# FIFTH REPORT TO CONGRESS ON THE EVALUATION OF THE MEDICARE COORDINATED CARE DEMONSTRATION: FINDINGS OVER 10 YEARS

## REPORT TO CONGRESS

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**Secretary of Health and Human Services**
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## ACKNOWLEDGMENTS

The Secretary's Report on the Evaluation of the Medicare Coordinated Care Demonstration is based on analysis by Mathematica Policy Research.

## CONTENTS

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## TABLES

## EXECUTIVE SUMMARY

Chronic illnesses, such as heart disease and diabetes, generate significant expense for the Medicare program and can be a major detriment to beneficiaries' quality of life. In 2010, the 37 percent of Medicare beneficiaries treated for four or more chronic conditions accounted for 74 percent of all Medicare expenditures. These high Medicare expenditures are driven primarily by hospital admissions and readmissions. Interventions to address chronically ill patients' barriers to better health could reduce hospitalizations and thereby decrease Medicare expenditures. Improvements would be expected if (1) patients received medical care that is more consistent with recommended standards; (2) patients adhered more rigorously to recommended diet, medication, exercise, and self-care regimens; (3) providers communicated more effectively with each other and with their patients; (4) patients' health problems were identified and addressed in a more timely way; and (5) patients received recommended care when transitioning from hospital to home. Several small, single-center trials designed to improve care coordination have improved outcomes and reduced health care utilization, but few large, rigorously designed studies of such interventions have been conducted to date. Further, the literature shows mixed effects of such programs on health outcomes and cost.

**The Medicare Coordinated Care Demonstration.** To determine whether care coordination improves quality of care and reduces Medicare expenditures, Section 4016 of the Balanced Budget Act of 1997 (BBA) (Public Law 105-33) mandated, among other things, that the Secretary of the U.S. Department of Health and Human Services (DHHS) conduct demonstration projects for the purpose of evaluating methods, such as case management and other models of coordinated care, that (1) improve the quality of items and services provided to target individuals (an individual who has a chronic illness as defined and identified by the Secretary and is enrolled under the fee-for-service program under Parts A and B of Title 18 of the Social Security Act (the Act) and (2) reduce expenditures under the Medicare program under Title 18 of the Act for services provided to target individuals. The BBA authorized the Secretary of DHHS to permanently implement certain components of the demonstration if a report under Section 4016(c) of the BBA contains an evaluation as described in Section 4016(b)(3)(A) that the demonstration projects (1) reduce Medicare expenditures or (2) increase the quality of health care services provided to target individuals and satisfaction of beneficiaries and health care providers without increasing Medicare expenditures. Total expenditures under the demonstration include Medicare payments for the regular Medicare-covered Part A and B services that enrollees used as well as the additional care coordination fees that the Centers for Medicare & Medicaid Services (CMS) paid the demonstration programs. The BBA also requires the Secretary of DHHS to submit reports to Congress describing the programs and their effectiveness, as outlined in the statute.

In 2001, CMS selected 15 demonstration programs for the Medicare Coordinated Care Demonstration (MCCD), each with its own intervention and target population of Medicare beneficiaries with chronic illnesses. CMS paid each program a monthly fee for each beneficiary they served to finance the intervention activities.[1] The MCCD has progressed in two phases.

[1] Section 4016(d) of the BBA provided waiver authority and Section 4016(e) of the BBA provided funding authority for the demonstration projects.

The first phase, from 2002 to 2010, tested each of the 15 original programs. The programs ran for varying lengths of time (from four to eight years) depending on whether they received extensions to the initial four-year period to test their model further. One program, Mercy Medical Center, substantially reduced hospitalizations over its first four years of operations but, with high monthly program fees, increased total expenditures to Medicare. In 2008, CMS extended Mercy's program through 2010 but reduced its fees by 45 percent to increase the chances that it would generate net savings to Medicare. Mercy's program concluded in 2010.

The demonstration's second phase began in October 2010 when CMS extended the sole remaining program, Health Quality Partners (HQP), through June 2013 but revised the target population based on the evaluation findings from the first phase. Although the HQP program increased total Medicare expenditures among all of its enrollees over the first 6.5 years of operations, it generated a net savings of an estimated $397 per beneficiary per month for a subgroup of patients who were at greater risk of hospitalization and high costs. This high-risk subgroup had coronary artery disease (CAD), congestive heart failure (CHF), or chronic obstructive pulmonary disease (COPD) and one or more hospitalizations in the year before enrollment and comprised 14 percent of HQP's total enrollment. Further, an additional 28 percent of enrollees had CAD but no hospitalization in the year before enrollment (the CAD-only population). For the CAD-only population, the program reduced two-year mortality rates but did not measurably reduce hospitalizations. In the second phase of the demonstration, the Medicare Coordinated Care Demonstration-Phase Two (MCCD2), CMS limited enrollment to patients who met either the high-risk[2] or CAD-only definition (in this report, the population that remained eligible in the second phase of the demonstration is referred to as the MCCD2 population). HQP continued to serve treatment-group patients who were already enrolled and met the new eligibility criteria when they enrolled or at the start of the extension in 2010 and also enrolled new patients who met the new eligibility criteria. In the second phase, HQP could also expand into new service areas to test the replicability of the results with a more racially and socioeconomically diverse population than originally served. In June 2013, CMS extended HQP again through December 2014 to allow for a more complete evaluation of program effects for the MCCD2 population.

**Report objectives.** We set forth two objectives with this report. First, we provide final estimates of program impacts for Mercy through its full 8 years of operations (2002–2010). The most recent Report to Congress (Schore et al. 2011) covers impacts through 6.5 years of operations (from April 2002 to September 2008).[3] Second, we describe HQP's impacts for its new target population (the MCCD2 population) over 10 years of operations (the full period, 2002–2012) and during the 21 months following the October 2010 extension (the MCCD2

[2] For the October 2010 extension, CMS expanded the high-risk definition to include patients with diabetes and a hospitalization in the year before enrollment. Only a small number of new patients met the high-risk definition based on the new criteria; most patients with diabetes already met the earlier definition because they also had CAD, CHF, or COPD. Patients with diabetes and a recent hospitalization were included in the high-risk definition because (1) HQP administrators believed that they helped these patients and (2) the estimates of program effects were very similar with and without these patients in the research sample.

[3] An earlier version of the Fifth Report to Congress was completed previously. However, as part of the CMS process of reviewing and approving the request to extend the second phase of the MCCD, it was determined that the Report to Congress should include more information on the second phase, thereby delaying the current report.

period, 2010–2012).[4] Earlier evaluation reports describe the impacts of the other 13 programs that participated in the MCCD but ended after 4 or 6 years of operation (Brown et al. 2007; Peikes et al. 2008).

**Findings for Mercy Medical Center.** Mercy enrolled 1,392 patients from April 2002 through March 2009.[5] Over its eight years of operations (2002–2010), the program reduced hospitalizations by 10 percent for these patients but did not produce a statistically significant reduction in Medicare Part A and B expenditures. As a result, after accounting for program fees that averaged $203 per beneficiary per month (PBPM), the program increased total Medicare expenditures by an estimated 10 percent, or $146 PBPM. The findings were modestly more favorable for the 75 percent of patients at higher risk of hospitalization at the time of randomization because of diagnoses of heart failure, coronary artery disease, or chronic obstructive pulmonary disease and one or more hospitalizations in the year before enrollment. For this high-risk group, Mercy reduced hospitalizations by 14 percent. Furthermore, the treatment group's average Medicare Part A and B expenditures PBPM were $145 lower than the control group's expenditures, but the difference is not statistically significant ($p = 0.17$). The average monthly program fee paid over the period for these high-risk patients ($198 PBPM) exceeded the estimated savings in traditional Medicare expenditures.[6] Therefore, to have achieved cost neutrality for this high-risk group, Mercy would have had to cut its fee significantly (while maintaining the same level of effectiveness) or improve its effectiveness.

**Findings for Health Quality Partners for the MCCD2 population.** From April 2002 through June 2011, HQP enrolled 1,016 patients (treatment and control) who met the new eligibility criteria when they enrolled.[7] Over 10 years of operations (2002–2012), the program reduced hospitalizations for those patients included in the treatment group by 17 percent and Medicare Part A and B expenditures by $129 PBPM, an amount sufficient to offset fully the program fees paid for the MCCD2 population, which averaged $108 PBPM. Therefore, the program was budget-neutral to Medicare with respect to the MCCD2 population over the full 10

[4] In addition, Appendix B describes results for HQP over the first phase of the demonstration (2002–2010) for *all* enrollees who met HQP's original target criteria as well as for the high-risk subgroup. The results are similar to those presented in Schore et al. (2011) and, for the high-risk subgroup, similar to the results presented in the main body of this report.

[5] In this report, "enrollees" are beneficiaries who enrolled in the study and were assigned either to the treatment or control group.

[6] The mean fee CMS paid for Mercy's high-risk enrollees is $5 lower PBPM than the mean fee CMS paid for all of Mercy's enrollees ($198 versus $203) for two possible reasons. First, the high-risk beneficiaries may have enrolleed slightly later, on average, than other enrollees, leading to a slightly larger share of their follow-up period falling in the 2008–2010 period, when the negotiated fee was $147 PBPM rather than the higher 2002–2008 rate of $269. Second, the high-risk enrollees may have received care coordination services for a slightly smaller portion of their follow-up period than all enrollees. CMS only paid Mercy the negotiated fees in months that enrollees remained in the program.

[7] This sample definition excludes the 330 patients whom HQP continued to serve after the October 2010 extension because they met the new eligibility criteria at the time of the extension but not when they enrolled. We excluded these beneficiaries out of concern that defining the research sample based on patient characteristics after the start of the intervention could bias the impact estimates. Sensitivity analyses that included the 330 patients in the impact analyses found essentially the same results as those reported here.

years. However, we note that for 8 of the 10 years, HQP was paid to treat a broader population. It is unknown what share of the overall payments HQP expended on the MCCD2 population to generate the savings identified here.

The effects were concentrated almost entirely among the 410 patients in the high-risk subgroup. For these patients, the program reduced hospitalizations by 25 percent and Medicare Part A and B expenditures by $291 PBPM. Even though the Medicare Part A and B savings were greater than the program fees that averaged $139 PBPM, the statistical uncertainty in the savings estimate makes it impossible to conclude with certainty that the program generated net savings to Medicare for the high-risk subgroup. In addition to the favorable effects on service use and costs, the program reduced two- and five-year mortality rates by 31 to 43 percent for the MCCD2 population and its two subgroups. The program also reduced emergency department visits by 28 percent for the high-risk subgroup and increased from 71 to 78 percent the share of CAD patients who consistently received recommended cholesterol testing each year.

In contrast to these favorable findings over 10 years, HQP did not measurably affect hospitalizations or Medicare Part A and B expenditures during the first 21 months after the October 2010 extension (the MCCD2 period). The lack of measured effects may be a function of low statistical power to detect effects (given smaller sample sizes and the shorter duration of the study period). However, the program may also have become less effective as a result of either administrative barriers to implementation caused by the program's near termination in October 2010 or caseloads for the nurse care coordinators that were too high to meet the needs of the MCCD2 population.

For two reasons, we believe that the 10-year estimates provide a more reliable picture of the program's overall effects on care quality, service use, and Medicare costs for the MCCD2 population than the 21-month estimates. First, the program was often implemented as intended over the full 10 years, whereas it was not fully implemented as intended for much of the MCCD2 period (as explained later in this report). Second, the longer time period increases the statistical power to detect effects.

The continuation of HQP through December 2014—with its new enrollment and longer outcome period—should help clarify the effects of the care coordination intervention during the MCCD2 period. However, the program's near termination in June 2013 disrupted program implementation, potentially undermining program effects. Nonetheless, if the program generates favorable results despite disruptions, the findings would provide strong confirmation of the robustness of HQP's model.

**Program features associated with reducing hospitalizations.** Several features appear to distinguish HQP and Mercy from other MCCD programs that were unable to reduce hospitalizations among high-risk patients. The features of HQP and Mercy and two other MCCD programs that reduced hospitalizations were compared with seven other former MCCD programs with substantial enrollment that were still in operation in 2008 but did not reduce hospitalizations. Representatives of the successful programs all agreed that reliance on highly educated and experienced registered nurses to provide the appropriate interventions to the right people appears to be one key—but not the only key—to reducing hospitalizations. Some less successful programs used similar staff as care coordinators. The successful programs, however, were much more likely than the unsuccessful programs to provide (1) frequent face-to-face contact with patients to build rapport; (2) opportunities for face-to-face contact with a patient's

physician; (3) strong patient education rooted in behavioral change theory; (4) comprehensive management of care setting transitions; (5) care coordinators serving as a communications hub among providers and between patient and providers; and (6) comprehensive medication management. These lessons on the elements of effective care coordination can guide CMS's current initiatives that rely on care coordination for high-risk patients to help achieve the triple aim of improved care for patients, improved population health, and reduced expenditures. However, the findings from MCCD also suggest that generating substantial net savings to Medicare will require either modest fees or greater effectiveness in reducing hospital stays than seen in the MCCD—or both.

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# I. BACKGROUND

Chronic illnesses, such as heart disease and diabetes, generate significant expense for the Medicare program and can be a major detriment to beneficiaries' quality of life. In 2010, the 37 percent of Medicare beneficiaries treated for four or more chronic conditions accounted for 74 percent of all Medicare expenditures (Centers for Medicare & Medicaid Services 2012). In addition, the 10 most expensive disease categories among Medicare beneficiaries in 2006 accounted for about half the inflation-adjusted rise in Medicare spending over the two decades since 1987 (Thorpe et al. 2010). These high Medicare expenditures are driven primarily by hospital admissions and readmissions (Medicare Payment Advisory Commission 2008), some of which could potentially be prevented with improved patient self-management and clinical care.

