Why Has Growth in Spending for Fee-for-Service Medicare Slowed?

Michael Levine
Congressional Budget Office

Melinda Buntin
Vanderbilt University

Abstract

Growth in spending per beneficiary in the fee-for-service portion of Medicare has slowed substantially in recent years. The slowdown has been widespread, extending across all of the major service categories, groups of beneficiaries that receive very different amounts of medical care, and all major regions. We estimate that slower growth in payment rates and changes in observable factors affecting beneficiaries' demand for services explain little of the slowdown in spending growth for elderly beneficiaries between the 2000–2005 and 2007–2010 periods. Specifically, available evidence does not support a finding that demand for health care by Medicare beneficiaries was measurably diminished by the financial turmoil and recession. Instead, much of the slowdown in spending growth appears to have been caused by other factors affecting beneficiaries' demand for care and by changes in providers' behavior. We discuss the contribution that those factors may have made to the slowdown in spending growth and the difficulties in quantifying those influences and predicting their persistence.

Notes

Unless otherwise indicated, years referred to in this working paper are calendar years.

Numbers in the text and tables may not add up to totals because of rounding.

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Summary

Between fiscal years 1980 and 2005, spending per beneficiary in the fee-for-service (FFS) portion of Medicare grew at an annual rate of about 8 percent, while between fiscal years 2007 and 2012, that rate was 3 percent. A reduction in economywide core price inflation explains part of that slowdown, but inflation-adjusted average growth in spending per FFS beneficiary also slowed markedly between those periods—from 4 percent to less than 1 percent.[1] Spending growth has fluctuated over the past several decades, but previous declines were typically associated with significant policy changes (see Figure 1). For instance, the drop that began in the early 1980s was caused partly by the anticipation and implementation of the inpatient prospective payment system. The sharp drop in the late 1990s was precipitated in part by the Balanced Budget Act of 1997, which enacted a broad range of changes in payments to providers. But the most recent slowdown in spending, which began in the mid-2000s, cannot be so readily explained by legislated changes in policy.

This paper focuses on the slowdown in the growth of FFS Medicare spending for elderly beneficiaries through 2010, the most recent year for which detailed survey data on beneficiaries are available. Annual nominal growth in FFS spending per elderly beneficiary, which on average was very similar to the growth in per-person spending for all Medicare beneficiaries, was 7.1 percent from 2000 to 2005 and 3.8 percent from 2007 to 2010.[2] The difference in growth rates between those two periods, 3.2 percentage points (rounded), constitutes the slowdown our study seeks to explain.[3]

To try to identify the causes of that slowdown, we performed a series of descriptive and statistical analyses based on a diverse array of data sources. However, those analyses did not yield an explanation for most of the slowdown in spending growth:

- Certain factors with quantifiable effects on spending growth, such as increases in payment rates, demographic changes among beneficiaries, and changes in the proportion of beneficiaries who enroll only in Part A of Medicare (hospital insurance), explain a small share of the slowdown.

- Notably, we did not find evidence that the financial crisis and economic downturn caused beneficiaries to use less care. Although the elderly as a group faced substantial declines in home values, significant losses in financial assets, and slower income growth, we could not identify a relationship between those factors and the amount of health care used by elderly FFS Medicare beneficiaries through 2010. The fact that spending growth remained slow in 2011 and 2012, after financial markets and income growth had begun to slowly recover, further suggests that factors other than the recession's impact on beneficiaries' finances were responsible for most of the slowdown.

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[1] The analyses contained in this paper generally exclude 2006, the year in which the Part D prescription drug benefit was implemented. Although our focus is on spending in Parts A and B, the implementation of the large new drug benefit in 2006 may have had unobservable effects on how beneficiaries used services paid for under Parts A and B that year.

[2] Average spending in Parts A, B, and D for all Medicare beneficiaries grew at an annual rate of 7.2 percent between 2000 and 2005 and 4.1 percent between 2007 and 2010. See Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds, *2013 Annual Report of the Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds* (May 2013), Table V.D1, http://go.usa.gov/bUZm.

[3] With economywide core price inflation subtracted, the difference in growth rates was 3.0 percentage points.

