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**Fourth Report to Congress on
the Evaluation of the Medicare
Coordinated
Care Demonstration**

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Background

Chronic illnesses, such as heart disease and diabetes, incur significant expense for the Medicare program and are a major detriment to beneficiaries' quality of life. Medicare spending for the roughly half of all beneficiaries identified in 1997 as having multiple chronic conditions was nearly 60 percent higher over the subsequent four years than for the typical beneficiary (Congressional Budget Office 2005). These high Medicare expenditures are driven primarily by hospital admissions and readmissions (Medicare Payment Advisory Commission 2008). Several factors appear to contribute to the high rate of hospitalizations. Chronically ill patients may have received inadequate counseling on diet, medication, and self-care, or may find it hard to adhere 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, or they may not have ready access to medical help other than 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' 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 multiple physicians with no one physician responsible for all care (Pham et al. 2007). In addition, physicians may not routinely communicate with each other, and fee-for-service systems do not reimburse physicians for more effective coordination.

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 this hypothesis is lacking. 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 better 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); and (4) patients' health problems were identified and addressed in a more timely way (Powell et al. 2007; Powell et al. 2008). A number of small, single-center trials designed to improve care coordination have improved outcomes and reduced health care utilization for patients with chronic illnesses (Lorig et al. 1999; Clark et al. 2005; McAlister et al. 2004). However, there have been few large, rigorously designed studies of such interventions, and the literature shows mixed effects of such programs on health outcomes and cost (Mattke et al. 2007; Gravelle et al. 2007; Smith et al. 2005; DeBusk et al. 2004; Galbreath et al. 2004; Congressional Budget Office 2004). Against this backdrop, the Centers for Medicare & Medicaid Services (CMS) conducted rigorous evaluations of several large-scale programs of coordinated care. In addition to the Medicare Coordinated Care Demonstration (MCCD), the subject of this report, CMS has implemented and evaluated the Medicare, Medicaid, and SCHIP Benefits Improvement and Protection Act of 2000 (BIPA) Demonstration Project for Disease Management for Severely Ill Medicare Beneficiaries, the Informatics for Diabetes Education and Telemedicine (IDEATel) Demonstration, and the Medicare Health Support pilot program, among others. None of these larger-scale programs has been found to be cost neutral or to have reduced

hospitalizations, which raises questions about the effectiveness of care coordination (Bott et al. 2009).

A. The Medicare Coordinated Care Demonstration

To determine whether care coordination improves the quality of care and reduces Medicare expenditures, the Balanced Budget Act of 1997 (BBA) mandated that the Secretary of Health and Human Services implement and evaluate care coordination programs in the Medicare fee-for-service setting. In early 2001, CMS selected 15 demonstration programs for the MCCD out of 58 applicants in a competitive awards process under which *each program was allowed to define, within broad boundaries, its own intervention and target population*. Each program began enrolling patients between April and September of 2002 and was authorized to operate for four years. Eleven of the 15 programs later requested, and were granted, two-year extensions, and continued to operate into 2008.

To date, evaluation findings regarding care coordination have not been encouraging. Mathematica Policy Research (Mathematica) conducted the evaluation of the *15 original* demonstration programs during the period from program starts in 2002 to June 2006. The evaluation culminated in the third report to Congress, submitted in 2008 (Peikes et al. 2008).[1] The original legislation (Balanced Budget Act of 1997, Section 4016(b)(3)(B) of Pub. L. No. 105-33, shown in Appendix A) had authorized the Secretary of Health and Human Services to permanently implement components of the demonstration, if a report to Congress under Section 4016(c) of the BBA contains an evaluation, as described in Section 4016(b)(3)(A), that the projects (1) reduced Medicare expenditures, or (2) increased the "quality of health care services provided to target individuals and satisfaction of beneficiaries and health care providers" without increasing expenditures. The third report to Congress showed that, when care coordination fees were included, none of the 15 programs generated net savings over the original four-year evaluation period (through mid-2006), 9 programs definitely *increased* net costs, 3 probably increased costs, and 3 (Georgetown University Medical School, QMed, and Health Quality Partners [HQP]) appeared to have been cost neutral and thus were potential candidates for extension beyond 2008. However, Georgetown was not a viable candidate, because it chose to stop operating in 2006 (and, in any case, had achieved very low enrollment). QMed was offered continuation, but closed in summer 2008, along with its host organization, a disease management provider. Hence, of these 3, only HQP has continued to operate throughout 2010, under two successive additional extensions. It is currently extended through June 2013, with a revised, more-focused model.

In addition to extending HQP's program, CMS authorized Mercy Medical Center North Iowa (Mercy) to continue for another two years (through March 2010), but at a lower fee than it had been receiving. It ceased participation after that extension. Mercy reduced the average annualized number of hospitalizations by 17 percent—a statistically significant finding and the

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[1] The first report to Congress, submitted in 2005, described the first year of program implementation and the beneficiaries who enrolled. The second report to Congress, submitted in 2007, presented impacts on Medicare service use and expenditures measured over the first two years of the demonstration and findings from telephone surveys of beneficiaries enrolled in the programs and of their physicians, as well as describing program implementation in more detail.

largest reduction observed among the 11 programs still in operation in 2006. The treatment group's average monthly Part A and Part B expenditures were 9 percent ($113) lower than those of the control group, but the difference was not statistically significant, and was not large enough to offset the program fees. Although Mercy did not achieve cost neutrality, it might have done so had its program fees been lower. Thus, for the continuation, CMS reduced Mercy's monthly fees per beneficiary from $269 at the inception of the program to $147, with $113 paid to the program and $34 withheld, to be paid if savings exceeded the $113 fee paid. HQP continued to receive monthly fees of $110 or $130 depending on patient severity (and $50 for beneficiaries who had enrolled earlier in the demonstration and were classified as lower risk), the rates it received during the first four years of the demonstration. The HQP and Mercy programs are the subject of this fourth report.