Several factors appear to contribute to the higher-than-necessary rate of hospitalizations. Chronically ill patients may have received inadequate counseling on diet, medication, and self-care or may experience difficulty in adhering to such regimens (Castro et al. 2007; Kripalani et al. 2008; Makaryus and Friedman 2005; Maniaci et al. 2008; Stewart and Pearson 1999; Subramanian et al. 2008; Bodenheimer et al. 2002), leading to acute exacerbations of their conditions (Ho et al. 2008; Koelling et al. 2005; Powell et al. 2007; Powell et al. 2008; Tsuyuki et al. 2001; Williams et al. 2004). Patients may lack the knowledge to recognize early signs of deterioration in their conditions or the skills to respond to such signs, and some may not have ready access to medical care other than in hospital emergency rooms (Powell et al. 2007; Powell et al. 2008; Coleman et al. 2006). Physicians may be unaware of patients' deficits in knowledge and skills or of patients' other barriers to adherence (Alexander et al. 2003; Bell et al. 2001; Stewart 1995). Furthermore, the care that Medicare beneficiaries receive for chronic illnesses is often of uneven and poor quality (Asch et al. 2006; Leatherman and McCarthy 2005; Jencks et al. 2003). Coordinating care for these patients is difficult because chronically ill Medicare beneficiaries often see several physicians, and no one physician is responsible for overall care (Pham et al. 2007). In addition, the fee-for-service system has not separately reimbursed physicians for coordinating care.[8]

Studies have suggested that interventions to address the barriers faced by chronically ill patients could reduce hospitalizations and thereby decrease Medicare expenditures, but compelling evidence to support the adoption of these interventions by the Medicare fee-for-service program is limited. Improvements would be expected if (1) patients received medical care that is more consistent with recommended standards (Institute of Medicine 2001; Shojania et al. 2004; Jencks et al. 2003); (2) patients adhered more rigorously to recommended diet, medication, exercise, and self-care regimens (Bodenheimer et al. 2002); (3) providers communicated better with each other and their patients (Coleman and Berenson 2004; Stille et al. 2005); (4) patients' health problems were identified and addressed in a more timely way (Powell et al. 2007; Powell et al. 2008); and (5) patients received recommended care when transitioning from the hospital to their homes (Naylor et al. 2011). A number of small, single-center trials designed to improve care coordination, including some narrowly focused on transitional care,

[8] Although CMS does not separately reimburse physicians for coordinating care, CMS has increased reimbursement under the physician fee schedule for certain new codes that include an evaluation and management (E/M) service plus care coordination after a hospital discharge.

have improved outcomes and reduced health care utilization for patients with chronic illnesses (Lorig et al. 1999; Stewart et al. 1999; Clark et al. 2005; McAlister et al. 2004; Counsell et al. 2007, 2009; Dorr et al. 2008; Jack et al. 2009; Naylor et al. 2004; Rich et al. 1995; Coleman et al. 2006). However, only a few large, rigorously designed investigations have studied such interventions, and the literature shows mixed effects of such programs on health outcomes and cost (Brown et al. 2011; McCall et al. 2011; Boult et al. 2011; Mattke et al. 2007; Gravelle et al. 2007; Smith et al. 2005; DeBusk et al. 2004; Galbreath et al. 2004; Congressional Budget Office 2004). Therefore, little evidence supports the claims of vendors of disease management services that care coordination definitively reduces hospitalizations and costs.

Against this backdrop, CMS has conducted rigorous evaluations of several large-scale programs of coordinated care. In addition to the MCCD, the subject of this report, CMS has implemented and evaluated the Medicare, Medicaid, and SCHIP Benefits Improvement and Protection Act of 2000 Demonstration Project for Disease Management for Severely Ill Medicare Beneficiaries, the Informatics for Diabetes Education and Telemedicine Demonstration, and the Medicare Health Support pilot program, among others. Most of these larger-scale programs have not been found to be cost-neutral or to have reduced hospitalizations, yet they have largely tested care coordination interventions predominantly delivered remotely by telephone, leaving open the question of whether programs with more in-person contacts and stronger interventions could be more effective and for which types of patients (Bott et al. 2009; Brown et al. 2012; Peikes et al. 2012; Nelson 2012).

## II. THE MEDICARE COORDINATED CARE DEMONSTRATION

To determine whether care coordination improves quality of care and reduces Medicare expenditures, the Balanced Budget Act of 1997 (BBA) (Public Law 105-33) mandated that the Secretary of the U.S. Department of Health and Human Services (DHHS) conduct demonstration projects for the purpose of evaluating methods, such as case management and other models of coordinated care, that (1) improve the quality of items and services provided to target individuals (an individual who has a chronic illness as defined and identified by the Secretary and is enrolled under the fee-for-service program under Parts A and B of Title 18 of the Social Security Act (the Act) and (2) reduce expenditures under the Medicare program under Title 18 of the Act for services provided to target individuals. Section 4016(b)(3)(B) of the BBA authorized the Secretary of DHHS to permanently implement certain components of the Medicare Coordinated Care Demonstration if a report to Congress under Section 4016(c) of the BBA contains an evaluation, as described in Section 4016(b)(3)(A), showing that the demonstration projects (1) reduce Medicare expenditures or (2) increase the "quality of health care services provided to target individuals and satisfaction of beneficiaries and health care providers" without increasing Medicare expenditures. In early 2001, CMS selected 15 demonstration programs out of 58 applicants for the Medicare Coordinated Care Demonstration (MCCD) in a competitive awards process under which each program was allowed to define, within broad boundaries, its own intervention and target population of Medicare beneficiaries with chronic illnesses. CMS paid each program a monthly fee for each beneficiary they served to finance the intervention activities. The fees, which varied by program based on pre-startup negotiations, depended on the program's expected costs, the expected Medicare expenditures of the population it targeted, and the percentage savings in Part A and B expenditures that would be required to make the program budget neutral. Each program began enrolling patients between April and September 2002 and was authorized to operate for four years. Eleven of the 15 programs later requested and were granted two-year extensions and continued operating into 2008.

To date, evaluation findings for the MCCD have shown that a small number of programs have been effective for select patients. The main evaluation of the original MCCD culminated in the Third Report to Congress, which presented estimates of program effects from demonstration start-up in 2002 through the initial demonstration period, ending in 2006 (Peikes et al. 2008, 2009a).[9] Over this period, most programs increased total Medicare expenditures or likely increased expenditures after factoring in the fees that CMS paid the program each month. However, CMS extended the Health Quality Partners (HQP) and Mercy Medical Center-North Iowa (Mercy) programs through 2010.[10] HQP appeared to have been cost-neutral to Medicare, and Mercy may have demonstrated cost neutrality if it had received a lower fee. In the extension, CMS reduced Mercy's fees from $269 to $147 per beneficiary per month (PBPM), with $113 paid to the program and $34 withheld but subsequently paid if savings exceeded the $113 fee paid. Facing lower fees, Mercy increased caseloads and reduced in-person contacts. Mercy's program ended in March 2010. The Fourth Report to Congress, which examined effects

[9] The first three reports to Congress and related publications are at http://www.mathematica-mpr.com/health/coordinatedcarereports.asp (accessed November 1, 2013).

[10] One other program, QMed, was offered continuation through 2010 but closed in summer 2008, along with its host organization, a disease management provider.

from 2002 to 2008, found that neither the Mercy nor HQP program met CMS's objectives of cost neutrality or net savings for all of its enrollees but that the effects were more favorable for a subgroup of enrollees at greater risk of hospitalization and high costs (Schore et al. 2011).[11] The subgroup included patients who, in addition to meeting the respective programs' eligibility criteria, had congestive heart failure (CHF), coronary artery disease (CAD), or chronic obstructive pulmonary disease (COPD) and had at least one hospitalization in the year before enrollment. For this high-risk group, Mercy reduced hospitalizations by 18 percent and generated Medicare Part A and B savings that would have covered the revised fee it received in its subsequent two years of operations (2008–2010), although the savings were not great enough to cover the higher fees Mercy received over the period the report covered. HQP reduced hospitalizations by 39 percent and reduced Medicare expenditures (including program fees) by 28 percent, or $397 PBPM. Further, additional analyses that guided CMS in its extension decisions found that HQP substantially reduced two-year mortality rates for the subset of patients with CAD but who had *not* been hospitalized the year before enrollment. However, HQP did not measurably reduce hospitalizations or Medicare Part A and B expenditures for this CAD-only subgroup.

In October 2010, CMS started a new a phase of MCCD by extending the HQP program through June 2013 for a revised model based on the earlier evaluation results. CMS made three changes for the extension period, which we term the MCCD2 period. First, it restricted eligibility to patients who, at the time of enrollment or the 2010 extension, had (1) CAD but no hospitalization in the previous year (CAD-only beneficiaries) or (2) CAD, CHF, COPD, or diabetes and one or more hospitalizations in the previous year (high-risk beneficiaries).[12] HQP could enroll new patients who met these criteria and continue to serve treatment group patients who met the criteria at either initial enrollment or the start of the extension. Second, CMS revised the program fees, which had been $110 or $130 PBPM depending on patient severity (and $50 for beneficiaries who had enrolled earlier in the demonstration and were classified as lower risk). The fees were changed to $83 PBPM for the CAD-only beneficiaries and to $281 PBPM for those meeting the high-risk definition (with an earlier hospitalization). Third, CMS authorized HQP to expand into new market areas to test whether HQP's model would succeed in more economically, racially, and ethnically diverse areas than HQP's original service area in suburban eastern Pennsylvania. In June 2013, CMS granted HQP another extension until December 2014 for a more complete evaluation of its model for the MCCD2 population.

We have organized this report around two objectives. First, we provide final estimates of program impacts for Mercy through its full 8 years of operations (the most recent report to Congress by Schore et al. in 2011 covers impacts through 6.5 years of operations). Given that the results in this report are similar to those previously reported and in view of Mercy's closing,

[11] See http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/Schore_Fourth_Eval_MCCD_March_2011.pdf (accessed November 1, 2013).

[12] Only a small number of patients met the MCCD2 eligibility criteria because they had diabetes but did *not* have one of the other qualifying diagnoses. These patients were not part of the original high-risk subgroup for which the Fourth Report to Congress found large effects (Schore et al. 2011), but they were included in the eligibility criteria because (1) HQP administrators believed that HQP helped these patients and (2) estimates of program impacts were similar with and without this small number of beneficiaries in the research sample.

the discussion of Mercy's results is brief. Second, the report describes HQP's impacts for its new target population (the MCCD2 population) over 10 years of operations (the full period) and during the first 21 months of the MCCD2 period. In addition, in Appendix B, we describe results for HQP over the first 8 years of operations for *all* enrollees who met HQP's original eligibility criteria, including beneficiaries at lower risk of hospitalization than those in the MCCD2 population. Those findings add 1.5 more years to the follow-up than previously reported (Schore et al. 2011) and therefore increase the estimates' statistical precision. However, the results are highly similar. In Table II.1, we show the populations and outcome periods covered in each section of the report.

**Table II.1. Populations and Outcome Periods Covered in Different Sections of the Report**

| Report Section | Program | Population | Outcome Period |
|---|---|---|---|
| IV | Mercy | **All enrollees** | **Full period:** 8 years of program operations (2002–2010) |
| V | HQP | **MCCD2 population:** Enrollees meeting the new eligibility criteria established in the October 2010 extension and comprising two subgroups:<br>**High-risk:** Enrollees with CAD, CHF, COPD, or diabetes and one or more hospitalizations in the year before enrollment (under extension, CMS pays $281 PBPM)<br>**CAD-only:** Enrollees with CAD but no hospitalization in the year before enrollment (under extension, CMS pays $83 PBPM) | **Full period:**[a] 10 years of program operations (2002–2012)<br>**MCCD2 period:** 21 months following the start of the October 2010 extension (2010–2012) |
| Appendix B | HQP | **All enrollees** | **MCCD1 period:** 8 years before the start of the October 2010 extension (2002–2010) |

[a]HQP is still operating and is scheduled to end in December 2014. The end of the outcome period for the report is June 2012 because that is the most recent date for which full claims data are available.

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## III. EVALUATION DESIGN

The evaluation uses the most rigorous design possible—a randomized controlled trial and an intent-to-treat design. Both the treatment and control groups continue to obtain their traditional Medicare-covered services from fee-for-service providers; patients randomly assigned to the treatment group also are offered the intervention. To preserve the integrity of random assignment, the evaluation included research sample members in the analyses from the time they were randomly assigned, regardless of whether or how long they received the intervention (an intent-to-treat design).[13] We obtained outcomes and baseline characteristics from Medicare Part A and B claims and eligibility data. A full analysis of Part D data on drug use and cost was not within the scope of this evaluation and would have applied only to beneficiaries who enrolled in Part D plans, once this option became available in 2006.[14] For Mercy, program impacts on Medicare Part A and B service use, cost, and quality-of-care measures are based on the Medicare claims and enrollment database data through the program's end in March 2010. The research sample is restricted to beneficiaries who enrolled between the program's start in April 2002 and March 2009, thereby ensuring that at least one year of follow-up was potentially available for all sample members and that members of the treatment group would have at least one year of potential exposure to the intervention.

We assessed program impacts for Health Quality Partners over two periods—10 years of program operations (April 2002 through June 2012) and during MCCD2 (October 2010 through June 2012). The 10-year estimates show the program's long-term effects for the new target population while the 21-month estimates show effects of HQP's most recent version of its intervention. As described in Section V.B., HQP made some modest changes in its intervention during MCCD2. For both outcome periods, the research sample is limited to beneficiaries who enrolled through June 2011, met MCCD2's eligibility criteria (Table II.1) at the time of enrollment,[15] and were alive at the start of the outcome period.

[13] Seven percent of patients died or disenrolled from the HQP and Mercy programs during the first year. Some disenrolled because they relocated or became ineligible for the program; a very small number disenrolled voluntarily (Brown et al. 2007).

[14] An examination of Part D data for 2006–2008 in an internal memorandum (Esposito, Peikes, and Flick 2011) showed that just over half of MCCD enrollees across the 11 plans still in operation over that period were enrolled in Part D. For this group, the interventions had few effects on the use of prescription drugs. Given that Medicare payments for prescription drugs are capitated, an analysis of program effects on costs would not be informative.

[15] Three hundred and thirty beneficiaries met the MCCD2 eligibility criteria at the start of the MCCD2 period in 2010 but not when they initially enrolled in the program. During the MCCD2 period, HQP has continued to serve the subset of those 330 beneficiaries who were assigned to the treatment group. However, the 330 beneficiaries are not included in the main research sample for this report owing to concerns that defining the research sample based on medical treatment and hospitalizations that occurred after the start of the demonstration could bias the impact estimates. Sensitivity analyses show that the impact estimates are highly similar to those reported in the main body of this report if the 330 beneficiaries are included in the research sample.

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## IV. FINDINGS FOR MERCY MEDICAL CENTER (2002–2010)

### A. Patient Enrollment

Mercy enrolled beneficiaries living in rural central Iowa who had one of several serious chronic illnesses[16] and had been hospitalized or had visited the emergency room in the year before enrollment. From April 2002 through March 2009, Mercy enrolled 1,392 beneficiaries in the treatment and control groups. Reflecting the eligibility criteria, Mercy's enrollees were, on average, much sicker and had higher rates of chronic conditions than the Medicare fee-for-service (FFS) population (Appendix Table A.1). The average Medicare expenditure per person in the year before enrollment for Mercy enrollees was $1,649 per month, three times the average expenditure per person of $552 per month for all Medicare FFS beneficiaries in 2003.[17] The average number of hospitalizations in the year before enrollment was 1.5, five times the national average of 0.3 for the Medicare FFS population. The enrollees also had an average of 3.3 of 12 chronic conditions compared with 1.5 chronic conditions for the Medicare FFS population.[18] In addition, Mercy enrollees were less likely than the Medicare FFS average to be under age 65 at the time of enrollment (and therefore qualify for Medicare because of disability). They were less likely to be black or Hispanic (less than 1 versus 11 percent for the Medicare FFS population), which is a reflection of the program's service area, and less likely to be poor enough to have Medicaid coverage (as identified by Medicaid's payment of Medicare premiums and deductibles) (12 versus 18 percent for the Medicare FFS population). Finally, as expected from random assignment, the treatment and control groups did not vary systematically or substantially on baseline characteristics.