Figure 1.
Annual Growth in Per-Beneficiary Spending in Parts A and B of Medicare, Fiscal Years 1980 to 2012

(Percent)
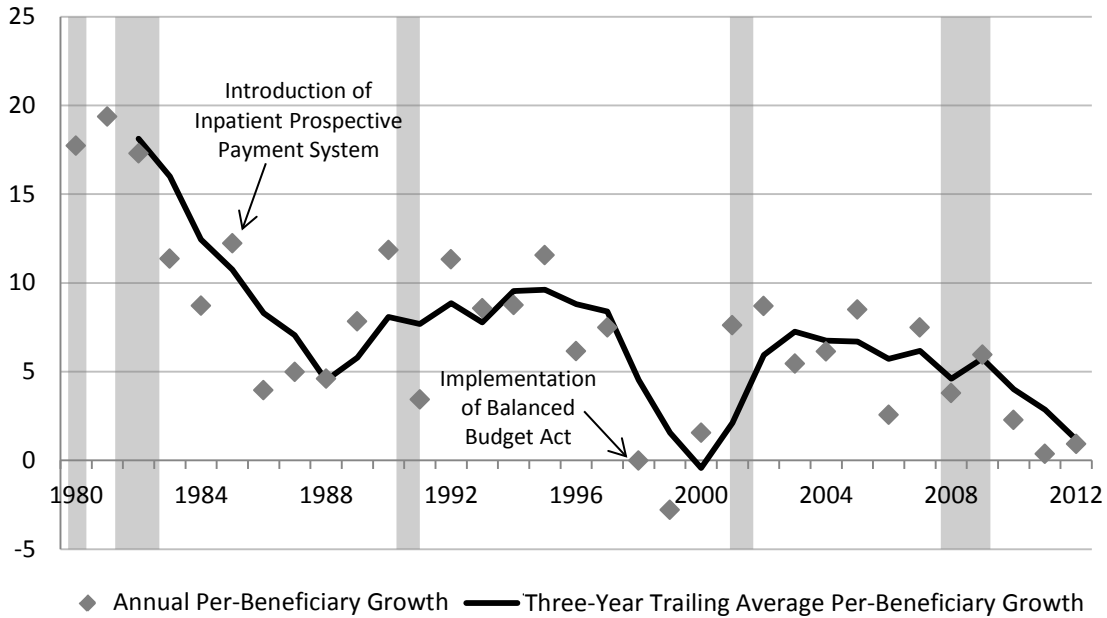
Source: Based on expenditure data provided by the Centers for Medicare and Medicaid Services, Office of the Actuary.

Note: Shaded bars indicate recessions.

Our analyses are subject to limitations and uncertainty, and future research could be helpful in examining potential effects of economic conditions that we did not investigate. We nevertheless conclude that factors other than the effect of the financial turmoil and weak economy on beneficiaries' demand for services played the predominant role in causing the decline in Medicare spending growth. However, the quantitative analysis that we undertook did not identify those specific factors.

Given the large share of the slowdown that our quantitative analyses could not explain, we turned to qualitative assessments of other factors—in particular, factors affecting how medical care was delivered—to help explain the slowdown in spending growth. For instance, we considered the extent to which changes in Medicare's payment rates might have affected providers' incentives to deliver care to beneficiaries. We also explored trends in how care was delivered, such as a shift away from inpatient care later in the decade as well as changes in the rate at which new technologies and services were introduced. Although those qualitative assessments yielded no concrete explanations of the slowdown's causes, we hope to have laid the groundwork for future research on those factors.

In investigating the sources of the slowdown in spending growth, we restricted most of our analyses to Medicare's expenditures for elderly beneficiaries in the fee-for-service portions of Part A (covering hospital inpatient care, skilled nursing facility care, hospice care, and some home health care) and Part B (covering physicians' services, hospital outpatient care, laboratory services, durable medical equipment,

and other services, including some home health care).[4] We investigated those classes of expenditures because we had detailed information on them; we restricted our analysis to the elderly, as data allowed, because we could better estimate the effects of the recession and demographic changes for that more homogeneous subset of beneficiaries.[5]

How Widespread was the Slowdown in Spending Growth?

The reduction in per-beneficiary spending growth for elderly FFS beneficiaries was distributed broadly across many different types of services, beneficiaries, and regions. Comparing growth in per-beneficiary spending between 2000 and 2005 with the slower growth between 2007 and 2010, we find the following:

- Annual growth in spending for every major service category was slower in the later period, though the declines in growth rates varied among services.

