 5***.

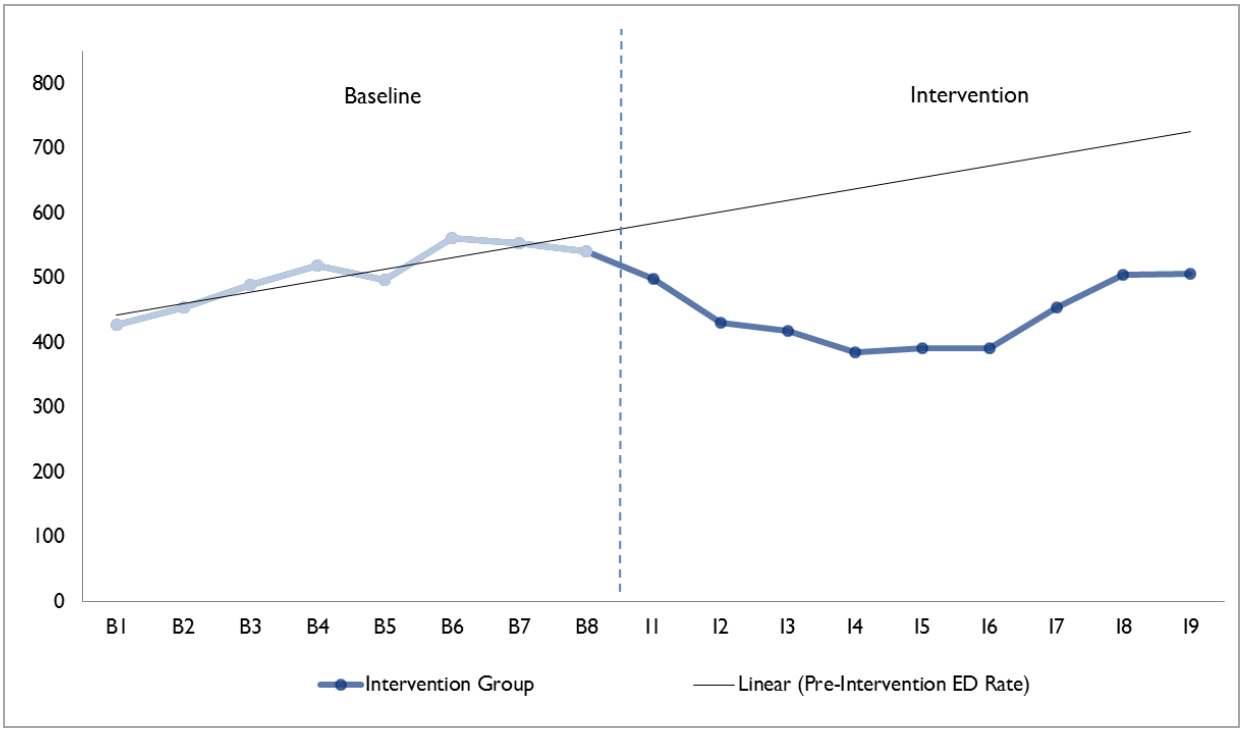
Table 13. ED Visits per 1,000 Participants: Mary's Center

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters								
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8	I9
Intervention Group																		
1C1CMS 331074	Mary's Center																	
	ED rate	428	454	489	519	496	562	554	541	499	431	418	386	391	392	454	505	506
	Std dev	1,063	1,368	1,229	1,269	1,213	1,399	1,717	1,601	1,604	1,657	1,296	1,052	1,048	919	983	1,120	1,037
	Unique patients	2,256	2,294	2,335	2,368	2,391	2,411	2,423	2,424	2,419	2,267	2,094	1,784	1,395	1,092	811	533	253
Comparison Group																		
1C1CMS 331074	Mary's Center																	
	ED rate	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Std dev	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Unique patients	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Intervention − Comparison rate		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Source: RTI analysis of Medicaid fee-for-service and managed care claims data provided by Mary's Center.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.
— Data not yet available.

Figure 5. ED Visits per 1,000 Participants: Mary's Center



Source: RTI analysis of Medicaid fee-for-service and managed care claims data provided by Mary's Center.

The ED visit rate trend line slopes up before enrollment for the intervention group. ED visits decrease in post-enrollment quarters until I7 when the ED visit rate increases but remains below the trend line. On average, the ED visit rate is lower in post-intervention quarters than in pre-intervention quarters. Further statistical testing using a comparison group and multivariate analyses is required to draw more definitive conclusions about the impact of the intervention.

Discussion

The lack of comparison group data and multivariate analyses hinders the ability to obtain statistically significant evidence that the innovation affected spending and health care utilization among individuals enrolled in the innovation. Additional data are required to draw firm conclusions about the impact of the innovation.

The results may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicaid beneficiaries who we were able to match with the identifiers provided by the site. This represents 84.7 percent of the overall population reached by the innovation.

1.3.3 Other Awardee-Specific Data

Table 14 lists the awardee-specific outcome measures selected for the innovation's evaluation, with an indication of the status of the data requested and whether the data are presented in this annual

report. We received patient-level data from CCIIN used to generate each measure listed in Tables 5 and 14 for each quarter through Q11 (March 31, 2015).

Table 14. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Clinical effectiveness	Patient care	HCIA Provider Survey	Collected by RTI
Health outcomes	Hypertension	Percentage of patients with hypertension with their last blood pressure <140/90 mmHg	Data received from CCIN
Health care outcomes	Utilization	Percentage of participants who have been to a primary care provider during enrollment	Data received from CCIN

CCIN = Capital Clinical Integrated Network.

Clinical Effectiveness

Evaluation Question

- How has implementation of the innovation impacted provider perceptions of patient care?

Data on the impact on patient care came from the HCIA Provider Survey. Providers were fairly evenly split on whether CCIN impacted patients' care: 55.1 percent indicated it impacted patient care while 44.9 percent indicated it did not impact patient care. Of those that indicated that the innovation had an impact on patient care, the vast majority of providers reported the impact to be somewhat positive (70.4%) or very positive (25.9%)

Providers' views on the specific impacts of CCIN on patient care varied (***Table 15***). A majority of providers reported the innovation was beneficial to patients in their practice (69.4%). Just over half of providers indicated they strongly or somewhat agreed that the innovation helped them provide better patient care (53.1%) and that the innovation was beneficial in the care patients received, among patients who were aware of the innovation (53.1%).

Table 15. Summary of Perceptions Regarding the Impact on Patient Care

Question	Percentage of Mary's Center Providers Indicating Strongly Agree/ Somewhat Agree	Percentage of Mary's Center Providers Indicating Strongly Disagree/ Somewhat Disagree	Percentage of Mary's Center Providers Indicating Neither Agree nor Disagree	Percentage of Mary's Center Providers Indicating Not Applicable/ Missing
Innovation helps provide better patient care.	53.1 N=26	8.2 N=4	28.6 N=14	10.2% N=5
Innovation leads to more effective communication during patient visits.	42.9% N=21	10.2% N=5	32.7% N=16	14.3% N=7
Innovation has improved my patients' access to care.	44.9% N=22	12.2% N=6	32.7% N=16	10.2% N=5
Innovation has increased the time I am able to spend with patients during office visits.	20.4 N=10	24.5 N=12	38.8 N=19	16.3 N=8
Innovation helps me develop good relationships with my patients.	36.7 N=18	16.3 N=8	38.8 N=19	8.2 N=4
Innovation has improved perceived patient satisfaction with care.	34.7 N=17	10.2 N=5	40.8 N=20	14.3 N=7
Innovation has been beneficial for patients in my practice.	69.4 N=34	6.1 N=3	14.3 N=7	10.2 N=5
Among my patients that *are aware* of Innovation, the majority of patients would say it has been beneficial in the care they receive.	53.1 N=26	10.2 N=5	20.4 N=10	16.3 N=8
Among my patients that *are not aware* of Innovation, if I told them about it, the majority of patients would say it has been beneficial in the care they receive.	49.0 N=24	10.2 N=5	28.6 N=14	12.2 N=6

Health Outcomes

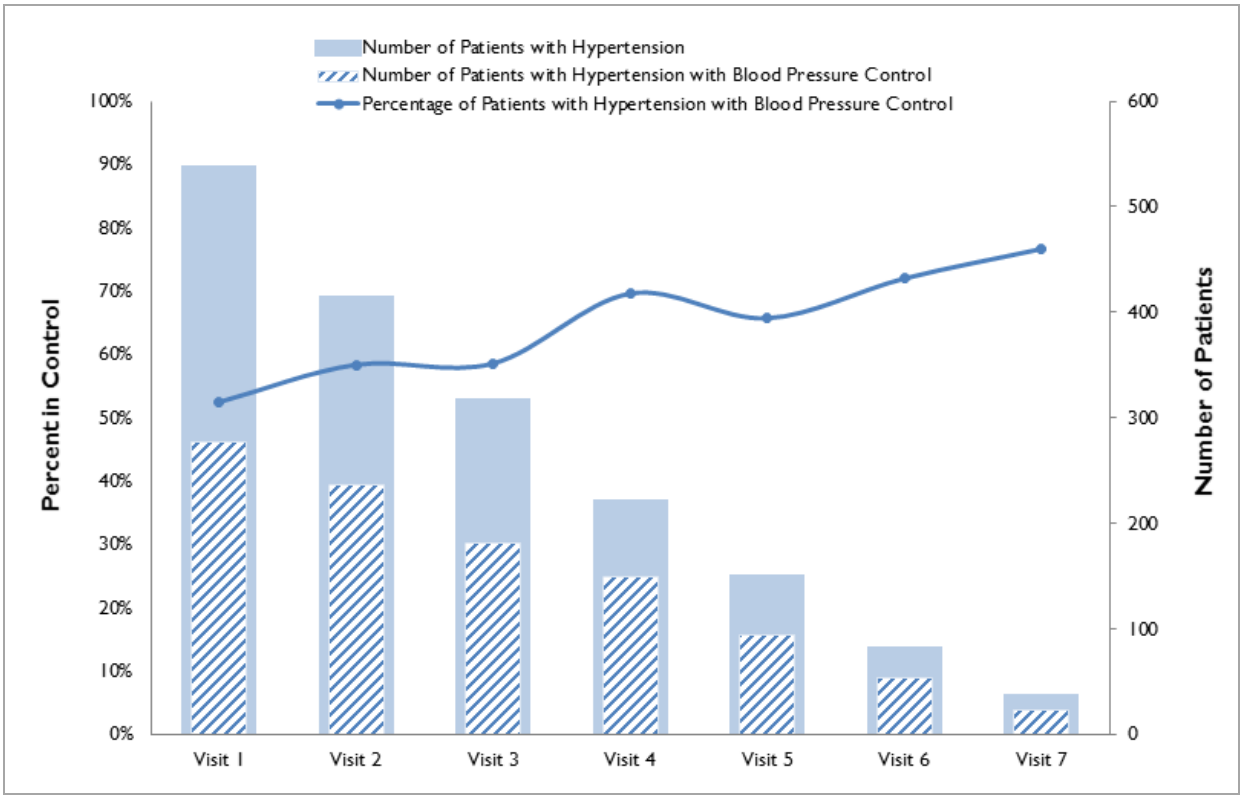
We examined health outcomes among patients with hypertension with blood pressure readings, as well as all patients enrolled in the innovation, to determine who visited a primary care provider (PCP) during the course of enrollment.

Evaluation Question

- Has the percentage of participants with blood pressure control improved for patients with hypertension through participation in the innovation?

Figure 6 provides the percentage of participants with hypertension with blood pressure control by CHW visit number. To complete the program participants had to meet one of the following criteria: (1) six successful home visits, (2) three successful home visits, (3) two successful home visits and the completion of a goal. The denominator may drop with each additional visit past the second visit as a result of program completion or lack of participant engagement. As shown, the percentage of patients with hypertension with blood pressure below 140/90 mm HG increased as the number of visits increased. More specifically, for the first visit, the percentage of patients with blood pressure control was more than half (52.5%). By the fourth visit, nearly 70 percent were in control, and by the seventh visit more than three-quarters (76.7%) were in control. However, the denominator is very small because few enrolled participants receive a seventh visit because of the above mentioned completion criteria.

Figure 6. Percentage of Participants with Hypertension with Blood Pressure Control by Visit



(continued)

Figure 6. Percentage of Participants with Hypertension with Blood Pressure Control by Visit (continued)

	Visit Number	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6	Visit 7
●	Percentage of patients with hypertension with blood pressure control	52.5	58.4	58.6	69.6	65.7	72.0	76.7
	Number of patients with hypertension	530	406	309	214	143	75	30
	Number of patients with hypertension with blood pressure control	278	237	181	149	94	54	23

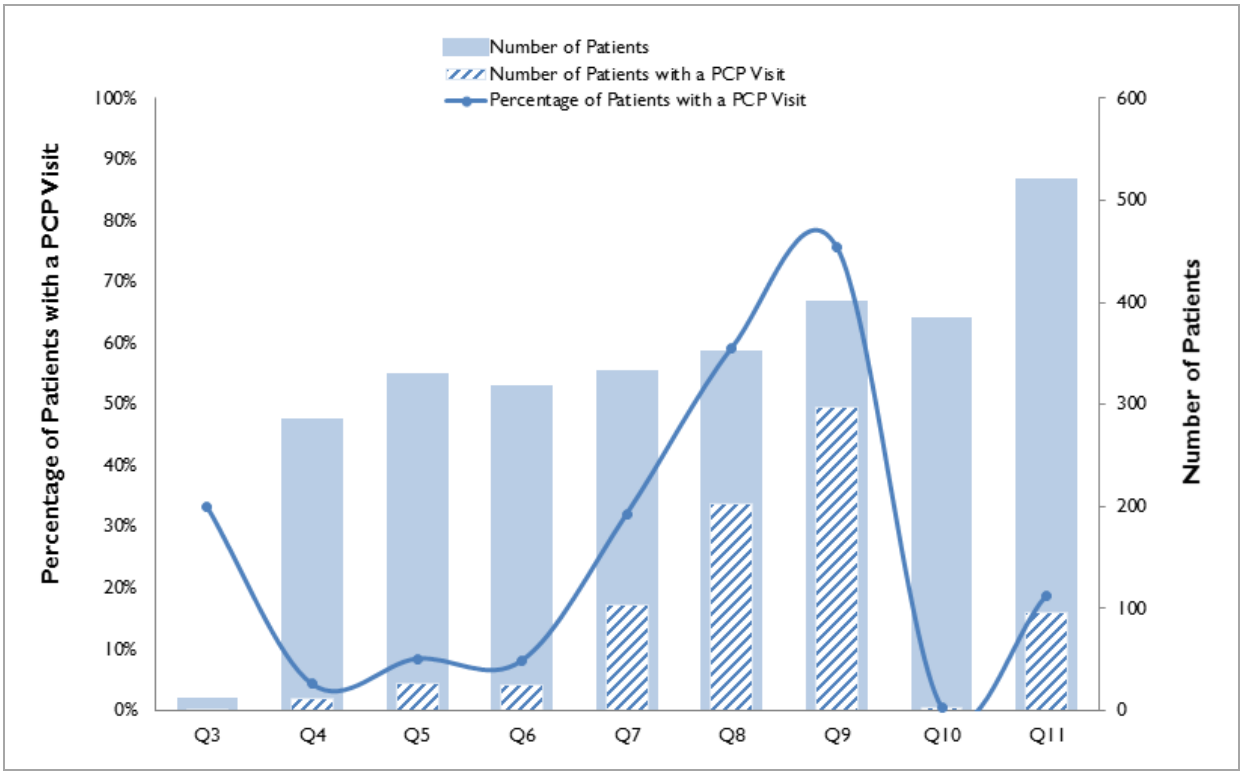
Source: Patient-level data provided to RTI by Capital Clinical Integrated Network.

Evaluation Question

- Has the percentage of participants who visited a primary care provider during their enrollment improved through the duration of the innovation?

Figure 7 provides the percentage of participants who visited a primary care provider (PCP) during their enrollment in the program in each quarter (among those who completed the program). The number of participants who visit a PCP fluctuates because a PCP visit is a goal but not a requirement and enrollment only lasts 90 days. As shown, the highest percentage of patients (75.8%) visited a PCP in Q9. Q10 shows a significant decrease in the number of individuals visiting a primary care provider. This decrease is partially because the visit with the PCP data was only collected for a smaller subset of the CCIN population, beginning in Q9.

Figure 7. Percentage of Participants Who Visited a Primary Care Provider during Enrollment



	Quarter	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
●	Percentage of patients with a PCP visit	33.3	4.3	8.4	8.1	32.1	59.2	75.8	0.5	18.8
	Number of patients	3	277	321	309	324	343	392	376	512
	Number of patients with a PCP visit	1	12	27	25	104	203	297	2	96

Source: Patient-level data provided to RTI by Capital Clinical Integrated Network.
PCP = primary care provider.

Discussion of Other Awardee-Specific Findings

CCIN targets Medicaid recipients who are high-cost/high users of the ED. By teaming patients with CHWs to perform home visits and help patients navigate their health care into a clinic setting, costs can be reduced and overall health can be improved. Although an individual does not require a specific disease or condition to enroll in the program, patients with hypertension, diabetes, and asthma are targeted. Data provided to RTI show that as the number of home visits increase among patients enrolled in the program, the percentage of individuals with hypertension and blood pressure control increases. An implication of this finding is that patients who are invested in the program receive more home visits, and are more likely to work on improving their health conditions (although data are limited because of the small number of participants receiving a seventh home visit).

Assisting patients in navigating their health care often involves helping them to connect or reconnect with a PCP at a clinic to establish lower cost, routine behaviors for managing their health. The

number of patients visiting their PCP during their enrollment in the program increased every quarter from Q4 to Q9.

For the provider survey, the majority of providers were satisfied with the innovation although only 55 percent indicated they thought it impacted patient care. Those who did indicate the innovation impacted patient care believed that the impacts were overwhelming positive.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing CCIN as well as accomplishments to date. In this section, we assess CCIN's progress on achieving HCIA goals to date.

- **Smarter spending.** Trends in Medicaid spending per patient for innovation beneficiaries are decreasing in the post-intervention period and are below the pre-intervention trend line.
- **Better care.** CCIN reached 16.5 percent of its target population. CHWs completed care plans for 93 percent of enrolled patients, and spoke on the phone with nearly all patients. The ED visit rate declined in the period after the innovation began.
- **Healthier people**. The percentage of enrolled patients with hypertension and blood pressure control increased as the number of home visits increased. By the fourth visit, approximately 69.6 percent of patients with hypertension had blood pressure below 140/90 mm Hg. Although percentage of patients with hypertension with a blood pressure below 140/90 mm Hg remained high in visits 6 and 7, the number of patients who received that many home visits (54 and 23 respectively) was so low that it is not a representative group.

From the outset of the innovation, CCIN faced challenges with implementation, recruiting, and sustainability as a result of the newly contracted Washington, DC MCOs and since the first annual report, minimal progress has been made to resolve the issue. Despite consistent efforts by CCIN leadership to engage them, the new MCOs did not show interest in partnering with CCIN to provide care coordination services to their high-utilization/high-cost clients. To fully implement the care coordination component of the innovation, CCIN needs to increase the number of participants enrolled. CCIN sought innovative solutions and tried other avenues of recruitment. CHWs went door to door to persuade patients to participate in the program. When providers permitted, CHWs established a regular presence at health care practices and sought "warm handoffs" from partners such as Medical Mall. These strategies took great time and effort but resulted in little success. During the site visit, CCIN staff were considering another innovative solution: creating a specialized position focused solely on recruiting new participants, to be filled by CHWs who excelled at that task.

After reassessing how CHWs were hired, CCIN's administrative staff created a model to hire highly effective CHWs to implement the innovation. Using this model, CCIN moved forward with care coordination and recruitment activities despite the challenges in enrolling participants. Staffing levels are sufficient to handle the current need. However, CCIN notes that it has the ability to expand its CHW staff and the capacity to do so when the need is warranted.

CPC–HIE was successfully launched, connecting five clinics and Providence Hospital. CCIN is now working with the Maryland CRISP HIE to connect to CPC–HIE because of the proximity of the two locations, with patients often seeking care across borders. The connection with CRISP will facilitate connections with regional hospitals and medical providers outside of Washington, DC. Deemed the most sustainable and valuable component of the innovation, the CPC-HIE has buy-in from key stakeholders in Washington, DC, including the DCPCA, which leads the governance effort to establish policy and regulation of the HIE.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Michigan Public Health Institute

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

Michigan Public Health Institute

1.1 Introduction

The nonprofit Michigan Public Health Institute (MPHI) is located in Okemos, MI. Awarded a total of $14,145,784, MPHI launched the Michigan Pathways to Better Health (Pathways) project in January 2013 in three Michigan counties: Saginaw, Muskegon, and Ingham. The innovation seeks to achieve the following HCIA goals:

1. **Smarter spending.** Reduce spending by 2 percent over 1 year ($17,498,641 over 3 years). Pathways enrollees' health care spending will be lowered through the community hub[1] and community health worker (CHW) coordination of care, reducing unnecessary ED visits and hospitalizations.

2. **Better care.** Pathways enrollees will shift their utilization to appropriate and lower cost health and human services via the community hub and CHW chronic disease management by 5 percent over 1 year.

3. **Healthier people.** Pathways enrollees will improve chronic disease related health outcomes by 5 percent over 1 year.

Table 2 provides a summary of changes that occurred with MPHI during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data submitted by MPHI through March 31, 2015; and key informant interviews with MPHI's leaders and staff conducted June 10, 2015 and the RTI HCIA Provider Survey.

Table 2 Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	No change since the first annual report.[1]
Program Participant Characteristics	Majority of participants (73.1%) were from 25 to 64 years of age, and more than one half (61.0%) were female. Almost 45% were covered by Medicaid; 12.4% were covered by Medicare, including Medicare Advantage, and almost 20% are dual eligible.
Implementation Process	
Execution	MPHI spent 42.3% of its Year 3 budget, which is below the projected target.
Leadership	No change since the first annual report.
Organizational capacity	The TPM was tested and refined.

(continued)

[1] Defined as a community organization that has the infrastructure to coordinate delivery and connect at-risk individuals to health and social services while avoiding duplication of services.

Table 2 Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation adoption and workflow	The majority of MPHI providers indicated that the innovation resulted in no change in the amount of time spent on specific activities, such as providing direct patient care, communicating with patients, or looking up patient information in either EMRs or paper-based records. Over half of providers, however, did indicate that they spent less time arranging social service referrals for patients, and 38.9% spent less time engaging in other care coordination activities.
Workforce Development	
Hiring/retention	The innovation was fully staffed with 85.57 FTEs. Between Q8 (June 2014) and Q10, there was one staff separation at MPHI.
Training	MPHI provided 803 individual trainings totaling 5,379 hours of training.
Implementation Effectiveness	
Reach	Since the first annual report, MPHI enrolled an additional 3,671 participants in the innovation and an additional 3,156 participants are considered active. However, overall reach declined slightly since the first annual report from 72.5% to 72.1% for those enrolled and 65.0% to 63.1% for those considered active.
Dose	The most common Pathways are medical referrals, completed by approximately half of participants (56.9%) an average of 5.5 times, and social service referrals, completed by 73.5% of participants an average of 4.2 times.

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by MPHI.
Key informant interviews conducted Feb–June 2015.
RTI HCIA Provider Survey

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

EMR = electronic medical record; FTE = full-time equivalent; TPM = transitional payment model.

1.1.1 Innovation Components

The Pathways community hub model seeks to establish networks of collaborating community agencies and outreach to Pathways' enrollees through three components: (1) community hubs, neutral agencies that refer eligible participants to a care coordinating agency (CCA), which then assign participants to a community health worker (CHW); (2) CHWs, who enroll participants, conduct assessments, and assist them with social and health needs; and (3) a transitional payment model (TPM), which is a "pay for deliverable" model tied to CHW performance and completion of participant pathways. The first two components have not changed since RTI's first annual report.[2]

[2] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

Regarding the TPM, progress on developing and refining the TPM was a major focus in Year 3 and will continue to be a focus in the no-cost extension Year 4. MPHI developed this model to acclimate the community hubs and CHWs to a potential funding model that could be implemented post-award to sustain Pathways and to provide MPHI with data on CHW efficiency. The goals of the TPM are to increase: (1) prioritization of and support for CHW client services and outcomes; (2) recruitment and retention of high-utilizer/high-risk clients; and (3) timely entry of complete data documenting CHW services to clients. Overall, the TPM assigns and rewards points based on a number of different factors, such as the recruitment and retention of clients and completion of client pathways. More points, for example, are assigned for recruiting and retaining high-utilizer/high-risk clients and completing more complicated pathways that take more effort from the CHW, or are longer-term service requests, such as housing assistance. The TPM assigns a dollar amount for each point earned. All sites have a uniform monthly target of 1,500 points.

The partners for this innovation also remained the same since RTI's first annual report. The Michigan Department of Community Health (MDCH) remains actively involved in the innovation as well as the three main partners in each of the three implementation sites: Saginaw County Community Mental Health Authority, Muskegon Community Health Project, and Ingham County Health Department.

1.1.2 Program Participant Characteristics

Table 3 provides the demographic characteristics of all participants ever enrolled in the innovation. We first reported patient demographic characteristics in the first annual report, based on data through Q7. The distribution of patient characteristics is similar to that in the first annual report. More specifically, a majority of participants (73.1%) were from 25 to 64 years of age and more than half (61.0%) were female. Most participants (55.3%) were white, and nearly one-third (29.4%) were black. As would be expected based on eligibility criteria, almost 45% were covered by Medicaid; 12.4% were covered by Medicare, including Medicare Advantage; and almost 20% are dual eligible.

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Number of Participants[1]	Percentage of Participants
Total	6,597	100.0
Age		
<18	0	0.0
18–24	309	4.7
25–44	1,714	26.0
45–64	3,108	47.1
65–74	819	12.4
75–84	422	6.4
85+	218	3.3
Missing	7	0.1

(continued)

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015 (continued)

Characteristic	Number of Participants[1]	Percentage of Participants
Sex		
Female	4,024	61.0
Male	2,557	38.8
Missing	16	0.2
Race/ethnicity		
White	3,646	55.3
Black	1,939	29.4
Hispanic	313	4.7
Asian	34	0.5
American Indian or Alaska Native	35	0.5
Native Hawaiian or Other Pacific Islander	40	0.6
Other	149	2.3
Missing/refused	441	6.7
Payer Category		
Dual	1,284	19.5
Medicaid[2]	2,950	44.6
Medicare	615	9.3
Medicare Advantage	203	3.1
Other	96	1.5
Uninsured	0	0.0
Missing[3]	1,449	22.0

Source: Patient-level data provided to RTI by MPHI.
[1] Enrollment is based on completion of a release of information (ROI).
[2] Includes participants expected to be included in Medicaid expansion (i.e., county insurance).
[3] Missing includes participants who indicated that they did not have Medicaid, Medicare, or Medicare Advantage and, thus, could include other types of insurance (i.e., self-pay, commercial). Missing also may include participants with pending insurance coverage as participants may be in the process for applying for coverage.

1.2 Implementation Progress

The first annual report (2014) described MPHI's implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area. ***Table 4*** lists these measures and their status as of May 31, 2015. The results of analyses for all of these measures are included in this annual report.

This section presents MPHI's process measures and a qualitative analysis of the factors that determined MPHI's implementation progress. This analysis draws on patient-level data provided to RTI by MPHI as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation Process	Workflow Integration	HCIA Provider Survey	Collected by RTI
	Provider Satisfaction	HCIA Provider Survey	Collected by RTI
Implementation effectiveness	Reach	Number/percentage of clients enrolled (i.e., completed ROI) based on clients referred	Data received from MPHI
		Number/percentage of active clients (i.e., completed ROI + adult checklist) based on clients referred	Data received from MPHI
	Dose	Number and type of Pathways completed per participant (e.g., medical referral)	Data received from MPHI

HCIA = Health Care Innovation Award; MPHI = Michigan Public Health Institute; ROI = release of information.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through MPHI's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include MPHI's reports from Q8 through Q10 and interviews conducted on June 10, 2015 and the RTI HCIA Provider Survey.

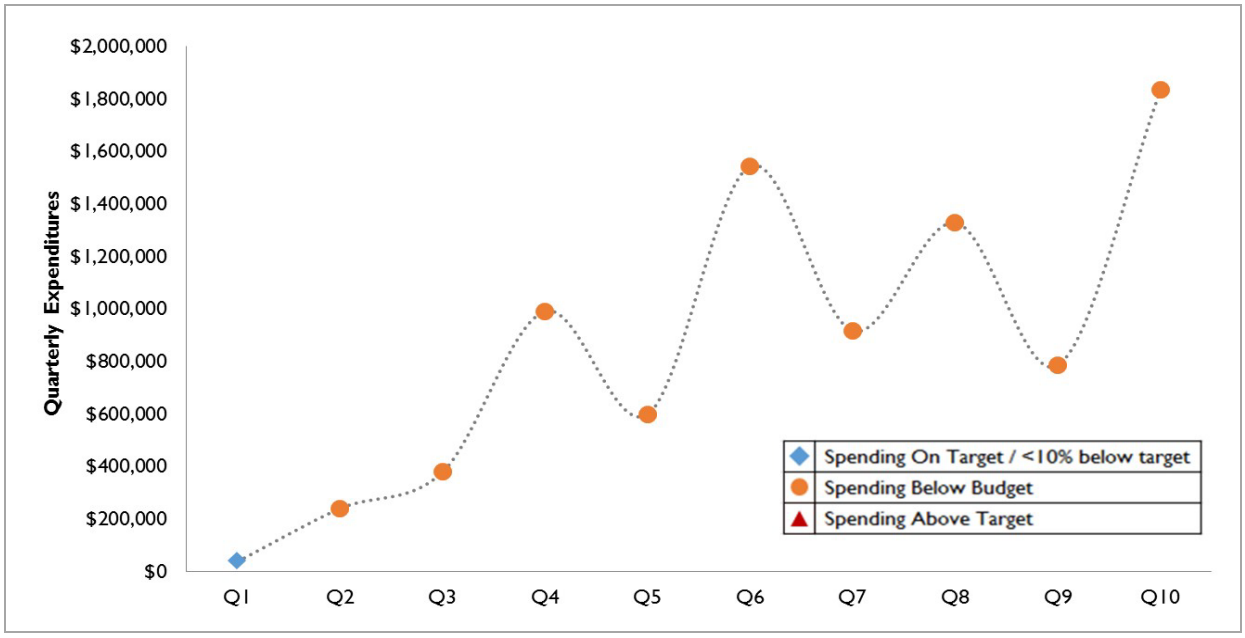
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?
- How has implementation of the innovation impacted provider workflow?
- How has implementation of the innovation impacted provider satisfaction?

Execution of Implementation

The annual report highlights the significance of MPHI's expenditure rates on implementation. As of December 2014 (Q10), MPHI spent 42.3 percent of its Year 3 budget, which is below the projected target (see ***Figure 1***). MPHI experienced some staff turnover in Year 3, which may have impacted spending. Leadership at MPHI also noted they experienced an increase in enrollment in early 2015 so spending can be expected to increase in subsequent quarters. In addition, MPHI received a no-cost extension for an additional 12 months; thus, much of the remaining funds are likely to be spent during Year 4.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December 31, 2014)



Leadership

Since inception, support from project leadership was high at MPHI and at each of the three implementing sites. Specifically, MPHI as well as the Pathways project director had experience conducting similar federal and state-funded innovations aimed at improving health and reducing health disparities in Michigan. The PI specifically was described as being "well respected with many years of experience, and is the champion of the program. She has gathered the support of many smart people that help add to her vision of the program." The leadership at MPHI and of the Pathways project not only helped secure and sustain partners at each of the implementation sites (Saginaw, Muskegon, Ingham), but also helped garner statewide support of reimbursement mechanisms for CHWs. Also given the complexity of the program, MPHI had to select supportive organizations with strong leaders that could bring together the necessary stakeholders in their respective communities. Each community hub partnered with seven to 12 local partners. In addition to strong leaders who could bring together relevant stakeholders and partners, MPHI facilitated communication with the communities through frequent meetings and conference calls and opportunities and trainings for the CHWs to learn and support one another. Overall, strong leadership support at MPHI and the implementing sites facilitated successful implementation of the Pathways innovation.

Organizational Capacity

MPHI has an internal structure and access to resources that support implementation of the Pathways innovation. For example, although several key members of the implementation team left toward the end of Year 3, MPHI filled those positions with other MPHI employees without disrupting implementation of the innovation. In addition, MPHI constructed and managed an internal database used for project data collection after uncovering issues with its initial database. A flexible structure and access

to internal resources allowed MPHI to successfully implement the Pathways innovation. Although the Michigan Department of Community Health (MDCH) no longer co-leads the innovation due to the retirement of the Co-PI, the MDCH continued to be a strong partner. The MDCH facilitated partnerships with Medicaid managed care organizations (MCOs) to potentially provide reimbursement for CHW activities in the future.

The three implementation sites continued to face organizational issues and unique challenges. In Ingham, MPHI noted that bringing all relevant stakeholders together was difficult, as many of the key organizations in Ingham are siloed in their respective activities. Collaboration efforts in Muskegon and Saginaw, however, were less of a challenge because many of the necessary relationships were in place prior to the innovation. MPHI staff considered the collaboration across all sites to be sufficient, and overall implementation effectiveness was not limited by organizational issues.

Innovation Adoption and Workflow Integration

Provider Perceptions of Clinical Workflow and Satisfaction

Data on workflow integration and provider satisfaction with the innovation came from the RTI HCIA Provider Survey administered in spring 2015. Of MPHI's eligible providers, 167 (59.2%) responded to the HCIA Provider Survey. Almost 40 percent of respondents were nurses (29.4% registered nurses and 9.0% registered nurse practitioners); more than 20 percent were physicians, and an additional 7.2 percent were social workers. CHWs were not eligible to complete the survey. Responding providers were in practice an average of 16.2 years. The majority of providers (62.3%) worked in family medicine. Approximately 30 percent of providers worked in a federally qualified health center (FQHC) (29.3%), more than one-quarter worked in a group practice setting (26.4%), and an additional 15.6 percent were hospital based.

For several questions about integrating the Pathways innovation into the clinical workflow, the majority of MPHI providers indicated that the innovation resulted in no change in the amount of time spent on specific activities, such as providing patient care (66.5%), communicating with patients (60.5%), looking up patient information in electronic medical records (EMRs) (66.5%), meeting with staff (63.5%), and consulting with outside clinicians (65.3%) (***Table 5***). These results were not surprising because the CHWs were not clinical providers and CHW role was not designed to directly impact any component of patient care. Furthermore, not every physician surveyed may practice at a clinic or practice where a CHW was located. Across all three communities, many of the CHWs were located at FQHCs, but in Muskegon CHWs were also located in hospital.

Among the specific activities in which the CHWs may have had an impact, over half of providers (52.7%) indicated that they spent less time arranging social service referrals for patients, and 32.9 percent spent less time engaging in other care coordination activities. In addition, 29.9 percent indicated they spent less time arranging clinical referrals and follow-up care for patients. Therefore, these results indicate that the CHWs had a positive impact on workflow, especially as it related to coordinating additional services.

Table 5. Summary of Clinical Care Workflow

Question	Percentage of MPHI Providers Indicating More Time	Percentage of MPHI Providers Indicating Less Time	Percentage of MPHI Providers Indicating No Change	Percentage of MPHI Providers Indicating Not Applicable/Missing
Providing direct patient care	10.8 N=18	7.2 N=12	66.5 N=111	15.6 N=26
Communicating with patients by phone, e-mail	8.4 N=14	16.8 N=28	60.5 N=101	14.4 N=24
Looking up patient information in EMRs or other health information systems	9.6 N=16	7.2 N=12	66.5 N=111	16.8 N=28
Looking up patient information in paper-based medical charts	2.4 N=4	6.6 N=11	38.3 N=64	52.7 N=88
Arranging clinical referrals and follow-up for patients	5.4 N=9	29.9 N=50	44.9 N=75	19.8 N=33
Arranging social service referrals for patients	6.0 N=10	52.7 N=88	25.1 N=42	16.2 N=27
Meeting with staff and clinicians in my practice	7.2 N=12	6.0 N=10	63.5 N=106	23.4 N=39
Consulting with clinicians outside of my practice	5.4 N=9	8.4 N=14	65.3 N=109	21.0 N=35
Engaging in other care coordination activities	15.0 N=25	32.9 N=55	38.9 N=65	13.2 N=22
Reviewing data on clinic practice population to identify individuals needing additional services	14.4 N=24	18.0 N=30	48.5 N=81	19.2 N=32
Planning practice-based (or community-based) interventions to address issues common to my practice population	12.6 N=21	15.0 N=25	46.7 N=78	25.8 N=43

EMR = electronic medical records; MPHI = Michigan Public Health Institute; N = number.

Regarding provider satisfaction, we found that the vast majority of providers were either very satisfied (41.9%) or extremely satisfied (32.9%) with Pathways. Regarding ease of use, the majority of providers (54.5%) found the innovation very easy to use, while more than a quarter (27.5%) found it somewhat easy to use.

For the specific questions regarding provider satisfaction with Pathways, the majority of providers indicated that they strongly or somewhat agreed with four of the seven measures (***Table 6***), including that sufficient resources were provided to interact with the innovation (62.9%), that investing in the innovation was worthwhile (77.2%), that their practice functioned more efficiently with the innovation (65.9%), and that the innovation saves them time (62.9%). The majority of providers (56.3%) also either strongly or somewhat disagreed that the added logistics of the innovation were a burden on them.

Table 6. Summary of Provider Satisfaction Measures

Question	Percentage of MPHI Providers Indicating Strongly Agree/ Somewhat Agree	Percentage of MPHI Providers Indicating Strongly Disagree/ Somewhat Disagree	Percentage of MPHI Providers Indicating Neither Agree nor Disagree	Percentage of MPHI Providers Indicating Not Applicable/ Missing
Sufficient resources (e.g., support staff, time, training) have been provided for me to use/interact with the innovation.	62.9 N=105	7.8 N=13	17.4 N=29	12.0 N=20
Innovation produces financial benefits for my clinic or practice.	26.9 N=45	11.4 N=19	33.5 N=56	28.1 N=47
Investing in the innovation is worthwhile in terms of time, energy, and resources.	77.2 N=129	1.8 N=3	9.6 N=16	11.4 N=19
Sufficient IT support is available to operate the innovation.	27.5 N=46	8.4 N=14	28.7 N=48	35.3 N=59
Overall, my practice functions more efficiently with the innovation.	65.9 N=110	4.2 N=7	15.0 N=25	15.0 N=25
Innovation saves me time.	62.9 N=105	6.0 N=10	18.0 N=30	13.2 N=22
The added logistics required by the innovation are a burden on me and/or my staff.	12.0 N=20	56.3 N=94	19.2 N=32	12.6 N=21

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with 85.57 full-time equivalent (FTE) staff members. Between Q8 (June, 2014) and Q10 there was one staff separation at MPHI. One of the data analysts, considered to be a key MPHI staff member, left the innovation. However, the internal structure and resources available to MPHI enabled another employee to fill the position with minimal disruption to the project. MPHI also noted that Saginaw will have to hire some additional CHWs due to staff separations. MPHI noted that turnover is expected to increase in the CHW and clinical supervisor positions as the award period comes to a close.

Skills, Knowledge, and Training

Between Q8 and Q10, MPHI provided 5,379 hours of training to 803 individuals. MPHI conducted trainings that were updated based on the previous year's training satisfaction and training needs assessment data. Newly hired CHWs continued to receive the week-long intensive CHW training. On average, CHWs receive approximately 13 trainings per year and administrative staff members receive approximately 2 trainings per year. Refresher courses are also planned for CHWs in Year 4. Specifically, MPHI provided trainings on workflow processes and the transitional payment model (TPM). Other trainings included new CHW and clinical supervisor training (Pathways model, chronic conditions, the MiPathways database, and roles). In addition to the training offered by MPHI, sites offered training on topic areas such as diabetes, arthritis, human trafficking, cultural competency and social justice, nursing home placement, and mental health first aid.

MPHI also developed a MiPathways user guide and training manual. The user guide included instructions on managing hub tasks, entering clinical and other data, recording data in checklists and pathways, running reports, and accessing educational resources on chronic conditions. The manual was used in software training provided to hub managers and staff, clinical supervisors, and CHWs.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach) and (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

Reach

Pathways program participants were adults aged 18 years or older who were either enrolled in or eligible for Medicare or Medicaid and lived in Saginaw, Muskegon, or Ingham Counties or selected adjacent counties. To qualify for enrollment, participants must also have had two or more chronic conditions. Pathways targets high ED users (i.e., five or more visits) and hospital inpatient services (i.e., three or more visits), although MPHI does not limit enrollment to high ED users.

We provide two calculations of reach for MPHI. First, we examined the number enrolled, defined as participants who signed a release of information (ROI), as a percentage of those referred to Pathways. Second, we examined the number of active participants as a percentage of those referred to Pathways. This definition requires participants to have signed an ROI and to have completed the mandatory adult

checklist. According to the Pathways data provided to RTI, and as shown in ***Table 7***, 6,597 participants were enrolled across the three sites, but only 5,778 were considered active through Q11.

The number of enrolled and active participants reported vary across the three sites. Differences are likely because Muskegon operates within a single health system, Mercy Health, a part of Trinity Health. The organizational structure at Muskegon allows for access to system-wide electronic health records, which helps clinical supervisors use real-time clinical data to locate and verify high ED users.

Table 7. MPHI Enrolled and Active Participants as of Q11

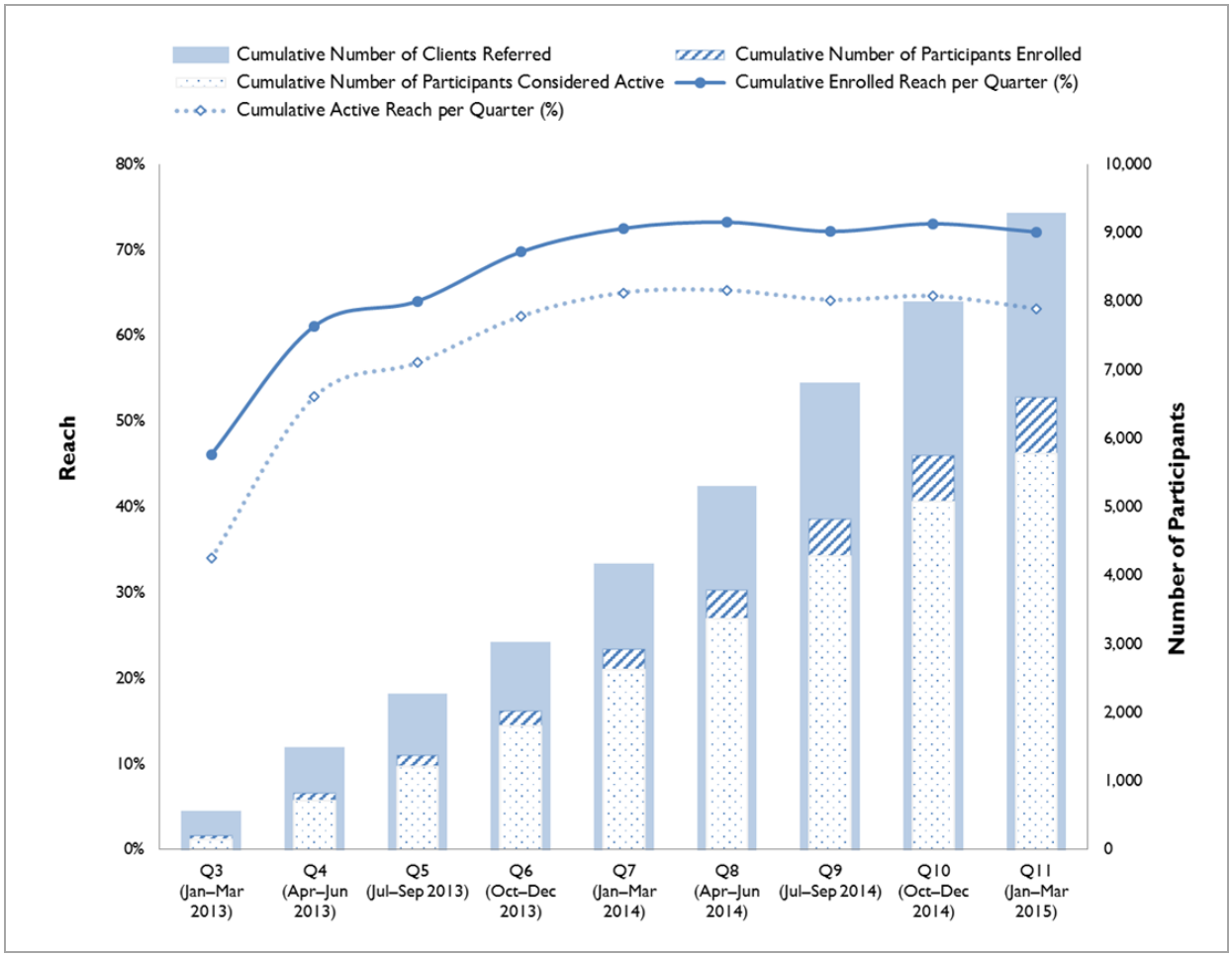
Participants	Saginaw	Muskegon	Ingham	Total
Number enrolled: ROI signed	1,660	2,726	2,205	6,597
Number active: ROI signed + adult checklist	1,511	2,220	2,047	5,778
Difference in participants: ROI signed but no adult checklist	149	506	158	819

Source: Patient-level data provided to RTI by MPHI.
MPHI = Michigan Public Health Institute; ROI = release of information.

Figure 2 shows reach by quarter since the launch of the innovation. We first reported reach in the first annual report, based on data through Q7. Since that time, the awardee enrolled an additional 3,671 participants in the innovation, and an additional 3,156 participants are considered active. Reach declined slightly since the first annual report, from 72.5 percent to 72.1 percent for those enrolled and 65.0 percent to 63.1 percent for those considered active.

As noted in previous reports, the number of participants reported in the *Quarterly Awardee Performance Reports* is consistent with the number of participants reported in the RTI quarterly and annual reports.

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch



	Quarter	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan–Mar 2015)
●	Cumulative enrolled reach per quarter (%)	46.2	61.1	64.0	69.8	72.5	73.2	72.2	73.1	72.1
◊	Cumulative active reach per quarter (%)	34.0	52.8	56.8	62.2	65.0	65.2	64.1	64.6	63.1
	Cumulative number of clients referred	429	1,353	2,141	2,888	4,034	5,168	6,675	7,861	9,154
	Cumulative number of participants enrolled	198	827	1,371	2,015	2,926	3,785	4,817	5,744	6,597
	Cumulative number of participants considered active	146	715	1,217	1,797	2,622	3,372	4,282	5,077	5,778

Source: Patient-level data provided to RTI by MPHI.

Dose

A standard or target dose does not exist for this innovation, given that the number, type, and duration of the specific Pathways vary by participant. We first reported dose in the first annual report, based on data through Q7. As expected, the number of services provided and the percentage of

participants receiving those services increased. ***Table 8*** provides the total number of Pathways provided to participants, the number of participants completing each Pathway, and the average number of Pathways per participant. The most common Pathways are medical referrals, completed by approximately half of participants (56.9%) an average of 5.5 times and social service referrals, completed by 73.5 percent of participants an average of 4.2 times. In addition, 46.2 percent of all participants completed the medication assessment Pathway an average of one time, and approximately one-third of participants (34.9%) completed the education Pathway an average of 2.9 times. Fewer than 25 percent of participants completed the remaining Pathways. Overall, participants completed an average of approximately three Pathways.

Table 8. Number and Types of Pathways Provided to Participants

Pathway Name	Total Number Completed Pathways[1]	Number (Percentage) of Participants Receiving Service[2]	Average Number of Services per Participant
Medical referral	18,040	3,289 (56.9)	5.5
Social service referral	17,718	4,249 (73.5)	4.2
Medication assessment	3,282	2,672 (46.2)	1.2
Education	5,859	2,016 (34.9)	2.9
Health insurance	1,015	921 (15.9)	1.1
Medical home	1,125	920 (15.9)	1.2
PHQ-9 Screening Tool	1,984	1,361 (23.6)	1.5
Fall Prevention Tool	1,426	1,116 (19.3)	1.3
Medication management	414	340 (5.9)	1.2
Healthy Changes Plan	544	360 (6.2)	1.5
Healthy Homes Checklist	282	255 (4.4)	1.1
Tobacco cessation	223	214 (3.7)	1.0
CAGE AID	150	114 (2.0)	1.3
Family planning	38	35 (0.6)	1.1
Pregnancy	44	42 (0.7)	1.0
Postpartum	24	24 (0.4)	1.0
Total number completed	52,168	17,928	2.9

Source: Patient-level data provided to RTI by MPHI.
[1] Individuals may have completed Pathways multiple times.
[2] Counts only one completed Pathway per participant.
CAGE AID = The CAGE Questionnaire Adapted to Include Drugs

Sustainability

Since the first annual report, a major focus of the innovation was sustainability, including the development of the TPM as described above. Since the first annual report, MPHI developed, virtually tested, and refined the TPM. This virtual test allowed MPHI and the participating CCAs to understand the amount that employed CHWs would be paid if the innovation were sustained using the TPM. This virtual test included a review of the MiPathways database and the process in which points are assigned for CHW performance. This virtual test revealed challenges with regard to the payment model, specifically

that the CHWs were "gaming the points system." The CHWs discovered that initiating certain Pathways with a higher value would yield a higher financial award. This also led to neglect of less valued Pathways. Strategies were put into place to mitigate these issues and block the "gaming," including targeted training by Pathways staff and reassessment of the points assigned for each Pathway to more accurately reflect CHW effort. Other efforts to support implementation of the TPM included engaging project officers, hubs, and lead agencies to implement the TPM and sustainability plan. In addition, MPHI provided the sites with supporting documents to implement the TPM, such as a statement of work, invoicing guidance, and programmed forms for billing. As a condition of the extension granted to MPHI, a new alternative payment model will have to be developed that is less complex and does not involve a points system.

Additional, sustainability efforts included the development of a sustainability committee of representatives from all three sites, which met twice per month. MPHI also reached out to the Medicaid Managed Care Plans (MMCPs) to develop a partnership to include the MMCPs as potential payers for services following the end of the grant period, and to act as current referral sources for eligible participants. Each hub also initiated its own efforts to achieving sustainability. Ingham conducted outreach to local funding sources including Community Foundations, United Way, Michigan State University, local hospitals, and payers. Muskegon applied to Trinity Health, Call to Care, and the MDCH for funding. The project director reported that Mercy Health, part of the larger Trinity Health, will likely fund parts of innovation in Muskegon not covered by the no-cost extension. Last, Saginaw was awarded hub certification. The hub continues to work with MiCHW Alliance on CHW certification and reimbursement. Saginaw is also working with the Saginaw County Mental Health Authority to discuss creating a Peer Partner Team for behavior health patient-centered medical homes (PCMH) that would include CHWs. MPHI and the sites submitted a concept paper to the W.K. Kellogg Foundation for funding following the end of the grant period. MPHI is considering other grants and federal contracts as possible sources of postgrant gap funding.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of MPHI's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data MPHI collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers essential to the evaluation of MPHI innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 9 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of whether the payer-specific data are presented in this annual report.

Table 9. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	Yes
		Hospital unplanned readmissions rate	Yes	Yes
		ED visit rate	Yes	Yes
	Cost	Spending per patient	Yes	Yes
		Estimated cost savings	Yes	Yes

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis

The analysis focuses on the Medicare beneficiaries enrolled in the Pathways innovation and comparison group beneficiaries with similar characteristics identified using propensity score methods. We include patients who were enrolled prior to December 31, 2014, and we present Medicare claims data through December 31, 2014.

Comparison Groups

To construct the comparison group, we use propensity score matching (PSM) to identify individuals located in the same three counties (Saginaw, Muskegon, and Ingham) where the intervention was conducted, who had two or more chronic conditions, and who were not enrolled in the innovation. We selected comparison group members from the same counties where the intervention was conducted to minimize variation in sociodemographic characteristics that can influence service use and expenditures. Program participants and comparison group members were matched using a logit model predicting the likelihood of program participation as a function of demographics (gender, age, and ethnicity), health

characteristics in the calendar year prior to enrollment (number of chronic conditions, disability status, and end-stage renal disease), health care utilization in the calendar quarter prior to enrollment (number of inpatient admissions and ED visits), and spending in the quarter and year prior to program participation. ***Appendix B.2*** provides technical details on the updated propensity score methodology.

Table 10 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. Three treatment beneficiaries were dropped from the subsequent analyses due to the lack of an appropriately matched comparison beneficiary.

After performing PSM, we calculated absolute standardized differences between the treatment group and both the unmatched and matched comparison groups, and checked whether matching decreases the absolute standardized differences and achieves acceptable balance. Many researchers consider that an absolute standardized difference ≤0.10 indicates acceptable balance.[3] The results in Table 10 show that matching reduced the absolute standardized differences and achieved adequate balance for all variables in the model except for *percent disabled*. Even though matching reduced the standardized difference noticeably for this variable (1.15 to 0.12), the absolute standardized difference remained slightly above the 0.10 threshold.

[3] Austin, P.C.: An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research. 46.3: 399–424, 2011. *PMC*. Web. 2 June 2015.

Table 10. Medicare Spending per Patient: MPHI

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrollment	6,974	15,494	2,295	7,469	0.38	6,886	15,352	7,183	9,982	0.02
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	19,972	36,839	8,150	18,898	0.40	19,629	35,786	19,476	34,214	0.00
Age	61.50	14.29	69.46	13.71	0.57	61.53	14.29	61.03	9.41	0.04
Percentage male	37.53	48.44	43.22	49.54	0.16	37.54	48.44	37.14	28.56	0.01
Percentage white	63.51	48.15	80.46	39.65	0.54	63.63	48.12	62.76	28.58	0.03
Percentage disabled	71.56	45.13	33.90	47.34	1.15	71.51	45.15	75.15	25.54	0.12
Percentage ESRD	4.42	20.57	1.15	10.66	0.28	4.37	20.45	4.12	11.75	0.02
Number of dual eligible months in the previous calendar year	6.84	5.61	2.66	4.88	0.79	6.83	5.61	7.04	3.38	0.05
Number of chronic conditions	8.26	3.97	6.75	3.80	0.39	8.25	3.96	8.41	2.47	0.05
Number of ED visits in calendar quarter prior to enrollment	0.74	1.85	0.15	0.57	0.43	0.72	1.75	0.59	1.04	0.09
Number of inpatient stays in calendar quarter prior to enrollment	0.33	0.79	0.08	0.34	0.42	0.33	0.77	0.36	0.55	0.04
Number of beneficiaries	1,628	—	600,737	—	—	1,625	—	4,853	—	—
Number of unique beneficiaries[1]	1,628	—	85,490	—	—	1,625	—	4,758	—	—
Number of weighted beneficiaries	—	—	—	—	—	—	—	1,623	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

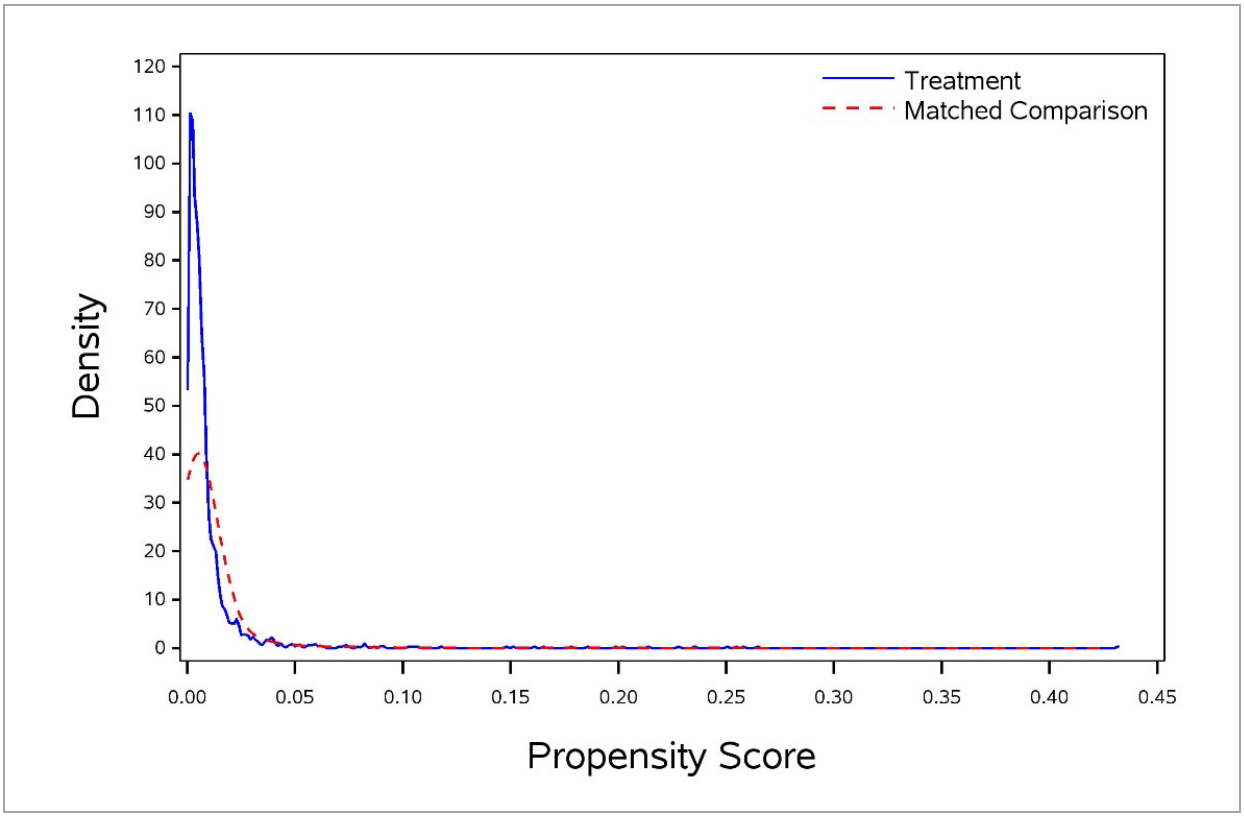
[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B for discussion of weights).

ED = emergency department; ESRD = end-stage renal disease.

— Data not yet available.

Figure 3 shows the distribution of the propensity scores for both the treatment and comparison groups. The figure demonstrates a very close overlap between the treatment group's and comparison group's propensity scores. Therefore, we present the Medicare claims analysis using both the treatment group and the matched comparison group.

Figure 3. Distribution of Propensity Scores for Comparison and Intervention Groups: MPHI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
MPHI = Michigan Public Health Institute.

Descriptive Analysis

This report includes claims through December 31, 2014. ***Table 11*** reports Medicare spending per patient in the eight quarters before and the eight quarters after enrolling in the innovation. Because patients with two or more chronic conditions were selected for the innovation and the comparison groups, average spending per patient is higher in the sample than for a typical Medicare patient. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 11. Medicare Spending per Patient: MPHI

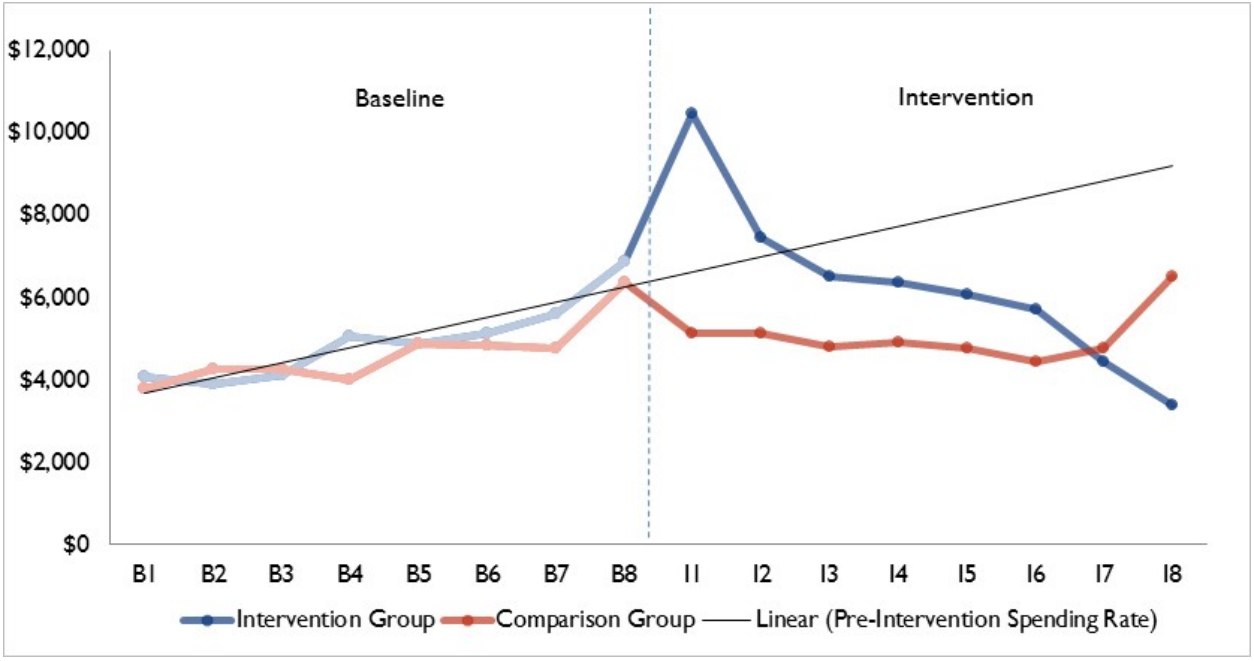
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331025	MPHI																
	Spending rate	$4,098	$3,902	$4,113	$5,066	$4,883	$5,155	$5,614	$6,886	$10,478	$7,456	$6,513	$6,358	$6,073	$5,711	$4,435	$3,378
	Std dev	$10,995	$9,698	$8,625	$12,612	$10,504	$13,047	$13,418	$15,347	$16,445	$13,794	$12,015	$13,264	$13,558	$12,316	$7,959	$4,399
	Unique patients	1,392	1,425	1,462	1,487	1,519	1,558	1,588	1,625	1,625	1,356	1,053	764	530	337	192	38
Comparison Group																	
1C1CMS 331025	MPHI																
	Spending rate	$3,791	$4,264	$4,267	$4,023	$4,893	$4,854	$4,782	$6,358	$5,129	$5,151	$4,818	$4,909	$4,780	$4,443	$4,773	$6,512
	Std dev	$9,340	$12,148	$15,046	$10,771	$32,429	$14,382	$14,438	$15,344	$12,194	$13,558	$12,082	$12,993	$11,759	$10,596	$11,433	$19,479
	Unique patients	1,476	1,496	1,520	1,543	1,564	1,590	1,613	1,623	1,623	1,371	1,067	785	551	354	205	43
Savings per Patient		−$307	$362	$153	−$1,043	$10	−$301	−$831	−$528	−$5,349	−$2,305	−$1,695	−$1,449	−$1,293	−$1,268	$338	$3,134

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 4 illustrates the Medicare spending per beneficiary in Table 11 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 4. Medicare Spending per Patient: MPHI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
MPHI = Michigan Public Health Institute.

The trend line based on the pre-intervention period slopes upward, showing that spending increased. The spending rates are very similar between the intervention and comparison groups in the baseline period. For the intervention group, spending increases noticeably in the first post-intervention quarter, but declines steadily in the remaining intervention quarters (I2–I8). In the final quarter we examined, I8, the spending rate of the intervention group is noticeably below the comparison group's rate. This decline is encouraging and may indicate evidence of a delayed impact of the intervention on the spending rate. Further statistical test results on the impact of the innovation on the spending rate are provided in the regression analysis section.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 12*** and ***Figure 5***.

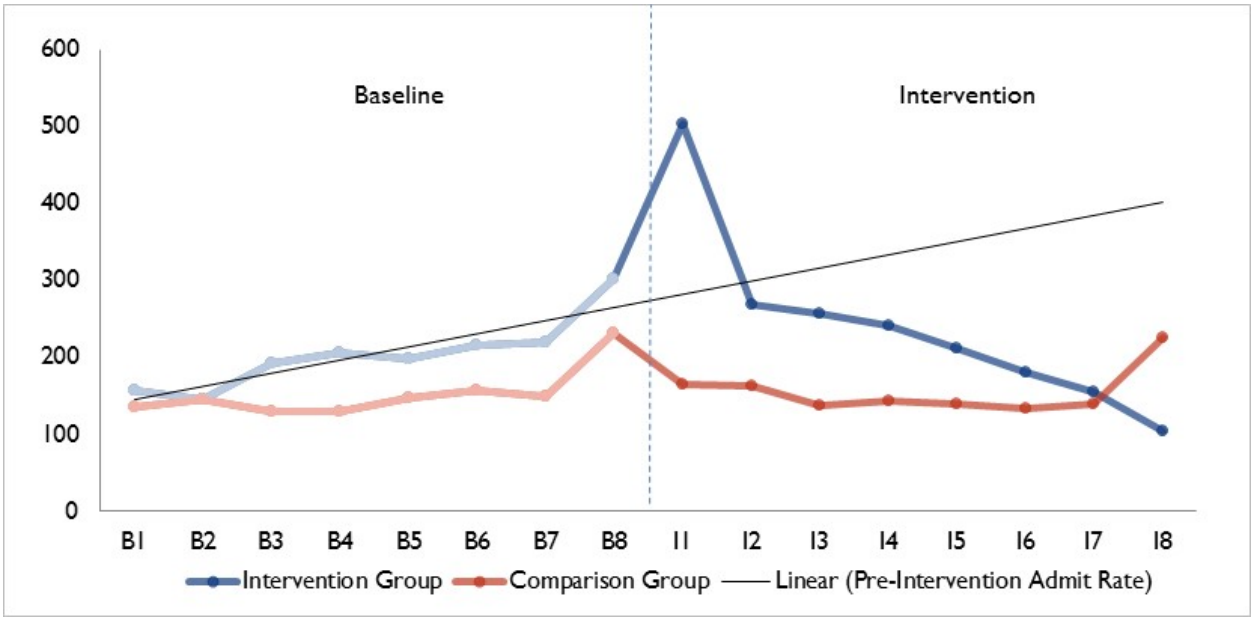
Table 12. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: MPHI

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331025	MPHI																
	Admit rate	158	145	193	207	199	216	219	302	505	268	256	241	211	181	156	105
	Std dev	508	473	551	594	578	646	655	729	881	742	671	745	636	545	452	383
	Unique patients	1,392	1,425	1,462	1,487	1,519	1,558	1,588	1,625	1,625	1,356	1,053	764	530	337	192	38
Comparison Group																	
1C1CMS 331025	MPHI																
	Admit rate	137	146	131	131	148	157	150	231	166	162	138	145	139	134	141	227
	Std dev	490	556	487	475	495	543	506	740	560	549	530	479	466	489	470	731
	Unique patients	1,476	1,496	1,520	1,543	1,564	1,590	1,613	1,623	1,623	1,371	1,067	785	551	354	205	43
Intervention − Comparison Rate		21	0	62	76	51	59	69	71	339	106	118	96	72	47	15	-121

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 5. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: MPHI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
MPHI = Michigan Public Health Institute.

Trends in the inpatient admissions rate for the intervention and comparison groups are very similar to those observed in the spending rate. The rates for both groups follow a similar, slightly rising trend in the baseline period. The admissions rate for the intervention group rises noticeably in the first post-intervention quarter, but declines steadily in the remaining post-intervention quarters. The admissions rate for the intervention group falls noticeably in the final quarter (I8) and is lower than the comparison group rate; however, the sample size is relatively small. The similar trends between the spending and admissions rates may be due to a correlation between the number of inpatient admissions and total spending per person. Further statistical test results on the impact of the innovation on admissions rate are provided in the next section.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 13*** and ***Figure 6***.

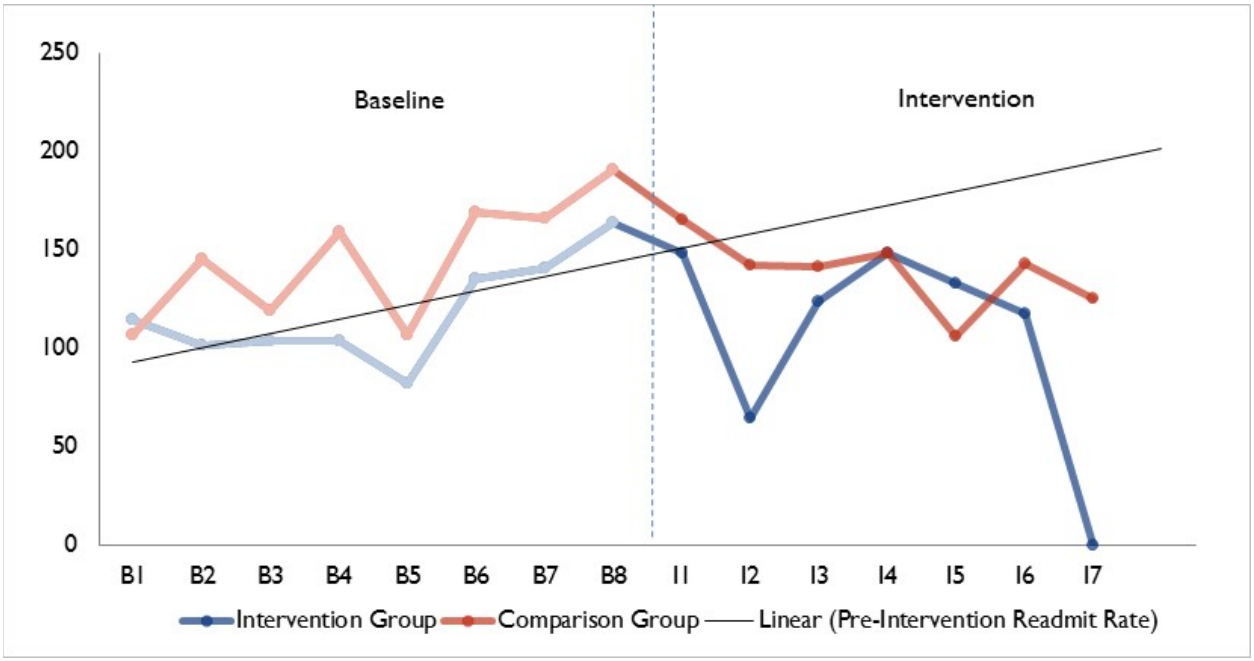
Table 13. Hospital Unplanned Readmissions Rates per 1,000 Admissions: MPHI

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group																
1C1CMS 331025	MPHI															
	Readmit rate	115	102	104	104	83	135	140	164	148	65	124	148	133	118	0
	Std dev	319	302	305	306	275	342	348	370	356	246	329	355	340	322	0
	Total admissions	61	59	106	96	109	111	121	165	330	108	89	54	45	17	10
Comparison Group																
1C1CMS 331025	MPHI															
	Readmit rate	107	145	119	159	107	169	166	190	165	142	142	148	106	143	125
	Std dev	309	352	324	366	309	375	372	393	371	349	349	355	308	350	331
	Total admissions	78	98	76	84	101	116	118	188	110	95	61	46	22	19	11
Intervention − Comparison Rate		8	−44	−15	−55	−25	−34	−25	−27	−16	−78	−18	0	27	−25	−125

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6. Hospital Unplanned Readmissions Rates per 1,000 Admissions: MPHI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
MPHI = Michigan Public Health Institute.

The trend line reflecting the unplanned readmissions rate for both the intervention and comparison groups increase slightly with minor fluctuations in the baseline period. In I7, the rates between the two groups diverge and the unplanned readmissions rate declines for the intervention group compared to the comparison group. This discrepancy is largely driven by the very small sample size in the total number of admissions in this quarter among both groups (i.e., the number of total admissions for the two groups is 10 and 11, respectively). I8 is not shown in the table because fewer than 10 index admissions occurred during that period.

ED visits per 1,000 participants are shown in ***Table 14*** and ***Figure 7***.

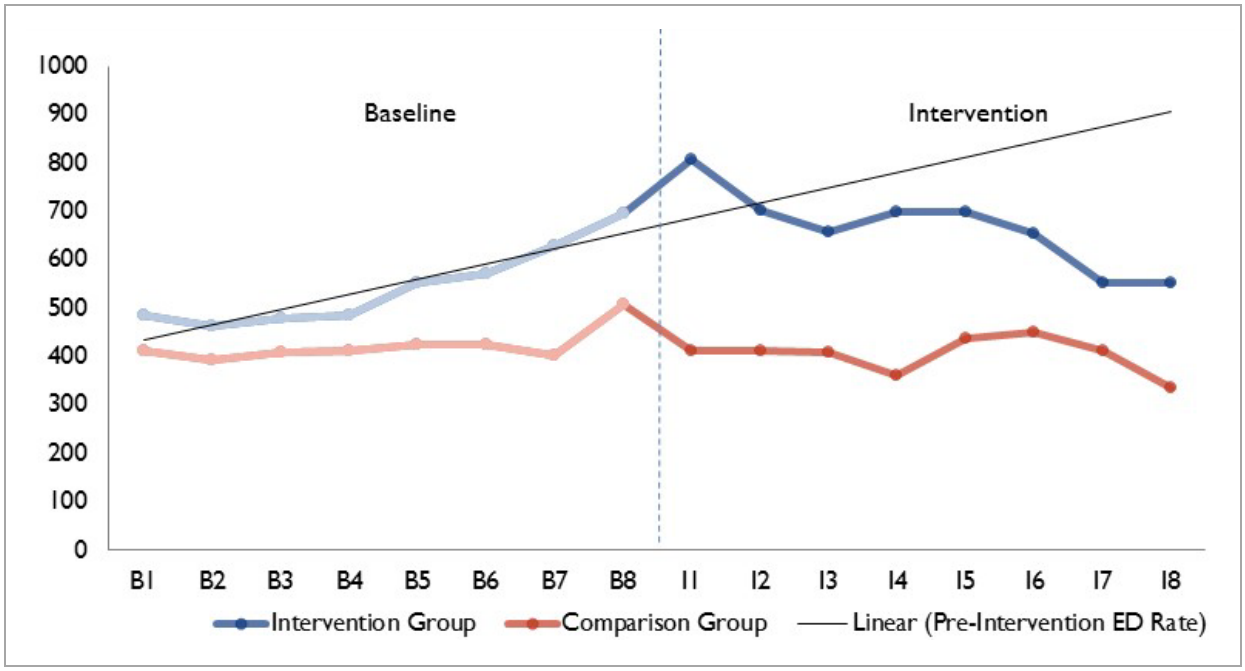
Table 14. ED Visits per 1,000 Participants: MPHI

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331025	MPHI																
	ED rate	487	462	480	485	552	573	628	696	809	702	658	699	700	656	552	553
	Std dev	1356	1134	1330	1467	1371	1546	1741	1726	1815	1748	1738	1737	2101	2224	1042	2023
	Unique patients	1,392	1,425	1,462	1,487	1,519	1,558	1,588	1,625	1,625	1,356	1,053	764	530	337	192	38
Comparison Group																	
1C1CMS 331025	MPHI																
	ED rate	414	393	410	412	427	427	403	507	412	412	409	363	436	451	414	335
	Std dev	845	838	790	810	858	881	802	917	749	733	838	676	871	1118	1049	651
	Unique patients	1,476	1,496	1,520	1,543	1,564	1,590	1,613	1,623	1,623	1,371	1,067	785	551	354	205	43
Intervention − Comparison Rate		74	69	70	73	126	146	225	189	397	290	249	336	264	205	138	218

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
ED = emergency department.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 7. ED Visits per 1,000 Participants: MPHI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
MPHI = Michigan Public Health Institute.

The ED visit rates for both groups follow a similar, rising trend in the baseline period. Similar to the spending rate, the ED visit rate for the intervention group rises slightly in the first post-intervention quarter, but declines slightly in I2 to I7. In the final quarter of data we examined, the ED rates of the two groups diverge slightly. Further statistical test results on the impact of the innovation on admissions rates are provided in the next section.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit.

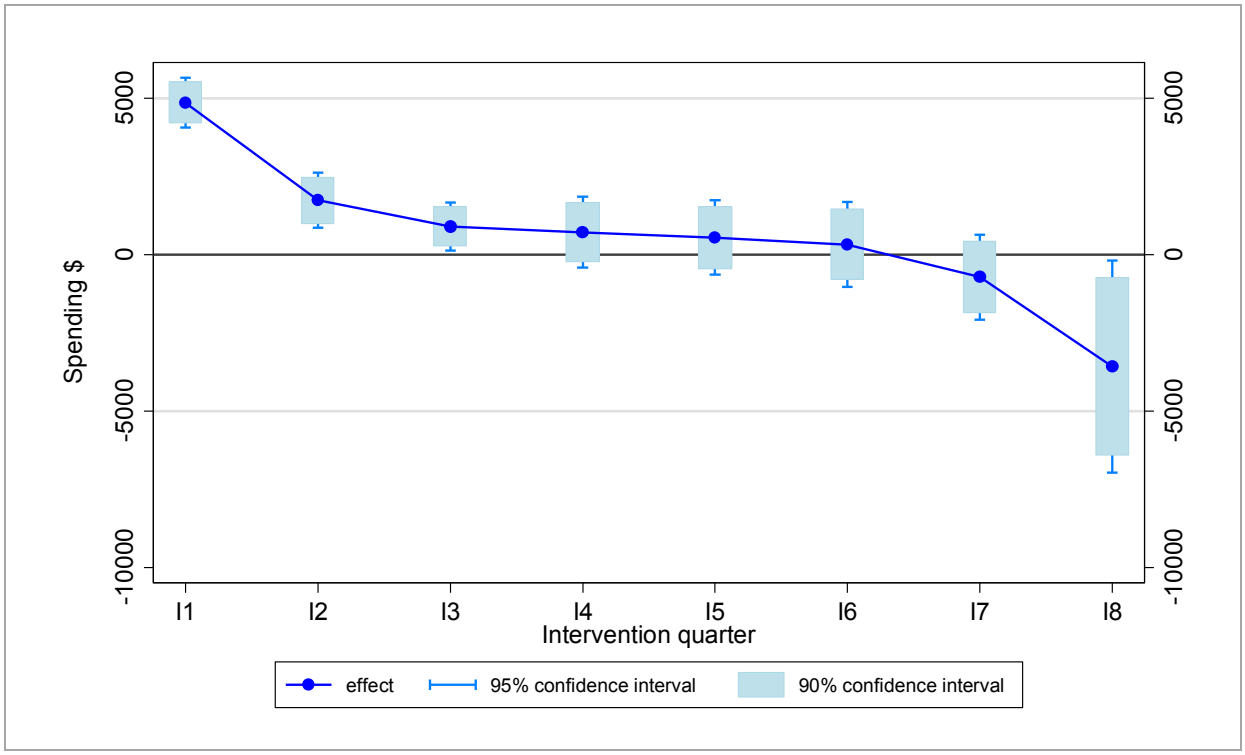
Table 15 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. ***Figure 8*** illustrates these quarterly difference-in-differences estimates.

Table 15. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: MPHI

Quarter	Coefficient	Standard Error	P-Values
I1	4,853	403	<.001
I2	1,733	450	0.000
I3	894	390	0.022
I4	709	577	0.219
I5	543	605	0.369
I6	317	691	0.646
I7	−720	693	0.299
I8	−3,579	1,731	0.039

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
MPHI= Michigan Public Health Institute; OLS = ordinary least squares.

Figure 8. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: MPHI

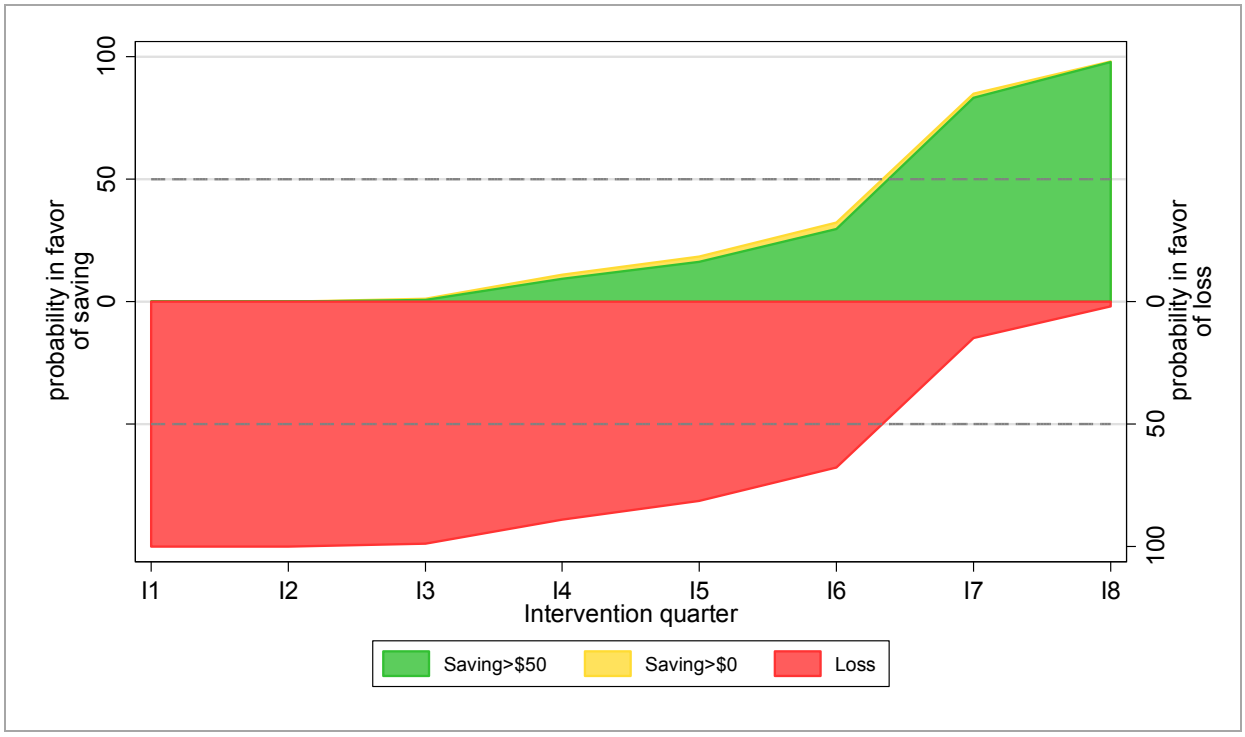


Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
MPHI = Michigan Public Health Institute; OLS = ordinary least squares.

In I1, the change in spending among treatment group individuals is $4,853 higher than the change in spending among comparison group individuals, and the difference is statistically significant. As presented in Figure 6, the spending difference between the treatment and comparison groups declines overall in quarters I2 to I8. In I8, the spending among treatment group individuals is $3,579 lower than the comparison group spending rate, and the difference is significant. The estimated negative coefficient in the final quarter is promising, suggesting that the intervention may lead to long-term savings.

Figure 9 presents the strength of evidence in favor of a saving or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis. Because the quarterly spending estimates are lower for the treatment group than the comparison group in I7 and I8, we see some evidence supporting the hypothesis that the innovation may have generated savings in these final quarters.

Figure 9. Quarterly Strength of Evidence in Favor of Saving/Loss: MPHI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
MPHI = Michigan Public Health Institute.

We also present the overall weighted average treatment effect per member per quarter during the intervention period for beneficiaries enrolled in the innovation as compared with their matched comparison group. The weighted average quarterly spending differential in the post-innovation period, indicating a loss, is −$1,975 (90% CI: −$2,424, −$1,525) per member per quarter.

We also present linear probability model coefficients for inpatient admissions and outpatient ED visits. Although logistic regression coefficients correctly predict the direction and significance of the effect,

a simple transformation of the logistic regression coefficient into probability does not result in the estimated effect.[4] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, linear probability model coefficients have often been empirically demonstrated to be consistent with marginal effects generated from nonlinear models.[5] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention), not just the direction of the effect.

Table 16 presents the results of a linear probability model where the dependent variable is set to one for patients who had an inpatient hospital visit during the quarter.

Table 16. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: MPHI

Quarter	Coefficient	Standard Error	P-Values
I1	0.18	0.01	<.0001
I2	0.01	0.01	0.184
I3	0.03	0.01	0.009
I4	0.00	0.01	0.756
I5	0.00	0.02	0.814
I6	−0.01	0.02	0.707
I7	−0.01	0.02	0.600
I8	−0.10	0.05	0.049

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
MPHI = Michigan Public Health Institute.

In the first three quarters after the innovation start date, the estimated coefficients are positive, indicating treatment group patients are more likely to be hospitalized than the comparison group. In I4 and I5, the coefficients are zero. The coefficient estimates turn negative in I6 to I8, suggesting a lower probability of hospitalizations in the treatment group. Specifically in I8, the treatment group patients are 10 percentage points less likely to have been hospitalized, and this difference is statistically significant. These estimates suggest the innovation may have an impact in reducing the likelihood of hospitalization in the long run. The average quarterly difference-in-differences estimate for inpatient admissions is 5.7 percentage points, indicating that the treatment-control difference is 5.7 percentage points higher during

[4] To obtain the correct effect, it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run even when not competing with other users for computer resources.
[5] Angrist, J.D., and Pischke J.-S.: Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

the intervention period. This is the average difference in inpatient admissions probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: .046, .068).

Table 17 presents results of a linear probability model where the dependent variable is set to one for patients who had an ED visit during that quarter.

Table 17. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: MPHI

Quarter	Coefficient	Standard Error	P-Values
I1	0.18	0.01	<.0001
I2	0.03	0.01	0.021
I3	0.05	0.02	0.001
I4	0.01	0.02	0.666
I5	0.01	0.02	0.524
I6	0.01	0.03	0.743
I7	0.01	0.04	0.784
I8	−0.15	0.07	0.028

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
MPHI = Michigan Public Health Institute.

Treatment group patients are significantly more likely to have visited the ED in quarters I1 to I3. The estimate becomes negative in I8, suggesting treatment group patients are 15 percentage points less likely to have an ED visit in this quarter, and this difference is statistically significant. The average quarterly difference-in-differences estimate for ED visits is 6.8 percentage points, indicating that the treatment-control difference is 6.8 percentage points higher during the intervention period. This is the average difference in ED visit probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: .053, .082). We will continue to estimate the impact on the probability of ED visits in later innovation quarters as more claims data become available.

Discussion

The Pathways innovation does not seem to have a short-term impact on reducing total spending per patient among the Medicare population. This result is not surprising, because the innovation focused on improving the enrollees' use of appropriate services. By completing Pathways such as medical referrals, the innovation participants were likely to use more services initially, which can explain the higher spending and utilization among treatment group individuals compared with the comparison group in I1. In the long run, however, the findings suggest that the innovation might lead to a reduction in patients'

spending and utilization. In the final quarter examined (I8), the spending among treatment group individuals is $3,579 lower than the comparison group (p=0.039); the treatment group patients are 10 percentage points less likely to have been hospitalized (p=0.049) and 15 percentage points less likely to have visited the ED (p=0.028).

However, these results may not be fully representative of the overall Medicare population served by the innovation. The results presented here are only for fee-for-service Medicare beneficiaries whom we matched with the identifiers provided by the site, which represent approximately 25 percent of the overall population reached by the innovation.

Medicaid Claims Analysis

The Medicaid data analysis uses claims data from the Centers for Medicare & Medicaid Services Alpha-MAX, which is currently available through September 2013. The analysis focuses on Medicaid fee-for-service beneficiaries enrolled in the Pathways innovation.

Comparison Groups

To construct the comparison group, we used PSM to identify individuals located in the same three counties (Saginaw, Muskegon, and Ingham) where the intervention was conducted, who were enrolled in fee-for-service Medicaid, and who were not enrolled in the innovation. Program participants and comparison-group members were matched using a logit model predicting the likelihood of program participation as a function of demographics (gender, age, and ethnicity), disability status, dual eligibility, number of months of Medicaid eligibility during the calendar year prior to the intervention, new Medicaid enrollee indicator, health care utilization in the calendar quarter prior to enrollment (number of inpatient admissions and ED visits), and spending in the quarter and year prior to program participation.

Table 18 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. ***Appendix B.2*** provides technical details on the propensity score methodology. One treatment beneficiary was dropped from the subsequent analyses due to lack of an appropriately matched comparison beneficiary.

Table 18. Mean Values and Standardized Differences of Variables in Propensity Score Model: MPHI

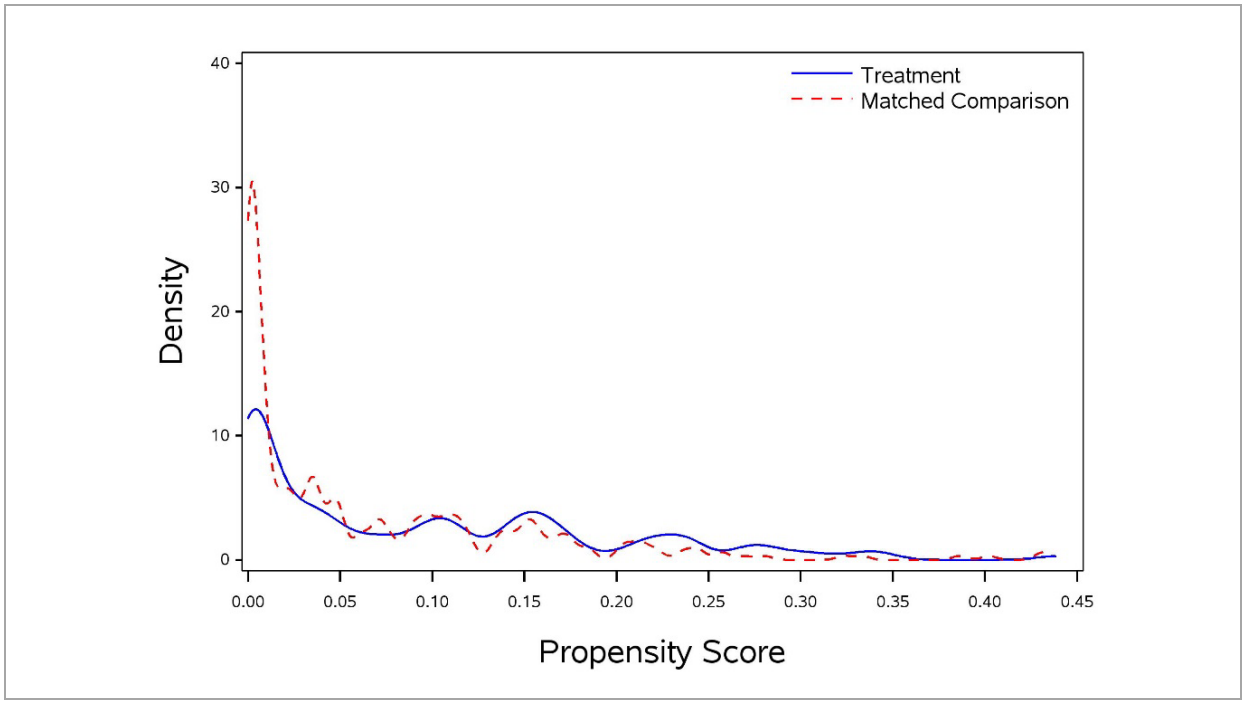
Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrollment	2,442	9,502	561	1,978	0.27	1,748	5,131	2,575	5,290	0.16
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	2,367	11,100	1,900	6,289	0.05	1,583	6,462	1,936	5,923	0.06
Age	47.14	12.20	49.42	20.56	0.13	47.29	12.12	50.31	11.74	0.25
Percentage female	52.63	50.12	66.18	47.31	0.39	53.03	50.10	43.69	32.06	0.27
Percentage white	46.62	50.07	60.59	48.87	0.40	46.97	50.10	40.40	31.71	0.19
Percentage disabled or aged	30.08	46.03	62.20	48.49	0.96	29.55	45.80	39.39	31.58	0.29
Percentage nondisabled adult	55.64	49.87	19.90	39.92	1.12	56.06	49.82	50.76	32.31	0.15
Percentage dual	18.05	38.60	66.29	47.27	1.58	18.18	38.72	23.74	27.50	0.19
Percentage less than 1 year on Medicaid	61.65	48.81	19.55	39.66	1.34	61.36	48.88	50.51	32.31	0.31
Number of Medicaid eligible months in the previous calendar year	3.29	4.72	9.97	3.91	1.54	3.31	4.73	3.98	3.27	0.17
Number of ED visits in calendar quarter prior to enrollment	0.73	1.99	0.08	0.53	0.45	0.73	2.00	0.79	1.74	0.03
Number of inpatient stays in calendar quarter prior to enrollment	0.09	0.29	0.01	0.10	0.37	0.08	0.28	0.08	0.18	0.00
Number of unique beneficiaries	133	—	22,932	—	—	132	—	317	—	—
Number of weighted beneficiaries	—	—	—	—	—	—	—	86	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
ED = emergency department; MPHI = Michigan Public Health Institute; SD = standard deviation.
— Data not yet available.

After performing propensity score matching, we calculate absolute standardized differences between the treatment group and both the unmatched and matched comparison groups, and check whether matching decreases the absolute standardized differences and achieves acceptable balance. Many researchers consider that an absolute standardized difference ≤ 0.10 indicates acceptable balance.[6] The results in Table 18 show that matching reduced the absolute standardized differences noticeably for almost all variables in the model, even though it did not achieve adequate balance for most variables.

Figure 10 shows the distribution of the propensity scores for both the treatment and comparison groups. The figure demonstrates a very close overlap between the treatment and comparison groups' propensity scores. Therefore, we present the Medicare claims analysis using both the treatment group and the matched comparison group.

Figure 10. Distribution of Propensity Scores for Comparison and Intervention Groups: MPHI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
MPHI = Michigan Public Health Institute.

Descriptive Analysis

Table 19 reports Medicaid spending per patient in the eight quarters before and two quarters after enrolling in the innovation.

[6] Austin, P.C. An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research. 46.3: 399–424, 2011. *PMC*. Web. 2 June 2015.

Table 19. Medicaid Spending per Patient: MPHI

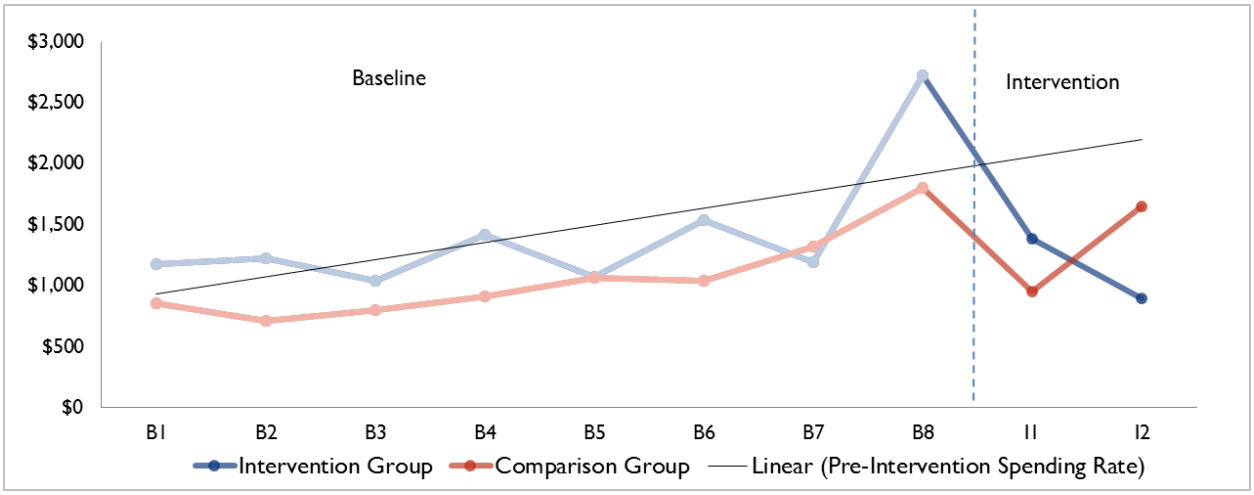
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters	
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2
Intervention Group											
1C1CMS 331025	MPHI										
	Spending rate	$1,180	$1,227	$1,036	$1,415	$1,074	$1,535	$1,194	$2,725	$1,385	$893
	Std dev	$2,586	$3,146	$2,093	$4,092	$2,681	$3,696	$3,178	$7,032	$3,231	$1,969
	Unique patients	34	37	36	38	42	39	42	59	132	49
Comparison Group											
1C1CMS 331025	MPHI										
	Spending rate	$859	$714	$798	$915	$1,065	$1,043	$1,324	$1,803	$953	$1,650
	Std dev	$1,530	$1,166	$1,258	$1,338	$1,805	$1,578	$2,366	$3,988	$1,521	$3,316
	Unique patients	51	49	42	37	41	64	116	110	86	65
Savings per Patient		−$320	−$513	−$238	−$501	−$10	−$492	$131	−$922	−$432	$757

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates.
I1 is “Intervention Q1”; B1 is “Baseline Q1.”

Figure 11 illustrates the Medicaid spending per beneficiary in Table 19. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 11. Medicaid Spending per Patient: MPHI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
MPHI = Michigan Public Health Institute.

The trend line for spending based on the pre-intervention period slopes upward. The spending rates are very similar between the intervention and comparison groups in the baseline period. Spending per person falls below the trend line for both the intervention and comparison groups in the first post-intervention quarter (I1). In I2, the intervention group spending rate is noticeably lower than the comparison group rate. We further explore the impact of the innovation on the spending rate in the regression analysis section below.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 20*** and ***Figure 12***.

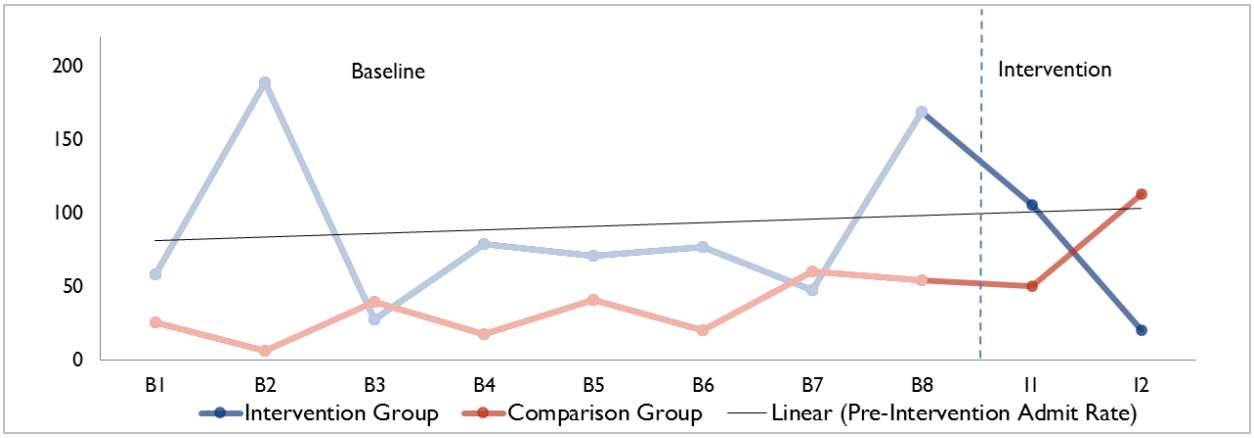
Table 20. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: MPHI

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters	
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2
Intervention Group											
1C1CMS 331025	MPHI										
	Admit rate	59	189	28	79	71	77	48	169	106	20
	Std dev	239	701	167	359	261	270	216	461	483	143
	Unique patients	34	37	36	38	42	39	42	59	132	49
Comparison Group											
1C1CMS 331025	MPHI										
	Admit rate	26	7	40	18	41	21	61	54	51	113
	Std dev	117	49	115	77	137	87	183	154	138	323
	Unique patients	51	49	42	37	41	64	116	110	86	65
Intervention − Comparison rate		33	182	−12	61	30	56	−13	115	55	−93

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 12. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: MPHI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
MPHI = Michigan Public Health Institute;

The inpatient admission rates for both groups follows a relatively flat trend in the baseline period with minor fluctuations. The admissions rate for the intervention group rises noticeably in the final baseline quarter, but declines steadily in the two post-intervention quarters. Similar to the spending rate, the admissions rate for the intervention group is noticeably lower than the comparison group rate in I2. Further statistical testing on the impact of the innovation on admissions rate is performed in the next section.

Hospital readmissions rates per 1,000 admissions are shown in ***Table 21*** and ***Figure 13***.

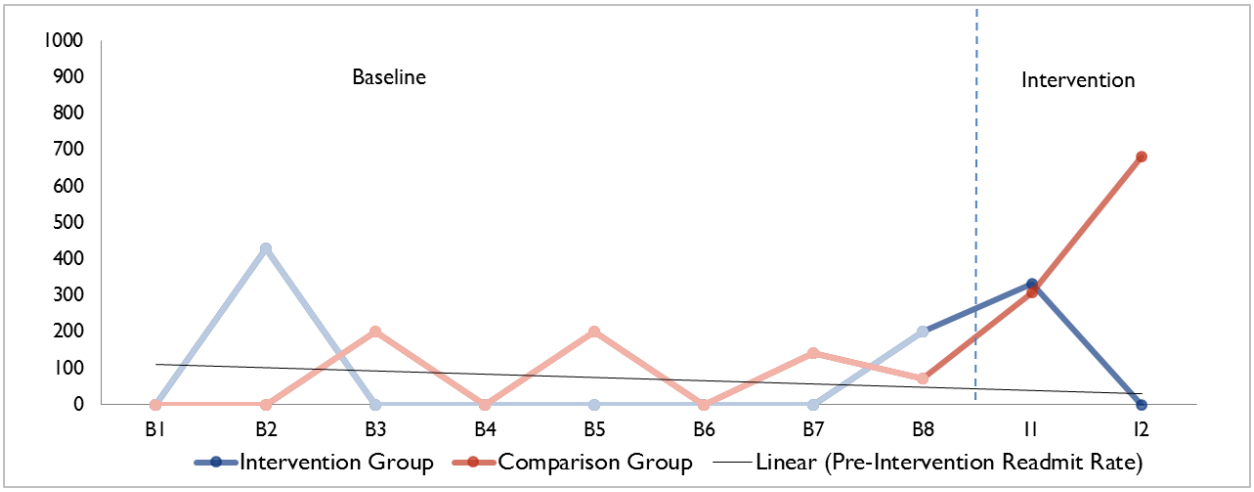
Table 21. Hospital Readmissions Rates per 1,000 Admissions: MPHI

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters	
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2
Intervention Group											
1C1CMS 331025	MPHI										
	Readmit rate	0	429	0	0	0	0	0	200	333	0
	Std dev	0	495	0	0	0	0	0	400	471	0
	Total admissions	1	7	1	2	2	3	2	10	6	1
Comparison Group											
1C1CMS 331025	MPHI										
	Readmit rate	0	0	200	0	200	0	143	71	308	682
	Std dev	0	0	400	0	400	0	350	258	462	466
	Total admissions	1	1	2	1	2	1	5	5	4	7
Intervention − Comparison rate		0	857	−200	0	−200	0	−143	329	359	−682

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 13. Hospital Readmission Rates per 1,000 Admissions: MPHI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
MPHI = Michigan Public Health Institute;

Among the intervention group patients, we observe no readmissions in seven of the 10 quarters examined (B1, B3-B7, and I2). This finding is not particularly surprising, given the small sample size and the rare incidence of readmissions. In I2, the rates between the intervention and comparison groups diverge noticeably where the unplanned readmissions rate is particularly lower for the intervention group. This discrepancy is mostly due to the very small number of index admissions in this quarter among the intervention group (i.e., number of total admissions was 1), and does not have a meaningful interpretation. We will explore these trends further in later reports as the innovation continues and more data become available.

ED visits per 1,000 participants are shown in ***Table 22*** and ***Figure 14***.

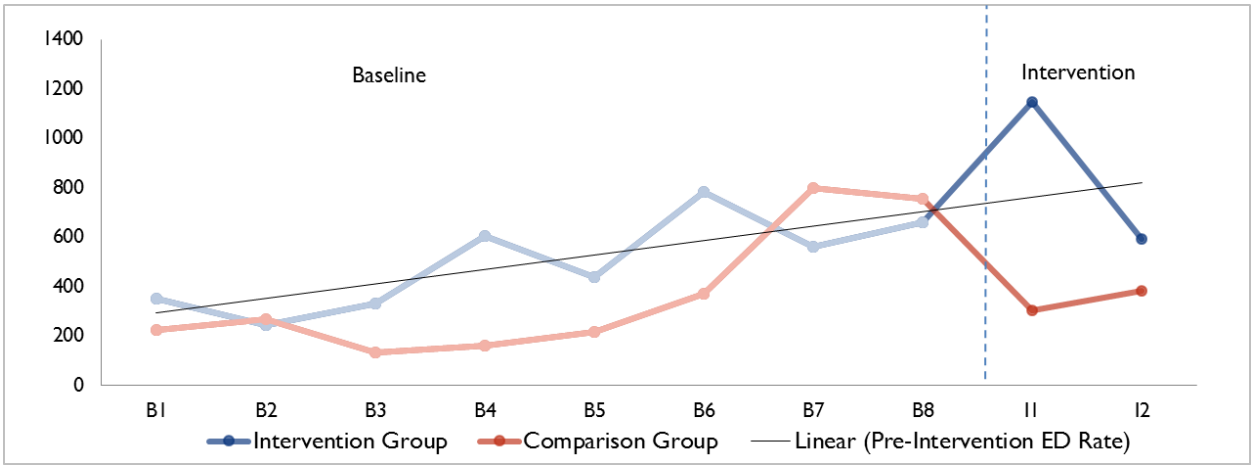
Table 22. ED Visits per 1,000 Participants: MPHI

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters	
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2
Intervention Group											
1C1CMS 331025	MPHI										
	ED rate	353	243	333	605	440	782	560	661	1148	592
	Std dev	917	683	894	1,871	958	2,944	1,353	1,726	3,848	1,695
	Unique patients	34	37	36	38	42	39	42	59	132	49
Comparison Group											
1C1CMS 331025	MPHI										
	ED rate	224	270	135	162	217	370	800	757	304	384
	Std dev	632	688	527	416	698	1,222	1,842	1,452	1,055	1,005
	Unique patients	51	49	42	37	41	64	116	110	86	65
Intervention − Comparison rate		129	−27	198	443	223	412	−240	−96	844	208

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 14. ED Visits per 1,000 Participants: MPHI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
MPHI = Michigan Public Health Institute;

The ED visit rates for both groups follows a slightly rising trend in the baseline period. The ED visit rate for the intervention group rises noticeably above the trend line in the first post-intervention quarter, but it declines in I2, almost converging with the comparison group rate. Further statistical testing on the impact of the innovation on ED visit rates is performed in the next section.

Regression Analysis

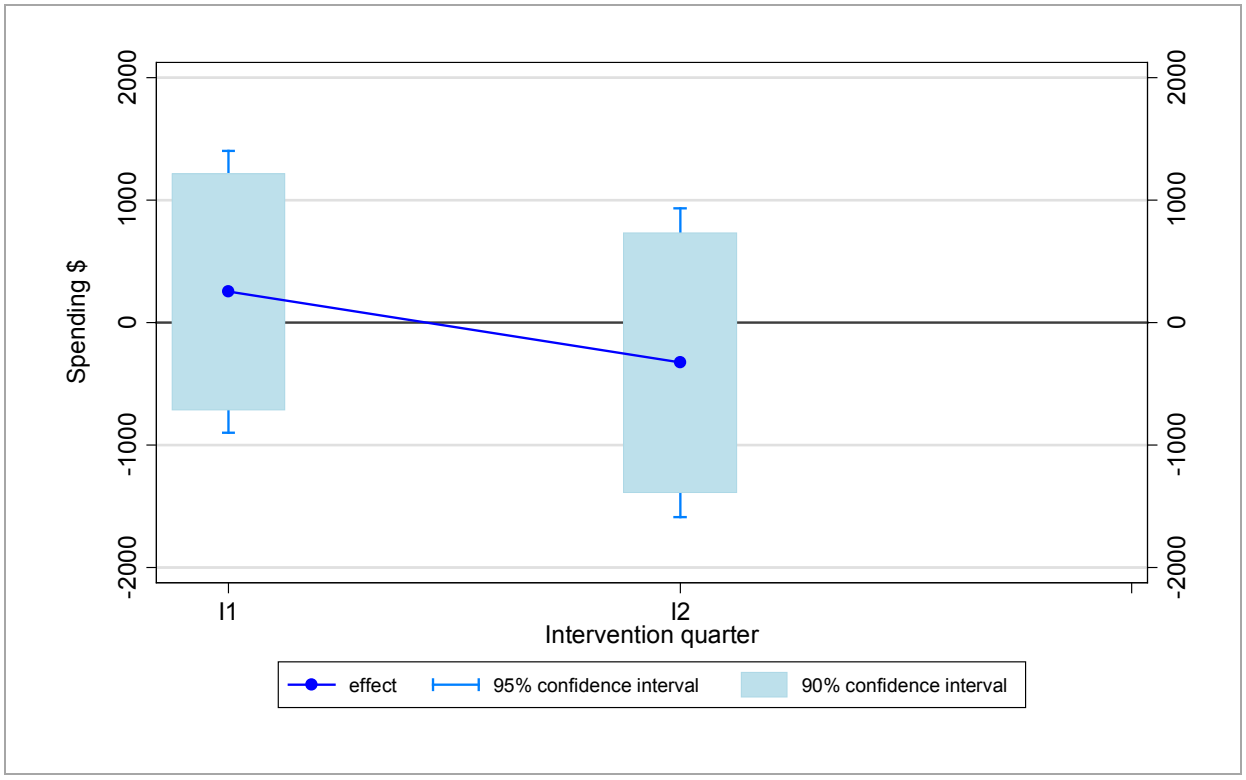
Table 23 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. ***Figure 15*** illustrates these quarterly difference-in-differences estimates.

Table 23. Difference-In-Differences OLS Regression Estimates for Quarterly Medicaid Spending per Participant: MPHI

Quarter	Coefficient	Standard Error	P-Values
I1	252	587	0.667
I2	−328	644	0.611

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, dual eligibility, number of months of Medicaid eligibility during the calendar year prior to the intervention, and the new enrollee indicator. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
MPHI= Michigan Public Health Institute; OLS = ordinary least squares.

Figure 15. Difference-In-Differences OLS Regression Estimates for Quarterly Medicaid Spending per Participant: MPHI

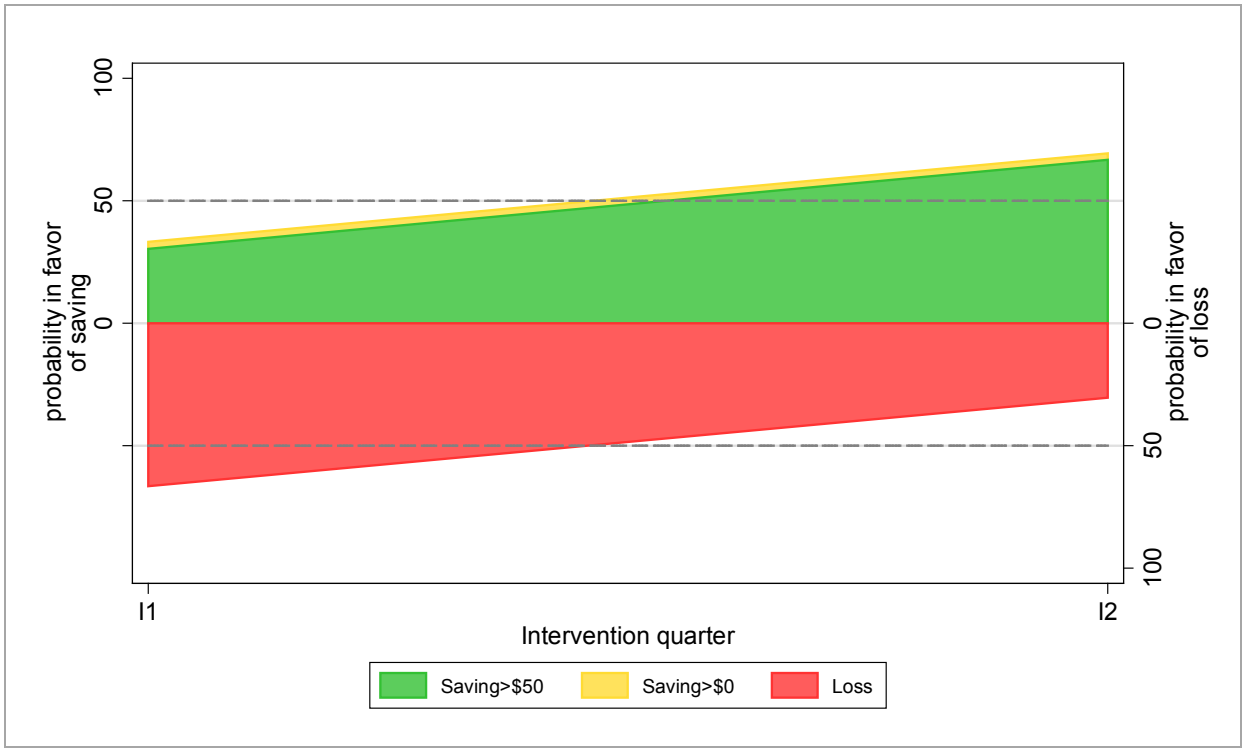


Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
MPHI = Michigan Public Health Institute; OLS = ordinary least squares.

In I1, change in spending among treatment group individuals is $252 higher than the change in spending among comparison group individuals. The spending difference between the two groups declines in I2 where the spending among treatment group individuals is $328 lower than the comparison group, Even though both coefficients are insignificant, the estimated negative coefficient in I2 is promising.

Figure 16 presents the strength of evidence in favor of savings or loss. Because the quarterly spending estimate is lower for the treatment group than the comparison group in I2, we see some evidence supporting the hypothesis that the innovation may have generated savings in this quarter.

Figure 16. Quarterly Strength of Evidence in Favor of Savings/Loss: MPHI



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
MPHI = Michigan Public Health Institute.

We also present the overall weighted average treatment effect per member per quarter during the intervention period for beneficiaries enrolled in the innovation as compared with their matched comparison group. The weighted average quarterly spending differential in the post-innovation period, indicating a loss, is −$148 (90% CI: −$1,053, $758) per member per quarter.

Table 24 presents the results of a linear probability model where the dependent variable is set to one for patients who had an inpatient hospital visit during the quarter.

Table 24. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: MPHI

Quarter	Coefficient	Standard Error	P-Values
I1	−0.03	0.03	0.372
I2	−0.05	0.03	0.174

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, dual eligibility, number of months of Medicaid eligibility during the calendar year prior to the intervention, and the new enrollee indicator. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
MPHI = Michigan Public Health Institute.

In both quarters after the innovation start date, the estimated coefficients are negative, indicating treatment group patients were less likely to be hospitalized than the comparison group by 3 and 5 percentage points, respectively. However, the estimated coefficients are not statistically significant.

Table 25 presents results of a linear probability model where the dependent variable is set to one for patients who had an ED visit during that quarter.

Table 25. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: MPHI

Quarter	Coefficient	Standard Error	P-Values
I1	−0.07	0.06	0.226
I2	−0.01	0.06	0.853

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, dual eligibility, number of months of Medicaid eligibility during the calendar year prior to the intervention, and the new enrollee indicator. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
MPHI = Michigan Public Health Institute.

Treatment group patients are less likely to have visited the ED in quarters I1 and I2 by 7 and 1 percentage points, respectively. The estimates in these two quarters are not statistically significant. We will estimate the impact on the probability of ED visits in later innovation quarters as more claims data become available.

Discussion

The Pathways innovation did not have a significant impact on reducing total spending per patient or utilization (inpatient admissions and ED visits) among the Medicaid population in the two quarters examined. These results may not be fully representative of the overall Medicaid population served by the innovation. The results presented here are only for fee-for-service Medicaid beneficiaries whom we could match with the identifiers provided by the site, which represents 5 percent of the Medicaid population

reached by the innovation. In addition, the sample size was small, which hinders detection of changes in spending. We will continue to estimate the impact of the innovation in later quarters as more claims data become available.

1.3.3 Other Awardee-Specific Data

Table 26 lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. We received patient-level data used to generate each measure listed in Tables 4 and 26 for each quarter through Q11 (March 31, 2015).

Table 26. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Clinical effectiveness	Diabetes	Percentage of patients with diabetes who received an HbA1c test	Data received from MPHI
		Percentage of patients with diabetes who received a LDL-C screening	Data received from MPHI
	Weight Management	Percentage of patients who received BMI assessment	Data received from MPHI
	Hypertension	Percentage of patients who received blood pressure screening	Data received from MPHI
	Patient Care	HCIA Provider Survey	Collected by RTI
Health outcomes	Diabetes	Percentage of patients with diabetes who had hemoglobin A1c >9.0%	Data received from MPHI
		Percentage of patients with diabetes who had LDL-C <100 mg/dL	Data received from MPHI
	Weight Management	Percentage of patients who are overweight (BMI 25.0–29.9) or obese (BMI >30)	Data received from MPHI
	Hypertension	Percentage of patients with hypertension with blood pressure <140/90 mm Hg	Data received from MPHI

BMI = body mass index; LDL-C = low-density lipoprotein cholesterol; MPHI = Michigan Public Health Institute.

Clinical Effectiveness

Clinical effectiveness measures include an analysis of data received directly from MPHI as well as from the HCIA Provider Survey. For diabetes, measures include the percentage of participants who received an HbA1c test as well as the percentage who received and LDL-C test. For weight management, measures include the percentage of participants that received a BMI assessment and for hypertension, measures include the percentage of participants that included a blood pressure screening. From the HCIA Provider Survey we can determine provider satisfaction with the innovation and perceptions on impacts on patient care.

Evaluation Questions

- Has the percentage of patients with diabetes who received an HbA1c test and lipid profile assessment increased over time among those enrolled in the innovation?
- Has the percentage of patients with who received a body mass index (BMI) assessment increased over time among those enrolled in the innovation?
- Has the percentage of patients with hypertension who received a blood pressure reading increased over time among those enrolled in the innovation?
- How has implementation of the innovation impacted provider perceptions of patient care?

Table 27 shows the number and percentage of participants by the most common health conditions and by number of health conditions. As a requirement for eligibility to enroll, participants must have had at least two chronic conditions. Most patients had three to five chronic conditions (43.0%), although 25.6 percent had six to eight chronic conditions, and 13.6 percent had nine or more chronic conditions. Hypertension (47.7%), depression (47.0%), arthritis (34.8%), diabetes (29.0%), anxiety (31.8%), and hyperlipidemia (25.1%) were the most prevalent conditions among participants. This table shows that MPHI is indeed serving a population with many chronic illnesses.

Table 27. Number and Percentage of Active Participants by Type and Number of Health Conditions for Those Enrolled through Q11

Type and Number of Health Conditions	All Active Patients[1] (N=5,778)	
	Number	Percentage
Specific Health Condition		
Hypertension	2,757	47.7
Depression	2,717	47.0
Arthritis	2,013	34.8
Diabetes type II	1,678	29.0
Anxiety disorder	1,839	31.8
Hyperlipidemia	1,449	25.1
Other[2]	3,272	56.6
Number of Health Conditions		
<=2 conditions reported	1,028	17.8
3–5 conditions reported	2,487	43.0
6–8 conditions reported	1,477	25.6
>=9 conditions reported	786	13.6

Source: Patient-level data provided to RTI by MPHI.
[1] Based on most recent adult checklist completed.
[2] Other includes (1) conditions in the checklist that have been mislabeled as "other" (e.g., anxiety, back pain); (2) conditions that may not be considered chronic health conditions (e.g., illiteracy); and (3) other conditions not included in the checklist (e.g., sleep apnea, fibromyalgia).

Table 28 shows the percentage of patients, by health condition, receiving clinical services. As shown in the table, approximately one-third of patients with diabetes received an HbA1c test (30.5%) and approximately 20 percent received a low-density lipoprotein cholesterol (LDL-C) assessment at some

point during enrollment. Among those with hypertension, approximately 40 percent received a blood pressure screening, and 32.4 percent of all patients enrolled in Pathways received a BMI assessment during enrollment.

Table 28. Percentage of Patients Who Received Clinical Services Post-Enrollment

Measure	Percentage of Patients Receiving Clinical Services[1]
Diabetes Type II (n=1,678)	
Percentage patients with diabetes who received an HbA1c test	30.5
Percentage of patients with diabetes who received an LDL-C assessment	20.1
General Health and Wellness (n=5,778)	
Percentage of patients who received BMI assessment	32.4
Hypertension (n=2,757)	
Percentage of patients with hypertension who received a blood pressure screening	39.9

Source: Patient-level data provided to RTI by MPHI.
BMI = body mass index; LDL-C = low-density lipoprotein cholesterol.

Provider Perceptions of Patient Care

Data on the impact on patient care came from the HCIA Provider Survey. The majority of providers (80.2%) indicated that Pathways had an impact on patient care. Of those that indicated that the innovation had an impact on patient care, the majority of providers (69.4%) said the impact was very positive and 29.1 percent said it was somewhat positive. No providers indicated that Pathways had a negative impact on patients.

Provider views on the specific impacts of Pathways on patient care were generally positive (***Table 29***). Providers indicated that they either strongly or somewhat agreed that the innovation helped them provide better patient care (79.0%), that the innovation was beneficial for their patients (85.0%), that, among their patients who were aware (and not aware) of the innovation, the majority of patients would say that it was beneficial to the care they received (81.4% and 68.9%, respectively), and that the innovation led to more effective communication during patient visits.

Table 29. Summary of Perceptions Regarding the Impact on Patient Care

Question	Percentage of MPHI Providers Indicating Strongly Agree/ Somewhat Agree	Percentage of MPHI Providers Indicating Strongly Disagree/ Somewhat Disagree	Percentage of MPHI Providers Indicating Neither Agree nor Disagree	Percentage of MPHI Providers Indicating Not Applicable/Missing
Innovation helps provide better patient care.	79.0 N=132	3.0 N=5	7.2 N=12	10.8 N=18
Innovation leads to more effective communication during patient visits.	65.3 N=109	5.4 N=9	15.6 N=26	13.8 N=23

(continued)

Table 29. Summary of Perceptions Regarding the Impact on Patient Care (continued)

Question	Percent of MPHI Providers Indicating Strongly Agree/ Somewhat Agree	Percent of MPHI Providers Indicating Strongly Disagree/ Somewhat Disagree	Percent of MPHI Providers Indicating Neither Agree nor Disagree	Percent of MPHI Providers Indicating Not Applicable/Missing
Innovation has improved my patients' access to care.	78.4 N=131	2.4 N=4	8.4 N=14	10.8 N=18
Innovation has increased the time I am able to spend with patients during office visits.	38.3 N=64	10.2 N=17	28.1 N=47	23.4 N=39
Innovation helps me develop good relationships with my patients.	56.3 N=94	4.8 N=8	23.4 N=39	15.6 N=26
Innovation has improved perceived patient satisfaction with care.	63.5 N=106	3.0 N=5	19.8 N=33	13.8 N=23
Innovation has been beneficial for patients in my practice.	85.0 N=142	1.8 N=3	4.2 N=7	9.0 N=15
Among my patients who *are aware* of Innovation, the majority of patients would say it has been beneficial in the care they receive.	81.4 N=136	2.4 N=4	5.4 N=9	10.8 N=18
Among my patients who *are not aware* of Innovation, if I told them about it, the majority of patients would say it has been beneficial in the care they receive.	68.9 N=115	4.8 N=8	10.2 N=17	16.2 N=27

IT = information technology; MPHI = Michigan Public Health Institute.

Health Outcomes

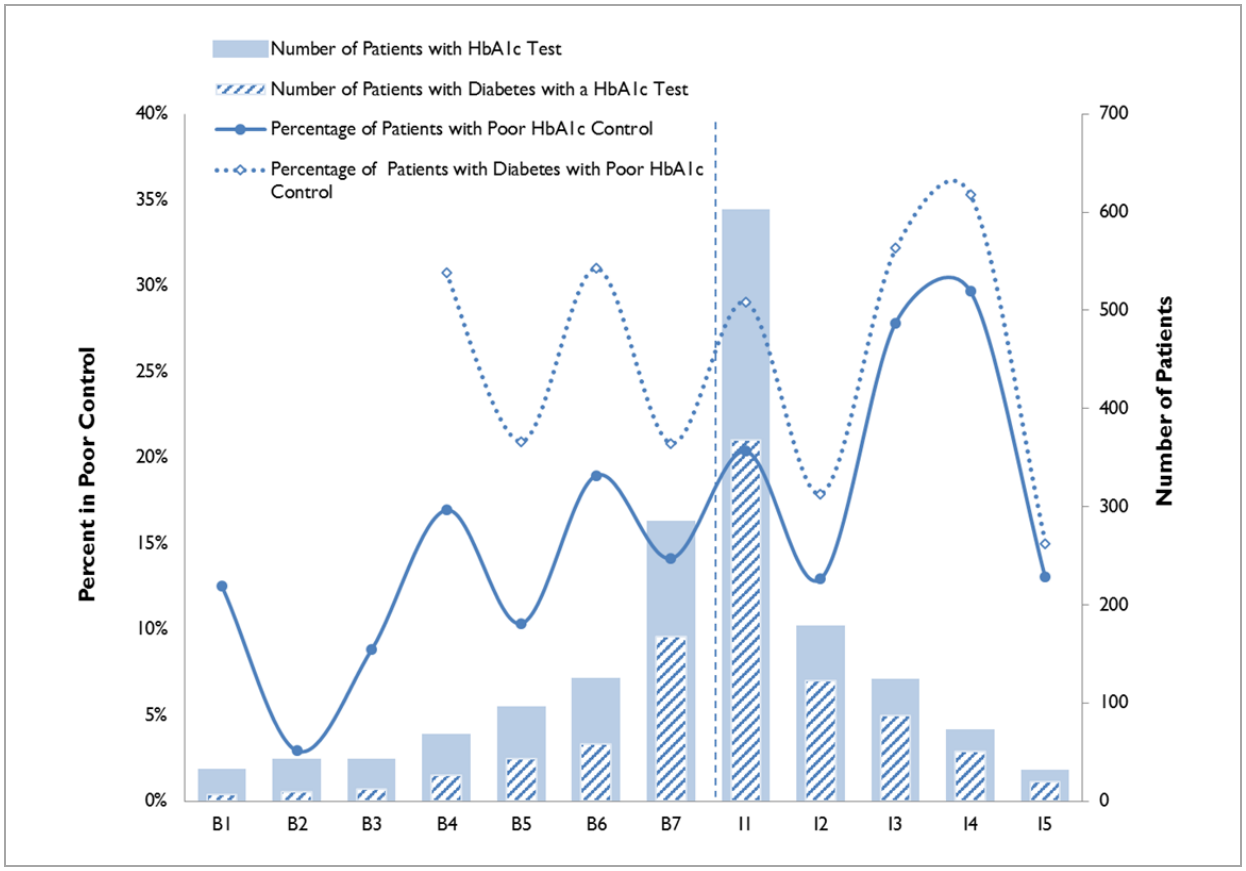
We examined health outcomes among participants who received at least one LDL-C screening, HbA1c test, blood pressure test, or BMI assessment. The following run charts take into account rolling enrollment. The baseline quarters (Bs) represent data prior to enrollment. The intervention quarters (Is) are based on individual enrollment date. For example, I1 is equal to the first quarter of enrollment for all participants who received a specific test. We provide B and I data when at least 20 patients have a test or reading within the quarter.

Evaluation Question

- Has the percentage of diabetes patients with poor HbA1c control decreased over time among those enrolled in the innovation?

Figure 17 presents the percentage of all participants with an HbA1c test and the percentage of participants with diabetes with an HbA1c test indicating poor control (i.e., HbA1c >9%) for both the baseline and intervention quarters. Given that not all patients who received an HbA1c test indicated they were diabetic on the adult checklist, we include both populations in the figure. Overall, the percentage of patients with diabetes in poor control fluctuates over time and, although it increases slightly from 29.1 percent in I1 to 32.2 percent in I3, it drops to 15 percent by I5. Thus, HbA1c control among participants with diabetes enrolled in the innovation improves over time.

Figure 17. Percentage of Patients with Diabetes with Poor HbA1c Control over Time



(continued)

Figure 17. Percentage of Patients with Diabetes with Poor HbA1c Control over Time (continued)

	Quarter	B1	B2	B3	B4	B5	B6	B7	I1	I2	I3	I4	I5
●	Percentage of patients with poor HbA1c control (%)	12.5	2.9	8.8	16.9	10.3	19.0	14.1	20.4	12.9	27.8	29.7	13.0
◊	Percentage of patients with diabetes with poor HbA1c control (%)				30.8	20.9	31.0	20.8	29.1	17.9	32.2	35.3	15.0
	Number of patients with HbA1c test	24	34	34	59	87	116	276	594	170	115	64	23
	Number of patients with diabetes with a HbA1c test	7	10	12	26	43	58	168	368	123	87	51	20

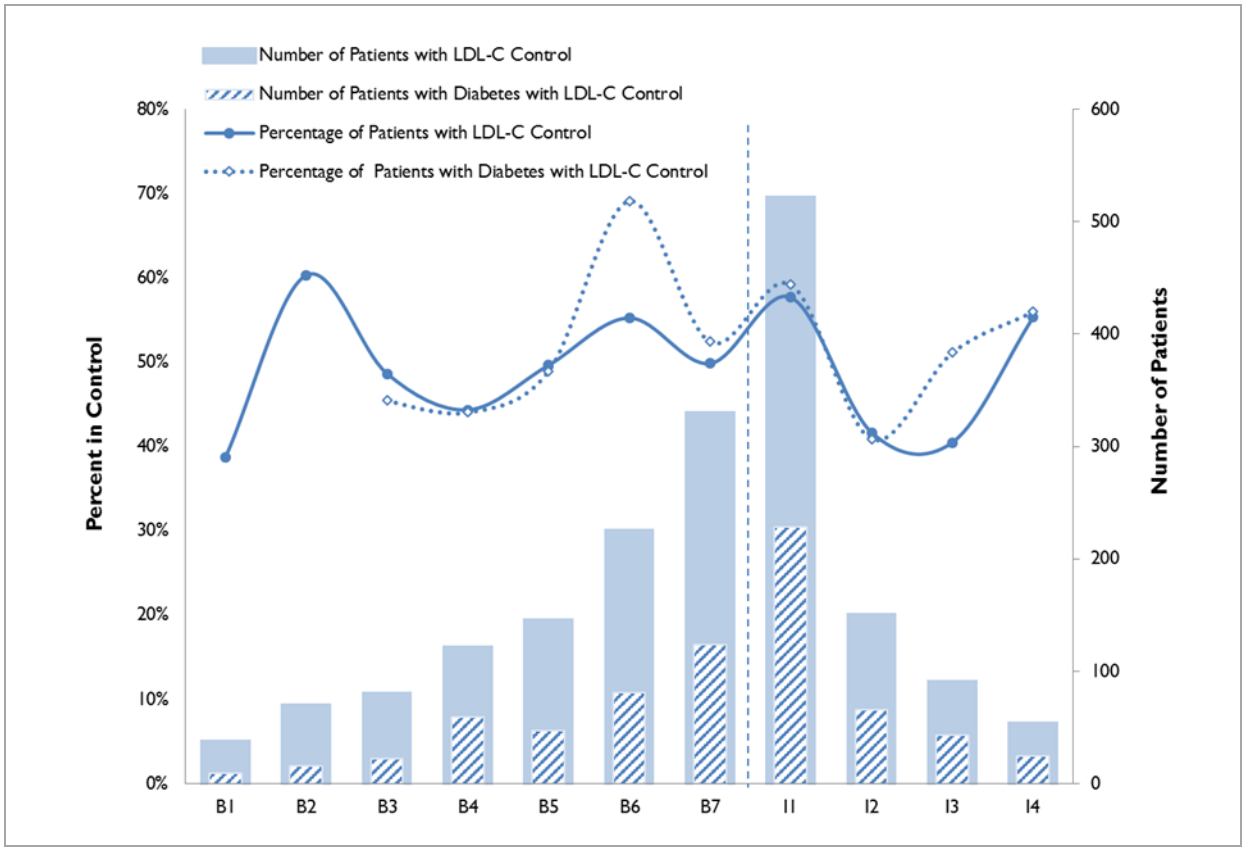
Source: Patient-level data provided to RTI by MPHI.

Evaluation Question

- Has the percentage of diabetes patients with LDL-C control increased over time among those enrolled in the innovation?

Figure 18 presents the percentage of all patients who received an LDL-C assessment and the percentage of diabetic participants with an LDL-C assessment who achieved LDL-C control (i.e., <100 mg/dL) for both baseline (B) and intervention quarters (I). Overall, the percentage achieving LCL-C control fluctuates somewhat as participants stay enrolled in the innovation. Overall, between I1 and I4, the percentage of those with diabetes with LDL-C control drops slightly from 59.1 percent in I1 to 56.0 percent in I4. Thus, LDL-C control among those with diabetes enrolled in the innovation does not improve over time.

Figure 18. Percentage of Patients with Diabetes with LDL-C Control over Time



	Quarter	B1	B2	B3	B4	B5	B6	B7	I1	I2	I3	I4
●	Percentage of patients with LDL-C control	38.7	60.3	48.6	44.3	49.6	55.3	49.8	57.7	41.7	40.5	55.3
◊	Percentage of patients with diabetes with LDL-C control			45.5	44.1	48.9	69.1	52.4	59.2	40.9	51.2	56.0
	Number of patients with LDL-C control	31	63	74	115	139	219	323	515	144	84	47
	Number of patients with diabetes with LDL-C control	9	16	22	59	47	81	124	228	66	43	25

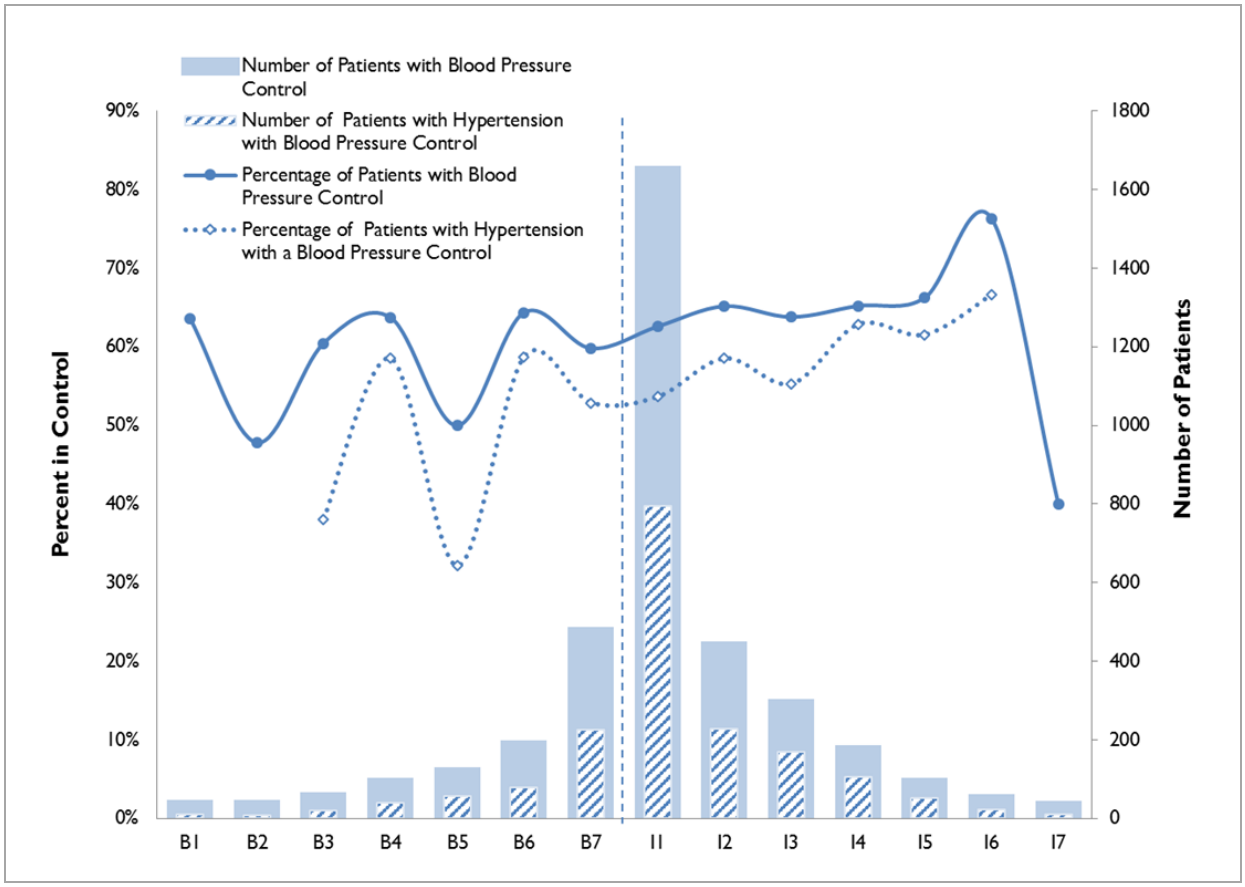
Source: Patient-level data provided to RTI by MPHI.

Evaluation Question

- Has the percentage of hypertension patients with blood pressure control increased over time among those enrolled in the innovation?

Figure 19 presents the percentage of all participants with a blood pressure test and hypertensive participants with a blood pressure test who were in good control (i.e., <140/90 mm Hg) for both the baseline and intervention quarters. Overall, the majority of participants remain in control of their blood pressure over time. More important, the percentage of hypertensive patients with blood pressure control increases from 53.7 percent in I1 to 66.7 percent in I6.

Figure 19. Percentage of Patients with Hypertension with Blood Pressure Control over Time



	Quarter	B1	B2	B3	B4	B5	B6	B7	I1	I2	I3	I4	I5	I6	I7
●	Percentage of patients with blood pressure control (%)	63.6	47.8	60.5	63.8	50.0	64.4	59.8	62.6	65.2	63.8	65.2	66.3	76.3	40.0
◊	Percentage of patients with hypertension with a blood pressure control (%)	N/A	N/A	38.1	58.5	32.1	58.8	52.9	53.7	58.5	55.3	62.9	61.5	66.7	N/A
	Number of patients with blood pressure control	22	23	43	80	106	174	463	1,636	425	279	161	80	38	20
	Number of patients with hypertension with blood pressure control	10	8	21	41	56	80	225	794	229	170	105	52	24	11

Source: Patient-level data provided to RTI by MPHI.

Evaluation Question

- Has the percentage of patients who are obese or overweight decreased over time among those enrolled in the innovation?

Table 30 presents the BMI over the baseline and intervention quarters. The percentage of obese participants (BMI >30) increases from 57.1 percent in B1 to 70.6 percent in I5, although it fluctuates more than 25 percentage points (between 45.5% and 70.6%) during this period. The percentage of overweight participants declines slightly from 9.5 percent in B1 to 5.9 percent in I5, fluctuating more than

16 percentage points (between 5.9% and 22.4%) over time. Thus, the innovation produces little to no improvement in weight control over time among participants enrolled in the innovation.

Table 30. Percentage of Overweight and Obese Patients over Time

Quarter	B1	B2	B3	B4	B5	B6	B7	I1	I2	I3	I4	I5	I6
Percentage of patients who are overweight: 25 < BMI <29.9	9.5	13.6	12.1	10.8	19.2	20.4	22.4	20.4	18.0	20.0	14.7	18.2	5.9
Percentage of patients who are obese: BMI >30	57.1	45.5	54.5	62.2	51.5	51.7	60.5	54.3	61.0	63.0	62.8	57.1	70.6
Number of patients who are overweight: 25 < BMI <29.9	2	3	4	8	19	30	96	302	71	53	23	14	2
Number of patients who are obese: BMI >30	12	10	18	46	51	76	259	802	241	167	98	44	24

Source: Patient-level data provided to RTI by MPHI.
BMI = body mass index.

Discussion of Other Awardee-Specific Findings

The awardee-specific outcome data analyzed to date demonstrate that MPHI participants are taking part in the Pathways innovation as designed (i.e., completing common Pathways). Although this participation rate does not necessarily indicate that MPHI is reaching those with the highest ED use, MPHI is reaching a chronically ill population. Overall, the data suggest that the innovation may be slightly affecting health outcomes in the long run, but that rates have fluctuated over time. The most notable improvements are the increase in the percentage of participants with diabetes with LDL-C control and the decrease in the percentage of participants with diabetes with poor HbA1c control, although given our limited sample size, any conclusions must be reached with caution.

Regarding the provider survey, overall MPHI providers were satisfied with the innovation and believed it had a positive impact on patient care. More specifically, almost 75 percent of providers were either very satisfied or extremely satisfied with Pathways. In addition, approximately 70 percent of providers indicated that Pathways had a very positive impact on patient care, and no providers indicated that Pathways had a negative impact on patients. These findings are significant because they include providers across all three implementation sites and a variety of clinical practices and settings. Provider buy-in and support may be critical in the sustainability of Pathways innovation following the end of the grant.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing MPHI as well as accomplishments to date. In this section, we assess MPHI's progress on achieving HCIA goals to date:

- **Smarter spending.** Although Pathways does not seem to have a short-term impact on reducing total spending per patient, in the long run, the findings suggest that the innovation could lead to a reduction in Medicare patients' spending. The short-term spending increase is not surprising, given that participants may use more services initially, which can explain the higher spending observed among treatment group individuals compared to the comparison group in I1. In the final quarter examined, however, spending among treatment group individuals is $3,579 lower than the comparison group (p=0.039)

- **Better care.** The data also suggest that the innovation may have an impact on reducing the likelihood of hospitalizations and ED visits for Medicare patients in the long run. Specifically, in I8, treatment group patients were 10 percentage points less likely to have been hospitalized, and this difference was statistically significant. Additionally, estimates also demonstrate a 15 percentage point lower probability of ED visits in the eighth innovation quarter. Regarding the clinical effectiveness process measures, approximately one-third of patients with diabetes received an HbA1c test and approximately 20 percent received an LDL-C assessment at some time during enrollment. Among those with hypertension, approximately 40 percent received a blood pressure screening In addition, over 63 percent of enrolled participants are considered active (i.e., completed the adult checklist) and on average complete approximately three pathways.

- **Healthier people**. Overall, the data suggest that the innovation may be slightly affecting health outcomes in the long run, but the rates have fluctuated over time. The most notable improvement is the increase in the percent of participants with diabetes with LDL-C control and the decrease in the percent of participants with diabetes with poor HbA1c control, although again given the limited sample size, results should be interpreted with caution.

Overall, MPHI was successful at implementing the Pathways innovation in three communities in Michigan: Saginaw, Muskegon, and Ingham. The innovation may reduce utilization and spending in the long-run; moreover, efforts are in place to sustain the innovation after grant funding. In the following year, MPHI hopes to continue to refine the proposed payment model to make it more standardized and less complex. Although staff turnover may continue to be an issue as staff members find more permanent employment, MPHI remains flexible and has access to internal resources that should help prevent future turnover from impacting implementation and/or sustainability efforts.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Mineral Regional Health Center

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

Mineral Regional Health Center

1.1 Introduction

The Mineral Regional Health Center (Mineral Regional hereafter) is a nonprofit regional collaborative in Superior, MT, that serves as the grant convener for the Frontier Medicine Better Health Partnership (FMBHP). FMBPH, the innovation, is a partnership of 25 critical access hospitals (CAHs) across the state. The majority of participating CAHs have 21 to 25 beds (76.0%) and are nonprofit (68.0%). Mineral Regional received an award of $10,499,899 and began enrolling CAHs in November 2012. The FMBPH is standardizing the coordination of care in participating CAHs across the spectrum of medical services in five key improvement areas (program pillars), ensuring that patients receive the right care at the right time from the right provider. The innovation seeks to achieve the following HCIA goals:

1. **Smarter spending.** Lower total expenditures by 7 to 15 percent over 3 years for frontier and rural populations, patients, and communities.

2. **Better care.** Increase patients' satisfaction and improve their experience by 30 percent over 3 years for frontier and rural populations, patients, and communities.

3. **Healthier people**. Improve outcomes by 10 percent over 3 years for frontier and rural populations, patients, and communities.

Table 2 provides a summary of changes that occurred with Mineral Regional during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data submitted by Mineral Regional through March 31, 2015; and key informant interviews with Mineral Regional's leaders/staff conducted June 4–5, 2015.

Table 2 Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	The innovation components remained the same since the beginning with primary focus on the first three components: workforce development, community engagement, and the provider-based research network. More work with value-based purchasing occurred in Year 2 while work in integration of EHR systems did not occur.
Program Participant Characteristics	No change. Characteristics of the CAHs remained the same over time.
Implementation Process	
Execution	Development of the FRIN was completed in Q9. Spent 50.90% of Year 3 budget, spending is at target.
Leadership	No change. Leadership of the organization remained the same in Year 2.
Organizational capacity and leadership	Although organizational capacity remained relatively the same for Mineral Regional in Year 2, capacity among FMBPH staff and CAHs to collaborate and implement activities across the partnership increased as a result of workforce development activities in Year 2 and full integration of the last 5 CAHs engaged in the innovation.
Innovation adoption and workflow	No change

(continued)

Table 2 Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Workforce Development	
Hiring/retention	No changes in hiring and retention in Year 2. At the end of Q10 the innovation was fully staffed with 33.0 full-time equivalent (FTE) staff members.
Training	Provided 16,774 hours of training to 1,573 individuals
Implementation Effectiveness	
Reach	No change. The number of enrolled CAHs (25) remained the same over time.
Dose	For Component 1 (workforce development) 68% of CAHs completed a BHIP, 92% hired a BHIS, and 60% completed a BHIP and hired a BHIS. For Component 2 (community participation) 88% of CAHs completed a CNA, 48% established a community collaborative, and 44% completed a CNA and established a community collaborative. For Component 3 (provider-based research network), 84% of CAHs participated in the formulary management project, 44% in the end-of-life registry project, 20% in the swing-bed research study, and 16% completed all three projects. No data relevant to dose were available for Components 4 and 5.

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by Mineral Regional.
Key informant interviews conducted Feb–June 2015.
BHIP = Better Health Improvement Plan; BHIS = Better Health Improvement Specialists; CAH = critical access hospital; CNA = Community Needs Assessment; FMBPH = Frontier Medicine Better Health Partnership; FRIN = Frontier Rural Innovation Network.

1.1.1 Innovation Components

This innovation consists of five components: (1) workforce development through hiring and training a cadre of Better Health Improvement Specialists (BHISs) to spearhead quality improvement initiatives at the participating CAHs; (2) community participation in a planning process that engages the CAHs and their community partners in a community needs assessment (CNA) and guides improvement initiatives; (3) provider-based research network known as the Frontier Rural Innovation Network (FRIN) that brings together providers in rural and frontier areas who wish to collaborate and carry out practice-based research relevant to their settings; (4) promotion of rural participation in value-based purchasing by giving CAHs data on their financial performance and educating CAH chief executive officers (CEOs) on value-based purchasing; and (5) assistance to CAHs for integration and adoption of electronic health record (EHR) systems. Work within all these components is facilitated by the BHISs who work closely with partners and participating CAHs to promote evidence-based, community responsive health delivery innovations.

Since we provided details on these components in the first annual report, efforts in workforce development, community participation and the provider-base network increased in Year 2.[1] FMBPH

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid

initiated efforts in value-based purchasing in Year 2. According to interviews with project staff at the end of Year 2, FMBPH staff reported limited activities in the fifth component beyond providing training to CAHs on EHR systems and ensuring each CAH developed an EHR system.

Workforce Development. This component's main focus was hiring and training BHISs. BHIS qualifications and background aligned with the needs and goals of the hospital that hired the BHIS. Training offered to BHIS included Lean health care training and the Lean Six Sigma certification, which became a key strategy for workforce development. The intent of Lean training is to focus on applied continuous quality improvement efforts in the health care setting aimed specifically at reducing waste and increasing efficiency. The BHIS used Lean methodologies to develop projects that improve the health and health care of the community while also achieving the goals specific to the hospital. Since the first annual report FMBHP trained a total of 22 certified Lean instructors. Originally FMBPH staff reported they did not believe the Lean training would play such a central role in workforce development. However, they learned that Lean allowed the BHISs to increase their skills in health care improvement and also helped engage CEOs in the innovation—through the Lean process, CEOs could see the direct results of the BHIS's work in cost savings and efficiencies for their hospitals: "Looking back I would say it [Lean} is one of the biggest things we did. Lean was what hospitals bought into the most, that we could give them cost savings. I'm glad we did that."

Community Participation. The CNA was designed to engage community partners in the CAHs' efforts by identifying community priorities, existing initiatives, and available resources in the community. The CNA administered by the BHIS was the basis of the Better Health Improvement Plan (BHIP) developed by the BHIS. The BHIP for each CAH, which is updated annually, includes goals, strategy to achieve these goals, and measurements for monitoring results. The BHIS work in community participation this year centered on the completion of the CNA and development of a community collaborative to support the CNA and the BHIP as well as increase learning and participation among community members. FMBHP staff completed training BHISs in all CAHs on how to organize community collaboratives and engage key stakeholders in the community such that collaboratives take a lead role in steering health care priorities and responsiveness in these communities.

Provider-Based Research Network. The FRIN is a research network focused on improving frontier and rural health care delivery to achieve better health, better health care, and better health care value. The KnowledgeWeb is the networking platform FRIN uses to give participating members access to ongoing research projects, research expertise, and Interval Review Board services. iVantage provides technical support for the KnowledgeWeb. Since the last annual report, the FMBHP used KnowledgeWeb to discuss recruitment and relevant research topics and processes. As a result of the FRIN research, the FMBHP is researching two projects focusing on swing-bed and end-of-life (EOL) care. Five CAHs are participating in the swing-bed research project with support from the FRIN research support team. The swing-bed research team worked on developing four indicators, and a swing-bed overview education website will be provided to the five CAHs during Q11. The EOL research project included 10 CAHs and

Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

the FRIN research support team. After conducting initial research on EOL and gathering education materials, the team used Lean methodologies to prioritize issues regarding EOL utilization and standardizing an EOL registry inquiry and patient education materials.

Rural Participation in Value-Based Purchasing. The staff focused efforts in this innovation component to provide data back to the CAH on its financial performance and efforts to educate staff on value-based purchasing. iVantage, an innovation partner, provided the CAH with data allowing the CAH to evaluate hospital performance. Since the first annual report, FMBHP provided training on value-based purchasing to all 38 CEOs of Montana's CAHs, including the 25 participating in the innovation; FMBHP also initiated discussion about value-based payments and shared savings. FMBPH assisted seven hospitals in applying for the rural accountable care organization (ACO) designation as a result of CEOs' increased understanding of the value-based approach. FMBHP partnered with the Montana Hospital Association to conduct research before and after value-based purchasing. In partnership with CEOs, they plan to develop a white paper and recommendations to the Centers for Medicare & Medicaid Services (CMS) on defining value in rural and frontier health care.

Integrated EHR System. FMBHP originally intended to integrate EHR systems in each CAH. Integration posed some challenges, mainly because some CAHs did not have an EHR system. In addition, the CAHs with EHRs had different systems that did not easily communicate with one another; thus, the integration of EHR systems across the partnership became even more challenging. Instead, FMBHP focused efforts in Year 2 on ensuring that each BHIS could collected and report comparative data through the iVantage data system.

In Year 3 FMBHP staff focused instead on providing training and facilitating the adoption of EHRs for those CAHs without a system. An additional part of this component is helping CAHs use EHRs to achieve meaningful use. Since the first annual report, FMBHP organized the Montana Healthcare Improvement Consortium and participating CAHs to work toward creating a standardized health care data collection crosswalk that is projected to be distributed in 2015.

This statewide innovation involves a multitude of partners (over 40 total). Two partners, Vree Health and Holy Rosary Health Care, left the innovation team. Although no reason for their departure was given, it is possible that their role in the innovation (training, health IT, and transitional aftercare) ended. Since the first annual report, eight new partners joined the innovation team to provide health IT and research support or training (see ***Table 3***).

Table 3. HCIA Partners, Role, and Location

Partner Name	Role in HCIA Project	Location
Regional Health Center Partners		
Partnership Health Center	Project management/administration, PCMH guidance	Missoula, MT
Made You Think	Training, community-based and physician leadership	Missoula, MT
Montana State University – School of Nursing	Journal submissions and publishing	Bozeman, MT
Montana Medical Association	Training, Physicians Leadership Forum	Helena, MT
Montana Health Co-op	Health IT	Helena, MT
Montana Hospital Association	Training, health IT, value-based purchasing interventions	Helena, MT
Lucris Clinical and Research Consultants, LLC	Training, swing-bed research and criteria	Lexington, KY
U. Kentucky Research Foundation	Training, research, and publishing	Lexington, KY

HCIA = Health Care Innovation Awards; IT = information technology; PCMH = patient-centered medical home.

1.1.2 Program Participant Characteristics

The FMBHP does not work directly with providers or patients as part of the innovation, but rather assists CAHs in implementing initiatives by developing better health/better care plans and deploying BHISs to implement the innovation's five components. As described in the previous annual report, FMBHP reached its target of enrolling 25 CAHs, which is considered at capacity for this innovation. ***Table 4*** provides the characteristics of all CAHs involved in the innovation. The distribution of CAH characteristics has not changed over time: a majority of CAHs had 21 to 25 beds (76.0%) while only 16.0 percent had 6 to 10 beds. The CAHs were spread across the state: 32.0 percent were located in northeastern Montana, 28.0 percent in western Montana, 24.0 percent in central Montana, and 16.0 percent in southeastern Montana (***Figure 1***). In addition, the majority of CAHs were nonprofit (68.0%), which is not surprising given the stringent requirements in place for hospitals to seek the CAH designation.