### B. Program Features

A hospital in rural central Iowa hosted the Mercy program, which focused on changing patients' behavior and coordinating care across providers rather than making physician practice more evidence-based. The care coordinators, who were highly experienced registered nurses, initially worked to establish trusting relationships with patients (and, as needed, with their caregivers) and then turned to teaching patients self-management skills (such as how to adhere more fully to physicians' treatment recommendations, communicate more effectively with physicians, and coordinate their own care) and to providing basic information about their medical conditions and evidence-based recommendations for routine preventive care. Care coordinators met frequently with patients in-person (about once per month in the first year of the demonstration; see Peikes et al. 2009a) but also contacted patients by telephone as well. Mercy's care coordinators adopted the ongoing role of "communications hub" across providers. That is, they routinely ensured that all providers had a full list of patients' medications, that polypharmacy problems were addressed, that tests per evidence-based guidelines were ordered

[16] Illnesses included congestive heart failure, chronic obstructive pulmonary disease, chronic lung disease, liver disease, stroke, vascular disease, or renal failure (Aliotta et al. 2003).

[17] We use Medicare FFS totals in 2003 as the reference because the year before randomization for most enrollees fell between 2001 and 2005, making 2003 the approximate midpoint.

[18] The 12 chronic conditions are coronary artery disease, chronic heart failure, diabetes, chronic obstructive pulmonary disease, cancer, stroke, depression, dementia, atrial fibrillation, osteoporosis, rheumatoid arthritis/ osteoarthritis, and chronic kidney disease.

on schedule, and that providers had test results when they saw patients. They also provided hospital staff with relevant patient information upon admission and ensured that, after discharge, patients understood discharge plans and made follow-up appointments with physicians.

## C. Program Effects over 8 Years (2002–2010)

**Medicare hospitalizations and expenditures.** Mercy reduced hospitalizations for all its enrollees (n = 1,392) by 10 percent over the eight years that it operated (2002 through 2010). However, the reductions did not translate into statistically significant reductions in Medicare Part A and B expenditures (Appendix Tables A.2 and A.3). As a result, the program increased total Medicare expenditures, including program fees, by an estimated 10 percent (p = 0.07). The program was moderately more successful for the 75 percent (n = 1,050) of enrollees classified as high-risk because, at the time of enrollment, they had congestive heart failure, coronary artery disease, or chronic obstructive pulmonary disease and had experienced one or more hospitalizations in the previous year. For this group, Mercy reduced hospitalizations by 14 percent. For these high-risk beneficiaries, the treatment group's Medicare Part A and B expenditures were $145 (10 percent) lower per beneficiary per month, on average, than those for the control group, but the difference was not statistically significant (p = 0.17). The lack of significance may be attributable to a true lack of impact or to the higher variance in expenditures than in hospitalization rates, making it harder to detect impacts on expenditures. However, given the large effects on hospitalizations, the more plausible interpretation is that Mercy did reduce Medicare Part A and B expenditures for the high-risk group, albeit modestly. The best estimate for Medicare Part A and B savings ($145 PBPM) is lower than the mean care coordination fee that Mercy received on average over eight years ($198 PBPM), indicating that Mercy most likely increased costs to Medicare for high-risk beneficiaries.[19] It is possible that, if Mercy had received the lower fee of $147 during the entire period of the demonstration (not just from 2008 to 2010), the program would have been budget-neutral to Medicare for the high-risk beneficiaries. However, it is unclear whether Mercy would have been able to generate the same effects for the lower fee, particularly if it served only high-risk patients who likely required particularly intense care coordination.

**Physician and patient satisfaction.** As noted in detail in earlier reports, patients and their usual care providers were generally very satisfied with care coordination (Peikes et al. 2008; Brown et al. 2007). Care coordinators earned high ratings on four dimensions—support and monitoring, help with arranging services, ability to provide education to patients, and ability to assist patients in adhering to treatment recommendations—each of which included three or four indicators. Even though these findings are based on patient and provider surveys conducted in 2003 and 2004, we have no reason to expect that the key findings have changed since then.

**Quality of care and patient survival.** Mercy did not measurably improve several measures of the quality of patient care. Specifically, Mercy did not reduce emergency room visits over eight years of operations (2002–2010). Further, as reported previously, Mercy did not

[19] However, given that the 90 percent confidence interval for program effects on Medicare expenditures, including program fees, spans 0 (-$123 to $228 PBPM), it is possible that the program was cost-neutral to Medicare for the high-risk patients.

consistently improve processes of care (such as lipid tests for patients with coronary artery disease) or reduce potentially preventable hospital visits (Schore et al. 2011). However, the small sample sizes for disease-specific measures made it difficult to determine whether the demonstration improved quality of care unless the improvements were quite large (see Schore et al. 2011 for a more detailed description of the findings). Finally, Mercy did not affect the percentage of patients who survived to two years after enrollment (Appendix Table A.4).

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# V. FINDINGS FOR HEALTH QUALITY PARTNERS' NEW TARGET POPULATION (2002–2012 AND 2010–2012)

## A. Patient Enrollment

From April 2002 through June 2011, Health Quality Partners enrolled 1,016 beneficiaries who, at the time of enrollment, met the new eligibility criteria established for MCCD2.[20] Of these beneficiaries, 410 (40 percent) met the high-risk definition—that is, they had coronary artery disease, heart failure, chronic obstructive pulmonary disease, or diabetes and one or more hospitalizations in the year before enrollment (for whom CMS currently pays $281 per PBPM). The other 606 beneficiaries (60 percent) met the CAD-only definition—they had CAD but no hospitalization in the year before enrollment (for whom CMS currently pays $83 PBPM).

The 1,016 enrollees in the research sample were sicker than the national Medicare fee-for-service (FFS) average and were much more likely to have one of the diagnoses targeted by the new eligibility criteria (Table V.1). Almost all (92 percent) enrollees had CAD compared to 30 percent in the Medicare FFS population. Thirty-four percent of enrollees had diabetes (versus 21 percent for the national Medicare FFS population), 28 percent had CHF (versus 15 percent for the national Medicare FFS population), and 16 percent had COPD (versus 10 percent for the national Medicare FFS population). The research sample enrollees had an average of 0.6 hospitalizations in the year before enrollment, twice the national Medicare FFS average of 0.3. The enrollees' Medicare Part A and B expenditures in the previous year ($965 PBPM) were almost twice the 2003 national Medicare FFS average of $552.[21] These statistics differ substantially from those in the Fourth Report to Congress (Schore et al. 2011) for *all* HQP enrollees—before the MCCD2 criteria restricted the sample to those at greater risk of hospitalization. The full sample was close to the national Medicare FFS average in terms of diagnoses and recent service use.

The enrollees in the research sample also differed from the national Medicare FFS average in terms of age, racial composition, and Medicaid enrollment. None of the enrollees was under age 65 (HQP excluded patients under 65 who were eligible for Medicare because of disability) compared to 14 percent for the national Medicare FFS population. Further, reflecting the demographics of its service area, enrollees were much less likely than the national Medicare FFS average to be black (0.9 versus 9.3 percent for the national Medicare FFS average) or Hispanic (0.1 versus 1.7 percent for the national Medicare FFS average). Only 3 percent of beneficiaries were also eligible for Medicaid versus 18 percent for the national Medicare FFS average. As expected from random assignment, the pre-enrollment characteristics showed no substantial or

[20] These beneficiaries also met HQP's own inclusion and exclusion criteria. Before October 2010, HQP enrolled patients with asthma, diabetes, heart failure, coronary artery disease, hyerlipidemia, or hypertension (Archibald et al. 2003). After October 2010, HQP enrolled only patients who met the MCCD2 eligibility criteria. HQP excludes patients with rare conditions that are unusually complex to manage (such as HIV/AIDS) or with conditions that would affect their ability to learn self-management (e.g., serious mental illness or dementia). HQP also excludes patients who are terminally ill, have end-stage renal disease, or are living in a nursing home or are under age 65 at the time of enrollment.

[21] We use Medicare FFS totals in 2003 as the reference because the year before randomization for most enrollees fell between 2001 and 2006, making 2003 the approximate midpoint.

consistent differences between the treatment and control groups (only one of the differences is statistically significant at the p = 0.05 level, as expected by chance given the multiple comparisons).[22]

HQP continued to enroll beneficiaries after June 2011; they are not included in the research sample for this report but will be included in future analyses. Specifically, from June 2011 to December 2012, HQP enrolled an additional 316 patients in the treatment and control groups combined. The terms of the October 2010 extension required HQP to end enrollment in December 2012. However, HQP's most recent extension through December 2014 allows HQP to continue enrolling new patients through June 2014. It is unclear how many new patients HQP will enroll under the most recent extension; HQP began new enrollment in September 2013.[23]

[22] The percentage of beneficiaries with diabetes at enrollment was 37.1 for the treatment group and 31.3 for the comparison group, a difference that is statistically significant (p = 0.05).

[23] Under the extension, CMS capped new enrollment at 700 treatment group beneficiaries in the Doylestown, Pennsylvania, area and another 700 in the Philadelphia, Pennsylvania, area. At the current rate of enrollment, HQP is unlikely to reach these caps.

**Table V.1. Pre-Enrollment Characteristics of Health Quality Partners' Enrollees Who Met the MCCD2 Eligibility Criteria at the Time of Enrollment (percentages unless otherwise noted)**

| | | | Health Quality Partners' Enrollees | | | | |
|---|---|---|---|---|---|---|---|
| | | FFS Medicare Average in 2003 (n = 31 million) | Treatment and Control (n = 1,016) | Treatment (n = 515) | Control (n = 501) | Difference | *p*-Value |
| Age | < 65 | 14.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.78[g] |
| | > or = 85 | 11.8 | 13.3 | 13.6 | 13.0 | 0.6 | |
| Male | | 42.2 | 53.2 | 53.0 | 53.5 | -0.5 | 0.88 |
| Race/Ethnicity | Black, non-Hispanic | 9.3 | 0.9 | 0.6 | 1.2 | -0.6 | 0.30 |
| | Hispanic | 1.7[f] | 0.1 | 0.2 | 0.0 | 0.2 | 0.32 |
| Medicaid Buy-In[a] | | 18.2 | 2.6 | 2.7 | 2.4 | 0.3 | 0.74 |
| Less than High School Education[b] | | 15.9 | 11.1 | 12.3 | 9.8 | 2.5 | 0.51 |
| Diagnosis[c] | CAD | 30.0 | 92.4 | 92.6 | 92.2 | 0.4 | 0.81 |
| | CHF | 15.3 | 27.6 | 29.1 | 25.9 | 3.2 | 0.26 |
| | Diabetes | 21.0 | 34.3 | 37.1 | 31.3 | 5.8 | 0.05* |
| | COPD | 9.5 | 16.1 | 14.8 | 17.6 | -2.8 | 0.22 |
| | Cancer[d] | 6.1 | 13.5 | 14.4 | 12.6 | 1.8 | 0.40 |
| | Stroke | 12.1 | 7.4 | 7.8 | 7.0 | 0.8 | 0.63 |
| | Depression | 10.6 | 9.5 | 8.9 | 10.2 | -1.2 | 0.50 |
| | Dementia | 7.8 | 3.2 | 3.7 | 2.8 | 0.9 | 0.39 |
| Number of Chronic Conditions (out of 12)[e] | | 1.5 | 2.8 | 2.8 | 2.8 | 0.1 | 0.42 |
| In Year before Randomization | Annualized hospitalizations (number) | 0.3 | 0.61 | 0.63 | 0.58 | 0.05 | 0.39 |
| | Medicare expenditures ($PBPM) | 552 | 965 | 982 | 947 | 35 | 0.68 |

Sources: Medicare National Claims History File, Standard Analytic File, Enrollment Databases, and Mathematica survey of demonstration enrollees. Medicare FFS totals come from Mathematica's analysis of 2002 and 2003 Medicare 5 percent files (which include FFS beneficiaries only). Education, monthly expenditures, and proportion who had a stroke are exceptions and come from the 2003 Medicare Current Beneficiary Survey ([http://www.cms.hhs.gov/MCBS/Downloads/CNP_2003_section1.pdf] and Section 2). The survey includes all Medicare enrollees, not just those in FFS.

Notes: The sample includes beneficiaries randomized from April 2002 through June 2011 who, at the time of enrollment, met the new eligibility criteria for the second phase of the demonstration (MCCD2), which began in October 2010. These criteria require patients to (1) have CAD, CHF, COPD, or diabetes and one or more hospitalizations in the previous year or (2) have CAD (without a requirement for a hospitalization in the previous year).

We use Medicare FFS totals in 2003 as the reference because the year before randomization for most enrollees fell between 2001 and 2005, making 2003 the approximate midpoint.

[a]Medicaid Buy-In indicates that the beneficiary is eligible for both Medicare and Medicaid.

[b]For program treatment and control group members, the level of education comes from the patient survey conducted by Mathematica on a sample of patients enrolled through June 2004.

**Table V.1** *(continued)*

[c]Diagnoses are based on the CCW definitions, version 1.6. These definitions use a look-back period of one year before enrollment for COPD, stroke, and depression and two years for CAD, CHF, and diabetes. The evaluation used a two-year look-back period for dementia rather than the three years used by CCW because of the limits of the Medicare claims data extracted for the analysis. The evaluation also used a broader definition of cancer than did CCW, capturing all types of malignant neoplasms (other than skin cancer) and using a one-year look-back period.

[d]This category excludes skin cancer.

[e]The 12 diagnoses include the 8 listed in the table plus atrial fibrillation, osteoporosis, rheumatoid arthritis/osteoarthritis, and chronic kidney disease.

[f]Because the data on the research sample come from the Medicare Enrollment Database, the table shows the national FFS average using the 5 percent Medicare Enrollment Database as well. However, the Medicare Current Beneficiary Survey shows that a higher percentage of beneficiaries are Hispanic (7.6 percent).

[g]Only one *p*-value is reported for the treatment-control differences in age because a chi-squared test was used to determine whether the overall age distribution for the treatment group was different from the distribution for the control group.

