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Medicare Health Care Quality (MHCQ) Demonstration Evaluation

Indiana Health Information Exchange

Final Year 2 Evaluation Report

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MEDICARE HEALTH CARE QUALITY (MHCQ) DEMONSTRATION EVALUATION
INDIANA HEALTH INFORMATION EXCHANGE

FINAL YEAR 2 EVALUATION REPORT

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EXECUTIVE SUMMARY

Introduction

The Medicare Health Care Quality (MHCQ) demonstration was developed to address concerns about the U.S. health care system, which typically fragments care while also encouraging both omissions in and duplication of care. To rectify this situation, Congress directed the Centers for Medicare & Medicaid Services (CMS) through Section 646 of the Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (MMA) to test major changes to the health care delivery and payment systems to improve the quality of care while also increasing efficiency across the health care system.

Four sites have participated in the MHCQ demonstration at various time periods (see **Table ES-1**). Because each MHCQ demonstration site has a different and self-defined plan for its intervention, the evaluation of each site is presented in a separate report. This report presents evaluation results for the Indiana Health Information Exchange (IHIE).

Table ES-1
MHCQ Demonstration Sites

Participating site	Focus of the MHCQ demonstration	Date of implementation	End date
Indiana Health Information Exchange (IHIE)	Quality Health First program	July 1, 2009	January 31, 2013
North Carolina Community Care Network (NC-CCN)	Medical home program for dually eligible Medicare-Medicaid enrollees	January 1, 2010	December 31, 2012
Gundersen Health System (GHS)	Advanced disease coordination program	February 1, 2010	April 30, 2014
Meridian Health System (MHS)	Meridian Care Journey program	July 1, 2012	June 30, 2016

SOURCE: RTI International.

This Year 2 evaluation report reviews both quantitative and qualitative evaluation data regarding the structure, goals, and performance of the IHIE demonstration. Quantitative information includes descriptive statistical profiles and multivariate statistical analysis of demonstration impacts on cost, quality, and utilization. For these analyses, the evaluation used the same intervention and comparison groups that the implementation contractor used for the financial reconciliation analysis to maintain consistency between the two analyses. The methodology for determining the comparison group is outlined in more detail in IHIE's demonstration protocol. The counties found to be most similar to the demonstration area and agreed upon with IHIE in their demonstration protocol are:

- Wisconsin: Milwaukee, Ozaukee, Washington, and Waukesha
- Ohio: Delaware, Fairfield, Franklin, Licking, Madison, Morrow, and Pickaway
- Indiana: Clark, Floyd, Harrison, and Scott

- Kentucky: Bullitt, Jefferson, and Oldham

The comparison group includes beneficiaries who met the requirements for participation in the IHIE demonstration[1], resided in a defined comparison group county, and received a qualifying treatment in the base year or a performance year (PY). Because the IHIE participating providers changed over demonstration years, the intervention group (IG) beneficiaries were separated into those treated by an initial panel of physicians (Panel 1) who began participation in the MHCQ demonstration in PY1 and those treated by another panel of physicians (Panel 2) who began participation in the demonstration in PY2. Separate comparison groups were selected for each of the Panels.

The qualitative data focus on RTI International's site visit to IHIE in November 2012, IHIE's reports to CMS for its MHCQ implementation contract, and internal analysis and reports on demonstration and related implementation and performance assessment efforts that IHIE provided to the evaluation team.

Administration and Infrastructure

IHIE is a nonprofit, 501(c)(3) organization formed in 2004 to support Indiana's communities by providing medical information and data-sharing services. IHIE represents a broad coalition of health care stakeholders in the Indianapolis region, including hospitals, physician groups and practices, other health care providers, public and private payers, and other stakeholders. In November 2012, IHIE had 72 staff members.

The IHIE MHCQ demonstration was focused on IHIE's Quality Health First (QHF) program, which provides reports on quality of care to physicians, physician groups, payers, and the public. QHF is built on the Indiana Network for Patient Care's (INPC's) data repository system, which aggregates data from health insurance claims and enrollment information, hospital medical records, physician group medical records, and other clinical data. A central goal of IHIE's MHCQ demonstration was to integrate Medicare claims data, along with data from third-party payers and Medicaid, into QHF, making its reports on quality of care comprehensive and representative of an entire patient population. The IHIE MHCQ demonstration included the nine-county metropolitan Indianapolis area and was intended as a 5-year project. It began in 2009, and IHIE decided to withdraw from the MHCQ demonstration in early 2013.

The MHCQ demonstration was contained within the QHF program, which was in turn contained within IHIE. As a result, the MHCQ demonstration used the administration and infrastructure developed for IHIE and QHF. IHIE did not develop any separate administration or infrastructure solely for the MHCQ demonstration.

The MHCQ demonstration did not include any funding for administration or infrastructure. For IHIE, the MHCQ demonstration included a shared savings incentive design, which required that IHIE change utilization patterns enough to produce savings for Medicare. If

[1] Eligibility criteria for beneficiaries included: 1) no months of Part A-only or Part B-only Medicare enrollment; 2) no months of Medicare Advantage enrollment; 3) no months of coverage under an employer-sponsored group health insurance plan; and 4) has a valid Medicare enrollment file record.

IHIE's financial savings performance met specified targets, Medicare would share a portion of the savings with IHIE. An additional portion of the savings would be shared if IHIE also met specified targets for quality performance. The financial performance target was calculated each year by comparing the Medicare claims costs of the IHIE-assigned beneficiaries to the Medicare claims costs of similar beneficiaries identified in comparison regions.

Health Information Technology

IHIE staff reported that they received data from more than 15 different data sources for INPC and QHF in the course of a month, including hospitals, physician groups, laboratories, Medicare, Medicaid, and private health insurance companies (such as Anthem). Under the initial implementation of the QHF program, physician offices were required to manually code any data corrections they found into paper reports and fax them back to IHIE for entry into the INPC database. To allow for better reporting and data collection, by 2012 users could submit relevant information for data corrections or additions through the QHF Web site.

Staff at most of the medical groups interviewed said that they reviewed and reconciled the data for all of the patients included in their QHF reports because Anthem and Unified Group Services used the all-payer population quality measure scores in their pay-for-performance incentive systems. However, IHIE expressed concern that this level of reconciliation may change because Anthem is changing its incentive system to focus on its own covered lives only, instead of the all-payer population scores. Anthem planned to change because United Healthcare (the second largest carrier in Indiana), Medicaid, and the MHCQ demonstration focus only on their own covered lives and not on community-wide quality performance improvement by using all-payer quality performance results.

The new QHF Web application also provided patient care alerts and reminders to providers online. The providers could click on patients or quality measures and drill down online to review data the QHF program used to derive the quality measure results. The providers could sort and search results by different criteria, including physician group, individual provider, quality measure, patient name, and gender. IHIE reported that the patient-level alert and reminders tools were widely used by providers in managing the care of their patient populations.

Although IHIE provided physicians with QHF reports on the quality of care received by their patients, IHIE recognized that their patients were generally not aware of the QHF program or the MHCQ demonstration. This lack of awareness might change over time, however, as IHIE began making QHF quality measure reports publicly available at the practice-site level in late 2012. Large employers participating in IHIE indicated that they would promote use of the QHF Web site to their employees once the physician practice-site-level quality reports became publicly available.

In 2011, IHIE began public reporting of QHF community-wide quality measure results. The data were published on IHIE's Web site, http://www.ihie.org. In 2011, the public reporting included nine quality measures and both quantitative and graphical comparisons of the quality measure scores for the community between the quarter ending December 31, 2009, and the quarter ending June 30, 2010. IHIE reported that their results showed some improvement on eight of the nine quality measures between those two time periods. Starting in the fall of 2012,

IHIE began publicly posting quality measure results at the practice-site level for the 170 practice sites that opted in for this level of public reporting.

Provider and Beneficiary Participation

IHIE reported to CMS that the number of primary care providers (PCPs) participating in the QHF program as a whole had grown over time to reach a total of 2,141 statewide by June 2012. However, the number of PCPs had not grown significantly in the nine-county MHCQ demonstration area, because QHF already had approximately 75 percent of the PCPs in that area participating. In June 2012, QHF had 1,356 PCPs participating in this nine-county area, and the MHCQ demonstration had 760 PCPs participating in that same area. Over the first 3 performance years the number of PCPs participating in the MHCQ demonstration had steadily increased, with approximately 600 participating in PY1, 788 in PY2, and 1,017 in PY3 at the outset of that performance year. However, several large physician groups left the MHCQ demonstration in PY3 to be eligible to join accountable care organizations (ACOs), so the number of PCPs fell to 760 by June 2012.

Because ACOs are Medicare programs that also have a shared savings financial incentive design, physician groups were not permitted by Medicare to participate in both an ACO and the MHCQ demonstration. CMS required physician groups to choose between participating in either an ACO or the MHCQ demonstration.

The quantitative analysis for provider and beneficiary participation includes descriptive statistics from Medicare claims to provide profiles of the IHIE MHCQ demonstration providers and assigned beneficiaries. This report includes data on the IHIE BY, which was from July 2008 to June 2009; data on PY1, which was from July 2009 to June 2010; and data on PY2, which was from July 2010 to June 2011.

In PY2, a new set of providers joined the IHIE MHCQ demonstration; these were termed Panel 2 providers to differentiate them from the original providers participating in PY1, who were termed Panel 1. The IHIE MHCQ demonstration providers included both participating PCPs and specialist physicians providing primary care services and billing through the same tax identification number as the participating PCPs. Descriptive data on these providers show that Panel 1 included 979 providers and Panel 2 included 434 providers. PCPs were 74 percent of the total for Panel 1, whereas non-PCP providers were 26 percent of those in Panel 1. Panel 2 had 53 percent PCPs and 47 percent non-PCPs.

For this demonstration, intervention group beneficiaries were identified using a "one-touch" assignment (attribution) algorithm agreed upon by CMS and IHIE, meaning beneficiaries had to have at least one primary care visit with an IHIE MHCQ demonstration provider. Descriptive statistics for CMS-assigned beneficiaries indicate that both the IHIE intervention group (IG) and the comparison group (CG) had very large numbers of assigned beneficiaries for statistical analysis in the base year (BY), PY1, and PY2. In PY2, they totaled 165,528 for the IG and 345,502 for the CG. The CG is more than two times the size of the IG, which adds statistical power for the multivariate statistical analysis of demonstration outcomes.

Demographic data show that the assigned beneficiaries were mostly older than age 65, had a higher percentage of females than males, and had Medicare eligibility mainly due to being

aged, consistent with the national demographic and Medicare eligibility patterns in the Medicare population. CMS-assigned beneficiaries included more than 25 percent with diabetes and more than 10 percent with chronic obstructive pulmonary disease, vascular disease, congestive heart failure, and cancer.

Descriptive statistics on utilization for the assigned beneficiaries showed that hospital admissions per 1,000 beneficiaries had a consistent pattern across most of the IG and CG groups, ranging from 406 to 429. Panel 2 beneficiaries had higher rates of 456 to 482 admissions per 1,000 beneficiaries, likely due to the higher percentage of specialist physicians among Panel 2 providers. The 30-day readmission rates also had consistent patterns, ranged from 13.2 percent to 14.7 percent for the IG groups, although slightly higher for the CG groups that ranged from 15.1 percent to 15.7 percent. ED visits per 1,000 beneficiaries ranged from 791 to 863 for the IG, and were lower for the CG groups, where the range was 692 to 755, but growing over time more than the IG.

On average, CMS-assigned beneficiaries had about $9,500–$11,000 in Medicare expenditures per year, consistently across the IG and CG. A general trend of increasing expenditures over time, across the BY, PY1, and PY2, is consistent with the nationwide pattern of general medical care cost increases over time. The percentage of assigned beneficiaries who had any inpatient Medicare expenses was consistent across the IG and CG as well, at about 23–24 percent across the different years.