Table 4. Characteristics of All CAHs Ever Enrolled in the Innovation through March 2015

Characteristic	Number of CAHs	Percentage of CAHs
Total	25	100.0
Size (Number of Beds)		
1–5	0	0.0
6–10	4	16.0
11–15	0	0.0
16–20	2	8.0
21–25	19	76.0

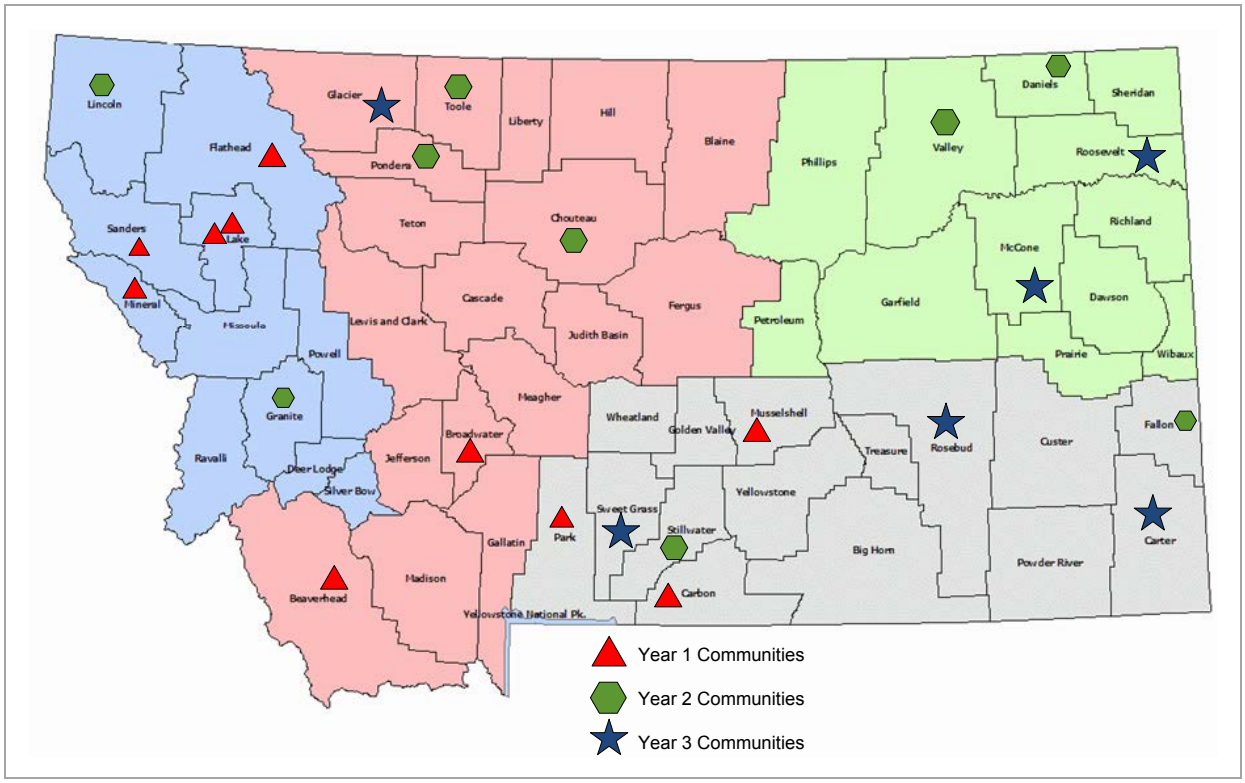
(continued)

Table 4. Characteristics of All CAHs Ever Enrolled in the Innovation through March 2015 (continued)

Characteristic	Number of CAHs	Percentage of CAHs
Location		
Northeastern Montana	8	32.0
Southeastern Montana	4	16.0
Western Montana	7	28.0
Central Montana	6	24.0
Ownership		
Nonprofit	17	68.0
Government	8	32.0

Source: Hospital-level data provided to RTI.
CAH = critical access hospital.

Figure 1. Statewide Location of All CAHs Ever Enrolled in the Innovation through March 2015



Source: Hospital-level data provided to RTI.
CAH = critical access hospital.

1.2 Implementation Progress

The first annual report (2014) described Mineral Regional's implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area. ***Table 5*** lists these measures and their status as of May 31, 2015. The result of analyses for all of these measures are included in this annual report.

This section presents Mineral Regional's process measures and a qualitative analysis of the factors that determined Mineral Regional's implementation progress. This analysis draws on hospital-level data provided to RTI as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 5. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Workforce development	Education and training	Number and type of trainings	Data received from Mineral Regional
Implementation effectiveness	Reach	Number/percentage of participating CAHs	Data received from Mineral Regional
	Dose	Number/percentage of CAHs participating in Component 1, workforce development activities, (e.g., completed/updated BHIP, hired a BHIS)	Data received from Mineral Regional
		Number/percentage of CAHs participating in Component 2, community participation, (e.g., completed a community needs assessment, established a community collaborative)	Data received from Mineral Regional
		Number/percentage of CAHs participating in Component 3, provider-based research network, (e.g., swing-bed study, formulary management study, end-of-life registry)	Data received from Mineral Regional
		Number and type of Lean projects	Data received from Mineral Regional

BHIP = Better Health Improvement Plan; BHIS = Better Health Improvement Specialist; CAH = critical access hospital; Mineral Regional = Mineral Regional Health Center.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through Mineral Regional's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include Mineral Regional's reports from Q8 through Q10 and interviews conducted June 4-5, 2015.

Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

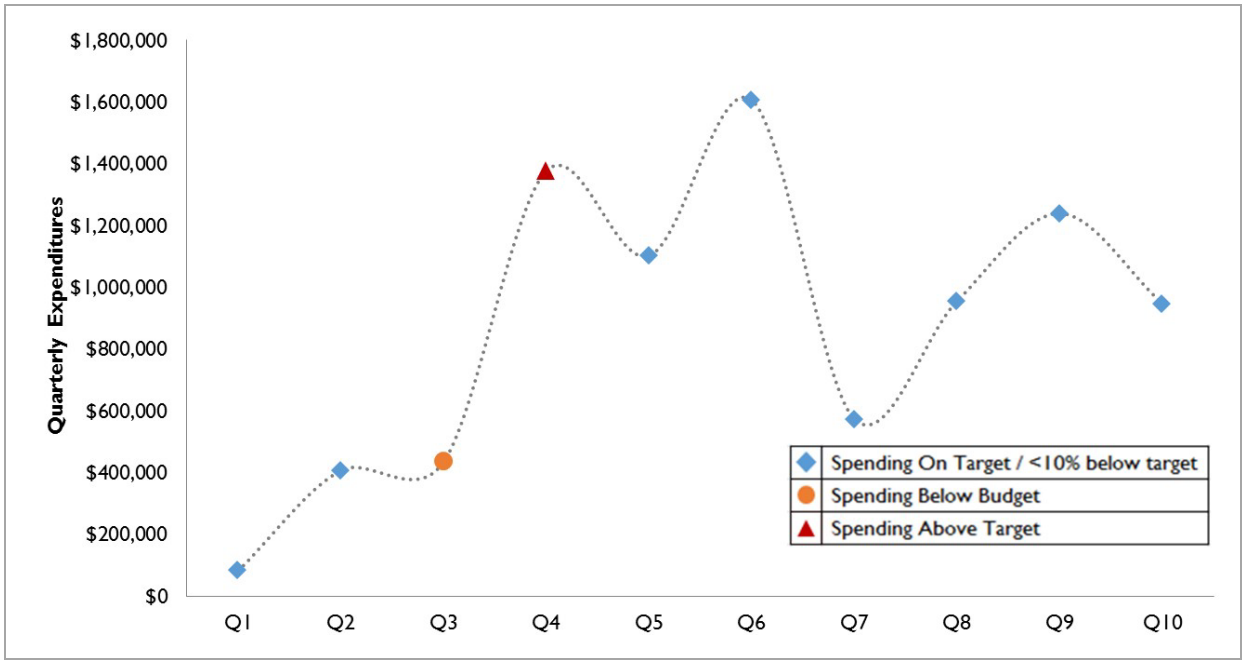
Execution of Implementation

The annual report highlights the significance of Mineral Regional's expenditure rates on implementation. As of December 2014 (Q10), Mineral Regional spent 50.9 percent of its Year 3 budget, which is at the projected target (see ***Figure 2***).

One of the greatest barriers to implementation (reported in the first annual report) was that funds for the innovation were used inappropriately during Year 1, resulting in resignation of staff and additional mandated reporting and oversight by CMS. This event delayed the innovation's execution and, in particular, the enrollment of the 25 CAHs. In Year 2, FMBHP staff worked to gain lost ground by hiring BHISs and conducting training for CAHs who were engaged in Year 2, moving forward with training and other implementation activities for those that had been previously engaged. In Year 3 Mineral Regional made progress toward the fourth component, value-based purchasing, by engaging the CAH CEOs. FMBHP staff also worked on activities with EHR systems, Component 5, by initiating the Montana Healthcare Improvement Consortium to facilitate a data collection crosswalk across the partnership.

In Year 3 Mineral Regional continued to be under financial scrutiny for the innovation, which added additional layers of administration and reporting to CMS by FMBPH staff and resulted in less time for implementation activities. The additional scrutiny also affected communication among FMBHP staff and between staff and CMS. FMBPH staff, aside from the project director and Mineral Regional leadership, had no direct communication with CMS. Some staff reported that they felt uninformed of communication occurring at the leadership level, making it more challenging for them to make informed decisions related to implementation of the innovation.

Figure 2. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Leadership

Internal leadership at Mineral Regional remained constant this year. For the most part, they did not closely manage FMBHP staff in implementing of the innovation and they empowered staff with adequate resources to carry out planned activities. The CEO at Mineral Regional, who was initially involved in programmatic aspects of the innovation, focused primarily on ensuring fiscal accountability given the additional monitoring and corrective action taken by CMS. Some reported feeling that the Mineral Regional leadership was "out of touch" with the CAHs and the innovation. From their perspective, the Mineral Regional board did not show interest in the innovation or in the board reports submitted by the project staff.

The creation of the Leadership Advisory Council (LAC) made up of the CEOs from each of the CAHs helped to enhance leadership support for the innovation among the CAHs. The LAC continued to meet monthly in Year 3 with the CEO and FMBPH project staff to facilitate the CAHs' ability to focus on components of the innovation and their application to issues important to the frontier and rural community.

Despite the LAC, according to FMBHP staff, the CAH CEOs were not sufficiently engaged and lacked the health care background that would have facilitated engagement. Furthermore, the contracts established between FMBHP and the CAH had "zero meat in them," according to a staff member. Yearly funding to the CAHs was guaranteed by the contract agreement without requiring results or deliverables that could be leveraged. As a result, each project initiated by FMBHP was met with resistance by the participating CAHs.

Organizational Capacity

The FMPBH project and staff remained a separate entity organizationally within Mineral Regional where Mineral Regional serves as the fiduciary agent. Mineral Regional leadership monitored fiscal aspects of the innovation and left programmatic management and operation of the innovation to project leadership who accelerated efforts in Year 3 to meet milestones of their self-monitoring plan. FMBHP staff continued to be situated across the state and conduct most of their work remotely. The distance between CAH sites continued to be a challenge to collaboration that FMBHP staff and the BHIS at each CAH must overcome. The BHISs span the state of Montana, and one in-person meeting with each of the 25 BHIS would cost an estimated $12,800.00. Using technology Mineral Regional created a culture of collaboration through regular conference calls, webinars, and in-person meetings when possible. In addition, the FMBHP staff made great efforts to visit each CAH in-person.

As last reported, the FMBHP staff led the development and implementation of initiatives in the 25 CAHS. FMBHP staff worked primarily with the BHISs in each site, and were challenged to keep leadership of CAHs engaged. For instance, some sites were reluctant to sign on to new innovation efforts such as the swing-bed or EOL registry. As some staff reported, CAH leadership had a “wait and see” attitude, which was often problematic in this 3-year award. CEOs had no incentive other than opportunities for training and the work of the BHIS to be actively involved. In addition, it was reported that some CEOs did not fully understand or support the role of the BHIS and saw the BHIS position as a way to get additional funding. The BHISs were often pulled into other work not related to the innovation.

As a result, the FMBHP staff developed virtually everything in collaboration with BHISs and minimal input from CAH leadership. In the end, all the CAHs likely benefited from activities developed by a handful, but initial engagement and support of CAH leadership across the board would have helped to increase local investment and partnership to sustain these initiatives.

In hindsight, the innovation could have benefited from greater engagement with CAH leadership. This could have been accomplished through better regular communication by Mineral Regional leadership with the CAH boards in their support for the innovation and the FMBHP staff. In addition, more formalized professional development opportunities for CEOs should have been provided to help them understand the innovation and their role. Finally, involvement early of partners such as the Montana Hospital Association, who support and work closely with CAHs, could have helped promote the innovation and the CEOs’ roles.

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with 33.0 full-time equivalent (FTE) staff members. Since the first annual report, eight FTE FMBHP staff were hired and no separations were reported. Retention of staff has been a strength of the FMBHP innovation. Only one BHIS out of 25 hired left her position. This low turnover may be a result of the numerous trainings and the Lean certification offered to BHISs as part of the innovation as well as the supportive network created among BHISs across the state to facilitate cross-site learning and problem solving.

Skills, Knowledge, and Training

Between Q8 and Q10, Mineral Regional provided 16,774 hours of training to 1,573 individuals. In addition to the data on hours and individuals from the progress reports, FMBHP staff provided information on the types of training provided through March 2015 in ***Table 6***.

Workforce development is a major component of the FMBHP. Many reported that it was the most successful part of the innovation in that it created a workforce of individuals with skills and abilities crucial to CAHs—community health and health care improvement. According to staff, the Lean review and certification training was the most valuable training conducted during the innovation. This training resulted in a network of 22 Lean-certified BHISs. Lean and the cost savings that result are considered the main factors that led the participating CAHs to buy into the FMBHP innovation. Other trainings focused on collaboration and development of the BHISs' role. These trainings included data analytics, media advocacy, community collaboration, community collaboration and collective impact, Health Insurance Portability and Accountability Act (HIPAA), leadership development, and Covey effective habits training.

Table 6. Total Number of Trainings Provided through March 2015

Type of Training	Number of Trainings (2013)	Number of Trainings (2014)	Number of Trainings (2015)	Number of Trainings (Total)
BHIS orientation	2	1	0	3
BHIS training	14	9	4	27
LAC training	5	1	0	6
FMBHP specific training	3	1	2	6
Overall Lean trainings[1]	2	0	0	2
Site-specific Lean trainings[2]	0	9	4	13
Total	**26**	**21**	**10**	**57**

Source: Hospital-level data provided to RTI.
BHIS = better health improvement specialist; CAH = critical access hospital; FMBHP = Frontier Medicine Better Health Partnership; LAC = Leadership Advisory Council; Q = quarter.
[1] Lean trainings were provided to multiple sites in 11-week Webinar sessions.
[2] Site-specific Lean trainings were provided to specific CAHs following the overall trainings.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach); and (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

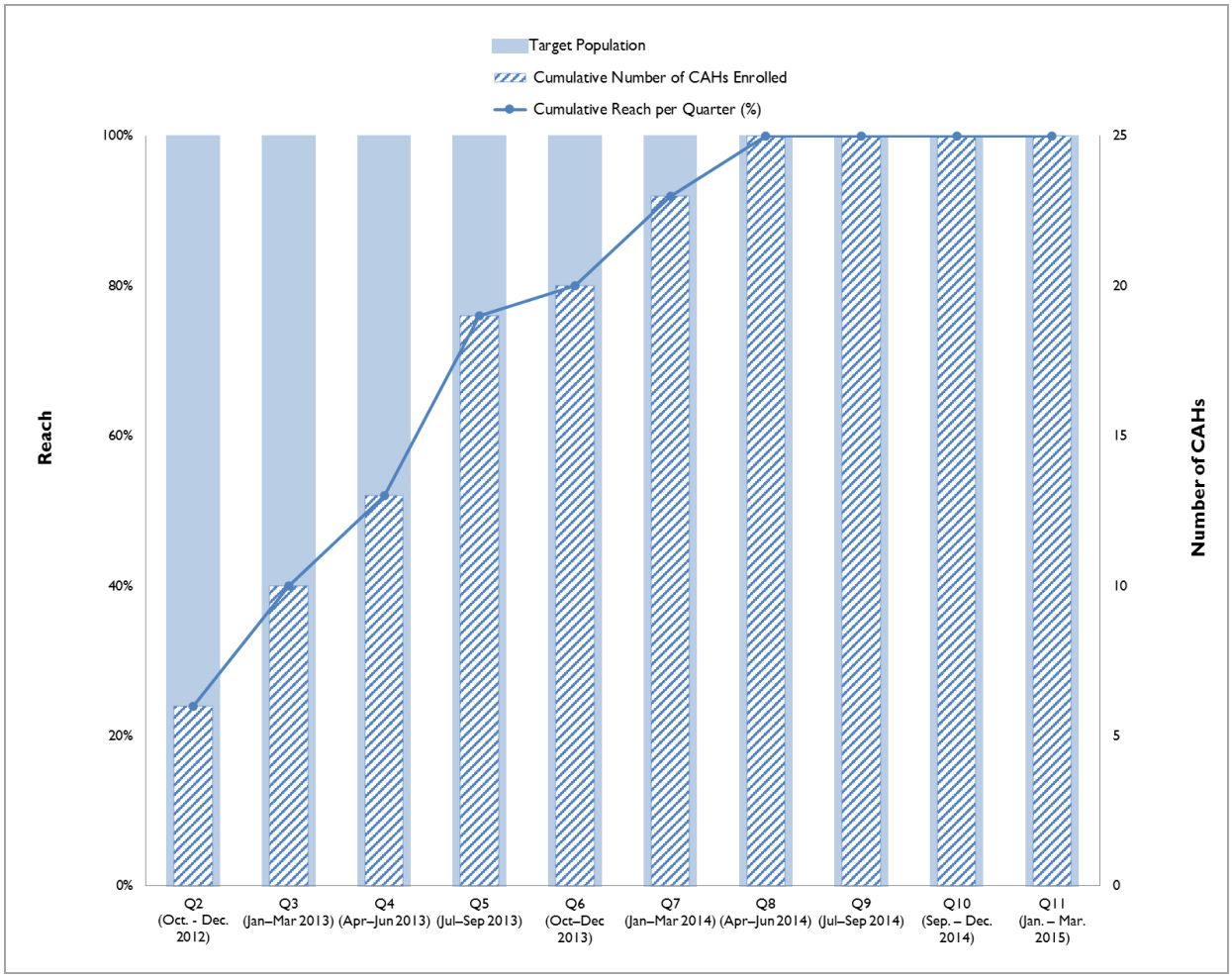
- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

Reach

Figure 3 provides reach by quarter since the launch of the innovation. We reported reach in the first annual report, based on data through Q7. Since that time, the FMBHP innovation did not enroll any additional CAHs in the innovation (25 CAHs was the intended target). Although the FMBHP innovation partnered with 25 total CAHs overall as planned, FMBHP staff noted they were supposed to enroll 10 CAHs in 2012, 10 CAHs in 2013, and 5 CAHs in 2014. They enrolled only 6 CAHs in 2012, but did enroll 14 CAHs in 2013, and 5 CAHs in 2014. Therefore, they were successful at reaching their intended participants.

In the *Quarterly Awardee Performance Reports* Mineral Regional did not report serving any direct participants, but provided an estimate of the number of indirect participants served since the innovation started. After speaking with FMBHP staff, RTI learned that Mineral Regional estimated the total number of indirect participants based on individuals participating in any component of the innovation, including the Lean research projects, the community collaboratives, trainings, and CNA process. RTI, however, determines reach based on the number of CAHs enrolled in the innovation overall. Because we did not receive complete information from FMBHP staff on the total number of potential participants, we are unable to verify the estimated number of indirect participants reported in the *Quarterly Awardee Performance Reports*.

Figure 3. Participant Enrollment and Reach for Each Quarter since Project Launch



	Quarter	Q2 (Oct–Dec 2012)	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan–Mar 2015)
●	Cumulative reach per quarter (%)	24.0	40.0	52.0	76.0	80.0	92.0	100.0	100.0	100.0	100.0
	Cumulative target number	25	25	25	25	25	25	25	25	25	25
	Cumulative number of participants enrolled	6	10	13	19	20	23	25	25	25	25

Dose

Table 7 provides the number and percentage of CAHs that participated in the three main innovation components. We first reported dose in Q5, based on data through Q9. As expected, the number of CAHs receiving services increased over time. Dose as it relates to Component 1 (workforce development) can be assessed by whether CAHs (1) completed a BHIP and/or (2) hired a BHIS. In Q5 only 52 percent of CAHs completed a BHIP and hired a BHIS, compared to the 60 percent of CAHs that

completed a BHIP and hired a BHIS as of Q11. In addition, in Q5 only 64 percent completed a BHIP compared to 68 percent through Q11, and 80 percent hired a BHIS compared to 92 percent that hired a BHIS.

For Component 2 (community participation), we examined dose by assessing whether CAHs (1) completed the CNA and/or (2) established a community collaborative in their respective communities. Although the vast majority of CAHs completed the CNA process with the Office of Rural Health in Montana (88.0%), only 48.0 percent of CAHs established a community collaborative. This number represents a significant increase compared to Q5, where only 12 percent had established a community collaborative. However, 11 of the 12 CAHs that created a community collaborative also completed the CNA process.

Finally, for Component 3 (provider-based research network), we examined dose by assessing whether CAHs participated in three main research projects: (1) medication cost study, (2) EOL registry project, and (3) swing-bed research study. The majority of CAHs participated in the formulary management project through the FRIN (84.0%), while fewer CAHs participated in the EOL registry and swing-bed research study—44.0 percent and 20.0 percent, respectively. In addition, only 16.0 percent of CAHs participated in all three research projects. The number and percentage of CAHs participating in the FRIN projects remained similar since dose was first reported in Q5.

Table 7. Number and Percentage of CAHs Participating in Three Main Innovation Components

Component	Number of CAHs	Percentage of Total Enrolled CAHs (n=25)
Workforce Development (Component 1)		
Completed a BHIP	17	68.0
Hired a BHIS	23	92.0
Completed a BHIP and hired a BHIS	15	60.0
Community Participation (Component 2)		
Completed a CNA[1]	22	88.0
Established a community collaborative	12	48.0
Completed a CNA and established a community collaborative	11	44.0
Provider-Based Research Network (FRIN) (Component 3)		
Participated in formulary management	21	84.0
Participated in end-of-life registry	11	44.0
Participated in swing-bed research study	5	20.0
Participated in formulary management, end-of-life registry, and swing-bed research study	4	16.0

Source: Hospital-level data provided to RTI.
[1] CNA completed when a hospital completed survey, focus groups, and report.
BHIP = Better Health Improvement Plan; BHIS = Better Health Improvement Specialist; CAH = critical access hospital; CNA = community needs assessment; FRIN = Frontier Rural Information Network.

We also examined dose by the number and type of projects BHISs completed at the CAHs as part of the overall innovation. Few changes occurred compared to Q5 when dose was first reported. The

most common types were strategic planning projects (72.0% of all CAHs completed), community resource projects and data projects (64.0% of CAHs completed), and relationship-building projects (52.0% of CAHs completed). Among those CAHs completing these projects, on average 2.5 strategic planning projects were completed, 2.3 community resource projects were completed, 3.1 data projects were completed, and 1.8 relationship-building projects were completed. The remaining projects are presented in ***Table 8***.

Table 8. Number and Types of Projects Completed at the CAHs

Project Type	Number of Projects	Number (Percentage) of CAHs Completing Projects	Average Number of Projects per CAH
Strategic planning	45	18 (72.0)	2.5
Community resources	37	16 (64.0)	2.3
Data	49	16 (64.0)	3.1
Media advocacy	22	12 (48.0)	1.8
Relationship building	23	13 (52.0)	1.8
Fostering consumer engagement	7	4 (16.0)	1.8
Community health education opportunity	5	2 (8.0)	2.5

Source: CAH-level data provided to RTI
CAH = critical access hospital.

Sustainability

Mineral Regional will not sustain FMBHP after June 30, 2015. FMBHP formed a 501(c)(3) nonprofit entity, the Frontier Rural Health Network (FRHN), to apply for funding. The FRHN will seek private and foundation funding, government grants, private partnerships, and collaborations with other organizations that work on similar activities. Recent interviews with project staff revealed no updates on new sources of funding for the FRHN.

A survey conducted with BHISs indicated that approximately 80 percent will remain in their positions with funding from the CAHs. Their responsibilities may change, although they are likely to continue with certain BHIS activities such as Lean training, data synthesis, and quality improvement. The Lean-certified BHISs created a voluntary BHIS network of Lean instructors that meet to share best practices. The network elected leaders and created by-laws to sustain the work going forward. This network has agreements with all 25 CAHs to continue teaching Lean methods once the project is completed.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of Mineral Regional's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data Mineral Regional collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome

measures RTI considers essential to the evaluation of Mineral Regional's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 9 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of the status of the data requested and whether the data are presented in this annual report.

Table 9. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	Yes
		Hospital unplanned readmissions rate	Yes	Yes
		ED visit rate	Yes	Yes
	Cost	Spending per patient	Yes	Yes
		Estimated cost savings	Yes	No

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis

We include patients who were enrolled prior to December 31, 2014 in any of the 25 participating CAHs and we present Medicare claims data through December 31, 2014. We focus only on utilization within CAHs during a given quarter, which means that results represent cost and utilization conditional on attending a CAH and do not necessarily represent a unique cohort over time.

Comparison Groups

Mineral Regional is a provider-level innovation comprising a network of 25 participating CAHs in Montana. Because our analysis centers on patient outcomes, we assume that users are randomly distributed across CAHs so that people use the CAHs nearest to them. Montana has a total of 48 CAHs, so the comparison group includes the 23 nonparticipating CAHs in the state. No propensity score matching was performed.

Descriptive Analysis

This report includes claims through December 31, 2014. ***Table 10*** reports Medicare spending per patient in the eight quarters before and the nine quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 10. Medicare Spending per Patient: Mineral Regional

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

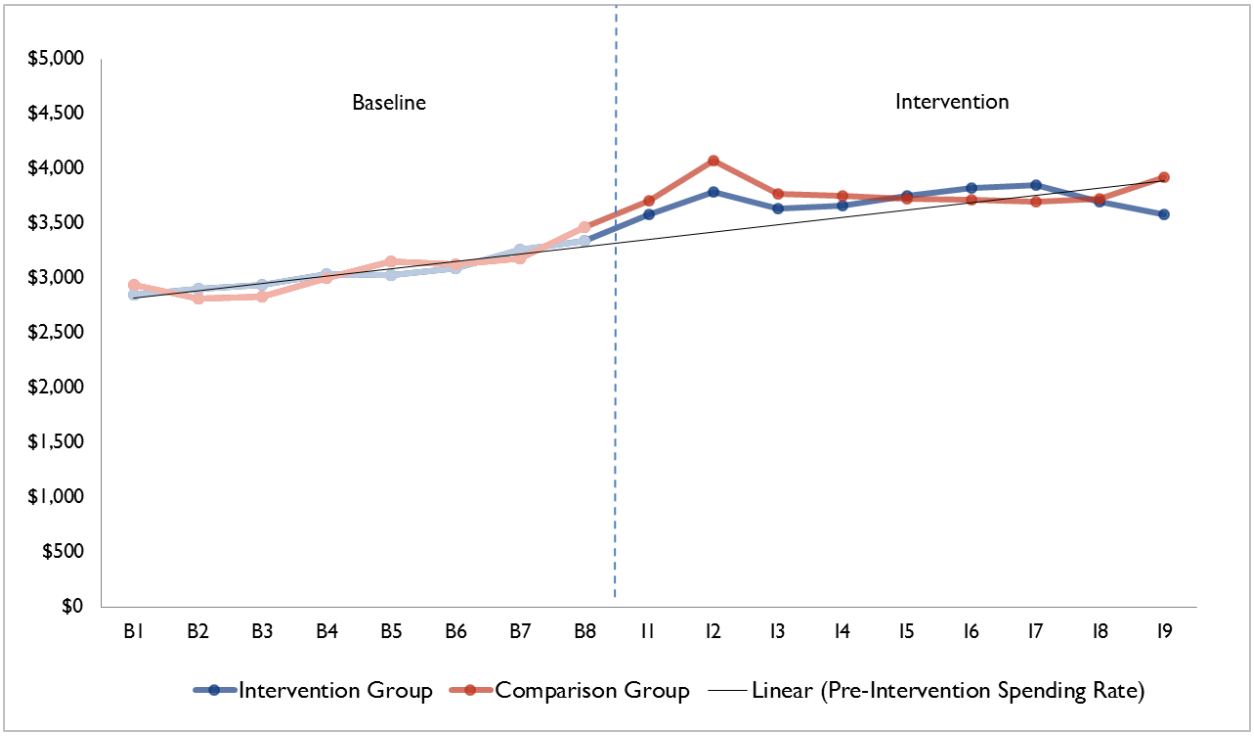
Awardee Number	Description	Baseline Quarters								Intervention Quarters								
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8	I9
Intervention Group																		
1C1CMS 331058	Mineral Regional																	
	Spending rate	$2,850	$2,905	$2,937	$3,034	$3,024	$3,093	$3,257	$3,338	$3,583	$3,789	$3,637	$3,660	$3,749	$3,820	$3,851	$3,697	$3,579
	Std dev	$7,404	$7,464	$8,068	$7,961	$7,457	$7,963	$8,013	$8,250	$9,001	$9,873	$9,725	$9,547	$9,048	$9,652	$9,444	$9,253	$9,443
	Unique patients	10,790	11,275	11,904	12,278	12,132	12,364	12,966	13,645	13,578	13,434	13,567	13,498	12,149	11,531	9,144	8,530	5,535
Comparison Group																		
1C1CMS 331058	Mineral Regional																	
	Spending rate	$2,941	$2,815	$2,833	$3,001	$3,154	$3,128	$3,176	$3,461	$3,704	$4,077	$3,772	$3,750	$3,725	$3,712	$3,694	$3,726	$3,922
	Std dev	$8,242	$7,799	$7,362	$7,365	$8,433	$8,035	$8,018	$8,970	$9,409	$10,651	$9,866	$9,078	$9,265	$10,005	$9,380	$9,784	$9,913
	Unique patients	9,356	9,489	10,377	10,594	10,491	10,333	11,178	11,483	11,555	11,163	11,806	12,084	11,665	10,970	11,953	11,874	11,723
Savings per Patient		$91	−$90	−$104	−$33	$130	$35	−$81	$124	$121	$287	$135	$90	−$24	−$108	−$157	$29	$343

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 4 illustrates the Medicare spending per beneficiary in Table 10 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Average spending per beneficiary is very similar for the intervention and comparison group in the pre-intervention period. For both the participating and nonparticipating CAHs, spending increases relative to the pre-intervention period in intervention quarters I1 and I2 before decreasing back to the trend line.

Figure 4. Medicare Spending per Patient: Mineral Regional



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Mineral Regional = Mineral Regional Health Center.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 11*** and ***Figure 5***. Inpatient admissions are consistently higher for comparison CAHs than for participating CAHs over time.

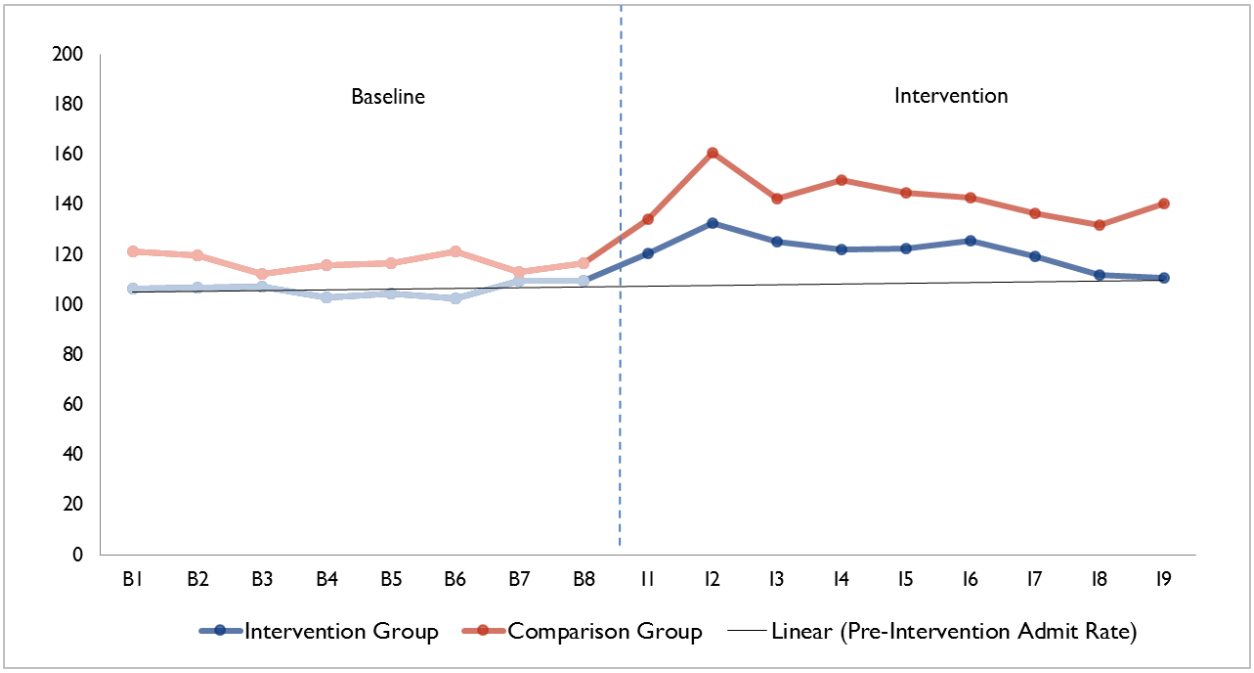
Table 11. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Mineral Regional

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters								
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8	I9
Intervention Group																		
1C1CMS 331058	Mineral Regional																	
	Admit rate	107	107	107	103	104	103	110	110	120	132	125	122	123	126	119	112	0
	Std dev	369	375	369	373	364	357	373	377	399	424	411	406	414	419	407	378	379
	Unique patients	10,790	11,275	11,904	12,278	12,132	12,364	12,966	13,645	13,578	13,434	13,567	13,498	12,149	11,531	9,144	8,530	5,535
Comparison Group																		
1C1CMS 331058	Mineral Regional																	
	Admit rate	121	120	112	116	117	121	113	117	134	161	142	150	145	143	136	132	141
	Std dev	417	419	383	393	395	402	398	392	430	468	439	467	442	439	435	422	436
	Unique patients	9,356	9,489	10,377	10,594	10,491	10,333	11,178	11,483	11,555	11,163	11,806	12,084	11,665	10,970	11,953	11,874	11,723
Intervention − Comparison Rate		−15	−13	−5	−13	−12	−19	−3	−7	−14	−28	−17	−28	−22	−17	−17	−20	−141

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 5. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Mineral Regional



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Mineral Regional = Mineral Regional Health Center.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 12*** and ***Figure 6***. Unplanned readmissions rates are higher in the nonparticipating CAHs across all periods.

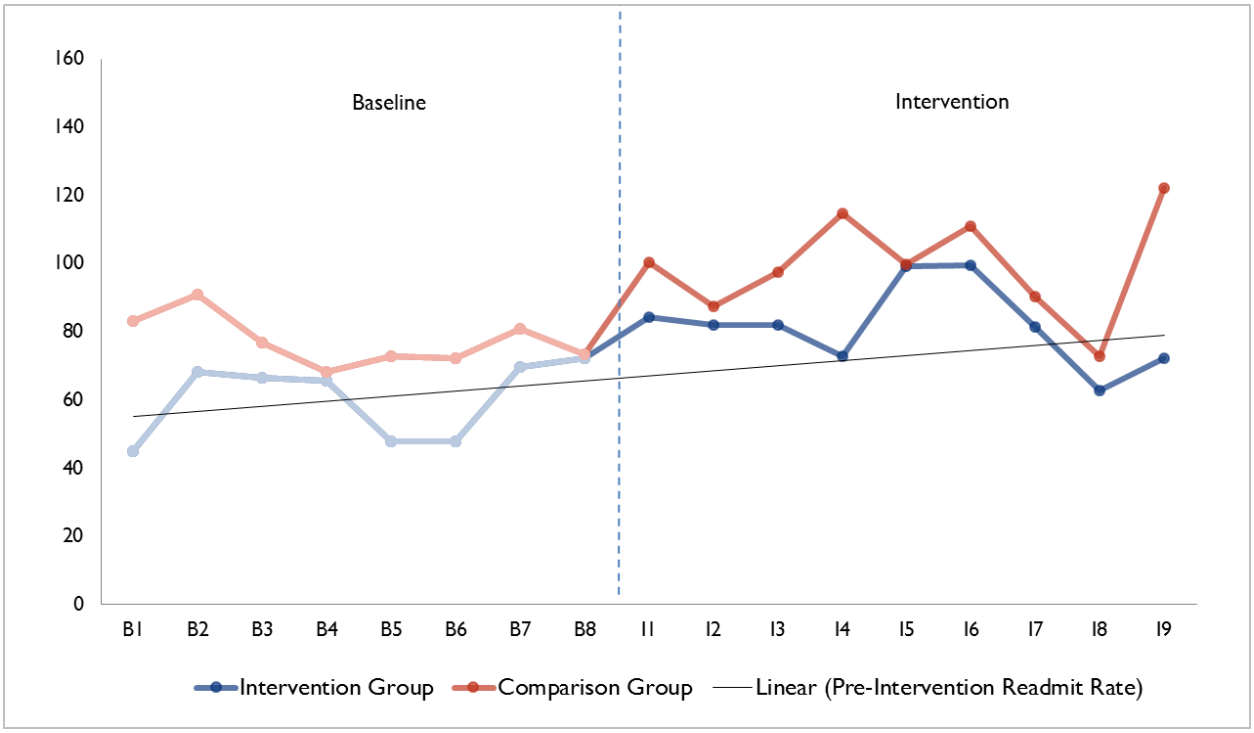
Table 12. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Mineral Regional

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters								
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8	I9
Intervention Group																		
1C1CMS 331058	Mineral Regional																	
	Readmit rate	45	68	67	66	48	48	70	72	84	82	82	73	99	99	81	63	72
	Std dev	207	252	249	248	214	214	254	259	278	275	274	260	299	299	273	242	0
	Total admissions	891	910	1,021	1,005	1,003	1,021	1,121	1,206	1,303	1,377	1,341	1,223	1,119	1,006	799	622	304
Comparison Group																		
1C1CMS 331058	Mineral Regional																	
	Readmit rate	83	91	77	68	73	72	81	74	100	87	98	115	100	111	90	73	122
	Std dev	276	288	267	252	260	259	273	261	301	283	297	319	300	314	287	260	0
	Total admissions	877	902	936	954	974	996	976	1,061	1,225	1,383	1,302	1,385	1,312	1,188	1,219	1,180	810
Intervention − Comparison Rate		−38	−23	−10	−2	−25	−24	−11	−1	−16	−5	−16	−42	−1	−12	−9	−10	−50

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Mineral Regional



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Mineral Regional = Mineral Regional Health Center.

ED visits per 1,000 participants are shown in ***Table 13*** and ***Figure 7***.

ED visit rates are, on average, higher for comparison CAHs than for innovation CAHs in the pre-intervention period. During the post-intervention quarters, however, participating CAHs exhibit higher ED visit rates than comparison CAHs. Nevertheless, the ED rate for participating CAHs remains close to the pre-intervention trend.

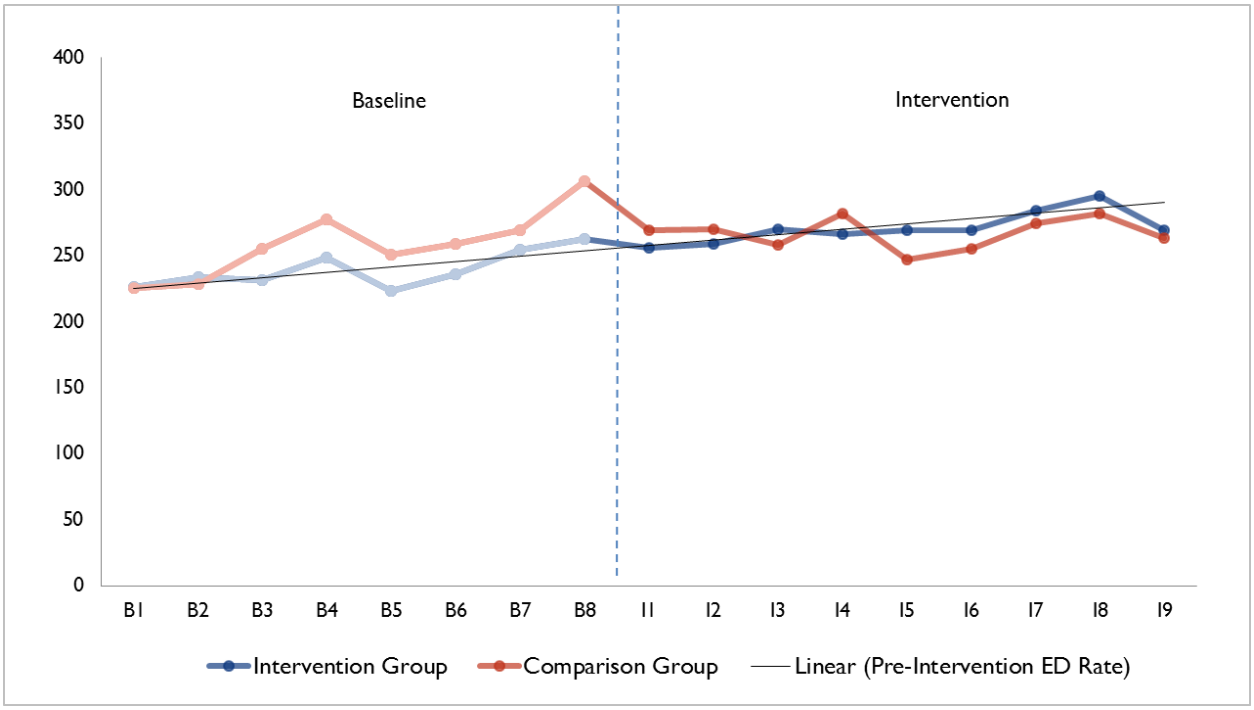
Table 13. ED Visits per 1,000 Participants: Mineral Regional

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters								
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8	I9
Intervention Group																		
1C1CMS 331058	Mineral Regional																	
	ED rate	226	234	231	248	223	236	255	262	256	259	270	267	270	269	284	295	269
	Std dev	722	864	779	733	629	728	768	824	872	729	710	691	738	844	853	911	0
	Unique patients	10,790	11,275	11,904	12,278	12,132	12,364	12,966	13,645	13,578	13,434	13,567	13,498	12,149	11,531	9,144	8,530	5,535
Comparison Group																		
1C1CMS 331058	Mineral Regional																	
	ED rate	226	229	255	277	251	259	269	306	269	270	258	282	247	255	274	282	263
	Std dev	618	659	672	695	661	689	712	834	747	665	651	978	723	780	783	786	0
	Unique patients	9,356	9,489	10,377	10,594	10,491	10,333	11,178	11,483	11,555	11,163	11,806	12,084	11,665	10,970	11,953	11,874	11,723
Intervention − Comparison Rate		1	5	−24	−29	−28	−23	−15	−44	−14	−11	12	−15	22	14	10	13	6

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 7. ED Visits per 1,000 Participants: Mineral Regional



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Mineral Regional = Mineral Regional Health Center.

Regression Analysis

We estimated difference-in-differences regressions to analyze the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit. All regressions include an indicator variable for the treatment group, an indicator variable for each calendar quarter from Q1 2010 to Q4 2014, and quarterly indicators interacted with the treatment group variable in the post-intervention period. We control for age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions.

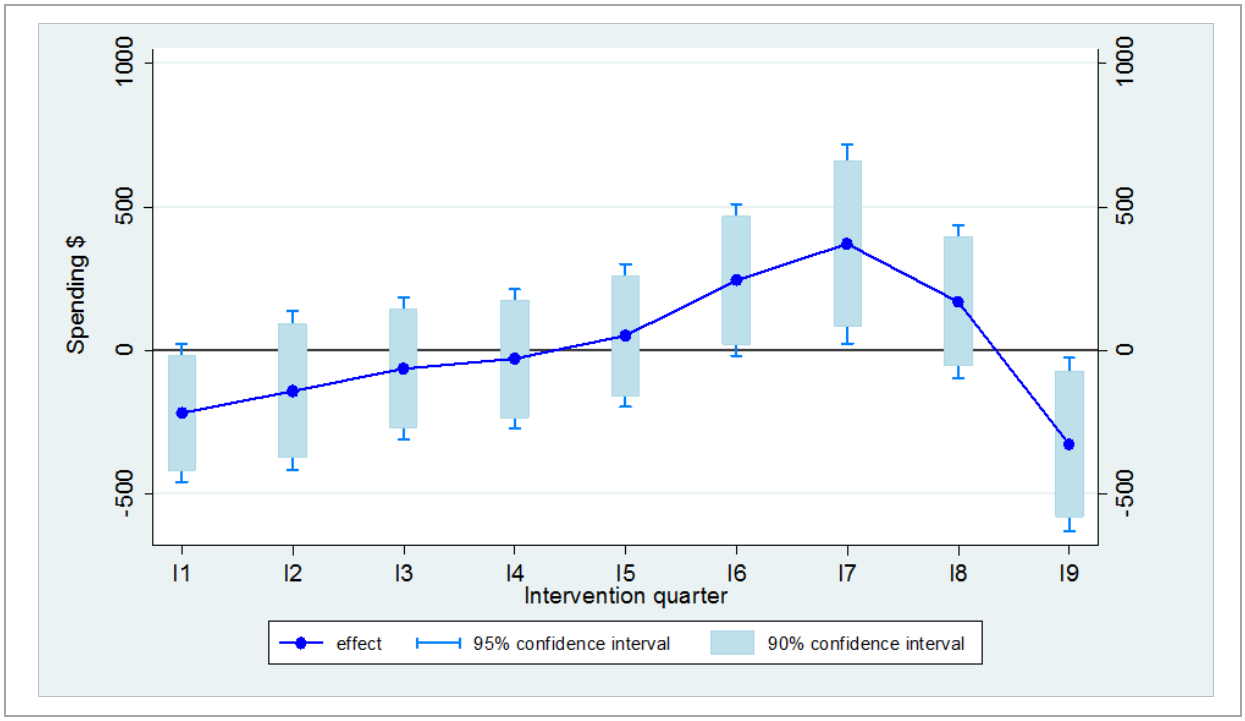
Table 14 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. ***Figure 8*** illustrates these quarterly difference-in-differences estimates. The evidence on savings is mixed. Earlier quarters appear to show savings, though they are not significantly different than zero. Later quarters appear to show losses, although only one quarter is significantly different than zero.

Table 14. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Mineral Regional

Quarter	Coefficient	Standard Error	P-Values
I1	−219	122	0.071
I2	−142	142	0.317
I3	−64	127	0.616
I4	−30	124	0.810
I5	51	127	0.686
I6	244	135	0.071
I7	370	177	0.037
I8	168	137	0.219
I9	−328	154	0.034

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
NOTES: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
Mineral Regional = Mineral Regional Health Center; OLS = ordinary least squares.

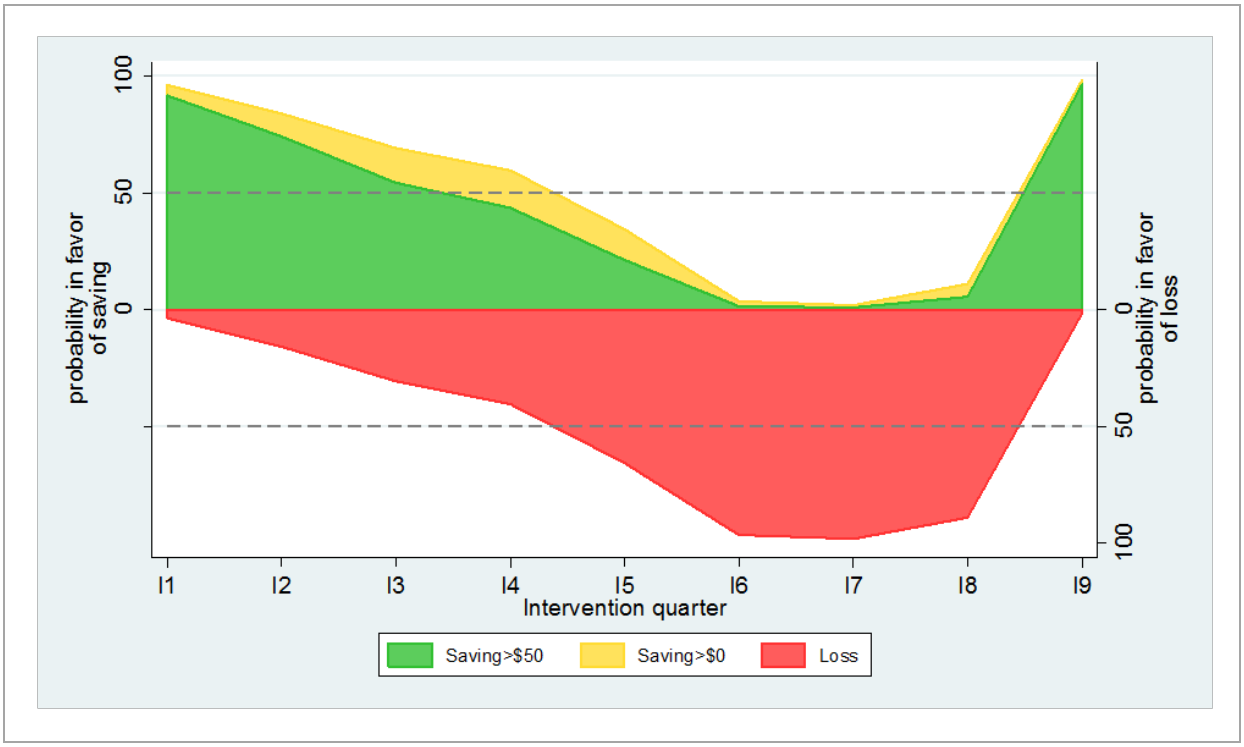
Figure 8. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Mineral Regional



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Mineral Regional = Mineral Regional Health Center; OLS = ordinary least squares.

Figure 9 presents the strength of evidence in favor of a saving or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis. Preliminary evidence shows a high probability of savings in the first four intervention quarters. These savings were mitigated by a high probability of losses in the next four intervention quarters. The last quarter of data available shows evidence of savings. In future reports we will investigate whether or not there is a cyclical pattern across geographic areas.

Figure 9. Quarterly Strength of Evidence in Favor of Saving/Loss: Mineral Regional



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Mineral Regional = Mineral Regional Health Center.

We also present the weighted average treatment effect per quarter during the intervention period for beneficiaries enrolled in the innovation compared to their matched comparison group. The weighted average quarterly spending differential in the post-innovation period, indicating a loss, is −$3 (90% CI: −$109, $103). This figure represents the differential spending per quarter in the post-intervention period between individuals enrolled in the innovation and comparison group individuals, on average, weighted by the number of intervention beneficiaries in each quarter. The 90 percent confidence interval is the range in which the true parameter estimate falls, with 90 percent confidence.

We also present linear probability model coefficients for inpatient admissions, and outpatient ED visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the

estimated effect.[2] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, empirical demonstrations have shown that linear probability model coefficients are often consistent with marginal effects generated from nonlinear models.[3] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention), not just the direction of the effect.

Table 15 presents the results of a linear regression with the dependent variable set to one for patients who had a hospital visit during the quarter. The utilization pattern closely mirrors the expenditure pattern previously reported where individuals who visited participating CAHs appear less likely to be hospitalized than individuals who visited nonparticipating CAHs in the first year post-intervention (herein in the first five quarters). In the subsequent quarters there is zero effect and in Q9 we find evidence of decreased utilization. The average quarterly difference-in-differences estimate for inpatient admissions is −1 percentage point, indicating that the treatment-control difference is 1 percentage point lower during the intervention period. This is the average difference in inpatient admissions probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: −.012, −.005).

Table 15. Difference-In-Differences Logistic Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: Mineral Regional

Quarter	Coefficient	Standard Error	P-Values
I1	−0.01	0.00	0.090
I2	−0.01	0.00	0.006
I3	−0.01	0.00	0.155
I4	−0.01	0.00	0.012
I5	−0.01	0.00	0.001
I6	0.00	0.00	0.396
I7	0.00	0.00	0.347
I8	0.00	0.00	0.589
I9	−0.01	0.00	0.020

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
NOTES: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
Mineral Regional = Mineral Regional Health Center.

[2] To obtain the correct effect it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run even when not competing with other users for computer resources.

[3] Angrist, J.D., and Pischke J.-S. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

Table 16 presents results of a linear regression with the dependent variable set to one for patients who had an ED visit during the quarter. The coefficient signs suggest that individuals treated by participating CAHs are more likely to visit the ED and significantly so in five out of 9 quarters post-innovation. The average quarterly difference-in-differences estimate for ED visits is 1 percentage point, indicating that the treatment-control difference is 1 percentage point higher during the intervention period. This is the average difference in ED visit probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: .010, .019).

Table 16. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: Mineral Regional

Quarter	Coefficient	Standard Error	P-Values
I1	0.00	0.01	0.648
I2	0.00	0.01	0.480
I3	0.02	0.01	<.0001
I4	0.00	0.01	0.596
I5	0.03	0.01	<.0001
I6	0.02	0.01	<.0001
I7	0.03	0.01	<.0001
I8	0.03	0.01	<.0001
I9	0.01	0.01	0.322

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
NOTES: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
Mineral Regional = Mineral Regional Health Center.

Discussion

We find small and temporary effects of the innovation on both spending and utilization. ED rates were consistently higher for participating CAHs compared to nonparticipating hospitals, but inpatient rates were consistently lower for participating CAHs. The results may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicare beneficiaries. Mineral Regional CAHs also serve privately insured, Medicaid, and uninsured patients.

In later reports, we will examine whether CAHs and patient characteristics differ across the treatment and comparison groups. We plan to investigate whether systematic baseline differences in health outcomes exist across CAHs. If differences exist, we will consider using propensity score matching to control for differences between the treatment and comparison groups.

In Q5 we examined the entire medical utilization of people ever going to a CAH. This approach, however, obscures the impact of the innovation within the CAHs. Therefore, we chose to exclusively

examine utilization within the CAH. This approach focuses on the spending that is within the control of the CAH.

In the future we aim to look at both within CAH spending and total spending for patients who went to a CAH. We will consider whether the treatment has an effect from the two different ways of looking at the outcome variables. If, for example, the impact on spending is the same, then we could infer that there is no impact of spending outside of the CAH.

We will also explore interactions between dose and post-intervention quarters because different CAHs embraced different aspects of the Lean program over time. However, comparison CAHs do not operate in a vacuum and might have implemented management changes over time similar to the changes implemented by participating CAHs. As we progress in the evaluation of Mineral Regional, we plan to better understand the criteria for selection into the Mineral Regional network.

Medicaid Claims Analysis

Medicaid Alpha-MAX data for the state of Montana are still available only up to Q2 2013; we are, therefore, only able to analyze 13 out of the 25 participating CAHs because the remaining CAHs began participation after June 2013. In previous reports we presented only summary statistics for the controls, in this report we also include a descriptive analysis for controls.

Even though the set of participating CAHS was the same as in Q6 and the time period of observation was the same, we now capture more individuals in the treated CAHs than we did in the Q6 reporting. Although an identical program was run in the Chronic Conditions Data Warehouse environment, more data appear to be available now. We believe this was due to a processing error in the Chronic Conditions Data Warehouse that did not read in all of the observations.

Comparison Groups

The comparison group are Medicaid beneficiaries using the 23 nonparticipating CAHs in Montana. On average, each participating CAH served 60 percent more Medicaid beneficiaries than nonparticipating ones. Although several small nonparticipating CAHs are located in rural Native American communities, this finding was unexpected and we will investigate further in later reports.

As in the Medicare analysis, we assume that users are randomly distributed across CAHs so that people use the CAHs nearest to them; therefore, no propensity score matching was performed.

Descriptive Analysis

Table 17 reports Medicaid spending per patient in the eight quarters before and in the three quarters after CAHs enrolled in the innovation. Similar to Medicare spending, we only consider the costs incurred within the CAHs. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 17. Medicaid Spending per Patient: Mineral Regional

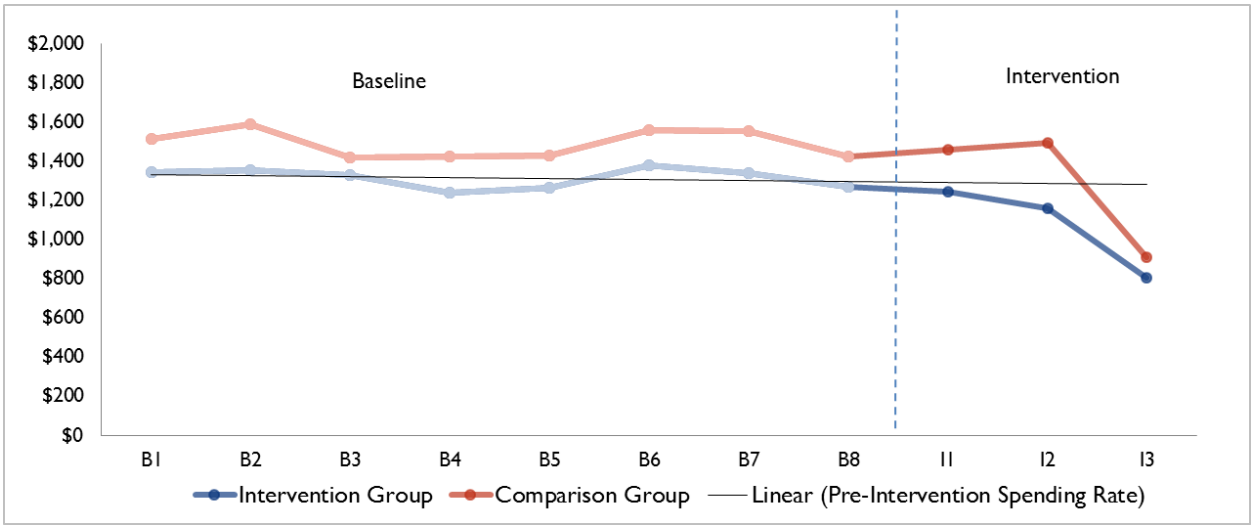
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 331058	Mineral Regional											
	Spending rate	$1,344	$1,355	$1,332	$1,238	$1,264	$1,380	$1,340	$1,270	$1,246	$1,159	$806
	Std dev	$3,650	$3,600	$4,544	$3,808	$3,992	$4,249	$4,201	$4,069	$4,070	$3,304	$2,181
	Unique patients	13,320	13,678	13,745	13,763	13,764	13,878	14,013	13,943	13,851	13,053	8,565
Comparison Group												
1C1CMS 331058	Mineral Regional											
	Spending rate	$1,516	$1,588	$1,421	$1,425	$1,431	$1,558	$1,554	$1,423	$1,457	$1,495	$911
	Std dev	$4,485	$5,773	$3,570	$4,406	$6,313	$4,264	$5,000	$4,137	$4,253	$3,940	$2,662
	Unique patients	14,143	14,466	14,546	14,725	14,678	14,593	14,592	14,672	14,566	14,288	14,041
Savings per Patient		$172	$232	$90	$187	$167	$178	$214	$153	$211	$336	$105

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 10 illustrates Medicaid spending per beneficiary for individuals visiting treatment CAHs. The light blue line represents values for beneficiaries enrolled in the innovation in the pre-innovation quarters. The dark blue line represents values for post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters. Average spending per beneficiary is higher for the comparison group than for the intervention groups throughout all pre- and post-intervention periods. Spending is close to the trend line in I1 and I2 before it drops in I3; however, the latter drop may be due to incomplete data in I3.

Figure 10. Medicaid Spending per Patient: Mineral Regional



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Mineral Regional = Mineral Regional Health Center.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 18*** and ***Figure 11***.

The inpatient admissions rates for participating CAHs in the baseline quarters are very similar to the rates in the comparison CAHs. In the second post-intervention quarter only, a slight difference in admission rates appears to occur between CAHs in the Mineral Regional network and nonparticipating CAHs.

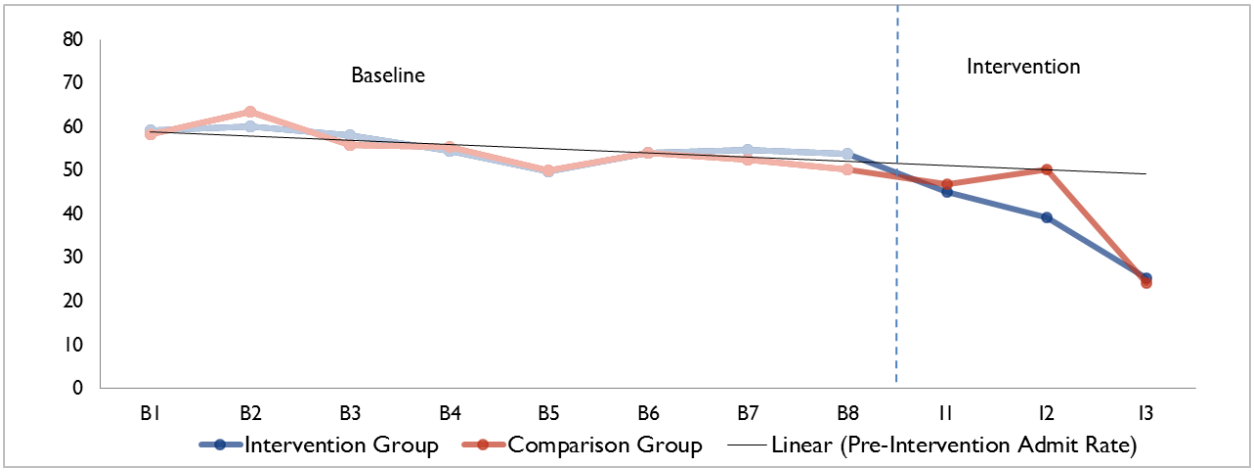
Table 18. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Mineral Regional

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 331058	Mineral Regional											
	Admit rate	59	60	58	55	50	54	55	54	45	39	25
	Std dev	254	260	257	244	234	245	247	251	226	211	164
	Unique patients	13,320	13,678	13,745	13,763	13,764	13,878	14,013	13,943	13,851	13,053	8,565
Comparison Group												
1C1CMS 331058	Mineral Regional											
	Admit rate	58	64	56	55	50	54	52	50	47	50	24
	Std dev	275	282	257	249	240	248	246	248	237	248	168
	Unique patients	14,143	14,466	14,546	14,725	14,678	14,593	14,592	14,672	14,566	14,288	14,041
Intervention – Comparison rate		1	−3	2	−1	0	0	2	4	−2	−11	1

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 11. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Mineral Regional



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Mineral Regional = Mineral Regional Health Center.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 19*** and ***Figure 12***. Similarly to the descriptive statistics for Medicare participants, unplanned readmissions rates are higher among the nonparticipating CAHs across all periods.

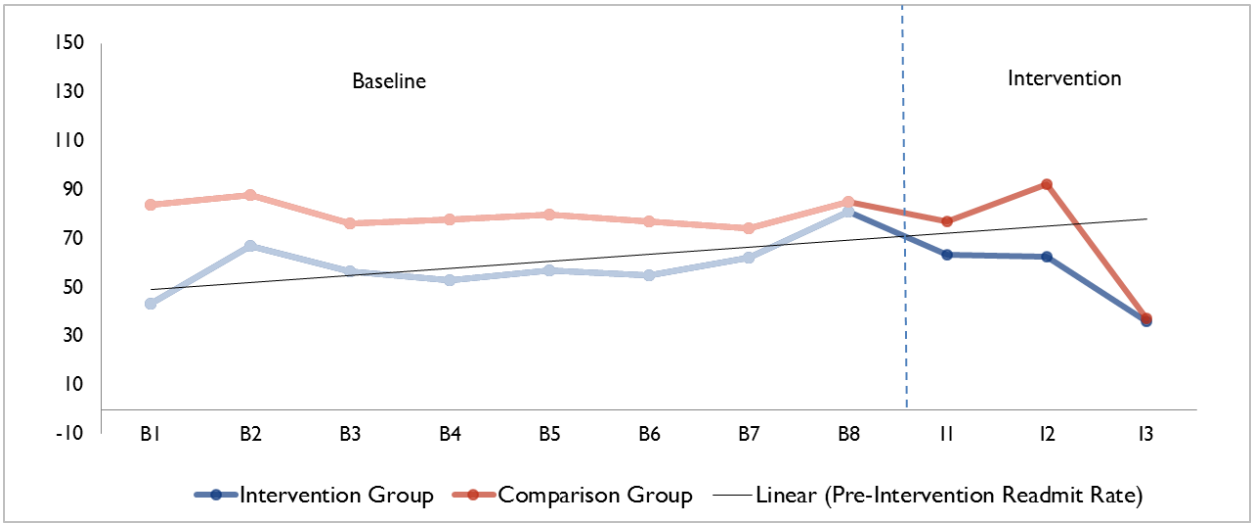
Table 19. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Mineral Regional

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 331058	Mineral Regional											
	Readmit rate	43	67	57	53	57	55	62	81	64	63	36
	Std dev	204	250	231	224	232	228	242	273	244	242	187
	Total admissions	716	792	758	719	651	725	738	715	598	479	193
Comparison Group												
1C1CMS 331058	Mineral Regional											
	Readmit rate	84	88	76	78	80	77	74	85	77	92	37
	Std dev	277	283	265	268	271	267	262	279	266	289	189
	Total admissions	703	889	774	782	689	751	739	706	650	672	296
Intervention – Comparison rate		−41	−21	−19	−25	−23	−22	−12	−4	−13	−30	−1

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
Readmit rate: (Sum all readmits to eligible hospital within 30 days/all admissions in quarter) * 1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 12. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Mineral Regional



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Mineral Regional = Mineral Regional Health Center.

ED visits per 1,000 participants are shown in ***Table 20*** and ***Figure 13***. ED visit rates are, on average, higher for comparison CAHs than for innovation CAHs in the pre-intervention period. During the post-intervention quarters, however, participating CAHs exhibit higher ED visit rates than comparison CAHs in two out of three quarters.

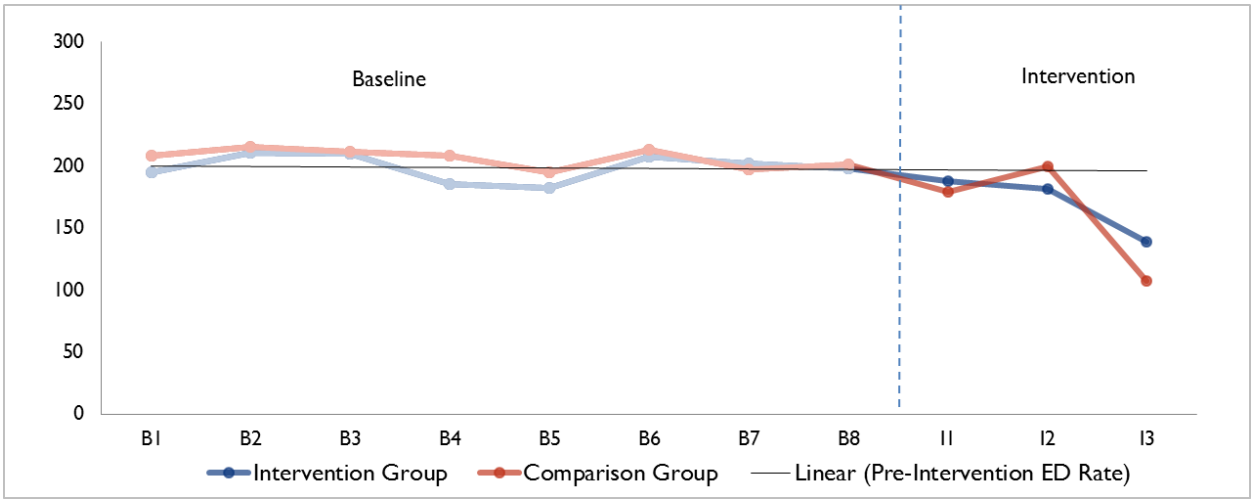
Table 20. ED Visits per 1,000 Participants: Mineral Regional

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 331058	Mineral Regional											
	ED rate	195	211	210	185	182	208	202	198	188	182	139
	Std dev	599	651	631	607	569	658	644	638	610	551	510
	Unique patients	13,320	13,678	13,745	13,763	13,764	13,878	14,013	13,943	13,851	13,053	8,565
Comparison Group												
1C1CMS 331058	Mineral Regional											
	ED rate	208	216	212	209	195	213	197	202	180	200	108
	Std dev	663	636	691	674	645	643	603	666	606	641	491
	Unique patients	14,143	14,466	14,546	14,725	14,678	14,593	14,592	14,672	14,566	14,288	14,041
Intervention – Comparison rate		−13	−5	−2	−23	−13	−5	5	−4	9	−18	31

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 13. ED Visits per 1,000 Participants: Mineral Regional



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Mineral Regional = Mineral Regional Health Center.

Discussion

The results may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicaid beneficiaries.

At this time, we do not present regression analysis on the Medicaid claims, because the Medicaid Alpha-MAX file for Montana does not include post-innovation data for many of the CAHs participating in the Mineral network. As more quarters of data become available, we will include regression analysis for Medicaid beneficiaries in later reports.

1.3.3 Other Awardee-Specific Data

We did not receive patient-level data directly from the FMBHP innovation; therefore, we do not include any additional awardee-specific analyses in this report.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing Mineral Regional as well as accomplishments to date. In this section we assess Mineral Regional's progress on achieving HCIA goals to date:

- **Smarter spending.** We find mixed results on Medicare spending with some savings in the early innovation quarters followed by losses in the later innovation quarters. Overall, there is no significant effect on spending.
- **Better care.** Inpatient admissions for Medicare beneficiaries appear to be slightly lower in the treatment group in the intervention period. ED visits, however, appear to be 2-3 percentage points higher among the treatment beneficiaries.

Overall, the FMBHP initiative reached its goal of enrolling 25 CAHs in the innovation. In addition, the majority of CAHs completed a BHIP (68%), hired a BHIS (92%), completed a CNA (88%), and participated in the formulary management project (84%) through the FRIN.

- **Healthier people**. We did not receive any health outcomes data from the FMBHP innovation.

FMBHP staff worked hard to accelerate workforce development and community participation efforts for CAHs that more recently joined the partnership as well as continuing to engage and expand efforts with other CAHs. They continue to be challenged by the vast geographical area where CAHs reside and limited staff to cover in-person visits. Although they used remote forms of communication such as KnowledgeWeb to work across sites, staff found it most effective for meeting with leadership and providing support to BHISs when they could travel to the various sites and meet one-on-one.

FMBHP staff worked mostly in a vacuum with little programmatic support from Mineral Regional. Engaging CAH leadership was driven solely by FMBHP staff. Better communication from Mineral Regional's leadership with CAH CEOs might have helped CAH leaders to stay vested in the work. According to FMBHP staff, the Mineral Regional board of directors is not invested in sustaining the FMBHP innovation. Instead, it is focused on ensuring that the innovation is on track financially. The board is content that the end of the current funding period will also be the end of the innovation.

Linking innovation activities to the overall goals of the innovation proved challenging. Although there may be evidence of reduced costs, these results are not statistically significant. In addition, inpatient admissions data do not indicate that the goal of better care was achieved and no health outcomes were reported for this innovation. In essence the innovation was primarily designed to address internal cost savings in the CAHs, not health care and utilization costs of patients. As a result, it may not be possible to link innovation activities to changes in areas such as health care and health outcomes because these goals are not directly linked to the innovation's five components.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

National Health Care for the Homeless Council

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through end-of-year interviews in National Health Care for the Homeless Council's 11th and 12th quarter of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Medicare	February–June 2015
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–December 2014

National Health Care for the Homeless Council (NHCHC)

1.1 Introduction

The National Health Care for the Homeless Council (NHCHC) is a nonprofit organization that was awarded $2,681,877 to implement an innovation (launched in February 2013[1]) in 12 locations nationwide to transition people experiencing homelessness and who frequently use emergency departments (EDs) for health care into appropriate primary care. The innovation seeks to achieve the following HCIA goals:

1. **Smarter spending.** Decrease hospital/ED utilization for nonurgent care and associated spending among people who are homeless and frequent users of EDs by $4,544 per patient per year.

2. **Better care.** Collaborate with selected Health Care for the Homeless (HCH) primary care programs and local hospitals to ensure that people experiencing homelessness have access to quality health care and services; increase the health workforce and clinical capacity of 12 HCH programs to improve quality of care. Establish medical homes for 500 patients who are homeless, frequent ED users and are located near one of 12 programs.

3. **Healthier people.** Reduce health disparities, broadly defined, including but not limited to diabetes and hypertension. Decrease the number of patients with poor diabetes (A1c > 9.0) and hypertension (blood pressure > 140/90 mm Hg) control.

Table 2 provides a summary of changes that occurred with NHCHC during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data received from NHCHC as of May 31, 2015; and key informant interviews with NHCHC's leader and staff conducted on June 8, 2015.

[1] Data available in the *Q9 Quarterly Awardee Performance Report* indicate the start date as January 2013, but the awardee stated in the review process that patients were not enrolled until February 2013.

Table 2 Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	NHCHC uses a single innovation component, CHWs, to help homeless persons access medical care and social services
Program Participant Characteristics	The majority (83.3%) of participants were 25 to 64 years of age; 58.9% were male. Nearly half (43.2%) were white; 32.6% were black. A quarter (25.8%) were covered by Medicaid and 4.8% by Medicare.
Implementation Process	
Execution	33.6% of Year 3 budget expended, <10% below projected rate due to lag in subcontractor invoicing and loss of subcontractor staff member.
	Collecting data from hospital partners was challenging due to complex hospital policies for data sharing and competing priorities.
	Because the CHW position required structured and consistent supervision, local clinic personnel, who were not financially supported by the HCIA, spent more administrative time on the project than initially planned.
Leadership	NHCHC continued to host monthly conference calls with supervisors and CHWs at the 12 HCH programs.
Organizational capacity	HCH programs sought partnering organizations that could help sustain the innovation after the award period ended, but had limited buy-in without evidence of innovation success.
Innovation adoption and workflow	CHWs established strong relationships with clinical providers and social workers after improving communication with patients and extending care to nonclinical settings
	CHWs led workshops promoting the CHW model for treating homeless populations at the NHCHC's 2014 National Conference and Policy Symposium in New Orleans, LA, May 27-30, 2014.
Workforce Development	
Hiring/retention	No new hires occurred between Q8 and Q10. Two CHWs were terminated and one resigned in Q8. Increase of one FTE during Q9 and decrease of 2.8 FTEs during Q10. Six to nine CHWs identified at least one indicator for job burnout in each quarter.
Training	As of Q10 NHCHC provided 171 cumulative trainees with 1,723 cumulative hours of training. 385 hours were offered in Q8, 72 in Q9, and 0 in Q10.
	Q8 training included attendance at a mini-conference and workshops assembled for the NHCHC's 2014 National Conference and Policy Symposium in New Orleans, LA, May 27-30, 2014.
Implementation Effectiveness	
Reach	82.8% of the target population enrolled through August 2014, a 21.2% increase between Q8 and Q9 (the last quarter of enrollment).
Dose	The number of participants receiving enabling services increased since first reported in the Q9 report. Transportation and health education/supportive counseling were provided to the greatest number of participants (i.e., 119 and 110, respectively).

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by NHCHC.
Key informant interviews conducted Feb–June 2015.

CHW = community health worker; FTE = full-time equivalent; HCH = Health Care for the Homeless; NHCHC = National Health Care for the Homeless Council.

1.1.1 Innovation Components

This innovation consists of one component—community health workers (CHWs), who provide care coordination, patient navigation, and a wide range of social services to homeless persons who frequent the ED. Since we first described this component in the first annual report, no changes to this component have been made.[2] Each of the 12 HCH programs employs one to two HCIA-funded CHWs, many with personal experiences of homelessness. Depending on the site, CHWs identify eligible patients using information or referrals from hospitals and advocacy organizations, data stored in internal or external medical records, and personal referrals. After a patient consents to participate and completes program intake, CHWs support patient care transitions from hospitals to medical homes at the HCH programs. Patients receive services appropriate to their social and medical needs. To facilitate the transition away from ED use, CHWs maintain extensive contacts with organizations in their local communities, including state agencies, nonprofits, hospitals, and providers. Many CHWs' personal experiences with homelessness help them locate, empathize with, and provide quality care to patients. CHWs try to prevent patients from becoming lost to follow-up by visiting locations that they know homeless persons frequent, using all available contact information, and even checking with local agencies to ensure that noncommunicative patients have not become incarcerated or passed away.

Since the first annual report, NHCHC reports that the CHWs required more structure and supervision from member HCH programs than previously warranted. This challenge is discussed in more detail in the Workforce Development section of this report.

The HCH programs working with the NHCHC to implement this innovation (located in CA, IL, NC, NE, NH, MA, and TX) remain unchanged since the first annual report. These programs do not function as traditional partners, given that they serve as extensions of NHCHC in the cities where they provide services. Furthermore, each program cooperates with local partners for patient identification and services for its target population.

1.1.2 Program Participant Characteristics

Patient characteristics data were first reported in the Q4 report. At that time, we received and reported aggregate-level data for 308 participants. The distribution of patient characteristics in ***Table 3*** is similar to that reported in the Q5 report. More specifically, a majority of participants (83.3%) were 25 to 64 years old and more than half (58.9%) were male. Nearly half of participants (43.2%) were white, and approximately one-third were black (32.6%). More than one-third of participants (36.7%) were uninsured; over one-quarter (25.8%) were covered by Medicaid, and less than 5 percent were covered by Medicare.

[2] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Number of Participants	Percentage of Participants
Total	414	100.0
Age		
< 18	0	0.0
18–24	10	2.4
25–44	120	29.0
45–64	225	54.3
65–74	7	1.7
75–84	2	0.5
85+	0	0.0
Missing	50	12.1
Sex		
Female	116	28.0
Male	244	58.9
Transgender	2	0.5
Missing	52	12.6
Race/ethnicity		
White	179	43.2
Black	135	32.6
Hispanic	24	5.8
Asian	4	1.0
American Indian or Alaska Native	12	2.9
Other	7	1.7
Missing/refused	53	12.8
Payer Category		
Dual	26	6.3
Medicaid	107	25.8
Medicare	20	4.8
Medicare Advantage	0	0.0
Other	46	11.2
Uninsured	152	36.7
Missing	63	15.2

Source: Patient-level data provided to RTI by NHCHC.

1.2 Implementation Progress

The first annual report (2014) described NHCHC's implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area. ***Table 4*** lists these measures and their status as of May 31, 2015. The results of analyses for all of these measures are included in this annual report.

This section presents NHCHC's process measures and a qualitative analysis of the factors that determined NHCHC's implementation progress. This analysis draws on patient-level data that NHCHC provided to RTI as of May 31, 2015, performance documents, and key informant interviews conducted on June 8, 2015.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation effectiveness	Reach	Number/percentage of clinically eligible patients (i.e., homeless population) by quarter	Data received from NHCHC
	Dose	Number and type(s) of enabling services (e.g., transportation, interpretation services, health education/supportive counselling, outreach, case management [assessment, treatment and referral], eligibility assistance/ financial counselling)	Data received from NHCHC

NHCHC = National Health Care for the Homeless Council.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through NHCHC's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include NHCHC's reports from Q8 through Q10 and interviews conducted on June 8, 2015.

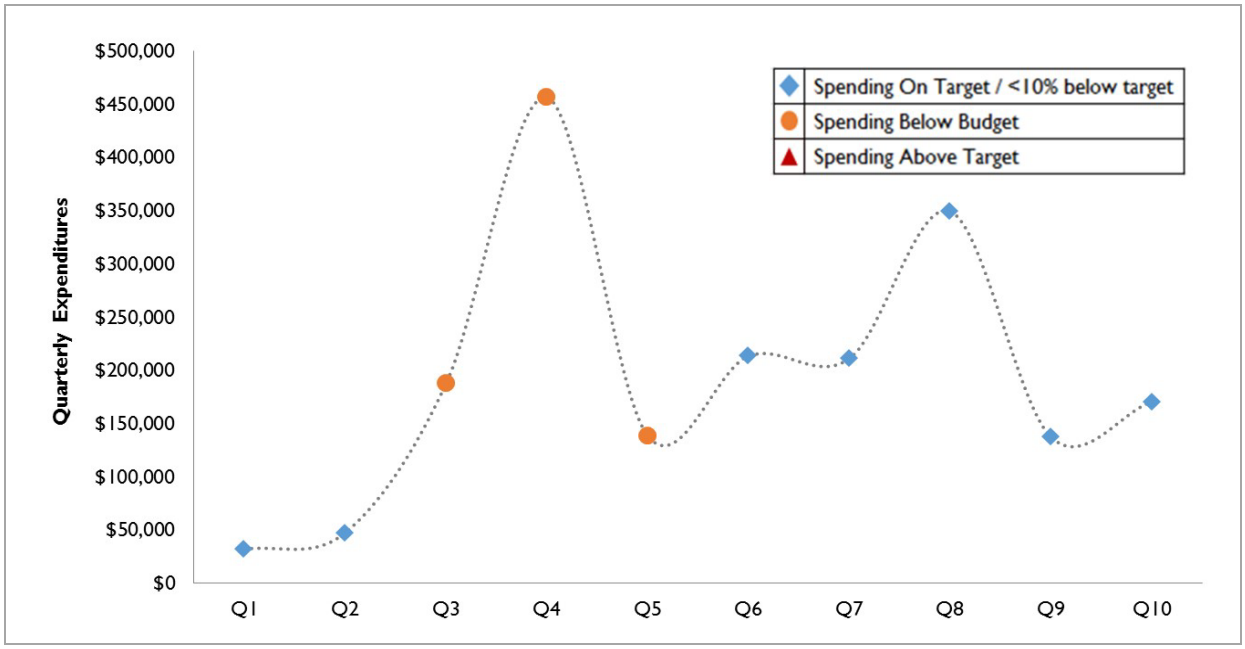
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

Execution of Implementation

The annual report highlights the significance of NHCHC's expenditure rates on implementation. As of December 2014 (Q10), NHCHC spent 33.6 percent of its Year 3 budget, which is less than 10 percent below the projected rate, due to a lag in subcontractor invoicing and loss of a subcontractor staff member. Prior to the subcontractor invoicing issues NHCHC first reported in Q10, NHCHC met spending projections in Q8 and Q9. ***Figure 1*** shows that NHCHC spent on target or less than 10 percent below its target for all but three quarters, and none in Year 3.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Leadership

In the 2014 annual report, RTI detailed NHCHC's leadership and commitment to the innovation. Leaders at both the HCH programs and national level continue to support the innovation. During our end-of-year (EOY) interviews, we learned that the chief executive officer (CEO) of the Houston site provides vision, focus, and guidance for the project. As in the Year 1 site visit, the program leader reiterated that the team meets regularly and that the "open door" culture of the organization allows staff to access the CEO whenever needed. As the innovation matured and staff developed a "flow," however, the CEO became less involved.

NHCHC (national) is credited by a NHCHC interviewee as "closely interwoven" with the Houston program and maintaining monthly communications. Staff at NHCHC support the HCH programs with quality assurance and by completing innovation paperwork, the national organization is welcoming when the team calls with questions. This NHCHC interviewee noted, however, that some programs seemed to interact more with NHCHC than others.

When asked about other champions of the innovation, the NHCHC interviewee stated that administrative staff at the HCH programs, who are not funded by the project, spearheaded efforts to integrate the innovation into their clinics and identify problems. She also explained how providers became champions after seeing CHWs identify otherwise unknown obstacles to care, and their ability to extend care from clinical to nonclinical settings.

Organizational Capacity

NHCHC continued to host monthly conference calls with the supervisors and CHWs at all local HCH programs. The calls allowed CHWs to exchange field stories to promote shared learning, voice

training needs, and provide feedback on how skills learned during trainings inform outreach and services. The programs varied dramatically in organizational structure, partnerships, and local resources; monthly calls help heighten staff's awareness about resources available to other programs that are lacking in their own communities. The calls also promoted cooperation among programs that are geographically close to one another (e.g., Boston, MA and Hyannis, MA). For example, patients residing in one HCH community may travel to a neighboring site for otherwise inaccessible services.

In the first annual report RTI described the challenges that NHCHC faced in regard to establishing memoranda of agreements (MOAs) with the public hospitals in the various NHCHC programs because of complicated policies and bureaucracies. In the quarters (8-10) since the annual report NHCHC identified an additional obstacle to collecting data from hospital partners. NHCHC has no direct access to patients or their identifiers, and each local program had to establish contracts with the local hospital to monitor ED use among enrolled patients. These contracts took a great deal of time to establish and are generally with the one local hospital most likely to treat homeless or uninsured patients (i.e., public hospitals). This situation is particularly challenging while NHCHC is working toward sustainability and needs to demonstrate the benefits of its innovation to partner hospitals and community agencies. Program administrators expressed that, "it is difficult to pitch the project without the data results." NHCHC expected to receive data with the potential to demonstrate health benefits or cost reductions in June 2015. RTI anticipates receiving these data by October 2015 and will include the results in the next annual report.

Innovation Adoption and Workflow Integration

Within HCH programs, providers, social workers, and CHWs developed strong working relationships that improved care. For example, one CHW explained to a clinician that a patient was not taking his blood pressure medications because diarrhea was a side effect of his treatment, and it was awkward to experience diarrhea in a homeless shelter. The physician would not have otherwise considered this contextual obstacle to medication adherence. Awardee leadership described how providers' recognition of CHW expertise led clinicians, social workers, and CHWs to convene and strategize on ways to ensure that patients received necessary specialty services.

One CHW working at the Durham, NC site made such a powerful impression in her community that the city will allocate money to sustain her CHW position. A local hospital publicized the importance of her work, capturing the mayor's attention. The CHW in question was very involved in creating the position, despite her plans to leave the HCH site for graduate school.

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was understaffed by 2.8 full-time equivalent (FTE) staff members with a total of 14.2 FTEs. Between Q8 (June 2014) and Q10, staffing dropped by 0.8 FTE. During Q8, the NHCHC lost 3 CHWs: 2 terminations for "boundary violation," and 1 resignation due to stress and burnout. Existing staff increased their hours to equal 16 FTEs at the end of Q9; the figure then dropped again to 14.2 at the end of Q10.

NHCHC collects quarterly data on CHW burnout as part of larger efforts to solicit staff feedback and satisfaction. Innovation leaders acknowledged that working with the homeless population is emotionally demanding, and that many CHWs experienced vicarious trauma as they empathized with innovation patients. Monitoring burnout allows innovation leaders to identify problems quickly and intervene to provide self-care resources as needed. Six CHWs (66%) reported at least one indicator of job burnout at the end of Q10, a decrease in job burnout since Q8 (78%) and Q9 (90%). According to an EOY interview, burnout resulted not only from dealing with high-need clients, but also from "being disheartened by larger organizations." CHWs struggled against bureaucracies and policies insensitive to the realities of homelessness, creating frustration as CHWs found themselves unable to help their clients. The interviewee also suggested that especially high rates of burnout during Year 3 may have resulted from CHW's efforts to "race to the finish" of the innovation.

NHCHC took several actions to address burnout and support CHWs more generally. The awardee hosted a training on self-care prior to the 2014 NHCHC National Conference and Policy Symposium (see next section for more information). According to feedback solicited after the training, CHWs found the trainer and content to be excellent. NHCHC is also developing training materials for supervisors on how to effectively manage CHWs.

Skills, Knowledge, and Training

Between Q8 and Q10, NHCHC provided 457 hours of training to 20 CHWs and 2 HCIA-employed administrators in Q8, 3 HCIA-employed administrators in Q9, and 0 staff in Q10.

The Q8 training took place at the 2014 NHCHC National Conference and Policy Symposium in New Orleans, LA. CHWs attended a full-day pre-conference on trauma-informed care and developing strategies for working with high-needs clients; and stress, vicarious trauma, and burnout. During the conference itself, CHWs attended three workshops: (1) Combating Overdose and Opioid Poisoning Death among People Experiencing Homelessness, (2) LGBTQ Homeless Youth: Stories of Risk and Resilience, and (3) Breaking the Habit of Complacency: Addressing Tobacco use among Individuals with Severe Mental Illness Who Are Homeless or Vulnerably Housed. Conference feedback suggests that the content was positively received.

In addition to attending the 2014 conference, HCIA staff led 2015 conference activities and became advocates for the CHW model of addressing health care for persons experiencing homelessness. A few CHWs hosted roundtable sessions on integrating CHWs into the HCH model of care. Their sessions were entitled:

- Connecting the Dots: Community Health Workers as Vital Pieces of the HCH Model of Care,
- Partnering with Hospitals: Community health Workers and Care Coordination, and
- Connecting to Care: Integrating Community Health Workers into your Outreach and Engagement Efforts.

CHWs also supported a conference booth where attendees could learn more about the role of CHWs in care for the homeless.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach) and; (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

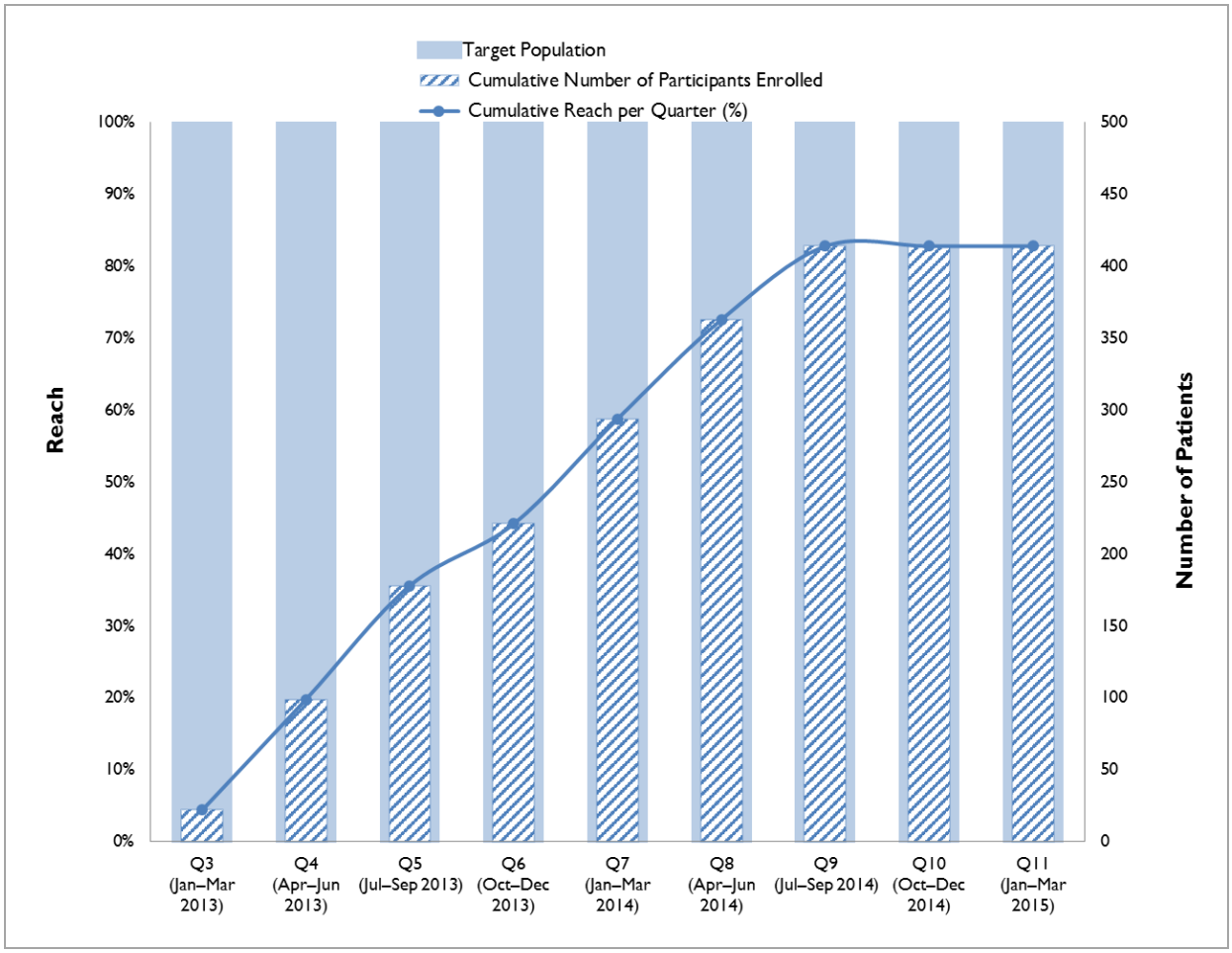
Evaluation Question

- What is the implementation effectiveness, including reach and dose, of the innovation thus far?

Reach

Figure 2 shows reach by quarter since the launch of the innovation. We reported overall reach for the first time in the Q4 report, based on data through Q8. This annual report is the first report in which we are reporting reach by quarter. Overall reach increased 21.2 percent between Q8 and Q9 (the last quarter of enrollment). Reach rose steadily throughout each quarter until leveling off in Q9, the final quarter in which participants were enrolled in the innovation.

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch



	Quarter	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct-Dec 2014)	Q11 (Jan-Mar 2015)
●	Cumulative reach per quarter (%)	4.4	19.8	35.6	44.2	58.8	72.6	82.8	82.8	82.8
	Target population	500	500	500	500	500	500	500	500	500
	Cumulative number of participants enrolled	22	99	178	221	294	363	414	414	414

Source: Patient-level data provided to RTI by NHCHC.

The number of participants enrolled based on the secondary data NHCHC provided is consistent with that reported in the NHCHC's *Quarterly Awardee Performance Reports.* NHCHC distinguishes between patients who enrolled in the innovation and those who enrolled and also completed consent and intake processes (N=368), but RTI did not receive data on patient consent or participation in intake.

RTI's EOY interviews offer possible explanations for their success in reaching patients. First, when early efforts to recruit patients based on hospital referrals proved unsuccessful, CHWs assumed a more active role in patient identification. One interviewee described extensive efforts to triangulate data

from hospital records, the HCH database, and partnering organizations and state agencies to find and retain homeless patients. Second, CHWs spent much time building rapport in their target communities. Staff frequently met with homeless persons several times before patients were successfully recruited in order to build trust. A leader at NHCHC described recruitment processes as taking two to three times longer than initially anticipated. Third, staff became increasingly selective during Year 3 about the types of patients that they added to their caseloads. Early patients with complex social and medical needs taught CHWs that some patients would not make progress in managing their care, despite the CHW's best efforts. By recruiting a mix of highly and moderately complex patients, CHWs could increase the number of patients under their supervision and achieve success with individuals who simply need "a helping hand."

Dose

CHWs offered a wide array of social and medical services to help patients transition from EDs to primary care. Based on the EOY interviews, RTI believes that the dose data reported here fail to capture the many types of services that CHWs provided. For instance, both leaders identified secure housing as essential to improving the health of homeless persons. One interviewee explained the importance of addressing basic human needs for food and housing prior to the management of chronic conditions: "People who are struggling with diabetes are more concerned with where their next meal is going to come from or where they're going to be sleeping at night. So the CHWs approach can't be 'I understand that you don't know where you're going to sleep at night, but let's talk about your diabetes or your asthma.' That's not going to work. You have to address what it is that's their priority and then you get to how it's affecting their health care." A site leader we interviewed similarly described linking innovation patients with a local housing waiver program as a major task for the staff at her site. CHWs not only helped patients obtain housing, but also supported patients as they made the difficult transition from long-term homelessness to managing a household, or as patients coped with their inability to maintain housing. Despite the importance of housing to innovation patients, RTI did not receive data on CHWs' delivery of housing support services.

RTI also lacks data on the intensity with which patient received services from CHWs. Without such information, innovation services may appear less involved than they really were. For example, during an EOY interview, one leader described how one CHW arranged for two patients to have cataracts removed. A single surgery might require several meetings with physicians and nurses, along with complicated transit planning to facilitate each clinical encounter. These complicated cases, which can transform patients' lives and consume CHWs' time, are not evident in the data provided by NHCHC.

Table 5 provides the number and percentage of participants who received enabling services through Q11, based on the data RTI received. We first reported dose for enabling services in the Q5 report, based on data through Q9. As would be expected, the number of participants who received enabling services increased between Q9 and Q11. The most commonly received enabling services were transportation (28.7%) and health education and supportive counseling (26.6%).

Table 5. Number and Types of Services Provided to Participants

Type of Service	Number of Participants Receiving Service	Percentage of Total Enrolled Participants (n=414)
Enabling services		
Transportation	119	28.7
Health education/supportive counseling	110	26.6
Eligibility assistance/financial counseling	29	7.0
Interpretation services	11	2.7

Source: Patient-level data provided to RTI by NHCHC.

Sustainability

NHCHC's narrative progress reports and EOY interviews suggest that the awardee was very focused on sustaining CHW services during Year 3. NHCHC cannot sustain innovation services, but they offered nonfinancial support in strategy and vision. For instance, NHCHC is currently developing a curriculum on integrating CHWs into HCH programs and drafting documents on how to create effective supervisors for the CHW role.

The dedication of HCH site leaders to maintaining the CHW positions beyond the HCIA funding period was also evident. Local programs led ongoing discussions with their partner hospitals and community agencies to strategize on sustainability plans. In some locations, hospitals agreed to supplement the cost of the program, and the EOY interviewee at NHCHC attributed this to the strong relationships several hospitals have with HCH programs. She explained, "bureaucracy and administration in hospitals can sometimes be really difficult to work with, so when you find that kind of common ground, it is pretty cool, and I think it's made a huge impact for clients and their experience accessing care." Selected other programs will sustain CHWs by cutting other expenses or through new funding. For example, the HHH site secured grant monies to dramatically expand their CHW program.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of NHCHC's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data NHCHC collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers essential to the evaluation of NHCHC's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 6 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of the status of the data requested and whether the data are presented in this annual report. We do not present any Medicare or Medicaid claims analyses for NHCHC: NHCHC cannot provide patient identifiers for its participants because of constraints on sharing patient identifiers. NHCHC may be able to provide utilization and cost data for participants aggregated at the city level.

Table 6. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Status
Health care outcomes	Utilization	All-cause inpatient admissions rate	Not available.
		Hospital unplanned readmissions rate	Not available.
		ED visit rate	Not available.
	Cost	Spending per patient	Not available.
		Estimated cost savings	Not available.

ED = emergency department.

1.3.2 Claims Data

In future reports, this section will describe the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization if claims data and patient identifiers become available.

Medicare Claims Analysis

Most participants in the NHCHC innovation were uninsured or enrolled in Medicaid. However, NHCHC cannot provide patient identifiers for its participants because of constraints on sharing patient identifiers. Therefore, we will not present Medicare claims analyses for NHCHC.

Medicaid Claims Analysis

Although the largest share of NHCHC participants were uninsured, a significant share of participants had Medicaid coverage. Because NHCHC cannot provide patient identifiers for participants in the innovation, we will not present Medicaid claims analyses for NHCHC.

Comparison Groups

Because of the lack of patient identifiers for participants, RTI will not be able to develop comparison groups for NHCHC.

1.3.3 Other Awardee-Specific Data

Table 7 lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. The results of analyses for all of these measures are included in this annual report. The data we present in this section are current through March 2015.

Table 7. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Clinical effectiveness	Asthma	Percentage of patients with asthma for whom appropriate medications were dispensed	Data received from NHCHC
	Diabetes	Percentage of patients with diabetes who received a foot exam	Data received from NHCHC
	Mental health	Percentage of patients with mental illness for whom appropriate medications were dispensed	Data received from NHCHC
	Patient perceived health and functioning	Quality of life scale	Data received from NHCHC
		General self-efficacy scale	Data received from NHCHC
Health outcomes	Diabetes	Percentage of patients with diabetes who had hemoglobin A1c > 9.0 %	Data received from NHCHC
	Hypertension	Percentage of patients with hypertension with blood pressure < 140/90 mm Hg	Data received from NHCHC

ED = emergency department; NHCHC = National Health Care for the Homeless Council.

Clinical Effectiveness

RTI reviewed clinical effectiveness measures among homeless patients with asthma, diabetes, and/or hypertension, as well as homeless patients with mental health issues. The following run charts take into account rolling enrollment. The intervention quarters (Is) are based on individual enrollment date. For example, I1 is equal to the first quarter of enrollment for all participants who received a specific test.

Table 8 shows the number and percentage of patients with EHR-flagged health conditions for each of the 12 programs. As shown in the table, the percentage of patients with asthma ranged from 2.6 percent (Houston, Texas) to 36.4 percent (San Jose, California). The percentage with diabetes ranged from 12.5 percent (Hyannis, Massachusetts) to 42.4 percent (Durham, NC), and the percentage with hypertension ranged from 6.0 percent (Houston, Texas) to 37.5 percent (San Jose, California). When interpreting the percentages for each site, one must consider the small sample sizes ranging from 11 to 116 participants. Overall, diabetes was the most common health condition, occurring in 26.8 percent of all patients, followed by hypertension (13.5%), and asthma (12.1%). Because RTI received data flags only when CHWs could affirm patient conditions using EHR entries, it is unclear whether other patients did not

have medical conditions flagged or do not have the conditions at all. This suggests that the percentages below are conservative lower bound.

Table 8. Number and Percentage of Participants by Health Condition by Site

Site	Health Condition					
	Asthma		Diabetes		Hypertension	
	Number	Percent	Number	Percent	Number	Percent
Boston, MA (n=16)	3	18.8	5	31.2	6	37.5
Chicago, IL (n=21)	4	19.0	6	28.6	4	19.0
Cleveland, OH (n=23)	3	13.0	3	13.0	3	13.0
Durham, NC (n=33)	5	15.2	14	42.4	8	24.2
Houston, TX (n=116)	3	2.6	36	31.0	7	6.0
Hyannis, MA (n=16)	1	6.2	2	12.5	2	12.5
Los Angeles, CA (n=21)	2	9.5	7	33.3	4	19.0
Manchester, NH (n=27)	1	3.7	6	22.2	3	11.1
Nashua, NH (n=37)	13	35.1	5	13.5	6	16.2
Omaha, NE (n=56)	6	10.7	13	23.2	7	12.5
San Fernando, CA (n=33)	5	15.1	11	33.3	3	9.1
San Jose, CA (n=15)	4	36.4	3	27.3	3	27.3
Total (414)	*50*	*12.1*	*111*	*26.8*	*56*	*13.5*

Source: Patient-level data provided to RTI by NHCHC.

Evaluation Question

- To what extent have participants in the innovation received appropriate clinical services?

Table 9 shows the percentage of patients by health condition receiving clinical services across NHCHC's 12 programs. As shown in the table, more than three-fourths (78%) of participants with asthma were dispensed appropriate medications. Among patients with diabetes, about 14 percent received a foot exam and/or an HbA1c and lipid profile assessment. For those with hypertension, about half (48.2%) had a blood pressure reading that was below 140/90 mm Hg, indicating blood pressure control. About 12 percent of patients were dispensed appropriate medications for mental illness. The data that RTI received from NHCHC did not include diagnosis or service delivery timing, so we cannot independently establish a causal order between CHWs' identification of health conditions and the services reported in Table 9. However, based on quarterly reports and key informant interviews, we understand that CHWs facilitated linkages to primary care.

Table 9. Clinical Effectiveness Services among Participants with Asthma, Diabetes, and Hypertension

Measure	Percentage of Patients Receiving Clinical Services
Asthma (n=50)	
Percentage of patients with persistent asthma who were dispensed appropriate medications	78.0
Diabetes (n=111)	
Percentage of patients with diabetes who received a foot exam	14.4
Percentage of adult patients with diabetes 18-75 years of age who received a hemoglobin A1c and lipid profile assessment	14.4
Mental Health (n=414)	
Percentage of patients with mental illness who were dispensed appropriate medication	11.8

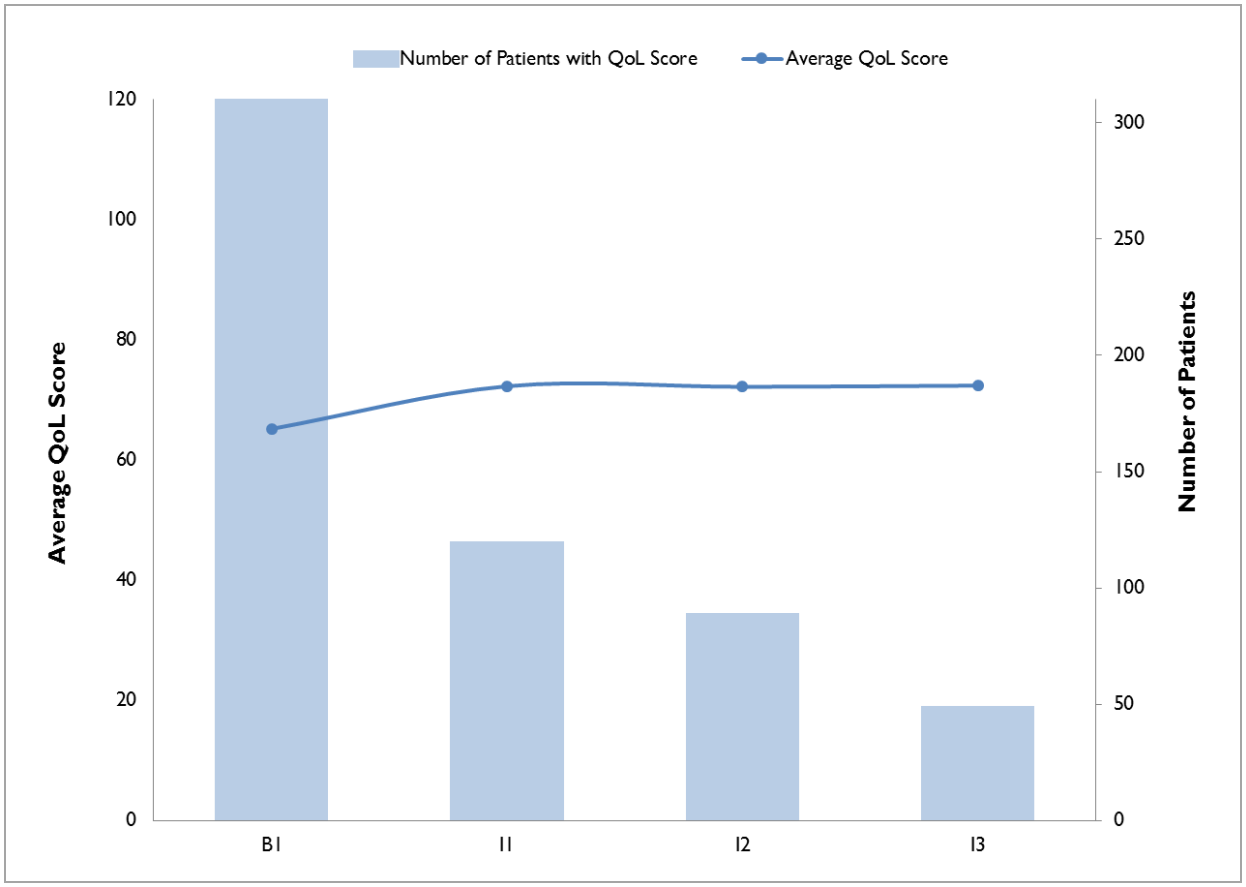
Source: Patient-level data provided to RTI by NHCHC.

Evaluation Question

- To what extent has patient perceived health and functioning changed over time among those enrolled in the innovation?

Figure 3 shows perceived quality of life over time for participants across all 12 programs. The Quality of Life Scale (QoLS) is a self-reported score that measures quality of life in a variety of ways including family, housing stability, and recreation. The highest score that can be obtained on the QOLS is 120, with higher scores indicating a perceived higher quality of life. As shown in the figure, patients' reported quality of life increased slightly after enrollment in the innovation, but remained quite stable while enrolled in the innovation over time.

Figure 3. Perceived Quality of Life over Time

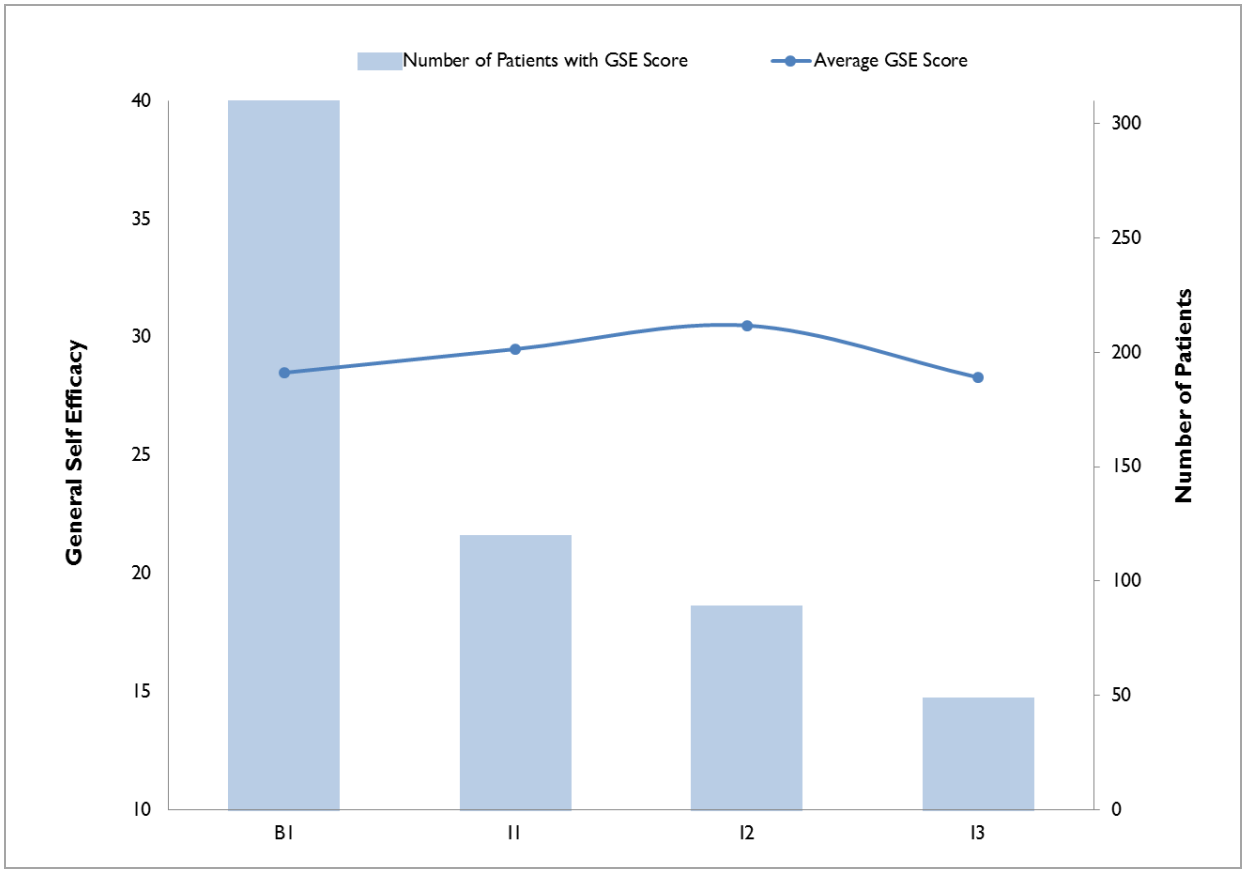


	Quarter	B1	I1	I2	I3
●	Average QoL score	65.2	72.3	72.2	72.4
	Number of patients with QoL score	308	116	85	45

Source: Patient-level data provided to RTI by NHCHC.

Figure 4 shows general self-efficacy over time for participants across all 12 programs. The self-reported General Self-Efficacy Scale (GSE) measures the belief in one's competence to cope with a broad range of stressful or challenging demands. The higher the score, the more confident a person is in his/her ability to handle stressful situations, with a total score of 40 possible. As the figure shows, general self-efficacy remained fairly consistent over time at an average of about 30. GSE increased slightly after enrollment in the innovation and decreased slightly below the average at baseline by the third innovation quarter. However, the third innovation quarter had the smallest sample size and is, thus, subject to more variation.

Figure 4. General Self Efficacy over Time



	Quarter	B1	I1	I2	I3
●	Average GSE score	28.5	29.5	30.5	28.3
	Number of patients with GSE score	308	116	85	45

Source: Patient-level data provided to RTI by NHCHC.

Health Outcomes

RTI examined health outcomes among homeless patients with diabetes, as well as homeless patients who had hypertension. The following run charts take into account rolling enrollment. The intervention quarters (Is) are based on individual enrollment date. For example, I1 is equal to the first quarter of enrollment for all participants who received a specific test.

Evaluation Question

- To what extent have health outcomes (e.g., blood pressure) improved over time among patients with hypertension enrolled in the innovation?

Table 10 shows the percentage of diabetes patients with poor HbA1c control. Among the patients with diabetes who received an HbA1c test, about 95 percent were in control of their HbA1c (i.e., <10.0%).

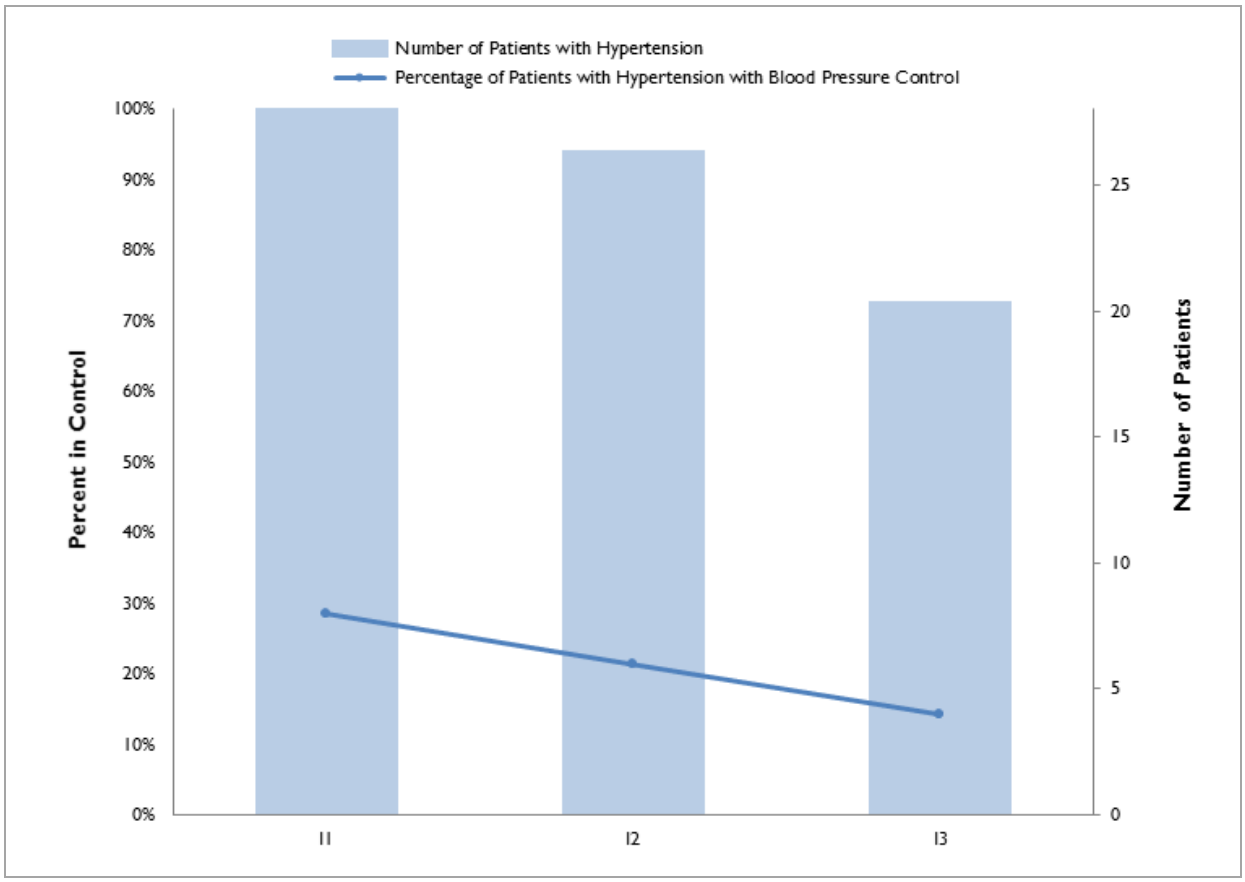
Table 10. Health Outcomes among Participants with Diabetes

Measure	Percentage of Patients with Poor HbA1c Control
Percentage of patients with diabetes who had HbA1c >9.0%	5.4

Source: Patient-level data provided to RTI by NHCHC.

As shown in ***Figure 5***, the percentage of hypertension patients who kept their blood pressure under control decreased over time. The denominator represents the number of hypertension patients who received a blood pressure reading for each quarter. The numerator represents the number of hypertension patients who received a blood pressure reading that was <140/90 mm Hg. As shown in the figure, the percentage of patients with blood pressure control decreased over time from about 30 percent in I1 to about 15 percent in I3.

Figure 5. Percentage of Hypertension Patients with Controlled Blood Pressure



	Quarter	I1	I2	I3
●	Percentage of patients hypertension with blood pressure control	28.6	21.4	14.3
	Number of patients with hypertension	28	26	20

Source: Patient-level data provided to RTI by NHCHC.

Discussion of Other Awardee-Specific Findings

Our findings show that across all programs, diabetes is the most common health condition, followed by hypertension and asthma. Of these, asthma patients were the most likely to receive clinical services: 78 percent received appropriate medications. Almost half (48.2%) of hypertension patients had at least one blood pressure reading below 140/90 mm Hg, although rates of blood pressure control decreased over time. Patients' perceived quality of life and general self-efficacy remained relatively consistent since enrollment in the innovation. Overall, about 95 percent of patients with diabetes had control of their HbA1c. However, because we do not have HbA1c test results over time, we cannot determine if this reflects an increase following enrollment in the innovation. Thus, overall, we do not find an impact of the innovation on patients' receipt of clinical services and health outcomes.

End-of-year interviews suggest that CHWs address a complex array of issues that have more immediate social benefits than health impact, as health problems often cannot be addressed until patients' pressing needs for housing, food, and other basic necessities are met. We will continue to monitor health outcomes to determine whether impact may become evident after more time has passed.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing NHCHC as well as accomplishments to date. In this section we assess NHCHC's progress on achieving HCIA goals to date:

- **Smarter spending.** RTI is unable to evaluate changes in spending because patient identifiers are not available. RTI requested access to ED spending data compiled by partnering hospital sites and data are expected in September 2015.

- **Better care.** NHCHC stopped enrolling patients in August 2014, so its final overall reach is 82.8 percent (414 patients out of a target of 500). More than three-fourths of asthma patients were dispensed appropriate medications, and almost 14 percent of diabetic patients received a foot exam. For those with hypertension, almost half had a blood pressure reading below 140/90 mm Hg, and approximately 11 percent of patients with mental illness were dispensed appropriate medications. NHCHC's measures of dose, while somewhat informative, fail to capture the range and frequency of patient services. Patients' perceived quality of life and self-efficacy remained consistent throughout the innovation period.

- **Healthier people**. The percentage of hypertension patients with their blood pressure under control decreased over time. Overall, the majority (95%) of patients with diabetes have an A1c under control. However, because we do not have HbA1c test results over time, we cannot determine if this reflects an increase following enrollment innovation.

National and local leaders continue to communicate strong investment in the CHW care delivery model. Organizational leaders at the HCH programs provide resources, vision, and guidance, and administrative champions volunteer their time to manage and support CHWs. NHCHC cannot provide ongoing funding for the CHW role after HCIA funding ends, but they offer various forms of nonfinancial

support for the CHW model. NHCHC fosters communication and learning across the HCH programs, and develops materials to improve work flow and staff well-being.

National and local leaders agree that their CHWs became experts on delivering services to homeless patients. CHWs maintain extensive networks with local agencies and existing homeless communities, which facilitate patient recruitment and retention and connections to specialty care and social services. CHWs offer a unique perspective on contextual barriers to care that traditional providers typically lack, resulting in clinician support for the CHW model. One of the greatest barriers to helping homeless persons transition out of ED care is a lack of knowledge and resources in the communities where CHWs operate.

Throughout Year 3, NHCHC and partnering HCH programs focused on efforts to sustain CHW services. Despite strong buy-in from leaders and HCH programs, four locations are not in a position to continue to support the CHW role. NHCHC suggests that without evidence of cost savings or improvement in health, local partners are sometimes reluctant to offer funding for ongoing services. NHCHC expects that data from local hospitals will provide evidence of program impact and potentially increase the likelihood that CHW services will be sustained. Programs continue to strategize on how they can use other national, state, or local resources to continue providing care.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Northeastern University

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Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

Northeastern University

1.1 Introduction

Northeastern University (NEU) is a private university in Boston, Massachusetts. Awarded $8,000,002, NEU began enrolling health systems into its HCIA Community Resource innovation in November 2012. The aim of this innovation is to develop and enable professional collaboration between NEU and various health systems to promote the application of industrial and systems engineering (ISyE) in process improvement projects. The innovation seeks to achieve the following HCIA goals:

1. **Smarter spending.** Reduce expenditures by $60.8 million through quality improvement projects implemented at health systems (up to three projects per health system) in a 3-year period.

2. **Better care.** Improve care by applying ISyE methods to health care systems in Years 1–3 and developing a workforce of health systems engineers.

3. **Healthier people**. Improve health outcomes through more effective and efficient processes of care and service delivery.

Table 2 provides a summary of changes that occurred with NEU during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data submitted by NEU through March 31, 2015; and key informant interviews with the principal investigator at NEU that we conducted on June 12, 2015.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	Completed and implemented projects in 20 health care systems
Program Participant Characteristics	A majority of participants (83.2%) were younger than 64 years old. A majority (58.0%) were covered by Medicaid.
Implementation Process	
Execution	61.5% of Year 3 budget; below target
Leadership	The leader was effective in motivating students and staff about the project's vision, but was challenged in managing day-to-day operations.
Organizational capacity	Heavy staff workload both at the REC and at the health systems was a challenge to implementation.
Innovation adoption and workflow	Data not available.
Workforce Development	
Hiring/retention	Total FTEs decreased by 8 between Q8-Q10.
Training	Between Q8 and Q10, NEU provided 4,700 hours of training to 745 trainees, including HCIA project-employed personnel and community-based personnel, according to the *Quarterly Awardee Performance Report.*

(continued)

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Implementation Effectiveness	
Reach	Five projects affected the care of 14,153 patients through Q11.[1]
Dose	NEU spent 417 hours scoping projects in Q11 and 16,556 hours scoping projects since the start of the innovation.[1]

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by NEU.
Key informant interviews conducted Feb–June 2015.
[1] Defined in Q5 report
FTE = full-time equivalent; HCIA = Health Care Innovation Award; NEU = Northeastern University; Q = quarter; REC = regional extension center.

1.1.1 Innovation Components

NEU's innovation plans and executes multiple projects at various health systems with different scopes, goals, and target populations. Therefore, we use a two-tiered approach (macro and micro levels) to evaluate NEU's innovation:

- Component 1: Regional Extension Center (REC) Model (macro level): Every project in NEU's innovation uses core principles of ISyE, and deploys NEU students and staff to work with health care systems to improve processes based on these principles. To select projects based on principles of ISyE and consistent with the goals of the award, NEU first considers multiple projects based on individual health system needs and priorities. This scoping process requires significant interaction between NEU and the health system to identify and plan an appropriate ISyE project. This component involves assessing the time taken to scope projects, engagement of health care partners, and project sustainability beyond the initial implementation period.

- Component 2: Process Improvement Projects (micro level). This component focuses on individual projects within each health system. Since no two projects were identical, each project has different evaluation measures.

NEU's initial goal was to complete 15 projects, mostly in the greater Boston area, but also in Seattle and Charlotte. According to the Q10 Narrative Progress Report, NEU is engaged in scoping projects in both Seattle and Charlotte; however, at the time of this report, those projects had not yet been implemented. Due to the difficulty in obtaining data for all completed projects from NEU, the Centers for Medicare & Medicaid Services (CMS) and NEU, with input from RTI, worked to prioritize 10 projects for evaluation in Year 3, as shown in ***Table 3***. NEU designed these projects and the health system implemented them. Level 1 projects were the highest priority and had the full attention of NEU and RTI to obtain and analyze data. In addition, if NEU was able to receive agreement from any nonprioritized health system (listed in the table as "Other") to share data with RTI, RTI would include that project's data in our evaluation. The partners for this innovation remain unchanged

Table 3. Summary of Prioritized Health System Projects

Partner Name[1]	Project Name	Location
Level 1 Prioritization		
Cambridge Health Alliance	Resident Team Scheduling—Primary Care Continuity	Boston, MA
Hallmark Health	Breast Cancer Patient Access	Boston, MA
Level 1 Prioritization (continued)		
Lahey Health	CHF Post-discharge Scheduling	Boston, MA
	COPD Readmissions Reduction	
Massachusetts General Hospital	Central Line Infection (CLABSI)	Boston, MA
	Neurology Department Appointment Access	
Maine Health	OR Block Optimization	Portland, ME
Level 2 Prioritization		
Hallmark Health	ED Opioid Abuse	Boston, MA
Lahey Health	Surgery Nurse Staffing Optimization	Boston, MA
Maine Health	Perioperative Inventory	Portland, ME
Other		
Boston Medical Center	OB/GYN Ambulatory Clinic	Boston, MA

CHF = congestive heart failure; CLABSI = central line-associated blood infection; COPD = chronic obstructive pulmonary disorder; ED = emergency department; OR = operating room.

1.1.2 Program Participant Characteristics

NEU's innovation aims to change health systems and processes. Thus, under NEU's innovation, there are no direct participants and patients and/or providers included in the projects are indirect participants. As of March 31, 2015, we received patient-level data from NEU for four prioritized projects: Cambridge Health Alliance (CHA) Primary Care Continuity project, the Lahey Health System Congestive Heart Failure (CHF) Post-discharge Scheduling project, the Lahey Health System Chronic Obstructive Pulmonary Disease (COPD) project, and the Hallmark Health Breast Cancer Patient Access project. In addition, we received data from one nonprioritized project, the Boston Medical Center OB/GYN Ambulatory Appointment Access project.

Table 4 provides the demographic characteristics of participants included in all five projects. We first reported patient demographics in the Q5 report, based on two of these five projects. Nearly two-thirds of participants (63.7%) were between 25 and 64 years old. More than half (58.0%) were covered by Medicaid, and less than 10% were covered by Medicare, Medicare Advantage, or are dually eligible for both Medicare and Medicaid. Nearly two-thirds of participants were missing data on sex and race/ethnicity. We received data on sex for three of the projects (i.e., Hallmark Health Breast Cancer Patient Access, Lahey Health System COPD, and BMC OB/GYN Ambulatory Appointment Access projects). Among those with data for sex, nearly all (98.9%) were female. We received data on race/ethnicity from two projects (i.e., Hallmark Health Breast Cancer Patient Access and Lahey Health System COPD projects). Nearly all of those patients (91.8%) were white.

Table 4. Characteristics of Participants Included

Characteristic	Number of Participants	Percentage of Participants
Total	14,153	100.0
Age		
< 18	2,013	14.2
18–24	757	5.3
25–44	4,100	29.0
45–64	4,915	34.7
65–74	1,314	9.3
75–84	617	4.4
85+	174	1.2
Missing	263	1.9
Sex		
Female	5,182	36.6
Male	57	0.4
Missing	8,914	63.0
Race/ethnicity		
White	4,552	32.2
Black	133	0.9
Hispanic	0	0.0
Asian	186	1.3
American Indian or Alaska Native	2	0.0
Native Hawaiian or Other Pacific Islander	5	0.0
Other	79	0.6
Missing/refused	9,196	65.0
Payer Category		
Dual	876	6.2
Medicaid	8,213	58.0
Medicare	166	1.2
Medicare Advantage	45	0.3
Other	4,590	32.4
Uninsured	0	0.0
Missing	263	1.9

Source: Patient-level data provided to RTI by NEU for the following five projects: Lahey Health System CHF, Lahey COPD Readmissions Reduction, Cambridge Health Alliance Primary Care Continuity, Hallmark Health Breast Cancer Patient Access, and Boston Medical Center OB/GYN Ambulatory Appointment Access.

1.2 Implementation Progress

The first annual report (2014) described NEU's implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area.[1] ***Tables 5*** and ***6*** list these measures and their status as of May 31, 2015. The results of analyses for most of these measures are included in this annual report. We anticipated reporting dose at the REC-model level but NEU informed us that it did not collect these data. Therefore, we do not expect to report on this measure in subsequent reports.

This section presents NEU's process measures and a qualitative analysis of the factors that determined NEU's implementation progress. This analysis draws on patient-level data that NEU provided to RTI as of May 31, 2015, performance documents, and key informant interviews with NEU leaders and staff conducted in the 11th and 12th quarters of operations.

Table 5. Quantitative Explanatory Measures for the Regional Extension Center Model

Evaluation Domains	Subdomains	Measures	Status
Workforce development	Education and training	Number of staff (including undergraduate cooperative education students, graduate students, and postdoctoral fellows) that have been a part of NEU's HCIA projects	Data received from NEU
Implementation process	Execution	Time taken to complete scoping	Data received from NEU
Implementation effectiveness	Reach	Number of projects completed	Data received from NEU
		Number of health systems conducting at least one project	Data received from NEU
	Dose	Number of contacts with health systems on the following topics: outreach, scoping, implementation, wrap-up, and evaluation of potential for scalability	Data unavailable
	Sustainability	Number of process improvement projects sustained after project period	Data received from NEU
	Replicability	Number of process improvement projects scaled to other units/departments within health system or spread to other health systems	Data received from NEU

HCIA = Health Care Innovation Award; NEU = Northeastern University.

Table 6 lists explanatory measures for the prioritized projects and their status as of May 31, 2015. We received some data from the Hallmark Health Breast Cancer Patient Access project but were unable to analyze the data because of content issues, including inconsistencies and extreme values. We requested data for the measures for all the other projects listed in Table 6. However, for various reasons, including the health system's inability to share data, we did not receive explanatory measures data for

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

nine of the 10 prioritized projects. We also did not receive explanatory measures data for the Boston Medical Center OB/GYN Ambulatory Clinic project, a nonprioritized project. We do not anticipate including these measures in subsequent reports.

Table 6. Quantitative Explanatory Measures for Prioritized Process Improvement Projects

Project Site	Project Name	Evaluation Domains	Subdomains	Measures	Status
Level 1 Prioritization					
Cambridge Health Alliance	Resident Team Scheduling—Primary Care Continuity	Implementation process	Workflow processes	Average percentage of primary care subteams represented in each regular family medicine clinic session	Dropped; data not received from NEU
Hallmark Health	Breast Cancer Patient Access	Implementation effectiveness	Reach	Actual number of patients visiting the clinic segmented by procedure type	Dropped; data unavailable
Lahey Health System	CHF Post-discharge Scheduling	Implementation process	Care coordination	Timely CHF post-discharge follow-up appointments made	Dropped; data not received from NEU
				Timely CHF post-discharge appointments kept	Dropped; data not received
Lahey Health System (continued)	COPD Readmission Reduction	Implementation process	Care coordination	Number of patients whose provider completed COPD education tool	Dropped; data not received from NEU
				Percentage of patients whose provider completed depression screening tool	Dropped; data not received from NEU
				Percentage of patients contacted within 7–10 business days post-discharge	Dropped; data not received from NEU
Massachusetts General Hospital	CLABSI	Implementation process	Care coordination	Central line insertion compliance among clinicians	Dropped; data not received from NEU
	Neurology Department Epilepsy Appointment Access	Implementation process	Workflow processes	Percentage of cancelled appointments that get scheduled and filled	Dropped; data not received from NEU
Maine Health	OR Block Optimization	Implementation process	Workflow processes	Operating room utilization rate	Dropped; data not received from NEU

(continued)

Table 6. Quantitative Explanatory Measures for Prioritized Process Improvement Projects (continued)

Project Site	Project Name	Evaluation Domains	Subdomains	Measures	Status
Level 2 Prioritization					
Hallmark Health	ED Opioid Abuse	Implementation effectiveness	Reach	Number of patients whose provider used the Prescription Drug Monitoring Program	Dropped; data not received from NEU
Lahey Health System	Surgery Staff Scheduling	Implementation process	Workflow processes	Number of planned registered nurse hours	Dropped; data not received from NEU
				Number of actual registered nurse hours	Dropped; data not received from NEU
Maine Health	Perioperative Inventory[1]	—	—	—	Dropped; data not received from NEU
Boston Medical Center	OB/GYN Ambulatory Clinic	Implementation process	Care Coordination	Percentage of appointments available for 8 generalist MDs to which patients arrived to be seen	Dropped; data not received from NEU
				Percentage of new patients given the third next available appointment	Dropped; data not received from NEU

[1] NEU provided little documentation on this project. RTI was unable to determine measures to include in our evaluation.

CHF = congestive heart failure; CLABSI = central line-associated blood infection; COPD = chronic obstructive pulmonary disorder; ED = emergency department; NEU = Northeastern University; OR = operating room; TBD = to be discussed; OB/GYN = Obstetrics / Gynecology.

— Information not available.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through NEU's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include NEU's reports from Q8 through Q10 and interviews conducted on June 12, 2015.

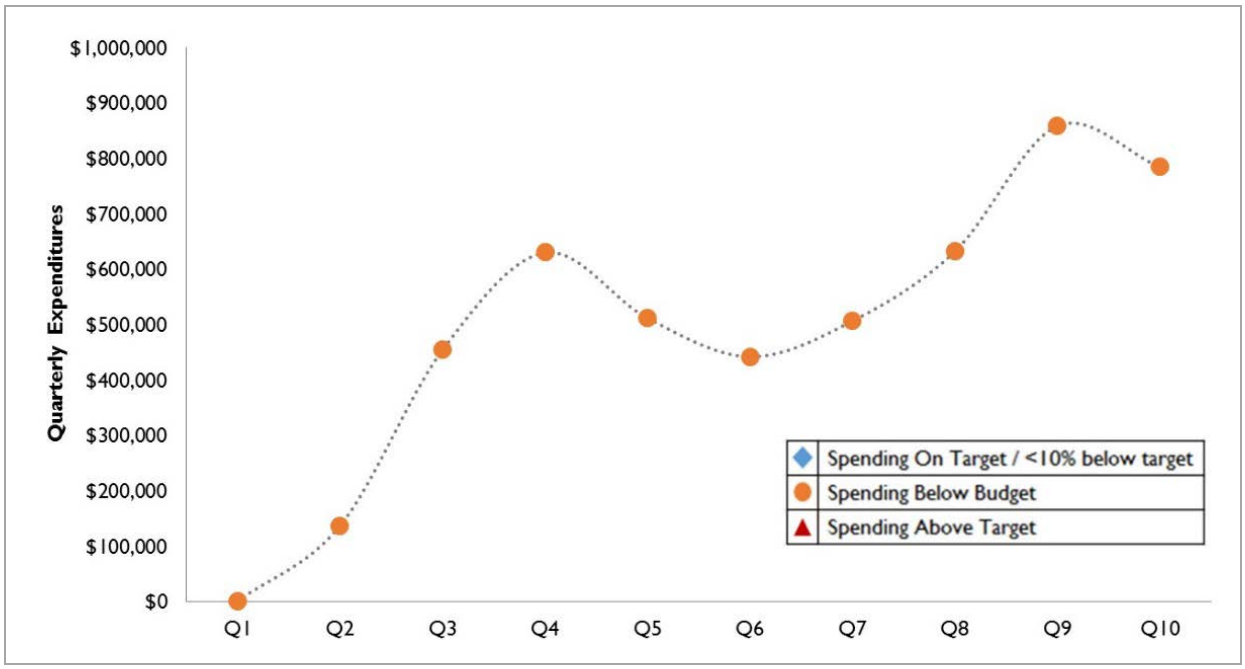
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

Execution of Implementation

The annual report highlights the significance of NEU's expenditure rates on implementation. As of December 2014 (Q10), NEU spent 61.45 percent of its Year 3 budget, which is below the projected target. NEU reported two barriers that had a direct impact on implementation progress. They were unable to maintain health system engagement, thus negatively impacting the number of process improvement projects they were able to implement. Engagement also lagged due to competing priorities at the health system. Additionally, NEU stated that maintaining the focus of the projects at the health systems was a barrier to execution. This lack of focus of the health systems' projects occurred because of a heavy workload and competing priorities at the health system. Thus, progress was slower than anticipated, resulting in slower execution and spending.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Leadership

NEU's leadership was effective in motivating students and staff about the vision of the project, but was challenged in managing and carrying out day-to-day operations. Despite hiring additional staff to support the leadership, efficient operational planning and management remained issues for NEU through the award period. Although NEU's leadership had initial success in motivating and engaging health systems by presenting them with process improvement project activities, they struggled to maintain a high level of engagement with the health systems. NEU attempted to address this concern by adding a clinical champion to the team in the second half of the award. NEU's intention was that the clinical champion would help engage health system's leaders and provide credibility and clinical context. Additionally, NEU cited that hiring a grants manager may have provided leadership support and helped manage projects at the health systems.

Organizational Capacity

NEU's innovation applies principles of ISyE to improve health care processes. This approach is similar to the REC model employed by the Office of the National Coordinator for Health Information Technology (ONC). ONC's extension centers focus on assisting health care providers and health care systems adopt health information technology (HIT) while NEU helps health systems incorporate ISyE principles to solve problems within systems. NEU is well known for its cooperative (coop) education program where undergraduate students gain 12 to 18 months of work experience during their enrollment at the university.[2]

Across both evaluation components, the REC level and health system level, NEU cited heavy staff workload as a challenge to implementation. This lack of capacity also impacted NEU's ability to get the data needed for evaluation. One success was the ability to leverage the engineering students enrolled at NEU to execute the process improvement projects at the health system; however, a clinical or organizational leader was still needed to keep the projects on task. No issues were reported regarding space or equipment; however, some students worked remotely in relation to the health systems they were assisting, which slowed communication, according to NEU.

Specifically, at the REC level, the workload of staff made managing the timelines and scoping process of the health system projects difficult. The lack of standardized processes also challenged capacity. According to the Narrative Progress Report, NEU cited they were learning to be more consistent with internal process improvement to identify barriers, identify bottlenecks, and streamline institute processes. In addition to scoping, these processes include uniformity in closing out completed projects (required forms, project summaries, dissemination plans, and surveys for the health system and students). NEU also cited the challenge remains to prevent projects from stagnating in the scoping process. The scoping process can be summarized as follows:

- Identify a health system: The identification of health systems with which to have initial conversations about scoping can take place in two ways. NEU proactively reaches out to health systems and requests conferences to discuss potential projects or health systems contact NEU after hearing about projects at similar systems.
- Select a project: Once a health system has been identified, the most promising project(s) are scoped based on factors such as estimated impact on the triple aim, process measures, outcome measures, spread potential, and timeline.

According to the Narrative Progress Report, NEU said it was most successful with health systems who have the capacity to maintain communication and project timeline.

[2] Northeastern University: Cooperative Education. 2015, July. Accessed at: http://www.northeastern.edu/experiential-learning/cooperative-education/.

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with 34 full-time equivalent (FTE) staff members which includes administrative staff, students, and interns. Between Q8 (June, 2014) and Q10 the number of FTEs decreased. NEU cited one lesson learned about hiring and retention: the failure to hire people immediately at the start of the award negatively impacted execution. This delay in hiring occurred because of difficulty in finding staff with the unique mix of engineering and health care skills. Thus, NEU reported that it did not have full staffing capacity until 1 year into the award.

Skills, Knowledge, and Training

Between Q8 and Q10, NEU provided 4,700 hours of training to 745 trainees. These trainees were described as HCIA project administrative personnel and community-based clinical and nonclinical personnel, according to the *Awardee Quarterly Performance Reports*. Between Q8 and Q10, NEU conducted 14 educational seminars and educational events with a total of 449 audience members to increase the visibility of their work and engage health systems.

In regards to its cooperative program, NEU reported that a total of 30 former students were placed in various health care systems as well as research and consulting organizations. This number should grow as more students graduate in the upcoming year. NEU would like to expand its postdoctoral training program and include more professional development to help lead and run the industrial engineering departments at hospitals. NEU also intends to hire an experiential education coordinator to manage the workforce development program for its students.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of indirect participants (reach) and (2) health systems were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

Reach

NEU planned to conduct at least 15 projects over 3 years. According to the *Q11 Narrative Progress Report* provided by NEU, 20 projects were completed and implemented across 13 health systems. An additional 10 projects were under way in the scoping process. Twenty-one other projects were discontinued.

Table 7 provides the number of unique patients included in the Lahey Health System CHF, Lahey COPD Readmissions Reduction, Cambridge Health Alliance Primary Care Continuity, Hallmark Health Breast Cancer Patient Access, and Boston Medical Center OB/GYN Ambulatory Appointment Access projects. Based on our discussions with NEU and the health systems, the projects had no target number of patients to include because they were designed to reach as many indirect patients as possible at the health system. We first reported reach in the Q5 report, based on data from two projects through Q9. Since that time, we received patient-level data from an additional three health systems; the number of patients included increased from 8,914 to 14,153.

Table 7. Participant Enrollment by Project

Project Site	Project Name	Number of Unique Patients Included
Cambridge Health Alliance	Resident Team Scheduling—Primary Care Continuity	8,651
Lahey Health System	CHF Post-discharge Scheduling	263
Lahey Health System	COPD Readmissions Reduction	27
Hallmark Health	Breast Cancer Patient Access	4,972
Boston Medical Center	OB/GYN Ambulatory Appointment Access	240
Total through Q11		14,153

Source: Patient-level data provided to RTI by NEU.
CHF = congestive heart failure; Q = quarter.

As noted in previous reports, the number of participants reported in the *Quarterly Awardee Performance Reports* differs from the number of participants reported in the RTI quarterly and annual reports. Because NEU executes multiple projects at various health systems, we asked NEU to describe what it considers indirect participants so that we could better understand the reason for the discrepancy between the number of patients included in this report based on the data provided and the number reported in the *Awardee Performance Reports*. We did not receive a response; thus, we report only the number of patients included in the data received from the health systems.

Dose

We anticipated reporting dose at the REC model (component 1)-level, by presenting the number of contacts with each health system on the following topics: outreach, scoping, implementation, wrap-up,

and evaluation of scalability as well as the effort NEU staff spent to scope and define the projects with the health systems. These topics were defined in the first annual report. In discussions with NEU, we were informed it does not collect the number of contacts with each health system. NEU reported spending 16,556 hours scoping all projects since the beginning of the innovation and 417 hours scoping projects in Q11.

Sustainability

At the REC level, NEU is working to sustain its innovation by exploring opportunities with states, federal agencies, and quality improvement organizations to secure additional funding. In the *Q10 Narrative Progress Report*, NEU reported it has secured additional funding of $8.1M from the Agency for Healthcare Research and Quality (AHRQ) and the National Institutes of Health (NIH), and funding of $125M from the Veteran's Health Administration (VHA) to continue its work in process improvement.

NEU defines replication as the number of projects that are recreated either within a given health system (i.e., in other departments or units) or across another health system. At the process improvement level, NEU defines sustainability as the number of projects that continue to be active at health systems beyond their initial implementation period. Twelve projects were replicated across and within health systems and internal departments. Additionally, 17 projects were sustained by health systems beyond their initial end date.

Beyond the HCIA funding period, NEU plans to maintain relationships with health systems and pursue projects that have demonstrated impact. NEU reports that expanding its coop education program in the future to include more students will contribute to improving sustainability.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of NEU's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data NEU collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers essential to the evaluation of NEU's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 8 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of whether the payer-specific data are presented in this annual report. We are not able to present the claims-based outcome measures for Medicaid patients in this report since the CMS Alpha-MAX data files are not available in the period after the innovation was launched. We report claims data for two health systems: Cambridge Health Alliance (CHA) and Lahey Health System (Lahey).

Table 8. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	No
		Hospital unplanned readmissions rate	Yes	No
		ED visit rate	Yes	No
	Cost	Spending per patient	Yes	No
		Estimated cost savings	Yes	No

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis

Medicare claims analyses are reported for two project sites: Cambridge Health Alliance (CHA) and Lahey Health System. We present Medicare claims data through December 31, 2014.

The CHA analysis focuses on 936 beneficiaries impacted by the innovation who were fee-for-service Medicare Part A and Part B beneficiaries. These patients attended the Malden Family Medicine Center. The Lahey Health System analysis focuses on 183 beneficiaries impacted by the Lahey innovation who were fee-for-service Medicare Part A and Part B beneficiaries. The first date of hospitalization for CHF after innovation launch date was used as the innovation start date for each patient.

1. Cambridge Health Alliance

Comparison Groups

To construct the comparison group for CHA, we used propensity score matching (PSM) to identify individuals living in the Greater Boston area (Middlesex, Essex, Norfolk, Plymouth, and Suffolk counties) who were not included in the innovation. We selected comparison group members from the Greater Boston area to minimize variation in sociodemographic characteristics that may influence service use and expenditures. Program participants and comparison-group members were matched using a logit model predicting the likelihood of program participation as a function of:

- demographics (age, gender, and ethnicity),
- number of dually eligible months,
- health characteristics in the calendar year prior to enrollment (number of chronic conditions, disability status, and end-stage renal disease [ESRD]),
- number of inpatient admissions and ED visits in the lagged year prior to enrollment, and
- spending in the quarter and year prior to program participation.

Table 9 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. ***Appendix B.2*** provides technical details on the updated propensity score methodology.

Table 9. Mean Values and Standardized Differences of Variables in Propensity Score Model: CHA

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarters prior to enrollment	2,711	7,883	2,576	9,035	0.02	2,711	7,883	2,899	5,366	0.03
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	11,302	27,627	9,278	24,398	0.08	11,302	27,627	11,481	14,680	0.01
Age	60.87	16.02	70.76	13.28	0.67	60.87	16.02	62.41	9.37	0.12
Percentage male	43.48	49.60	42.80	49.48	0.02	43.48	49.60	43.33	28.67	0.00
Percentage white	73.40	44.21	84.45	36.24	0.39	73.40	44.21	70.72	26.32	0.08
Percentage disabled	58.33	49.33	25.97	43.84	0.98	58.33	49.33	56.25	28.70	0.06
Percentage ESRD	0.75	8.62	0.70	8.33	0.01	0.75	8.62	0.82	5.20	0.01
Number of dual eligible months in the previous calendar year	7.37	5.58	3.11	5.17	0.79	7.37	5.58	7.84	3.22	0.10
Number of chronic conditions	5.29	3.64	6.24	3.79	0.26	5.29	3.64	5.63	2.22	0.12
Number of ED visits in the second, third, fourth, and fifth calendar quarters prior to enrollment	1.30	4.87	0.49	1.50	0.22	1.30	4.87	0.93	1.76	0.10
Number of inpatient stays in second, third, fourth, and fifth calendar quarters prior to enrollment	0.45	1.23	0.29	0.84	0.15	0.45	1.23	0.47	0.79	0.02
Number of beneficiaries	936	—	2,632,658	—	—	936	—	2,808	—	—
Number of unique beneficiaries[1]	936	—	481,458	—	—	936	—	2,803	—	—
Number of weighted beneficiaries	—	—	—	—	—	—	—	936	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B for discussion of weights).

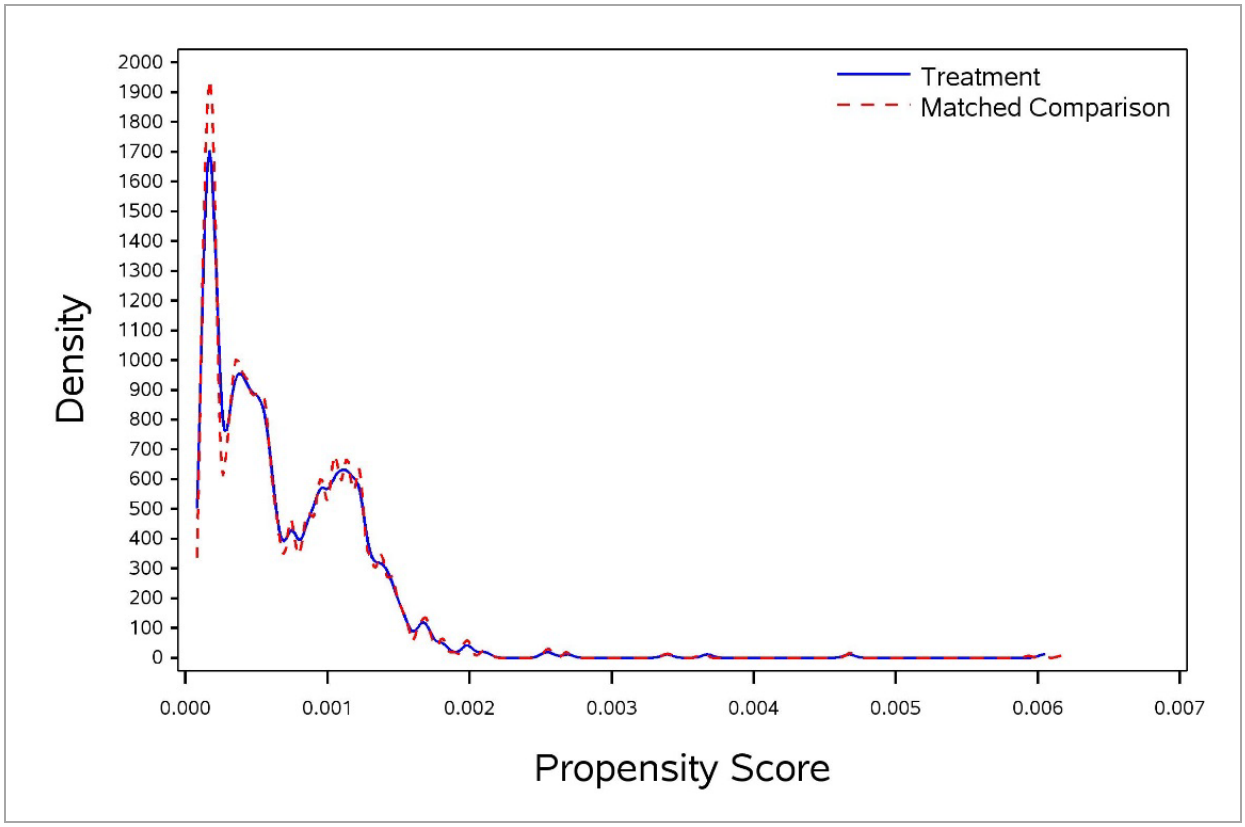
ESRD = end-stage renal disease; SD = standard deviation.

— Data not yet available.

After performing PSM, we calculate absolute standardized differences between the treatment group and both the unmatched and matched comparison groups and check whether matching decreases the absolute standardized differences and achieves acceptable balance (Table 9). Many researchers consider that an absolute standardized difference ≤ 0.10 indicates acceptable balance.[3] Researchers also point out that critical variables in determining selection into treatment (e.g., those with significant effects in the propensity score equation) should have greater balance, while indicators with minor importance in determining treatment selection do not require optimal balance. The results in Table 9 show that matching reduced the absolute standardized differences and achieved adequate balance for most variables in the model except for age and number of chronic conditions. Even though the standardized difference remained slightly above the 0.10 threshold for these variables, matching reduced the absolute standardized differences considerably.

Figure 2 shows the distribution of propensity scores for both comparison and intervention groups. The figure shows a very close overlap between treatment and comparison groups' propensity scores.

Figure 2. Distribution of Propensity Scores for Comparison and Intervention Groups: CHA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
CHA = Cambridge Health Alliance.

[3] Austin, P.C. An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research. 46.3: 399–424, 2011. *PMC*. Web. 2 June 2015.

Descriptive Analysis

This report includes claims through December 31, 2014. ***Table 10*** reports Medicare spending per patient in the eight quarters before and the eight quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 10. Medicare Spending per Patient: CHA

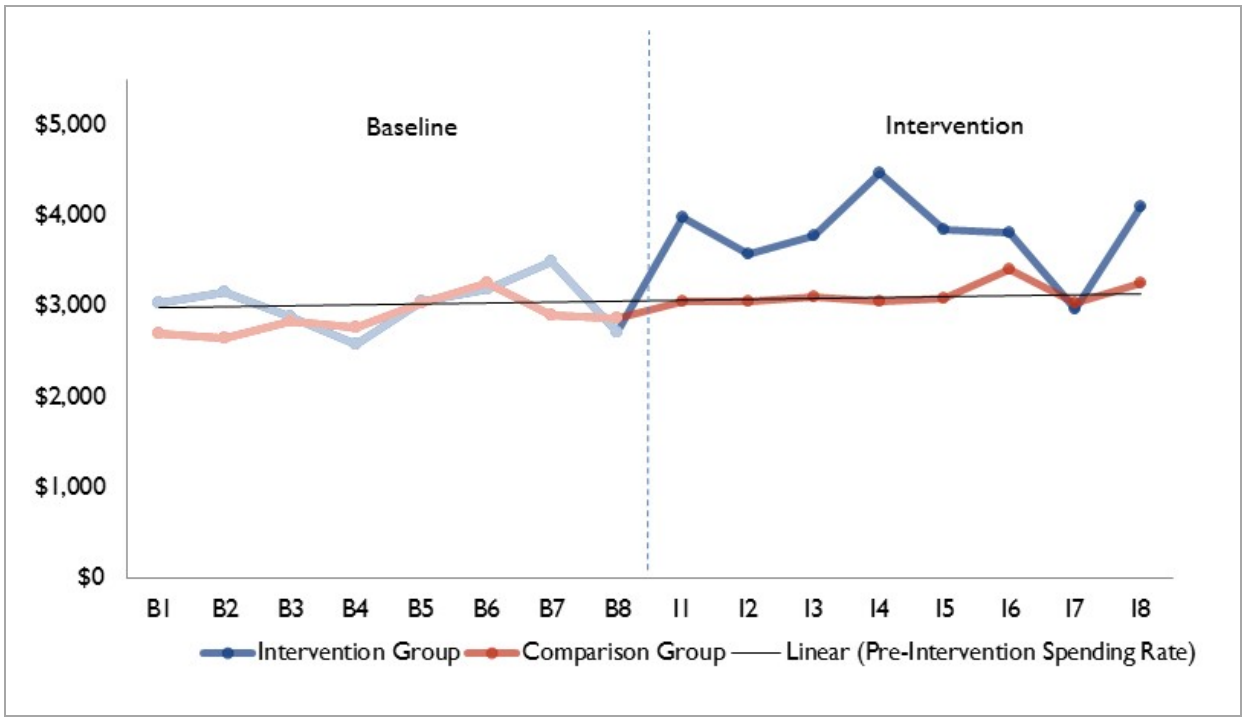
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331050	NEU: CHA																
	Spending rate	$3,035	$3,147	$2,892	$2,586	$3,062	$3,196	$3,498	$2,711	$3,978	$3,579	$3,782	$4,467	$3,849	$3,815	$2,973	$4,092
	Std dev	$9,781	$8,359	$8,291	$8,087	$9,988	$10,824	$11,861	$7,879	$11,075	$10,477	$11,821	$13,113	$10,041	$9,156	$7,105	$10,673
	Unique patients	746	768	783	811	840	870	894	936	936	928	904	831	721	616	485	211
Comparison Group																	
1C1CMS 331050	NEU: CHA																
	Spending rate	$2,695	$2,649	$2,842	$2,760	$3,041	$3,263	$2,910	$2,862	$3,046	$3,053	$3,107	$3,055	$3,095	$3,409	$3,030	$3,265
	Std dev	$9,588	$7,513	$8,000	$7,660	$9,688	$10,529	$8,814	$9,132	$9,496	$9,875	$9,101	$8,723	$8,746	$10,538	$8,454	$8,348
	Unique patients	805	826	842	862	885	905	926	936	936	932	913	831	735	639	502	225
Savings per Patient		−$340	−$498	−$50	$174	−$21	$67	−$588	$151	−$932	−$526	−$674	−$1,412	−$754	−$406	$57	−$827

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 3 illustrates the Medicare spending per beneficiary in Table 10 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 3. Medicare Spending per Patient: CHA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
CHA = Cambridge Health Alliance.

Spending per patient for the intervention group is similar to the comparison group rate in all baseline quarters. The spending rate of the intervention group rises noticeably in the first innovation quarter I1. Further statistical testing on the impact of the innovation is performed in the regression analysis section that follows.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 11*** and ***Figure 4***.