CAD = coronary artery disease; CCW = Chronic Condition Warehouse; CHF = congestive heart failure; COPD = chronic obstructive pulmonary disease; FFS = fee-for-service; PBPM = per beneficiary per month

*p = 0.05

## B. Program Features

HQP is a care coordination services provider operating in eastern Pennsylvania. As with Mercy's program, HQP's care coordination intervention focuses on changing patient behavior rather than changing physician practice. HQP's highly experienced registered nurses initially work to establish trusting relationships with patients (and, as needed, with their caregivers) and then turn to teaching patients self-management skills. HQP care coordinators' efforts to help patients make needed lifestyle changes are rooted in behavior change theory, and the program's patient education content is based on disease-specific evidence-based guidelines. Care coordinators meet frequently with patients in-person (about once per month in the first year of the demonstration; see Brown et al. 2007) but also contact patients by telephone as well. Care coordinators also adopt the role of "communications hub," relaying key information to patients' providers primarily *around specific patient situations* (for example, hospital discharges or acute exacerbations).

HQP uses a data-driven approach to manage both patients and the program. In 2006, HQP developed a web-enabled platform from which managers and care coordinators routinely generate reports, including program reports that allow managers to see whether the program is meeting its goals of improving care quality and patient health and patient reports that allow care coordinators to track outcomes for an individual in order to link changes in outcomes with behavior change or life events. HQP management has also developed an increasing number of protocols to ensure that interventions are implemented consistently as the program grows.

During MCCD2, HQP modified its care coordination model along three dimensions. First, it began identifying prospective enrollees through hospital discharge records rather than from lists of eligible patients provided by physicians who had agreed to participate in the program. This new identification approach allows HQP to identify patients who have been recently hospitalized. During MCCD2, HQP only receives the higher care coordination fee for patients with a recent hospitalization. Second, HQP expanded into new geographic areas, including areas with a higher proportion of low-income and lower-socioeconomic status (SES) patients than previously served. Specifically, HQP has signed collaborative agreements with two new hospitals/hospital systems during MCCD2—Crozer-Keystone Health System (July 2011) and St. Mary Medical Center (November 2011). Overall, the two new hospitals/hospital systems serve a lower-SES population than Doylestown Hospital, HQP's primary hospital partner in the original demonstration. HQP continues its partnership with Doylestown Hospital in MCCD2. Third, HQP made several modest adjustments to its intervention to meet the needs of a more consistently high-risk patient population. The adjustments include more in-person and in-home visits, more time coordinating care with physicians, more effort addressing psychosocial needs (e.g., substance abuse, intimate partner and family violence), and fewer group classes (more patients are homebound and functionally unable to participate in group programs). These adjustments made the interventions more time-intensive for the nurses; accordingly, HQP decreased the target caseloads for its nurse care coordinators from 108 to 75 patients per nurse.

Even though the impact of HQP's program could be affected by both the new method for identifying patients and the expansion of service areas, the changes should have little or no influence on the impact estimates presented in this report. Only 69 of the 1,016 patients in the research sample for this report enrolled after October 2010, which is when the changes took effect. Further, all 69 beneficiaries came from HQP's original service area, not from the

expansion areas. Thus, only changes to the intervention and staffing are likely to influence the results reported here for the MCCD2 period.

## C. Program Effects over 10 Years (2002–2012)

**Medicare hospitalizations and expenditures.** Over 10 years of operations (2002–2012) for the MCCD2 population, the program reduced hospitalizations by 17 percent and reduced Medicare Part A and B expenditures without program fees by $129 PBPM (11 percent), enough to offset fully the program fees received by HQP that averaged $108 PBPM (Tables V.2 and V.3). As a result, the program was cost-neutral to Medicare for the MCCD2 population over 10 years of operations.

The program impacts on hospitalizations and costs are driven largely by the 40 percent of patients who meet the high-risk subgroup definition. For such beneficiaries, the program reduced hospitalizations by 25 percent and reduced Medicare Part A and B expenditures by an estimated 21 percent, or $291 PBPM ($p = 0.03$). Even though the estimated savings are more than twice as large as the average fee received by HQP for high-risk enrollees ($139 PBPM), the statistical uncertainty in the Medicare Part A and B savings means that we cannot be entirely confident that the program generated net savings to Medicare for the high-risk subgroup (the 90 percent confidence interval for the impact on Medicare costs, including program fees, ranges from $377 PBPM in savings to $73 in cost increases). In other words, it is possible, though unlikely, that we would see such a large difference between our treatment and control groups in these data if the program did not reduce total Medicare expenditures for enrollees compared to what the expenditures would have been had they not been in the program.

Among the CAD-only subgroup of patients (accounting for 60 percent of the research sample), the annualized hospitalization rate and Medicare Part A and B expenditures did not differ between the treatment and control groups ($p > 0.22$). The reason may be that the program truly did not affect outcomes for these patients or that the statistical power to detect modest effects was low for CAD-only patients. Specifically, the evaluation would be able to detect impacts reliably only for (1) hospitalizations that are at least 23 percent of the control group mean and (2) impacts on costs that are $199 PBPM or greater. Despite sufficient power to detect effects as large as those found for the high-risk group, the power is not sufficient to detect more modest but still meaningful effects on hospitalizations or costs. For example, the evaluation has only a 27 percent chance of detecting effects on Medicare Part A and B expenditures of $83 PBPM, the amount that CMS currently pays for CAD-only enrollees.

**Medicare expenditures by type of service for high-risk enrollees.** To understand better how HQP generated Medicare Part A and B savings for the high-risk subgroup of the MCCD2 population, the evaluation examined effects on different categories of expenditures. Reductions in facility payments to hospitals drove the overall reductions in Medicare expenditures by accounting for 77 percent of the total reduction. The program also reduced outpatient emergency department (ED) facility payments by an estimated $4 PBPM (27 percent, $p = 0.09$), total Medicare Part B costs by $68 PBPM (12 percent, $p = 0.08$), and physician services delivered in the ED or hospital by $21 PBPM (34 percent, $p = 0.06$). Spending for other services, such as outpatient physician visits, provided no offsetting increases.

**Table V.2. Effects of Health Quality Partners' Program on Hospitalizations (2002–2012)**

| | Enrollees (treatment and control) | | | Annualized Number of Hospitalizations | | | |
|---|---|---|---|---|---|---|---|
| Population[a] | Number | Percentage of MCCD2 Population | Mean Number of Follow-Up Months[b] | Control Group Mean | Treatment-Control Difference, Adjusted (90 percent confidence interval) | Percentage Difference | *p*-Value |
| MCCD2 | 1,016 | 100 | 63.1 | 0.633 | -0.106 (-0.176, -0.035) | -16.7 | 0.01 |
| High-risk | 410 | 40 | 57.5 | 0.817 | -0.206 (-0.343, -0.068) | -25.2 | 0.01 |
| CAD-only | 606 | 60 | 70.0 | 0.527 | -0.058 (-0.138, 0.021) | -11.1 | 0.23 |

Source: Medicare Enrollment Database, National Claims History File, Standard Analytic File, and Mathematica randomization file.

Notes: Outcomes are measured from April 2002 through June 2012 among enrollees randomized through June 2011. The outcomes are weighted according to the proportion of the follow-up period during which each sample member met CMS's demonstration-wide requirements. The requirements are as follows: being in fee-for-service, having both Medicare Part A and B coverage, having Medicare as the primary payer, and being alive part of the month. Weights are calculated separately for each program's treatment and control groups.

Treatment-control differences are adjusted for baseline characteristics to increase the precision of the estimates and to account for chance differences between the treatment and control groups.

The table excludes the few treatment and control group members who did not meet CMS's demonstration-wide requirements or who had an invalid health insurance claim number on Mathematica's enrollment file because Medicare data showing their payments in the fee-for-service program were not available.

Negative estimates of treatment-control differences indicate that hospitalizations are lower for the treatment group—a favorable outcome.

[a]The MCCD2 population includes beneficiaries who, at the time of enrollment, met the eligibility criteria for the second phase of the demonstration (MCCD2). Beneficiaries met these criteria if they fell into one of two subgroups: (1)"high-risk—beneficiaries with CAD, CHF, COPD, or diabetes and one or more hospitalizations in the previous year (for whom CMS pays $281 PBPM during MCCD2) or (2) CAD- only—beneficiaries with CAD but no hospitalization in the previous year (for whom CMS pays $83 PBPM).

[b]Mean number of follow-up months for both the treatment and control group members.

**Table V.3. Effects of the Health Quality Partners' Program on Medicare Expenditures (2002–2012)**

| | | Medicare Part A and B Expenditures ($PBPM) Not Including Program Fees | | | | Medicare Part A and B Expenditures ($PBPM) Including Program Fees | | |
|---|---|---|---|---|---|---|---|---|
| Population[a] | Mean Program Fees Paid ($PBPM)[b] | Control Group Mean | Treatment-Control Difference, Adjusted (90 percent confidence interval) | Percentage Difference | *p*-Value | Treatment-Control Difference, Adjusted (90 percent confidence interval) | Percentage Difference | *p*-Value |
| MCCD2 | 108 | 1,137 | -129 (-246, -12) | -11.4 | 0.07 | -21 (-138, 96) | -1.8 | 0.77 |
| High- risk | 139 | 1,400 | -291 (-515, -66) | -20.8 | 0.03 | -152 (-377, 73) | -10.9 | 0.27 |
| CAD-only | 92 | 984 | -49 (-181, 82) | -5.0 | 0.54 | 42 (-90, 174) | 4.3 | 0.60 |

Source: Medicare Enrollment Database, National Claims History File, Standard Analytic File, and Mathematica randomization file.

Notes: Outcomes are measured from April 2002 through June 2012 among enrollees randomized through June 2011. In Table V.2, we present the sample sizes, weighting, and statistical adjustments.

Treatment-control differences are adjusted for baseline characteristics to increase the precision of the estimates and to account for chance differences between the treatment and control groups.

Negative estimates of treatment-control differences indicate that Medicare expenditures (with or without the care coordination fee) are lower for the treatment group—a favorable outcome.

[a]The MCCD2 population includes beneficiaries who, at the time of enrollment, met the eligibility criteria for the second phase of the demonstration (MCCD2). Beneficiaries met these criteria if they fell into one of two subgroups: (1) high-risk—beneficiaries with CAD, CHF, COPD, or diabetes and one or more hospitalizations in the previous year (for whom CMS pays $281 PBPM during MCCD2) or (2) CAD-only—beneficiaries with CAD but no hospitalization in the previous year (for whom CMS pays $83 PBPM).

[b]The mean monthly fees that CMS paid per beneficiary in the treatment group for care coordination services. The mean amount paid is less than the negotiated fee because some patients in the treatment group did not receive services for some months.

**Hospitalizations and expenditures by year of follow-up for high-risk enrollees.** Program impacts on hospitalizations and expenditures could change by year of patient follow-up. They could increase if the benefits of care coordination accrue over time. On the other hand, impacts could decrease if patients are more likely to disengage from the program in later years or patients' diseases progress to the degree that ongoing care management can no longer prevent hospital stays. To determine the time path of effects, the evaluation estimated program impacts on hospitalizations and expenditures for each year of follow-up among the high-risk patient subgroup (Table V.4). None of the estimates of program impacts for hospitalizations or Medicare Part A and B expenditures is statistically significant in any of the individual years of patient follow-up, probably because of low statistical power in a single year.[24] However, for the high-risk subgroup, the treatment group consistently demonstrated lower rates of hospitalizations (between 0.122 and 0.303 fewer hospitalizations per person per year) and lower Medicare Part A and B expenditures (between $223 and $408 lower per beneficiary per month) in the first eight years of follow-up. In the ninth year, the hospitalization rates and Medicare Part A and B costs were *higher* in the treatment group than in the control group, but the estimates are imprecise given the few patients (95 patients in the treatment and control groups) who enrolled early enough to be followed for nine or more years. The results suggest that the program impacts for the high-risk subgroup are consistent and large through the first eight years of enrollment but may diminish thereafter.

One factor that may contribute to diminishing effects in the ninth year of enrollment is that the percentage of beneficiaries in the treatment group receiving treatment declines to 69 percent (from a range of 75 to 99 percent in earlier years), as proxied by the percentage of patients for whom HQP submitted bills for at least one month in the year for care coordination services rendered. Given the study's intent-to-treat design, the 31 percent of patients not receiving services in the ninth year of enrollment remain in the impact estimates for that year. People may stop receiving services over time because they move out of the service area or otherwise become disengaged. However, the decline in the percentage of patients receiving services probably does not fully explain the large decline in the impact estimate for the ninth year of enrollment because a majority of patients still received services.

**Patient survival.** The program substantially reduced mortality risk (Table V.5). Specifically, it reduced the percentage of enrollees who died within two years of enrollment by 3.6 percentage points (or 38 percent of a control group mean of 9.3 percent, $p = 0.03$). Further, it reduced the percentage who died within five years of enrollment by 8.0 percentage points (or 34 percent of a control group mean of 23.7, $p = 0.005$). Unlike the findings for hospitalizations and expenditures with benefits concentrated among the high-risk patient subgroup, the impacts on mortality were similar for both the high-risk and CAD-only subgroups.

[24] The power to detect effects in a single year is lower than the power to detect effects over several years because the variance in outcomes is higher over the shorter period.

**Quality of care.** The evaluation estimated HQP's effects on several quality-of-care measures, including hospital stays deemed potentially preventable with better ambulatory care (Agency for Healthcare Research and Quality 2010), emergency room visits, and patient receipt of recommended clinical processes of care.

**Table V.4. Effects of Health Quality Partners' Program on Hospitalizations and Medicare Expenditures, by Year of Follow-Up Among High-Risk Patients**

| | | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Size (treatment and control) | | | 408 | 386 | 316 | 288 | 199 | 173 | 152 | 141 | 95 |
| Percentage of Treatment Group with Bills for Services[a] | | | 99 | 94 | 92 | 91 | 91 | 90 | 84 | 75 | 69 |
| Treatment-Control Difference, Adjusted (*p*-value) | Annualized hospitalizations (number) | | -0.133 (0.31) | -0.204 (0.16) | -0.247 (0.14) | -0.184 (0.33) | -0.308 (0.13) | -0.178 (0.47) | -0.227 (0.24) | -0.202 (0.38) | 0.143 (0.71) |
| | Medicare Part A and B Expenditures ($PBPM) | Not including program fees | -381 (0.11) | -223 (0.32) | -237 (0.29) | -408 (0.16) | -248 (0.27) | -260 (0.45) | -290 (0.36) | -276 (0.39) | 594 (0.34) |
| | | Including program fees | -247 (0.30) | -94 (0.68) | -92 (0.68) | -270 (0.35) | -126 (0.58) | -141 (0.68) | -150 (0.63) | -118 (0.71) | 780 (0.20) |

Source: Medicare Enrollment Database, National Claims History File, and Standard Analytic File.