Cost and Savings

To determine whether the IHIE MHCQ demonstration achieved Medicare savings, CMS contracted with an implementation contractor (independent of the RTI evaluation contract) to calculate Medicare savings according to the terms and conditions in the demonstration protocol. Both the IHIE PY1 and PY2 financial reconciliation reports prepared by the implementation contractor determined that IHIE's Medicare savings did not exceed the minimum savings requirement of the demonstration protocol, so IHIE did not earn a performance payment from Medicare for either PY1 or PY2.

The MHCQ evaluation analysis included a multivariate statistical analysis of the impact of the IHIE MHCQ demonstration intervention on financial outcomes. This evaluation analysis showed that for beneficiaries assigned to Panel 1 providers, per capita costs increased significantly between the BY and PY2 compared with the increase in the CG during the same time period. This was an unfavorable impact of the IHIE demonstration. For beneficiaries assigned to Panel 2 providers and for the two panels combined, the increase in per capita costs between the BY and PY2 was not significantly different from the increase experienced in the CG. These evaluation results are consistent with the results of the IHIE MHCQ demonstration financial reconciliation.

To test whether Medicare savings would have occurred if beneficiaries were assigned based on a plurality of touches with an IHIE practice, as opposed to the one-touch rule used for beneficiary assignment for IHIE in the MHCQ demonstration, another analysis was done as a sensitivity test with reassigned beneficiaries. A plurality assignment methodology similar to the methodologies used in the CMS Physician Group Practice demonstration and for the Medicare

Shared Savings Program ACOs was used on the combined Panel 1 and Panel 2 IHIE beneficiaries. This analysis found that per capita costs increased significantly between the BY and PY2 for assigned beneficiaries compared to the trend in costs found in the CG. This was an unfavorable impact of the demonstration.

When the impact of the IHIE MHCQ demonstration on per capita expenditures was analyzed by subpopulations, only a few significant effects were found, and all showed cost increases that were unfavorable impacts of the MHCQ demonstration. Significant increases in per capita spending were found for beneficiaries with cancer, beneficiaries with vascular disease assigned to Panel 2, and Panel 1 beneficiaries with any inpatient expenses.

The multivariate analysis of costs by expenditure components showed more statistically significant effects, including 13 of 27 expenditure component and panel combinations analyzed, but 8 of the 13 significant effects were for unfavorable cost increases. The 8 expenditure component and panel combinations showing significant cost increases included inpatient skilled nursing facility (Panel 1 and Panel 1 and 2 combined), Outpatient Total (Panel 2 only), outpatient institutional (hospital) (Panel 2 only), outpatient Part B physician/supplier (Panel 1 only), and hospice (Panel 1, Panel 2, and Panel 1 and 2 combined). The 5 expenditure component and panel combinations showing significant cost decreases included outpatient institutional (Hospital) (Panel 1 and Panel 1 and 2 combined), outpatient Part B physician/supplier (Panel 2 only), and outpatient home health (Panel 1 and Panel 1 and 2 combined).

Quality

One of the provider groups interviewed by the evaluation team during the November 2012 site visit was a large physician network with more than 600 employed physicians, including 206 PCPs participating in the MHCQ demonstration. The network staff reported that the quality measures provided by QHF were a subset of the quality measures that they already produced themselves separately from QHF. The network staff reported to the evaluation team that they believed that the value in QHF was to bring a broader range of providers, payers, and employers together to agree on a common set of quality metrics and to develop a common vision for how quality would be measured. The network staff reported that without QHF, no single organization (single insurance company or single employer) would have enough patients to make it worthwhile for the network to follow their lead in how to measure quality.

The network staff also reported to the evaluation team that one of the challenges in working with IHIE had been QHF patient attribution. The network had spent a considerable amount of time and money trying to resolve discrepancies between their own internal data and the data they received through IHIE.

The network staff reported during the site visit that only one payer had contracted with them to pay incentives based on results from QHF. They needed to have more payers (preferably five or more) participating in QHF-based incentive contracts with them to make QHF a more viable long-term way to track quality measures. The network also reported that they were concerned about tracking quality metrics for a lot of different groups (QHF and multiple private insurers).

The large physician network had an incentive-based compensation structure, in which up to 5 percent of a physician's compensation was based on internal quality measures. They also had 1 to 2 percent of compensation based on results from QHF. In addition, access measures calculated by the network could account for up to 4 percent of compensation. Among other things, the access measures took into account patient waiting time and weekend or evening availability. They used access measures defined by the American Medical Association.

IHIE's internal quality measures for the MHCQ demonstration, which were assessed against targets agreed upon with CMS and not against a CG, showed limited improvement. Even with modest targets in PY1, PY2, and PY3—2 percentage points' improvement over prior-year values for most of the measures, except for three measures in PY3 whose targets ranged from 0.9 to 1.5 percentage points' improvement—the results were mixed. IHIE reported meeting quality targets for 6 of the 10 eligible quality measures in PY1, for 5 of the 10 eligible measures for PY2, and for 7 of the 12 eligible measures in PY3. Thus, by PY3, IHIE was still meeting quality targets for only 58 percent of eligible quality measures. Moreover, IHIE had agreed in the original MHCQ demonstration protocol to implement 14 quality measures in PY1, 14 measures in PY2, and 20 measures in PY3. Thus by PY3 IHIE had still not implemented the number of quality measures originally required for PY1.

The evaluation analysis included multivariate statistical analysis of the impact of the IHIE demonstration on five claims-based quality-of-care measures that have also been used in other CMS demonstration project. These claims-based measures enable the analysis to assess IHIE's quality performance in relation to the CG because quality measure performance results can also be calculated for the CG using Medicare claims data. This analysis found effects for two of five quality measures and for four quality measure and panel group combinations that were statistically significant. However, the results were unfavorable, indicating that the IHIE demonstration was associated with a lower probability of receiving the indicated care. None of the multivariate statistical analysis results showed effects representing improvements in quality-of-care measures.

The two quality measures showing unfavorable but significant results in the statistical analysis were DM-4, a quality measure for low-density lipoprotein (LDL) testing once per year for beneficiaries with diabetes, and CAD-5, a quality measure for lipid profile testing once per year for beneficiaries with coronary artery disease. The three quality measures showing no significant results in the statistical analysis were DM-1, a quality measure for glycated hemoglobin (HbA1c) testing once per year for beneficiaries with diabetes; DM-6, a quality measure for urine protein testing once per year or for evidence of medical attention for nephropathy for beneficiaries with diabetes; and HF-2, a quality measure for beneficiaries hospitalized with a principal diagnosis of heart failure during the current year who also had left ventricular ejection fraction testing during the current year.

Utilization

Although IHIE had not yet implemented a formal utilization report for physicians or providers at the time of the site visit in November 2012, it had developed some prototype utilization reports that were undergoing testing. These included utilization performance measures for emergency department (ED) visits, readmissions, and others.

IHIE staff indicated during the site visit that they were also developing a new utilization management system for admission/discharge/transfer (A/D/T) alerts from hospitals. These alerts would provide utilization data in real time to enable more timely clinical interventions to reduce the numbers of readmissions. This new A/D/T system was also viewed as a benefit for marketing IHIE's services to ACOs.

The multivariate regression analysis included results for utilization outcomes in terms of hospital admissions, 30-day readmissions, and ED visits. The IHIE demonstration results showed statistically significant and favorable effects on all three of these utilization measures, with reductions in utilization for each of them compared to the CG. However, it seems that these reductions in these utilization measures were not large enough to generate overall cost savings for the IHIE demonstration that were statistically significant, as described above.

Lessons Learned and Implications for Future Programs

A variety of lessons learned and implications for Medicare can be gleaned from the results of the IHIE MHCQ demonstration in its first two performance years.

- The IHIE intervention has not shown any impacts on Medicare costs. The overall cost impact of the IHIE demonstration over the first two performance years was not statistically significant and thus cannot be assumed to be different from $0. Disaggregating the results by panel, beneficiary subgroup, and expenditure component indicated more cost-increasing effects than cost-reducing effects.

- The quality results are surprisingly mixed, since quality feedback reports are the centerpiece of the IHIE MHCQ demonstration intervention. The multivariate analysis showed lower-quality results in comparison to the CG, and IHIE's internal quality measures did not reach the modest IHIE demonstration improvement targets for almost half of the measures. In sum, these quality results indicate that this type of HIE intervention, attempting to bring together multiple payers and providers who are otherwise fierce competitors, may not be effective in terms of either implementing joint efforts for quality measurement or producing improved quality performance.

- The multivariate analysis of utilization impacts of the IHIE demonstration, in comparison to the CG, found significant reductions in utilization for hospital admissions, ED visits, and 30-day readmissions. However, any cost savings impacts of reduced utilization for these types of health care services was offset by cost increases for other types of services, such as skilled nursing facilities.

Qualitative analysis and descriptive statistics also provide a number of lessons learned and implications for future programs.

- A major issue was the exit of many physicians from the MHCQ demonstration in PY3, when a several large physician groups left the demonstration to join ACOs instead. Because CMS required that medical groups not be in two different Medicare shared savings programs at the same time (e.g., in both the MHCQ demonstration and in an ACO), the groups had to choose one or the other. The lack of financial

incentive payments to date in the MHCQ demonstration was one factor in this decision, but physician groups also viewed the demonstration as too limited in focusing only on the nine-county Indianapolis region. ACOs were able to define larger and more flexible service areas. Notably, those physicians remained in QHF even while leaving the MHCQ demonstration because of QHF's continuing involvement with private payers that did not include geographic restrictions.

- In addition, large physician groups and IPAs found the QHF quality reports less useful and less timely than the internal reports they developed using their in-house EHRs. Their internal data systems enabled more rapid access to data for clinical interventions that required day-to-day decision making by providers. As more providers join ACOs, the prevalence of stronger internal data systems is likely to increase, and the future role of external data systems such as QHF may become less important.

- On the positive side, providers indicated that they viewed the QHF quality reports as a fair and honest reflection of the care they provide. IHIE had worked to ensure that they provided doctors with timely, accurate data; opportunities to correct data errors through the reconciliation process; and data reports that covered all of a doctor's patients, not just patients from one payer. Both providers and IHIE staff indicated that the ability to add Medicare claims data to the QHF reports was a benefit for the development of IHIE and QHF because Medicare patients are a large part of most physicians' practices. Without Medicare data, the QHF reports would have been unable to provide comprehensive quality reports covering the complete range of a provider's patients.

- These results from the MHCQ demonstration indicate that HIEs that bring multiple and competing providers and payers together may not be effective for pay-for-performance programs such as MHCQ. However, they may continue to be useful for public reporting. The internal IHIE processes took a long time to develop consensus among stakeholders and data systems for implementing new quality measures, and the impact of the QHF quality measure reports on quality outcomes was too limited. It may be that multi-provider and multi-payer HIEs are better suited for public reporting and public accountability programs, as IHIE has implemented with both community-wide and practice site-specific quality data publicly reported on the IHIE Web site. These public reporting systems provide community accountability for providers without requiring the rapid data feedback to providers across multiple quality measures for clinical interventions as was provided for the large physician groups by their internal data systems. The broad stakeholder trust that IHIE has built up enables their reports to be the focal point for public reporting of quality results that merge data from competing payers and providers.

- CMS should continue to participate in these public reporting efforts by HIEs, as the public reports should include data from all payers and all providers serving patients in a community to provide comprehensive public reports on the quality of care for a community.

In implementing the MHCQ demonstration, IHIE identified a number of challenges that should also be considered in designing future CMS programs. These include:

- Disagreements with CMS on how patients should be attributed to providers, due to ambiguities in the demonstration protocol document developed at the outset. Experience with beneficiary attribution in this MHCQ demonstration and in the ACO program should enable improved clarity in attribution algorithms for providers in future programs.

- The nine-county geographic region of the MHCQ demonstration was found to be too limited to retain large physician groups in the demonstration when options for joining ACOs with larger geographic coverage became available.