Eight of the original MCCD programs (including HQP and Mercy) continue to work in the area of chronic care. In 2008, Congress appropriated funds to CMS to support the planning efforts of the Medicare Chronic Care Practice Research Network (MCCPRN), a consortium including the hosts of those 8 programs and 4 other healthcare organizations and universities with experience in care management and coordination. The MCCPRN hired Mathematica to help analyze data from the demonstration to guide the design of a pilot they are proposing that builds on lessons learned from the MCCD and, if they obtain additional funding, would test the replication of successful features. This report, the fourth report to Congress for the MCCD, which focuses on the HQP and Mercy programs, also incorporates some relevant findings from the work Mathematica conducted for the MCCPRN. As mandated by BBA Section 4016(c), this report includes a description of the demonstration projects and an evaluation of the cost effectiveness, quality of health care services, and beneficiary and provider satisfaction under the demonstration.

B. Findings from the Extended Evaluation

1. Evaluation Design

The evaluation uses the most rigorous design possible—a randomized control trial and an intent-to-treat design. Eligible beneficiaries who agree to participate are randomly assigned by the evaluator (Mathematica) to either the treatment group, which receives the intervention, or the control group. Both groups continue to obtain their traditional Medicare-covered services from fee-for-service providers in the usual manner. To preserve the integrity of random assignment, the evaluation included research sample members in the analyses from the time they are randomly assigned, regardless of whether or how long they received the intervention.[2] Program impacts on Medicare Part A and B service use, cost, and quality-of-care measures were based on Medicare claims and enrollment database data through September 2008. The research sample was restricted to beneficiaries who enrolled between the programs' start dates in April 2002 and September 2007 to ensure that at least one year of followup was potentially available for all sample members and that those in the treatment group would have at least one year of potential

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[2] 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, while a very small number disenrolled voluntarily (Brown et al. 2007).

exposure to the intervention. Because the Medicare Part D program did not begin until 2006, sufficient Part D data were not available to estimate impacts of prescription drug use and expenditures for this report. Part D drug data will be analyzed in a separate report to CMS in 2011, covering the 3-year span of available Part D analytic data files (from Part D initiation in January 2006 through 2008). This will encompass all 11 programs that continued into 2008, including: the 9 programs that ended in 2008; Mercy, that ended in March 2010; and HQP, that has been extended through June 2013.

2.   Patient Enrollment

HQP and Mercy enrolled 2,965 beneficiaries in the evaluation treatment and control groups through September 30, 2007 (1,721 and 1,244, respectively). Enrollees at HQP and Mercy (combined) differed from Medicare fee-for-service beneficiaries nationally in terms of demographics and socioeconomic status (Table 1). They were less likely to be under 65 years old (2 versus 14 percent), partly as a result of HQP's decision to target those over 65, and less likely to be Black or Hispanic (1 versus 11 percent), which reflects the programs' service areas (eastern Pennsylvania and central Iowa). Both HQP and Mercy enrollees were much less likely to be poor enough to have Medicaid coverage (as identified by Medicaid having paid Medicare premiums and deductibles) (6 versus 18 percent nationally).

Mercy enrollees were, on average, much sicker and had higher rates of chronic conditions than the Medicare fee-for-service population. This is due largely to the fact that Mercy required enrollees to have one of several serious chronic illnesses and to have been hospitalized or to have visited the emergency room in the year prior to enrollment. The average per-person Medicare expenditure in the year prior to enrollment for Mercy enrollees was $1,538 per month, almost three times the average per-person expenditure for all Medicare beneficiaries of $552. The average number of hospitalizations in the year prior to enrollment was 1.4, nearly five times the national average of 0.3. They also had an average of 3.4 of 12 chronic conditions, compared with 1.5 for the Medicare fee-for-service population.[3]

In contrast, HQP's enrollees were on average much less sick than Mercy's enrollees and about as sick as the Medicare fee-for-service population. This reflects HQP's strategy of intentionally enrolling beneficiaries with a variety of severity levels to test whether the effects of care coordination varied by severity of illness. HQP's average per-person Medicare expenditure in the year prior to enrollment was $497 per month, slightly lower than the $552 for all Medicare beneficiaries, although the average number of hospitalizations in the year prior to enrollment was 0.3 per person, matching the national average.

The treatment and control groups within each program are very similar on average, as one would expect when random assignment is successfully implemented. Of the 36 comparisons of baseline characteristics of the treatment and control groups conducted for the two programs, there are only two statistically significant, but small, treatment-control differences at the

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[3] 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.

Table 1. Preenrollment Characteristics of Research Sample Randomized Through September 2007 (Percentages Unless Otherwise Noted)