Notes: The research sample includes beneficiaries who enrolled through June 2011 and met (1) the high-risk definition at enrollment and (2) CMS's demonstration-wide requirements for at least one month during the follow-up period. To be high-risk, a beneficiary needs to have CAD, CHF, COPD, or diabetes and at least one hospitalization in the year before enrollment. To meet CMS's eligibility criteria in a month, a beneficiary needs to (1) be alive and enrolled in Medicare Part A and B, (2) have Medicare as the primary payer of medical bills, and (3) not be enrolled in a comprehensive HMO. Sample size declines in later years of patient follow-up because, for the longer periods, fewer patients enrolled early enough to receive a follow-up and because some patients died before the start of the later periods.

The table excludes treatment and control group members who did not meet CMS's demonstration-wide requirements or who had an invalid health insurance claim number on Mathematica's enrollment file because Medicare data showing their payments in the fee-for-service program were not available.

Outcomes are measured during the patient follow-up year and are weighted according to the proportion of the months in a year a sample member met CMS's demonstration-wide requirements.

Negative estimates of treatment-control differences imply that hospitalizations or Medicare expenditures (with or without the monthly program fee) are lower for the treatment group—a favorable outcome.

Although some patients were followed up for 10 years, the table excludes the 10$^{th}$ year of follow-up because the sample size is so small (34 beneficiaries) that estimates for that year are not reliable.

[a]The percentage of beneficiaries in the treatment group for whom CMS paid care coordination fees for at least one month during the follow-up year, a proxy for the percentage of treatment group beneficiaries who received services for at least part of the year.

**Table V.5. Effects of Health Quality Partners' Program on Mortality Risk (2002–2012)**

| Population[a] | Number of Enrollees | Percentage Who Died | | | |
|---|---|---|---|---|---|
| | | Control Group Mean | Treatment-Control Difference, Adjusted | Percentage Difference | *p*-Value |
| **Died within Two Years of Enrollment** | | | | | |
| MCCD2 | 962 | 9.3 | -3.6 | -38.4 | 0.03 |
| High-risk | 357 | 12.1 | -5.1 | -42.3 | 0.09 |
| CAD-only | 605 | 7.7 | -3.3 | -42.7 | 0.08 |
| **Died within Five Years of Enrollment** | | | | | |
| MCCD2 | 685 | 23.7 | -8.0 | -33.6 | 0.005 |
| High-risk | 253 | 30.5 | -9.5 | -31.3 | 0.08 |
| CAD-only | 432 | 19.6 | -7.7 | -39.5 | 0.02 |

Source: Medicare Enrollment Database, National Claims History File, and Standard Analytic File.

Notes: Data on beneficiary deaths are captured for April 2002 through June 2012. The outcomes are not weighted.

The research sample includes enrollees randomized through June 2010 and June 2007 for the two- and five-year mortality rates, respectively. This sample definition ensures that each sample member could receive follow-up for at least two or five years, respectively.

Treatment-control differences are adjusted for baseline characteristics to account for chance differences between the treatment and control groups.

The table excludes the few treatment and control group members who did not meet CMS's demonstration-wide requirements or who had an invalid health insurance claim number on Mathematica's enrollment file because Medicare enrollment data on whether they were deceased and their dates of death could not be linked to our data.

Negative estimates of treatment-control differences indicate that mortality is lower for the treatment group—a favorable outcome.

[a]The MCCD2 population includes beneficiaries who, at the time of enrollment, met the eligibility criteria for the second phase of the demonstration (MCCD2). Beneficiaries met these criteria if they fell into one of two subgroups: (1) high-risk—beneficiaries with CAD, CHF, COPD, or diabetes and one or more hospitalizations in the previous year (for whom CMS pays $281 PBPM during MCCD2) or (2) CAD-only—beneficiaries with CAD but no hospitalization in the previous year (for whom CMS pays $83 PBPM).

Perhaps surprisingly, given the overall reduction in hospitalizations over 10 years, HQP did not measurably reduce hospital stays deemed potentially preventable as a consequence of better ambulatory care. Such stays accounted for 19 percent of all hospital stays for beneficiaries who met the MCCD2 eligibility criteria at enrollment. However, we observed no measurable difference in hospitalization rates between the treatment and control groups. HQP program administrators were not surprised that the program's overall effects on hospitalizations were not concentrated among those stays that the Agency for Healthcare Research and Quality (AHRQ) algorithm (version 4.4) identifies as potentially preventable. Rather, they think that their program reduces a wide range of hospital stays, including stays for heart or orthopedic conditions that are not included in the AHRQ definition but are nonetheless frequent and sensitive to improved patient self-care and clinical care. Consistent with its effects on hospitalizations, HQP's program reduced ED visits by 0.22 visits per person per year among high-risk patients (or 28 percent of the control group mean of 0.78, $p = 0.06$). The program did not measurably reduce ED visits among CAD-only patients.

Finally, the program improved patient receipt of an important process-of-care measure for CAD but did not measurably improve receipt of three processes of care for diabetes. For each enrollee with CAD at enrollment, we analyzed Medicare claims to assess whether the enrollee received recommended cholesterol (LDL) testing in each year of follow-up. A patient was identified as consistently receiving the recommended LDL test if he or she underwent testing in at least three-quarters of his or her years of follow-up. Over the 10 years of operations, the program increased the percentage of patients who consistently received LDL testing from 71 to 78 percent, a 10 percent increase ($p = 0.01$). The program did not measurably improve the percentage of patients who consistently received three recommended processes of care for diabetes (LDL testing, blood glucose [HbA1c] testing, or eye examinations). However, the power to detect effects was much lower for the diabetes measures than the power for the CAD measure, given that 938 patients (in treatment and control groups combined) had CAD at enrollment but that only 379 patients had diabetes.

**Physician and patient satisfaction.** For completeness, we summarize the results reported in the Third Report to Congress for physician and patient satisfaction based on survey data collected earlier in the demonstration. Patients and their usual care providers were generally very satisfied with care coordination (Peikes et al. 2008; Brown et al. 2007). Care coordinators earned high ratings on four dimensions—support and monitoring, help with arranging services, ability to provide education to patients, and ability to assist patients in adhering to treatment recommendations—each of which encompassed three or four indicators. HQP's patients generally gave the demonstration notably higher ratings than the patients in other programs. Two-thirds or more of physicians reported that HQP provided very good or excellent overall monitoring and follow-up of patients and made it easier to care for their patients. The patient and provider surveys were conducted in 2003 and 2004, yet we have no reason to expect that the key findings have changed since then. Indeed, over 90 percent of high-risk beneficiaries who were still eligible for the program after six years remained enrolled in the program at that time, suggesting that they continued to be satisfied with program services.

## D. Program Effects During the Second Phase of the Demonstration (2010–2012)

**Medicare hospitalizations and total expenditures over first 21 months of MCCD2.** From October 2010 to June 2012, the HQP program did not measurably affect hospitalizations or Medicare Part A and B expenditures for enrollees who met the new eligibility criteria for

MCCD2. The treatment group hospitalization rate was 4.6 percent lower than that for the control group, and the treatment group Medicare Part A and B expenditures (PBPM) were 4.0 percent lower than those for the control group, but neither of the differences is statistically significant ($p > 0.67$). As a result, the program did not generate any measurable savings to offset program fees, which averaged $130 per treatment group member per month (Tables V.6 and V.7). In contrast to the 10-year estimates, the estimates of program effects during MCCD2 were not greater for the high-risk subgroup. However, in view of the short follow-up period and modest sample sizes, the estimates involve considerable statistical uncertainty. The 90 percent confidence interval indicates that the true impact on hospitalizations for the MCCD2 population during the period likely fell within the range of a 24 percent reduction to a 15 percent increase. Further, it is not possible to conclude with certainty that the program increased costs to Medicare for the MCCD2 population during the period. Even though total Medicare expenditures, including program fees, were $77 higher in the treatment versus control group, the difference is not statistically different from 0 ($p = 0.52$). The confidence interval for Medicare Part A and B savings includes both 0 and amounts larger than the fee paid, making it impossible to arrive at firm conclusions about the effects of the program during the short follow-up period.

**Hospitalizations and Medicare expenditures by year of program operations.** The lack of measurable effects during the 21 months of MCCD2 for the high-risk subgroup was unexpected given the large effects over 10 years of operations for the same subgroup. To put the MCCD2 estimates in context, we calculated program impacts by calendar year for the high-risk subgroup in order to look for any unique patterns during the first three years of MCCD2 (2010–2012) compared to the earlier years (2002–2009). In Table V.8, we show that the treatment group experienced between 15 and 45 percent lower hospitalization rates than did the control group from 2003[25] through 2009, although the differences are statistically significant ($p < 0.10$) only in 2003, 2005, and 2006. The treatment group hospitalization rates were 11 percent *higher* than those of the control group in 2011 but returned to 36 percent lower in 2012 (although the difference is not statistically different from 0, $p = 0.14$). The program impacts on Medicare Part A and B expenditures showed patterns similar to those for the impacts on hospitalizations. The results suggest that 2011 was an anomalous year of poor performance and that, for the high-risk group, the program may have become roughly as effective in 2012 as it had been in earlier years (as described in Section VI.A, the poor performance in 2011 may reflect the difficulties associated with implementing the intervention as intended that year). However, with the impacts on neither hospitalizations nor Medicare Part A and B expenditures statistically significant ($p = 0.14$ and 0.26, respectively), we cannot conclude with certainty that the program was effective in 2012.

[25] The hospitalization rate was 437 percent higher in the treatment group than in the control group in 2002, although the estimate is unreliable because of very small sample sizes (34 patients in the treatment and control groups combined) and because most of the 19 patients in the treatment group had been exposed to the intervention for only a few months in 2002.

**Table V.6. Effects of Health Quality Partners' Program on Hospitalizations During the First 21 Months of MCCD2 (2010–2012)**

| | Enrollees (treatment and control) | | | Annualized Number of Hospitalizations | | | |
|---|---|---|---|---|---|---|---|
| Population[a] | Number | Percentage of MCCD2 Population | Mean Number of Follow-Up Months[b] | Control Group Mean | Treatment-Control Difference, Adjusted (90 percent confidence interval) | Percentage Difference | *p*-Value |
| MCCD2 | 752 | 100 | 19.2 | 0.634 | -0.029 (-0.153, 0.094) | -4.6 | 0.70 |
| High-risk | 296 | 39 | 18.2 | 0.767 | -0.043 (-0.279, 0.192) | -5.6 | 0.76 |
| CAD-only | 456 | 61 | 19.8 | 0.555 | -0.044 (-0.182, 0.094) | -7.9 | 0.60 |

Source: Medicare Enrollment Database, National Claims History File, Standard Analytic File, and Mathematica randomization file.

Notes: Outcomes are measured from October 2010 through June 2012, the first 21 months of the second phase of the demonstration (MCCD2). The research sample is limited to enrollees randomized through June 2011 who were alive for at least one month during the outcome period. The outcomes are weighted according to the proportion of the follow-up period during which each sample member met CMS's demonstration-wide requirements. The requirements are as follows: being in fee-for-service, having both Medicare Part A and B coverage, having Medicare as the primary payer, and being alive part of the month. Weights are calculated separately for each program's treatment and control groups.

Treatment-control differences are adjusted for baseline characteristics to increase the precision of the estimates and to account for chance differences between the treatment and control groups.

The table excludes the few treatment and control group members who did not meet CMS's demonstration-wide requirements or who had an invalid health insurance claim number on Mathematica's enrollment file because Medicare data showing their payments in the fee-for-service program were not available.

Negative estimates of treatment-control differences indicate that hospitalizations are lower for the treatment group—a favorable outcome.

[a]The MCCD2 population includes beneficiaries who, at the time of enrollment, met the eligibility criteria for the second phase of the demonstration (MCCD2). Beneficiaries met these criteria if they fell into one of two subgroups: (1) high-risk—beneficiaries with CAD, CHF, COPD, or diabetes and one or more hospitalizations in the previous year (for whom CMS pays $281 PBPM during MCCD2) or (2) CAD-only—beneficiaries with CAD but no hospitalization in the previous year (for whom CMS pays $83 PBPM).

[b]Mean number of follow-up months for both the treatment and control group members.

**Table V.7. Effects of Health Quality Partners' Program on Medicare Expenditures During the First 21 Months of MCCD2 (2010–2012)**

| | | Medicare Part A and B Expenditures ($PBPM) Not Including Program Fees | | | | Medicare Part A and B Expenditures ($PBPM) Including Program Fees | | |
|---|---|---|---|---|---|---|---|---|
| Population[a] | Mean Program Fees Paid ($PBPM)[b] | Control Group Mean | Treatment-Control Difference, Adjusted (90 percent confidence interval) | Percentage Difference | *p*-Value | Treatment-Control Difference, Adjusted (90 percent confidence interval) | Percentage Difference | *p*-Value |
| MCCD2 | 130 | 1,336 | -53 (-252, 146) | -4.0 | 0.67 | 77 (-122, 275) | 5.7 | 0.52 |
| High-risk | 227 | 1,545 | -56 (-440, 329) | -3.6 | 0.81 | 172 (-212, 556) | 11.1 | 0.46 |
| CAD-only | 73 | 1,210 | -64 (-280, 152) | -5.3 | 0.63 | 9 (-207, 224) | 0.7 | 0.95 |

Source: Medicare Enrollment Database, National Claims History File, Standard Analytic File, and Mathematica randomization file.

Notes: Outcomes are measured from October 2010 through June 2012, the first 21 months of the second phase of the demonstration (MCCD2). The research sample is limited to enrollees randomized through June 2011 who were alive for at least one month during the outcome period. In Table V.6, we describe the sample sizes, weighting, and statistical adjustments.

Treatment-control differences are adjusted for baseline characteristics to increase the precision of the estimates and to account for chance differences between the treatment and control groups.

Negative estimates of treatment-control differences indicate that Medicare expenditures (with or without the care coordination fee) are lower for the treatment group—a favorable outcome.

[a]The MCCD2 population includes beneficiaries who, at the time of enrollment, met the eligibility criteria for the second phase of the demonstration (MCCD2). Beneficiaries met these criteria if they fell into one of two subgroups: (1) high-risk—beneficiaries with CAD, CHF, COPD, or diabetes and one or more hospitalizations in the previous year (for whom CMS pays $281 PBPM during MCCD2) or (2) CAD-only—beneficiaries with CAD but no hospitalization in the previous year (for whom CMS pays $83 PBPM).

[b]The mean monthly fees that CMS paid per beneficiary in the treatment group for care coordination services. The mean amount paid is less than the negotiated fee because some patients in the treatment group did not receive services in some months.