- Growth in hospital inpatient spending, which accounted for the largest share of the program's spending, fell from an average annual rate of 4.3 percent between 2000 and 2005 to 1.7 percent between 2007 and 2010.

- The decline in the growth rate was especially pronounced for spending on hospice services, durable medical equipment, and drugs covered under Part B. Altogether, growth in spending for those items and services declined from an annual rate of 13.6 percent between 2000 and 2005 to 2.3 percent between 2007 and 2010. However, those categories accounted for less than a tenth of Medicare spending in 2010.

- Overall, the reduction in the growth of spending for the three largest service categories (hospital inpatient care, physicians' services, and hospital outpatient care) accounted for the majority of the slowdown.

The slowdown in spending growth also occurred among both low-cost and high-cost beneficiaries. It was most dramatic for elderly FFS beneficiaries with no or relatively low Medicare expenditures, but the reduction in growth for the one-fifth of beneficiaries with the highest Medicare expenditures accounted for most of the slowdown. (Spending on those beneficiaries accounted for more than 80 percent of spending in 2010.) In addition, the slowdown was pervasive across states with different levels of spending per beneficiary and in both rural and urban counties.

The breadth of the reduction in spending growth did not point to particular causes of the slowdown.

What Factors Caused the Slowdown?

In seeking to explain the 3.2 percentage-point difference in per-beneficiary spending growth between the two periods examined, we considered numerous potential contributors. We were able to estimate the effects of two of those possible causes: changes in Medicare's payment rates and various factors affecting beneficiaries' demand for medical services. We estimate that, taken together, they accounted for only about 0.8 percentage points of the slowdown in spending growth studied here (see Table 1).

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[4] Medicare Parts C (the Medicare Advantage program) and D (the prescription drug program) are excluded from our analyses, as are beneficiaries under the age of 65.

[5] Within the FFS portion of Medicare, elderly beneficiaries accounted for roughly four-fifths of spending in 2010.

Table 1.
Contributions of Various Factors to Annual Growth in Per-Beneficiary Spending for the Elderly in Parts A and B of Medicare

(Percentage points)

	2000 to 2005	2007 to 2010	Difference
Overall Spending Growth	**7.1**	**3.8**	**-3.2**
Potential Contributors to the Slowdown			
Growth in average payment rate	2.7	2.5	-0.2
Growth in demand by beneficiaries			
Changes in the age and health status of beneficiaries[a]	0.0	-0.3	-0.3
Growth in the proportion of beneficiaries enrolled only in Part A[b]	-0.1	-0.3	-0.2
Growth in the use of prescription drugs	-0.5	-0.6	-0.1
The financial crisis and economic downturn	0.0	0.0	0.0
Changes in supplemental coverage[c]	*	*	*
Unexplained Contribution to Growth			**-2.4**

Source: Authors' calculations.

Note: The analysis covers spending under Parts A and B for beneficiaries age 65 or older in the fee-for-service portion of Medicare. It excludes spending on beneficiaries in private health plans as well as spending under Part D of Medicare.

a. Changes in the health status of beneficiaries reflect changes in the age distribution, obesity status, and smoking history of the elderly population in the fee-for-service portion of Parts A and B.

b. The estimates represent changes in the share of beneficiaries enrolled only in Part A after accounting for changes in the age distribution of beneficiaries.

c. On the basis of a qualitative analysis of trends in supplemental coverage, we conclude that any contribution to the slowdown in spending growth would have been small.

That estimate is subject to considerable uncertainty; nonetheless, it informs our view that other factors—namely, a combination of changes in providers' behavior and changes in beneficiaries' demand for care that we did not measure —were responsible for a substantial portion of the slowdown in Medicare spending growth. Although we did not attempt to quantify the effects of those other contributors to the slowdown, we investigated some ways in which the delivery of medical services changed over the course of the decade as well as some of the factors that might have affected providers' behavior.

Increases in Payment Rates. Changes in payment rates for Medicare services are determined by law, regulation, and economywide measures of inflation. We estimate that average payments grew at only a slightly slower rate between 2007 and 2010 than they did between 2000 and 2005 and, therefore, that the difference in payment rate growth can explain only about 0.2 percentage points of the slowdown. (That estimate accounts only for the effect of changing Medicare payments on the amount spent for a given service and ignores the possible effects on the quantity of services provided, which are discussed later in the paper.) That outcome was the result of two partially offsetting trends. Economywide inflation, which determines the increase in Medicare's payments for most services in the absence of legislation and other regulatory changes, was slower in the later part of the decade, whereas legislation appears to have done more, on average, to restrain growth in payment rates from 2000 to 2005 than from 2007 to 2010.