	Age			Race/Ethnicity				Diagnosis[b]								Number of Chronic Conditions (of 12 Possible)[f]	During the Year Prior to Randomization	
	<65	≥85	Male	Black, Non-Hispanic	Hispanic	Medicaid Buy-In[c]	Less Than High School Education[d]	CAD	CHF	Diabetes	COPD	Cancer[e]	Stroke	Depression	Dementia		Annualized Hospitalizations (#)	Monthly Expenditures ($)
Medicare FFS Total in 2003 (n=30.6 million)	14.2	11.8	42.2	9.3	1.7[g]	18.2	15.9	30.0	15.3	21.0	9.5	6.1	12.1	10.6	7.8	1.5	0.3	552
Health Quality Partners																		
Treatment + Control (n=1,721)	0.0	7.4	39.7	0.8	0.0	2.2	10.6	38.2	12.5	23.4	7.8	9.8	4.1	7.0	1.9	1.6	0.3	497
Treatment (n=866)	0.0	7.5	39.0	0.3	0.0	1.8	9.7	40.0	12.9	25.4	8.2	10.2	5.0	6.7	1.8	1.7	0.3	512
Control (n=855)	0.0	7.4	40.5	1.3	0.0	2.6	11.6	38.4	12.0	21.4	7.4	9.4	3.2	7.3	1.9	1.6	0.3	482
Difference	0.0	0.1	-1.4	-0.9	0.0	-0.7	-1.8	-0.4	0.9	4.0	0.8	0.8	1.8	-0.6	0.0	0.1	0.0	30
p-value	0.98[a]		0.54	0.03*	n/a	0.31	0.44	0.87	0.58	0.05*	0.52	0.57	0.06	0.65	0.97	0.21	0.78	0.50
Mercy																		
Treatment + Control (n=1,244)	4.3	17.0	54.6	0.4	0.1	11.5	30.5	69.4	64.7	33.0	47.0	15.0	11.8	22.1	4.7	3.4	1.4	1,538
Treatment (n=622)	4.2	16.9	54.7	0.2	0.0	11.6	27.4	69.3	64.5	32.5	48.9	13.8	10.6	20.9	4.7	3.4	1.4	1,559
Control (n=622)	4.5	17.2	54.5	0.6	0.2	11.4	33.8	9.5	65.0	33.6	45.2	16.1	13.0	23.3	4.8	3.4	1.4	1,517
Difference	-0.3	-0.3	0.2	-0.5	-0.2	0.2	-6.3	-0.2	-0.5	-1.1	3.7	-2.3	-2.4	-2.4	0.2	0.0	0.0	43
p-value	0.52[a]		0.96	0.18	0.32	0.93	0.08	0.95	0.86	0.67	0.19	0.27	0.19	0.31	0.89	>0.99	0.90	0.65
Combined																		
Treatment + Control (n=2,965)	1.8	11.5	46.0	0.6	0.0	6.1	20.3	51.3	34.4	27.5	24.2	11.9	7.3	13.3	3.1	2.4	0.7	935
Treatment (n=1,488)	1.7	11.4	45.6	0.3	0.0	5.9	18.3	51.1	34.5	28.4	25.2	11.7	7.3	12.6	3.0	2.4	0.7	950
Control (n=1,477)	1.9	11.5	46.4	1.0	0.1	6.3	22.3	51.5	34.3	26.5	23.3	12.2	7.3	14.0	3.1	2.4	0.7	918
Difference	-0.1	-0.1	-0.8	-0.7	-0.1	-0.4	-4.0	-0.4	-0.1	1.8	1.9	-0.5	0.0	-1.4	-0.1	0.0	0.0	32
p-value	0.76[a]		0.66	0.01*	0.32	0.66	0.07	0.84	0.93	0.27	0.23	0.68	0.99	0.27	0.27	0.47	0.90	0.53

Sources: Medicare National Claims History File, Standard Analytic File, Enrollment Databases, and Mathematica survey of demonstration enrollees. Medicare FFS totals come from Mathematica analysis of Medicare 5% 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). They include all Medicare enrollees, not just those who are in FFS.

[a] 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.

[b] Diagnoses are based on the Chronic Condition Warehouse (CCW) definitions [http://www.ccwdata.org/downloads/CCW%20User%20Manual.pdf]. These definitions use a look-back period of one year prior to enrollment for COPD, stroke, and depression, and two years for CAD (which includes ischemic heart disease and acute myocardial infarction), CHF, and diabetes. The evaluation used a two-year look-back period for dementia, rather than the three years used by CCW due to the limits of the Medicare claims data extracted for the analysis. The evaluation also used a broader definition for cancer than did CCW, capturing all types of malignant neoplasms (other than skin cancer) and used a one-year look-back.

[c] Medicaid Buy-In indicates dual-eligible status, which is a proxy for poverty.

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

[e] Excludes skin cancer.

[f] The 12 diagnoses include the 8 listed in the table plus these 4: (1) atrial fibrillation, (2) osteoporosis, (3) rheumatoid arthritis/osteoarthritis, and (4) chronic kidney disease.

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

*p=0.05.

FFS = fee-for-service; CAD = coronary artery disease; CHF = congestive heart failure; COPD = chronic obstructive pulmonary disease.

5 percent level (both are for Health Quality Partners, where modest differences are seen on race/ethnicity and proportion with diabetes). By chance alone, one would expect about two such differences.

3. Program Features

The HQP and Mercy programs are hosted by different types of organizations, but the interventions they provide are similar in many ways (Table 2). HQP is hosted by a quality improvement services provider operating in eastern Pennsylvania, the Mercy program by a hospital in rural central Iowa. Care coordination in both programs focuses on changing patient behavior rather than physician practice. Both programs require that care coordinators be highly experienced registered nurses. Care coordinators work initially to establish trusting relationships with patients (and, as needed, their caregivers) and then turn to teaching them self-management skills (such as how to better adhere to physicians' treatment recommendations, recognize early warning signs for their chronic conditions, communicate more effectively with physicians, and coordinate their own care), as well as to providing basic information about their medical conditions and evidence-based recommendations for routine preventive care. At both programs, relatively frequent in-person contact is key to establishing trusting relationships with patients, but coordinators contact patients by telephone as well.

The two programs differ markedly in their approaches to facilitating communications across providers, their use of data to inform decision making, and their patient education. Mercy's care coordinators adopt an *ongoing role* of "communications hub" across providers. That is, they routinely ensure that all providers have a full list of patients' medications and that polypharmacy problems are addressed, make sure tests recommended by evidence-based guidelines are ordered on schedule and that providers have the results when they see the patient, provide hospital staff with relevant patient information upon admission, and ensure after discharge that patients understand discharge plans and make follow-up appointments with physicians. By contrast, HQP's care coordinators take on this communication role primarily *around specific patient situations* (for example, hospital discharges or acute exacerbations).