**Table V.8. Effects of Health Quality Partners' Program on Hospitalizations and Medicare Expenditures by Calendar Year Among High-Risk Patients (2003–2012)**

| | | | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Size (treatment and control) | | | 143 | 202 | 225 | 209 | 226 | 220 | 270 | 256 | 290 | 265 |
| Percentage of Treatment Group with Bills for Services[a] | | | 99 | 97 | 93 | 96 | 92 | 94 | 92 | 88 | 83 | 84 |
| Treatment-Control Difference, Adjusted (*p*-value) | Annualized hospitalizations (number) | | -0.496 (0.07) | -0.099 (0.54) | -0.439 (0.03) | -0.419 (0.05) | -0.185 (0.35) | -0.269 (0.21) | -0.109 (0.50) | -0.194 (0.27) | 0.072 (0.65) | -0.330 (0.14) |
| | Medicare Part A and B costs ($PBPM) | Not including fees | -728 (0.06) | -320 (0.29) | -742 (0.04) | -180 (0.56) | -415 (0.07) | -208 (0.56) | -201 (0.59) | -245 (0.38) | 191 (0.41) | -423 (0.26) |
| | | Including fees | -609 (0.11) | -206 (0.50) | -627 (0.08) | -63 (0.84) | -303 (0.19) | -100 (0.78) | -93 (0.80) | -114 (0.68) | 419 (0.07) | -189 (0.61) |

Source: Medicare Enrollment Database, National Claims History File, and Standard Analytic File.

Notes: The research sample includes beneficiaries who (1) enrolled through June 2011, (2) met the high-risk definition at enrollment, and (3) met CMS's demonstration-wide requirements for at least one month during the calendar year. To be high-risk, a beneficiary must have CAD, CHF, COPD, or diabetes and at least one hospitalization in the year before enrollment. To meet CMS's eligibility criteria in a month, a beneficiary must (1) be alive and enrolled in Medicare Part A and B, (2) have Medicare as the primary payer of medical bills, and (3) not be enrolled in a comprehensive HMO.

The table excludes treatment and control group members who did not meet CMS's demonstration-wide requirements or who had an invalid health insurance claim number on Mathematica's enrollment file because Medicare data showing their payments in the fee-for-service program were not available.

Outcomes are measured during the calendar year and are weighted according to the proportion of the months in that year that a sample member met CMS's demonstration-wide requirements.

Negative estimates of treatment-control differences imply that hospitalizations or Medicare expenditures (with or without the fee included) are lower for the treatment group—a favorable outcome.

Although some patients enrolled in 2002, the table excludes 2002 because the sample size is so small (34 beneficiaries) that estimates for that year are not reliable.

[a]The percentage of beneficiaries in the treatment group for whom CMS paid care coordination fees for at least one month during the year, a proxy for the percentage of treatment group beneficiaries who received services for at least part of the year.

# VI. DISCUSSION

## A. Health Quality Partners' Effectiveness

In this section, we discuss the apparent decline in HQP's effects on hospitalizations and Medicare Part A and B expenditures in the first 21 months of MCCD2 as well as possible explanations for the decline. We conclude that, because the 21-month estimates have low statistical precision and cover a period when HQP did not implement its model as fully as intended (as explained further below), the 10-year estimates likely provide a more reliable picture of HQP's effects on quality of care, service use, and costs for the MCCD2 population.

**Decline in effects for high-risk patients during MCCD2.** The lack of measured program effects on hospitalizations or Medicare Part A and B expenditures for high-risk patients during the 21 months of MCCD2 is surprising. The Fourth Report to Congress (Schore et al. 2011) found that, from 2002 to 2008, for patients who met a similar high-risk definition, the program reduced hospitalizations by -0.347 per person per year (39 percent), Medicare Part A and B expenditures by 36 percent (or $511 per person per month), and expenditures including program fees by 28 percent.[26] The estimates were based on a small-sample research sample (248 beneficiaries in the treatment and control groups), and the actual impact sizes were uncertain, with the 90 percent confidence interval indicating that the impact on hospitalizations could range from a reduction of 61 to 17 percent. The impact estimates during the 21 months of MCCD2 also involve considerable uncertainty because of small samples and the relatively short follow-up period. It is therefore *possible* that the true impacts during the 21 months are as large as those of the original demonstration.[27] However, given the large differences in the best estimates for program impacts during the two time periods, it is likely that a true decline in program effects did in fact occur, raising the question of what drove the decline.

**Most likely explanations for apparent decline.** The most likely explanation for the decline is that the intervention during the 21 months of MCCD2 was not as strong as in the period from 2002 to 2010. Differences in the strength of the intervention might be a function of difficulties in implementation or caseloads too high to meet the needs of the MCCD2 population. According to program administrators, HQP was not able to deliver its intervention as fully as intended for roughly a year following the October 2010 extension because of disruptions caused by the program's near termination. Specifically, as part of natural attrition, several nurse care coordinators left HQP before the program's planned end in 2010. HQP did not hire new care coordinators to replace them because future funding was uncertain. When the MCCD2 period began, HQP then needed to hire new care coordinators. Although HQP believes that the new care coordinators were as effective as the previous ones, the program still needed time to build

[26] The only difference in the high-risk definition is that this report's definition includes the few patients with diabetes and a recent hospitalization at the time of enrollment and without any of the other qualifying diagnoses (CHF, COPD, or CAD). The definition in the Fourth Report to Congress did not include these beneficiaries. As explained earlier, the exclusion of patients with diabetes from the research sample does not meaningfully change the impact estimates for the 21 months of MCCD2.

[27] This possibility is indicated by the overlapping 90 percent confidence intervals for the impact estimates for hospitalizations and Medicare Part A and B costs during the two time periods (2002–2008 and 2010–2012).

up caseloads. As a result, the more experienced care coordinators carried caseloads well above the target level of patients per nurse. Furthermore, HQP did not serve 69 (or 7 percent) of the patients in the treatment group for nine months after the extension because it thought the patients did not meet the MCCD2 eligibility criteria. The final assessment of which treatment group members met the MCCD2 eligibility criteria was based on an analysis of Medicare claims data (HQP did not have access to the data). Given the time lags in the availability of complete claims, Mathematica completed the final assessment in June 2012 and found that the 69 patients were indeed eligible for the demonstration. HQP re-enrolled many of these patients and began serving them again.

HQP's own records on the percentage of patients whom it did not contact in a month reflect the implementation challenges in the first year of MCCD2. The percentage of patients not contacted in the first year of MCCD2 operations was high (16 percent) but declined to an average of 9 percent in 2012, a period when HQP administrators believe that the program was once again operating at full strength.

The estimates of program impacts by calendar year provide some support for the hypothesis that program effects diminished during MCCD2 in response to limitations in implementation. The hospitalization rate for the high-risk treatment group members was 36 percent lower than for the control group in 2012, a time when HQP administrators thought that the program was again fully operational. Even though the difference is large (and comparable to estimates from the Fourth Report to Congress), it is not statistically significant ($p = 0.14$).

A decline in program effectiveness in response to implementation barriers is plausible, but the lower target caseloads during MCCD2 may still be too high for the more acute needs of the more consistently high-risk patients in the MCCD2 population.

**Other factors potentially contributing to the decline.** Two other factors may have also contributed to the apparent decline in program effects during MCCD2, but sensitivity tests suggest that the factors' influence was modest. First, given that the program reduced mortality risk (Table V.5), some patients in the treatment group who survived to the start of MCCD2 (October 2010) might have died had they been in the control group. If such patients are sicker and have higher hospitalization rates than the average beneficiary in the treatment group, they could conceivably increase the treatment group's overall hospitalization rate, in turn making the overall treatment effect on hospitalizations and costs appear smaller than if the program had not improved survival. However, even very conservative assumptions suggest that adjusting for survival differences would increase the impact estimates for hospitalizations by a -0.04 reduction in hospital stays per person per year to at most a -0.12 reduction in stays per person per year. These revised estimates would still be only a third of the impact size observed in the Fourth Report to Congress. Second, 27 percent of patients in the research sample had been enrolled in the program for 9 or 10 years at the outset of MCCD2. As indicated in Table V.4, program effects appear to fade after patients have been enrolled for that many years. However, even if the program is assumed to have had no effect on long-term enrollees during MCCD2, the estimate of effects for the remaining 73 percent of patients would increase only modestly.

**Conclusions about program effectiveness.** For two reasons, we believe that the 10-year estimates provide a more reliable picture of the program's overall effects on care quality, service use, and Medicare expenditures for the MCCD2 population than the 21-month estimates. First, the program was often implemented as intended over the full 10 years, whereas it was not fully

implemented for much of the MCCD2 period. Second, the longer time period increases the statistical power to detect effects. Over 10 years, the program substantially reduced mortality risk and hospitalization rates and was cost-neutral to Medicare for the MCCD2 population, with the effects on hospitalizations and costs concentrated among high-risk patients. For high-risk patients, the program was at least cost-neutral and may even have produced savings. Nonetheless, the lack of measured effects during MCCD2 does raise the possibility that the intervention may have been less effective for MCCD2's 21 months because of either administrative barriers to implementation or caseloads too high for the needs of the MCCD2 population.

**Continued testing of the HQP model.** A longer follow-up period and a larger sample will help increase the accuracy of the impact estimates for MCCD2. Under its most recent extension, HQP will continue serving the MCCD2 population through December 2014. Further, as of September 2013, HQP has enrolled an additional 385 beneficiaries (all of whom met the high-risk definition) since the MCCD2 period began in October 2010. Therefore, future evaluation reports to CMS should provide more precise impact estimates for MCCD2. However, enrollment in new locations beyond HQP's original service area has been limited thus far, potentially constraining efforts to assess impacts for new patient populations. Another challenge for the ongoing evaluation is that the program came close to termination in June 2013, at which time it was extended for 1.5 years. According to HQP administrators, the program did not deliver the intervention as fully as intended during the months leading up to and following the June 2013 extension, perhaps once again constraining program effects, as a similar near-termination may have done in October 2010. Nonetheless, if the program generates favorable results despite the disruption, the findings would provide strong confirmation of the robustness of HQP's revised model.

## B. Program Features Associated with Reducing Hospitalizations

The success of HQP and Mercy in reducing hospitalizations for high-risk patients cannot be attributed conclusively to particular features of the intervention, but we did nonetheless identify several features that appear to be associated with such reductions. In earlier work (Brown 2012; Schore et al. 2011), we distilled these features by comparing the four relatively successful programs—those at HQP, Mercy, Hospice of the Valley, and Washington University in St. Louis—with seven former MCCD programs that had substantial enrollment and that were still operating in 2008 but had not reduced hospitalizations for their high-risk enrollees. These features are still relevant given this report's findings of the strong effects of Mercy's and HQP's programs on hospitalizations for high-risk patients over 8 and 10 years, respectively.

In addition to reliance on *highly educated and experienced registered nurses* as care coordinators and several features that commonly characterize a number of care coordination programs (such as patient assessments and care plans), the successful programs were more likely than the unsuccessful ones to include the following intervention features:

1. **Frequent face-to-face contact with patients—**About once per month on average to build rapport with patients
2. **Opportunities for face-to-face contact with patients' physicians—**For example, through colocation, regular contact during hospital rounds, or accompanying patients on physician visits, combined with assigning all of a physician's patients to the same

care coordinator when possible, so that physicians are more likely to recognize and trust the care coordinator

3. **Strong patient education rooted in behavioral change theory—**Including effective education of patients on how to take their medications correctly and better adhere to other treatment recommendations
4. **Comprehensive management of care setting transitions—**Timely, comprehensive response to care setting transitions (most notably from hospitals)
5. **Care coordinators as a communications hub—**Among providers and between patient and providers
6. **Comprehensive medication management—**Care coordinators armed with information about prescribed medications from nonpatient sources, such as physicians or health system electronic records; readily able to consult with pharmacists or physicians about any problems that arise

In addition, successful programs indicated that the *availability of social work resources* (provided by program staff, a consultant, or through collaboration with local Area Agencies on Aging) was critical for patients who had psychological problems or needed help in accessing health-related services. (These patients, however, accounted for a minority of enrollees in most MCCD programs, making it unclear as to the magnitude of the role played by social workers in the demonstration's overall success.) Representatives of individual programs cited other features when asked about the factors they viewed as central to program effectiveness (e.g., HQP attributes success in part to the program's sophisticated information system); however, the above factors were the only features found to be common to all or nearly all the successful programs and to be absent from all or nearly all the unsuccessful ones.

Many of CMS's current initiatives targeted to achieving the triple aim of better care for patients, better health for communities, and lower costs rely on care coordination interventions to reduce hospitalizations for high-risk patients with chronic conditions. For example, care coordination/care management for high-risk patients is a core component of the Comprehensive Primary Care Initiative. Therefore, the lessons from the MCCD can inform the intervention components these models can adopt to reduce hospitalizations. Indeed, based on HQP's success through eight years of program operations, CMS commissioned the development of a detailed protocol describing HQP's intervention for other organizations interested in implementing a similar model. However, the findings from the MCCD also suggest that generating net savings to Medicare will require modest fees, increased effectiveness in reducing hospital stays, or both. Across the four programs that reduced hospitalizations for high-risk patients, the observed reductions in hospital stays generated sufficient savings to cover monthly care coordination fees only if fees had ranged roughly between $125 and $150 per beneficiary, lower than most programs charged (Brown et al. 2012).

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## VII. SUMMARY OF FINDINGS

**Over its full eight years of operations, the Mercy program reduced hospitalizations but increased costs to Medicare.** Mercy enrolled 1,392 patients from April 2002 through March 2009. Even though Mercy reduced hospitalizations among these patients by 10 percent, the reductions did not translate into a statistically significant reduction in Medicare Part A and B expenditures. As a result, after accounting for program fees that averaged $203 PBPM, the program increased costs to Medicare by an estimated 10 percent, or $146 PBPM. The findings were modestly more favorable for the 75 percent of patients at higher risk of hospitalization at the time of randomization owing to heart failure, coronary artery disease, or chronic obstructive pulmonary disease and one or more hospitalizations in the year before enrollment. For this group, Mercy reduced hospitalizations by 14 percent. Mercy's treatment group had lower Medicare Part A and B costs than the control group, but the difference is not statistically significant ($145, $p = 0.17$), and the average monthly program fee paid over the period ($198 PBPM) exceeded the estimated savings in traditional Medicare expenditures. Therefore, to achieve cost neutrality, Mercy would have had to cut its fee significantly (while maintaining the same level of effectiveness) or improve its effectiveness.