Changes in Beneficiaries' Demand. The growth of Medicare spending per elderly FFS beneficiary could have slowed as a result of "demand-side" factors—that is, the characteristics and behavior of

beneficiaries. We tried to quantify the effects of five such factors; we estimate that, altogether, they explain about 0.6 percentage points of the slowdown:

- *Changes in the Age and Health Status of Beneficiaries.* We estimate that changes in the age distribution, obesity status, and smoking history of the elderly population, taken together, explain about 0.3 percentage points of the slowdown.

- *Changes in Enrollment in Only Part A.* From 2007 to 2010, an influx of younger elderly beneficiaries, many of whom continued working past age 65, contributed to the growth in the share of elderly FFS beneficiaries who had other sources of health insurance coverage and therefore chose to enroll only in Part A; in addition, within each age group among the elderly population, the share of beneficiaries enrolling only in Part A rose. Aside from the shift in enrollment brought about by changes in the age distribution of elderly beneficiaries (already accounted for above), the rise in the share of enrollment only in Part A explains roughly 0.2 percentage points of the slowdown, we estimate.

- *Changes in the Use of Prescription Drugs*. By our estimates, growth in the use of prescription drugs was slightly faster in the later part of the decade. On the basis of the finding by the Congressional Budget Office (CBO) that an increase in prescription drug utilization is associated with a decrease in spending on medical services and items besides drugs, we estimate that the faster growth in drug utilization explains about 0.1 percentage points of the decrease in the growth of FFS Medicare spending.[6]

- *The Financial Crisis and Economic Downturn.* We find that the use of Medicare services by beneficiaries has not, on average over the past few decades, moved in concert with the business cycle. In addition, we find no evidence of a relationship between sudden declines in the value of elderly beneficiaries' assets or their income and their use of health care. We do not, therefore, attribute the difference in spending growth between the two study periods to the recession's effect on unemployment, lost income, or declines in the values of beneficiaries' assets. That finding for Medicare differs from recently published estimates suggesting that the recession can explain anywhere from one-third to three-quarters of the slowdown in the growth in total national health care spending. Thus, whereas some evidence suggests that demand for health care outside of Medicare responds to the business cycle, we find no evidence that growth in the demand for Medicare services by elderly beneficiaries in FFS is affected by macroeconomic factors.

- *Changes in Supplemental Coverage.* The share of elderly FFS beneficiaries with some form of supplemental coverage remained between 89 percent and 91 percent from 2000 to 2010. Among those with supplemental coverage, there were shifts in the proportion with employment-based coverage, and there were probably shifts in the comprehensiveness of coverage provided by employers. However, our limited qualitative analysis of changes in supplemental insurance suggests that neither the change in the distribution of enrollees among different types of plans nor the change in the benefits offered is likely to explain a notable share of the slowdown in spending growth.

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[6] See Congressional Budget Office, *Offsetting Effects of Prescription Drug Use on Medicare's Spending for Medical Services* (November 2012), www.cbo.gov/publication/43741.

Changes in the Delivery of Care to Beneficiaries. We suspect that, over the decade, providers may have shifted toward methods of delivering care that resulted in slower growth in the volume, intensity, and cost of the care delivered. For instance, providers increasingly treated high-cost beneficiaries in lower-cost sites of care. To the extent that such trends accelerated in the later part of the decade, they would have contributed to the slowdown in spending growth studied here. Improvements in care management could have reduced spending growth, but evidence that they occurred to a significant extent or in ways that reduced spending during the period we studied is scant. In addition, slower adoption of cost-increasing technologies may also have reduced spending growth, though more research is needed to determine the extent to which the use of new technologies in fact slowed. Furthermore, providers may have developed cost-decreasing process innovations and reduced the number of services delivered to patients in the course of care. Finally, because beneficiaries did not report diminished access to care during our study period, we conclude that providers probably did not contract supply in a way that can explain a meaningful part of the slowdown. The effects that changes in the delivery system might have had on spending growth are difficult to measure, and future research is needed to develop a better understanding of them.