SECTION 1
INTRODUCTION

The Medicare Health Care Quality (MHCQ) demonstration was developed to address concerns about the U.S. health care system, which typically fragments care while also encouraging both omissions in and duplication of care. To rectify this situation, Congress directed the Centers for Medicare & Medicaid Services (CMS) to test major changes to the health care delivery and payment systems to improve the quality of care while also increasing efficiency across the health care system. This goal could be achieved through several types of interventions: adoption and use of information technology and decision support tools by physicians and their patients, such as evidence-based medicine guidelines, best practice guidelines, and shared decision-making programs; reform of payment methodologies; improved coordination of care among payers and providers serving defined communities; measurement of outcomes; and enhanced cultural competence in the delivery of care.

Section 1866C of the Social Security Act, as amended by Section 646 of the Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (P.L. 108-173, Section 1866C[b]), requires the Secretary of the Department of Health and Human Services to establish a 5-year demonstration under which the Secretary may approve demonstration projects that examine health delivery factors that encourage improved quality in patient care. This section also authorizes the Secretary to waive compliance with such requirements of Titles XI and XVIII of the Social Security Act (42 U.S.C. 1395 et seq.) as may be necessary for the purposes of carrying out the demonstration project.

Three types of "health care groups" were eligible to participate in the MHCQ demonstration: (1) groups of physicians, (2) integrated health care delivery systems, and (3) organizations representing regional coalitions of groups or systems. The MHCQ demonstration is designed to examine the extent to which major, multifaceted changes to traditional Medicare's health delivery and financing systems lead to improvements in the quality of care provided to Medicare beneficiaries without increasing total program expenditures.

Four sites have participated in the MHCQ demonstration at various times (see **Table 1**). Because each MHCQ demonstration site has a different and self-defined plan for its intervention, the evaluation of each site is presented in a separate report. This report presents evaluation results for the Indiana Health Information Exchange (IHIE).

Table 1
MHCQ Demonstration Sites

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SOURCE: RTI International.

1.1 Objectives and Structure of This Year 2 Evaluation Report

This Year 2 Evaluation Report for the IHIE reviews both quantitative and qualitative evaluation data regarding its structure, goals, and performance.

Section 2 includes the detailed evaluation of IHIE using qualitative and quantitative data and analysis. The focus of the quantitative analysis is on multivariate statistical analysis of the impacts of the IHIE demonstration on cost, quality, and utilization outcomes. The qualitative analysis describes the goals, governance, and interventions as well as the barriers and challenges that IHIE experienced in implementing its interventions. Section 3 includes the conclusions, lessons learned, and implications for future programs.

1.2 Evaluation Methods

1.2.1 Quantitative Analysis

To evaluate improvements in quality, utilization, and costs in the IHIE demonstration, it is necessary to specify a comparison group of beneficiaries not subject to the IHIE intervention. This enables the evaluation to assess whether the observed effects on quality, utilization, and costs may have happened even in the absence of the IHIE demonstration.

We used the same intervention and comparison groups that the implementation contractor used for the financial reconciliation analysis to maintain consistency between the two analyses. The methodology for determining the comparison group is outlined in more detail in IHIE's demonstration protocol. There were two basic steps to match intervention and comparison group beneficiaries. The first step was to identify counties with metropolitan areas that were similar to the Indianapolis area in regard to the sociodemographic characteristics of their Medicare populations. The counties found to be most similar to the demonstration area and agreed upon with IHIE in their demonstration protocol are:

- Wisconsin: Milwaukee, Ozaukee, Washington, and Waukesha
- Ohio: Delaware, Fairfield, Franklin, Licking, Madison, Morrow, and Pickaway
- Indiana: Clark, Floyd, Harrison, and Scott
- Kentucky: Bullitt, Jefferson, and Oldham

The second step was to retrospectively identify beneficiaries in the comparison counties who met the eligibility criteria for the IHIE demonstration[2]. The comparison group includes beneficiaries who met the requirements for participation in the IHIE demonstration, who resided in a defined comparison group county, and who received a qualifying treatment in the base year or a performance year (PY). Because the IHIE participating providers changed over

[2] Eligibility criteria for beneficiaries included: 1) no months of Part A-only or Part B-only Medicare enrollment; 2) no months of Medicare Advantage enrollment; 3) no months of coverage under an employer-sponsored group health insurance plan; and 4) has a valid Medicare enrollment file record.

demonstration years, the intervention group (IG) beneficiaries were separated into those treated by an initial panel of physicians (Panel 1) who began participation in the IHIE MHCQ demonstration in PY1 and those treated by another panel of physicians (Panel 2) who began participation in the demonstration later on, in PY2. Separate comparison groups were also selected for each of the Panels.

Quantitative information includes descriptive statistical profiles and multivariate statistical analysis of IHIE demonstration outcomes. The descriptive statistical profiles include the IHIE intervention group (IG) and a matched comparison group (CG) of beneficiaries; base year (BY) and performance years 1 (PY1) and 2 (PY2) time periods; beneficiaries treated by Panel 1 physicians, Panel 2 physicians, and the combined data for those treated by either Panel 1 or Panel 2 physicians and data on beneficiary demographic, Medicare enrollment, and disease characteristics. The BY included July 2008 through June 2009, PY1 covered July 2009 through June 2010, and PY2 was from July 2010 through June 2011. Table 4 in Section 2.3.2 shows how the IG and CGs are similar in terms of demographics, risk scores, and chronic disease patterns.

The multivariate statistical analysis methodology involves two main methods. First, propensity scores are estimated and propensity score weights are applied to the data to balance the IG and a CG with respect to key beneficiary characteristics before conducting the impact analyses.

Second, a multivariate regression model combining data from the IG and CG, over multiple time periods including the BY as well as PY1 and PY2, is used to estimate the impact of the demonstration on Medicare expenditures, quality, and utilization. This multivariate difference-in-differences regression model estimates the effect of the IHIE demonstration on an outcome of interest during the demonstration period after controlling for beneficiary characteristics, CG performance on the same outcome, and time trends throughout the entire observation period. Further details of the statistical analysis methods are included in the MHCQ Demonstration Evaluation Design Report (Trisolini et al., 2013).

1.2.2 Qualitative Analysis

The qualitative data in this report include information provided to RTI International during a site visit to IHIE in November 2012, IHIE's reports to CMS, and site-specific analysis and reports on demonstration and related implementation and performance assessment efforts provided by IHIE to the evaluation team.

The IHIE site visit was conducted November 12–14, 2012, through in-person meetings in Indianapolis and the surrounding region. The interviews were guided by unique protocols tailored to specific types of interviewees, representing IHIE staff; data users; data providers; and external stakeholders such as employers. **Table 2** on the following page describes the types and numbers of site visit interviewees. Site visit interviews were conducted by a team of three RTI staff.

1.2.3 Assessing Lessons Learned and Implications for Future Programs

Assessing lessons learned and implications for future programs relies on several aspects of the IHIE evaluation, including the quantitative and qualitative data analysis available at this

point in the evaluation. The evaluation team has synthesized these analyses to identify key themes, barriers, and opportunities to inform future demonstration projects and the Medicare program.

Table 2
Number of IHIE site visit interviewees by type of protocol

Type of protocol	Number of interviewees
IHIE management and program staff	9
IHIE data center staff	5
Data users	8
Data providers	2
External stakeholders	7

NOTE: IHIE = Indiana Health Information Exchange.

SOURCE: RTI International.

SECTION 2
ANALYSIS

This section includes the following topics: administration and infrastructure, health information technology, provider and beneficiary participation, cost and savings, quality, and utilization.

2.1 Administration and Infrastructure

The IHIE is a nonprofit, 501(c)(3) organization formed in 2004 to support Indiana's communities by providing medical information and data-sharing services. IHIE represents a broad coalition of health care stakeholders in the Indianapolis region, including hospitals, physician groups and practices, other health care providers, public and private payers, and other stakeholders. In November 2012, IHIE had 72 staff members.

Development of IHIE's data repository began in 1995, when the Regenstrief Institute developed a clinical data-sharing network that linked hospitals and other clinical providers, called the Indiana Network for Patient Care (INPC). By 2012, the INPC had expanded to include health insurance claims and clinical data that follow patients regardless of where they receive health care. IHIE provides data reporting and quality improvement programs to physician groups, physician practices, and public and private health insurance organizations using the INPC database. In 2012, the INPC was moved from Regenstrief to IHIE, a process that was under way at the time of the RTI site visit in November 2012.

The IHIE MHCQ demonstration focused on IHIE's Quality Health First (QHF) program, which provides quality reports to physicians, physician groups, payers, and the public. A central goal of IHIE's MHCQ demonstration was to integrate Medicare claims data, along with data from third-party payers and Medicaid, into QHF, making the quality reports more comprehensive and representative of an entire patient population. The IHIE MHCQ demonstration included the nine-county metropolitan Indianapolis area and was intended as a 5-year project. It began in 2009, and IHIE decided to withdraw from the MHCQ demonstration in early 2013.

QHF is a community-wide health care quality reporting, quality improvement, and disease management service. It helps physicians identify and prioritize necessary health screenings and other testing to ensure that patients receive recommended preventive care and to ensure that chronic diseases are appropriately monitored and managed. QHF is built on INPC's data repository system, which aggregates data from health insurance claims and enrollment information, hospital medical records, physician group medical records, and other clinical data. In 2012, QHF provided a variety of quality reports to providers, including the Measure Metrics Report, Measure Payor Metrics Report, Result Matrix Report, Quarterly Score Report, and Provider Graphic Summary Report.

The MHCQ demonstration was contained within the QHF program, which was in turn contained within IHIE. As a result, the MHCQ demonstration used the administration and infrastructure developed for IHIE and QHF. IHIE did not develop any separate administration or infrastructure solely for the MHCQ demonstration.

A group of employers reported during the November 2012 site visit that the impetus for the creation of QHF was a combination of employers, health care systems, and insurance companies that came together. The benefit for them was that no other place could combine all of the clinical and claims data into one system. Physicians would actively read and use the QHF reports if they included all of their patients and not just a small slice of their patients from just one payer. Physicians also reported to the employers that they liked having just one set of quality measures, not different sets of measures from different payers. The employers reported that some third-party payers paid additional incentives to providers demonstrating high quality of care, as measured by QHF reports. They told the evaluation team in 2012 that they would like IHIE to develop a mechanism in the future to add specialist information into QHF, as well as the primary care provider (PCP) information in the reports. Many PCPs could benefit financially from their participation in QHF because of the performance incentives paid by commercial carriers using QHF for their pay-for-performance programs. However, the employers were concerned about the number of "free riders" of QHF—that is, insurance companies that did not provide payment incentives to physicians. For example, some physicians complained to IHIE that they had to review and correct (reconcile) data reports for the populations whose insurance companies did not provide incentive payments, including Medicaid and Medicare.

IHIE reported to the evaluation team that some private payers were providing incentive payments to physicians based on the QHF reports for their pay-for-performance programs. Another private payer contributed data and paid an administrative fee to IHIE but did not use the QHF reports in its incentive program (although it used similar quality measures). Medicaid provided claims and administrative data to IHIE but did not use QHF for a pay-for-performance program and did not pay administrative fees to IHIE.

Under the MHCQ demonstration program, Medicare offered the potential for shared savings incentives for IHIE. This payment method included targets for both financial and quality performance. The financial performance incentive was calculated by comparing the Medicare claims costs of the IHIE-assigned beneficiaries to the Medicare claims costs of similar beneficiaries identified in comparison regions. An additional portion of the savings would be shared if IHIE also met specified targets for quality performance.

IHIE reported that it had limited success in getting major private health insurance companies to participate fully in QHF. In 2012, only one private health insurance company was fully participating in both the quality reporting and pay-for-performance programs. Other large insurance companies had less interest in QHF because they already had large national quality reporting plans of their own that covered multiple states. IHIE hoped that other large insurance companies would use QHF for their quality-of-care reporting and improvement programs, but most wanted to focus on quality-of-care reporting programs that covered multiple states and not just Indiana.