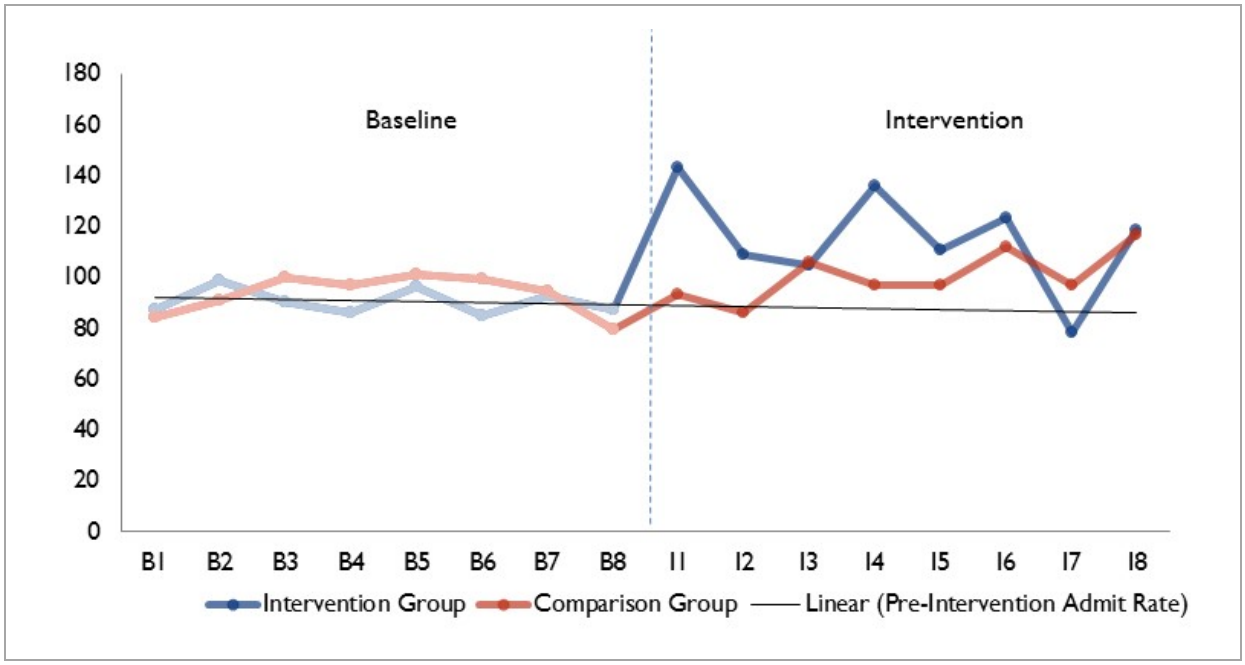
Table 11. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: CHA

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331050	NEU: CHA																
	Admit rate	87	99	91	86	96	85	93	88	143	109	105	136	111	123	78	118
	Std dev	400	386	405	381	435	345	371	371	571	489	443	500	446	474	318	477
	Unique patients	746	768	783	811	840	870	894	936	936	928	904	831	721	616	485	211
Comparison Group																	
1C1CMS 331050	NEU: CHA																
	Admit rate	84	91	100	97	102	100	95	80	93	86	106	97	97	112	97	117
	Std dev	372	395	416	378	444	426	406	366	402	388	467	403	420	488	433	539
	Unique patients	805	826	842	862	885	905	926	936	936	932	913	831	735	639	502	225
Intervention − Comparison Rate		3	8	−9	−11	−5	−15	−2	8	50	23	−1	39	14	12	−19	1

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 4. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: CHA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
CHA = Cambridge Health Alliance.

Trends in the inpatient admissions rate are similar to the spending rate. The admissions rate for the intervention group is similar to the comparison group rate in all baseline quarters. The admissions rate of the intervention group rises noticeably in the first innovation quarter I1. In the final quarters of data we examined, the gap between the two groups diminishes. Further statistical testing on the impact of the innovation is performed in the regression analysis section that follows.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 12*** and ***Figure 5***.

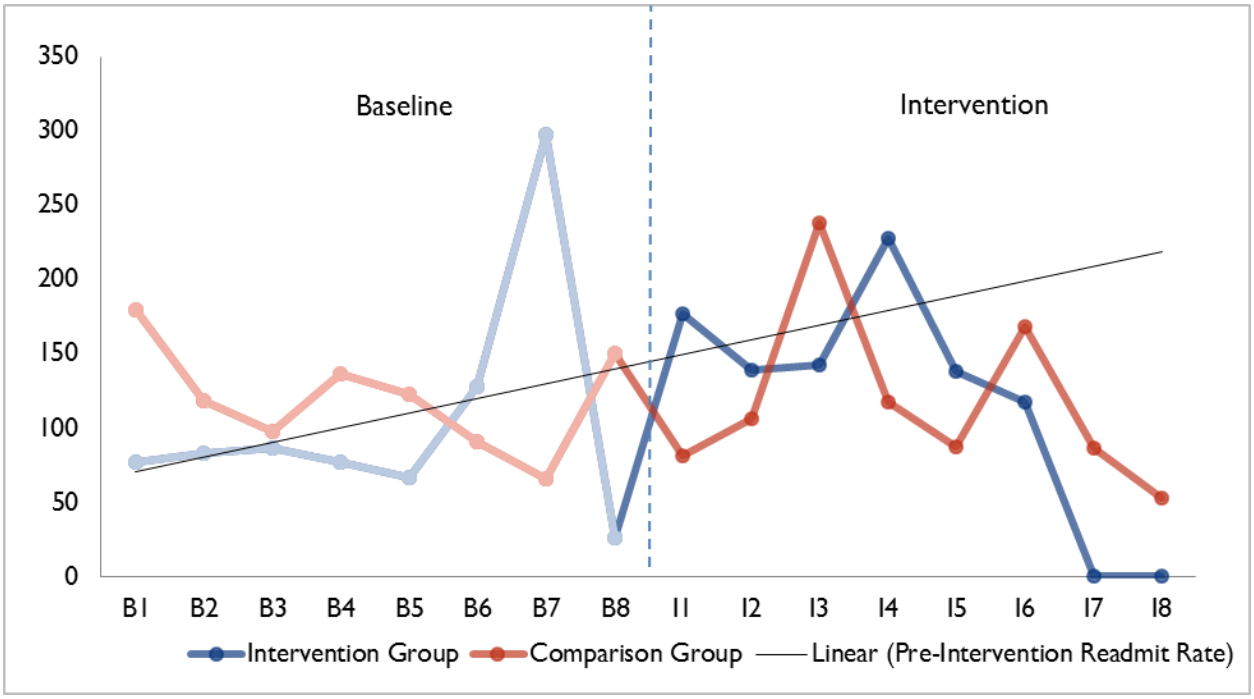
Table 12. Hospital Unplanned Readmissions Rates per 1,000 Admissions: CHA

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331050	NEU: CHA																
	Readmit rate	77	83	87	77	67	128	297	26	177	140	143	228	138	118	0	0
	Std dev	267	276	282	267	249	334	457	160	382	347	350	420	345	322	0	0
	Total admissions	26	36	23	26	30	39	37	38	62	43	49	57	29	34	12	5
Comparison Group																	
1C1CMS 331050	NEU: CHA																
	Readmit rate	180	118	98	136	122	91	66	150	82	107	238	118	88	169	87	53
	Std dev	384	323	297	343	328	288	248	357	274	309	426	322	283	375	282	223
	Total admissions	30	31	34	37	33	37	35	33	37	34	43	40	27	28	15	6
Intervention − Comparison Rate		−103	−35	−11	−59	−56	37	231	−124	96	33	−96	110	50	−51	−87	−53

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 5. Hospital Unplanned Readmissions Rates per 1,000 Admissions: CHA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
CHA = Cambridge Health Alliance.

For both intervention and comparison groups, the readmissions rate is fairly volatile in all baseline and post-intervention quarters. Overall, both groups have a slightly increasing trend line until the rates start to decline in the final quarters, I7 and I8. In these quarters, the readmissions rate is zero for the intervention group, mostly due to the small number of total admissions (N=12 and 5, respectively). Further statistical testing on the impact of the innovation on the readmissions rates is discussed in the regression analysis section.

ED visits per 1,000 participants are shown in ***Table 13*** and ***Figure 6***.

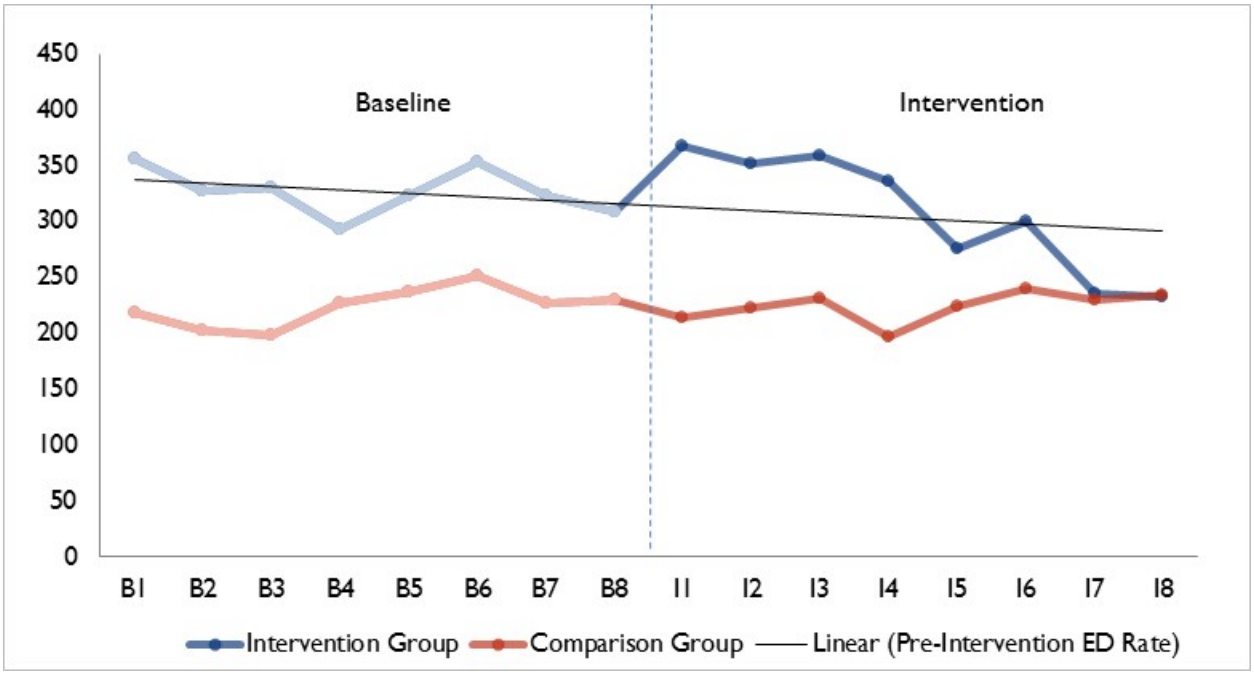
Table 13. ED Visits per 1,000 Participants: CHA

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331050	NEU: CHA																
	ED rate	357	327	331	293	323	354	323	309	368	351	360	336	276	300	235	232
	Std dev	1243	1308	1191	1012	1114	1489	1236	1339	1244	1216	1523	1345	930	870	676	592
	Unique patients	746	768	783	811	840	870	894	936	936	928	904	831	721	616	485	211
Comparison Group																	
1C1CMS 331050	NEU: CHA																
	ED rate	219	202	199	227	237	251	227	230	214	223	232	196	225	240	230	234
	Std dev	524	424	426	556	525	602	481	504	533	516	495	470	603	572	457	448
	Unique patients	805	826	842	862	885	905	926	936	936	932	913	831	735	639	502	225
Intervention − Comparison Rate		138	125	132	66	85	103	97	78	153	129	127	139	51	60	5	−2

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6. ED Visits per 1,000 Participants: CHA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
CHA = Cambridge Health Alliance.

The ED visit rate for the intervention group is quite flat in the baseline period. It rises slightly in the first intervention quarter, I1, and falls below the trend line in I5. The comparison group ED visit rate follows a similar trend but is consistently lower than the intervention group in most quarters. In the final quarters of data we examined, I7 and I8, the gap between the two groups diminishes as the intervention group rate falls. Further statistical testing on the impact of the innovation is discussed in the next section.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit.

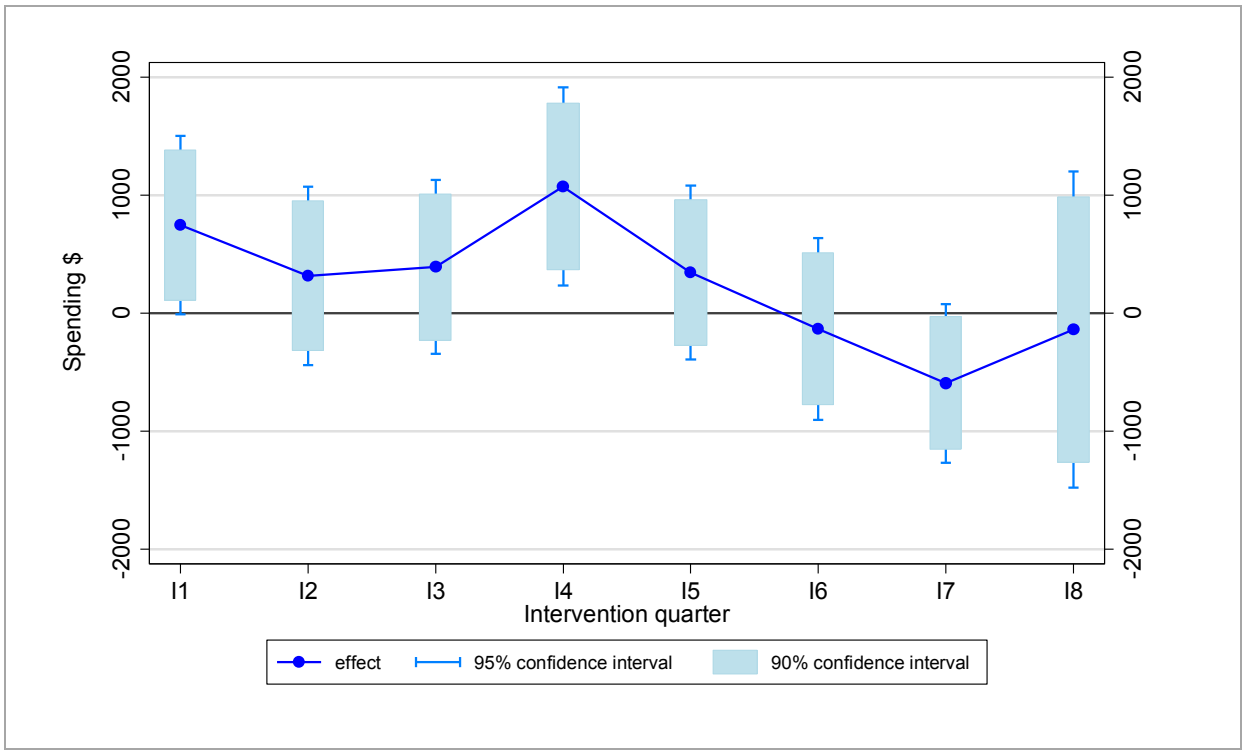
Table 14 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. ***Figure 7*** illustrates these quarterly difference-in-differences estimates.

Table 14. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: CHA

Quarter	Coefficient	Standard Error	P-Values
I1	747	387	0.053
I2	318	386	0.411
I3	392	377	0.299
I4	1,075	430	0.013
I5	345	376	0.358
I6	−135	394	0.732
I7	−595	343	0.082
I8	−141	684	0.837

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
CHA = Cambridge Health Alliance; OLS = ordinary least squares.

Figure 7. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: CHA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
CHA = Cambridge Health Alliance; OLS = ordinary least squares.

The change in spending among treatment group individuals is higher than the change in spending among comparison group individuals in the first five intervention quarters, I1 to I5. The difference between the treatment and comparison group turns negative in quarters I6 to I8, indicating savings; however, the estimates are not statistically significant. In I8 the treatment group spending rate is $141 lower than the comparison group rate.

Figure 8 presents the strength of evidence in favor of savings or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis. Because the quarterly spending estimates were higher for the treatment group than the comparison group in the initial quarters, the evidence mostly supports the supposition that the innovation did not generate savings in I1 to I5. There is a probability in favor of savings in I6 to I8.

Figure 8. Quarterly Strength of Evidence in Favor of Savings/Loss: CHA

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
CHA = Cambridge Health Alliance.

We also present the overall weighted average treatment effect per member per quarter during the intervention period for beneficiaries enrolled in the innovation as compared to their matched comparison group. The weighted average quarterly spending differential in the post-innovation period, indicating a loss, is -$355 (90% CI: -$717, $7) per member per quarter. This estimate is not statistically significant. This figure represents the differential spending per quarter in the post-intervention period between individuals enrolled in the innovation and comparison group individuals, on average, weighted by the

number of intervention beneficiaries in each quarter. The 90 percent confidence interval is the range in which the true parameter estimate falls, with 90 percent confidence.

We also present linear probability model coefficients for inpatient admissions and outpatient ED visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the estimated effect.[4] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, linear probability model coefficients have often been empirically demonstrated to be consistent with marginal effects generated from nonlinear models.[5] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention), not just the direction of the effect.

Table 15 presents the results of a linear probability model where the dependent variable is an indicator denoting whether the patient had an inpatient hospital visit during the quarter. The estimated coefficient is positive in the initial intervention quarters, indicating that treatment group patients are 1 to 2 percentage points more likely to be hospitalized in that quarter. However, most of these estimates are not statistically significant. The coefficient estimates are negative in I7 and I8, suggesting a lower probability of hospitalizations in the treatment group in those quarters. However, the estimated negative coefficients are not statistically significant. We will estimate the innovation's impact on the probability to be hospitalized in later innovation quarters as more claims data become available. The average quarterly difference-in-differences estimate for inpatient admissions is 0.6 percentage points, indicating that the treatment-control difference is 0.6 percentage points higher during the intervention period. This is the average difference in inpatient admissions probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is not statistically significant (90% CI: −.003, .015).

[4] To obtain the correct effect it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run even when not competing with other users for computer resources.

[5] Angrist, J.D., and Pischke J.-S. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

Table 15. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: CHA

Quarter	Coefficient	Standard Error	P-Values
I1	0.02	0.01	0.037
I2	0.01	0.01	0.424
I3	0.00	0.01	0.867
I4	0.01	0.01	0.198
I5	0.00	0.01	0.982
I6	0.01	0.01	0.603
I7	−0.01	0.01	0.242
I8	−0.01	0.02	0.576

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
CHA = Cambridge Health Alliance.

Table 16 presents the results of a linear probability model where the dependent variable is an indicator denoting whether the patient had an ED visit during the quarter. Treatment group patients are more likely to have visited the ED in the early intervention quarters. The coefficient estimates are negative in I7 and I8, suggesting a lower probability of ED visits in the treatment group, but these differences are not statistically significant. We will estimate the innovation's impact on the probability of an ED visit in later innovation quarters as more claims data become available. The average quarterly difference-in-differences estimate for ED visits is 1.5 percentage points, indicating that the treatment-control difference is 1.5 percentage points higher during the intervention period. This is the average difference in ED visit probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is not statistically significant (90% CI: .001, .029).

Table 16. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: CHA

Quarter	Coefficient	Standard Error	P-Values
I1	0.05	0.02	0.000
I2	0.03	0.01	0.050
I3	0.01	0.01	0.496
I4	0.02	0.01	0.150
I5	0.00	0.02	0.785
I6	0.01	0.02	0.609
I7	−0.03	0.02	0.121
I8	−0.02	0.03	0.484

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
CHA = Cambridge Health Alliance; ED = emergency department.

2. Lahey: Comparison Groups

To construct the comparison group for Lahey, we used PSM to identify individuals living in the Greater Boston area (Middlesex, Essex, Norfolk, Plymouth, and Suffolk counties) who ever had CHF and who were not included in the innovation. We selected comparison group members from the Greater Boston area to minimize variation in sociodemographic characteristics that may have influenced service use and expenditures. Program participants and comparison group members were matched using a logit model predicting the likelihood of program participation as a function of:

- demographics (age, gender, and ethnicity),
- number of dually eligible months,
- health characteristics in the calendar year prior to enrollment (number of chronic conditions, disability status, and ESRD),
- health care utilization in the lagged year prior to enrollment (number of inpatient admissions), and
- spending in the quarter and year prior to program participation.

Table 17 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. ***Appendix B.2*** provides technical details on the propensity score methodology.

Table 17. Mean Values and Standardized Differences of Variables in Propensity Score Model: Lahey

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarters prior to enrollment	14,718	22,147	5,564	13,543	0.50	14,718	22,147	13,949	15,876	0.04
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	32,302	43,302	19,726	33,151	0.33	32,302	43,302	29,323	25,618	0.08
Age	81.13	8.78	77.53	11.43	0.35	81.13	8.78	81.22	5.22	0.01
Percentage male	53.01	50.05	44.09	49.65	0.25	53.01	50.05	41.05	28.53	0.34
Percentage white	95.63	20.50	87.81	32.72	0.41	95.63	20.50	97.83	8.45	0.18
Percentage disabled	10.93	31.29	22.03	41.44	0.43	10.93	31.29	11.21	18.30	0.01
Percentage ESRD	3.28	17.86	2.29	14.97	0.08	3.28	17.86	3.07	10.01	0.02
Number of dual eligible months in the previous calendar year	1.26	3.58	3.33	5.28	0.46	1.26	3.58	1.20	1.97	0.02
Number of chronic conditions	11.58	2.96	10.27	3.21	0.43	11.58	2.96	11.76	1.84	0.07
Number of inpatient stays in second, third, fourth, and fifth calendar quarters prior to enrollment	1.28	1.74	0.66	1.28	0.41	1.28	1.74	1.19	1.25	0.06
Number of beneficiaries	183	—	806,405	—	—	183	—	549	—	—
Number of unique beneficiaries[1]	183	—	114,981	—	—	183	—	547	—	—
Number of Weighted Beneficiaries	—	—	—	—	—	—	—	183	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

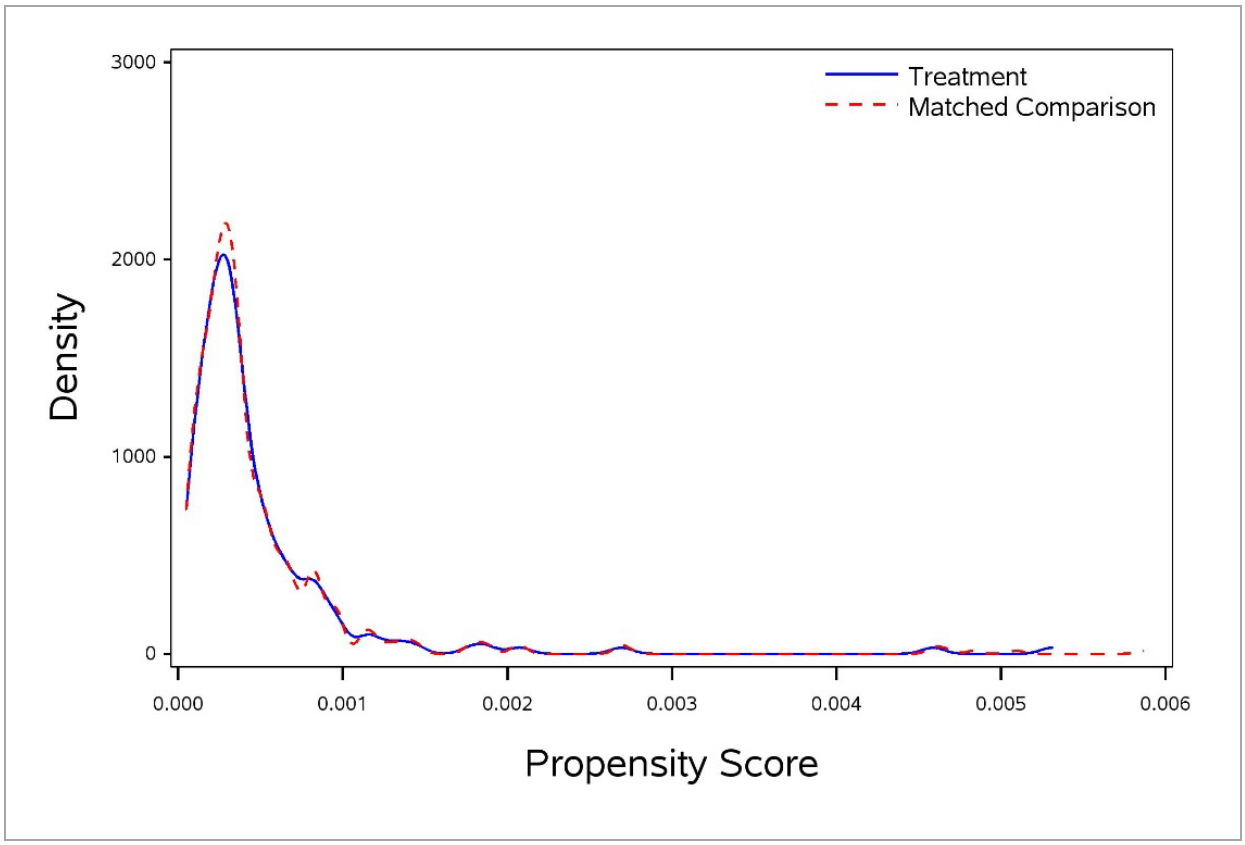
[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B for discussion of weights).

ESRD = end-stage renal disease; SD = standard deviation.

— Data not yet available.

After performing PSM, we calculated absolute standardized differences between the treatment group and both the unmatched and matched comparison groups and checked whether matching decreased the absolute standardized differences and achieved acceptable balance (Table 17). The results in Table 17 show that matching reduced the absolute standardized differences for almost all variables; the absolute standardized difference for only two variables (gender and race) remained above the 0.10 threshold. ***Figure 9*** shows the distribution of the propensity scores for both the comparison and intervention groups. The figure demonstrates a very close overlap between the treatment and comparison groups' propensity scores.

Figure 9. Distribution of Propensity Scores for Comparison and Intervention Groups: Lahey



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Lahey = Lahey Health System.

Descriptive Analysis

This report includes claims through December 31, 2014. ***Table 18*** reports Medicare spending per patient in the eight quarters before and the eight quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 18. Medicare Spending per Patient: Lahey

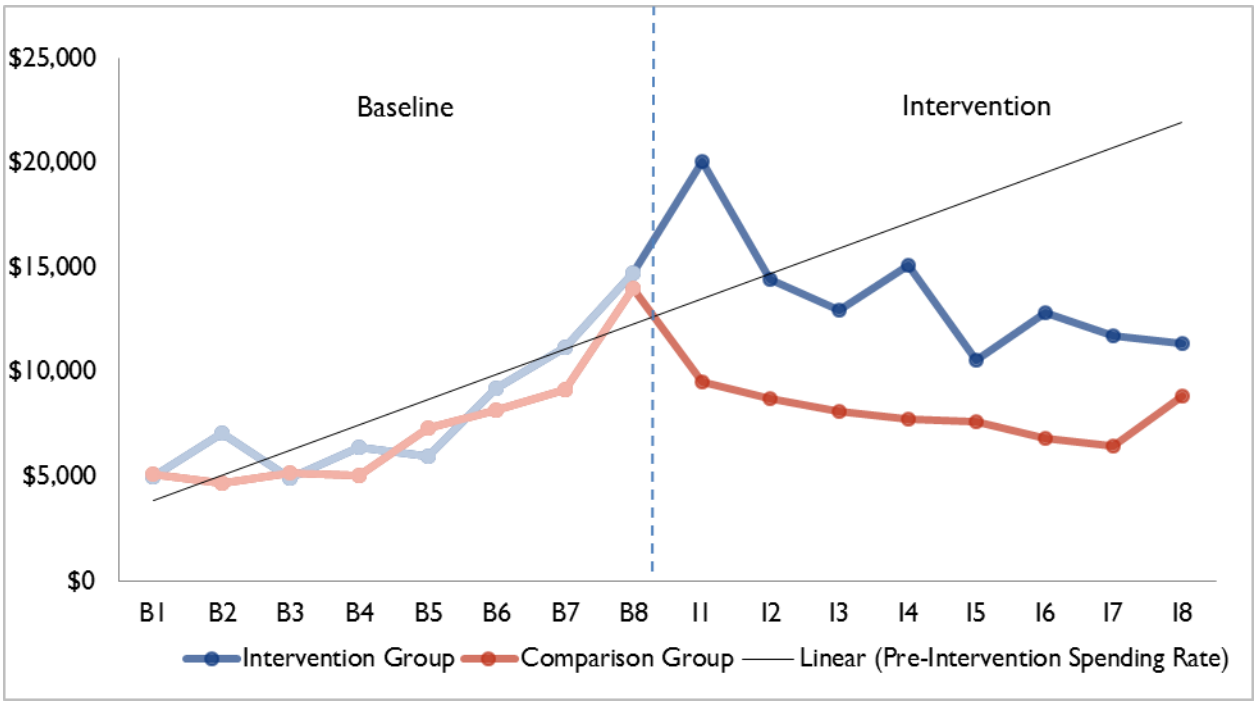
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331050	NEU: Lahey																
	Spending rate	$4,983	$7,053	$4,960	$6,411	$5,986	$9,225	$11,165	$14,718	$20,048	$14,399	$12,947	$15,080	$10,572	$12,827	$11,757	$11,363
	Std dev	$10,920	$12,967	$8,976	$13,138	$12,577	$23,414	$21,630	$22,086	$21,825	$17,655	$15,679	$28,411	$14,472	$18,820	$13,787	$20,358
	Unique patients	172	173	175	178	180	180	182	183	183	177	161	148	116	91	62	26
Comparison Group																	
1C1CMS 331050	NEU: Lahey																
	Spending rate	$5,128	$4,696	$5,178	$5,061	$7,340	$8,171	$9,175	$14,022	$9,527	$8,730	$8,092	$7,725	$7,623	$6,850	$6,441	$8,865
	Std dev	$11,479	$12,173	$10,978	$12,687	$17,453	$15,888	$18,648	$27,469	$19,356	$17,301	$16,440	$16,714	$13,929	$12,480	$11,188	$19,160
	Unique patients	177	179	179	180	180	181	183	183	183	179	167	154	128	103	75	36
Savings per Patient		$145	−$2,357	$218	−$1,350	$1,354	−$1,054	−$1,990	−$697	−$10,520	−$5,669	−$4,856	−$7,355	−$2,949	−$5,977	−$5,316	−$2,498

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 10 illustrates the Medicare spending per beneficiary in Table 17 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 10. Medicare Spending per Patient: Lahey



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Lahey = Lahey Health System.

Pre-intervention spending for Lahey patients follows an increasing trend line. For the intervention group, spending is above the trend line in the first post-intervention quarter (I1), and falls below the trend line in other intervention quarters (I2-I8). Spending for the comparison group follows a similar trend in the baseline period. The spending rate of the comparison group is consistently lower than the intervention group in the post-intervention period. Because these statistics are descriptive, it is premature to conclude whether the innovation had a significant effect on the spending rate. We will explore this question further in the regression analysis section below.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 19*** and ***Figure 11***.

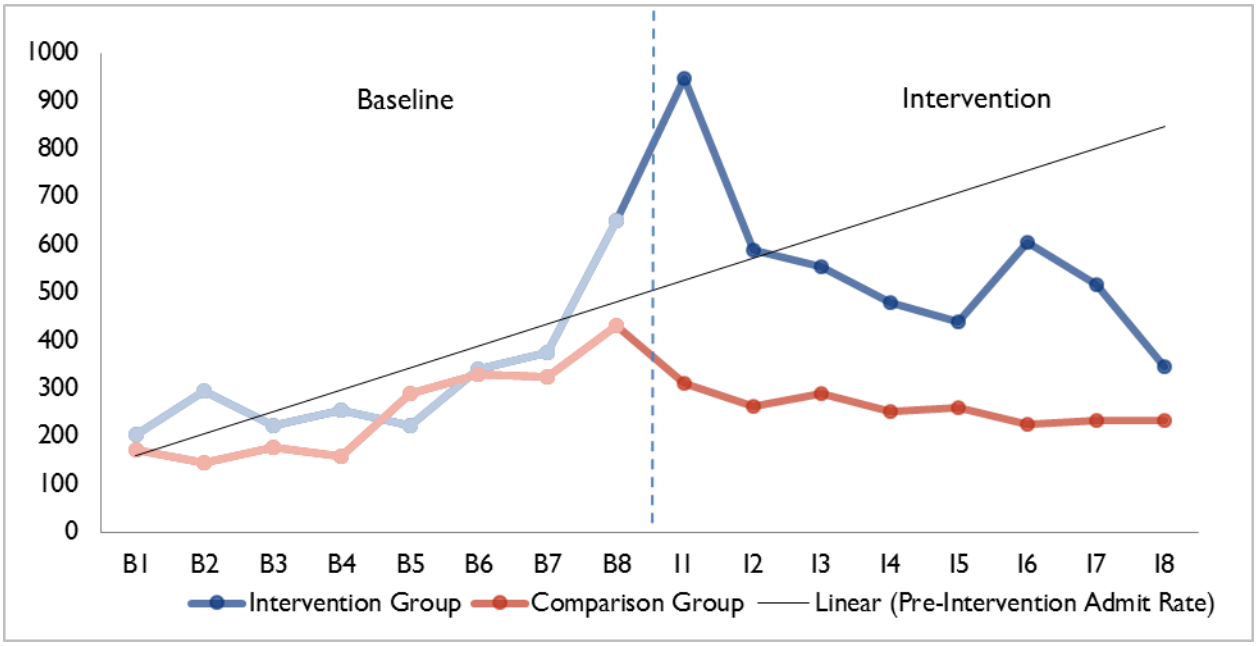
Table 19. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Lahey

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331050	NEU: Lahey																
	Admit rate	203	295	223	253	222	339	374	650	945	588	553	480	440	604	516	346
	Std dev	590	721	597	607	611	708	885	928	922	879	918	792	791	1138	690	617
	Unique patients	172	173	175	178	180	180	182	183	183	177	161	148	116	91	62	26
Comparison Group																	
1C1CMS 331050	NEU: Lahey																
	Admit rate	172	144	178	158	289	328	324	430	311	263	290	252	258	225	232	234
	Std dev	530	457	511	523	801	737	735	844	677	604	743	654	627	591	567	605
	Unique patients	177	179	179	180	180	181	183	183	183	179	167	154	128	103	75	36
Intervention − Comparison Rate		31	151	45	95	−67	10	49	220	634	325	263	228	181	379	284	113

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 11. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Lahey



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Lahey = Lahey Health System.

The inpatient admissions rate for the intervention and comparison groups are very similar in the baseline period. In the first intervention quarter, the admissions rate increases for the intervention group. The increase may occur because the intervention group patients receive the necessary inpatient care they needed as they are impacted by the innovation. In the remaining post-intervention quarters the admissions rate remains higher among the intervention group patients compared to the comparison group until they start to converge in I8. Further statistical testing on the impact of the innovation on admissions rate is performed in the next section.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 20*** and ***Figure 12***.

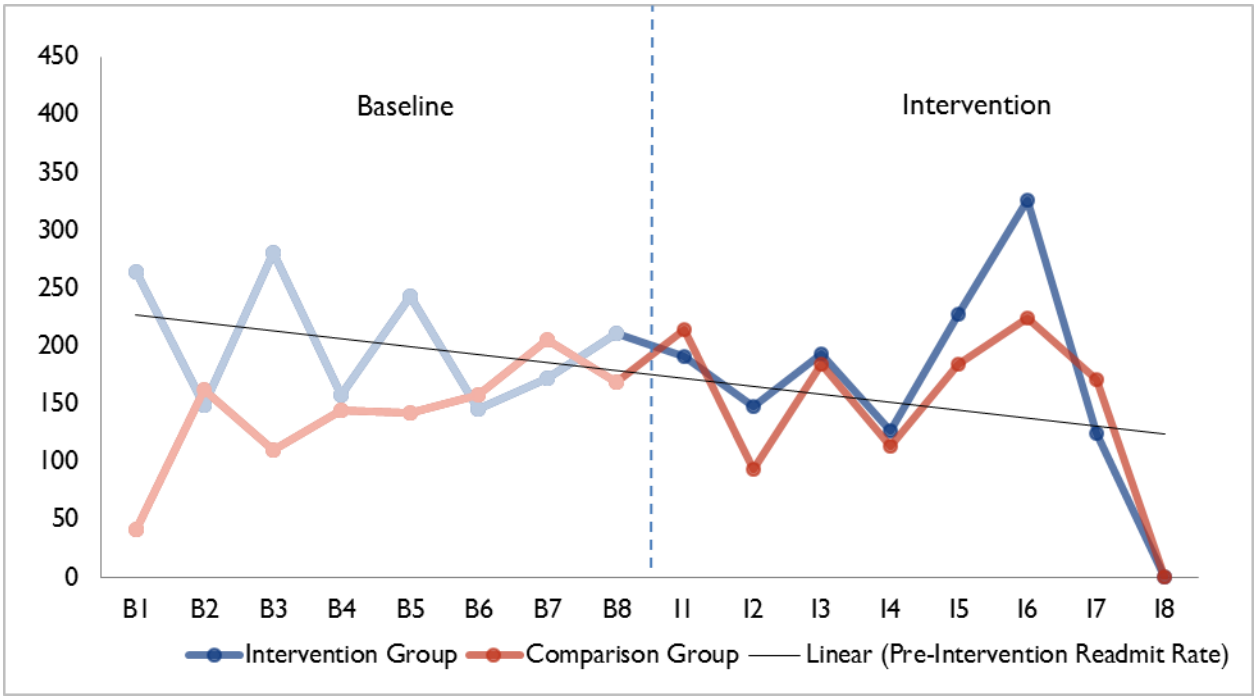
Table 20. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Lahey

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331050	NEU: Lahey																
	Readmit rate	265	149	281	158	243	146	172	211	191	148	193	127	227	326	125	0
	Std dev	441	356	450	365	429	353	378	408	393	355	395	333	419	469	331	0
	Total admissions	34	47	32	38	37	48	58	109	157	88	83	55	44	46	24	5
Comparison Group																	
1C1CMS 331050	NEU: Lahey																
	Readmit rate	41	162	110	145	143	158	206	168	215	93	184	114	184	224	171	0
	Std dev	199	368	313	352	350	365	404	374	411	291	388	317	388	417	376	0
	Total admissions	24	23	27	23	42	51	45	63	50	36	38	29	25	19	14	4
Intervention − Comparison Rate		224	−13	171	13	100	−12	−33	43	−24	54	9	14	43	102	−46	0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 12. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Lahey



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Lahey = Lahey Health System.

For both intervention and comparison groups, the readmissions rate is quite volatile in all baseline and post-intervention quarters. Overall, both groups have a slightly decreasing trend line. In I8, the readmissions rate is zero for both the intervention and comparison groups due to the small number of total admissions among both groups (N=5 and 4, respectively). Further statistical testing on the impact of the innovation on the readmissions rates will be provided in the regression analysis section.

ED visits per 1,000 participants are shown in ***Table 21*** and ***Figure 13***.

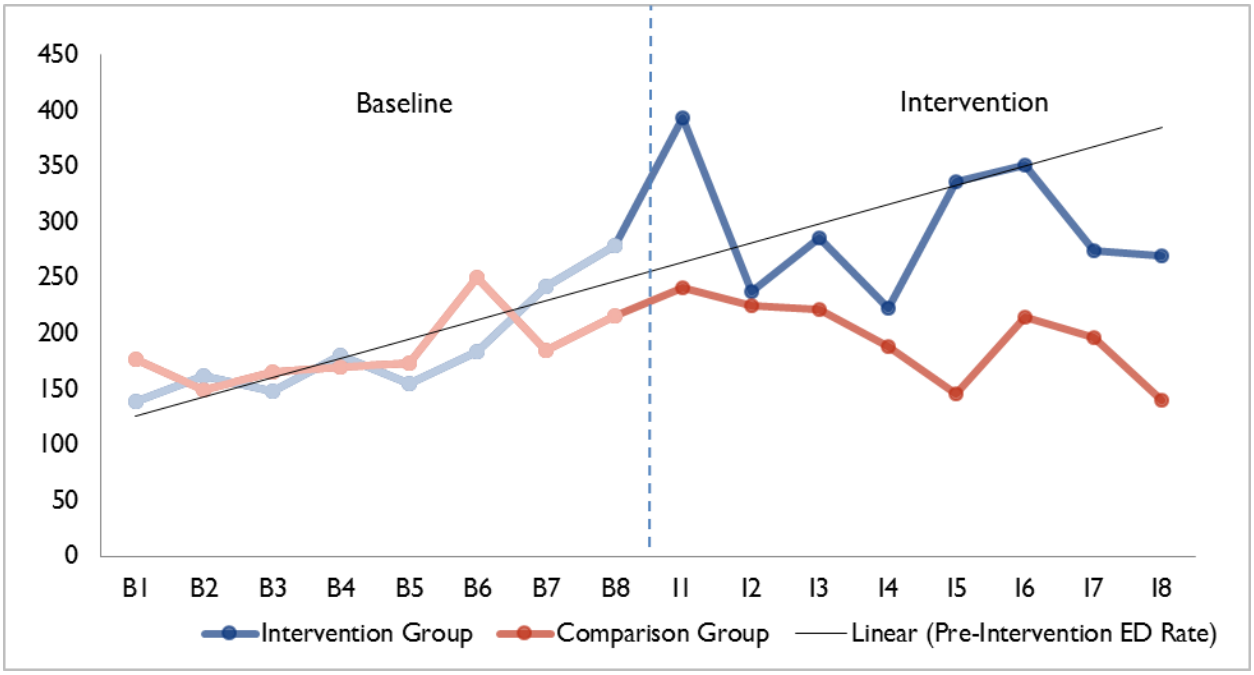
Table 21. ED Visits per 1,000 Participants: Lahey

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331050	NEU: Lahey																
	ED rate	140	162	149	180	156	183	242	279	393	237	286	223	336	352	274	269
	Std dev	463	467	416	440	393	512	543	606	783	489	737	519	757	1004	605	667
	Unique patients	172	173	175	178	180	180	182	183	183	177	161	148	116	91	62	26
Comparison Group																	
1C1CMS 331050	NEU: Lahey																
	ED rate	177	149	166	170	174	250	184	215	241	225	221	188	145	214	196	140
	Std dev	290	314	355	344	281	420	274	439	388	429	357	305	267	438	313	291
	Unique patients	177	179	179	180	180	181	183	183	183	179	167	154	128	103	75	36
Intervention − Comparison Rate		−37	13	−17	9	−18	−67	57	63	153	12	65	35	191	137	78	129

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 13. ED Visits per 1,000 Participants: Lahey



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Lahey = Lahey Health System

The ED visit rate is similar for the treatment and comparison groups during the baseline period. The ED visit rate increases in I1 for the intervention group, then remains at or below the baseline trend during the remaining quarters. The ED visit rate is below the trend line and the intervention group's ED visit rate in all post-intervention quarters for the comparison group. We explore whether the differences between the intervention and comparison groups are statistically significant in the next section.

Regression Analysis

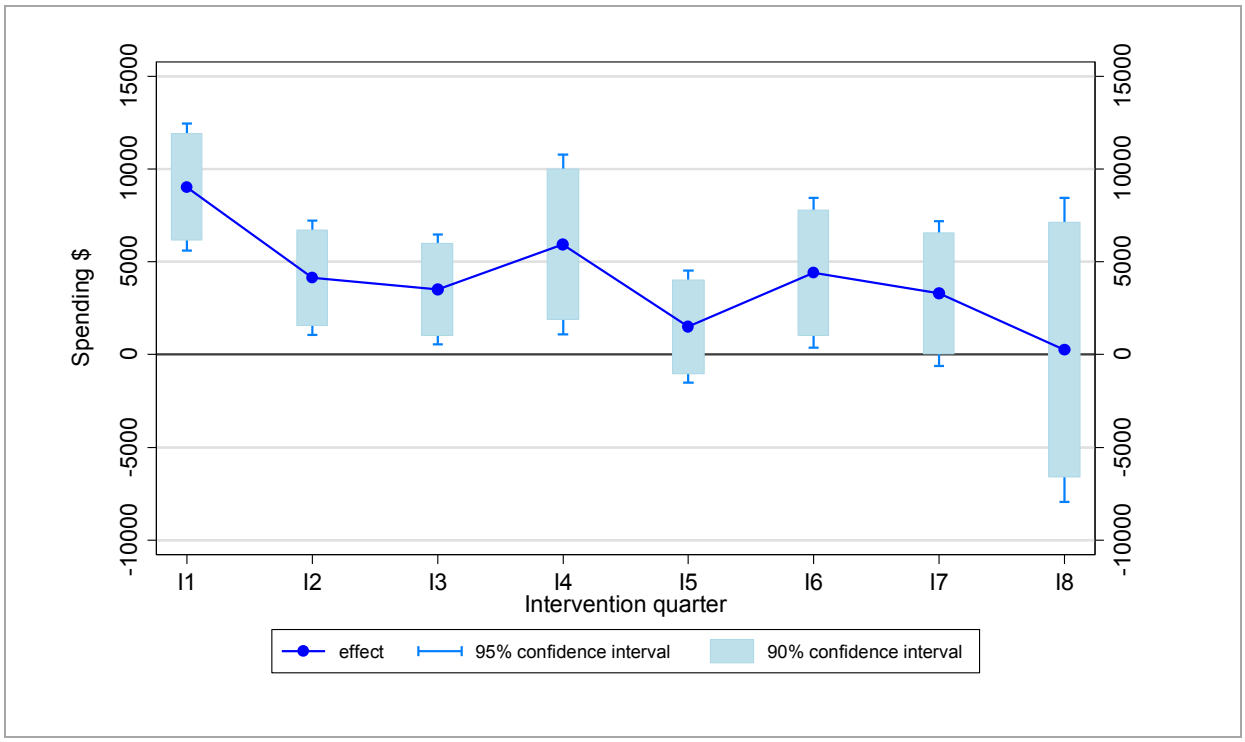
Table 22 presents the results of an OLS regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. ***Figure 14*** illustrates these quarterly difference-in-differences estimates.

Table 22. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Lahey

Quarter	Coefficient	Standard Error	P-Values
I1	9,038	1,753	<.0001
I2	4,140	1,571	0.009
I3	3,513	1,517	0.021
I4	5,931	2,476	0.017
I5	1,505	1,540	0.329
I6	4,422	2,060	0.032
I7	3,302	1,993	0.098
I8	245	4,185	0.953

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
Lahey = Lahey Health System; OLS = ordinary least squares.

Figure 14. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Lahey

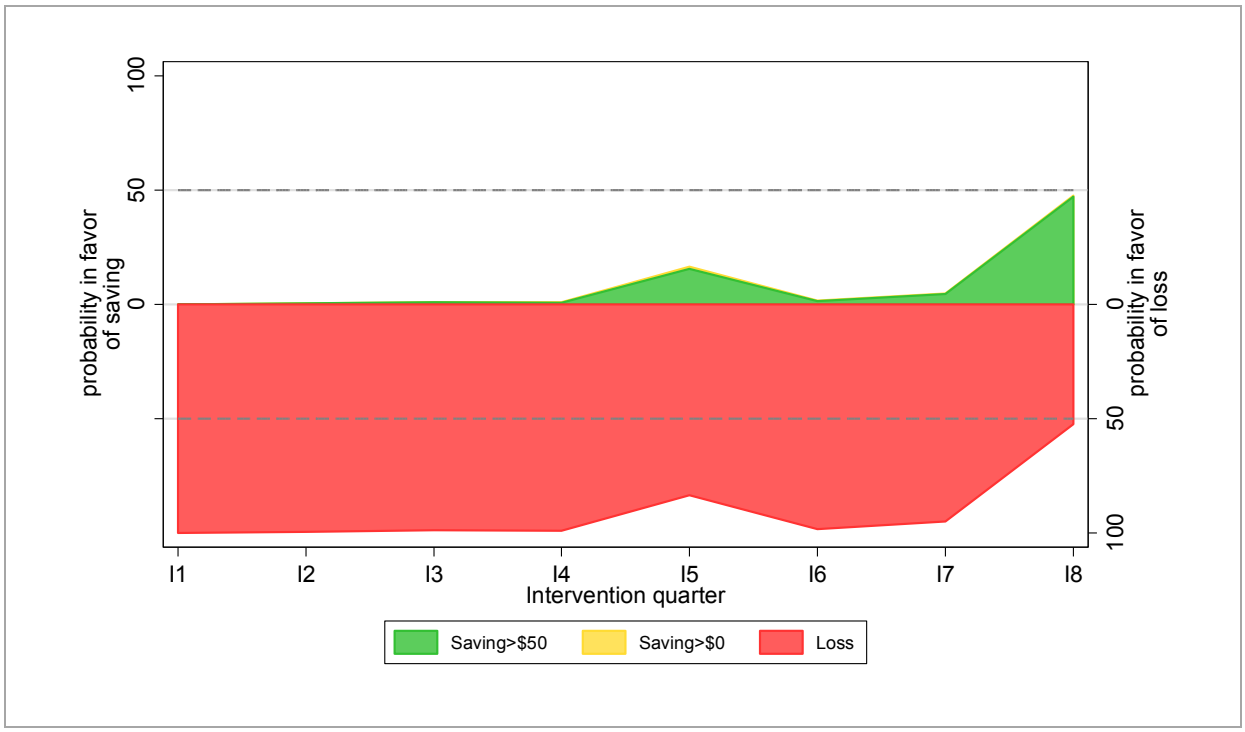


Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Lahey = Lahey Health System; OLS = ordinary least squares.

Change in spending among treatment group individuals is higher than the change in spending among comparison group individuals in all quarters. The treatment group has significantly higher spending in the first four post-intervention quarters (I1–I4) and in the sixth and seventh intervention quarters (I6 and I7); the difference declines and loses its significance in the remaining quarters examined (I5, I7–I8).

Figure 15 presents the strength of evidence in favor of savings or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis. Because the quarterly spending estimates are higher for the treatment group than the comparison group for all quarters, the evidence mostly supports the supposition that the innovation did not generate savings.

Figure 15. Quarterly Strength of Evidence in Favor of Savings/Loss: Lahey



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Lahey = Lahey Health System.

We also present the overall weighted average treatment effect per member per quarter during the intervention period for beneficiaries included in the innovation as compared to their matched comparison group. The weighted average quarterly spending differential in the post-innovation period, indicating a loss, is −$4,780 (90% CI:-$6,518, -$3,042) per member per quarter. This estimate is statistically significant. This figure represents the differential spending per quarter in the post-intervention period between individuals included in the innovation and comparison group individuals, on average, weighted

by the number of intervention beneficiaries in each quarter. The 90 percent confidence interval is the range in which the true parameter estimate falls, with 90 percent confidence.

Table 23 presents the results of a linear probability model where the dependent variable is an indicator denoting whether the patient had an inpatient hospital visit during the quarter. The estimated coefficients are positive and significant in most quarters (I1–I4, I6–I7), indicating that treatment group patients are more likely to be hospitalized in each of these quarters. The coefficient estimate is noticeably smaller in I8 and loses its significance. Specifically, in I8, treatment group patients are 2 percentage points more likely to have been hospitalized; and this difference is not statistically significant. We will estimate the innovation's impact on the probability of being hospitalized in later innovation quarters as more claims data become available. The average quarterly difference-in-differences estimate for inpatient admissions is 16.1 percentage points, indicating that the treatment-control difference is 16.1 percentage points higher during the intervention period. This is the average difference in inpatient admissions probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: .122, .200).

Table 23. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: Lahey

Quarter	Coefficient	Standard Error	P-Values
I1	0.35	0.04	<.0001
I2	0.16	0.04	<.0001
I3	0.13	0.04	0.003
I4	0.10	0.04	0.023
I5	0.06	0.05	0.203
I6	0.11	0.05	0.041
I7	0.15	0.07	0.020
I8	0.02	0.09	0.791

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
Lahey = Lahey Health System.

Table 24 presents results of a linear probability model where the dependent variable is an indicator denoting whether the patient had an ED visit during the quarter. Treatment group patients are more likely to have visited the ED in most post-intervention quarters (I1–I7), and almost all of these estimates are statistically significant at the 5 percent confidence level. The coefficient estimate is negative in the final quarter I8, suggesting a lower probability of ED visits in the treatment group. Specifically, in I8, treatment group patients are 1 percentage point less likely to have an ED visit, but this difference is not statistically significant. We will estimate the innovation's impact on the probability of an ED visit in later innovation quarters as more claims data become available. The average quarterly difference-in-

differences estimate for ED visits is 14.5 percentage points, indicating that the treatment-control difference is 14.5 percentage points higher during the intervention period. This is the average difference in ED visit probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: .105, .185).

Table 24. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: Lahey

Quarter	Coefficient	Standard Error	P-Values
I1	0.31	0.04	<.0001
I2	0.15	0.04	0.000
I3	0.07	0.05	0.132
I4	0.09	0.04	0.037
I5	0.09	0.05	0.064
I6	0.14	0.06	0.014
I7	0.14	0.07	0.044
I8	−0.01	0.10	0.936

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
NOTES: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
ED = emergency department; Lahey = Lahey Health System.

Discussion

In the eight post-intervention quarters examined, no evidence shows that the Lahey innovation has a statistically significant impact on reducing spending, hospitalizations, or ED visits. The findings are slightly more encouraging for the CHA innovation. The estimated spending rate among the treatment group was lower than the comparison group rate in the final three quarters examined. Even though these estimates were not statistically significant, these estimates show some evidence in favor of savings in these final quarters. For health utilization outcomes, treatment group individuals were less likely to have an inpatient hospitalization or ED visit in I7 and I8, but these estimates were also not statistically significant.

The results may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicare beneficiaries whom we were able to match with identifiers provided by the site and were enrolled in Medicare FFS. This number represents about 12 percent and 64 percent of the overall population reached by the CHA and Lahey innovations, respectively. In addition, the sample size for the Lahey innovation was small, which can hinder the detection of changes in spending.

Medicaid Claims Analysis

The Medicaid data analysis uses data from the Centers for Medicare & Medicaid Services Alpha-MAX data files. At this time, the Alpha-MAX data files are not available in the period after the innovation was launched. Therefore, we are not able to present the claims analysis measures for Medicaid patients in this report.

1.3.3 Other Awardee-Specific Data

NEU has a unique innovation: it executes multiple projects at various health systems and no two projects are identical. Thus, we present a two-tier evaluation of NEU's innovation:

- Component 1: REC Model
- Component 2: Process Improvement Projects

Outcome measures for the REC-level were also used for the claims-based analysis listed in **Table 8.** ***Table 25*** lists the process improvement project-level outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. As described in ***Section 1.1***, Level 1 projects were those of highest priority based upon the ability to obtain data from the health system. The data we present in this section are current through March 2015. We received some data from the Hallmark Health Breast Cancer Patient Access project, but were unable to analyze the data due to content issues, including various inconsistencies and extreme values. We requested data for the measures for all other projects listed in Table 25. To request data, we had to rely heavily on NEU facilitating conversation with the health system. However, for various reasons including long delays in response times from NEU, resistance to RTI contacting the health systems, and the health system's inability to share data, we did not receive outcome measures data for the remaining nine prioritized projects. Therefore, we do not anticipate including these measures in subsequent reports.

Table 25. Quantitative Outcome Measures for Prioritized Process Improvement Projects

Project Site	Project Description	Evaluation Domains	Subdomains	Measures	Status
Level 1 Prioritization					
Cambridge Health Alliance	Resident Team Scheduling—Primary Care Continuity	Coordinated care	Efficiency	Percentage of appointments that occurred with patients' primary care providers or someone on their subteam	Dropped; data not received from NEU
Hallmark Health	Breast Cancer Patient Access	Coordinated care	Timeliness of care	The number of business days between booking an appointment and the calendar date of that appointment	Dropped; data unusable

(continued)

Table 25. Quantitative Outcome Measures for Prioritized Process Improvement Projects (continued)

Project Site	Project Description	Evaluation Domains	Subdomains	Measures	Status
Level 1 Prioritization (continued)					
Massachusetts General Hospital	CLABSI	Coordinated care	Timeliness of care	Length of hospital stay associated with central line infections	Dropped; data not received from NEU
Massachusetts General Hospital	Neurology Department Epilepsy Appointment Access	Coordinated care	Timeliness of care	Percentage of patients whose appointments are made within 21 days of request date	Dropped; data not received from NEU
				Percentage of new patients given the third next available appointment	Dropped; data not received from NEU

CHF = congestive heart failure; CLABSI = central line-associated blood infection; COPD = chronic obstructive pulmonary disorder; ED = emergency department; NEU = Northeastern University; OR = operating room.

Overview of Data Requested and Received

We requested, but did not receive patient-level data from NEU used to generate each measure listed in Tables ***5, 6,*** and ***25*** for each quarter through Q11 (March 31, 2015). ***Table 26*** summarizes the process and status of the data requests for the prioritized projects as of March 31, 2015. We do not anticipate receiving any additional data from any of the remaining health systems.

Table 26. Data Request Status of Prioritized Projects

Project Site	Project Name	Data Requested from Health System	Patient Identifiers Received	Outcome Measures Received
Level 1 Prioritization				
Cambridge Health Alliance	Resident Team Scheduling—Primary Care Continuity	Yes	Yes	No
Lahey Health System	CHF Post-discharge Scheduling	Yes	Yes	Yes
	COPD Readmission Reduction	Yes	Yes	Yes
Massachusetts General Hospital	CLABSI	Yes	No	No
	Neurology Department Epilepsy Appointment Access	Yes	No	No
Maine Health	OR Block Optimization	Yes	No	No
Hallmark Health	Breast Cancer Patient Access	Yes	Yes	Yes
Level 2 Prioritization				
Hallmark Health	ED Opioid Abuse	Yes	No	No
Lahey Health System	Surgery Staff Scheduling	Yes	No	No
Maine Health	Perioperative Inventory	Yes	No	No

CHF = congestive heart failure; CLABSI = central line-associated blood infection; COPD = chronic obstructive pulmonary disorder; ED = emergency department; NEU = Northeastern University; OR = operating room.

Health Outcomes

As noted previously, we received some data from the Hallmark Health Breast Cancer Patient Access project but were unable to analyze the data due to content issues, including various inconsistencies and extreme values. We do not anticipate receiving any additional data from any of the remaining health systems.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing NEU as well as accomplishments to date. In this section we assess NEU's progress on achieving HCIA goals to date:

- **Smarter spending.** Claims analyses were performed for two project sites: Lahey Health System and CHA. For Lahey Health System, we found evidence of a statistically significant increase in spending. For CHA, we found a nonsignificant downward trend in spending post-intervention, which may indicate potential long-term savings.

- **Better care.** We found no evidence showing that the Lahey or CHA innovations had an impact in decreasing the probability of inpatient admissions or ED visits. Based on the five projects for which we received data, 14,153 patients were included in various projects through Q11. NEU spent 16,556 hours scoping health system projects over the course of the award.

- **Healthier people**. We did not receive any of the requested health outcome data. Therefore, we are unable to provide a summary of findings related to health outcomes.

NEU was able to leverage the university's existing coop program to implement projects across various health systems. However, NEU's progress was hindered by challenges of leadership and organizational capacity. Although NEU's leadership was effective at motivating both NEU staff and health system leaders for the process improvement projects, they lacked strong managerial support at the leadership level. This lack of detailed oversight and project management contributed to challenges in collecting uniform data across projects, maintaining timelines, and ensuring smooth, timely communication among all parties. As NEU noted, the innovation would have benefited from a project or grants manager to help the project director ensure projects were meeting timelines and progressing as expected. NEU added a clinical champion at the REC level to help with communication with health systems, which was a useful addition to the team. In spite of these challenges, NEU met its goals of completing at least 15 process improvement projects; however, we were unable to receive data for all of them to determine impact.

NEU's greatest asset was the skill of the undergraduate coop students who staffed their process improvement projects. Moving forward, NEU states that it hopes to expand its co-op program by hiring an experiential education coordinator. With respect to other staff for this project, NEU cited difficulty in hiring people with the ideal mix of engineering and health care knowledge, which impacted the startup time.

With respect to sustainability, according to the *Q10 Narrative Progress Report*, NEU secured additional funding of $8.1M from AHRQ and NIH, and funding of $125M from the VHA to continue its work in process improvement. NEU reports that it will continue its work with health systems, implementing

projects that had been replicated and streamlining processes. NEU also hopes to standardize processes to keep projects from stagnating in the scoping phase. In the future, NEU reports it would like to make data acquisition easier by discussing this need early in the process of engaging health systems. This practice will help evaluation efforts.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Prosser Public Hospital District

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

Prosser Public Hospital District

1.1 Introduction

Prosser Public Hospital District (Prosser), a critical access hospital in Prosser, WA, received an award of $1,470,017 to implement a community paramedic (CP) program in which trained CPs provide a one-time follow-up health service to targeted high-risk patients. The innovation began enrolling participants on January 1, 2013 and seeks to achieve the following HCIA goals:

1. **Smarter spending.** Lower spending by reducing unexpected encounters for patients with a history of frequent use of emergency medical services and reducing unplanned hospital readmissions; anticipate savings of $1.8 million for 100 Cohort 1 patients.

2. **Better care.** Improve care by increasing the number of patients who understand their discharge instructions, attend follow-up appointments, and fill prescriptions according to discharge instructions.

3. **Healthier people**. Improve health by reducing the number of unexpected encounters for targeted patients.

Table 2 provides a summary of changes that occurred with Prosser during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data received from Prosser as of May 31, 2015; and key informant interviews with Prosser's leaders and staff conducted on June 4, 2015 and June 5, 2015.

Table 2 Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	Paramedics in the field can now make CP referrals; previously, health care providers made all referrals.
	The CP program now serves patients who live in the Prosser service area, but are seen at Kadlec Regional Medical Center (another local hospital), allowing Prosser to offer CP services when patients return home.
	The RN case manager now regularly tracks patients transferred to Kadlec Regional Medical Center.
Program Participant Characteristics	About half of participants (50.8%) were 25 to 64 years old, and more than half (63.3%) were female. More than half of participants (51.5%) were Hispanic, and less than half (45.0%) were white. More than one-third (38.5%) were covered by Medicare or Medicare Advantage, while nearly one-third (29.5%) were covered by Medicaid.

(continued)

Table 2 Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Implementation Process	
Execution	Expenditures were above the projected target for Year 2.
Leadership	The original project director left Prosser in February 2015 for another position. He was replaced by a paramedic who worked as a CP since the inception of the program and was promoted to project director/EMS manager.
Organizational capacity	A new tracking system at Kadlec Regional increased capacity to capture referrals and provide CP service to patients in the catchment area once they return home.
	CEO of Prosser is in negotiations with health insurance providers to include CP innovation as a contract addendum to sustain CP services.
Innovation adoption and workflow	Scheduling CP visits continues via the hospital's central scheduling department. Case manager now tracks patients who refuse a CP visit and refers them to an RN who conducts a follow-up call to schedule a CP appointment.
Workforce Development	
Hiring/retention	As of Q10, 4.85 FTEs work on the project, which is at projection. One staff person, the project director, left the organization in February 2015.
Training	CPs took over the design and delivery of the CP training through Yakima Community College and revised the curriculum to incorporate more hands-on field training.
	Three new paramedics received 100 hours of training.
	Three paramedics who work for a private ambulance company in a nearby county also participated in training.
Implementation Effectiveness	
Reach	From the project's inception through Q11, Prosser enrolled 911 total unique participants, which corresponds to 65.6% reach for Cohort 1, 85.7% reach for Cohort 2, and 68.1% reach for Cohort 3 based on the number of clients referred.
Dose	Following the pre-assessment conducted at each CP visit, 29.3% of all 1,052 CP visits were followed up with at least one CP service. For the remaining 70.7% of visits, patients did not need additional services.

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by Prosser.
Key informant interviews conducted Feb–June 2015.
CP = community paramedic; FTE = full-time equivalent; Q = quarter; RN = registered nurse.

1.1.1 Innovation Components

This innovation consists of one component: a CP program in which trained CPs provide a one-time follow-up visit to targeted patients to prevent hospital readmissions and ED visits. Patients are identified for the program if they were previously classified as high ED users and present for an ED visit; undergo open abdominal, joint replacement, and other selected surgeries; or if a health care provider thinks they could benefit from the program due to chronic illnesses. Patients are recruited for a single CP visit through a referral by a provider at hospital discharge or during an office visit. As detailed in the first annual report, during the visit the CP checks that patients have obtained prescriptions and made the

necessary follow-up appointments with their primary care provider (PCP) and helps patients understand and follow the discharge instructions.[1]

Prosser is following three cohorts of identified patients for the program. Cohort 1, identified before Prosser began the program, originally included 121 patients with a history of system overuse (presented to Prosser Memorial Hospital more than five times (ED, observation, or in-patient) between Jan. 1, 2011 and June 30, 2012). Cohort 2 includes patients who undergo surgery at Prosser (open abdominal, total joint replacement, and other selected surgeries). Cohort 3 includes patients who receive a CP visit after they present to the ED (but are not high users identified in Cohort 1), patients who are referred for a CP visit by a provider, and patients released from nearby Kadlec Hospital who live within the Prosser catchment area. Patients from all cohorts receive the same CP services.

Since we first described these components in the first annual report, Prosser made the following changes to its referral processes: (1) Prosser reported during Q8 that paramedics in the field can now make CP referrals, whereas health care providers previously made all referrals; and (2) the CP program now serves patients who live in the Prosser service area, but were seen at Kadlec Regional Medical Center (another local hospital). During Q9 Prosser changed its referral system to allow the registered nurse (RN) case manager at Prosser to regularly track patients transferred to Kadlec Regional Medical Center via Prosser's ambulance service.

The partners for this innovation remain unchanged. In the first annual report we listed Sue Jetter Consulting Services as a partner. However, based on the *Q8 Narrative Progress Report*, Ms. Jetter is the local evaluator and an integral member of the staffing team. We now consider Ms. Jetter's role to be a contractor rather than a partner.

1.1.2 Program Participant Characteristics

Table 3 provides the demographic characteristics of all participants ever enrolled in the innovation, unique by cohort. The distribution of age, sex, and race/ethnicity is similar to that in the first annual report, the earliest report in which patient characteristics based on secondary data were reported. Data for payer information were not available for the first annual report; however, since we began reporting payer information in the Q5 report, the payer mix has remained consistent. As shown in the table, half of participants (50.8%) were 25 to 64 years old, and more than half (63.3%) were female. More than half of participants (51.5%) were Hispanic, and less than half (45.0%) were white. More than one-third (38.5%) were covered by Medicare or Medicare Advantage while nearly one-third (29.5%) were covered by Medicaid.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Number of Participants	Percentage of Participants
Total	911	100.0
Age		
< 18	33	3.6
18–24	77	8.5
25–44	240	26.3
45–64	223	24.5
65–74	133	14.5
75–84	119	13.1
85+	77	8.5
Missing	9	1.0
Sex		
Female	577	63.3
Male	326	35.8
Missing	8	0.9
Race/ethnicity		
White	410	45.0
Black	3	0.3
Hispanic	469	51.5
Asian	1	0.1
American Indian or Alaska Native	3	0.3
Native Hawaiian or Other Pacific Islander	0	0.0
Other	0	0.0
Missing/refused	25	2.8
Payer Category		
Dual	0	0.0
Medicaid	269	29.5
Medicare	283	31.1
Medicare Advantage	67	7.4
Other	264	29.0
Uninsured	0	0.0
Missing	28	3.1

Source: Patient-level data provided to RTI by Prosser.
[1] Unique patients by cohort.
[2] Other includes private commercial insurance, self-pay, or other government-funded insurance (i.e., Veteran's Health, state employee).

1.2 Implementation Progress

The first annual report (2014) described Prosser's implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area. ***Table 4*** lists these measures and their status as of May 31, 2015. Table 4 lists the explanatory measures determined as most relevant for our evaluation, with an indication of the status of the data requested and whether the data are presented in this annual report. The results of analyses for all of these measures are included in this annual report.

This section presents Prosser's process measures and a qualitative analysis of the factors that determined Prosser's implementation progress. This analysis draws on patient-level data that Prosser provided to RTI as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation effectiveness	Reach	Number/percentage of patients referred to the CP program who had a CP visit within 7 days of discharge from Prosser Public Hospital District (ED, observation, or inpatient admission) by cohort	Data received from Prosser
	Dose	Number and type(s) of contacts received by patients from CPs	Data received from Prosser
		Help with making follow-up appointment	Data received from Prosser
		Help with filling a prescription	Data received from Prosser
		Review discharge instructions	Data received from Prosser

CP = community paramedic; ED = emergency department; Prosser = Prosser Public Hospital District.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through Prosser's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include Prosser's reports from Q8 through Q10 and interviews conducted on June 4, 2015 and June 5, 2015.

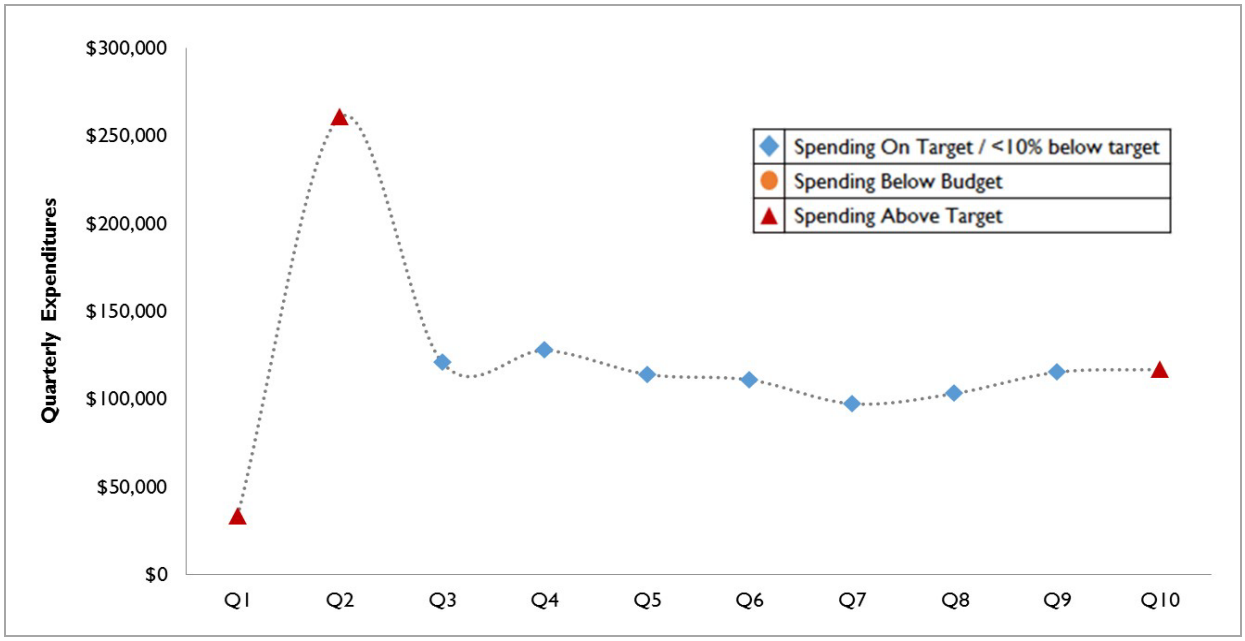
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

Execution of Implementation

The annual report highlights the significance of Prosser's expenditure rates on implementation. As of December 2014 (Q10), Prosser spent 52 percent of its Year 3 budget—which was above the projected target—likely due to increased patient enrollment and community paramedic activity at the end of Year 2.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Leadership

According to interviews with project staff in June 2015, the project director (who conceptualized the innovation and was its champion) resigned in February 2015. A paramedic, who worked as a CP since the inception of the program, was promoted to project director/EMS manager. The new project director and RN case manager reorganized their job responsibilities to take on key leadership functions of the program. The project director handles staff management, budgetary matters and represents the program to the hospital management team, CEO and Board of Commissioners. The RN case manager continues to work on patient case management, program promotion, CP training development, patient scheduling, data collection and physician contact/follow-up.

The two leaders collaborate on leading team meetings, hiring new paramedics, and providing training to the CPs. The nurse case manager's office is located in the ambulance building. By streamlining the nurse case manager's work to focus on outreach, tracking and follow-up duties rather than administrative tasks, staff's ability to reach and engage more patients who could benefit from the CP visit has increased. Support from senior leadership within Prosser Memorial Hospital (PMH) remains relatively strong. In the first annual report, we reported that leaders were initially somewhat skeptical that the proposed team had the skills and capacity to implement the innovation. Part of the reason for the skepticism may have been lack of awareness among hospital leadership and other providers regarding

the innovation. The project director and other innovation staff have since worked to address questions about the program from other departments in the hospital as well as community agencies who might have been concerned about turf issues. Greater awareness of the program as it unfolded in the hospital and larger community resulted in stronger leadership and provider support. Additionally, the hospital's chief executive officer (CEO) expanded external promotion of the program to support sustainability.

Interest in the innovation has grown beyond the Prosser community. During the past year, the Washington state legislature requested information about the CP program and invited the RN case manager and program director to present information on CP medicine, specifically about the program. The legislature reportedly was very interested in the program and stated they particularly favored the model of a nurse and physician involved as an integral support for the CPs.

Innovation staff reported that they felt leadership supported their work and gave them autonomy to implement the innovation, i.e., freedom and flexibility that allowed them to make improvements where necessary. Leadership support, in combination with the hospital's small size and close community, contributed to implementation of the innovation. Because Prosser is a small rural hospital, staff reported they could make changes midstream in training design and delivery and in referral and scheduling processes to improve implementation efforts without the layers of approval and oversight that a larger organization might have required. Innovation staff were given time to work on the project and were supported in their work. As one interviewee stated, "the leadership empowered the group to run the innovation with little decision making."

Organizational Capacity

The innovation's organizational structure and capacity increased during Q9. Prosser expanded its ability to serve more patients by entering into an agreement with Kadlec Regional Medical Center to refer eligible patients who reside in the Prosser service area and return to the area when discharged from the hospital. The RN case manager's tracking system enabled staff to effectively monitor referred patients discharged from Kadlec Regional Medical Center and to track whether they receive a follow-up visit. In the Q10 report, Prosser discussed the CEO's negotiations with health insurance providers to include the CP services as a contract addendum in annual contract. Outcomes of these negotiations are pending.

The local evaluator was contracted and serves as a program manager of sorts to the Prosser CP team on the basis of her decades of experience writing federal grants. Her role remained fairly stable since the site visit in June 2014, although her time was increased to handle the reporting requirements for the award. She continues to work with the data to prepare quarterly reports and measures for the self-monitoring plans and follows up with the innovation team members to ensure they complete their reporting.

Innovation Adoption and Workflow Integration

No staff were funded full-time on this innovation, which initially resulted in some splintered efforts, because the original nurse case manager and project director had other clinical and management responsibilities. Now that the new CP nurse case manager has helped to streamline tasks such as

running reports and overseeing education, the operating logistics of the program are not as fractured and are running more smoothly. She learned to track patients more efficiently by having access to their reports in the ambulance office; she also had more time to track patients and review their discharge information. For referrals from Kadlec Regional Medical Center, she routinely logs into the Kadlec electronic medical records system to check on these patients. Once the patient is discharged from Kadlec back to the Prosser service area, the patient is contacted and scheduled for a CP visit. Workflow has also been enhanced now that paramedics in the field can make CP referrals. This referral change in Year 2 enabled the CP nurse case manager to use the paramedic log to efficiently integrate these new referrals into the scheduling system.

1.2.2 Workforce Development

The innovations seeks to improve the quality of care by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with 4.85 full-time equivalent (FTE) staff members. No changes in staffing occurred between Q8 (June, 2014) and Q10, maintaining staffing at projection. We learned through interviews after Q10 that the project director resigned in February 2015.

Skills, Knowledge, and Training

One of the innovation's key outcomes is to train certified paramedics to become CPs and deliver at-home services that improve health outcomes and reduce ED and other unplanned visits. Prosser took the curriculum from Eagle County Colorado paramedics program, pieces from home health care guidelines and other resources, and then developed its own curriculum. Between Q8 and Q10, Prosser provided 100 hours of classroom training to three new paramedics and three paramedics who work for a private ambulance company in Yakima that is considering implementing a similar service. In Year 2, two CPs revised the curriculum to be more relevant and better meet the needs of paramedics; they then led the training themselves. They also added more time as part of the training for clinical practice and rotation in the field. In hindsight, the staff learned that they should have engaged the paramedics during the initial development phase. The new curriculum includes about 80 hours of ride time; classroom training is tailored to focus on the types of patients the CPs are likely to see in terms of types of medications and chronic illnesses and includes observations of medical floor and ED discharges. One training area in which the team hopes to improve is teaching CPs skills for dealing with psychiatric patients. Some CPs

reported they did not feel comfortable or prepared to respond to patients with psychiatric illnesses. In the past, they only transported these individuals to the hospital.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach) and; (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

Reach

Reach is the extent to which the targeted numbers of patients are exposed to the innovation. Prosser achieved its goals for the number of unique patients that received a visit (i.e., 50 for Cohort 1 and 150 for Cohorts 2 and 3, respectively). We present reach as the percentage of unique patients referred for a CP program visit who enrolled in the program and received a visit within 7 days of discharge from PMH. ***Figure 2*** *shows r*each by quarter since the program launch. Overall, through Q11, 911 total participants were enrolled across all three cohorts. The sum of unique participants in ***Figure 2***, however, is 907 because we are missing cohort indications for three participants and enrollment date for one participant.

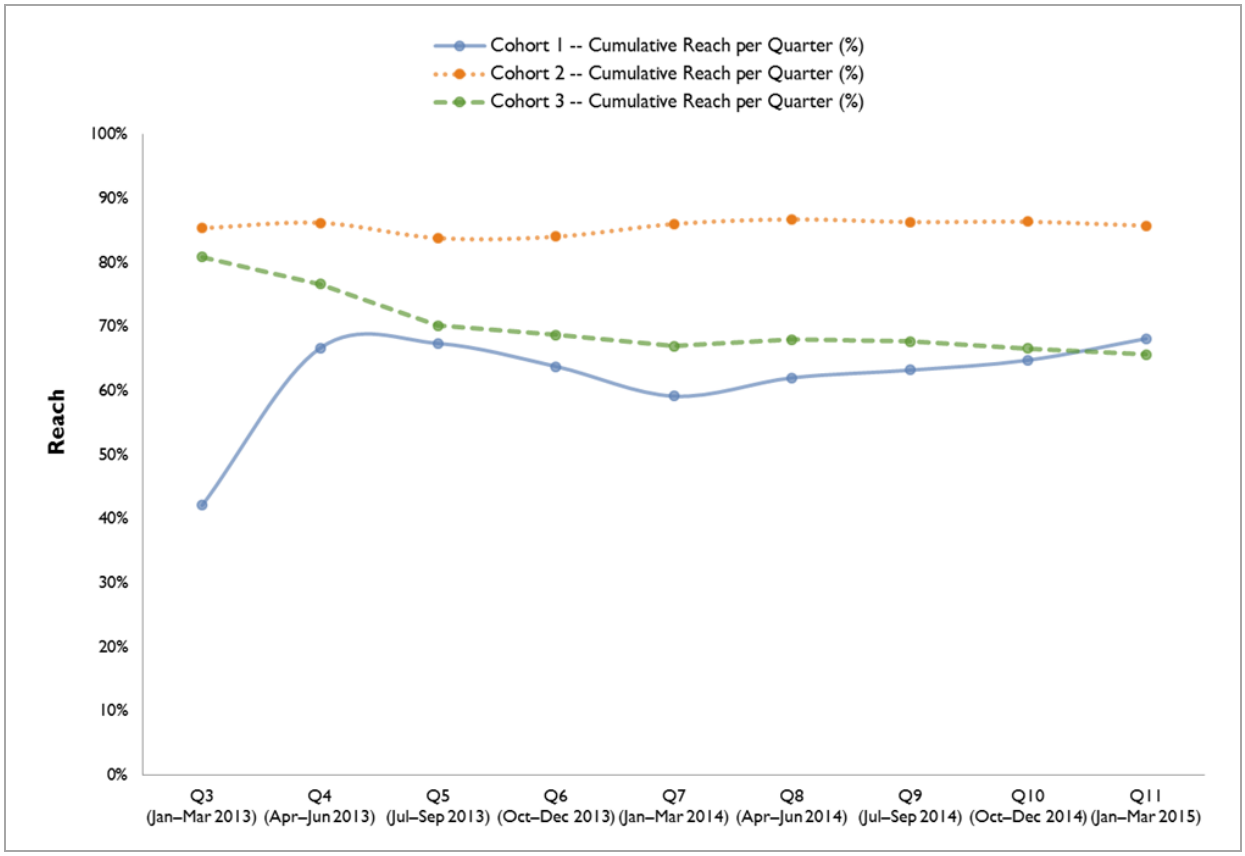
Table 5 provides reach by total number of referrals and total number of visits (not unique patients). Cohort 1 included those with more than five visits, including ED, observational, or inpatient to the PMH Medical Center from January 2011 to June 2012. For Cohort 1, overall reach was fairly steady over time—between 66.7 percent in Q4 to 68.1 percent in Q11. One challenge in reaching some Cohort 1 patients was their reluctance to give up their regular source of care: the ED. Some patients, particularly those older than age 75, had more chronic health issues that kept them sick while others were near death but not yet eligible for hospice care. In these instances, staff reported that a one-time follow-up visit did not meet these high-risk patients' needs to keep them out of the hospital or ED and, as a result, was ineffective in reducing costs. Project staff found that the one-time CP visit was most effective for Cohort 1 patients aged 50-75 years who had chronic conditions such as diabetes, congestive heart failure (CHF), and chronic obstructive pulmonary disease (COPD).

Cohort 2 included all patients who underwent surgery at Prosser and received a CP visit. Reach was highest for Cohort 2: 85.7 percent of all referred clients received a CP visit. Reach was steady over time with a range of 83.8 percent in Q5 and 86.7 percent in Q8. Reach for Cohort 2 may be higher

because patients in this cohort had a surgical procedure and were likely infrequent or low users of the health system. They may have been more motivated to avoid readmissions or additional visits to the ED. Patients in Cohort 2 were not high ED users and wanted to avoid the ED after surgery to recover at home, which may account for the high percentage of reach by Cohort 2.

Finally, Cohort 3 included patients who received a CP visit after they presented to the ED (but were not part of Cohort 1), patients referred for a CP visit by a provider, and those discharged by nearby Kadlec Hospital who reside within the PMH service area. Reach for Cohort 3 was 65.6 percent. Reach was highest in Q3 (80.9%), but decreased slightly over time to about two-thirds in Q11 (65.6%). Cohort 3 patients, like the subset in Cohort 1 of individuals aged 50–75, were reported to have a more favorable response to the CP visits because they had chronic health conditions, which may have motivated them to manage their disease and avoid the ED.

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch



(continued)

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch (continued)

	Quarter	Q3 (Jan-Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan–Mar 2015)
●	Cohort 1—Cumulative reach per quarter (%)	42.1	66.7	67.4	63.8	59.2	62.0	63.2	64.8	68.1
	Cohort 1—Cumulative # enrolled	8	24	31	37	42	49	55	57	62
●	Cohort 2—Cumulative reach per quarter (%)	85.4	86.2	83.8	84.0	86.0	86.7	86.3	86.4	85.7
	Cohort 2—Cumulative # enrolled	35	75	119	179	234	288	322	374	427
●	Cohort 3—Cumulative reach per quarter (%)	80.9	76.6	70.2	68.7	67.0	67.9	67.7	66.6	65.6
	Cohort 3—Cumulative # enrolled	55	105	134	158	207	248	308	371	418

Source: Patient-level data provided to RTI by Prosser.

As noted in previous reports, the number of participants reported in the *Quarterly Awardee Performance Reports* is consistent with the number of participants reported in the RTI quarterly and annual reports.

Table 5. Total Number of Referrals and Total CP Visits by Cohort

Cohort	Total Number of Referrals	Total Number of Visits	Total Reach, %
Cohort 1	218	121	55.5
Cohort 2	512	434	84.8
Cohort 3	777	494	63.6
Missing	3	3	N/A
Total	1,510	1,052	69.7

Source: Patient-level data provided to RTI by Prosser.
CP = community paramedic; N/A = not applicable.

Dose

Table 6 provides the number of initially targeted services provided across all CP visits among participants in all three cohorts. These services include making PCP appointments, filling prescriptions, and reviewing discharge instructions. Since most participants only receive one CP visit as part of the innovation, we define dose as the types of services offered during that one visit. The most common of these services provided by the CP are assisting in making a primary care appointment (10.8% of visits) and reviewing hospital discharge instructions (9.1% of visits). Only 2.6 percent of visits included all three services. Overall, 29.3 percent of all 1,052 CP visits included at least one CP service. In the remaining 70.7 percent of visits, patients' needs were assessed in these areas but they did not receive one of the specific services of the innovation. These patients indicated that they had already made a primary care provider (PCP) appointment, filled their prescriptions, and understood their discharge instructions (i.e., noted "yes" on their pre-assessment of activities to be provided by the CP).

The percentage of CP visits in which a specific service was provided increased slightly since the Q5 report, the first time in which dose was reported this way. In the Q5 report, only 1.1 percent of all visits included all three services compared with 2.6 percent in this annual report. In the Q5 report, in 68.7 percent of visits, patients' needs were assessed in these areas but they did not receive one of the specific services, as compared with 70.7 percent in this annual report.

Table 6. Number and Types of Services Provided to Participants across All Cohorts

CP Specific Services[1]	Number of Services Provided across CP Visits[2]	Percentage of CP Visits in which a Specific Service was Provided
Help making PCP appointments	114	10.8
Help filling prescriptions	23	2.2
Review of discharge instructions	96	9.1
Help making PCP appointments and help filling prescriptions	19	1.8
Help making PCP appointments and review of discharge instructions	23	2.2
Help filling prescriptions and review of discharge instructions	6	0.6
All three services	27	2.6
Needs assessed but no service indicated	744	70.7
Total	1,052	100.0

Source: Patient-level data provided to RTI by Prosser.
[1] Includes all participants that indicated "no" on the pre-assessment of activities to be provided by CP.
[2] Includes total number of services provided across all CP visits.
CP = community paramedic; PCP = primary care provider.

Sustainability

PMH committed to absorbing the budget for the CP innovation beyond the project period. The innovation team applied for an HRSA Rural Health Care Services Outreach Grant to sustain the CP innovation by extending service in the CP service area to patients who were discharged from larger hospitals in the region. The grant, which was not funded, would have expanded CP services to residents in the Yakima Valley Memorial Hospital and Kadlec Regional Hospital regions and would have brought more staff on to accommodate the expansion. When the grant was not funded, staff worked with Prosser leadership to pare down the budget. They also worked to determine essential elements to keep the program running in the Prosser hospital district without expansion to these other areas and without external evaluator support for the data reporting piece required for HCIA.

The proposed budget was submitted to the board in June 2015 for approval. If the budget is approved, the CEO at Prosser will ask leaders at Yakima and Kadlec Regional Hospitals to provide funding to expand the program to those areas. As reported earlier, paramedics from Yakima Valley Memorial Hospital participated in the CP paramedic training, and the nurse case manager at Prosser developed a referral and tacking system with Kadlec Regional Hospital for discharged patients who reside in the Prosser district.

In addition, the chief financial officer discussed the CP program with Prosser's health insurance providers in the annual contract negotiations to get CP services included as a contract addendum for the coming year (to begin July 2015). These discussions were reportedly well received, and the team expected to hear about decisions in mid-June 2015. Finally, at the state level there is great interest in the CP model. In spring 2015, the Washington legislature passed a bill creating a CP/health worker program and assigned the Washington Department of Health to create the requirements and standards. Although staff reported that movement in this direction is good, they await decisions from the Department of Health about standards and certification requirements. Prosser staff are continuing discussions with the state as they work on these standards. They hope to serve as a test site for a nationally recognizable certification exam being developed by the Board of Critical Care Transport Paramedic Certification.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of Prosser's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data Prosser collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers essential to the evaluation of Prosser's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee. As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 7 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of the status of the data requested and whether the data are presented in this annual report.

Table 7. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	Yes
		Hospital unplanned readmissions rate	Yes	Yes
		ED visit rate	Yes	Yes
	Cost	Spending per patient	Yes	Yes
		Estimated cost savings	Yes	No

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?
- Do program effects change by cohort (i.e. if a person was enrolled due to heavy ED use, surgery, or referral by a provider)?

Medicare Claims Analysis

We include patients who were enrolled prior to December 31, 2014, and we present Medicare claims data through December 31, 2014. The treatment group comprises 229 individuals enrolled in fee-for-service Medicare Parts A and B during the innovation (32 in Cohort 1, 44 in Cohort 2 and, 153 in Cohort 3). In previous reports we pooled data from the three cohorts into a single participating sample. In this report, we analyze each cohort separately.

Comparison Groups

As comparison groups for each cohort we use the list of individuals who were eligible (i.e., were invited to participate by Prosser in one of the three groups based on their discharge records) but did not participate in the CP intervention.

In the current round of data submission, up to December 2014, there are 338 unique controls across all cohorts; 88 of these were linked to IDs corresponding to fee-for-service Medicare beneficiaries in the Chronic Conditions Data Warehouse (24, 8, and 56 in Cohorts 1, 2 and 3, respectively).

For each claims outcome measure, we compared eligible participants to eligible nonparticipants. To ensure validity of comparisons between participant and nonparticipant groups, we used a propensity score matching (PSM) approach to adjust for the following potentially confounding factors: sex, race, disability, renal failure, number of chronic conditions, total expenditures, and ED visits. This adjustment is only possible for Cohort 3 because it is the only cohort with more than 100 patients. Specifications with a lower number of observations (Cohorts 1 and 2) would give unreliable results.

Table 8 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model for Cohort 3 before and after matching. Many researchers consider that an absolute standardized difference ≤ 0.10 indicates acceptable balance.[2] Researchers also point out that critical variables in determining selection into treatment (e.g., those with significant effects in the propensity score equation) should have greater balance, while indicators with minor importance in determining treatment selection do not require optimal balance. The standardized differences generally improve with matching, but not all variables achieve a value less than 0.10. The variables that do not

[2] Austin, P.C. An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research. 46.3: 399–424, 2011. *PMC*. Web. 2 June 2015.

strictly fall below the 0.10 threshold are payments in calendar quarter prior to enrollment, age, percentage male, percentage white, percentage disabled, and number of months of dual eligibility. The small number of nonparticipants (56) for matching limits our ability to achieve good balance on these variables.

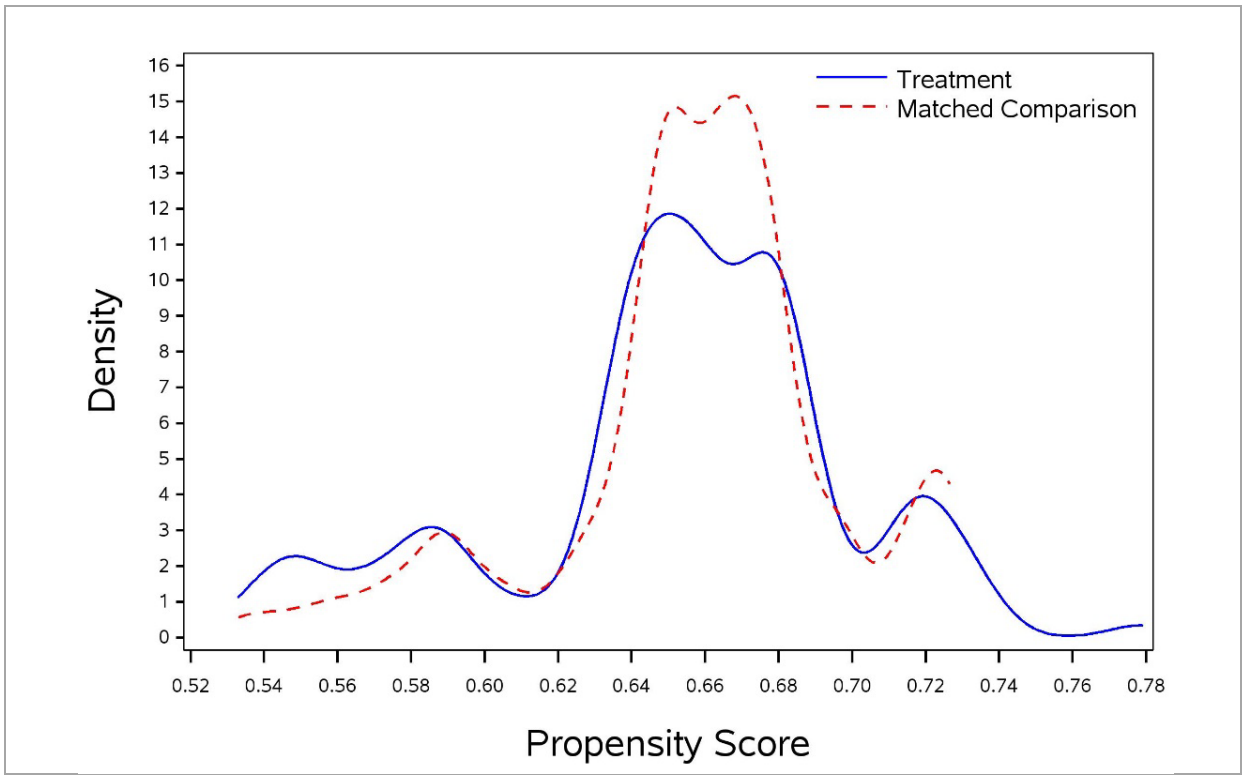
Figure 3 shows the distribution of the propensity scores for both the comparison and intervention groups of Cohort 3. ***Appendix B.2*** provides technical details on the propensity score methodology. Twenty-nine treatment beneficiaries were dropped from the subsequent analyses because they did not have an appropriately matched comparison beneficiary. The two distributions show that matched comparison beneficiaries had somewhat similar propensity scores to treatment beneficiaries.

Table 8. Mean Values and Standardized Differences of Variables in Propensity Score Model: Prosser – Cohort 3

Variable[1]	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrolment	$6,315	$18,559	$3,876	$8,530	0.17	$2,336	$6,884	$1,445	$6,701	0.13
Total payments in second, third, fourth, and fifth calendar quarters prior to enrolment	$11,554	$17,934	$14,226	$29,943	0.11	$9,241	$15,104	$10,161	$25,796	0.04
Number of ED visits in second, third, fourth, and fifth calendar quarters prior to enrolment	1.50	2.74	1.63	2.99	0.04	1.40	2.66	1.60	4.30	0.06
Number of inpatient stays in second, third, fourth, and fifth calendar quarters prior to enrollment	0.39	0.95	0.50	1.45	0.09	0.34	0.96	0.39	1.68	0.04
Age	76.50	10.81	72.07	13.24	0.37	76.81	10.82	71.99	23.92	0.26
Percentage male	50.33	50.16	50.00	50.45	0.01	49.19	50.20	55.81	98.68	0.19
Percentage white	73.20	44.44	75.00	43.69	0.06	72.58	44.79	68.49	92.31	0.13
Percentage disabled	24.18	42.96	28.57	45.58	0.14	23.39	42.50	16.24	73.29	0.25
Percentage ESRD	1.96	13.91	—	—	0.28	—	—	—	—	—
Number of dual eligible months in the previous calendar year	2.67	4.84	3.21	5.21	0.11	2.49	4.78	4.02	10.99	0.18
Number of chronic conditions	8.96	3.68	8.45	4.06	0.13	8.68	3.60	8.77	5.02	0.02
Number of beneficiaries	153	—	56	—	—	124	—	302	—	—
Number of unique beneficiaries[1]	153	—	56	—	—	124	—	50	—	—
Number of weighted beneficiaries	—	—	—	—	—	—	—	124	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
ED = emergency department; ESRD = end-stage renal disease.
[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B for discussion of weights).
— Data not yet available.

Figure 3. Distribution of Propensity Scores for Comparison and Intervention Groups: Prosser – Cohort 3



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Descriptive Analysis

This report includes claims through December 31, 2014.

Cohort 1

Table 9 reports Medicare spending per patient participating in Cohort 1 in the eight quarters before and the six quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors. Data are available for two more quarters; however, Q7 and Q8 have fewer than 10 participants, so the descriptive statistics in those periods are highly unreliable. Participants in Cohort 1 have a history of ED overuse (more than five ED visits to the PMH Medical Center between January 1, 2011 and June 30, 2012). No PSM was performed before presenting summary statistics because of data paucity. Therefore, except for ER use, we do not expect pre-intervention outcomes to be comparable between treated and controls. Spending, for instance, is consistently higher in the years preceding the intervention for controls than for participating individuals.

Table 9. Medicare Spending per Patient: Prosser – Cohort 1

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

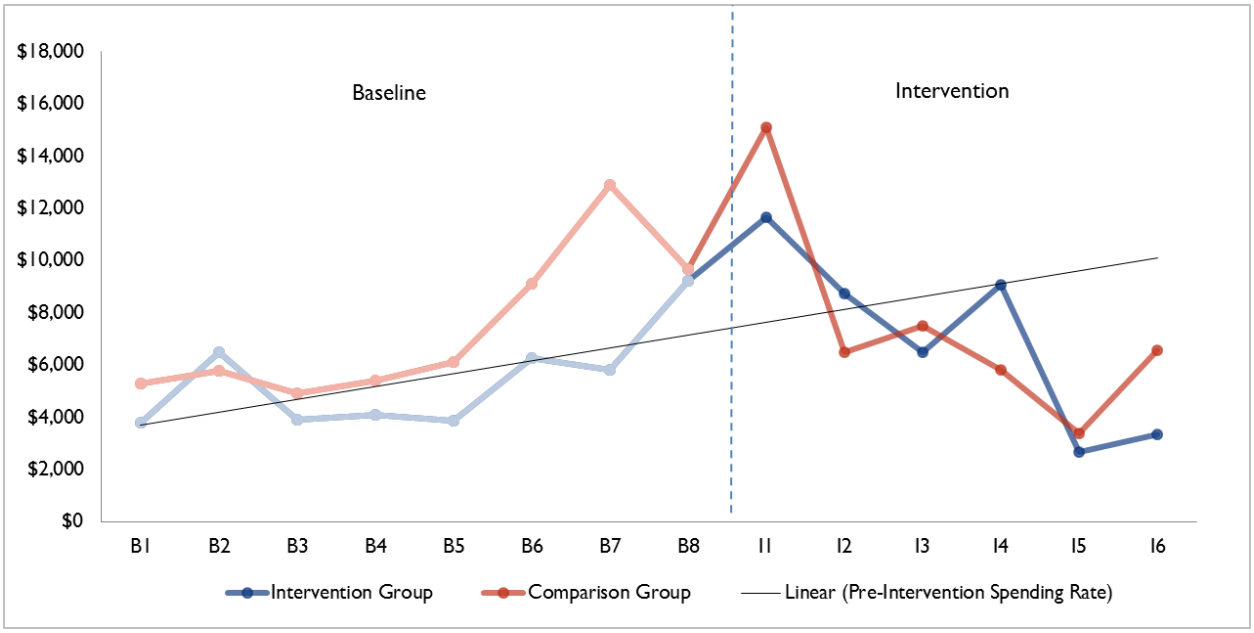
Awardee Number	Description	Baseline Quarters								Intervention Quarters					
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6
Intervention Group															
1C1CMS 331036	Prosser														
	Spending rate	$3,781	$6,511	$3,919	$4,111	$3,887	$6,264	$5,820	$9,213	$11,658	$8,724	$6,500	$9,091	$2,682	$3,357
	Std dev	$4,907	$15,399	$5,551	$8,007	$4,848	$19,825	$11,700	$14,622	$14,858	$11,309	$8,295	$13,878	$3,975	$3,823
	Unique patients	26	27	27	30	32	32	32	32	29	26	21	15	12	10
Comparison Group															
1C1CMS 331036	Prosser														
	Spending rate	$5,295	$5,766	$4,918	$5,423	$6,113	$9,115	$12,895	$9,676	$15,095	$6,492	$7,499	$5,824	$3,382	$6,550
	Std dev	$5,482	$12,007	$6,960	$9,128	$11,068	$22,597	$26,887	$12,458	$16,987	$8,688	$10,261	$8,293	$4,111	$6,106
	Unique patients	22	23	23	22	23	24	24	24	22	21	19	16	15	10
Savings per Patient		$1,514	−$745	$999	$1,312	$2,226	$2,850	$7,075	$463	$3,436	−$2,232	$999	−$3,267	$699	$3,193

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 4 illustrates the Medicare spending per beneficiary in Table 9 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters. The eligible nonparticipants have substantially higher spending in the years preceding the intervention than those who later chose to participate.

We observe a marked decrease in costs and utilization for controls in Cohort 1 after I1, which could mean that nonparticipants might be getting care or might have chosen to receive care in a hospice setting.

Figure 4. Medicare Spending per Patient: Prosser – Cohort 1



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 10*** and ***Figure 5***. Cohort 1-eligible but nonparticipating individuals' inpatient admission rates closely mirror the patterns of expenditures.

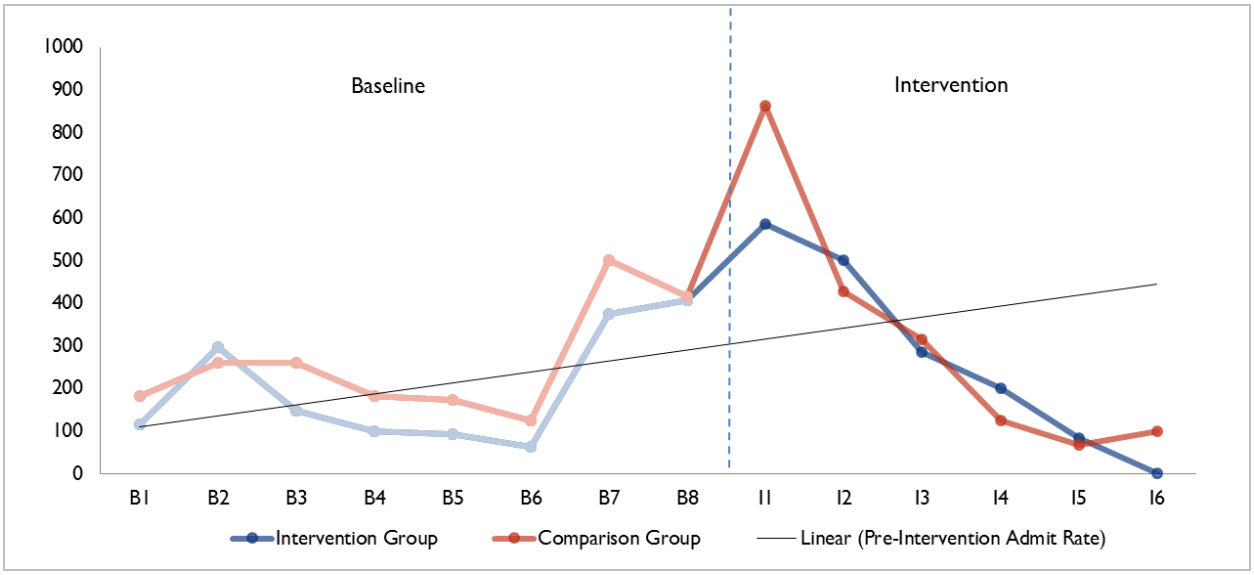
Table 10. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Prosser – Cohort 1

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters					
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6
Intervention Group															
1C1CMS 331036	Prosser														
	Admit rate	115	296	148	100	94	63	375	406	586	500	286	200	83	0
	Std dev	319	808	590	300	384	242	960	655	891	797	700	542	276	0
	Unique patients	26	27	27	30	32	32	32	32	29	26	21	15	12	10
Comparison Group															
1C1CMS 331036	Prosser														
	Admit rate	182	261	261	182	174	125	500	417	864	429	316	125	67	100
	Std dev	386	674	674	386	636	331	816	571	1140	660	729	484	249	300
	Unique patients	22	23	23	22	23	24	24	24	22	21	19	16	15	10
Intervention − Comparison Rate		−66	35	−113	−82	−80	−63	−125	−10	−277	71	−30	75	17	−100

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 5. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Prosser – Cohort 1



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 11*** and ***Figure 6***. There are not enough observations to accurately determine readmissions rates for Cohort 1 at this stage because of the low number of index admissions (the denominator in the readmissions measure).

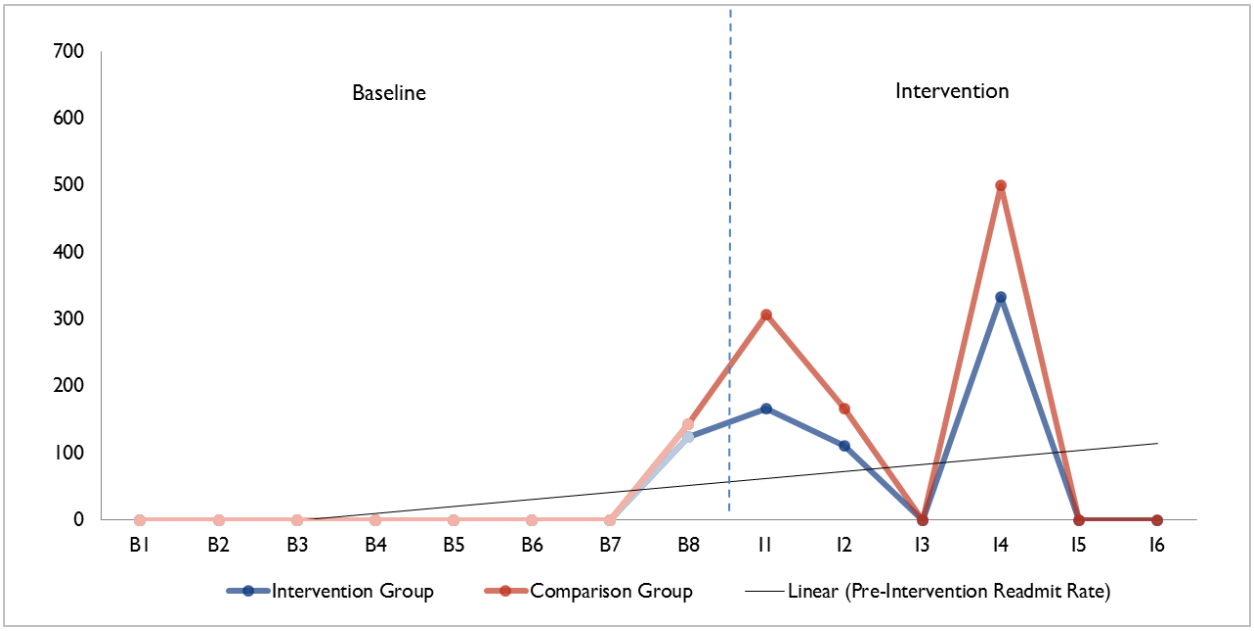
Table 11. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Prosser – Cohort 1

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters					
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6
Intervention Group															
1C1CMS 331036	Prosser														
	Readmit rate	0	0	0	0	0	0	0	125	167	111	0	333	0	0
	Std dev	0	0	0	0	0	0	0	331	373	314	0	471	0	0
	Total admissions	3	3	4	2	1	1	6	8	12	9	3	3	1	0
Comparison Group															
1C1CMS 331036	Prosser														
	Readmit rate	0	0	0	0	0	0	0	143	308	167	0	500	0	0
	Std dev	0	0	0	0	0	0	0	350	462	373	0	500	0	0
	Total admissions	4	3	4	3	1	1	7	7	13	6	2	2	1	0
Intervention − Comparison Rate		0	0	0	0	0	0	0	−18	−141	−56	0	−167	0	0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Prosser – Cohort 1



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

ED visits per 1,000 participants are shown in ***Table 12*** and ***Figure 7***.

Not surprisingly, treatment and controls follow similar patterns because ED is the criteria for eligibility in both groups. Although the difference at this stage is not statistically significant, selection effects may have been present because the controls have consistently higher ER rates than those who chose to receive the intervention. Again, for both groups the ED rate declines after the intervention.

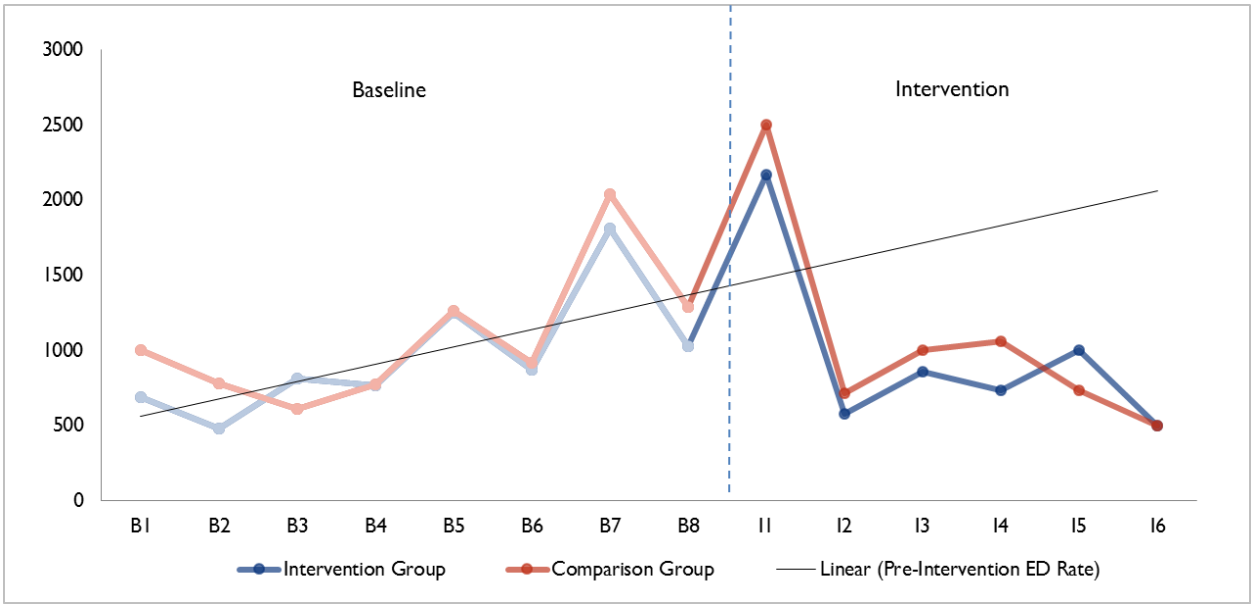
Table 12. ED Visits per 1,000 Participants: Prosser – Cohort 1

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters					
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6
Intervention Group															
1C1CMS 331036	Prosser														
	ED rate	692	481	815	767	1,250	875	1,813	1,031	2,172	577	857	733	1,000	500
	Std dev	1,011	580	1,469	1,073	1,778	1,212	3,393	2,221	3,616	1,270	1,652	1,486	1,859	972
	Unique patients	26	27	27	30	32	32	32	32	29	26	21	15	12	10
Comparison Group															
1C1CMS 331036	Prosser														
	ED rate	1,000	783	609	773	1,261	917	2,042	1,292	2,500	714	1,000	1,063	733	500
	Std dev	1,155	1,043	839	1,152	1,789	1,177	3,557	2,476	4,080	1,189	1,599	1,611	1,668	972
	Unique patients	22	23	23	22	23	24	24	24	22	21	19	16	15	10
Intervention − Comparison Rate		−308	−301	206	−6	−11	−42	−229	−260	−328	−137	−143	−329	267	0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 7. ED Visits per 1,000 Participants: Prosser – Cohort 1



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Cohort 2

Cohort 2 patients consist of all patients who underwent surgery at Prosser and received a CP visit, which includes all types of surgery. Just as for Cohort 1, this report includes claims through December 31, 2014. Unlike other cohorts, very few eligible fee-for-service Medicare beneficiaries opt not to participate; thus, only eight possible controls are linked to the Chronic Conditions Data Warehouse. After Q6, the summary statistics become unreliable as the sample size decreases to fewer than 10 individuals.

Table 13 reports Medicare spending per patient in the eight quarters before and the six quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 13. Medicare Spending per Patient: Prosser – Cohort 2

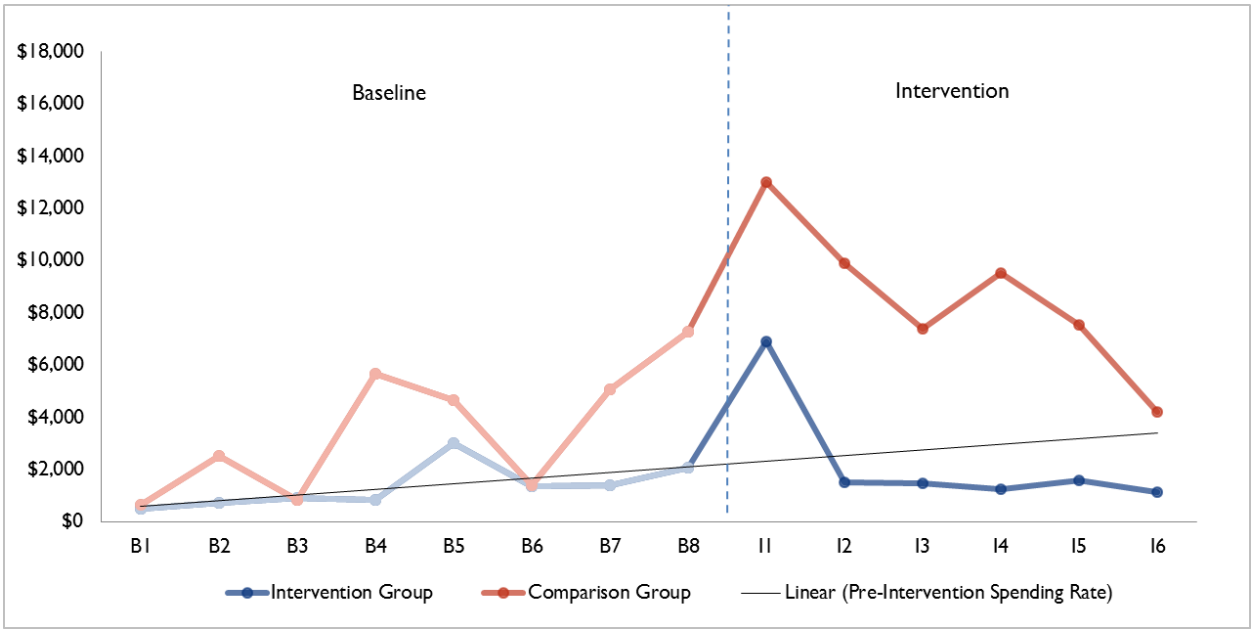
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters					
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6
Intervention Group															
1C1CMS 331036	Prosser														
	Spending rate	$509	$718	$903	$846	$3,021	$1,370	$1,400	$2,084	$6,887	$1,526	$1,459	$1,243	$1,582	$1,141
	Std dev	$1,071	$1,082	$2,741	$1,879	$10,107	$3,545	$2,968	$5,482	$5,863	$2,691	$3,304	$1,982	$3,057	$1,607
	Unique patients	37	37	38	38	40	40	44	44	36	29	29	24	20	12
Comparison Group															
1C1CMS 331036	Prosser														
	Spending rate	$662	$2,519	$838	$5,650	$4,667	$1,383	$5,055	$7,268	$13,007	$9,892	$7,391	$9,514	$7,559	$4,213
	Std dev	$893	$3,712	$1,028	$13,325	$10,771	$2,000	$10,881	$16,046	$6,519	$12,854	$14,125	$7,921	$9,108	$4,425
	Unique patients	6	6	6	7	7	8	8	8	6	6	5	4	3	3
Savings per Patient		$153	$1,800	−$65	$4,805	$1,646	$13	$3,655	$5,184	$6,119	$8,366	$5,932	$8,271	$5,977	$3,071

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 8 illustrates the Medicare spending per beneficiary in Table 13 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters. The group of patients in the intervention group show substantially lower costs after surgery than the group that chose not to participate. Two caveats must be considered when examining these results: (1) no PSM was conducted for lack of data, and (2) both groups have a high degree of uncertainty—particularly the control group, which has only six individuals.

Figure 8. Medicare Spending per Patient: Prosser – Cohort 2



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 14*** and ***Figure 9***.

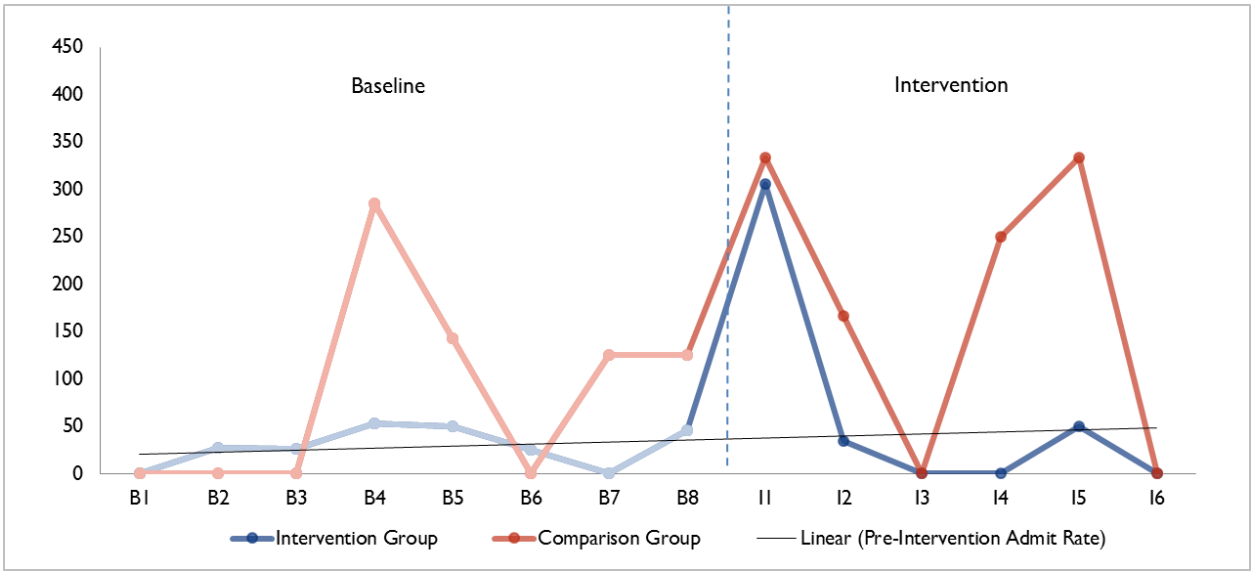
Table 14. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Prosser – Cohort 2

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters					
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6
Intervention Group															
1C1CMS 331036	Prosser														
	Admit rate	0	27	26	53	50	25	0	45	306	34	0	0	50	0
	Std dev	0	162	160	223	218	156	0	208	517	182	0	0	218	0
	Unique patients	37	37	38	38	40	40	44	44	36	29	29	24	20	12
Comparison Group															
1C1CMS 331036	Prosser														
	Admit rate	0	0	0	286	143	0	125	125	333	167	0	250	333	0
	Std dev	0	0	0	700	350	0	331	331	471	373	0	433	471	0
	Unique patients	6	6	6	7	7	8	8	8	6	6	5	4	3	3
Intervention − Comparison Rate		0	27	26	−233	−93	25	−125	−80	−28	−132	0	−250	−283	0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 9. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Prosser – Cohort 2



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

No hospital unplanned readmissions rates were reported or observed for the treated or control groups so these are not reported.

ED visits per 1,000 participants are shown in ***Table 15*** and ***Figure 10***. Throughout the pre-intervention and post-intervention period, the ED visit rate is similar in the treatment and comparison groups. The ED rate is highly volatile, however.

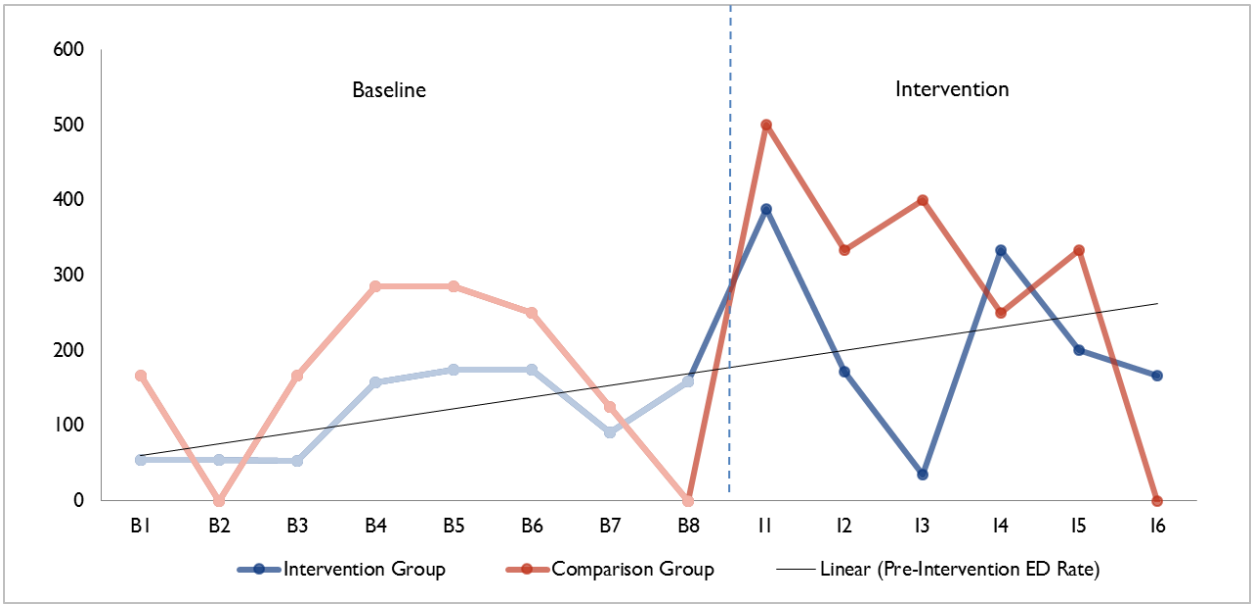
Table 15. ED Visits per 1,000 Participants: Prosser – Cohort 2

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters					
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6
Intervention Group															
1C1CMS 331036	Prosser														
	ED rate	54	54	53	158	175	175	91	159	389	172	34	333	200	167
	Std dev	229	229	226	437	447	550	291	428	803	468	186	637	696	389
	Unique patients	37	37	38	38	40	40	44	44	36	29	29	24	20	12
Comparison Group															
1C1CMS 331036	Prosser														
	ED rate	167	0	167	286	286	250	125	0	500	333	400	250	333	0
	Std dev	408	0	408	756	488	707	354	0	837	516	548	500	577	0
	Unique patients	6	6	6	7	7	8	8	8	6	6	5	4	3	3
Intervention − Comparison Rate		−113	54	−114	−128	−111	−75	−34	159	−111	−161	−366	83	−133	167

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 10. ED Visits per 1,000 Participants: Prosser – Cohort 2



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee

Cohort 3

Cohort 3 individuals become eligible to receive a CP visit after they visit the ED (but are not part of Cohort 1) or because they are referred for a CP visit by a provider. All tables showing the descriptive statistics of the outcomes of interest for Cohort 3 represent the uniquely matched sample (N=104). Here all eight quarters of available post-intervention data are shown. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 16. Medicare Spending per Patient: Prosser – Cohort 3

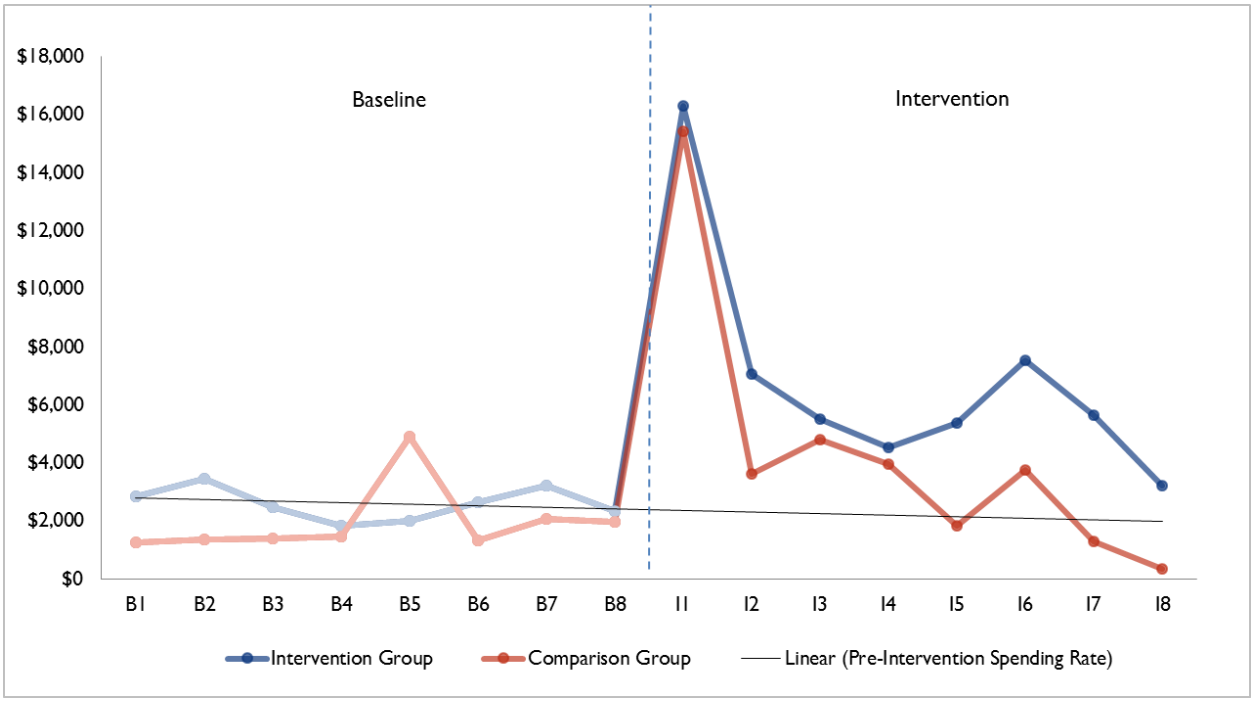
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331036	Prosser																
	Spending rate	$2,869	$3,471	$2,498	$1,854	$2,011	$2,650	$3,209	$2,336	$16,324	$7,062	$5,524	$4,545	$5,391	$7,549	$5,643	$3,237
	Std dev	$8,208	$11,303	$4,999	$3,340	$5,001	$7,477	$8,806	$6,856	$22,775	$19,258	$11,404	$8,009	$11,717	$17,312	$14,150	$7,060
	Unique patients	107	110	111	111	116	119	122	124	124	98	80	60	40	34	25	10
Comparison Group																	
1C1CMS 331036	Prosser																
	Spending rate	$1,273	$1,376	$1,396	$1,484	$4,917	$1,350	$2,069	$1,968	$15,430	$3,640	$4,812	$3,965	$1,858	$3,780	$1,311	$356
	Std dev	$1,486	$3,024	$4,909	$5,183	$9,336	$1,765	$4,034	$4,515	$24,233	$8,010	$10,402	$7,432	$2,362	$5,768	$836	$0
	Unique patients	121	121	121	121	124	124	124	124	124	101	85	66	45	39	26	14
Savings per Patient		−$1,596	−$2,095	−$1,103	−$370	$2,906	−$1,300	−$1,140	−$367	−$894	−$3,423	−$711	−$580	−$3,533	−$3,769	−$4,332	−$2,881

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 11 illustrates the Medicare spending per beneficiary in Table 16 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters. Spending is similar for treated and controls in the baseline period. After the intervention, the individuals that receive the CP intervention show consistently higher overall spending.

Figure 11. Medicare Spending per Patient: Prosser – Cohort 3



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 17*** and ***Figure 12***.

Mirroring the trend in total costs, the pre-intervention trend in inpatient utilization is similar for both treated and control individuals in the baseline period. The inpatient admission rate for the treated group in the second and subsequent quarters' post-intervention is higher than the rate of those who chose not to participate. It is possible that some fraction of those who do not participate are treated in nursing homes or in hospice care. If they went to hospice care, they would have waived the right to interventions beyond palliative care and, hence, might show lower cost and utilization.

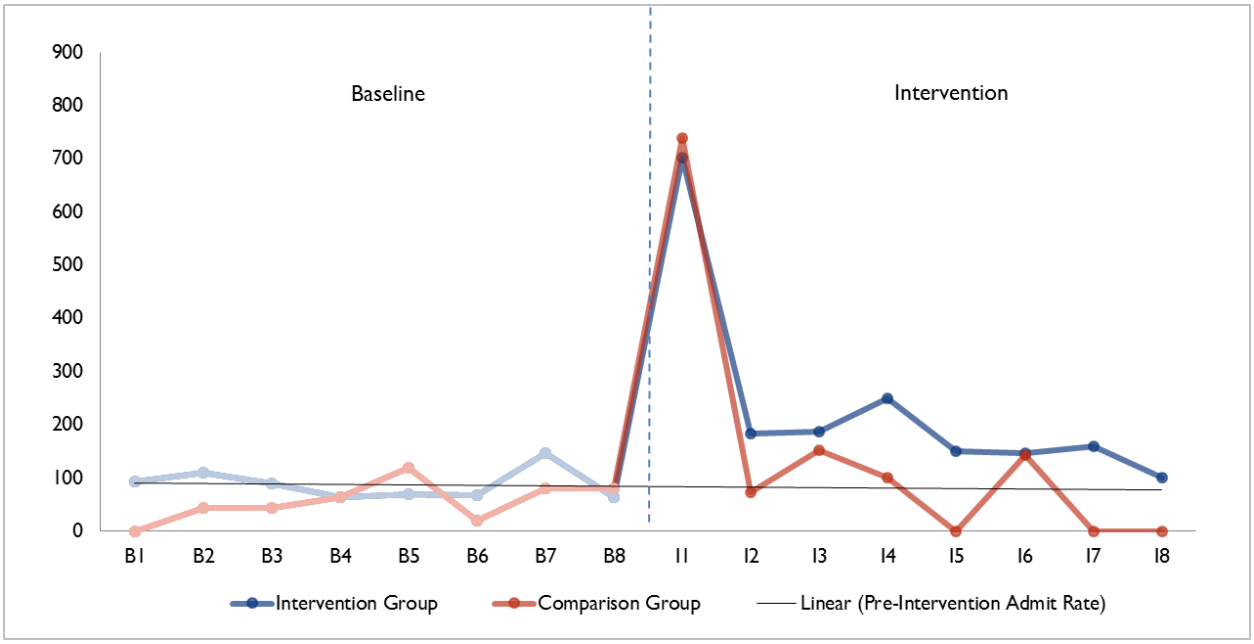
Table 17. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Prosser – Cohort 3

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331036	Prosser																
	Admit rate	93	109	90	63	69	67	148	65	702	184	188	250	150	147	160	100
	Std dev	322	412	286	308	340	282	596	246	861	541	572	536	527	493	612	300
	Unique patients	107	110	111	111	116	119	122	124	124	98	80	60	40	34	25	10
Comparison Group																	
1C1CMS 331036	Prosser																
	Admit rate	0	43	43	64	120	20	80	80	740	73	152	100	0	143	0	0
	Std dev	0	343	193	194	658	126	384	145	726	254	419	330	0	345	0	0
	Unique patients	121	121	121	121	124	124	124	124	124	101	85	66	45	39	26	14
Intervention − Comparison Rate		93	66	47	−1	−51	47	68	−15	−38	111	36	150	150	4	160	100

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 12. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Prosser – Cohort 3



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Hospital unplanned readmission rates per 1,000 admissions are shown in ***Table 18*** and ***Figure 13***. Because of the low number of index admissions (the denominator in the readmissions measure), the unplanned readmissions rate is highly variable. As more beneficiaries enroll in the innovation and more claims data become available, the sample size will increase and the unplanned readmissions measure may be reported with more precision.

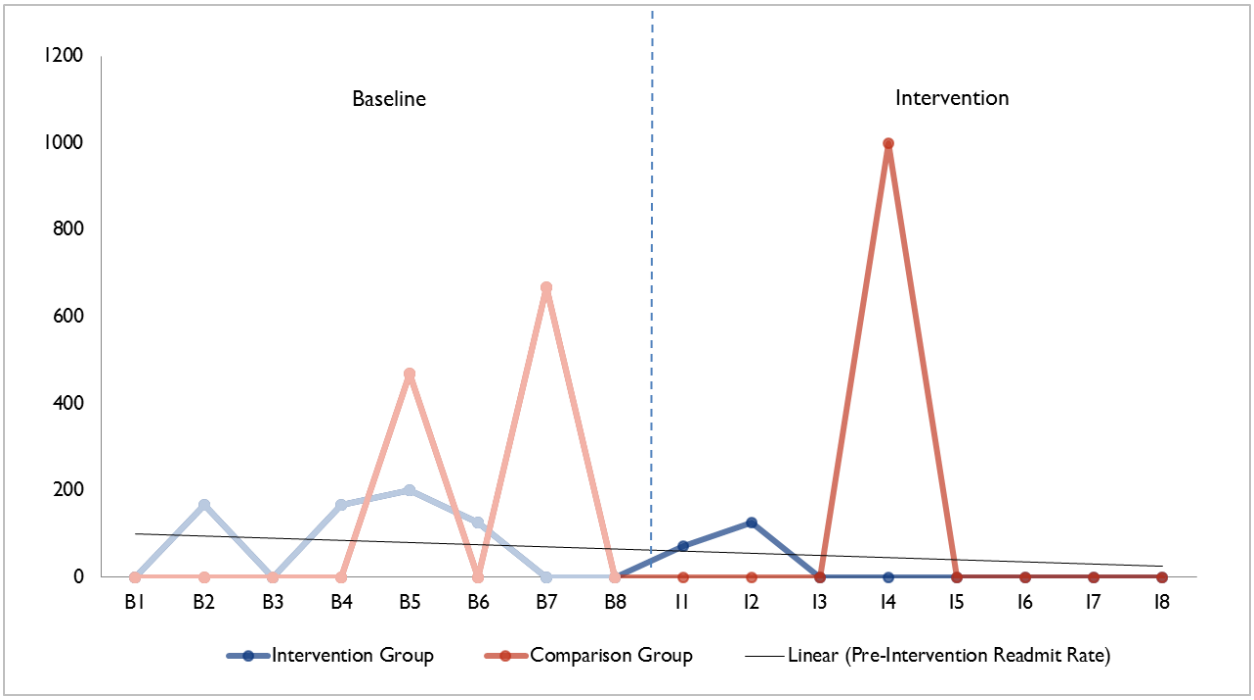
Table 18. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Prosser – Cohort 3

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331036	Prosser																
	Readmit rate	0	167	0	167	200	125	0	0	70	125	0	0	0	0	0	0
	Std dev	0	373	0	373	400	331	0	0	256	331	0	0	0	0	0	0
	Total admissions	9	6	10	6	5	8	11	4	71	16	9	7	5	4	3	0
Comparison Group																	
1C1CMS 331036	Prosser																
	Readmit rate	0	0	0	0	468	0	667	0	0	0	0	1,000	0	0	0	0
	Std dev	0	0	0	0	499	0	471	0	0	0	0	0	0	0	0	0
	Total admissions	0	7	3	3	31	2	6	3	62	7	13	5	0	1	0	0
Intervention − Comparison Rate		0	167	0	167	−268	125	−667	0	70	125	0	−1,000	0	0	0	0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 13. Hospital Unplanned Readmission Rates per 1,000 Admissions: Prosser – Cohort 3



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

ED visits per 1,000 participants are shown in ***Table 19*** and ***Figure 14***, showing a similar pattern as spending and hospital admissions whereby the post-intervention period shows higher ER utilization for the treatment group than for the comparison group.

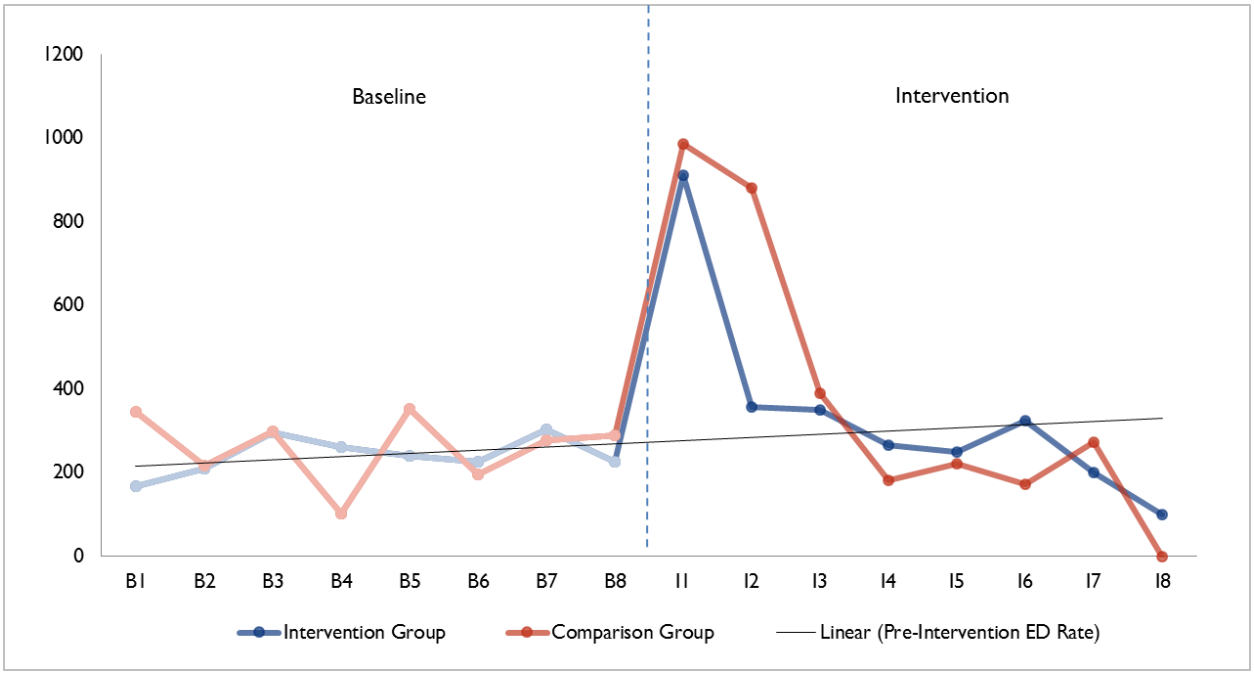
Table 19. ED Visits per 1,000 Participants: Prosser – Cohort 3

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 331036	Prosser																
	ED rate	168	209	297	261	241	227	303	226	911	357	350	267	250	324	200	100
	Std dev	485	509	930	599	599	644	1,052	523	884	763	781	660	543	684	500	316
	Unique patients	107	110	111	111	116	119	122	124	124	98	80	60	40	34	25	10
Comparison Group																	
1C1CMS 331036	Prosser																
	ED rate	345	217	298	102	353	195	277	289	987	881	390	183	222	172	272	0
	Std dev	1,068	805	1990	520	1,740	630	1,856	1,683	2,795	2,674	1,004	798	936	1,045	1,374	0
	Unique patients	121	121	121	121	124	124	124	124	124	101	85	66	45	39	26	14
Intervention − Comparison Rate		−177	−8	−1	160	−112	32	26	−63	−75	−524	−40	84	28	151	−72	100

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 14. ED Visits per 1,000 Participants: Prosser – Cohort 3



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Regression Analysis

Cohort 3

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit. All regressions included an indicator variable for the treatment group, an indicator variable for each quarter, and quarterly indicators that interacted with the treatment group variable in the post-intervention period. Besides matching by propensity score, we controlled for age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The regression specification assumes the same quarterly fixed effect for treatment and comparison individuals in the pre-innovation period and allows for a separate quarterly effect for treatment individuals after enrolling in the innovation.

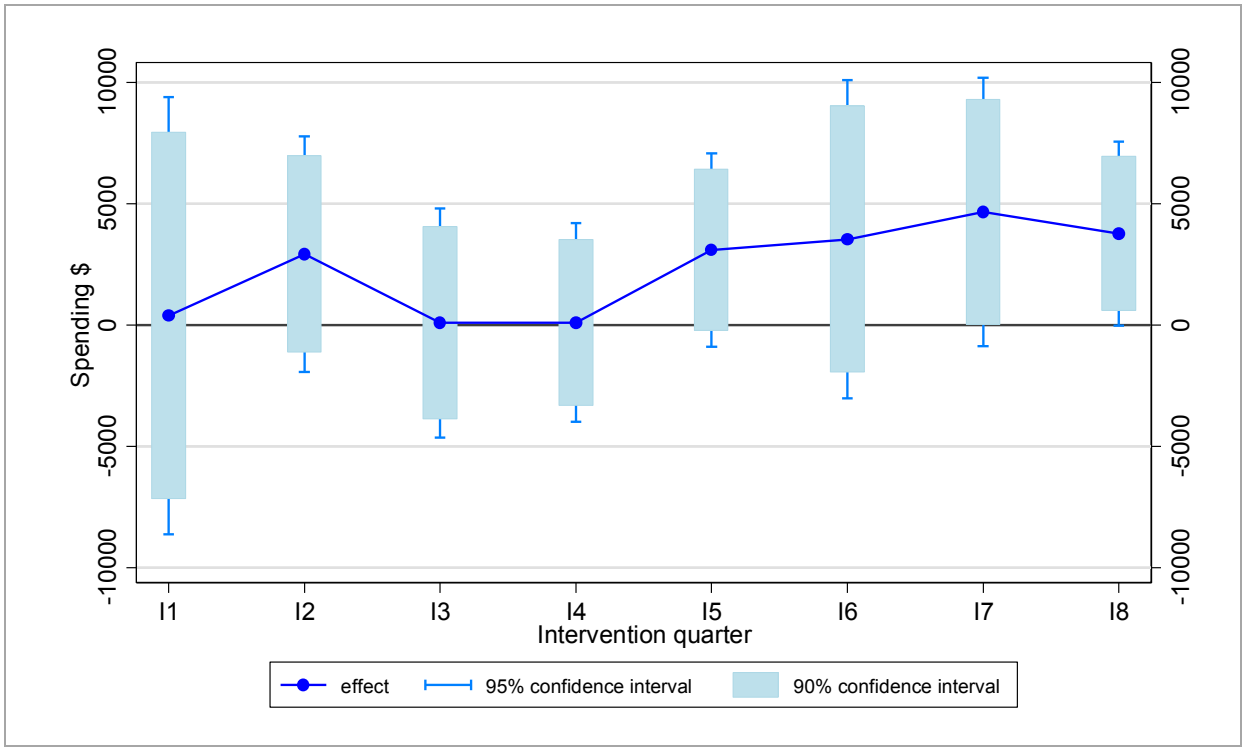
Table 20 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. ***Figure 15*** illustrates these quarterly difference-in-differences estimates. Evidence of losses persist throughout all post- intervention periods, although these are not significantly different from zero at the conventional levels.

Table 20. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Prosser – Cohort 3

Quarter	Coefficient	Standard Error	P-Values
I1	385	4,603	0.934
I2	2,922	2,473	0.239
I3	86	2,414	0.972
I4	98	2,089	0.963
I5	3,090	2,033	0.130
I6	3,533	3,345	0.292
I7	4,663	2,819	0.100
I8	3,768	1,937	0.053

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
OLS = ordinary least squares.

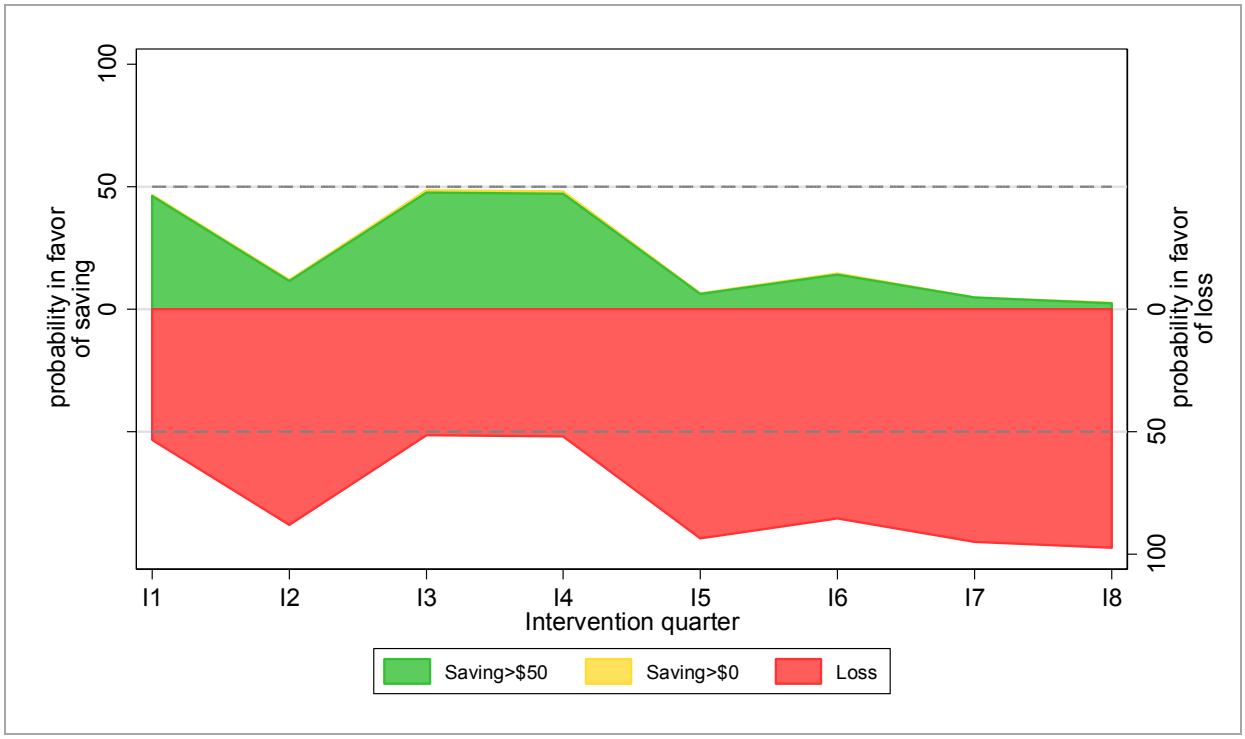
Figure 15. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Prosser – Cohort 3



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
OLS = ordinary least squares.

Figure 16 presents the strength of evidence in favor of a saving or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis.

Figure 16. Quarterly Strength of Evidence in Favor of Saving/Loss: Prosser – Cohort 3



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

We also present the overall weighted average treatment effect per member per quarter during the intervention period for beneficiaries enrolled in the innovation compared with their matched comparison group. The weighted average quarterly spending differential in the post-innovation period, indicating a loss, is $−1,581 (90% CI: −$4,576, $1,141) per member per quarter. This effect is not statistically significant. This figure represents the differential spending per quarter in the post-intervention period between individuals enrolled in the innovation and comparison groups, on average, weighted by the number of intervention beneficiaries in each quarter. The 90 percent confidence interval is the range in which the true parameter estimate falls, with 90 percent confidence.

We also present linear probability model coefficients for inpatient admissions and outpatient emergency department visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does

not result in the estimated effect.[3] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, their coefficients have often been empirically demonstrated to be consistent with marginal effects generated from non-linear models.[4] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention), not just the direction of the effect.

There is no statistically significant effect on inpatient admissions in any of the eight intervention quarters. The average quarterly difference-in-differences estimate for inpatient admissions is −0.6 percentage point, indicating that the treatment-control difference is 0.6 percentage point lower during the intervention period. This is the average difference in inpatient admission probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is not statistically significant (90% CI: −.073, .060).

Table 21. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: Prosser – Cohort 3

Quarter	Coefficient	Standard Error	P-Values
I1	−0.09	0.10	0.387
I2	0.03	0.06	0.601
I3	−0.03	0.08	0.715
I4	0.05	0.09	0.575
I5	0.08	0.05	0.120
I6	−0.06	0.14	0.663
I7	0.09	0.06	0.155
I8	0.12	0.08	0.124

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.

There is no statistically significant effect on ED admissions in any of the eight intervention quarters (***Table 22***). The average quarterly difference-in-differences estimate for ED visits is 4.4 percentage points, indicating that the treatment-control difference is 4.4 percentage points higher during the intervention period. This is the average difference in ED visit probability for all intervention quarters,

[3] To obtain the correct effect, it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run, even when not competing with other users for computer resources.

[4] Angrist, J.D., and Pischke J.-S. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

weighted by the number of beneficiaries in the quarter. The effect is not statistically significant (90% CI: −.072, 0.160).

Table 22. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: Prosser – Cohort 3

Quarter	Coefficient	Standard Error	P-Values
I1	0.11	0.10	0.271
I2	−0.04	0.11	0.697
I3	−0.05	0.13	0.701
I4	0.14	0.09	0.133
I5	0.06	0.10	0.578
I6	0.16	0.11	0.160
I7	−0.07	0.19	0.696
I8	0.04	0.11	0.707

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.

Discussion

The descriptive statistics are based on very small numbers of treatment and comparison group beneficiaries and, therefore, should be viewed with caution. The measures suggest similar trends for the treatment and comparison group for the outcomes of interest during the baseline periods. Higher spending and utilization in the first quarter are likely due to the enrollment criteria for the intervention, which are based on recent utilization. Although the PSM applied in Cohort 3 provides fair balance in matching participants with controls, we lose approximately 19 percent of our sample in the process. In further reports we hope to improve identification of comparison group members subject to data availability and sufficient sample size. PSM may help control for sample selection into the treatment group on the basis of observable variables, but we cannot rule out selection based on unobservable variables.

Medicaid Claims Analysis

In this reporting quarter we linked 57 fee-for-service participants in the treatment group to Medicaid claims in Alpha-MAX data set in the Chronic Conditions Data Warehouse. These participants enrolled between January 2013 and December 2013. Compared to the previous reporting quarter, we gained one more quarter of Alpha-MAX data availability for the state of Washington and 33 more participants.

Comparison Groups

We used PSM to identify nonparticipants who had similar characteristics to participants in the intervention. Because relatively few Medicaid patients were enrolled in the intervention, we had to pool the three Prosser cohorts for PSM. ***Table 23*** describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. ***Figure 17*** shows the distribution of the propensity scores for both the comparison and intervention group. ***Appendix B.2*** provides technical details on the propensity score methodology. One treatment beneficiary was dropped from the subsequent analyses due to the lack of an appropriately matched comparison beneficiary.

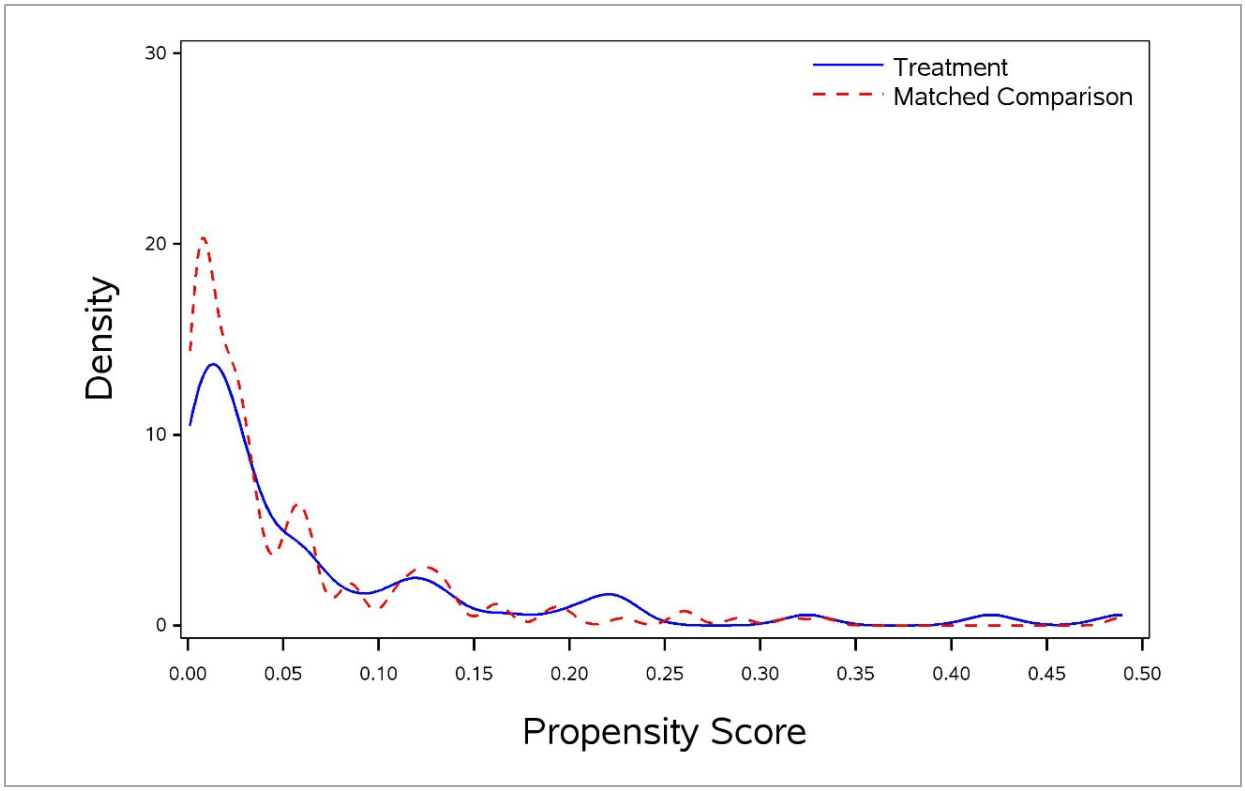
Table 23 describes the mean values and standardized differences of the variables of interest included in the propensity score model. ***Figure 17*** shows the distribution of the propensity scores for the comparison and intervention group. Only three out of nine of the explanatory variables in the PSM achieve good balance, with the absolute standardized differences less than 0.10. The distributions of propensity scores for the comparison and treatment groups are relatively close despite lack of match for individual variables. This issue occurs because we are pooling three very different cohorts' together due to lack of data to analyze any of them independently.

Table 23. Mean Values and Standardized Differences of Variables in Propensity Score Model: Prosser

Variable[1]	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrolment	$3,406	$6,464	$1,306	$2,719	0.424	$2,723	$3,927	$3,125	$2,947	0.116
Total payments second, third, fourth, and fifth calendar quarters prior to enrolment	$7,203	$10,775	$4,814	$9,445	0.236	$7,332	$10,828	$7,729	$6,414	0.045
Percentage with ED visit in calendar quarter prior to enrolment	0.16	0.65	0.05	0.32	0.207	0.16	0.65	0.25	0.51	0.152
Percentage with inpatient stay in calendar quarter prior to enrolment	0.07	0.26	0.02	0.14	0.239	0.07	0.26	0.09	0.17	0.081
Age	67.41	16.34	49.39	21.99	0.930	67.48	16.48	64.71	11.36	0.196
Percentage male	50.88	50.44	28.28	45.04	0.672	51.79	50.42	46.43	30.07	0.152
Percentage not white	64.91	48.15	39.1	48.8	0.756	64.29	48.35	68.45	28.02	0.125
Percentage disabled	38.6	49.11	40.56	49.11	0.057	39.29	49.28	39.29	29.45	0.000
Number of dual eligible months in the previous calendar year	8.91	4.96	7.33	5.78	0.294	9.07	4.85	8.29	3.16	0.192
Number of beneficiaries	57	—	4,332	—	—	56	—	155	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
ED = emergency department.

Figure 17. Distribution of Propensity Scores for Comparison and Intervention Groups: Prosser



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.

Descriptive Analysis

Table 24 reports Medicaid spending per patient in the eight quarters before and the four quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors. The spending rates are very similar between the intervention and comparison groups in the baseline period. For the intervention group, spending increases noticeably in the first post-intervention quarter because individuals are selected into treatment due to their medical utilization such as an ED visit or a surgical procedure; spending for the treated group declines in the next three quarters.