Changes in Factors Affecting Providers' Incentives. We considered a number of factors that might have caused providers to make changes in the delivery of care that resulted in slower spending growth after 2007. Although Medicare's payment rates rose from 2000 to 2005, on average, at a rate fairly similar to that from 2007 to 2010, there is some evidence that rates paid by private insurers grew faster than Medicare rates later in the decade. As a result, providers might have had diminishing incentives to treat Medicare beneficiaries over the 2007–2010 period. The rise in unemployment due to the recession could have had the opposite effect, potentially increasing providers' incentives to treat Medicare patients, as the demand for care among privately insured patients fell. Our statistical analysis of that hypothesis yielded mixed results: Although we found that higher unemployment is strongly associated with faster Medicare spending growth, direct measures of demand for health care in the private sector (such as the number of people without health insurance) do not appear to be associated with faster growth in Medicare spending. Finally, the rising share of beneficiaries in managed care plans, the growing public concern over health care costs, and uncertainty about future policy changes as part of health care reform may have indirectly led to a reduction in the rate of growth in the volume and complexity of services provided. Both the individual effects of such factors on Medicare spending and their interactions are difficult to measure, and we did not attempt to quantify their net contribution to the slowdown.

Will the Slowdown Persist?

In sum, our understanding of the causes of the slowdown in Medicare spending growth between 2000 and 2010 remains incomplete. As a result, our understanding of whether that slowdown will be short-lived or long-lived is incomplete as well. Nevertheless, we can say that the slowdown appears to have been caused in substantial part by factors that were not related to the recession's effect on beneficiaries' demand for services. Some of the other influences on Medicare spending that may have contributed to the slowdown, such as changes in how care is delivered to beneficiaries, might well have persistent effects on spending growth. The fact that growth slowed even further in 2011 and 2012 for the fee-for-service portion of Medicare indicates that the slowdown persisted, and perhaps intensified, after our study period. That view is consistent with CBO's recent forecast of Medicare spending growth, which projects slower growth in the next few years than prior forecasts anticipated. As further analysis of more recent years of the program's spending emerges and understanding of the slowdown improves, those insights will inform future projections by CBO and others.

Approach

Understanding the factors that have caused the recent slowdown in Medicare spending per beneficiary is a key concern of federal lawmakers, as the government spent over half a trillion dollars on care for Medicare beneficiaries in fiscal year 2012.[7] Such sums account for a significant share of the federal budget and are projected to grow substantially in the coming years. In many years, Medicare spending has grown rapidly, but in recent years, growth in Medicare spending per beneficiary has been substantially below the historical average. Such slowdowns in spending growth have occurred at other times over the past several decades, but previous drops, unlike the current slowdown, were often associated with significant policy changes. Given the unexpected nature of this slowdown, a related question is whether it will persist.

To measure the slowdown in Medicare spending growth, we compared per-person spending on elderly beneficiaries in the fee-for-service portion of the program in two periods: From 2000 to 2005, spending on such beneficiaries grew at an average rate of 7.1 percent per year; from 2007 to 2010, the average rate was 3.8 percent per year (see Figure 2).[8] The difference between those two average growth rates, 3.2 percentage points, constitutes the slowdown we seek to explain in this working paper.

We used three criteria to select that study period:

- First, we sought to include years in which the structure of Medicare's payments to providers was fairly consistent.[9]

- Second, we excluded spending growth in 2006 and 2007, because the introduction of Medicare's prescription drug program, Part D, might have affected the utilization of other types of medical care in ways that are difficult to observe and control for.[10]

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[7] Gross Medicare spending totaled $557 billion in fiscal year 2012; spending net of premiums was $472 billion. In this paper, we report gross spending figures.

[8] Those growth rates are based on tabulations of mean spending for beneficiaries in the Master Beneficiary Summary File (MBSF), 2000 to 2010. A number of analyses in the paper use the MBSF. In order to focus the analysis on elderly FFS beneficiaries, we restricted our sample to beneficiaries age 65 or older who were not enrolled in a private health plan in July of the given year. That approach yielded four types of beneficiaries in our sample: those in the FFS portion of Medicare the whole year, those who died during the year and who were enrolled in the FFS portion of Medicare in July, those who entered the program after July, and those who were in the FFS portion of Medicare for part of the year (including July) and not in other parts of the year. Trends in average spending over time were not significantly affected by our choice of a sample. Our estimates do not include the program's spending for direct-to-provider payments, for instance, direct Medicare payments to hospitals for graduate medical education.