**Over 10 years for the MCCD2 population, HQP reduced hospitalizations, improved survival and other quality-of-care measures, and remained cost-neutral to Medicare.** From April 2002 through June 2011, HQP enrolled 1,016 patients (treatment and control) who met the new eligibility criteria at enrollment. Of these, 410 met the high-risk subgroup definition, and 606 met the CAD-only definition. The program reduced hospitalizations for all 1,016 patients by 17 percent and Medicare Part A and B costs by $129 PBPM, an amount sufficient to offset fully program fees that averaged $108 PBPM over the 10 years. Therefore, the program was budget-neutral to Medicare over the full 10 years. The effects were concentrated almost entirely among the 410 patients in the high-risk subgroup. For these patients, the program reduced hospitalizations by 25 percent and Medicare Part A and B costs by $291 PBPM. Even though the savings were greater than the program fees that averaged $139 PBPM, the statistical uncertainty in the savings estimate make it impossible to conclude, with certainty, that the program generated net savings to Medicare for the high-risk group. In addition to the favorable effects on service use and costs, the program reduced by 30 to 43 percent the two- and five-year mortality rates for the MCCD2 population and its two subgroups. The program also reduced ED visits by 28 percent for high-risk patients. Finally, it increased from 71 to 78 percent the share of patients with CAD who consistently received recommended cholesterol testing each year.

**In the first 21 months of MCCD2 (October 2010 through June 2012), HQP did not measurably affect hospitalizations or Medicare expenditures.** The lack of treatment-control differences for all enrollees or for either of the patient subgroups may be attributable to low statistical power to detect effects given both the small sample size and short duration of the follow-up period. However, the program also may have become less effective during MCCD2 because of administrative barriers to implementation caused by the program's near termination in October 2010 or caseloads that may be too high to meet the needs of the MCCD2 population.

**The 10-year impacts likely provide a better estimate of the program's overall effect for the MCCD2 population than do the 21-month estimates.** Given their statistical imprecision and their coverage of a period when administrators believe that the program was not operating fully, the 21-month estimates likely do not reflect the program's true effects if the program was implemented properly. Over the full 10 years of operations, the program often operated as

intended. Further, the longer time frame and larger sample sizes for the 10-year period increase the estimates' statistical precision. Therefore, the 10-year estimates likely provide a more reliable picture of the overall effects of the HQP program for the MCCD2 population with respect to quality of care, service use, and expenditures.

**The recent continuation of HQP through December 2014 will increase the precision of future impact estimates, but some challenges remain for the ongoing evaluation.** From the outset of MCCD2 in October 2010 until September 2013, HQP enrolled 385 new beneficiaries. The expanded enrollment, combined with the extended outcome period, should increase the statistical precision of the impact estimates in future reports to CMS. However, as of September 2013, enrollment in areas beyond the original service area has been limited, potentially constraining the ability of future reports to assess effects reliably for new patient populations. Further, in the months leading up to and following its near termination in June 2013, the program did not implement the model as fully as intended. These implementation barriers could have undermined program effects. Nonetheless, if the program generates favorable results despite the disruptions, the findings would provide strong confirmation of the robustness of HQP's model.

**Several intervention features appear to distinguish HQP and Mercy from programs that were unable to reduce hospitalizations for high-risk patients.** The features of HQP and Mercy and two other MCCD programs that reduced hospitalizations were compared to the other seven MCCD programs with substantial enrollment that were still operating in 2008 but did not reduce hospitalizations. Representatives of the successful programs all agreed that reliance on highly educated and experienced registered nurses to provide the appropriate interventions to the right people appears to be one key—but not the only key—to reducing hospitalizations. Some less successful programs used similar staff as care coordinators. The successful programs, however, were much more likely than unsuccessful ones to provide the following:

- Frequent face-to-face contact with patients to build rapport
- Opportunities for face-to-face contact with patients' physicians
- Strong patient education rooted in behavioral change theory
- Comprehensive management of care setting transitions
- Care coordinators playing an active role as a communications hub among providers and between the patient and providers
- Comprehensive medication management

These lessons on elements of effective care coordination can inform CMS's current initiatives, such as the Comprehensive Primary Care Initiative, that rely on care coordination for high-risk patients to help achieve the triple aim of improved patient health, improved population health, and reduced expenditures. However, the findings from the four MCCD programs that reduced hospitalizations also suggest that generating net savings to Medicare will require modest fees or increased effectiveness in reducing hospital stays—or both.

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# APPENDIX A

# TABLES SHOWING MERCY MEDICAL CENTER'S IMPACTS (2002–2010)

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**Table A.1. Pre-Enrollment Characteristics of Enrollees in the Mercy Program (percentages unless otherwise noted)**

| | | | Mercy Enrollees | | | | |
|---|---|---|---|---|---|---|---|
| | | Medicare Average in 2003 (n = 31 million) | Treatment and Control (n = 1,392) | Treatment (n = 696) | Control (n = 696) | Difference | *p*-Value |
| Age | < 65 | 14.2 | 5.3 | 5.2 | 5.3 | -0.1 | 0.47[g] |
| | > or = 85 | 11.8 | 16.7 | 16.4 | 17.0 | -0.6 | |
| Male | | 42.2 | 54.3 | 53.9 | 54.7 | -0.9 | 0.75 |
| Race/Ethnicity | Black, non-Hispanic | 9.3 | 0.4 | 0.1 | 0.6 | -0.4 | 0.18 |
| | Hispanic | 1.7[f] | 0.1 | 0.0 | 0.3 | -0.3 | 0.16 |
| Medicaid Buy-In[a] | | 18.2 | 12.0 | 12.4 | 11.6 | 0.7 | 0.68 |
| Less than High School Education[b] | | 15.9 | 30.5 | 27.4 | 33.8 | -6.3 | 0.08 |
| Diagnosis[c] | CAD | 30.0 | 70.0 | 68.8 | 71.1 | -2.3 | 0.35 |
| | CHF | 15.3 | 64.3 | 63.8 | 64.8 | -1.0 | 0.70 |
| | Diabetes | 21.0 | 34.3 | 33.8 | 34.9 | -1.1 | 0.65 |
| | COPD | 9.5 | 45.8 | 47.4 | 44.1 | 3.3 | 0.22 |
| | Cancer[d] | 6.1 | 15.0 | 13.6 | 16.4 | -2.7 | 0.15 |
| | Stroke | 12.1 | 12.1 | 11.5 | 12.8 | -1.3 | 0.46 |
| | Depression | 10.6 | 22.8 | 22.1 | 23.4 | -1.3 | 0.57 |
| | Dementia | 7.8 | 4.7 | 4.6 | 4.9 | -0.3 | 0.80 |
| Number of 12 Chronic Conditions (out of 12)[e] | | 1.5 | 3.5 | 3.4 | 3.5 | -0.1 | 0.57 |
| In Year before Randomization | Annualized hospitalizations (number) | 0.3 | 1.47 | 1.46 | 1.48 | -0.02 | 0.80 |
| | Medicare expenditures ($PBPM) | 552 | 1,649 | 1,658 | 1,640 | 18 | 0.84 |

Source: Medicare National Claims History File, Standard Analytic File, Enrollment Databases, and Mathematica survey of demonstration enrollees. Medicare FFS totals come from Mathematica's analysis of 2002 and 2003 Medicare 5 percent files (which include FFS beneficiaries only). Education, monthly expenditures, and proportion who had a stroke are exceptions and come from the 2003 Medicare Current Beneficiary Survey ([http://www.cms.hhs.gov/MCBS/Downloads/CNP_2003_section1.pdf] and Section 2). The survey includes all Medicare enrollees, not just those in FFS.

**Table A.1** *(continued)*

Notes: The research sample includes patients randomized from April 2002 through March 2009. We used Medicare FFS totals in 2003 as the reference because the year before randomization for most enrollees fell between 2001 and 2005, making 2003 the approximate midpoint.

[a]Medicaid Buy-In indicates that the beneficiary is eligible for both Medicare and Medicaid.

[b]For program treatment and control group members, the level of education comes from the patient survey conducted by Mathematica on a sample of enrollees randomized through June 2004.

[c]Diagnoses are based on the CCW definitions, version 1.6. The definitions use a look-back period of one year before enrollment for COPD, stroke, and depression and two years for CAD, CHF, and diabetes. The evaluation used a two-year look-back period for dementia rather than the three years used by CCW because of the limits of the Medicare claims data extracted for the analysis. The evaluation also used a broader definition of cancer than did CCW, capturing all types of malignant neoplasms (other than skin cancer) and using a one-year look-back period.

[d]This category excludes skin cancer.

[e]The 12 diagnoses include the 8 listed in the table plus atrial fibrillation, osteoporosis, rheumatoid arthritis/osteoarthritis, and chronic kidney disease.

[f]Because the data on the research sample come from the Medicare Enrollment Database, the table shows the national FFS average by using the 5 percent Medicare Enrollment Database as well. However, the Medicare Current Beneficiary Survey shows that a higher percentage of beneficiaries are Hispanic (7.6 percent).

[g]Only one *p*-value is reported for the treatment-control differences in age because a chi-squared test was used to determine whether the overall age distribution for the treatment group was different from the distribution for the control group.

**Table A.2. Effects of Mercy's Program on Hospitalizations (2002–2010)**

| Type of Enrollee | Enrollees (treatment and control) | | Mean Number of Follow-Up Months | Annualized Number of Hospitalizations | | | |
|---|---|---|---|---|---|---|---|
| | Number | Percentage of All Enrollees | | Control Group Mean | Treatment-Control Difference, Adjusted (90 percent confidence interval) | Percentage Difference | *p*-Value |
| All | 1,392 | 100 | 45.5 | 0.978 | -0.094 (-0.180, -0.009) | -9.7 | 0.07 |
| High-Risk[a] | 1,050 | 75 | 43.6 | 1.071 | -0.154 (-0.260, -0.049) | -14.4 | 0.02 |

Source: Medicare Enrollment Database, National Claims History File, Standard Analytic File, and Mathematica randomization file.

Notes: Outcomes are measured over the full life of the program from April 2002 through March 2010 among enrollees randomized through March 2009. The outcomes are weighted according to the proportion of the follow-up period during which each sample member met CMS's demonstration-wide requirements. The requirements are as follows: being in fee-for-service, having both Medicare Part A and B coverage, having Medicare as the primary payer, and being alive part of the month. Weights are calculated separately for each program's treatment and control groups.

Treatment-control differences are adjusted for baseline characteristics to increase the precision of the estimates and to account for chance differences between the treatment and control groups.

The table excludes the few treatment and control group members who did not meet CMS's demonstration-wide requirements or who had an invalid health insurance claim number on Mathematica's enrollment file because Medicare data showing their payments in the fee-for-service program were not available.

Negative estimates of treatment-control differences indicate that Medicare expenditures (with or without the care coordination fee) are lower for the treatment group—a favorable outcome.

[a]Patients who, at the time of enrollment, had coronary artery disease, chronic heart failure, or chronic obstructive pulmonary disease and at least one hospitalization in the previous year.

**Table A.3. Effects of Mercy's Program on Medicare Expenditures (2002–2010)**

| Type of Enrollee | Mean Program Fees Paid ($PBPM)[a] | Medicare Part A and B Expenditures ($PBPM) Not Including Program Fees: Control Group Mean | Treatment-Control Difference, Adjusted (90 percent confidence interval) | Percentage Difference | *p*-Value | Medicare Part A and B Expenditures ($PBPM) Including Program Fees: Treatment-Control Difference, Adjusted (90 percent confidence interval) | Percentage Difference | *p*-Value |
|---|---|---|---|---|---|---|---|---|
| All | 203 | 1,415 | -57 (-195, 82) | -4.0 | 0.50 | 146 (8, 285) | 10.3 | 0.08 |
| High-Risk[b] | 198[c] | 1,521 | -145 (-321, 30) | -9.6 | 0.17 | 53 (-123, 228) | 3.5 | 0.62 |

Source: Medicare Enrollment Database, National Claims History File, Standard Analytic File, and Mathematica randomization file.

Notes: Outcomes are measured over the full life of the program from April 2002 through March 2010 among enrollees randomized through March 2009. Sample sizes, weighting, and statistical adjustments are as described in Appendix Table A.2.

Negative estimates of treatment-control differences indicate that Medicare expenditures (with or without the care coordination fee) are lower for the treatment group—a favorable outcome.

[a]The mean monthly fees that CMS paid per beneficiary in the treatment group for care coordination services. The mean paid amount is less than the negotiated fee because some patients in the treatment group did not receive services in some months.

[b]Patients who, at the time of enrollment, had coronary artery disease, chronic heart failure, or chronic obstructive pulmonary disease and at least one hospitalization in the previous year.

[c]The mean fee paid is $5 lower PBPM for high-risk enrollees than all enrollees ($198 versus $203) for two possible reasons. First, the high-risk beneficiaries may have enrolled slightly later, on average, than other enrollees, leading to a slightly larger share of their follow-up period falling in the 2008–2010 period, when the negotiated fee was $147 PBPM rather than the higher 2002–2008 rate of $269. Second, the high-risk enrollees may have received care coordination services for a slightly smaller portion of their follow-up period than all enrollees. CMS only paid Mercy the negotiated fees in months that enrollees remained in the program.

**Table A.4. Effects of Mercy's Program on Mortality Risk (2002–2010)**

| Type of Enrollee | Number of Enrollees | Percentage Who Died Within Two Years of Enrollment | | | |
|---|---|---|---|---|---|
| | | Control Group Mean | Treatment-Control Difference, Adjusted | Percentage Difference | *p*-Value |
| All | 1,294 | 22.3 | -1.3 | -6.0 | 0.55 |
| High-Risk[a] | 962 | 23.0 | -0.3 | -1.3 | 0.91 |

Source: Medicare Enrollment Database, National Claims History File, and Standard Analytic File.

Notes: Data on beneficiary deaths are captured for April 2002 through March 2010 among enrollees randomized through March 2008. The outcomes are not weighted.

Treatment-control differences are adjusted for baseline characteristics to account for chance differences between the treatment and control groups.

The table excludes the few treatment and control group members who did not meet CMS's demonstration-wide requirements or who had an invalid health insurance claim number on Mathematica's enrollment file because Medicare enrollment data on whether they were deceased and their dates of death could not be linked to our data.

Negative estimates of treatment-control differences indicate that mortality is lower for the treatment group—a favorable outcome.

[a]Patients who, at the time of enrollment, had coronary artery disease, chronic heart failure, or chronic obstructive pulmonary disease and at least one hospitalization in the previous year.

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# APPENDIX B

# FINDINGS FOR HEALTH QUALITY PARTNERS' ORIGINAL TARGET POPULATION (2002–2010)

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In this appendix, we present results for the impacts of the Health Quality Partners program over eight years of operations (2002 through 2010). The results differ from those in the main body of the report in two ways. First, the sample includes *all* enrollees in HQP's program, whereas the main report presents results for the enrollees who met the new target criteria established in October 2010 for MCCD2. As shown in Table B.1, the population of all enrollees was substantially less sick, with lower rates of previous hospitalization, on average than those in the MCCD2 population (Table V.1). Second, the outcome period for the appendix covers just the first phase of the demonstration (from 2002 through 2010), whereas the earlier results covered the full 10 years of operations (spanning both the first and second phases) and the first 21 months of the second phase.