Table 24. Medicaid Spending per Patient: Prosser

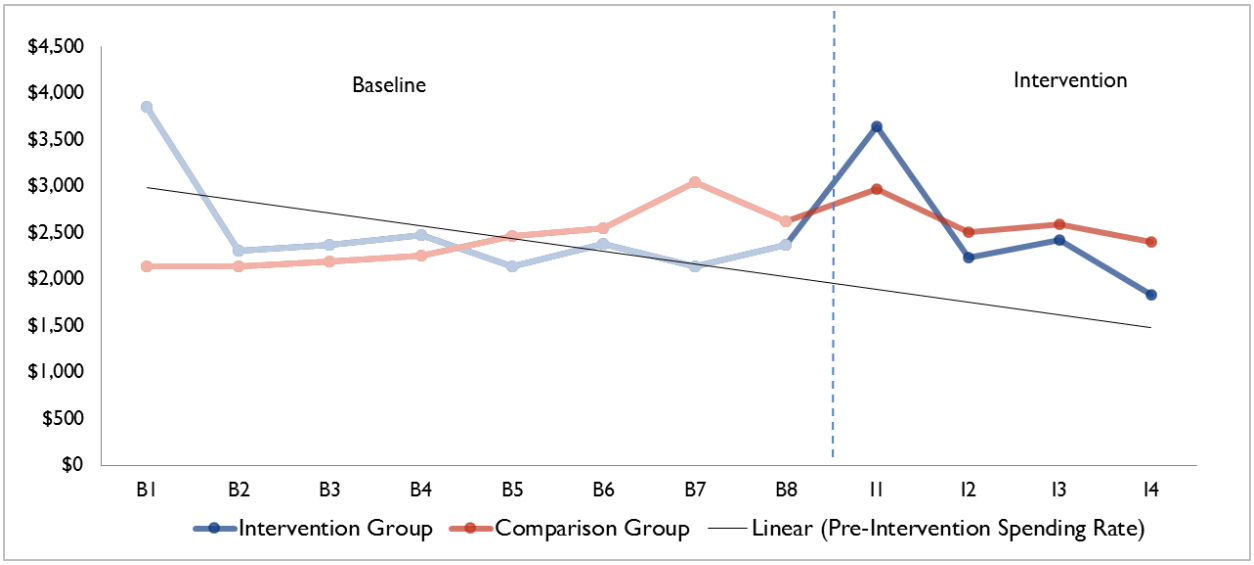
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters			
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4
Intervention Group													
1C1CMS 331036	Prosser												
	Spending rate	$3,857	$2,309	$2,366	$2,476	$2,141	$2,384	$2,138	$2,372	$3,643	$2,230	$2,422	$1,830
	Std dev	$9,425	$3,147	$3,057	$3,010	$2,848	$3,124	$2,886	$3,284	$6,650	$2,771	$3,000	$1,762
	Unique patients	39	38	40	42	44	47	47	51	55	46	32	14
Comparison Group													
1C1CMS 331036	Prosser												
	Spending rate	$2,135	$2,138	$2,185	$2,256	$2,463	$2,549	$3,038	$2,619	$2,966	$2,503	$2,589	$2,404
	Std dev	$1,846	$1,715	$1,581	$1,629	$1,856	$2,022	$2,835	$2,239	$3,947	$2,131	$2,169	$1,857
	Unique patients	48	45	45	45	46	47	53	54	50	45	35	15
Savings per Patient		−$1,722	−$171	−$180	−$219	$322	$164	$901	$247	−$677	$274	$167	$573

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 18 illustrates the Medicaid spending per beneficiary in Table 24 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 18. Medicaid Spending per Patient: Prosser



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 25*** and ***Figure 19.*** Trends in the inpatient admissions rate for the intervention and comparison groups are again very similar to each other throughout the baseline period. The admissions rate for the intervention group rises noticeably above the trend line in the first post-intervention quarter, but it declines subsequently thereafter, albeit not to the pre-intervention trend line.

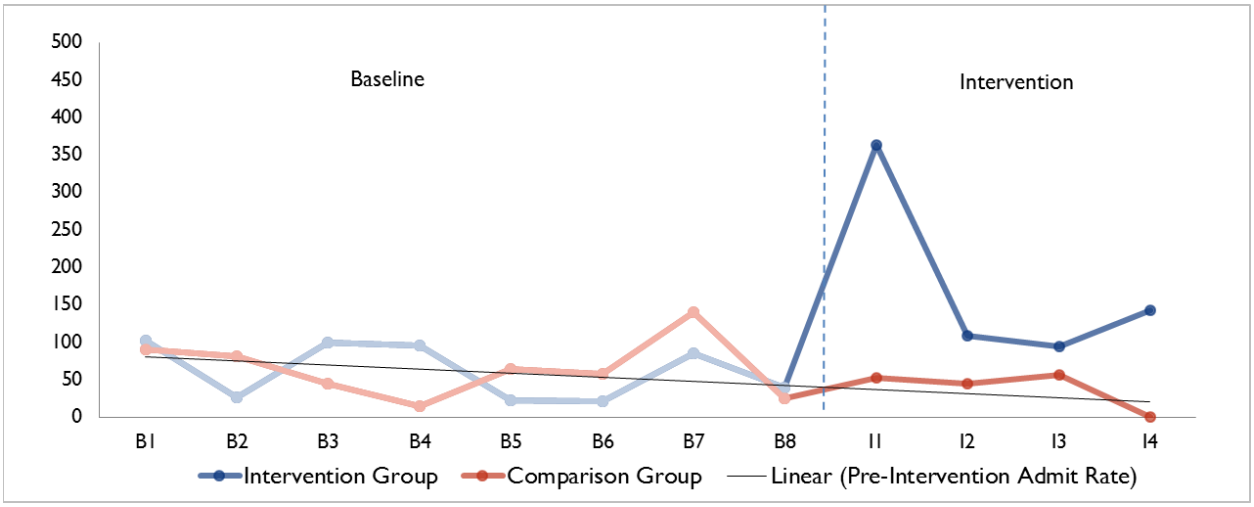
Table 25. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Prosser

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters			
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4
Intervention Group													
1C1CMS 331036	Prosser												
	Admit rate	103	26	100	95	23	21	85	39	364	109	94	143
	Std dev	307	162	304	297	151	146	282	196	522	315	296	363
	Unique patients	39	38	40	42	44	47	47	51	55	46	32	14
Comparison Group													
1C1CMS 331036	Prosser												
	Admit rate	90	81	45	15	65	57	139	25	53	44	57	0
	Std dev	106	179	185	58	112	141	206	139	99	73	76	0
	Unique patients	48	45	45	45	46	47	53	54	50	45	35	15
Intervention − Comparison rate		13	−55	55	80	−42	−36	−54	15	311	65	37	143

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 19. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Prosser



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 26*** and ***Figure 20.*** The unplanned readmissions rate for both the comparison group is zero through all periods. In all cases, but in the quarter preceding the intervention, there are no readmissions and the numerator for the measure is 0 for the treatment group too.

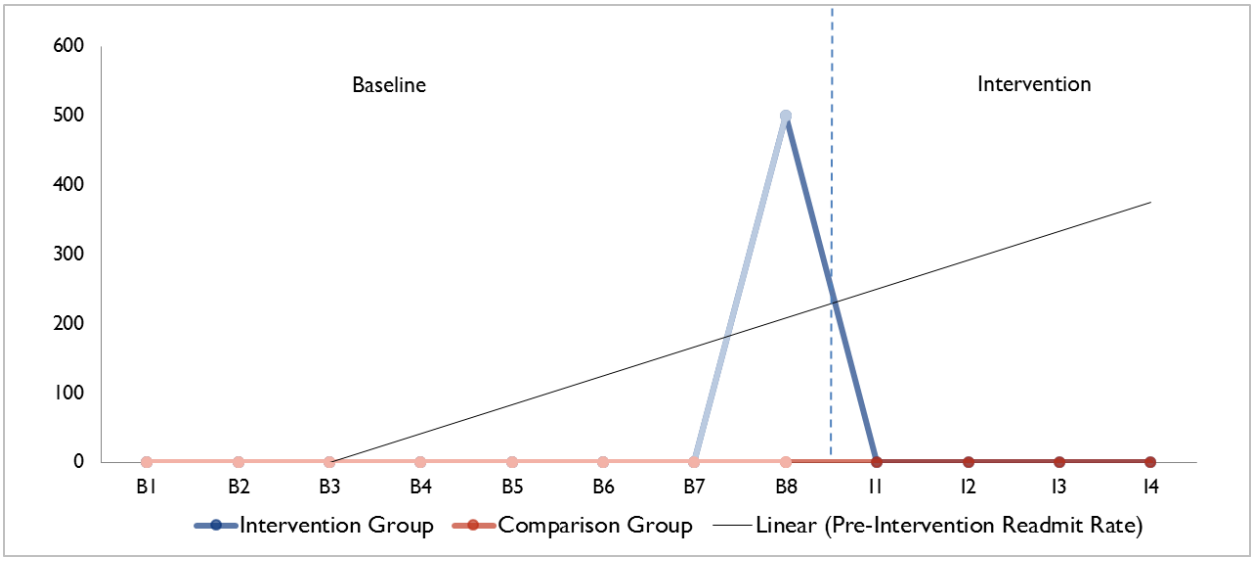
Table 26. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Prosser

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters			
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4
Intervention Group													
1C1CMS 331036	Prosser												
	Readmit rate	0	0	0	0	0	0	0	500	0	0	0	0
	Std dev	0	0	0	0	0	0	0	500	0	0	0	0
	Total admissions	4	1	4	4	1	1	4	2	19	5	1	2
Comparison Group													
1C1CMS 331036	Prosser												
	Readmit rate	0	0	0	0	0	0	0	0	0	0	0	0
	Std dev	0	0	0	0	0	0	0	0	0	0	0	0
	Total admissions	8	9	6	2	9	6	12	4	6	6	4	0
Intervention − Comparison rate		0	0	0	0	0	0	0	500	0	0	0	0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 20. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Prosser



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.

ED visits per 1,000 participants are shown in ***Table 27*** and ***Figure 21***. The ED visit rates for both groups follow a similar pattern across all periods. The rates are both volatile and hover around the baseline trend line.

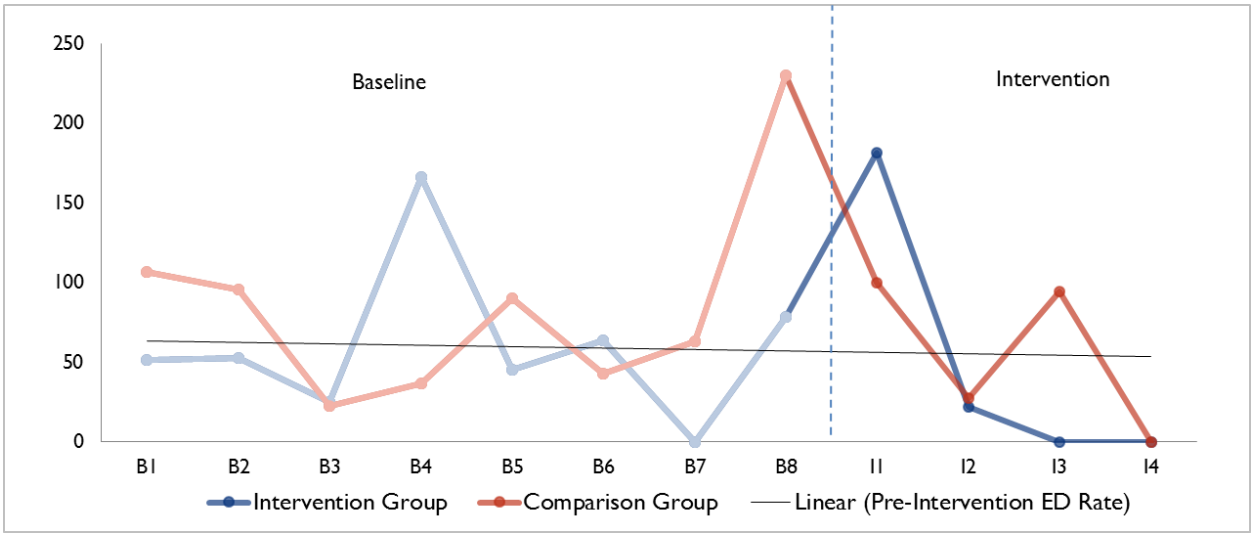
Table 27. ED Visits per 1,000 Participants: Prosser

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters			
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4
Intervention Group													
1C1CMS 331036	Prosser												
	ED rate	51	53	25	167	45	64	0	78	182	22	0	0
	Std dev	320	324	158	935	302	438	0	440	905	147	0	0
	Unique patients	39	38	40	42	44	47	47	51	55	46	32	14
Comparison Group													
1C1CMS 331036	Prosser												
	ED rate	107	96	22	37	90	43	63	230	100	28	94	0
	Std dev	363	346	443	96	133	118	209	213	194	211	0	0
	Unique patients	48	45	45	45	46	47	53	54	50	45	35	15
Intervention − Comparison rate		−56	−43	3	130	−44	21	−63	−152	82	−6	−94	0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 21. ED Visits per 1,000 Participants: Prosser



Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.

Discussion

The Medicaid descriptive statistics for the outcomes values of interest suggest similar trends for the treatment and comparison group for the outcomes of interest during the baseline periods. Higher spending and utilization in the first quarter are likely due to the enrollment criteria for the intervention, which are based on recent utilization. Although the PSM provides fair balance in matching participants with controls using patients as the unit of analysis, more participants might permit improved identification of comparison group members with high spending early in I1 (that could have potentially triggered enrollment in the innovation). Adding more participants could be accomplished by using hospital admissions and ED episodes as the unit of analysis. The constraint we face, however, is a very small Medicaid sample size and, therefore, the impossibility of treating the three rather different Prosser cohorts in separate analyses.

1.3.3 Other Awardee-Specific Data

We received patient-level data from Prosser used to generate each measure listed in Tables 4 and 28 for each quarter through Q11 (March 31, 2015). ***Table 28*** lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report.

Table 28. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Clinical effectiveness	Coordinated Care	Percentage of patients who:	
		make follow-up appointments,	Data received from Prosser
		fill their prescriptions, and	Data received from Prosser
		understand their discharge instructions from beginning until end.	Data received from Prosser

Prosser = Prosser Public Hospital District.

Clinical Effectiveness

Evaluation Question

- To what extent has a CP visit increased the proportion of patients who (1) make their follow-up appointments, (2) fill prescriptions according to discharge instructions, and (3) understand their discharge instructions from beginning until end?

Patients were asked to complete an assessment before and after their CP visit. This assessment included questions about whether patients were able to make their own PCP appointments, fill their own prescriptions, and understand their discharge instructions. The goal of the pre-assessment is to determine what services are needed during the CP visit, and the post-assessment determines whether the patient believed the CP provided the services.

Table 29 includes the total percentage of patients who indicated "yes" on the post-assessment as a percentage of those receiving the services at all (i.e., those indicating "no" on the pre-assessment). Although the vast majority of patients who received help reviewing their discharge instructions indicated that they understood their discharge instructions after the CP visit (92.2%), the majority of patients did not note a change in their ability to make PCP appointments or fill their prescriptions after the CP visit (47.6% and 28.8%, respectively).

Table 29. Number and Percentage of Patients Achieving Outcomes Based on Specific CP Services Provided: Prosser

CP Service	Total Number of Participants Receiving CP Service[1]	Total Number of Participants Post-CP Visit Achieving Outcome[2]	Percentage of Participants Receiving CP Service that Achieved Outcome Post-CP Visit
Help making PCP appointments	166	79	47.6
Help filling prescriptions	73	21	28.8
Review of discharge instructions	141	130	92.2
Total	275	177	64.4

Source: Patient-level data provided to RTI by Prosser.
[1] Includes all patients that indicated "no" on the pre-assessment of activities (i.e., they had not made a PCP appointment, filled their prescription and/or had reviewed their discharge instructions) to be provided by CP.
[2] Includes all patients that indicated "yes" on the post-assessment of activities (i.e., they made a PCP appointment, filled their prescription, and/or reviewed their discharge instructions) provided by CP.
CP = community paramedic; PCP = primary care provider.

Discussion of Other Awardee-Specific Findings

Overall, the majority of patients that Prosser reached indicated that they do not need help with filling their prescriptions, making a PCP appointment, or reviewing their discharge instructions. Of those who indicated they need help filling their prescriptions during the pre-assessment, only about a third reported that the CP visit resulted in a filled prescription. Regarding making a PCP appointment, while a number of participants received the service, slightly less than half noted the visit actually resulted in an appointment made after the CP visit. Interestingly, many patients noted that they did not understand their discharge instructions before the CP visit, whereas the vast majority noted they did understand their instructions after the CP visit. This difference may be occurring because the CP can easily walk through the discharge instructions with the participant during the visit and can explain them, whereas the other two services are more complex and rely on further interactions with the health care system such as the PCP office or pharmacy. The results, however, are based on a small sample size and therefore, we cannot make any conclusions regarding the impact of the innovation on the participant's understanding of their instructions.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing Prosser as well as accomplishments to date. In this section we assess Prosser's progress on achieving HCIA goals to date:

- **Smarter spending.** The probability of Medicare loss for Cohort 3 is higher than the probability of savings. The evidence, however, might be inconclusive at this time given the small sample size.

- **Better care.** Individuals that opted into the CP program tend to have higher rates of ED visits than those who refused the program. Reach has been fairly consistent across the three cohorts over time. Reach is highest, however, for Cohort 2 (85.7%).

  Overall, although all patients have their needs assessed, the majority did not receive one of the three initially targeted services from the CP (70.7%). The innovation seems to have the most effect in helping patients understand their discharge instructions after the CP visit (92.2% reported they understood instructions more completely). Following the CP visit, a smaller percentage of patients noted a change in making PCP appointments or filling their prescriptions (47.6% and 28.8%, respectively). This result could be because patients already made an appointment with their PCP before the CP visit and also filled their prescriptions.

- **Healthier people**. Since we do not receive health outcome data from Prosser, we are unable to assess the effect of the innovation on patients' health.

Leadership support for the innovation increased noticeably since Year 1. This support is largely due to the project staff's efforts to educate other departments within the hospital and community agencies about the innovation and how it can complement the work already provided. This year, as more individuals came into contact with the CPs, collaborative efforts have increased to reach those patients most likely to benefit from CP services.

Prosser's innovation had the advantage of being implemented in a small community where members of the hospital and staff work closely together. Once awareness was raised about the CPs' work and buy-in achieved among CPs, momentum increased this year to ensure those who could benefit from the innovation were reached. This momentum is most evident in the addition of the referral network with Kadlec Regional Hospital.

The small size of the team who implemented the innovation was instrumental because they were able to be more flexible and make improvements midstream to the training curriculum, scheduling protocol, and responsibilities of the nurse case manager. Had Prosser been a larger, more complex system with more layers of bureaucracy, these improvements would probably not have been easily undertaken. That said, in this smaller setting and smaller patient population, changes in health outcomes have been more challenging to capture. Given the low numbers, we are unable to make any inferences regarding the effectiveness of the innovation to achieve better health for those patients served. The innovation is likely more effective with certain types of patients, particularly those who received surgery (Cohort 2) and those with chronic health conditions but not high utilizers (Cohort 3).

The CP innovation will be sustained with dedicated funding from Prosser. Efforts are also under way to determine how insurance carriers for Prosser can include CP services as a contract addendum as another means of sustaining the program. In addition, the Washington state legislature has taken great interest in the model and is working through the Department of Health to develop standards for training and accreditation, which may further institutionalize the CP approach.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Regional Emergency Medical Services Authority

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March 2016

RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources. For REMSA specifically, usable data was provided only through Q10. Therefore, all data presented in this report are through December 2014.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–December 2014

Regional Emergency Medical Services Authority (REMSA)

1.1 Introduction

The Regional Emergency Medical Services Authority (REMSA) is a nonprofit emergency medical services (EMS) provider in Reno, NV, which is the exclusive provider of ground transport services for the cities of Reno and Sparks and for Washoe County. REMSA received an award of $10,824,025, beginning on December 10, 2012 to implement programs that would promote the appropriate utilization of health care services. The innovation seeks to achieve the following HCIA goals:

1. **Smarter spending.** Reduce spending (per-patient cost by $10.5 million over 3 years for Washoe County acute and nonacute patients) by reforming existing payment systems to achieve sustainable funding for patient care services.

2. **Better care.** Improve care by increasing access to appropriate levels of quality care and treatment.

3. **Healthier people**. Improve health by establishing new linkages between the emergency ambulance delivery system and the broader health care delivery system by engaging key health care partners, community stakeholders, and target patient populations, and by finding alternative pathways for patients seeking evaluation of urgent medical conditions.

Table 2 provides a summary of changes that occurred with REMSA during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data submitted by REMSA through December 31, 2015; and key informant interviews with REMSA leaders and staff conducted on June 5, 2015.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	REMSA's Community Health Program includes three unique components: Community Paramedics, Ambulance Transport Alternatives, and the Nurse Health Line.
Program Participant Characteristics	Across the entire innovation of three components, 12,336 individuals enrolled or had an encounter. Almost one-third (29.2%) of participants were younger than 18 years of age; 60.5% were female. Insurance status was only available for the CP and CP E&R programs. For CP, 69.7% were dual eligibles or had either Medicare, Medicare Advantage or Medicaid, and for CP E&R, 41.1% were dual eligibles or had either Medicare, Medicare Advantage or Medicaid.
Implementation Process	
Execution	Through Q10 spending was below target, at 41.5% of this year's budget.
Leadership	This innovation has a clearly established leader with the requisite experiences, skills, and authority to marshal resources and make decisions.

(continued)

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Implementation Process (continued)	
Organizational capacity	This innovation is provided with adequate space, technology, and equipment to operate this innovation with few challenges or issues.
Innovation adoption and workflow	REMSA used existing relationships and skills to ensure innovation adoption and workflow integration both internally and externally.
Workforce Development	
Hiring/retention	At the end of Q10, REMSA had 18.3 FTEs, which is below the projected number. They analyzed reasons for separations and used those lessons to make strategic hiring decisions.
Training	Between Q8 and Q10, REMSA provided 2,686 hours of training to 16 personnel.
Implementation Effectiveness	
Reach	Reach is based on encounter-level data for CP E&R, ATA, and NHL while the CP component is based on the number of unique participants. The CP component reached 55.1% of the target population, CP E&R reached 94.4% of the target population, ATA reached 12.2% of the target population, and NHL reached 10.9% of the target population.
Dose	Dose is only relevant to the CP component. Patients enrolled in the CP program receive on average 5.4 home visits during the 30 days of their enrollment.

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by REMSA.
Key informant interviews conducted Feb–June 2015.

[1] RTI currently only reports payer category data for the CP and CP E&R components of the innovation. RTI expects to receive payer information for the other components for reporting in the next annual report.

ATA = Ambulance Transport Alternatives; CP = Community Paramedic; E&R = Evaluate and Refer; FTE = full-time equivalent; NHL = Nurse Health Line; Q = quarter; REMSA = Regional Emergency Medical Services Authority.

1.1.1 Innovation Components

REMSA's Community Health Program (CHP) is complex and initially included three components: (1) Community Paramedics (CPs) to reduce avoidable hospital readmissions by conducting home visits and performing medication reconciliation with at-risk discharged patients (those with congestive heart failure (CHF) or chronic obstructive pulmonary disease (COPD) and frequent 911 users); (2) Ambulance Transport Alternatives (ATA) in which low-acuity patients who call 911 can be transported by ambulance to a more appropriate location than the ED (urgent care center, community triage center, detoxification center, mental health hospital, or clinic); and (3) the Nurse Health Line (NHL), an alternate non-911 number that callers with low-acuity problems can use to gain access to a health professional who will triage the call and determine a recommended level of care.

Health information technology (HIT) and a community outreach program support these components.

Since the first annual report, the awardee has added a fourth component of having the CPs Evaluate and Refer (E&R) patients.[1] For this component, local physicians call the CPs when a patient calls with complications or complaints and the physician believes the patient should be assessed but is unsure whether a trip to the ED is necessary. The CP goes to the patient's home to assess his/her condition, then calls the physician to describe the situation; together, they decide the patient's care plan. Although this scenario was detailed and discussed in the first annual report, RTI only recently began receiving the secondary data for this program.

The six original partners for this innovation remain unchanged, although REMSA expanded its services to more patients by adding contracts with two new locations for alternative patient transports. By the end of Q10, REMSA arranged for a total of 16 non-ED locations that agreed to receive patient transports. REMSA completed contracts with the HOPES clinic to provide primary care office visits to uninsured patients transported or referred by REMSA and with the WestCare community triage center to provide observational office visits to uninsured patients transported or referred by REMSA.

1.1.2 Program Participant Characteristics

Because of an issue with the usability of the files provided to RTI, the patient-level data included in this report is only through December 31, 2014. ***Table 3*** provides the demographic characteristics of all participants ever enrolled in the innovation, through Q10. We first reported reach in the first annual report, based on data through Q7. The distribution of patient characteristics is similar to that in the first report. Demographic data are separated below by program component, showing the different distribution of characteristics for participants in each of the four program components. In general, data presented for the ATA, NHL, and CP E&R components are encounter-level. The participant characteristics, however, only include unique individuals (not encounters) to avoid double counting; thus, the numbers in ***Table 3*** will differ from the number of encounters presented in the reach tables for the ATA, NHL, and CP E&R component. The CP program examines participants at the individual level, not the encounter level.

Participants in each component increased steadily since the first annual report. The majority of the ATA participants (72.2%) were 25 to 64 years old and more than half (70.7%) were male. For the NHL component, nearly one-third of participants were children under 18 (32.2%), which is likely due to the high volume of calls from parents; more than half (63.0%) were female. For the CP E&R component, more than half (55.1%) were 85 years or older, and almost 67 percent were female. For the CP enrollment program, one-third of its participants (36.6%) were between 45 to 64 years old, and over half (56.6%) were male. Payer data were only available for the CP enrollment and the CP E&R programs. In the CP enrollment program, 34.4 percent of participants were covered by Medicare, 17.4 percent by Medicare Advantage, and 16.6 percent by Medicaid. In the CP E&R program, 33.3 percent were covered by Medicare, 1.3 percent were covered by Medicaid, and 19.3 percent were uninsured.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through Q11[1]

Characteristic	ATA Participants		CP Participants		CP E&R Patients Referred		NHL Participants		Participants In All Components	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Total Number	Percentage
Total	566	100.0	579	100.0	78	100.0	11,113	100.0	12,336	100.0
Age										
<18	13	2.3	0	0.0	1	1.2	3,571	32.2	3,585	29.1
18–24	49	8.7	3	0.5	0	0	1,248	11.2	1,300	10.5
25–44	175	30.9	40	6.9	2	2.6	2,677	24.1	2,894	23.5
45–64	234	41.3	212	36.6	2	2.6	2,102	18.9	2,550	20.7
65–74	60	10.6	135	23.3	7	9.0	834	7.5	1,036	8.4
75–84	14	2.5	114	19.7	21	26.9	446	4.0	595	4.8
85+	10	1.8	67	11.6	43	55.1	235	2.1	355	2.9
Missing	11	1.9	8	1.4	2	2.6	0	0	21	0.2
Sex										
Female	166	29.3	244	42.2	52	66.6	7,000	63.0	7,462	60.5
Male	400	70.7	328	56.6	25	32.1	4,113	37.0	4,866	39.4
Missing	0	0.0	7	1.2	1	1.3	0	0.0	8	0.1
Race/ethnicity										
White	—	—	—	—	—	—	—	—	—	—
Black	—	—	—	—	—	—	—	—	—	—
Hispanic	—	—	—	—	—	—	—	—	—	—
Asian	—	—	—	—	—	—	—	—	—	—
American Indian or Alaska Native	—	—	—	—	—	—	—	—	—	—
Native Hawaiian or Other Pacific Islander	—	—	—	—	—	—	—	—	—	—
Other	—	—	—	—	—	—	—	—	—	—
Missing/ refused	—	—	—	—	—	—	—	—	—	—

(continued)

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through Q11[1] (continued)

Characteristic	ATA Participants		CP Participants		CP E&R Patients Referred		NHL Participants		Participants In All Components	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Total Number	Percentage
Payer Category[2]										
Dual	0	0.0	7	1.3	0	0.0	0	0.0	7	0.1
Medicaid	0	0.0	96	16.6	1	1.3	0	0.0	97	0.8
Medicare	0	0.0	199	34.4	26	33.3	0	0.0	225	1.8
Medicare Advantage	0	0.0	101	17.4	5	6.4	0	0.0	106	0.9
Other	0	0.0	46	7.9	5	6.4	0	0.0	51	0.4
Uninsured	0	0.0	76	13.1	15	19.3	0	0.0	91	0.7
Missing	566	100.0	54	9.3	26	33.3	11,113	100.0	11,759	95.3

Source: Patient-level data provided to RTI by REMSA.
Note: Due to long-standing EMS operating procedures, REMSA does not collect data regarding race/ethnicity.
[1] The participant characteristics includes unique individuals (not encounters); thus, the numbers in ***Table 3*** differ from the number of encounters presented in the reach tables for each program component.
[2] REMSA provided 21 individuals with a secondary payer. That information is not included here because it is less than 0.1 percent of those enrolled in the innovation. RTI currently only reports payer category data for the CP and CP E&R components of the innovation. RTI expects to receive payer information for the other components for reporting in the next annual report.
ATA = Ambulance Transport Alternatives; CP = Community Paramedic; E&R = Evaluate and Refer; FTE = full-time equivalent; NHL = Nurse Health Line; Q = quarter.
— Data not available.

1.2 Implementation Progress

The first annual report (2014) described REMSA's implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area. REMSA's self-monitoring plan utilizes a site-specific methodology that is tailored to the EMS-based initiative and is representative of the population served. ***Table 4*** lists these measures and their status as of May 31, 2015. The results of analyses for all of these measures are included in this annual report. As noted above data for REMSA is through December 2014 (Q10).

This section presents REMSA's process measures and a qualitative analysis of the factors that determined REMSA's implementation progress. This analysis draws on patient-level data that REMSA provided to RTI as of December 31, 2014, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation effectiveness	Reach	CP: Number/percentage of patients enrolled in the CP program	Data received from REMSA
		CP E&R: Number /percentage of patients visited by CPs	Data received from REMSA
		ATA: Number/percentage of patients transported to alternative location	Data received from REMSA
		NHL: Number/percentage of NHL callers	Data received from REMSA
	Dose	CP: Number of encounters/CP visits	Data received
Coordinated care	Efficiency	ATA: Repatriation to ED in the ATA	Data received from REMSA
		CP E&R: Evaluate and Refer patients sent to ED by CP	Data received from REMSA
		NHL: Number of NHL protocols completed with callers	Data received from REMSA
		NHL: Rate of repatriation in the NHL	Data received from REMSA

ATA = Ambulance Transport Alternatives; CHP = Community Health Program; CP = community paramedic; ED = emergency department; NHL = Nurse Health Line; Q = quarter; REMSA = Regional Emergency Medical Services Authority.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through REMSA's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include REMSA's reports from Q8 through Q10 and interviews conducted on June 5, 2015.

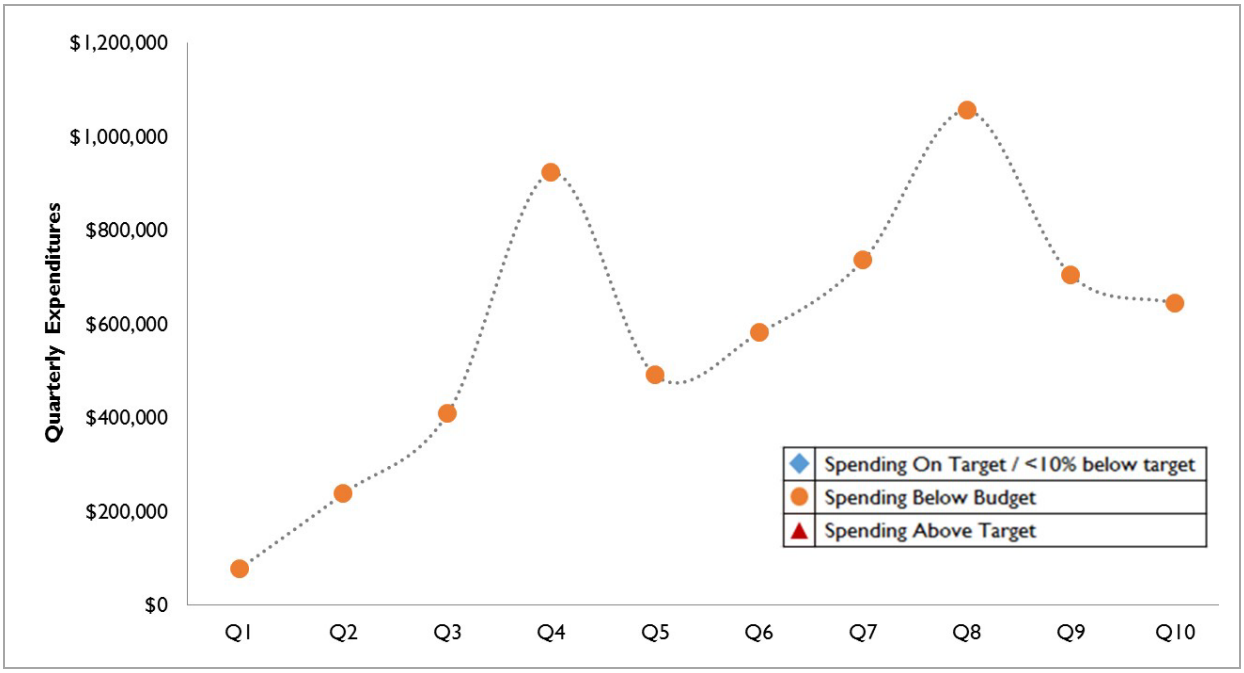
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

Execution of Implementation

The annual report highlights the significance of REMSA's expenditure rates on implementation. As of December 2014 (Q10), REMSA's spent 41.4 percent of its Year 3 budget, which is below the projected target.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Leadership

As stated in the first annual report, this innovation has a clearly designated leader with the requisite experience, skills, and authority to marshal resources and make decisions. She has significant experience working for ambulance companies, understands the billing and policy aspects, and has both a local and national perspective on issues regarding emergency medicine. This innovation has a high level of organizational support across all levels of the organization; the chief executive officer (CEO), chief medical officer, managers, supervisors, and coordinators all understand the innovation and can articulate their direct involvement.

One challenge that innovation leadership experienced in Year 3 was the lack of assistance at her level to deal both with running the innovation and planning for sustainability. REMSA was unable to hire a full-time employee (with benefits) to help because that position would not be sustainable after the end of the contact period, and then REMSA would have to rely on temporary part-time support personnel.

Organizationally, this innovation as remained a priority for high-level leaders, and the innovation continued to benefit from this support.

Organizational Capacity

REMSA has adequate space, technology, and equipment to operate this innovation and there were no challenges or issues in this aspect.

Innovation Adoption and Workflow Integration

Issues regarding the adoption of the components of the innovation and workflow integration occurred in some aspect for each component of REMSA's innovation.

Workflow integration was necessary for the NHL and the CP components of the innovation. The NHL was physically integrated into the Emergency Dispatch Center, and the nurse navigators needed to integrate with the emergency dispatchers. Although this setup allowed for easy transfer of nonemergency calls from 911 to the NHL (and vice versa), there was some concern about staff creating a cohesive unit. During the 2014 site visit, RTI learned that this hesitancy was due to a previous bad experience REMSA emergency medical dispatchers (EMDs) had when they shared a call center with nurse navigators from another organization before this innovation. However, there were no issues with the integration of the nurse navigators for the NHL in the current innovation, probably because NHL nurse navigators are a part of REMSA, the nurse navigators trained with the existing EMDs to understand the job, and REMSA recognized the previous issue and worked with all involved to address the hesitancy.

The CP's were easily accepted into the largest health care system, Renown Health, at the beginning of the innovation though it took time for physicians to become aware of their services and refer patients to this aftercare plan. This easy integration is attributed to the existing relationships with Renown Health staff, as well as including representatives from Renown in the innovation development process. The CPs work closely with the hospital to obtain daily rosters of those eligible for the program, and CPs then visit each patient to recruit them into the program.

Innovation adoption has also been an issue internally. For both CP and ATA, this innovation is a shift in the usual scope of work for a paramedic. For the CP component, paramedics are used to critical situations in which they quickly assess the patient and take him or her to the hospital (i.e., "load and go"). Transitioning to this new role of providing follow-up care to patients who are no longer in an urgent medical situation was a big shift. This challenge culminated in several CPs leaving their position in 2014, but as discussed in the workforce development section, REMSA used these lessons learned to recruit more effectively for the CP positions.

The ATA innovation did not remove paramedics from their traditional role, but did add the step of making advanced assessments to determine if a patient—who is not in a life-threatening situation—could be treated at an alternative location. Again, this shift in the usual protocol presented a challenge to paramedics who were used to taking all of their patients to the ED, regardless of condition. There was also concern about paramedics making medical decisions about patients without appropriate training and

protocols. To ensure the new protocol was adopted and followed, REMSA conducted educational sessions for the paramedics, as well as audits of each unit following their shifts, to determine if advanced assessments were being done on patients. REMSA also reviewed the documentation for eligible patients who were transported to alternative locations.

Although providers at REMSA were included in the HCIA Provider Survey, we are not reporting results among only REMSA providers due to a limited sample size. We do not report at the individual awardee level if there were less than 20 respondents and we received responses from 10 out of the 18 (55.6%) eligible providers surveyed. The data from REMSA providers will, however, be included in the cross-site analysis of the Provider Survey.

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was staffed with 18.3 full-time equivalent (FTE) staff members. The CP component of the innovation had some staffing challenges. For this component, REMSA initially recruited internally from existing paramedics; issues subsequently arose regarding the expectations of the new paramedics about their role as part of the innovation. Because the CP program had not begun at the time of recruitment, innovation leaders did not understand how much the conceptualized innovation would need to change so that it could be actualized. REMSA determined that it had to fully address candidates' expectations during the hiring process so that informed decisions about positions could be made on both sides. After two CP separations (and one promotion), REMSA used these lessons learned in hiring new staff for the CP positions.

Skills, Knowledge, and Training

Between Q8 and Q10, REMSA provided 2,686 hours of training to 16 personnel (6 nurse navigators, 3 community paramedics, and 7 employees needing continuing education). The 6 nurse navigators were involved in a 368-hour nurse navigator training to prepare them to work at the NHL. Three CPs took the new condensed CP training, which originally was a 16-week 500-hour course, but an evaluation determined that a condensed 4-week, 150-hour course would achieve the same outcomes of educating the CPs in a clinically safe manner.

REMSA has a well-organized in house training program that was established originally for the paramedics; they are well versed in developing curriculum to educate staff and used that strength in preparing current staff to implement this innovation.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach) and (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

Reach

Reach is a critical dimension for determining the extent to which an innovation met its goals of affecting key health behaviors. REMSA had a complex innovation with multiple components that must be assessed individually for reach. ***Figure 2*** shows reach by quarter since the launch of the innovation. We first reported reach in the first annual report, based on data through Q7. Since that time, REMSA enrolled an additional 8,884 unique patients across all components of the innovation, with reach varying depending on the component.

As of Q10, 579 patients enrolled in the CP component of the innovation, which is 55.1 percent of the target population, those who were referred to the CP program. Reach increased in Q10 for the second consecutive quarter.

As of Q10, in the CP Evaluate and Refer (E&R) component, REMSA reached 94.4 percent of its target population, which represents 78 unique patients or 102 E&R encounters. These participants were patients of primary care providers who engaged REMSA for help in assessing patients that the providers could not see. Overall reach decreased slightly (by a less than a percentage point) between Q9 and Q10 (-0.4%).

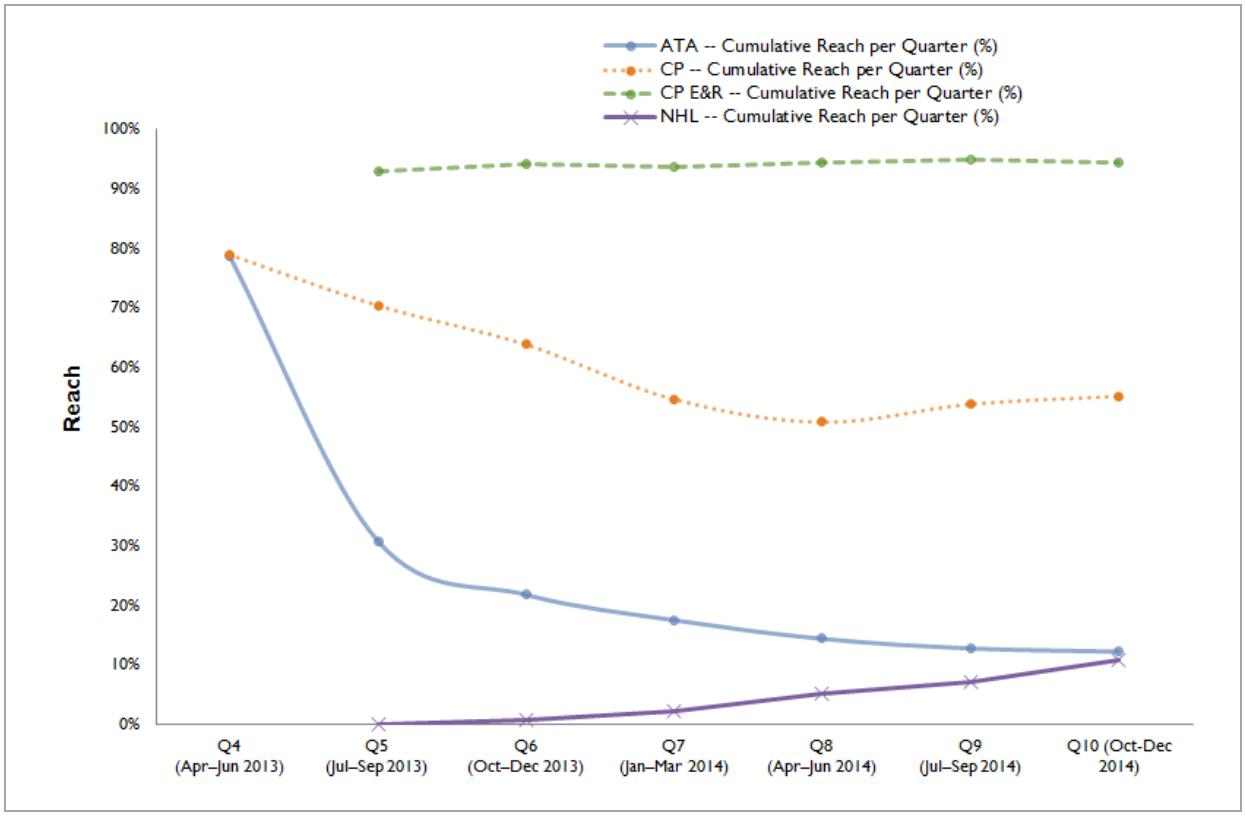
For the ATA component REMSA completed 773 transports to alternative destinations other than the ED through Q10, 12.2 percent of its eligible target population. These transports occurred for 566 unique patients; we expanded the definition of an alternative transport to include all individuals who were transported by REMSA paramedics to an alternative location. Previously, we reported only individuals who completed an advanced assessment and were transported. REMSA has subsequently reported that early in the launch of ATA, a few transports to alternative destinations occurred where an advanced

assessment was completed by the field medic but was not documented in the ambulance electronic patient care report. This deficiency was identified and corrected by REMSA.

Because many external factors influence whether an alternative transport is possible, the explanation of reach for ATA is difficult. These factors include: determining an appropriate alternative location (e.g., urgent care center, community triage/detoxification center, mental health hospital) with space available; finding an alternative location that accepts the patient's insurance or noninsurance status; and obtaining the patient's consent to transport him/her to the alternative location. If any of these factors is not aligned, the patient will refuse transport anywhere or be taken to the ED.

For the NHL component of the innovation, reach is assessed as the number of calls made to the NHL over the total number of households in Washoe County per the 2009–2013 census.[2] The NHL fielded 17,810 calls through Q10 (10.9% of households in Washoe County). Any one household may have made multiple calls to the NHL, so the percentage of households making at least one call to the NHL may be smaller than the numbers reported in ***Figure 2***.

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch, All Components[3]



(continued)

[2] http://quickfacts.census.gov/qfd/states/32/32031.html
[3] Note that data presented in this graph included duplicate counts of patients (i.e., encounters).

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch, All Components (continued)

	Quarter	Q2 (Oct-Dec 2012)	Q3 (Jan-Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct-Dec 2014)
●	ATA—Cumulative reach per quarter (%)[1]	—	—	78.6	30.8	21.8	17.5	14.4	12.8	12.2
	ATA—Cumulative # enrolled	12	56	132	244	337	424	537	636	773
●	CP—Cumulative reach per quarter (%)	0.0	0.0	78.9	70.1	63.8	53.9	50.3	54.0	55.1
	CP—Cumulative # enrolled	0	0	15	68	150	246	353	459	579
●	CP E&R—Cumulative reach per quarter (%)	0.0	0.0	0.0	92.9	94.1	93.8	94.5	94.8	94.4
	CP E&R—Cumulative # enrolled	0	0	0	13	16	45	69	91	102
●	NHL—Cumulative reach per quarter (%)	0.0	0.0	0.0	0.0	0.8	2.2	5.2	7.3	10.9
	NHL—Cumulative # enrolled[2]	0	0	0	29	1,303	3,634	8,460	11,912	17,810

Source: Patient-level data provided to RTI by REMSA.
[1] REMSA did not provide the necessary denominator data (number of advanced assessments) used to calculate the reach percentage in Q2, Q3. REMSA noted these data were not collected at this stage of the innovation.
[2] Based on how data were provided, all calls prior to Q6 to the NHL are considered direct calls to the 858-1000 number.
— Data not available.

Dose

Table 5 provides the number of services provided across participants in the CP enrollment component of the innovation, the number of participants receiving services, and the average number of services per participant through Q10. Dose is not calculated for other components of the innovation as they are encounter based services, and each participant receives one encounter per visit.

We first reported dose for the CP enrollment component of the innovation in the first annual report, based on data through Q7. As expected, the average number of services per patient increased from Q7. As shown in the table, patients received on average 5.4 home visits during their 30-day enrollment in the CP program, an increase of 0.2 home visits per patient from Q7.

Table 5. Number and Types of Services Provided to Participants

Services	Number of Services Provided across Patients	Number (Percentage) of Participants Receiving Service	Average Number of Services per Participant
Home Visits Made by CPs	3,152	579 (100%)	5.4

Source: Patient-level data provided to RTI by REMSA.
CP = community paramedic.

Coordinated Care Outcomes

For the CP component of the innovation, RTI received data on the E&R program, which offers an alternative for physicians who (because of weekends, holidays, or lack of available appointments) would normally send patients who call their office to the ED. The goal of the program is to avoid unnecessary ED visits (and unnecessary 911 calls) among individuals who are not experiencing a medical emergency, while still confirming the patient's health and ensuring that he or she is not experiencing a medical emergency. The data shows that only 15 ED visits out of 102 ED visits made by E&R patients (n=78 patients) were sent by the paramedics to the ED; therefore, this program avoided 87 ED visits that otherwise most likely would have taken place if not for the paramedics and the E&R program.

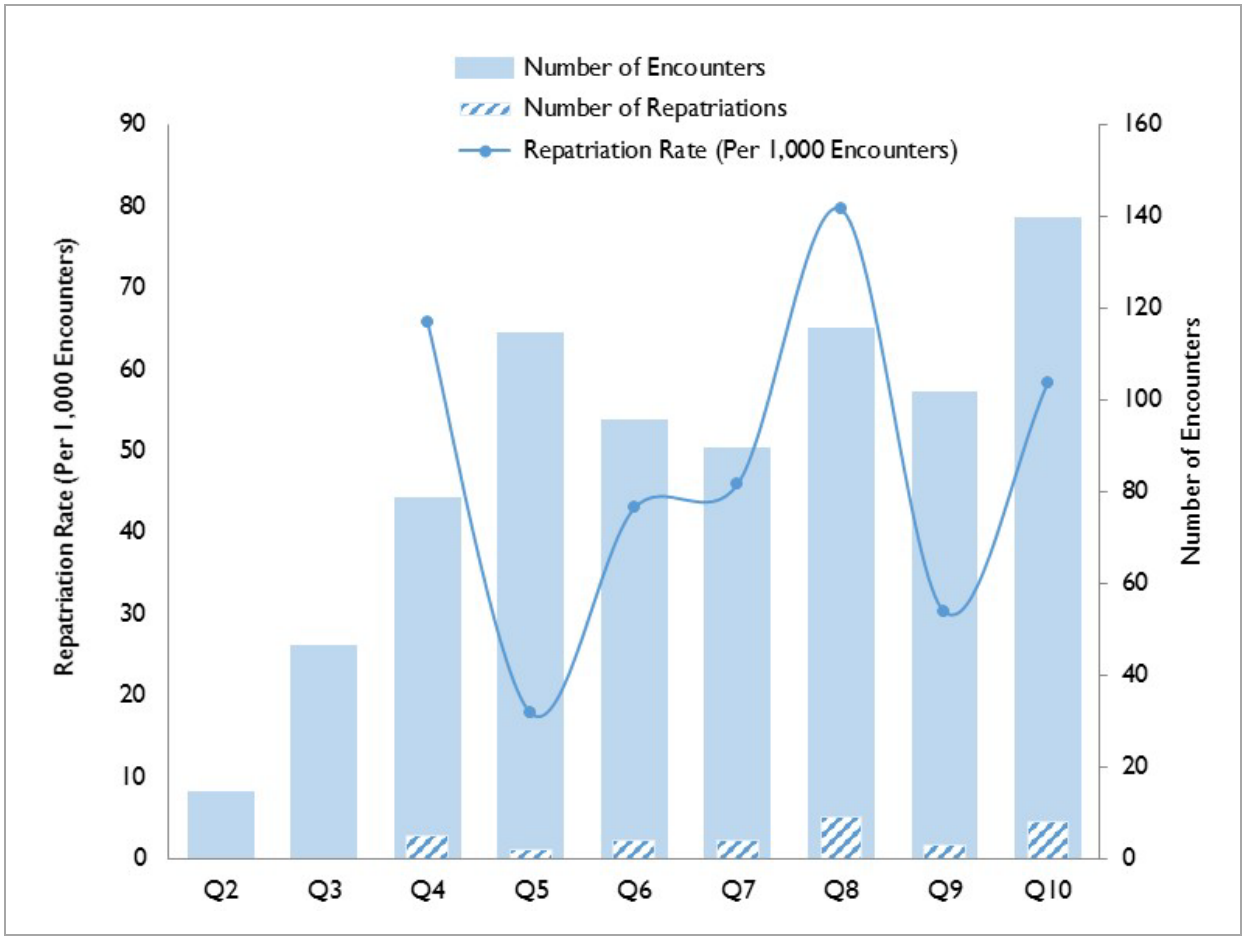
Table 6. ED Visits by E&R Patient Encounters[1]

Quarter	Number of Encounters with E&R Patients	Number of ED Visits by E&R Patients	Percentage of Encounters Sent to ED
Q5 (Jul–Sep 2013)	13	2	15.4
Q6 (Oct–Dec 2013)	3	0	0.0
Q7 (Jan–Mar 2014)	29	5	17.2
Q8 (Apr–Jun 2014)	24	4	16.7
Q9 (Jul–Sep 2014)	22	3	13.6
Q10 (Oct-Dec 2014)	11	1	9.1
Total	102	15	14.7

[1] These data represent 78 patients.
ED = emergency department; E&R = Evaluate and Refer.

For the ATA component of the innovation, repatriations are monitored to ensure that, overall, the component is providing appropriate care. A repatriation occurs when an individual receives emergency services, is transported to an alternative location, but then has to be transported to an ED within 6 hours of the original transport because the facility capacity or resources changed, the patient withdrew his/her consent, the patient's condition changed, or the initial assessment was inaccurate. As shown in ***Figure 3,*** repatriations ranged from a high of 79.7 per 1,000 patients (7.97%) transported to an alternative location in Q8, to a low of 17.9 per 1,000 patients (1.79%) transported to an alternative location in Q5. The rate of repatriation for Q10 was 58.4 per 1,000 patients (5.84%) transported to an alternative location, and the overall rate of repatriation was 45.3 per 1,000 patients (4.53%) transported to an alternative location. A total of 35 individuals out of 773 who were transported to an alternative location were repatriated, less than 5 percent of all those who were transported.

Figure 3 ATA Repatriation Rate since Project Launch



	Quarter	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
●	Repatriation rate (per 1,000 encounters)	0.0	0.0	65.8	17.9	43.0	46.0	79.6	30.3	58.4
	Number of encounters	12	44	76	112	93	87	113	99	137
	Number of repatriations	0	0	5	2	4	4	9	3	8

Source: Patient-level data provided to RTI by REMSA.
ATA = Ambulance Transport Alternatives; Q = quarter.

As shown in ***Table 7,*** approximately 64 percent of calls to the NHL had a protocol completed (a series of scripted questions used to match callers to the appropriate level of care). The remaining 36 percent of the calls to the NHL did not a complete a protocol for various reasons (e.g., wrong number/hangups, caller terminated the call).

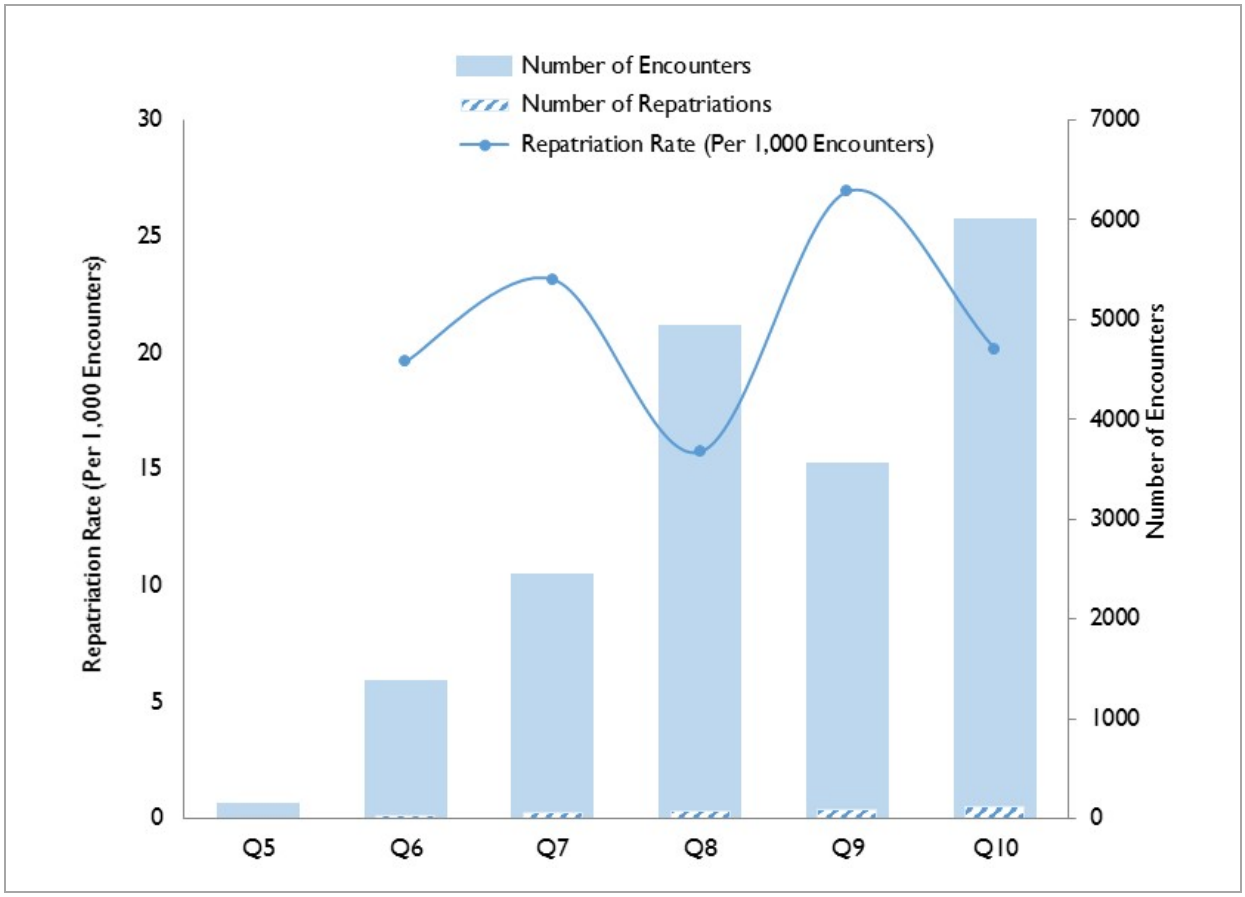
Table 7. Number and Percentage of NHL Protocols Completed

Quarter	Protocols Completed with Callers	Number of NEW NHL Encounters	Percentage of Protocols Completed
Q5 (Jul–Sep 2013)	—	29	—
Q6 (Oct–Dec 2013)	921	1,274	72.3%
Q7 (Jan–Mar 2014)	1,619	2,331	69.5%
Q8 (Apr–Jun 2014)	2,576	4,826	53.4%
Q9 (Jul–Sep 2014)	3,092	3,452	89.6%
Q10 (Oct-Dec 2014)	3,193	5,897	54.2%
Total	11,402[1]	17,810[1]	64.0%

Source: Patient-level data provided to RTI by REMSA.
[1] Missing Date for 1 NHL encounter & date protocol was completed.
NHL = Nurse Health Line; Q = quarter.
— Data not available.

The final coordinated care outcome measure for the NHL component of the innovation is repatriation (a call transferred from the NHL to 911 for an emergency response). As shown in ***Figure 4***, repatriation ranged from a high of 27.4 per 1,000 patients (2.74%) transferred to 911 from the NHL in Q9, to a low of 16.1 per 1,000 patients (1.61%) transferred to 911 from the NHL in in Q8. The rate of repatriation for Q10 was 20.3 per 1,000 patients (2.03%) transferred to 911 from the NHL, and the overall rate of repatriation was 21.0 per 1,000 patients (2.1%) transferred to 911 from the NHL. A total of 367 individuals (out of 17,475 who called the NHL, were transferred to 911, and then transported to the ED) were repatriated—less than 2 percent of all who called the NHL. These results show that the NHL is reaching the appropriate target population (individuals in nonemergency situations) and providing a useful service: for more than 17,000 encounters, an emergency call or dispatch was not required when the situation might have otherwise resulted in a call to 911.

Figure 4 Rate or Repatriation in the NHL (Calls Transferred from NHL to 911)



	Quarter	Q5	Q6	Q7	Q8	Q9	Q10
●	Repatriation rate (per 1,000 encounters)	0.0	19.6	24.0	16.1	27.4	20.3
	Number of encounters	29	1,274	2,331	4,826	3,452	5,897
	Number of repatriations	0	25	54	76	93	119

Source: Patient-level data provided to RTI by REMSA.
Q = quarter.

Sustainability

REMSA has been working for the past year to ensure the sustainability of its innovation by leveraging the success of the current components to gain notoriety and recognition from Nevada and from other emergency medical service providers. REMSA obtained earned media and received recognition for its efforts throughout the course of the innovation (citations were provided in the progress reports). REMSA's innovation was featured in a *USA Today* article on May 10, 2015, "Paramedics work to keep patients out of the E.R".[4] In year 3, REMSA was also invited to work with the state of Nevada innovation team to develop a SIM driver diagram to improve Nevada's health status from 39th to 34th in the nation. The state expressed interest in including all of REMSA's innovations (CP, ATA, NHL) in the

[4] Gorman, A. (n.d.). Paramedics work to keep patients out of the E.R. *USA Today*.

driver diagram to make them available to all people in Nevada. REMSA also gained recognition for the program by the successful passage of legislation about the roles in which paramedics can function. On May 26, 2015, the governor signed a bill that fully authorized REMSA's paramedics (and paramedics throughout the state) to function in this new community paramedicine role.

Administratively, REMSA established a committee that meets regularly to assist and advise on sustainability efforts. This committee gained the approval of REMSA's board of directors. REMSA worked with third-party payers to establish reimbursement for services currently covered under the grant. REMSA had some success in getting some insurance payers (Medicaid and commercial insurers) to reimburse for ATA services. REMSA received a 12-month no-cost extension from the Center for Medicare & Medicaid Services that will be used to shore up sustainability efforts, and continue to work with third-party payers to establish reimbursement contracts for REMSA's other services.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of REMSA's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data REMSA collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers essential to the evaluation of REMSA's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 8 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of whether the payer-specific data are presented in this annual report. Because Medicaid claims for REMSA are available in Alpha-MAX only through Q1 2013, no data are available during the time period of program implementation. We will be able to provide Medicaid analyses in subsequent reports as Alpha-MAX data become available.

Table 8. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	No
		Hospital unplanned readmissions rate	Yes	No
		ED visit rate	Yes	No
	Cost	Spending per patient	Yes	No
		Estimated cost savings	Yes	No

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization for participants in two distinct innovations, ATA and CP. who were enrolled for at least one quarter in Medicare fee-for-service parts A and B. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions. This evaluation of Medicare claims data presently excludes an analysis of the Nurse Health Line due to data limitations. We will determine if REMSA can identify an alternative method for utilizing unique patient identifiers to obtain Medicare claims data for NHL. We will investigate this issue further with REMSA and see if NHL data can be included in analyses in later reports.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis (ATA)

We include patients who were enrolled prior to December 31, 2014 and we present Medicare claims data through December 31, 2014.

Comparison Groups

The comparison group for REMSA ATA consists of beneficiaries enrolled in fee-for-service Medicare Parts A and B and living in Washoe County in the state of Nevada. We identified and excluded individuals in the claims data who had an inpatient admission within 7 days of ED visit. We then used those who had an ED visit without hospitalization within 7 days as our possible comparison sample. Although alternative locations are primarily detoxification centers and mental health hospitals, we no longer narrowed our search criteria to individuals with a history of substance abuse (drugs and alcohol) and mental illness because 71.6 percent of individuals in the treatment sample have one of these three conditions. If we consider as a comparison sample those individuals without an inpatient admission in the week following ED visit, 56 percent have one of the three conditions previously described. This realization

changed the composition of the comparison group: in Q6 the sample was composed of people who did not have an inpatient admission within 7 days of the ED visit or who had one of three conditions: inebriation OR substance abuse OR psychiatric. The comparison sample is now, therefore, marginally better than in previous reports where the 7-day rule was not imposed on all individuals. As a result of these new rules, propensity score matching (PSM) improved significantly.

One important caveat in finding an adequate counterfactual is that while we want to rule out high spenders who need IP services (people in car accidents, with heart attacks, etc.), we are conscious of a possible endogeneity bias that selecting a sample based on an outcome may generate. Although, by definition, our control group had no patients with an IP admission within 7 days of an ED visit, 11 treated individuals during the post-intervention period (14.86% of the sample) were hospitalized shortly after an ED visit.

We used PSM to select comparison group beneficiaries with similar characteristics as treatment group beneficiaries. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, disability, end-stage renal disease status, number of chronic conditions, total Medicare payments in the calendar quarter and year prior to the innovation, and number of ED visits in the calendar quarter and year prior enrollment.

Table 9 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. ***Figure 5*** shows the distribution of the propensity scores for both the comparison and intervention groups. ***Appendix B.2*** provides technical details on the propensity score methodology.

Table 9. Mean Values and Standardized Differences of Variables in Propensity Score Model: REMSA ATA

Variable	Before Matching				Standardized Difference	After Matching				Standardized Difference
	Treatment Group		Comparison Group			Treatment Group		Comparison Group		
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrollment	$5,891.30	$10,264.25	$4,702.00	$11,141.87	0.11	$5,470.19	$10,055.94	$6,505.40	$11,013.64	0.10
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	$19,423.00	$37,877.40	$14,682.58	$23,603.09	0.15	$18,365.42	$37,759.79	$16,495.15	$13,964.54	0.07
Number of ED visits in calendar quarter prior to enrollment	1.53	2.47	0.19	0.61	0.74	1.28	1.99	0.97	1.10	0.19
Number of ED visits in second, third, fourth, and fifth calendar quarters prior to enrollment	4.43	8.76	0.67	1.63	0.60	3.46	6.57	2.21	2.65	0.25
Age	58.20	16.35	71.53	12.46	0.92	58.79	16.13	57.44	10.29	0.10
Number of dual eligible months in the previous calendar year	5.92	5.72	2.03	4.38	0.76	5.75	5.70	6.73	3.38	0.21
Percentage male	62.16	48.83	45.35	49.78	0.48	62.50	48.75	66.29	28.12	0.11
Percentage white	74.32	43.98	86.50	34.18	0.44	73.61	44.38	67.41	27.88	0.19
Percentage disabled	67.57	47.13	25.34	43.50	1.32	66.67	47.47	74.11	26.06	0.23
Percentage ESRD	1.35	11.62	1.96	13.85	0.07	1.39	11.79	1.34	6.84	0.01
Number of chronic conditions	5.66	4.11	7.43	3.71	0.45	5.61	4.13	5.63	2.29	0.00
Number of beneficiaries	74	—	72,100	—	—	74	—	212	—	—
Number of unique beneficiaries[1]	74	—	10,388	—	—	74	—	208	—	—
Number of weighted beneficiaries	—	—	—	—	—	74	—	74	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

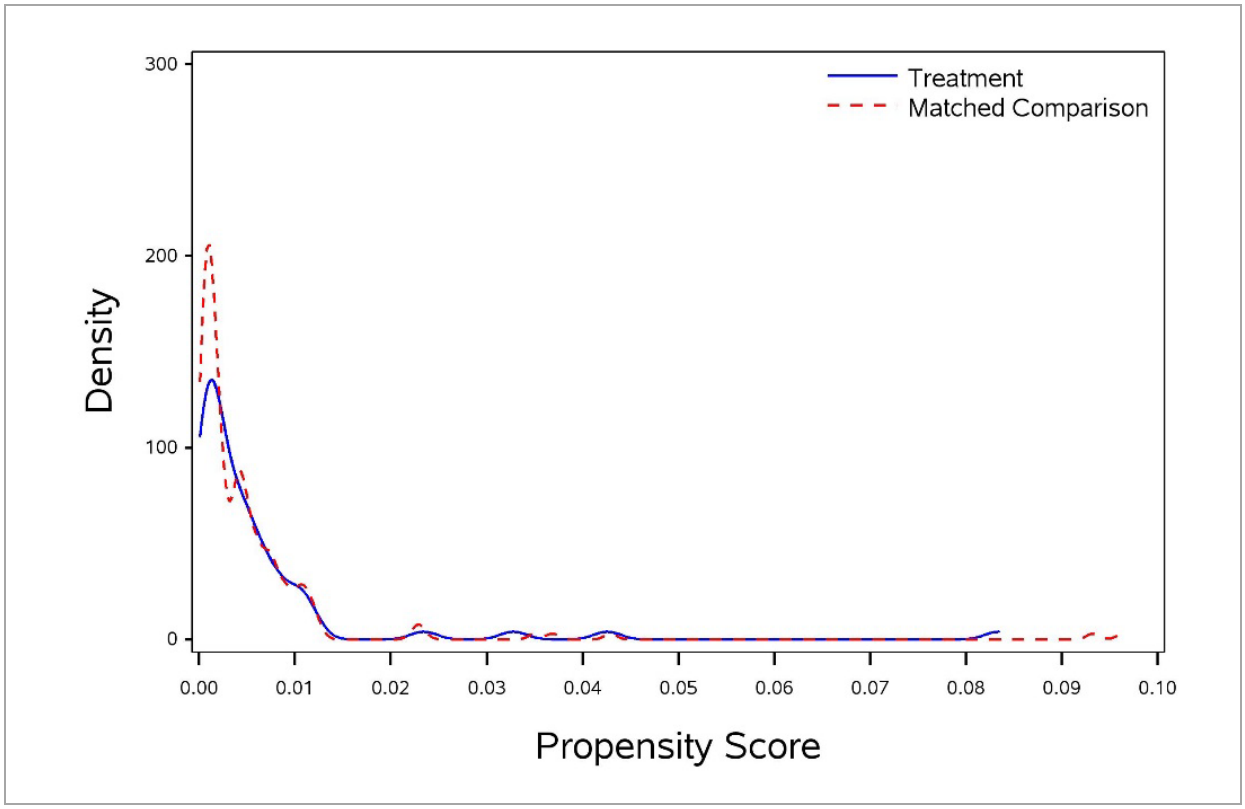
[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B.2 for discussion of weights).

ED = emergency department; ESRD = end-stage renal disease.

— Data not applicable

After performing PSM, we calculate absolute standardized differences between the treatment group and both the unmatched and matched comparison groups and check whether matching decreases the absolute standardized differences and achieves acceptable balance (Table 9). Many researchers consider that an absolute standardized difference ≤ 0.10 indicates acceptable balance.[5] Researchers also point out that critical variables in determining selection into treatment (e.g., those with significant effects in the propensity score equation) should have greater balance, while indicators with minor importance in determining treatment selection do not require optimal balance. The results in Table 9 show that matching reduces the absolute standardized differences in all the variables included. However for most of these variables, we fail to attain values for the standardized difference that are less than 0.1. Despite these shortcomings, the kernel density plot shows a remarkably good overlap between the matched treatment and comparison groups (***Figure 5***).

Figure 5. Distribution of Propensity Scores for Comparison and Intervention Groups: REMSA ATA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
REMSA ATA = Regional Emergency Medical Services Authority Ambulance Transport Alternative.

[5] Austin, P.C. An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research. 46.3: 399–424, 2011. *PMC*. Web. 2 June 2015.

Descriptive Analysis

This report includes claims through December 31, 2014.

Table 10 reports Medicare spending per patient in the eight quarters before and the seven quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors. An additional quarter of data is available but not reported because only five Medicare fee-for-service participants with observations were reported in I8.

Table 10. Medicare Spending per Patient: REMSA ATA

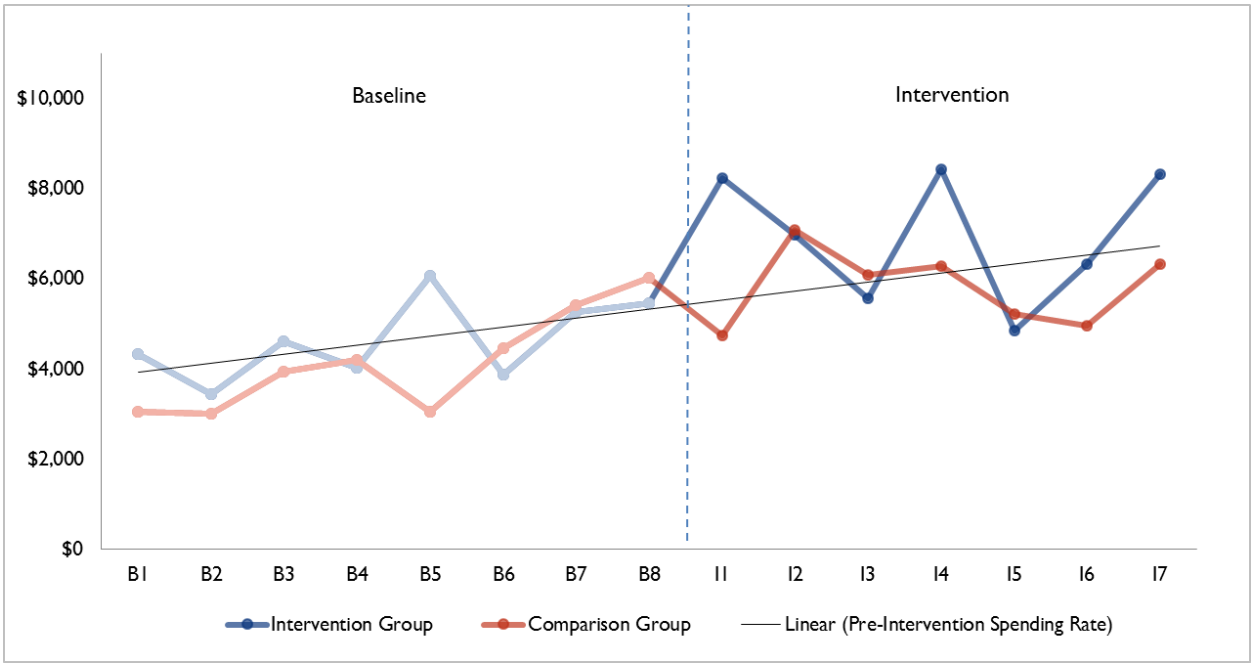
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group																
1C1CMS 330971	REMSA – ATA															
	Spending rate	$4,348	$3,440	$4,615	$4,043	$6,081	$3,888	$5,261	$5,470	$8,247	$6,993	$5,567	$8,446	$4,856	$6,332	$8,321
	Std dev	$8,099	$7,499	$13,492	$9,344	$16,973	$10,903	$10,550	$9,986	$10,141	$11,662	$9,804	$17,859	$10,906	$9,367	$9,551
	Unique patients	63	65	66	67	68	68	71	72	72	69	54	45	31	26	18
Comparison Group																
1C1CMS 330971	REMSA– ATA															
	Spending rate	$3,063	$3,014	$3,954	$4,210	$3,065	$4,478	$5,428	$6,021	$4,754	$7,103	$6,097	$6,300	$5,218	$4,970	$6,334
	Std dev	$7,307	$7,029	$8,201	$9,460	$8,127	$9,557	$10,322	$17,875	$9,556	$17,243	$20,667	$14,765	$9,026	$11,142	$10,814
	Unique patients	187	189	194	198	203	203	206	208	208	199	166	135	95	81	51
Savings per Patient		−$1,285	−$427	−$661	$168	−$3,016	$589	$168	$551	−$3,494	$110	$529	−$2,147	$361	−$1,361	−$1,987

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6 illustrates the Medicare spending per beneficiary in ***Table 11*** for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters. Spending for both treated and controls is very volatile and might reflect the particular spending pattern of individuals who qualify for ATA.

Figure 6. Medicare Spending per Patient: REMSA ATA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
REMSA ATA = Regional Emergency Medical Services Authority Ambulance Transport Alternative.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 11*** and ***Figure 7***. The gap between treated and controls is widest in the intervention quarter and appears to narrow in the post-intervention period.

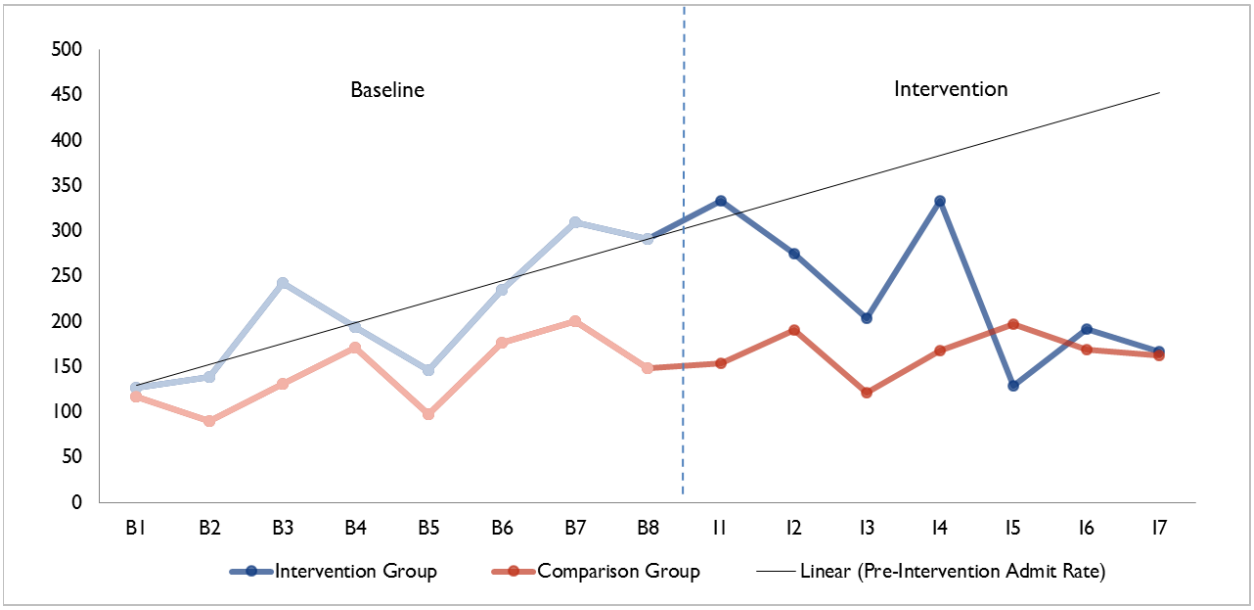
Table 11. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: REMSA ATA

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group																
1C1CMS 330971	REMSA – ATA															
	Admit rate	127	138	242	194	147	235	310	292	333	275	204	333	129	192	167
	Std dev	378	492	799	579	462	644	958	633	707	1020	557	1011	335	394	500
	Unique patients	63	65	66	67	68	68	71	72	72	69	54	45	31	26	18
Comparison Group																
1C1CMS 330971	REMSA – ATA															
	Admit rate	118	90	131	171	97	177	201	149	154	191	122	168	198	169	163
	Std dev	460	393	453	549	311	462	444	428	421	521	321	448	395	467	370
	Unique patients	187	189	194	198	203	203	206	208	208	199	166	135	95	81	51
Intervention − Comparison Rate		9	49	111	23	50	59	109	143	179	84	82	165	-69	23	3

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 7. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: REMSA ATA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
REMSA ATA = Regional Emergency Medical Services Authority Ambulance Transport Alternative.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 12*** and ***Figure 8***. Because of the low number of index admissions (the denominator in the readmissions measure), the unplanned readmissions rate is highly variable. As more beneficiaries enroll in the innovation and more claims data become available, the sample size will increase and the unplanned readmissions measure may be reported with more precision.

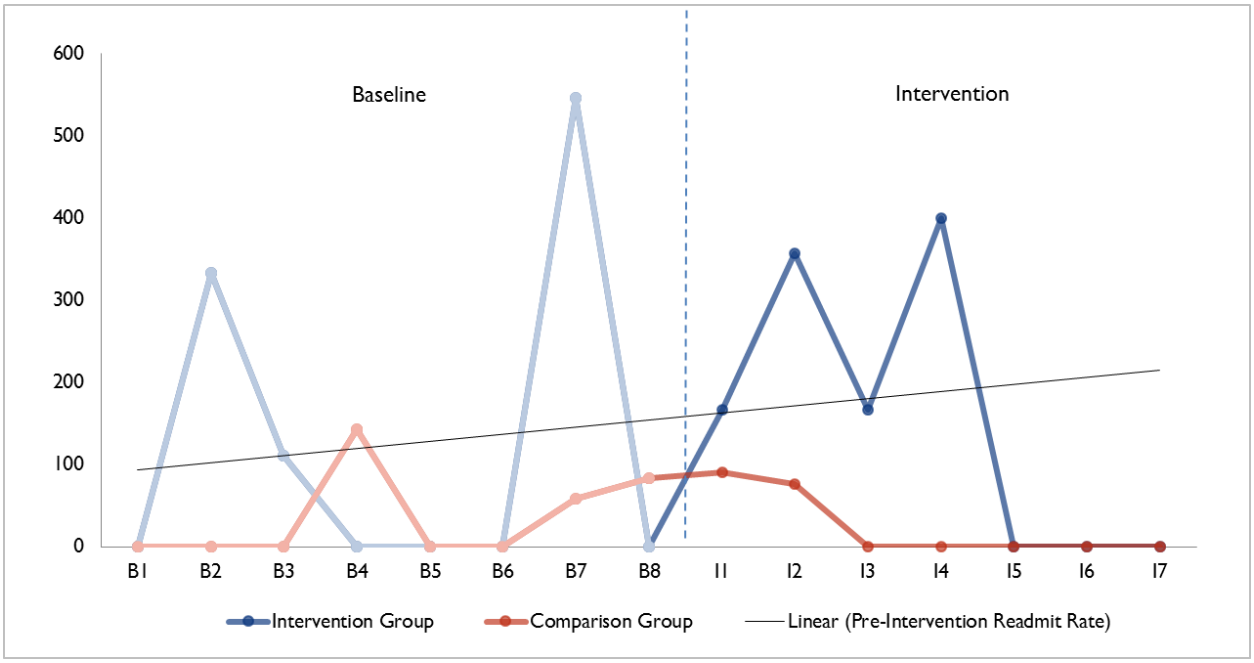
Table 12. Hospital Unplanned Readmissions Rates per 1,000 Admissions: REMSA ATA

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group																
1C1CMS 330971	REMSA – ATA															
	Readmit rate	0	333	111	0	0	0	545	0	167	357	167	400	0	0	0
	Std dev	0	471	314	0	0	0	498	0	373	479	373	490	0	0	0
	Total admissions	6	3	9	6	2	8	11	8	12	14	6	5	1	1	0
Comparison Group																
1C1CMS 330971	REMSA – ATA															
	Readmit rate	0	0	0	143	0	0	59	83	91	77	0	0	0	0	0
	Std dev	0	0	0	350	0	0	235	276	288	267	0	0	0	0	0
	Total admissions	2	2	2	2	2	3	6	4	4	4	3	2	2	2	1
Intervention − Comparison Rate		0	333	111	-143	0	0	487	-83	76	280	167	400	0	0	0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 8. Hospital Unplanned Readmissions Rates per 1,000 Admissions: REMSA ATA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
REMSA ATA = Regional Emergency Medical Services Authority Ambulance Transport Alternative.

ED visits per 1,000 participants are shown in ***Table 13*** and ***Figure 9***. The ED visit rate is higher for the intervention group than for the comparison group both pre- and post-intervention.

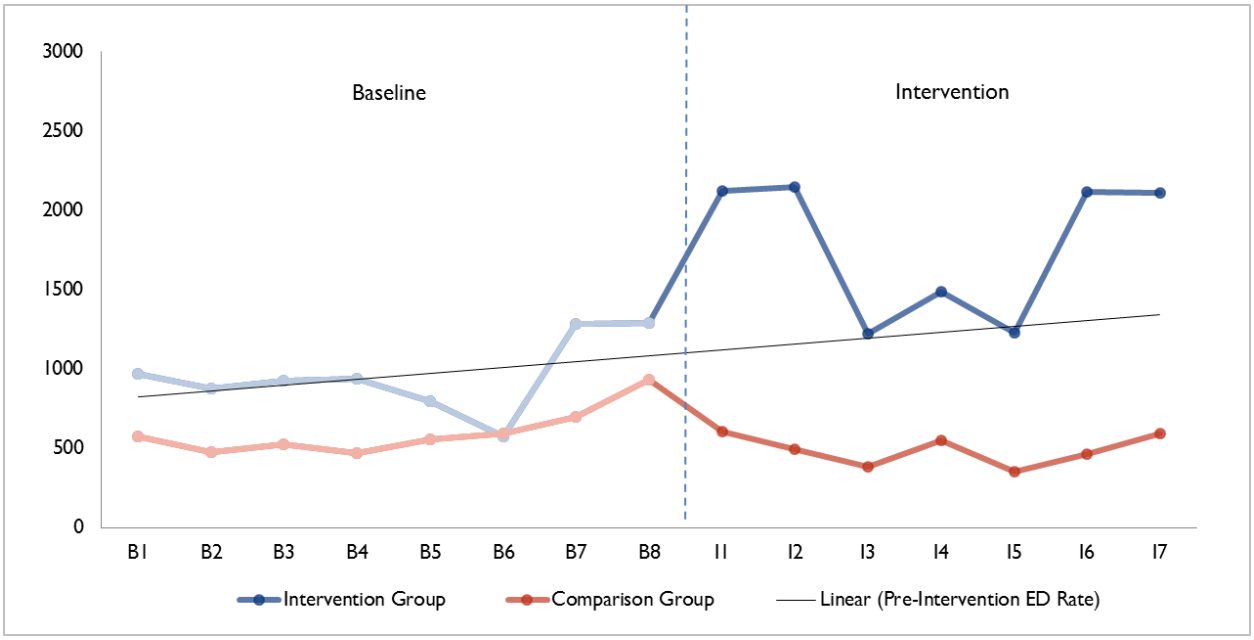
Table 13. ED Visits per 1,000 Participants: REMSA ATA

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group																
1C1CMS 330971	REMSA – ATA															
	ED rate	968	877	924	940	794	574	1,282	1,292	2,125	2,145	1,222	1,489	1,226	2,115	2,111
	Std dev	2,094	1,949	2,018	2,611	2,012	1,319	1,973	2,059	2,589	3,159	2,462	3,145	2,872	4,131	3,047
	Unique patients	63	65	66	67	68	68	71	72	72	69	54	45	31	26	18
Comparison Group																
1C1CMS 330971	REMSA – ATA															
	ED rate	577	474	528	472	554	595	698	933	604	493	385	549	350	466	596
	Std dev	1,328	774	819	722	735	961	837	1,070	926	909	551	882	695	542	1,016
	Unique patients	187	189	194	198	203	203	206	208	208	199	166	135	95	81	51
Intervention − Comparison Rate		392	403	397	469	240	−21	584	359	1521	1652	837	940	876	1,650	1,515

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 9. ED Visits per 1,000 Participants: REMSA ATA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
REMSA ATA = Regional Emergency Medical Services Authority Ambulance Transport Alternative.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit.

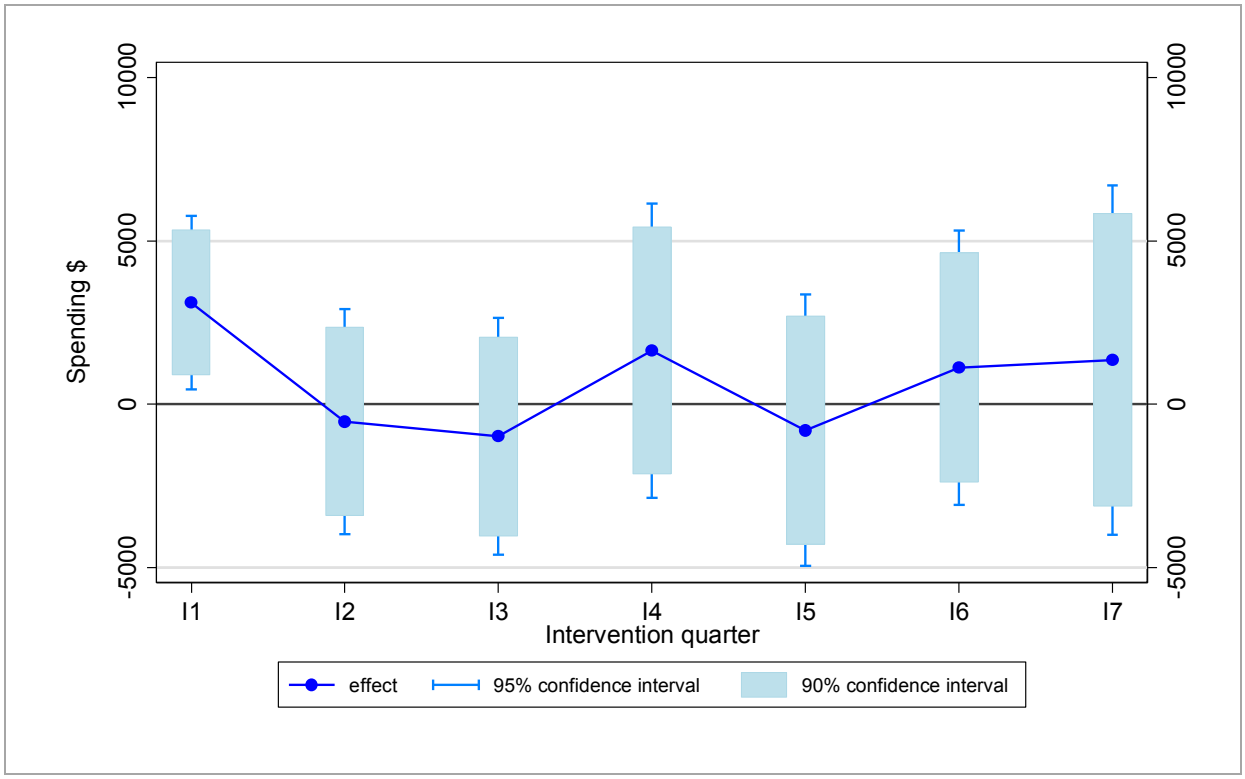
Table 14 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. ***Figure 10*** illustrates these quarterly difference-in-differences estimates. The results indicate that in the first quarter post-intervention, losses are statistically significant at the 5 percent level. This finding may be the result of an overly restrictive criteria in selecting the new comparison group, where inpatient admissions that occur within 7 days of an ED visit are completely ruled out.

Table 14. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: REMSA ATA

Quarter	Coefficient	Standard Error	P-Values
***-I1**	3,116	1,355	0.022
I2	−534	1,758	0.762
I3	−988	1,850	0.594
I4	1,638	2,301	0.477
I5	−801	2,122	0.706
I6	1,119	2,143	0.602
I7	1,350	2,728	0.621

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
OLS = ordinary least squares; REMSA ATA = Regional Emergency Medical Services Authority Ambulance Transport Alternative.

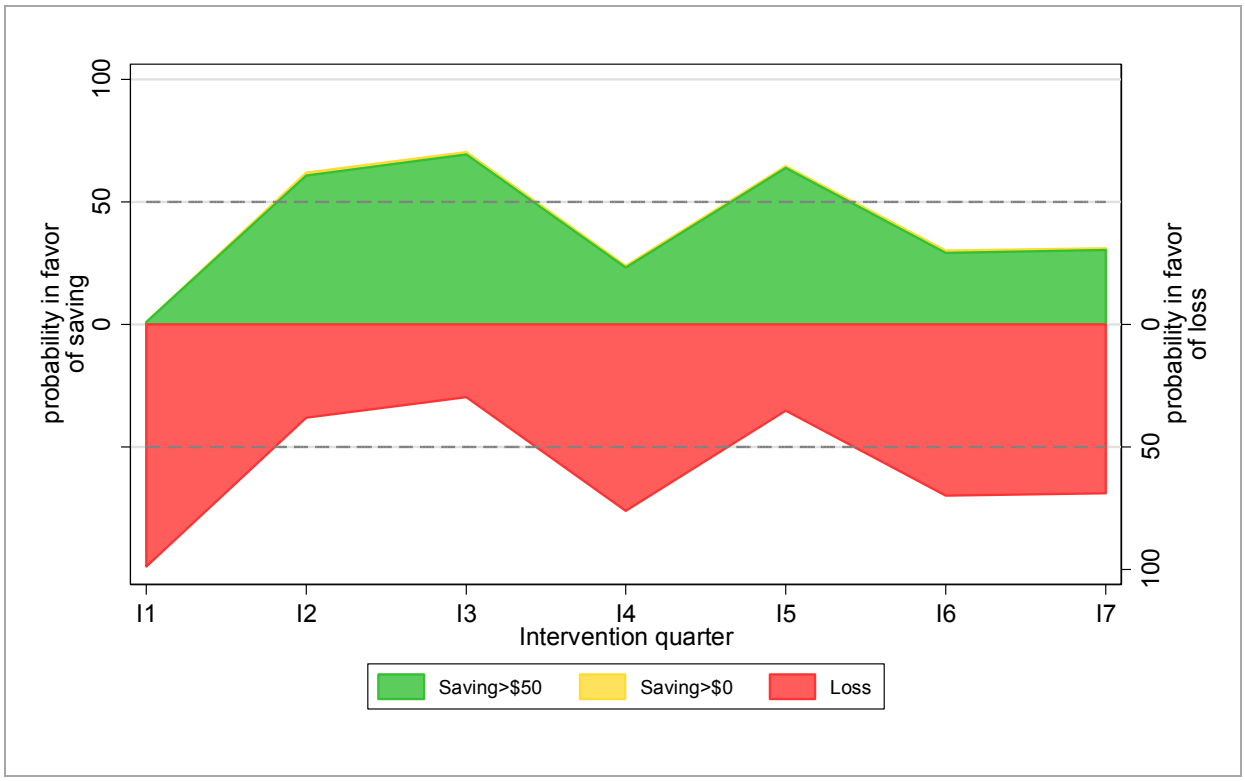
Figure 10. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: REMSA ATA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
OLS = ordinary least squares; REMSA ATA = Regional Emergency Medical Services Authority Ambulance Transport Alternative.

Figure 11 presents the strength of evidence in favor of savings or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis. At this stage, with the exception of I1, there is no statistically significant evidence of savings or losses, but the strength of evidence analysis indicates greater probability of loss rather than savings for innovation quarters 1, 4, 6, and 7.

Figure 11. Quarterly Strength of Evidence in Favor of Savings/Loss: REMSA ATA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
REMSA ATA = REMSA Ambulance Transport Alternative.

We also present the weighted average treatment effect per quarter during the intervention period for beneficiaries enrolled in the innovation as compared to their matched comparison group. The weighted average quarterly spending differential in the post-innovation period, indicating a loss, is −$890 (90% CI: −$2,625, $844). This estimate is not statistically significant. This figure represents the differential spending per quarter in the post-intervention period between individuals enrolled in the innovation and comparison group individuals, on average, weighted by the number of intervention beneficiaries in each quarter. The 90 percent confidence interval is the range in which the true parameter estimate falls, with 90 percent confidence.

We also present linear probability model coefficients for inpatient admissions, and outpatient ED visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the

estimated effect.[6] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, linear probability model coefficients have often been empirically demonstrated to be consistent with marginal effects generated from nonlinear models.[7] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention) and not just the direction of the effect.

Table 15 presents the results of a linear probability model regression with the dependent variable set to one for patients who had a hospital visit during the quarter. The estimated coefficients have large standard errors, making it difficult to draw statistically significant conclusions about the relative likelihood of an inpatient hospital admission between treatment and comparison individuals. Most post-intervention quarters show that participants were more likely to be admitted to inpatient hospitals than the controls; however, these differences are not statistically significant for any intervention quarter. The average quarterly difference-in-differences estimate for inpatient admissions is 0.4 percentage points, indicating that the treatment-control difference is 0.4 percentage points higher during the intervention period. This is the average difference in inpatient admissions probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is not statistically significant (90% CI: −.046, .039).

Table 15. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: REMSA ATA

Quarter	Coefficient	Standard Error	P-Values
I1	0.08	0.05	0.163
I2	−0.01	0.05	0.774
I3	0.01	0.05	0.755
I4	0.01	0.06	0.796
I5	−0.09	0.07	0.211
I6	0.02	0.09	0.806
I7	−0.08	0.08	0.324

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
REMSA ATA = REMSA Ambulance Transport Alternative.

Table 16 presents results of a linear probability model regression with the dependent variable set to one for patients who had an ED visit during the quarter. In all seven post-intervention quarters, the treatment group has a higher likelihood of ED admissions than the comparison group. ED visits are

[6] To obtain the correct effect it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run even when not competing with other users for computer resources.

[7] Angrist, J.D., and Pischke J.-S. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

statistically higher in I1 and I2 only. The average quarterly difference-in-differences estimate for ED visits is 19.9 percentage points, indicating that the treatment-control difference is 19.9 percentage points higher during the intervention period. This is the average difference in ED visit probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: .133, .265).

Table 16. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: REMSA ATA

Quarter	Coefficient	Standard Error	P-Values
I1	0.40	0.06	<.001
I2	0.25	0.06	<.001
I3	0.08	0.07	0.221
I4	0.12	0.08	0.128
I5	0.04	0.10	0.678
I6	0.12	0.11	0.238
I7	0.11	0.13	0.390

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
REMSA ATA = Regional Emergency Medical Services Authority Ambulance Transport Alternative.

Discussion

RTI no longer narrowed the search criteria for controls to individuals with a history of substance abuse (drugs and alcohol) and mental illness because these conditions are only present in approximately 72 percent of the treatment sample at least once in the year after ATA, suggesting that people are treated for other conditions in alternative locations. More work has to be done to identify from the data, if at all possible, other conditions that might lead to alternative locations. Given the treatment group's young age, it appears, for instance, that a high proportion of them are eligible because of disability. With a bigger sample size, these conditions could become part of the propensity score estimates.

We now mitigate some of the high spending in the constructed comparison group by excluding individuals in the claims data who had an inpatient admission within 7 days of ED visit, leading to a better match of controls to treated individuals than in previous reports.

Results may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicare beneficiaries whom we could match with the identifiers provided by the site. This number is approximately 13 percent of the overall population reached by the innovation. In addition, the sample size is small which hinders detection of changes in spending.

Medicare Claims Analysis (CP)

We include patients who were enrolled prior to December 31, 2014 and we present Medicare claims data through December 31, 2014.

There are two separate CP interventions. The first includes a 30-day enrollment period for those who were admitted to the hospital for congestive heart failure (CHF) or myocardial infarction (MI). The enrollees are visited by CPs several times during enrollment to help them manage their condition and medication so as to avoid ED visits and readmissions. The second intervention is E&R, a program in which doctors call CPs to visit patients when a physician is not available (late at night, during holidays, etc.). In the absence of a referral, the patient would call 911 or go to the ED. Through this program, CPs can instead visit patients (approximately 1-hour response time) to determine if the situation is an emergency or if it can wait until office hours the next day. The goal is also to avoid unnecessary ED visits.

We pooled participants from these two programs together both to increase sample size and to reflect the substantial overlap between the two samples (more than one-third of those in the referral program are part of the 30-day program). This strategy is however not ideal given the very different selection mechanisms for these two programs. As recruitment increases, with more data we may be able to analyze these two programs separately in subsequent reports.

Comparison Groups

The potential comparison group for CP consists of beneficiaries enrolled in fee-for-service Medicare Parts A and B and living in Washoe County in Nevada. Comparison beneficiaries must have been alive in at least one post-intervention quarter and had MI or CHF. As with ATA, we used PSM to select comparison group beneficiaries with similar characteristics as treatment group beneficiaries.

Table 17 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. The standardized differences generally improve with matching, but not all variables achieve a value less than 0.10.Many researchers consider that an absolute standardized difference ≤ 0.10 indicates acceptable balance.[8] Researchers also point out that critical variables in determining selection into treatment (e.g., those with significant effects in the propensity score equation) should have greater balance, while indicators with minor importance in determining treatment selection do not require optimal balance. The variables that do not strictly fall within the 0.1 threshold include: total payments in the calendar quarter prior to enrollment, number of ED visits in the calendar quarter and year prior to enrollment, age, number of dual eligible months, percentage white, and percentage disabled. This lack of balance might happen because we do not model selection directly into the program; as such, those who accept the CP visit may have specific characteristics that determine their entry into the program. For example, individuals taking part in the CP intervention are older but less likely to have disabilities or be dual eligible.

[8] Austin, P.C. An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research. 46.3: 399–424, 2011. *PMC*. Web. 2 June 2015.

Figure 12 shows the distribution of the propensity scores for both the comparison and intervention groups. The propensity scores in Figure 12 are low because the cloning methodology increases the number of comparison beneficiaries in the propensity score model, which mechanically lowers the propensity score. The two distributions overlap substantially, indicating that matched comparison beneficiaries have similar propensity scores to treatment beneficiaries. ***Appendix B.2*** provides technical details on the propensity score methodology. Twelve treatment beneficiaries were dropped from the subsequent analyses due to the lack of an appropriately matched comparison beneficiary.

Table 17. Mean Values and Standardized Differences of Variables in Propensity Score Model: REMSA CP

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrollment	$7,217.81	$11,780.07	$5,677.86	$13,802.89	0.12	$6,752.10	$11,779.45	$8,192.51	$13,808.90	0.11
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	$20,384.53	$29,641.92	$18,596.23	$30,492.76	0.06	$19,599.57	$28,350.02	$18,206.57	$21,194.80	0.06
Number of ED visits in calendar quarter prior to enrollment	0.60	2.19	0.19	0.57	0.25	0.30	0.89	0.63	0.94	0.36
Number of ED visits in second, third, fourth, and fifth calendar quarters prior to enrollment	1.23	3.21	0.69	1.47	0.22	0.76	1.42	1.11	1.33	0.25
Age	71.26	13.54	77.44	9.79	0.52	73.61	10.73	71.84	7.77	0.19
Number of dual eligible months in the previous calendar year	2.83	4.89	1.86	4.19	0.21	2.44	4.61	3.09	3.37	0.16
Percentage male	58.39	49.46	55.07	49.75	0.09	59.12	49.34	55.64	33.34	0.10
Percentage white	79.19	40.73	88.77	31.58	0.37	82.48	38.15	86.11	23.21	0.14
Percentage disabled	38.26	48.76	18.57	38.89	0.63	32.85	47.14	40.45	32.94	0.22
Percentage ESRD	4.70	21.23	3.72	18.92	0.07	5.11	22.10	6.62	16.68	0.09
Number of chronic conditions	10.00	3.43	11.21	3.20	0.37	10.36	3.25	10.50	2.33	0.05
Number of beneficiaries	149	—	4,950	—	—	137	—	398	—	—
Number of unique beneficiaries[1]	149	—	825	—	—	137	—	350	—	—
Number of weighted beneficiaries	—	—	—	—	—	137	—	350	—	—

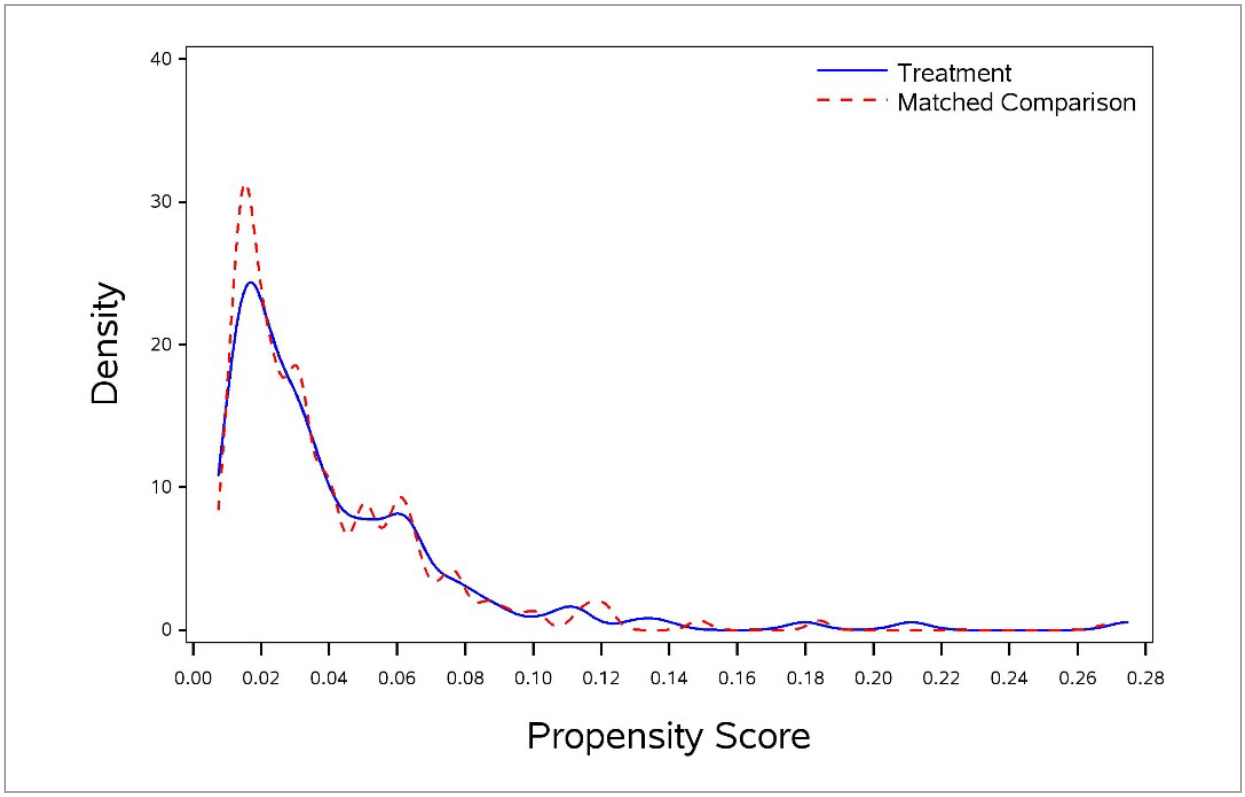
Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B.2 for discussion of weights).

EED = emergency department; SRD = end-stage renal disease.

— Data not applicable to this table.

Figure 12. Distribution of Propensity Scores for Comparison and Intervention Groups: REMSA CP



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
REMSA CP = Regional Emergency Medical Services Authority community paramedic.

Descriptive Analysis

This report includes claims through December 31, 2014.

Table 18 reports Medicare spending per patient in the eight quarters before and the six quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors. Data are available for one more quarter, however, in quarter seven we have only three participants, and we therefore suppress the information until more information becomes available.

Table 18. Medicare Spending per Patient: REMSA CP

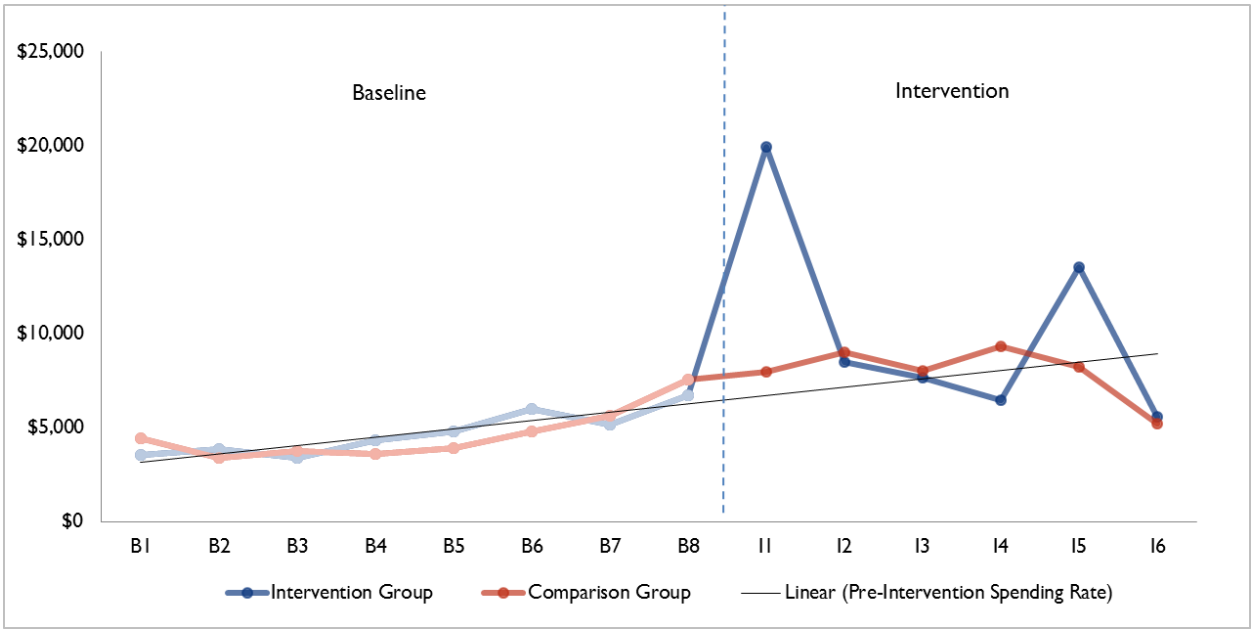
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters					
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6
Intervention Group															
1C1CMS 330971	REMSA – CP														
	Spending rate	$3,568	$3,879	$3,375	$4,321	$4,813	$6,017	$5,175	$6,752	$19,957	$8,474	$7,647	$6,456	$13,548	$5,578
	Std dev	$6,911	$7,295	$6,061	$9,775	$11,871	$13,454	$10,713	$11,736	$19,761	$15,216	$12,062	$11,098	$47,444	$8,537
	Unique patients	119	121	123	125	133	134	135	137	137	103	75	47	24	11
Comparison Group															
1C1CMS 330971	REMSA – CP														
	Spending rate	$4,441	$3,379	$3,766	$3,617	$3,919	$4,820	$5,651	$7,548	$7,979	$9,023	$8,008	$9,355	$8,254	$5,195
	Std dev	$11,636	$8,477	$9,418	$8,717	$10,151	$12,415	$16,091	$20,876	$17,967	$19,414	$18,337	$17,751	$14,121	$8,113
	Unique patients	331	331	332	337	342	343	350	350	350	265	197	134	75	33
Savings per Patient		$873	−$500	$390	−$704	−$893	−$1,197	$476	$796	−$11,978	$549	$361	$2,898	−$5,294	−$383

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 13 illustrates the Medicare spending per beneficiary in Table 18 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters. Intervention group patients experience a spike in spending in I1, which may reflect the hospitalization preceding enrollment into the CP for persons with hospitalization for CHF or MI. In the baseline period, the levels of spending are comparable between the treatment and comparison groups. Post-intervention, the evidence is mixed.

Figure 13. Medicare Spending per Patient: REMSA CP



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
REMSA CP = Regional Emergency Medical Services Authority community paramedic.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 19*** and ***Figure 14***. Mirroring expenditures, the spike in inpatient admissions observed in the first quarter of enrollment likely represents selection into the program. Thereafter, the trend reverses toward mean values of utilization.

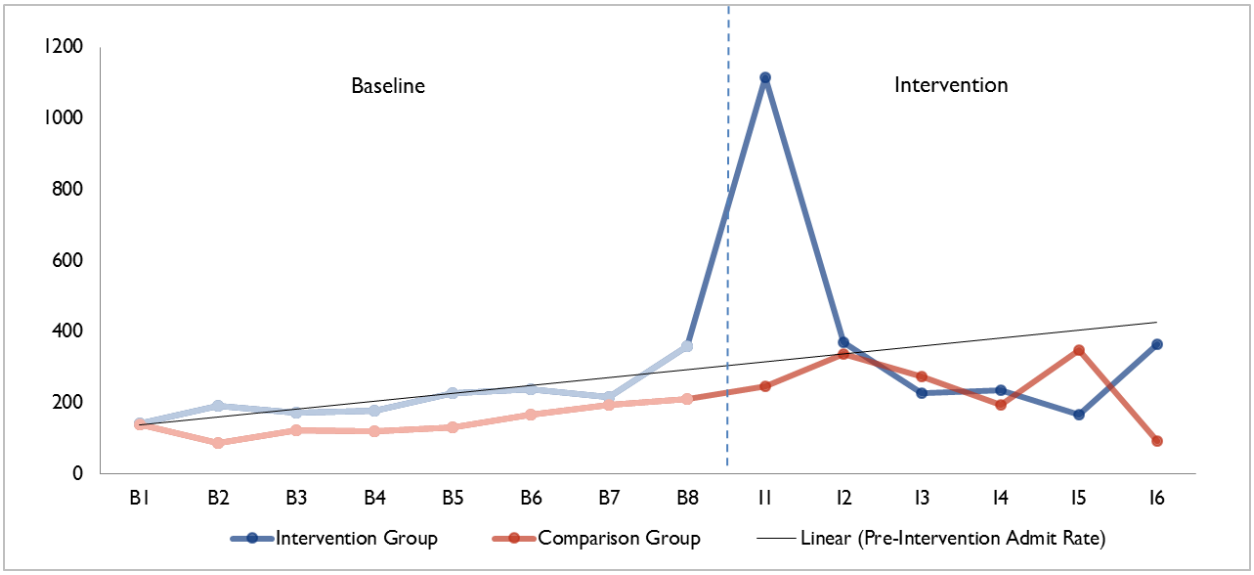
Table 19. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: REMSA CP

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters					
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6
Intervention Group															
1C1CMS 330971	REMSA – CP														
	Admit rate	143	190	171	176	226	239	215	358	1,117	369	227	234	167	364
	Std dev	350	503	436	474	557	601	522	702	1,101	737	449	471	373	881
	Unique patients	119	121	123	125	133	134	135	137	137	103	75	47	24	11
Comparison Group															
1C1CMS 330971	REMSA – CP														
	Admit rate	139	88	123	119	132	166	194	211	246	336	274	194	347	91
	Std dev	496	326	367	353	405	425	642	538	625	664	680	546	692	287
	Unique patients	331	331	332	337	342	343	350	350	350	265	197	134	75	33
Intervention − Comparison Rate		4	102	47	57	94	73	21	146	871	33	−47	40	−180	273

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 14. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: REMSA CP



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
REMSA CP = Regional Emergency Medical Services Authority community paramedic.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 20*** and ***Figure 15***. Because of the low number of index admissions (the denominator in the readmissions measure), the unplanned readmissions rate is highly variable. As more beneficiaries enroll in the innovation and more claims data become available, the sample size will increase and the unplanned readmissions measure may be reported with more precision. Low number of index admissions is a common feature for a number of awardees and programs.

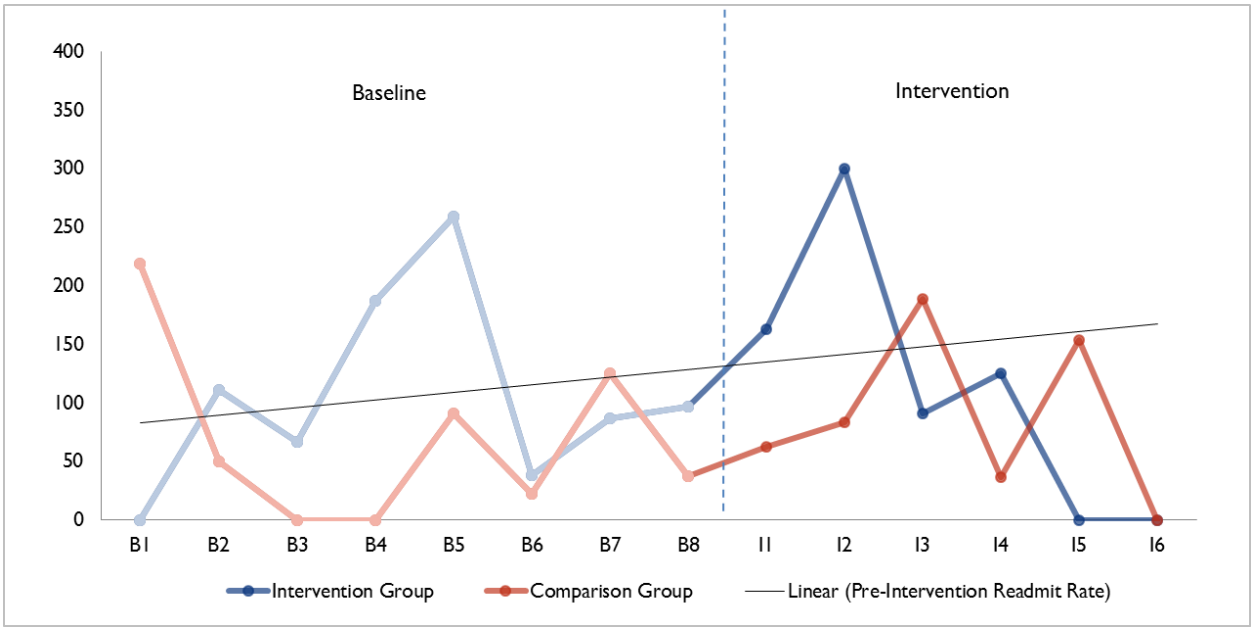
Table 20. Hospital Unplanned Readmissions Rates per 1,000 Admissions: REMSA CP

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters					
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6
Intervention Group															
1C1CMS 330971	REMSA – CP														
	Readmit rate	0	111	67	188	259	38	87	97	163	300	91	125	0	0
	Std dev	0	314	249	390	438	192	282	296	370	458	288	331	0	0
	Total admissions	12	18	15	16	27	26	23	31	104	20	11	8	3	1
Comparison Group															
1C1CMS 330971	REMSA – CP														
	Readmit rate	219	50	0	0	91	22	125	38	63	83	189	37	154	0
	Std dev	413	218	0	0	288	147	331	191	243	276	392	189	361	0
	Total admissions	11	7	8	10	11	15	16	18	21	20	12	9	4	1
Intervention − Comparison Rate		−219	61	67	188	168	16	−38	59	100	217	−98	88	−154	0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 15. Hospital Unplanned Readmissions Rates per 1,000 Admissions: REMSA CP



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
REMSA CP = Regional Emergency Medical Services Authority community paramedic.

ED visits per 1,000 participants are shown in ***Table 21*** and ***Figure 16***. The treatment group has a spike in the ED visit rate in I1 that decreases in subsequent periods but not fast enough to mirror the ED rate of the comparison group, which is consistently lower.

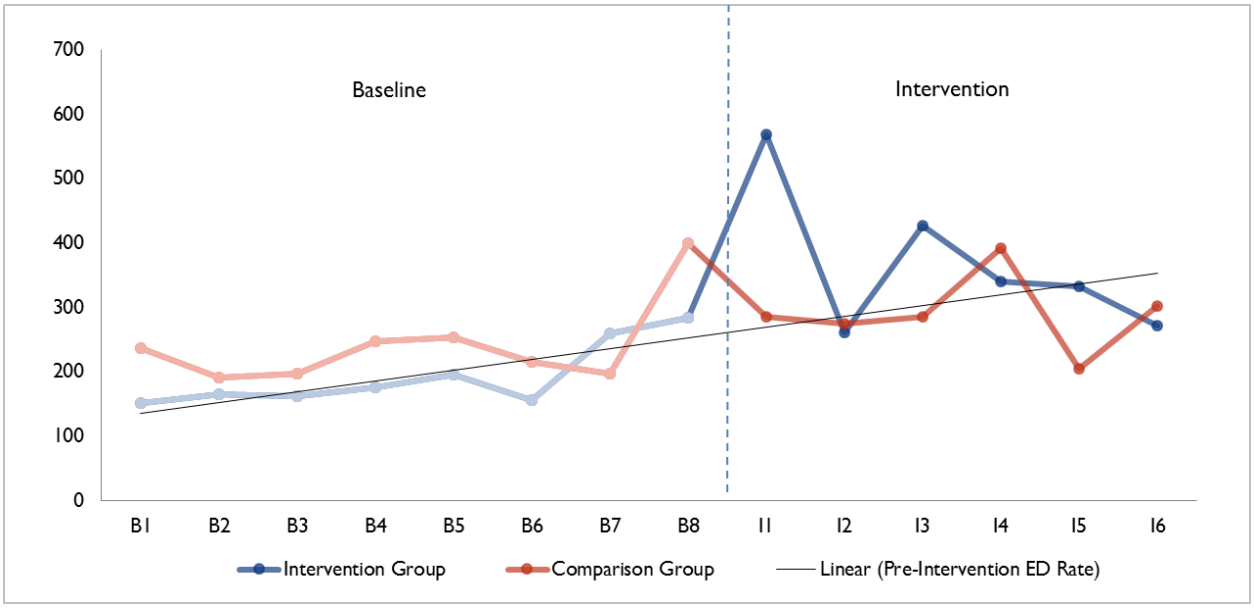
Table 21. ED Visits per 1,000 Participants: REMSA CP

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters					
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6
Intervention Group															
1C1CMS 330971	REMSA – CP														
	ED rate	151	165	163	176	195	157	259	285	569	262	427	340	333	273
	Std dev	463	454	564	525	514	488	598	923	938	593	1,002	731	868	647
	Unique patients	119	121	123	125	133	134	135	137	137	103	75	47	24	11
Comparison Group															
1C1CMS 330971	REMSA – CP														
	ED rate	237	192	198	248	253	216	197	400	286	276	285	393	205	303
	Std dev	497	308	404	437	368	379	372	672	404	506	474	615	274	338
	Unique patients	331	331	332	337	342	343	350	350	350	265	197	134	75	33
Intervention − Comparison Rate		−86	−27	−35	−72	−58	−60	62	−116	283	−14	142	−52	128	−30

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 16. ED Visits per 1,000 Participants: REMSA CP



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
REMSA CP = Regional Emergency Medical Services Authority community paramedic.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit. All regressions included an indicator variable for the treatment group, an indicator variable for each quarter, and quarterly indicators interacted with the treatment group variable in the post-intervention period. We controlled for age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The regression specification assumes the same quarterly fixed effect for treatment and comparison individuals in the pre-innovation period and allows for a separate quarterly effect for treatment individuals after enrolling in the innovation.

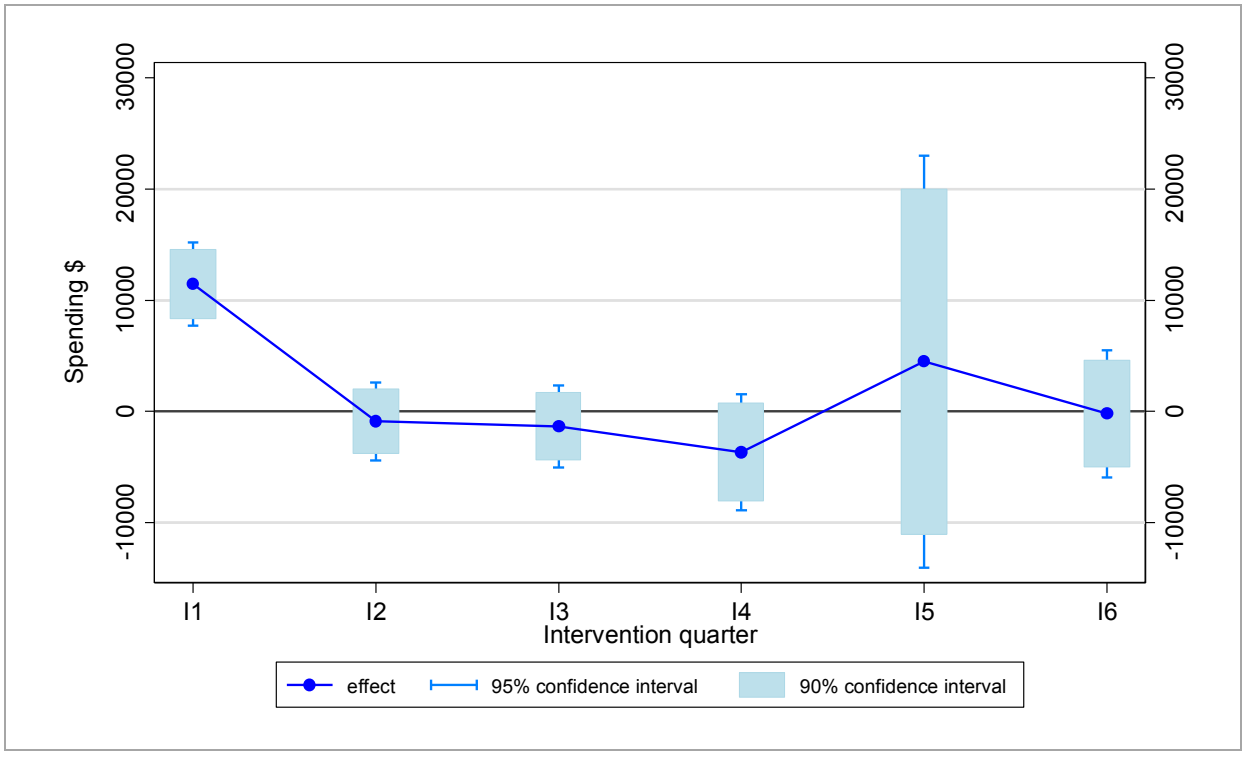
Table 22 presents the results of an OLS regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. Spending for participants in the CP intervention is significantly higher in I1. Although the majority of the remaining post-intervention periods suggest some savings from the program, these are not statistically significant. ***Figure 17*** illustrates these quarterly difference-in-differences estimates.

Table 22. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: REMSA CP

Quarter	Coefficient	Standard Error	P-Values
I1	11,454	1,905	<.001
I2	−898	1,779	0.614
I3	−1,353	1,873	0.471
I4	−3,653	2,665	0.171
I5	4,483	9,448	0.635
I6	−215	2,915	0.941

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
OLS = ordinary least squares; REMSA CP = Regional Emergency Medical Services Authority community paramedic.

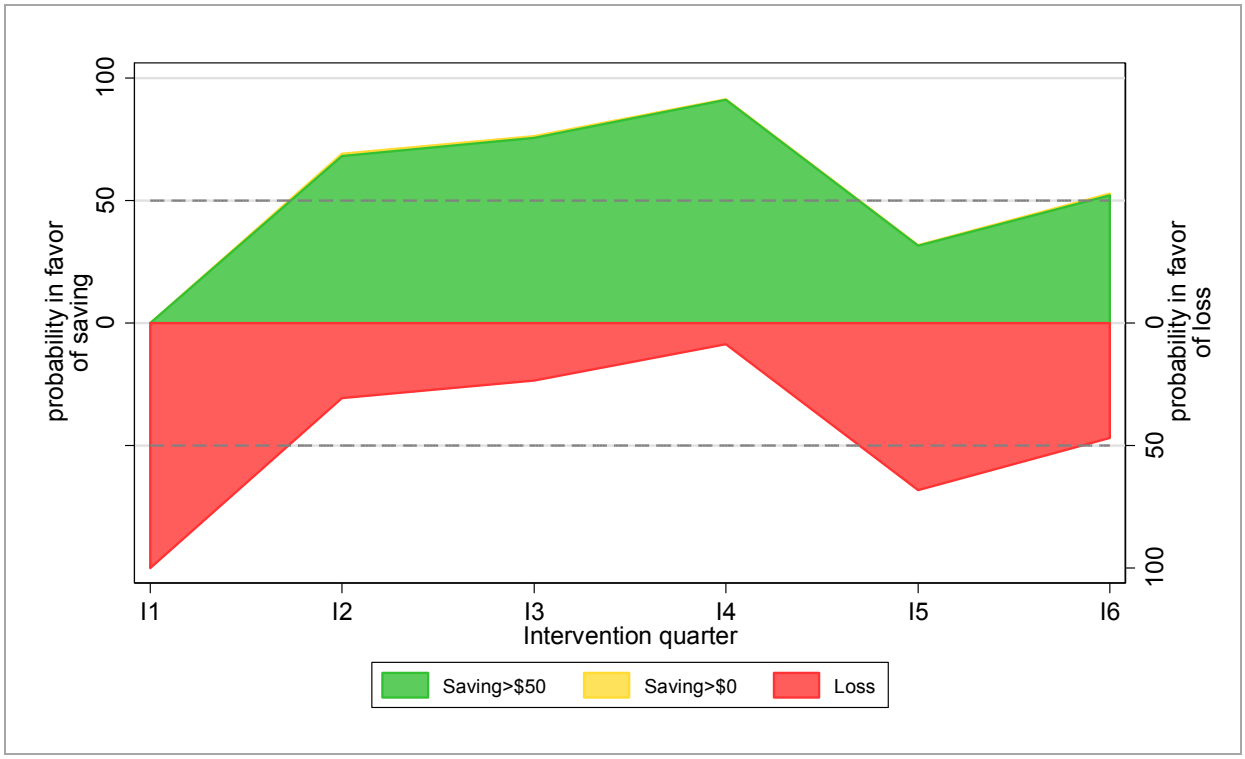
Figure 17. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: REMSA CP



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
OLS = ordinary least squares; REMSA CP = Regional Emergency Medical Services Authority Community Paramedics.

Figure 18 presents the strength of evidence in favor of savings or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis. In I1, spending is substantially higher in the treatment group than the comparison group and Figure 18 supports the innovation generating losses in that period. Thereafter, however, the probability of savings is comparable to the probability of losses. Savings greater than $50 and savings greater than zero completely overlap.

Figure 18. Quarterly Strength of Evidence in Favor of Savings/Loss: REMSA CP



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
REMSA CP= Regional Emergency Medical Services Authority community paramedics.

We also present the weighted average treatment effect per quarter during the intervention period for beneficiaries enrolled in the innovation as compared to their matched comparison group. The weighted average quarterly spending differential in the post-innovation period, indicating a loss, is −$3,251 (90% CI: -$1,198, −$5,304). This estimate is statistically significant. This figure represents the differential spending per quarter in the post-intervention period between individuals enrolled in the innovation and comparison group individuals, on average, weighted by the number of intervention beneficiaries in each quarter. The 90 percent confidence interval is the range in which the true parameter estimate falls, with 90 percent confidence.

We also present linear probability model coefficients for inpatient admissions and outpatient ED visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the

estimated effect.[9] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, linear probability model coefficients have often been empirically demonstrated to be consistent with marginal effects generated from nonlinear models.[10] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention), not just the direction of the effect.

Table 23 presents the results of a linear probability model regression with the dependent variable set to one for patients who had a hospital visit during the quarter. The probability of hospitalization is significantly higher for the treatment group in I1. There is evidence of lower hospital admissions in subsequent quarters, with the exception of I6, but these results are not statistically significant. The average quarterly difference-in-differences estimate for inpatient admissions is 15.0 percentage points, indicating that the treatment-control difference is 15.0 percentage points higher during the intervention period. This is the average difference in inpatient admissions probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: .10, .20).

Table 23. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: REMSA CP

Quarter	Coefficient	Standard Error	P-Values
I1	0.48	0.05	<.001
I2	−0.01	0.05	0.830
I3	−0.02	0.05	0.773
I4	−0.03	0.07	0.642
I5	−0.12	0.09	0.172
I6	0.02	0.13	0.865

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
NOTES: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
REMSA CP = Regional Emergency Medical Services Authority community paramedics.

Table 24 presents results of a linear probability model regression with the dependent variable set to one for patients who had an ED visit during the quarter. The ED visit rate is significantly higher for the treatment group in I1. Although some evidence indicates decreased ED visits for those participating in the program during I4-I6, the evidence is not statistically significant. The average quarterly difference-in-

[9] To obtain the correct effect it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run even when not competing with other users for computer resources.

[10] Angrist, J.D., and Pischke J.-S. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

differences estimate for ED visits is 17.4 percentage points, indicating that the treatment-control difference is 17.4 percentage points higher during the intervention period. This is the average difference in ED visit probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: .119, .229).

Table 24. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: REMSA CP

Quarter	Coefficient	Standard Error	P-Values
I1	0.50	0.04	<.0001
I2	0.04	0.06	0.506
I3	0.04	0.06	0.521
I4	−0.03	0.08	0.710
I5	−0.12	0.10	0.256
I6	−0.12	0.15	0.414

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
REMSA CP= Regional Emergency Medical Services Authority community paramedics.

Discussion

Although the CP intervention shows marginal improvements in the outcomes of interest in quarters after I1, the improvements are not statistically significant. A caveat in interpreting the results is that the path that leads to treatment (CP visit) starts with a hospitalization for individuals in the 30-day program. Currently, the cloning approach imposes a lag in I1 from using calendar quarters rather than monthly enrollment. Matching hospitalizations as the unit of analysis, rather than people-quarters, may provide a more realistic unit of analysis. In the future we also plan to split the sample by program, subject to higher enrollment numbers of Medicare beneficiaries.

CP results may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicare beneficiaries whom we could match with the identifiers provided by the site. This number represents approximately 26 percent of the overall population reached by the innovation. In addition, a small sample size hinders the detection of changes in spending.

Medicaid Claims Analysis

Currently, Medicaid claims for REMSA are available in Alpha-MAX only through Q1 2013. This time period does not overlap with the program implementation. We will be able to provide Medicaid analyses in subsequent reports as Alpha-MAX data become available. We will report tables and figures similar to those for Medicare.

1.3.3 Other Awardee-Specific Data

We received patient-level data used to generate each measure listed in Tables 8 and 25 for each quarter through Q10 (December 31, 2014). ***Table 25*** lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. The data we present in this section are current through March 2015. REMSA, however, only provided data through Q10, December 2014. The results of analyses for all of these measures are included in this annual report.

Table 25. Awardee-Specific Outcome Measures

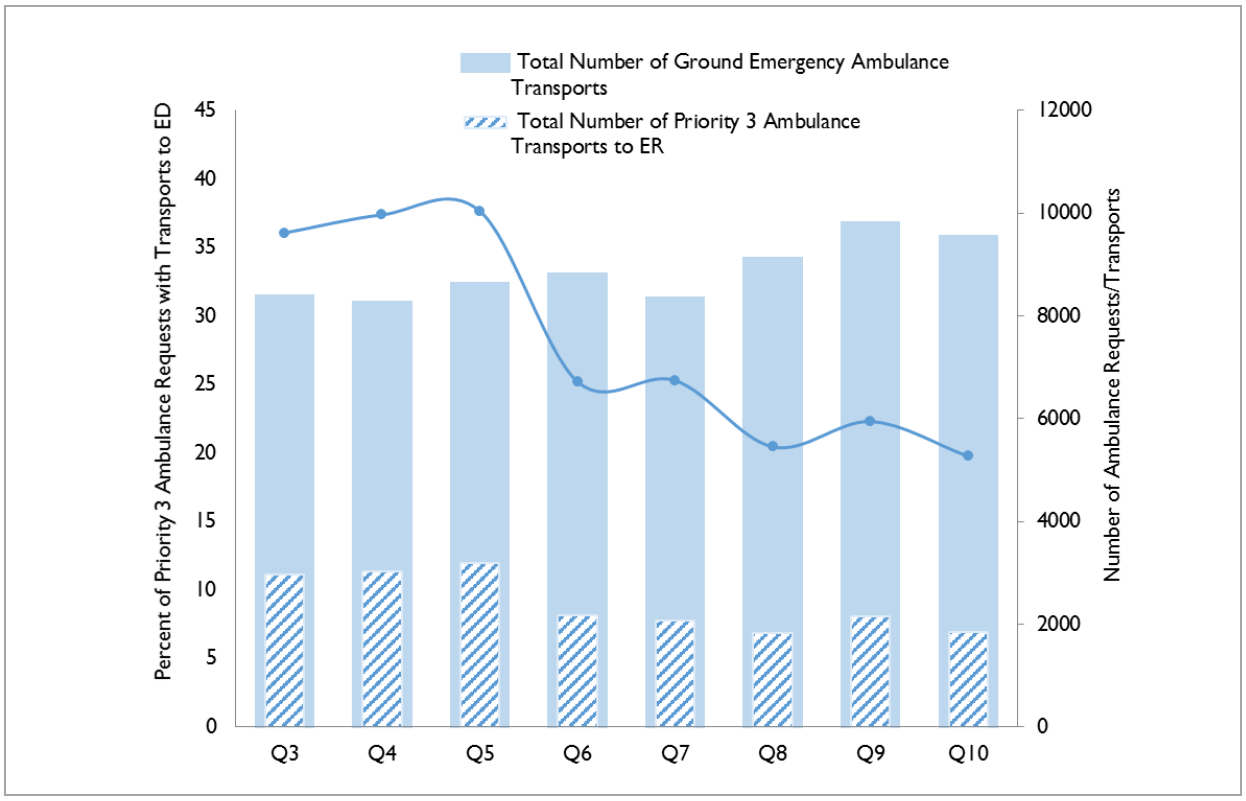
Evaluation Domains	Subdomains	Measure	Status
Health care outcomes	Utilization	Number/percentage of Priority 3/low-priority ambulance transports to ED	Data received from REMSA
		Hospital readmission rate	Data received from REMSA

REMSA = Regional Emergency Medical Services Authority.

Health Care Outcomes

REMSA provided health care utilization data to RTI, related to REMSA's goals of improving appropriate care and reducing costs. The source of this data is aggregated data provided in REMSA's self-monitoring plan. ***Figure 19*** *(Priority 3 transports to ED)* demonstrates that about 20 percent of transports to the ED are nonemergency (Priority 3/low priority). Over time, if the ATA and NHL components of this innovation are successful, we expect to see a decrease in the percentage of nonemergency ambulance transports to the ED.

Figure 19. (Priority 3 transports to ED). Percent of Priority 3/Low Priority Transports to the ED though Q10



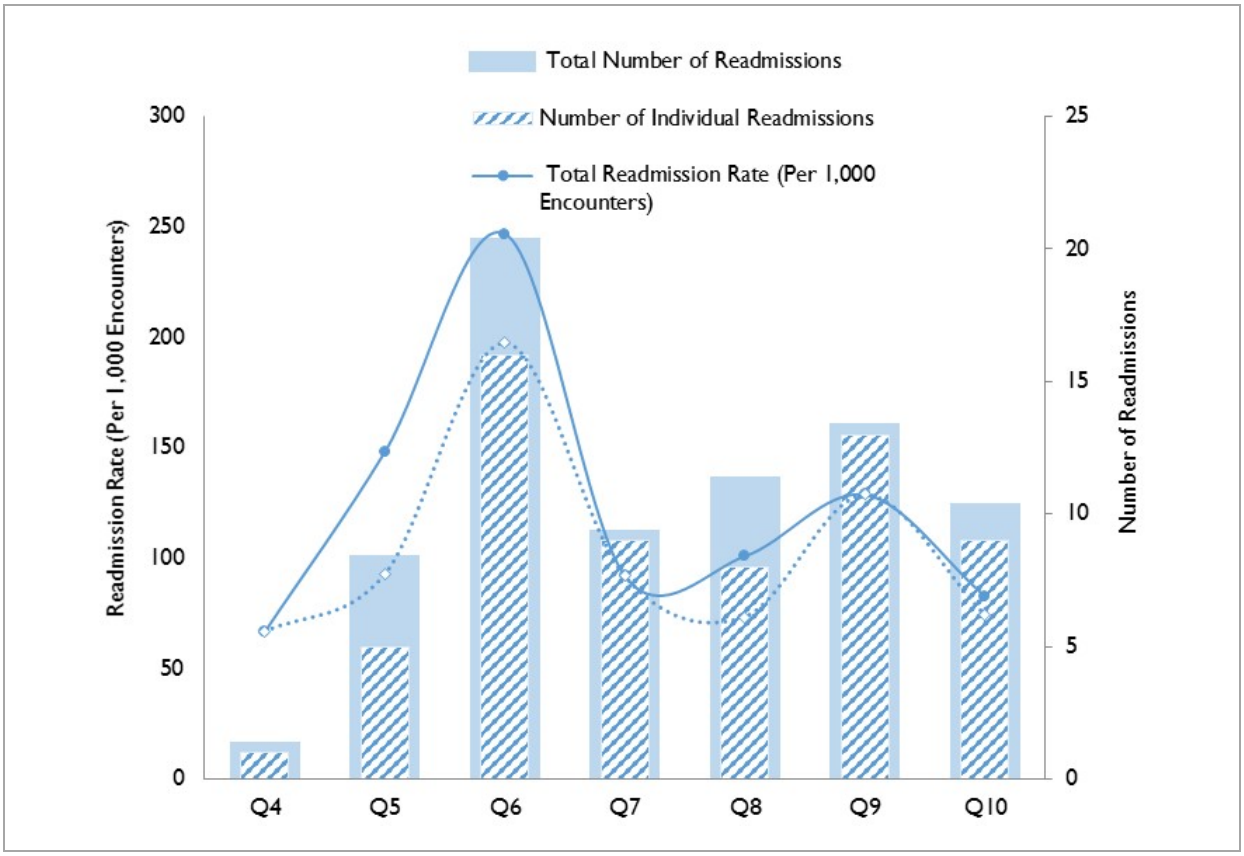
	Quarter	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
●	Percent of Priority 3 ambulance transports to ED	36.1	37.4	37.7	25.2	25.3	20.4	22.3	19.8
	Total number of ground emergency ambulance transports	8,212	8,098	8,456	8,650	8,176	8,945	9,641	9,378
	Total number of Priority 3 transports to ED	2,962	3,028	3,184	2,180	2,068	1,829	2,150	1,853

Source: Aggregate data provided in self-monitoring plan
ED = emergency department; Q = quarter.

REMSA provided patient-level data on the rate of total hospital readmissions for participants in the CP program by quarter through Q10, as well as the rate of individual hospital readmissions for participants enrolled in the CP program. RTI is presenting this data in both ways, because, due to the nature of the diseases for which people enroll in the CP program (CHF, COPD), readmission rates can be high, and if individuals are very ill, they will need to be readmitted multiple times. ***Figure 20 (CP readmission)*** shows that for every 1,000 participants enrolled in the program in Q10, 82.6 participants are readmitted to the hospital during the course of their enrollment. This rate decreases to 74.4 readmissions for every 1,000 participants when unique individuals are considered rather than participants enrolled in the program. Overall, since the inception of the innovation in Q4, the total rate of readmission

for individuals enrolled in the CP program is 110.5 for every 1,000 participants, and the individual rate of readmission for those enrolled in the CP program is 93.3 for every 1,000 participants.

Figure 20. (CP Readmissions). Rate of Total and Individual Hospital Readmissions for Patients Enrolled in the CP Program



	Quarter	Q4	Q5	Q6	Q7	Q8	Q9	Q10
●	Total readmission rate (per 1,000 encounters)	66.7	148.1	246.9	91.8	100.9	148.5	82.6
◊	Individual readmission rate (per 1,000 encounters)	66.7	92.6	197.5	91.8	82.6	138.6	74.4
	Total number of readmissions	1	8	20	9	11	15	10
	Number of individual readmissions	1	5	16	9	9	14	9

Source: Patient-level data provided to RTI by REMSA.
CP = community paramedic; Q = quarter.

Evaluation Question

- Has the number of Priority 3 and Omega transports to the ED decreased for the ATA component of the innovation?
- Has follow-up by the CPs resulted in fewer hospital readmissions?

Discussion of Other Awardee-Specific Findings

REMSA is focused on decreasing the number of nonemergency calls to 911 (through the NHL program), decreasing the number of nonemergency transports to the ED (through the ATA program), and decreasing the number of hospital readmissions for individuals enrolled in the CP program. Early indications are that the CP component may decrease readmission rates. REMSA shared that approximately 20 percent of CHF patients they serve have historically been readmitted within 30 days (June 2014 site visit). The current total readmission rate for CP patients, most of whom have CHF, is only 11.1 percent—a marked improvement. As we receive additional data from REMSA for CP patients specifically, we hope to examine these potential impacts further.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing REMSA as well as accomplishments to date. In this section we assess REMSA's progress on achieving HCIA goals to date.

- **Smarter spending.** Based on the claims analysis, the ATA has insignificant effects on spending overall. The CP is associated with significantly higher spending overall and in I1. For both analyses, the comparison group may not be optimal and small sample sizes may hinder the ability to detect changes in spending. Although REMSA reported savings of nearly $3.4 million using an avoided encounters savings methodology from the CP and ATA innovations, RTI is unable to duplicate those finding at this time.

- **Better care.** The ATA innovation has insignificant effects on hospitalizations and is associated with significantly higher ED visits. The CP innovation is associated with significantly higher hospitalizations and ED visits overall, but this may be driven largely by hospitalizations that occur in I1 that trigger enrollment in the program. The number of individuals encountered by each of the components of the innovation continues to increase for Q10 (with the exception of ATA, which decreased 0.3%). For the ATA component to be successful and increase its reach, many exogenous factors must be considered that REMSA has no control over (e.g., patient agreeing to alternate transport, alternate location having a bed available for the patient, patient having insurance accepted by the alternate location).

  The NHL shows increasing participation/usage each quarter, with a continually increasing reach, and the reach of the CP enrollment and CP E&R components remain relatively stable potentially because they have very specific target populations. The paramedics in the CP component of the innovation continue to provide home visits for the enrolled participants; they performed 3,159 home visits since the inception of the program, which is an average of 5.4 visits per patient during their 30-day enrollment.

- **Healthier people**. REMSA has not yet provided data on health outcomes to RTI.

REMSA's innovation is clearly "cutting edge" in the field of emergency medicine and has received statewide and national attention. The leadership worked effectively to engage key partners, including payers, in the process of development and recently received approval from 75 percent of their patient payers' sources for payment of transport to alternative locations. Medicare is the only funder yet to approve this change. Two key outcomes signify the promise REMSA holds in cutting health care costs

and better using services. First, Nevada was recently selected as a State Innovation Model (SIM) state by CMS, and REMSA was invited to be a member of the stakeholder meeting. The state recently decided to use REMSA as a model to implement statewide and included the intervention in its statewide SIM driver diagram, particularly the CP component. Second, the governor of Nevada recently signed legislation for the state to support CPs in other areas as of June 2015.

With all of this promise, REMSA leadership learned a great deal about the implementation process. They note that staff selection is key, particularly for the CP role since it drastically changes the paramedics' job responsibilities. The change in roles took time and training for people to accept but they are mostly enjoying the work as of June 2015. They also acknowledge that, "it takes a long time to move public policy." Changing the payment models so that their services could be supported beyond the HCIA 3-year funding period has been challenging. As the leaders note, their innovation is a true "paradigm shift" which takes time to implement. Achieving acceptance has required clever marketing and dissemination of successes, such as the recent accreditation by the International Academy of Emergency Dispatch of the NHL.

Overall, REMSA achieved great success in implementing the three components they planned and in adding a fourth based on input from their external partners. Leadership has been engaged throughout implementation and the project leader had the right mix of strengths in understanding emergency medicine and the business side of that care, networking with partners and internal collaborators, and being open to adaptations to the innovation as it evolved. She recognizes that REMSA did not have the proper organizational capacity; she believes it would have been helpful to have a data manager who could devote more time to the project and had specific training in the types of data RTI needed. A business development coordinator would have also helped to support the leaders in engaging payers and partners in the innovation moving forward.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

South County Community Health Center

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant Interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

South County Community Health Center

1.1 Introduction

South County Community Health Center[1] (South County) is a federally qualified health center (FQHC) in Palo Alto, CA, that received an award of $7,060,843 to identify, prioritize, and manage high-risk patients. South County's innovation seeks to achieve the following HCIA goals.

1. **Smarter spending.** Reduce expenditures by 5 to 10 percent by better planning and managing care for complex patients, resulting in fewer ED visits and approximately $6.2 million in system savings.

2. **Better care.** Improve care by enhancing access to chronic disease services; successfully managing care and utilization of these services; and creating and implementing a workforce development and training coordination deployment plan.

3. **Healthier people**. Improve health outcomes (e.g., hypertension and diabetes) for patients with chronic disease.

Table 2 provides a summary of changes that occurred with South County during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data received from South County as of May 31, 2015; and key informant interviews with South County's leaders and staff conducted June 3–5, 2015.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	No change since the first annual report;[1] innovation involves a total transformation of care such that patients are assessed from the start and assigned to a medical team for active management and care coordination within the clinic and intensified linkages within the community.
Program Participant Characteristics	Majority of participants were less than 18 years of age. More specifically, the percentage of participants less than 18 years of age increased from 20.5% in Q9 to 42.8% in Q11, while the percentage of those 25 to 64 years of age declined from 62.1% to 42.7%. More than half (60.5%) were female. The majority were Hispanic and were covered by Medicaid (84.1% and 84.9%, respectively).

(continued)

[1] Also referred to as Ravenswood in some documents; South County is the legal name.

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Implementation Process	
Execution	Improved efficiencies in appointments (i.e., more patients seen each day, fewer "no shows").
	Refined the EHR system, and put in place care coordination templates and patient and organizational dashboards to monitor specific conditions or care processes.
	Spending rate for Year 3 budget was 47.5%, slightly below projected rate.
Leadership	No change since the first annual report; leadership remained highly involved in the innovation.
Organizational capacity	South County previously had staff in different buildings, but opened its new building in 2015, where entire staff is now co-located. Unification of staff drove efficiencies in patient care.
	Creating templates that align with the new workflow processes in the EHR system was challenging. However, South County gradually improved reporting of patient outcomes, although it continued to struggle with data analysis and seem to have limited capacity for providing and analyzing patient data.
Innovation adoption and workflow	The new building with collocated staff (e.g., pediatrics now has a central location) eased coordination of care processes. The staff had access to the new nurse, who focuses on patients who have been to the ED and coordinates their care to better integrate them into primary care services.
Workforce Development	
Hiring/retention	No new hires; three separations in Q8; FTE staff funded by the program declined to 29.3, below projection by 1.00 FTE.
Training	407 hours of training were provided to 40 staff members (mostly employed clinical staff).
	87 trainees underwent 418 training hours.
	Family practice MAs and RNs were trained in diabetes foot screening; highest attendance was in wellness workshops.
	110 trainees (predominately administrative personnel) underwent 576 training hours.
	Created opportunity with collaborating agencies for nonclinical staff to receive medical assistant training and industry certification.
Implementation Effectiveness	
Reach	51.1% of target population was enrolled (3,222 participants).
Dose	Majority of all enrolled completed a comprehensive assessment (92.7%), initiated care plan (92.8%), and had contact with a health coach (40.2%). High-risk patients (i.e., those with poor HbA1c control) received an average of six contacts with health coaches. More than 20% of high-risk patients received an IBHS referral.

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by South County.
Key informant interviews conducted Feb–June 2015.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

EHR = electronic health record; FTE = full-time equivalent; IBHS = integrated behavioral health services; MA = medical assistant; RN = registered nurse.

1.1.1 Innovation Components

This innovation consists of four program components that have transformed South County's internal care coordination processes, staff roles, and clinic flow:

1. Comprehensive health assessments, completed by patient navigators with new and returning patients, that capture family medical history, current chronic conditions, prescribed medications, allergies, and patient barriers to care; this information is entered into the electronic health record (EHR) system (called NextGen);

2. Panel management and family practice care teams that engage providers (nurse practitioner, physician's assistant, or physician), medical assistants, and health coaches/panel managers to collaboratively manage panels of high-risk patients;

3. RN (registered nurse) care coordinator and health coaches assigned to frequent users of the Stanford University Medical Center ED (Stanford) to access follow-up care and promote long-term changes to health risk; and

4. Community resources referrals to three community organizations—Nuestra Casa, Voices of Recovery (VOR), and the San Mateo County Health System Behavioral Health & Recovery Services (BHRS)—to provide intensified, immediate referrals and linkages to behavioral health or substance abuse treatment, transportation, housing, and food assistance.

The innovation involves both care coordination changes within the clinic to treat or prevent complications of chronic conditions such as diabetes, high blood pressure, and heart disease. No changes were made to these components since they were described in the first annual report.[2] The partners for this innovation (Neustra Casa, VOR, BHRS) also remained the same.

1.1.2 Program Participant Characteristics

Table 3 provides the demographic characteristics of all participants ever enrolled in the innovation. We first reported patient characteristics based on secondary data in the Q4 evaluation report, based on data through Q8 of innovation implementation. The distribution of gender, race/ethnicity, and payer type is similar to that in the Q4 evaluation report. More specifically, at enrollment, more than half of participants (60.5%) were female. The majority were Hispanic and were covered by Medicaid (84.1% and 84.9%, respectively). However, the distribution of age differs from that reported in the Q4 evaluation report. In particular, the percentage of participants less than 18 years of age increased from 20.5 percent to 42.8 percent, whereas the percentage of those between 25 and 64 years of age declined from 62.1 percent to 42.7 percent. These changes are due to South County's efforts to enter data into the new EHR system retrospectively so that the proportion of patients overall who are in the system is increasing. Since all patients are technically part of the innovation (i.e., system transformation) and receive many of the associated services (e.g., comprehensive health assessment, assignment to medical care teams),

[2] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

these changes are expected. South County will eventually enter all patients into the EHR, but still only provide health coaching to the targeted chronic conditions of hypertension and diabetes.

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Number of Participants	Percentage of Participants
Total	3,222	100.0
Age		
< 18	1,378	42.8
18–24	225	6.9
25–44	703	21.9
45–64	672	20.8
65–74	144	4.6
75–84	68	2.1
Age (continued)		
85+	32	0.9
Missing	0	0.0
Sex		
Female	1,950	60.5
Male	1,268	39.4
Missing	4	0.1
Race/ethnicity		
White	73	2.3
Black	207	6.4
Hispanic	2,711	84.1
Asian	15	0.5
American Indian or Alaska Native	2	0.1
Native Hawaiian or Other Pacific Islander	153	4.7
Other	15	0.5
Missing/refused	46	1.4
Payer Category		
Dual	139	4.3
Medicaid	2,734	84.9
Medicare	0	0.0
Medicare Advantage	0	0.0
Other	349	10.8
Uninsured	0	0.0
Missing	0	0.0

Source: Patient-level data provided to RTI by South County.

1.2 Implementation Progress

The first annual report (2014) described South County's implementation process, workforce development, and progress toward effectiveness, and detailed the quantifiable measures to assess each area. ***Table 4*** lists these measures and their status as of May 31, 2015. The results of analyses for all of these measures are included in this annual report.

This section presents South County's process measures and a qualitative analysis of the factors that determined South County's implementation progress. This analysis draws on patient-level data that South County provided to RTI as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation effectiveness	Reach	Number/percentage of target population patients	Data received from South County
	Dose	Care plans initiated	Data received from South County
		Completed comprehensive assessments	Data received from South County
		Number of contacts with health coaches	Data received from South County
Coordinated care	Comprehensiveness	Number/percentage of patients referred to IBHS	Data received from South County

IBHS = integrated behavioral health services; South County = South County Community Health Center.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through South County's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include South County's reports from Q8 through Q10 and interviews conducted from June 3-5, 2015.

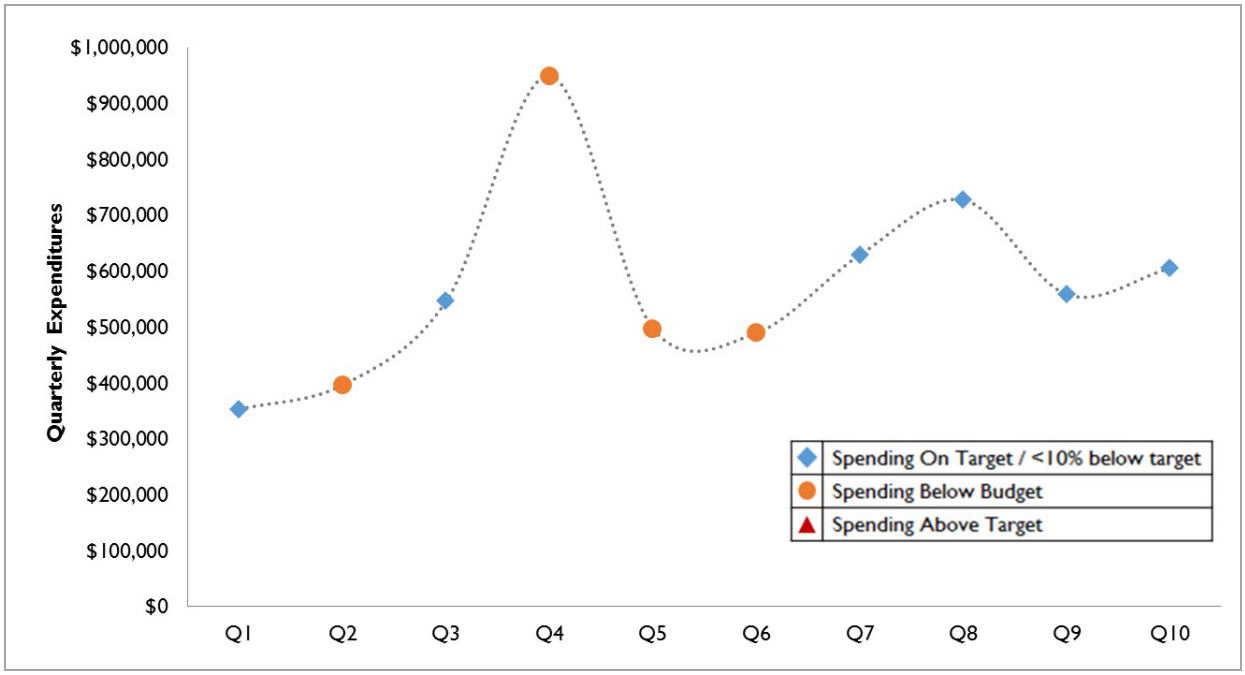
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

Execution of Implementation

The annual report highlights the significance of South County's expenditure rates on implementation. As of December 2014 (Q10), South County spent 47.5 percent of its Year 3 budget, which is slightly below the projected target.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Leadership

The leadership at South County did not change; the chief executive officer (CEO) and all other leaders, including the medical director, were highly involved in the implementation of the innovation. As described in the first annual report, South County's innovation transformed its entire process of care delivery and was envisioned by the CEO as a means to provide more comprehensive and coordinated care to all patients. The CEO and medical director worked together to create the entire vision for the innovation and implement workflow process changes. Since this was such a dramatic change from their previous patient flow of care, staff in a few departments were more amenable to change than in other departments. However, the CEO worked effectively to engage the support of providers across the organization to increasingly incorporate their patients into the new processes. She shared her strong belief that this new process of care provides South County's patients with better outcomes and is personally invested in seeing that the changes continue.