IHIE staff reported to the evaluation team that the cost of developing the large database that combined claims and medical records data was too high to be financially sustainable from QHF and the limited range of other services that IHIE was providing in 2012 that were limited to the state of Indiana. IHIE staff intended to take advantage of economies of scale from their large database to develop additional services, market services to additional clients such as accountable care organizations (ACOs) and self-funded employers, and expand to other states. IHIE staff

indicated that they would like to provide services to predict outcomes, such as readmissions, complications, and adverse events, instead of reporting only on retrospective analysis of process quality measures.

2.2 Health Information Technology

IHIE staff reported that they received data from more than 15 different data sources for INPC and QHF in the course of a month, including hospitals, physician groups, laboratories, Medicare, Medicaid, and private health insurance companies. The data were converted into a common data format known as Health Level Seven (HL7). This common data format allowed IHIE to create standardized reports.

Since the IHIE case study for the MHCQ demonstration in 2010, the QHF program developed a Web site application to replace the manual patient care data reconciliation (correction) process. Under the initial implementation of the QHF program, physician offices were required to manually code data corrections into paper reports and fax them back to IHIE for entry into the INPC database. To allow for better reporting and data collection, users now submit relevant information for data corrections or additions through the QHF Web site. Providers reported to the evaluation team that they found the new Web-based reconciliation system much easier to use than the former paper-based system.

For example, if there was QHF alert that a glycated hemoglobin (HbA1c) test was missing a result value and the physician office had that result in their medical records, the provider could submit the result along with the date the test was performed through the QHF Web site. These new data would then added to the INPC database and included in the next QHF report run, in the same manner that claims and other clinical information were collected and used in new measure calculations for new quarterly QHF reports. This reconciliation process allowed the provider to get quality measure performance credit for having an HbA1c test result on file for the patient, and it also allowed for more accurate QHF program reports.

Staff at most of the medical groups interviewed said that they reviewed and reconciled the data for all of the patients included in their QHF reports because some private payers used the all-payer population quality measure scores in their pay-for-performance incentive systems. However, IHIE expressed concern that this level of reconciliation may change because a large private payer was changing its incentive system to focus on its own covered lives only, instead of the all-payer population scores. That large private payer planned to change because another large private payer, Medicaid, and the MHCQ demonstration focus only on their own covered lives and not on community-wide quality performance improvement by using all-payer quality performance results.

The new QHF Web application also provides patient care alerts and reminders to providers online. Providers can click on patients or quality measures and drill down online to review data the QHF program used to derive the quality measure results. The providers can sort and search results by different criteria, including physician group, individual provider, quality measure, patient name, and gender. IHIE reported that the patient-level alert and reminders tools are widely used by providers in managing the care of their patient populations.

Staff at a community health center reported to the evaluation team that each month they receive through the QHF Web portal a lengthy report (around 48 pages) that contains alerts for the previous month. The alerts identify beneficiaries in need of essential services, such as diabetics who are missing their HbAlc tests. The diabetic coordinator at the community health center combed through the report, identified diabetics who were missing a test, and called them for an appointment or put a note in their medical record. Since it began using QHF, the health center staff reported they had seen significant improvements in test results for diabetics. Furthermore, they reported that they had more than a 100 percent increase in the volume of testing during their first 90 days using QHF.

Because QHF pools a patient's medical information across a variety of settings (hospitals, insurers, etc.), these reports allowed the community health center to identify patients who they did not know were missing important tests. The health center staff also used QHF to identify patients who were diabetic whose conditions were not already known to them. That is, sometimes the health center's own records might not have indicated that a patient was diabetic, but QHF's access to data from health insurance claims and medical records from other providers treating the same patient alerted them to the patient's disease status. The community health center also used QHF to identify women in need of an annual physical examination. The health center was working out a way to use QHF to identify patients in need of statin treatment for lowering cholesterol. Overall, the community health center staff reported to the evaluation team that they believed using QHF led to providing better care for patients.

The reports produced under the QHF program also provided this community health center with a relative performance index so staff could see how they were performing on quality measures relative to other providers. To make the performance index more meaningful, the performance index was adjusted for the payer mix (it accounted for the proportion of the health center's patients who are Medicare-, Medicaid-, and privately insured in comparison to other providers). The quality scores produced by QHF are also used by the community health center when writing grant applications. The community health center staff also reported to the evaluation team that they would like a body mass index measure added to the list of quality measures they receive from QHF.

A large physician network reported to the evaluation team that it compensated physicians for "completing" a patient's medical record. For example, if a patient said that he or she went to the emergency department (ED) at a non-network hospital, then the physician or staff at the network had an incentive to call the ED and verify this information. As a result, the network, independent of QHF, already had an incentive system in place that led staff to call other non-network providers and obtain the patient's medical information. At the same time, QHF had become a resource for the network staff in this regard, because QHF provided much of this information.

The large physician network's staff reported during the site visit that only one payer had contracted with them to pay incentives based on results from QHF. They needed to have more payers (preferably five or more) participating in QHF-based incentive contracts with them to make QHF a more viable long-term option to track quality measures. The network staff also reported that they were concerned about tracking quality metrics for a multitude of different groups (QHF and multiple private insurers).

QHF sent alerts and reminders to the large physician network regarding important medical information for their patients, such as indicating if they had a missing test or screening. The network already had its own internal alert system, however, so its providers did not need to use QHF's system. The network staff indicated that the QHF alerts and QHF in general were more useful for smaller practices, especially those that still had all of their medical records on paper. They suggested that for many small or individual physician practices QHF may be their only source of quality performance information.

Staff from an independent practice association (IPA) reported during the evaluation team's site visit that they began using QHF about 3 years ago. They indicated that the only additional work they experienced from their participation in QHF was to report some data from their medical records to QHF. At the same time, they used the quality results they received from QHF in determining physician compensation.

The IPA's staff reported that in their own internal electronic health record (EHR) system they also had the ability to track the quality of patient care. The staff indicated that their own EHR system was moving toward being able to produce most of the quality measures that QHF reports. However, they also indicated that the alerts that QHF produced, such as the diabetic alerts for HbAlc tests, were very useful and they were not able to produce those types of alerts using their own internal EHR system.

Although IHIE provided physicians with QHF reports on the quality of care received by their patients, IHIE recognized that their patients were generally not aware of the QHF program or the MHCQ demonstration. This lack of awareness might change in the future, as IHIE began making QHF quality measure reports publicly available at the practice-site level in late 2012. Large employers participating in IHIE indicated that they would promote use of the QHF Web site to their employees once the physician practice-site level quality reports became publicly available.

In 2011, IHIE began public reporting of QHF community-wide quality measure results. The data were published on IHIE's Web site, http://www.ihie.org. In 2011, the public reporting included nine quality measures and both quantitative and graphical comparisons of the quality measure scores for the community between the quarter ending December 31, 2009, and the quarter ending June 30, 2010. IHIE reported that their results showed some improvement on eight of the nine quality measures between those two time periods. Starting in the fall of 2012, IHIE began publicly posting quality measure results at the practice-site level for the 170 practice sites that opted in for this level of public reporting.

IHIE indicated in a report to the evaluation team that it had not found a utilization reporting system that was affordable within its current QHF revenue stream (Kariyanna, 2012). As a result, it had worked to develop its own utilization reports, but these had not been as robust as commercial utilization reporting systems.

2.3 Provider and Beneficiary Participation

2.3.1 Providers

Patients are attributed to a primary care provider (PCP) as part of the QHF quality performance reporting process. The PCP is then held accountable for quality measure performance for that patient. PCPs include physicians, nurse practitioners, and physician assistants who participate in the QHF program; their fields of practice include internal medicine, family medicine, general practice, geriatrics, obstetrics and gynecology, and pediatrics. To verify which providers are PCPs, QHF checks the provider's specialty designation from the National Plan and Provider Enumeration System (NPPES) created and maintained by CMS and also checks to see if the provider is billing for primary care evaluation and management (E&M) services. QHF receives periodic updates (lists) of PCPs who would like to participate in QHF program. Some of the larger physician groups and hospitals give twice-monthly or even weekly updates of their providers who want to participate in QHF.

IHIE reported to CMS that the number of PCPs participating in the QHF program as a whole had grown over time to 2,141statewide by June 2012 (Hiller & Kariyanna, 2013). IHIE reported that the numbers were growing by about 50 PCPs per month. However, the number of PCPs had not grown significantly in the nine-county MHCQ demonstration area, because QHF already had approximately 75 percent of the physicians in that area enrolled. This also meant that the MHCQ demonstration project had limited additional growth potential in PCPs. In June 2012, QHF had 1,356 PCPs participating in this nine-county area, and the MHCQ demonstration had 760 PCPs participating in that same area. The difference was partly because some types of PCPs, such as pediatricians, do not typically serve the mostly older Medicare beneficiaries, and also because PCPs had to complete additional paperwork to participate in the MHCQ demonstration. Over the first 3 PYs the number of PCPs participating in the MHCQ demonstration had steadily increased, with approximately 600 participating in PY1, 788 in PY2, and 1,017 in PY3 at the beginning of that performance year. However, several large physician groups left the MHCQ demonstration in PY3 in order to be eligible to join Medicare ACOs, so the number of PCPs fell to 760 by June 2012.

Because ACOs are Medicare programs that also have a shared savings financial reconciliation model, physician groups were not permitted by Medicare to participate in both an ACO and the MHCQ demonstration. CMS required that physician groups choose between participating in either an ACO or the MHCQ demonstration. Of the five largest primary care groups in the MHCQ demonstration, three terminated their participation in the MHCQ demonstration program in 2012 (but not their participation in IHIE's QHF program) to join ACOs that had larger geographical footprints than the nine-county MHCQ demonstration area.

Staff from an IPA reported to the evaluation team that they had decided to leave the MHCQ demonstration and become a Medicare Shared Savings Program ACO. Because the ACO program was viewed as the wave of the future, they wanted to join an ACO and they learned from Medicare that they could not become an ACO with Medicare and also stay in the MHCQ demonstration. The ACO also offered some financial incentives that they had not received from their participation in the MHCQ demonstration. The IPA's staff indicated that they would continue to participate in QHF after they became an ACO and left the MHCQ

demonstration, as they did receive some financial incentives for participating in QHF from a private health insurance company. The QHF alerts and reminders and quality measure reports were viewed as useful tools for quality improvement. The IPA indicated that as an ACO, the QHF reports regarding admission and discharges would prove to be useful, especially if they became real-time reports, as IHIE staff had indicated they were considering, that could help with planning for medication reconciliation and care transitions.

The IPA staff also reported to the evaluation team that in the beginning many physicians were afraid to use QHF, because they had concerns about Regenstrief's involvement. Specifically, they worried that in doing their own research studies, Regenstrief staff might contact their patients "out of the blue." To get physicians to come on board, IHIE had to explain exactly how patients' identities would be protected in the centralized database and how their data would be used.

Because some physicians were added (and some withdrew) each performance year and new beneficiaries were assigned to the providers each year, panels of physicians were defined for the different performance years in order to identify the assigned beneficiaries associated with the different groups of physicians. The new set of providers who joined the IHIE MHCQ demonstration in PY2 were termed Panel 2 providers to differentiate them from the original providers participating in PY1, who were termed Panel 1. Descriptive data on these providers show that Panel 1 included 979 providers and Panel 2 included 434 providers. The IHIE MHCQ demonstration providers included both participating PCPs, who were the focus of QHF, and also specialist physicians providing primary care services and billing through the same tax identification number as the participating PCPs. PCPs were 74 percent of the total for Panel 1, and non-PCP providers were 26 percent. Panel 2 had 53 percent PCPs and 47 percent non-PCP providers. For the IHIE MHCQ demonstration, PCPs were defined using specialty codes for family medicine, internal medicine, general practice, physician assistant, nurse practitioner, and clinical nurse specialist.

In sum, the new PY2 MHCQ demonstration providers in Panel 2 had only about half as many total providers as Panel 1. In addition, the Panel 2 providers had a significantly lower percentage of PCPs (53 percent compared with 74 percent in Panel 1). As a result, the new Panel 2 providers starting in PY2 looked different from the Panel 1 providers starting in PY1.