**Patient enrollment.** HQP enrolled 2,159 patients into the treatment and control groups from April 2002 through June 2009. HQP's enrollees were on average as sick as the overall Medicare fee-for-service population nationwide (Table B.1), reflecting HQP's initial strategy of intentionally enrolling beneficiaries with a variety of severity levels to test whether the effects of care coordination vary by severity of illness. HQP's average Medicare expenditure per person in the year before enrollment was $523 per month, which is close to the average expenditure of $552 per person per month for all Medicare beneficiaries in 2003; the average number of hospitalizations in the year before enrollment was 0.3 per person, matching the national Medicare FFS average. As expected with random assignment, we did not observe any systematic differences between the treatment and control groups on baseline characteristics.

**Effects on hospitalizations and expenditures.** HQP did not measurably reduce hospitalizations or Medicare Part A and B expenditures for all enrollees over eight years of operations (2002–2010) (Tables B.2 and B.3). Taking into consideration care coordination fees that averaged $95 PBPM, the program increased total expenditures by an estimated 13 percent. However, consistent with findings in the Fourth Report to Congress (Schore et al. 2011), the findings were much more favorable for the 15 percent of enrollees at greater risk of hospitalization and high costs because they met the definition of high risk at the time of enrollment—that is, they had a diagnosis of congestive heart failure, coronary artery disease, or chronic obstructive pulmonary disease and at least one hospitalization in the year before enrollment.[28] For this group, the HQP program reduced hospitalizations by 34 percent and reduced Medicare Part A and B costs by an estimated $425 PBPM (or 30 percent). With the inclusion of care coordination fees, the total PBPM expenditures for HQP's high-risk treatment group were $313, or 22 percent lower than those for the control group ($p = 0.06$); therefore, the evaluation concludes that HQP generated savings for the high-risk subgroup. However, the small sample size gives rise to considerable statistical uncertainty in the magnitude of the savings; the true savings are estimated to fall between $40 to $587 PBPM (the 90 percent confidence interval). We expect that the program generated larger effects for higher-risk patients because of more opportunities to reduce avoidable hospitalizations for such patients.

[28] This high-risk definition is the same as that used in the Fourth Report to Congress (Schore et al. 2011). The definition differs from that in the main body of the report, which adds diabetes as a qualifying diagnosis to reflect CMS's definition of high risk for the October 2010 extension. However, the addition of diabetes as a qualifying diagnosis does not substantially change the composition of the high-risk group. Almost all beneficiaries who meet the definition of high-risk because they have diabetes also meet the high-risk definition because they have CAD, CHF, or COPD.

To understand better how HQP generated savings for the high-risk group, the evaluation examined effects on different categories of expenditures. Reductions in facility payments to hospitals drove the overall reductions in Medicare expenditures by accounting for two-thirds of the total reduction. The program also reduced skilled nursing facility costs by an estimated $56 PBPM (or 50 percent, p = 0.05), total Medicare Part B costs by $91 PBPM (or 16 percent, p = 0.03), and physician services delivered in the ED or hospital by $28 PBPM (or 34 percent, p = 0.03). We observed no offsetting increases in spending for other services, such as outpatient physician visits.

**Quality of care for all enrollees and high-risk enrollees.** The MCCD programs were expected to improve the quality of patient care (for example, by reducing ED visits, increasing rates of recommended immunizations for all patients, increasing disease-specific preventive care such as glucose testing among those with diabetes, or reducing rates of preventable hospitalizations and complications). Over the first 8 years of operations, HQP's program reduced ED visits by 31 percent (p = 0.06) for high-risk enrollees but had no effect for all enrollees. Earlier analyses have shown that the program produced a few modest improvements on measures of preventive care and preventable adverse outcomes over the first 6.5 years of program operations (April 2002 through September 2008). However, the small sample sizes for disease-specific measures made it difficult to determine whether the programs improved quality of care unless the improvements were noticeably large (see Schore et al. 2011 for a detailed description of these findings).

**Mortality for all enrollees and high-risk enrollees.** We analyzed whether HQP affected the percentage of beneficiaries who died within two years of enrollment among all beneficiaries enrolled during the first six years of operations (Table B.4). HQP reduced two-year mortality substantially among all enrollees and high-risk enrollees. Specifically, for all enrollees, the program reduced the probability of death within two years of enrollment by 1.7 percentage points (or 33 percent of the control group mean of 5.2 percent, p = 0.06). Among high-risk enrollees, the program reduced the probability of death within two years of enrollment by 7.9 percentage points (or 57 percent of the control group mean of 13.8 percent, p = 0.04). The difference for the high-risk group accounts for over two-thirds of the estimated overall effect, implying a reduction of only about 0.6 percentage points for the other 85 percent of the HQP sample that is not high-risk. Given considerable statistical uncertainty in the magnitude of the effects, HQP's true reduction in the mortality rate for the high-risk group likely lies between 2 and 12 percentage points.

**Table B.1. Pre-Enrollment Characteristics of Enrollees Who Met Health Quality Partners' Original Target Criteria at the Time of Enrollment (percentages unless otherwise noted)**

| | | | Health Quality Partners Enrollees | | | | |
|---|---|---|---|---|---|---|---|
| | | Medicare Average in 2003 (n = 31 million) | Treatment and Control (n = 2,159) | Treatment (n = 1,084) | Control (n = 1,075) | Difference | *p*-Value |
| Age | < 65 | 14.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.96[g] |
| | > or = 85 | 11.8 | 8.9 | 8.9 | 8.8 | 0.1 | |
| Male | | 42.2 | 40.7 | 40.6 | 40.7 | -0.2 | 0.94 |
| Race/Ethnicity | Black, non-Hispanic | 9.3 | 1.0 | 0.5 | 1.5 | -1.0 | 0.02* |
| | Hispanic | 1.7[f] | 0.1 | 0.1 | 0.0 | 0.1 | 0.32 |
| Medicaid Buy-In[a] | | 18.2 | 2.0 | 1.6 | 2.4 | -0.8 | 0.16 |
| Less than High School Education[b] | | 15.9 | 10.6 | 9.7 | 11.5 | -1.8 | 0.16 |
| Diagnosis[c] | CAD | 30.0 | 40.6 | 40.8 | 40.4 | 0.4 | 0.85 |
| | CHF | 15.3 | 12.7 | 13.0 | 12.4 | 0.6 | 0.66 |
| | Diabetes | 21.0 | 25.3 | 26.4 | 24.2 | 2.2 | 0.24 |
| | COPD | 9.5 | 8.6 | 8.5 | 8.7 | -0.3 | 0.83 |
| | Cancer[d] | 6.1 | 10.1 | 10.3 | 9.9 | 0.5 | 0.72 |
| | Stroke | 12.1 | 4.4 | 4.9 | 3.9 | 1.1 | 0.23 |
| | Depression | 10.6 | 7.1 | 6.6 | 7.6 | -0.9 | 0.37 |
| | Dementia | 7.8 | 1.8 | 2.0 | 1.6 | 0.5 | 0.43 |
| Number of Chronic Conditions (out of 12)[e] | | 1.5 | 1.7 | 1.7 | 1.7 | 0.05 | 0.41 |
| In Year before Randomization | Annualized hospitalizations (number) | 0.3 | 0.29 | 0.30 | 0.27 | 0.03 | 0.33 |
| | Medicare expenditures ($PBPM) | 552 | 523 | 539 | 507 | 31 | 0.45 |

Sources: Medicare National Claims History File, Standard Analytic File, Enrollment Databases, and Mathematica survey of demonstration enrollees. Medicare FFS totals come from Mathematica's analysis of 2002 and 2003 Medicare 5 percent files (which include FFS beneficiaries only). Education, monthly expenditures, and proportion who had a stroke are exceptions and come from the 2003 Medicare Current Beneficiary Survey ([http://www.cms.hhs.gov/MCBS/Downloads/CNP_2003_section1.pdf] and Section 2). The survey includes all Medicare enrollees, not just those in FFS.

Notes: The research sample includes patients randomized from April 2002 through June 2009. We used Medicare FFS totals in 2003 as the reference because the year before randomization for most enrollees fell between 2001 and 2005, making 2003 the approximate midpoint.

**Table B.1** *(continued)*

[a]Medicaid Buy-In indicates that the beneficiary is eligible for both Medicare and Medicaid.

[b]For program treatment and control group members, the level of education comes from the patient survey conducted by Mathematica on a sample of enrollees randomized through June 2004.

[c]Diagnoses are based on the CCW definitions, version 1.6. The definitions use a look-back period of one year before enrollment for COPD, stroke, and depression and two years for CAD, CHF, and diabetes. The evaluation used a two-year look-back period for dementia rather than the three years used by CCW because of the limits of the Medicare claims data extracted for the analysis. The evaluation also used a broader definition of cancer than did CCW, capturing all types of malignant neoplasms (other than skin cancer) and using a one-year look-back period.

[d]This category excludes skin cancer.

[e]The 12 diagnoses include the 8 in the table plus atrial fibrillation, osteoporosis, rheumatoid arthritis/osteoarthritis, and chronic kidney disease.

[f]Because the data on the research sample come from the Medicare Enrollment Database, the table shows the national FFS average using the 5 percent Medicare Enrollment Database as well. However, the Medicare Current Beneficiary Survey reports that a higher percentage of beneficiaries are Hispanic (7.6 percent).

[g]Only one p-value is reported for the treatment-control differences in age because a chi-squared test was used to determine whether the overall age distribution for the treatment group was different from the distribution for the control group.

*$p < 0.05$.

**Table B.2. Effects of Health Quality Partners' Program on Hospitalizations for the Original Target Population (2002–2010)**

| Type of Enrollee | Enrollees (treatment and control) | | Mean Number of Follow-Up Months | Annualized Number of Hospitalizations | | | |
|---|---|---|---|---|---|---|---|
| | Number | Percentage of All Enrollees | | Control Group Mean | Treatment-Control Difference, Adjusted (90 percent confidence interval) | Percentage Difference | *p*-Value |
| All | 2,159 | 100 | 53.8 | 0.397 | -0.023 (-0.062, 0.016) | -5.7 | 0.34 |
| High-Risk[a] | 322 | 15 | 49.4 | 0.872 | -0.293 (-0.458, -0.129) | -33.7 | 0.004 |

Source: Medicare Enrollment Database, National Claims History File, Standard Analytic File, and Mathematica randomization file.

Notes: Outcomes are measured from April 2002 through June 2010 among enrollees randomized through June 2009. This outcome period ends before the start of the second phase of the demonstration (MCCD2) in October 2010. The outcomes are weighted according to the proportion of the follow-up period during which each sample member met CMS's demonstration-wide requirements. The requirements are as follows: being in fee-for-service, having both Medicare Part A and B coverage, having Medicare as the primary payer, and being alive part of the month. Weights are calculated separately for each program's treatment and control groups.

Treatment-control differences are adjusted for baseline characteristics to increase the precision of the estimates and to account for chance differences between the treatment and control groups.

The table excludes the few treatment and control group members who did not meet CMS's demonstration-wide requirements or who had an invalid health insurance claim number on Mathematica's enrollment file because Medicare data showing their payments in the fee-for-service program were not available.

Negative estimates of treatment-control differences indicate that hospitalizations or Medicare expenditures (with or without the care coordination fee) are lower for the treatment group—a favorable outcome.

[a]Patients who, at the time of enrollment, had coronary artery disease, chronic heart failure, or chronic obstructive pulmonary disease and at least one hospitalization in the previous year.

**Table B.3. Effects of Health Quality Partners' Program on Medicare Expenditures for the Original Target Population (2002–2010)**

| Type of Enrollee | Mean Program Fees Paid ($PBPM)[a] | Medicare Part A and B Expenditures ($PBPM) Not Including Program Fees: Control Group Mean | Treatment-Control Difference, Adjusted (90 percent confidence interval) | Percentage Difference | *p*-Value | Medicare Part A and B Expenditures ($PBPM) Including Program Fees: Treatment-Control Difference, Adjusted (90 percent confidence interval) | Percentage Difference | *p*-Value |
|---|---|---|---|---|---|---|---|---|
| All | 95 | 756 | 3 (-63, 68) | 0.4 | 0.95 | 98 (32, 164) | 13.0 | 0.01 |
| High-Risk[b] | 112 | 1,415 | -425 (-698, -152) | -30.1 | 0.01 | -313 (-587, -40) | -22.1 | 0.06 |

Source: Medicare Enrollment Database, National Claims History File, Standard Analytic File, and Mathematica randomization file.

Notes: Outcomes are measured from April 2002 through June 2010 among enrollees randomized through June 2009. This outcome period ends before the start of the second phase of the demonstration (MCCD2) in October 2010. The sample sizes, weighting, and statistical adjustments are shown in Appendix Table B.2.

Negative estimates of treatment-control differences indicate that Medicare expenditures (with or without the care coordination fee) are lower for the treatment group—a favorable outcome.

[a]The mean monthly fees that CMS paid per beneficiary in the treatment group for care coordination services. The mean amount paid is less than the negotiated fee because some patients in the treatment group did not receive services for some months.

[b]Patients who, at the time of enrollment, had coronary artery disease, chronic heart failure, or chronic obstructive pulmonary disease and at least one hospitalization in the previous year.

**Table B.4. Effects of Health Quality Partners' Program on Mortality Risk for the Original Target Population (2002–2010)**

| Type of Enrollee | Number of Enrollees | Percentage Who Died Within Two Years of Enrollment | | | |
|---|---|---|---|---|---|
| | | Control Group Mean | Treatment-Control Difference, Adjusted | Percentage Difference | *p*-Value |
| All | 1,727 | 5.2 | -1.7 | -33.0 | 0.06 |
| High-Risk[a] | 248 | 13.8 | -7.9 | -57.4 | 0.04 |

Source: Medicare Enrollment Database, National Claims History File, and Standard Analytic File.

Notes: Data on beneficiary deaths are captured for April 2002 through June 2010 among enrollees randomized through June 2008. The outcomes are not weighted.

Treatment-control differences are adjusted for baseline characteristics to account for chance differences between the treatment and control groups.

The table excludes the few treatment and control group members who did not meet CMS's demonstration-wide requirements or who had an invalid health insurance claim number on Mathematica's enrollment file because Medicare enrollment data on whether they were deceased and their dates of death could not be linked to our data.

Negative estimates of treatment-control differences indicate that mortality is lower for the treatment group—a favorable outcome.

[a]Patients who, at the time of enrollment, had coronary artery disease, chronic heart failure, or chronic obstructive pulmonary disease and at least one hospitalization in the previous year.