Organizational Capacity

During spring 2015, South County moved into a new building that now houses all staff. Previously, staff members were distributed among several buildings. The colocation of staff, with strategic placement of medical teams all in the same site, was intended to increase efficiencies and coordination for patient care. At the same time, South County implemented a new EHR system (Epic) and continued to struggle with creating templates and interfaces that match the workflow process and procedures. The EHR was a primary barrier to reporting data for patients enrolled in the innovation, but during Year 3, the staff were able to enter more patient data into the system.

Innovation Adoption and Workflow Integration

With the new space, medical teams are now co-located; a clinician, medical assistant, and health coach are in the same area. The goal of united medical teams is to enhance communication among team members on behalf of patients. Some teams adapted well to this new setup and used co-location to enhance patient care coordination; others were more resistant to sharing the same space. Because the workflow processes for South County has changed so drastically as a result of this innovation, it has taken time to evolve and diffuse across the organization and into all departments. Since the intention of the new setup is to enhance communication and collaboration and departments that accepted the innovation first are seeing improvements now, it is likely that outcomes from these efforts will improve beyond the funding period of this award for more patients.

In terms of workflow integration, in early 2014 South County added a new role for a nurse to follow up with patients who had visited the ED. The purpose of this contact was to better connect patients with their primary care providers and to prevent unnecessary future ED visits. According to South County's self-monitoring data, ED visits among high-risk patients decreased starting in April 2014 (n=119, 20%) to March 2015 (n=51, 8%).

Although providers at South County were included in the HCIA Provider Survey, we are not reporting results among only South County providers due to a limited sample size. We do not report at the individual awardee level if there were less than 20 respondents and we received responses from 8 out of the 10 (80%) eligible providers surveyed. The data from South County providers are, however, included in the cross-site analysis of the Provider Survey.

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was staffed with 29.3 full-time equivalent (FTE) staff members, below projection by 1.00 FTE. There were no FTE new hires and three separations occurred between Q8 (June 2014) and Q10. South County reported some workforce challenges in its Q10 *Narrative Progress Report*: Staff members were out for the holidays and on maternity leave during the months of November and December 2014.

Skills, Knowledge, and Training

Between Q8 and Q10, South County provided 1,461 hours of training to 237 clinical staff and administrative personnel. As shown by these numbers, training staff in the new workflow process has been a key component for this innovation. Training modalities included classroom, discussion, and text, and represented a range of courses on topics including health coaching, wellness, boundaries and ethics, behavior-based interviewing, family planning, diversity, and cultural and community resources. Family practice medical assistants and RNs also completed training for foot diabetes screening to allow transitioning basic patient care tasks so that primary care providers (PCPs) could devote more time to medical management. Staff provided feedback on evaluation forms for 10 weeks post-implementation, and results showed 22 percent improvement in foot screening and education. The *Quarterly Awardee Performance Report* notes that the total cumulative number of trainees was 604, with 5,884 total cumulative training hours through December 2014. South County organized the health coach/panel manager curriculum content in a repository and created an inventory of all patient education materials that are used by the health coach/panel manager staff. In addition, a physician/health coach team was identified to work closely with the clinical curriculum development specialist to provide input and guidance for the health coach/panel manager curriculum.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach) and (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

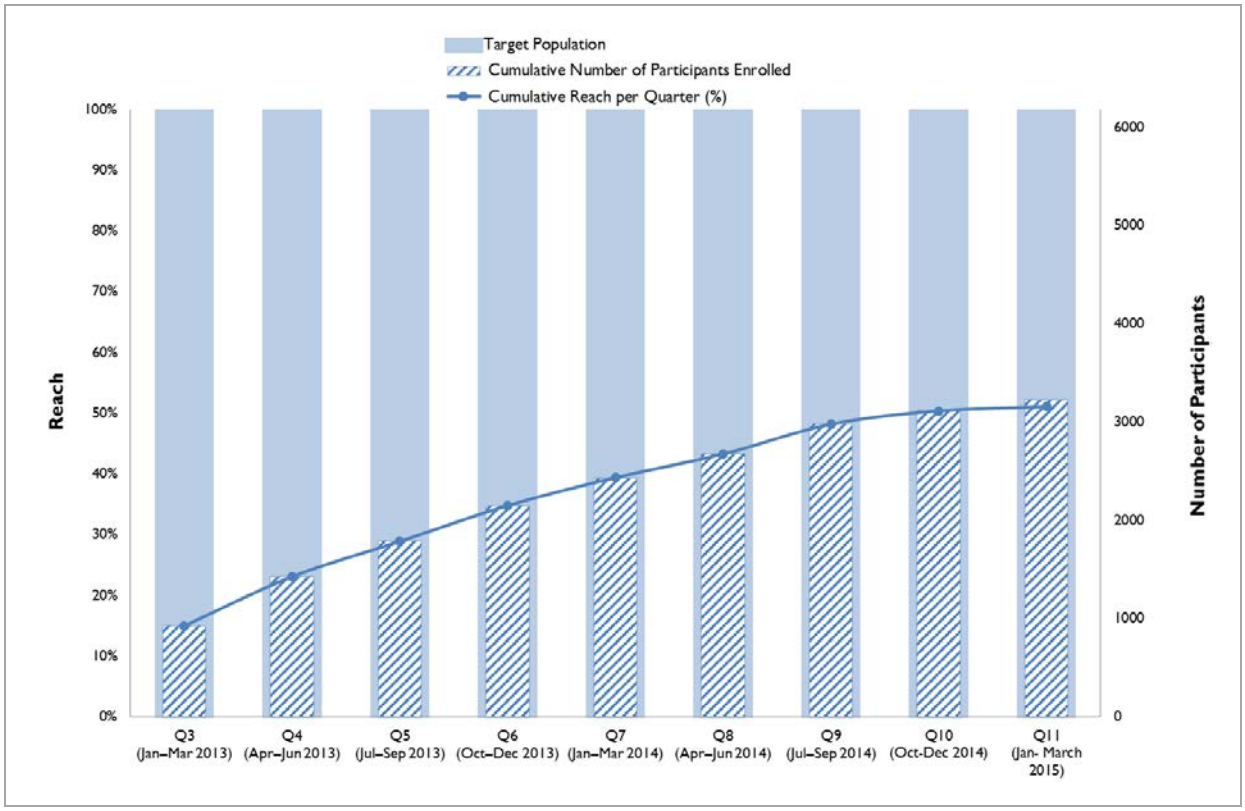
Reach

As previously noted in the first annual report and subsequent quarterly reports, all patients of South County are exposed to the innovation because it thoroughly transforms their process of care delivery. Because of challenges in integrating its new EHR system into the health center and retrospectively adding patient cases, the number of patients included in the innovation has evolved over time (i.e., South County provides patient data from the EHR so only those patients entered into it are included in RTI's findings). ***Figure 2*** shows reach by quarter since the launch of the innovation. We first reported reach in the Q4 report, based on data through Q8. At that time, the data we received indicated that 1,346 participants were enrolled between Q3 and Q8. However, the data received through Q10 indicated that an additional 1,327 patients were enrolled between Q3 and Q8, increasing the total enrolled

through Q8 to 2,673. This discrepancy resulted from the challenges South County faced in the labor-intensive process of updating the EHR documentation for those enrolled in the innovation in (i.e., the health coach had to remember to back into the template in the system and enter a date to include a patient in the enrollment numbers). Over time, South County steadily increased the number of its enrollees, with a total 549 patients enrolled between Q9 and Q11 (51.1% reach).

As noted in previous reports, the number of participants reported in the *Quarterly Awardee Performance Reports* was larger than the number reported in the RTI quarterly and annual reports because South County reports the number of patients who were seen at the clinic since the project started on January 1, 2013, not the number enrolled in the innovation. We report only those enrolled in the innovation. The number of enrollees was lower than expected, likely because of the disruption caused when South County moved into its new building; the focus on entering data into the system and ensuring patients were accounted for in the data was compromised by the move. South County expects to enroll its target number of patients by the end of the innovation as planned. Note, however, that in the past year for which RTI has data (April 2014–March 2015), the reach increased only by 7.8 percent (n=549 patients), and only 3 months remained in South County's funded period.

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch



(continued)

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch (continued)

	Quarter	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct-Dec 2014)	Q11 (Jan-Mar 2015)
●	Cumulative reach per quarter (%)	15.0	23.1	28.9	34.8	39.4	43.3	48.2	50.4	51.1
	Target population	6,180	6,180	6,180	6,180	6,180	6,180	6,180	6,180	6,180
	Cumulative number of participants enrolled	929	1,426	1,788	2,150	2,432	2,673	2,979	3,116	3,222

Source: Patient-level data provided to RTI by South County.

Dose

Table 5 shows the number of services provided across participants, the number of participants receiving services, and the average number of services per participant for the overall population and among those identified as high risk. High-risk participants (i.e., chronic conditions, high cost, high utilization based on an algorithm used by the medical care team) represent 28.6 percent of all those enrolled.

We first reported dose, including comprehensive assessments completed, care plans initiated, and contacts with health coaches in the Q4 report based on data through Q8. As expected, the number of these services provided and the percentage of participants receiving these services increased from Q8 to Q11. More specifically, 92.7 percent of all participants and 97.4 percent of high-risk participants completed a comprehensive assessment. More than half of all participants, including both high-risk and all patients, had contact with a health coach (60.2% and 40.2%, respectively). South County focuses its assessments and coaching efforts on patients at higher risk.

We also included integrated behavioral health services (IBHS) referrals, a measure of coordinated care comprehensiveness, for the first time in this annual report. As shown in the table, almost 10 percent of all patients and more than 20 percent of high-risk patients were referred to IBHS.

Table 5. Number and Types of Services Provided to Participants through Q11

Services	Number of Services Provided Across Participants	Number (Percentage) of Participants Receiving Service	Average Number of Services per Participant
All enrolled patients (3,222)			
Comprehensive assessment completed	3,027	3,027 (92.7)	1.0
Care plan initiated	2,967	2,967 (92.8)	1.0
Contact with health coaches	5,538	1,296 (40.2)	4.3
Referred to IBHS	442	393 (12.2)	1.1

(continued)

Table 5. Number and Types of Services Provided to Participants through Q11 (continued)

Services	Number of Services Provided Across Participants	Number (Percentage) of Participants Receiving Service	Average Number of Services per Participant
High-risk patients[1] (921)			
Comprehensive assessment completed	897	897 (97.4)	1.0
Care plan initiated	860	860 (93.4)	1.0
Contact with health coaches	3,360	555 (60.2)	6.1
Referred to IBHS	228	195 (21.2)	1.2

Source: Patient-level data provided to RTI by South County.
[1] Patients identified as being at high or super-high risk (e.g., chronic conditions, high cost, high utilization).
IBHS = integrated behavioral health services.

Sustainability

The South County innovation involves a total transformation of care such that patients were assigned to and managed by a medical team that focused on ensuring comprehensive care, particularly for patients at greatest risk for experiencing complications resulting in ED visits, hospitalizations, or readmissions. As the CEO reported, during the same time that South County received the HCIA, it received approval to build a new facility, and was preparing to implement an EHR. The new building opened in spring 2015 and all staff were moved. The new space was engineered to encourage coordination within teams: each team had a shared space to facilitate conferring on treatment plans and improving care coordination for each patient. The innovation is regarded as a start for how South County plans to provide care from now, and South County will sustain the new model.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of South County's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data South County collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures that RTI considers essential to the evaluation of South County's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, RTI incorporates the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 6 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of whether the payer specific data are presented in this annual report. This report includes measures for participants enrolled in Medicare, but we do not yet have enough observations to estimate Medicare cost savings. Claims data for Medicaid participants are not yet available.

Table 6. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	No
		Hospital unplanned readmissions rate	Yes	No
		ED visit rate	Yes	No
	Cost	Spending per patient	Yes	No
		Estimated cost savings	No	No

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis

We include patients who were enrolled prior to December 31, 2014, and we present Medicare claims data through December 31, 2014. The analysis uses data from the Centers for Medicare & Medicaid Services (CMS) Chronic Conditions Data Warehouse. Measures are presented for these beneficiaries in the quarters before and after enrolling in the innovation.

Comparison Groups

In addition to comparing beneficiaries pre- and post-innovation, for each claims outcome measure, we compare beneficiaries enrolled in the innovation with beneficiaries not enrolled in the innovation. The comparison group comprises fee-for-service Medicare beneficiaries with at least one chronic disease who lived near South County. We excluded patients who visited South County since the innovation started enrolling patients in January 2013. In addition, comparison beneficiaries were required

to have lived in California from 2010 to December 31, 2014, and in San Mateo County for at least 1 month while the intervention enrolled beneficiaries.

Because individuals were not randomly assigned to the intervention, the probability of treatment may be correlated with the outcome variables of interest. Thus, simply comparing the mean value of the outcome variables for the treated and untreated groups may be biased by the existence of confounding factors. Propensity score matching (PSM) was used to select a comparison group of Medicare beneficiaries similar in observable characteristics to intervention Medicare beneficiaries. From the 3,222 patients enrolled in the innovation to date, 139 (4.3%) were eligible for both Medicaid and Medicare, and 0 percent were eligible for Medicare alone. The lack of Medicare beneficiaries limited the number of variables available for use in the matching regression. The PSM model adjusts for the following potentially confounding factors: age, gender, race, and total payments in the second to fifth quarters prior to enrollment. ***Appendix B.2*** provides technical details on the propensity score methodology.

After PSM, we calculate absolute standardized differences between the treatment group and the unmatched and matched comparison groups, and check whether matching decreases absolute standardized differences and achieves acceptable balance. ***Table 7*** describes the mean values and standardized differences of variables of interest included in the PSM model before and after matching. Many researchers consider that an absolute standardized difference ≤0.10 indicates acceptable balance.[3] Researchers also pointed out that critical variables in determining selection for treatment (e.g., those with significant effects in the propensity score equation) should have greater balance, whereas attaining optimal balance is less critical for indicators with minor importance in determining treatment selection. Results in Table 7 show that matching reduces absolute standardized differences and achieves adequate balance for most variables. Age and race have a significant effect in the propensity score model. Before matching, race (percentage white) has a standardized difference of 2.32, which declines to 0.00 after matching. Age has a standardized difference of 0.73 before matching that reduces to 0.02 after matching. The standardized difference for payments in the calendar year before the innovation increased from 0.1 before matching to 0.26 after matching; however, this variable does not have a significant effect in the propensity score model. Based on observable characteristics, the comparison group selected is a good match to patients in South County.

[3] Austin, P.C.: Balance diagnostics for comparing the distribution of baseline covariates between treatment groups in propensity-score matched samples. Statist. Med. 28:3083-3107, 2009.

Table 7. Mean Values and Standardized Differences of Variables in Propensity Score Model: South County

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	$10,635	$22,835	$8,408	$21,700	0.10	$10,635	$22,835	$6,063	$9,174	0.26
Age	66.55	11.31	74.36	10.20	0.73	66.55	11.31	66.37	6.32	0.02
Percentage male	44.90	50.25	41.89	49.34	0.09	44.90	50.25	46.26	28.88	0.04
Percentage white	10.20	30.58	72.74	44.53	2.32	10.20	30.58	10.20	17.54	0.00
Beneficiaries	49	N/A	75,893	N/A	N/A	49	N/A	147	N/A	N/A
Unique beneficiaries[1]	49	N/A	12,157	N/A	N/A	49	N/A	147	N/A	N/A
Number of weighted beneficiaries	N/A	N/A	N/A	N/A	N/A	49	N/A	49	N/A	N/A

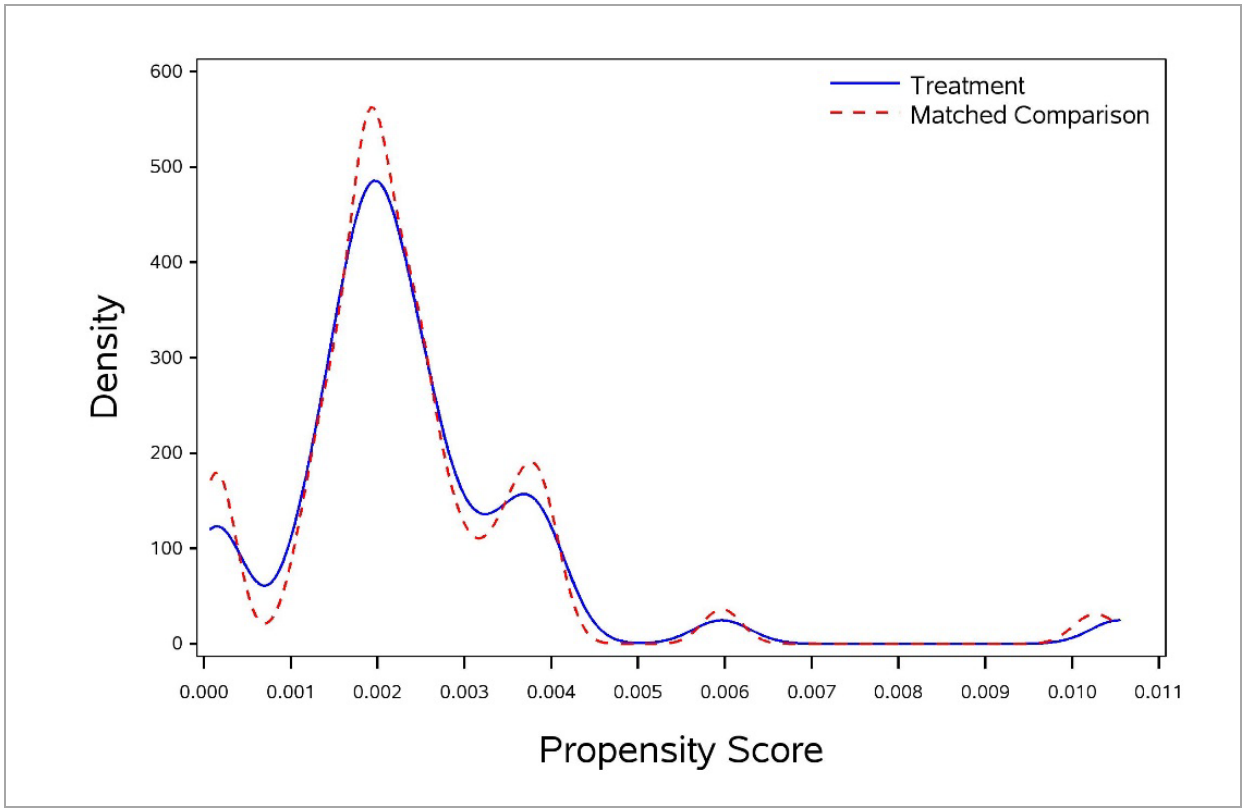
Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B for discussion of weights).

N/A = Not applicable; SD= standard deviation.

Figure 3 shows the distribution of the propensity scores for both the comparison and intervention groups. There were no treatment beneficiaries dropped from subsequent analyses because of lack of an appropriately matched comparison beneficiary. The figure demonstrates a reasonably close overlap between the treatment and comparison groups' propensity scores. Therefore, we present the Medicare claims analysis using both the treatment group and the matched comparison group.

Figure 3. Distribution of Propensity Scores for Comparison and Intervention Groups: South County



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Descriptive Analysis

This report includes claims through December 31, 2014. ***Table 8*** reports Medicare spending per patient in the eight quarters before and the eight quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 8. Medicare Spending per Patient: South County

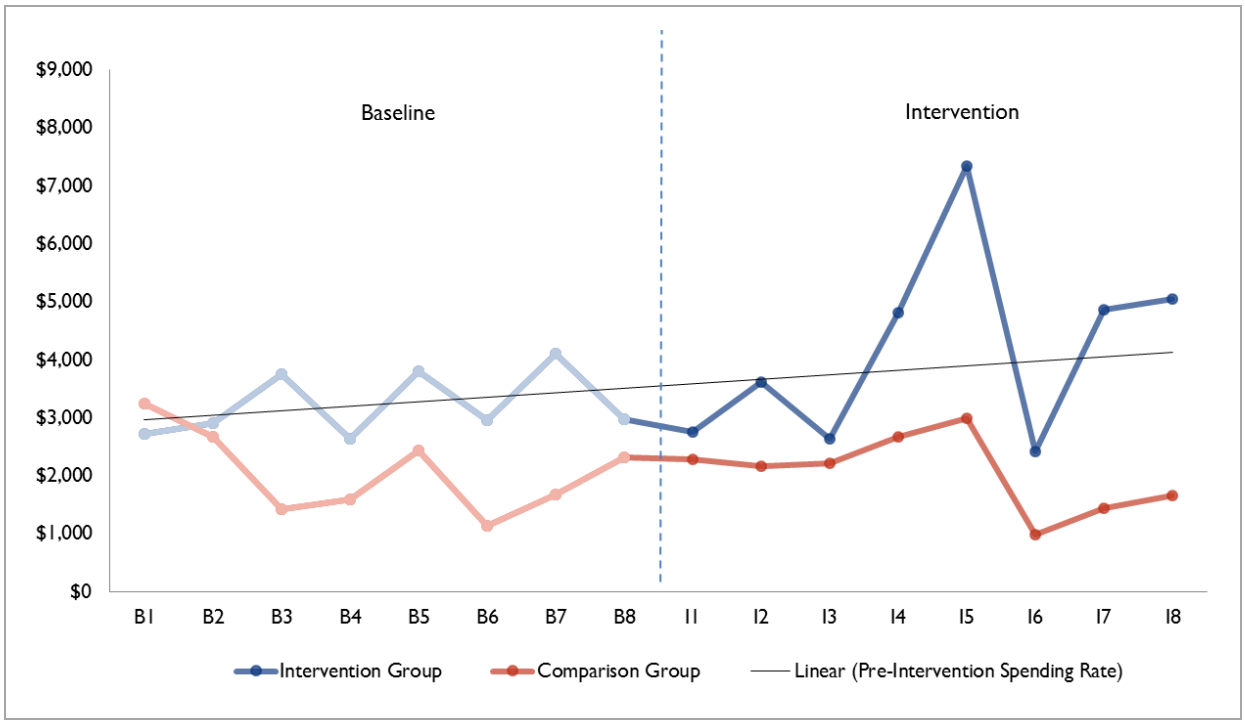
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 330972	South County																
	Spending rate	$2,726	$2,909	$3,754	$2,639	$3,797	$2,969	$4,100	$2,977	$2,760	$3,615	$2,641	$4,825	$7,355	$2,418	$4,872	$5,051
	Std dev	$5,550	$6,102	$11,299	$5,900	$9,317	$6,213	$10,261	$7,314	$6,156	$6,988	$5,797	$20,853	$21,284	$7,720	$15,928	$8,247
	Unique patients	30	31	31	34	35	37	46	49	49	46	42	39	31	15	13	11
Comparison Group																	
1C1CMS 330972	South County																
	Spending rate	$3,252	$2,677	$1,427	$1,602	$2,443	$1,136	$1,677	$2,325	$2,283	$2,177	$2,223	$2,678	$2,997	$990	$1,450	$1,655
	Std dev	$13,089	$9,631	$4,906	$5,524	$7,224	$2,975	$5,804	$7,269	$7,321	$7,246	$7,347	$9,682	$15,291	$3,214	$3,852	$4,195
	Unique patients	37	38	39	41	42	44	47	49	49	49	47	45	36	31	27	23
Savings per Patient		$526	−$232	−$2,327	−$1,038	−$1,354	−$1,833	−$2,423	−$652	−$477	−$1,437	−$418	−$2,147	−$4,358	−$1,428	−$3,421	−$3,395

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee−for−service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 4 illustrates the Medicare spending per beneficiary in Table 8 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 4. Medicare Spending per Patient: South County



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

As shown by the pre-innovation trend line for the treatment group, spending increases slightly prior to enrollment. The time series for both the intervention and comparison groups varies widely, and high standard deviations are evident for all periods. After the innovation, the spending pattern of the treatment group is higher than that of the comparison group for all intervention quarters, with noticeable peaks above the pre-intervention line at intervention quarters 5, 7, and 8. The high peak at I8 for the treatment group is associated with an even smaller sample size (n=11). The comparison of spending trends between the intervention and comparison groups is further limited in that, even after propensity score matching, spending in the calendar year before the innovation is higher for the intervention group than for the comparison group. Spending for the comparison group is below the pre-intervention trend line for all intervention periods. In the future, when sample size permits, RTI plans to statistically compare spending trends and assess the impact of the innovation in the difference in spending between treatment and comparison groups.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 9*** and ***Figure 5***.

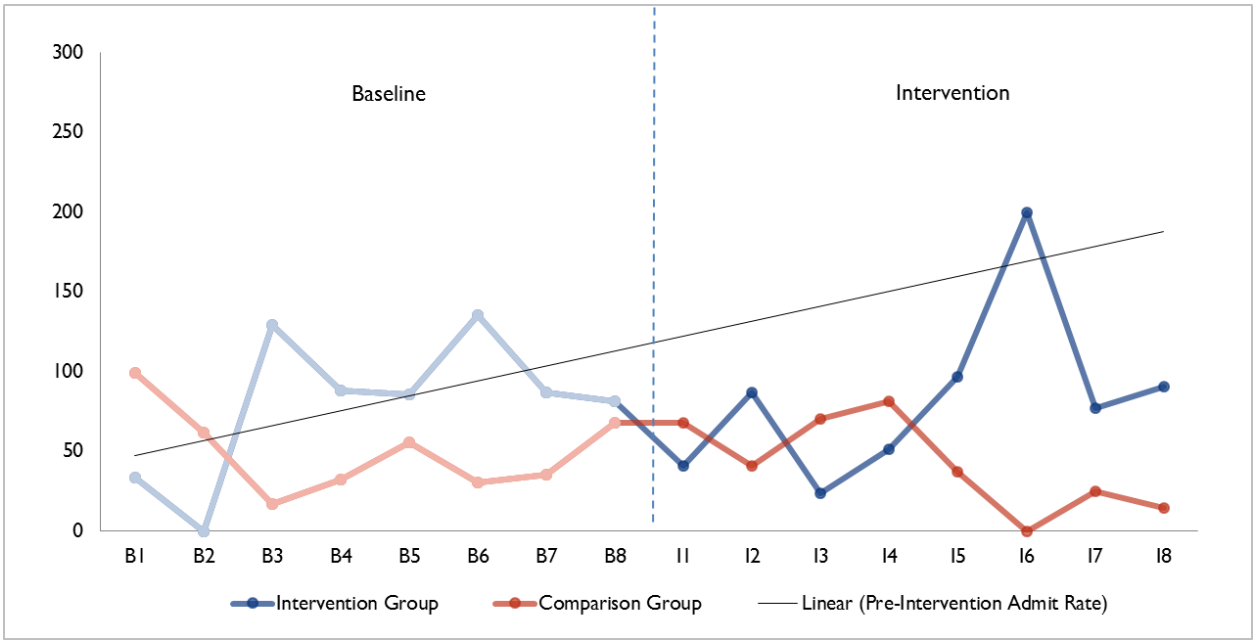
Table 9. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: South County

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 330972	South County																
	Admit rate	33	0	129	88	86	135	87	82	41	87	24	51	97	200	77	91
	Std dev	180	0	491	284	368	474	282	274	198	282	152	316	296	748	266	287
	Unique patients	30	31	31	34	35	37	46	49	49	46	42	39	31	15	13	11
Comparison Group																	
1C1CMS 330972	South County																
	Admit rate	99	62	17	33	56	30	35	68	68	41	70	81	37	0	25	14
	Std dev	424	306	130	218	229	211	185	363	343	230	328	440	234	0	155	120
	Unique patients	37	38	39	41	42	44	47	49	49	49	47	45	36	31	27	23
Intervention − Comparison Rate		−66	−62	112	56	30	105	51	14	−27	46	−47	−30	59	200	52	76

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 5. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: South County



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

The inpatient admissions rate trends upward during the pre-intervention period. After the intervention begins, inpatient admissions for both groups are below the pre-intervention trend for all periods, with the exception of a high peak at I6 for the treatment group. However, as presented in Table 8, the standard deviation is high for all periods. When sample size permits, we will compare inpatient admissions trends between the intervention and comparison groups, and assess whether differences are statistically significant.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 10*** and ***Figure 6***.

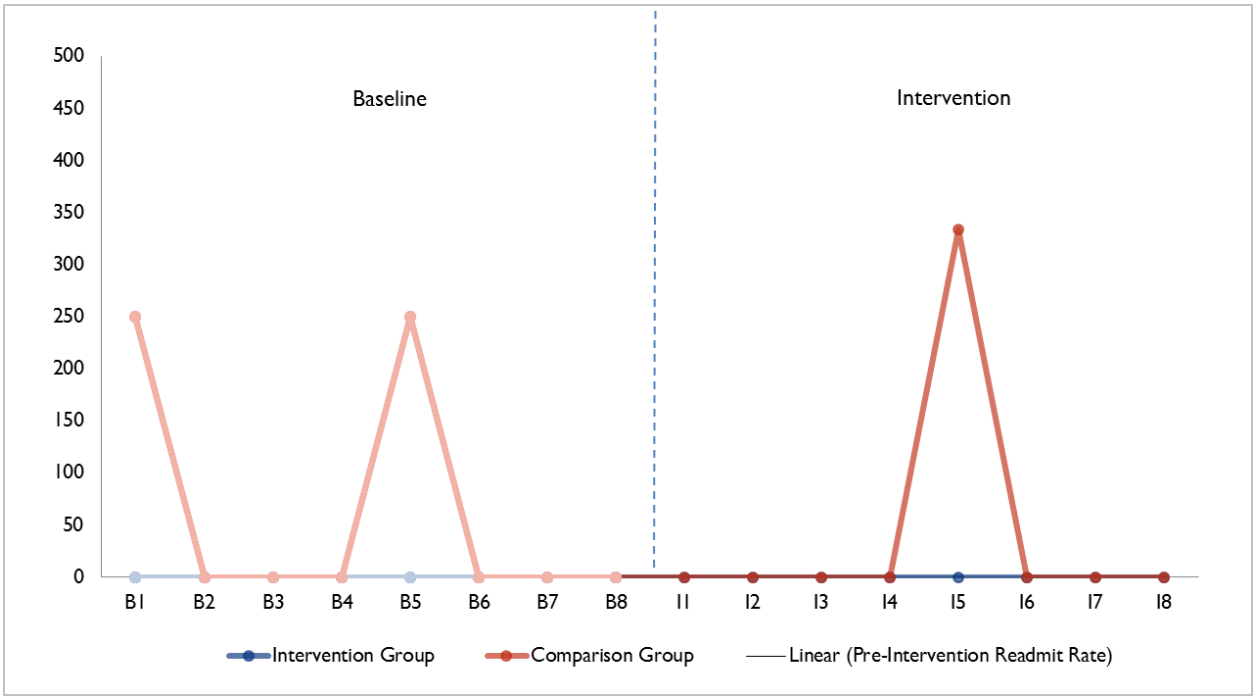
Table 10. Hospital Unplanned Readmissions Rates per 1,000 Admissions: South County

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 330972	South County																
	Readmit rate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Std dev	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total admissions	1	0	0	1	1	2	3	2	2	2	0	1	1	0	0	0
Comparison Group																	
1C1CMS 330972	South County																
	Readmit rate	250	0	0	0	250	0	0	0	0	0	0	0	333	0	0	0
	Std dev	433	0	0	0	433	0	0	0	0	0	0	0	471	0	0	0
	Total admissions	3	0	0	0	1	0	1	0	1	1	1	1	1	0	1	0
Intervention − Comparison Rate		−250	0	0	0	−250	0	0	0	0	0	0	0	−333	0	0	0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6. Hospital Unplanned Readmissions Rates per 1,000 Admissions: South County



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

Readmission rates are highly variable before and after enrollment, reflecting the small number of hospital admissions during each quarter. With few admissions (the denominator in the readmission rate) and a relatively low underlying percentage of readmissions, the readmission rate varies widely over time. As more beneficiaries enroll in the innovation and more claims data become available, the sample size will increase and the readmissions measure can be reported with more precision.

ED visits per 1,000 participants are shown in ***Table 11*** and ***Figure 7***.

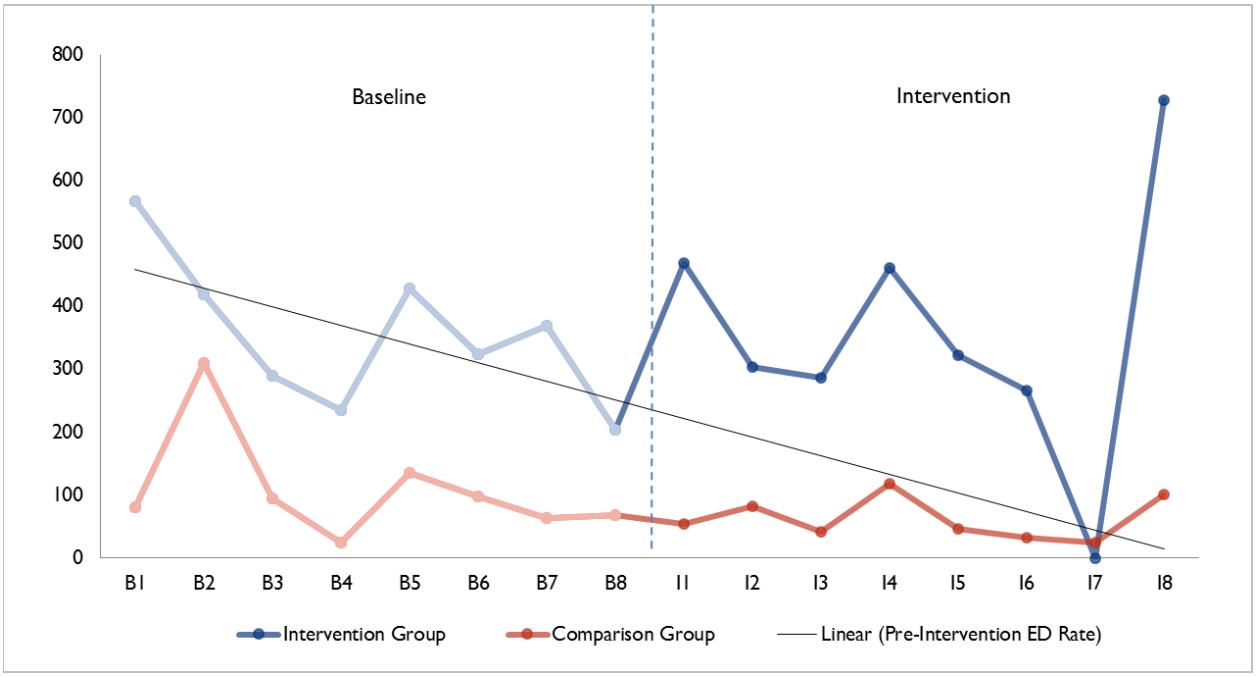
Table 11. ED Visits per 1,000 Participants: South County

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 330972	South County																
	ED rate	567	419	290	235	429	324	370	204	469	304	286	462	323	267	0	727
	Std dev	1357	1119	1101	741	917	852	1271	539	1120	1008	805	1393	1107	799	0	1794
	Unique patients	30	31	31	34	35	37	46	49	49	46	42	39	31	15	13	11
Comparison Group																	
1C1CMS 330972	South County																
	ED rate	81	310	94	24	135	98	64	68	54	82	42	119	47	32	25	101
	Std dev	176	1524	227	89	724	212	158	174	148	172	117	235	146	103	90	202
	Unique patients	37	38	39	41	42	44	47	49	49	49	47	45	36	31	27	23
Intervention − Comparison Rate		486	110	196	211	294	226	306	136	415	223	243	343	276	234	-25	626

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1; ED = emergency department.

Figure 7. ED Visits per 1,000 Participants: South County



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

ED visits trend downward during the pre-intervention period. The ED visit rate exhibits a fair amount of variability before and after patient enrollment in the innovation. As with the other measures, ED visits has a high standard deviation. In spring 2015, South County allocated a nurse to begin working directly with patients who were seen at the ED at Stanford (i.e., the hospital that serves a large portion of South County's patients). The purpose was to follow up with those patients to ensure that they were seen by a primary care medical team to prevent additional ED visits. It took time to initiate the relationship with the ED to share medical records but, since that time, the nurse also followed up with patients at the other hospital's ED. South County aims for enrollment for this component to increase enough in the final months of the innovation to permit an examination of its impact. When sample size permits, we will compare the rate of ED visits between the two groups, and assess whether the differences are statistically significant.

Discussion

For all four measures, we found considerable variability and high standard deviations accompanied by a very small sample size of Medicare beneficiaries. As more beneficiaries enroll in the innovation and more claims data become available, the sample size will increase and we will assess the statistical significance of differences found between the propensity score matched comparison group and the intervention group. Only after those statistical analyses are completed can we gauge the impact of the innovation on spending and health care utilization among individuals enrolled in the innovation.

The results may not be fully representative of the overall population served by the innovation. In addition, the results presented here are only for Medicare beneficiaries who we were able to match with

the identifiers provided by the site; this group represents less than 2 percent of the overall population reached by the innovation. Focusing only on a very small subset of the population served by the innovation may not capture the full impact on spending and health care utilization.

Medicaid Claims Analysis

For most HCIA awardees, the Medicaid data analysis uses data from the CMS Alpha-MAX data files. However, claims data for California during the innovation period are not yet available in the Alpha-MAX data files. In addition, San Mateo Medicaid beneficiaries are enrolled in managed care rather than fee-for-service Medicaid, and claims data in the CMS Alpha-MAX files may not be available for all managed care enrollees. Thus, to perform a Medicaid claims analysis for South County, RTI may need to obtain data directly from South County or from California's Department of Health Care Services.

1.3.3 Other Awardee-Specific Data

Table 12 lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. The data we present in this section are current through March 2015. The results of analyses for all of these measures are included in this annual report.

Table 12. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Clinical effectiveness	Diabetes	Percentage of patients with diabetes who received a foot exam	Data received from South County
Health outcomes	Diabetes	Percentage of patients with diabetes who had hemoglobin A1c >9.0%	Data received from South County
		Percentage of patients with diabetes who had LDL-C control <100 mg/dL	Data received from South County
	Hypertension	Percentage of patients with a diagnosis of hypertension with last blood pressure <140/90 mm Hg	Data received from South County

South County = South County Community Health Center.

Clinical Effectiveness

We looked at clinical effectiveness measures among patients with diabetes.

Evaluation Question

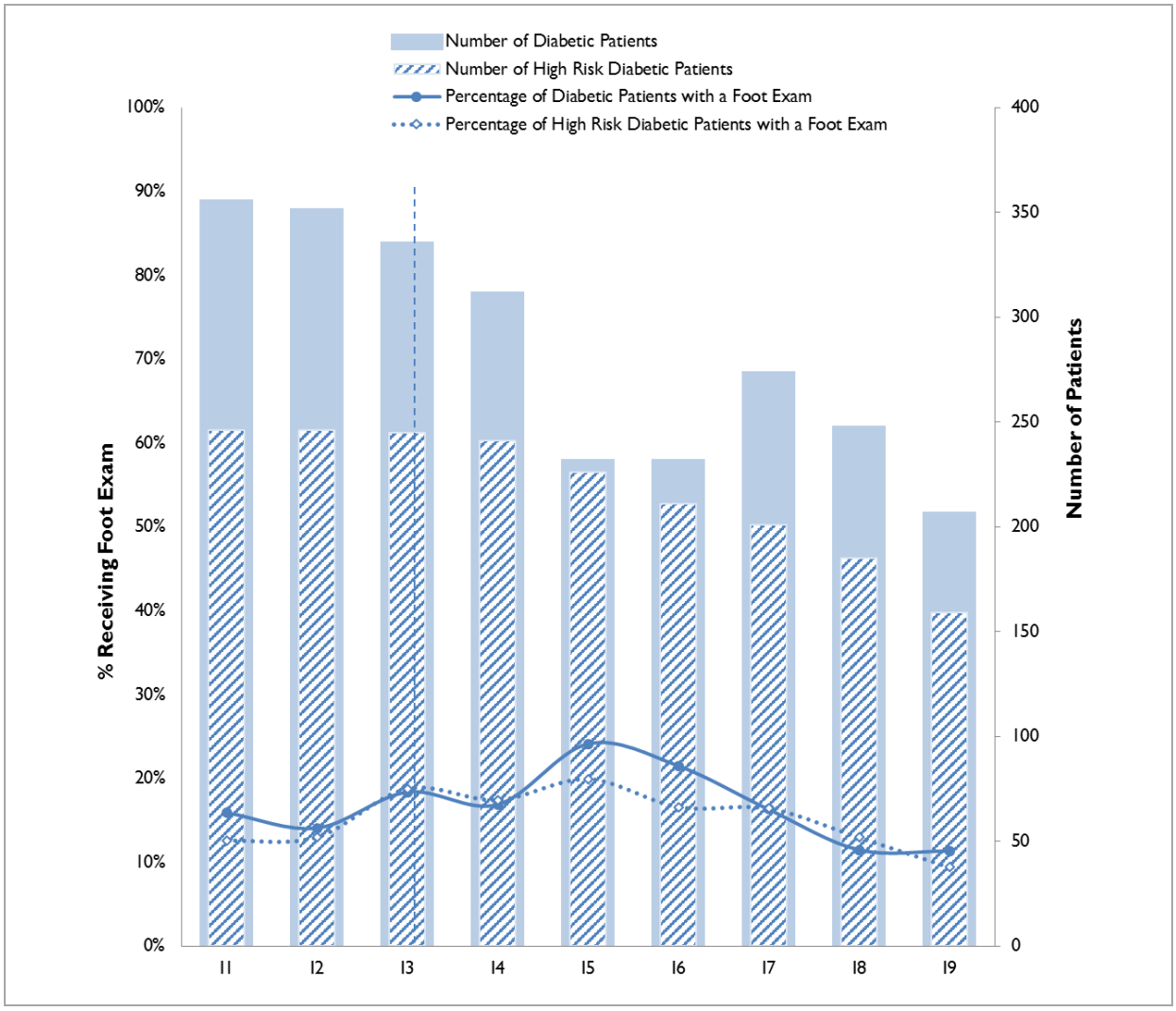
- How have diabetes-related clinical effectiveness outcomes (e.g., foot exams) been affected by the innovation?

As of Q11, 475 patients out of 3,222 enrolled had diabetes, 319 of whom were high-risk patients. ***Figure 8*** shows foot exam rates for diabetic patients by quarter. The percentage of diabetic patients who received a foot exam varies by intervention quarter. As shown in the figure, the percentage of diabetic patients who received a foot exam increases slowly after the start of the innovation, then levels off and

begins to decline after the fifth and sixth intervention quarters. Rates of patients receiving foot exams are highest during the fifth intervention quarter, at 24 percent for all diabetic patients and 20 percent for high-risk diabetic patients. This timing corresponds to a concerted effort to train health coaches/medical assistants on how to conduct foot exams.

We also examined the percentage of diabetic patients who ever received a foot exam across all intervention quarters. Among all enrolled patients with diabetes across all intervention quarters, more than half (66.5%) received a foot exam by the end of Q11, an increase over the 58.1 percent of diabetic patients who received a foot exam as of Q8. Among only high-risk patients with diabetes, the rate of patients who received a foot exam increased from 52.7 percent in Q8 to 70.2 percent in Q11. Thus, even with an increase of more than 500 patients between Q8 and Q11, a greater percentage of patients with diabetes, both overall and high-risk only, received foot exams. This result suggests that the innovation may be effective in providing foot exams to those with diabetes.

Figure 8. Percentage of Patients with Diabetes with Foot Exams



(continued)

Figure 8. Percentage of Patients with Diabetes with Foot Exams (continued)

	Quarter	I1	I2	I3	I4	I5	I6	I7	I8	I9
●	Percentage of diabetic patients with a foot exam	15.9	14.1	18.4	16.9	24.1	21.5	16.3	11.5	11.3
◊	Percentage of high-risk diabetic patients with a foot exam	12.6	13.0	18.8	17.4	19.9	16.6	16.4	12.9	9.4
	Number of diabetic patients	352	348	332	308	228	228	270	244	203
	Number of high-risk diabetic patients	246	246	245	241	226	211	201	185	159

Health Outcomes

We examined health outcomes among all patients with diabetes or hypertension, as well as high-risk patients who had diabetes or hypertension. The following run charts take into account rolling enrollment. The baseline quarters (Bs) represent data prior to enrollment. The intervention quarters (Is) are based on individual enrollment date. For example, I1 is equal to the first quarter of enrollment for all participants who received a specific test. We provide B and I data when at least 20 patients have a test or reading within the quarter.

Evaluation Question

- How have diabetes-related and hypertension-related health outcomes improved over time among those enrolled in the innovation?

Table 13 shows the number and percentage of participants with diabetes and hypertension. As shown in the table, a greater percentage of high-risk patients had diabetes and hypertension (34.9% and 45.7%, respectively) than patients overall (14.8% and 20.3%, respectively).

Table 13. Number and Percentage of Patients Overall and High-Risk Patients by Health Condition

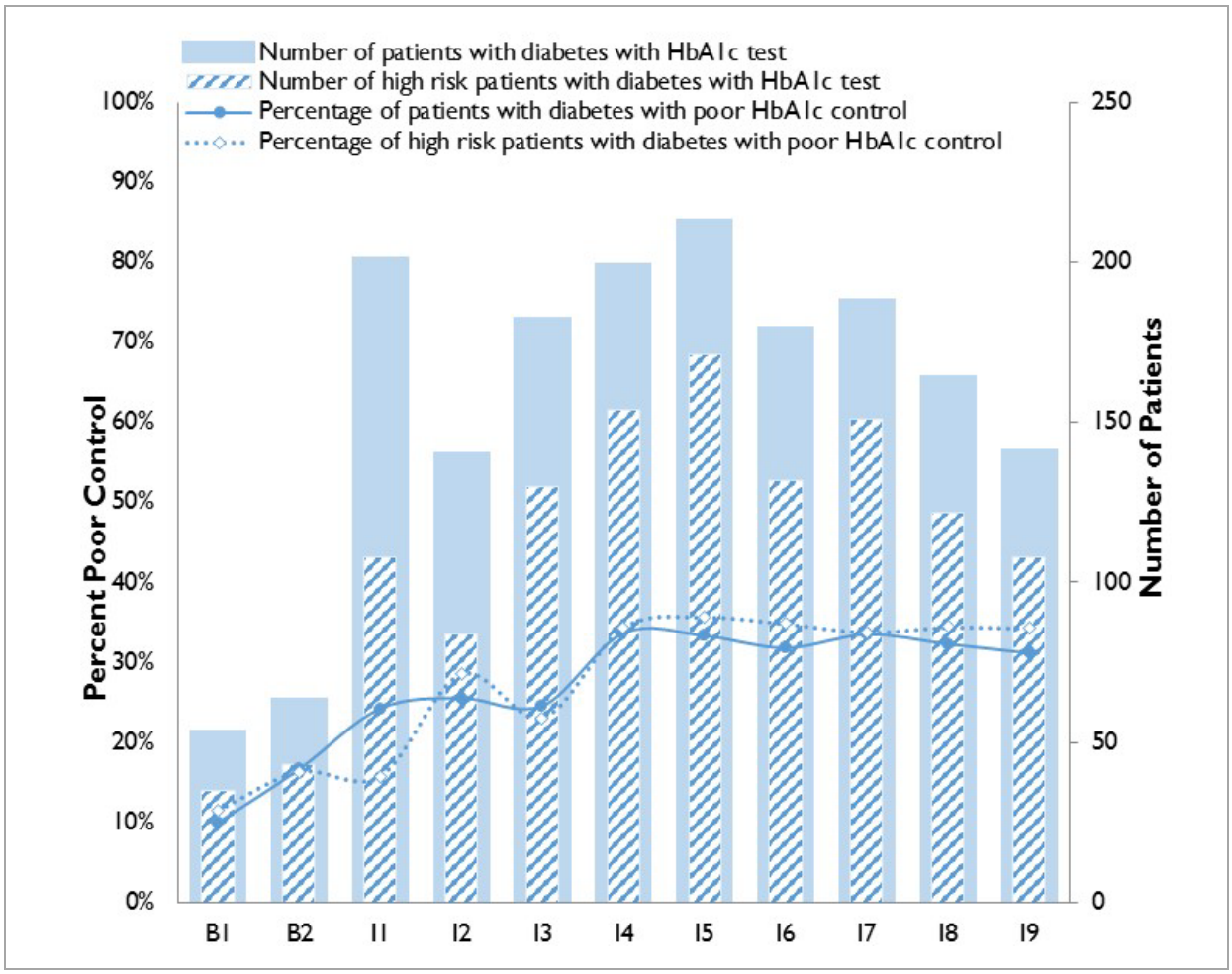
Health Condition	All Patients (n=3,222)		High-Risk Patients (n=921)	
	Number	Percentage	Number	Percentage
Diabetes	475	14.8	319	34.9
Hypertension	652	20.3	418	45.7

Source: Patient-level data provided to RTI by South County.

Figure 9 presents the percentage of participants, overall and high risk, with diabetes who had an HbA1c test indicating poor control (i.e., HbA1c >9%) over time. The denominator represents the number of overall or high-risk patients with diabetes who received an HbA1c test for each quarter. The numerator represents the number of overall or high-risk patients with diabetes who received an HbA1c test that was >9.0 percent. As shown in the figure, the percentage of patients with poor HbA1c control increased over time. About one-fourth of patients overall (24.2%) had poor HbA1c control at I1. This percentage increased to 33.7 percent in I4 and then dropped slightly to 31.2 percent in I9. Among high-risk diabetic

patients, the increase in the percentage with poor HbA1c control was more pronounced. The percentage increased from more than 15 percent in I1 to 35.7 percent in I5 and remained close to that percentage through I9. Thus, HbA1c control did not improve over time in diabetic patients enrolled in the innovation.

Figure 9. Percentage of Patients with Diabetes with HbA1c Control over Time

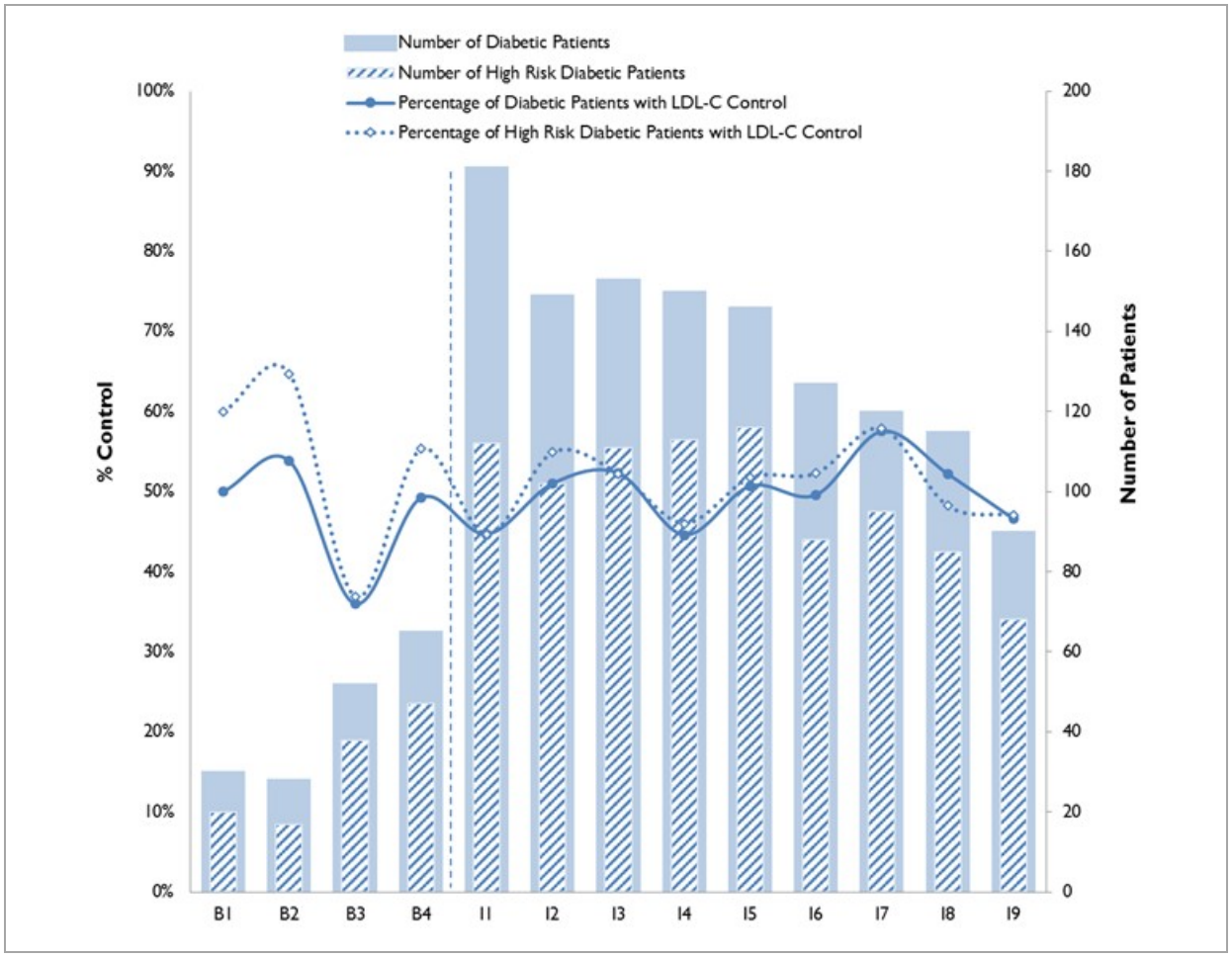


	Quarter	B1	B2	I1	I2	I3	I4	I5	I6	I7	I8	I9
●	Percentage of patients with diabetes with poor HbA1c control	10.0	16.7	24.2	25.5	24.6	33.7	33.3	31.8	33.5	32.3	31.2
◊	Percentage of high-risk patients with diabetes with poor HbA1c control	11.4	16.3	15.7	28.6	23.1	34.4	35.7	34.8	33.8	34.4	34.3
	Number of patients with diabetes with an HbA1c test	50	60	198	137	179	196	210	176	185	161	138
	Number of high-risk patients with diabetes with an HbA1c test	35	43	108	84	130	154	171	132	151	122	108

Source: Patient-level data provided to RTI by South County.

Figure 10 presents the percentage of participants, overall and high risk, with diabetes with an LDL-C test indicating good control (i.e., <100 md/dL) over time. The denominator represents the number of overall or high-risk patients who received an LDL-C test for each quarter. The numerator represents the number of overall or high-risk patients who received an LDL-C test result that was <100 md/DL. As shown in the figure, the percentage of patients with LDL-C control fluctuated over time. Among all diabetic patients, the percentage with LDL-C control ranged from 36 percent in B3 to 58 percent in I7. The percentage was similar in I1 and I9 (44.7% and 46.6%, respectively). The range of LDL-C control among high-risk diabetic patients was broader; percentages ranged from 36.8 percent in B3 to 64.7 percent in B2. Similar to diabetic patients overall, the percentages of high-risk diabetic patients with LDL-C control in I1 and I9 were similar (44.6% and 47.1%, respectively). Thus, similar to HbA1c control, LDL-C control did not improve over time among diabetic patients enrolled in the innovation.

Figure 10. Percentage of Patients with Diabetes with LDL-C Control over Time



(continued)

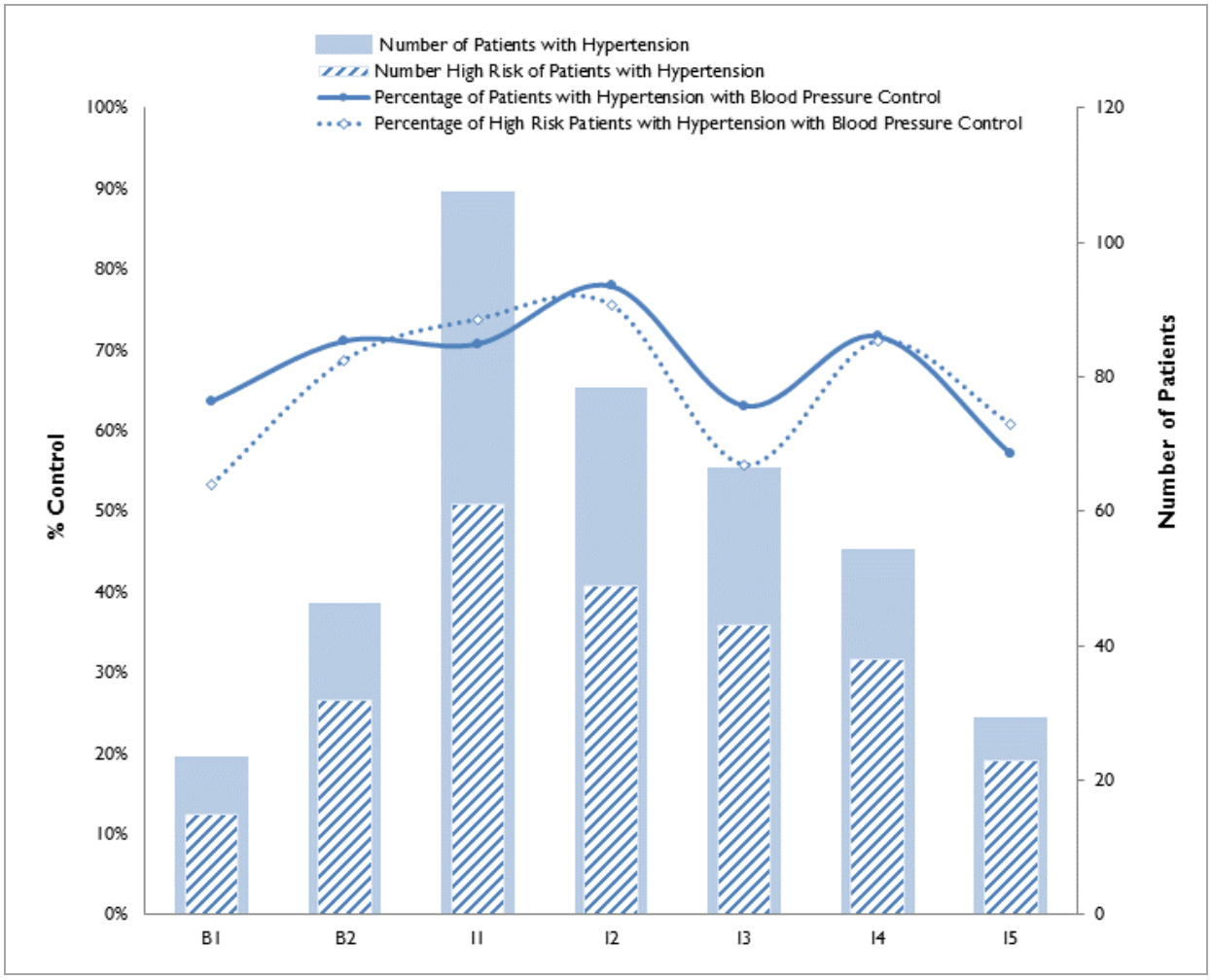
Figure 10. Percentage of Patients with Diabetes with LDL-C Control over Time (continued)

	Quarter	B1	B2	B3	B4	I1	I2	I3	I4	I5	I6	I7	I8	I9
•	Percentage of patients with diabetes with LDL-C control	50.0	53.8	36.0	49.2	44.7	51.0	52.3	44.6	50.7	49.6	57.5	52.2	46.6
◊	Percentage of high-risk patients with diabetes with LDL-C control	60.0	64.7	36.8	55.3	44.6	54.9	52.3	46.0	51.7	52.3	57.9	48.2	47.1
	Number of patients with diabetes with an LDL-C test	28	26	50	63	179	147	151	148	144	125	118	113	88
	Number of high-risk patients with diabetes with an LDL-C test	20	17	38	47	112	102	111	113	116	88	95	85	68

Source: Patient-level data provided to RTI by South County.
LDL-C = low-density lipoprotein cholesterol.

Figure 11 presents the percentage of participants, overall and high risk, with hypertension with a blood pressure reading indicating control (<140/90 mm Hg) over time. The denominator represents the number of hypertension patients, overall or high risk, who received a blood pressure reading for each quarter. The numerator represents the number of hypertension patients, overall or high risk, who received a blood pressure reading that was <140/90 mm Hg. As shown in the figure, the percentage of patients with blood pressure control fluctuated over time. Across all hypertensive patients, the percentage of those with blood pressure control declined from approximately 71 percent in I1 to approximately 57 percent in I5. Among high-risk hypertensive patients, the percentage of those with blood pressure control declined from approximately 74 percent in I1 to approximately 61 percent in I5. Thus, blood pressure control did not improve over time among hypertensive patients enrolled in the innovation.

Figure 11. Percentage of Patients with Hypertension with Blood Pressure Control over Time



	Quarter	B1	B2	I1	I2	I3	I4	I5
●	Percentage of patients with hypertension with blood pressure control	63.6	71.1	70.8	77.9	63.1	71.7	57.1
◊	Percentage of high-risk patients with hypertension with blood pressure control	53.3	68.8	73.8	75.5	55.8	71.1	60.9
	Number of patients with hypertension	22	45	106	77	65	53	28
	Number of high-risk patients with hypertension	15	32	61	49	43	38	23

Source: Patient-level data provided to RTI by South County.

Discussion of Other Awardee-Specific Findings

Based on RTI's findings, patients enrolled in South County's innovation show little to no improvement in health-related outcomes since the start of the innovation. Overall, the percentage of participants receiving clinical services increased over time. The rate of patients who received a foot exam increased over time. However, other diabetes-related and hypertension-related health outcomes have not shown improvement. The percentages of patients with LDL-C control and blood pressure control fluctuated over time, while the percentage of patients with poor HbA1c control increased.

High-risk participants (i.e., chronic conditions, high cost, high utilization based on an algorithm used by the medical care team) represent 28.6 percent of all those enrolled. South County focuses its assessments and coaching efforts on patients at higher risk.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing South County as well as accomplishments to date. In this section, we assess South County's progress on achieving HCIA goals to date.

- **Smarter spending.** Limited claims data were available for assessing spending under the innovation. We had data only for Medicare patients, whereas South County primarily serves Medicaid and uninsured patients. Medicare spending trends varied widely. Because of the small number of patients in the intervention group, RTI cannot form any conclusions on the impact of the innovation on spending at this time.

- **Better care.** Hospital inpatient admissions, hospital unplanned readmissions, and ED visits for Medicare patients varied widely. Because of the small number of patients in the Medicare claims sample and the lack of Medicaid data for 85 percent of the participants, RTI cannot form any conclusions on the impact of the innovation on these measures at this time. Although an RN is working specifically with South County patients who visit the ED with the goal of decreasing ED visits, it is too soon to tell if the effort is improving patient care. RTI was able to demonstrate that there has been an increase in the proportion of patients with diabetes receiving foot exams.

  As of Q11, reach was 51.1 percent, with a total of 3,222 participants enrolled in the innovation. Although reach increased over time, it is only about half of South County's target population of 6,180.

  Nearly all participants completed the comprehensive assessment and had a care plan initiated. More than half of all participants and high-risk patients had at least one contact with a health coach. Findings indicate that patients who have been categorized as high risk are more likely to receive health coaching and other services. Nearly 10 percent of all patients and more than 20 percent of high-risk patients were referred for IBHS.

- **Healthier people.** Despite increased enrollment and provision of services, patients enrolled in South County's innovation have not shown improvements in health outcomes over time. Rates of HbA1c control, LDL-C control, and blood pressure control did not significantly improve over time among the diabetic and hypertensive patients, regardless of whether they were high-risk patients.

South County attempted to implement a comprehensive innovation that transformed patient care simultaneously with the introduction of a new EHR system, construction of a new building, and relocation of staff into the new building. As noted by site visit respondents, the timing of this innovation was not ideal but was necessary to improve South County's patient care. South County succeeded in setting up medical teams of multidisciplinary staff members, each with distinct roles in delivering patient care plans. South County instituted, and required all staff to complete, comprehensive training to learn about the new workflow processes and procedures. Unfortunately, as the center began to roll out the innovation, South County recognized that the new EHR system needed significant improvements in its ability to track and monitor patients enrolled in the innovation. During the first 2 years, substantial effort focused on learning

the new EHR and creating templates or interfaces so that the work to assess and track patients could be documented. RTI encountered challenges in obtaining data from South County, mostly because what was provided was inconsistent and difficult to interpret based on how the innovation was organized. Over time, South County's data have improved, but many of the findings presented in this report are likely influenced by the quality and quantity of the data received to date and retrospectively entered into the new EHR system since the start of the innovation (i.e., they have yet to enter all their patients in the system). With more time, South County may improve its ability to document more in-depth contacts with patients and improvements in patient health measures; thus far, these changes are not evident.

Overall, South County succeeded in implementing its innovation. The center hired and trained staff to fill new roles and held a major training program for the staff; the center also instituted changes to its workflow. South County identified key partners in the community that have the resources to fill gaps in the center's patient care services, and maintained those relationships throughout the implementation. South County steadily increased the number of patients enrolled in the innovation, although the center is unlikely to enroll as many as targeted. South County now has medical teams in place in most of its clinics to manage panels of patients and ensure comprehensive and coordinated care, particularly for those at highest risk. Nevertheless, given the health outcomes data South County provided for all its enrolled patients, we determined that no improvements were documented for patients with diabetes or hypertension.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Southeast Mental Health Services

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in Southeast Mental Health Services' 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

Southeast Mental Health Services

1.1 Introduction

The Southeast Mental Health Services (SEMHS) provides mental health care and substance abuse treatment in the rural, frontier southeast corner of Colorado. Awarded $1,405,924, SEMHS seeks to provide health navigation to Medicaid patients living in Prowers County who are frequent users of the health care system. The innovation has the following HCIA goals:

1. **Smarter spending.** Lower spending by reducing the health care expenditures for the highest users of Medicaid, Medicare, and Child Health Plan Plus (CHP+) by 15 percent from baseline or $1.875 million by June 2015.

2. **Better care.** Increase access to primary and secondary prevention by connecting high-risk patients with primary care through patient navigation (i.e., health navigators) services.

3. **Healthier people**. Improve health status through care coordination and appropriate primary and follow-up care to high users of the system.

Table 2 provides a summary of changes that occurred with Southeast Mental Health Services (SEMHS) during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data submitted by SEMHS through March 31, 2015; and key informant interviews with SEMHS leaders and staff conducted June 3 and June 5, 2015.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	The innovation components remained the same since the beginning with a focus on providing care coordination from health navigators (HN) and a formal training program developed through the Otero Junior College (OJC).
Program Participant Characteristics	Majority (57.3%) of participants were 25 to 64 years of age; 67.3% were female. Almost 22% were children (<18 years of age) even though the innovation intended to focus on adult services. Slightly more than one-third (35.9%) were white; 9.7% were Hispanic; 85.6% were covered by Medicaid, and 1.8% by Medicare.
Implementation Process	
Execution	Execution during the final year of the innovation was more successful than in prior years, largely because staff were in place and leadership was actively engaged in implementation. The role of the HNs was refined over time and gaps were identified in the services they provided to support development of sustainability plans. Expenditures are at projected target for Year 3 (49%).
Leadership	The leadership has not changed for the program since the first annual report.[1]

(continued)

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Implementation Process (continued)	
Organizational capacity	With the addition of an HN located in the Prowers Medical Center, there were increased efforts to integrate primary care within SEMHS and with external partners. SEMHS continued to struggle because of insufficient staff to support the CIO for the data management of the innovation (e.g., though it was always responsive, SEMHS had only limited data to report, particularly for patient tracking and monitoring).
Innovation adoption and workflow	As noted in the first annual report for SEMHS, HNs were not as well integrated with other staff and services to support innovation adoption. In the past year, SEMHS more effectively involve HNs in follow-up care with current clients and develop workflow procedures. SEMHS developed a sustainability plan that seems to build on the strengths of the HN innovation in moving forward.
Workforce Development	
Hiring/retention	Staffing remained at 8.25 full-time equivalent (FTE) positions.
Training	Students in the first class of the OJC Community Health Workers program received certification in 2014. The program received statewide recognition with efforts made to replicate the program in other community colleges.
Implementation Effectiveness	
Reach	A total of 596 patients were referred for HN services through Q11 with 47 enrolled in Q11.
Dose	Based on data received from the program, 596 patients received services through Q11, with many receiving outreach, case management, or nonbillable services such as scheduling appointments or providing reminders.

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by SEMHS. Key informant interviews conducted Feb–June 2015.

1 Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

1.1.1 Innovation Components

This innovation consists of two components: (1) the Community Health Worker Training Program conducted in partnership with Otero Junior College (OJC) that would establish a CHW certificate program with 31.5 hours of course and fieldwork; and (2) health navigators (HNs) hired through SEMHS with the primary role of increasing patients' access to behavioral care, primary care, and early intervention services, as well as offering team-based education and coaching to improve self-management of disease.

. As noted in the first annual report, SEMHS planned for HNs to work from three different locations: the SEMHS main office in Prowers County, the High Plains Community Health Center (HPCHC), and the Prowers Medical Center (PMC).[1] During Year 3, HNs remained in the main office and

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid

PMC but were removed from HPCHC when that partnership dissolved during Year 2. No changes to innovation components occurred during the final year of funding. The other partners (OJC and Prowers Medical Center) remain with the innovation.

1.1.2 Program Participant Characteristics

Table 3 provides the demographic characteristics of all participants ever enrolled in the innovation. We first reported patient demographic characteristics in the first annual report, based on data through Q7. The distribution of patient characteristics is similar to that in the first annual report. More specifically, a majority of participants (57.3%) were between 25 to 64 years of age at enrollment, and more than half (67.3%) were female. Slightly more than one-third of participants (35.9%) were white and approximately 9.7 percent were Hispanic. A majority (85.6%) were covered by Medicaid, approximately 1.8 percent were covered by Medicare or Medicare Advantage, and another 4.4 percent were eligible for both Medicare and Medicaid.

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Number of Participants	Percentage of Participants
Total	596	100.0
Age		
< 18	128	21.6
18–24	71	11.9
25–44	191	32.0
45–64	151	25.3
65–74	32	5.4
75–84	18	3.0
85+	5	0.8
Missing	0	0.0
Sex		
Female	401	67.3
Male	193	32.4
Missing	2	0.3
Race/ethnicity		
White	214	35.9
Black	6	1.0
Hispanic	58	9.7
Asian	0	0.0
American Indian or Alaska Native	3	0.5
Native Hawaiian or Other Pacific Islander	0	0.0
Other	29	4.9
Missing/refused	286	48.0

(continued)

Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015 (continued)

Characteristic	Number of Participants	Percentage of Participants
Payer Category		
Dual	26	4.4
Medicaid	510	85.6
Medicare	11	1.8
Medicare Advantage	0	0.0
Other	49	8.2
Uninsured	0	0.0
Missing	0	0.0

Source: Patient-level data provided to RTI by SEMHS.

1.2 Implementation Progress

The first annual report (2014) described SEMHS's implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area. ***Table 4*** lists these measures and their status as of May 31, 2015. In this annual report, we include the measures for reach and dose but not for care coordination. After determining that the proposed coordinated care measures listed below were not available through SEMHS, RTI found that these data were also unavailable in the claims data, thus these measures are not included in our analyses.

This section presents SEMHS's process measures and a qualitative analysis of the factors that determined SEMHS's implementation progress. This analysis draws on patient-level data that SEMHS provided to RTI as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation effectiveness	Reach	Number/percentage of participants who receive services from HNs	Data received from SEMHS
	Dose	Number of HN contacts with participants	Data received from SEMHS
		Length of assistance from HN per patient (e.g., 1 month or 1 week)	Data received from SEMHS
		Number and types of services provided to each enrollee	Data received from SEMHS
Coordinated care	Receipt of care	Number/percentage of patients receiving primary care (who had not done so in the year prior to the innovation)	Data unavailable
		Number/percentage of participants receiving follow-up care as referred by the HN	Data unavailable

HN = health navigator; SEMHS = Southeast Mental Health Services.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through SEMHS *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include SEMHS reports from Q8 through Q10 and interviews conducted June 3 and June 5, 2015.

Evaluation Questions

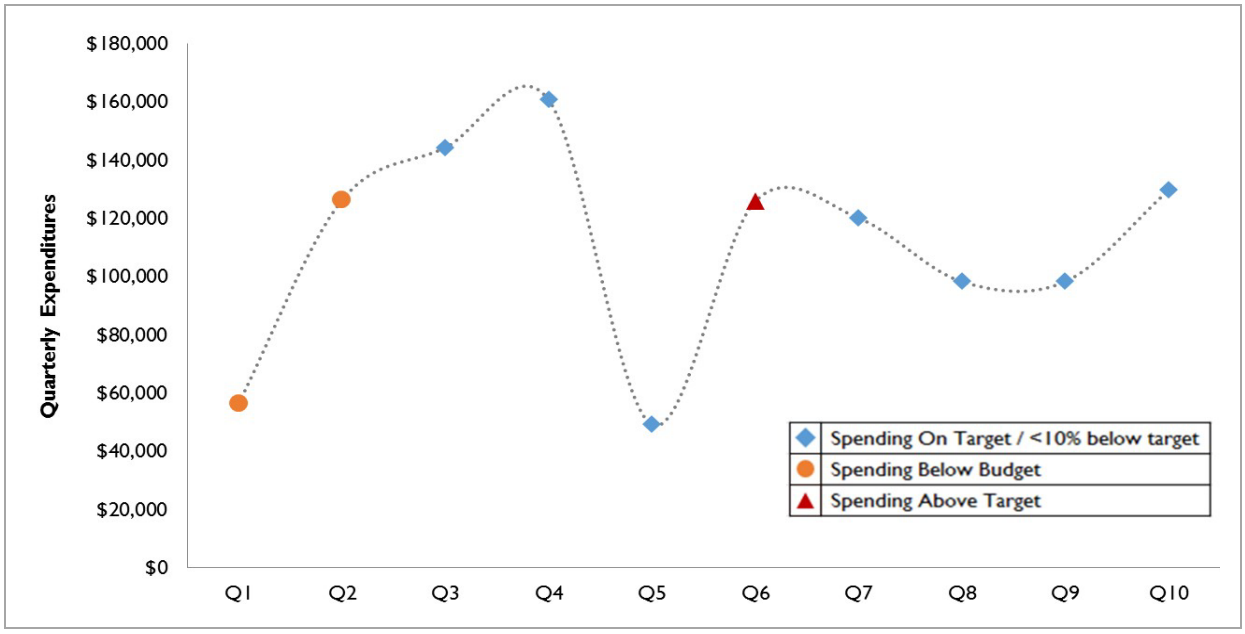
- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

Execution of Implementation

Execution during the final year of the innovation was more successful than in prior years, largely because staff were in place and leadership, while engaged from the beginning, played a more active role in problem solving and oversight of implementation. The role of the HNs was refined over time and gaps were identified in the services they were provided so that sustainability plans could be developed. HN services are targeted to patients at high risk of overusing the health system, and consist of community outreach, case management, individual and group skills training, transportation, and scheduling. SEMHS has six HNs currently working in the program. The training program at OJC expanded to provide the Community Health Worker Training Program to residents at Fort Lyon Community College residential site for the homeless. Fort Lyon, a former veteran's hospital campus, provides recovery-oriented transitional housing to homeless individuals with mental health and substance abuse disabilities. OJC provides college classes on Fort Lyon's campus as part of its workforce development efforts. Plans to develop a degree program reported in Year 1 did not progress this year because leaders and partners with the Colorado Department of Health and Human Services needed to define and standardize HN/community health worker (CHW) roles and responsibilities and reforms payment models to permit services to be billable. Despite this change in plans, OJC's efforts were recognized statewide. This year, OJC received an award for the Community Health Worker Training Program from the Colorado Community College system. In addition, the director of the program has delivered presentations about the program to audiences around the country. Additionally, as reported in the Q10 progress report, OJC was successful in obtaining a grant for sustainability of the program from the Colorado Department of Public Health and Environment to support the program for 3 years.

The annual report highlights the significance of SEMHS expenditure rates on implementation. As of December 2014 (Q10), SEMHS spent 49 percent of its Year 3 budget, which is at the projected target.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Leadership

Through December 2014, there were no changes in leadership at SEMHS from the information provided in the previous annual report. During Years 2 and 3, support from senior leadership within SEMHS was strong. The chief executive officer (CEO) was an avid champion of the program and used her position to promote the program in the larger community. The leadership reported in hindsight that more in-depth conversations with partners at the beginning would have been beneficial to align stakeholders on the understanding of the HN'HN's work and how integrated health care could work in their communities. Although the leaders at SEMHS believed they had a vision of integrated care, they were unsure that their partners shared the same vision and they wish they had spent more time getting partners onboard to avoid some of the challenges they encountered during the first year.

Organizational Capacity

With the addition of an HN located in the Prowers Medical Center (PMC) in early 2014, efforts accelerated to integrate primary care within SEMHS and with external partners. SEMHS continued to struggle because of insufficient staff to support the CIO for the data management of the innovation. Staffing resources are scarce in this region; therefore, many of the selected innovation staff had no prior experience or training in HN services. Almost all of the HNs were new bachelor-level graduates with limited experience working with patients, particularly those served by SEMHS whose needs were complex.

Innovation Adoption and Workflow Integration

As reported in the first annual report, SEMHS initially intended to establish a formal partnership with the local community health center to have direct access to primary care for patients it contacts. The

partnership was initiated in the first year of the program but dissolved in early 2014. Since that time, the SEMHS HNs have worked directly with the patient navigator at the health center on a case-by-case basis, but it has not been an integrated component of the innovation as intended. The HN located at the PMC has played a critical role in the ongoing care of patients who come into the ED. The SEMHS chief operation officer reported that staff from PMC called to request that the program continue beyond the funding period, noting that "you guys are our only hope," particularly for patients struggling with substance abuse and/or mental illness. SEMHS developed a sustainability plan that seems to build on the strengths of the HN innovation in moving forward. It is anticipated that an HN will continued to be located at the PMC and others who work from the SEMHS main office, for a total of four HNs.

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question:

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with 8.25 full-time equivalent (FTE) staff members. Between Q8 (June, 2014) and Q10. In Year 2, no changes in staff occurred for the innovation. Innovation staff learned over the past year that not everyone can be an effective HN and that certain key qualities and skills are inherent to the role. These qualities include being compassionate, caring, and having strong communication and motivational interviewing skills. In hindsight, staff members felt that they could have been more diligent during interviews in identifying HN candidates who did not have those qualities, and should have been more proactive in finding replacements for unsuitable HN hires.

Skills, Knowledge, and Training

Between Q8 and Q10, SEMHS provided 4,242 hours of training to 157 individuals including predominantly community college students and HCIA-employed clinical personnel. These courses included topics such as first aid, motivational interviewing, mental health first aid, and healthy living for diabetes, in addition to the HN certification courses. These courses continued to support the innovation's objectives to prepare HNs and staff for their roles in the innovation and prepare a workforce of HNs; however, HNs needed more training early on about working with clients who have chronic diseases. Eventually, HNs received the Healthier Living training, Colorado's version of the Stanford Model's Chronic Disease Self-Management Program (CDSMP); however, training occurred late in Year 1 when HNs already had significant patient loads. The Healthier Living course would have been more useful as part of

or soon after completing the CHW training, so HNs could have been better prepared to treat and advise clients with complex chronic diseases.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach) and; (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

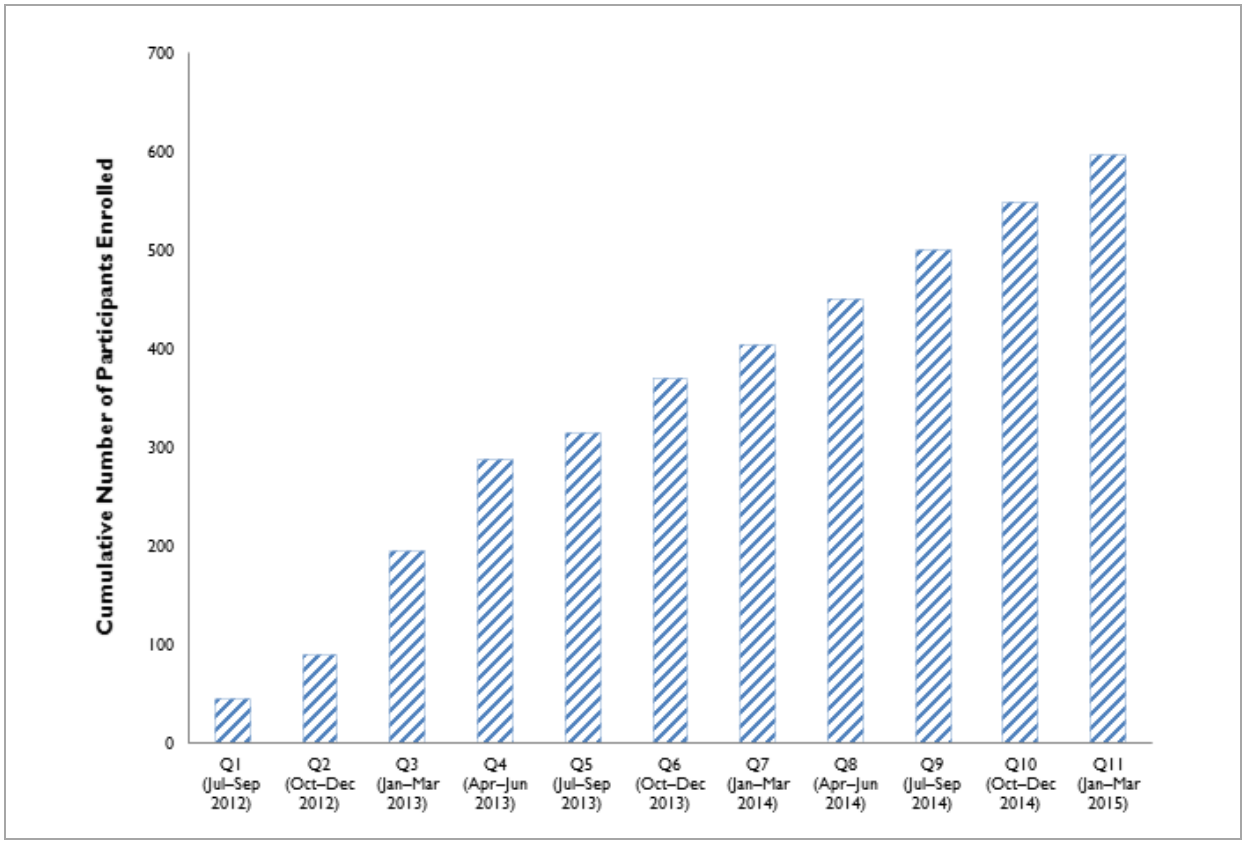
- What is the implementation effectiveness, including reach and dose, of the innovation thus far?

Reach

Figure 2 shows cumulative participant enrollment by quarter since the launch of the innovation based on data provided by SEMHS. RTI worked with SEMHS to define a target population during evaluation planning but determined that any data it could provide would be misleading and would not represent the true target of the innovation. In addition to targeting those that are high users of services that are on the ICHP list from ValueOptions, SEMHS also targeted residents of Prowers County, including Medicaid recipients not on ICHP, Medicare beneficiaries and the uninsured; thus, the number changes frequently. In addition, SEMHS does not maintain historic lists of high users of CHP services from ValueOptions so they are unable to tell us the number of people on the list during prior quarters.

Enrolled patients are defined as those who were reported as served by HNs. We first reported participant enrollment in the first annual report, based on data through Q7. Since that time, SEMHS enrolled an additional 193 patients in the innovation. As noted in the table, we are only able to provide the count of enrollees per quarter based on dates of service

Figure 2. Participant Enrollment for Each Quarter since Project Launch



	Quarter	Q1 (Jul–Sept 2012)	Q2 (Oct–Dec 2012)	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan–Mar 2015)
	Cumulative number of participants enrolled	45	89	195	288	314	370	403	450	501	549	596

Dose

Table 5 illustrates the number of services provided to participants, the number of participants receiving services, and the average number of services per participant through Q11. We first reported dose in the first annual report, based on data through Q7. As expected, the number of services provided and the percentage of participants receiving those services increased from Q7 to Q11. As shown in the table, 65.9 percent of participants received outreach services, and 47.0 percent of participants received nonbillable types of services. Only a small percentage of patients received any individual skills trainings (2.0%) or group skills trainings (4.4%). However, those who received at least one of these services had an average of 23.0 individual skills training services and 30.5 group skills training services. The number of life skills services per individual may be high because one HN was located in the SEMHS day program; this HN provided individual and group life skills classes for SEMHS patients with multiple chronic conditions. One explanation is that most patients receiving these services may have participated in this day program. An average of 10.0 services was provided to participants.

Table 5. Number and Types of Services Provided to Participants through Q11

Services	Number of Services Provided Across Participants	Number (Percentage) of Unique Participants Receiving Service[1]	Average Number of Services per Participant
Outreach	457	393 (65.9)	1.2
Case management	751	123 (20.6)	6.1
Individual skills training	276	12 (2.0)	23.0
Group skills training	793	26 (4.4)	30.5
Transportation	1,161	63 (10.6)	18.4
Nonbillable (scheduling, reminders)	2,329	280 (47.0)	8.3
Other	165	86 (14.4)	1.9
Total	5,932	596	10.0

[1] Because participants could receive more than one service, we only count participants once, even if they received more than one service.
Source: Patient-level data provided to RTI by SEMHS.

Table 6 provides the duration in which participants received HN assistance. As shown in the table, most participants (56.7%) received services over just 1 day. It is important to monitor the length of services because the shorter the period of services provided the less likely they may be to affect the priority outcomes of HCIA.

Table 6. Length of Services Provided to Participants through Q11

Length of Assistance[1]	Number of Unique Participants	Percentage of Unique Participants
Less than 1 day	338	56.7
1 day to less than 1 week	21	3.5
1 week to less than 1 month	34	5.7
1 month to less than 3 months	35	5.9
3 months to less than 6 months	34	5.7
6 months to less than 1 year	50	8.4
1 year or more	84	14.1
Total	596	100.0

[1] Length of assistance is considered the time between the first service and the most recent service provided. Patients with the first and most recent service occurring on the same day are included in the "less than 1 day" category.
Source: Patient-level data provided to RTI by SEMHS.

Table 7 lists the type of contacts made with the enrolled patients contacted by HNs through Q11. Slightly more than one-third of the contacts (36.4%) were in-person visits, while 39.6 percent of contacts were done through telephone calls. Approximately 23.3 percent of participants received both types of contacts.

Table 7. Number of Participants Contacted by HNs through Q11

Type of HN Contact	Number of Participants Contacted	Percentage of Participants Contacted
In-person visit	217	36.4
Telephone call	236	39.6
Both types of contact	139	23.3
Other[1]	4	0.7
Total	596	100.0

Source: Patient-level data provided to RTI by SEMHS.
[1] Other types of contacts include written contact or video conferencing.

Sustainability

SEMHS leadership has secured approval to use monies received from the Accountable Care Organization (ACO) to maintain the current services and expand to all six counties in the region. The organization plans to maintain funding for the remaining four HNs (i.e., two recently resigned), project manager, and HNHN supervisor. The leadership noted that although the HN located at PMC was among those who recently left her position, the hospital has requested that they fill the position again so it will be one of the four positions moving forward. ACO funds will sustain HNs as long as they are not doing office work or traveling all over the state.

SEMHS leadership is still trying to determine how the other three HNs will divide their time across the six-county region. The leaders worked to refine the functions fulfilled by the HNs so that their time will be used more efficiently. SEMHS is shifting the provision of transportation services (which consume much of HNs' time and effort)) to peers with a history of behavioral health issues. The increase in Medicaid-eligible enrollees enabled SEMHS to hire peers who are supported by SEMHS services, including a respite house that opened in 2014. This house, staffed by peers and supervised by clinical staff, provides respite for these individuals to prevent ED visits or inpatient admissions. Peers will be paid to provide transportation for patients receiving HN services, which will free up time for HNs to focus on other support services such as case management, education, and individual training skills to increase access to behavioral care, primary care, and early intervention services. SEMHS can hire two peers for the cost of one bachelor-level HN. HNs will likely continue to coordinate transportation with peers, but will be able to focus more of their time on core HN activities, with special focus on the new expanded Medicaid population and how these patients can be served through patient navigation services.

Finally, SEMHS began to implement plans to further integrate primary care within the organization. SEMHS recently broke ground on a wellness center and hired a masters of public health (MPH) graduate to oversee programming, which will bring much-needed wellness opportunities to its clients in rural Colorado where preventive care resources are scarce. SEMHS hired a health coach, funded through a grant, who works with HNs and their clients to provide wellness services. The health coach helped SEMHS to solidify a team approach to address the needs of high-risk patients and ultimately reduce costs and improve health.

SEMHS leadership is aware of rumors in the community that the HN program is ending, and recognizes the need to better inform the community about how the program will be sustained and expanded regionally to counter this perception.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of SEMHS innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data SEMHS collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures that RTI considers essential to the evaluation of SEMHS innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, RTI incorporates the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 8 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of whether the payer specific data are presented in this annual report.

Table 8. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	Yes
		Hospital unplanned readmissions rate	Yes	Yes
		ED visit rate	Yes	Yes
	Cost	Spending per patient	Yes	Yes
		Estimated cost savings	No	No

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis

We include patients who were enrolled prior to December 31, 2014, and we present Medicare claims data through December 31, 2014.

Descriptive Analysis

This report includes claims through December 31, 2014 for 33 dual Medicaid and Medicare fee-for-service beneficiaries enrolled in the innovation. As more claims data become available, the sample size will increase and propensity score matching (PSM) will be used to select a comparison group with similar characteristics to the treatment group. With so few beneficiaries currently enrolled in the innovation, a propensity score model would not converge to allow selection of a comparison group.

Table 9 reports Medicare spending per patient in the eight quarters before and the four quarters after enrolling in the innovation.

Table 9. Medicare Spending per Patient: SEMHS

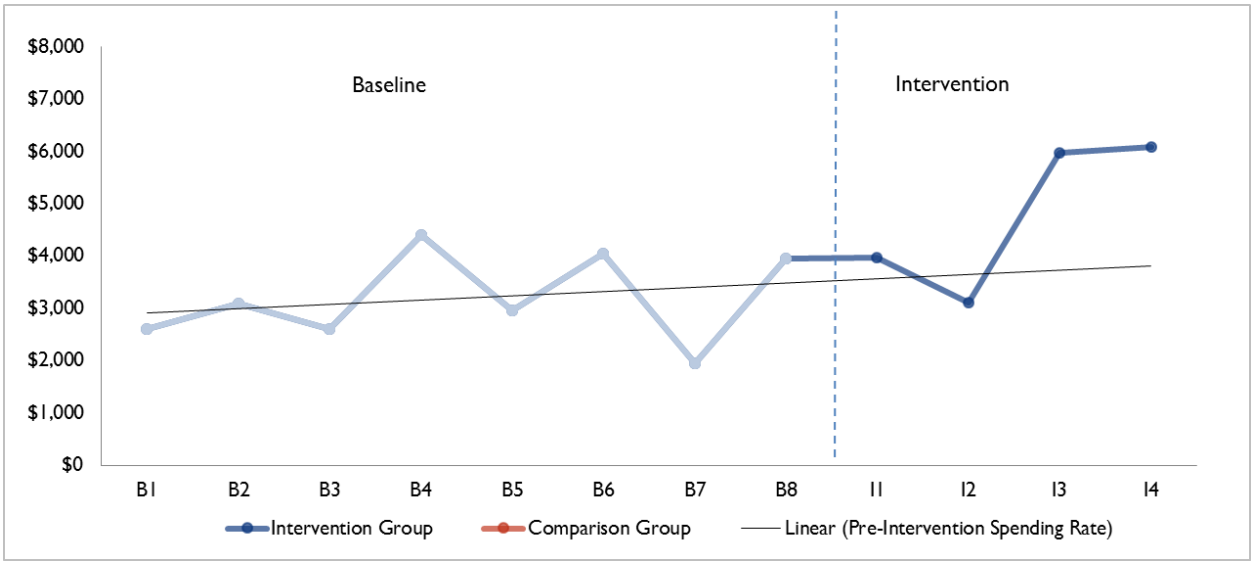
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters			
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4
Intervention Group													
1C1CMS 330988	SEMHS												
	Spending rate	$2,595	$3,080	$2,596	$4,401	$2,960	$4,049	$1,951	$3,954	$3,960	$3,114	$5,965	$6,083
	Std dev	$4,225	$6,074	$4,593	$8,660	$5,887	$8,217	$2,398	$7,400	$6,468	$5,394	$10,475	$15,517
	Unique patients	31	31	31	30	32	32	31	32	33	29	26	21
Comparison Group													
1C1CMS 330988	SEMHS												
	Spending rate	—	—	—	—	—	—	—	—	—	—	—	—
	Std dev	—	—	—	—	—	—	—	—	—	—	—	—
	Unique patients	—	—	—	—	—	—	—	—	—	—	—	—
Savings per Patient		—	—	—	—	—	—	—	—	—	—	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.
— Data not yet available.

Figure 3 illustrates the Medicare spending per beneficiary (ranging from 21 to 33 patients each quarter) in ***Table 9*** for innovation group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 3. Medicare Spending per Patient: SEMHS



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
SEMHS = Southeast Mental Health Services.

During the baseline period, spending per beneficiary trends slightly upward and averages approximately $3,000 per quarter. As shown in the table, spending has a high standard deviation resulting from the small number of Medicare beneficiaries enrolled in the innovation. During the intervention period, spending per beneficiary rises above the trend line in three of the four quarters; however, this rise does not necessarily imply that the innovation caused spending to increase. Because the standard deviation in spending was so high during the baseline and intervention period, deviations from the trend should not be interpreted as caused by the intervention.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 10*** and ***Figure 4***.

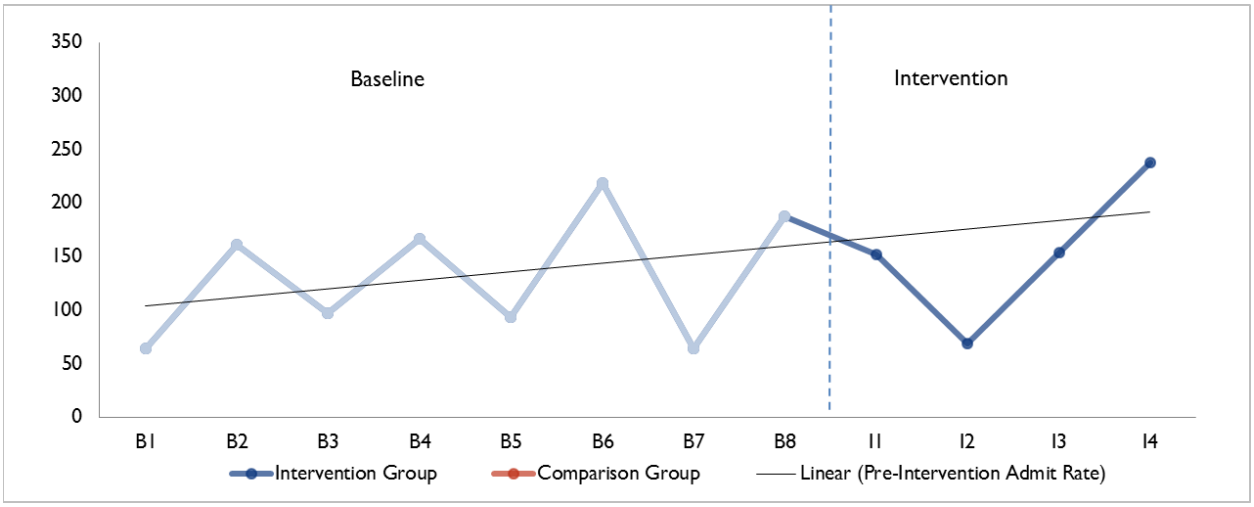
Table 10. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: SEMHS

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters			
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4
Intervention Group													
1C1CMS 330988	SEMHS												
	Admit rate	65	161	97	167	94	219	65	188	152	69	154	238
	Std dev	246	368	296	453	384	649	246	527	435	253	361	610
	Unique patients	31	31	31	30	32	32	31	32	33	29	26	21
Comparison Group													
1C1CMS 330988	SEMHS												
	Admit rate	—	—	—	—	—	—	—	—	—	—	—	—
	Std dev	—	—	—	—	—	—	—	—	—	—	—	—
	Unique patients	—	—	—	—	—	—	—	—	—	—	—	—
Intervention − Comparison Rate		—	—	—	—	—	—	—	—	—	—	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.
— Data not yet available.

Figure 4. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: SEMHS



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
SEMHS = Southeast Mental Health Services.

The inpatient admissions rate varies from quarter to quarter due to the small number of beneficiaries enrolled in the innovation (ranges from 21 to 33 beneficiaries each quarter) and the relative infrequency of inpatient admissions. During the intervention period, the inpatient admissions rate is initially below the baseline trend and then rises above the baseline trend. Because the standard deviation in inpatient admissions is so high during the baseline and intervention period, deviations from the trend should not be interpreted as caused by the intervention.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 11*** and ***Figure 5.***

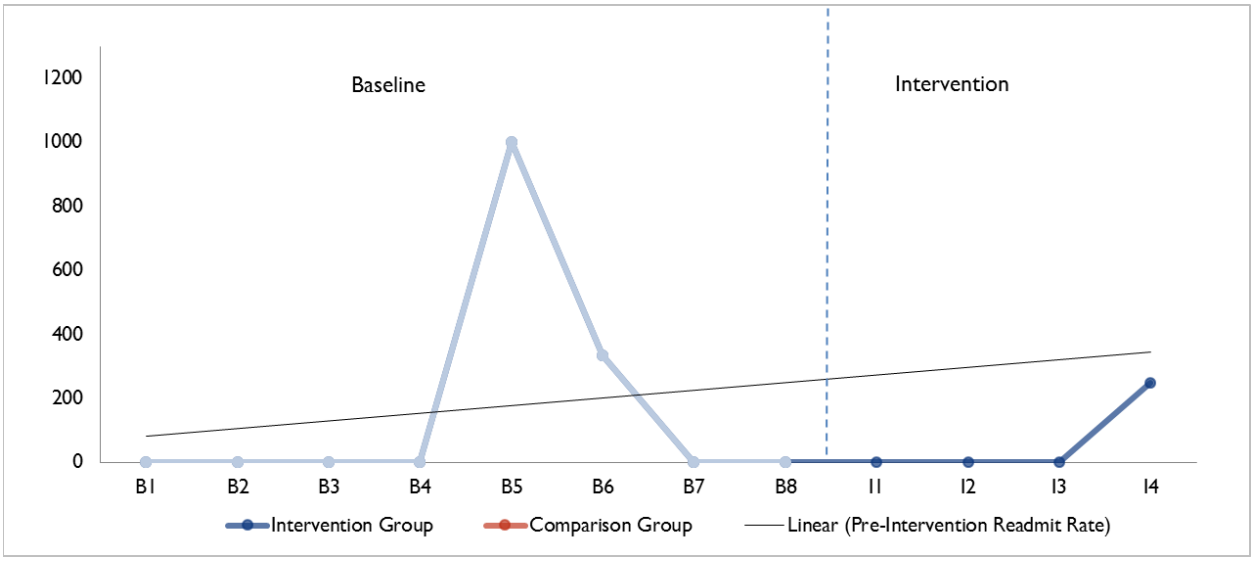
Table 11. Hospital Unplanned Readmissions Rates per 1,000 Admissions: SEMHS

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters			
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4
Intervention Group													
1C1CMS 330988	SEMHS												
	Readmit rate	0	0	0	0	1,000	333	0	0	0	0	0	250
	Std dev	0	0	0	0	0	471	0	0	0	0	0	433
	Total admissions	0	1	1	2	2	6	1	2	2	1	1	4
Comparison Group													
1C1CMS 330988	SEMHS												
	Readmit rate	—	—	—	—	—	—	—	—	—	—	—	—
	Std dev	—	—	—	—	—	—	—	—	—	—	—	—
	Total admissions	—	—	—	—	—	—	—	—	—	—	—	—
Intervention − Comparison Rate		—	—	—	—	—	—	—	—	—	—	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.
— Data not yet available.

Figure 5. Hospital Unplanned Readmissions Rates per 1,000 Admissions: SEMHS



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
SEMHS = Southeast Mental Health Services.

In all but three quarters, the readmissions rate is zero because there are very few inpatient admissions (the denominator in the readmissions rate). With relatively few admissions, the probability of observing a readmission in a given quarter is low. SEMHS's Medicare fee-for-service population is not large enough to analyze the impact of the intervention on hospital readmission rates.

ED visits per 1,000 participants are shown in ***Table 12*** and ***Figure 6***.

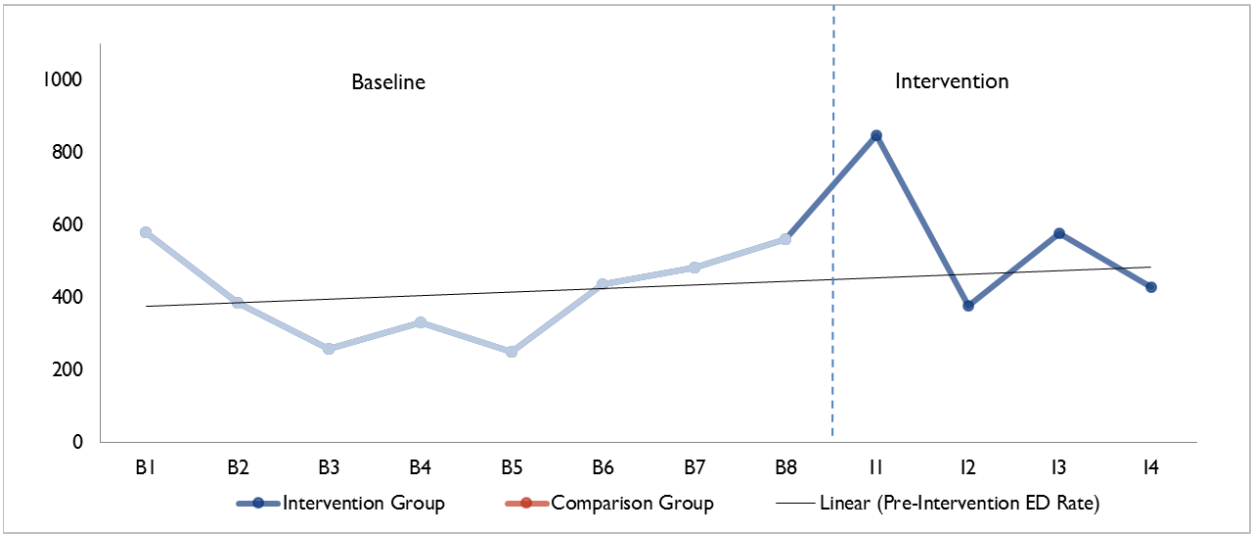
Table 12. ED Visits per 1,000 Participants: SEMHS

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters			
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4
Intervention Group													
1C1CMS 330988	SEMHS												
	ED rate	581	387	258	333	250	438	484	563	848	379	577	429
	Std dev	1177	1308	576	844	622	914	996	948	1064	903	1419	811
	Unique patients	31	31	31	30	32	32	31	32	33	29	26	21
Comparison Group													
1C1CMS 330988	SEMHS												
	ED rate	—	—	—	—	—	—	—	—	—	—	—	—
	Std dev	—	—	—	—	—	—	—	—	—	—	—	—
	Unique patients	—	—	—	—	—	—	—	—	—	—	—	—
Intervention − Comparison Rate		—	—	—	—	—	—	—	—	—	—	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1; ED = emergency department.
— Data not yet available.

Figure 6. ED Visits per 1,000 Participants: SEMHS



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
SEMHS = Southeast Mental Health Services.

ED visits trend slightly upward in baseline period and bounce above and below the baseline trend during the intervention period. As with the other measures, changes in the ED visit rate should be interpreted with caution due to the small sample size.

Discussion

The small number of Medicare fee-for-service beneficiaries enrolled in the SEMHS innovation makes it difficult to draw conclusions about the innovation's impact on spending, inpatient admissions, readmissions, and ED visits. However, the results for Medicare fee-for-service beneficiaries may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicare beneficiaries who we were able to match with the identifiers provided by the site. This represents approximately 5 percent of the overall population reached by the innovation.

Medicaid Claims Analysis

The Medicaid analysis uses claims data provided by ValueOptions and contains all Medicaid patients in Prowers County from July 2013 to December 2014. The sample includes 121 Medicaid beneficiaries who were enrolled in the innovation and appeared in the 18 months of claims data provided by ValueOptions. Although RTI made a substantial effort to provide analyses using the claims data provided, the analysis has limitations, which are described below.

First, because RTI received a fixed 18 months of data (2013 Q3 to 2014 Q4Q4), we observe each beneficiary over six calendar quarters. In contrast to the Medicare analysis, we do not observe a single beneficiary in all baseline and intervention quarters in the Medicaid claims data. Instead, beneficiary claims may be available before, after, or at the time of innovation enrollment because beneficiaries enroll between 2012 Q3 and 2014 Q4. For example, a beneficiary who enrolled in the innovation in 2014 Q1 would have claims data for the final three baseline quarters (B6 to B8) and the first three intervention

quarters (I1 to I3). RTI pooled all beneficiaries together to analyze five baseline and six intervention quarters; however, a beneficiary will only be present in a maximum of six consecutive quarters. The number of unique patients in each quarter is provided in ***Table 10.***

Second, some patients do not appear in the claims data for all quarters. If a patient did not generate a claim in a quarter, we assume that the patient had zero spending and utilization during the quarter. Although this assumption is reasonable given the short time period of data, other reasons for not generating a claim include death, switch of Medicaid plans, or loss of Medicaid eligibility. These variables are not observed in the claims data provided. As a result, the spending and utilization figures may be understated if zeros are inserted for some individuals whose spending and utilization is not observed for the aforementioned reasons.

Additionally, some Medicaid patients who enrolled in the innovation did not appear in the claims data at all; therefore, RTI was unable to include these beneficiaries in the analysis. Out of the 596 innovation enrollees, 121 appeared in the claims data provided by ValueOptions. A Medicaid beneficiary who was enrolled in the innovation might not appear in the claims data for several reasons: (1) the Medicaid ID provided by SEMHS was incorrect, (2) the beneficiary did not generate any claims in the 6 quarter period, or (3) the beneficiary lived outside of Prowers County.

Comparison Groups

We used PSM to select a comparison group of beneficiaries that appeared in the Medicaid data from ValueOptions but were not enrolled in the innovation. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age and gender. We were limited to using only age and gender in the propensity score model because these were the only patient characteristics included in the claims data provided by ValueOptions.

Table 13 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. ***Figure 7*** shows the distribution of the propensity scores for both the comparison and intervention group. ***Appendix B.2*** provides technical details on the PSM methodology. Five treatment beneficiaries were dropped from the subsequent analyses due to the lack of an appropriately matched comparison beneficiary.

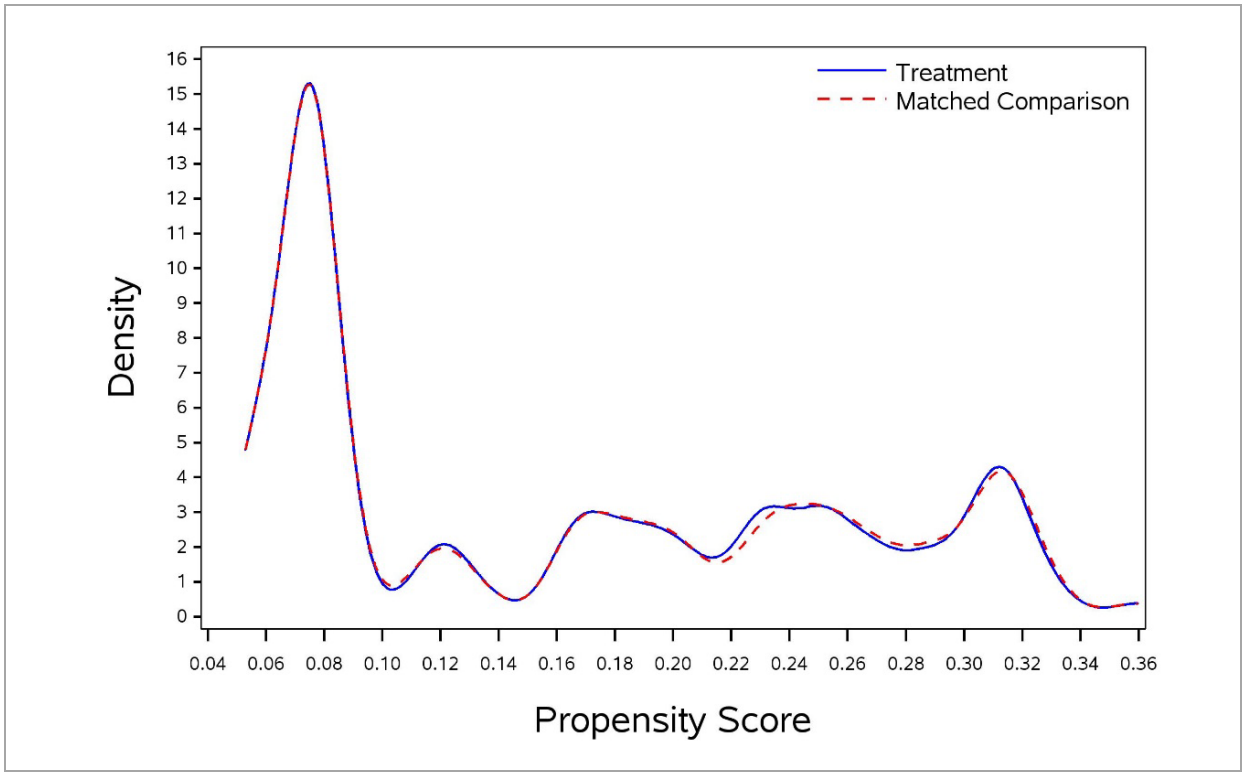
Table 13. Mean Values and Standardized Differences of Variables in Propensity Score Model: SEMHS

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Age	22.64	19.85	12.39	17.69	0.55	20.96	18.55	16.15	18.44	0.26
Percentage female	66.54	47.23	54.55	49.79	0.25	69.48	46.05	69.23	46.15	0.01
Number of unique beneficiaries	126	—	966	—		121	—	121	—	

SD = standard deviation.
— Data not yet available.

After performing PSM, we calculate absolute standardized differences between the treatment group and both the unmatched and matched comparison groups and check whether matching decreases the absolute standardized differences and achieves acceptable balance (Table 13). Many researchers consider that an absolute standardized difference ≤ 0.10 indicates acceptable balance. Researchers also point out that critical variables in determining selection into treatment (e.g., those with significant effects in the propensity score equation) should have greater balance, while indicators with minor importance in determining treatment selection do not require optimal balance. The results in Table 13 show that matching reduced the absolute standardized differences for age and gender and achieved adequate balance for gender.

Figure 7. Distribution of Propensity Scores for Comparison and Intervention Groups: SEMHS



SEMHS = Southeast Mental Health Services.

Because the comparison group was selected based on two characteristics, caution should be used when interpreting the comparison group's outcomes as the counterfactual for the treatment group in the absence of the innovation.

Descriptive Analysis

Table 14 reports Medicaid spending per patient in the five quarters before and the six quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 14. Medicaid Spending per Patient: SEMHS

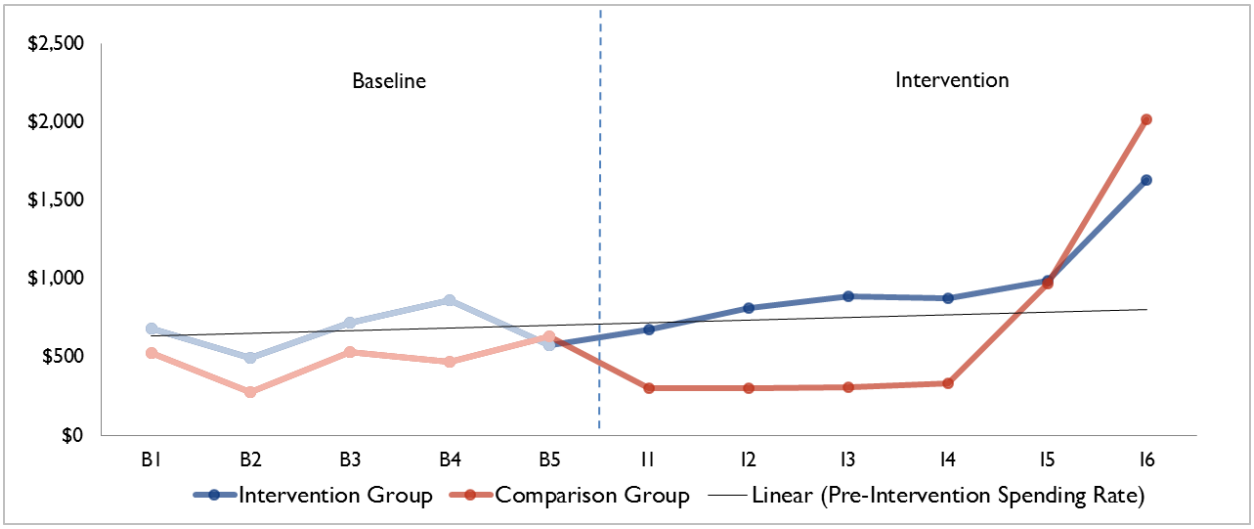
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters					Intervention Quarters					
		B1	B2	B3	B4	B5	I1	I2	I3	I4	I5	I6
Intervention Group												
1C1CMS 330988	SEMHS											
	Spending rate	$681	$495	$722	$866	$578	$674	$813	$886	$878	$988	$1,627
	Std dev	$1,338	$937	$1,085	$1,407	$757	$1,063	$988	$1,607	$1,409	$1,498	$2,343
	Unique patients	21	30	44	54	48	41	49	51	42	45	24
Comparison Group												
1C1CMS 330988	SEMHS											
	Spending rate	$529	$276	$533	$470	$630	$301	$302	$311	$332	$967	$2,018
	Std dev	$1,627	$360	$835	$1,101	$1,953	$720	$441	$405	$448	$3,881	$5,925
	Unique patients	21	30	44	54	46	41	49	51	43	46	23
Savings per Patient		−$152	−$218	−$190	−$396	$52	−$373	−$510	−$574	−$546	−$21	$391

Source: RTI analysis of Medicaid claims provided by ValueOptions.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 8 illustrates the Medicaid spending per beneficiary in ***Table 10*** for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 8. Medicaid Spending per Patient: SEMHS



Source: RTI analysis of Medicaid claims provided by ValueOptions.
SEMHS = Southeast Mental Health Services.

During the baseline period, the spending trends for the treatment and comparison group are parallel. During the intervention period, spending for the treatment group continues along the baseline trend and the difference in spending increases between the treatment and comparison groups. During I5 and I6, spending increases for both the treatment and comparison groups. Without statistical testing, it would be premature to draw conclusions about the innovation's impact on spending.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 15*** and ***Figure 9***.

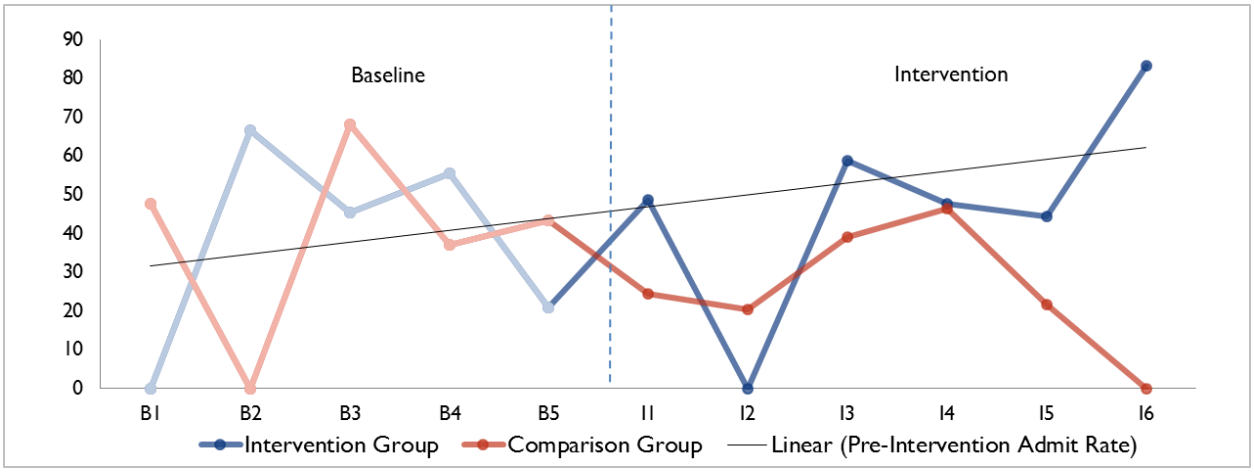
Table 15. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: SEMHS

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters					Intervention Quarters					
		B1	B2	B3	B4	B5	I1	I2	I3	I4	I5	I6
Intervention Group												
1C1CMS 330988	SEMHS											
	Admit rate	0	67	45	56	21	49	0	59	48	44	83
	Std dev	0	254	211	302	144	218	0	238	216	208	282
	Unique patients	21	30	44	54	48	41	49	51	42	45	24
Comparison Group												
1C1CMS 330988	SEMHS											
	Admit rate	48	0	68	37	43	24	20	39	47	22	0
	Std dev	218	0	452	191	206	156	143	280	213	147	0
	Unique patients	21	30	44	54	46	41	49	51	43	46	23
Intervention − Comparison Rate		−48	67	−23	19	−23	24	−20	20	1	23	83

Source: RTI analysis of Medicaid claims provided by ValueOptions.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 9. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: SEMHS



Source: RTI analysis of Medicaid claims provided by ValueOptions.
SEMHS = Southeast Mental Health Services.

The all-cause inpatient admissions rate exhibits a high degree of variability in the quarters before and after the intervention. In future reports, and if the data permit, we will include statistical tests for innovation effects on the inpatient admissions rate.

Hospital unplanned readmission rates per 1,000 admissions are shown in ***Table 16*** and ***Figure 10***.

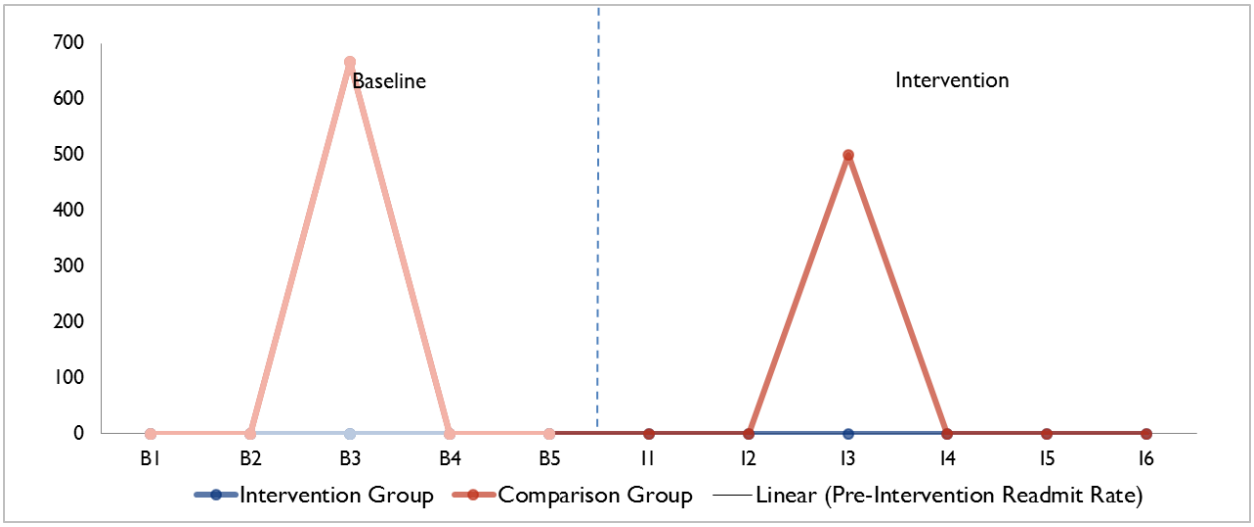
Table 16. Hospital Unplanned Readmissions Rates per 1,000 Admissions: SEMHS

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters					Intervention Quarters					
		B1	B2	B3	B4	B5	I1	I2	I3	I4	I5	I6
Intervention Group												
1C1CMS 330988	SEMHS											
	Readmit rate	0	0	0	0	0	0	0	0	0	0	0
	Std dev	0	0	0	0	0	0	0	0	0	0	0
	Total admissions	0	2	2	3	1	2	0	3	2	2	2
Comparison Group												
1C1CMS 330988	SEMHS											
	Readmit rate	0	0	667	0	0	0	0	500	0	0	0
	Std dev	0	0	471	0	0	0	0	500	0	0	0
	Total admissions	1	0	3	2	2	1	1	2	2	1	0
Intervention − Comparison Rate		0	0	–667	0	0	0	0	–500	0	0	0

Source: RTI analysis of Medicaid claims provided by ValueOptions.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 10. Hospital Readmission Rates per 1,000 Admissions: SEMHS



Source: RTI analysis of Medicaid claims provided by ValueOptions.
SEMHS = Southeast Mental Health Services.

The treatment group had no hospital readmissions during the observation period due to the small sample size. Hospital admissions (the denominator in the readmissions measure) are infrequent and at most three admissions are observed per quarter. With three or fewer hospital admissions per quarter, it is unlikely that a hospital readmission would be observed.

ED visits per 1,000 participants are shown in ***Table 17*** and ***Figure 11***.

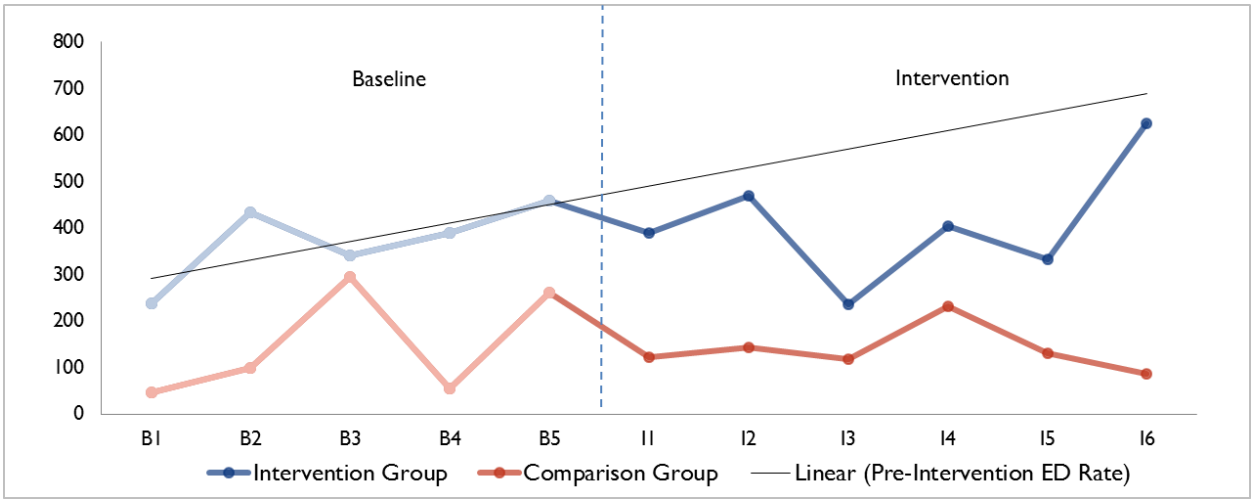
Table 17. ED Visits per 1,000 Participants: SEMHS

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid
Admissions Measure: All cause

Awardee Number	Description	Baseline Quarters					Intervention Quarters					
		B1	B2	B3	B4	B5	I1	I2	I3	I4	I5	I6
Intervention Group												
1C1CMS 330988	SEMHS											
	ED rate	238	433	341	389	458	390	469	235	405	333	625
	Std dev	539	935	680	763	922	891	892	586	701	674	875
	Unique patients	21	30	44	54	48	41	49	51	42	45	24
Comparison Group												
1C1CMS 330988	SEMHS											
	ED rate	48	100	295	56	261	122	143	118	233	130	87
	Std dev	218	305	632	231	929	400	456	382	527	453	417
	Unique patients	21	30	44	54	46	41	49	51	43	46	23
Intervention − Comparison Rate		190	333	45	333	197	268	327	118	172	203	538

Source: RTI analysis of Medicaid claims provided by ValueOptions.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 11. ED Visits per 1,000 Participants: SEMHS



Source: RTI analysis of Medicaid claims provided by ValueOptions.
SEMHS = Southeast Mental Health Services.

The time series for ED visits trends slightly upward during the baseline period for the intervention group. During the intervention period, the treatment group's ED visit rate falls below the baseline trend. During the baseline and intervention period, the comparison group's trend in ED visits is parallel to the treatment group's trend; however, the standard deviation of the ED visit rate is high for both groups. In future reports, and if the data permit, we will include statistical tests for innovation effects on the ED visit rate.

Discussion

This analysis presents the results using the Medicaid claims data that ValueOptions shared with RTI for evaluating the intervention. Because of the small sample size, it is difficult to draw conclusions about the intervention's effect on spending, inpatient admissions, unplanned readmissions, and ED visits. However, the results may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicaid beneficiaries who we were able to match with the identifiers provided by the site, which, which represents 20 percent of the overall population reached by the innovation.

1.3.3 Other Awardee-Specific Data

Table 18 lists the awardee-specific outcome measure selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. The data we present in this section are current through March 2015. The results of analyses of this measure are not included in this annual report. Neither ValueOptions nor SEMHS keeps a record of participants and their associated ICHP risk level over time.

Table 18. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Clinical effectiveness	General health and wellness	Number of high-risk participants who step down to lower risk level during HN intervention	Data unavailable

HN = health navigator; SEMHS = Southeast Mental Health Services.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing SEMHS as well as accomplishments to date. In this section we assess SEMHS's progress on achieving HCIA goals to date.

- **Smarter spending.** Spending increased after enrolling in the intervention for both Medicare and Medicaid beneficiaries; however, it is premature to conclude that the innovation resulted in higher spending because the standard deviation in spending was very high in both groups. Adding more patients to the intervention or examining a different set of patients could change the observed spending trends.

- **Better care.** The time series for ED visits and admissions varied highly. Because of the small sample size and high standard deviation in these measures, we are precluded from drawing any firm conclusions about the innovation's impact on those measures.

  In most quarters, no readmissions were observed. Because an insufficient number of patients were enrolled in the innovation to generate a time series in readmissions, no conclusion can be reached concerning the innovation's impact on hospital readmissions.

  SEMHS enrolled an additional 47 participants in Q11, bringing the total enrollment to 596. An average of 10, services was provided per participant; the majority received less than 1 day of service. RTI did not receive clinical effectiveness data regarding the impact of the innovation on reducing the risk levels. Therefore, we do not present these data in this report.

- **Healthier people**. The awardee informed RTI that health outcome data were not available so are not presented in this report.

Prowers County is located at the edge of the Colorado and Oklahoma with an estimated population of 12,291 as of 2013. Some parts of this very rural area qualify as "frontier" designations and, as such, the region's residents must travel considerable distances to reach services. SEMHS is one of only a few service agencies available to residents in the six-county region that includes Prowers, and is well known as a key provider in the area. The HN innovation provided the opportunity to integrate the services so that people were assured of receiving comprehensive preventive care. Unfortunately, SEMHS's primary care provider was no longer linked with the innovation (as of early 2014) so SEMHS had to establish effective ways to link patients with that care. SEMHS maintained strong ties with the internal patient navigator at the primary care provider during the first year of implementation but the linkage between these services was compromised.

The SEMHS innovation had mixed success. One success was the development of a community health worker certificate program through OJC and the certification of its first group of students. This

program component has received both state and national recognition, and holds the promise of growing into a degree program in the coming years. Assessing the impact of the HN services will be almost impossible, given the challenges of the data quality.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

University of Chicago

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

University of Chicago

1.1 Introduction

The University of Chicago (U-Chicago), an academic research organization on the South Side of Chicago, received an award of $5,862,027. Launched on March 21, 2013, the CommunityRx (CommRx) innovation seeks to achieve the following goals:

1. **Smarter spending.** Reduce spending by 0.5 percent per beneficiary per year by providing community referrals for healthier lifestyles and self-care. One way that spending can be reduced is by decreasing low-acuity ED visits.

2. **Better care.** Improve care by providing primary care and emergency care providers with a patient-centered prescription for community services (Healthe*Rx*) for healthy lifestyles, disease management, and social services in their neighborhoods.

3. **Healthier people.** Improve health by providing information on community programs and services available to local residents for health maintenance and disease management.

Table 2 provides a summary of changes that occurred with U-Chicago during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data submitted by U-Chicago through March 31, 2015; and key informant interviews with U-Chicago's leaders and staff conducted on May 4-6 and May 11, 2015.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	Since the first annual report, CommRx launched to one additional clinical site (CFHC's Pullman site).[1]
	Completed initial setup activities for 10 additional clinical sites in anticipation of implementation.
	Expanded Healthe*Rx* requests to five additional zip codes.
	Completed updates and upgrades to the core CommRx system.
	Continued testing to initiate SMS messaging pilot.
Program Participant Characteristics	Majority of participants (38.3%) were less than 18 or between 25 and 64 years of age (41.8%), female (62.3%), and black (81.7%). About half (45.7%) were covered by Medicaid, and more than 10% were covered by Medicare or dually eligible for both Medicare and Medicaid.
Implementation Process	
Execution	30.9% of U-Chicago's Year 3 budget was expended, slightly below target. The underrun was in part driven by delays implementing the innovation in new clinical sites where there were competing priorities (i.e., ACA and Meaningful Use requirements and EMR upgrades).
Leadership	No change since the first annual report, and leadership at the university remains strong.

(continued)

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Implementation Process (continued)	
Organizational capacity	No change since first annual report, organizational capacity to continue the innovation through the funding period remains in place.
Innovation adoption and workflow	During implementation at CFHC's Pullman site, the existing EHR interface was modified to enable operation with the existing workflow. Modification was made to ensure that the Healthe*Rx* prints at a nearby nursing station but appears onscreen in the exam room for medical assistants to review with patients.
	Pilot testing of SMS texting with GE Centricity at eight Near North Health Service Corporation clinics went live January 15, 2015. SMS texting was not fully incorporated into the other 25 participating clinics due to budget limitations.
Workforce Development	
Hiring/retention	Two new part-time community health information specialists (CHIS) were hired (1 FTE) and the project maintained 100% retention rate in other staff.
Training	U-Chicago continued to train providers on how to generate a Healthe*Rx* and added the training for CHIS on SMS texting. A significant number of hours were spent training the MAPSCorps field coordinators and field team.
Implementation Effectiveness	
Reach	90,386 participants (count current as of March 2015); 53.2% of the target population have received at least one Healthe*Rx*, up from 31% in Q9.
	83% of the targeted clinical sites began implementing Healthe*Rx* by Q11, up from 70% in Q9.
Dose	More than half of participants (57.1%) received one Healthe*Rx* report, and the other half received two or more reports (up from 20.5% in Q9).

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by U-Chicago.
Key informant interviews conducted Feb–June 2015.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

ACA = Affordable Care Act; CFHC = Chicago Family Health Center; CHIS = community health information specialists; EHR = electronic health record; EMR = electronic medical record; FTE = full-time equivalent; MAPSCorps = Meaningful Active Productive Science in Service to Communities; SMS = short message service.

1.1.1 Innovation Components

This innovation consists of three components: (1) Healthe*Rx* via CommRx involves a database (CommRx), which receives electronic health records (EHR) data from the participating health care sites to produce an e-prescription for community health and social services (Healthe*Rx)* tailored to the patient's conditions and the resources available in their communities; (2) identifying, engaging, and preparing clinical sites so providers are willing to explain and deliver the Healthe*Rx* to their patients; and (3)

deploying community health information specialists (CHIS) to support recipients of the Health*eRx* who want more information or assistance connecting to local health and social services.

Since we provided details on these components in the first annual report, only a few minor changes to these components were made.[1] At the end of the year, U-Chicago successfully piloted short message service (SMS) texting at eight Near North Health Corporation clinics. (Although worth mentioning, because SMS texting was not fully integrated into the innovation and at all sites, the pilot test is not included as a new innovation component.) Although the CHIS had always been involved with identifying and gathering additional information about the health resources in the community, this work became more of a central focus for these team members. Additionally, two new CHIS were hired to call and visit organizations that provide resources to community residents, and gather additional detail including, but not limited to, the population they serve and the types of services provided. Unlike the existing CHIS, these new staff members did not routinely receive calls from program participants. The partners for this innovation remain unchanged.

1.1.2 Program Participant Characteristics

Table 3 provides the demographic characteristics of all participants ever enrolled in the innovation. We first reported reach in the Q5 report, based on data for participants enrolled through Q9 (September 2014). The percentage of missing values decreased from approximately 30 percent in the Q5 report to less than 10 percent in this annual report. Otherwise, the distribution of patient characteristics was similar to that in the Q5 report. More specifically, the majority of participants were either younger than 18 (38.0%) or between 25 and 64 (41.6%), female (62.4%), and black (81.8%). About half (47.1%) were covered by Medicaid, with more than 10 percent covered by Medicare or dually eligible for both Medicare and Medicaid.

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Number of Participants[1]	Percentage of Participants
Total	90,386	100.0
Age		
<18	34,361	38.0
18–24	8,812	9.7
25–44	20,866	23.1
45–64	16,700	18.5
65–74	4,507	5.0
75–84	2,892	3.2

(continued)

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015 (continued)

Characteristic	Number of Participants[1]	Percentage of Participants
Age (continued)		
85+	1,354	1.5
Missing	894	1.0
Sex		
Female	56,396	62.4
Male	33,987	37.6
Missing	3	0.0
Race/ethnicity		
White	8,963	9.9
Black	73,901	81.8
Hispanic	4,096	4.5
Asian	1,414	1.6
American Indian or Alaska Native	82	0.1
Native Hawaiian or Other Pacific Islander	106	0.1
Other	88	0.1
Missing/refused	1,736	1.9
Payer Category		
Dual	2,439	2.7
Medicaid	42,542	47.1
Medicare	6,812	7.5
Medicare Advantage	2	0.0
Other	23,908	26.4
Uninsured	8,578	9.5
Missing	6,105	6.8

Source: Patient-level data provided to RTI by U-Chicago.
[1] Based on data received from U-Chicago (n=51,857), Chicago Family (n=8,112), Friend Family (n=18,910), and Near North (n=10,394).

1.2 Implementation Progress

The first annual report (2014) described U-Chicago's implementation process, workforce development, and progress toward effectiveness, and detailed the quantifiable measures to assess each area. ***Table 4*** lists these measures and their status as of May 31, 2015. In this annual report, we provide the results of analyses of most of these measures. We include the number of participants who received a Health*eRx*, but not by ontology. We anticipate including those data in the next quarterly report.

This section presents U-Chicago's process measures and a qualitative analysis of the factors that determined U-Chicago's implementation progress. This analysis draws on patient-level data that U-Chicago provided to RTI as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation Process	Workflow Integration	HCIA Provider Survey	Collected by RTI
	Provider Satisfaction	HCIA Provider Survey	Collected by RTI
Workforce development	Education and training	Number of information specialists completing training course	Data received from U-Chicago
	Recruitment and retention	Retention rate of information specialists and HCIA-funded staff	Data received from U-Chicago
Implementation effectiveness	Reach	Number/percentage of unique (unduplicated) participants who received a Healthe*Rx*	Data received from U-Chicago
		Number/percentage of unique (unduplicated) participants who received a Healthe*Rx*, by ontology	Data received from U-Chicago
		Number/percentage of clinical sites that were approached regarding implementing this innovation	Data received from U-Chicago
	Dose	Number of tailored Healthe*Rx* reports generated for each unique patient (unduplicated count)	Data received from U-Chicago
		Number of times information specialists were contacted by phone, text, e-mail, in person, or instant message	Data received from U-Chicago

U-Chicago = University of Chicago.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through U-Chicago's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include U-Chicago's reports from Q8 through Q10 and interviews conducted May 4–6 and May 11, 2015.

Evaluation Questions

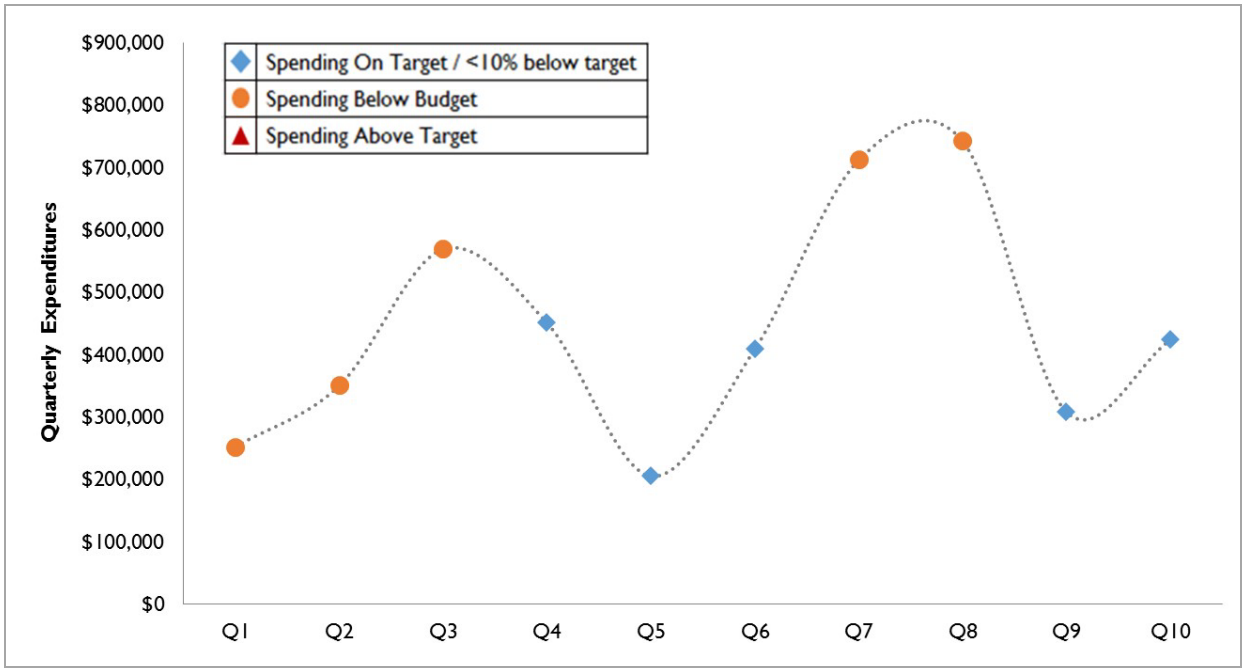
- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?
- How has implementation of the innovation impacted provider workflow?
- How has implementation of the innovation impacted provider satisfaction?

Execution of Implementation

The annual report highlights the significance of U-Chicago's expenditure rates on implementation. As of December 2014 (Q10), U-Chicago spent 30.91 percent of its Year 3 budget, which is below projection, but by less than 10 percent since inception (***Figure 1***). The target underrun for Year 3 is likely due to challenges U-Chicago faced in bringing new sites on line due to competing priorities at the sites

(i.e., Affordable Care Act [ACA] and Meaningful Use requirements and electronic medical record [EMR] upgrades).

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December 31, 2014)



Leadership

Based on the RTI's review of quarterly reports from Q8 through Q10 and team learnings during virtual site visits in the first week of May 2015, the team assessed a consistent high level of support and enthusiasm for implementation and sustainability of the CommRx innovation. Throughout the evaluation, leadership and governance infrastructure remained clearly defined, and this structure was articulated during the site visit interviews. As the primary lead for the multisite innovation, U-Chicago's CommRx innovation is nested within University of Chicago Medical Center's Department of Obstetrics and Gynecology. The designated primary leader of the innovation (project director) is based at U-Chicago and oversees the South Side Health & Vitality Studies, which is a part of the Urban Health Initiative (UHI).

Since inception of the award, the steering committee, led by the project director, provided leadership for U-Chicago's CommRx innovation. Other members of the steering committee included the leaders of the four working groups (technology, workforce, clinical partners, and research and evaluation), key consultants, and medical center legal counsel. The implementation partners collaborated through the working groups with primary responsibility for developing key components of the innovation. Feedback from all working groups informed subsequent revisions or redesigns of the key components. The core operations team supported the working groups and facilitated the flow of information among the groups. RTI's assessment is that the innovation has strong and capable leadership; the various working groups seem to include the right stakeholders and appear to be working well. Since the evaluation presented in

the first annual report, program and organizational leadership and working groups remain critical to addressing issues and challenges and achieving the innovation's milestones.

The leadership team continues to collaborate with the four working groups to implement and scale up the innovation to additional clinical sites. Leadership support helped to implement the innovation at one additional clinic, the Chicago Family Health Center's (CFHC) Pullman site; complete initial implementation activities at 10 additional clinical sites; and expand Healthe*Rx* requests to five additional zip codes. Meanwhile, the leadership team continued to experience delays in implementation at new clinical sites. As mentioned above, the delays were often a result of sites' competing priorities, whether internal (e.g., change in leadership) or external (e.g., time needed for Meaningful Use requirements and EMR upgrades) and were beyond the control of the innovation team.

U-Chicago's CommRx innovation also requires the commitment of designated leaders at each of the implementation sites: three Community Health Center (CHC) corporations and University of Chicago Medical Center (UCMC), totaling 22 clinical sites. Ultimately, the site representative determined the workflow and how the innovation was implemented at the site. At one site, for example, an administrative staff member, rather than the provider, gave the Healthe*Rx* to the patient at checkout. This tailoring suggests that the leaders at the sites had some flexibility in how they implemented the innovation. Based on the site visit interviews with the U-Chicago team, RTI concluded that implementation of this innovation was a high priority for these four corporations (3 CHC corporations and UCMC) and their 22 clinical sites at which CommRx is live. During our site visit, we met with one site leader and several members of the Clinical Partners Working Group, which supports the sites. One member of the Clinical Partners Working Group stated that, "the innovation became a routine part of care, which meant there was much less to discuss in our regular meetings." RTI assessed that utilizing the working group structure for implementing CommRx helped providers facilitate the delivery of the Healthe*Rx* within their site's current workflow.

Furthermore, CommRx's core leadership was proactively establishing and seeking strategic ways to sustain the program after funding ends. The formation of a limited liability corporation (LLC), CareIT Health, will allow other organizations to purchase CommRx functionalities and has potential implications for sustainability. In addition, CommRx leaders continue to investigate funding streams to support CommRx and engage other organizations for potential partnerships and collaborations. CommRx leaders reported tension between meeting the potential clinical sites' desires for customization of the CommRx and maintaining the innovation's fidelity for evaluation. Several potential sites were interested in changing the services or ontologies that the CommRx includes in the Healthe*Rx*. This customization of CommRx functionalities for a specific number of sites would create complexities for evaluation, but U-Chicago leaders believe is an important strategy to consider for sustainability.

Organizational Capacity

Key facilitators to the implementation of the Healthe*Rx* were U-Chicago's strong organizational capacity, aforementioned extensive planning, involvement of key stakeholders in the working group structure, and integration with existing urban health initiatives. Through the UHI, U-Chicago had experience with implementing similar community-engaged innovations such as MAPSCorps, which is now

an integral part of the CommRx innovation. U-Chicago's core operation team continued a collaborative relationship with UHI, which serves as the internal technology development team. Although UHI supports other work priorities, CommRx has a partially funded information technology project manager who supports CommRx and other UHI supported projects. If additional program support is needed, UHI's technology team is available. The close proximity of CommRx's core operation and the UHI's technology team allows the core operation team to leverage the expertise of faculty and administrative leadership across the institution. The virtual site visit found that core staff and implementing technology partners have sufficient time and resources to dedicate to the innovation's day-to-day tasks.

U-Chicago's additional organizational strength is its internal and partner-level technology expertise with managing different EMR systems across the 22 sites. This ability to adapt how CommRx communicates with the various EMR systems and workflows allowed U-Chicago to stay nimble and continue to make progress on the generation of Healthe*Rx*s. Despite delays with sites changing EMR vendors and trying to achieve meaningful use standards, the technology partners remained invested in assuring that the innovation is compatible and resourceful for all participating sites.

The current challenge with sustaining CommRx as a technology is that the database would need more financing to ensure that it remains up to date and accurately reflects the community resources available at the time. CommRx requires updated information from the constantly changing community-based resources that are available to residents in the target zip codes. RTI's assessment is that U-Chicago as a lead may have the capacity in staff and leadership, but CommRx may not be prioritized enough within the larger university setting to sustain it into the future, if additional funding sources are not identified.

U-Chicago also experienced challenges in sustaining a training program with their partner—The Graham School, which designed the initial certificate program for the CHIS with tailored skills, tools, and resources for working with both community residents and providers in clinical settings. The challenges relating to this program are explained in more detail in ***Section 1.2.2***.

Innovation Adoption and Workflow Integration

For CommRx to meet the needs and resources of each clinical site, U-Chicago allowed the processes of implementation to be tailored somewhat to each site's specific workflow and needs. For example, the U-Chicago technology team made a slight modification to operate CommRx within a new clinical site's existing workflow. The U-Chicago technology team adapted the innovation during the implementation of CommRx at CFHC's Pullman site. The Pullman site's workflow consists of the medical assistants reviewing information about the encounter in the exam room with the patient prior to checkout. Since printers are not in the exam room, the slight modification now allows the medical assistant to review the Healthe*Rx* with the patient in the exam room, after which the patient picks up the printed Healthe*Rx* at the nearby nursing station prior to checkout. Allowing clinical sites the flexibility to tailor the delivery of the Healthe*Rx*, rather than forcing the sites into a procedure that does not align with the resources available (e.g., printer in the exam room) or staff availability (e.g., delivery of the Healthe*Rx* by a nurse vs. a checkout person) minimized the burden and facilitated greater buy-in by providers and practices.

Provider Perceptions of Clinical Workflow and Satisfaction

Data on workflow integration and provider satisfaction with the innovation came from the RTI HCIA Provider Survey administered in spring 2015. Thirty-two (40.0%) eligible providers surveyed responded to the HCIA Provider Survey. The majority of providers (65.7%) were either physicians (34.4%) or registered nurses (31.3%). Responding providers had been in practice an average of 11.4 years. About one-fifth of providers worked in pediatrics (21.9%), family medicine (21.9%), and emergency medicine (18.8%), respectively. Slightly less than half of providers (46.9%) worked in a federally qualified health center (FQHC), almost 20 percent worked in an academic health center (18.8%), and 15.6 percent worked in a hospital-based practice. The full set of survey questions and answers summarized by awardee is available in ***Appendix C***.

For all of the items regarding integrating CommRx into clinical workflow, the majority of providers engaged in the U-Chicago innovation indicated that the innovation has resulted in either no change in the amount of time spent on specific activities or answered not applicable/missing to the question (***Table 5***).

Table 5. Summary of Clinical Care Workflow

Question	Percentage of CommunityRx Providers Indicating More Time	Percentage of CommunityRx Providers Indicating Less Time	Percentage of CommunityRx Providers Indicating No Change	Percentage of CommunityRx Providers Indicating not Applicable/ Missing
Providing direct patient care	15.6 N=5	3.1 N=1	50.0 N=16	31.3 N=10
Communicating with patients by phone, email	6.3 N=2	9.4 N=3	40.6 N=13	43.8 N=14
Looking up patient information in EMRs or other health information systems	9.4 N=3	6.3 N=2	50.0 N=16	34.4 N=11
Looking up patient information in paper-based medical charts	3.1 N=1	9.4 N=3	31.3 N=10	56.3 N=18
Arranging clinical referrals and follow-up for patients	12.5 N=4	6.3 N=2	37.5 N=12	43.8 N=14
Arranging social service referrals for patients	9.4 N=3	9.4 N=3	40.6 N=13	40.6 N=13
Meeting with staff and clinicians in my practice	3.1 N=1	3.1 N=1	56.3 N=18	37.5 N=12
Consulting with clinicians outside of my practice	6.3 N=2	3.1 N=1	46.9 N=15	43.8 N=14
Engaging in other care coordination activities	9.4 N=3	3.1 N=1	43.8 N=14	43.8 N=14

(continued)

Table 5. Summary of Clinical Care Workflow (continued)

Question	Percentage of CommunityRx Providers Indicating More Time	Percentage of CommunityRx Providers Indicating Less Time	Percentage of CommunityRx Providers Indicating No Change	Percentage of CommunityRx Providers Indicating not Applicable/ Missing
Reviewing data on clinic practice population to identify individuals needing additional services	9.4 N=3	3.1 N=1	34.4 N=11	53.1 N=17
Planning practice-based (or community-based) interventions to address issues common to my practice population	12.5 N=4	3.1 N=1	37.5 N=12	46.9 N=15

EMR = electronic medical record.

As designed and described by interview respondents, the CommRx innovation is intended to be minimally burdensome on the providers that choose to adopt it. Because it is integrated with the provider's EMR system and automatically generated based upon the ICD9 codes entered into the system, the providers are primarily responsible for picking up the Healthe*Rx* from the printer and giving it to the patient. Consistent with what interview respondents reported, a majority of survey respondents reported that the innovation did not change the amount of time spent providing many common services or resources to patients. This is not surprising given the type and purpose of the innovation—it is intended to provide patients with resources, not necessarily to impact provider practices. Because of the minimal burden, providers are most likely distributing a Healthe*Rx* to each patient at each visit, leading to patients receiving multiple Healthe*Rx*s over time.

Regarding provider satisfaction, overall we found that 37.5 percent were moderately satisfied and 28.1 percent were very satisfied, whereas only 12.5 percent were not at all satisfied. Regarding ease of use, overall provider responses indicated that the innovation was easy to use. Approximately one-third of providers (31.3%) found it somewhat easy to use, 15.6 percent found it very easy to use, and 28.1 percent of providers felt that the innovation was neither easy nor difficult to use.

For all of the specific questions regarding provider satisfaction with CommRx, no significant trends were observed; responses varied among all four categories. (***Table 6***).

Table 6. Summary of Provider Satisfaction Measures

Question	Percentage of CommunityRx Providers Indicating Strongly Agree/ Somewhat Agree	Percentage of CommunityRx Providers Indicating Strongly Disagree/ Somewhat Disagree	Percentage of CommunityRx Providers Indicating Neither Agree nor Disagree	Percentage of CommunityRx Providers Indicating not Applicable/Missing
Sufficient resources (e.g., support staff, time, training) have been provided for me to use/interact the innovation.	31.3 N=10	25.0 N=8	25.0 N=8	18.8 N=6
Innovation produces financial benefits for my clinic or practice.	12.5 N=4	18.8 N=6	37.5 N=12	31.3 N=10
Investing in the innovation is worthwhile in terms of time, energy, and resources.	31.3 N=10	15.6 N=5	28.1 N=9	25.0 N=8
Sufficient technical support is available to operate the innovation.	25.0 N=8	28.1 N=9	12.5 N=4	34.4 N=11
Overall, my practice functions more efficiently with the innovation.	21.9 N=7	28.1 N=9	15.6 N=5	34.4 N=11
Innovation saves me time.	9.4 N=3	28.1 N=9	28.1 N=9	34.4 N=11
The added logistics required by the innovation is a burden on me and/or my staff.	18.8 N=6	34.4 N=11	15.6 N=5	31.3 N=10

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with 18.5 full-time equivalent (FTE) staff members, which is currently at U-Chicago's projected number of FTEs. Most staff roles were in management; remaining staff roles consisted of CHIS and IT technicians/specialists. Since the first annual report, U-Chicago increased its FTEs by 5.5 (from 13 to 18.5). This increase occurred in part

because U-Chicago amended the CHIS model and created two new part-time positions. The new CHIS role focuses on contacting community-based service providers and updating their availability and contact information. The two part-time CHIS hired in Q9 increased the FTEs by 1.0, whereas the remaining 4.5 FTEs were backfilled by management/administrative role and IT technicians/specialists due to separations in Q8.

The workforce working group had challenges in retaining CHIS staff in the amended CHIS model. The group continued to work closely with U-Chicago leadership to learn from their past experiences to strategically plan for the future. After one CHIS left the position for another position with the City of Chicago, the workforce working group decided to refine the specific skill set and personality traits that are necessary for job satisfaction and productivity. U-Chicago reported currently using evidence-based tools to inform future job searches for the CHIS role. When reflecting on the amended CHIS model and lessons learned, one interviewee said that, "there needs to be an inside/outside function. We opted for an outside function and perhaps we should have had someone more onsite who is attached to community health organization." Based on the interviewee's feedback, RTI assessed that solidifying the CHIS role to have more of a physical presence a specific sites could benefit connecting patients to community-based resources.

Skills, Knowledge, and Training

Through Q10, U-Chicago provided 1,400 hours of training to 311 trainees. Most training time (1,199 hours) was delivered to 110 individuals who were a part of MAPSCorps Field Team (90 individuals) and Field Coordinators (26 individuals). This staff included HCIA project-employed administrative personnel and community-based nonclinical personnel. MAPSCorps staff are charged with building the CommRx database that identifies the community resources available to address the various ontologies of the innovation.

Additional training in through Q10 included 184 providers who received training on how to generate and deliver a Healthe*Rx* in their practices. The SMS texting pilot was also implemented in Year 3, and four CHIS staff members received 1.5 hours of training on use of the SMS texting protocol and system and how to communicate via SMS texting with patients who had questions about the information on their Healthe*Rx*. The SMS texting, however was piloted only at eight sites that were a part of one corporation and, because of the timing of the pilot and funding, will not be pushed out to all participating clinical sites.

Other trainings included Adoption Specialist Training (1 person), CHIS Optimization Training-Service Level Survey updates (3 people) and Interviewer Specialist Training (3 people). RTI assesses that U-Chicago continues to streamline its training approaches to improve efficiency and buy-in of the innovation from providers and clinical site leadership.

For the full-time CHIS to conduct field work to better understand and describe the community-based services available, two additional part-time CHIS were hired and trained at U-Chicago to call community-based service providers (CBSPs) to update their services offered, cost of services (or option

of a sliding scale fee), hours of operation, and contact information. The addition of the two part-time CHIS allowed U-Chicago to increase its call volume and encourage the full-time CHIS to work more with the sites. Like the full-time CHIS, the two part-time CHIS were trained at U-Chicago, but the initial full-time CHIS were also trained through a tailored program administered by the Graham School of Education. The training program for the CHIS at the Graham School did not have sufficient resources to sustain the program for future CHIS. In addition, the full-time CHIS received the U-Chicago training that was provided to the part-time CHIS. U-Chicago successfully trained four CHIS; only two CHIS are actively deployed with the innovation (two left the program before completion of HCIA).

As mentioned previously, U-Chicago experienced challenges with maintaining its initial CHIS training program, which was designed by the Graham School. Although the Graham School certificate program was created specifically for the CHIS staff, the intent was to design and offer the training to Healthe*Rx* staff as well as others seeking the necessary skills to work in similar environments or roles. Through the virtual site visit interviews, we learned that the Graham School had tuition/revenue targets it had to meet to keep the program in place, and because of low enrollment, the training program closed. U-Chicago reported that meeting revenue targets through sufficient enrollment was a challenge in implementing such training programs at private organizations such as U-Chicago, which are not accustomed to providing training for students from diverse educational and training backgrounds (GED, associate's degree, bachelor's degree, or more advanced degree or training).