2.3.2 Beneficiaries

For the MHCQ demonstration, CMS assigned beneficiaries to participating MHCQ demonstration-participating PCPs if the beneficiary had at least one qualifying E&M visit with that PCP, or to another provider billing under the same tax identification number, during the given performance year. This "one-touch" attribution rule was applied after the performance year was completed, looking back at the claims data reported for the prior year. This retrospective method keeps the attribution accurately focused on patients who received services from providers participating in the demonstration. However, this method also means that IHIE does not receive information on new MHCQ assigned patients during a performance year, and this information is not available to IHIE for up to a year after the end of the performance year.

Descriptive statistics for assigned beneficiaries are shown in **Tables 3–5** on the following pages. **Table 3** indicates that both the IG and CG had very large numbers of assigned beneficiaries for statistical analysis in the BY, PY1, and PY2. In PY2, they totaled 165,528 for the IG and 345,502 for the CG. The CG is more than two times the size of the IG, which adds statistical power for the multivariate statistical analysis of demonstration outcomes that is presented in the following sections.

Table 3
IHIE MHCQ demonstration beneficiary assignments and exclusions across performance years

Assignments and exclusions	BY IG Panel 1	BY IG Panel 2	PY1 IG	PY2 IG Panel 1	PY2 IG Panel 2	PY2 IG (combined panels)[1]	BY CG	PY1 CG	PY2 CG
Assigned beneficiaries before exclusions	131,090	66,325	135,925	132,074	46,642	178,716	394,603	395,331	382,256
Total beneficiaries excluded from assignment[2]	13,019	23,118	13,424	10,160	3,028	13,188	39,251	53,694	36,754
Total assigned beneficiaries	118,071	43,207	122,501	121,914	43,614	165,528	355,352	341,637	345,502

NOTES:

IHIE = Indiana Health Information Exchange; MHCQ = Medicare Health Care Quality; PY1 = performance year 1; PY2 = performance year 2; BY = base year; IG = intervention group; CG = comparison group.

Base Year Panel 1: July 1, 2008–June 30, 2009
Base Year Panel 2: July 1, 2009–June 30, 2010
Performance Year 1: July 1, 2009–June 30, 2010
Performance Year 2: July 1, 2010–June 30, 2011

1. The combined panel measures are the sum of the Panel 1 and Panel 2 assignments and exclusions.
2. Exclusions are based on the criteria for the demonstration to ensure that complete claims data are available for statistical analysis. They include no Medicare Advantage enrollment, requiring both Part A and Part B enrollment, no Medicare secondary payer status, and others. Exclusions are not mutually exclusive. A beneficiary may be excluded for more than one reason.

SOURCE: RTI International analysis of July 2008–June 2011 100% Medicare claims files and enrollment datasets.

Table 4
IHIE MHCQ demonstration beneficiaries by demographics and disease subgroups across performance years and panels

Measure	BY IG Panel 1	BY IG Panel 2	PY1 IG	PY2 IG Panel 1	PY2 IG Panel 2	PY2 IG (combined panels)[1]	BY CG	PY1 CG	PY2 CG
Age (%)									
Age < 65	16.4	12.3	17.4	17.9	13.5	16.8	17.9	19.5	20.3
Age 65–75	42.6	40.0	42.3	42.3	41.5	42.1	39.3	38.2	38.2
Age 75–85	30.6	34.7	29.4	28.9	32.4	29.8	30.7	29.8	28.9
Age 85+	10.5	13.0	10.8	10.9	12.6	11.3	12.0	12.5	12.6
Gender (%)									
Male	39.3	44.2	39.5	39.7	46.7	41.5	40.7	40.9	41.1
Female	60.7	55.8	60.5	60.3	53.3	58.5	59.3	59.1	58.9
Medicare eligibility (%)									
Aged[2]	83.0	87.0	82.0	81.5	85.9	82.6	81.4	79.9	79.1
End stage renal disease [ESRD][3]	1.0	1.1	1.1	1.2	1.0	1.1	1.3	1.3	1.4
Disabled	16.0	11.9	17.0	17.4	13.1	16.3	17.3	18.8	19.6
Medicaid (%)	14.5	11.3	15.7	16.8	12.1	15.7	14.5	13.7	16.8
Mean risk score for upper 10% risk score[4]	5.3	5.2	5.3	5.4	5.2	5.4	5.4	5.5	5.5
Mean risk score for upper 25% risk score[4]	3.3	3.4	3.4	3.4	3.4	3.4	3.5	3.6	3.5
Any of 7 diseases below (%)	60.8	65.4	61.0	62.0	64.4	62.6	56.5	57.4	57.3
Diabetes (%)	31.3	30.8	31.8	32.6	31.1	32.2	26.8	27.2	28.0
Chronic obstructive pulmonary disease (%)	17.1	18.8	17.3	17.9	18.7	18.1	15.1	15.6	15.7
Vascular disease (%)	16.1	20.0	16.9	18.0	20.0	18.5	17.6	18.6	18.6
Congestive heart failure (%)	15.7	23.5	15.3	15.5	22.7	17.4	14.5	14.7	14.7
Cancer (%)	14.9	13.5	14.8	15.2	12.9	14.6	13.6	13.8	13.6
Stroke (%)	4.5	4.8	4.4	4.6	4.9	4.7	4.4	4.4	4.3
Acute myocardial infarction (%)	5.5	10.0	5.4	5.6	9.7	6.6	3.7	3.7	3.4

(continued)

Table 4 (continued)
IHIE MHCQ demonstration beneficiaries by demographics and disease subgroups across performance years and panels

NOTES:

IHIE = Indiana Health Information Exchange; MHCQ = Medicare Health Care Quality; PY1 = performance year 1; PY2 = performance year 2; BY = base year; IG = intervention group; CG = comparison group.

Base Year Panel 1: July 1, 2008–June 30, 2009
Base Year Panel 2: July 1, 2009–June 30, 2010
Performance Year 1: July 1, 2009–June 30, 2010
Performance Year 2: July 1, 2010–June 30, 2011

1. The combined panel measures are estimated by calculating the weighted sum of the Panel 1 and Panel 2 measures.
2. Includes beneficiaries aged 65 or older without ESRD.
3. Includes beneficiaries with ESRD regardless of age.
4. Risk scores are calculated using hierarchical condition categories (HCCs). Higher risk scores represent sicker beneficiaries.

SOURCE: RTI International analysis of July 2008–June 2011 100% Medicare claims files and enrollment datasets.

Table 5
IHIE MHCQ demonstration assigned beneficiaries by utilization and expenditures across performance years and panels

Variable	BY IG Panel 1	BY IG Panel 2	PY1 IG	PY2 IG Panel 1	PY2 IG Panel 2	PY2 IG (combined panels)[1]	BY CG	PY1 CG	PY2 CG
Mean count of qualified office or other outpatient evaluation and management (E&M) visits per beneficiary[2]	8.15	9.25	8.45	8.81	9.21	8.91	7.52	7.74	8.51
Hospital admissions per 1,000 beneficiaries[3]	407	482	412	419	456	429	414	406	410
30-day readmission rate (% of beneficiaries)	14.1%	14.2%	14.7%	14.2%	13.2%	13.9%	15.7%	15.1%	15.2%
Emergency department visits per 1,000 beneficiaries	791	859	811	853	863	855	692	722	755
Mean annualized Medicare expenditures PBPY[4]	$9,527	$10,994	$10,011	$10,587	$10,975	$10,688	$9,473	$9,862	$10,138
Mean annualized Medicare expenditures PBPM	$794	$916	$834	$882	$915	$891	$789	$822	$845
Percent of beneficiaries with some inpatient expenses (%)	23.1%	27.1%	23.5%	23.9%	23.7%	24.6%	23.0%	23.3%	23.2%

NOTES:

IHIE = Indiana Health Information Exchange; MHCQ = Medicare Health Care Quality; PY1 = performance year 1; PY2 = performance year 2; BY = base year; IG = intervention group; CG = comparison group; PBPY = per beneficiary per year; PBPM = per beneficiary per month.
Base Year Panel 1: July 1, 2008–June 30, 2009
Base Year Panel 2: July 1, 2009–June 30, 2010
Performance Year 1: July 1, 2009–June 30, 2010
Performance Year 2: July 1, 2010–June 30, 2011

1. The combined panel measures are estimated by calculating the weighted sum of the Panel 1 and Panel 2 measures.
2. Qualified E&M visits are defined to be visits with one of the following HCPCS codes: 99201–99205 and 99211–99215. Qualified E&M visits are counted regardless of performing physician.
3. Refers to hospital admissions at any provider.
4. Annualized Medicare expenditures per beneficiary are calculated by dividing actual expenditures by the fraction of the year the beneficiary is alive and are capped at $100,000 for non-end stage renal disease (ESRD) beneficiaries and $200,000 for ESRD beneficiaries. Expenditures have been rounded to the nearest dollar for presentation purposes.

SOURCE: RTI International analysis of Medicare claims and enrollment data for July 2008–June 2011.

Table 4 shows that the assigned beneficiaries were mostly older than age 65, had a higher percentage of females than males, and had Medicare eligibility mainly due to being aged. These patterns were consistent across the BY, PYs, IG, and CG. They are also consistent with the national demographic and Medicare eligibility patterns in the Medicare population, which also show most beneficiaries as older than age 65 (84 percent), with a higher percentage of females (55 percent), and mostly eligible for Medicare due to being aged (84 percent; MEDPAC, 2012).

Table 4 also presents mean risk scores for the upper 10 percent and upper 25 percent of the hierarchical condition category (HCC) risk score distribution among assigned beneficiaries. They illustrate how those groups had significantly higher severity of illness than the average for the Medicare population, which is set by the HCC risk scoring methodology at 1.0. As expected, the upper 10 percent group had a higher severity of illness than the upper 25 percent group.

Table 4 also shows the percentages of assigned Medicare beneficiaries with chronic diseases of interest, which have high prevalence or high costs. IHIE assigned beneficiaries include more than 25 percent with diabetes and more than 10 percent with chronic obstructive pulmonary disease, vascular disease, congestive heart failure, and cancer across the different beneficiary groupings. These percentages are mostly similar to those for the national Medicare beneficiary population, which show 28 percent with diabetes, 12 percent with chronic obstructive pulmonary disease, and 16 percent with congestive heart failure, although the national percentage with cancer is somewhat lower at 8 percent (CMS, 2012). Notably, more than 60 percent of IG beneficiaries had at least one of the seven chronic diseases highlighted in **Table 4**, and the percentages are almost as high in the CG.

Table 5 presents descriptive statistics on utilization and expenditures for the assigned beneficiaries. It shows that beneficiaries in the IG had about 8–9 office or other outpatient E&M visits per year on average, whereas the CG had a similar but slightly lower average range of about 7.5–8.5 visits of the same type per year. This is equivalent to a range of 8,000–9,000 visits per 1,000 beneficiaries for the IG and a range of 7,500–8,500 visits per 1,000 beneficiaries for the CG. Hospital admissions per 1,000 beneficiaries had a consistent pattern across most of the IG and CG groups, ranging from 406 to 429. Panel 2 beneficiaries show higher rates of 456 to 482 admissions per 1,000 beneficiaries, likely due to the higher percentage of specialist physicians among Panel 2 providers. The 30-day readmission rates ranged from 13.2 percent to 14.7 percent for the IG groups, and were higher for the CG groups that range from 15.1 percent to 15.7 percent. ED visits per 1,000 beneficiaries ranged from 791 to 863 for the IG, and were lower for the CG groups, where the range was 692 to 755.

Table 5 also presents data on mean annualized Medicare expenditures per beneficiary. For this IHIE evaluation, Medicare expenditures are expressed as per beneficiary per month (PBPM) expenditures or as per beneficiary per year (PBPY) expenditures. Medicare expenditures include all Part A and Part B fee-for-service claims components (inpatient, skilled nursing, outpatient, physician/supplier, home health, durable medical equipment, and hospice). Part D expenditures for pharmaceutical expenses are not included because those claims data were not readily accessible for some of the time periods involved in this demonstration. PBPY expenditures in the baseline and annual performance periods are defined as the sum of Medicare expenditures for the eligible months in that period, and PBPM expenditures are the PBPY

amounts divided by the number of eligible months in that period. IG and CG observations are weighted by the beneficiary's fraction of eligible months in the demonstration period.