HQP uses a much more data-driven approach to manage patients and the program itself than Mercy does. In 2006 HQP developed a web-enabled platform from which managers and care coordinators routinely generate reports (including program-level reports that allow managers to see whether the program is meeting its goals for improving care quality and patient health, and patient-level reports that allow care coordinators to track outcomes for an individual over time 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. Mercy's management style and approach to engaging patients have been relatively more judgment-driven, and Mercy has turned its attention only recently to using data to support its activities.

Finally, although both programs provide patient education, 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. HQP care coordinators also offer group education (such as for fall prevention and weight loss) to patients. Mercy's education consists primarily of delivering factual information to patients as often as necessary; group education is not feasible for most patients in Mercy's very large and rural service area.

Table 2.   Key Similarities and Differences Between the HQP and Mercy Programs, and Major Program Changes Over Time

Similarities

- Target population includes wide range of chronic conditions
- Focus is improving patient self-management rather than physicians' clinical practice
- Care coordinators are highly experienced registered nurses
- In-person patient contact is relatively frequent
- Access to hospital databases is available for 60 to 65 percent of patients

Differences

- Mercy patients as a group are more seriously ill and at higher risk of hospitalization
- Mercy care coordinators have ongoing and routine role as "communications hub"
- Mercy care coordinators have closer ties to primary care physicians

- HQP patient education is based in behavior change theory and includes groups
- HQP approach to management is data-driven
- HQP interventions are widely based on the use of protocols

Major Changes

Mercy

- Parent organization (Mercy Health Network) adopted electronic health records systems in 2005
- Fee reduction in April 2008 led in July 2008 to elimination of care coordinator position and reduction of social worker to part time; elimination of care coordinator position led to higher caseloads and less in-person contact

HQP

- Added clinical nurse specialist consultant to address patients' psychiatric problems in 2003
- Added group education in 2004 for weight and physical activity management and in 2005 for fall prevention
- Expanded service area to Bethlehem PA in 2005 and to Quakertown PA in 2009
- Excluded less seriously ill beneficiaries in September 2006
- Adopted data-reporting platform in 2006
- Developed care setting transition protocol in 2007

4.   Program Effects

To summarize, neither program met CMS's objectives of cost neutrality or net savings for all of its enrollees during the full six-and-a-half year period examined for this report (April 2002 through September 2008), but the findings were more positive for a subgroup of enrollees at greater risk of hospitalization and high costs. For this subgroup: (1) HQP generated gross savings greater than the fee the program was paid during 2002 to 2008; and (2) Mercy generated gross savings that would have covered the revised fee it has been receiving since April 2008, but that were *not* sufficient to cover the higher fees received over the full period covered by this report.

Medicare Hospitalizations and Total Expenditures for All Enrollees. Mercy reduced hospitalizations for all its enrollees by 12 percent over the life of the program (Table 3). However, these reductions did not translate into statistically significant reductions in Part A and B expenditures. HQP did not reduce either hospitalizations or expenditures for all

Table 3. Regression-Adjusted Effects on Annualized Hospitalizations and Monthly Medicare Expenditures from Program Starts in April 2002 Through September 2008, Among Patients Randomized Through September 2007

| | | Annualized Number of Hospitalizations | | | | Monthly Medicare Part A and B Expenditures, $ | | | | | | |
| | | | | | | Without Program Fees | | | | With Program Fees | | |
	Number of Enrollees (Treatment and Control)	Control Group Mean	Treatment-Control Difference	% Differ-ence	p-value	Control Group Mean	Treatment-Control Difference	% Differ-ence	p-value	Treatment-Control Difference	% Differ-ence	p-value
Health Quality Partners	1,721	0.395	-0.029	-7.3	0.30	731	-27	-3.7	0.54	69	9.4	0.13
Mercy Medical Center	1,244	0.963	-0.113	-11.8	0.04	1,328	-50	-3.8	0.47	182	13.7	0.01
Combined	2,965	0.611	-0.061	-10.0	0.02	957	-36	-3.8	0.35	112	11.7	<0.01

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

Notes: Treatment and control group members who did not meet the demonstration-wide requirements of the Centers for Medicare & Medicaid Services (CMS), or who had an invalid Health Insurance Claim number on Mathematica's enrollment file, are excluded from this table because Medicare data showing their payments in the fee-for-service program were not available.

The outcomes are weighted according to the proportion of the follow-up period each sample member met CMS's demonstration-wide requirements. CMS's requirements are as follows: being in fee-for-service, having both Part A and Part B coverage, having Medicare as the primary payer, and being alive part of the month. Weights are calculated separately for the treatment and control groups.

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

enrollees. Taking program fees into account for all enrollees, each program increased total Medicare expenditures.[4]

Medicare Hospitalizations and Total Expenditures for High-Risk Enrollees. For the restricted set of enrollees who were classified as high-risk based on pre-enrollment characteristics (*that is, those who had congestive heart failure, coronary artery disease, or chronic obstructive pulmonary disease, and had at least one hospitalization in the year prior to enrollment*) both programs were substantially more successful than they were overall.[5] This high-risk subgroup comprised 14 percent of HQP's enrollees and 74 percent of Mercy's. These high-risk enrollees in HQP and Mercy had 39 and 18 percent fewer annualized hospitalizations (both statistically significant, $p \leq 0.01$) than corresponding control group members, respectively (Table 4). Average monthly Part A and B expenditures were lower by $511 per month, or 36 percent in HQP (statistically significant at the 0.01 level), and $130 per month, or 9 percent, in Mercy.[6] After including fees, the monthly (net) expenditures for HQP's treatment group were $397 lower than those for the control group ($p=0.05$); thus the evaluation concludes that HQP generated net savings for this high-risk subgroup. Mercy's monthly average treatment group expenditures including program fees were $100 higher than those of the control group. Thus, while Mercy was not cost neutral at the fees paid over the 2002-2008 period, the treatment-control difference of -$130 in Part A and B expenditures for this high-risk subgroup would have been sufficient to cover the reduced fee CMS now pays Mercy ($113 per beneficiary per month guaranteed, with an additional $34 deferred pending cost neutrality).