It was suggested that a public college or university that has strong relationships with a community college system may be better suited for this type of training program because such institutions may not be as concerned with meeting challenging revenue targets. Another suggestion was to develop a memorandum of understanding between a university and the funded program that states that if the organization providing the training cannot break even (in terms of costs related to technology, salary, benefits of the instructor, and other indirect costs), then the funded program is responsible for covering the costs. Otherwise, there is high risk to any university that agrees to develop and offer a comprehensive training curriculum.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach) and; (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

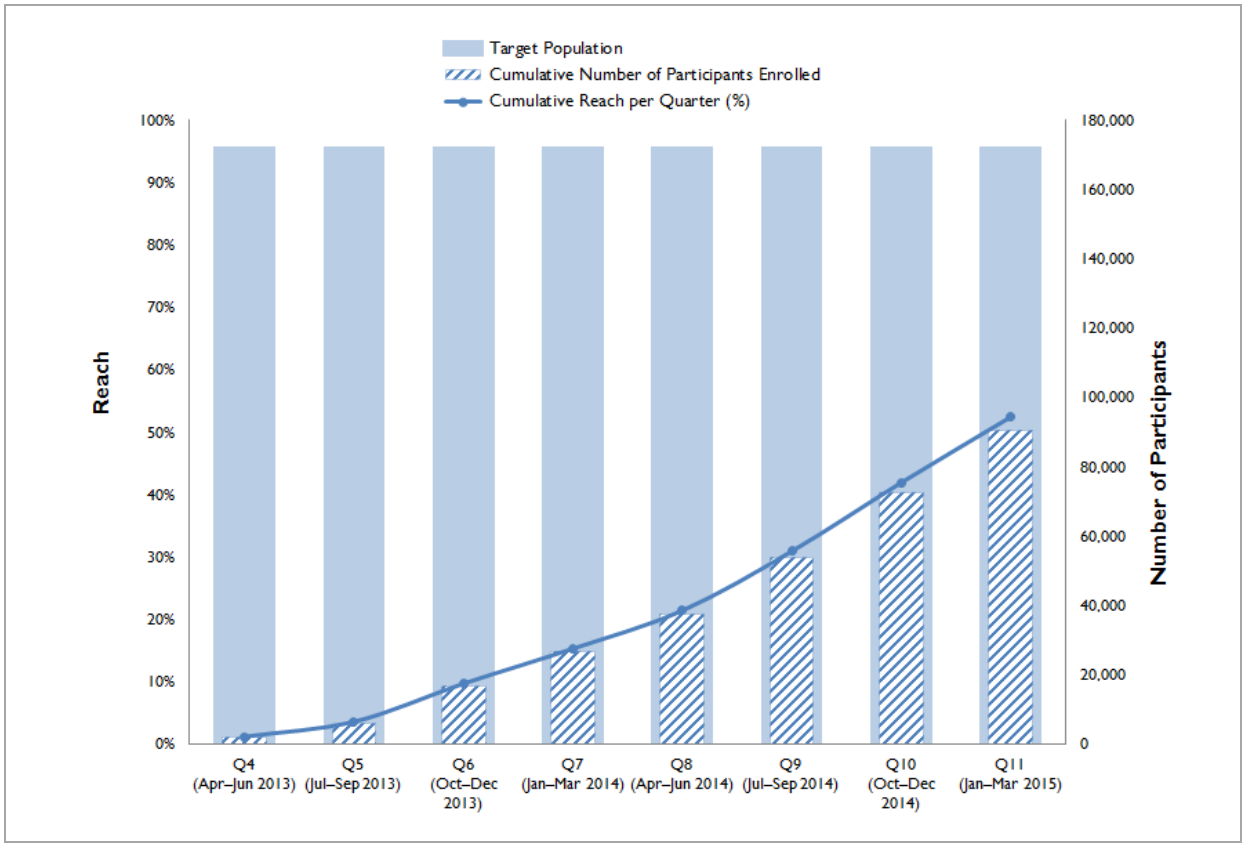
Reach

Figure 2 shows reach by quarter since the launch of the innovation. U-Chicago aimed to enroll about 170,000 of those living in one of the 11 high-poverty high-risk zip codes on Chicago's South Side who received care at (1) a CommRx community health center site or (2) the adult or children's ED, or other ambulatory clinics at the UCMC for low-acuity problems, and received an After Visit Summary at the given care appointment. We first reported reach in the Q5 report, based on data for participants enrolled through Q9 (September 2014). Since that time, U-Chicago enrolled an additional 36,571 patients in the innovation, increasing reach to 90,386, from 31 percent to 52.5 percent.

As noted in previous reports, the number of participants reported in the *Quarterly Awardee Performance Reports* by U-Chicago differs from the number of participants reported in the RTI quarterly and annual reports. Based on our understanding, the numbers reported in the *Q10 Awardee Performance Report* are provided 3 months before the data are provided to RTI. U-Chicago may discover and correct issues prior to RTI receiving the data.

U-Chicago is striving to increase the reach of its target population by scaling the innovation at additional clinical sites. From the first annual report to Q10, U-Chicago increased the number of clinical sites by two (from 20 to 22) and added zip codes where services are mapped for the Healthe*Rx* by five (from 11 to 16). By implementing CommRx within the adult and pediatric emergency rooms and several ambulatory clinics at UCMC, U-Chicago increased its reach into the patient population. The streamlined implementation processes and the ability to tailor the process also helped U-Chicago access additional sites and easily replicate the implementation process. U-Chicago continued to work with several potential sites about implementing CommRx in its clinics. Based on the trajectory of U-Chicago's reach in ***Figure 2*** and U-Chicago's current efforts to scale the innovation, RTI assesses that U-Chicago will come close to reaching its target population.

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch

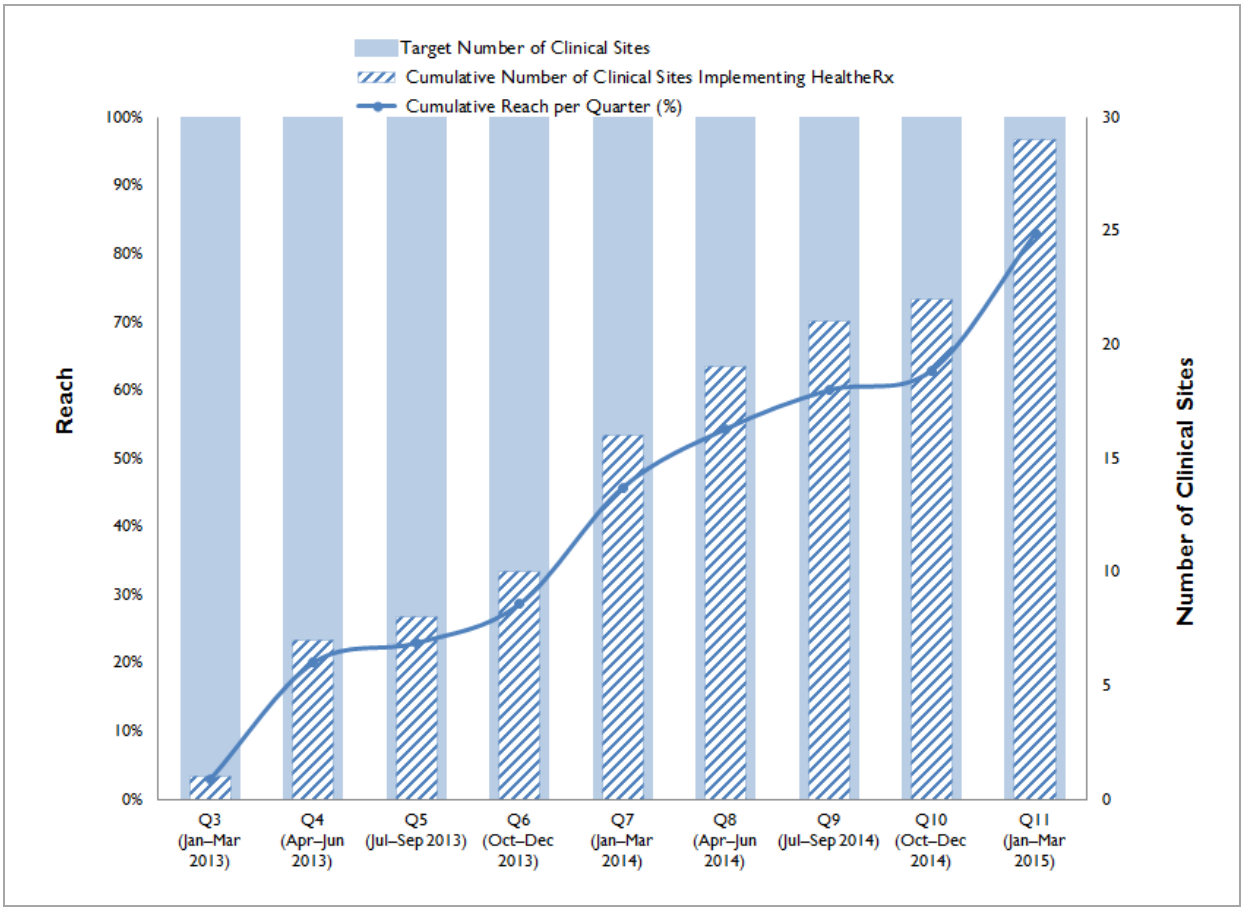


	Quarter	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan–Mar 2015)
●	Cumulative reach per quarter (%)	1.3	3.7	9.8	15.4	21.5	31.0	42.0	52.5
	Target population	170,000	170,000	170,000	170,000	170,000	170,000	170,000	170,000
	Cumulative number of participants enrolled	2,215	6,272	17,063	26,890	37,454	53,815	72,538	90,386

Source: Patient-level data provided to RTI by U-Chicago.

Figure 3 presents reach at the clinical site level. As shown in the figure, about 83 percent of the targeted clinical sites began implementing Healthe*Rx* by Q11.

Figure 3. Clinical Sites Implementing Healthe*Rx* and Reach since Project Launch



	Quarter	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan–Mar 2015)
●	Cumulative reach per quarter (%)	2.9	20.0	22.9	28.6	45.7	54.3	60.0	62.9	82.9
	Target number of clinical sites	35	35	35	35	35	35	35	35	35
	Cumulative number of clinical sites implementing Healthe*Rx*	1	7	8	10	16	19	21	22	29

Source: Data provided to RTI.

Dose

Measuring exposure to the CommRx innovation (e.g., defining and tracking "dose" such as the number of tailored Healthe*Rx*s generated by the CommRx database for each unique patient, the period and frequency of the Healthe*Rx*, the type of services on the Healthe*Rx* used by each patient) is somewhat limited by available data collection systems. Currently, the CommRx database tracks the number of tailored Healthe*Rx*s that it generates.

Table 7 provides number of Healthe*Rx* reports generated for each patient, the number of participants receiving the reports, and the percentage of enrolled participants represented. We first reported dose in the Q5 report, based on data through Q9. As shown in the table, over half of participants (57.1%) received one Healthe*Rx* report, and the other half received two or more reports (up from 20.5% in Q9). The number of reports likely mirrors the number of times a patient visits his/her provider, as they are automatically generated at each visit. Those who received a Healthe*Rx* during an ED visit may have received one Healthe*Rx* at that visit and then another Healthe*Rx* if they visited a primary care provider who is participating in the innovation, or if they were readmitted to the same ED.

Table 7. Number and Percentage of Participants by Number of Healthe*Rx* Reports Received

Number of Healthe*Rx* Reports Generated for Each Unique Patient	Number of Participants	Percentage (%) of Enrolled Participants (N=89,273)
1 report	51,241	57.1
2 reports	18,115	20.2
3+ reports	20,405	22.7

Source: Patient-level data provided to RTI by U-Chicago.

In addition to data on Healthe*Rx*s generated, U-Chicago also tracks the number of times (frequency) the services of a CBSP are listed on the Healthe*Rx*. The CommRx database creates quarterly reports that aggregate data on the demographics for patients who received a Healthe*Rx* and the health and social services programs to which they were referred. At the time of the site visit, U-Chicago had provided reports to three partner CBSPs and two clinical sites. The team learned that U-Chicago is evaluating the most effective and efficient mode and time frame (e.g., quarterly, annually) to share that information with the CBSPs. Also, U-Chicago tracks the number of participant-initiated contacts with the CHIS (e.g., phone call, voice mail, text messages, e-mail, in person) to seek information or assistance with accessing services on its tailored Healthe*Rx* or other needs.

Table 8 shows the number of contacts that a CHIS had with participants by mode. As shown in the table, contacting a CHIS by phone was the most common mode (77.2%). Interestingly, contact via text was the second most likely method of contact (14.0%). E-mail was the least likely method for contacting a CHIS (2.9%), perhaps because many people in lower-income neighborhoods have access to a cell phone with text messaging capabilities, but do not have access to a smart phone with e-mail or consistent access to the Internet to use e-mail. Because the SMS texting pilot was only fielded in Q10, and only at one site, this finding indicates texting may be a beneficial option for communication between patients and the CHIS.

RTI received data on the number of contacts made to the CHIS by mode, but not the number of unique patients who contacted the CHIS. It is possible that 685 unique patients contacted the CHIS, but it is just as likely that fewer than 685 patients contacted the CHIS, with some patients contacting the CHIS more than once. If the total number of contacts, at 685, is indeed unduplicated, less than 1 percent of the 89,273 participants contacted a CHIS with questions about their Healthe*Rx*. Participant contact is only

one of several responsibilities of the two CHIS staff members; the majority of their time appears to be spent contacting new CBSPs to include in the CommRx database.

Table 8. Number and Types of Contacts from Participants through Q11

Type of Contact	Number of Contacts Across Patients	Percentage of Contacts Across Patients
Phone	529	77.2
E-mail	20	2.9
Text	96	14.0
In person	40	5.9
Total	685	N/A

Source: Patient-level data provided to RTI by U-Chicago.

Sustainability

Based on RTI site visits and Lewin data, the CommRx core leadership and working groups are diligently trying to determine the amount of resources and staffing required to sustain the innovation after HCIA funding ends. The leadership team created an LLC as a potential option to commercialize the CommRx innovation. The creation of an LLC builds on the momentum of interested third parties in the CommRx database and community-based tailored resources. In addition, the leadership team is exploring other funding mechanisms to further sustain the research and implementation of the innovation. The team secured a grant from the National Institutes of Health (NIH)/National Institute on Aging to evaluate the impact of the CommRx intervention on a community population.

Although the core leadership and technological partners identified parts of the innovation that will move forward with specific funding, they were uncertain of its sustainability as it relates to staffing and resources. Until HCIA funding ends, CommRx leadership will continue to look for ways to sustain the innovation. RTI assesses that CommRx has strong leadership commitment to sustaining this innovation, but at the time of this report, the sustainability of the innovation as it currently stands and serves the community is uncertain.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of U-Chicago's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data U-Chicago collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers essential to the evaluation of U-Chicago's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 9 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of the status of the data requested and whether the data are presented in this annual report. We present both Medicare and Medicaid health care outcomes in this report, with an exception of estimated cost savings for Medicaid patients, due to the lack of a balanced comparison group.

Table 9. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	Yes
		Hospital unplanned readmissions rate	Yes	Yes
		ED visit rate	Yes	Yes
	Cost	Spending per patient	Yes	Yes
		Estimated cost savings	Yes	No

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?

Medicare Claims Analysis

We include patients who were enrolled prior to December 31, 2014, and we present Medicare claims data through December 31, 2014.

Comparison Groups

The Medicare claims analysis focuses on 7,122 Medicare beneficiaries enrolled in fee-for-service Medicare Parts A and B during the innovation launch. We present measures for beneficiaries enrolled in

the innovation as well as a group of statistically matched comparison beneficiaries with fee-for-service Medicare living in the initial 11 zip code areas of the South Side of Chicago.

We use propensity score matching (PSM) to select comparison group beneficiaries with similar characteristics as treatment group beneficiaries. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, disability, end-stage renal disease status, dual Medicare-Medicaid status, number of chronic conditions, number of ED visits and inpatient stays in the calendar quarter prior to the innovation, and total Medicare payments in the calendar quarter and calendar year prior to the innovation. We use one-to-variable matching with replacement, matching each treatment beneficiary to up to three comparison group beneficiaries with the closest propensity score.

Table 10 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. ***Appendix B.2*** provides technical details on the propensity score methodology. Fourteen treatment beneficiaries were dropped from the subsequent analyses due to the lack of an appropriately matched comparison beneficiary.

Table 10. Mean Values and Standardized Differences of Variables in Propensity Score Model: U-Chicago

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrollment	5,391	12,919	3,341	9,450	0.18	5,327	12,804	6,443	11,076	0.09
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	17,619	35,081	11,778	24,690	0.19	17,410	34,445	20,219	24,396	0.09
Age	68.78	15.41	68.78	13.85	0.00	68.83	15.38	68.84	9.26	0.00
Percentage male	31.27	46.36	40.32	49.05	0.27	31.23	46.35	29.14	29.19	0.06
Percentage white	10.11	30.15	11.01	31.3	0.04	10.1	30.14	10.86	19.98	0.04
Percentage disabled	38.58	48.68	35.29	47.79	0.10	38.49	48.66	39.59	31.41	0.03
Percentage ESRD	4.82	21.41	2.89	16.75	0.14	4.76	21.28	6.52	15.85	0.11
Number of dual eligible months in the previous calendar year	5.34	5.77	4.37	5.62	0.17	5.33	5.77	5.62	3.73	0.06
Number of chronic conditions	7.86	4.1	6.79	4.11	0.26	7.85	4.1	8.32	2.76	0.14
Number of ED visits in calendar quarter prior to enrollment	0.3	1.07	0.13	0.49	0.21	0.27	0.79	0.28	0.56	0.02
Number of inpatient stays in calendar quarter prior to enrollment	0.17	0.6	0.11	0.43	0.12	0.17	0.59	0.19	0.38	0.05
Number of beneficiaries	7,122	—	335,876	—	—	7,108	—	21,219	—	—
Number of unique beneficiaries[1]	7,122	—	51,293	—	—	7,108	—	19,106	—	—
Number of weighted beneficiaries	—	—	—	—	—	7,108	—	7,108	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B for discussion of weights).

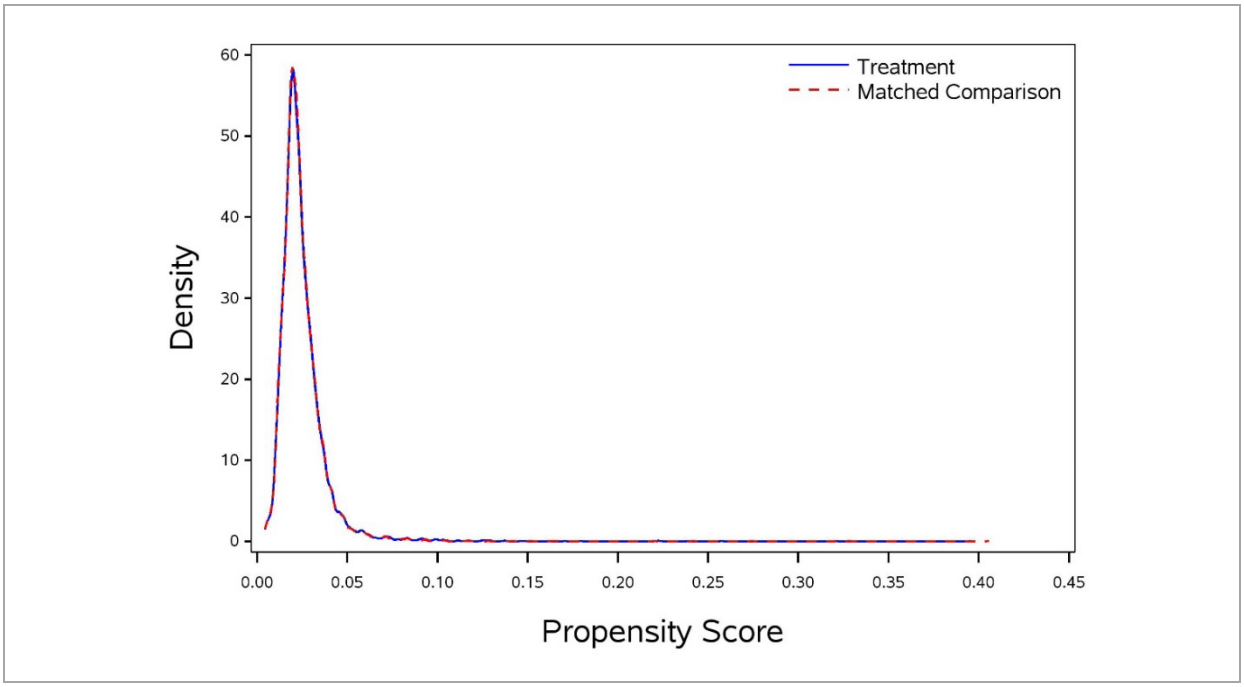
ED = emergency department; ESRD = end-stage renal disease.

— Data not available.

After performing PSM, we calculate absolute standardized differences between the treatment group and both the unmatched and matched comparison groups, and determine whether matching decreases the absolute standardized differences and achieves acceptable balance (Table 10). Many researchers consider that an absolute standardized difference ≤0.10 indicates acceptable balance.[2] Researchers also point out that critical variables in determining selection into treatment (e.g., those with significant effects in the propensity score equation) should have greater balance, while indicators with minor importance in determining treatment selection do not require optimal balance. The results in Table 10 show that matching reduced the absolute standardized differences and achieved adequate balance for all variables except for the percentage of beneficiaries with ESRD and the number of chronic conditions.

Figure 4 shows the distribution of the propensity scores for the intervention and comparison groups. The figure demonstrates a very close overlap between treatment and comparison groups' propensity scores. Therefore, we present the Medicare claims analysis using both the treatment group and the matched comparison.

Figure 4. Distribution of Propensity Scores for Comparison and Intervention Groups: U-Chicago



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
U-Chicago = University of Chicago.

Descriptive Analysis

This report includes claims through December 31, 2014. ***Table 11*** reports Medicare spending per patient in the eight quarters before and the seven quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

[2] Austin, P.C.: An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research. 46.3: 399–424, 2011. *PMC*. Web. 2 June 2015.

Table 11. Medicare Spending per Patient: U-Chicago

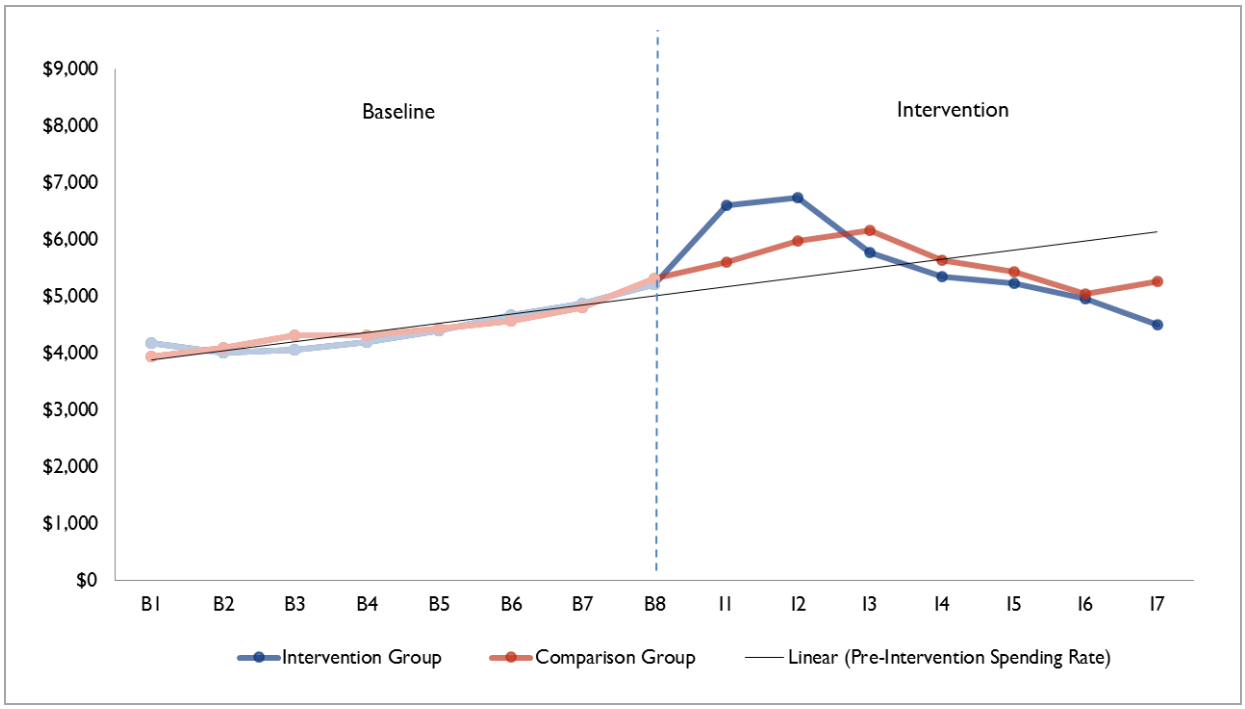
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group																
1C1CMS 330997	U-Chicago															
	Spending rate	$4,183	$4,005	$4,060	$4,191	$4,398	$4,677	$4,866	$5,210	$6,597	$6,737	$5,776	$5,348	$5,237	$4,959	$4,499
	Std dev	$10,802	$9,746	$11,126	$13,622	$11,814	$11,653	$13,006	$12,624	$13,656	$17,281	$12,821	$12,697	$13,043	$11,681	$9,664
	Unique patients	6,319	6,412	6,499	6,601	6,715	6,846	6,969	7,098	7,105	5,827	4,529	3,283	2,303	1,296	459
Comparison Group																
1C1CMS 330997	U-Chicago															
	Spending rate	$3,935	$4,092	$4,318	$4,316	$4,439	$4,566	$4,804	$5,308	$5,611	$5,980	$6,161	$5,641	$5,434	$5,038	$5,259
	Std dev	$9,771	$10,002	$11,393	$10,718	$11,637	$11,548	$12,681	$14,932	$14,355	$14,658	$15,734	$14,267	$13,944	$12,202	$12,031
	Unique patients	6,208	6,314	6,433	6,543	6,666	6,806	6,948	7,035	7,046	5,931	4,607	3,271	2,232	1,267	492
Savings per Patient		−$248	$87	$258	$126	$41	−$111	−$62	$98	−$987	−$757	$385	$293	$197	$78	$761

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 5 illustrates the Medicare spending per beneficiary in Table 11 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 5. Medicare Spending per Patient: U-Chicago



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
U-Chicago = University of Chicago.

As shown by the pre-innovation trend line for innovation enrollees, spending trends upward in the pre-intervention quarters for both the innovation and comparison beneficiaries. Post-intervention, spending remains stable for the comparison group, whereas spending jumps for the intervention group in the first quarter post-intervention. A likely reason for the initial spike in expenditures in the treatment group is that a majority of beneficiaries were enrolled in the CommRx innovation when they visited an ED. Therefore, beneficiaries in the first quarter after intervention (I1) incur inpatient or outpatient costs. The result is an artifact of the enrollment dates coinciding with the ED visit date. The spending gap between the two groups disappeared after the second quarter post-intervention. However, it is premature to conclude any impact of the innovation on spending on this basis. As shown in Table 11, the standard deviation for spending is very high, representing the skewed nature of expenditures. We will estimate the statistical impact of the innovation in the difference-in-differences analyses that follow.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 12*** and ***Figure 6***.

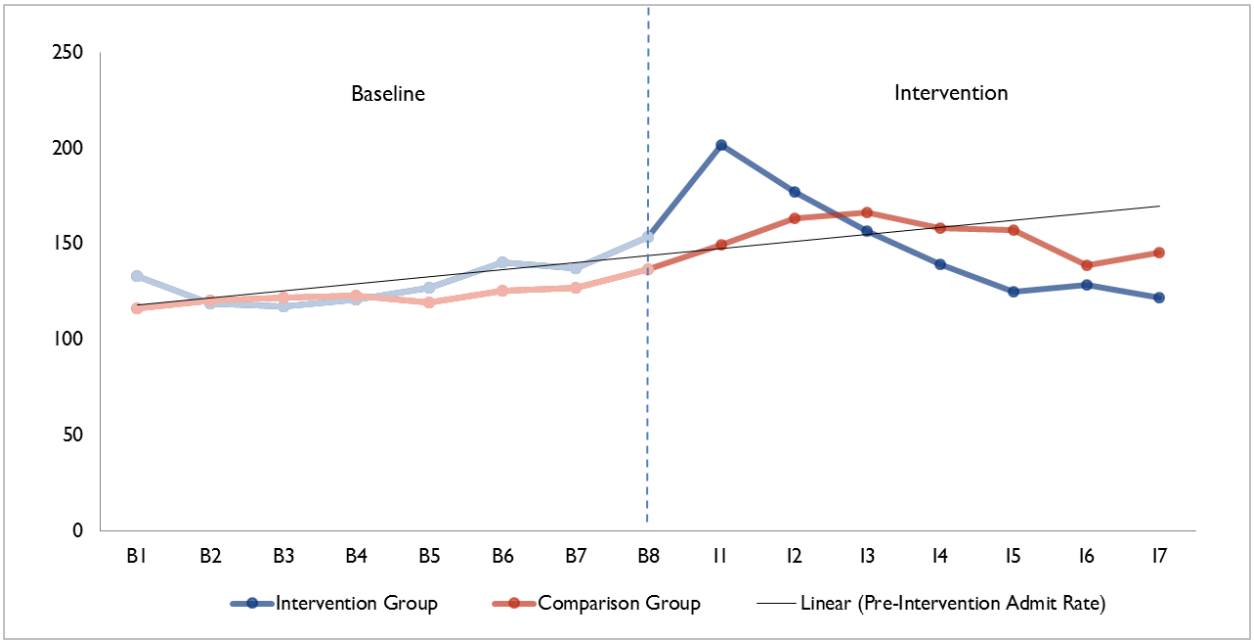
Table 12. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: U-Chicago

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group																
1C1CMS 330997	U-Chicago															
	Admit rate	133	119	117	121	127	140	138	154	202	177	157	140	125	129	122
	Std dev	553	488	484	477	481	512	517	554	630	587	533	523	445	464	446
	Unique patients	6,319	6,412	6,499	6,601	6,715	6,846	6,969	7,098	7,105	5,827	4,529	3,283	2,303	1,296	459
Comparison Group																
1C1CMS 330997	U-Chicago															
	Admit rate	117	120	122	123	120	126	127	137	150	163	166	158	157	139	145
	Std dev	492	478	477	486	484	491	477	505	566	564	570	536	535	479	489
	Unique patients	6,208	6,314	6,433	6,543	6,666	6,806	6,948	7,035	7,046	5,931	4,607	3,271	2,232	1,267	492
Intervention − Comparison Rate		16	−1	−5	−2	7	15	11	17	52	14	−9	−19	−32	−10	−23

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: U-Chicago



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
U-Chicago = University of Chicago.

Inpatient admissions trend slightly upward and are similar in the pre-intervention period for both the treatment and comparison group. Relative to the comparison group, inpatient admissions increase for beneficiaries enrolled in the innovation during the first quarter post-intervention. The result is consistent because a majority of patients were enrolled in the CommRx innovation at their ED visit. Inpatient admissions trend downward starting from the second quarter post-intervention for the treatment group, whereas impatient admissions remain stable in the rest of the post-intervention quarters for the comparison beneficiaries. Without statistical testing, it is premature to conclude that the innovation caused the increase; we examine this question in the difference-in-differences analyses that follow.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 13*** and ***Figure 7***.

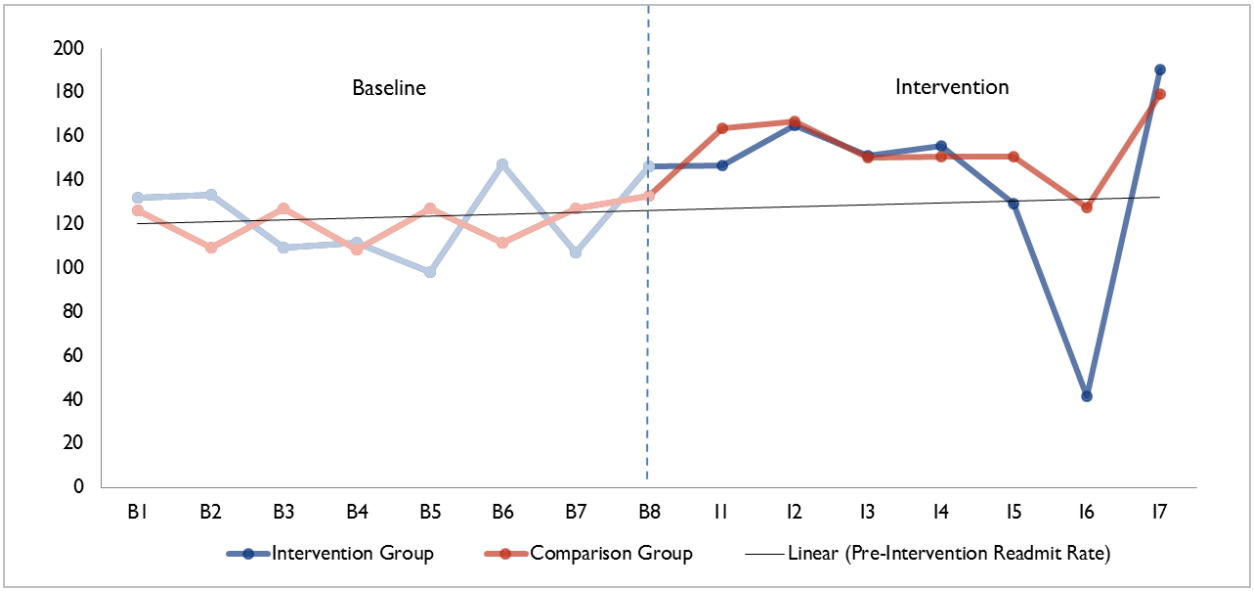
Table 13. Hospital Unplanned Readmissions Rates per 1,000 Admissions: U-Chicago

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group																
1C1CMS 330997	U-Chicago															
	Readmit rate	132	133	109	111	98	147	107	146	147	165	151	156	129	42	190
	Std dev	338	340	312	315	297	355	309	354	354	371	358	363	336	200	393
	Total admissions	379	375	366	368	408	475	485	553	756	509	344	231	139	72	21
Comparison Group																
1C1CMS 330997	U-Chicago															
	Readmit rate	126	110	127	109	127	111	127	133	163	167	150	151	151	128	179
	Std dev	332	312	333	311	333	315	333	340	370	373	358	358	358	334	384
	Total admissions	393	438	473	461	465	499	524	600	630	557	437	291	177	92	35
Intervention − Comparison Rate		6	24	−18	3	−29	36	−20	13	−17	−2	1	5	−21	−86	11

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 7. Hospital Unplanned Readmissions Rates per 1,000 Admissions: U-Chicago



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
U-Chicago = University of Chicago.

Hospital unplanned readmissions rates fluctuate around the trend line prior to the innovation's launch, and the trend line rises. The readmissions rates for the intervention group are higher than the comparison group for most of the post-intervention period until the sixth quarter post-intervention (I6). Claims data are not complete in the last two quarters (I6 and I7) and include only a small number of index admissions. Without statistical testing, it is premature to conclude that the innovation caused the increase; we examine this question in the difference-in-differences analyses that follow.

ED visits per 1,000 participants are shown in ***Table 14*** and ***Figure 8***.

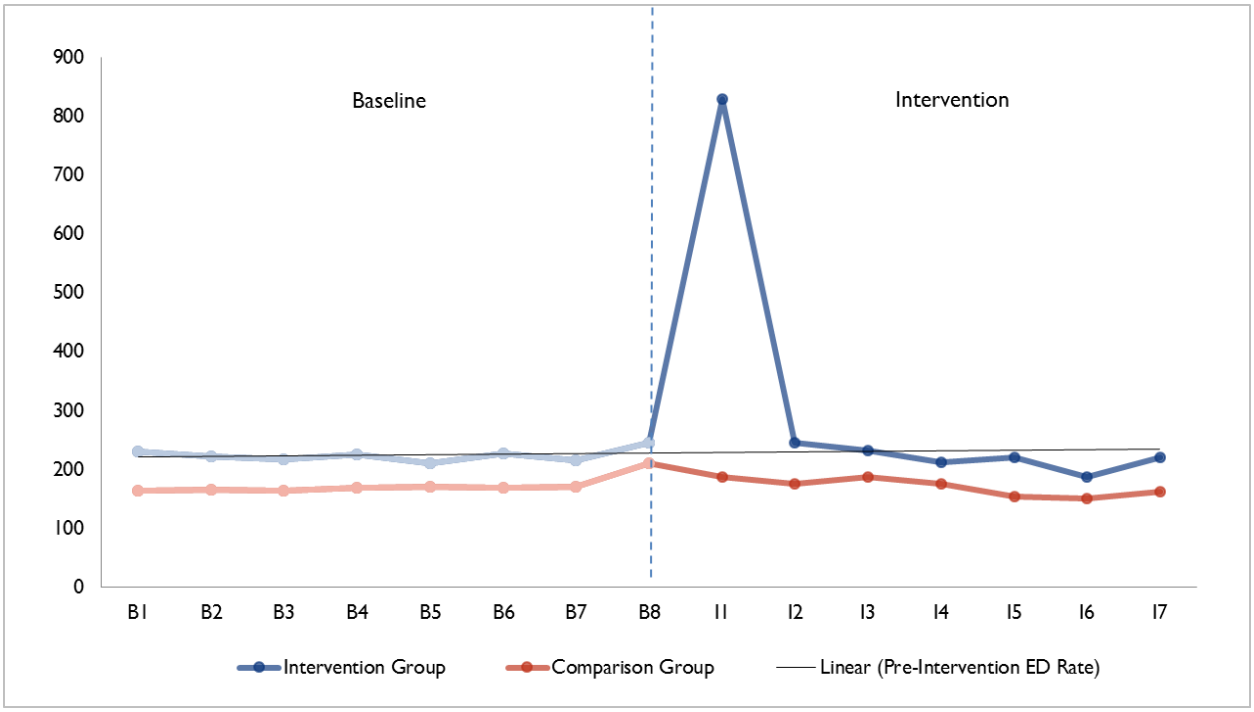
Table 14. ED Visits per 1,000 Participants: U-Chicago

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters						
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7
Intervention Group																
1C1CMS 330997	U-Chicago															
	ED rate	231	223	217	226	211	227	217	245	829	245	233	213	221	188	220
	Std dev	737	694	718	683	664	685	724	768	1144	773	678	720	685	603	997
	Unique patients	6,319	6,412	6,499	6,601	6,715	6,846	6,969	7,098	7,105	5,827	4,529	3,283	2,303	1,296	459
Comparison Group																
1C1CMS 330997	U-Chicago															
	ED rate	164	166	165	170	172	169	171	211	187	175	188	176	154	151	163
	Std dev	348	378	354	375	378	356	365	447	407	363	473	364	306	276	360
	Unique patients	6,208	6,314	6,433	6,543	6,666	6,806	6,948	7,035	7,046	5,931	4,607	3,271	2,232	1,267	492
Intervention − Comparison Rate		67	56	52	56	39	58	46	34	642	70	45	37	66	38	57

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 8. ED Visits per 1,000 Participants: U-Chicago



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
U-Chicago = University of Chicago.

The ED visit rate remains stable before launch and jumps during the first post-intervention quarter because of patient enrollment at ED visit, as mentioned previously. During the subsequent post-intervention quarters, the ED visit rate remains close to the trend line for the treatment group, and the gap between the treatment and comparison group remains the same. As with the other variables, we will include statistical tests on the ED visit rate in the following section.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit.

All regressions include an indicator variable for the treatment group, an indicator variable for each quarter, and quarterly indicators interacted with the treatment group variable in the post-intervention period. We control for age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The regression specification assumes the same quarterly fixed effect for treatment and comparison individuals in the pre-innovation period and allows for a separate quarterly effect for treatment individuals after enrolling in the innovation.

Table 15 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in

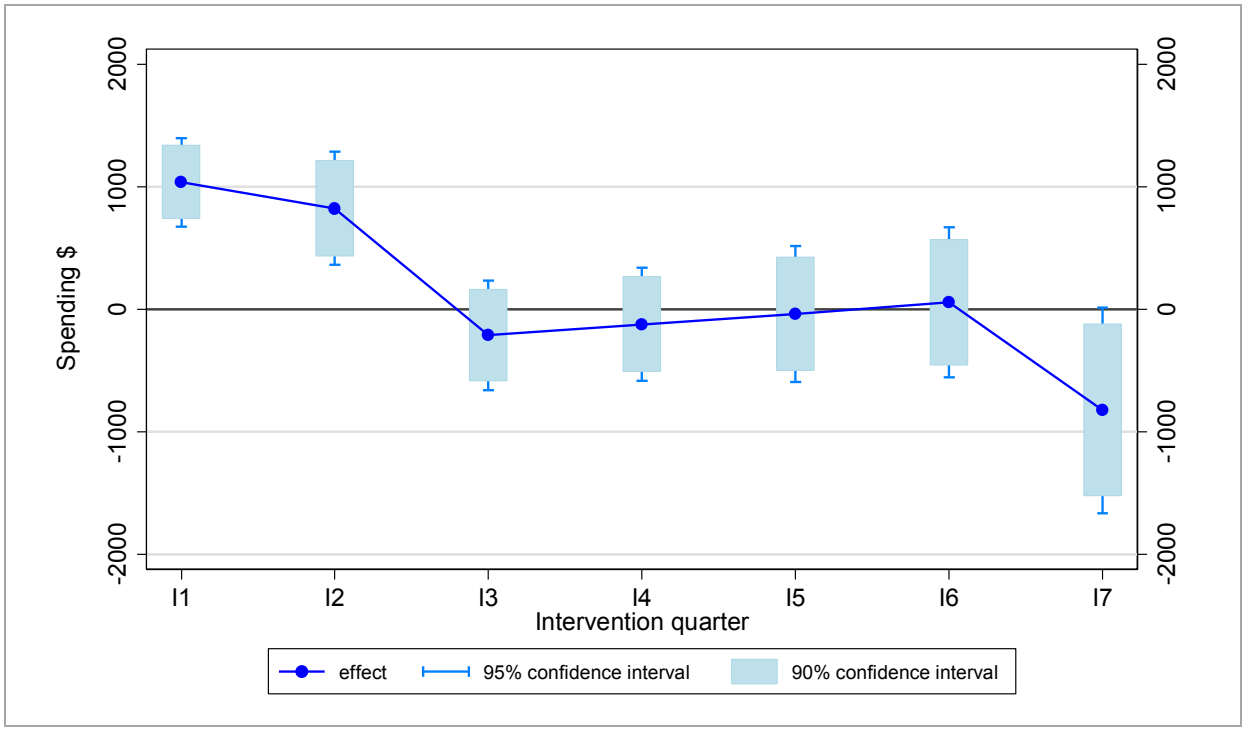
post-intervention quarters between the treatment and comparison groups. ***Figure 9*** illustrates these quarterly difference-in-differences estimates.

Table 15. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: U-Chicago

Quarter	Coefficient	Standard Error	P-Values
I1	1,039	184	<0.001
I2	826	237	0.001
I3	−212	228	0.354
I4	−123	237	0.603
I5	−38	283	0.892
I6	58	312	0.853
I7	−825	429	0.054

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
OLS = ordinary least squares; U-Chicago = University of Chicago.

Figure 9. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: U-Chicago

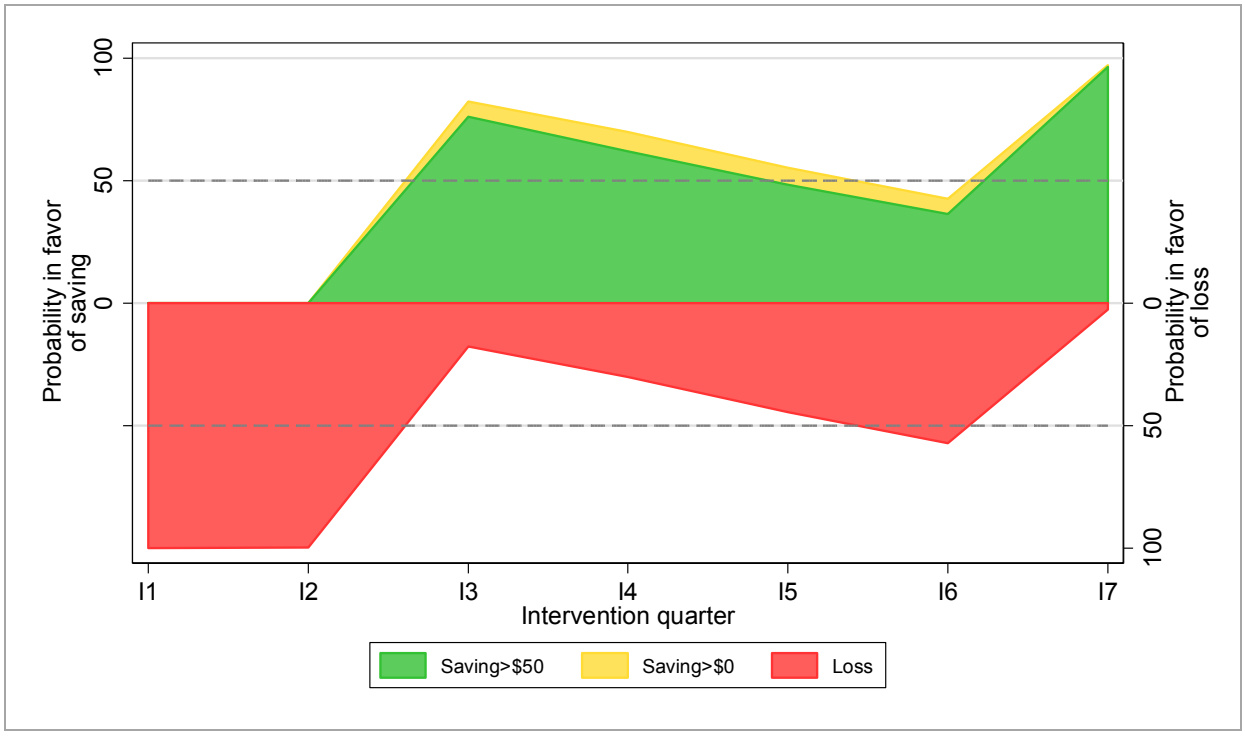


Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
OLS = ordinary least squares; U-Chicago = University of Chicago.

In the first and second quarters after intervention (I1 and I2), spending among treatment group individuals is, on average, $1,039 and $826 higher than spending among comparison group individuals, respectively, and the estimates are statistically significant. This increase occurred, in part, because most beneficiaries were enrolled at their ED visits. In the remaining quarters post-intervention, however, we observe mixed spending patterns between the two groups. The difference-in-differences regression coefficients range from –$212 to $58 in the third through the sixth quarters in the post-intervention period, and none of the regression coefficients are statistically significant. The coefficient in the last post-intervention quarter is –$825, indicating savings.

Figure 10 presents the strength of evidence in favor of savings or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis.

Figure 10. Quarterly Strength of Evidence in Favor of Savings/Loss: U-Chicago



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
U-Chicago = University of Chicago.

Because the quarterly spending estimates are not statistically significant from the third post-intervention quarter onward, we observe a 50/50 chance of savings versus loss for the remaining intervention period.

We also present the weighted average treatment effect per quarter during the intervention period for beneficiaries enrolled in the innovation compared to their matched comparison group. The weighted average quarterly spending differential in the post-innovation period, indicating a loss, is –$394 (90% CI:

–$611, –$177). This estimate is statistically significant. This figure represents the differential spending per quarter in the post-intervention period between individuals enrolled in the innovation and comparison group individuals, on average, weighted by the number of intervention beneficiaries in each quarter. The 90 percent confidence interval is the range in which the true parameter estimate falls, with 90 percent confidence.

We also present linear probability model coefficients for inpatient admissions and outpatient ED visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the estimated effect.[3] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, linear probability model coefficients have often been empirically demonstrated to be consistent with marginal effects generated from nonlinear models.[4] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention), not just the direction of the effect.

Table 16 presents the results of a linear probability model regression with the dependent variable set to one for patients who had a hospital visit during the quarter. In the first two quarters after the innovation launch, treatment group beneficiaries are more likely than the comparison group to have been hospitalized, possibly due to the intervention enrollment design. The intervention effect is statistically significant in I1. In subsequent quarters post-intervention, however, treatment group beneficiaries have nearly the same likelihood of being hospitalized as the comparison group. The results are reflected in that most of the linear probability model regression coefficients are not statistically significant. The average quarterly difference-in-differences estimate for inpatient admissions is 0.7 percentage points, indicating that the treatment-control difference is 0.7 percentage points higher during the intervention period. This is the average difference in inpatient admissions probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: .003, .012).

[3] To obtain the correct effect, it is necessary to perform simulations because a nonlinear model, such as a logit, does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run, even when not competing with other users for computer resources.

[4] Angrist, J.D., and Pischke J.-S.: Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

Table 16. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: U-Chicago

Quarter	Coefficient	Standard Error	P-Values
I1	0.03	0.00	<0.001
I2	0.01	0.00	0.066
I3	0.00	0.01	0.695
I4	−0.01	0.01	0.025
I5	−0.01	0.01	0.387
I6	0.00	0.01	0.756
I7	−0.01	0.01	0.303

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
U-Chicago = University of Chicago.

Table 17 presents results of a linear probability model regression with the dependent variable set to one for patients who had an ED visit during the quarter. Treatment group beneficiaries have a 37 percentage point increase in the probability of having an ED visit in the first quarter post-intervention due to enrollment design. However, in most of the subsequent quarters post-intervention, the coefficients are not statistically significant and are not different from zero, suggesting that treatment beneficiaries had the same likelihood of visiting an ED as the comparison group. The average quarterly difference-in-differences estimate for ED visits is 9.7 percentage points, indicating that the treatment-control difference is 9.7 percentage points higher during the intervention period. This is the average difference in ED visit probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: .092, .104).

Table 17. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: U-Chicago

Quarter	Coefficient	Standard Error	P-Values
I1	0.37	0.01	<0.001
I2	0.01	0.01	0.170
I3	0.00	0.01	0.950
I4	−0.01	0.01	0.043
I5	0.00	0.01	0.595
I6	−0.02	0.01	0.103
I7	−0.01	0.02	0.711

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
U-Chicago = University of Chicago.

Discussion

The claims measures provide descriptive data on a subset of Medicare beneficiaries enrolled in the CommRx innovation before and after their enrollment dates. Because a majority of these beneficiaries were enrolled in the innovation upon their ED visit, the Medicare claims analysis shows an increase in three of the four core measures in the first intervention quarter: Medicare spending, hospital inpatient admissions, and ED visits. However, in the remaining quarters post-intervention, the intervention group performed similarly to the comparison group in these three core measures, as reflected by an equal likelihood of hospital admissions and ED visits. These measures may not provide a complete evaluation of U-Chicago's CommRx innovation for several reasons.

First, the innovation was launched on March 21, 2013. The impact of receiving a tailored Healthe*Rx* with community-based resources specific to the patient's diagnosis on these more distal outcomes may not be immediate. As discussed previously, the assumption is that the provider gave the Healthe*Rx* to patients, and patients used those community resources listed on the Healthe*Rx* and, as a result, learned how to manage their chronic conditions better and change their behaviors. Because U-Chicago is not tracking whether patients access and use the services on their tailored Healthe*Rx*, we do not know which patients used the services.

Second, although the U-Chicago CommRx innovation offered potential benefits to all enrollees, the benefits were likely to be most pronounced for patients with certain diseases or conditions. The claims measures listed previously are reported at the aggregate level for all Medicare fee-for-service patients, and the sample size is not adequate to examine different condition subsets.

Finally, the results may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicare beneficiaries who we were able to match with the identifiers provided by the site. This number represents 8 percent of the overall population reached by the innovation. Many patients served by U-Chicago's CommRx innovation were not enrolled in Medicare.

Medicaid Claims Analysis

The Medicaid data analysis uses data from the CMS Alpha-MAX data files. Currently, Medicaid claims for U-Chicago are available in Alpha-MAX through Q3 2013. Because the U-Chicago innovation was launched on March 21, 2013, and claims after the intervention launch are limited, we present the four core measures for Medicaid patients who enrolled before July 31, 2013, in this report.

Comparison Groups

The Alpha-MAX Medicaid claims analysis focuses on 2,419 Medicaid beneficiaries enrolled in fee-for-service Medicaid during the innovation launch. We present measures for beneficiaries enrolled in the innovation as well as a group of statistically matched comparison beneficiaries with fee-for-service Medicaid living in the initial 11 zip code areas of the South Side of Chicago.

We use PSM to select comparison group beneficiaries with similar characteristics as treatment group beneficiaries. Innovation and comparison beneficiaries are matched using a logit model predicting the likelihood that a beneficiary is enrolled in the innovation as a function of age, gender, race, disability, dual Medicare-Medicaid status, enrollee status, number of months of Medicaid eligibility during the calendar year prior to the innovation, number of ED visits and inpatient stays in the calendar quarter prior to the innovation, and total Medicare payments in the calendar quarter and calendar year prior to the innovation. We use one-to-variable matching with replacement, matching each treatment beneficiary with up to three comparison group beneficiaries with the closest propensity score.

Table 18 describes the mean values and standardized differences of the variables of interest that are included in the propensity score model before and after matching. ***Figure 11*** shows the distribution of the propensity scores for both the comparison and intervention group. ***Appendix B.2*** provides technical details on the propensity score methodology. Five treatment beneficiaries were dropped from the subsequent analyses due to the lack of an appropriately matched comparison beneficiary.

Table 18. Mean Values and Standardized Differences of Variables in Propensity Score Model: U-Chicago

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrollment	$1,125	$6,696	$257	$2,093	0.175	$983	$5,321	$2,601	$8,868	0.221
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	$2,593	$13,310	$2,541	$9,050	0.005	$2,476	$12,171	$5,379	$11,857	0.242
Age	14.46	15.12	24.05	20.08	0.539	14.41	15.05	17.18	8.95	0.224
Percentage female	55.68	49.69	64.94	47.72	0.269	55.68	49.69	58.82	31	0.090
Percentage adult, and nondisabled	18.31	38.69	27.03	44.41	0.296	18.27	38.65	21.48	25.87	0.114
Percentage blind, disabled, or aged	7.28	25.98	13.12	33.77	0.275	7.25	25.94	11.16	19.83	0.192
Percentage white	1.28	11.25	1.48	12.06	0.024	1.28	11.26	1.23	6.94	0.007
Percentage less than 1 year on Medicaid	6.82	25.22	3.1	17.34	0.243	6.84	25.24	6.28	15.28	0.032
Percentage dual eligible in the previous calendar year	0.7	8.36	8.46	27.82	0.534	0.7	8.36	0.99	6.25	0.045
Number of months of Medicaid eligibility in second, third, fourth, and fifth calendar quarters prior to enrollment	10.28	3.97	11.41	1.45	0.376	10.29	3.96	10.92	1.52	0.209
Number of ED visits in calendar quarter prior to enrollment	0.33	1.05	0.07	0.35	0.328	0.3	0.76	0.59	1.03	0.323
Number of inpatient stays in calendar quarter prior to enrollment	0.04	0.21	0.01	0.09	0.224	0.04	0.2	0.09	0.18	0.228
Number of unique beneficiaries[1]	2,419	—	80,271	—	—	2,414	—	6,085	—	—
Number of weighted beneficiaries	—	—	—	—	—	2,414	—	2,414	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Alpha-MAX Medicaid fee-for-service claims.

[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B for discussion of weights).

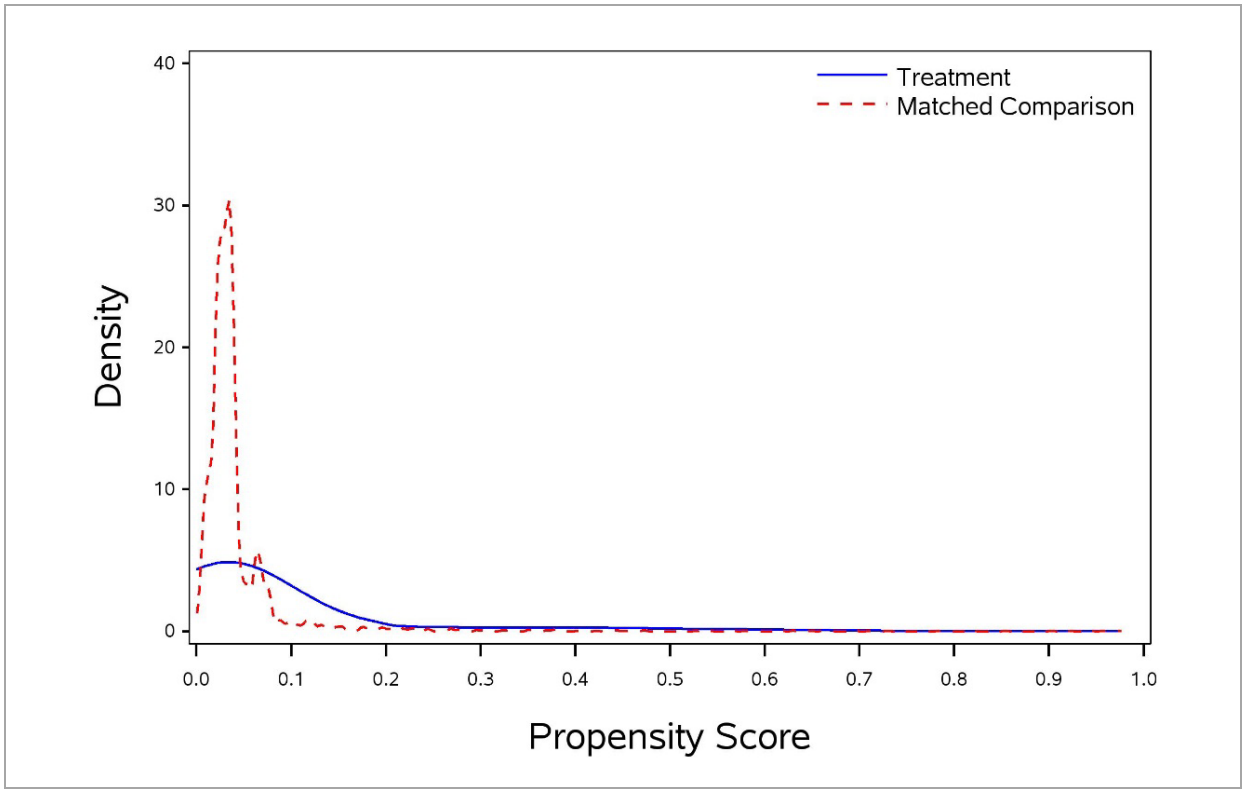
ED = emergency department; SD = standard deviation.

— Data not yet available.

After performing PSM, we calculate absolute standardized differences between the treatment group and both the unmatched and matched comparison groups, and determine whether matching decreases the absolute standardized differences and achieves acceptable balance (Table 18). Many researchers consider that an absolute standardized difference ≤0.10 indicates acceptable balance.[5] Researchers also point out that critical variables in determining selection into treatment (e.g., those with significant effects in the propensity score equation) should have greater balance, while indicators with minor importance in determining treatment selection do not require optimal balance. The results in Table 18 show that matching reduced the absolute standardized differences and achieved adequate balance for only a few select variables but not others. Since we have not yet achieved a closely matched comparison group, we do not report results for a comparison group in this report. We will continue working to identify the Medicaid comparison group and plan to include results for this group in future reports.

Figure 11 shows the distribution of the propensity scores for both the intervention and comparison groups. The figure demonstrates a poor overlap between the treatment and comparison groups' propensity scores.

Figure 11. Distribution of Propensity Scores for Comparison and Intervention Groups: U-Chicago



Source: RTI analysis of Chronic Conditions Data Warehouse Alpha-MAX Medicaid fee-for-service claims.
U-Chicago = University of Chicago.

[5] Austin, P.C.: An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research. 46.3: 399–424, 2011. *PMC*. Web. 2 June 2015.

Descriptive Analysis

The tables and figures presented in this section are descriptive. Without statistical testing, it is premature to conclude that the innovation had any effect on outcomes; we will examine this question as the evaluation continues.

Table 19 reports Medicaid spending per patient in the eight quarters before and the three quarters after enrolling in the innovation.

Table 19. Medicaid Spending per Patient: U-Chicago

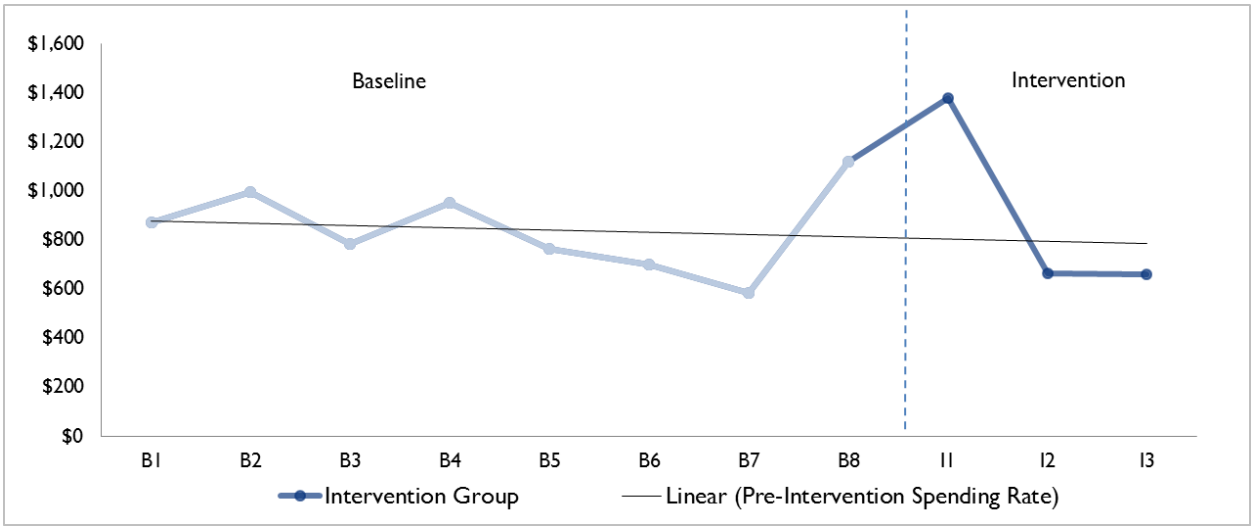
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 330997	U-Chicago											
	Spending rate	$874	$995	$784	$952	$762	$700	$583	$1,118	$1,378	$664	$659
	Std dev	$5,303	$7,479	$4,245	$6,640	$5,281	$5,415	$3,786	$6,769	$8,485	$5,646	$3,799
	Unique patients	1,834	1,920	1,970	2,063	2,085	2,090	2,153	2,355	2,419	1,857	156
Comparison Group												
1C1CMS 330997	U-Chicago											
	Spending rate	—	—	—	—	—	—	—	—	—	—	—
	Std dev	—	—	—	—	—	—	—	—	—	—	—
	Unique patients	—	—	—	—	—	—	—	—	—	—	—
Savings per Patient		—	—	—	—	—	—	—	—	—	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
Spending rate: Total quarter quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = "Intervention Q1"; B1 = "Baseline Q1."
— Data not yet available.

Figure 12 illustrates the Medicaid spending per beneficiary in Table 19 for innovation group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters.

Figure 12. Medicaid Spending per Patient: U-Chicago



Source: RTI analysis of Alpha-MAX Medicaid claims.

The trend line for spending based on the pre-intervention period has a slightly downward slope. Spending increases during the first post-intervention quarter due to beneficiary enrollment at ED visit, before dropping back below the pre-intervention trend line in the second and third post-intervention quarters. As shown in Table 19, the standard deviation for spending is very high, representing the skewed nature of expenditures. We will estimate the statistical impact of the innovation in later reports.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 20*** and ***Figure 13***.

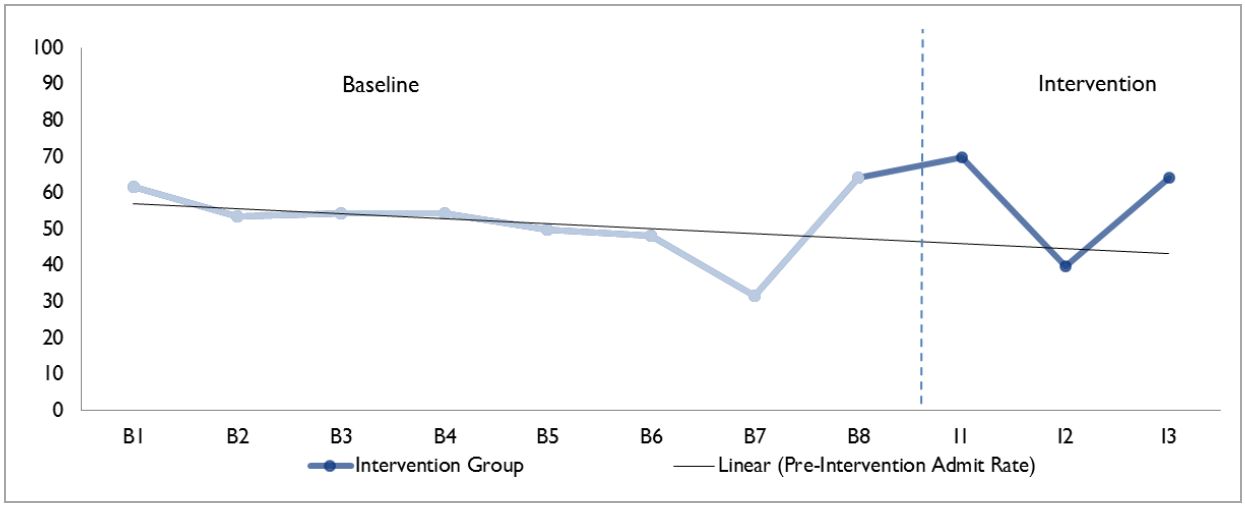
Table 20. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: U-Chicago

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 330997	U-Chicago											
	Admit rate	62	54	54	54	50	48	32	64	70	40	64
	Std dev	402	400	353	372	422	402	251	441	493	309	388
	Unique patients	1,834	1,920	1,970	2,063	2,085	2,090	2,153	2,355	2,419	1,857	156
Comparison Group												
1C1CMS 330997	U-Chicago											
	Admit rate	—	—	—	—	—	—	—	—	—	—	—
	Std dev	—	—	—	—	—	—	—	—	—	—	—
	Unique patients	—	—	—	—	—	—	—	—	—	—	—
Intervention − Comparison Rate		—	—	—	—	—	—	—	—	—	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = “Intervention Q1”; B1 = “Baseline Q1.”
— Data not yet available.

Figure 13. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: U-Chicago



Source: RTI analysis of Alpha-MAX Medicaid claims.

Inpatient admissions fluctuate around the pre-intervention trend line and trend downward in the pre-intervention period for the innovation beneficiaries. Inpatient admissions rise during the first post-intervention quarter and continue to fluctuate around the trend line. Without statistical testing, it is premature to conclude that the innovation caused the increase; we will examine this question as the evaluation continues.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 21*** and ***Figure 14***.

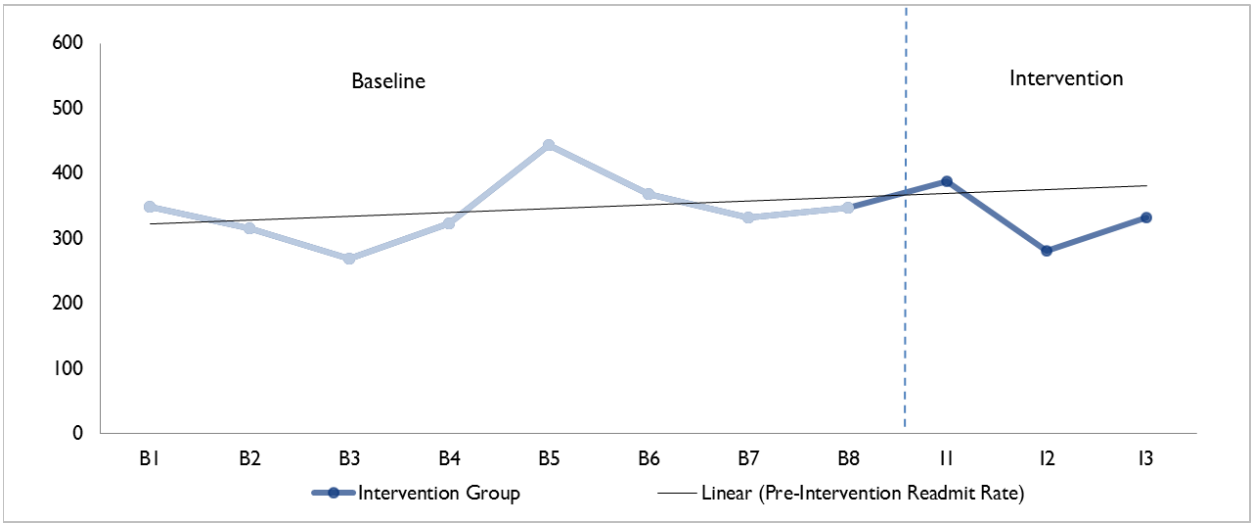
Table 21. Hospital Unplanned Readmissions Rates per 1,000 Admissions: U-Chicago

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 330997	U-Chicago											
	Readmit rate	349	316	269	324	444	368	333	347	389	281	333
	Std dev	477	465	444	468	497	482	471	476	487	450	471
	Total admissions	106	98	104	105	99	95	66	144	157	64	9
Comparison Group												
1C1CMS 330997	U-Chicago											
	Readmit rate	—	—	—	—	—	—	—	—	—	—	—
	Std dev	—	—	—	—	—	—	—	—	—	—	—
	Total admissions	—	—	—	—	—	—	—	—	—	—	—
Intervention − Comparison Rate		—	—	—	—	—	—	—	—	—	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
Readmit rate: (Sum all readmits to eligible hospital within 30 days/all admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 is “Intervention Q1”; B1 is “Baseline Q1.”
— Data not yet available.

Figure 14. Hospital Unplanned Readmissions Rates per 1,000 Admissions: U-Chicago



Source: RTI analysis of Alpha-MAX Medicaid claims.
U-Chicago = University of Chicago.

Hospital unplanned readmission rates fluctuate around the trend line prior to the innovation's launch, although the trend is going upward. The unplanned readmission rates are below the trend line in the second and third quarters after innovation launch, possibly due to incomplete Medicaid claims data. As with the other variables, we will include statistical tests on the unplanned readmissions rate in subsequent reports as more data become available.

ED visits per 1,000 participants are shown in ***Table 22*** and ***Figure 15***.

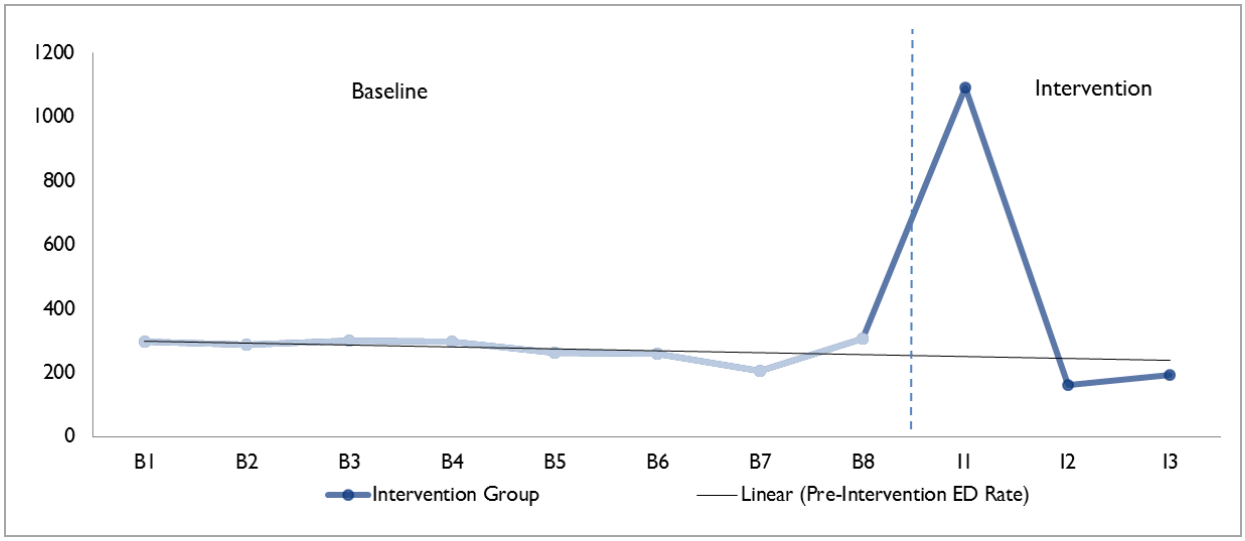
Table 22. ED Visits per 1,000 Participants: U-Chicago

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicaid

Awardee Number	Description	Baseline Quarters								Intervention Quarters		
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3
Intervention Group												
1C1CMS 330997	U-Chicago											
	ED rate	298	287	300	296	263	258	208	306	1,091	163	192
	Std dev	881	804	907	875	827	916	655	1,045	1,106	695	683
	Unique patients	1,834	1,920	1,970	2,063	2,085	2,090	2,153	2,355	2,419	1,857	156
Comparison Group												
1C1CMS 330997	U-Chicago											
	ED rate	—	—	—	—	—	—	—	—	—	—	—
	Std dev	—	—	—	—	—	—	—	—	—	—	—
	Unique patients	—	—	—	—	—	—	—	—	—	—	—
Intervention − Comparison Rate		—	—	—	—	—	—	—	—	—	—	—

Source: RTI analysis of Chronic Conditions Data Warehouse Medicaid fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = “Intervention Q1”; B1 is “Baseline Q1”; ED = emergency department.
— Data not yet available.

Figure 15. ED Visits per 1,000 Participants: U-Chicago



Source: RTI analysis of Alpha-MAX Medicaid claims.
ED = emergency department; U-Chicago = University of Chicago.

The ED visit rate remains stable before launch and jumps during the first post-intervention quarter because of patient enrollment at ED visit, as mentioned previously. During the subsequent post-intervention quarters, the ED visit rate remains close to the trend line for the intervention group. As with the other variables, we will include statistical tests on the ED visit rate in the following section.

Discussion

The four measures provide descriptive data on Medicaid patients enrolled in the U-Chicago innovation before, during, and after the launch of the innovation. These measures may not provide a complete evaluation picture of the U-Chicago innovation for reasons previously stated in the discussion under Medicare claims analysis. The four measures listed above are reported at the aggregate level for all Medicaid patients. Without statistical testing, it is premature to conclude that the innovation had any effect on outcomes; we will examine this question as the evaluation continues by introducing comparison groups and regression analyses.

The results may not be fully representative of the overall population served by the innovation. The results presented here are only for Medicaid beneficiaries who we were able to match with the identifiers provided by the site. This represents 3 percent of the overall population reached by the innovation.

1.3.3 Other Awardee-Specific Data

Table 23 lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. We received patient-level data from U-Chicago used to generate each measure listed in Tables 4 and 23 for each quarter through Q11 (March 31, 2015).

Table 23. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Clinical effectiveness	Patient care	HCIA Provider Survey	Collected by RTI
Health outcomes	Diabetes	Percentage of patients with diabetes who had HbA1c >9.0%	Data received from U-Chicago
	Hypertension	Percentage of patients with a diagnosis of hypertension with BP <140/90 mm Hg	Data received from U-Chicago
	Weight	Percentage of patients who are overweight (BMI 25.0–29.9) or obese (BMI >30)	Data received from U-Chicago

BMI = body mass index; BP = blood pressure; U-Chicago = University of Chicago.

Clinical Effectiveness

Evaluation Question

- How has implementation of the innovation impacted provider perceptions of patient care?

Data on the impact on patient care came from the HCIA Provider Survey. As mentioned above, 32 percent or 40.0 percent of eligible providers surveyed responded to the HCIA Provider Survey. Therefore, results should be interpreted with the sample size and response rate in mind. Overall, 41 percent of providers indicated that the innovation impacted patient care. Of those who indicated that the innovation had an impact on patient care, most providers (81.8%) found that impact to be somewhat positive and 18.2 percent found it to be very positive.

Provider views on the specific impacts of CommRx on patient care varied (***Table 24***). For seven of the nine measures in this area, provider responses were evenly distributed across response categories. Half of providers (50.0%) indicated, however, that CommRx was beneficial for patients in their practice and that among patients aware of the innovation, one-half indicated that the innovation benefitted their care (50.0%).

Table 24. Summary of Perceptions Regarding the Impact on Patient Care

Question	Percentage of CommunityRx Providers Indicating Strongly Agree/ Somewhat Agree	Percentage of CommunityRx Providers Indicating Strongly Disagree/ Somewhat Disagree	Percentage of CommunityRx Providers Indicating Neither Agree nor Disagree	Percentage of CommunityRx Providers Indicating not Applicable/ Missing
Innovation helps provide better patient care.	40.6 N=13	18.8 N=6	18.8 N=6	21.9 N=7
Innovation leads to more effective communication during patient visits.	34.4 N=11	21.9 N=7	12.5 N=4	31.3 N=10
Innovation has improved my patients' access to care.	34.4 N=11	18.8 N=6	18.8 N=6	28.1 N=9
Innovation has increased the time I am able to spend with patients during office visits.	15.6 N=5	28.1 N=9	18.8 N=6	37.5 N=12
Innovation helps me develop good relationships with my patients.	28.1 N=9	15.6 N=5	25.0 N=8	31.3 N=10
Innovation has improved perceived patient satisfaction with care.	34.4 N=11	18.8 N=6	15.6 N=5	31.3 N=10
Innovation has been beneficial for patients in my practice.	50.0 N=16	12.5 N=4	18.8 N=6	18.8 N=6
Among my patients that are aware of Innovation, the majority of patients would say it has been beneficial in the care they receive.	50.0 N=16	9.4 N=3	18.8 N=6	21.9 N=7
Among my patients that are not aware of Innovation, if I told them about it, the majority of patients would say it has been beneficial in the care they receive.	37.5 N=12	12.5 N=4	28.1 N=9	21.9 N=7

The HCIA Provider Survey data are supported by what we learned from the case study interviews, in that the providers we spoke with reported that the innovation was minimally burdensome and relatively easy for the people in their practice to use. Because the innovation is intended to provide resources to patients with certain conditions, and not intended to change the processes used to deliver patient care, it is not surprising that only 41 percent of providers indicated that CommRx helped provide better patient care.

Health Outcomes

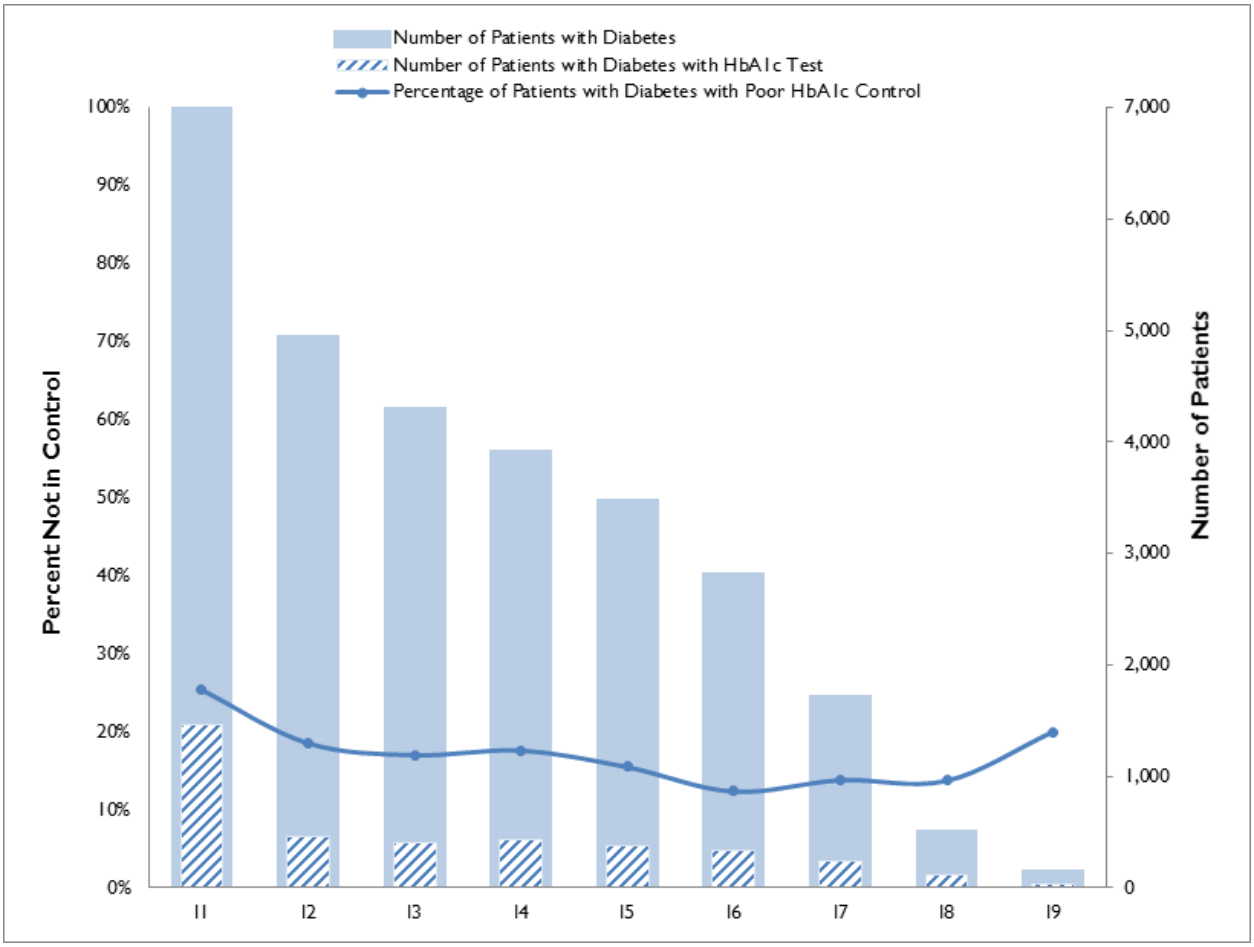
We examined health outcomes among patients with diabetes, hypertension, and those who were overweight or obese. The following run charts take into account rolling enrollment. The intervention quarters (Is) are based on individual enrollment date. For example, I1 is equal to the first quarter of enrollment for all participants who received a specific test. We provide I data when at least 20 patients have a test or reading within the quarter. For U-Chicago, the enrollment date reflects the date in which a patient received a Healthe*Rx*. The lab data for the results below are obtained during the first visit in which a patient received a Healthe*Rx*, as well as any follow-up visits through Q11. Thus, the denominators are based on the number of patients who had a visit in which they received a test during each quarter following their first enrollment quarter. Patients are unlikely to have a visit each quarter after they receive a Healthe*Rx*. Therefore, the patients included in the denominator for each quarter changes over time, and the number of quarters in which patients are eligible to have a lab result is based on the quarter in which they were enrolled. For example, the 2,215 patients enrolled in Q4 (Apr-Jun 2013) may have data in any of the following seven quarters (i.e., Q5-Q11) reported in this annual report. The additional 4,057 patients enrolled in Q5 (Jul-Sep 2013) may have data in any of the following six quarters (Q6-Q11). Thus, only 6,272 patients are eligible to have lab data for more than five quarters after enrollment. As such, the denominator in the results below drops over time, making strong interpretations of the findings difficult.

Evaluation Question

- Has the percentage of patients with diabetes with poor HbA1c control decreased over time among those enrolled in the innovation?

Figure 16 presents the percentage of patients with diabetes with an HbA1c test indicating poor control (i.e., HbA1c >9%) over time. The denominator represents the number of diabetes patients who received an HbA1c test for each quarter. The numerator represents the number of diabetes patients who received an HbA1c test that was >9.0 percent. As shown in the figure, the percentage of patients with poor HbA1c control fluctuated somewhat, but declined over time between I1 and I8. More specifically, the percentage of patients with poor HbA1c control declined from approximately 25 percent in I1 to approximately 14 percent in I8. This finding suggests that the innovation may be helpful in reducing the percentage of patients with poor HbA1c control over time. However, as noted above, the denominator decreases substantially across the intervention quarters as fewer patients are eligible to have a test result in later quarters, making interpretation of the findings tentative.

Figure 16. Percentage of Patients with Diabetes with Poor HbA1c Control over Time



Quarter	I1	I2	I3	I4	I5	I6	I7	I8	I9
Percentage of patients with diabetes with poor HbA1c control	25.3	18.6	17.0	17.6	15.5	12.4	13.9	13.8	20.0
Number of patients with diabetes	6,928	4,874	4,223	3,841	3,395	2,746	1,639	432	74
Number of patients with diabetes with HbA1c test	1,469	458	405	431	380	330	245	116	35

Source: Patient-level data provided to RTI by U-Chicago.

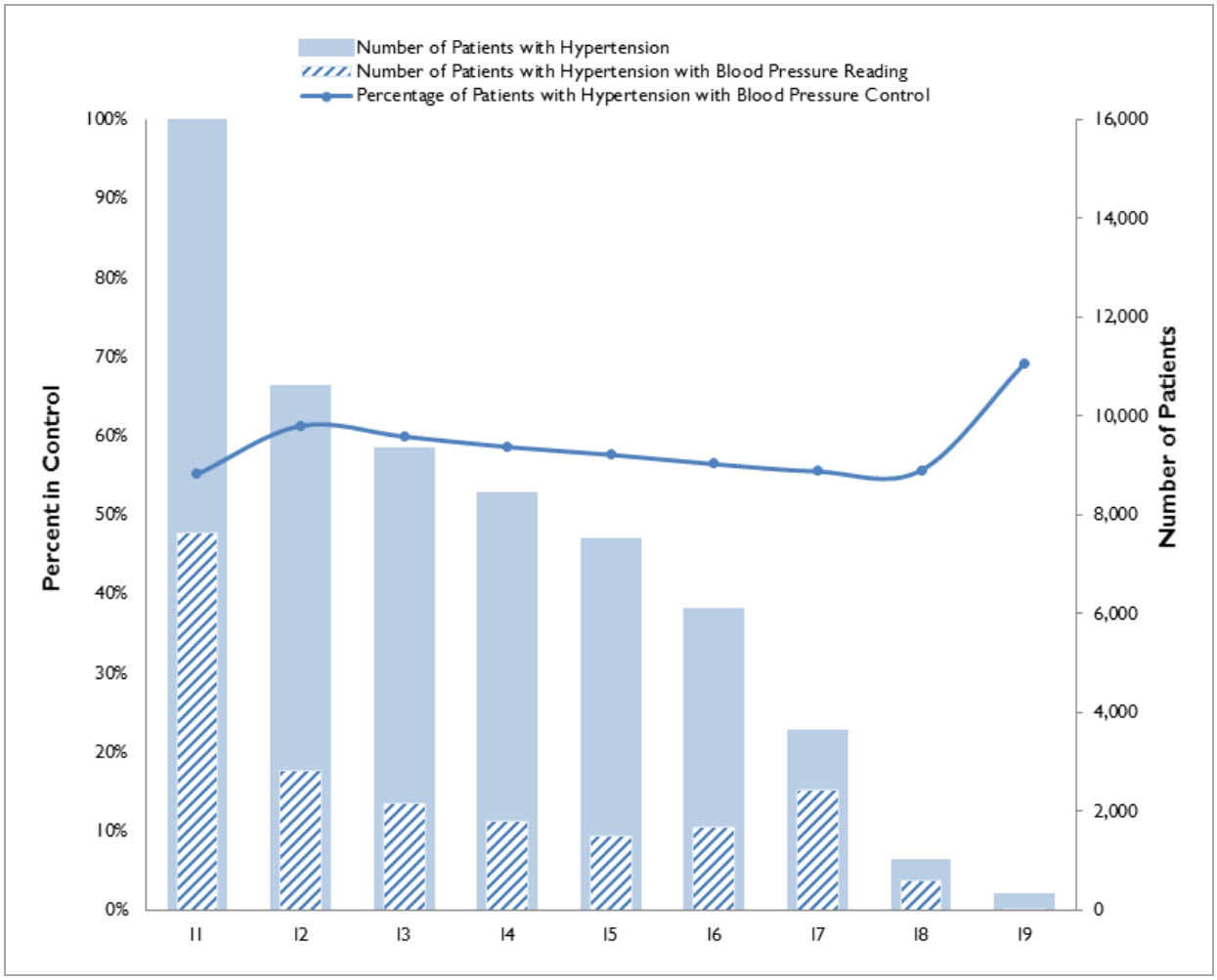
Evaluation Question

- Has the percentage of patients with hypertension with blood pressure control increased over time among those enrolled in the innovation?

Figure 17 presents the percentage of patients with hypertension who had a blood pressure reading indicating good control (i.e., <140/90 mm Hg), over time. The denominator represents the number of hypertension patients who received a blood pressure reading for each quarter. The numerator represents the number of hypertension patients who received a blood pressure reading that was <140/90

mm Hg. As shown in the figure, the percentage of patients with blood pressure control remained fairly consistent between I1 and I8. However, among those with blood pressure readings eight quarters after receiving their first Healthe*Rx*, the percentage of those with blood pressure control increased from approximately 56 percent in I8 to approximately 70 percent in I9. There are relatively few patients in the quarters beyond I8. Therefore, this is not strong evidence to suggest that the innovation is helpful in increasing the percentage of patients with blood pressure control over time. However, as noted above, the denominator decreases substantially across the intervention quarters as fewer patients are eligible to have a test result in later quarters, making interpretation of the findings tentative.

Figure 17. Percentage of Patients with Hypertension with Blood Pressure Control over Time



(continued)

Figure 17. Percentage of Patients with Hypertension with Blood Pressure Control over Time (continued)

	Quarter	I1	I2	I3	I4	I5	I6	I7	I8	I9
●	Percentage of patients with hypertension with blood pressure control	55.2	61.3	60.0	58.7	57.7	56.5	55.6	55.7	69.2
	Number of patients with hypertension	15,970	10,425	9,158	8,266	7,337	5,921	3,459	847	146
	Number of patients with hypertension with blood pressure reading	7,622	2,832	2,165	1,798	1,501	1,669	2,429	596	26

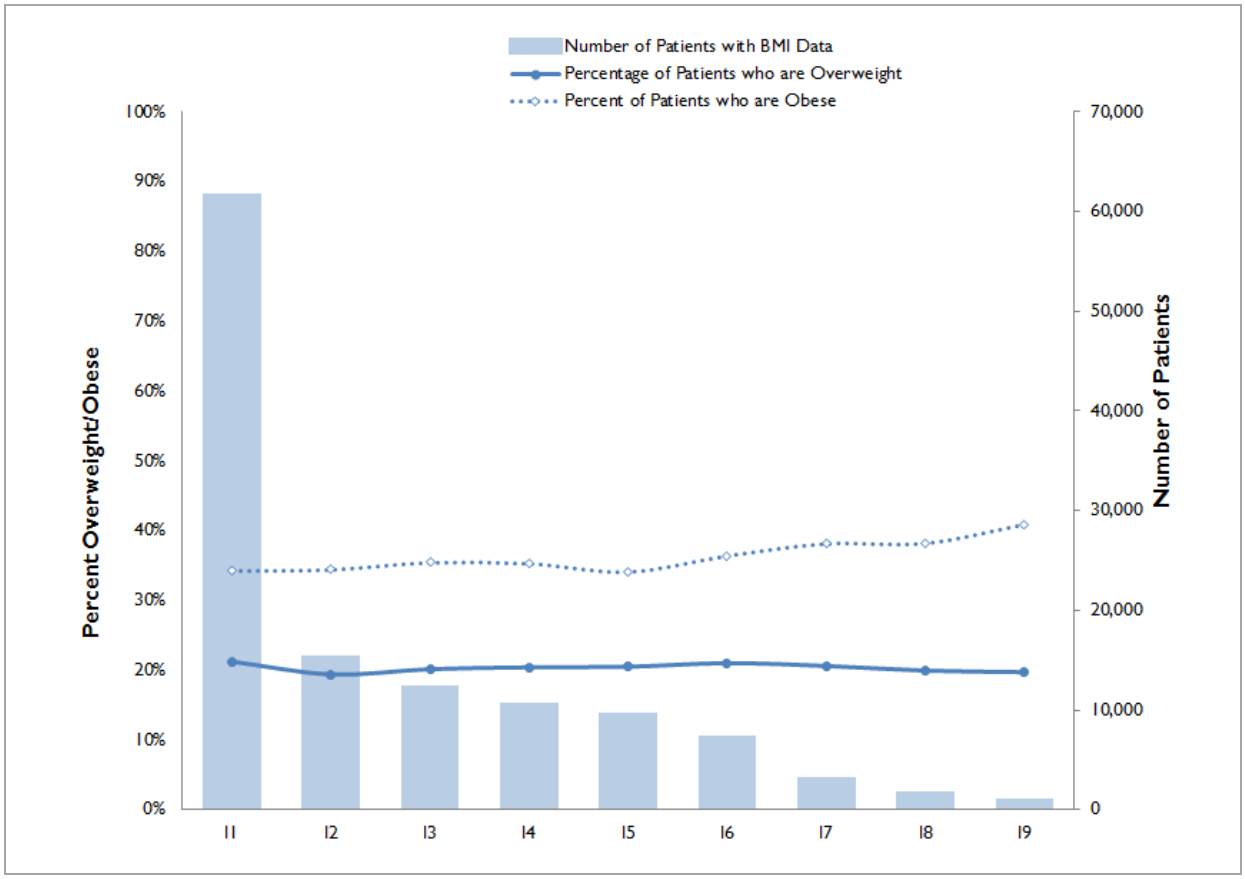
Source: Patient-level data provided to RTI by U-Chicago.

Evaluation Question

- Has the percentage of overweight or obese patients decreased over time among those enrolled in the innovation?

Figure 18 presents the percentage of overweight and obese patients over time. The denominator represents the number of patients with height and weight data available to calculate body mass index (BMI). The numerator represents the number of those patients who were overweight or obese. As shown in the figure, the percentage of overweight and obese patients remains relatively consistent over time with a slight upward trend for obese patients. The percentage of overweight patients increases from approximately 21 percent in I1 to approximately 20 percent in I9. The percentage of obese patients increases from approximately 34 percent in I1 to approximately 41 percent in I9. Thus, the percentage of overweight and obese patients did not decrease over time among those who received a Healthe*Rx*. However, as noted above, the denominator decreases substantially across the intervention quarters as fewer patients are eligible to have a test result in later quarters, making interpretation of the findings tentative.

Figure 18. Percentage of Overweight and Obese Patients over Time



	Quarter	I1	I2	I3	I4	I5	I6	I7	I8	I9
●	Percentage of patients who are overweight	21.2	19.4	20.2	20.4	20.5	21.0	20.6	19.9	19.7
◊	Percentage of patients who are obese	34.2	34.4	35.4	35.3	34.1	36.4	38.1	38.2	40.8
	Number of patients with BMI data	60,876	14,506	11,575	9,780	8,738	6,529	2,378	883	218

Source: Patient-level data provided to RTI by U-Chicago.
BMI = body mass index.

Discussion of Other Awardee-Specific Findings

We report findings for health outcomes among patients with diabetes, hypertension, and weight-related issues. The percentage of diabetes patients with poor HbA1c control declined slightly over time, from approximately 25 percent in I1 to approximately 14 percent in I8. The percentage of patients with hypertension with blood pressure control remains consistent over time. However, a large increase occurs between I8 (55.7%) and I9 (69.2%). The percentage of overweight and obese patients increases slightly over time. Because the denominator decreases substantially across the intervention quarters as fewer patients are eligible to have a test result in later quarters, interpretation of the findings presented should

be made with caution. Furthermore, because we have not conducted inferential analyses, we cannot report whether any of the changes over time are significant.

For the HCIA Provider Survey, the findings indicate significant variation in responses from providers affiliated with the CommRx innovation possibly because we sampled providers from a variety of clinics that may have implemented the innovation in different ways. We also received only 32 responses (40.0% of those surveyed) from providers affiliated with the CommRx innovation; therefore, results should be interpreted with caution. In addition, the innovation itself is relatively low impact, so it is not surprising that many providers did not believe the innovation impacted patient care or was difficult to implement. That said, providers generally believed that the innovation and the information patients received was helpful to their patients. However, because we lack the data, we cannot determine the linkage between receiving the information about resources and utilizing those resources to improve health.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing U-Chicago as well as accomplishments to date. In this section we assess U-Chicago's progress on achieving HCIA goals to date:

- **Smarter spending.** Regression results show that Medicare spending among the intervention group is similar to that of the comparison group in the post-intervention period after the first intervention quarter for Medicare patients.

- **Better care.** Regression results show that over the entire intervention period, admissions and ED visits are significantly higher in the intervention group among Medicare beneficiaries. The increase in ED visits largely occurs in the first period of the intervention and may be an artifact of the enrollment date used in the analysis. More than half (52.5%) of the target population was enrolled and approximately 45 percent of those enrolled received more than one Healthe*Rx*. HCIA Provider Survey results indicate that although providers are generally satisfied with the innovation, find it is easy to use, and believe the innovation is beneficial for their patients, the benefits may accrue because the innovation is minimally burdensome to providers while providing patients with resources that were not available previously. Because the innovation does not directly seek to impact patient care practices, this finding is not surprising.

- **Healthier people**. For the diabetes-related health outcome, the percentage of diabetes patients with poor HbA1c control declined slightly over time. The percentage of patients with hypertension with blood pressure control remained consistent over time, with a large increase between I8 and I9. However, relatively few patients appeared in the quarters beyond I8; therefore, we do not have strong evidence to suggest that the innovation was helpful in increasing the percentage of patients with blood pressure control over time. The percentage of overweight and obese patients increased slightly over time. Because we did not conduct inferential analyses, we cannot determine if any of these differences are significant.

In Year 3, U-Chicago continued to successfully recruit and engage practice sites from the target community in the implementation of the CommRx innovation, expanding the innovation to one additional clinical site and completing initial setup activities for 10 additional sites. U-Chicago also expanded its identification of resources available to five additional zip codes, increasing the number of resources

available to patients when they receive a Healthe*Rx*. Although U-Chicago was not able to fully implement SMS texting due to budget constraints, staff continued to pilot test its viability through at one clinical site.

The strong leadership and organizational support within U-Chicago is a major strength of the innovation, and will be critical as the team works to identify future resources to sustain the innovation. Because the innovation is housed within a large private university, with diverse priorities and limited funding to self-sustain an innovation such as this, identification of other resources will be critical. The team has already identified some resources for this purpose through the grant from NIH and the formulation of an LLC that could commercialize the innovation. Another strength of the innovation is its ability to continue to grow and adapt, which was evident in the innovation team's flexibility in allowing some differences in implementation among the clinical settings (i.e., where the Healthe*Rx* is generated and who distributes it to the patient). The team also continued to grow the innovation by enhancing the database to include more ICD-9 codes, expanding compatibility with multiple EMR systems, expanding to additional zip codes, and including more community resources through its partnership with the MAPSCorps project.

The innovation had challenges. Training and engaging the CHIS staff was somewhat challenging. Although all CHIS obtained in-house training on the technical aspects of the job responsibilities, the plans for the partnership with the Graham School to provide a certificate program to the CHIS staff and others proved financially unsustainable given the revenue targets set by the school and the lower than targeted enrollments. These issues led to a more streamlined and efficient "in-house" training approaches for all the CHIS. Although the CHIS model always allowed for CHIS to be involved in the identification of community resources, the two part-time CHIS in Year 3 were hired solely to identify community resources. The two existing CHIS continued to support participants, in addition to identifying resources. While relatively few participants communicated with the CHIS, communication using the SMS texting pilot test showed promise among the innovation's population.

The innovation and its corresponding internal evaluation was designed to improve patient access to information and resources that patients could use to improve their health. The greatest evaluation challenge continues to be the lack of data that help us understand what patients do with the information after they receive it. The external evaluation was unable to create a link between patients receiving a Healthe*Rx* and using the information it contains to enroll in or obtain services to improve their health. Without this information, it is difficult to link the innovation to improved health outcomes.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

University of Miami

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the University of Miami's 11th and 12th quarter of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

University of Miami

1.1 Introduction

The University of Miami (U-Miami) innovation expands a longstanding network of school-based health clinics that provide comprehensive health care to school-aged students in Miami-Dade County. The innovation seeks to achieve the following HCIA goals:

1. **Smarter spending.** Reduce spending by approximately $1.8 million while providing the appropriate level of care and improving access to preventive services.
2. **Better care.** Give students access to nutrition, dermatology, dental and mental health services, offer a medical home to children with coordinated care, and leverage community health workers (CHWs) to supplement care and provide social services.
3. **Healthier people.** Improve control of chronic conditions such as asthma.

Table 2 provides a summary of changes that occurred with U-Miami during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data submitted by U-Miami through March 31, 2015; and key informant interviews with U-Miami's leaders and staff conducted in March 2015.

Table 2. Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	U-Miami leveraged opportunities throughout the university to share resources, e.g., with the U-Miami Medical Group.
Program Participant Characteristics	The majority of participants (57.9%) were 12 to 18 years of age. Race and sex were missing for most participants (92.5% and 86.1%, respectively). More than half (55.1%) were covered by Medicaid.
Implementation Process	
Execution	Spending rates are 10% to 20% below projection.
Leadership	No changes occurred in leadership since the descriptions provided in the first annual report.[1]
Organizational capacity	The number of CHWs decreased since the last annual report. There are no plans to replace CHWs who departed, which resulted in more students per CHW.
Innovation adoption and workflow	Because CHWs are responsible for more students, they had to triage provision of services. Organizational leadership helped set priorities.
Workforce Development	
Hiring/retention	The innovation had 9.75 total FTEs, which is below projection by 6.4 FTEs. There are no plans to increase FTEs or replace CHWs who left.
Training	A total of 191 trainees received 8,346 cumulative training hours as of Q10.

(continued)

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Implementation Effectiveness	
Reach	86.3% of the target population was enrolled. Children receiving well-child care examinations increased by 4.48%. 228 additional students enrolled for clinic services this quarter.
Dose	About 10% of those enrolled in the innovation received at least one dental, CHW, or telehealth service. Dental services represent 5.8% with the rest split between CHW and telehealth services.

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by U-Miami.
Key informant interviews conducted Feb–June 2015.

1 Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

CHW = community health worker; FTE = full-time equivalent.

1.1.1 Innovation Components

This innovation originally consisted of five components: (1) CHWs who provide coordination services in the clinic, social services, and assistance with Medicaid enrollment; (2) a dental services expansion including oral exams and screenings, cleanings, fluoride varnish applications, placement of dental sealants, and fluoride rinses; (3) telemedicine intended to increase access to primary care, mental health care, nutritional counseling, and dermatology care, whereby patients can be seen by an offsite physician for a limited physical exam with the aid of a nurse or medical assistant; (4) an ED diversion clinic where students and families are referred to the Center for Haitian Studies in lieu of ED visits; and (5) development of a new payment mechanism by which agreements are established with managed care organizations (MCOs) to explore payment models. Since the first annual report, the following changes occurred:[1]

- Medicaid enrollment: The initial focus on Medicaid enrollment diminished once the deadline for Florida Medicaid Managed Care passed.
- CHWs: The CHWs are obtaining a newly developed state certification for care coordinators.
- Dental services: Intraoral telehealth screening is planned after Q10.
- Telemedicine: Delivery of telehealth services slowed significantly because of inefficient broadband coverage, as reported in the Q10 progress report. During the connection outages, U-Miami implemented alternative care delivery approaches such as providing onsite care or via a secured electronic e-mail system. During the second site visit, U-Miami reported that these connection problems have been resolved.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

- ED diversion clinic: Amerigroup data from U-Miami indicate that very few ED visits and inpatient stays were in the zip codes of participating schools. However, during the site visit, participants explained that the ED diversion clinic was not well attended because families preferred to go to hospitals near their homes.

- Payment mechanism: U-Miami contracted with the following health maintenance organizations (HMOs): Amerigroup, Inc., Sunshine, Inc., Molina, Coventry, and Wellcare. U-Miami plans to implement an alternative payment plan in collaboration with Amerigroup. The alternative payment plan expects to achieve of cost savings by replacing fee-for-service with a capitated rate.

- Toolkit: U-Miami also produced a toolkit for advocacy and engagement of HMOs. The toolkit includes a white paper, a cost savings template developed by a health economist, and a PowerPoint presentation the HMO consultant uses when meeting with HMOs. The partners named for this innovation remain unchanged since the first annual report.

1.1.2 Program Participant Characteristics

Table 3 provides the demographic characteristics of all participants ever enrolled in the innovation. The distribution of patient characteristics is similar to that in the Q5 report, the earliest report in which patient characteristics based on secondary data were reported. More specifically, a majority of participants (57.9%) were between 12 and 18 years of age at enrollment. Race and sex were missing for most participants (92.5% and 86.1%, respectively). More than half (55.1%) were covered by Medicaid. It is notable that these data are not complete as evidenced by the large number of participants missing sex and race information.

Table 3. Characteristics of All Participants Ever Enrolled in Innovation through December 2014

Characteristic	Number of Participants	Percentage of Participants
Total	9,548	100.0
Age		
0–2	17	0.2
3–5	598	6.3
6–8	1,309	13.7
9–11	1,540	16.1
12–15	3,254	34.1
16–18	2,271	23.8
>18	126	1.3
Missing	433	4.5
Sex		
Female	674	7.1
Male	650	6.8
Missing	8,224	86.1
Race/ethnicity		
White	511	5.4
Black	31	0.3
Hispanic	40	0.4

(continued)

Table 3. Characteristics of All Participants Ever Enrolled in Innovation through December 2014 (continued)

Characteristic	Number of Participants	Percentage of Participants
Race/ethnicity (continued)		
Asian	1	0.0
American Indian or Alaska Native	0	0.0
Native Hawaiian or Pacific Islander	3	0.0
Other	133	1.4
Missing/refused	8,829	92.5
Payer Category		
Dual	217	2.3
Medicaid	5,261	55.1
Medicare	89	0.9
Medicare Advantage	53	0.6
Other	0	0.0
Uninsured	0	0.0
Missing	3,928	41.1

Source: Patient-level data provided to RTI by U-Miami.
The most recent data were provided by U-Miami in December 2014.

1.2 Implementation Progress

The first annual report (2014) described U-Miami's implementation process, workforce development, and progress toward effectiveness, and detailed the quantifiable measures to assess each area. ***Table 4*** lists these measures and their status as of May 31, 2015. The results of analyses for one of these measures are included in this annual report. We have not received patient-level data from U-Miami for most of these measures; the data we received is from December 31, 2014. If we receive additional data by the end of the contract, June 30, 2015, we will report them in the next quarterly report.

This section presents U-Miami's process measures and a qualitative analysis of the factors that determined U-Miami's implementation progress. This analysis draws on patient-level data that U-Miami provided to RTI as of May 31, 2015, performance documents, and key informant interviews conducted with U-Miami's leaders and staff in the 11th and 12th quarters of operations.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation effectiveness	Reach	Number enrolled in Medicaid/ Kidcare by CHWs	Data anticipated
		Number/percentage of enrolled participants receiving CHW services	Data received from U-Miami
		Number/percentage of enrolled participants receiving dental services	Data received from U-Miami
		Number/percentage of enrolled participants receiving telehealth services by specialty (e.g., dermatology, nutrition, and mental health)	Data received from U-Miami
		Number of household visits by CHWs	Data anticipated
	Dose	Number of CHW encounters and number per participant	Data received from U-Miami
Coordinated care	Efficiency	Number of ED diversion program referrals by CHWs for uninsured families	Data anticipated

CHW = community health worker; ED = emergency department; U-Miami = University of Miami.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through U-Miami's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include U-Miami's reports from Q8 through Q10 and interviews conducted in March 2015.

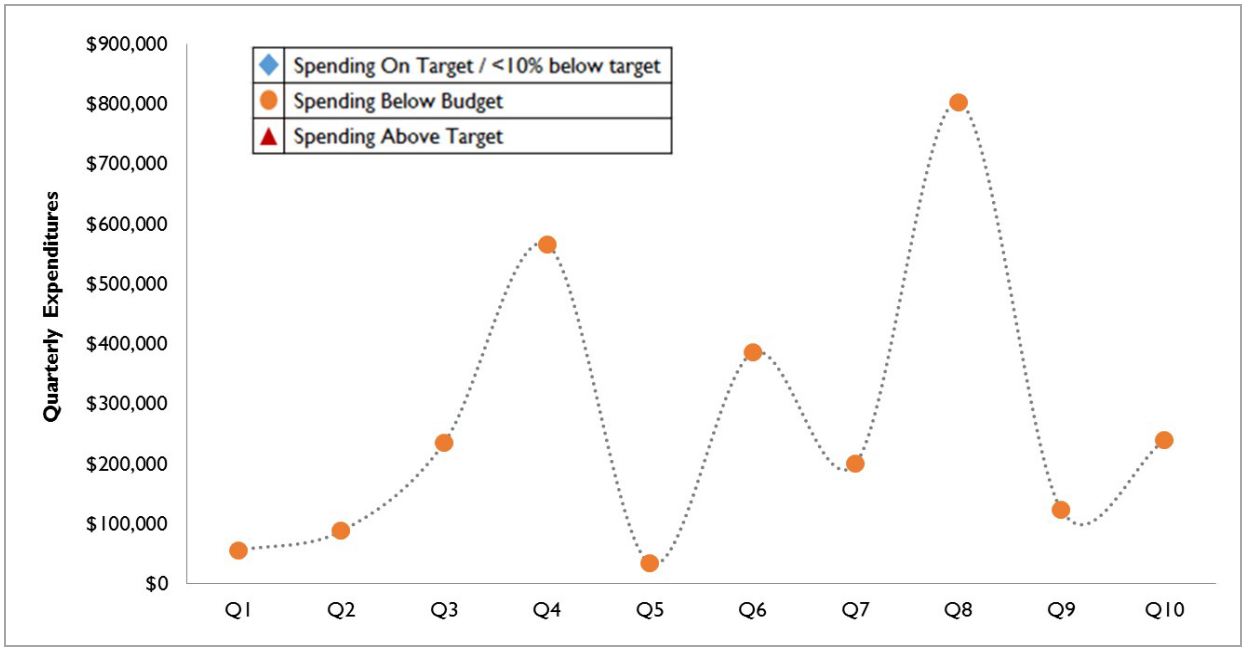
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

Execution of Implementation

The annual report highlights the significance of U-Miami's expenditure rates on implementation. As of December 2014 (Q10), U-Miami spent 71.56 percent of its Year 3 budget, which is below the projected target (see ***Figure 1***). U-Miami is below the projected number of staff members originally anticipated because of the delay in executing the subcontracts. Although subcontracts were executed during the second quarter of Year 3, subcontractors have yet to invoice U-Miami, so those expenditures are pending receipt.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December 31, 2014)



Leadership

As noted in the first annual report, the original project director retired at the start of the innovation. The project director's role was assumed by the medical director who took on additional responsibilities. At the same time, the project's administrator left the project, leaving an administrative void. Thus, the medical director stepped in to fulfill the roles of both the project director and administrator in addition to medical director duties. During the second site visit, participants indicated that U-Miami provided support and oversight to the project director in managing projects of this size and scope through the grants office and billing office. In addition, the project manager took on increased administrative responsibilities between the first and second site visits, freeing the project director from active management of the CHWs and social workers.

The project director worked with the CMMI project officer to refine the original, ambitious goals of the program and focus on shorter-term attainable goals, such as tracking and sustainability. Foundation leadership also encouraged the project director to focus on sustainability. As a result, the HMO consultant was hired to work with payers and given leeway to facilitate contracts with local Medicaid MCOs. The Foundation assisted U-Miami in selection of the HMO consultant.

Leaders at U-Miami (president, dean and provost) were not directly involved in the management of the innovation (e.g., did not attend meetings, communicate routinely with the project director). The dean received quarterly reports about the project, and the grants management office regularly met with project leadership to provide contractual oversight. The university's leadership became more closely involved toward the end of the project and was interested in ensuring the project met its financial goals. For example, the vice chair of the billing department became a champion of the program and facilitated contract negotiation in support of alternative billing arrangements.

Organizational Capacity

Since the first annual report, the program manager's role expanded. The program manager supervised the CHWs and clinic staff. The project director continues to provide clinical oversight of clinic staff. Through continued involvement, the program manager encouraged collaboration across roles and locations, provided schedule and assignment structure, and gave CHWs access to resources such as laptops. These measures produced a more effective and cohesive team structure. CHWs are now better able to plan their duties and organize ahead of time. The program manager makes rounds at all the clinics and interacts directly with students and their families, which allows for a more holistic view of the students' interactions with the program's services. This is of particular importance since the number of CHWs decreased through turnover—thus, each CHW is responsible for more students. The program manager assists with prioritization.

U-Miami continues to encounter difficulties with contracting and personnel capacity, as evidenced by the delay in executing subcontracts and the delay in receiving invoices. In addition, U-Miami data availability continues to be a concern, as outlined in the first annual report.

U-Miami had an ambitious program with a number of interrelated components. Participants indicated they felt the pace of the project was too fast and would have preferred the first year of the project focus on planning and laying the groundwork rather than full implementation. Maintaining adequate staff also proved to be a challenge because of turnover, employee medical leave, and recent restrictions placed on medical assistant qualifications. In addition, key staff such as data management and evaluation were only devoted to the innovation in small percentages; consequently, difficulties occurred in attaining necessary information for tracking and monitoring.

Partnerships remained stable since the first annual report. U-Miami indicated that its biggest challenge for sustainability was the slow Medicaid application process. They made a big push to have CHWs assist families with applications. In addition, Medicaid MCOs slowly adapted to the concept of contracting with school-based health centers (SBHCs) and with the rest of the U-Miami. The HMO consultant was instrumental in developing contracting arrangements with Medicaid MCOs. In addition, plans are under way for school teachers and staff to be seen at the clinics; those visits would be reimbursed by insurance. As claims are filed and reimbursed, the sustainability of the innovation will be affected.

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was understaffed, with 10.75 full-time equivalent (FTE) staff members. Between Q8 (June 2014) and Q10, total staffing numbers fluctuated, but consistently remained well below projections. The lack of total FTEs was primarily due to staff turnover and unexpected maternity and medical leave. The number of employed CHWs declined because CHWs were not replaced as turnover occurred. Participants at U-Miami reported mixed views about whether the innovation would benefit from a greater number of CHWs. Also, with continued funding from the Children's Trust, a change in the staffing pattern was requested for all school health programs in Miami-Dade County. This change required that nursing support staff consist of licensed practical nurses in lieu of medical assistants. U-Miami is seeking additional sources of funding that would enable the current medical assistants to remain on staff.

Skills, Knowledge, and Training

Between Q8 and Q10, U-Miami provided 236 hours of training to 55 individuals. Training consisted of refreshers on system use, education on the Managed Medical Assistance (MMA) program as part of the Statewide Medicaid Managed Care (SMMC) program, and Health Insurance Marketplace training. Site visit interviews indicated that earlier trainings were more intensive, and more recent trainings refreshed and updated that knowledge. Staff anticipated a small number of upcoming trainings, barring Medicaid changes. Staff also indicated that the trainings were helpful, but not long enough, and did not always answer all of their questions.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort, because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach), and (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Questions

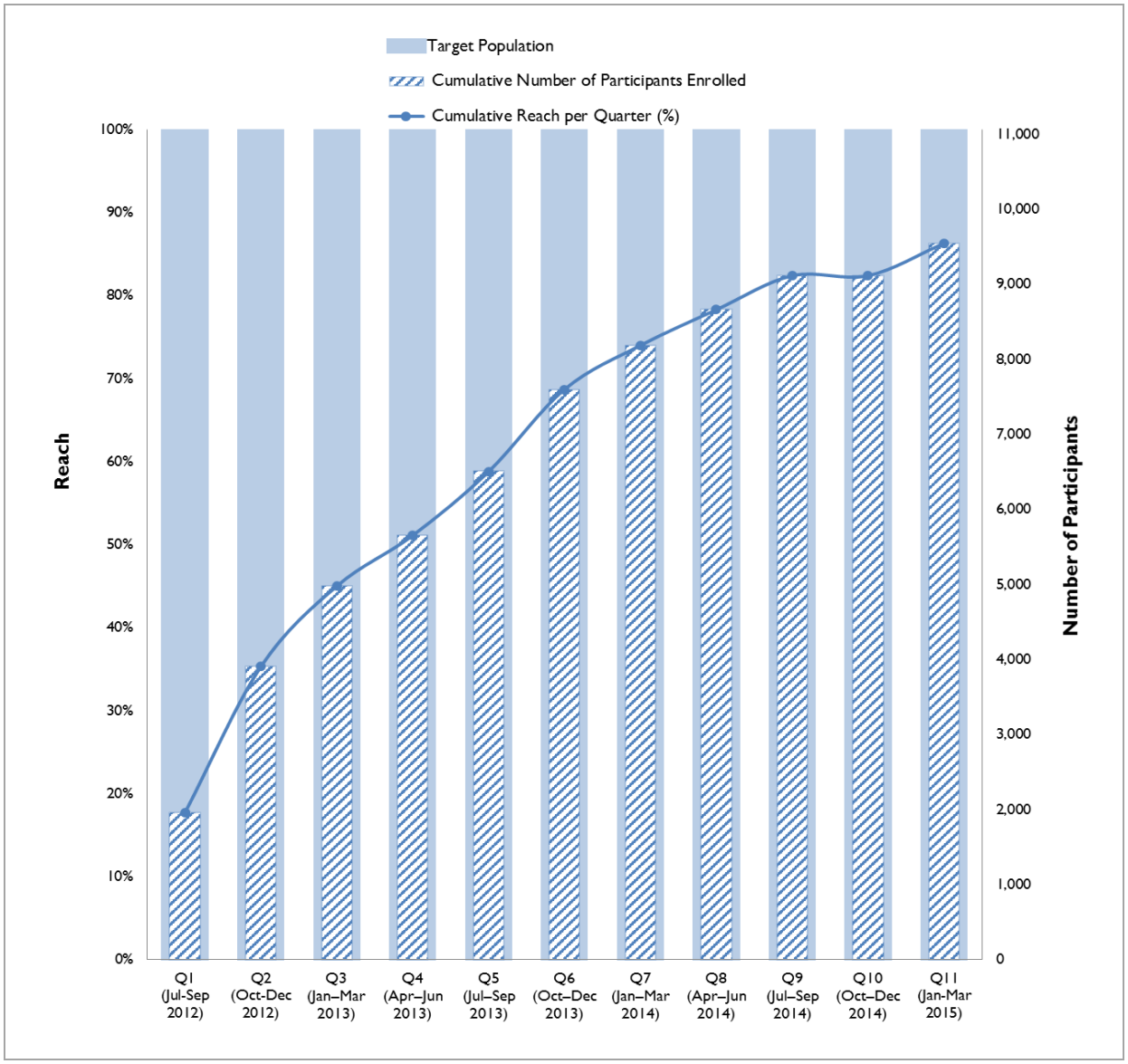
- What is the implementation effectiveness, including reach and dose of the innovation thus far?

Reach

Figure 2 shows reach by quarter since the launch of the innovation for students for whom we received patient identifiers or secondary data as of December 31, 2014 (we did not receive additional data by May 31, 2015, to include in this annual report). Reach was first reported in the Q5 report, based on data through Q9. Since that time, U-Miami enrolled an additional 434 patients in the innovation, increasing reach from 82.6 percent to 86.3 percent.

The target population for this program were all students within nine selected schools in Miami-Dade County. U-Miami set up clinical services at all nine locations and marketed the study to all students and their families. Based on the *Q11 Narrative Progress Report*, U-Miami reports that 11,063 unique direct participants have been served since the innovation started. This number represents the total population eligible to receive care at the SBHC program, which is what we consider their target population. Participation requires student or parent consent and was limited by the number of families that chose to participate. Participation may also vary as students enter and leave the school system through moving or graduating. Cumulative reach increased over time, but is still short of the program's goal.

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch



(continued)

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch (continued)

	Quarter	Q1 (Jul-Sep 2012)	Q2 (Oct-Dec 2012)	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan-Mar 2015)
●	Cumulative reach per quarter (%)	17.7	35.3	45.0	51.1	58.8	68.7	74.0	82.8	82.8	82.4	86.3
	Target population	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063
	Cumulative number of participants enrolled	1,959	3,911	4,977	5,657	6,509	7,599	8,187	8,663	9,114	9,114	9,548

Source: Patient-level data provided to RTI by U-Miami.
Note: Q11 includes those with missing enrollment dates.

Dose

Table 5 provides the number of services provided across participants, the number and percentage of participants receiving services, and the average number of services per participant through .services. In the Q6 report, CHW and mental health telehealth services were included. RTI has not received any new data from U-Miami since the Q6 report. Therefore, no changes are reported in this annual report. As shown in the table, about 4 percent of those enrolled received assistance with the Affordable Care Act (ACA), Kidcare, or Medicaid application. Two percent received assistance with food stamps, Supplemental Nutrition Assistance Program (SNAP), or Women, Infants, and Children (WIC). Overall, only about 10 percent of those enrolled received at least one of the services listed in the table.

Although reach numbers increased steadily and were close to the target goal, dose numbers remained low. The number of participants who received services was minimal: dental services was the highest at just 5.8 percent. It is important to note that the intent of the innovation was not to provide all enrollees with each service in the table. Therefore, it is difficult to make inferences about the program's effectiveness regarding dose.

Table 5. Number and Types of Services Provided to Participants

Services	Number of Services Provided Across Participants	Number (Percentage) of Participants Receiving Service	Average Number of Services per Participant
Dental services	1,255	551 (5.8)	2.3
CHW services			
Assistance with ACA, Kidcare, or Medicaid application	547	409 (4.3)	1.3
Behavioral health/counseling	5	3 (0.1)	1.7
Community health resources	11	9 (0.1)	1.2
Food stamps/SNAP/WIC assistance	289	184 (1.9)	1.6
Health education	97	38 (0.4)	2.6
Other (e.g., legal, housing, fraud, financial assistance)	16	14 (0.1)	1.1

(continued)

Table 5. Number and Types of Services Provided to Participants (continued)

Services	Number of Services Provided Across Participants	Number (Percentage) of Participants Receiving Service	Average Number of Services per Participant
Telehealth			
Dermatology	—	—	—
Mental health	7	7 (0.1)	1.0
Nutrition	—	—	—
Total	**2,227**	**992 (10.4)**	**2.2**

Source: Patient-level data provided to RTI by U-Miami.
ACA = Affordable Care Act; CHW = community health worker; SNAP = Supplemental Nutrition Assistance Program; WIC = Women, Infants, and Children.
— Data not available.

Sustainability

U-Miami has a sustainability plan in place, and efforts are underway to secure and maintain funding after the HCIA period ends. The primary source of funding is expected to be Medicaid. U-Miami remains contracted with five HMOs that provide Medicaid managed care services. Amerigroup is now assigning members to U-Miami as primary care providers, to enable the initiative to meet its goal of 500 members so that the alternative payment plan (capitation rates) will be initiated. Discussions are also underway with Miami-Dade County public schools to allow U-Miami to provide patient care to its teachers and staff and bill insurance. Revenue generated through this venue may be used to offset costs of clinical care and for students served by the initiative. Finally, the Miami-Dade School Health Medical Advisory Committee is advocating for mandated well-child care exams for students entering 6th and 9th grades. With current guidelines, such an exam is required only upon school entry, so children do not receive a second exam during their school enrollment. U-Miami would pilot this program, which would help to generate revenue. U-Miami also reported efforts to obtain patient-centered medical homes (PCMH) designation, which would open up additional revenue streams.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of U-Miami's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data U-Miami collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures that RTI considers essential to the evaluation of U-Miami's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported vary by awardee.

As the data are received, RTI incorporates the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 6 lists the claims-based outcome measures determined by CMMI as most relevant for the HCIA evaluation, with an indication of whether the payer specific data are presented in this annual report. Since U-Miami's innovation targets school-aged children who are not Medicare beneficiaries, we do not present claims-based outcome measures for Medicare for this awardee. For Medicaid, we are not able to present the outcome measures because the CMS Alpha-MAX data files are not available in the period after the innovation was launched.

Table 6. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	No	No
		Hospital unplanned readmissions rate	No	No
		ED visit rate	No	No
	Cost	Spending per patient	No	No
		Estimated cost savings	No	No

ED = emergency department.

1.3.2 Claims Data

In future reports, this section will describe the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization when claims data become available.

Medicare Claims Analysis

U-Miami's innovation targets school-aged children and, therefore, includes virtually no Medicare beneficiaries. Accordingly, we do not conduct Medicare claims analysis for this awardee.

Medicaid Claims Analysis

The Medicaid claims analysis uses data from the CMS Alpha-MAX data files, which were not available in the period after the innovation was launched. U-Miami's innovation was launched on July 2012 and Medicaid claims for U-Miami are only available in Alpha-MAX through Q4 2011. Accordingly, we are not presenting claims-based measures for Medicaid in this report. We do not anticipate presenting Medicaid analyses for U-Miami in subsequent reports until Florida's Alpha-MAX data have claims through Q3 2012.

Comparison Groups

If more Alpha-MAX data become available, in addition to comparing U-Miami's patients pre- and post-innovation, RTI will construct a comparison group of Medicaid fee-for-service patients in Miami. This comparison group will control for external, non-innovation factors affecting both innovation participants and nonparticipants.

1.3.3 Other Awardee-Specific Data

Table 7 lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. As noted previously, we have not received patient-level data from U-Miami for most of these measures. If we receive these data by the end of the contract, June 30, 2015, we will report them in the next quarterly report. We received body mass index (BMI) data for about 5 percent of participants. However, these data are baseline, and therefore, are not appropriate to report as the health outcome.

Table 7. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Clinical effectiveness	Asthma	Percentage of children identified as having persistent asthma and dispensed appropriate medications	Data anticipated
	Diabetes	Percentage of children with diabetes who received a hemoglobin A1c and lipid profile assessment during the measurement year	Data anticipated
		Percentage of parents/caregivers of pediatric patients with diabetes who received nutrition counselling	Data anticipated
		Percentage of children with diabetes who received an eye exam	Data anticipated
	Mental health	Percentage of children with a confirmed diagnosis of depression following a referral for psychiatric evaluation	Data anticipated
Health outcomes	Asthma	Percentage of children with asthma who have FEV1 ≥80%	Data anticipated
	Weight	BMI: (1) percentage of children overweight (BMI ≥25.0 and ≤29.9); (2) percentage of children obese (BMI >30)	Data received from U-Miami

BMI = body mass index; FEV1 = Forced Expiratory Volume (1 second); U-Miami = University of Miami.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing U-Miami as well as accomplishments to date. In this section, we assess U-Miami's progress on achieving HCIA goals to date:

- **Smarter spending.** RTI is unable to evaluate changes in spending because Medicaid claims data are not available.

- **Better care.** RTI is unable to evaluate changes in health care utilization because Medicaid claims data are not available.

  Based on the secondary data received from U-Miami, approximately 86 percent of the target population was enrolled. However, only 10 percent of those enrolled received at least one dental, CHW, or telehealth service. These findings do not match with qualitative findings from the case study, as noted in the first annual report. Case study participants cited providing these services in far greater numbers than was documented.

- **Healthier people.** RTI did not receive any of the requested health outcome data from U-Miami. Therefore, we are unable to provide a summary of findings related to health outcomes.

U-Miami had an ambitious program with multiple activities occurring simultaneously. Thus, staff were spread thin and their attention to attaining goals was diverted. A component of the U-Miami innovation to facilitate sustainability was the work contracting with managed Medicaid HMOs, which will help in billing and revenue generation and, ultimately, the sustainability of SBHCs. Through this innovation, U-Miami determined the best way to approach these issues was to contract with a professional HMO consultant who can serve as a liaison with managed Medicaid HMOs and SBHCs. Other initiatives to sustain the innovation centers include the PCMH designation, expansion of the clinic to provide reimbursable care to teachers and staff, and mandatory well-child exams for students entering 6th and 9th grades.

Dental care was the most frequently provided service. In addition, while tracking was difficult due to staff availability and inconsistent tracking methods, anecdotal evidence suggests innovation components were well received by students. However, because of the persistent data-tracking and availability issues, rigorously evaluating the success of the U-Miami innovation will not be feasible.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:

Women and Infants Hospital of Rhode Island

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March 2016

RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in W&I's 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. Table 1 presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

Women and Infants Hospital of Rhode Island (W&I)

1.1 Introduction

The Women & Infants Hospital of Rhode Island (W&I) is a nonprofit acute care hospital in Providence, RI. The W&I Neonatal Intensive Care Unit (NICU) provides state-of-the-art tertiary care to more than 1,200 high-risk infants annually. W&I received an award of $3,261,494 to implement its innovation, Partnering with Parents, through which it is currently working to improve transition to home services for high-risk preterm and full-term infants in Rhode Island, Connecticut, and Massachusetts. The innovation seeks to achieve the following HCIA goals:

1. **Smarter spending.** Reduce health spending for families of high-risk preterm and full-term infants in Rhode Island by 25 percent.

2. **Better care.** Improve care for a diverse population of high-risk preterm and full-term infants and families by ensuring that more than 90 percent receive enhanced transition care education and support in the NICU, during a post-discharge home visit, and in the follow-up clinic, and that more than 90 percent express satisfaction with the innovation. Reduce 30-day readmissions rate by 10 percent, 3-month readmissions rate by 25 percent, and 30-day ED visits by 25 percent.

3. **Healthier people**. Reduce all-cause mortality among medically fragile infants.

Table 2 provides a summary of changes that occurred with W&I during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data submitted by W&I as of May 31, 2015; and key informant interviews with W&I's leaders and staff conducted July 3, 2105 and July 8, 2015.

Table 2 Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	To maximize enrollment, W&I shortened the follow-up time for Partnering with Parents infants and families from 3 months corrected age to 1 month post discharge. The program stopped enrolling late preterm infants at the end of May in preparation for project closeout.
Program Participant Characteristics	All participants (100%) were infants less than 1 year of age; 54.5% were male. More than half (58.3%) were white; 21.9% were Hispanic; and 53.7% were enrolled in Medicaid.
Implementation Process	
Execution	W&I spent 45% of its Year 2 budget, which is below the projected target, as of Q10.
Leadership	There were no changes in leadership from descriptions provided in the first annual report and quarterly reports.[1] W&I had strong innovation and organizational leadership that supported the innovation.

(continued)

Table 2. Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Implementation Process (continued)	
Organizational capacity	There were no changes in organizational capacity since the first annual report. W&I had the organizational capacity necessary to implement the Partnering with Parents innovation.
Innovation adoption and workflow	There were no changes in innovation adoption and workflow since the first annual report. The innovation was adopted as planned by W&I and incorporated into the NICU workflow.
Workforce Development	
Hiring/retention	W&I's innovation was fully staffed in Q10 with 13.25 FTE staff members, and had only one separation and new hire from Q8 to Q10. In June, W&I reported that it retained a small portion of its staff for the no-cost extension period. Several staff members, including the program coordinator, found new jobs.
Training	From Q8 to Q10, W&I provided 384 hours of training to 96 individuals.
Implementation Effectiveness	
Reach	1,250 cumulative participants enrolled; 77.3% of eligible early and moderate preterm infants were enrolled; and 70.7% of eligible late preterm and full-term infants were enrolled.
Dose	Across the four infant groups, nearly all received a post-discharge phone call (98.1–100%); a majority received a 1-month assessment (74.6–90.4%) and a 3-month assessment (68.4–87.8%); and at least 77% of eligible mothers completed the Edinburgh Depression Scale.

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by W&I.
Key informant interviews conducted Feb–June 2015.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

FTE = full-time equivalent; NICU = neonatal intensive care unit; q = quarter; W&I = Women's and Infants.

1.1.1 Innovation Components

The W&I innovation, Partnering with Parents (PWP), is an expansion of the Transition Home Plus (THP) program, offering support to newborns who spend 5 or more days in the NICU and their families. This innovation includes an infant and family intervention consisting of four components: (1) peer support, (2) social worker support, (3) clinical support, and (4) patient navigation. The innovation included community education and engagement efforts that consist of periodic educational workshops with broad stakeholder participation and a health information technology partnership. Since we first presented these components in the first annual report, W&I has not significantly changed hem.[1] However, based on interviews with W&I's leaders and staff, we learned that W&I shortened the follow-up time for PWP infants

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

and families from 3 months corrected age to 1 month post-discharge, and the program stopped enrolling late preterm infants at the end of May in preparation for project closeout.

Since the first annual report, the W&I PWP program reported one new formal partner and two new informal partners. The Massachusetts Welcome Family program is a pilot home visiting program funded by the Massachusetts Department of Health that offers nurse home visits to all parents of newborns residing in several large communities in Massachusetts. This partnership is similar to the Rhode Island First Connections and serves the enrolled infants who live in Massachusetts. PWP program staff will educate families about the Welcome Family Program and facilitate enrollment of eligible families.

Informal partners include a new collaboration to support data analysis in Q9. Kathleen Hawes, PhD, RN, a psychiatric clinical nurse specialist and member of the W&I NICU clinical team, will provide subject matter expertise to the PWP program on perinatal depression and mood disorders, and be involved in the analyses of maternal health risk factors, the Edinburgh Postpartum Depression Scale, and other measures of parental stress. W&I also is in the initial stages of developing a partnership with a community mental health partner, Care New England.

1.1.2 Program Participant Characteristics

Table 3 provides the demographic characteristics of all participants ever enrolled in the innovation. Enrollment increased by 464 infants since first reported by RTI in the Q4 report (data through Q8). The distribution of age, gender, race/ethnicity, and insurance type is similar to that in the Q4 report, the earliest report in which patient characteristics based on secondary data were reported.

As shown in the table, all participants (100%) were infants less than 1 year old and more than half (54.5%) were male. Most participants (58.3%) were white, and approximately 22 percent were Hispanic. A majority (53.7%) were covered by Medicaid, while the rest (46.3%) had private insurance or self-pay.

Table 3. Characteristics of All Participants Ever Enrolled in Innovation through March 2015

Characteristic	Number of Participants	Percentage of Participants
Total	1,250	100.0
Age		
< 18	1,250	100.0
18–24	0	0.0
25–44	0	0.0
45–64	0	0.0
65–74	0	0.0
75–84	0	0.0
85+	0	0.0
Missing	0	0.0

(continued)

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015 (continued)

Characteristic	Number of Participants	Percentage of Participants
Sex		
Female	568	45.4
Male	682	54.6
Missing	0	0.0
Race/ethnicity		
White	728	58.3
Black	127	10.2
Hispanic	274	21.9
Asian	49	3.9
American Indian or Alaska Native	9	0.7
Other	53	4.2
Missing/refused	10	0.8
Payer Category		
Dual	0	0.0
Medicaid	671	53.7
Medicare	0	0.0
Medicare Advantage	0	0.0
Other[1]	579	46.3
Uninsured	0	0.0
Missing	0	0.0

Source: Patient-level data provided to RTI by W&I.
[1] Self pay and private insurance

1.2 Implementation Progress

The first annual report (2014) described W&I's implementation process, workforce development, and progress toward effectiveness and detailed the quantifiable measures to assess each area. ***Table 4*** lists these measures and their status as of May 31, 2015.

This section presents W&I's process measures and a qualitative analysis of the factors that determined W&I's implementation progress. This analysis draws on patient-level data that W&I provided to RTI as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations. ***Table 4*** lists the explanatory measures determined as most relevant for our evaluation, with an indication of the status of the data requested and whether the data are presented in this annual report. The results of analyses for all of these measures are included in this annual report.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation Process	Workflow Integration	HCIA Provider Survey	Collected by RTI
	Provider Satisfaction	HCIA Provider Survey	Collected by RTI
Implementation effectiveness	Reach	Number/percentage of eligible early and moderate preterm infants enrolled in the study	Data received from W&I
		Number/percentage of eligible late preterm and full-term infants who enrolled in the study	Data received from W&I
	Dose	Number of families who received post-discharge phone calls within 24 hours of infants' discharge	Data received from W&I
		Number of nurse practitioner home visits	Data received from W&I
		Number of 1-month follow-up assessments	Data received from W&I
		Number of 3-month follow-up assessments	Data received from W&I
		Number of phone calls with enrolled families during first month after discharge	Data received from W&I
		Number of phone calls with enrolled families during first 3 months after discharge	Data received from W&I
		Number of mothers of enrolled infants screened for clinical depression	Data received from W&I

W&I = Women and Infants Hospital of Rhode Island.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through W&I's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include W&I's reports from Q8 through Q10 and interviews conducted July 3, 2105 and July 8, 2015.

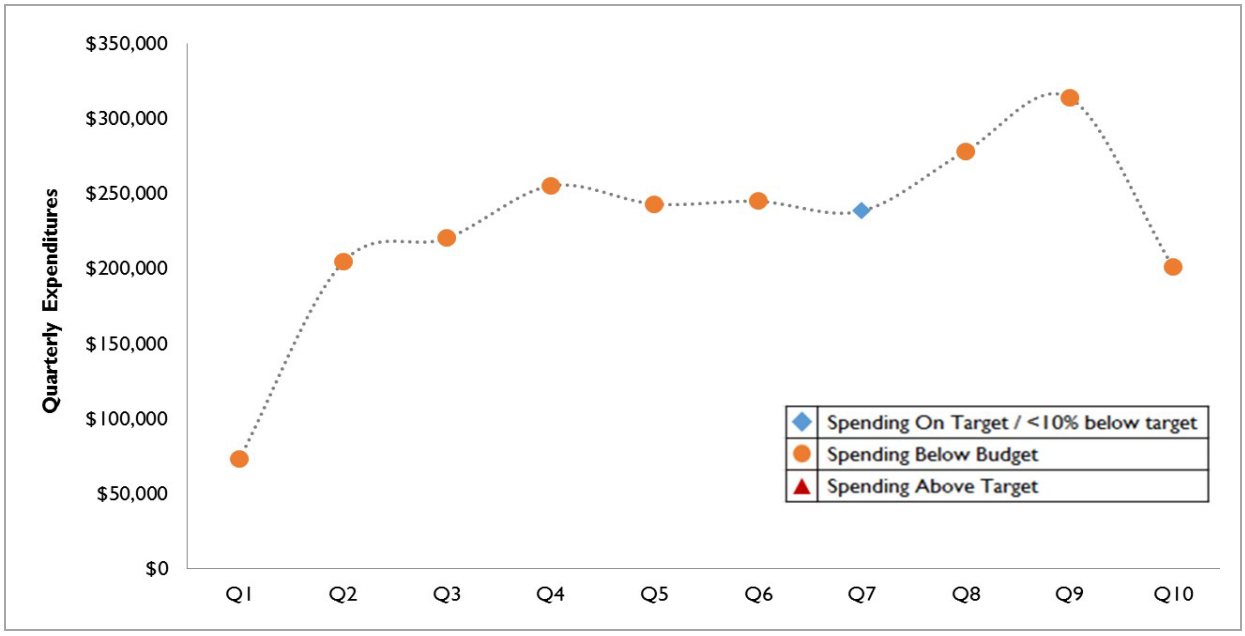
Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?
- How has implementation of the innovation impacted provider workflow?
- How has implementation of the innovation impacted provider satisfaction?

Execution of Implementation

The annual report highlights the significance of W&I's expenditure rates on implementation. As of December 2014 (Q10), W&I spent 45 percent of its Year 3 budget, which is below the projected target. W&I noted in its Q10 *Quarterly Awardee Performance Report* that it experienced difficulties with a new accounts payable system, so not all innovation expenses were invoiced. Invoicing delays contributed to the below-target spend rate.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December, 31, 2014)



Leadership

The PWP leadership and staff have extensive experience implementing different innovations and projects. There is also strong organizational leadership support for this innovation. Senior hospital leadership recognize the value of the innovation and have approached the innovation leaders for their assistance in rolling the PWP program into bundling agreements with payers as the end of the contract approaches.

Organizational Capacity

As noted in the first annual report, the PWP innovation's organizational capacity was strong and remained consistently so in the last year. Based on a number of factors, there was significant organizational capacity and support for this program. These factors included: (1) W&I is a hospital with experience in receiving grants, (2) W&I is affiliated with an academic institution experienced in receiving, supporting, and implementing grants, and (3) PWP is an expansion of an existing program, THP, that serves a smaller pool of medically fragile preterm infants and is currently reimbursed through Medicaid of Rhode Island.

Innovation Adoption and Workflow Integration

Adoption of the PWP innovation and integration into clinical workflow can be spoken about at two levels, internally within the hospital, and external to the hospital with partners, providers, and insurance payers. Internal to the W&I hospital there is NICU staff, who serve as gatekeepers to parents of medically fragile infants in the NICU. To assist them with innovation adoption and integration in their workflow, PWP made strategic hiring decisions that included individuals who had worked in the NICU and would be accepted by the staff there. PWP staff began attending grand rounds in the NICU to introduce themselves and the program to clinical staff, and also established meetings with the NICU social workers and case managers to assist the inpatient teams to provide seamless support to families' transition out of the NICU to home. The PWP innovation also educated NICU staff about the transition to home programs available.

Externally, PWP staff have worked with partners, providers, and insurance payers. W&I works to ensure that all of the infant's primary care providers are aware of what enrollment in the program includes, and encourages collaboration. PWP CurrentCare, Rhode Island's health information exchange, has also been an integral partner and assisted with integrating the innovation with the workflow for the HCIA and NICU clinical staff. When infant are enrolled in the PWP innovation, they may also be enrolled in CurrentCare (64% of enrolled PWP infants are also enrolled in CurrentCare), which provides instant alert to the PWP program when an infant visits the ER or is admitted to the hospital. The family resources specialist (FRS) or independent licensed clinical social worker (ILCSW)) assigned to that infant can reach out to the family to determine the reason for the visit and if any support can be provided. Those infants not enrolled in the CurrentCare program are tracked by 1-month and 3-month assessments, at which the caregivers report outcomes of interest.

Provider Perceptions of Clinical Care Workflow and Satisfaction

Data on workflow integration and provider satisfaction with the innovation came from the RTI HCIA Provider Survey administered in spring 2015. Forty-five (84.9%) of W&I's eligible providers responded to the HCIA Provider Survey. The majority of responding providers were physicians (53.3%). In addition, respondents were nurses (11.1%), nurse practitioners (15.6%), and social workers (8.9%). Responding providers had been in practice an average of 14.6 years. Over half of providers (55.6%) reported working in pediatrics. The full set of survey questions and answers summarized by awardee is available in ***Appendix C***.

For the items about integrating PWP into clinical workflow, provider results were mixed. For two of the 11 measures, the majority of W&I providers indicated that the innovation resulted in no change in the amount of time spent on specific activities, such as providing patient care (55.6%) and looking up patient information in electronic medical records (51.1%). In addition, 48.9 percent indicated no change in the amount of time spent meeting with internal staff (***Table 5***). However, 40 percent indicated they spent less time arranging social service referrals for patients and approximately one-third (31.3%) indicated they spent less time reviewing data on their clinical population.

Table 5. Summary of Clinical Care Workflow

Question	Percentage of W&I Providers Indicating More Time	Percentage of W&I Providers Indicating Less Time	Percentage of W&I Providers Indicating No Change	Percentage of W&I Providers Indicating Not Applicable/ Missing
Providing direct patient care	15.6 N=7	0.0 N=0	55.6 N=25	28.9 N=13
Communicating with patients by phone, e-mail	17.8 N=8	11.1 N=5	33.3 N=15	37.8 N=17
Looking up patient information in EMRs or other health information systems	11.1 N=5	11.1 N=5	51.1 N=23	26.7 N=12
Looking up patient information in paper-based medical charts	6.7 N=3	6.7 N=3	44.4 N=20	42.2 N=19
Arranging clinical referrals and follow-up for patients	13.3 N=6	28.9 N=13	31.1 N=14	26.7 N=12
Arranging social service referrals for patients	8.9 N=4	40.0 N=18	28.9 N=13	22.2 N=10
Meeting with staff and clinicians in my practice	13.3 N=6	4.4 N=2	48.9 N=22	33.3 N=15
Consulting with clinicians outside of my practice	13.3 N=6	6.7 N=3	35.6 N=16	44.4 N=20
Engaging in other care coordination activities	17.8 N=8	31.1 N=14	22.2 N=10	28.9 N=13
Reviewing data on clinic practice population to identify individuals needing additional services	11.1 N=5	20.0 N=9	35.6 N=16	33.3 N=15
Planning practice-based (or community-based) interventions to address issues common to my practice population	15.6 N=7	17.8 N=8	33.3% N=15	33.3 N=15

EMR = electronic medical record.

Regarding overall provider satisfaction, the vast majority of providers were satisfied with PWP. Over half of providers (51.1%) indicated they were very satisfied with the innovation and 37.8 percent indicated they were extremely satisfied. Regarding ease of use, the majority of providers (77.8%) found the innovation very easy to use while 11.1 percent found it somewhat easy to use.

For the specific questions regarding provider satisfaction with PWP, the majority of providers indicated that they strongly or somewhat agreed with five of the seven measures (***Table 6***). Most notably, providers agreed that investing in the innovation was worthwhile (88.9%) that their practice functioned more efficiently with the innovation (75.6%), and sufficient resources had been provided to implement the innovation (64.4%). The majority of providers (64.4%) also strongly or somewhat disagreed that the added logistics PWP required were burdensome.

Table 6. Summary of Provider Satisfaction Measures

Question	Percentage of W&I Providers Indicating Strongly Agree/ Somewhat Agree	Percentage of W&I Providers Indicating Strongly Disagree/ Somewhat Disagree	Percentage of W&I Providers Indicating Neither Agree nor Disagree	Percentage of W&I Providers Indicating Not Applicable/ Missing
Sufficient resources (e.g., support staff, time, training) have been provided for me to use/interact the innovation.	64.4 N=29	6.7 N=3	8.9 N=4	20.0 N=9
Innovation produces financial benefits for my clinic or practice.	42.2 N=19	2.2 N=1	17.8 N=8	37.8 N=17
Investing in the innovation is worthwhile in terms of time, energy, and resources.	88.9 N=40	4.4 N=2	0.0 N=0	6.7 N=3
Sufficient technical support is available to operate the innovation.	20.0 N=9	8.9 N=4	15.6 N=7	55.6 N=25
Overall, my practice functions more efficiently with the innovation.	75.6 N=34	4.4 N=2	4.4 N=2	15.6 N=7
Innovation saves me time.	51.1 N=23	4.4 N=2	20.0 N=9	24.4 N=11
The added logistics required by the innovation is a burden on me and/or my staff.	6.7 N=3	64.4 N=29	6.7 N=3	22.2 N=10

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care of by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with 13.25 full-time equivalent (FTE) staff members. Between Q8 (June, 2014) and Q10 there was one separation and one new hire. In June, W&I reported that it retained a small portion of staff for the no-cost extension period, while several staff members, including the program coordinator, found new jobs. However, throughout the course of the innovation, very few separations occurred. The challenge to hiring could also be the reason

for successful retention because the qualifications for the FRS role are highly specific. W&I uses The Rhode Island Parent Information Network (RIPIN), a nonprofit agency that directly links parents, children, and individuals with special health care needs to health care and education.[2] W&I has contracted RIPIN to hire and train personnel for FRS positions; RIPIN specializes in hiring parents who can mentor and support other parents with whom they share a similar experience. For the W&I PWP program, an FRS must be a former parent of a child in the NICU, be able to maintain good boundaries with the enrolled families, and know how to practice self-care. These requirements result in a small, unique pool of individuals who, once hired, are well qualified to succeed in the job.

Skills, Knowledge, and Training

Between Q8 and Q10 W&I provided 384 hours of training to 96 individuals in a 4-hour community partner workshop. All training for the FRSs is developed and conducted by RIPIN. RIPIN's trainings are staggered throughout the year so they can accommodate employees' work schedules.

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach) and (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

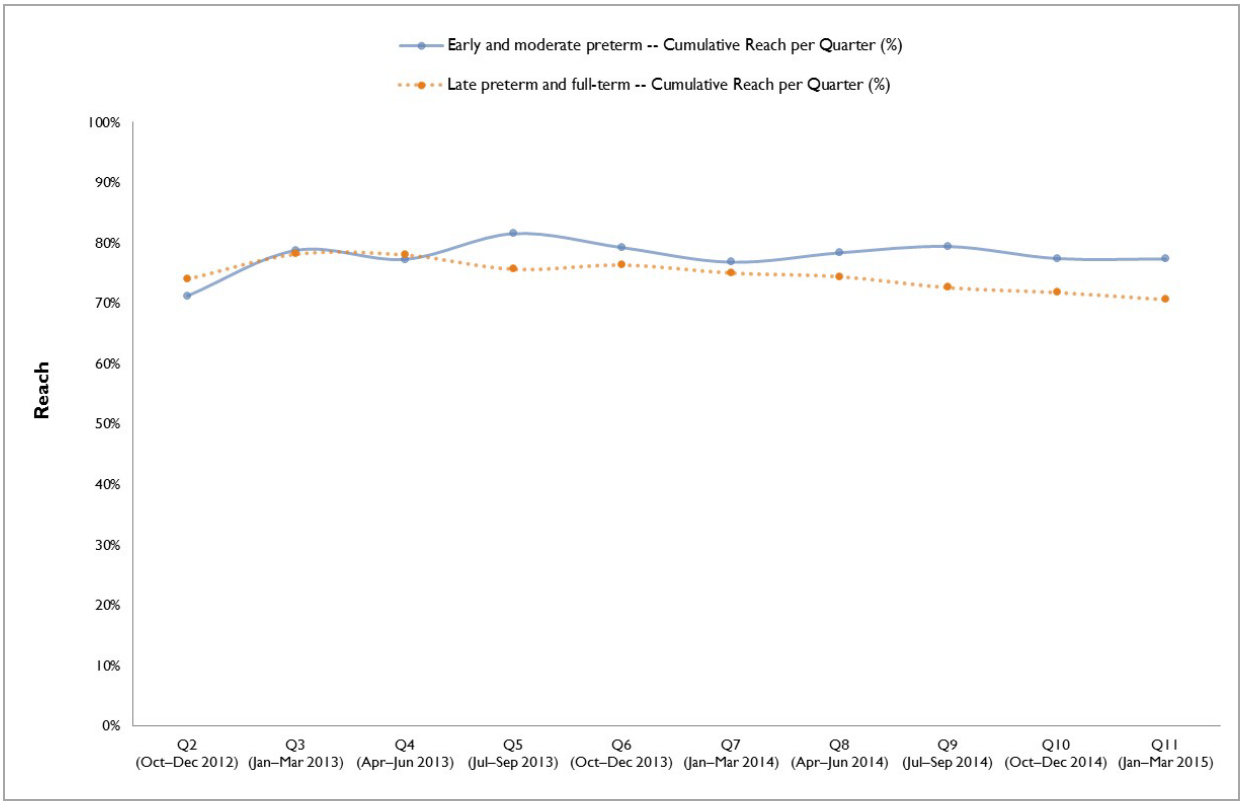
Reach

W&I is working to reach early, moderate, late preterm and full-term infants residing in Rhode Island, Connecticut, and Massachusetts who spend 5 or more days in the W&I or Kent Hospital NICU. ***Figure 2*** shows reach by quarter since the launch of the innovation. We first reported reach in the Q4 report, based on data through Q8. Since that time, the awardee enrolled an additional 464 patients in the innovation. Reach, defined as the proportion of eligible infants in a quarter who are enrolled in the innovation, remained fairly steady over time, ranging from 71.3 percent in Q2 to 81.5 percent in Q5 for early preterm and moderate preterm infants, and ranging from 74.1 percent in Q2 to 78.2 percent in Q3 for late preterm and full-term infants. Reach through Q11 is 77.3 percent for early and moderate preterm infants and 70.7 percent for late and full-term infants.

[2] Rhode Island Parent Information Network. N.p., n.d. Accessed 14 July 2015. www.ripin.org

Although W&I has a fairly high overall reach within its eligible population, enrollment numbers are below those projected at the time of the application. A decrease in the number of all infants eligible for enrollment is thought to be due to a decrease in overall birth rates and NICU admissions. This decreasing birth rate that is part of a national trend.

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch



	Quarter	Q2 (Oct–Dec 2012)	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan–Mar 2015)
●	Early and moderate preterm—Cumulative reach per quarter (%)	71.3	78.8	77.3	81.5	79.2	76.8	78.4	79.4	77.4	77.3
	Early and moderate preterm—Cumulative # enrolled	57	104	143	190	225	275	344	405	456	512
●	Late preterm and full-term—Cumulative reach per quarter (%)	74.1	78.2	78.0	75.7	76.4	75.1	74.5	72.6	71.8	70.7
	Late preterm and full-term—Cumulative # enrolled	40	86	135	196	278	346	443	543	648	738

Dose

Tables 7, 8, 9, and ***10*** detail the number of services provided across participants, the number and percentage of participants receiving services, and the average number of services per participant, by each enrollment group through Q11. Many of the services are not appropriate for or offered to all participants. Therefore, in each table the number of participants eligible to receive each service (i.e., the denominator) varies based on the PWP protocol, which outlines the services to be provided to each infant group and the target timeframe for providing those services. Data for the 1-month assessment and phone calls include only participants enrolled by January 31, 2015 to ensure adequate time for those services to be provided as outlined in the PWP protocol. Similarly, data for the 3-month assessment and phone calls include only participants who were enrolled in the program by November 30, 2014. Finally, administration of the Edinburgh Depression scale is assessed only for mothers of infants who were enrolled by November 30, 2014.

We first reported dose in the Q4 quarterly report, based on data through Q8. The average number of services per patient through Q11 has remained consistent since we began reporting dose over the last several quarters. As shown in the tables, most services were provided to the majority of participants in the respective enrollment group. In the early preterm participant group, at least 81 percent of participants received the services for which they were eligible. That number declined slightly in the moderate preterm participant group where at least 78 percent of infants received services for which they were eligible. In the late preterm and full-term participant groups, 73 percent and 68 percent of participants, respectively, received services for which they are eligible.

Table 7. Number and Types of Services Provided to Early Preterm Participants through Q11

Services	Number of Services Provided Across Preterm Patients	Number (Percentage) of Preterm Participants Receiving Service	Average Number of Services per Preterm Participant
Receive 1-month assessment	255	255 (90.4)[1]	1
Receive 3-month assessment	224	224 (87.8)[2]	1
Complete Edinburgh Depression Scale	198	198 (90.0)[3]	1
Receive additional calls during first month after discharge	560	231 (81.9)[1]	1.99
Receive additional calls during 3 months after discharge	836	225 (88.2)[2]	3.28
Receive a post-discharge phone call	295	295 (98.7)[4]	1
Receive a nurse practitioner home visit	251	251 (94.4)[5]	1

Source: Patient-level data provided to RTI by W&I.

[1] Denominator is 282. This denominator includes only participants enrolled by January 31, 2015.

[2] Denominator is 255. This denominator includes only participants enrolled by November, 30, 2014.

[3] Denominator is 220. This denominator includes all of the mothers of infants in this enrollment group, and only those whose infants were enrolled in the program by November, 30, 2014.

[4] Denominator is 299. This denominator includes all participants enrolled through March 31, 2015.

[5] Denominator is 266. This denominator includes only participants who live in Rhode Island and are enrolled through March 31, 2015.