[9] Spending growth fell dramatically with the passage of the Balanced Budget Act of 1997, which introduced five prospective payment systems. The three payment systems with the highest expenditures—those for skilled nursing facilities, home health care, and hospital outpatient care—all were implemented by the end of calendar year 2000. Growth returned to its pre-1997 trend by 2001, in part because of the reversal of some cuts that was included in the Balanced Budget Refinement Act of 1999. By beginning our analysis in 2000, we reduced the risk that spending growth might have been driven by difficult-to-quantify responses to new payment systems. The Medicare, Medicaid, and SCHIP Benefits Improvement Act of 2000 introduced changes to payment rates but not the payment structure.

[10] In addition, because this analysis includes an estimate of the effect of increased use of prescription drugs on medical spending on items besides drugs, we wanted to exclude the year with a large one-time change in utilization to which the growth in such spending would be particularly sensitive.

Figure 2.
Annual Growth in Per-Beneficiary Spending for the Elderly in Parts A and B of Medicare, 2000 to 2010

(Percent)
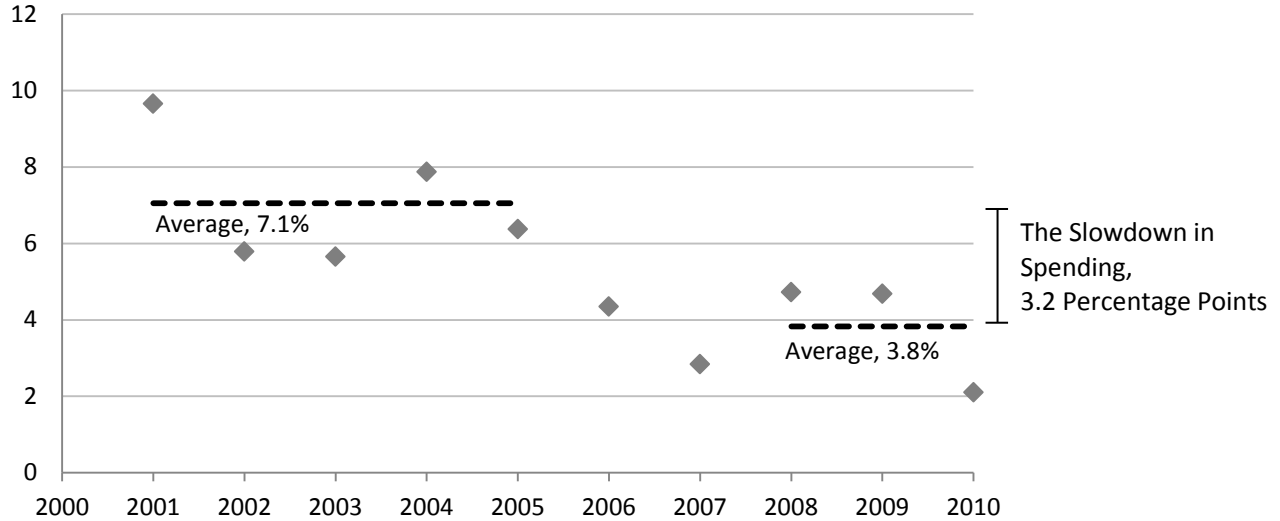
Source: Based on the Master Beneficiary Summary File, 2000 to 2010.

Notes: Estimates include spending on elderly beneficiaries who were enrolled in Part A or B in at least one month of the calendar year and who were not enrolled in a private health plan in July.

Figures do not include direct-to-provider payments or payments made by beneficiaries or third-party payers.

- Third, we included only years for which we had detailed survey data on Medicare beneficiaries and therefore ended our analysis with 2010.

We restricted our analysis of spending growth to Parts A and B so that our measures of spending would, for the most part, not reflect changes in the prescription drug market, such as the rising prevalence of generic drugs later in the decade.[11] We excluded Medicare spending on beneficiaries in private health plans because we lacked detailed spending data on those enrollees, although we discuss the possible effects of growing enrollment in managed care plans on per-beneficiary FFS spending growth.[12] The share of Medicare beneficiaries enrolled in private plans fell from 17 percent in 2000 to 14 percent in 2005, before rising rapidly to 25 percent in 2010.[13] We focused on spending for the elderly in order to avoid the analytical complexities that might be associated with a less homogeneous group of beneficiaries and to focus more clearly on any contributions that the recession and changes in the health status of the

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[11] Our analysis includes spending on physician-administered drugs covered under Part B. Expenditures on drugs covered under Part B accounted for 3.6 percent of Medicare's spending on elderly FFS beneficiaries in 2010.