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[4] When limited to the two-year period from July 2006 through September 2008, which is subsequent to the period covered by the third report to Congress (program startup in 2002 through June 2006), these 2 programs also increased total expenditures by amounts comparable to those of the full period. However, sample sizes were smaller, which reduced statistical precision; therefore, this report focuses on findings for the full six and a half-year follow-up period.

[5] This high-risk subgroup and several others the evaluation explored were based on input from MCCPRN members, who suggested possible subgroups they believed to be most amenable to intervention *in advance of the analysis.* The high-risk subgroup described above provided the most consistent findings for the two programs that are the subject of this report. Beneficiaries who met the definition for any of the high-risk subgroups explored also met their program's specific targeting criteria (and CMS's Medicare eligibility criteria).

[6] While the estimated effect on Medicare expenditures for Mercy's high-risk subgroup was not statistically significant, despite the significant effect on hospitalizations, some additional analyses suggest that this is due to the high variability of expenditures rather than to an absence of effect on expenditures. First, analyses of the program's effects on specific types of services did show a statistically significant effect on hospital expenditures of $92 per beneficiary per month ($p=0.10$) (not shown). None of the other service categories showed treatment-control differences of more than $10 per beneficiary per month, in either direction (most were negative). Thus, the lack of effects on total expenditures appears to be due to the "noise" of the non-hospital expenditures, rather than to offsetting increases in expenditures on physician or other services. (Total Part B costs were $30 lower for the treatment than the control group.) Furthermore, regressions in which the logarithm of expenditures was used as the dependent variable—a common method for dealing with skewed variables such as medical expenditures--showed that the treatment group had significantly lower costs, by 11.5 percent ($p=0.07$), than the control group mean, which translates into an estimated dollar difference of $162 per beneficiary per month when multiplied by the control group mean of $1,411. Thus, the reduction in hospitalizations does appear to lead to a modest reduction in expenditures for Mercy for this high-risk group.

Table 4. Regression-Adjusted Effects on Annualized Hospitalizations and Monthly Medicare Expenditures from Program Starts in April 2002 Through September 2008, Among High-Risk Patients Randomized Through September 2007

| | | Annualized Number of Hospitalizations | | | | Monthly Medicare Part A and B Expenditures, $ | | | | | | |
| | | | | | | Without Program Fees | | | | With Program Fees | | |
	Number of Enrollees (Treatment and Control)	Control Group Mean	Treatment-Control Difference	% Differ-ence	p-value	Control Group Mean	Treatment-Control Difference	% Differ-ence	p-value	Treatment-Control Difference	% Differ-ence	p-value
Health Quality Partners	248	0.894	-0.347	-38.8	<0.01	1,441	-511	-35.5	0.01	-397	-27.6	0.05
Mercy Medical Center	917	1.050	-0.185	-17.6	0.01	1,411	-130	-9.2	0.13	100	7.1	0.24
Combined	1,165	1.012	-0.225	-22.2	<0.01	1,418	-223	-15.7	0.01	-21	-1.5	0.80

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

Notes: Treatment and control group members who did not meet the demonstration-wide requirements of the Centers for Medicare & Medicaid Services (CMS), or who had an invalid Health Insurance Claim number on Mathematica's enrollment file, are excluded from this table because Medicare data showing their payments in the fee-for-service program were not available.

The outcomes are weighted according to the proportion of the follow-up period each sample member met CMS's demonstration-wide requirements. CMS's requirements are as follows: being in fee-for-service, having both Part A and Part B coverage, having Medicare as the primary payer, and being alive part of the month. Weights are calculated separately for the treatment and control groups.

High-risk enrollees are defined as those 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 prior year.

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

When looking at effects by year of enrollment for the high-risk subgroup, Mercy had a statistically significant reduction in annualized hospitalizations only in year one (.24 hospitalizations, p=0.02) (not shown). The size of the treatment-control differences in hospitalizations dropped in years two and three, but returned in years four, five, and six to levels nearly identical to that of year one (.24, .21, and .27, respectively). However, the higher variance arising from the smaller sample sizes over time leads to these similar estimates of differences not being statistically significant. The effects for HQP were relatively consistent across all six years, but also are not statistically significant after year one.

Notably, analyses conducted under the MCCPRN contract showed that only 2 of the other 9 MCCD programs extended beyond the originally specified 2006 end date of the demonstration (Hospice of the Valley and Washington University) had favorable effects for this and a very similar subgroup (also suggested by MCCPRN members) that also includes enrollees with a chronic condition and *two or more* hospitalizations in the prior year (Peikes et al. 2009). Therefore, simply targeting this high-risk subgroup does not ensure success in reducing beneficiaries' need for hospitalizations. Success is dependent on both appropriate targeting and intervention features. Underscoring that effects were concentrated among this high-risk group, for enrollees who did *not* meet this definition of high-risk, HQP and Mercy had no effects on hospitalizations or Part A and B expenditures, and therefore significantly increased net costs for HQP and Mercy (not shown).