Table 8. Number and Types of Services Provided to Moderate Preterm Participants through Q11

Services	Number of Services Provided Across Preterm Patients	Number (Percentage) of Preterm Participants Receiving Service	Average Number of Services per Preterm Participant
Receive 1-month assessment	175	175 (88.8)[1]	1
Receive 3-month assessment	150	150 (84.3)[2]	1
Complete Edinburgh Depression Scale	125	125 (86.2)[3]	1
Receive additional calls during first month after discharge	390	154 (78.2)[1]	1.98
Receive additional calls during 3 months after discharge	588	153 (86.0)[2]	3.30
Receive a post-discharge phone call	214	214 (100.0)[4]	1
Receive a nurse practitioner home visit	161	161 (89.4)[5]	1

Source: Patient-level data provided to RTI by W&I.
[1] Denominator is 197. This denominator includes only participants enrolled by January 31, 2015.
[2] Denominator is 178. This denominator includes only participants enrolled by November, 30, 2014.
[3] Denominator is 145. This denominator includes all of the mothers of infants in this enrollment group, and only those whose infants were enrolled in the program by November, 30, 2014.
[4] Denominator is 214. This denominator includes all participants enrolled through March 31, 2015.
[5] Denominator is 180. This denominator includes only participants who live in Rhode Island and are enrolled through March 31, 2015.

Table 9. Number and Types of Services Provided to Late Preterm Participants through Q11

Services	Number of Services Provided Across Preterm Patients	Number (Percentage) of Preterm Participants Receiving Service	Average Number of Services per Preterm Participant
Receive 1-month assessment	365	365 (83.0)[1]	1
Receive 3-month assessment	298	298 (73.2)[2]	1
Complete Edinburgh Depression Scale	279	279 (81.3)[3]	1
Receive additional calls during first month after discharge	710	378 (85.9)[1]	1.61
Receive additional calls during 3 months after discharge	1,284	395 (97.1)[2]	3.15
Receive a post-discharge phone call	473	473 (99.4)[4]	1
Receive a nurse practitioner home visit	NP	NP	NP

Source: Patient-level data provided to RTI by W&I.
[1] Denominator is 440. This denominator includes only participants enrolled by January 31, 2015.
[2] Denominator is 407. This denominator includes only participants enrolled by November, 30, 2014.
[3] Denominator is 343. This denominator includes all of the mothers of infants in this enrollment group, and only those whose infants were enrolled in the program by November, 30, 2014.
[4] Denominator is 476. This denominator includes all participants enrolled through March 31, 2015.
NP = This service was not part of the protocol for this participant group.

Table 10. Number and Types of Services Provided to Full-Term Participants through Q11

Services	Number of Services Provided Across Preterm Patients	Number (Percentage) of Preterm Participants Receiving Service	Average Number of Services per Preterm Participant
Receive 1-month assessment	178	178 (74.5)[1]	1
Receive 3-month assessment	147	147 (68.7)[2]	1
Complete Edinburgh Depression Scale	163	163 (77.6)[3]	1
Receive additional calls during first month after discharge	419	203 (84.9)[1]	1.75
Receive additional calls during 3 months after discharge	703	198 (92.5)[2]	3.29
Receive a post-discharge phone call	256	256 (98.1)[4]	1
Receive a nurse practitioner home visit	NP	NP	NP

Source: Patient-level data provided to RTI by W&I.
[1] Denominator is 240. This denominator includes only participants enrolled by January 31, 2015.
[2] Denominator is 215. This denominator includes only participants enrolled by November, 30, 2014.
[3] Denominator is 210. This denominator includes all of the mothers of infants in this enrollment group, and only those whose infants were enrolled in the program by November, 30, 2014.
[4] Denominator is 262. This denominator includes all participants enrolled through March 31, 2015.
NP = This service was not part of the protocol for this participant group.

Sustainability

W&I has put significant effort toward the sustainability of the PWP program during Year 3. Due to strong support by the hospital, external partners, and payers, there is no dissent on whether or not this innovation should continue; the challenge lies in where to get the funding. Innovation leaders have reached out to private partners (March of Dimes), funders (Care New England, Blue Cross) and government (State of Rhode Island). W&I and innovation leaders are attempting to fit PWP into the new ACO model with W&I's biggest private payer, Blue Cross, as well as negotiate with Rhode Island Medicaid for an extension on the contract for the Transition Home Plus (THP) program (which currently on serves infants born less than 1500g) to include the infants born weighting more than 1500g.

These efforts have been challenged by the fact that the timelines (the negotiations vs. the end of CMS funding) are not aligning, and hospital negotiations are a complicated process that involve multiple programs and services that are all negotiated at the same time. Thus, the PWP program will cease on September 30, 2015.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of W&I's innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data W&I collects and submits to RTI (that we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures RTI considers essential to the

evaluation of W&I's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported vary by awardee. As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 11 lists the claims-based outcome measures determined by the Center for Medicare & Medicaid Innovation as most relevant for the HCIA evaluation, with an indication of the status of the data requested and whether the data are presented in this annual report.

Table 11. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	No	No
		Hospital unplanned readmissions rate	No	No
		ED visit rate	No	No
	Cost	Spending per patient	No	No
		Estimated cost savings	No	No

ED = emergency department.

W&I uses the state health information exchange, Current Care, and parents' self-reports to obtain data on ED visits and hospital admissions for program participants. The W&I innovation can be evaluated to some degree with outcome data received directly from the awardee. At this time, however, the Centers for Medicare & Medicaid Services Alpha-MAX data files are not available for the period after the innovation was launched. Thus, we do not yet have Medicaid data to validate outcome data provided by W&I. We will provide Medicaid analyses in subsequent reports as more data become available. In addition to the Alpha-MAX data, we are seeking a data reuse agreement with Rhode Island that would allow us to access Rhode Island Medicaid data that RTI obtained for another project. Because Medicare rarely covers newborns, we do not expect to perform Medicare claims analyses for this innovation.

1.3.2 Claims Data

In future reports, this section will describe the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization when claims data become available.

Development of Comparison Groups

We will use propensity score matching to identify infants with similar characteristics as W&I participants to serve as a comparison group for the innovation participants. Virtually all high-risk infants

born in Rhode Island are treated in one of the two participating hospitals. Consequently, we cannot compare outcomes of W&I with other in-state hospitals in the period after W&I launched its innovation.

We propose a before-and-after analysis in the state of Rhode Island. Prior to the innovation, W&I treated high-risk infants through a similar program, Transition Home Plus. Babies were identified through provider identification codes, NICU code, and diagnostic codes. The PWP innovation expanded the Transition Home Plus program to less high-risk babies, where risk is denoted by weight at birth and level of prematurity. In this instance, a before-and-after analysis is challenging but still possible by comparing the outcomes, by levels of risk, of all babies in-state who spent 5 or more days in the NICU before and after the intervention, controlling for the hospital they attended.

1.3.3 Other Awardee-Specific Data

Table 12 lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. We received patient-level data from W&I used to generate each measure listed in Tables 4 and 12 for each quarter through Q11 (March 31, 2015).

Table 12. Awardee-Specific Outcome Measures

Evaluation Domains	Subdomains	Measure	Status
Clinical effectiveness	Patient Care	HCIA Provider Survey	Collected by RTI
Health outcomes	Mortality	Participant all-cause mortality rate	Data received from W&I
Health care outcomes	Utilization	Hospital readmission rate	Data received from W&I
		ED visit rate	Data received from W&I

ED = emergency department; W&I = Women and Infants Hospital of Rhode Island.

Clinical Effectiveness

Evaluation Question

- How has implementation of the innovation impacted provider perceptions of patient care?

Data on the impact on patient care came from the HCIA Provider Survey. The majority of providers (80.0%) indicated that PWP had an impact on patient care. Of those who indicated that the innovation had an impact on patient care, almost all providers (91.7%) found that impact to be very positive.

Table 13 shows that providers' views on the specific impacts of PWP on patient care were generally very positive. The majority of providers either strongly or somewhat agreed that the innovation was beneficial for patients (84.4%), improved perceived patient satisfaction with care (77.8%), improved patient access to care (77.8%), helps provide better care (71.1%), and led to more effective

communication with patients (71.1%). In addition, 84.4 percent of providers agreed that, among patients aware of the innovation, the majority would say it has been beneficial in the care they receive.

Table 13. Summary of Perceptions Regarding the Impact on Patient Care

Question	Percentage of W&I Providers Indicating Strongly Agree/ Somewhat Agree	Percentage of W&I Providers Indicating Strongly Disagree/ Somewhat Disagree	Percentage of W&I Providers Indicating Neither Agree nor Disagree	Percentage of W&I Providers Indicating Not Applicable/ Missing
Innovation helps provide better patient care.	71.1 N=32	6.7 N=3	4.4 N=2	17.8 N=8
Innovation leads to more effective communication during patient visits.	71.1 N=32	0.0 N=0	2.2 N=1	26.7 N=12
Innovation has improved my patients' access to care.	77.8 N=35	2.2 N=1	6.7 N=3	13.3 N=6
Innovation has increased the time I am able to spend with patients during office visits.	31.1 N=14	2.2 N=1	2.2 N=1	64.4 N=29
Innovation helps me develop good relationships with my patients.	53.3 N=24	4.4 N=2	11.1 N=5	31.1 N=14
Innovation has improved perceived patient satisfaction with care.	77.8 N=35	4.4 N=2	6.7 N=3	11.1 N=5
Innovation has been beneficial for patients in my practice.	84.4 N=38	2.2 N=1	4.4 N=2	8.9 N=4
Among my patients that are aware of Innovation, the majority of patients would say it has been beneficial in the care they receive.	84.4 N=38	2.2 N=1	4.4 N=2	8.9 N=4
Among my patients that are not aware of Innovation, if I told them about it, the majority of patients would say it has been beneficial in the care they receive.	71.1 N=32	2.2 N=1	11.1 N=5	15.6 N=7

Health Outcomes

Evaluation Questions

- Have unplanned readmissions decreased for those participating in the Partnering with Parents program?
- Have ED visits decreased for those participating in the Partnering with Parents program?
- Has mortality rate decreased below expected levels for those participating in the Partnering with Parents program?

ED visits, unplanned hospital admissions, and mortality are the major outcomes for this innovation, and we examined these outcomes for all infants in the W&I PWP program. The following run charts take into account rolling enrollment.

Figure 3 displays the ED visit rate (per 1,000) by enrollment group. The rates for the early and moderate preterm enrollment groups ranged from a low of 103 ED visits for every 1,000 patients enrolled in Q4, to 507 ED visits for every 1,000 patients enrolled in Q8. In Q11 the ED visit rate was 143 per 1,000 early and moderate preterm patients enrolled. For the late preterm and full-term enrollment group, the ED visit rate ranged from a low of 143 ED visits for every 1,000 patients enrolled in Q4 to 400 ED visits for every 1,000 patients enrolled in in Q2. In Q11 the ED visit rate was 187 per 1,000 late preterm and full-term patients enrolled in the innovation.

Figure 3. Hospital ED Visit Rate (per 1,000) by Enrollment Group

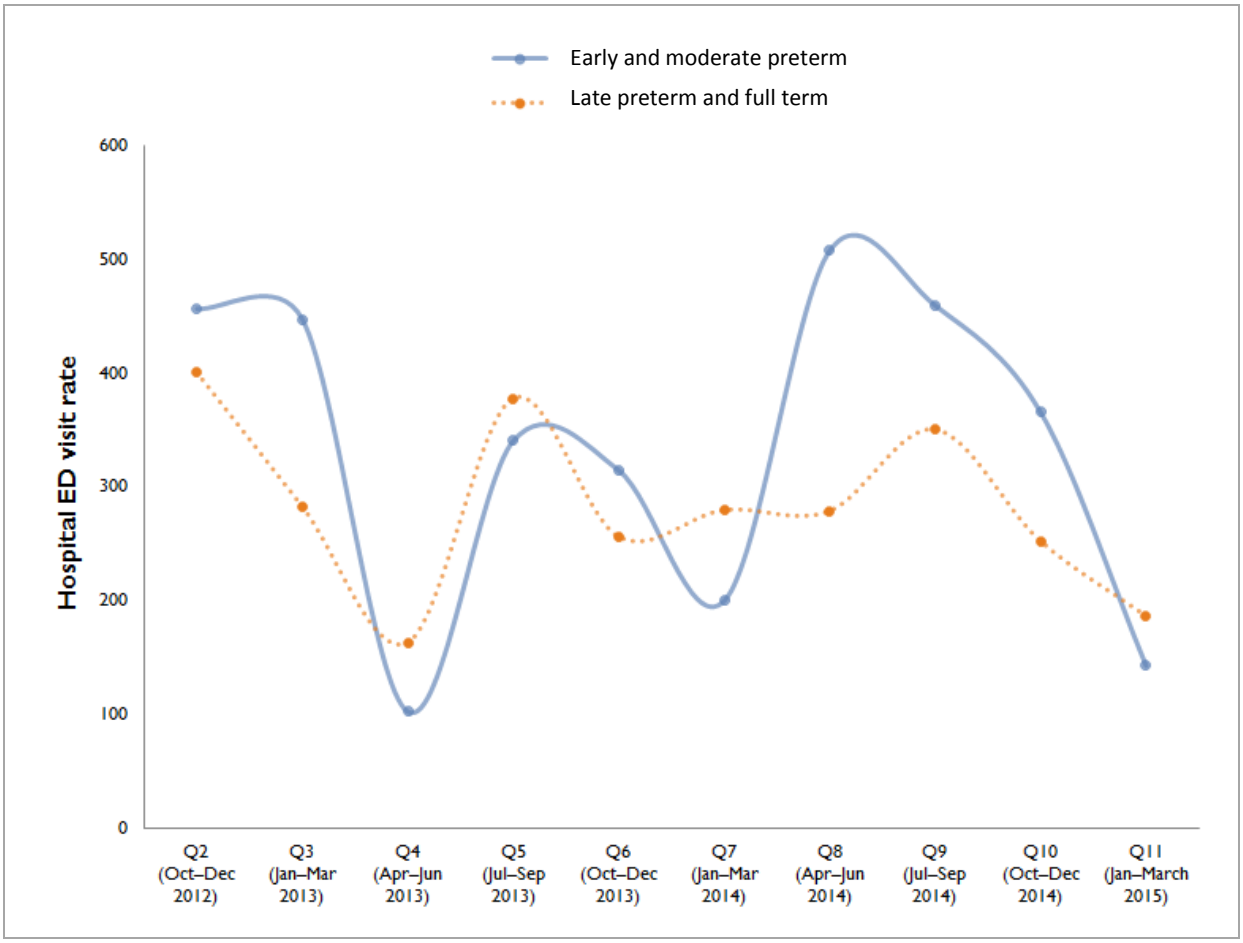


Figure 4 displays the unplanned hospitalization rate (per 1,000) by enrollment group. The rates for the early and moderate preterm enrollment groups ranged from a low of 26 unplanned hospitalizations for every 1,000 patients enrolled in Q4 to 245 unplanned hospitalizations for every 1,000 patients enrolled in Q2. In Q11 the unplanned hospitalization rate was 54 per 1,000 early and moderate preterm patients enrolled. For the late preterm and full-term enrollment group, the unplanned hospitalization rate ranged from a low of 43 unplanned hospitalizations for every 1,000 patients enrolled in in Q3 to 150 unplanned hospitalizations for every 1,000 patients enrolled in Q2. In Q11 the unplanned hospitalization rate was 55 per 1,000 late preterm and full-term patients enrolled in the innovation.

Figure 4. Hospital Unplanned Readmissions Rate (per 1,000) by Enrollment Group

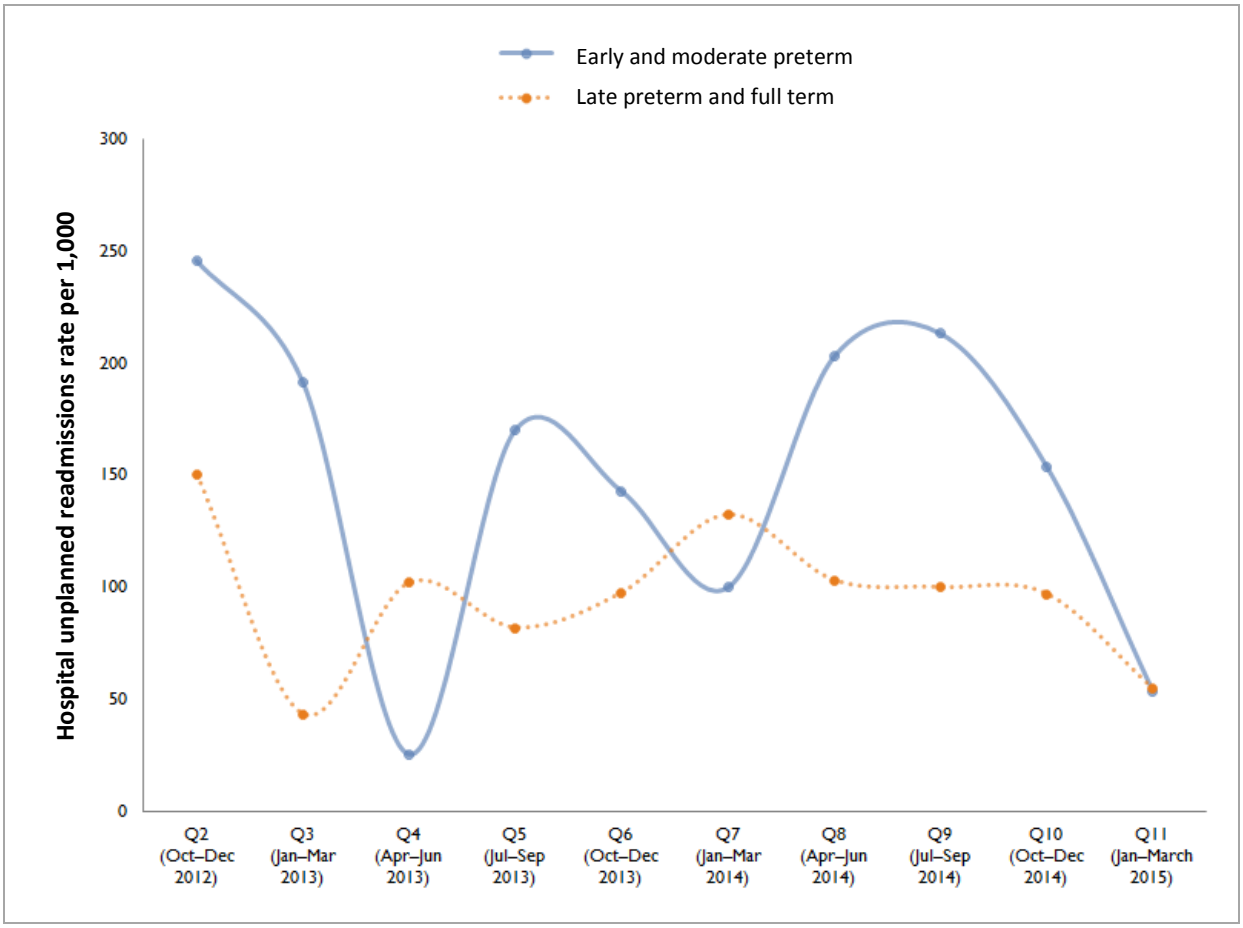
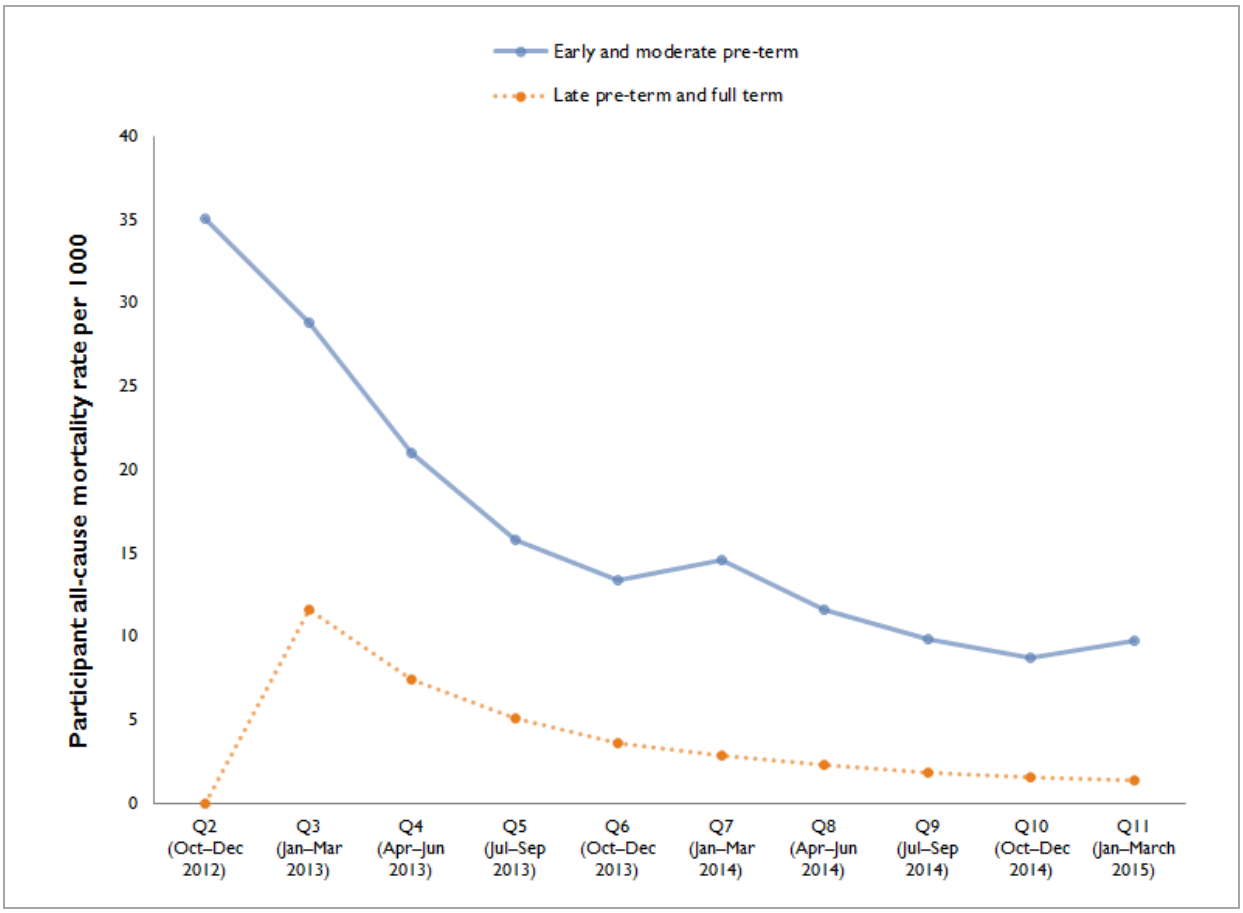


Figure 5 displays cumulative mortality rates (per 1,000) for all enrollment groups. According to the U.S. Department of Health and Human Services in the 2013 *Child Health USA 2013*[3] report, the overall infant mortality rate in 2011 was 6.05 per 1,000. The mortality rate for the early and moderate preterm infants exceeded the national 2011 rate in each of the quarters of the innovation; however, the rate for late preterm and full-term infants dropped and stayed below that rate as of Q5.

[3] U.S. Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau. *Child Health USA 2013.* Rockville, Maryland: U.S. Department of Health and Human Services, 2013.

Figure 5. Mortality Rate (per 1,000) by Enrollment Group



Discussion of Other Awardee-Specific Findings

Overall, W&I providers were satisfied with the innovation based on the findings from the provider survey. Not only did providers agree that investing in PWP was worthwhile, but they also felt that that their practice functioned more efficiently with the innovation. In addition, providers overwhelming viewed the innovation as beneficial for their patients. The high levels of provider support and engagement observed among W&I providers may be critical in both the successful implementation of the innovation as well as efforts to sustain PWP in the future.

W&I is focused on decreasing the number of unplanned hospital admissions, ED visits, and mortality among its target population. Rates of unplanned hospital admissions and ED visits varied by infant group: early and moderate preterm infants had the highest overall rates of both unplanned hospital admissions and ED visits. Participants cited widely varying reasons for ED visits during their enrollment in the PWP program: the majority of visits were for respiratory issues (40.7%). Other major issues included gastrointestinal problems (22.5%) and infection and fever (13.3%). The patterns of hospital ED visits and unplanned hospital admissions fluctuate, and there is no clear trend that can be attributed to the innovation. Potential reasons could include: (1) the sample size was relatively small or (2) FRSs and social workers delivering the protocol may be refining their delivery of services for the innovation over

time, thus focusing more on preventing readmissions and ED visits. Another reason for fluctuating patterns could be that the innovation is enrolling fewer medically fragile infants (more prone to ED visits or readmissions) in later quarters. Other than a possible seasonal pattern, no clear trend in the data is detected that can be attributed to the intervention.

The all-cause mortality rate for all enrollment groups exceeded the national 2011 rate. The rate for early and moderate preterm infants exceeded the rate throughout the innovation, while the rate for late preterm and full-term infants dropped and stayed below that rate as of Q5. A criteria for inclusion in this innovation is a minimum 5-day stay in the NICU following birth—so all infants included in this innovation are medically fragile to some degree, which contributes to the higher than average mortality rates.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing W&I as well as accomplishments to date. In this section we assess W&I progress on achieving HCIA goals to date:

- **Smarter spending.** RTI is unable to evaluate this goal because Medicaid data for W&I are not available for this report.

- **Better care.** RTI received secondary data from W&I for hospital readmissions and ED visits. The rates fluctuate over time in a similar pattern, likely because ED visits may lead to unplanned hospital readmissions. Both readmission and ED visits rates do decline starting around Q9. This decline could occur because the FRSs and social workers delivering the protocol are improving their delivery of the innovation over time, thus refining the intervention to focus on preventing readmissions and ED visits. Another reason could be that the innovation is enrolling fewer medically fragile infants (more prone to ED visits or readmissions) in later quarters. As claims data become available for W&I, we can explore these trends further with comparison groups.

  The W&I PWP has an overall reach of 73.2 percent; enrollment group-specific reaches of 77.3 percent for early preterm and moderate preterm infants; and a cumulative reach of 70.7 percent for late preterm and full-term infants. W&I PWP maintained an overall quarterly reach of 67 percent or higher since the innovation's beginning. Across the four infant groups, the W&I PWP program provided consistently high levels of dose to enrollees throughout the innovation. Nearly all enrollees received a post-discharge phone call, and the majority received a 1-month assessment and a 3-month assessment. Three-quarters of eligible mothers completed the Edinburgh Depression Scale.

- **Healthier people**. Mortality rates (per 1,000) for late and full-term infants were below the national rate; six infants died following their enrollment in the innovation. Whether the innovation itself is impacting mortality rates is difficult to ascertain without a control group because many other factors influence mortality unrelated to the innovation.

W&I implemented the PWP innovation as planned and even extended services to high-risk preterm and full-term infants in Connecticut and Massachusetts. W&I is exploring several options for sustaining the innovation, including incorporating it into the new ACO model with W&I's biggest private payer, Blue Cross. However, efforts to sustain the program through contracts with payers are part of larger hospital negotiation processes that involve multiple programs and services, and the timing of

hospital negotiations is not aligned with timeline for innovation closeout. Thus, the innovation is unlikely to transition seamlessly from CMS to other funding sources; current staff expect a gap in services.

Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring, Annual Report 2015

Awardee-Level Findings:
YMCA of the USA

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March 2016

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RTI Project Number 0212790.010.001.004
Contract HHSM-500-2010-00021I
Order HHS-500-T0010

RTI INTERNATIONAL

Overall Evaluation Summary

RTI International was selected to lead an independent evaluation of the 24 Health Care Innovation Award (HCIA) awardees categorized as Community Resource Planning, Prevention, and Monitoring (Community Resource). In this role, RTI is responsible for an in-depth evaluation of each innovation, as well as a cross-site evaluation that includes similar innovations targeting the same priority outcomes (e.g., emergency department [ED] visits). The evaluation methods vary by awardee innovation and are tailored to the type of innovation and availability of data. RTI's annual reporting includes a review, coding, and analysis of each awardee's *Narrative Progress Reports* and the *Quarterly Awardee Performance Reports*. In addition, RTI collected qualitative data through virtual site visits and end-of-year interviews in the 11th and 12th quarters of operations. Each awardee's report incorporates this knowledge.

RTI presents claims-based data analyses for those awardees that provide patient identifiers for enrolled participants who are Medicare and/or Medicaid beneficiaries. To date, RTI obtained patient or provider identifiers for 23 of the 24 awardees. This report also presents secondary data received directly from awardees that quantify the impact of the innovation on clinical effectiveness and health outcomes. ***Table 1*** presents the reporting periods for each of the data sources.

Table 1. Reporting Periods for Second Annual Report

Data Source	Period Covered
Awardee Narrative Progress Report	Q8–Q10 (June–December 2014)
Quarterly Awardee Performance Report	Q8–Q10 (June–December 2014)
Key informant interviews	February–June 2015
Medicare	Launch date–December 2014
Medicaid	Launch date–December 2014
Awardee-specific data	Launch date–March 2015

YMCA of the USA (Y-USA)

1.1 Introduction

The YMCA of the USA (Y-USA), a nonprofit community-based organization headquartered in Chicago, received an award of $11,885,134 to expand a prevention program for prediabetic beneficiaries n 17 participating YMCAs across the nation. Y-USA began enrolling participants on February 15, 2013. The innovation seeks to achieve the following HCIA goals:

1. **Smarter spending.** Reduce health care expenditures by $1.8 million by June 2015. This goal was revised from a previous target of $4.2 million.

2. **Better care.** Improve care through diabetes-related preventive services in at least 500 community- and primary care-based settings by offering a diabetes prevention program (DPP) in community or clinical settings.

3. **Healthier people.** Achieve better health through changes in nutrition and physical activity, resulting in at least 5 percent weight loss, and reduced risks for diabetes, hypertension, and hypercholesterolemia for at least 50 percent of the 10,000 expected Medicare participants.

Table 2 provides a summary of changes that occurred with Y-USA during the third year of operations. These updates are based on a review of the Q8 to Q10 *Narrative Progress Reports, Quarterly Awardee Performance Reports*; secondary data submitted by Y-USA through March 31, 2015; and key informant interviews with Y-USA's leaders and staff conducted on June 8, 2015.

Table 2 Summary of Updates through June 2015

Evaluation Domains and Subdomains	Updated Information through 6/2015
Innovation Components	Implemented diverse recruitment strategies to increase participant enrollment.
Program Participant Characteristics	Majority (66.7%) of participants were from 65 to 74 years of age; 61.0% were female and 100% were covered by Medicare.
Implementation Process	
Execution	Expended 31.3% of budget by the end of Q10, which is below target.
	Implemented final "surge" of recruitment efforts. Some of these efforts were not fully implemented because of administrative delays in obtaining approval of carry-forward funds.
	Launched One Million More campaign in November to encourage 1 million people in the United States to complete a diabetes risk test. The campaign was a Y-USA campaign that was not funded by the HCIA project; however, the hope was that enrollment in the initiative would increase due to the campaign.

(continued)

Table 2 Summary of Updates through June 2015 (continued)

Evaluation Domains and Subdomains	Updated Information through 6/2015
Implementation Process (continued)	
Leadership	Y-USA leadership remains committed to the innovation.
Organizational capacity	Networking by Y-USA leadership with partner organizations vested in this area of work resulted in Y-USA's involvement in a study of competencies needed by CHWs.
Innovation adoption and workflow	Applied for CPT code to facilitate sustainability of the innovation.
Workforce Development	
Hiring/retention	No new hires or separations occurred between Q8 and Q10.
	In Q9, 1.5 FTE reduction from Q8, representing 0.5 FTE short of full staffing. As of Q10, at projection with 2.85 FTEs, 0.35 higher than Q9.
Training	Between Q8 and Q10, innovation had 1,726 new trainees, for a cumulative total of 2,992 (since inception).
Implementation Effectiveness	
Reach	1,968 new participants enrolled (5,696 cumulative total enrolled); 82.9% of participants recruited enrolled.
Dose	37.5% of participants completed between 9 and 16 sessions, 25.4% completed 17 or more sessions, and 37% completed fewer than 9 sessions.

Source: Q8-*Q10 Narrative Progress Report*.
Q8-*Q10 Quarterly Awardee Performance Report*.
Patient-level data provided to RTI by Y-USA.
Key informant interviews conducted Feb–June 2015.
CPT = current procedural terminology; CHW = community health worker; FTE = full-time equivalent.

1.1.1 Innovation Components

The HCIA innovation at Y-USA implements the national Diabetes Prevention Program Lifestyle intervention [also referred to as the Diabetes Prevention Program (DPP)] in 17 YMCA facilities across the country. For HCIA, the innovation expands the DPP to prediabetic Medicare beneficiaries. The Y-USA innovation includes two program components: hiring and training YMCA lifestyle coaches to teach the program's curricula, and conducting community-based trainings among eligible participants. The overarching goals of Y-USA's HCIA innovation are to get participants to lose 5 percent or more of their body weight and gradually increase their physical activity to 150 minutes per week.

No changes were made to these components since their initial presentation in the first annual report.[1] However, Y-USA took significant steps to increase recruitment of participants into the innovation. We describe these efforts in detail in ***Section 1.2.1***. The partners for this innovation have remained unchanged and include the Diabetes Prevention and Control Alliance (a subsidiary of United Health Group's Optum Solutions), seven national nonprofits, and 17 local YMCAs.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

1.1.2 Program Participant Characteristics

Table 3 provides the demographic characteristics of all participants ever enrolled in the innovation. We first reported patient demographic characteristics in the Q6 report, based on data through Q10. The distribution of patient characteristics is similar to that in the Q6 report. More specifically, the majority of participants (66.7%) were between 65 and 74 years of age at enrollment, and more than half (61.0%) were female. Less than half of participants (41.4%) were white, 7.6 percent were black, 1.8 percent were Hispanic, 48.5 percent were missing race/ethnicity, and the remaining 0.7 percent were Asian, American Indian/Alaska Native, or Native Hawaiian or other Pacific Islander. One hundred percent of enrollees were covered by either Medicare or Medicare Advantage.

Table 3. Characteristics of All Participants Ever Enrolled in the Innovation through March 2015

Characteristic	Number of Participants	Percentage of Participants
Total	5,696	100
Age		
< 18	0	0.0
19–24	1	0.0
25–44	9	0.2
45–64	171	3.0
65–74	3,799	66.7
75–84	831	14.6
85+	885	15.5
Missing	0	0.0
Sex		
Female	3,478	61.0
Male	1,399	24.6
Missing	819	14.4
Race/ethnicity		
White	2,361	41.4
Black	432	7.6
Hispanic	101	1.8
Asian	20	0.4
American Indian or Alaska Native	12	0.2
Native Hawaiian or Other Pacific Islander	5	0.1
Other	0	0.0
Missing/refused	2,765	48.5
Payer category		
Dual	0	0.0
Medicaid	0	0.0
Medicare[1]	5,696	100.0
Medicare Advantage	0	0.0
Other	0	0.0
Uninsured	0	0.0
Missing	0	0.0

Source: Patient-level data provided to RTI by Y-USA.
[1] Also includes Medicare Advantage beneficiaries; however, we are unable to distinguish Medicare fee-for-service from Medicare Advantage beneficiaries based on the data provided by Y-USA.

1.2 Implementation Progress

The first annual report (2014) described Y-USA's implementation process, workforce development, and progress toward effectiveness, and detailed the quantifiable measures to assess each area. ***Table 4*** lists these measures and their status as of May 31, 2015. This annual report includes the results of analyses for all of these measures.

This section presents Y-USA's process measures and a qualitative analysis of the factors that determined Y-USA's implementation progress. This analysis draws on patient-level data that Y-USA provided to RTI as of May 31, 2015, performance documents, and key informant interviews conducted in the 11th and 12th quarters of operations.

Table 4. Quantitative Explanatory Measures

Evaluation Domains	Subdomains	Measures	Status
Implementation effectiveness	Reach	Number/percentage of participants recruited (i.e., attended at least one core session)	Data received from Y-USA
		Number/percentage of participants who enrolled in the DPP (i.e., completed at least four core sessions)	Data received from Y-USA
	Dose	Number of sessions attended by each participant	Data received from Y-USA

DPP = diabetes prevention program; Y-USA = YMCA of the USA.

1.2.1 Implementation Process

The evaluation focuses on the components of implementation process—execution, organizational capacity, and leadership. RTI evaluates these components through Y-USA's *Narrative Progress Reports, Quarterly Awardee Performance Reports,* and qualitative interviews with key staff that provide additional context and detail. The findings presented here include Y-USA's reports from Q8 through Q10 and an interview conducted on June 8, 2015.

Evaluation Questions

- What is the overall execution of the innovation award in terms of the overall rate of expenditures relative to the projected rate?
- Does the awardee have sufficient overall organizational capacity and leadership to implement the innovation effectively?

Execution of Implementation

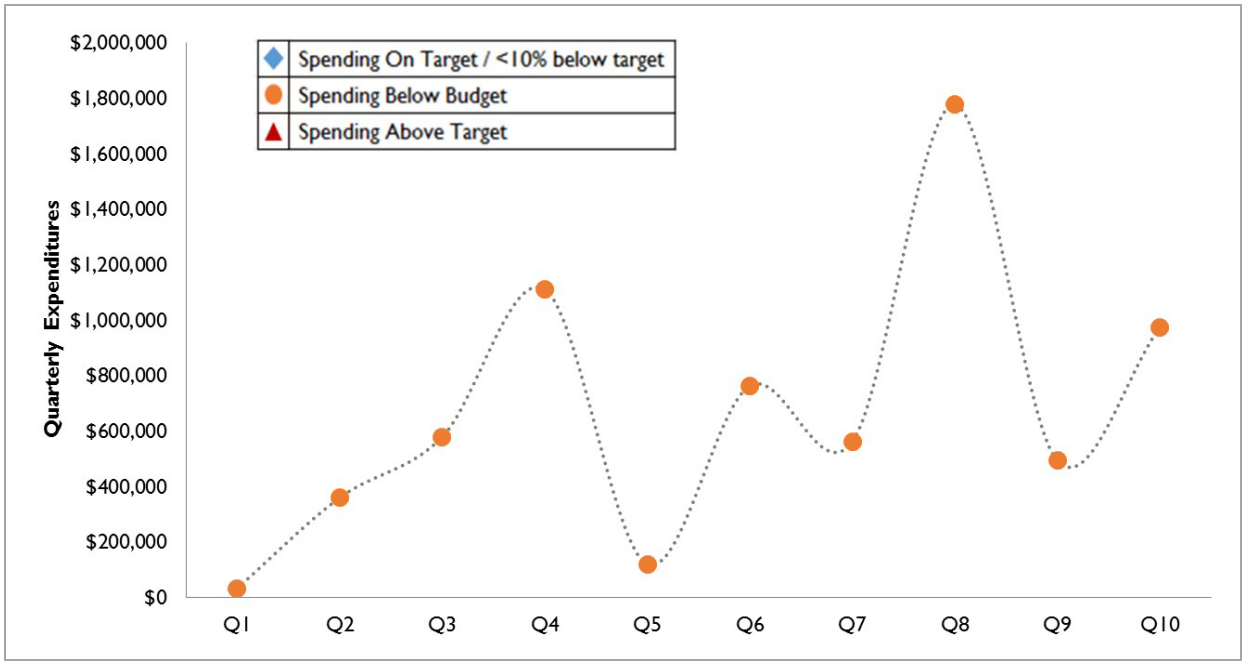
The annual report highlights the significance of Y-USA's expenditure rates on implementation. As of December 2014 (Q10), Y-USA spent 31.3 percent of its Year 3 budget, which was below projection. Although an improvement from Q9, when Y-USA's spending rates were more than 40 percent below projection, it is still critical at 20 to 40 percent below projection. According to the Q9 *Quarterly Awardee Performance Report*, Y-USA explained that routine project spending was on target and that the low spending rates reflected lower overall enrollment and timing of participant reimbursement for the DPP

through its partner, the Diabetes Prevention and Control Alliance (DPCA). Y-USA filed for, and received, an extension for funding allowing them to continue program efforts for the next 12 months.

The Q9 and Q10 *Narrative Progress Reports* suggest that Y-USA is very optimistic about reaching the triple-aim objectives, even with the enrollment challenges it faced. Although Y-USA's enrollment greatly benefited from the decision to accept Medicare Advantage beneficiaries into the program at the end of Q6, recruitment remained a challenge in the last quarter of 2014 (Q10), partly because of the holiday season. Y-USA planned to continue enrolling participants through first quarter 2015, and to help build demand, Y-USA and its partners launched the "One Million More" education campaign in November 2014 (during National Diabetes Awareness Month), which will continue until Diabetes Alert Day in late March. The campaign is designed to promote diabetes screening tests that are required for enrollment in a DPP.

During the key informant interviews, we learned that the approach to enrollment also changed: each YMCA now holds monthly orientation sessions for all those referred to the program. Through the sessions, potential participants learn about the program and sign a release form if they are interested in taking part. This process helped the YMCAs better explain the program and what it entails, and answer questions for people who did not understand why they were referred to the program.

Figure 1. Spend Rate from Q1 (July 1, 2012) to Q10 (December 31, 2014)



Leadership

In the first annual report, we detailed the commitment of the Y-USA organizational leadership to the HCIA innovation, which they designated as the first "signature program" in their Healthy Living initiative. We further discussed the leadership structure and the efforts of the Y-USA chief executive officer (CEO) to meet with each of the CEOs at the 17 innovation sites and develop strategic plans for

revising recruitment efforts when the YMCAs were struggling with the process. Initially, recruitment focused only on fee-for-service covered beneficiaries, which led to confusion among consumers about the Medicare Advantage Plan. Y-USA changed its criteria to include Medicare Advantage beneficiaries, which greatly aided enrollment.

During the key informant interviews, respondents reiterated that this project remains a high priority for Y-USA, and the accountability is shared throughout all levels of leadership. The HCIA project focus and outcomes are reported up to the national board, as it is tied to all of the leadership performance goals (CEO, chief operating officer, president, and technical advisor). The project director is involved in all aspects of communication, leads calls with the project officer and partner organizations, attends the calls with Y-USA, and reports to the vice president of innovation and strategy, who reviews all reports.

Organizational Capacity

As mentioned in the first annual report, Y-USA had strong organizational capacity to implement the DPP, given that 75 YMCAs already had experience implementing the evidence-based DPP model through other funding and with a different priority population. Y-USA continues to build organizational capacity to recruit and provide services to the Medicare population. New training strategies are described in ***Section 1.2.2.***

Furthermore, the organizational capacity of Y-USA depends largely on its partnerships and ability to leverage various resources. During the key informant interviews, Y-USA reported the need for additional support and resources to increase capacity. Gaining buy-in from all partners, which includes organizations like the American Medical Association (AMA), American Diabetes Association and the American Heart Association (AHA), was not an easy process; although they all agreed to support the program, it took time to build shared communication strategies and determine the best way to share information with the partner's local affiliates. Some partners could require involvement of local affiliates, while others could not and were limited to only national-level communication strategies. These efforts to engage the partners and their affiliates led to supplementary blood pressure monitoring projects with the AMA and AHA. The strategy of building these partnerships began with building trust and then demonstrating the value of the project through local affiliate testimony. This work helped to motivate additional changes and build buy-in.

Y-USA helped the local YMCA affiliates develop their capacity by linking them to the communities in a sustainable way. The initial plan to partner with physician champions was not sufficient to meet the recruitment demands and volume of the HCIA innovation. One respondent reported that, "we needed to partner with health system[s] to get more impact, which is a slow growing process." Each health care system added a layer of complexity because of the need to navigate numerous medical records systems and different processes required to reach and recruit patients. Some health care systems identified participants and asked that YMCA staff contact patients directly; however, local YMCA staff did not have this capacity. One respondent reported that while the AMA was a facilitator in bridging the clinic-to-community gap, some challenges remain in getting health systems engaged.

Innovation Adoption and Workflow Integration

As already discussed, the HCIA innovation was adopted and well integrated into the workflow of the YMCA sites that implemented it. This program is part of Y-USA's strategic plan with strong organizational support for sustaining it in the future. At a local level, all 17 participating YMCAs implemented the DPP program prior to the launch of the innovation, but with a different population. For HCIA, the innovation expanded the intervention to recruit and enroll prediabetic Medicare beneficiaries. Innovation adoption and workflow integration occurred at both the national and local levels. Because implementation takes place at local YMCAs, the lifestyle coaches at the local level were key to successful implementation. For example, during our Year 1 site visit at the YMCA of Central Ohio (Columbus), a team member noted that some of the most successful lifestyle coaches were established YMCA employees because they understand the mission of the YMCA, their neighborhood population, and how to engage people. These lifestyle coaches are mostly part-time employees who also worked at this site in other roles, including reception staff, wellness coaches, and chronic disease coordinators.

1.2.2 Workforce Development

The HCIA innovations seek to improve the quality of care by ensuring that a workforce of sufficient size, capacity, and skill is in place to carry out new and enhanced models of care. RTI examined these workforce factors to better understand their role in innovation implementation.

Evaluation Question

- What accomplishments specific to hiring or training staff improved the organization's capacity to implement the innovation effectively?

Hiring and Retention

At the end of Q10 (December 2014), the innovation was fully staffed with 2.85 full-time equivalent (FTE) staff members. This number does not include the lifestyle coaches that lead the innovation activities at each YMCA affiliate. Between Q8 (June, 2014) and Q10, no new hires or separations took place and staffing changes were minimal. At of the end of Q9 (September 2014), the innovation was 0.5 FTE short of planned staffing levels. Changes in staff FTEs resulted because the workforce development manager was not included in the project budget for Year 3 and the communications coordinator role shifted from a staff to a consultant role.

Skills, Knowledge, and Training

Between Q8 and Q10, Y-USA provided 14,080 hours of training to 1,726 HCIA administrative and community-based nonclinical personnel. Training topics included:

- Lifestyle Coach Curriculum
- Facilitating Change in Small Groups

- Medical Community Partnerships
- HIPAA Privacy and Security

In addition, to help build local YMCA capacity to obtain earned media as a strategy to advertise the local DPP programs to their target population, Y-USA held a media training on June 11, 2014. Participation was high and staff from all but one partner YMCA attended. A senior public relations manager at Y-USA and an outside public relations agency led the training and sought to provide YMCA staff with the skills needed to "communicate key messages related to the YMCA's DPP and the Center for Medicare & Medicaid Innovation (CMMI) project across all media platforms and in various situations."

1.2.3 Effectiveness

A major focus of the evaluation is to assess the effectiveness of the implementation effort because the evaluation cannot make conclusive assessments about the innovation's impact without first determining if the innovation was implemented with sufficient rigor to effect a change in outcomes. Effectiveness is measured as the extent to which: (1) the innovation reached the number of targeted patients or participants (reach); and (2) patients or participants were exposed to the services provided (dose). To better understand the role of implementation effectiveness, the evaluation addresses the following question.

Evaluation Question

- What is the implementation effectiveness, including reach, and dose of the innovation thus far?

Reach

Figure 2 shows reach by quarter since the launch of the innovation. Reach is calculated as the number of participants who enrolled (i.e., attended at least four core sessions) as a percentage of the number of participants recruited (i.e., attended at least one core session). Therefore, the number of participants recruited does not necessarily mean those participants will enroll in the program and take part in at least four core sessions. We first reported reach in the Q5 report, based on data through Q9. In Q7 Y-USA reported great improvements in enrollment since they began allowing Medicare Advantage beneficiaries to enroll and the key informant interview expounded on this matter stating, "there was a lot of confusion among our consumers about the Medicare Advantage Plan and we are now able to enroll from both fee for service and the advantage plan, which helped with recruitment, though roughly 2/3 of our participants remain fee for service." Since that time, Y-USA enrolled an additional 1,968 people, increasing enrollment from 3,728 to 5,696. The overall total reach is 82.9 percent. Reach dropped slightly over time, ranging from 95.7 percent in Q3 to 82.9 percent in Q11.

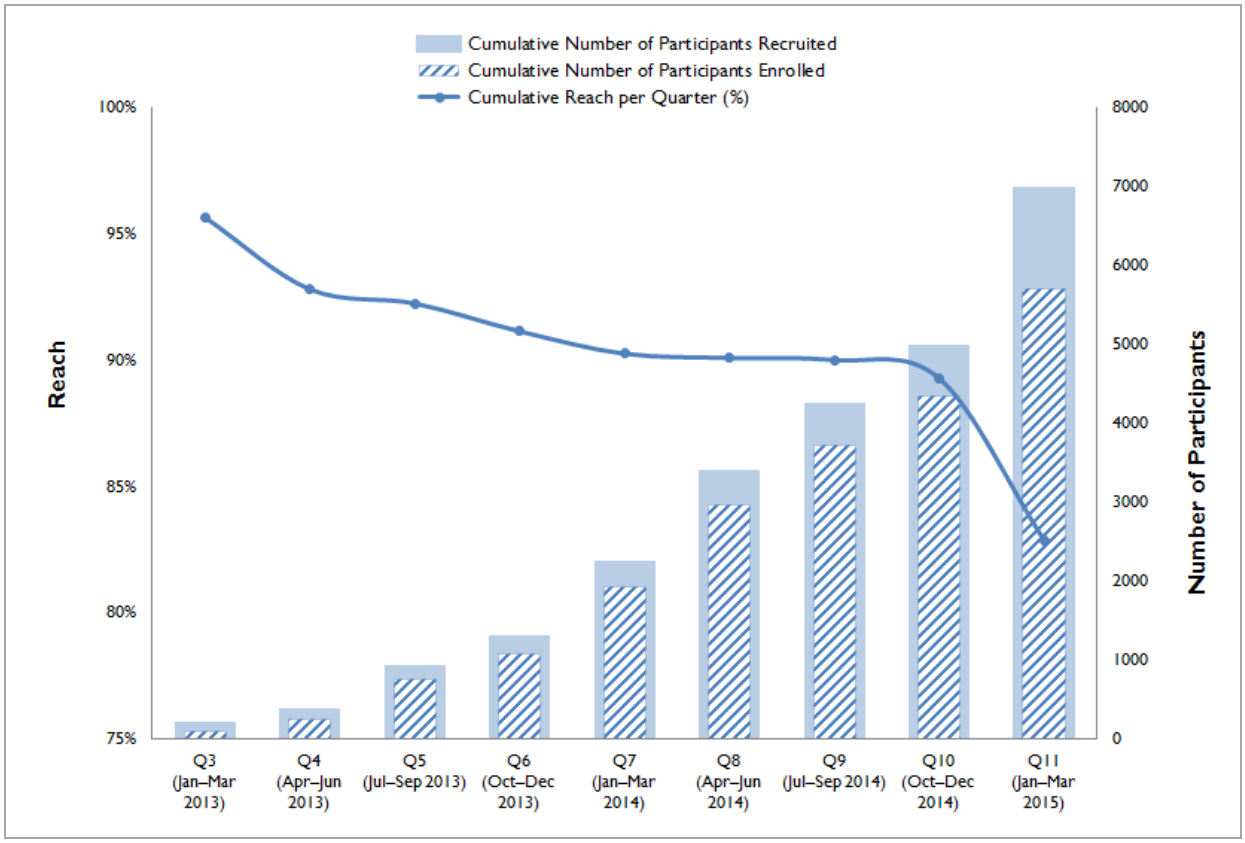
Y-USA focused much of its efforts on recruiting participants into the innovation—recruitment was one of the most significant challenges they faced. The drop in calculated reach may reflect the increased efforts to enroll anyone who qualifies and may benefit from the innovation. Because reach is calculated using a percentage of those enrolled (i.e., attending at least four core sessions) relative to the number

recruited, one would expect the number of people recruited to increase—however, the number enrolled has not increased at the same rate. The Y-USA team focused much of its recent efforts on identifying new ways to recruit participants into the DPP innovation. As previously described, during Q10, the local YMCA affiliates implemented a final recruitment effort "surge" to increase the number of eligible participants enrolled in the innovation and reported that "a total of 524 participants attended their first class in January, compared to 663 in the entire first quarter of 2014." They also held orientation meeting to help answer questions posed by those referred to the innovation. This recruitment push successfully enrolled new participants, but because the YMCA used a rolling enrollment process, the number of participants that participated in at least four core sessions (the criterion for enrollment) will be uncertain until the innovation ends. One key informant interview said, "We have had a huge increase from 197 people in Year 1 to almost 7,000 enrolled. YMCAs have utilized different recruitment strategies; they sought other health care partners, looked within their own membership, and identified ways to get health systems to search through their medical records for our at-risk population." Therefore, we anticipate that the reach number may increase as we enter the final phases of the innovation and the recruitment effort ends.

The other challenge with increasing enrollment and, therefore reach, involves understanding the participants' motivation to enroll and to remain involved with the multisession innovation. One interview respondent indicated that while the YMCA started with engagement strategies that successfully recruited a working-age population, they found these strategies were not as effective in recruiting and engaging the older population targeted by the HCIA project. YMCA staff learned that it was critical to build on the connection between Medicare patients and their physicians by engaging physicians in the referral process, and then ensuring that providers had the right information to share with their patients about prediabetes and the importance of addressing it. This respondent further reported that ensuring that doctors were actively involved in and aware of the innovation added a step to the recruitment process that was not previously required.

As noted in previous reports, the number of participants reported in the *Quarterly Awardee Performance Reports* was consistent with the number of participants reported in the RTI quarterly and annual reports.

Figure 2. Participant Enrollment and Reach for Each Quarter since Project Launch



	Quarter	Q3 (Jan–Mar 2013)	Q4 (Apr–Jun 2013)	Q5 (Jul–Sep 2013)	Q6 (Oct–Dec 2013)	Q7 (Jan–Mar 2014)	Q8 (Apr–Jun 2014)	Q9 (Jul–Sep 2014)	Q10 (Oct–Dec 2014)	Q11 (Jan–Mar 2015)
●	Cumulative reach per quarter (%)	95.7	92.8	92.%	91.1	90.3	90.1	90.0	89.3	82.9
	Cumulative number of participants recruited	92	264	812	1,185	2,134	3,289	4,142	4,867	6,874
	Cumulative number of participants enrolled	88	245	749	1,080	1,926	2,963	3,728	4,345	5,696

Source: Patient-level data provided to RTI by Y-USA.
[1] Participants recruited attended at least one core session.
[2] Participants enrolled completed at least four core sessions.

Dose

Participants received varying doses of the program, depending on the number of sessions attended. The maximum dose is 24 1-hour sessions (16 weekly sessions plus 8 monthly maintenance sessions). Dose is defined as attending between 1 and 3 sessions, completing at least 4 but fewer than 9 sessions, completing at least 9 of the 16 core sessions, and completing at least 1 post-core session (at least 17 sessions in total). ***Table 5*** provides the number of sessions attended by participants. We first reported dose in the Q5 report, based on data through Q9. As expected, the number of participants attending sessions more than doubled—from 3,296 in Q9 to 6,874 in Q11.

As shown in the table, 37.5 percent of recruited participants completed 9 to 16 sessions, whereas almost 20 percent (19.9%) completed 4 to 8 sessions and 25.4 percent completed 17 or more sessions. Less than 20 percent (17.2%) completed only 1 to 3 sessions. Programs that are able to engage participants in 9 or more sessions meet the Centers for Disease Control and Prevention criteria for quality providers of diabetes prevention programs. As such, these data show that Y-USA effectively kept participants engaged with the innovation. Because this innovation uses rolling enrollment, tracking those individuals who participated in fewer than 8 sessions will be helpful to determine if they attend more than 8 sessions by the end of the innovation.

Table 5. Number and Types of Services Provided to Participants

Number of Sessions	Number of Participants	Percentage of Total Recruited Participants[1] (n=6,874)
1–3 sessions	1,178	17.2
4–8 sessions	1,370	19.9
9–16 sessions	2,578	37.5
17+ sessions	1,748	25.4
Total	6,874	100.0

[1] Recruited participants include those who have attended at least one session.

One interview respondent reported that having access to the group process and collective learning that occurs through the innovation kept many participants enrolled and engaged. This may help to explain why more than 62 percent of those enrolled in the innovation attended 9 or more sessions. The respondents also reported that participants wanted the group to continue to meet without their lifestyle coaches after the innovation ends.

Sustainability

The DPP innovation has been a longstanding priority for Y-USA, which demonstrated a clear commitment to sustaining the innovation after the award ends, with a focus on this population. Y-USA already developed a sustainability plan that will guide future scaling and dissemination activities through 2017. This focus on sustainability includes developing a community profile for the 17 markets it serves, to document information on the key partners engaged (including health care partners) and recruitment activities used. Y-USA hopes that this information will facilitate the work of other YMCA affiliates who want to implement this innovation in their community. Y-USA plans to add guidance to existing program materials about engaging a more senior population. The Y-USA also leveraged its experience with the HCIA effort to obtain funding from the John A. Hartford Association, which is interested in Medicaid and diabetes prevention, and is exploring the potential to communicate lessons learned for specific topics like electronic medical records (EMR) integration.

To address the priority of providing patients free or inexpensive access to prediabetes resources like the DPP, the Y-USA applied for a CPT code that would allow reimbursement for participation in the DPP innovation and for sustaining the innovation. The CPT code would help Y-USA overcome one challenge of recruiting new participants because it would eliminate any out-of-pocket expenses for

participation. Having a CPT code would also make the program more financially viable and sustainable for Y-USA.

1.3 Evaluation Outcomes

RTI uses two possible types of quantitative data to assess the impact of Y-USAs innovation on key outcomes. The first type includes claims data for Medicare and/or Medicaid beneficiaries, depending on the innovation's participants. The second type includes patient-level administrative and utilization data Y-USA collects and submits to RTI (which we labeled "other awardee-specific data"). Both sets of data capture health care, clinical effectiveness, and health outcome measures that RTI considers essential to the evaluation of Y-USA's innovation. RTI selected these measures based on the goals of the innovation and the availability of sufficient and robust data. Consequently, the number and diversity of measures reported varies by awardee.

As the data are received, we incorporate the findings into quarterly/annual reports. The following sections present the findings for quantitative data through March 2015.

1.3.1 Claims-Based Measures for Evaluation

Table 6 lists the claims-based outcome measures determined by CMMI as most relevant for the HCIA evaluation, with an indication of whether the payer-specific data are presented in this annual report.

Table 6. Claims-Based Outcome Measures

Evaluation Domain	Subdomains	Measure	Medicare Reported in Annual Report	Medicaid Reported in Annual Report
Health care outcomes	Utilization	All-cause inpatient admissions rate	Yes	No
		Hospital unplanned readmissions rate	Yes	No
		ED visit rate	Yes	No
	Cost	Spending per patient	Yes	No
		Estimated cost savings	Yes	No

ED = emergency department.

1.3.2 Claims Data

This section describes the innovation's impact on health care spending per patient, hospital inpatient admissions, hospital unplanned readmissions, and ED visits that do not lead to a hospitalization. These measures are described in more detail in ***Appendix B.1***. A key concern of the evaluation is to address the following cost and utilization questions.

Evaluation Questions

- Has the innovation reduced inpatient admissions, ED visits, or unplanned readmissions?
- Has the innovation reduced spending per patient?
- Does compliance to the program affect the spending pattern of participants?

Medicare Claims Analysis

We include patients who were enrolled prior to December 31, 2014, and we present Medicare claims data through December 31, 2014. The analysis uses data from the CMS Chronic Conditions Data Warehouse. The treatment group includes 1,702 participants who were enrolled for at least one quarter in Medicare fee-for-service parts A and B. Measures are presented for these beneficiaries in the quarters before and after enrolling in the innovation.

Comparison Groups

Comparison beneficiaries must have been enrolled in fee-for-service Medicare for at least 1 month since the innovation began enrolling beneficiaries. We excluded from the potential sample individuals who had ever been classified as having diabetes. Furthermore, we only included individuals who met the requirement criteria for enrollment in the DPP: at least 65 years of age and diagnosed with prediabetes. To identify prediabetes patients, we used the following ICD-9 codes: 790.29 (abnormal glucose); 277.7 (metabolic syndrome); 790.21 (impaired fasting glucose levels, but not yet diagnosed with diabetes); and 790.22 (failed glucose tolerance test, but still not diagnosed with diabetes).

We used propensity score matching (PSM) to identify comparison group members with similar characteristics to the treatment group. ***Table 7*** describes the mean values and absolute standardized differences of the variables of interest that are included in the propensity score model before and after matching. Ideally, PSM will improve (i.e., lower) the absolute standardized difference between the treatment and comparison group. Standardized differences less than 0.10 are generally accepted as an adequate threshold of balance.[2] The balancing table includes two variables not included in the propensity score model: percentage with diabetes ever and percentage with less than 1 year on Medicare. Surprisingly, a large share of the treatment group (34%) had the diabetes ever variable equal to one (an exclusion criteria for the comparison group). A small number of comparison group beneficiaries was enrolled in Medicare for less than 1 year. Researchers also point out that critical variables in determining selection into treatment (e.g., those with significant effects in the propensity score equation) should have greater balance, while indicators with minor importance in determining treatment selection do not require optimal balance. The results in ***Table 7*** show that matching reduced the absolute standardized differences for all variables except ED visits in the calendar quarter prior to enrollment. All variables included in matching achieved adequate balance.

Figure 3 shows the distribution of the propensity scores for both the comparison and intervention groups. The two distributions overlap substantially, indicating that the propensity scores for the matched comparison beneficiaries are similar to those of the treatment beneficiaries. ***Appendix B.2*** provides technical details on the propensity score methodology. Twenty-three treatment beneficiaries were dropped from the subsequent analyses due to the lack of an appropriately matched comparison beneficiary.

[2] Austin, P.A.: Balance diagnostics for comparing the distribution of baseline covariates between treatment groups in propensity-score matched samples. Statist. Med. 28:3083-3107, 2009.

Table 7. Mean Values and Standardized Differences of Variables in Propensity Score Model: Y-USA

Variable	Before Matching					After Matching				
	Treatment Group		Comparison Group		Standardized Difference	Treatment Group		Comparison Group		Standardized Difference
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Payments in calendar quarter prior to enrollment	$1,302	$3,192	$1,913	$5,825	0.13	$1,289	$3,181	$1,383	$2,057	0.04
Total payments in second, third, fourth, and fifth calendar quarters prior to enrollment	$5,704	$10,090	$6,888	$13,915	0.10	$5,660	$10,029	$6,059	$6,771	0.05
Number of ED visits in calendar quarter prior to enrollment	0.08	0.38	0.07	0.32	0.03	0.07	0.29	0.10	0.46	0.08
Number of inpatient stays in calendar quarter prior to enrollment	0.02	0.17	0.05	0.26	0.13	0.02	0.16	0.02	0.10	0.01
Age	69.96	6.27	74.87	7.48	0.71	70.29	5.57	70.20	3.14	0.02
Percentage male	27.38	44.60	41.65	49.30	0.43	27.52	44.67	28.27	26.35	0.02
Percentage white	81.37	38.94	86.86	33.79	0.21	81.89	38.52	79.97	23.42	0.07
Percentage ESRD	0.18	4.20	0.21	4.60	0.01	0.18	4.22	0.17	2.44	0.00
Number of chronic conditions	6.07	3.04	6.59	3.27	0.16	6.08	3.04	6.30	1.90	0.08
Percentage with diabetes ever	33.78	47.31	—	—	1.43	33.89	47.35	—	—	1.43
Number of dual eligible months in the previous calendar year	0.70	2.75	0.97	3.23	0.09	0.64	2.63	0.72	1.64	0.04
Percentage less than 1 year on Medicare	5.52	22.85	3.99	19.56	0.10	5.54	22.88	7.45	15.36	0.11
Number of beneficiaries	1,702	—	1,776,402	—	—	1,679	—	5,021	—	—
Number of unique beneficiaries[1]	1,702	—	242,962	—	—	1,679	—	4,969	—	—
Number of weighted beneficiaries	—	—	—	—	—	1,679	—	1,679	—	—

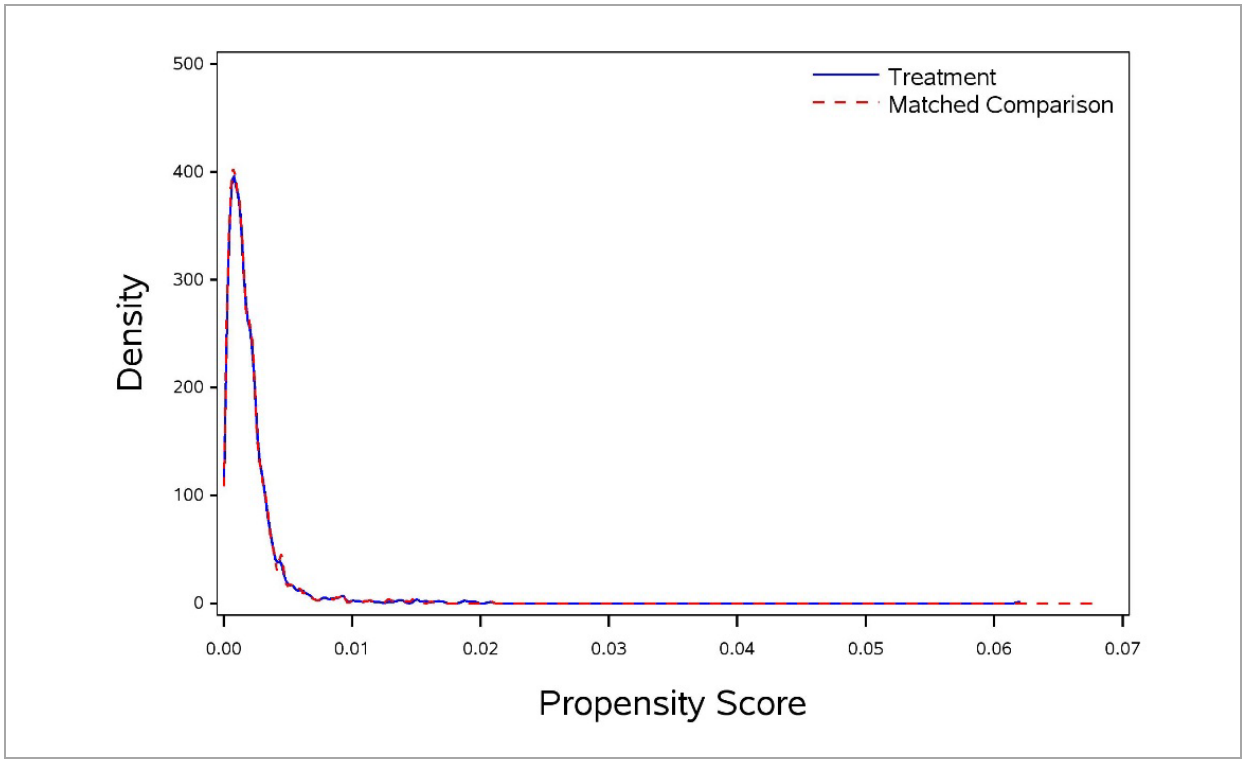
Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.

[1] Before matching, differences in the number of beneficiaries and the number of unique beneficiaries in the comparison group are due to multiple observations of each comparison beneficiary (clones). After matching, differences in the number of beneficiaries and the number of unique beneficiaries are due to weighting (see Appendix B for discussion of weights).

ED = emergency department; ESRD = end-stage renal disease; SD = standard deviation.

— Data not available.

Figure 3. Distribution of Propensity Scores for Comparison and Intervention Groups: Y-USA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Y-USA = YMCA of the USA.

Descriptive Analysis

This report includes claims through December 31, 2014. ***Table 8*** reports Medicare spending per patient in the eight quarters before and the eight quarters after enrolling in the innovation. Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

Table 8. Medicare Spending per Patient: Y-USA

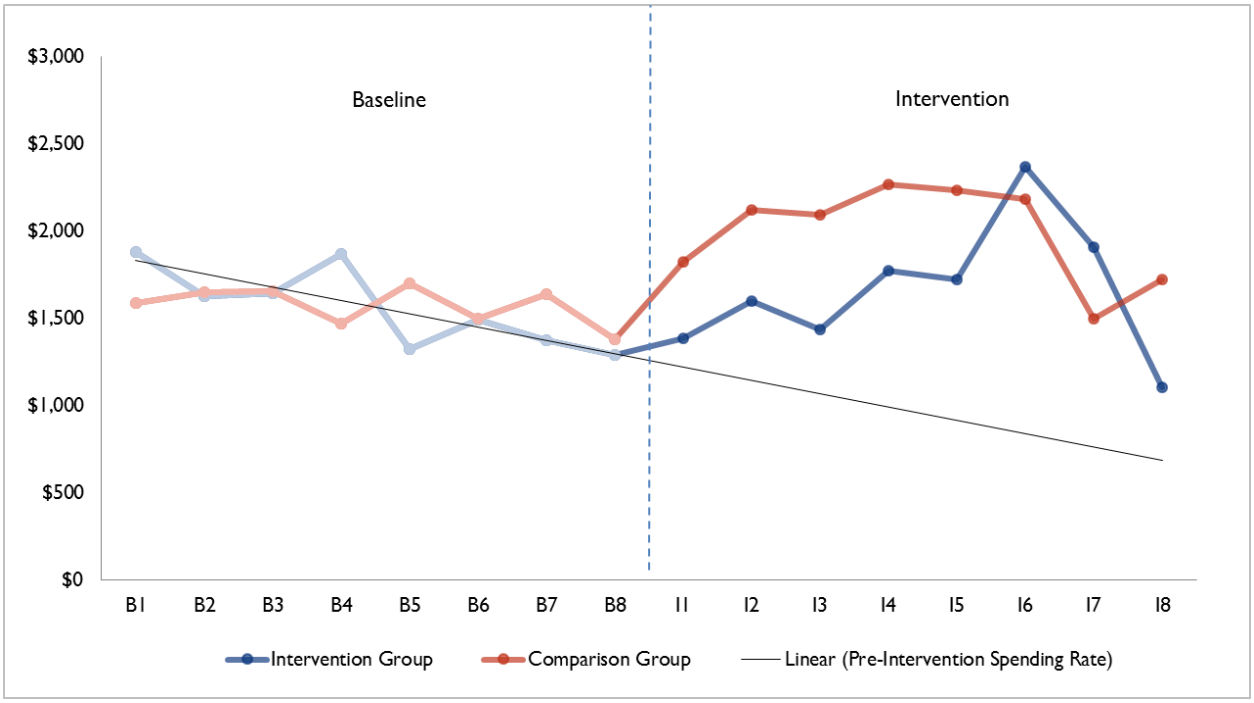
Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 330965	Y-USA																
	Spending rate	$1,881	$1,631	$1,647	$1,872	$1,327	$1,495	$1,374	$1,289	$1,384	$1,601	$1,435	$1,777	$1,723	$2,369	$1,907	$1,104
	Std dev	$5,819	$4,810	$4,094	$5,518	$3,218	$4,210	$3,244	$3,180	$3,815	$4,463	$3,656	$5,189	$4,370	$5,596	$4,154	$1,414
	Unique patients	1,344	1,400	1,448	1,496	1,549	1,601	1,641	1,679	1,679	1,429	1,136	765	515	362	138	57
Comparison Group																	
1C1CMS 330965	Y-USA																
	Spending rate	$1,591	$1,651	$1,655	$1,472	$1,701	$1,497	$1,637	$1,380	$1,827	$2,125	$2,095	$2,271	$2,238	$2,184	$1,497	$1,726
	Std dev	$4,571	$4,508	$4,734	$3,969	$4,864	$4,225	$4,787	$3,548	$5,343	$7,746	$6,370	$8,419	$7,515	$6,079	$3,578	$4,682
	Unique patients	1,379	1,430	1,475	1,524	1,570	1,615	1,654	1,678	1,678	1,427	1,133	764	519	365	135	56
Savings per Patient		−$291	$21	$8	−$400	$374	$2	$263	$92	$443	$524	$660	$494	$515	−$185	−$410	$621

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 4 illustrates the Medicare spending per beneficiary in Table 8 for innovation and comparison group beneficiaries. The blue line represents values for beneficiaries enrolled in the innovation and is darker in post-innovation quarters. The red line represents values for comparison group beneficiaries and is darker in post-innovation quarters. The graph includes a trend line for innovation beneficiaries based on linear regression for pre-innovation quarters. In this case, the trend line suggests decreased spending pre-intervention. Spending is higher than the trend line in all post-intervention quarters. Comparison beneficiaries have higher spending than participants in six of the eight post-intervention quarters. Because of high variability, these differences are not statistically different from zero. The number of participants declines noticeably in the last five quarters post-intervention; this decline represents the lower recruitment in the first quarters of the program than in subsequent quarters.

Figure 4. Medicare Spending per Patient: Y-USA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Y-USA = YMCA of the USA.

The all-cause inpatient admissions rate per 1,000 participants is shown in ***Table 9*** and ***Figure 5***. The comparison groups has slightly higher inpatient admission rates than the controls, this difference widens during the first year post-intervention and disappears subsequently.

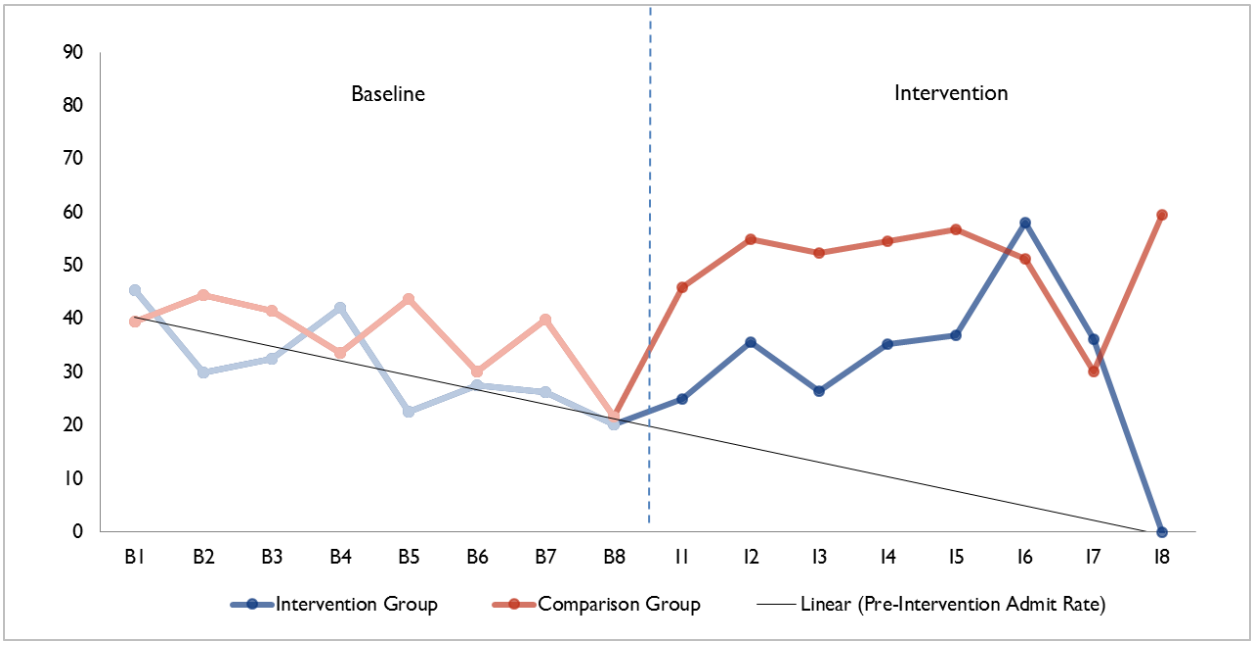
Table 9. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Y-USA

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 330965	Y-USA																
	Admit rate	45	30	32	42	23	27	26	20	25	36	26	35	37	58	36	0
	Std dev	247	190	185	214	153	171	174	157	164	189	171	211	208	256	187	0
	Unique patients	1,344	1,400	1,448	1,496	1,549	1,601	1,641	1,679	1,679	1,429	1,136	765	515	362	138	57
Comparison Group																	
1C1CMS 330965	Y-USA																
	Admit rate	39	44	41	34	44	30	40	22	46	55	52	55	57	51	30	60
	Std dev	238	231	231	204	246	194	241	164	239	289	269	272	290	254	169	282
	Unique patients	1,379	1,430	1,475	1,524	1,570	1,615	1,654	1,678	1,678	1,427	1,133	764	519	365	135	56
Intervention − Comparison Rate		6	−14	−9	8	−21	−3	−14	−1	−21	−19	−26	−19	−20	7	6	−60

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Admit rate: (Total unquarterized admissions /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 5. All-Cause Inpatient Admissions Rate per 1,000 Enrollees: Y-USA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Y-USA = YMCA of the USA.

Hospital unplanned readmissions rates per 1,000 admissions are shown in ***Table 10*** and ***Figure 6***. Because of the low number of index admissions (the denominator in the readmissions measure), the unplanned readmissions rate is highly variable. As more beneficiaries enroll in the innovation and more claims data become available, the sample size will increase and the unplanned readmissions measure may be reported with more precision.

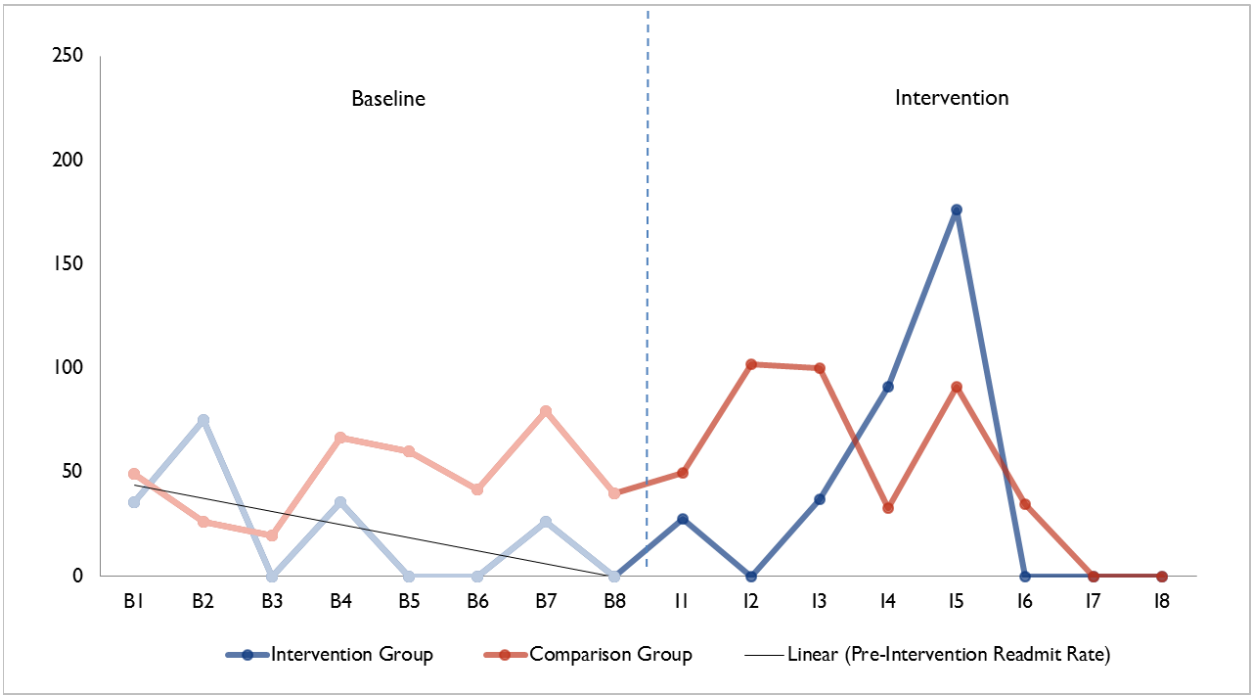
Table10. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Y-USA

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 330965	Y-USA																
	Readmit rate	36	75	0	36	0	0	26	0	28	0	37	91	176	0	0	0
	Std dev	186	263	0	186	0	0	160	0	164	0	189	288	381	0	0	0
	Total admissions	56	40	42	56	30	39	38	31	36	39	27	22	17	12	3	0
Comparison Group																	
1C1CMS 330965	Y-USA																
	Readmit rate	49	26	20	67	60	42	80	40	50	102	100	33	91	34	0	0
	Std dev	216	160	138	249	237	200	271	195	218	303	300	179	288	183	0	0
	Total admissions	41	51	51	45	56	40	59	34	67	65	42	30	22	10	3	2
Intervention − Comparison Rate		−13	49	−20	−31	−60	−42	−53	−40	−22	−102	−63	58	86	−34	0	0

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Readmission rate: (Sum all eligible readmits to eligible hospital within 30 days/all eligible admissions in quarter)*1,000.
Total admissions: All eligible admissions in quarter.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 6. Hospital Unplanned Readmissions Rates per 1,000 Admissions: Y-USA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Y-USA = YMCA of the USA.

ED visits per 1,000 participants are shown in ***Table 11*** and ***Figure 7***. Throughout the pre-intervention and the first four post-intervention periods, the ED visit rate is similar in the treatment and comparison groups. In I5 through I8, ED visit rates are higher in the treatment group than in the comparison group.

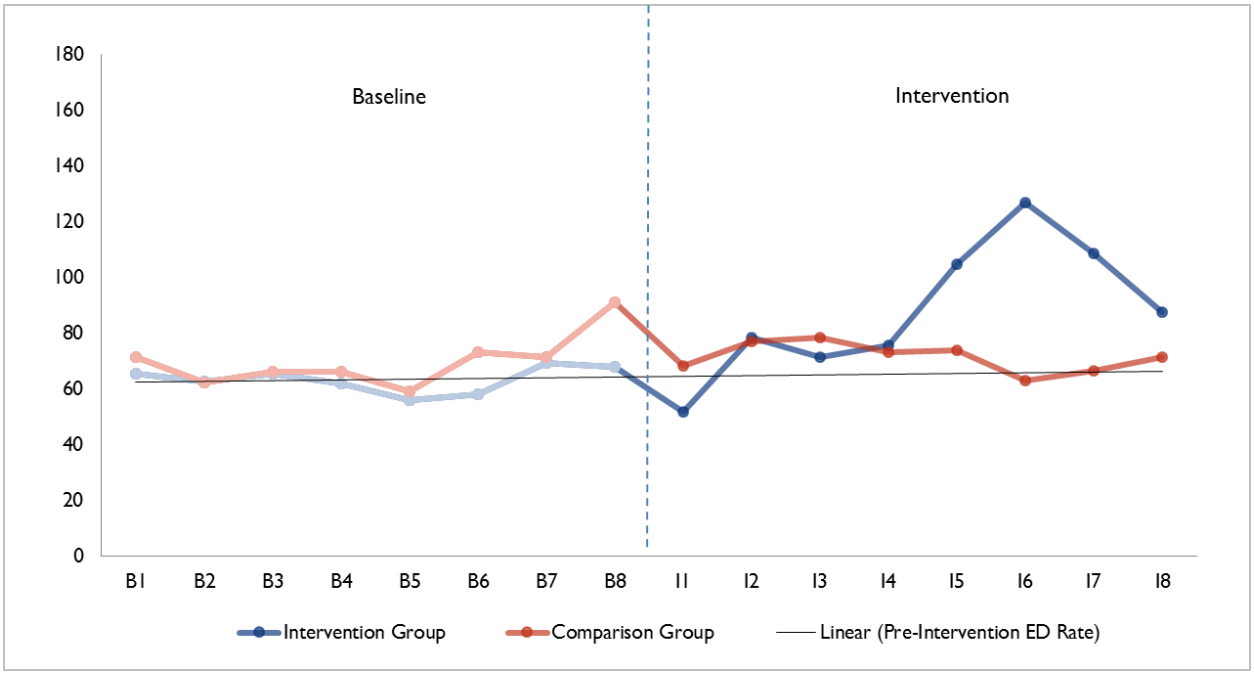
Table 11. ED Visits per 1,000 Participants: Y-USA

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Intervention Group																	
1C1CMS 330965	Y-USA																
	ED rate	65	63	66	62	56	58	69	68	52	78	71	76	105	127	109	88
	Std dev	271	286	282	282	262	262	303	283	245	332	290	319	337	435	395	342
	Unique patients	1,344	1,400	1,448	1,496	1,549	1,601	1,641	1,679	1,679	1,429	1,136	765	515	362	138	57
Comparison Group																	
1C1CMS 330965	Y-USA																
	ED rate	72	62	66	66	59	73	72	91	68	77	79	73	74	63	67	71
	Std dev	196	165	172	171	169	251	225	331	173	208	183	193	186	158	167	174
	Unique patients	1,379	1,430	1,475	1,524	1,570	1,615	1,654	1,678	1,678	1,427	1,133	764	519	365	135	56
Intervention − Comparison Rate		−6	1	−1	−4	−3	−15	−2	−23	−17	1	−7	2	31	64	42	16

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
ED rate: (Total quarterized ED visits and observation stays /unique patients)*1,000.
Intervention – comparison rate may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1; ED = emergency department.

Figure 7. ED Visits per 1,000 Participants: Y-USA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Y-USA = YMCA of the USA.

Regression Analysis

We completed regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit. All regressions include an indicator variable for the treatment group, an indicator variable for each quarter, and quarterly indicators that interacted with the treatment group variable in the post-intervention period. We control for age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The regression specification assumes the same quarterly fixed effect for treatment and comparison individuals in the pre-innovation period and allows for a separate quarterly effect for treatment individuals after enrolling in the innovation.

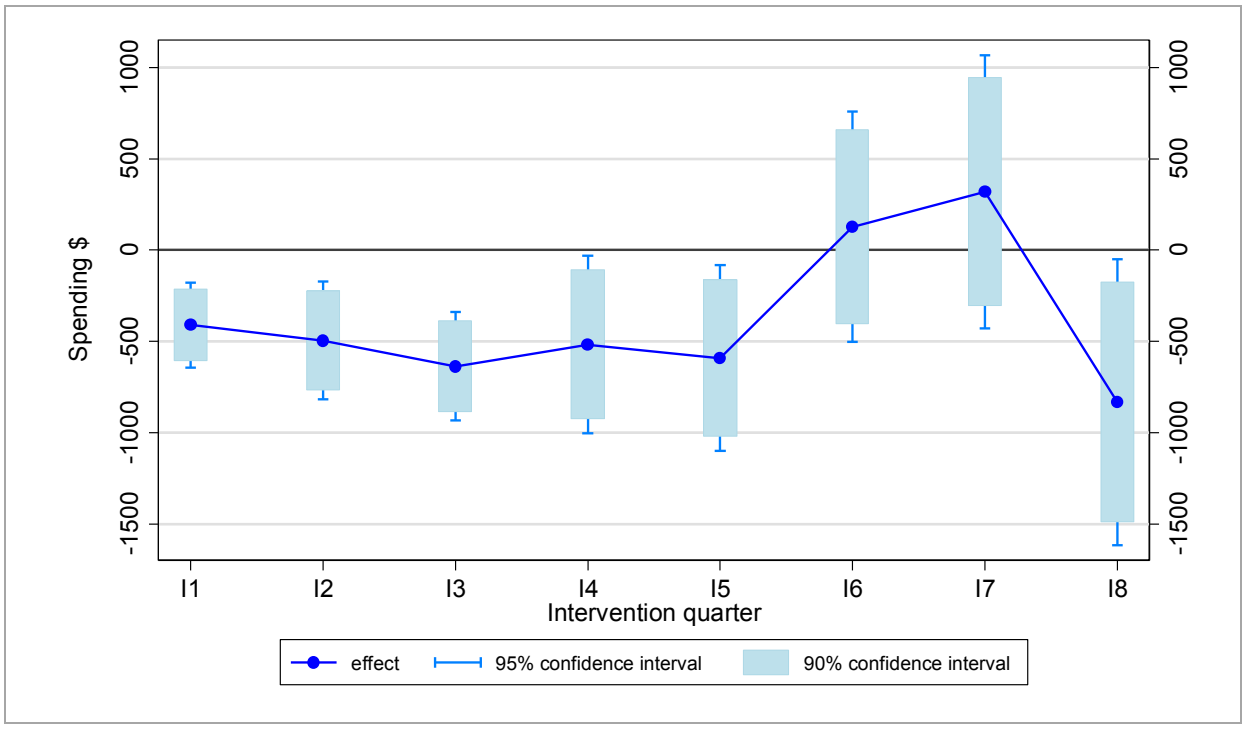
Table 12 presents the results of an ordinary least squares (OLS) regression with quarterly spending as the dependent variable. The coefficients represent the difference in quarterly spending in post-intervention quarters between the treatment and comparison groups. We find statistically significant differences in spending in the first five quarters of the innovation. These savings become insignificant in subsequent quarters, with the exception of I8. ***Figure 8*** illustrates these quarterly difference-in-differences estimates.

Table 12. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Y-USA

Quarter	Coefficient	Standard Error	P-Values
I1	−411	119	0.001
I2	−495	165	0.003
I3	−636	152	<.0001
I4	−517	248	0.038
I5	−591	260	0.023
I6	128	322	0.691
I7	319	381	0.403
I8	−833	399	0.037

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
Y-USA = YMCA of the USA; OLS = ordinary least squares.

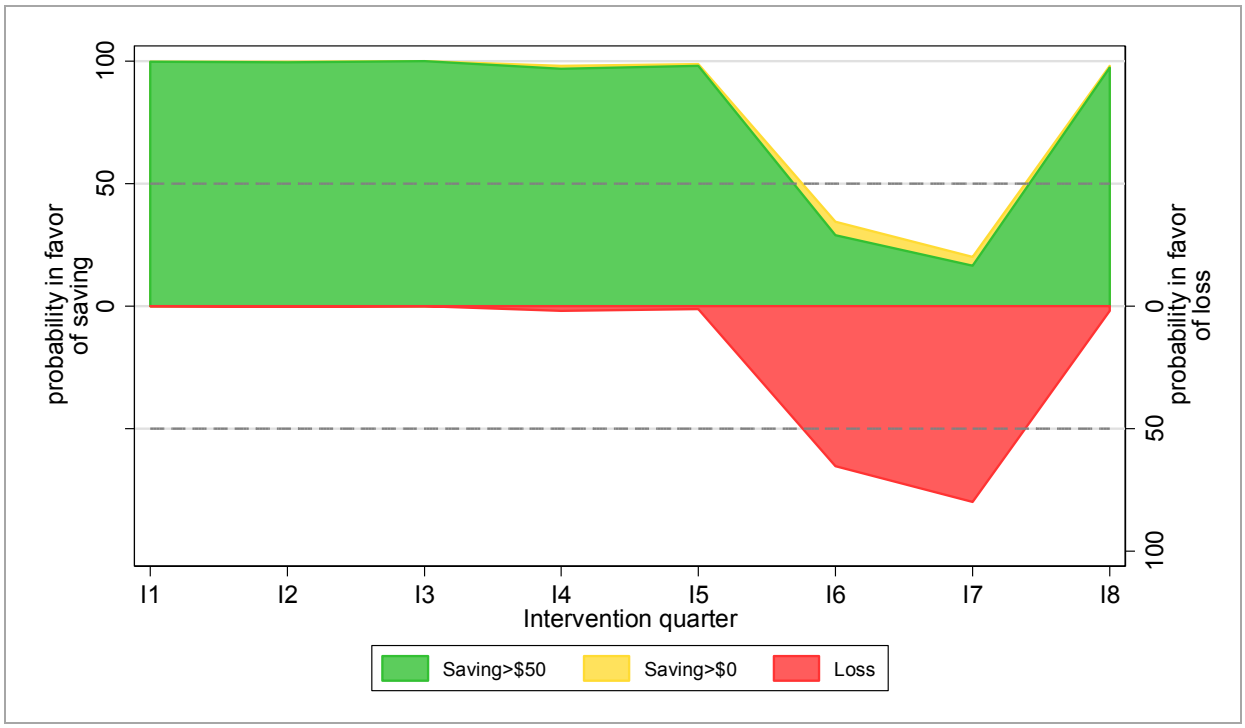
Figure 8. Difference-In-Differences OLS Regression Estimates for Quarterly Medicare Spending per Participant: Y-USA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Y-USA = YMCA of the USA; OLS = ordinary least squares.

Figure 9 presents the strength of evidence in favor of savings or loss. The strength of evidence is quantified by the probability of the observed estimate against the null hypothesis in favor of a one-sided alternative. The larger the probability, the more convincing the evidence is against the null and in favor of the alternative hypothesis. Evidence of savings persist through the initial five quarters post-intervention and in quarter 8. In quarters 6 and 7 losses are not significant at the conventional levels.

Figure 9. Quarterly Strength of Evidence in Favor of Savings/Loss: Y-USA



Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Y-USA = YMCA of the USA.

We also present the overall weighted average treatment effect per member per quarter during the intervention period for beneficiaries enrolled in the innovation compared with their matched comparison group. The weighted average quarterly spending differential in the post-innovation period, indicating savings, is $455 (90% CI: $299, $612) per member per quarter. This effect is statistically significant. This figure represents the differential spending per quarter in the post-intervention period between individuals enrolled in the innovation and comparison group individuals, on average, weighted by the number of intervention beneficiaries in each quarter. The 90 percent confidence interval is the range in which the true parameter estimate falls, with 90 percent confidence.

We also present linear probability model coefficients for inpatient admissions and outpatient ED visits. Although logistic regression coefficients correctly predict the direction and significance of the effect, a simple transformation of the logistic regression coefficient into probability does not result in the

estimated effect.[3] Linear probability models have the advantage that the magnitude of the coefficients can be directly interpreted, albeit with caution. Despite concerns regarding statistical inferences with linear probability models, linear probability model coefficients have often been empirically demonstrated to be consistent with marginal effects generated from nonlinear models.[4] We present linear probability model coefficients because the goal of this evaluation is to estimate marginal effects (i.e., the impact of the intervention) and not just the direction of the effect.

The innovation has a statistically significant effect on inpatient admissions during four of the eight intervention quarters (***Table 13***). These effects both indicate that innovation participants were 1- to 3-percentage points less likely to be hospitalized than the comparison group. The average quarterly difference-in-differences estimate for inpatient admissions is −1.1 percentage points, indicating that the treatment-control difference is 1.1 percentage points lower during the intervention period. This is the average difference in inpatient admissions probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is statistically significant (90% CI: −.016, −.005).

Table 13. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had Inpatient Hospital Admission: Y-USA

Quarter	Coefficient	Standard Error	P-Values
I1	−0.01	0.00	0.004
I2	−0.01	0.01	0.233
I3	−0.01	0.01	0.017
I4	−0.01	0.01	0.098
I5	−0.01	0.01	0.220
I6	0.01	0.01	0.596
I7	0.01	0.02	0.631
I8	−0.05	0.02	0.003

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
Y-USA = YMCA of the USA.

With the exception of the sixth post-intervention quarter, we found no statistically significant differences on ED admission rates (***Table 14***). ED admissions within a short period of time may not be the most accurate outcome measure if one is analyzing an innovation (like a DPP) that lasts up to a year and focuses on long-term health behavior changes such as diet and exercise. The average quarterly

[3]To obtain the correct effect, it is necessary to perform simulations because a nonlinear model such as a logit does not satisfy the identification properties for a difference-in-differences model. Beyond a simple two-period model, a simulation using the results from one logit can take days to run even when not competing with other users for computer resources.
[4]Angrist, J.D., and Pischke J.-S.: Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press, 2008.

difference-in-differences estimate for ED visits is −0.2 percentage points, indicating that the treatment-control difference is 0.2 percentage points lower during the intervention period. This is the average difference in ED visit probability for all intervention quarters, weighted by the number of beneficiaries in the quarter. The effect is not statistically significant (90% CI: −.010, .006).

Table 14. Difference-In-Differences Linear Probability Model Regression Estimates for Probability that Participant Had ED Visit: Y-USA

Quarter	Coefficient	Standard Error	P-Values
I1	−0.01	0.01	0.212
I2	0.00	0.01	0.957
I3	−0.01	0.01	0.162
I4	−0.01	0.01	0.583
I5	0.01	0.01	0.346
I6	0.04	0.02	0.032
I7	0.01	0.03	0.672
I8	−0.03	0.04	0.480

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes: The linear probability model regression coefficients are the quarterly difference-in-differences estimates. Besides the intervention quarters, the regression controls for the following variables: age, gender, race, disability, end-stage renal disease, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The difference-in-differences specification also controls for fixed differences between the treatment and control group and for quarterly effects that have the same impact on the treatment and control groups.
Y-USA = YMCA of the USA.

Dose

An important question to answer is whether compliance with the program results in better outcomes for participants than noncompliance. Following the DPP and Y-USA standards, we define completers as participants who finished at least nine sessions of the program. To conduct a fair comparison between completers and noncompleters (individuals with less than nine visits), we considered only people who were in the sample for at least 20 weeks, which reduced the sample from 1,702 to 1,253 participants. Completers correspond to approximately 81 percent of participants. Participation, however, is endogenous to the process in that being a completer might be correlated with other patient-specific characteristics that can affect the outcomes under consideration. For example, healthier individuals may be more likely to complete, and may incur lower costs and have lower utilization rates than less healthy individuals.

Table 15 shows preliminary summary statistics to illustrate the differences in mean spending per quarter for completers and noncompleters. We find that, on average, noncompleters incur overall higher costs than completers. One refinement to the analysis that we will implement in future reports is to use a different set of controls by dose group to account for the possibility that completers and noncompleters might be intrinsically different (see ***Figure 10***). Savings per patient reflect the spending differential between the matched comparison group and the intervention group, not controlling for other factors.

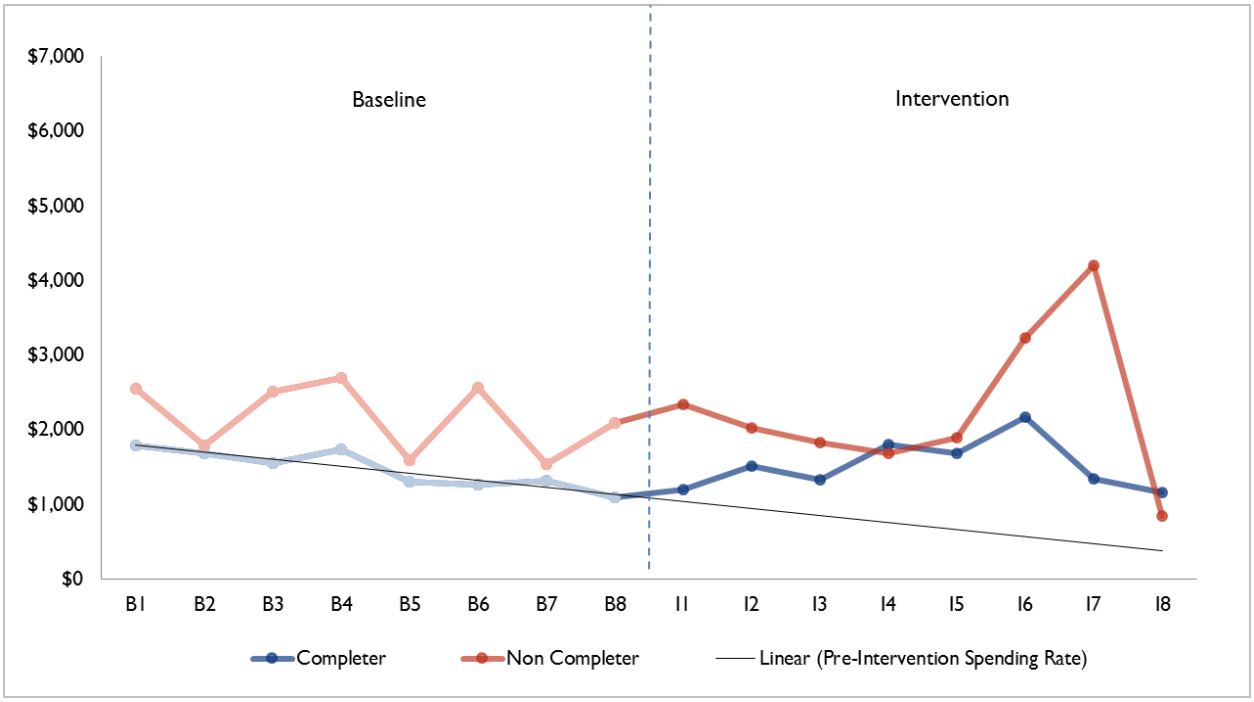
Table 15. Medicare Spending per Patient for Completers and Noncompleters: Y-USA

Evaluation Group: RTI International (Community Resource Planning)
Payer Group: Medicare

Awardee Number	Description	Baseline Quarters								Intervention Quarters							
		B1	B2	B3	B4	B5	B6	B7	B8	I1	I2	I3	I4	I5	I6	I7	I8
Completers																	
1C1CMS 330965	Y-USA																
	Spending rate	$1,791	$1,682	$1,555	$1,743	$1,307	$1,263	$1,316	$1,101	$1,198	$1,523	$1,338	$1,799	$1,683	$2,176	$1,347	$1,160
	Std dev	$5,405	$4,306	$3,943	$5,365	$3,390	$3,137	$3,002	$2,774	$2,952	$4,627	$3,213	$5,460	$4,579	$5,388	$2,522	$1,520
	Unique patients	816	845	873	902	931	962	984	1,011	1,011	1,008	914	610	420	296	111	47
Non-Completers																	
1C1CMS 330965	Y-USA																
	Spending rate	$2,550	$1,790	$2,520	$2,693	$1,600	$2,564	$1,549	$2,091	$2,340	$2,022	$1,832	$1,691	$1,902	$3,233	$4,208	$844
	Std dev	$7,281	$3,972	$5,575	$7,372	$3,131	$7,412	$3,107	$4,535	$7,196	$4,670	$5,069	$3,944	$3,288	$6,374	$7,449	$672
	Unique patients	201	207	212	218	228	234	239	242	242	241	222	155	95	66	27	10
Savings per Patient		$758	$108	$965	$950	$293	$1,301	$233	$989	$1,142	$499	$494	−$108	$219	$1,057	$2,861	−$316

Source: RTI analysis of Chronic Conditions Data Warehouse Medicare fee-for-service claims.
Notes:
Spending rate: Total quarterized payments/number of unique patients.
Savings per patient: Difference in comparison minus intervention average spending rates. Savings may not add up exactly due to rounding.
I1 = Intervention Q1; B1 = Baseline Q1.

Figure 10. Medicare Spending per Patient for Completers and Noncompleters: Y-USA



Y-USA = YMCA of the USA.

Discussion

Analysis of currently available data shows that the innovation is associated with statistically significant reductions in Medicare spending, inpatient admissions, and ED visits during two and at most three post-innovation periods. For all post-intervention quarters, the weighted average quarterly reduction in spending is $455, the reduction in the probability of having an inpatient admission is 1.1 percentage points, and the reduction in the probability of having an ED visit is 0.2 percentage points. These results are all significant at the 10 percent level.

The evidence in favor of a reduction in spending is strongest in the first three quarters after enrollment. This finding is somewhat surprising because the goal of the innovation is to reduce diabetes onset, which in turn is expected to improve health and reduce expenditures in the long run, but not necessarily immediately. The source of the short-term savings, if they exist, is not clear.

The claims analysis has several limitations. First, in the absence of a randomly assigned comparison group, we cannot be certain that we have a matched comparison group that is similar to the participants receiving the innovation. We used PSM to select a comparison group, and the matched comparison group shows good balance on most of the matching characteristics. However, prediabetes status is not routinely available in claims data, so we had to rely on other diagnostic codes (abnormal glucose, metabolic syndrome, impaired fasting glucose, impaired fasting glucose but not yet diagnosed with diabetes, failed glucose tolerance test but still not diagnosed with diabetes) to select the potential comparison group. Second, we discovered that—unexpectedly—34 percent of the participants in the

innovation had a previous diagnosis of diabetes based on claims data from the Chronic Conditions Data Warehouse (all participants had a recent blood glucose test within the prediabetes range). In contrast, we excluded persons with diagnosed diabetes from the comparison group. We performed an auxiliary analysis (not shown) where we excluded persons with diagnosed diabetes from both the treatment and comparison groups, which reduced the estimated average weighted quarterly savings to $223 (90% confidence interval: $45 to $401). However, the innovation still had a significant effect on reducing inpatient admissions over the course of the innovation.

Third, we cannot measure beneficiary motivation. Participants in the innovation may be especially motivated to avoid diabetes, and this unobserved variable may also affect future Medicare spending. Fourth, the results may not fully represent the overall population served by the innovation. The results presented here are only for Medicare fee-for-service beneficiaries whom we matched with the identifiers provided by the site. Y-USA now also enrolls members of Medicare managed care organizations. Fee-for-service beneficiaries account for approximately 80 percent of the YMCA enrollment. Equally important in considering the validity of the cost savings is the question of why the DPP intervention would affect different aspects of spending.

Finally, results of this preliminary analysis may change as enrollment in the innovation increases and more beneficiaries progress to later post-intervention quarters. This report includes participants enrolled through December 31, 2014. The rate of enrollment in the Y-USA innovation has increased throughout the project, so future reports will include the large number of participants enrolled after December 31, 2014; in addition, more participants will have been enrolled long enough to have data in I5 through I8.

Medicaid Claims Analysis

Y-USA does not serve Medicaid beneficiaries (unless the beneficiary is eligible for both Medicare and Medicaid). Therefore, we do not present Medicaid claims analyses.

1.3.3 Other Awardee-Specific Data

Table 16 lists the awardee-specific outcome measures selected for the innovation's evaluation with an indication of the status of the data requested and whether the data are presented in this annual report. We received patient-level data from Y-USA used to generate each measure listed in Tables 4 and 16 for each quarter through Q11 (March 31, 2015).

Table 16. Quantitative Outcome Measures

Evaluation Domains	Subdomains	Measures	Status
Health outcomes	Diabetes	Blood sugar levels at the onset of the program (HbA1c, fasting glucose, other risk factors)	Data received from Y-USA
	Weight management	Average weight loss for Medicare participants	Data received from Y-USA
		Percentage of patients who are overweight (25<BMI<29.9)	Data received from Y-USA
		Percentage of patients who are obese (BMI>30)	Data received from Y-USA

BMI = body mass index; HbA1c = glycated hemoglobin; Y-USA = YMCA of the USA.

Health Outcomes

Evaluation Questions

- Has the percentage of weight loss increased over time among those enrolled in the innovation as compared to other lifestyle or pharmaceutical diabetes interventions?
- Has the percentage of obese and overweight patients decreased over time among those enrolled in the innovation?

We examined weight loss over time among the HCIA intervention participants and selected other groups participating in diabetes prevention programs, presented in the following run chart and discussed in further detail below. In addition, we examined the percentage of obese and overweight participants over time among HCIA intervention participants.

Apart from the HCIA innovation project, Y-USA provided data to RTI on additional studies examining health outcomes after lifestyle or pharmaceutic intervention. These data were provided so that they could be used as a benchmark for comparison to the Y-USA CMMI participants. Data were provided to RTI on all Y-USA participants 65 years of age and older, as well as participants in lifestyle or pharmaceutic interventions (Metformin, lifestyle, placebo, and Deploy[5] [6]). To the study data provided by Y-USA, RTI added corresponding data on Y-USA CMMI participants 65 years of age and older.

Figure 11 shows changes in body weight over time according to data group based on these study data. The greatest average weight loss observed was in the lifestyle intervention group; the largest change, greater than –6.0 kg, was observed at both 4 to 6 months and 1 year. The average weight loss was –3.32 kg at 4 to 6 months for the CMMI group, which is slightly lower than the Y-USA's 65 years-and-older group, whose average weight loss at 4 to 6 months was –3.84 kg. At 1 year, however, average weight loss among the CMMI participants was –3.39 kg, which is lower than the Y-USA's 65 years-and-older group, whose average weight loss at 1 year was –5.25 kg.

[5] Knowler, W. C., Barrett-Connor, E., Fowler, S. E. et al.: Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med.; 346(6):393-403, 2002 Feb 7.

[6] Ackermann, R. T., Finch, E. A., Brizendine, E. et al.: Translating the Diabetes Prevention Program into the community. The DEPLOY pilot study. Am J Prev Med. 35(4):357-63. 2008 Oct.

Figure 11. Changes in Body Weight According to Group over Time

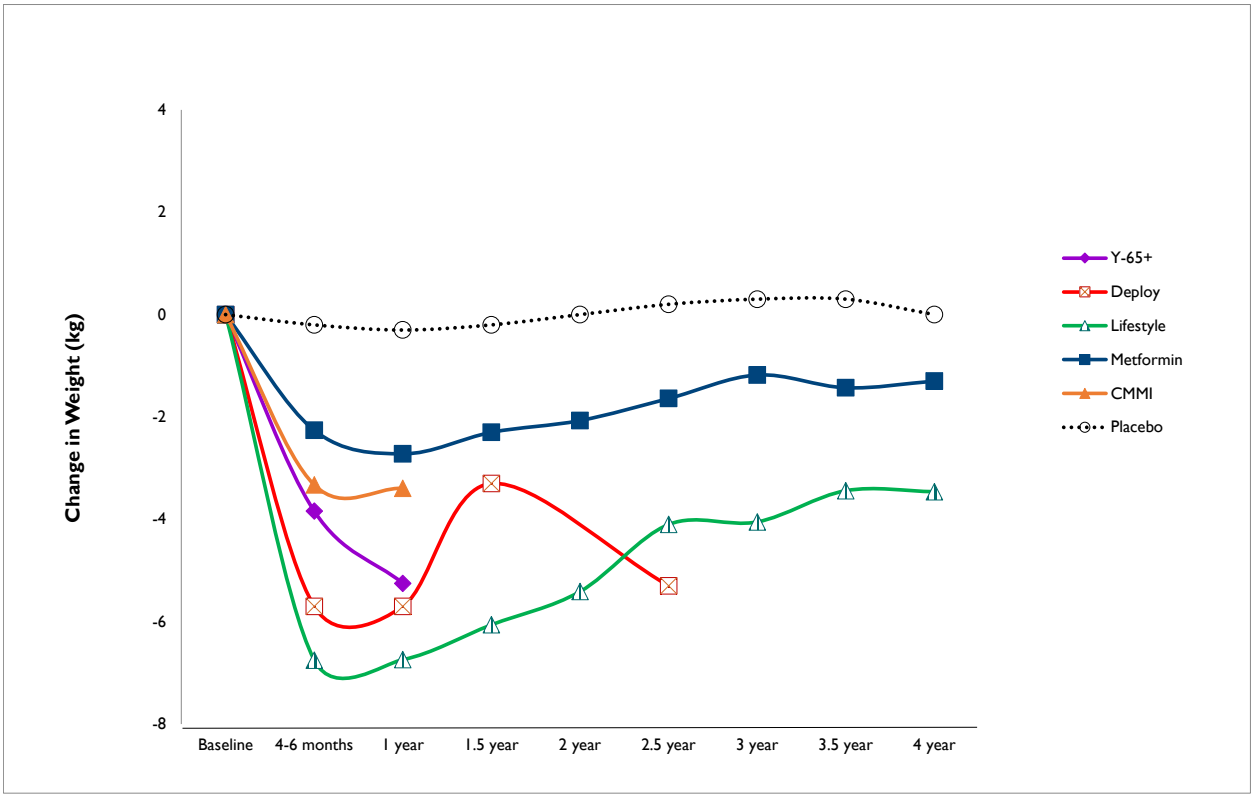


Figure 12 shows changes in body weight over time according to data group from studies examining health outcomes after lifestyle or pharmaceutic intervention, participants in the Y-USA 65 years of age and older, and participants 65 years of age and older in the Y-USA funded by HCIA who have completed the intervention.

For the CMMI participants 65 years of age and older, the analysis was restricted to those, who were in the program for at least 4 months, and who attended at least four core sessions and one post core session. The average weight loss was –5.09 kg at 4 to 6 months for the CMMI group, which is slightly higher than the Y-USA's 65-years-and-older group, whose average weight loss at 4 to 6 months was –5.04 kg. At 1 year, average weight loss among the CMMI participants and Y-USA participants was similar. For the CMMI participants, the average weight loss was –5.31 kg compared with the Y-USA's 65-years-and-older group, whose average weight loss at 1 year was –5.27 kg.

Figure 12. Changes in Body Weight According to Group, Among Completers

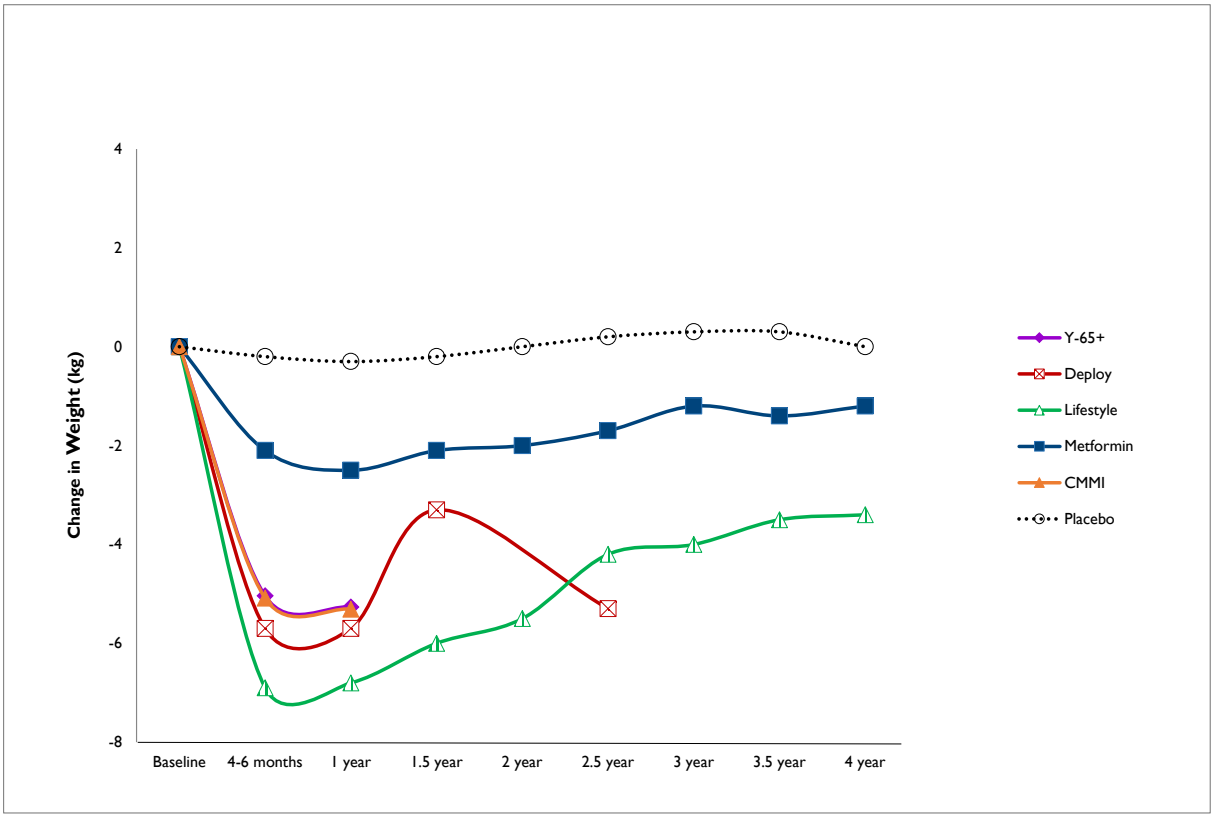


Table 17 provides average starting and ending weight, starting and ending body mass index (BMI), average weight loss, percentages of participants who are obese and overweight, and starting blood glucose values for participants enrolled through Q11. As Table 17 shows, on average, participants recruited lost 7.6 pounds, over the course of the innovation, whereas participants enrolled lost 9.0 pounds on average. In addition, slight differences occurred in the final BMI compared with the starting BMI. The BMI was initially 32.9 for both participants recruited and participants enrolled. The final BMI for those recruited was 31.7, compared with 31.5 for those enrolled. On average, among participants with a glycated hemoglobin (HbA1c) test, levels were 6 percent for both groups, which is in the prediabetic range (5.7% to 6.4 %) according to the American Diabetes Association.[7] The results for the other tests used to identify prediabetes indicate that, on the fasting plasma glucose (FPG) test, participants had an average level of 109.1 mg/dL, which is in the prediabetic range (100 mg/dL to 125 mg/dL).[8] For the oral glucose tolerance test (OGTT), participants recruited had an average level of 159.7 mg/dL, and participants enrolled had an average level of 158.5 mg/dL, which also falls in the prediabetic range (140 mg/dL to 199 mg/dL.[9] These results are not surprising, because the innovation targets prediabetics and encourages weight loss throughout its duration. The Q11 results were very similar to those reported through Q9 in the Q5 report.

[7] American Diabetes Association: Diagnosing Diabetes and Learning about Prediabetes. 2014, September 22. Available at: http://www.diabetes.org/diabetes-basics/diagnosis.
[8] Ibid.
[9] Ibid.

Table 17. Average/Frequencies Health Outcomes of all Participants through Q11

Health Outcome[1]	Average (min, max) for Those Recruited (Attending at Least 1 Core Session) (n=6,874)	Frequency (percentage) of Those Attending at Least 1Core Session (n=6,874)	Average (min, max) for Those Enrolled (Attending at Least 4 Core Sessions) (n=5,696)	Frequency (percentage) of Those Attending at Least 4 Core Sessions (n=5,696)
Weight Management[1]				
Starting weight (lbs)	200.7	—	201	—
	(95.4, 463)		(95.4, 463)	
Ending weight (lbs)	193.3	—	192.1	—
	(94.2, 440.4)		(94.2, 449.4)	
Weight loss (lbs)	7.6	—	9	—
	(−23.2, 122.2)		(−23.2, 122.2)	
Starting BMI (kg/m^2)	32.9	—	32.9	—
	(17.8, 72.4)		(14.6, 67.8)	
Ending BMI (kg/m^2)	31.7	—	31.5	—
	(17.8, 72.4)		(17.8, 67.0)	
Obese[2] pre-intervention	—	3,865	—	3,182
		56.2		55.9
Obese[2] post-intervention	—	3,294	—	2,619
		47.9		46
Overweight[3] pre-intervention	—	1,948	—	1,582
		28.3		27.8
Overweight[3] post-intervention	—	2,190	—	1,818
		31.9		31.9
Blood Glucose[4]				
Starting HbA1c	6	—	6	—
	(5.7, 7.1)		(5.7, 7.1)	
Starting FPG	109.1	—	109.2	—
	(100, 131)		(100, 131)	
Starting OGTT	159.7	—	158.5	—
	(140, 197)		(140, 197)	

Source: Patient-level data provided to RTI by Y-USA.
[1] Outcomes reported among those attending at least four core sessions n=5,696
[2] Obesity: body mass index (BMI)=>30.
[3] Overweight: BMI = 25–29.9.
[4] Majority of participants complete either HbA1c test, FPG test, or OGTT to determine prediabetes status.
BMI = body mass index; FPG = fasting plasma glucose; lbs = pounds; OGTT = oral glucose tolerance test.
— Data not available.

Discussion of Other Awardee-Specific Findings

Overall, the Y-USA's lifestyle change program appears to be effective at encouraging weight loss over time. Participants who completed at least four core sessions lost more weight, on average, than those who only enrolled (completed at least one session) in the program. Data on blood glucose levels were available only at the onset of the program and not over time, so we cannot determine effectiveness on the basis of blood glucose; however, the weight loss recorded during the intervention can improve diabetes outcomes in the future.

1.4 Overall Program Effectiveness to Date

This annual report described various implementation challenges and issues facing Y-USA as well as accomplishments to date. In this section, we assess Y-USA's progress in achieving HCIA goals to date.

- **Smarter spending.** The innovation is associated with a statistically significant reduction in Medicare spending for the initial five post-innovation periods. As noted in the discussion of the Medicare claims analysis (at the end of Section 1.3.2), this finding is subject to a number of limitations, and it is possible that the result will change as more data become available and our ongoing evaluation continues.

- **Better care.** The innovation is associated with statistically significant, but small, reductions in hospitalizations in four of the eight post-intervention periods. Given the disease focus, the innovation is unlikely to have an immediate impact on ED admissions. As of Q11, reach is 82.9 percent, a decrease of 9.3 percentage points from 92.2 percent in Q5, with a total of 5,696 new patients enrolled in the innovation through Q11. In addition, Y-USA appears to be keeping participants engaged with the innovation; for example, over a quarter of participants completed at least 1 post-core session and over one-third (37.5%) completed between 9 and 16 core sessions. Reach and dose will change as enrollment of new participants ends and those recruited have an opportunity to engage in four or more sessions (the threshold for enrollment).

- **Healthier people.** The innovation is associated with participants' weight loss: participants recruited (attending at least one session) lost an average of 7.6 pounds over the course of the innovation, whereas participants enrolled (attending at least four sessions) lost an average of 9.0 pounds. This conclusion is supported by analyses of secondary awardee data through Q11 suggesting that participants who enrolled in the innovation lost more weight than those who were recruited. Weight loss is a key indicator of health in prediabetes; however, weight loss can be slow and can change over time. Examination of long-term weight loss in the months or years after participation in the innovation may be a better indicator of long-term improvement in the health of participants.

Y-USA successfully built on a preexisting evidence-based DPP and expanded its capacity and knowledge of how to engage individuals older than 65 years in an innovation designed to address prediabetes. Although the preexisting DPP provided some organizational infrastructure for the innovation, the most significant challenges were identifying the most efficient and effective ways to recruit a senior population. Staff reported quickly learning that the strategies used to engage employers and working-age individuals would not be effective in reaching the target senior population. Y-USA teams worked to identify new recruitment strategies that engaged health care providers as key messengers for recruiting participants. While effective, this approach had challenges, such as allocating necessary time and resources to recruit and educate providers and larger health care organizations about the need to address prediabetes with their patients and how the DPP could serve as a valuable resource. With this new provider-based recruitment approach, the Y-USA and its local affiliates have improved their recruitment numbers in the second year of program funding.

To help move participants from recruitment to participation, staff developed a short orientation so individuals referred to the program by their providers could review the curriculum, understand what it offered to them, and to get answers to their questions. Examination of the program data indicates that the YMCA was very successful in getting participants to complete at least nine DPP classes (62.9% of

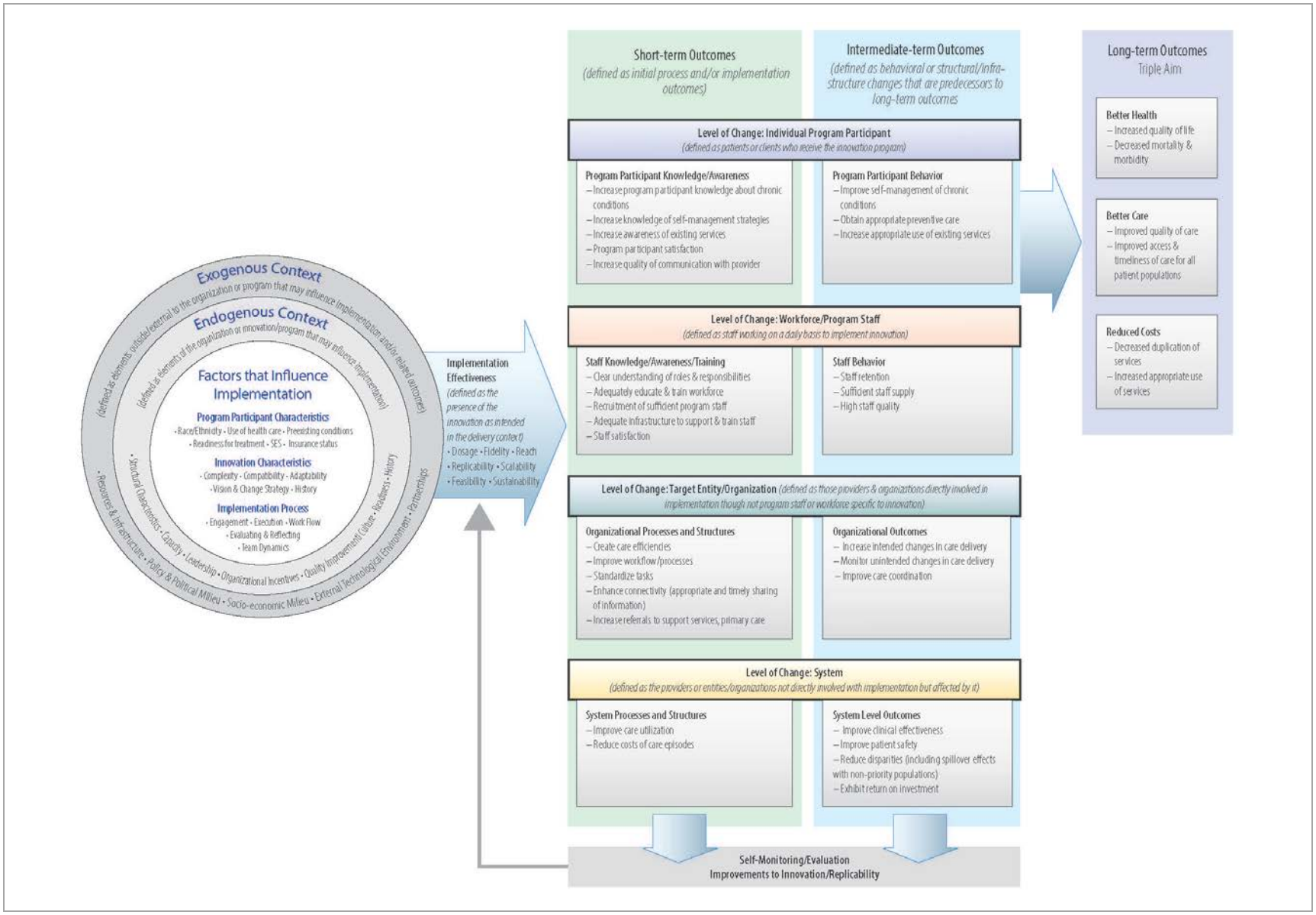
participants attended nine or more classes), meeting or exceeding CDC's recommendation for a successful DPP.

Y-USA maintains a strong organizational commitment to the DPP innovation and meeting the needs of a senior, Medicare-enrolled population. Even though Y-USA received a 12-month extension of funding from CMS, it has already begun to think about and look for resources to help it sustain the work started. With a sustainability plan in place that will lead Y-USA through 2017, Y-USA already started to develop community profiles that will serve as a new resource for local affiliates looking to implement the DPP in their communities. Y-USA also plans to update its existing DPP resources and tools with information and lessons learned for local YMCAs to successfully implement the DPP with individuals 65 years of age and older. A multicomponent program (like the DPP) requires financial resources and staffing to ensure that the innovation maintains programmatic fidelity. Y-USA has filed for a CPT code to allow for reimbursement for participation in the DPP innovation, which would help to sustain the innovation while minimizing or reducing the financial burden on participants. The CPT code would help Y-USA overcome the challenge of cost when recruiting new participants.

Appendix A

HCIA Community Resource Evaluation Framework

Figure A-1. HCIA Community Resource Evaluation Framework



Appendix B

Technical Methods

Technical Appendix B.1: Calculation of the Four Core Measures

Changes in This Report

The Medicare analyses in this quarterly report differ from the analyses included in the Year 1 Annual Report in several important ways.[1] First, the analyses in this report account for rolling enrollment by assigning the first intervention quarter (I1) separately to individual patients based on the quarter in which a patient is first enrolled in the innovation. For example, if Patient A is enrolled on August 25, 2013, that patient's I1 covers June, July, and August 2013. If Patient B is enrolled on November 7, 2013, that patient's I1 covers October, November, and December 2013. The same procedure is applied to the comparison group. We do not use the rolling 3 months after enrollment because of the large number of variants that would be introduced into the clone procedure described in ***Appendix B.2***. In the Year 1 Annual Report, I1 was assigned to the calendar quarter in which the intervention as a whole was launched. For example, if the innovation launch date was July 1, 2013, I1 was defined as July, August, and September 2013 for all patients, including Patients A and B. Applying rolling enrollment improves evaluation of the innovation because it does not lump together enrolled and not-yet-enrolled patients into the same intervention quarters and because it allows us to evaluate whether the innovation has differing effects over time after enrollment (e.g., does patient navigation have larger effects on costs and utilization in I5 than it has in I1?). A practical consequence of moving to rolling enrollment is that the number of unique patients will generally fall from I1 to I2 to I3 and so on, because early enrollees will have more exposure to the intervention than late enrollees.

Second, in this report, we now present data only for enrollees who have complete claims data for at least one quarter after enrollment. In the first annual report, we included data for any person who was enrolled in an awardee's innovation, even if the enrollment date occurred after the period when we had complete data. For the annual report, we often had patient identifiers for persons who enrolled through June 30, 2014, but we only had complete claims data through December 31, 2013. With the move to rolling enrollment in this report, we now include only persons with at least one quarter of data post-enrollment. This change ensures that we compare the same persons before and after the innovation launch. Medicare claims are now complete through December 31, 2014; therefore, our analysis includes persons who enrolled in awardees' innovations through December 31, 2014.

Third, we have included Medicare data for comparison groups for additional awardees in this report. More details on the methodology are provided in Appendix B.2.

[1] Rojas Smith, L., Holden, D. J., Hoerger, T., et al.: Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring Annual Report. 2014, October. Center for Medicare & Medicaid Innovation, Centers for Medicare & Medicaid Services. Available from: http://downloads.cms.gov/files/cmmi/HCIA-CommunityRPPM-FirstEvalRpt_4_9_15.pdf

We now include Medicaid claims analyses for additional awardees that have sufficient Medicaid data included in the Alpha-MAX files available in the Chronic Conditions Data Warehouse. For four awardees (Children's Hospital, Finity, Mary's Center, and SEMHS), we now include analyses based on claims data provided by the awardee. Alpha-MAX files that cover the innovation period are not yet available for these awardees' states.

Core Measures

As part of a broad assessment of health care innovations, the Center for Medicare & Medicaid Innovation (CMMI) is assessing the impact of its programs, including those funded specifically by HCIAs, on four core measures. The four core measures are

- health care spending per patient,
- hospital inpatient admissions,
- hospital unplanned readmissions, and
- emergency department (ED) visits not leading to a hospitalization.

We anticipate that CMMI programs will slow the increase in health care spending, reduce hospital admissions, reduce avoidable hospital readmissions, and prevent unnecessary ED visits. We are reporting these measures for all HCIA Community Resource Planning awardees so that the collective impact of the awards can be assessed. Discussed as follows, some awardees' innovations may not focus on these measures. Other awardees' innovations target specific conditions (e.g., imaging, diabetes) and may have significant impacts on spending, admissions, unplanned readmissions, and ED visits for the targeted conditions but not have a statistically detectable impact on the measures at the aggregate level because the targeted conditions represent only a small fraction of total spending, inpatient admissions, and ED visits.

The measures are calculated through analysis of Medicare and Medicaid fee-for-service (FFS) claims. Because of differences between Medicare and Medicaid patients in age, other demographic variables, and disease status, we report the Medicare and Medicaid results separately as follows. Currently, complete Medicare claims are available through the end of December 2014. Medicaid claims for awardees are taken from Alpha-MAX dataset contained in the Chronic Conditions Data Warehouse. Alpha-MAX availability varies by awardee and is dependent on the state reporting the data.

- **Health care spending per patient**. For Medicare beneficiaries, health care spending per patient includes Part A and Part B Medicare expenditures for persons enrolled in the Part A and Part B FFS program in at least one of the post-enrollment quarters. The variable focuses on Medicare FFS spending, so Medicare managed care (Part C) services are excluded, as are beneficiary copayments. Medicare Part D prescription spending is also excluded. Spending is reported on a per-person per-quarter basis. If a beneficiary is not enrolled for every month in a quarter, spending (except for hospital inpatient spending) is prorated to a quarterly basis based on the number of days enrolled during the quarter. Because hospital inpatient admissions are both rare and expensive, spending is not prorated for hospital inpatient spending. Prorating is also not performed for beneficiaries who die during a quarter.

For Medicaid beneficiaries, health care spending per patient is reported for FFS beneficiaries. Beneficiaries are only included in the analysis for spending (and the other measures) during periods when they are enrolled in Medicaid.

- **Hospital inpatient admissions**. This variable measures hospitalization, the single most expensive component of health care spending. Patients kept overnight in observation beds are excluded from this measure. Inclusion criteria for the analysis are the same as for spending. Hospital inpatient admissions are not prorated based on the number of days eligible during the quarter. The mean quarterly admission rate per 1,000 patients is reported.

- **Hospital unplanned readmissions**. Hospital unplanned readmission rates serve a dual purpose in evaluating HCIA impacts. Readmissions add to the costs of a prior hospitalization, and they often reflect a problem in the care provided during the first admission. All-cause readmissions are defined as a follow-up admission to any short-term acute general or long-term care hospital within 30 days of a discharge from another hospital of the same type. We ignore multiple admissions within 1 day of an initial admission because these often represent transfers between hospitals. We define index hospitalizations that begin during the quarter and follow each index admission for 30 days, even when the follow-up period extends beyond the end of the quarter. For Medicare analyses, we exclude patients under age 65 to be consistent with the Medicare Readmissions Reduction Program. We also exclude patients who died during hospitalization, were admitted to a prospective payment system (PPS)-exempt cancer hospital, who left against medical advice, were admitted for primary psychiatric diagnosis, rehabilitation, or medical treatment of cancer. Planned admissions (e.g., transplants) are not counted in the measure. Inclusion criteria for the analysis are the same as for spending. The unplanned readmissions rate equals the number of unplanned readmissions divided by the number of index hospitalizations during the quarter. Quarterly mean readmission rates per 1,000 admissions are reported.

- **ED visits**. ED visits are sometimes viewed as a symptom of the inability of the community's health care system to provide adequate preventive and ambulatory care visits. We report an all-cause ED visit rate that excludes ED visits resulting in an inpatient admission (which presumably represent unavoidable visits) and includes overnight ED visits without an inpatient admission. Inclusion criteria for the analyses are the same as for spending, and ED visits are also subject to the same prorating formula as for spending. The mean quarterly ED visit rate per 1,000 patients is reported.

Technical Appendix B.2: Propensity Score Matching, Comparison Group, and Regression Methodology

The HCIA awardees do not randomly assign individuals to treatment groups (TGs) and comparison groups (CGs). Thus, evaluating the impact of an intervention is challenging because we cannot compare outcomes for nearly identical persons who are randomly assigned to the TGs and CGs. To overcome the lack of random assignment in HCIA interventions, we employ several methods to obtain CGs. For the majority of the awardees, we use a standardized propensity score matching (PSM) methodology. Other HCIA interventions provided information on a logical comparison population (e.g., eligible nonparticipants), which we use as the CG. Other HCIA interventions were provider-focused. For these interventions, we selected similar providers and compared the patients of providers participating in the intervention to the patients of providers not participating in the intervention. The selected CG acts as the counterfactual case for the intervention group, providing a proxy for the intervention group's outcomes in the absence of treatment or intervention. All awardee-specific methodologies are described below.

Standardized Propensity Score Matching Methodology

When random assignment is not used, PSM is a method for selecting a CG that is observably similar to an intervention group at baseline. The propensity score model generates a propensity score for each individual that is a summary measure of the individual's likelihood of receiving the intervention based on baseline characteristics. After a propensity score is estimated, intervention group individuals are matched to CG individuals with the closest propensity scores. By matching intervention and comparison individuals, we select the CG most likely to be similar to the intervention group in the baseline period. Any changes after the baseline period can be attributed to the intervention.

The HCIA propensity score model matches intervention beneficiaries to comparison beneficiaries with similar demographics, disability status, end-stage renal disease (ESRD) status, chronic condition burden, emergency department (ED) and inpatient utilization, and spending in the pre-intervention period. The variables used in the propensity score model for each awardee are described in the awardee sections below. We match intervention and comparison beneficiaries using 1:variable caliper matching with replacement. Treatment beneficiaries are matched with up to three comparison beneficiaries within the caliper distance (described below). Once matches have been made, we use the Chronic Conditions Data Warehouse claims files to calculate the four core descriptive measures and run difference-in-differences regressions for TGs and CGs.

The first step in the PSM procedure is to limit the sample of potential comparison beneficiaries to those enrolled in fee-for-service (FFS) Medicare and living in the innovation's relevant geographic area or eligible nonparticipants. For some innovations, enrolled beneficiaries must meet additional requirements

such as having a threshold number of ED, hospital, or outpatient visits. Additional restrictions on CGs are made on an awardee-specific basis and are discussed in each awardee's report.

To estimate the propensity score, we use a logistic regression model to regress treatment status on the variables described in the awardee-specific treatment and control-balancing tables. One limitation of PSM is that the number of matching variables in the propensity score model is directly proportional to the number of treatment beneficiaries. If the number of treatment beneficiaries is small, then the number of matching variables also needs to be small for the logistic model to converge (i.e., approximately one matching variable for every 10 treatment beneficiaries). For relatively small interventions, treatment beneficiaries are matched to comparison beneficiaries using relatively few variables, potentially resulting in greater differences between the TG and CG than for awardees with large interventions.

After the propensity score model is estimated, we match each treated beneficiary with up to three comparison beneficiaries who had the closest propensity score within the caliper, calculated as 20 percent of the standard deviation of the logit of the propensity score. In rare cases, treatment beneficiaries had no comparison beneficiary within the caliper. In these cases, no adequate comparison beneficiary existed and unmatched treatment beneficiaries were not included in the subsequent analyses. Comparison beneficiaries are matched with replacement, meaning one comparison beneficiary can be matched to multiple treatment beneficiaries. When conducting the descriptive and outcome regression analysis, we use weighting to account for the number of times a comparison beneficiary is used as a control as well as the variable number of comparison beneficiaries across treatment beneficiaries. Matching based on the propensity score rather than all covariates is sufficient to produce unbiased estimates of treatment effects.[2] PSM allows us to estimate the average treatment effect on the treated (ATT), which is the impact of the intervention on those who participated.[3]

The approach to defining Medicare CGs for selected awardees in this quarterly report was similar to the approach used in Q6, which in turn was refined from earlier reports. The refined approach has several advantages over the previous methodology because we can precisely match TG beneficiaries to CG beneficiaries with similar characteristics, spending, and utilization in the quarter immediately prior to the TG beneficiary's enrollment in the innovation and the preceding four calendar quarters. This pre-enrollment quarter matching is an advancement from the prior approach because some TG beneficiaries incur a spike in spending (and underlying utilization) in the quarter prior to enrollment in the innovation. Often, this spike in spending (utilization) makes them eligible for the intervention. The refined approach allows us to match TG to CG beneficiaries who experience a similar spike in spending (utilization), improving the similarity of the CG to the TG on observed characteristics in the quarter prior to enrollment in the innovation and the four preceding quarters.

[2] Rosenbaum, P., and Rubin, D.B. The central role of the propensity score in observational studies for causal effects. Biometrika. 70(1):4155, 1983

[3] Imbens, G. Nonparametric estimation of average treatment effects under exogeneity: A review. Review Econ Stat. 86(1):1–29, 2004.

Cloning

The CG methodology aims to select similar CGs and TGs during the baseline period using both the calendar quarter prior to enrollment in the innovation and the four preceding calendar quarters. Because the HCIA awardees enroll TG beneficiaries over time, the baseline period is different for each enrollee. For example, a TG beneficiary who enrolls in an innovation on April 1, 2013 has a baseline period ending on March 30, 2013, but a TG beneficiary who enrolls in an innovation on January 1, 2014 has a baseline period ending December 31, 2013. The challenge is to select CG and TG beneficiaries with similar characteristics in the baseline period. However, CG beneficiaries do not have a date of enrollment and, therefore, they can theoretically have different baseline periods depending on their matched TG beneficiary.

To overcome this challenge, we apply a process we call "cloning" to introduce multiple versions of a CG beneficiary into the data prior to estimating a propensity score. We create one version of each potential CG beneficiary for each innovation quarter. Thus, if TG beneficiaries enroll in the innovation over five calendar quarters, we create five versions of the potential CG beneficiary with each version corresponding to one of the enrollment quarters. This CG beneficiary will have five different baseline periods, corresponding to the five different enrollment quarters. Because we observe the enrollment date of the TG, we are able to create variables containing spending and utilization in the baseline period. Although CG beneficiaries do not enroll in the innovation, because we have created a version of the CG beneficiary for each possible quarter of enrollment, each clone has a corresponding "enrollment" quarter and a corresponding baseline period. We are able to populate the variables containing last quarter's spending and utilization as well as the spending and utilization in the preceding four calendar quarters for the clones in each corresponding enrollment period.

For example, if enrollment in the innovation begins in the first quarter of 2013 (2013Q1) and continues through the end of 2014Q1, we create five clones of each CG beneficiary. The first clone has an enrollment quarter of 2013Q1 and last baseline quarter spending from 2012Q4; the second clone has an enrollment quarter of 2013Q2 and last baseline quarter spending from 2013Q1; and so on through 2014Q1. ***Table B.2-1*** provides an example of the data layout for two TG beneficiaries and one CG beneficiary with five clones.

Table B.2-1. Example Clone Data Layout

Beneficiary ID	Treatment Group	Clone	Enrollment Quarter	Last Baseline Quarter
1	1	0	2013Q1	2012Q4
2	1	0	2013Q2	2013Q1
3	0	1	2013Q1	2012Q4
3	0	1	2013Q2	2013Q1
3	0	1	2013Q3	2013Q2
3	0	1	2013Q4	2013Q3
3	0	1	2014Q1	2013Q4

One key advantage of the cloning approach is worth emphasizing. Previously, the propensity score equation included previous annual spending for the beneficiary, where annual spending was a variable in the Master Beneficiary Summary File (MBSF) produced on a calendar year basis (e.g., 2012 annual spending, 2013 annual spending, etc.). As a result, the lag between data availability and enrollment dates could vary for TG beneficiaries depending on when in a year they enrolled in the innovation. For example, annual data from 2013 would be used for a beneficiary who enrolled in the first quarter of 2014, and the same annual data for 2013 would have been used if the person had instead enrolled in the fourth quarter of 2014. For the second case, any acceleration in spending in the quarter prior to enrollment would not be reflected under the previous approach. This approach led to some cases where the spending match between TG and CG beneficiaries appeared reasonable one year before enrollment but began to diverge in the quarters prior to enrollment. By including lagged quarterly spending in our new approach, we now reflect the most recent pre-enrollment spending, allowing us to achieve better matches. In addition, we also include lagged spending in the four quarters prior to the quarter before enrollment to control for historical spending trends as well as the recent trend (quarter prior to enrollment). These changes do have computational costs; we must now calculate quarterly and lagged annual spending from individual claims instead of getting annual spending per beneficiary already calculated in the MBSF. This includes calculating quarterly and lagged annual spending for all potential CG beneficiaries, not just those who are ultimately matched with TG beneficiaries.

Currently, we only apply the cloning approach to Medicare claims. For Medicaid, we do not yet have enough periods of post-intervention data from Alpha-MAX to warrant cloning.

Propensity Score Matching

The TG beneficiaries (one per TG beneficiary) and the CG clones (e.g., five clones per CG beneficiary) are then included in a PSM process, with logistic regression estimating the probability of participation given selected beneficiary characteristics including last-quarter-before-enrollment spending and the lagged annual spending prior to enrollment. The probability of participation is mechanically lower using the cloning methodology because the CG size is multiplied by the number of clones. Propensity scores are estimated for each TG beneficiary and CG clone.

Although the logistic equation is estimated following the usual PSM approach, matching is done in several stages to ensure that (1) as many TG beneficiaries as possible receive at least one good match, and (2) a CG beneficiary acts as a control in a single enrollment quarter. To accomplish both requirements, we developed an algorithm that assesses the matches between TG beneficiaries and CG clones. We first allow multiple CG clones to match with each TG beneficiary, as long as the match is within a specified caliper. Second, if a CG beneficiary is only matched to TG beneficiaries in a single enrollment quarter (i.e., only one of the CG beneficiary's clones is matched, although the clone may match to more than one TG beneficiary in the same quarter), we retain those matches. Third, we consider the matches for CG beneficiaries who have clones that match TG beneficiaries across multiple quarters. The algorithm chooses the set of clone matches (one quarter per CG beneficiary) that result in the most

TG beneficiaries with at least one good match. Finally, for each TG beneficiary, we limit the maximum number of CG matches to three because prior research shows negligible gains in efficiency beyond three matched controls.[4]

Weighting

After applying the matching algorithm, we generate weights for the matched control beneficiaries. TG beneficiaries receive a weight of 1, whereas CG beneficiaries receive a weight that accounts for two factors: (1) up to three CG beneficiaries may match with each TG beneficiary (e.g., 1/3, 2/3 or 3/3); and (2) each CG beneficiary may match more than one TG beneficiary. The weights are incorporated in the balancing tables, summary descriptive tables, and regression analyses.

Post-Matching Diagnostics

For awardees whose CG is selected using PSM, we provide two diagnostic tests to assess the similarity of the treatment and matched control groups.

First, we provide a balancing table that includes the mean and standard deviation of the variables included in the propensity score model. The balancing table also calculates absolute standardized differences in the variables between the TG and CG before and after matching. Comparisons of the absolute standardized difference before and after matching allows the reader to assess the improvement in comparability of the unmatched and matched CG, respectively. An absolute standardized difference of 0.10 or lower is considered an acceptable level of balance between TG and CG.[5],[6]

Second, we present kernel density plots showing the distribution of propensity scores in the TG and matched CG. In contrast to the balancing table, which assesses differences between the TG and CG one variable at a time, the kernel density plot is a comparison of the propensity score, which is a summary measure of all covariates included in the propensity score model. Overlap in the density implies that the propensity score estimates are similarly distributed in the TG and CG.

The following sections describe the specific details of the propensity score models implemented for each awardee.

[4] Haviland, A., Nagin, D.S., and Rosenbaum, P. Combining propensity score matching and group-based trajectory analysis in an observational study. Psych Methods. 12.3: 247, 2007.
[5] Austin, P.C. Balance diagnostics for comparing the distribution of baseline covariates between treatment groups in propensity-score matched samples. Statist. Med. 28:3083–3107, 2009.
[6] Austin, P.C. An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research. 46.3: 399–424, 2011. *PMC*. Web. 2 June 2015

AACI

Medicare

Potential CG members include Medicare beneficiaries enrolled in FFS Medicare Parts A and B living near AACI. Patients who visited AACI since the innovation started enrolling patients in October 2013 were excluded. Comparison beneficiaries must have lived in California from 2010 to December 2014, and lived in Santa Clara County for at least 1 month while the intervention enrolled beneficiaries.

PSM was used to select a CG of Medicare beneficiaries similar in observable characteristics to intervention Medicare beneficiaries. The PSM model adjusted for the following potentially confounding factors: age, number of chronic conditions, percentage disabled, percentage ESRD, percentage male, percentage white, payments in calendar quarter prior to enrollment, number of dual eligible months in the previous calendar year, and total payments in the second, third, fourth, and fifth calendar quarters prior to enrollment.

Altarum

Medicare

The Altarum innovation is directed at changing physician behavior; therefore, we compare the patients of physicians who participated in the innovation to the patients of physicians who have not.

We used PSM to select CG physicians with similar characteristics as innovation physicians. The innovation group includes physicians who received ImageSmart training. The set of potential CG physicians included those who were not targeted for training by Altarum. Innovation and comparison physicians were matched using a logit model predicting the likelihood that a physician was enrolled in the innovation as a function of the number of Medicare patients a physician had, average patient spending, the average number of chronic conditions per patient, the age distribution of patients, patient gender, patient race, ESRD and disability status of patients, and practice specialty. Physicians were matched 1:1 with replacement using a caliper.

After completing PSM, we selected Medicare FFS patients who saw an innovation or matched comparison physician after the physician received ImageSmart training.[7] The sample contains 25,250 innovation patients and 28,688 comparison patients. The first intervention quarter (I1) for innovation and comparison patients is determined by the first date that the patient saw a physician after that physician/practice received ImageSmart training.

In previous reports, the innovation group consisted of physicians who received training and used the ImageSmart system and the comparison group included physicians who received training but did not use the ImageSmart system. However, some physicians in the CG may have had an employee proxy using the system on their behalf. We requested information linking proxy users to trained physicians from

[7] CG physicians did not receive ImageSmart training. Each comparison physician was assigned the same training date as the matched TG physician.

Altarum, but Altarum does not collect this data. Thus, for this report we refined the innovation group to include all physicians who received training and the CG to contain physicians who did not receive ImageSmart training. Because some physicians in the TG have not used the ImageSmart system, the results should have an intent-to-treat interpretation.

BAHC

Medicare

Potential CG members include Medicare beneficiaries enrolled in FFS Medicare Parts A and B living in southern Doña Ana County (excluding the city of Las Cruces) and the counties surrounding Doña Ana County (Luna, Sierra, and Otero Counties) during the innovation launch.

We used PSM to select CG and TG beneficiaries with similar characteristics. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, disability, ESRD status, dual Medicare-Medicaid status, diabetes, asthma, hypertension, number of chronic conditions, and total Medicare payments in the calendar quarter and year prior to the innovation.

Medicaid

Potential CG members include Medicare beneficiaries enrolled in FFS Medicare Parts A and B living in southern Doña Ana County (excluding the city of Las Cruces) and the counties surrounding Doña Ana County (Luna, Sierra, and Otero Counties) during the innovation launch.

We used PSM to select CG and TG beneficiaries with similar characteristics. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, dual Medicare-Medicaid status, and total Medicare payments in the calendar quarter and year prior to the innovation.

Bronx RHIO

Medicare

We used PSM to select CG and TG beneficiaries with similar characteristics. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, disability, ESRD status, dual Medicare-Medicaid status, number of chronic conditions, number of ED visits and inpatient stays in the calendar quarter prior to the innovation, and total Medicare payments in the calendar quarter and calendar year prior to the innovation. We used one-to-variable matching with replacement, matching each intervention treatment beneficiary to up to three CG beneficiaries with the closest propensity score.

Children's Hospital

Medicaid

Children's Hospital provided data on participants and nonparticipants in its innovation. We define nonparticipants as those who, despite agreeing to participate in Care Links, did not receive any home visit or who declined services. We did not have enough data to perform PSM; instead, we used nonparticipants as the CG.

Curators

Medicare

Potential CG members include FFS Medicare beneficiaries living in the 23 innovation counties in central Missouri. We used PSM to select CG and TG beneficiaries with similar characteristics. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, disability, ESRD status, dual Medicare-Medicaid status, number of chronic conditions, number of ED visits and inpatient stays in the calendar quarter prior to the innovation, and total Medicare payments in the calendar quarter and calendar year prior to the innovation. We used one-to-variable matching with replacement, matching each TG beneficiary with up to three CG beneficiaries with the closest propensity score.

Medicaid

Potential CG members include FFS Medicare beneficiaries living in the 23 innovation counties in central Missouri. We used PSM to select CG and TG beneficiaries with similar characteristics. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, disability, dual Medicare-Medicaid status, new enrollee status, number of months of Medicaid eligibility during the calendar year prior to the innovation, and total Medicare payments in the calendar quarter and calendar year prior to the innovation. We used one-to-variable matching with replacement, matching each TG beneficiary with up to three CG beneficiaries with the closest propensity score.

Delta Dental

Medicaid

To construct the CG, we used PSM to identify Medicaid FFS patients living in counties in South Dakota (where the Indian reservations are located) who have not participated in the Delta Dental innovation. We selected CG members from the same counties where the Indian reservations are to minimize variation in sociodemographic characteristics that may influence service use and expenditures. Program participants and CG members were matched using a logit model predicting the likelihood of program participation as a function of demographics (gender, age, and ethnicity), months of Medicaid eligibility, and total spending during the year prior to program participation.

ECCHC

Medicare

We constructed a CG of Medicare beneficiaries enrolled in FFS Medicare Parts A and B living in Richland County, South Carolina during the innovation launch. We used PSM to select CG and TG beneficiaries with similar characteristics. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, disability, ESRD status, dual Medicare-Medicaid status, number of chronic conditions, total payments in second, third, fourth, and fifth calendar quarters prior to enrollment, number of ED visits in calendar quarter prior to enrollment, number of inpatient stays in calendar quarter prior to enrollment, and total Medicare payments in the calendar quarter prior to the innovation. We matched each TG beneficiary with up to three CG beneficiaries whose propensity scores were within a predefined distance.

Finity

Medicaid

Potential CG members include eligible mothers who did not receive incentives from the Baby Partners program. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of mother's age; number of children; substance abuse; and mother's preexisting conditions, e.g., cerebrovascular disease, genital, cardiovascular, central nervous system related, gastrological infectious, metabolic, psychiatric, pulmonary, skeletal, and skin-related disease.

Imaging Advantage (IA)

Medicare

We used PSM to select Chicago-area comparison hospitals with similar characteristics to the hospitals enrolled in the innovation. Treatment and comparison hospitals were matched using a logit model predicting the likelihood that a hospital participated in the innovation as a function of number of beds, race composition of patients, total patient days, the fraction of hospital revenue from Medicaid, the fraction of hospital revenue from Medicare, and the resident-to-bed ratio. Each treatment hospital was matched with the comparison hospital having the nearest propensity score.

Because the IA innovation focuses on imaging services in the ED, our claims analysis focuses on patients who were seen in the ED. For each treatment and comparison hospital, we generated a list of all patients who visited the ED during the quarter. In each quarter, the sample size is the number of unique patients who visited a treatment or comparison hospital. Costs and utilization for patients visiting the ED in the comparison hospitals were then compared with the corresponding variables for patients who visited the ED in the treatment hospitals.

Medicaid

We used PSM to select Chicago-area comparison hospitals with characteristics similar to hospitals enrolled in the innovation. We used the same set of comparison hospitals for the Medicaid analysis as we used for the Medicare analysis.

Intermountain

Medicare

Potential CG members include Medicare beneficiaries enrolled in FFS Medicare Parts A and B living in the state of Utah during the innovation launch that were not enrolled in the innovation. The primary focus of the claims analysis is on patients participating in the IndiGO, shared savings model (SSM), and hot spotting (population management) components of Intermountain's innovation. Because of the complementarity of the IndiGO and SSM components, we divided the innovation beneficiaries into four groups for analysis: those enrolled in both IndiGO and SSM (Cohort 1), those enrolled in IndiGO only (Cohort 2), those enrolled in SSM only (Cohort 3), and those enrolled in hot spotting (Cohort 4).

We used PSM to select CG and TG beneficiaries with similar characteristics for Cohorts 1, 2, and 3. Because few patients were enrolled in hot spotting at the time of the report, we were not able to construct a CG for this cohort. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, disability, ESRD status, dual Medicare-Medicaid status, number of chronic conditions, total payments in second, third, fourth, and fifth calendar quarters prior to enrollment, number of ED visits in calendar quarter prior to enrollment, number of inpatient stays in calendar quarter prior to enrollment, and total Medicare payments in the calendar quarter prior to the innovation. We matched each TG beneficiary with up to three CG beneficiaries whose propensity scores were within a predefined distance.

Mineral Regional

Medicare

Mineral Regional is a network of 25 critical access hospitals (CAHs). Montana has a total of 48 CAHs, so the CG includes the 23 nonparticipating CAHs in the state. Because our analysis is centered on patient outcomes, we assume that users are randomly distributed across CAHs so that people will use the CAHs nearest to them.

Medicaid

The CG consists of Medicaid beneficiaries using the 23 nonparticipating CAHs in Montana. On average, each participating CAH appeared to serve 60 percent more Medicaid beneficiaries than nonparticipating ones. Although several small nonparticipating CAHs are located in rural Native American communities, this finding was unexpected and we will investigate further. As in the Medicare analysis, we assume that users are randomly distributed across CAHs so that people use the CAHs nearest to them; therefore, no PSM was performed.