On average, assigned beneficiaries had about $9,500–$11,000 in Medicare expenditures per year, consistently across the IG and CG. There is a general trend of increasing expenditures over time, across the BY, PY1, and PY2, that is consistent with the nationwide pattern of general medical care cost increases over time.

Table 5 also shows the percentage of assigned beneficiaries who had any inpatient Medicare expenses. This is generally consistent across the IG and CG, at about 23–24 percent for most groups.

2.4 Cost and Savings

2.4.1 Savings Calculated for Demonstration Performance Payments

To determine whether the IHIE MHCQ demonstration achieved Medicare savings, CMS contracted with an implementation contractor (independent of the RTI evaluation contract) to calculate savings according to the terms and conditions in the demonstration protocol. The IHIE PY1 and PY2 financial reconciliation reports both found that IHIE's Medicare savings did not exceed the minimum savings requirement, so IHIE did not earn a performance payment from Medicare for PY1 or for PY2 (Coomer et al., 2011; 2012).

IHIE reported that one of its challenges for achieving cost savings for Medicare was the difference in the population of the Medicare beneficiaries who were actively managed by IHIE providers and the Medicare beneficiaries who were included in the MHCQ demonstration financial reconciliation process. IHIE indicated that this discrepancy resulted from the differences between the MHCQ demonstration one-touch rule for patient assignment to providers and the QHF program plurality rule for patient assignment to QHF providers, as well as from the retrospective nature of the MHCQ assignment process.

2.4.2 Impact of the Demonstration on Cost Outcomes

The results of the multivariate analysis of the impact of the IHIE MHCQ demonstration intervention on a financial outcome measure are shown in **Table 6**. This table presents the impact of the IHIE demonstration on annualized Medicare expenditures per beneficiary. These multivariate regression analyses are weighted by propensity scores to balance the intervention and comparison groups. They also control for other variables not shown in **Table 6**, including HCC risk score, age, gender, Medicaid eligibility status, Medicare eligibility status, and race. Additional details of the multivariate analysis methodology are available in the MHCQ Demonstration Evaluation Design Report (Trisolini et al., 2013).

Table 6 presents demonstration impact results for Panel 1, Panel 2, Panel 1 and 2 combined, and for Panel 1 and Panel 2 combined using an alternate beneficiary assignment rule as a sensitivity test. For this analysis, the demonstration impact on per capita expenditures was examined across both PY1 and PY2 combined to provide more complete data. For beneficiaries assigned to Panel 1 providers—that is, providers who participated in the demonstration in PY1 and PY2—per capita costs increased significantly between the BY and PY2 compared with the

increase in the CG during the same time period ($94 PBPY). This was an unfavorable impact of the IHIE demonstration on Medicare costs. For beneficiaries assigned to Panel 2 providers and for the two panels combined, the increase in per capita costs between the BY and PY2 was not significantly different from the increase experienced in the CG, and thus these results indicate that the difference in cost could be $0 given statistical error margins. These multivariate statistical analysis results are consistent with the results of the IHIE MHCQ demonstration financial reconciliation.

Table 6
Demonstration impact on financial outcomes—multivariate regression results for per capita expenditures

Variable	Panel 1 [1,4]	Panel 2 [2,4]	Panel 1 and Panel 2 combined[3,4]	Panel 1 and Panel 2 combined[3,4] Plurality Assignment Rule Sensitivity Test
N	1,404,976	742,356	1,448,590	1,281,729
R^2	0.6416	0.6258	0.6410	0.6545
Demonstration effect coefficient[5]	$94	$40	$30	$190
Coefficient standard error	$42	$75	$41	$25
Coefficient statistical significance[6,7]	0.024*	0.594	0.464	0.000***

NOTES:
The dependent variable is Medicare annualized expenditures.
1. The regression is estimated on Panel 1 base year (BY) to performance year 2 (PY2) data (July 2008–June 2011) for intervention group (IG) and comparison group (CG) beneficiaries. The BY and PY1 dummies are omitted to avoid collinearity.
2. The regression is estimated on Panel 2 BY to PY1 data (July 2009–June 2011) for IG and CG beneficiaries.
3. The regression is estimated on overall BY to PY2 data (July 2008–June 2011) for IG and CG beneficiaries.
4. The regression is weighted by the Medicare eligibility fraction and by beneficiary propensity scores.
5. The demonstration impact is estimated by the coefficient of (Post-Demonstration Period)*(Assigned Beneficiary). Negative coefficients indicate savings, and positive coefficients indicate dis-savings or cost increases.
6. P-values for statistical significance of regression coefficient estimates are as follows: *Statistically significant at the <5% level; **Statistically significant at the <1% level; ***Statistically significant at the <0.1% level. A p-value of 0.000 indicates that the coefficient is significantly different from zero at better than the 0.1% level of significance. A p-value of 0.015 indicates a 1.5% level of significance.
7. Statistical significance levels and coefficient standard errors are adjusted for beneficiary-level clustering.

SOURCE: RTI International analysis of Medicare claims and enrollment data for July 2008–June 2011.

To test whether Medicare savings would have occurred if beneficiaries were assigned based on a plurality of touches with an IHIE practice, as opposed to the one-touch rule used for beneficiary assignment for IHIE in the MHCQ demonstration, another analysis was done as a sensitivity test with the reassigned beneficiaries. A plurality assignment methodology similar to

the methodologies used in the CMS Physician Group Practice demonstration and in the Medicare Shared Savings Program ACO program was used on the combined Panel 1 and Panel 2 beneficiaries. This analysis found a significant increase in per capita costs between the BY and PY2 for assigned beneficiaries compared to the trend in costs found in the CG ($190 PBPY). This represents an unfavorable impact of the IHIE demonstration on Medicare costs.

Table 7 presents results for the multivariate statistical analysis of the impact of the IHIE demonstration costs by beneficiary subgroups. The statistical methods are the same as for the results shown in **Table 6**. These results indicate that, when the impact of the demonstration on per capita expenditures was analyzed by subpopulations, only a few statistically significant effects were found.

Table 7
Demonstration impacts on financial outcomes—multivariate regression results for subgroup analyses for per capita expenditures

Demonstration effect coefficient by subgroup[5,6]	Panel 1 [1,3]	Panel 2 [2,4]	Panel 1 and Panel 2 combined[3,4]
1. Cancer	$196	$793**	$125
2. Congestive heart failure	$137	$427	$21
3. Diabetes	$97	$-15	$40
4. Chronic obstructive pulmonary disease	$-76	$-6	$-147
5. Acute myocardial infarction	$-215	$-62	$-395
6. Stroke	$579	$300	$509
7. Vascular disease	$132	$569*	$79
8. Any of 7 diseases	$91	$139	$7
9. Medicaid	$-144	$87	$-152
10. Originally disabled	$-95	$-403	$-198
11. End-stage renal disease	$251	$33	$-77
12. Disabled	$-159	$-80	$-177
13. Inpatient >$0	$365*	$30	$158
14. Upper 10% risk score	$486	$595	$-110
15. Upper 25% risk score	$107	$252	$-377

NOTES:
The dependent variable is Medicare annualized expenditures.
1. The regression is estimated on Panel 1 base year (BY) to performance year 2 (PY2) data (July 2008–June 2011) for IG and CG beneficiaries. The BY and PY1 dummies are omitted to avoid collinearity.
2. The regression is estimated on Panel 2 BY to PY1 data (July 2009–June 2011) for IG and CG beneficiaries.
3. The regression is estimated on overall BY to PY2 data (July 2008–June 2011) for IG and CG beneficiaries.
4. The regression is weighted by the Medicare eligibility fraction and by beneficiary propensity scores.
5. Negative coefficients indicate savings, and positive coefficients indicate dis-savings, or cost increases.
6. Statistical significance levels and coefficient standard errors are adjusted for beneficiary-level clustering. *Statistically significant at the <5% level; **Statistically significant at the <1% level; ***Statistically significant at the <0.1% level.

SOURCE: RTI International analysis of Medicare claims and enrollment data for July 2008–June 2011.

Of the 45 combinations of subgroups and panels analyzed in **Table 7**, only 3 had significant intervention effects. Increases in per capita spending were found for all 3 of these significant effects, which are unfavorable outcomes of the MHCQ demonstration. Significant savings were not found for any subgroups.

Table 8 presents multivariate statistical analysis results for the impact of the IHIE demonstration intervention on Medicare expenditure components. These results indicate that when the impact of the demonstration on per capita expenditures was analyzed by expenditure components, a number of statistically significant effects were found. Of the 30 combinations of expenditure components and panels analyzed, 14 combinations had significant intervention effects.

Statistically significant cost savings were found for the outpatient institutional expenditure component (e.g., hospital outpatient clinics) for both Panel 1 (-$69 PBPY) and Panel 1 and 2 combined (-$59 PBPY), for the outpatient Part B physician/supplier component (e.g., physician private practices) for Panel 2 (-$115 PBPY), and for the outpatient home health component for both Panel 1and for Panel 1 and 2 combined ($-15 and -$29 PBPY, respectively). These effects all represent favorable impacts of the IHIE demonstration on Medicare costs.

Statistically significant cost increases were found for total expenditures in Panel 1 ($94 PBPY, mirroring **Table 6**); for the inpatient skilled nursing facility component for Panel 1 and for Panel 1 and 2 combined ($63 and $43 PBPY, respectively); for the outpatient institutional component for Panel 2 ($172 PBPY); for the outpatient Part B physician/supplier component for Panel 1 ($64 PBPY); and for the hospice component for Panel 1, Panel 2, and Panel 1 and 2 combined ($14, $55, and $12 PBPY, respectively). These were all unfavorable impacts of the IHIE demonstration.

Overall, statistically significant cost savings results were scattered across different components and panel categories. Cost-increasing (unfavorable) results were also scattered, but more numerous (see **Table 8**) than cost savings results. The only statistically significant total expenditure result was for Panel 1, and it was an increase in costs.

Table 8
Demonstration impacts on financial outcomes—multivariate regression results for expenditure components for per capita expenditures

Demonstration effect coefficient by expenditure component[5,6]	Panel 1 [1,4]	Panel 2 [2,4]	Panel 1 and Panel 2 combined[3,4]
Total	$94*	$40	$30
Inpatient total	$43	$-113	$-20
Inpatient inpatient	$-20	$-96	$-63
Inpatient skilled nursing facility	$63***	$-17	$43**
Outpatient total	$-8	$115**	$-55
Outpatient institutional (hospital)	$-69***	$172***	$-59***
Outpatient Part B physician/supplier	$64**	$-115***	$25
Outpatient home health	$-15*	$-11	$-29***
Outpatient durable medical equipment	$-3	$15	$-5
Hospice	$14*	$55***	$12*

NOTES:

The dependent variable is Medicare annualized expenditures.

1. The regression is estimated on Panel 1 base year (BY) to performance year 2 (PY2) data (July 2008–June 2011) for intervention group (IG) and comparison group (CG) beneficiaries. The BY and PY1 dummies are omitted to avoid collinearity.
2. The regression is estimated on Panel 2 BY to PY1 data (July 2009–June 2011) for IG and CG beneficiaries.
3. The regression is estimated on overall BY to PY2 data (July 2008–June 2011) for IG and CG beneficiaries.
4. The regression is weighted by the Medicare eligibility fraction and by beneficiary propensity scores.
5. Negative coefficients indicate savings, and positive coefficients indicate dis-savings, or cost increases.
6. Statistical significance levels and coefficient standard errors are adjusted for beneficiary-level clustering. *Statistically significant at the <5% level; **Statistically significant at the <1% level; ***Statistically significant at the <0.1% level.

SOURCE: RTI International analysis of Medicare claims and enrollment data for July 2008–June 2011.