Medicare Expenditures by Type of Service for High-Risk Enrollees. To understand better why programs were effective for the high-risk group, this MCCD evaluation examined effects on different categories of expenditures. Reductions in payments to hospitals drive the overall reductions in Medicare expenditures by accounting for about two-thirds of the total reduction for each program. There were no offsetting increases in spending for other services such as physician visits. HQP also reduced emergency room visits by 37 percent (p=0.05) (not shown).

Quality of Care for All Enrollees and High-Risk Enrollees. The programs were also expected to improve the quality of patient care (for example, by increasing rates of recommended immunizations for all patients or by increasing disease-specific preventive care, such as glucose testing among those with diabetes, or by reducing rates of preventable hospitalizations and complications). Small sample sizes for the disease-specific measures (and thus low statistical power) made it difficult to determine whether the programs improved quality of care unless the improvements were quite large (Table 5). Among all patients, HQP substantially improved 4 of the 12 measures analyzed describing receipt of preventive services and reduced the rate of 1 of the 9 measures describing preventable adverse outcomes. Among high-risk patients, HQP improved quality according to two measures (one for preventive services and one for preventable adverse outcomes). For Mercy, among all patients, the evaluation found one significant improvement for receipt of preventive services, and among high-risk patients, the evaluation found a reduction for one preventable adverse outcome.

Mortality for All Enrollees and High-Risk Enrollees. HQP appears to have reduced mortality rates among all its enrollees and among the 29 percent of enrollees the program itself

Table 5. Summary of Treatment-Control Differences in Quality-of-Care Variables for High-Risk Enrollees and All Enrollees

| Quality-of-Care Measure | Treatment-Control Differences in Annualized Rates[a] | | | |
| | High-Risk Enrollees[b] | | All Enrollees | |
	HQP	Mercy	HQP	Mercy
RECEIPT OF PREVENTIVE SERVICES				
Full Sample				
Influenza vaccine	0	0	+	−
Pneumococcal vaccine	0	0	++	0
Patients with Diabetes				
Diabetes education	0	0	0	0
Blood test for lipids	0	0	++	0
Eye exam	0	0	0	0
A1C blood test	0	0	0	0
Podiatry visit	0	0	0	++
Blood glucose self-monitoring supplies	0	0	0	0
Therapeutic shoes	0	0	0	0
Urine tests for proteins	0	0	0	0
Patients with CHF				
Assessment of left ventricular function	0	0	0	0
Patients with CAD				
Blood test for lipids	++	0	++	0
POTENTIALLY PREVENTABLE HOSPITALIZATIONS AND COMPLICATIONS				
Full Sample				
Any potentially preventable hospitalization	0	0	0	0
Patients with Diabetes				
CHF hospitalization	0	0	0	0
Cardiac hospitalization	0	0	0	0
Diabetes hospitalization	0	++	0	0
Peripheral vascular or extremity complications	0	0	0	0
Microvascular complications	0	−	0	−
Patients with CHF				
CHF hospitalizations	0	0	0	0
Fluid/electrolyte problems	++	0	++	0
Patients with CAD				
CAD hospitalization	0	0	0	0

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

Notes: Treatment and control group members who did not meet the demonstration-wide requirements of the Centers for Medicare & Medicaid Services (CMS), or who had an invalid Health Insurance Claim number on Mathematica's enrollment file, are excluded from this table because Medicare data showing their payments in the fee-for-service program were not available.

The outcomes are weighted according to the proportion of the follow-up period each sample member met CMS's demonstration-wide requirements. CMS's requirements are as follows: being in fee-for-service, having both Part A and Part B coverage, having Medicare as the primary payer, and being alive part of the month. Weights are calculated separately for the treatment and control groups.

High-risk enrollees are defined as those 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 prior year.

[a]0 = No statistically significant difference (p>0.10).

[b]High-risk enrollees are defined as those enrollees who, at the time of enrollment, had CAD, CHF, or COPD and 1+ hospitalization in the prior year.

+ = Statistically significant difference (p<0.10) in a favorable direction (more preventive services; fewer hospitalizations or complications) that is less than 10 percent of the annualized rate for the control group mean.

++ = Statistically significant difference (p<0.10) in a favorable direction (more preventive services; fewer hospitalizations or complications) that is greater than 10 percent of the annualized rate for the control group mean.

− = Statistically significant difference (p<0.10) in an unfavorable direction (fewer preventive services; more hospitalizations or complications).

CHF = Congestive Heart Failure; CAD = Coronary Artery Disease; COPD = Chronic Obstructive Pulmonary Disease.

classified at enrollment as at highest risk (Table 6)[7].   Over the life of the study, among all enrollees, treatment group members were 3.3 percentage points less likely to die (10.3 versus 13.6 percent; p=0.02).   Mercy's treatment group also had lower mortality rates than its control group (45.9 versus 50.0 percent), but the difference, while slightly larger in absolute terms than the difference in HQP, was not statistically significant (4.1 percentage points, p=0.13).   The treatment-control difference in Mercy's program is not significantly different from the difference in HQP's program, however, and when pooled together, the two programs had a statistically significant reduction in mortality of 3.6 percentage points.

Turning to the high-risk subgroup, the treatment group had a lower mortality rate for each program separately and combined. While these differences were not statistically significant, the point estimates (5.4 and 3.9 percentage point reductions for the HQP and Mercy, respectively) were comparable to or larger than those for all enrollees, which suggests that the lack of statistical significance of mortality differences for this subgroup may have been due to low power. This conclusion is buttressed by the finding of a significant treatment-control difference in mortality for HQP's own defined high-risk group, which comprises over twice as many beneficiaries as the evaluation's high-risk subgroup.