MPHI

Medicare

To construct the CG, we used PSM to identify individuals located in the same three counties (Saginaw, Muskegon, and Ingham) where the intervention was conducted, who had two or more chronic conditions, and who were not enrolled in the innovation. We selected CG members from the same counties where the intervention was conducted to minimize variation in sociodemographic characteristics that may influence service use and expenditures. Program participants and CG members were matched using a logit model predicting the likelihood of program participation as a function of demographics (gender, age, and ethnicity), health characteristics in the calendar year prior to enrollment (number of chronic conditions, disability status and ESRD status), health care utilization in the calendar quarter prior to enrollment (number of inpatient admissions and ED visits), and spending in the quarter and year prior to program participation.

Medicaid

To construct the CG, we used PSM to identify individuals located in the same three counties (Saginaw, Muskegon, and Ingham) where the intervention was conducted, who were enrolled in FFS Medicaid, and who were not enrolled in the innovation. Program participants and CG members were matched using a logit model predicting the likelihood of program participation as a function of demographics (gender, age, and ethnicity), disability status, dual eligibility, number of months of Medicaid eligibility during the calendar year prior to the intervention, new Medicaid enrollee indicator, health care utilization in the calendar quarter prior to enrollment (number of inpatient admissions and ED visits), and spending in the quarter and year prior to program participation.

NEU

Medicare

To construct the CG for CHA, we used PSM to identify individuals living in the Greater Boston area (Middlesex, Essex, Norfolk, Plymouth, and Suffolk counties) who were not enrolled in the innovation. We selected CG members from the Greater Boston area to minimize variation in sociodemographic characteristics that may influence service use and expenditures. Program participants and CG members were matched using a logit model predicting the likelihood of program participation as a function of demographics (age, gender, and ethnicity), number of dually eligible months, health characteristics in the calendar year prior to enrollment (number of chronic conditions, disability status, and ESRD status), health care utilization in the lagged year prior to enrollment (number of inpatient admissions and ED visits), and spending in the quarter and year prior to program participation.

To construct the CG for Lahey, we used PSM to identify individuals living in the Greater Boston area (Middlesex, Essex, Norfolk, Plymouth, and Suffolk counties) who ever had congestive heart failure and who were not enrolled in the innovation. We used the same propensity score covariates as described above.

Prosser

Medicare

Cohort A and B

We used the comparison sample of Medicare beneficiaries enrolled in FFS Medicare Parts A and B who were eligible for the innovation and the respective cohort, but chose not to participate.

Cohort C

We first narrowed the comparison sample to Medicare beneficiaries enrolled in FFS Medicare Parts A and B who were eligible for the innovation and the cohort, but chose not to participate. We then matched innovation and comparison beneficiaries using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of gender, race, disability, ESRD status, number of chronic conditions, count of total ED stays during the previous four calendar quarters and, total Medicare payments in the calendar quarter and year prior to the innovation.

Medicaid

We used a similar matching procedure as outlined above for Medicaid FFS beneficiaries, but we pooled all three cohorts together for Medicaid analyses due to small sample sizes. We then matched innovation and comparison beneficiaries using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, disability, number of dual eligible months in the previous calendar year, count of total ED and inpatient stays during the previous four calendar quarters, and total Medicare payments in the calendar quarter and year prior to the innovation.

REMSA

Medicare

The potential CG for REMSA ATA consists of beneficiaries enrolled in FFS Medicare Parts A and B and living in Washoe County in the state of Nevada. We identified and excluded individuals in the claims data who had an inpatient visit within 7 days of ED admission. We then used those who had an ED visit without hospitalization within 7 days as our possible comparison sample.

The potential CG for CP consists of beneficiaries enrolled in FFS Medicare Parts A and B and living in Washoe County in Nevada. Additionally, comparison beneficiaries must have been alive in at least one post-intervention quarter and had myocardial infarction or congestive heart failure.

We used PSM to select CG beneficiaries with similar characteristics as TG beneficiaries. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, disability, ESRD status, number of chronic conditions, total Medicare payments in the calendar quarter and year prior to the innovation, and number of ED visits in the calendar quarter and year prior enrollment.

SEMHS

Medicaid

We used PSM to select a CG of beneficiaries that appeared in the ICHP data but were not enrolled in the innovation. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age and gender. We were limited to using only age and gender in the propensity score model because these were the only patient characteristics included in the claims data provided by ICHP.

South County

Medicare

Potential CG members include FFS Medicare beneficiaries with at least one chronic disease who lived near South County. Patients who visited the South County community health center since the innovation started enrolling patients in January 2013 were excluded. We also specified that comparison beneficiaries must have lived in California from 2010 to present and lived in San Mateo county for at least 1 month while the intervention enrolled beneficiaries (January 2013 to present).

Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, and total payments in the second to fifth quarters prior to enrollment. The small number of Medicare beneficiaries limited the number of variables available for use in the matching regression.

U-Chicago

Medicare

Potential CG members include Medicare beneficiaries enrolled in FFS Medicare Parts A and B living in the 11 zip code areas of the South Side of Chicago. We use PSM to select CG and TG beneficiaries with similar characteristics. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, disability, ESRD status, dual Medicare-Medicaid status, number of chronic conditions, number of ED visits and inpatient stays in the calendar quarter prior to the innovation, and total Medicare payments in the calendar quarter and calendar year prior to the innovation. We used one-to-variable matching with replacement, matching each TG beneficiary to up to three CG beneficiaries with the closest propensity score.

Medicaid

Potential CG members include Medicare beneficiaries enrolled in FFS Medicare Parts A and B living in the 11 zip code areas of the South Side of Chicago. We use PSM to select CG and TG beneficiaries with similar characteristics. Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age,

gender, dual eligibility status, race, new enrollee status, number of months of Medicaid eligibility during the calendar year prior to the innovation, number of ED visits and inpatient stays in the calendar quarter prior to the innovation, and total Medicare payments in the calendar quarter and calendar year prior to the innovation. We used one-to-variable matching with replacement, matching each TG beneficiary to up to three CG beneficiaries with the closest propensity score. As noted in the awardee section, the matched CG had relatively high standardized differences and a relatively poor match between the TG and CG kernel density curves.

Y-USA

Medicare

Potential CG members include beneficiaries enrolled in FFS Medicare for at least 1 month since the innovation began enrolling beneficiaries. We excluded from the potential sample individuals who had ever been classified as having diabetes. Furthermore, we only included individuals who met the requirement criteria for enrollment in the Diabetes Prevention Program: at least 65 years of age and diagnosed with prediabetes. To identify prediabetes patients we used the following ICD-9 codes: 790.29 (abnormal glucose); 277.7 (metabolic syndrome); 790.21 (impaired fasting glucose levels, but not yet diagnosed with diabetes); and 790.22 (failed glucose tolerance test, but still not diagnosed with diabetes).

Innovation and comparison beneficiaries were matched using a logit model predicting the likelihood that a beneficiary was enrolled in the innovation as a function of age, gender, race, ESRD status, dual eligibility status, number of chronic conditions, total Medicare payments in the calendar quarter and year prior to the innovation, number of inpatient stays in the calendar quarter prior to enrollment, and number of ED visits in the calendar quarter prior to enrollment.

Regression Analyses

The difference-in-differences (DinD) analytic approach is used to identify and quantify intervention effects of the HCIA demonstrations. This approach is used when pre-intervention data are available and whenever it is possible to identify CGs. The DinD regression specification involves both a comparison and intervention group along with pre-demonstration (or intervention) data on both. The preferred *Quarterly Fixed Effects* (QFE) model was designed by Professor Partha Deb for CMS's "rapid-cycle evaluations." The QFE model, in equation form, is:

$$y_{i,t} = \alpha_0 + \mu I_i + \sum_t^T \beta_t Q_t + \sum_t^T \theta_t (Q_t \cdot I_{i,t} \cdot D_t) + \sum_k \lambda_k X_{i,t,k} + \varepsilon_{i,t} \quad \text{(B-1)}$$

$y_{i,t}$ = a performance measure (e.g., Medicare payments per beneficiary per quarter) for the i[th] beneficiary in period t

$I_{i,t}$ = a 0,1 indicator of the observation in the comparison (=0) or intervention (=1) group

Q_t = 0,1 indicator of the observation in the t[th] quarter

D_t = a 0,1 indicator (= 0, base period, = 1, demonstration period)

$X_{i,t,k}$ = a vector of k patient, practice, and/or other characteristics

$\varepsilon_{i,t}$ = regression error term.

The I_i coefficient, μ, measures the average difference in performance between the intervention and CGs across all base and demonstration quarters. If intervention and comparison samples are well matched on baseline performance, then we expect $\mu = 0$. Separate quarter indicators (Q_t) are used from t = 2, the second baseline quarter (first baseline effects are in α_0) to the most current evaluation quarter (T). The β_t coefficients reflect the individual quarter-to-quarter changes in average CG performance through the entire baseline and intervention periods. Rising β coefficients in later quarters indicate greater spending per patient. During base period quarters, performance for the intervention sites would be ($\mu + \beta_t$) ignoring the intercept. To determine the marginal effects of the intervention during only the demonstration period, the quarterly indicators are interacted with an indicator representing a demonstration period quarter (D_t). The θ_t coefficients reflect the deviation from the intervention's baseline μ-effect in the demonstration quarters. The average (not the marginal) performance of intervention sites during the t^{th} demonstration quarter is given by the sum of ($\mu + \beta_t + \theta_t$). A vector of patient, practice, and/or other relevant characteristics are also included to further explain variance in performance and improve the reliability of the estimated coefficients. These characteristics are also necessary for inclusion in the regression when it is not possible to perfectly match the CG's characteristics to those of the intervention group.

The foregoing interpretations of the regression coefficients are applicable only to linear models estimated by ordinary least squares (OLS). When the outcome variables are Medicare payments, linear QFE models were estimated using OLS. When outcome variables were dichotomous or utilization counts, nonlinear QFE models were estimated using logits (logistic regressions).

Advantages of QFE Models

An obvious advantage of QFE modeling is its flexibility. It does not require a prior specification of the functional form of intervention effects over the life of the intervention or even the base period. For example, baseline trends in spending likely are not linear but exponential from compounded volume and price effects. Nor is it reasonable to expect intervention effects to be linear if interventions start slowly, then produce accelerated effects.

Another advantage of QFE is that it reports intervention performance, relative to a CG, quarter-by-quarter. This knowledge enables the researcher and policy maker to see any trends in performance that might be lost in a linear slope estimate of effects. How quickly a decision can be made to abandon, scale up, or refine an intervention depends on the observed pattern of θ_t coefficients. A minor advantage is that QFE modeling does not require seasonal adjustors because each quarter's effects are estimated separately, thereby "controlling" for season.

Disadvantages of QFE Models

Although QFE represents the most flexible approach to program testing, it adds to model complexity. The fact that QFE estimation can involve many more coefficients could be considered a computational disadvantage. Another concern is that one or two large quarters of "savings" or "losses" may not be sustained. This concern is heightened when estimating the model on small data sets with just a few hundred intervention observations—particularly for volatile spending information. Large savings in one quarter can turn into large losses in the next quarter. In both cases, the estimates may be insignificant at common levels of significance (10%, 5%), which makes inferences difficult. This problem is addressed to some degree through linear combination tests over several quarters, but it becomes an (unknown) tradeoff between working with smaller samples and the number of quarters of data. Generally, smaller samples require more quarters of consistently better (or worse) performance in the intervention group. Also, tradeoffs exist between how often to "look" at performance (monthly, quarterly, annually) and how significant short-period coefficients will be. More "looks" will show more volatility (and increase the likelihood of false-positives). Therefore, policy makers should view the quarterly coefficients carefully, and in the context of the results for a number of quarters.

Empirical Specification of the QFE Model

We performed QFE DinD regression analyses to determine the impact of the innovation on spending, the likelihood that a patient was hospitalized, and the likelihood that a patient had an ED visit. In addition to the quarter, treatment, and demo period indicators, all regressions controlled for age, gender, race, disability, ESRD, dual eligibility, number of months of dual eligibility status during the calendar year prior to the intervention, and the number of chronic conditions. The regression specification assumes the same quarterly fixed effect for treatment and comparison individuals in the pre-innovation period and allows for a separate quarterly effect for treatment individuals after enrolling in the innovation.

Technical Appendix B.3: Awardee Secondary Data

As part of their contract with CMS, all awardees developed a Self-Monitoring Measurement Plan, which specified the data to be collected and was used to monitor the progress of the innovation over time. In general, the data were collected as part of the innovation (e.g., spreadsheets tracking enrollment numbers) or were pulled from existing electronic health record (EHR) or other data collection systems.

We reviewed each awardee's self-monitoring measurement plan and identified explanatory and health outcome measures that would be useful to include as part of our evaluation of awardees' innovations. Our goal for the health outcomes measures was to determine which would be most useful in assessing the impact of the innovation on patient health. We met with all awardees to discuss their willingness to provide the selected data to RTI. While all awardees ultimately agreed to provide the data requested when available, in many instances the awardee did not ultimately collect measures listed in the self-monitoring measurement plans.

We began receiving these secondary data for each quarter from awardees in June 2014. As of June 2015, all awardees provided some type of secondary data to be used in RTI's evaluation. Once we received the data, we cleaned the data and provided a file containing patient identifiers (e.g., Medicare HIC number, Medicaid ID, social security number, name, address) to the claims analysis team. We then created new variables or recoded existing variables to include in the patient characteristics (e.g., age, race/ethnicity, sex, payer category), reach (e.g., first quarter of enrollment), and dose (e.g., number and types of services received) tables, as well as the clinical effectiveness (e.g., foot exam, blood pressure screening) and health outcomes sections (e.g., poor HbA1c control, blood pressure control), in the individual awardee chapters. Once the report was completed, we archived the data in case an inquiry is made on the data included in the report at any point.

To avoid overburdening the awardees, we did not place a lot of requirements on the structure or format of the data files they provided. We agreed to accept the raw data "as is" from their EHR or project-related tracking systems, which ultimately led to more work for us to process and manage the data. Most awardees provided the data across multiple files that needed to be merged. Some awardees provided only data for each quarter, whereas other awardees provided cumulative data of all patients ever enrolled each quarter. Files provided by different awardees included:

- Backup copy of a SQL database
- More than 15 cumulative data files
- More than 50 reports with patient-level data
- Documents for abstraction of qualitative data
- Photocopies of EHR data

Although we requested the data be provided in the same format as provided in the previous quarters, we often discovered changes over time that made working with the data more challenging such as:

- Names of variables changed, making it difficult to simply merge previous data with new data (e.g., Patient_Id in Q7 data file, patientid in Q8 data file, Personid in Q10 data file)
- Values of variables changed (e.g., a patient's enrollment date in the data for Q9 differed from the enrollment date in the data provided for Q8—sometimes with an earlier date, sometimes with a later date)
- Calculation of variables changed (e.g., awardee provided the health outcome value available prior to the encounter date to determine control through Q10, but changed to using the value actually taken on the encounter date in Q11)
- Existing enrollees "disappeared" (e.g., if the awardee provided cumulative data, in some instances patients "disappeared" from the data in subsequent quarters)
- New enrollees appeared (e.g., a new patient with an enrollment date from Q8 was not included in the data provided for Q8, but appeared in the data for Q9).

Even when the data were provided in the same format as in the previous quarters, there were other challenges, including:

- Duplicate records: sometimes a whole record was a duplicate; other times date of birth was missing in one record but included in another record for the same patient
- Duplicate records with mismatched identifiers: there may be two records with the same medical record number (MRN), but different social security numbers, making distinguishing a true duplicate record from a record in which a typo occurred difficult
- Impossible/invalid values: for example, systolic blood pressure >500; enrollment dates prior to the HCIA funding
- Values of variables represented in multiple ways, including misspellings (e.g., Male, M, MALE, male, mael)
- Invalid patient identifiers: The patient identifiers that we received could not be matched with any of the enrollment files for Medicare or Medicaid claims data.
- Two related variables provided in separate files (e.g., systolic blood pressure and diastolic blood pressure provided separately, with no way to determine which systolic goes with which diastolic value—unless the patient had only one reading on a specific date)
- Multiple values per cell separated by commas or not clearly delimited

With 24 awardees providing data from different EHR systems and other sources, we had to develop rules (e.g., recode any systolic blood pressure reading that is <70 or >250 and any diastolic blood pressure reading that is <45 or >150 to missing) to deal with all of these issues consistently across awardees.

Technical Appendix B.4: Qualitative Measures, Data Sources, and Analysis Methods

Definitions of Evaluation Planning Matrix Domains and Subdomains

Table B.4-1. Definitions of Evaluation Planning Matrix Domains and Subdomains

Domains	Corresponding Subdomains	Definition	Source(s) (abbreviated, full citation is below in endnotes)
Exogenous Factors		Elements outside/external to the organization or program that may influence implementation and/or related outcomes. Generally, the outer setting includes the economic, political, and social context within which an organization resides, and the inner setting includes features of structural, political, and cultural contexts through which the implementation process will proceed.[8]	Rycroft-Malone et al., 2002
	Partnerships/ Networks	Interrelationships between other organizations (e.g., between outpatient clinics and a community hospital).[9] The degree to which an organization is networked with other external organizations. Organizations that support and promote external boundary-spanning roles of their staff are more likely to implement new practices quickly.[10] Interagency cooperation and support from citizens have also been characterized as community support.[11]	AHRQ, 2013; Greenhalgh, 2004; Mihalic, 2003
	Community Resources and Infrastructure	The extent to which patient needs, as well as barriers and facilitators to meet those needs (outside the organization), are accurately known and prioritized by the organization. The extent to which the innovation characteristics are 'matched' to the readiness to change of patients.[12] This includes built environment, geographic characteristics, and institutional attributes.	Damschroder et al., 2009

[8] Rycroft-Malone, J.A, Kitson, G., Harvey, B., et al.: Ingredients for change: Revisiting a conceptual framework. (Viewpoint). Quality and Safety in Health Care. 11:174-180, 2002.

[9] Agency for Healthcare Research and Quality. Developing and Assessing Contextual Frameworks for Research on the Implementation of Complex System Interventions Draft Methods Research Report. 2013.

[10] Greenhalgh, T., Robert, G., Macfarlane, F., et al.: Diffusion of Innovations in Service Organizations: Systematic Review and Recommendations. London. University College London, 2004, pp. 1-49.

[11] Mihalic, S., and Irwin, K.: Blueprints for violence prevention: From research to real-world settings—Factors influencing the successful replication of model programs. Youth Violence and Juvenile Justice. 1(307):1-24, 2003.

[12] Damschroder, L.J., Aron, D.C., Keith, R.E., et al.: Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. Implementation Science 4:50. 2009. DOI:10.1186/1748-5908-4-50.

Table B.4-1. Definitions of Evaluation Planning Matrix Domains and Subdomains (continued)

Domains	Corresponding Subdomains	Definition	Source(s) (abbreviated, full citation is below in endnotes)
	Policy and Political Environment	**General Policy Environment**: External policies or regulations (governmental or other central entity), external mandates, clinical recommendations and guidelines, and public or benchmark reporting.[13] [14] **Existing Payment Models**: Fee for service, managed care, accountable care organizations, bundled payments, primary care transformation, and initiatives focused on the Medicaid and CHIP population, initiatives focus on Medicare–Medicaid enrollees, and other state and federal initiatives.[15]	Berry et al., 2013; Damschroder et al., 2009; AHRQ, 2013
	Socioeconomic Environment	Social conditions in which people live their daily lives. Interactions with families, friends, co-workers and others that shape everyday experiences in neighborhoods, communities, and institutions (such as schools, the workplace, places of worship, government agencies, etc.). This means that individual and community socioeconomic factors; social norms, social support and community connectedness; employment and working conditions; living conditions; and culture, religion, and ethnicity shape health. The social and economic environment of a community is created by the individual and combined actions of its members and is unique because of social norms and cultural customs.[16] **Social and economic determinants of health**: Social determinants of health are conditions in the environments in which people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks.[17] **Demographics**: The statistical data of a population, especially those showing average age, income, education, etc. Demographic change is the calculable shift in the characteristics of a geographically defined population. These include changes in population age profile, racial make-up or family structure.[18]	MN Department of Health, http://www.health.state.mn.us/strategies/social.pdf; CDC, 2013; Cohen, Health Affairs, 2002.

[13] Berry, S.H., Concannon, T.W., Gonzalez Morganti, K., et al.: CMS Innovation Center Health Care Innovation Awards RAND Project Report for CMS. 2013.
[14] Damschroder, L.J., Aron, D.C., Keith, R.E., et al.: Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. Implementation Science 4:50. 2009. DOI:10.1186/1748-5908-4-50.
[15] Agency for Healthcare Research and Quality. Developing and Assessing Contextual Frameworks for Research on the Implementation of Complex System Interventions Draft Methods Research Report. 2013.
[16] Minnesota Department of Health. Strategies for Public Health: A Compendium of Ideas, Experience and Research from Minnesota's Public Health Professionals, Volume 2. Available from: http://www.health.state.mn.us/strategies/social.pdf. Accessed 12/13/13.
[17] Centers for Disease Control and Prevention. Social Determinants of Health. Available at: http://www.healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=39. Accessed 12/13/13.
[18] Cohen, J., et al.: The case for diversity in healthcare workforce. Health Affairs 21(5):90-102. 2002. DOI:10.1377/hlthaff.21.5.90. Available at: http://content.healthaffairs.org/content/21/5/90.abstract.

Table B.4-1. Definitions of Evaluation Planning Matrix Domains and Subdomains (continued)

Domains	Corresponding Subdomains	Definition	Source(s) (abbreviated, full citation is below in endnotes)
	External Technological Environment	Technological trends and movements and the availability of technology that may affect the intervention and its context.[19]	AHRQ, 2013
Endogenous Factors		Tangible and intangible manifestation of characteristics of the organizations involved in the intervention, including structural characteristics, networks and communications, culture, climate, and readiness that all interrelate and influence implementation.[20]	AHRQ, 2013
	Structural Characteristics	Size of organization, practice, unit, maturity, mix of occupations, unit organization, employment status of providers and staff, ownership structure, etc. Also refers to the hierarchy of organization (how smaller units are clustered into larger units), degree of vertical integration, and administrative intensity.[21]	Damschroder et al., 2009
	Resources/ Capacity	The extent to which resources are dedicated to implementing the innovation, and the adequacy of those resources. Includes physical space and equipment, health IT and general IT, staff time.[22] The level of resources dedicated for implementation and ongoing operations including money, training, education, physical space, and time.[23]	AHRQ, 2013; Damschroder et al., 2009
	Leadership	Commitment, involvement, and accountability of leaders and managers for the innovation, including middle managers. Directionality of leadership for the innovation (top-down vs. bottoms-up) and a clearly designated implementation leader.[24]	Damschroder et al., 2009)
	Organizational Incentives	Extrinsic incentives such as goal-sharing awards, performance reviews, promotions, and raises in salary, as well as less tangible incentives such as increased stature or respect.[25]	Damschroder et al., 2009)

[19] Agency for Healthcare Research and Quality. Developing and Assessing Contextual Frameworks for Research on the Implementation of Complex System Interventions Draft Methods Research Report. 2013.
[20] Agency for Healthcare Research and Quality. Developing and Assessing Contextual Frameworks for Research on the Implementation of Complex System Interventions Draft Methods Research Report. 2013.
[21] Damschroder, L.J., Aron, D.C., Keith, R.E., et al.: Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. Implementation Science 4:50. 2009. DOI:10.1186/1748-5908-4-50.
[22] Agency for Healthcare Research and Quality. Developing and Assessing Contextual Frameworks for Research on the Implementation of Complex System Interventions Draft Methods Research Report. 2013.
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Table B.4-1. Definitions of Evaluation Planning Matrix Domains and Subdomains (continued)

Domains	Corresponding Subdomains	Definition	Source(s) (abbreviated, full citation is below in endnotes)
	Quality Improvement Culture	Norms, values, and beliefs within an organization (or subordinate unit) that may affect views of the innovation and its implementation. The competing values framework is one way to measure culture and is aligned along two dimensions: one is the degree to which an organization emphasized central command and control over processes vs. decentralization and flexibility. The second dimension is a trade-off between focus on internal environment and processes vs. the external environment and relationships with outside entities. Four archetypes of organizational culture then include (1) team culture, (2) hierarchical culture, (3) entrepreneurial culture, and (4) rational culture. These are not mutually exclusive.[26]	Damschroder et al., 2009
	History	Experiences with similar interventions within the setting and within the target population. The maturity, breadth, and depth of implementation activities.[27]	AHRQ, 2013
Innovation Characteristics		Process Redesign Intervention Characteristics: The characteristics of the intervention being implemented into a particular organization, including core components (the essential and indispensable elements of the intervention itself) and an adaptable periphery (adaptable elements, structures, and systems related to the intervention and organization into which it is being implemented). There are intrinsic characteristics of innovations that influence an individual's decision to adopt or reject an innovation.[28]	Rogers, 1995

[26] Damschroder, L.J., Aron, D.C., Keith, R.E., et al.: Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. Implementation Science 4:50. 2009. DOI:10.1186/1748-5908-4-50.
[27] Agency for Healthcare Research and Quality. Developing and Assessing Contextual Frameworks for Research on the Implementation of Complex System Interventions Draft Methods Research Report. 2013.
[28] Rogers, E. M.: Diffusion of Innovations (4th ed.). New York. Free Press, 1995.

Table B.4-1. Definitions of Evaluation Planning Matrix Domains and Subdomains (continued)

Domains	Corresponding Subdomains	Definition	Source(s) (abbreviated, full citation is below in endnotes)
	Complexity	The degree to which an innovation is perceived as relatively difficult to understand and use.[29] Stakeholders' perception of the perceived difficulty of implementation, reflected by duration, scope, centrality, and intricacy and number of steps required to implement.[30] One way to determine complexity is by assessing 'length' (the number of sequential sub-processes or steps for using or implementing an intervention) and 'breadth' (number of choices presented at decision points). Complexity is also increased with higher numbers of potential target organizational units (teams, clinics, departments) or types of people (providers, patients, managers) targeted by the intervention, and the degree to which the intervention will alter central work processes.[31]	Rogers, 1995; Damschroder, 2009
	Compatibility	Stakeholders' perception of alignment of the meaning, values, and norms attached to process redesign with those held by members of the practice or organization. The tangible fit between the intervention and the organizations' mission, goals, and resources; perceived risks and needs; practices; and workflows.[32]	Harwood, 2007
	Adaptability	Stakeholders' perception of the degree to which process redesign strategies, techniques, and practices can be adapted, tailored, refined, or reinvented to meet local needs.[33] The innovation is testable on a small scale in order to retool or modify as needed (or abandon). The innovation is able to be "pilot tested" before full implementation. The innovation can be adapted and tailored or reinvented to meet needs. Adaptability relies on the ability to define the innovation's "core" or irreducible elements versus the soft periphery, which can be adapted.[34]	Damschroder et al., 2009

[29] Rogers, E. M.: Diffusion of Innovations (4th ed.). New York. Free Press, 1995.
[30] Damschroder, L.J., Aron, D.C., Keith, R.E., et al.: Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. Implementation Science 4:50. 2009. DOI:10.1186/1748-5908-4-50.
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[33] Damschroder, L.J., Aron, D.C., Keith, R.E., et al.: Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. Implementation Science 4:50. 2009. DOI:10.1186/1748-5908-4-50.
[34] Damschroder, L.J., Aron, D.C., Keith, R.E., et al.: Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. Implementation Science 4:50. 2009. DOI:10.1186/1748-5908-4-50.

Table B.4-1. Definitions of Evaluation Planning Matrix Domains and Subdomains (continued)

Domains	Corresponding Subdomains	Definition	Source(s) (abbreviated, full citation is below in endnotes)
Workforce Development		Staff education programs and efforts to provide staff with requisite skills for new programs.[35]	AHRQ, 2013
	Education and Training	Assessing staff members' existing knowledge to identify knowledge gaps in order to plan for and support any additional education needs. Use of a training program that has institutional recognition or accreditation. Use of education/training that accommodates the adult learner. Training program provides the appropriate skill sets and prepares staff for new roles and/or responsibilities Includes discipline specific training issues. Inter-professional education occurs when two or more professions (e.g., physicians, nurses, pharmacists, etc.) learn with, from and about each other to improve collaboration and the quality of care.[36] [37]	AHRQ, 2013, Freeth et al., 2005
	Organizational Support	Physical and organizational resources needed to implement workforce development. Provision of resources (i.e. material, spatial, temporal) to support training. Involving partners to provide education/training programs. Having support from upper and middle management, HR department, clinical education department. Policies and practices that enable training programs to succeed (e.g., replacement/substitute staff for staff in training, staff dedicated to training and development, etc.). Refresher trainings/training to keep skills up to date. Services to enable workers to advance in their careers	
	Staff Recruitment	Organization's strategies and approach to identifying candidates to fill new staff positions or expand numbers of existing positions.[38]	AHRQ, 2013
	Staff Satisfaction	Staff satisfaction (or not) with new roles and responsibilities. Includes measures of "burnout" and staff retention. Staff satisfaction (or not) with the innovation. Staff satisfaction (or not) with trainings related to the innovation.[39] The degree to which providers are able to work "at the top of their license."	AHRQ, 2013

[35] Agency for Healthcare Research and Quality. Developing and Assessing Contextual Frameworks for Research on the Implementation of Complex System Interventions Draft Methods Research Report. 2013.
[36] Agency for Healthcare Research and Quality. Developing and Assessing Contextual Frameworks for Research on the Implementation of Complex System Interventions Draft Methods Research Report. 2013.
[37] Freeth, D., Hammick, H., Reeves, S., et al.: Effective Interprofessional Education: Development, Delivery and Evaluation. Oxford. Blackwell, 2005.
[38] Agency for Healthcare Research and Quality. Developing and Assessing Contextual Frameworks for Research on the Implementation of Complex System Interventions Draft Methods Research Report. 2013.
[39] Agency for Healthcare Research and Quality. Developing and Assessing Contextual Frameworks for Research on the Implementation of Complex System Interventions Draft Methods Research Report. 2013.

Table B.4-1. Definitions of Evaluation Planning Matrix Domains and Subdomains (continued)

Domains	Corresponding Subdomains	Definition	Source(s) (abbreviated, full citation is below in endnotes)
	Staff Roles and Responsibilities	Roles and responsibilities define program staff specific involvement and contribution to the program team. Program staff's ability to identify and adhere to roles and responsibilities may facilitate or impede the successful implementation of the program's intervention(s).[40] Care Coordination Activities as part of staff roles and responsibilities involve the deliberate organization of patient care activities that involves the marshalling of personnel and other resources needed to carry out all required patient care activities, and is often managed by the exchange of information among participants responsible for different aspects of care. Activities include: • Establish accountability and negotiate responsibility • Communicate • Facilitate transitions • Assess needs and goals • Create a proactive plan of care • Monitor, follow-up, and respond to change • Support self-management goals • Link to community resources • Align resources with patient and population needs[41] [42]	Kaiser, 2005; National Coalition on Care Coordination (N3C), 2007; AHRQ, 2010

[40] Kaiser, S., 2005; Healthcare Information and Management Systems Society (HIMSS), Implementation of Clinical Decision Support team, 2011
[41] National Coalition on Care Coordination (N3C). Policy Brief on Implementing Care Coordination in PPACA. McDonald, 2007.
[42] Agency for Healthcare Research and Quality. Care Coordination Measures Atlas. December 2010, pp. 1-280.

Table B.4-1. Definitions of Evaluation Planning Matrix Domains and Subdomains (continued)

Domains	Corresponding Subdomains	Definition	Source(s) (abbreviated, full citation is below in endnotes)
	Roles and Responsibilities - CHW "subcode"	CHWs are known by a variety of names, including community health worker, community health advisor, outreach worker, community health representative (CHR), promotora/promotores de salud (health promoter/promoters), patient navigator, navigator promotoras (navegadores para pacientes), peer counselor, lay health advisor, peer health advisor, and peer leader. CHWs are frontline public health workers who are trusted members of and/or have an unusually close understanding of the community served. This trusting relationship enables CHWs to serve as a liaison, link, or intermediary between health/social services and the community to facilitate access to services and improve the quality and cultural competence of service delivery. CHWs also build individual and community capacity by increasing health knowledge and self-sufficiency through a range of activities such as outreach, community education, informal counseling, social support, and advocacy.[43]	APHA, 2009
	Workforce Characteristics	Characteristics such as age, training, and practice setting, which are specific to awardee staff who coach and train prospective practitioners for conducting the intervention and practitioners themselves involved in facilitating the intervention.[44]	Damschroder, 2009
Implementation Process		A comprehensive set of strategies and steps used by a health care organization when preparing for and executing the adoption of a health care innovation. The format and content of the strategies/steps will vary depending upon the expectations and needs of the organization, but it most usually incorporates information about the innovations' expected time frames, chosen methods of training accompanying the adoption, cost estimates, distribution of labor and responsibilities and workflow changes, among other factors. The goal of the implementation process is to provide a specific and organized plan of attack in order to account for the many decisions and factors that contribute to adoption of a health care innovation.[45] [46] [47]	Berg, 2001; Kilbourne 2007; Mans, 2009

[43] American Public Health Association. Policy statement: Support for community health workers to increase health access and to reduce health inequalities. 2009. Available at: http://www.apha.org/advocacy/policy/policysearch/default.htm?id=1393.

[44] Damschroder, L.J., Aron, D.C., Keith, R.E., et al.: Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. Implementation Science 4:50. 2009. DOI:10.1186/1748-5908-4-50.

[45] Berg, M.: Implementing information systems in health care organizations: Myths and challenges. International Journal of Medical Informatics. 64:143-156, 2001.

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[47] Mans, R.S., Aalst, W., Russell, N., et al.: Implementation of a Healthcare Process in Four Different Workflow Systems, Department of Information Systems, The Netherlands, 2008.

Table B.4-1. Definitions of Evaluation Planning Matrix Domains and Subdomains (continued)

Domains	Corresponding Subdomains	Definition	Source(s) (abbreviated, full citation is below in endnotes)
	Stakeholder Engagement	Stakeholder engagement is involving the key players (patients, consumers, caregivers, providers, staff, researchers, policymakers, and community partners) in the implementation process to help focus the program and research on meaningful outcomes and increase the likelihood of stakeholder buy-in and sustainability of the program.[48] [49]	Health Affairs, 2012; AHRQ, 2011.
	Execution	Execution consists of the processes for achieving the program's objectives. The effectiveness of carrying out the tasks of the program may be facilitated or impeded by decision-making processes, organizational arrangements, or implementation planning.[50] [51]	Rodak, 2013 (Becker's hospital review)
	Workflow Processes	The tasks and workflows, including interdependencies between them that are the focus of the change strategy or that will be affected by it. The flow or path of the work steps, i.e., the way in which work progresses, including things like order of steps and selection between alternative steps. Like a process, a workflow has inputs and outputs, i.e., resources (mass, energy, information) and the people or things that perform the steps or activity that comprise the work are considered. It is an established business process describing how the tasks are done, by whom, in what order, and how quickly.[52]	Cain, 2008

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Table B.4-1. Definitions of Evaluation Planning Matrix Domains and Subdomains (continued)

Domains	Corresponding Subdomains	Definition	Source(s) (abbreviated, full citation is below in endnotes)
	Care Coordination	Care coordination is the conscious effort by two or more health care professionals to facilitate and coordinate the appropriate delivery of health care services for a patient. Care Coordination Approach is a person-centered, assessment-based, interdisciplinary approach to integrating health care and social support services in a cost-effective manner in which an individual's needs and preferences are assessed, a comprehensive care plan is developed, and services are managed and monitored by an evidence-based process which typically involves a designated lead care coordinator. Approaches includes: • Teamwork focused on Coordination • Health care home • Care Management • Medication Management • Health-IT enabled Coordination (i.e., Telemedicine)[53] [54]	National Coalition on Care Coordination (N3C). McDonald, 2007; AHRQ, 2010
	HIT workflow	HIT workflow entails the flow or path of electronic information exchange, and the tasks and steps that comprise that flow and interdependencies among them. It is an established business process describing how the tasks are done, by whom, in what order, and how quickly.[55]	AHRQ, 2013
	Evaluating and Reflecting	Self-monitoring is a procedure and tracking tool that aims to incentivize participants and improve participation, sustainability, and outcomes in health improvement programs. *The practice of self-monitoring has been shown to increase the accuracy with which direct service providers implement a variety of protocols in health programs.[56] [57]	Gaither, 2009; Plavnick, 2010

[53] National Coalition on Care Coordination (N3C). Policy Brief on Implementing Care Coordination in PPACA. McDonald, 2007.
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Table B.4-1. Definitions of Evaluation Planning Matrix Domains and Subdomains (continued)

Domains	Corresponding Subdomains	Definition	Source(s) (abbreviated, full citation is below in endnotes)
	Team Dynamics	Any references to the dynamics around staff interactions with each other and those outside of the practice (e.g., hospitals, mental health providers, other specialists). Statements either positive or negative about a collective sense of team, a shared vision, communication networks, information sharing, and levels of mutual respect and trust among team members (e.g., use of collective problem solving vs. top-down approach, clarity around roles/responsibilities, inclusive approach vs. non-inclusive approach).[58] [59] [60] [61]	O'Daniel, 2008; Hughes, 2008; AHRQ, 2013, Damschroder et al., 2009
Participant Characteristics		A set of defining traits, socioeconomic demographics, disease conditions, or risk behaviors belonging to a person prior to participating in the HCIA program. Participants include patients served by the intervention. Characteristics included in this domain include the characteristics that we are not able to abstract from site reports or claims data. The characteristics may include, but are not limited to the following: age, gender, race, country of origin, insurance status, occupation, level of education, comorbidities, access to services, time of follow-up, health literacy, cognitive abilities, participation rates, awareness of condition, empowerment, etc.[62] [63] [64]	Schell, 2013; The Health Communication Unit, 2007; Damschroder, 2009
	Demographics	Pre-existing, socioeconomic characteristics that relate to race/ethnicity, patient's income level, employment status, and insurance status. [65] [66]	Cochrane, 2011; Rychetnik, 2002

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Table B.4-1. Definitions of Evaluation Planning Matrix Domains and Subdomains (continued)

Domains	Corresponding Subdomains	Definition	Source(s) (abbreviated, full citation is below in endnotes)
	Risk Behaviors	A behavior or other factor that places a patient at risk for diseases, including such factors as poor nutrition, smoking, alcohol use, etc., which can contribute to leading causes of morbidity and mortality and are often interrelated and preventable.[67] [68]	CDC, 2012; Gardner, 2013
Implementation Effectiveness		The pooled or aggregate consistency and quality of targeted organizational members' use of an innovative technology or practice and targeted organizational members' commitment to consistent and quality use of that technology or practice[69]	Helfich, 2007
	Dosage	Dosage or exposure refers to the amount of an intervention received by participants; in other words, whether the frequency and duration of the intervention is as full as prescribed by its designers.[70]	Carroll, 2007
	Fidelity	Fidelity is defined as the degree to which an intervention was implemented as it was prescribed in the original protocol or as it was intended by the program developers. Includes the following components: • Integrity • Consistency • Timeliness of the Intervention[71]	Proctor, 2011

[67] Centers for Disease Control and Prevention. Morbidity and Mortality Weekly Report: Youth Risk Behavior Surveillance-United States, 2001. Surveillance Summaries. 61(4), June 8, 2012.
[68] Gardner, L., and Ratschen, E.: Tobacco smoking, associated risk behaviors, and experience with quitting: A qualitative study with homeless smokers addicted to drugs and alcohol, BMC Public Health, 13(951):1-8, 2013.
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[71] Proctor, E., et al.: Outcomes of implementation research: Conceptual distinctions, measurement challenges, and research agenda. Adm. Policy Ment. Health, 38:65-76, 2011.

Table B.4-1. Definitions of Evaluation Planning Matrix Domains and Subdomains (continued)

Domains	Corresponding Subdomains	Definition	Source(s) (abbreviated, full citation is below in endnotes)
	Reach	Reach is an individual-level measure (e.g., patient or employee) of participation. Reach refers to the percentage and risk characteristics of persons who receive or are affected by a policy or program. It is measured by comparing records of program participants and complete sample or "census." Information for a defined population, such as all members in a given clinic, health maintenance organization, or worksite. If accurate records are kept of both the numerator (participants) and the denominator (population), calculation of participation rates is straightforward.[72]	Glasgow, 1999
	Reach with population	Amount (e.g., number of patients, proportion of population) of the population reached by innovation.[73]	AHRQ, 2013
	Reach within organization	The absolute number, proportion, and representativeness of individuals who adopt or participate in the innovation within the organization.[74]	AHRQ, 2013
	Sustainability	Sustainability is defined as the extent to which a newly implemented treatment is maintained or institutionalized within a service setting's ongoing, stable operations.[75]	Proctor, 2011
	Formalization of Care Coordinator Role	CHWs are known by a variety of names, including community health worker, community health advisor, outreach worker, community health representative (CHR), promotora/promotores de salud (health promoter/promoters), patient navigator, navigator promotoras (navegadores para pacientes), peer counselor, lay health advisor, peer health advisor, and peer leader.[76]	CDC, 2011
	Replicability	Plans, timing, and/or methods of spread within and beyond the adopting site.[77]	AHRQ, 2013

[72] Glasgow, R., et al.: Evaluating the public health impact of health promotion interventions: The RE-AIM framework. American Journal of Public Health, 1999, 89(9):1322-1327, 1999.
[73] RTI International, Developing and Assessing Contextual Frameworks for Research on the Implementation of Complex System Interventions, Agency for Healthcare Research and Quality. 2013.
[74] RTI International, Developing and Assessing Contextual Frameworks for Research on the Implementation of Complex System Interventions, Agency for Healthcare Research and Quality. 2013.
[75] Proctor, E., et al.: Outcomes of implementation research: Conceptual distinctions, measurement challenges, and research agenda. Adm. Policy Ment. Health. 38:65-76, 2011.
[76] Centers for Disease Control and Prevention, Addressing Chronic Disease Through Community Health Workers: A Policy and Systems-level Approach. 2011, pp. 1-16.
[77] RTI International, Developing and Assessing Contextual Frameworks for Research on the Implementation of Complex System Interventions, Agency for Healthcare Research and Quality. 2013.

Table B.4-1. Definitions of Evaluation Planning Matrix Domains and Subdomains (continued)

Domains	Corresponding Subdomains	Definition	Source(s) (abbreviated, full citation is below in endnotes)
Coordinated Care		Coordinated care is outcomes of care coordination that are NOT tests (e.g., process is making the appointment, the outcome is keeping the appointment).	
	Efficiency		
	Timeliness of care		
Clinical Effectiveness	**Diabetes**	Delivery of comprehensive care for Type 2 diabetes (e.g., in 1 year, foot exam, regular hb1ac, LDL and BP checks, eye exam).	
	Asthma		
	Patient/Provider Satisfaction		
Health Care Outcomes	**Utilization**	Health care utilization is the defined as the number of times a patient visits a medical facility or uses medical resources within a hospital system during a given period. The numbers may include: primary care clinic visits, specialty care clinic visits, emergency department visits, hospitalizations, and laboratory, diagnostic, and radiologic tests (diagnostic services), among other visits. There are two types of utilization: (1) utilization of services that are in excess of a beneficiary's medical needs and condition (overutilization) or receiving a capitated Medicare payment and (2) failing to provide services to meet a beneficiary's medical needs and condition (underutilization).[78]	Bertakis, 2011; CMS Glossary

[78] Bertakis, K. D., and Azari R.: Is patient-centered care associated with decreased utilization? J Amer Board Fam Med;24:229-239, 2011.

Table B.4-1. Definitions of Evaluation Planning Matrix Domains and Subdomains (continued)

Domains	Corresponding Subdomains	Definition	Source(s) (abbreviated, full citation is below in endnotes)
	Appropriateness of Care	What works best for whom under what circumstances? "Clinical effectiveness research (CER) serves as the bridge between the development of innovative treatments and therapies and their productive application to improve human health. Building on efficacy and safety determinations necessary for regulatory approval, the results of these investigations guide the delivery of appropriate care to individual patients."[79] "Information relevant to guiding decision making in clinical practice requires the assessment of a broad range of research questions (e.g., how, when, for whom, and in what settings are treatments best used?), yet the current research paradigm, based on a hierarchical arrangement of study designs, assigns greater weight or strength to evidence produced from methods higher in the hierarchy, without necessarily considering the appropriateness of the design for the particular question under investigation" [80]	Institute of Medicine, 2010
	Unintended Consequences	Emergent, interim, or longer-term outcomes that were unanticipated and usually not desired[81]	CFIR - Draft Methods Report

[79] Institute of Medicine Roundtable on Value & Science-Driven Health Care. Olsen L.A., and McGinnis, J.M., eds.: Redesigning the Clinical Effectiveness Research Paradigm: Innovation and Practice-Based Approaches: Workshop Summary. Washington, D.C.: National Academies Press. 2010. Available at: http://www.ncbi.nlm.nih.gov/books/NBK51004/.

[80] Institute of Medicine Roundtable on Value & Science-Driven Health Care. Olsen L.A., and McGinnis, J.M., eds.: Redesigning the Clinical Effectiveness Research Paradigm: Innovation and Practice-Based Approaches: Workshop Summary. Washington, D.C.: National Academies Press. 2010. Available at: http://www.ncbi.nlm.nih.gov/books/NBK51004/.

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Table B.4-1. Definitions of Evaluation Planning Matrix Domains and Subdomains (continued)

Domains	Corresponding Subdomains	Definition	Source(s) (abbreviated, full citation is below in endnotes)
	Access	Facilitating access is concerned with helping people to command appropriate health care resources in order to preserve or improve their health. Access is a complex concept and at least four aspects require evaluation. If services are available and there is an adequate supply of services, then the opportunity to obtain health care exists, and a population may 'have access' to services. The extent to which a population 'gains access' also depends on financial, organizational and social or cultural barriers that limit the utilization of services. Thus access measured in terms of utilization is dependent on the affordability, physical accessibility and acceptability of services and not merely adequacy of supply. Services available must be relevant and effective if the population is to 'gain access to satisfactory health outcomes'. The availability of services, and barriers to access, have to be considered in the context of the differing perspectives, health needs and material and cultural settings of diverse groups in society. Equity of access may be measured in terms of the availability, utilization or outcomes of services. Both horizontal and vertical dimensions of equity require consideration.[82] Examples: Availability of medical advice by phone; length of time between making an appointment and the day of visit; length of time spent waiting in the office for the doctor; amount of visit time spent with doctors and staff; hours when the doctor's office is open; convenience of location of the office; ease of seeing the doctor of one's choice; making appointments for care by phone.[83]	Gulliford et al., 2002; ARHQ, 2013
Health Outcomes	**Mortality**	The death rate often made explicit for a particular characteristic (e.g., gender, sex, or specific cause of death). Mortality rate contains three essential elements: the number of people in a population exposed to the risk of death (denominator), a time factor, and the number of deaths occurring in the exposed population during a certain time period (numerator).	CMS Glossary
	Morbidity	A diseased state, often used in the context of a “morbidity rate.” In common clinical usage, any disease state, including diagnosis and complications.	CMS Glossary
	Comorbidities	Patients that experience simultaneous presence of two chronic diseases or conditions. The comorbid chronic conditions often make the care that a patient receives more complex for the provider to deliver and more costly for the patient and insurance provider.[84] [85]	Piette, 2006; Kelly, 2012

CHW = community health care worker; HIT = health information technology.

[82] Gulliford M., Figueroa-Munoz, J., Morgan, M., et al.: What does 'access to health care' mean? J. Health Serv. Res. Policy. 7(3):186-8, 2002.
[83] Agency for Healthcare Research and Quality. Patients who find it easy to access primary care are more likely to receive selected preventive services: Primary care. February 2013. Available at: http://www.ahrq.gov/news/newsletters/research-activities/13feb/0213RA5.html.
[84] Piette, J.D., and Kerr, E.A.: Commentary: Impact of comorbid chronic conditions on diabetes care. Diabetes Care. 2(3): 725-731, 2006.
[85] Kelly, T.M., Daley, D.C., and Douaihy, A.B.: Treatment of substance abusing patients with comorbid psychiatric disorders. Addictive Behaviors. 37:11-24, 2012.

Qualitative Data Collection Sources and Analysis Methods for the HCIA Community Resource Evaluation

Table B.4-2. Qualitative Data Collection Sources and Analysis Methods for the HCIA Community Resource Evaluation

Data Source	Brief Description and Use in the Evaluation	Analysis
Self-Monitoring Measurement Plans	Measures selected by awardees to monitor outcomes related to health care quality, health outcomes, and cost savings; as of Q5, awardees must submit self-monitoring plans quarterly. **Strengths**: The list of measures is extensive and is tied to the goals of the innovation. **Limitations**: Availability and quality of the data used for measurement will vary widely by awardee and sites within awardees.	• Data abstraction in Access database • Categorization, monitoring, and tracking of awardee self-monitoring measures
Application (Baseline)	The original application that awardees submitted to CMMI when applying for HCIA funding; awardee applications provide a baseline understanding of awardee goals, theory of change, target population, and plans for implementation. **Strengths**: Provides the benchmark for fidelity: the innovation as it was intended to be implemented. **Limitations:** The details of the innovation, its goals and purposes are not consistently well described.	• Data abstraction in Access database • Describe and characterize program interventions, organizations, and staffing • Monitor and track priority performance measures
Operational Plans	A detailed work plan used to monitor and track awardee goals and milestones; these goals and milestones are linked to the innovation's driver diagrams (logic model). **Strengths**: Provides an up-to-date overview of what aspects of implementation are on or off track. **Limitations:** The consistency of reporting may vary among awardees; some are more or less detailed; goals and milestones may not map logically to the intended outcomes or may fail to capture the full scale and significance of implementation challenges.	• Data abstraction in Access database • Categorization, monitoring, and tracking of awardee milestones and goals
Quarterly Awardee Performance Reports	An extensive inventory of categorical and numerical data that awardees submit quarterly; includes organizational characteristics (e.g., services provided, location of innovation, number of clinical sites), direct and indirect expenditures, staffing, training, and program participant characteristics. **Strengths:** Provides a standard means of collecting data across disparate innovations. **Limitations:** Awardees do not apply the definitions consistently; they may also use alternative definitions internally that are more useful for evaluation.	• Data abstraction • Development of themes for within- and cross-site awardee findings • Systematic data coding in Nvivo 10.0 qualitative analysis software

Table B.4-2. Qualitative Data Collection Sources and Analysis Methods for the HCIA Community Resource Evaluation (continued)

Data Source	Brief Description and Use in the Evaluation	Analysis
Awardee Narrative Progress Reports	The progress report summarizes the past quarter's activities; describes the project's accomplishments, lessons learned to date, and planned activities; and presents the results of self-monitoring. **Strengths:** Provides a narrative report from awardees that describes their progress and challenges. **Limitations:** Often, the details in this narrative report do not align with facts presented in other data sources.	• Data abstraction • Development of themes for within- and cross-site awardee findings • Systematic data coding in Nvivo qualitative analysis software
Interview Data	Qualitative data collected during site visits using a semistructured guide; interview topics include partnerships, organizational capacity, implementation processes and effectiveness, workforce development, and data sources and characteristics. Individuals interviewed include all key project leaders, partners, and field staff. **In-person site visits** to all 24 awardees were conducted in Year 1. In Year 2, six of the nine "HIT innovation" sites received an in-person site visit; **virtual telephone interviews** were conducted with the remaining three sites. In Year 2, interviews were conducted with CMMI and CDC **Project Officers** to gain their perspectives on how their assigned awardee(s) have implemented their innovation(s) to date. **End-of-year interviews** were conducted with Project Directors (PI) and/or Project Coordinator (PM) for all 24 awardees. Overall successes, challenges, lessons learned to date, and plans for sustainability were assessed. **Strengths:** Provides in-depth understanding of the innovation and its implementation that cannot be gleaned from secondary source, and insights into why aspects of the innovation or implementation are succeeding or failing. QCA (1) supports analysis of small populations, (2) assesses causal complexity, (3) accommodates multiple pathways to successful outcomes (i.e., equifinality), and (4) assumes an asymmetric concept of causation. **Limitations:** Captures a snapshot of a rapidly evolving project; cannot draw inferences on the impact of innovation on outcomes. QCA is unable to accommodate a large number of conditions; awardees must have some degree of comparability.	• Within-awardee analysis (uses methods to identify and verify conclusions about a single awardee). • Cross-awardee analysis • Development of themes • Systematic data coding in Nvivo qualitative analysis software • Independent coding of data to ensure interrater reliability • QCA using standardized QCA form. Using data collected via data review/abstraction, interviews, research teams assessed awardee on specific domains of the evaluation plan and framework

CDC = Centers for Disease Control and Prevention; CMMI = Center for Medicare & Medicaid Innovation; HIT = health information technology; QCA = quantitative comparative analysis.

NVivo (www.qsrinternational.com) is a qualitative data analysis software package used to categorize and synthesize unstructured data (e.g. key informant interviews, focus groups, narrative text, etc.). Within Nvivo, data is coded or "labeled" using key themes or concepts developed a-prior or those that emerge during data collection. This coding allows for the generation of reports to interpret qualitative findings.

Inter-rater reliability is used to assess the level of agreement between independent coders on the categorization of qualitative data. Establishing inter-rater reliability attempts to reduce the error and bias generated in processing and interpreting narrative or textual data. To ensure high inter-reliability (>85%) for this evaluation, coders were trained on the use and meaning of all codes and two analysts worked independently and concurrently on a subset (20%) of data (e.g., interview notes, narrative documents) to assure reliability of codes assigned to the qualitative data.

Technical Appendix B.5: Provider Survey Data Collection and Analyses

Data Collection Methods

For many of the 24 Community Resource HCIA awardees, health care providers play a critical role in successfully implementing the innovation within their target communities. RTI developed a provider survey to understand the significance and role of provider engagement. Specifically, we sought to examine (1) providers' buy-in to the innovation, (2) providers' role in and impact on patient care, and (3) the level of innovation integration into the provider's patient encounters.

To be eligible for the survey, an awardee must have at least 10 providers across all implementation sites who are able to comment on a change resulting from implementation of the HCIA innovation. An eligible awardee, therefore, must have a minimum of 10 providers who were present prior to the start of the innovation and continue to provide medical care services during the HCIA innovation period. Providers are defined as individuals who provide direct medical care services to patients in HCIA innovation programs, and include physicians, nurses, advanced practice providers, counselors, pharmacists, emergency medical technicians, and therapists. For the purpose of this evaluation, individuals responsible for patient outreach, recruitment, or navigation are not considered providers; thus, community health workers (CHWs) and patient navigators were not eligible to receive the provider survey. Based on these criteria, 11 awardees were eligible to participate in the survey. One awardee was not able to provide relevant information within the required timeframe; thus, a total of 10 awardees participated in the final survey.

RTI designed the provider survey based on a thorough literature review and both internal and external stakeholder feedback. To assess validated and tested provider surveys, RTI researchers conducted a literature search through PubMed for peer-reviewed articles that used a provider survey in their research methods. The search yielded over 30 peer-reviewed articles, which the RTI team reviewed and abstracted for key topics and validated questions. After reviewing several validated and tested survey tools and questions, RTI researchers divided relevant questions into the following seven key topic areas: patient safety, quality of care, provider satisfaction, quality of interactions, timeliness of care, efficiencies of care, and clinical care workflow. The draft survey included approximately 30 questions.

After drafting the survey, we requested internal feedback from three physicians at RTI. The initial internal feedback from RTI subject matter experts provided meaningful insight into the questions that needed to be tailored, added, or eliminated from the survey instrument. In addition, the internal feedback resulted in a draft set of questions that could be formatted and pilot-tested with two providers at a specific awardee site.

Prior to pilot-testing the survey questions, the provider survey team also worked with RTI's Survey Research Department to develop the survey's design and format based on standardized best practices. The survey was designed for both paper-and-pencil and Web-based formats. For the Web-based version, the survey was programmed and administered through SurveyGizmo, a cloud-based survey software that allowed respondents to take the survey on a variety of systems, including computer and mobile formats, on the surveys.rti.org domain. Because the survey was administered through a cloud-based system, all collected data were stored on HIPAA-compliant servers and were encrypted. Staff routinely monitored responses as they were submitted, checking to ensure that respondents did not face difficulties in completing the survey.

In January 2015, the Web-based survey was sent to two providers at one of the awardee sites for pilot testing. After receiving helpful feedback on how to tailor specific questions, the survey was finalized and ready to be administered to the target population of eligible providers at the 10 awardee sites. A complete inventory of survey items can be found in ***Appendix C***.

We worked with the project administration and management at each of the 10 awardee sites to obtain contact information (i.e., mailing address and e-mail address, if available) for all providers familiar with the innovation and affiliated with the respective awardee. We used a census of all providers that were obtained for 9 of the awardees. Because U-Chicago was unable to distinguish between providers that were actually using the innovation and those that were not, we elected to survey a stratified random sample of the providers based on provider type (e.g., nurse, physician). This reduced the sample from 450 providers to 103 providers.

Overall, we solicited responses from a total of 1,242 individual health care providers. Beginning with an initial notification letter sent to the entire sample, the provider survey consisted of five sequential mailings and three staggered e-mail notifications to nonrespondents with e-mail addresses. Waves of notifications were scheduled approximately 7, 17, 30, and 40 days after the initial e-mail notification. The schedule was slightly modified as needed to accommodate holidays, weekends, and other administrative logistics (***Table B.5-1***).

The first three mailings contained a letter with a Web link and provider identification number (PIN), inviting the providers to participate in an online survey. The unique PIN ensured that the correct individual was given the survey associated with the correct provider.

Table B.5-1. Survey Schedule

Contact	Method	
	Mail	E-mail
Initial notification	*Who:* All sample (n=1,242) *What:* Letter with link and PIN *When:* –3 days (March 17)	*Who:* All sample with e-mail (n=537) *What:* E-mail with link and PIN *When:* 0 days (March 20)
1st reminder	*Who:* All nonrespondents (n=1,176) *What:* Letter with link and PIN *When:* 7 days (March 24)	*Who:* Nonrespondents with e-mail (n=483) *What:* E-mail with link and PIN *When:* 10 days (March 27)
2nd reminder	*Who:* All nonrespondents (n=1,047) *What:* Letter with link and PIN *When:* 20 days (April 6)	*Who:* All nonrespondents with e-mail (n=470) *What:* E-mail with link and PIN *When:* 23 days (April 9)
3rd reminder, mode switch	*Who:* All nonrespondents (n=960) *What:* Paper/pencil survey, letter, business reply envelope *When:* 31 days (April 17)	
4th reminder, UPS	*Who:* All nonrespondents (n=910) *What:* Paper/pencil survey, letter, business reply envelope *When:* 43 days (April 29)	
Incentive mailing	Cover letter and $100 check	

PIN = personal identification number; UPS = United Parcel Service.

For respondents for whom RTI only had a mailing address (no e-mail address provided), a survey link that was unique by awardee (not individual) was sent by postal mail. Because the survey link sent by mail was unique to the awardee, respondents could attempt to complete the survey multiple times. When this occurred, completed surveys were taken over partially completed surveys, or if both submissions were complete, the first submission was accepted.

For each respondent for whom RTI had an e-mail address, an e-mail in addition to postal mail was sent. Both communications provided the same unique link directing the respondent to the survey. Each link was uniquely programed to be associated with an individual respondent to ensure that the survey responses were from the correct individual. Once the survey was completed, the link could no longer be accessed. As a secondary security measure, respondents were also given a unique PIN, which was required to initiate the survey.

The mode of contacting respondents changed after the third contact from a reminder letter to a paper copy of the survey for the third reminder mailing. All nonrespondents (n=960) received a letter inviting them to complete the survey by mail using the enclosed paper and pencil version of the survey and a business reply envelope. The final reminder mirrored the third reminder, but was sent through United Parcel Service rather than by the U.S. Postal Service. Eligible respondents who successfully completed the survey were offered a $100 honorarium. Of the 453 total respondents, 423 requested their honorarium. Incentives were processed and mailed from RTI's Research Operations Center on a biweekly basis.

All copies of surveys received via mail were entered and proofread by at least two RTI staff members.

Data Analysis

Out of the total 1,242 potential respondents, we received 453 complete surveys (***Table B.5-2***). We also received 19 partially completed surveys; we determined that, the partially completed surveys had been sufficiently completed to provide valuable data for the analysis.

In addition, of the 1,242 providers surveyed, 131 potential respondents were deemed ineligible and were removed from the analyses. Ineligibility was determined when: (1) a survey was returned as undeliverable, (2) a respondent reported that he or she was no longer employed by the provider, or (3) a respondent screened out from the survey based on their responses to screener questions. Screening criteria included providers being familiar with the innovation and having been at their practice prior to innovation implementation.

Table B.5-2. Response Rates by HCIA Awardee

Innovation Name	Total # Surveyed	Completed	Partial	No Contact	Refusal	Not Eligible	Response Rate
Altarum	460	89	6	306	2	57	23.57%
Bronx RHIO	11	8	0	2	1	0	72.73%
Curators	79	40	0	33	0	6	54.79%
IA	64	18	0	38	0	8	32.14%
Mary's Center	142	46	3	74	2	17	39.20%
MPHI	297	161	6	115	0	15	59.22%
REMSA	23	10	0	8	0	5	55.56%
South County	10	8	0	2	0	0	80.00%
U-Chicago	103	28	4	32	16	23	40.00%
W&I	53	45	0	7	1	0	84.91%
Cumulative	**1,242**	**453**	**19**	**617**	**22**	**131**	**42.48%**

Response rates were calculated based on standardized practices from the American Association for Public Opinion Research (***Figure B.5-1***). We divided all responses (both partial and complete) by all those that were determined as eligible for the survey. The cumulative response rate for the study was 42.48 percent. Across providers, the response rates ranged from 23.57 percent at Altarum to 84.91 percent at W&I.

Figure B.5-1. Response Rate Equation

$$\text{Response Rate} = \frac{(\text{Complete Interview} + \text{Partial Interview})}{(\text{Complete Interview} + \text{Partial Interview}) + (\text{Refusal} + \text{Non-contact})}$$

In addition to calculating the response rate overall and by awardee, we also examined responses overall by innovation focus and by individual awardee. For the individual awardees, we focused on examining the impacts on patient care, provider satisfaction, and clinical workflow for the seven awardees for whom we had more than 20 respondents, including Altarum, Curators, IA, Mary's Center, MPHI, U-Chicago, and W&I. The descriptive results, such as frequencies and/or means, are provided in each individual awardee section.

In the cross-site evaluation, we also examine the impacts on patient care, provider satisfaction, and clinical workflow overall for all 10 awardees and by innovation focus. We examine those that implemented an imaging-focused innovation (Altarum, IA) as well as those whose innovation included a CHW or patient navigator component (MPHI, REMSA, South County, W&I, Curators, Mary's Center). For these analyses, we provide descriptive statistics, such as frequencies and/or means. We also conduct two multivariate analyses that examine the overall impact on patient care and overall provider satisfaction with their respective innovations. For these analyses, we examine the impact of provider demographics, specific innovation, role/involvement in innovation, future plans, time spent in patient care, past involvement in innovative payment/delivery models for patient care, and provider satisfaction.

In addition, for the cross-site evaluation, we used survey weights to account for the variance in the number of those surveyed and respondents across awardees. The weights used for the overall analyses and by innovation focus are provided in ***Table B.5-3.*** Respondent weights are derived by examining the number of total responses as a portion of the total number of eligible participants surveyed.

Table B.5-3. Awardee Weight Charts

Awardee Name	Total # Eligible Surveyed	Total # Responses	Respondent Weight
Altarum	410	95	4.32
Bronx	11	8	1.38
Curators	77	40	1.93
IA	59	18	3.28
Mary's Center	133	49	2.71
MPHI	285	167	1.71
REMSA	20	10	2.00
South County	10	8	1.25
U-Chicago	88	32	2.75
W&I	53	45	1.18
Total	**1,146**	**472**	

Technical Appendix B.6: Qualitative Comparative Analysis Methods

To prepare for the analysis, we compiled the values from each awardee's QCA summary form into a single dataset and used the dataset to develop a truth table (see ***Table B.6-1***). Using the truth table and R software, we assessed individual condition sets for necessity and sufficiency, examined the necessary and sufficient combinations of conditions (hereafter, combinations), and calculated measures of consistency and coverage (i.e., parameters of fit within QCA). Within crisp sets, consistency indicates the proportion of cases in a truth table row that exhibited the outcome; it suggests how often a combination yielded the outcome. Coverage (within crisp sets) indicates the proportion of cases that achieved the outcome accounted for by the solutions; it identifies empirical relevance of a solution (i.e., a rare instance would have low coverage and would suggest that the solution lacked relevance for policymaking).

Table B.6-1. Truth Table

Row #	Strong Leadership Engagement	Having a History of Implementing the Innovation	High Organizational Priority for the Innovation	Number of Awardees in this Combination	Proportion of Awardees that Achieved the Outcome (i.e., Consistency in Crisp Sets)
1	0	0	0	2	0.000
2	0	0	1	6	0.167
3	0	1	0	3	0.000
4	0	1	1	4	1.000
5	1	0	0	0	—
6	1	0	1	3	1.000
7	1	1	0	1	1.000
8	1	1	1	5	.800

Because we lacked empirical cases in a truth table row (i.e., row, 5), we also examined the conservative, parsimonious, and intermediate solutions for the combinations. These solutions make different assumptions about how to handle the row with no cases when logically reducing the solutions. The conservative solution does not include any of the rows without cases in the logical reduction; the parsimonious solution uses the rows that achieve the fewest number of solution terms. The intermediate solution draws on theoretical expectations to determine whether to include a row. Our theoretical assumptions included that strong leadership engagement, a history of implementing the innovation, and high organizational priority would contribute to achieving implementation effectiveness. The intermediate and conservative solutions were identical; the parsimonious solutions presented supersets of the intermediate and conservative solutions (as it drew upon an additional row without cases to simplify the solutions). We present the intermediate solution in this report; this is currently a best practice in reporting

QCA results.[54] The super/subset relationship between the parsimonious and intermediate/conservative solutions support the robustness of the results. Also, to assess robustness, we tested our findings at different consistency thresholds, 0.75 and 0.80; the results were unchanged, which supports robustness.[86]

Because an underlying principle of QCA is asymmetry of potential solutions for an outcome, we conducted the same analyses for the non-occurrence of the outcome (i.e., NOT achieving implementation effectiveness) to ensure that no contradictory findings arose (i.e., one cannot find that X is sufficient for Y, and also for not-Y because sufficiency implies that where X is present Y is also present). The analysis of the non-occurrence of the outcome yield no contradictory results. The assessment instrument is presented below.

Table B.6-2 QCA Structured Instrument

IMPORTANT! Most measures represented in this document are AWARDEE-SPECIFIC. Thus, you will need to rely on your substantive knowledge of the awardee to make a qualitative judgment as to whether awardees meet particular thresholds per the categories provided.

<table>
<tr><th colspan="2">Leadership Engagement</th></tr>
<tr><td colspan="2">Generic Definition: Commitment, involvement, and accountability of leaders and managers, including middle managers, for the implementation</td></tr>
<tr><td>Evaluator Assessment of Leadership Engagement in the Implementation Process
Based on information you have collected through document review, interviews, or field observations, evaluate the leadership engagement of the implementation process within the Awardee organization.

Awardee leadership is defined as the person(s) the PI or PD of the innovation report to. They should be in a position of authority, not funded more than 25% of their time by HCIA, and have the power to make resource allocation decisions. Awardee leadership referred to throughout this document is NOT the PI/PD or program staff. Awardee leadership may be organizational leaders, such as the CEO.</td><td>Please mark all that apply:
☐ Awardee leadership understands the innovation well and can articulate their direct involvement
☐ Awardee leadership attends staff meetings involving the innovation
☐ Awardee leadership provides in-kind resources
☐ Awardee leadership provides for staff resources (i.e., created at least .5 FTE jobs that are not funded by HCIA)
☐ Awardee leadership ensures adequate space and/or equipment is allocated for the innovation
☐ Awardee leadership serve as a liaison to external partners for the program
☐ Other, specify:</td></tr>
<tr><th colspan="2">Implementation climate—Relative priority</th></tr>
<tr><td colspan="2">Generic Definition: Individuals' shared perception of the importance of the implementation of the innovation within the organization and how competing programs or initiatives distract or compete with implementation of the Awardee's innovation.</td></tr>
</table>

[86] Schneider, C.Q., and Wagemann, C.: Set-Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis. Cambridge: Cambridge University Press; 2012.

Evaluator Assessment of Relative Priority: Based on information you have collected through document review, interviews or field observations, evaluate the relative priority of the innovation within the Awardee organization. **The innovation team is defined as the core team of the innovation; this includes the PI or PD and anyone else internally who was considered key to their implementation.**	Implementation team is responsive to requests (e.g., data requests, emails) ☐ All the time ☐ Sometimes ☐ Rarely ☐ Never Implementation team has collected and shared data with RTI ☐ All requested data has been collected/shared ☐ Most data has been collected/shared ☐ Some data has been collected/shared ☐ None By December 2014, the innovation team had a feasible sustainability plan in place for continuing the innovation after the funding period ends ☐ Yes ☐ No
Implementation climate—experience with previous work/models	
Generic definition: Experience with implementing innovations similar to the HCIA innovation	
Evaluator Assessment of Experience with Previous Work/Models Based on information you have collected through document review, interviews or field observations, evaluate the experience with previous work/models within the Awardee organization. For multi-site implementations, base your assessment only on sites that have been interviewed or visited, unless the Awardee at the main or leading site has provided enough information for you to make assessments at sites that you did not interview or visit.	**Select one of the following:** ☐ Awardee (or convening organization) has experience in implementing this innovation (e.g., organization is scaling up an existing model/program) ☐ Awardee (or convening organization) has experience in implementing a similar innovation ☐ Awardee (or convening organization) has no experience in implementing this type of innovation (i.e., the innovation is completely new) ☐ Unable to evaluate alignment for this Awardee. Provide brief comments/justification for your rating below: *Brief justification*
Exogenous factors: Elements outside/external to the organization or program that may influence implementation and/or related outcomes. Generally, the outer setting includes the economic, political, and social context within which an organization resides.	
Please list any external factors that had an impact on implementation.	
Endogenous factors: Tangible and intangible manifestation of characteristics of the organizations involved in the intervention, including structural characteristics, networks and communications, culture, climate, and readiness that all interrelate and influence implementation.	
Please list any internal factors that had an impact on implementation.	

Internal Key Stakeholder Engagement	
Generic definition: Involving appropriate internal stakeholders (i.e., necessary entities within the organization) throughout planning and implementation. The engagement of internal key players helps to focus the program and research on meaningful outcomes and increase the likelihood of buy-in and sustainability of the program.	
Innovation team is defined as the core team of the innovation, to include the PI or PD and anyone else internally who was considered key to their implementation. Innovation leader is the PI or PD. By internal key stakeholder, we mean other individuals who are responsible for parts of the organizations that the Innovation team needed to collaborate with in order to implement the innovation successfully (e.g., IT department had to be on board with the clinicians for a HIT innovation).	**Please mark all that apply:** ☐ The innovation team attracted and involved appropriate individuals in implementation (e.g., used training programs, marketing strategies to inform stakeholders about rollout, role modeling) ☐ Members of the innovation team were carefully and thoughtfully selected ☐ Innovation team is a cohesive team ☐ Innovation team includes champions (or other key stakeholders who are most likely to make implementation successful) ☐ All (or most) internal key stakeholders are involved in the implementation ☐ Internal key stakeholders are engaged in solving problems or addressing implementation challenges ☐ Key innovation team members report having dedicated time for the innovation ☐ Key innovation team members feel supported and empowered in their efforts ☐ Key innovation team members are similar to the intended users (e.g., cultural background, similar SES, etc.) ☐ Implementation process has clearly defined leader(s) ☐ Innovation leader(s) were identified early in the planning or implementation process ☐ Innovation leader(s) have been involved/engaged through the implementation process ☐ None of the above
Execution	
Generic definition: The processes for achieving the program's objectives. Execution of an implementation plan may be organic with no obvious or formal planning, which makes execution difficult to assess. Quality of execution may consist of the degree of fidelity of implementation to planned courses of action, intensity (quality and depth) of implementation, timeliness of task completion, and degree of engagement of key involved individuals (e.g., implementation leaders) in the implementation process. The effectiveness of carrying out the tasks of the program may be facilitated or impeded by decision-making processes, organizational arrangements, or implementation planning.	

Evaluator Assessment of Execution Based on information you have collected through document review, interviews or field observations, evaluate the execution processes within the Awardee organization. **Innovation team is defined as the core team of the innovation, to include the PI or PD and anyone else internally who was considered key to their implementation. Implementation leader is the PI or PD.**	**Please mark all that apply:** ☐ Innovation team had a well-developed documented implementation plan that included the following (**mark all that apply**): ☐ A detailed timeline ☐ Detailed milestones ☐ Staff assignments for key milestones/steps ☐ Contingency plans (i.e., what they will do if problems are encountered) ☐ Specific measures mapped to measurable outcomes ☐ Innovation team made decisions that supported implementation *(please explain below)* – ☐ Organizational structure facilitated implementation ☐ PI/PD considered staff input in the implementation process ☐ All or most of required tasks for implementation have been completed on time ☐ Innovation team tried "dry runs" or practice sessions to train team members prior to "going live" ☐ Innovation team used incremental process (i.e., breaking down complex interventions into smaller, more manageable components that are gradually introduced) ☐ Innovation team worked with necessary entities within the organization to implement the innovation *(e.g., no collaboration with counselors)* ☐ Innovation team is on track to complete all milestones by the end of the funding cycle (i.e., operational plan milestones)—*they are well below their numbers* ☐ None of the above *HIT ONLY (i.e., only answer if an innovation program component included health IT)* The technical staff developing the IT interfaces/programs believed they understood what the users (e.g., clinical staff, analysts) needed prior to development. ☐ Yes ☐ No ☐ Not applicable (No-HIT component) The users of the IT interfaces/programs (e.g., clinical staff, analysts) believed that the IT interfaces/programs that were developed for the innovation took their needs into consideration. ☐ Yes ☐ No ☐ Not applicable (No-HIT component)

Staff retention	
Evaluator Assessment of staff adequacy Based on information you have collected through document review, data analysis, interviews or field observations, evaluate the staffing adequacy, turnover, or staffing gaps the awardee experienced.	**Awardee experienced** ☐ **Great staff adequacy**. Innovation team always had necessary staff in place to implement the innovation. Innovation team never experienced staff shortfall; innovation team lost no staff/retained all staff. ☐ **Considerable staff adequacy**. Innovation had necessary staff in place most of the time. The innovation team may have lost a few staff (minimal turnover) but COULD replace easily (thus, experiencing minimal staffing gaps ☐ Minimal **staff adequacy.** Innovation team seldom had all the staff they needed to implement the innovation. Innovation team may have lost a few staff and could not easily replace (thus, experienced staffing gaps) ☐ **Poor/no staff adequacy.** Innovation team was never or almost never staffed adequately to implement the innovation; key roles were consistently unfilled. Innovation team may have lost several staff or a single key staff critical to the innovation and could not easily replace the staff.
Self-Monitoring	
Generic Definition: Self-monitoring is a procedure (possibly with tracking tools) whereby the innovation team uses administrative/program data they collect to assess their progress and make mid-course corrections in their implementation.	
Evaluator Assessment of Data Systems Based on information you have collected through document review, interviews or field observations, evaluate the processes and systems in place to document and monitor innovation implementation (e.g., enrollment rates, services provided to patients, workforce development efforts, employment of trainees).	Innovation team had processes and/or systems in place to document and monitor innovation implementation (to ensure the innovation is on course to meet its goals): ☐ A great extent ☐ A considerable extent ☐ A slight extent ☐ None Innovation team had data systems in place to provide usable data to RTI by December 31, 2014 ☐ Yes ☐ No Innovation team is using systems to inform ongoing program development and quality improvement ☐ A great extent ☐ A considerable extent ☐ A slight extent ☐ None
Innovation characteristics	
Complexity	
Generic Definition: Duration, scope, radicalness, centrality, intricacy, and number of steps required to implement (length) and number of choices or pathways available at various decision points (“breadth”). Complexity is also increased when targeting larger number of potential targets or multiple organizational units. Innovations can be technically complex, administratively complex, or both.	

Evaluator Assessment of Intervention Complexity: Based on information you have collected through document review, data analysis, interviews or field observations, evaluate the complexity of the innovation.	**How does the innovation team enroll patients into the innovation (i.e., how complex of a process is it to identify, recruit, and enlist a patient into the innovation for those directly serving patients)? Please mark all that apply:** ☐ They invite patients to enroll as they come in for other services (i.e., captive audience) ☐ They obtain a list of patients from an external source (e.g., Medicaid eligible patients they have served) who meet specific criteria (e.g., ER visit in last month) and reach out to them by phone ☐ They obtain a list of patients from an internal roster (e.g., their electronic medical records) who meet specific criteria (e.g., ER visit in last month) and reach out to them by phone ☐ They conduct community outreach (e.g., through home visits) in areas where the target population lives and identify patients through in-person contact ☐ The patient is referred to the innovation by an external partner or provider ☐ The patient is referred to the innovation by an internal partner or provider ☐ Not relevant (the innovation serves indirect patients only) ☐ Other, please specify _____ ☐ Other, please specify _____
	What level of coordination within the awardee organization was needed to ***start up*** the innovation? ☐ Great ☐ Considerable ☐ Slight ☐ None What level of coordination within the awardee organization was needed to ***maintain*** the innovation? ☐ Great ☐ Considerable ☐ Slight ☐ None To what extent did the awardee have to change their workflow for the innovation? ☐ A great extent ☐ A considerable extent ☐ A slight extent ☐ None To what extent did the innovation change people's roles and responsibilities? ☐ A great extent ☐ A considerable extent ☐ A slight extent ☐ None

Implementation effectiveness

Dosage

Generic Definition: how much of the services or intervention an individual should receive in terms that are specific to the context and nature of the innovation (e.g., medical office visits, phone calls, counseling sessions, etc.). With this measure, we are trying to get a more accurate picture of the extent to which the awardee actually delivered the dose or exposure to the innovation as they had planned. We are not claiming that a longer or more frequent dose is better—we are simply trying to quantify what they delivered and can examine the extent to which these qualities are associated with key outcomes. This assessment is for all participants enrolled to the innovation, on average—so an innovation level measure not individual level assessment. In our data collection, we've talked about dose in terms of three measures—

1- Intensity, or the degree of exposure to the innovation (e.g., number of services they received over time, level of effort for those services such that if it's making an appointment for someone, that may be low intensity whereas a home visit would be high intensity)

2- Duration or the range of time patients received services (e.g., could be a one-time exposure which would be low or no duration or a 3 month follow up period which would be high duration)

3- Frequency or the number of times over the period of duration the innovation was delivered (e.g, many were just one time events so that frequency is low while others were several interactions over the course of a week or month which would be higher)

Evaluator Dosage Assessment:

Based on what we know now about this innovation, what is your opinion on the following measures for dose?

- What was the intensity of the innovation delivered (on average) to patients/participants? Please provide your assessment of the intensity and any notes to help explain why you rate it that way (there is no option for 'cannot determine' because we want you to give your opinion).
  - ☐ High (long contacts in person such as home visits)
  - ☐ Medium (contacts with participants lasted at least 30 minutes or more by phone or in person)
  - ☐ Medium Low (contacts with participants were short (greater than the 'low' category and <30 minutes), such as a reminder phone call, and required fairly low interaction with participant)
  - ☐ Low (contacts with participants were virtual/IT or passive such as giving them print material)
  - ☐ Not Applicable because _____

  Please briefly explain your answer:

- What was the duration of the innovation delivered (on average) to patients/participants? Please provide your assessment of the intensity and any notes to help explain why you rate it that way (there is no option for 'cannot determine' because we want you to give your opinion).
  - ☐ High (>30 days or a month)
  - ☐ Medium (> 2 weeks but <30 days or a month)
  - ☐ Medium Low (>1 day but ≤ 2 weeks)
  - ☐ Low (≤ 1 day/time/event)
  - ☐ Not Applicable because _____

  Please briefly explain your answer:

- What was the frequency of the innovation delivered (on average) to patients/participants? Please provide your assessment of the intensity and any notes to help explain why you rate it that way (there is no option for 'cannot determine' because we want you to give your opinion).
  - ☐ High (>10 encounters)
  - ☐ Medium (6-10 encounters on average)
  - ☐ Medium Low (2-5 encounters on average)
  - ☐ Low (≤ 1 time/event)
  - ☐ Not Applicable because _____

  Please briefly explain your answer:

Overall implementation effectiveness
Generic Definition: Effective implementation (also known as "implementation success") is the presence of the innovation delivered as intended (fidelity) to a substantial proportion of the targeted population (reach) in doses associated with effectiveness (dosage).
Evaluator Implementation Effectiveness Assessment: Based on your responses above and overall impression of the awardee's innovation, please rate their overall effectiveness in their innovation implementation *(awardees will never know what you rated them—please come to an agreement as a team for one rating)*: ☐ Very successful ☐ Successful ☐ Somewhat successful ☐ Not at all successful **Provide brief comments/justification for your rating:** *Brief justification*

Appendix C

Provider Survey Tables

Table C-1. Provider Satisfaction

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
How satisfied are you with the innovation overall?																						
Extremely Satisfied	1	1.1%	0	0.0%	10	25.0%	1	5.6%	3	6.1%	55	32.9%	8	80.0%	0	0.0%	1	3.1%	17	37.8%	96	20.3%
Very Satisfied	23	24.2%	2	25.0%	14	35.0%	7	38.9%	11	22.4%	70	41.9%	2	20.0%	3	37.5%	9	28.1%	23	51.1%	164	34.7%
Moderately Satisfied	21	22.1%	3	37.5%	14	35.0%	8	44.4%	23	46.9%	28	16.8%	0	0.0%	4	50.0%	12	37.5%	3	6.7%	116	24.6%
Slightly Satisfied	29	30.5%	2	25.0%	1	2.5%	2	11.1%	8	16.3%	8	4.8%	0	0.0%	1	12.5%	4	12.5%	1	2.2%	56	11.9%
Not at all Satisfied	13	13.7%	1	12.5%	1	2.5%	0	0.0%	3	6.1%	1	0.6%	0	0.0%	0	0.0%	4	12.5%	0	0.0%	23	4.9%
Missing	8	8.4%	0	0.0%	0	0.0%	0	0.0%	1	2.0%	5	3.0%	0	0.0%	0	0.0%	2	6.3%	1	2.2%	17	3.6%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
Please indicate how easy or hard it is to use the innovation as it has been implemented.																						
Very Easy to Use	8	8.4%	1	12.5%	8	20.0%	4	22.2%	5	10.2%	91	54.5%	9	90.0%	1	12.5%	5	15.6%	35	77.8%	167	35.4%
Somewhat Easy to Use	26	27.4%	3	37.5%	13	32.5%	10	55.6%	17	34.7%	46	27.5%	1	10.0%	4	50.0%	10	31.3%	5	11.1%	135	28.6%
Neither Easy nor Hard	16	16.8%	2	25.0%	12	30.0%	4	22.2%	14	28.6%	13	7.8%	0	0.0%	1	12.5%	9	28.1%	2	4.4%	73	15.5%
Somewhat Hard to Use	26	27.4%	1	12.5%	3	7.5%	0	0.0%	7	14.3%	5	3.0%	0	0.0%	2	25.0%	2	6.3%	0	0.0%	46	9.7%
Very Hard to Use	4	4.2%	0	0.0%	0	0.0%	0	0.0%	1	2.0%	0	0.0%	0	0.0%	0	0.0%	1	3.1%	0	0.0%	6	1.3%
Not Applicable	9	9.5%	1	12.5%	3	7.5%	0	0.0%	4	8.2%	7	4.2%	0	0.0%	0	0.0%	3	9.4%	3	6.7%	30	6.4%
Missing	6	6.3%	0	0.0%	1	2.5%	0	0.0%	1	2.0%	5	3.0%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	15	3.2%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
Based on the functionality of the innovation, please indicate if your system has done each of the following																						
Alerted me to a potential medication error																						
Yes, Within the Past 30 Days	7	7.4%	1	12.5%	8	20.0%	4	22.2%	4	8.2%	27	16.2%	4	40.0%	3	37.5%	1	3.1%	3	6.7%	62	13.1%
Yes, but Not Within the Past 30 Days	10	10.5%	1	12.5%	16	40.0%	2	11.1%	3	6.1%	38	22.8%	2	20.0%	4	50.0%	1	3.1%	6	13.3%	83	17.6%

(continued)

Table C-1. Provider Satisfaction (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
No, Not at All	36	37.9%	5	62.5%	14	35.0%	9	50.0%	29	59.2%	45	26.9%	2	20.0%	1	12.5%	19	59.4%	9	20.0%	169	35.8%
Not Applicable	34	35.8%	1	12.5%	2	5.0%	3	16.7%	11	22.4%	51	30.5%	2	20.0%	0	0.0%	9	28.1%	27	60.0%	140	29.7%
Missing	8	8.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	6	3.6%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	18	3.8%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
Reminded me to provide preventive care (e.g., vaccines)																						
Yes, Within the Past 30 Days	9	9.5%	0	0.0%	23	57.5%	0	0.0%	4	8.2%	24	14.4%	2	20.0%	2	25.0%	5	15.6%	4	8.9%	73	15.5%
Yes, but Not Within the Past 30 Days	8	8.4%	0	0.0%	7	17.5%	0	0.0%	7	14.3%	27	16.2%	1	10.0%	2	25.0%	3	9.4%	11	24.4%	66	14.0%
No, Not at All	34	35.8%	5	62.5%	8	20.0%	13	72.2%	26	53.1%	58	34.7%	1	10.0%	1	12.5%	13	40.6%	6	13.3%	165	35.0%
Not Applicable	36	37.9%	3	37.5%	2	5.0%	4	22.2%	9	18.4%	51	30.5%	6	60.0%	3	37.5%	9	28.1%	24	53.3%	147	31.1%
Missing	8	8.4%	0	0.0%	0	0.0%	1	5.6%	3	6.1%	7	4.2%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	21	4.4%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
Helped me order fewer tests due to better availability of lab/radiology results																						
Yes, Within the Past 30 Days	14	14.7%	2	25.0%	8	20.0%	3	16.7%	2	4.1%	14	8.4%	4	40.0%	3	37.5%	1	3.1%	1	2.2%	52	11.0%
Yes, but Not Within the Past 30 Days	26	27.4%	2	25.0%	7	17.5%	5	27.8%	5	10.2%	14	8.4%	4	40.0%	0	0.0%	1	3.1%	6	13.3%	70	14.8%
No, Not at All	26	27.4%	4	50.0%	24	60.0%	7	38.9%	27	55.1%	68	40.7%	0	0.0%	1	12.5%	17	53.1%	10	22.2%	184	39.0%
Not Applicable	21	22.1%	0	0.0%	1	2.5%	3	16.7%	13	26.5%	64	38.3%	2	20.0%	4	50.0%	11	34.4%	28	62.2%	147	31.1%
Missing	8	8.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	7	4.2%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	19	4.0%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%

(continued)

Table C-1. Provider Satisfaction (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Facilitated direct communication with a patient (e.g., e-mail or secure messaging)																						
Yes, Within the Past 30 Days	11	11.6%	1	12.5%	32	80.0%	1	5.6%	7	14.3%	71	42.5%	9	90.0%	4	50.0%	6	18.8%	18	40.0%	160	33.9%
Yes, but Not Within the Past 30 Days	7	7.4%	1	12.5%	3	7.5%	1	5.6%	8	16.3%	34	20.4%	0	0.0%	3	37.5%	2	6.3%	7	15.6%	66	14.0%
No, Not at All	33	34.7%	4	50.0%	3	7.5%	11	61.1%	23	46.9%	22	13.2%	0	0.0%	1	12.5%	13	40.6%	6	13.3%	116	24.6%
Not Applicable	36	37.9%	2	25.0%	2	5.0%	5	27.8%	9	18.4%	33	19.8%	1	10.0%	0	0.0%	9	28.1%	14	31.1%	111	23.5%
Missing	8	8.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	7	4.2%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	19	4.0%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
Alerted me that I received a patient summary from another provider																						
Yes, Within the Past 30 Days	9	9.5%	0	0.0%	15	37.5%	3	16.7%	10	20.4%	16	9.6%	3	30.0%	4	50.0%	2	6.3%	4	8.9%	66	14.0%
Yes, but Not Within the Past 30 Days	6	6.3%	1	12.5%	6	15.0%	0	0.0%	4	8.2%	21	12.6%	0	0.0%	2	25.0%	0	0.0%	4	8.9%	44	9.3%
No, Not at All	34	35.8%	6	75.0%	17	42.5%	12	66.7%	24	49.0%	74	44.3%	2	20.0%	0	0.0%	18	56.3%	13	28.9%	200	42.4%
Not Applicable	39	41.1%	1	12.5%	2	5.0%	3	16.7%	8	16.3%	49	29.3%	5	50.0%	2	25.0%	10	31.3%	24	53.3%	143	30.3%
Missing	7	7.4%	0	0.0%	0	0.0%	0	0.0%	3	6.1%	7	4.2%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	19	4.0%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
Led to some unintended consequences (e.g., "alarm fatigue" or incorrect identification of potential problems)																						
Yes, Within the Past 30 Days	6	6.3%	1	12.5%	5	12.5%	7	38.9%	3	6.1%	10	6.0%	2	20.0%	1	12.5%	2	6.3%	2	4.4%	39	8.3%
Yes, but Not Within the Past 30 Days	8	8.4%	1	12.5%	11	27.5%	1	5.6%	2	4.1%	10	6.0%	1	10.0%	2	25.0%	2	6.3%	1	2.2%	39	8.3%
No, Not at All	35	36.8%	5	62.5%	21	52.5%	8	44.4%	32	65.3%	88	52.7%	4	40.0%	4	50.0%	15	46.9%	18	40.0%	230	48.7%
Not Applicable	39	41.1%	1	12.5%	3	7.5%	2	11.1%	10	20.4%	51	30.5%	3	30.0%	1	12.5%	11	34.4%	24	53.3%	145	30.7%
Missing	7	7.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	8	4.8%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	19	4.0%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%

(continued)

Table C-1. Provider Satisfaction (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Please indicate how much you agree or disagree with each of the following statements regarding the potential impacts of the innovation																						
The innovation helps me provide better patient care																						
Strongly Agree	9	9.5%	2	25.0%	19	47.5%	2	11.1%	10	20.4%	76	45.5%	10	100.0%	4	50.0%	3	9.4%	18	40.0%	153	32.4%
Somewhat Agree	29	30.5%	2	25.0%	14	35.0%	11	61.1%	16	32.7%	56	33.5%	0	0.0%	3	37.5%	10	31.3%	14	31.1%	155	32.8%
Neither Agree nor Disagree	23	24.2%	3	37.5%	5	12.5%	3	16.7%	14	28.6%	12	7.2%	0	0.0%	1	12.5%	6	18.8%	2	4.4%	69	14.6%
Somewhat Disagree	11	11.6%	0	0.0%	0	0.0%	2	11.1%	2	4.1%	2	1.2%	0	0.0%	0	0.0%	3	9.4%	1	2.2%	21	4.4%
Strongly Disagree	7	7.4%	0	0.0%	1	2.5%	0	0.0%	2	4.1%	3	1.8%	0	0.0%	0	0.0%	3	9.4%	2	4.4%	18	3.8%
Not Applicable	9	9.5%	1	12.5%	1	2.5%	0	0.0%	3	6.1%	13	7.8%	0	0.0%	0	0.0%	5	15.6%	8	17.8%	40	8.5%
Missing	7	7.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	5	3.0%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	16	3.4%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
The innovation leads to more effective communication during patient visits																						
Strongly Agree	8	8.4%	1	12.5%	15	37.5%	1	5.6%	10	20.4%	53	31.7%	8	80.0%	3	37.5%	5	15.6%	20	44.4%	124	26.3%
Somewhat Agree	22	23.2%	3	37.5%	12	30.0%	7	38.9%	11	22.4%	56	33.5%	0	0.0%	4	50.0%	6	18.8%	12	26.7%	133	28.2%
Neither Agree nor Disagree	17	17.9%	3	37.5%	11	27.5%	8	44.4%	16	32.7%	26	15.6%	1	10.0%	1	12.5%	4	12.5%	1	2.2%	88	18.6%
Somewhat Disagree	14	14.7%	0	0.0%	0	0.0%	1	5.6%	3	6.1%	6	3.6%	0	0.0%	0	0.0%	4	12.5%	0	0.0%	28	5.9%
Strongly Disagree	11	11.6%	0	0.0%	1	2.5%	1	5.6%	2	4.1%	3	1.8%	0	0.0%	0	0.0%	3	9.4%	0	0.0%	21	4.4%
Not Applicable	16	16.8%	1	12.5%	1	2.5%	0	0.0%	4	8.2%	18	10.8%	1	10.0%	0	0.0%	8	25.0%	12	26.7%	61	12.9%
Missing	7	7.4%	0	0.0%	0	0.0%	0	0.0%	3	6.1%	5	3.0%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	17	3.6%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
The innovation has improved my patients' access to care																						
Strongly Agree	4	4.2%	1	12.5%	18	45.0%	0	0.0%	10	20.4%	86	51.5%	10	100.0%	3	37.5%	4	12.5%	28	62.2%	164	34.7%
Somewhat Agree	17	17.9%	4	50.0%	15	37.5%	3	16.7%	12	24.5%	45	26.9%	0	0.0%	5	62.5%	7	21.9%	7	15.6%	115	24.4%

(continued)

Table C-1. Provider Satisfaction (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Neither Agree nor Disagree	23	24.2%	2	25.0%	5	12.5%	5	27.8%	16	32.7%	14	8.4%	0	0.0%	0	0.0%	6	18.8%	3	6.7%	74	15.7%
Somewhat Disagree	11	11.6%	0	0.0%	1	2.5%	4	22.2%	4	8.2%	1	0.6%	0	0.0%	0	0.0%	4	12.5%	0	0.0%	25	5.3%
Strongly Disagree	14	14.7%	0	0.0%	0	0.0%	3	16.7%	2	4.1%	3	1.8%	0	0.0%	0	0.0%	2	6.3%	1	2.2%	25	5.3%
Not Applicable	19	20.0%	1	12.5%	1	2.5%	3	16.7%	3	6.1%	13	7.8%	0	0.0%	0	0.0%	7	21.9%	6	13.3%	53	11.2%
Missing	7	7.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	5	3.0%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	16	3.4%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
The innovation helps me develop good relationships with my patients																						
Strongly Agree	4	4.2%	1	12.5%	12	30.0%	0	0.0%	8	16.3%	46	27.5%	6	60.0%	4	50.0%	4	12.5%	17	37.8%	102	21.6%
Somewhat Agree	12	12.6%	1	12.5%	14	35.0%	5	27.8%	10	20.4%	48	28.7%	3	30.0%	2	25.0%	5	15.6%	7	15.6%	107	22.7%
Neither Agree nor Disagree	31	32.6%	5	62.5%	10	25.0%	6	33.3%	19	38.8%	39	23.4%	1	10.0%	2	25.0%	8	25.0%	5	11.1%	126	26.7%
Somewhat Disagree	10	10.5%	0	0.0%	2	5.0%	4	22.2%	6	12.2%	4	2.4%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	28	5.9%
Strongly Disagree	16	16.8%	0	0.0%	1	2.5%	2	11.1%	2	4.1%	4	2.4%	0	0.0%	0	0.0%	3	9.4%	2	4.4%	30	6.4%
Not Applicable	15	15.8%	1	12.5%	1	2.5%	1	5.6%	2	4.1%	21	12.6%	0	0.0%	0	0.0%	8	25.0%	14	31.1%	63	13.3%
Missing	7	7.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	5	3.0%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	16	3.4%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
Overall, my practice functions more efficiently with the innovation																						
Strongly Agree	4	4.2%	0	0.0%	18	45.0%	3	16.7%	7	14.3%	58	34.7%	6	60.0%	2	25.0%	0	0.0%	20	44.4%	118	25.0%
Somewhat Agree	20	21.1%	5	62.5%	8	20.0%	10	55.6%	15	30.6%	52	31.1%	3	30.0%	4	50.0%	7	21.9%	14	31.1%	138	29.2%
Neither Agree nor Disagree	19	20.0%	3	37.5%	9	22.5%	2	11.1%	18	36.7%	25	15.0%	0	0.0%	0	0.0%	5	15.6%	2	4.4%	83	17.6%
Somewhat Disagree	20	21.1%	0	0.0%	2	5.0%	2	11.1%	2	4.1%	2	1.2%	0	0.0%	2	25.0%	4	12.5%	0	0.0%	34	7.2%
Strongly Disagree	12	12.6%	0	0.0%	1	2.5%	1	5.6%	2	4.1%	5	3.0%	0	0.0%	0	0.0%	5	15.6%	2	4.4%	28	5.9%
Not Applicable	13	13.7%	0	0.0%	2	5.0%	0	0.0%	3	6.1%	20	12.0%	1	10.0%	0	0.0%	9	28.1%	7	15.6%	55	11.7%

(continued)

Table C-1. Provider Satisfaction (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Missing	7	7.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	5	3.0%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	16	3.4%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
The innovation saves me time																						
Strongly Agree	4	4.2%	0	0.0%	13	32.5%	1	5.6%	4	8.2%	60	35.9%	7	70.0%	2	25.0%	0	0.0%	14	31.1%	105	22.2%
Somewhat Agree	9	9.5%	5	62.5%	15	37.5%	8	44.4%	11	22.4%	45	26.9%	3	30.0%	5	62.5%	3	9.4%	9	20.0%	113	23.9%
Neither Agree nor Disagree	21	22.1%	3	37.5%	6	15.0%	4	22.2%	18	36.7%	30	18.0%	0	0.0%	0	0.0%	9	28.1%	9	20.0%	100	21.2%
Somewhat Disagree	19	20.0%	0	0.0%	4	10.0%	4	22.2%	6	12.2%	5	3.0%	0	0.0%	0	0.0%	3	9.4%	1	2.2%	42	8.9%
Strongly Disagree	23	24.2%	0	0.0%	1	2.5%	1	5.6%	2	4.1%	5	3.0%	0	0.0%	1	12.5%	6	18.8%	1	2.2%	40	8.5%
Not Applicable	11	11.6%	0	0.0%	1	2.5%	0	0.0%	5	10.2%	17	10.2%	0	0.0%	0	0.0%	9	28.1%	11	24.4%	54	11.4%
Missing	8	8.4%	0	0.0%	0	0.0%	0	0.0%	3	6.1%	5	3.0%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	18	3.8%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
The innovation has increased the time I am able to spend with patients during office visits																						
Strongly Agree	3	3.2%	0	0.0%	7	17.5%	0	0.0%	3	6.1%	25	15.0%	2	20.0%	2	25.0%	0	0.0%	9	20.0%	51	10.8%
Somewhat Agree	6	6.3%	1	12.5%	10	25.0%	5	27.8%	7	14.3%	39	23.4%	2	20.0%	2	25.0%	5	15.6%	5	11.1%	82	17.4%
Neither Agree nor Disagree	25	26.3%	6	75.0%	13	32.5%	5	27.8%	19	38.8%	47	28.1%	3	30.0%	2	25.0%	6	18.8%	1	2.2%	127	26.9%
Somewhat Disagree	13	13.7%	0	0.0%	7	17.5%	5	27.8%	9	18.4%	10	6.0%	0	0.0%	1	12.5%	4	12.5%	1	2.2%	50	10.6%
Strongly Disagree	26	27.4%	1	12.5%	2	5.0%	1	5.6%	3	6.1%	7	4.2%	0	0.0%	1	12.5%	5	15.6%	0	0.0%	46	9.7%
Not Applicable	15	15.8%	0	0.0%	1	2.5%	2	11.1%	6	12.2%	34	20.4%	3	30.0%	0	0.0%	10	31.3%	29	64.4%	100	21.2%
Missing	7	7.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	5	3.0%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	16	3.4%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
The innovation has increased the average number of weekly office visits to my practice																						
Strongly Agree	2	2.1%	0	0.0%	1	2.5%	0	0.0%	2	4.1%	7	4.2%	0	0.0%	2	25.0%	0	0.0%	4	8.9%	18	3.8%
Somewhat Agree	4	4.2%	1	12.5%	7	17.5%	1	5.6%	6	12.2%	18	10.8%	2	20.0%	3	37.5%	1	3.1%	3	6.7%	46	9.7%

(continued)

Table C-1. Provider Satisfaction (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Neither Agree nor Disagree	23	24.2%	6	75.0%	20	50.0%	5	27.8%	21	42.9%	64	38.3%	1	10.0%	1	12.5%	9	28.1%	2	4.4%	152	32.2%
Somewhat Disagree	9	9.5%	0	0.0%	8	20.0%	2	11.1%	5	10.2%	11	6.6%	2	20.0%	2	25.0%	7	21.9%	0	0.0%	46	9.7%
Strongly Disagree	30	31.6%	0	0.0%	3	7.5%	2	11.1%	5	10.2%	16	9.6%	1	10.0%	0	0.0%	4	12.5%	3	6.7%	64	13.6%
Not Applicable	20	21.1%	1	12.5%	1	2.5%	8	44.4%	8	16.3%	46	27.5%	4	40.0%	0	0.0%	9	28.1%	32	71.1%	129	27.3%
Missing	7	7.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	5	3.0%	0	0.0%	0	0.0%	2	6.3%	1	2.2%	17	3.6%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
Sufficient resources (e.g., support staff, time, training) have been provided for me to use/interact with the innovation																						
Strongly Agree	7	7.4%	1	12.5%	7	17.5%	0	0.0%	6	12.2%	56	33.5%	6	60.0%	1	12.5%	1	3.1%	18	40.0%	103	21.8%
Somewhat Agree	15	15.8%	3	37.5%	21	52.5%	10	55.6%	13	26.5%	49	29.3%	1	10.0%	3	37.5%	9	28.1%	11	24.4%	135	28.6%
Neither Agree nor Disagree	19	20.0%	1	12.5%	4	10.0%	3	16.7%	12	24.5%	29	17.4%	3	30.0%	0	0.0%	8	25.0%	4	8.9%	83	17.6%
Somewhat Disagree	20	21.1%	1	12.5%	6	15.0%	3	16.7%	11	22.4%	8	4.8%	0	0.0%	3	37.5%	5	15.6%	2	4.4%	59	12.5%
Strongly Disagree	13	13.7%	2	25.0%	1	2.5%	2	11.1%	4	8.2%	5	3.0%	0	0.0%	1	12.5%	3	9.4%	1	2.2%	32	6.8%
Not Applicable	14	14.7%	0	0.0%	1	2.5%	0	0.0%	1	2.0%	15	9.0%	0	0.0%	0	0.0%	4	12.5%	9	20.0%	44	9.3%
Missing	7	7.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	5	3.0%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	16	3.4%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
The innovation produces financial benefits for my practice																						
Strongly Agree	2	2.1%	0	0.0%	2	5.0%	1	5.6%	1	2.0%	19	11.4%	2	20.0%	2	25.0%	0	0.0%	13	28.9%	42	8.9%
Somewhat Agree	10	10.5%	1	12.5%	11	27.5%	5	27.8%	9	18.4%	26	15.6%	3	30.0%	3	37.5%	4	12.5%	6	13.3%	78	16.5%
Neither Agree nor Disagree	24	25.3%	5	62.5%	13	32.5%	7	38.9%	22	44.9%	56	33.5%	3	30.0%	2	25.0%	12	37.5%	8	17.8%	152	32.2%
Somewhat Disagree	9	9.5%	0	0.0%	4	10.0%	3	16.7%	3	6.1%	8	4.8%	0	0.0%	0	0.0%	3	9.4%	0	0.0%	30	6.4%
Strongly Disagree	25	26.3%	2	25.0%	2	5.0%	1	5.6%	2	4.1%	11	6.6%	0	0.0%	0	0.0%	3	9.4%	1	2.2%	47	10.0%
Not Applicable	18	18.9%	0	0.0%	8	20.0%	1	5.6%	10	20.4%	40	24.0%	2	20.0%	1	12.5%	8	25.0%	16	35.6%	104	22.0%

(continued)

Table C-1. Provider Satisfaction (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Missing	7	7.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	7	4.2%	0	0.0%	0	0.0%	2	6.3%	1	2.2%	19	4.0%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
Investing in the innovation is worthwhile in terms of time, energy, and resources																						
Strongly Agree	5	5.3%	1	12.5%	17	42.5%	3	16.7%	9	18.4%	78	46.7%	8	80.0%	4	50.0%	1	3.1%	34	75.6%	160	33.9%
Somewhat Agree	17	17.9%	5	62.5%	11	27.5%	9	50.0%	23	46.9%	51	30.5%	2	20.0%	3	37.5%	9	28.1%	6	13.3%	136	28.8%
Neither Agree nor Disagree	21	22.1%	1	12.5%	9	22.5%	2	11.1%	8	16.3%	16	9.6%	0	0.0%	0	0.0%	9	28.1%	0	0.0%	66	14.0%
Somewhat Disagree	15	15.8%	1	12.5%	1	2.5%	4	22.2%	3	6.1%	2	1.2%	0	0.0%	0	0.0%	2	6.3%	1	2.2%	29	6.1%
Strongly Disagree	18	18.9%	0	0.0%	0	0.0%	0	0.0%	1	2.0%	1	0.6%	0	0.0%	0	0.0%	3	9.4%	1	2.2%	24	5.1%
Not Applicable	12	12.6%	0	0.0%	2	5.0%	0	0.0%	3	6.1%	13	7.8%	0	0.0%	1	12.5%	6	18.8%	3	6.7%	40	8.5%
Missing	7	7.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	6	3.6%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	17	3.6%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
The innovation prevents me from providing high-quality patient care																						
Strongly Agree	5	5.3%	0	0.0%	1	2.5%	0	0.0%	1	2.0%	7	4.2%	0	0.0%	0	0.0%	0	0.0%	3	6.7%	17	3.6%
Somewhat Agree	12	12.6%	1	12.5%	1	2.5%	4	22.2%	1	2.0%	6	3.6%	1	10.0%	1	12.5%	2	6.3%	0	0.0%	29	6.1%
Neither Agree nor Disagree	21	22.1%	2	25.0%	3	7.5%	1	5.6%	10	20.4%	18	10.8%	0	0.0%	1	12.5%	5	15.6%	2	4.4%	63	13.3%
Somewhat Disagree	14	14.7%	3	37.5%	12	30.0%	9	50.0%	5	10.2%	16	9.6%	0	0.0%	2	25.0%	5	15.6%	2	4.4%	68	14.4%
Strongly Disagree	19	20.0%	2	25.0%	22	55.0%	4	22.2%	27	55.1%	95	56.9%	7	70.0%	4	50.0%	11	34.4%	30	66.7%	221	46.8%
Not Applicable	17	17.9%	0	0.0%	1	2.5%	0	0.0%	3	6.1%	20	12.0%	2	20.0%	0	0.0%	7	21.9%	8	17.8%	58	12.3%
Missing	7	7.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	5	3.0%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	16	3.4%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
The added logistics required by the innovation (i.e., paperwork, administration) are a burden on me and/or my staff																						
Strongly Agree	12	12.6%	0	0.0%	2	5.0%	1	5.6%	1	2.0%	5	3.0%	0	0.0%	1	12.5%	2	6.3%	1	2.2%	25	5.3%
Somewhat Agree	33	34.7%	4	50.0%	7	17.5%	3	16.7%	5	10.2%	15	9.0%	1	10.0%	2	25.0%	4	12.5%	2	4.4%	76	16.1%

(continued)

Table C-1. Provider Satisfaction (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Neither Agree nor Disagree	23	24.2%	1	12.5%	11	27.5%	6	33.3%	20	40.8%	32	19.2%	0	0.0%	0	0.0%	5	15.6%	3	6.7%	101	21.4%
Somewhat Disagree	5	5.3%	3	37.5%	7	17.5%	5	27.8%	8	16.3%	27	16.2%	3	30.0%	2	25.0%	7	21.9%	4	8.9%	71	15.0%
Strongly Disagree	3	3.2%	0	0.0%	12	30.0%	2	11.1%	10	20.4%	67	40.1%	6	60.0%	2	25.0%	4	12.5%	25	55.6%	131	27.8%
Not Applicable	12	12.6%	0	0.0%	1	2.5%	1	5.6%	3	6.1%	16	9.6%	0	0.0%	1	12.5%	8	25.0%	10	22.2%	52	11.0%
Missing	7	7.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	5	3.0%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	16	3.4%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
The innovation has improved perceived patient satisfaction with care																						
Strongly Agree	2	2.1%	0	0.0%	12	30.0%	0	0.0%	4	8.2%	48	28.7%	7	70.0%	1	12.5%	1	3.1%	21	46.7%	96	20.3%
Somewhat Agree	12	12.6%	1	12.5%	14	35.0%	5	27.8%	13	26.5%	58	34.7%	2	20.0%	6	75.0%	10	31.3%	14	31.1%	135	28.6%
Neither Agree nor Disagree	31	32.6%	7	87.5%	8	20.0%	8	44.4%	20	40.8%	33	19.8%	0	0.0%	1	12.5%	5	15.6%	3	6.7%	116	24.6%
Somewhat Disagree	9	9.5%	0	0.0%	3	7.5%	4	22.2%	4	8.2%	1	0.6%	0	0.0%	0	0.0%	4	12.5%	1	2.2%	26	5.5%
Strongly Disagree	18	18.9%	0	0.0%	0	0.0%	1	5.6%	1	2.0%	4	2.4%	0	0.0%	0	0.0%	2	6.3%	1	2.2%	27	5.7%
Not Applicable	16	16.8%	0	0.0%	3	7.5%	0	0.0%	5	10.2%	17	10.2%	1	10.0%	0	0.0%	8	25.0%	5	11.1%	55	11.7%
Missing	7	7.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	6	3.6%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	17	3.6%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
Sufficient technical IT support is available to operate the innovation																						
Strongly Agree	8	8.4%	1	12.5%	5	12.5%	0	0.0%	3	6.1%	21	12.6%	5	50.0%	0	0.0%	2	6.3%	3	6.7%	48	10.2%
Somewhat Agree	13	13.7%	1	12.5%	10	25.0%	11	61.1%	9	18.4%	25	15.0%	2	20.0%	1	12.5%	6	18.8%	6	13.3%	84	17.8%
Neither Agree nor Disagree	29	30.5%	5	62.5%	17	42.5%	4	22.2%	13	26.5%	48	28.7%	3	30.0%	1	12.5%	4	12.5%	7	15.6%	131	27.8%
Somewhat Disagree	15	15.8%	1	12.5%	4	10.0%	3	16.7%	11	22.4%	8	4.8%	0	0.0%	3	37.5%	6	18.8%	1	2.2%	52	11.0%
Strongly Disagree	8	8.4%	0	0.0%	1	2.5%	0	0.0%	2	4.1%	6	3.6%	0	0.0%	3	37.5%	3	9.4%	3	6.7%	26	5.5%
Not Applicable	15	15.8%	0	0.0%	3	7.5%	0	0.0%	9	18.4%	52	31.1%	0	0.0%	0	0.0%	8	25.0%	25	55.6%	112	23.7%

(continued)

Table C-1. Provider Satisfaction (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Missing	7	7.4%	0	0.0%	0	0.0%	0	0.0%	2	4.1%	7	4.2%	0	0.0%	0	0.0%	3	9.4%	0	0.0%	19	4.0%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%
The innovation has been integrated into clinical workflow																						
Strongly Agree	7	7.4%	0	0.0%	15	37.5%	1	5.6%	5	10.2%	35	21.0%	5	50.0%	1	12.5%	2	6.3%	22	48.9%	93	19.7%
Somewhat Agree	17	17.9%	2	25.0%	13	32.5%	14	77.8%	12	24.5%	52	31.1%	4	40.0%	4	50.0%	7	21.9%	10	22.2%	135	28.6%
Neither Agree nor Disagree	19	20.0%	4	50.0%	8	20.0%	2	11.1%	13	26.5%	29	17.4%	0	0.0%	1	12.5%	4	12.5%	2	4.4%	82	17.4%
Somewhat Disagree	14	14.7%	1	12.5%	2	5.0%	0	0.0%	10	20.4%	4	2.4%	0	0.0%	2	25.0%	6	18.8%	0	0.0%	39	8.3%
Strongly Disagree	20	21.1%	1	12.5%	0	0.0%	0	0.0%	2	4.1%	11	6.6%	0	0.0%	0	0.0%	2	6.3%	1	2.2%	37	7.8%
Not Applicable	11	11.6%	0	0.0%	2	5.0%	0	0.0%	5	10.2%	29	17.4%	1	10.0%	0	0.0%	9	28.1%	10	22.2%	67	14.2%
Missing	7	7.4%	0	0.0%	0	0.0%	1	5.6%	2	4.1%	7	4.2%	0	0.0%	0	0.0%	2	6.3%	0	0.0%	19	4.0%
Total	95	100.0%	8	100.0%	40	100.0%	18	100.0%	49	100.0%	167	100.0%	10	100.0%	8	100.0%	32	100.0%	45	100.0%	472	100.0%

[1] Raw frequencies and percentages; does not include weighted responses.

Table C-2. Clinical Care Workflow

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
There are a wide variety of activities you likely participate in at work during an average week. Please think about how much time you spent each week on each of the following activities before the start of the innovation and how much time you spend on those activities now. You may not do some activities now that you used to do, or you may do new activities now that you did not do before. Mark whether you spend more time, less time, or about the same amount of time for each activity since the start of the innovation.																						
Providing direct patient care (face-to-face)																						
More Time	9	9%	1	13%	7	18%	4	22%	4	8%	18	11%	0	0%	5	63%	5	16%	7	16%	60	13%
No Change	55	58%	7	88%	26	65%	12	67%	32	65%	111	66%	9	90%	3	38%	16	50%	25	56%	296	63%
Less Time	11	12%	0	0%	6	15%	1	6%	2	4%	12	7%	1	10%	0	0%	1	3%	0	0%	34	7%
Not Applicable	12	13%	0	0%	1	3%	1	6%	9	18%	20	12%	0	0%	0	0%	6	19%	13	29%	62	13%
Missing	8	8%	0	0%	0	0%	0	0%	2	4%	6	4%	0	0%	0	0%	4	13%	0	0%	20	4%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Communicating with patients by phone or e-mail																						
More Time	9	9%	0	0%	13	33%	1	6%	6	12%	14	8%	1	10%	3	38%	2	6%	8	18%	57	12%
No Change	54	57%	7	88%	9	23%	7	39%	27	55%	101	60%	3	30%	3	38%	13	41%	15	33%	239	51%
Less Time	7	7%	0	0%	17	43%	1	6%	4	8%	28	17%	6	60%	2	25%	3	9%	5	11%	73	15%
Not Applicable	17	18%	1	13%	1	3%	9	50%	10	20%	18	11%	0	0%	0	0%	10	31%	17	38%	83	18%
Missing	8	8%	0	0%	0	0%	0	0%	2	4%	6	4%	0	0%	0	0%	4	13%	0	0%	20	4%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Looking up patient information in electronic medical records or other health information systems																						
More Time	23	24%	3	38%	8	20%	4	22%	7	14%	16	10%	1	10%	4	50%	3	9%	5	11%	74	16%
No Change	38	40%	4	50%	22	55%	7	39%	24	49%	111	66%	7	70%	1	13%	16	50%	23	51%	253	54%
Less Time	9	9%	1	13%	9	23%	5	28%	7	14%	12	7%	2	20%	3	38%	2	6%	5	11%	55	12%
Not Applicable	17	18%	0	0%	1	3%	2	11%	9	18%	22	13%	0	0%	0	0%	7	22%	12	27%	70	15%
Missing	8	8%	0	0%	0	0%	0	0%	2	4%	6	4%	0	0%	0	0%	4	13%	0	0%	20	4%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Looking up patient information in paper-based medical charts																						
More Time	10	11%	0	0%	2	5%	0	0%	0	0%	4	2%	0	0%	0	0%	1	3%	3	7%	20	4%
No Change	33	35%	5	63%	6	15%	4	22%	18	37%	64	38%	3	30%	0	0%	10	31%	20	44%	163	35%
Less Time	20	21%	1	13%	13	33%	9	50%	5	10%	11	7%	0	0%	6	75%	3	9%	3	7%	71	15%

(continued)

Table C-2. Clinical Care Workflow (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Not Applicable	24	25%	2	25%	19	48%	5	28%	23	47%	82	49%	7	70%	2	25%	14	44%	19	42%	197	42%
Missing	8	8%	0	0%	0	0%	0	0%	3	6%	6	4%	0	0%	0	0%	4	13%	0	0%	21	4%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Arranging clinical referrals and follow-up for patients																						
More Time	8	8%	2	25%	2	5%	0	0%	2	4%	9	5%	2	20%	2	25%	4	13%	6	13%	37	8%
No Change	54	57%	6	75%	16	40%	10	56%	26	53%	75	45%	4	40%	4	50%	12	38%	14	31%	221	47%
Less Time	5	5%	0	0%	21	53%	2	11%	9	18%	50	30%	4	40%	2	25%	2	6%	13	29%	108	23%
Not Applicable	20	21%	0	0%	1	3%	5	28%	10	20%	27	16%	0	0%	0	0%	10	31%	12	27%	85	18%
Missing	8	8%	0	0%	0	0%	1	6%	2	4%	6	4%	0	0%	0	0%	4	13%	0	0%	21	4%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Arranging social service referrals for patients																						
More Time	4	4%	1	13%	2	5%	0	0%	2	4%	10	6%	1	10%	1	13%	3	9%	4	9%	28	6%
No Change	52	55%	7	88%	11	28%	10	56%	28	57%	42	25%	5	50%	5	63%	13	41%	13	29%	186	39%
Less Time	3	3%	0	0%	24	60%	0	0%	6	12%	88	53%	3	30%	2	25%	3	9%	18	40%	147	31%
Not Applicable	28	29%	0	0%	3	8%	7	39%	10	20%	21	13%	1	10%	0	0%	8	25%	10	22%	88	19%
Missing	8	8%	0	0%	0	0%	1	6%	3	6%	6	4%	0	0%	0	0%	5	16%	0	0%	23	5%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Meeting with staff and clinicians in my practice																						
More Time	6	6%	0	0%	11	28%	1	6%	2	4%	12	7%	2	20%	3	38%	1	3%	6	13%	44	9%
No Change	57	60%	8	100%	21	53%	10	56%	32	65%	106	63%	6	60%	4	50%	18	56%	22	49%	284	60%
Less Time	2	2%	0	0%	4	10%	0	0%	0	0%	10	6%	1	10%	1	13%	1	3%	2	4%	21	4%
Not Applicable	22	23%	0	0%	4	10%	6	33%	12	24%	32	19%	0	0%	0	0%	8	25%	15	33%	99	21%
Missing	8	8%	0	0%	0	0%	1	6%	3	6%	7	4%	1	10%	0	0%	4	13%	0	0%	24	5%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Consulting with clinicians outside of my practice																						
More Time	6	6%	3	38%	0	0%	1	6%	2	4%	9	5%	3	30%	2	25%	2	6%	6	13%	34	7%
No Change	55	58%	5	63%	34	85%	10	56%	29	59%	109	65%	6	60%	4	50%	15	47%	16	36%	283	60%

(continued)

Table C-2. Clinical Care Workflow (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Less Time	6	6%	0	0%	3	8%	1	6%	5	10%	14	8%	1	10%	1	13%	1	3%	3	7%	35	7%
Not Applicable	20	21%	0	0%	2	5%	5	28%	10	20%	29	17%	0	0%	1	13%	10	31%	20	44%	97	21%
Missing	8	8%	0	0%	1	3%	1	6%	3	6%	6	4%	0	0%	0	0%	4	13%	0	0%	23	5%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Engaging in other care coordination activities (e.g., coordinating transitions of care)																						
More Time	11	12%	3	38%	5	13%	3	17%	2	4%	25	15%	2	20%	3	38%	3	9%	8	18%	65	14%
No Change	50	53%	5	63%	13	33%	9	50%	27	55%	65	39%	3	30%	2	25%	14	44%	10	22%	198	42%
Less Time	3	3%	0	0%	20	50%	0	0%	5	10%	55	33%	5	50%	3	38%	1	3%	14	31%	106	22%
Not Applicable	23	24%	0	0%	2	5%	6	33%	12	24%	16	10%	0	0%	0	0%	10	31%	13	29%	82	17%
Missing	8	8%	0	0%	0	0%	0	0%	3	6%	6	4%	0	0%	0	0%	4	13%	0	0%	21	4%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Reviewing data on my practice population in order to identify individuals needing additional services																						
More Time	11	12%	4	50%	6	15%	1	6%	5	10%	24	14%	3	30%	3	38%	3	9%	5	11%	65	14%
No Change	46	48%	3	38%	20	50%	8	44%	23	47%	81	49%	5	50%	2	25%	11	34%	16	36%	215	46%
Less Time	6	6%	1	13%	11	28%	0	0%	3	6%	30	18%	2	20%	2	25%	1	3%	9	20%	65	14%
Not Applicable	24	25%	0	0%	3	8%	9	50%	15	31%	26	16%	0	0%	1	13%	13	41%	15	33%	106	22%
Missing	8	8%	0	0%	0	0%	0	0%	3	6%	6	4%	0	0%	0	0%	4	13%	0	0%	21	4%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Planning practice-based (or community-based) interventions to address issues common to my practice population																						
More Time	6	6%	2	25%	4	10%	1	6%	3	6%	21	13%	3	30%	1	13%	4	13%	7	16%	52	11%
No Change	50	53%	6	75%	23	58%	8	44%	26	53%	78	47%	2	20%	4	50%	12	38%	15	33%	224	47%
Less Time	5	5%	0	0%	8	20%	2	11%	1	2%	25	15%	4	40%	3	38%	1	3%	8	18%	57	12%
Not Applicable	26	27%	0	0%	5	13%	7	39%	16	33%	35	21%	1	10%	0	0%	11	34%	15	33%	116	25%
Missing	8	8%	0	0%	0	0%	0	0%	3	6%	8	5%	0	0%	0	0%	4	13%	0	0%	23	5%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%

[1] Raw frequencies and percentages; does not include weighted responses.

Table C-3. Timeliness of Care

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Before implementation of the innovation, approximately how many patients did you see in a typical day? Also, how many hours did you work in a typical practice day? ***If you are not able to provide an approximation, please leave the question blank.***																						
Number of patients seen[2]																						
0-15	20	21%	6	75%	20	50%	1	6%	8	16%	45	27%	5	50%	4	50%	8	25%	13	29%	130	28%
16-30	51	54%	2	25%	14	35%	13	72%	33	67%	59	35%	2	20%	3	38%	11	34%	8	18%	196	42%
31-45	5	5%	0	0%	0	0%	1	6%	0	0%	2	1%	0	0%	0	0%	0	0%	2	4%	10	2%
46+	19	20%	0	0%	6	15%	3	17%	8	16%	61	37%	3	30%	1	13%	13	41%	22	49%	136	29%
N/A	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Missing	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Practice day length (hours)[3]																						
0-4	1	1%	2	25%	3	8%	0	0%	1	2%	3	2%	1	10%	0	0%	2	6%	3	7%	16	3%
5-8	41	43%	5	63%	17	43%	4	22%	27	55%	65	39%	3	30%	5	63%	9	28%	4	9%	180	38%
9-12	27	28%	0	0%	3	8%	12	67%	13	27%	47	28%	4	40%	3	38%	13	41%	16	36%	138	29%
12+	23	24%	0	0%	3	8%	2	11%	8	16%	49	29%	2	20%	0	0%	8	25%	22	49%	117	25%
N/A	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Missing	3	3%	1	13%	14	35%	0	0%	0	0%	3	2%	0	0%	0	0%	0	0%	0	0%	21	4%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
After implementation of the innovation, approximately how many patients did you see in a typical day? Also, how many hours did you work in a typical practice day? ***If you are not able to provide an approximation, please leave the question blank.***																						
Number of patients seen[2]																						
0-15	21	22%	6	75%	22	55%	0	0%	9	18%	46	28%	5	50%	2	25%	4	13%	12	27%	127	27%
16-30	47	49%	2	25%	14	35%	13	72%	34	69%	61	37%	3	30%	5	63%	17	53%	9	20%	205	43%
30-45	6	6%	0	0%	0	0%	2	11%	0	0%	2	1%	0	0%	0	0%	0	0%	2	4%	12	3%
46+	21	22%	0	0%	4	10%	3	17%	6	12%	58	35%	2	20%	1	13%	11	34%	22	49%	128	27%
N/A	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%

(continued)

Table C-3. Timeliness of Care (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Missing	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Practice day length (hours)[3]																						
0-4	1	1%	2	25%	2	5%	0	0%	2	4%	5	3%	1	10%	0	0%	2	6%	4	9%	19	4%
5-8	40	42%	5	63%	17	43%	5	28%	26	53%	63	38%	2	20%	5	63%	9	28%	4	9%	176	37%
9-12	30	32%	0	0%	3	8%	10	56%	13	27%	46	28%	4	40%	3	38%	12	38%	16	36%	137	29%
12+	21	22%	0	0%	3	8%	3	17%	8	16%	50	30%	3	30%	0	0%	9	28%	21	47%	118	25%
N/A	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Missing	3	3%	1	13%	15	38%	0	0%	0	0%	3	2%	0	0%	0	0%	0	0%	0	0%	22	5%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Before implementation of the innovation, how many days did patients usually have to wait between the day the appointment was made and their actual visit (for nonemergency care)?																						
Same day	16	17%	0	0%	0	0%	3	17%	5	10%	15	9%	0	0%	1	13%	3	9%	2	4%	45	10%
1-2 days	24	25%	1	13%	6	15%	1	6%	7	14%	28	17%	1	10%	0	0%	2	6%	1	2%	71	15%
3-7 days	23	24%	2	25%	10	25%	1	6%	3	6%	34	20%	2	20%	0	0%	4	13%	2	4%	81	17%
8-14 days	8	8%	1	13%	6	15%	0	0%	2	4%	20	12%	2	20%	3	38%	2	6%	2	4%	46	10%
15-30 days	0	0%	1	13%	3	8%	1	6%	5	10%	8	5%	0	0%	1	13%	1	3%	3	7%	23	5%
More than 30 days	0	0%	0	0%	0	0%	0	0%	10	20%	4	2%	1	10%	0	0%	2	6%	0	0%	17	4%
Unknown	12	13%	3	38%	15	38%	11	61%	12	24%	47	28%	4	40%	3	38%	13	41%	27	60%	147	31%
Missing	12	13%	0	0%	0	0%	1	6%	5	10%	11	7%	0	0%	0	0%	5	16%	8	18%	42	9%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
After implementation of the innovation, how many days did patients usually have to wait between the day the appointment was made and their actual visit (for nonemergency care)?																						
Same day	18	19%	0	0%	2	5%	3	17%	5	10%	21	13%	0	0%	1	13%	4	13%	3	7%	57	12%
1-2 days	28	29%	1	13%	11	28%	2	11%	8	16%	36	22%	3	30%	0	0%	3	9%	0	0%	92	19%
3-7 days	17	18%	2	25%	8	20%	1	6%	2	4%	32	19%	2	20%	3	38%	4	13%	5	11%	76	16%
8-14 days	8	8%	1	13%	5	13%	0	0%	3	6%	11	7%	1	10%	1	13%	2	6%	1	2%	33	7%
15-30 days	0	0%	1	13%	0	0%	0	0%	3	6%	7	4%	1	10%	0	0%	1	3%	2	4%	15	3%
More than 30 days	0	0%	0	0%	0	0%	0	0%	11	22%	3	2%	0	0%	0	0%	1	3%	0	0%	15	3%

(continued)

Table C-3. Timeliness of Care (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Unknown	13	14%	3	38%	14	35%	11	61%	12	24%	45	27%	3	30%	3	38%	12	38%	29	64%	145	31%
Missing	11	12%	0	0%	0	0%	1	6%	5	10%	12	7%	0	0%	0	0%	5	16%	5	11%	39	8%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Please indicate how much you agree or disagree with each of the following statements																						
The innovation has helped expand patient care hours for my practice																						
Strongly Agree	2	2%	0	0%	5	13%	1	6%	3	6%	13	8%	2	20%	2	25%	1	3%	13	29%	42	9%
Somewhat Agree	5	5%	2	25%	8	20%	9	50%	8	16%	23	14%	2	20%	2	25%	3	9%	6	13%	68	14%
Neither Agree nor Disagree	24	25%	4	50%	17	43%	1	6%	20	41%	59	35%	3	30%	0	0%	10	31%	6	13%	144	31%
Somewhat Disagree	10	11%	0	0%	4	10%	1	6%	2	4%	12	7%	0	0%	1	13%	3	9%	0	0%	33	7%
Strongly Disagree	25	26%	0	0%	3	8%	3	17%	6	12%	14	8%	0	0%	2	25%	5	16%	0	0%	58	12%
Not Applicable	20	21%	2	25%	3	8%	3	17%	7	14%	38	23%	3	30%	1	13%	5	16%	20	44%	102	22%
Missing	9	9%	0	0%	0	0%	0	0%	3	6%	8	5%	0	0%	0	0%	5	16%	0	0%	25	5%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
The innovation has helped increase patients' access (e.g., by telephone or e-mail) to a physician, physician assistant, or nurse																						
Strongly Agree	3	3%	1	13%	22	55%	2	11%	7	14%	45	27%	8	80%	4	50%	4	13%	28	62%	124	26%
Somewhat Agree	12	13%	1	13%	12	30%	5	28%	16	33%	53	32%	2	20%	3	38%	5	16%	6	13%	115	24%
Neither Agree nor Disagree	23	24%	4	50%	5	13%	2	11%	9	18%	34	20%	0	0%	1	13%	8	25%	0	0%	86	18%
Somewhat Disagree	6	6%	1	13%	1	3%	0	0%	1	2%	8	5%	0	0%	0	0%	4	13%	0	0%	21	4%
Strongly Disagree	22	23%	0	0%	0	0%	3	17%	6	12%	5	3%	0	0%	0	0%	3	9%	1	2%	40	8%
Not Applicable	20	21%	1	13%	0	0%	6	33%	7	14%	14	8%	0	0%	0	0%	3	9%	10	22%	61	13%
Missing	9	9%	0	0%	0	0%	0	0%	3	6%	8	5%	0	0%	0	0%	5	16%	0	0%	25	5%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%

[1] Raw frequencies and percentages; does not include weighted responses.

[2] The reported number of patients seen were grouped into ranges (0-15, 16-30, 30-45, and 46+).

[3] The reported practice day lengths (number of hours) were grouped into ranges (0-4, 5-8, 9-12, and 12+).

Table C-4. Patient Care

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Overall, has the way you care for patients been impacted by the implementation of the innovation?																						
Yes	44	46%	6	75%	35	88%	16	89%	27	55%	134	80%	9	90%	8	100%	11	34%	36	80%	326	69%
No	50	53%	2	25%	5	13%	2	11%	22	45%	31	19%	1	10%	0	0%	20	63%	9	20%	142	30%
Missing	1	1%	0	0%	0	0%	0	0%	0	0%	2	1%	0	0%	0	0%	1	3%	0	0%	4	1%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
If yes, has the innovation had a positive or negative impact on the care of your patients?																						
Very Positive	6	6%	1	13%	17	43%	2	11%	7	14%	93	56%	9	90%	3	38%	2	6%	33	73%	173	37%
Somewhat Positive	22	23%	5	63%	18	45%	13	72%	19	39%	39	23%	0	0%	4	50%	9	28%	2	4%	131	28%
Neither Positive nor Negative	12	13%	0	0%	0	0%	1	6%	1	2%	2	1%	0	0%	1	13%	0	0%	1	2%	18	4%
Somewhat Negative	3	3%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	3	1%
Very Negative	1	1%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	0%
Missing	51	54%	2	25%	5	13%	2	11%	22	45%	33	20%	1	10%	0	0%	21	66%	9	20%	146	31%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Please indicate how much you agree or disagree with each of the following statements																						
The innovation has been beneficial for patients in my practice																						
Strongly Agree	9	9%	2	25%	22	55%	4	22%	12	24%	97	58%	10	100%	3	38%	9	28%	33	73%	201	43%
Somewhat Agree	18	19%	4	50%	15	38%	10	56%	22	45%	45	27%	0	0%	4	50%	7	22%	5	11%	130	28%
Neither Agree nor Disagree	31	33%	2	25%	3	8%	3	17%	7	14%	7	4%	0	0%	1	13%	6	19%	2	4%	62	13%
Somewhat Disagree	7	7%	0	0%	0	0%	1	6%	0	0%	1	1%	0	0%	0	0%	3	9%	0	0%	12	3%
Strongly Disagree	10	11%	0	0%	0	0%	0	0%	3	6%	2	1%	0	0%	0	0%	1	3%	1	2%	17	4%
Not Applicable	11	12%	0	0%	0	0%	0	0%	2	4%	8	5%	0	0%	0	0%	2	6%	4	9%	27	6%
Missing	9	9%	0	0%	0	0%	0	0%	3	6%	7	4%	0	0%	0	0%	4	13%	0	0%	23	5%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Among my patients who are aware of the innovation, the majority of patients would say it has been beneficial in the care they receive																						
Strongly Agree	6	6%	2	25%	18	45%	2	11%	12	24%	89	53%	10	100%	3	38%	5	16%	29	64%	176	37%
Somewhat Agree	16	17%	2	25%	12	30%	8	44%	14	29%	47	28%	0	0%	4	50%	11	34%	9	20%	123	26%
Neither Agree nor Disagree	27	28%	4	50%	10	25%	4	22%	10	20%	9	5%	0	0%	0	0%	6	19%	2	4%	72	15%

(continued)

Table C-4. Patient Care (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Somewhat Disagree	6	6%	0	0%	0	0%	1	6%	3	6%	3	2%	0	0%	0	0%	1	3%	0	0%	14	3%
Strongly Disagree	10	11%	0	0%	0	0%	1	6%	2	4%	1	1%	0	0%	0	0%	2	6%	1	2%	17	4%
Not Applicable	21	22%	0	0%	0	0%	2	11%	5	10%	11	7%	0	0%	1	13%	3	9%	4	9%	47	10%
Missing	9	9%	0	0%	0	0%	0	0%	3	6%	7	4%	0	0%	0	0%	4	13%	0	0%	23	5%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Among my patients who are not aware of the innovation, the majority of patients would say it has been beneficial in the care they receive																						
Strongly Agree	3	3%	0	0%	7	18%	3	17%	6	12%	52	31%	6	60%	3	38%	3	9%	19	42%	102	22%
Somewhat Agree	15	16%	4	50%	15	38%	8	44%	18	37%	63	38%	3	30%	4	50%	9	28%	13	29%	152	32%
Neither Agree nor Disagree	34	36%	4	50%	15	38%	5	28%	14	29%	17	10%	0	0%	1	13%	9	28%	5	11%	104	22%
Somewhat Disagree	9	9%	0	0%	3	8%	0	0%	1	2%	5	3%	0	0%	0	0%	1	3%	0	0%	19	4%
Strongly Disagree	7	7%	0	0%	0	0%	0	0%	4	8%	3	2%	0	0%	0	0%	3	9%	1	2%	18	4%
Not Applicable	18	19%	0	0%	0	0%	2	11%	3	6%	18	11%	0	0%	0	0%	3	9%	7	16%	51	11%
Missing	9	9%	0	0%	0	0%	0	0%	3	6%	9	5%	1	10%	0	0%	4	13%	0	0%	26	6%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	0%	427	90%
Has the innovation had any other impacts on you or your practice day length (hours)?																						
Yes	14	15%	2	25%	10	25%	1	6%	5	10%	39	23%	6	60%	3	38%	5	16%	19	42%	104	22%
No	72	76%	6	75%	30	75%	17	94%	40	82%	120	72%	4	40%	5	63%	23	72%	26	58%	343	73%
Missing	9	9%	0	0%	0	0%	0	0%	4	8%	8	5%	0	0%	0	0%	4	13%	0	0%	25	5%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%

[1] Raw frequencies and percentages; does not include weighted responses.

Table C-5. Demographics

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
In what ways have you been involved with the innovation?																						
Leader/Champion who oversees implementation	2	2%	2	25%	1	3%	1	6%	1	2%	4	2%	1	10%	0	0%	0	0%	1	2%	13	3%
Direct involvement (i.e., I am the end user of the HIT innovations)	33	35%	1	13%	30	75%	7	39%	15	31%	56	34%	4	40%	7	88%	6	19%	19	42%	178	38%
Indirect involvement (i.e., I do not work directly with the HIT innovations, but members of my staff or my colleagues do and/or I receive information from those using the innovations)	26	27%	4	50%	5	13%	8	44%	24	49%	76	46%	5	50%	1	13%	15	47%	19	42%	183	39%
No involvement with this innovation	26	27%	1	13%	4	10%	2	11%	4	8%	9	5%	0	0%	0	0%	8	25%	1	2%	55	12%
Other	7	7%	0	0%	0	0%	0	0%	5	10%	19	11%	0	0%	0	0%	2	6%	5	11%	38	8%
Missing	1	1%	0	0%	0	0%	0	0%	0	0%	3	2%	0	0%	0	0%	1	3%	0	0%	5	1%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
What is your sex?																						
Female	37	39%	1	13%	20	50%	9	50%	35	71%	134	80%	8	80%	4	50%	24	75%	32	71%	304	64%
Male	49	52%	7	88%	19	48%	9	50%	11	22%	26	16%	2	20%	4	50%	4	13%	13	29%	144	31%
Missing	9	9%	0	0%	1	3%	0	0%	3	6%	7	4%	0	0%	0	0%	4	13%	0	0%	24	5%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
What is your race?																						
White	71	75%	6	75%	34	85%	15	83%	29	59%	137	82%	10	100%	3	38%	15	47%	39	87%	359	76%
Missing	24	25%	2	25%	6	15%	3	17%	20	41%	30	18%	0	0%	5	63%	17	53%	6	13%	113	24%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Black or African American	2	2%	0	0%	0	0%	0	0%	13	27%	8	5%	0	0%	1	13%	8	25%	0	0%	32	7%
Missing	93	98%	8	100%	40	100%	18	100%	36	73%	159	95%	10	100%	7	88%	24	75%	45	100%	440	93%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%

(continued)

Table C-5. Demographics (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
American Indian or Alaskan Native	0	0%	0	0%	0	0%	0	0%	1	2%	1	1%	0	0%	0	0%	1	3%	0	0%	3	1%
Missing	95	100%	8	100%	40	100%	18	100%	48	98%	166	99%	10	100%	8	100%	31	97%	45	100%	469	99%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Asian	9	9%	2	25%	6	15%	3	17%	6	12%	6	4%	0	0%	1	13%	3	9%	5	11%	41	9%
Missing	86	91%	6	75%	34	85%	15	83%	43	88%	161	96%	10	100%	7	88%	29	91%	40	89%	431	91%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Native Hawaiian or Other Pacific Islander	0	0%	0	0%	0	0%	0	0%	1	2%	1	1%	0	0%	1	13%	1	3%	0	0%	4	1%
Missing	95	100%	8	100%	40	100%	18	100%	48	98%	166	99%	10	100%	7	88%	31	97%	45	100%	468	99%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Other Race	5	5%	1	13%	1	3%	0	0%	0	0%	10	6%	0	0%	2	25%	2	6%	0	0%	21	4%
Missing	90	95%	7	88%	39	98%	18	100%	49	100%	157	94%	10	100%	6	75%	30	94%	45	100%	451	96%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Are you of Hispanic, Latino, or Spanish origin?																						
Yes	3	3%	0	0%	0	0%	1	6%	6	12%	12	7%	0	0%	3	38%	2	6%	1	2%	28	6%
No	84	88%	8	100%	40	100%	17	94%	40	82%	149	89%	10	100%	5	63%	26	81%	44	98%	423	90%
Missing	8	8%	0	0%	0	0%	0	0%	3	6%	6	4%	0	0%	0	0%	4	13%	0	0%	21	4%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
What is your age?[2]																						
20-29	0	0%	0	0%	12	30%	1	6%	2	4%	17	10%	0	0%	0	0%	4	13%	2	4%	38	8%
30-39	7	7%	1	13%	13	33%	13	72%	21	43%	36	22%	2	20%	3	38%	13	41%	10	22%	119	25%
40-49	31	33%	3	38%	6	15%	2	11%	15	31%	40	24%	4	40%	5	63%	5	16%	11	24%	122	26%
50-59	27	28%	3	38%	4	10%	1	6%	5	10%	42	25%	2	20%	0	0%	5	16%	11	24%	100	21%
60+	30	32%	1	13%	5	13%	1	6%	6	12%	32	19%	2	20%	0	0%	5	16%	11	24%	93	20%
Missing	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%

(continued)

Table C-5. Demographics (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
How many years have you been practicing post training or residency?[3]																						
1-10 years	13	14%	2	25%	24	60%	14	78%	29	59%	53	32%	3	30%	5	63%	14	44%	18	40%	175	37%
11-20 years	33	35%	3	38%	8	20%	1	6%	13	27%	48	29%	4	40%	2	25%	8	25%	9	20%	129	27%
21-30 years	23	24%	2	25%	2	5%	1	6%	3	6%	22	13%	1	10%	0	0%	4	13%	5	11%	63	13%
31-40 years	10	11%	1	13%	5	13%	1	6%	1	2%	18	11%	1	10%	0	0%	1	3%	7	16%	45	10%
41+ years	16	17%	0	0%	1	3%	1	6%	3	6%	23	14%	1	10%	1	13%	5	16%	6	13%	57	12%
Not Applicable	0	0%	0	0%	0	0%	0	0%	0	0%	3	2%	0	0%	0	0%	0	0%	0	0%	3	1%
Missing	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
What is your medical degree/role in patient care?																						
MD	46	48%	5	63%	38	95%	9	50%	28	57%	21	13%	2	20%	2	25%	11	34%	24	53%	186	39%
DO	36	38%	2	25%	2	5%	1	6%	2	4%	15	9%	0	0%	1	13%	0	0%	0	0%	59	13%
RNP	0	0%	1	13%	0	0%	3	17%	9	18%	15	9%	3	30%	0	0%	2	6%	7	16%	40	8%
PA	2	2%	0	0%	0	0%	4	22%	4	8%	6	4%	0	0%	2	25%	0	0%	0	0%	18	4%
RN	0	0%	0	0%	0	0%	0	0%	0	0%	49	29%	1	10%	2	25%	10	31%	5	11%	67	14%
MSW	0	0%	0	0%	0	0%	0	0%	1	2%	12	7%	1	10%	0	0%	0	0%	4	9%	18	4%
Other	3	3%	0	0%	0	0%	1	6%	2	4%	43	26%	3	30%	1	13%	5	16%	5	11%	63	13%
Missing	8	8%	0	0%	0	0%	0	0%	3	6%	6	4%	0	0%	0	0%	4	13%	0	0%	21	4%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
What is your primary medical specialty?																						
Family Medicine	46	48%	2	25%	28	70%	1	6%	25	51%	104	62%	0	0%	6	75%	7	22%	0	0%	219	46%
Emergency Medicine	0	0%	0	0%	0	0%	17	94%	0	0%	6	4%	0	0%	0	0%	6	19%	0	0%	29	6%
Internal Medicine	31	33%	2	25%	9	23%	0	0%	7	14%	9	5%	1	10%	0	0%	3	9%	0	0%	62	13%
Pediatrics	1	1%	0	0%	0	0%	0	0%	8	16%	4	2%	0	0%	2	25%	7	22%	25	56%	47	10%
Geriatrics	0	0%	2	25%	1	3%	0	0%	0	0%	6	4%	1	10%	0	0%	1	3%	0	0%	11	2%
Hospitalist	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Radiology	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Cardiology	0	0%	0	0%	1	3%	0	0%	0	0%	1	1%	4	40%	0	0%	0	0%	0	0%	6	1%

(continued)

Table C-5. Demographics (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Endocrinology	0	0%	1	13%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	0%
Ob/Gyn	3	3%	0	0%	0	0%	0	0%	2	4%	1	1%	0	0%	0	0%	3	9%	1	2%	10	2%
Other	6	6%	1	13%	1	3%	0	0%	4	8%	29	17%	4	40%	0	0%	1	3%	18	40%	64	14%
Missing	8	8%	0	0%	0	0%	0	0%	3	6%	7	4%	0	0%	0	0%	4	13%	1	2%	23	5%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Please select any other subspecialties that you have																						
Family Medicine	12	13%	0	0%	5	13%	2	11%	8	16%	40	24%	1	10%	2	25%	3	9%	0	0%	73	15%
Missing	83	87%	8	100%	35	88%	16	89%	41	84%	127	76%	9	90%	6	75%	29	91%	45	100%	399	85%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Emergency Medicine	0	0%	1	13%	2	5%	4	22%	1	2%	4	2%	0	0%	0	0%	4	13%	0	0%	16	3%
Missing	95	100%	7	88%	38	95%	14	78%	48	98%	163	98%	10	100%	8	100%	28	88%	45	100%	456	97%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	1	472	1
Internal Medicine	6	6%	1	13%	3	8%	0	0%	0	0%	7	4%	1	10%	0	0%	0	0%	0	0%	18	4%
Missing	89	94%	7	88%	37	93%	18	100%	49	100%	160	96%	9	90%	8	100%	32	100%	45	100%	454	96%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	1	472	1
Pediatrics	3	3%	0	0%	2	5%	1	6%	0	0%	10	6%	0	0%	1	13%	8	25%	9	20%	34	7%
Missing	92	97%	8	100%	38	95%	17	94%	49	100%	157	94%	10	100%	7	88%	24	75%	36	80%	438	93%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Geriatrics	4	4%	0	0%	2	5%	0	0%	0	0%	5	3%	0	0%	0	0%	1	3%	0	0%	12	3%
Missing	91	96%	8	100%	38	95%	18	100%	49	100%	162	97%	10	100%	8	100%	31	97%	45	100%	460	97%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Hospitalist	0	0%	0	0%	1	3%	0	0%	0	0%	0	0%	1	10%	0	0%	0	0%	1	2%	3	1%
Missing	95	100%	8	100%	39	98%	18	100%	49	100%	167	100%	9	90%	8	100%	32	100%	44	98%	469	99%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Radiology	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Missing	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	1	472	1

(continued)

Table C-5. Demographics (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Cardiology	1	1%	0	0%	0	0%	0	0%	0	0%	4	2%	3	30%	0	0%	0	0%	0	0%	8	2%
Missing	94	99%	8	100%	40	100%	18	100%	49	100%	163	98%	7	70%	8	100%	32	100%	45	100%	464	98%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Endocrinology	0	0%	0	0%	0	0%	0	0%	0	0%	1	1%	0	0%	0	0%	0	0%	0	0%	1	0%
Missing	95	100%	8	100%	40	100%	18	100%	49	100%	166	99%	10	100%	8	100%	32	100%	45	100%	471	100%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Ob/Gyn	1	1%	0	0%	0	0%	1	6%	0	0%	4	2%	0	0%	0	0%	3	9%	2	4%	11	2%
Missing	94	99%	8	100%	40	100%	17	94%	49	100%	163	98%	10	100%	8	100%	29	91%	43	96%	461	98%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
I Do Not Have a Subspecialty	35	37%	4	50%	21	53%	7	39%	28	57%	72	43%	4	40%	4	50%	11	34%	10	22%	196	42%
Missing	60	63%	4	50%	19	48%	11	61%	21	43%	95	57%	6	60%	4	50%	21	66%	35	78%	276	58%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	1	2%	428	91%
Other	12	13%	2	25%	2	5%	0	0%	2	4%	26	16%	1	10%	0	0%	2	6%	20	44%	67	14%
Missing	83	87%	6	75%	38	95%	18	100%	47	96%	141	84%	9	90%	8	100%	30	94%	25	56%	405	86%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Which of the following describes your practice type?																						
Solo Practice	24	25%	0	0%	0	0%	0	0%	0	0%	7	4%	0	0%	0	0%	0	0%	1	2%	32	7%
Missing	71	75%	8	100%	40	100%	18	100%	49	100%	160	96%	10	100%	8	100%	32	100%	44	98%	440	93%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Group Practice	57	60%	0	0%	9	23%	9	50%	1	2%	53	32%	5	50%	2	25%	1	3%	4	9%	141	30%
Missing	38	40%	8	100%	31	78%	9	50%	48	98%	114	68%	5	50%	6	75%	31	97%	41	91%	331	70%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Managed Care Organization	0	0%	0	0%	0	0%	1	6%	0	0%	7	4%	1	10%	0	0%	2	6%	0	0%	11	2%
Missing	95	100%	8	100%	40	100%	17	94%	49	100%	160	96%	9	90%	8	100%	30	94%	45	100%	461	98%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Federally Qualified Health Center	0	0%	1	13%	0	0%	0	0%	43	88%	52	31%	0	0%	7	88%	16	50%	1	2%	120	25%
Missing	95	100%	7	88%	40	100%	18	100%	6	12%	115	69%	10	100%	1	13%	16	50%	44	98%	352	75%

(continued)

Table C-5. Demographics (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Fee-for-Service-based Practice	6	6%	0	0%	1	3%	0	0%	0	0%	1	1%	1	10%	0	0%	0	0%	0	0%	9	2%
Missing	89	94%	8	100%	39	98%	18	100%	49	100%	166	99%	9	90%	8	100%	32	100%	45	100%	463	98%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Hospital-based Practice	12	13%	6	75%	12	30%	10	56%	2	4%	27	16%	4	40%	0	0%	8	25%	26	58%	107	23%
Missing	83	87%	2	25%	28	70%	8	44%	47	96%	140	84%	6	60%	8	100%	24	75%	19	42%	365	77%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Emergency Services Provider (e.g., EMT, paramedics, ambulance services)	0	0%	0	0%	0	0%	1	6%	0	0%	2	1%	0	0%	0	0%	3	9%	0	0%	6	1%
Missing	95	100%	8	100%	40	100%	17	94%	49	100%	165	99%	10	100%	8	100%	29	91%	45	100%	466	99%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Academic Health Center	6	6%	0	0%	30	75%	1	6%	1	2%	10	6%	0	0%	0	0%	6	19%	10	22%	64	14%
Missing	89	94%	8	100%	10	25%	17	94%	48	98%	157	94%	10	100%	8	100%	26	81%	35	78%	408	86%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Other	1	1%	2	25%	1	3%	0	0%	1	2%	17	10%	2	20%	0	0%	0	0%	10	22%	34	7%
Missing	94	99%	6	75%	39	98%	18	100%	48	98%	150	90%	8	80%	8	100%	32	100%	35	78%	438	93%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
How often do you treat patients with chronic conditions?																						
Always or Most of the Time	78	82%	7	88%	39	98%	8	44%	36	73%	134	80%	8	80%	8	100%	21	66%	15	33%	354	75%
Sometimes	8	8%	1	13%	1	3%	9	50%	9	18%	13	8%	1	10%	0	0%	7	22%	20	44%	69	15%
Seldom or Never	0	0%	0	0%	0	0%	1	6%	1	2%	0	0%	0	0%	0	0%	0	0%	3	7%	5	1%
Not Applicable	1	1%	0	0%	0	0%	0	0%	0	0%	13	8%	1	10%	0	0%	0	0%	6	13%	21	4%
Missing	8	8%	0	0%	0	0%	0	0%	3	6%	7	4%	0	0%	0	0%	4	13%	1	2%	23	5%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
How much time do you spend on patient care (0% to 100%)?																						
0-25% time	39	41%	3	38%	12	30%	5	28%	15	31%	67	40%	3	30%	2	25%	13	41%	17	38%	176	37%
26-50% time	8	8%	3	38%	10	25%	2	11%	6	12%	16	10%	3	30%	3	38%	2	6%	14	31%	67	14%

(continued)

Table C-5. Demographics (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
51-75% time	10	11%	1	13%	7	18%	5	28%	9	18%	19	11%	2	20%	0	0%	0	0%	4	9%	57	12%
76-100% time	30	32%	1	13%	11	28%	6	33%	16	33%	55	33%	2	20%	3	38%	12	38%	9	20%	145	31%
Missing	8	8%	0	0%	0	0%	0	0%	3	6%	10	6%	0	0%	0	0%	5	16%	1	2%	27	6%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
In the next 12 months, do you plan to do any of the following?																						
Retire	0	0%	0	0%	0	0%	0	0%	0	0%	2	1%	0	0%	0	0%	1	3%	1	2%	4	1%
Move to a different job	5	5%	0	0%	11	28%	3	17%	5	10%	6	4%	0	0%	2	25%	5	16%	3	7%	40	8%
Significantly reduce my patient time at my current job	2	2%	0	0%	1	3%	0	0%	1	2%	4	2%	1	10%	0	0%	1	3%	0	0%	10	2%
None of the above	79	83%	8	100%	28	70%	15	83%	39	80%	149	89%	9	90%	6	75%	20	63%	41	91%	394	83%
Missing	9	9%	0	0%	0	0%	0	0%	4	8%	6	4%	0	0%	0	0%	5	16%	0	0%	24	5%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
As a provider, are you or your practice currently involved in any of the following initiatives?																						
Accountable Care Organization	37	39%	7	88%	2	5%	3	17%	8	16%	47	28%	7	70%	2	25%	7	22%	16	36%	136	29%
Missing	58	61%	1	13%	38	95%	15	83%	41	84%	120	72%	3	30%	6	75%	25	78%	29	64%	336	71%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Patient-centered Medical Home	71	75%	8	100%	31	78%	5	28%	42	86%	120	72%	4	40%	8	100%	14	44%	18	40%	321	68%
Missing	24	25%	0	0%	9	23%	13	72%	7	14%	47	28%	6	60%	0	0%	18	56%	27	60%	151	32%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Electronic Health Record Meaningful Use Attestation	61	64%	8	100%	31	78%	6	33%	44	90%	99	59%	8	80%	8	100%	18	56%	21	47%	304	64%
Missing	34	36%	0	0%	9	23%	12	67%	5	10%	68	41%	2	20%	0	0%	14	44%	24	53%	168	36%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
Other Innovative Care or Payment Delivery Models (e.g., bundled payments, episodes of care, pay-for-performance)	11	12%	2	25%	2	5%	2	11%	8	16%	39	23%	2	20%	0	0%	2	6%	11	24%	79	17%
Missing	84	88%	6	75%	38	95%	16	89%	41	84%	128	77%	8	80%	8	100%	30	94%	34	76%	393	83%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%

(continued)

Table C-5. Demographics (continued)

Question	Altarum		Bronx RHIO		Curators		Imaging Advantage		Mary's Center		MPHI		REMSA		South County		U-Chicago		Women and Infants		All Awardees[1]	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Other Similar Initiatives Not Listed	1	1%	0	0%	0	0%	1	6%	0	0%	22	13%	2	20%	0	0%	1	3%	0	0%	27	6%
Missing	94	99%	8	100%	40	100%	17	94%	49	100%	145	87%	8	80%	8	100%	31	97%	45	100%	445	94%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%
None	4	4%	0	0%	3	8%	11	61%	0	0%	19	11%	2	20%	0	0%	6	19%	10	22%	55	12%
Missing	91	96%	8	100%	37	93%	7	39%	49	100%	148	89%	8	80%	8	100%	26	81%	35	78%	417	88%
Total	95	100%	8	100%	40	100%	18	100%	49	100%	167	100%	10	100%	8	100%	32	100%	45	100%	472	100%

[1] Raw frequencies and percentages; does not include weighted responses.

[2] Individual age responses (years) were grouped into ranges (20-29, 30-39, 40-49, 50-59, and 60+).

[3] The years providers began practicing post training or residency were subtracted from 2015 to determine the number of years they have been providing care, and then grouped into ranges (1-10, 11-20, 21-30, 31-40, 40+).

EMT = emergency medical technician; HIT = health information technology.