[12] In fiscal year 2012, FFS beneficiaries accounted for 74 percent of spending for services covered under Parts A and B. The other 26 percent of Medicare spending for those services was for beneficiaries enrolled in private plans under Medicare Advantage. The growth in Medicare's payments to private plans is based in part on trends in FFS spending.

[13] See the Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds, *2013 Annual Report of the Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds* (May 2013), Table IV.C1, http://go.usa.gov/bUZm.

population might have made to the slowdown in spending growth.[14] Our findings, therefore, apply to the roughly 80 percent of FFS Medicare spending dedicated to elderly beneficiaries.

Describing the Slowdown in Spending

If the slowdown had been concentrated within specific types of services, beneficiaries, and regions, such concentration would have helped identify its causes. However, we find that the slowdown was widespread in the program, spanning many kinds of services, beneficiaries with varying amounts of Medicare spending, and differing geographic areas.

Services

We analyzed data from the Medicare Beneficiary Summary File (MBSF) to examine growth in the program's spending tied to medical claims for elderly FFS beneficiaries for various service categories. Across every major service category, we found that spending per beneficiary grew more slowly from 2007 to 2010 than from 2000 to 2005 (see Figure 3). For instance, the growth in spending per beneficiary on hospital inpatient services, which accounted for nearly two-fifths of the program's spending on elderly FFS beneficiaries in 2010, slowed from 4.3 percent between 2000 and 2005 to 1.7 percent between 2007 and 2010. Growth in per-beneficiary spending on hospital outpatient services and physicians' services slowed markedly as well.[15] Moreover, for each broad category of physicians' services, the growth in the volume of services used per beneficiary slowed (see Figure 4). The drop in the growth in imaging services was especially large, as discussed later.

The service categories with the most pronounced decline in spending growth over the decade included hospice services, durable medical equipment, and drugs covered under Part B. The slowdown in spending for hospice services followed a period of very rapid expansion in the early 2000s. The decline in the growth in spending for durable medical equipment and Part B drugs was caused in large part by significant changes in payment policy over the decade.[16] Growth in spending on care in skilled nursing facilities and home health services, which accounted for a larger share of spending among beneficiaries with high annual Medicare expenditures, slowed somewhat less than did spending on other services.

Beneficiaries

Just as the slowdown was pervasive across services, the same was true among elderly people with different amounts of Medicare spending. In 2010, the program's spending for the two least expensive quintiles of beneficiaries averaged about $250; for the third and fourth quintiles, it was $3,450; and for

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[14] Within the FFS portion of Medicare, elderly beneficiaries accounted for roughly four-fifths of the program's spending in 2010; disabled nonelderly beneficiaries and nonelderly patients with end-stage renal disease accounted for the remaining one-fifth of spending. Given the wide variety of aggregate data sources used, some evidence presented in the paper includes FFS spending on all beneficiaries.

[15] Here, spending for physicians' services is the sum of expenditures on evaluation and management, anesthesiology, imaging services, other procedures, and other services furnished in a physician's office.

[16] Expenditures on durable medical equipment slowed in part because of slower growth in payment rates legislated by the Congress that took effect after 2007. Two factors were key in driving the slowdown in drug expenditures under Part B: a statutory change in 2005 that lowered the price used by Medicare to reimburse physicians for drugs they administered and a reduction in the utilization of erythropoietin-stimulating agents (ESAs). We attempted to control for the first factor in the payment update index (described later). The latter change represents a meaningful change in service utilization. The implementation of Part D did not play a large role in explaining the reduction in spending growth for physician-administered drugs.