Physician and patient satisfaction. Survey data collected earlier in the demonstration indicate patients and their usual care providers were generally very satisfied with care coordination. Care coordinators were rated highly on four dimensions—support and monitoring, help arranging services, ability to provide education to patients, and ability to assist patients in adhering to treatment recommendations—each of which had three or four specific indicators. HQP's patients generally gave it notably higher ratings than the patients in other programs. Two thirds or more of physicians reported that each program provided very good or excellent overall monitoring and followup of patients, and made it easier to care for their patients. For Mercy, physicians also gave high ratings to the program for reducing polypharmacy and making things easier for staff (see Brown et al. 2007 for a more detailed description of the findings).

5.   Program Features That Are Key to Success

The reductions of hospitalizations of HQP and Mercy for their high-risk patients is associated with several intervention features present in one or both programs. Features that appear to be key to success were distilled by comparing the 4 relatively successful programs (HQP and Mercy, the 2 continuing MCCD programs, plus Hospice and Washington University, the 2 former MCCD programs being further evaluated under the MCCPRN contract) with 7 other former MCCD programs with substantial enrollment and still in operation in 2008 that did not reduce hospitalizations.

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[7] For the beneficiaries that HQP classified as high-risk using its own program-specific criteria at enrollment, the program reduced mortality by 7.5 percentage points (p=0.03). HQP classified beneficiaries as high-risk if they had complex medical conditions *and* were frail at the time of enrollment, but did not require a hospitalization within the year before enrollment.

Table 6. Regression-Adjusted Effects on Mortality from Program Starts in April 2002 Through September 2008, Among All Patients and High-Risk Subgroups Randomized Through September 2007

		Percentage of Enrollees Who Died During the Follow-Up Period			
	Number of Enrollees (Treatment and Control)	Control Group Mean (%)	Treatment-Control Difference (Percentage Points)	% Difference	p-value
All Enrollees					
Health Quality Partners	1,721	13.6	-3.3	-24.6	0.02
Mercy Medical Center	1,244	50.0	-4.1	-8.1	0.13
Combined	2,965	28.9	-3.6	-12.6	0.01
High-Risk Subgroup[a]					
Health Quality Partners	248	29.3	-5.4	-18.4	0.33
Mercy Medical Center	917	49.0	-3.9	-8.0	0.21
Combined	1,165	44.8	-4.2	-9.5	0.12
High-Risk Subgroup Based on Health Quality Partner's Definition[b]					
Health Quality Partners	502	24.8	-7.5	-30.4	0.03

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

Notes: Treatment and control group members who did not meet the demonstration-wide requirements of the Centers for Medicare & Medicaid Services, or who had an invalid Health Insurance Claim number on Mathematica's enrollment file, are excluded from this table because Medicare data showing their payments in the fee-for-service program were not available.

The outcomes are not weighted.

Negative treatment-control difference estimates imply that mortality is lower for the treatment group, a favorable outcome.

[a]High-risk enrollees are defined as those 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 prior year.

[b]Enrollees who met Health Quality Partners' highest risk level designation (Level IV) were frail and typically had multiple medical, social, and functional problems that required significant caregiver and social support.

In addition to using *highly educated and experienced registered nurses* as care coordinators, and using many features common to many care coordination programs (such as patient assessments and care plans), the recommended features for future care coordination efforts include:

1. **Face-to-face contact with patients.** Frequent face-to-face contact with patients (about once per month on average).

2. **Face-to-face contact with physicians.** Opportunities for ongoing face-to-face contact with patients' physicians (for example, through co-location, 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. **Patient education.** Providing a strong, evidence-based patient education intervention, including effective education of patients on how to take their medications correctly and better adhere to other treatment recommendations.

4. **Managing care setting transitions.** Having a timely, comprehensive response to care setting transitions (most notably from hospitals).

5. **Communications hub.** Care coordinators playing an active role as a communications hub among providers and between the patient and the providers.

6. **Medication management.** Providing comprehensive medication management that supplements nurse care coordinator knowledge with that of pharmacists or physicians.

In addition, 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 accessing health-related services. (These patients made up a minority of enrollees for most of the MCCD programs, however. Thus, it is unclear how big a role the availability of social work resources played in the success of the programs.)

C. SUMMARY OF FINDINGS

Overall, the two remaining projects (HQP and Mercy) successfully enrolled 2,965 beneficiaries in the research sample through September 30, 2007, and half were randomized to the treatment group and half to the control group. Mercy's enrollees were, on average, much sicker than the Medicare fee-for-service population nationwide; HQP's enrollees were similar to the fee-for-service population nationwide.

Neither program was cost effective overall, but results are promising for high-risk patients. Neither program achieved cost neutrality or net savings for all of its enrollees during the six and a half year period examined for this report (April 2002 through September 2008). However, for a subgroup of enrollees at greater risk of hospitalization and high costs, HQP generated savings for CMS of $397 per beneficiary per month after including the care coordination fee. Mercy's treatment group had lower Part A and B costs than the control group, but the difference was not statistically significant (-$130, p=0.13) and the average monthly program fee paid over the period ($230) substantially exceeded this estimated savings in

traditional Medicare expenditures. To summarize, while HQP generated savings for its high-risk patients, Mercy would have had to dramatically cut its fee or improve its effectiveness to have achieved cost neutrality. This high-risk subgroup, who had CHF, CAD, or COPD and at least one hospitalization in the year prior to enrollment, constitutes 14 percent of all Medicare beneficiaries in fee-for-service, and accounts for a disproportionate 30 percent of total Medicare expenditures in the year after identification.