2.5 Quality

2.5.1 Quality Feedback Reports

In 2012, IHIE reported to the evaluation team that the QHF physician feedback reports had not been revised in the past year, but efforts were being made to address providers' feedback on report content and design. IHIE staff indicated that the contents would also change as new clinical quality and utilization measures were added in the future. IHIE staff said that they intended to add a separate report as specialist physicians become part of QHF.

IHIE staff indicated to the evaluation team that the quarterly quality reports are more accurate than the monthly reports, because the monthly reconciliation data and claims lag are

used in the quarterly measures. For claims data, bills are often delayed by a month or more, so complete claims data may not be available for a given performance period until several months after the period has ended.

One of the QHF participants interviewed by the evaluation team was a large physician network with more than 600 employed physicians. Of the 600 physicians, 206 were PCPs who were participating in the MHCQ demonstration. This network required all of its physicians to use Epic as their EHR system. Although the network also participated in QHF, staff reported that the quality measures provided by QHF were a subset of the quality measures that they already produced themselves separate from QHF. The network staff reported that they believed that the value in QHF was to bring together a broader range of providers, payers, and employers to agree on a common set of quality metrics and to develop a common vision for how quality would be measured. The network staff reported that without QHF, no single organization (insurance company or employer) would have enough patients to make it worthwhile for the network to follow their lead in how to measure quality.

The staff of the large physician network viewed as unfortunate that the only issue that the IHIE participating medical groups had agreed to discuss was defining metrics. The participating groups had not had any shared learning on best medical practices, such as how the practices with high quality had achieved their performance.

The large physician network staff also reported to the evaluation team that one of the challenges in working with IHIE had been QHF patient attribution. The network had spent a considerable amount of time and money trying to resolve discrepancies between their own internal data and the data they received through IHIE. For example, their internal data showed that all of their quality scores were improving, whereas the QHF data showed the opposite—that all of their quality scores were worsening. The network staff believed that patient attribution was a major part of this discrepancy, as they internally assigned patients to a PCP, using a different method from the QHF patient attribution algorithm.

The large physician network had an incentive-based compensation structure, in which up to 5 percent of a physician's compensation was based on internal quality measures. They also had 1 to 2 percent of compensation based on results from QHF. In addition, access measures calculated by the network could account for up to 4 percent of compensation. Among other things, the access measures took into account patient waiting time and weekend or evening availability. They used access measures defined by the American Medical Association.

The network staff reported during the site visit that only one payer had contracted with them to pay incentives based on results from QHF. They needed to have more payers (preferably five or more) participating in QHF-based incentive contracts with them to make QHF a more viable long-term way to track quality measures. The network also reported that they were concerned about tracking quality metrics for a lot of different groups (QHF and multiple private insurers).

2.5.2 Quality Measures Reported by IHIE for the Demonstration

IHIE indicated that in 2012 the QHF reports had 21 quality measures included. Of these, 12 were included in the MHCQ demonstration for PY3, as shown in **Table 9**. **Table 9** also

shows that only 10 quality measures were reported by IHIE for the MHCQ demonstration in PY1 and PY2, but IHIE had implemented two additional measures for PY3, including diabetes care (HbA1c ≤ 8 percent) and heart health (lipid profile for patients with chronic stable coronary artery disease).

IHIE reported meeting quality targets for 7 of the 12 measures in PY3, as shown by the positive performance numbers relative to target for 7 measures in the last column of **Table 9**. For comparison, targets were met for 6 of the 10 eligible measures in PY1 and for 5 of the 10 eligible measures for PY2. These targets were 2 percentage points improvement over prior year values for all of the measures, except for 3 measures in PY3 whose targets ranged from 0.9 to 1.5 percentage points improvement.

IHIE indicated that several factors could explain these disappointing results for quality measure performance. First, it had a slow start to the MHCQ demonstration. IHIE did not receive Medicare claims and eligibility data until the 6th month of PY1. It took time to be able to use this information in QHF quality reports, so that the first quality report issued that included Medicare patients was in the 11th month of PY1.

Second, there was some interruption in claims data received from Medicare. During PY2, the flow of claims was stopped for 4 months. When claims resumed, IHIE discovered that the format had changed. As a result, IHIE had no new claims information incorporated into its quality reports for a 6-month period. So, for the first 24 months of the demonstration, IHIE provided quality reports with timely Medicare claims data for a total of about 8 months.

Third, two quality measures had coding changes in their specifications in PY3. In addition, the new measures introduced in PY3 could take some more time to show improvement.

Nonetheless, by PY3, IHIE was meeting quality targets for only 58 percent of eligible quality measures. Moreover, IHIE had agreed in the original MHCQ demonstration protocol to implement 14 quality measures in PY1, 14 measures in PY2, and 20 measures in PY3. Thus by PY3 IHIE had still not implemented the number of quality measures originally required for PY1.

2.5.3 Multivariate Statistical Analysis of IHIE's Quality Performance

Table 10 presents the results of the multivariate statistical analysis of the impact of the IHIE demonstration on five claims-based quality-of-care measures that have also been used in other CMS demonstration projects. These claims-based measures enable the analysis to assess IHIE's quality performance in relation to the CG because quality measure performance results can also be calculated for the CG using Medicare claims data. These regression analyses use a logistic regression model because they have dependent variables that are binary (coded as 1 or 0, representing either testing done in the past year or not done in the past year). These regression analyses include control variables for HCC risk scores, age, gender, Medicaid status, Medicare eligibility status, and race. Further details on the statistical methods are included in the MHCQ Demonstration Evaluation Design Report (Trisolini et al., 2013).

The results in **Table 10** indicate that 5 of the 15 quality measure and panel group combinations showed effects that were statistically significant. Each of these significant results has an odds ratio of less than 1.0 indicating that the IHIE demonstration was associated with a

lower probability of receiving the indicated care, in comparison to the CG, for the low-density lipoprotein (LDL) testing (DM-4) measure for Panel 1 and for Panel 1 and Panel 2 combined or for the lipid profile testing (CAD-5) measure for Panel 1, Panel 2, and Panel 1 and 2 combined.

These results indicate an unfavorable impact of the IHIE demonstration on quality of care. Five statistically significant demonstration effects showed lower quality and none showed higher quality of care.

Table 9
MHCQ demonstration quality measures and IHIE quality performance in PY1, PY2, and PY3 reported by IHIE, relative to target

Quality measures (Percentage of IHIE-assigned Medicare beneficiaries meeting numerator criteria)	PY1 performance relative to target (percentage points)	PY2 performance relative to target (percentage points)	PY3 performance relative to target (percentage points)
Diabetes care: HbA1c testing	17	-0.8	1
Diabetes care: HbA1c ≤ 9%	-6	12	-0.7
Diabetes care: LDL-C screening	19	-0.2	3
Diabetes care: LDL-C controlled at < 100 mg/dl	-2	10	-9
Diabetes care: kidney disease monitored	17	-14	-8
Diabetes care: retinal exam	11	-0.6	7
Diabetes care: HbA1c ≤ 8%	NA	NA	-4
Heart health: LDL-C screening for patients with cardiovascular conditions	19	-2	1
Heart health: LDL-C controlled at < 100mg/dl for patients with cardiovascular conditions	-2	5	6
Heart health: lipid profile for patients with chronic stable coronary artery disease	NA	NA	1
Breast cancer screening	-3	0.3	-3
Colorectal cancer screening	4	2	2

NOTE: HbA1c = glycated hemoglobin; IHIE = Indiana Health Information Exchange; LDL-C = low-density lipoprotein cholesterol; MHCQ = Medicare Health Care Quality; PY = performance year.

SOURCE: RTI calculations from IHIE quality measure reports for the MHCQ demonstration.

Table 10
Demonstration impact on quality outcomes—multivariate regression results for five claims-based quality measures

Demonstration effect by quality measure[5,6]	Panel 1 [1,4]	Panel 2 [2,4]	Panel 1 and Panel 2 combined[3,4]
HbA1c testing for beneficiaries with diabetes (DM-1)	1.05	1.01	1.00
LDL testing (DM-4)	0.93**	0.95	0.94**
Urine protein testing for beneficiaries with diabetes (DM-6)	1.02	1.06	0.99
Lipid profile testing for beneficiaries with coronary artery disease (CAD-5)	0.95*	0.93**	0.96*
LVEF testing for hospitalized heart failure patients (HF-2)	1.04	0.96	1.02

NOTES:

The dependent variable for each logistic regression is a binary indicator for achieving a quality measure. DM-1 is a quality measure for glycated hemoglobin (HbA1c) testing once per year for beneficiaries with diabetes. DM-4 is a quality measure for low-density lipoprotein (LDL) testing once per year for beneficiaries with diabetes. DM-6 is a quality measure for urine protein testing once per year or for evidence of medical attention for nephropathy for beneficiaries with diabetes. CAD-5 is a quality measure for lipid profile testing once per year for beneficiaries with coronary artery disease. HF-2 is a quality measure for beneficiaries hospitalized with a principal diagnosis of heart failure during the current year who also had left ventricular ejection fraction (LVEF) testing during the current year.

1. The regression is estimated on Panel 1 base year (BY) to performance year 2 (PY2) data (July 2008–June 2011) for intervention group (IG) and comparison group (CG) beneficiaries. The BY and PY1 dummies are omitted to avoid collinearity.
2. The regression is estimated on Panel 2 BY to PY1 data (July 2009–June 2011) for IG and CG beneficiaries.
3. The regression is estimated on overall BY to PY2 data (July 2008–June 2011) for IG and CG beneficiaries.
4. The regression is weighted by the Medicare eligibility fraction and by beneficiary propensity scores.
5. Odds ratios > 1.0 indicate higher quality of care, and odds ratios < 1.0 indicate lower quality of care.
6. Statistical significance levels and odds ratio standard errors are adjusted for beneficiary-level clustering. *Statistically significant at the <5% level; **Statistically significant at the <1% level; ***Statistically significant at the <0.1% level.

SOURCE: RTI International analysis of Medicare claims and enrollment data for July 2008–June 2011.

Measures assessing utilization indicators are included in the next section. Some of these, such as readmissions, are sometimes also viewed as quality measures because they reflect the impact of quality of care on utilization.

2.6 Utilization

IHIE's original goals for this demonstration included decreasing hospitalizations and ED visits and increasing preventive care by providing comprehensive quality feedback reports to PCPs. IHIE staff indicated to the evaluation team that they believed that the QHF program affected physician behavior by causing physicians to focus more intensive care management on

selected chronic conditions and cancer screening for the Medicare population. They believed that this level of care management could affect utilization of services.

Although IHIE has been providing reports to physicians on quality measures, at the time of the site visit in November 2012 they had not yet implemented a formal utilization report for physicians or providers. They had developed some prototype utilization reports that were undergoing testing at that time. These included utilization performance measures for ED visits, readmissions, and others.

IHIE staff indicated during the site visit that they were also developing a new utilization management system for admission/discharge/transfer (A/D/T) alerts from hospitals. These would provide utilization data in real time to enable more timely clinical interventions to reduce the numbers of readmissions. This new A/D/T system was also viewed by IHIE as a benefit for marketing their services to ACOs.

IHIE staff believed that if they were to continue to assist physicians in improving care, utilization reporting and efficiency measurement also need to be available to providers. They indicated that they had been researching potential partners for these efforts.

Table 11 presents the results of the multivariate regression analysis conducted by the evaluation team for IHIE's MHCQ demonstration utilization outcomes in terms of hospital admissions, ED visits, and 30-day readmissions. These results show that the demonstration effects were statistically significant for hospital admission outcomes for all three panel groups for both the predicted number of utilization events and for the overall demonstration effect on utilization. These effects were all negative, which means hospital admissions were reduced in comparison to the CG over the same time period, and thus they represent a favorable impact of the demonstration for this utilization outcome.

The percentage changes in **Table 11**, which are associated with the effect coefficients, translate the coefficients from the nonlinear statistical models into estimated percentage effect sizes. The estimated percentage effects on the number of hospitalizations for IHIE beneficiaries who had at least one hospitalization showed reductions across all three of the panels ranging from 1.65 percent to 3.65 percent.