The programs made limited improvements to the quality of care. Small sample sizes among disease-specific quality of care measures made it difficult to determine whether the programs improved quality of care unless the improvements were large. Among all patients, HQP improved 4 of 12 measures of receipt of preventive services and 1 of 9 measures of preventable adverse outcomes, and Mercy improved one measure of receipt of preventive services. In both programs the treatment group was significantly more likely than the control group to report that a health professional had explained to them how to take their medications properly. There were fewer measurable quality improvements among the high-risk patients, perhaps due to the smaller sample sizes. HQP's treatment group mortality was 3.3 percentage points lower than its control group's (p=0.02); Mercy's treatment group's mortality was 4.1 percentage points lower than its control group's (the difference was not statistically significant). Among the high-risk group, the treatment groups had lower mortality rates than the control group, but the differences were not statistically significant, perhaps due to their substantially smaller sample sizes and corresponding lower statistical power than for the full sample.

Patients and providers were highly satisfied with the intervention. Based on earlier results from surveys of patients and providers, the programs were well received by both patients and providers.

Several features of the interventions appear to contribute to HQP's and Mercy's ability to reduce hospitalizations for the 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. Using highly educated and experienced registered nurses to provide the right interventions to the right people appears to be the key to reducing hospitalizations. The successful programs were more likely to provide:

1. Face-to-face care coordinator contact with patients,

2. Face-to-face care coordinator contact with physicians,

3. Evidence-based patient education,

4. Management of care setting transitions,

5. Facilitation of communications across providers, and

6. Medication management.

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APPENDIX A

**LEGISLATION AUTHORIZING THE MEDICARE COORDINATED
CARE DEMONSTRATION**

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Pub. L. No. 105-33

Balanced Budget Act of 1997

SEC. 4016. MEDICARE COORDINATED CARE DEMONSTRATION PROJECT.

(a) DEMONSTRATION PROJECTS-

(1) IN GENERAL- The Secretary of Health and Human Services (in this section referred to as the `Secretary') shall conduct demonstration projects for the purpose of evaluating methods, such as case management and other models of coordinated care, that--

(A) improve the quality of items and services provided to target individuals; and

(B) reduce expenditures under the medicare program under title XVIII of the Social Security Act (42 U.S.C. 1395 et seq.) for items and services provided to target individuals.

(2) TARGET INDIVIDUAL DEFINED- In this section, the term `target individual' means an individual that 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 XVIII of the Social Security Act (42 U.S.C. 1395c et seq.; 1395j et seq.).

(b) PROGRAM DESIGN-

(1) INITIAL DESIGN- The Secretary shall evaluate best practices in the private sector of methods of coordinated care for a period of 1 year and design the demonstration project based on such evaluation.

(2) NUMBER AND PROJECT AREAS- Not later than 2 years after the date of enactment of this Act, the Secretary shall implement at least 9 demonstration projects, including--

(A) 5 projects in urban areas;

(B) 3 projects in rural areas; and

(C) 1 project within the District of Columbia which is operated by a nonprofit academic medical center that maintains a National Cancer Institute certified comprehensive cancer center.

(3) EXPANSION OF PROJECTS; IMPLEMENTATION OF DEMONSTRATION PROJECT RESULTS-

(A) EXPANSION OF PROJECTS- If the initial report under subsection (c) contains an evaluation that demonstration projects--

(i) reduce expenditures under the medicare program; or

(ii) do not increase expenditures under the medicare program and increase the quality of health care services provided to target individuals and satisfaction of beneficiaries and health care providers;

the Secretary shall continue the existing demonstration projects and may expand the number of demonstration projects.

(B) IMPLEMENTATION OF DEMONSTRATION PROJECT RESULTS- If a report under subsection (c) contains an evaluation as described in subparagraph (A), the Secretary may issue regulations to implement, on a permanent basis, the components of the demonstration project that are beneficial to the medicare program.

(c) REPORT TO CONGRESS-

(1) IN GENERAL- Not later than 2 years after the Secretary implements the initial demonstration projects under this section, and biannually thereafter, the Secretary shall

submit to Congress a report regarding the demonstration projects conducted under this section.

(2) CONTENTS OF REPORT- The report in paragraph (1) shall include the following:

> (A) A description of the demonstration projects conducted under this section.
> (B) An evaluation of--
>> (i) the cost-effectiveness of the demonstration projects;
>> (ii) the quality of the health care services provided to target individuals under the demonstration projects; and
>> (iii) beneficiary and health care provider satisfaction under the demonstration project.
> (C) Any other information regarding the demonstration projects conducted under this section that the Secretary determines to be appropriate.

(d) WAIVER AUTHORITY- The Secretary shall waive compliance with the requirements of title XVIII of the Social Security Act (42 U.S.C. 1395 et seq.) to such extent and for such period as the Secretary determines is necessary to conduct demonstration projects.

(e) FUNDING-

> (1) DEMONSTRATION PROJECTS-
>> (A) IN GENERAL-
>>> (i) STATE PROJECTS- Except as provided in clause (ii), the Secretary shall provide for the transfer from the Federal Hospital Insurance Trust Fund and the Federal Supplementary Insurance Trust Fund under title XVIII of the Social Security Act (42 U.S.C. 1395i, 1395t), in such proportions as the Secretary determines to be appropriate, of such funds as are necessary for the costs of carrying out the demonstration projects under this section.
>>> (ii) CANCER HOSPITAL- In the case of the project described in subsection (b)(2)(C), amounts shall be available only as provided in any Federal law making appropriations for the District of Columbia.
>> (B) LIMITATION- In conducting the demonstration project under this section, the Secretary shall ensure that the aggregate payments made by the Secretary do not exceed the amount which the Secretary would have paid if the demonstration projects under this section were not implemented.
> (2) EVALUATION AND REPORT- There are authorized to be appropriated such sums as are necessary for the purpose of developing and submitting the report to Congress under subsection (c).

Source: Balanced Budget Act of 1997, Pub. L. No. 105-33, 114 Stat.1997.

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