Table 11
Demonstration impacts on utilization outcomes—summary of effects for hospital admissions, emergency department visits, and 30-day readmissions

Type of analysis	Hospital admissions Panel 1	Hospital admissions Panel 2	Hospital admissions Panel 1 and Panel 2 combined	Emergency department visits Panel 1	Emergency department visits Panel 2	Emergency department visits Panel 1 and Panel 2 combined	30-day readmissions Panel 1	30-day readmissions Panel 2	30-day readmissions Panel 1 and Panel 2 combined
Predicted probability of a utilization event occurring[1]	0.0019	-0.0015	0.0021	-0.0046**	-0.0026	-0.0029	-0.0007577	-0.0103	-0.0012
Predicted number of utilization events[2]	-0.0262**	-0.0299**	-0.0240**	-0.0232*	-0.0065	-0.0207**	-0.0338**	-0.0467**	-0.0360**
Overall demonstration effect on utilization[3]	-0.0100**	-0.0175**	-0.0086**	-0.0211**	-0.0077	-0.0167**	-0.0102*	-0.0266**	-0.0113*
Percent change in predicted probability of utilization event occurring	0.81%	-0.63%	0.89%	-1.23%	-0.68%	-0.77%	-0.50%	-6.93%	-0.78%
Percent change in predicted number of utilization events	-1.80%	-2.04%	-1.65%	-1.23%	-0.34%	-1.10%	-2.59%	-3.63%	-2.76%
Percent change from overall demonstration effect on utilization	-2.22%	-3.65%	-1.92%	-2.36%	-0.85%	-1.87%	-4.38%	-11.47%	-4.88%

NOTES:
*Statistically significant at the <5% level; **Statistically significant at the <1% level; ***Statistically significant at the <0.1% level.

1. Logit regression models were used to calculate the predicted probability of utilization binary events (yes/no event) occurring, such as whether or not a beneficiary had at least one hospital admission per year.
2. Negative binomial regression models were used to predict the number of times a utilization event occurs. These models, which were estimated on beneficiaries who had at least one occurrence of the utilization event (such as beneficiaries with at least one hospital admission), predict the number of admissions among beneficiaries who had at least one admission.
3. Combined hurdle regression models were used to analyze the joint effects of two separate processes generating the utilization outcomes. These include one process generating whether or not a beneficiary experienced an event or not, whereas the other process generates the number of events the beneficiary experiences given that the beneficiary had at least one event. The combined hurdle models combine the information from the logit models and from the negative binomial models and calculate the overall effect of the demonstration on the utilization outcomes.

SOURCE: RTI International analysis of Medicare claims and enrollment data for July 2008–June 2011.

These results can be compared to **Table 8**, where some cost savings were estimated for the demonstration impact on the inpatient expenditures component, but those results were not statistically significant. As a result, it seems that the utilization results presented in **Table 11** were favorable in terms of reducing hospital admissions, but the reduction was not large enough to generate overall savings for inpatient expenditures that were statistically significant.

Table 11 also shows statistically significant reductions, compared to the CG, in ED visits for Panel 1 across all three analyses and for Panel 1 and 2 combined for the predicted number of ED events for those with at least one ED event and for the overall effect of the demonstration on ED utilization. These were also favorable effects of the demonstration. The estimated percentage reductions ranged from 1.1 percent to 2.4 percent.

In addition, **Table 11** shows statistically significant reductions, compared to the CG, in 30-day readmissions for all three panel groups. These were also favorable effects of the demonstration. The estimated percentage reductions ranged from 0.5 percent to 11.5 percent. The reductions were higher for Panel 2, indicating that the physicians treating those beneficiaries were more successful in preventing readmissions. Panel 2 had a large number of specialist physicians, so this could be a factor that enabled the larger reductions to be achieved.

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SECTION 3
CONCLUSIONS: LESSONS LEARNED AND IMPLICATIONS FOR FUTURE PROGRAMS

A variety of lessons learned and implications for Medicare can be gleaned from the results of the IHIE MHCQ demonstration in its first two performance years. These lessons are drawn from the results of the multivariate statistical analyses of the IHIE demonstration's impact on cost, quality, and utilization outcomes and the results of qualitative assessments and descriptive statistics regarding the structure and processes of IHIE's interventions.

The quantitative analysis of IHIE demonstration impacts showed mixed results. These multivariate analyses were all conducted in comparison to performance by the CG on the same outcomes and controlling statistically for other factors that could affect the outcomes. The cost impacts of the demonstration were mostly increases in costs to Medicare or not statistically significant. The only significant effect found for overall expenditures was an increase in costs for Panel 1. The sensitivity test using a plurality assignment algorithm for IHIE beneficiaries, in contrast to the one-touch assignment algorithm used in the IHIE demonstration, also showed a significant increase in costs, another unfavorable effect that included both Panel 1 and Panel 2 beneficiaries.

The multivariate analysis of costs by beneficiary subgroups showed statistically significant effects for only 3 of 45 subgroup and panel combinations analyzed, and they all showed cost-increasing effects. These subgroups included beneficiaries with cancer (Panel 2 only), vascular disease (Panel 2 only), and some inpatient expenditures (Panel 1 only).

The multivariate analysis of costs by expenditure components showed more statistically significant effects, including 13 of 27 expenditure component and panel combinations analyzed, but 8 of the 13 significant effects were cost increases. The 8 expenditure component and panel combinations showing significant cost increases included inpatient skilled nursing facility (Panel 1 and Panel 1 and 2 combined), outpatient total (Panel 2 only), outpatient institutional (hospital) (Panel 2 only), outpatient Part B physician/supplier (Panel 1 only), and hospice (Panel 1, Panel 2, and Panel 1 and 2 combined). The 5 expenditure component and panel combinations showing statistically significant cost decreases included outpatient institutional (hospital) (Panel 1 and Panel 1 and 2 combined), outpatient Part B physician/supplier (Panel 2 only), and outpatient home health (Panel 1 and Panel 1 and 2 combined).

The multivariate analysis of quality impacts of the IHIE demonstration, in comparison to the CG quality performance, found statistically significant and unfavorable (lower quality) impacts on two of the claims-based quality measures included in this analysis and no significant impacts on three other quality measures. The quality measures with significant and unfavorable effects included annual LDL testing for beneficiaries with diabetes and annual lipid profile testing for beneficiaries with coronary artery disease.

IHIE's internal quality measures for the MHCQ demonstration, which were assessed against targets agreed upon with CMS and not against a CG, showed only limited improvement. Even with modest targets in PY1, PY2, and PY3—2 percentage points' improvement over prior-year values for all of the measures, except for three measures in PY3 whose targets were lower

and ranged from 0.9 to 1.5 percentage points' improvement—IHIE was not able to meet the target for many measures and was not able to implement all of the measures originally planned. IHIE reported meeting quality targets for 6 of the 10 eligible quality measures in PY1, for 5 of the 10 eligible measures for PY2, and for 7 of the 12 eligible measures in PY3. Thus, by PY3 IHIE was still meeting quality targets for only 58 percent of eligible quality measures. Moreover, IHIE had agreed in the original MHCQ demonstration protocol to implement 14 quality measures in PY1, 14 measures in PY2, and 20 measures in PY3. Thus, by PY3 IHIE had still not implemented the number of quality measures originally required for PY1.

The multivariate analysis of utilization impacts of the IHIE demonstration, in comparison to CG performance, found statistically significant impacts for three utilization measures. Hospital admissions (all three panels), ED visits (Panel 1 and Panel 1 and 2 combined), and 30-day readmissions (all three panels) all had significantly lower utilization. However, the magnitude of these reductions was not sufficient to result in overall cost savings for the IHIE demonstration, as noted. In addition, the cost savings impacts of reduced utilization for these types of health care services was offset by cost increases for other types of services, such as skilled nursing facilities.

In sum, the lessons learned from the multivariate analysis of IHIE MHCQ demonstration are:

- The IHIE intervention has not shown any cost-savings impacts. The overall cost impact of the IHIE demonstration over the first two performance years was not statistically significant and thus cannot be assumed to be different from $0. Disaggregating the results by panel, beneficiary subgroup, and expenditure component indicated more cost-increasing effects than cost-reducing effects.

- The quality results are surprisingly mixed, since quality feedback reports were the centerpiece of the IHIE MHCQ demonstration intervention. The multivariate analysis showed lower-quality results in comparison to the CG, and IHIE's internal quality measures did not reach the modest IHIE demonstration improvement targets for almost half of the measures. In sum, these quality results indicate that this type of HIE intervention, attempting to bring together multiple payers and providers who are otherwise fierce competitors, may not be effective in terms of either implementing joint efforts for quality measurement or producing improved quality performance.

- The multivariate analysis of utilization impacts of the IHIE demonstration, in comparison to the CG quality performance, found significant reductions in utilization for hospital admissions, ED visits, and 30-day readmissions. However, any cost savings impacts of reduced utilization for these types of health care services was offset by cost increases for other types of services, such as skilled nursing facilities.

Qualitative analysis and descriptive statistics also provide a number of lessons learned and implications for future programs. A major issue was the exit of many physicians from the MHCQ demonstration in PY3, when several large physician groups left the demonstration to join ACOs. Because CMS required that medical groups not be in two different Medicare shared savings programs at the same time (e.g., in both the MHCQ demonstration and in an ACO), the

groups had to choose one or the other. The lack of financial incentive payments to date in the MHCQ demonstration was one factor in this decision, but physician groups also viewed the demonstration as too limited in focusing only on the nine-county Indianapolis region. ACOs were able to define larger and more flexible service areas. Notably, those physicians remained in IHIE's QHF program even while leaving the MHCQ demonstration because of QHF's continuing involvement with private payers that did not include geographic restrictions.

In addition, large physician groups and IPAs found the QHF quality reports less useful and less timely than the internal reports they developed using their in-house EHRs. Their internal data systems enabled more rapid access to data for clinical interventions that required day-to-day decision making by providers. As more providers join ACOs, the prevalence of stronger internal data systems is likely to increase, and the future role of external data systems such as QHF may become less important.

On the positive side, providers indicated that they viewed the QHF quality reports as a fair and honest reflection of the care they provide. IHIE worked to ensure that they provided doctors with timely, accurate data; opportunities to correct data errors through the reconciliation process; and data reports that covered all of a doctor's patients, not just patients from one payer. Both providers and IHIE staff indicated that the ability to add Medicare claims data to the QHF reports was a benefit for the development of IHIE and QHF because Medicare patients are a large part of most physicians' practices. Without Medicare data, the QHF reports would have been unable to provide comprehensive quality information covering the complete range of a provider's patients.

These results from the MHCQ demonstration indicate that HIEs that bring multiple and competing providers and payers together may not be effective for pay-for-performance programs such as MHCQ. However, they may continue to be useful for public reporting. The internal IHIE processes took a long time to develop consensus among stakeholders and to develop data systems for implementing new quality measures, and the impact of the QHF quality measure reports on quality outcomes was limited. It may be that multi-provider and multi-payer HIEs are better suited for public reporting and public accountability programs, as IHIE has implemented with both community-wide and practice site-specific quality data publicly reported on the IHIE Web site. These public reporting systems provide community accountability for providers without requiring the rapid data feedback to providers across multiple quality measures for clinical interventions as was provided for the large physician groups by their internal data systems. The broad stakeholder trust that IHIE has built up enables their reports to be the focal point for public reporting of quality results that merge data from competing payers and providers.

CMS should continue to participate in these public reporting efforts by HIEs, as the public reports should include data from all payers and all providers serving patients in a community to provide comprehensive public reports on the quality of care for a community.

In implementing the MHCQ demonstration, IHIE identified a number of challenges that should also be considered in designing future CMS programs. These included disagreements with CMS on how patients should be attributed to providers, due to ambiguities in the demonstration protocol document developed at the outset. Experience with beneficiary

attribution in this MHCQ demonstration should enable improved clarity in attribution algorithms for providers in future programs. Another issue was that the nine-county geographic region of the MHCQ demonstration was found to be too limited to retain large physician groups in the demonstration when options for joining ACOs with larger geographic coverage became available.

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