Figure 3.
Annual Growth in Per-Beneficiary Spending for the Elderly in Parts A and B of Medicare, by Selected Service Category, 2000 to 2005 Compared With 2007 to 2010
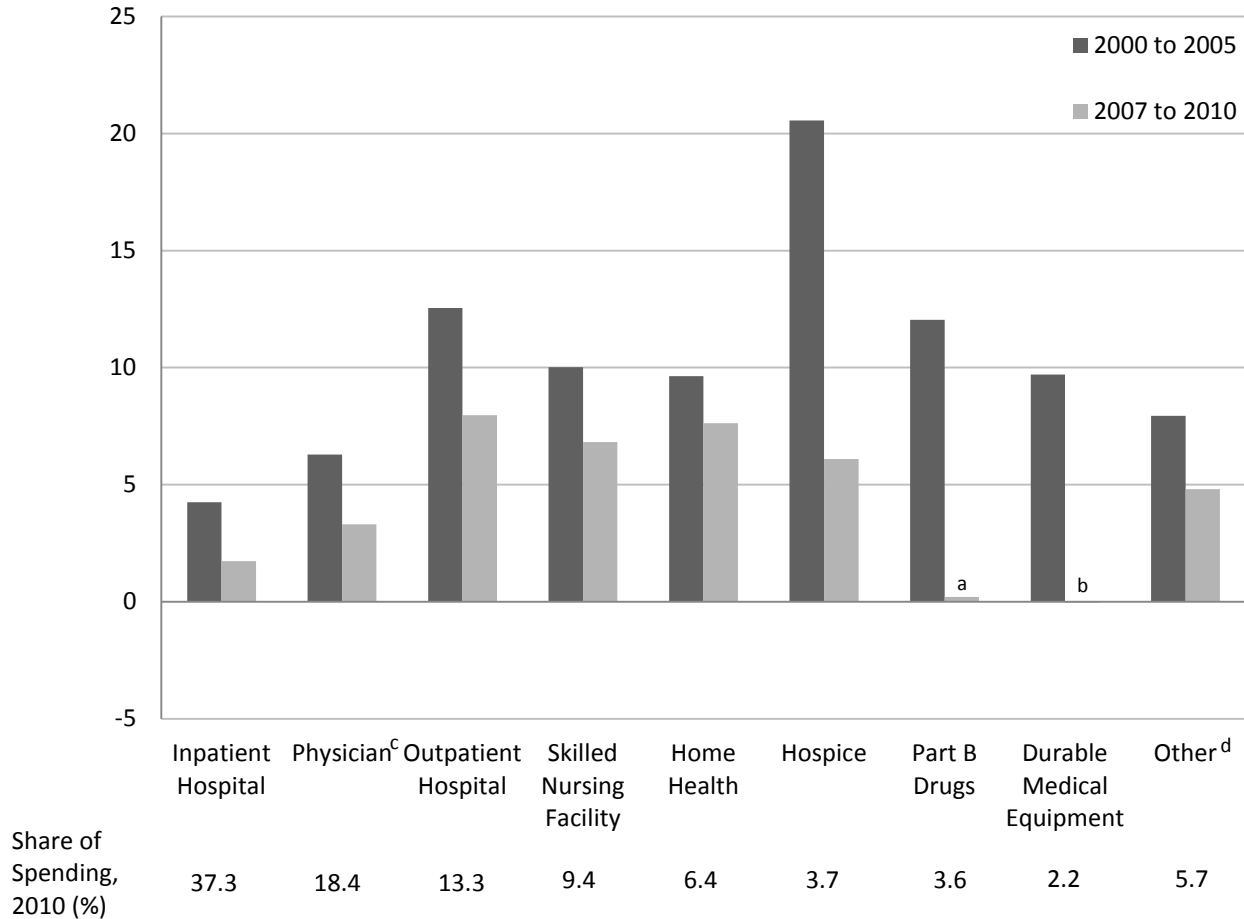
(Percent)

Share of Spending, 2010 (%)	Inpatient Hospital	Physician[c]	Outpatient Hospital	Skilled Nursing Facility	Home Health	Hospice	Part B Drugs	Durable Medical Equipment	Other[d]
	37.3	18.4	13.3	9.4	6.4	3.7	3.6	2.2	5.7

Source: Based on the Master Beneficiary Summary File, 2000 to 2010.

Notes: Estimates include spending on elderly beneficiaries who were enrolled in Part A or B in at least one month of the calendar year and who were not enrolled in a private health plan in July.

Figures do not include direct-to-provider payments or payments made by beneficiaries or third-party payers.

a. Annual growth in per-beneficiary spending on drugs under Part B averaged 0.2 percent between 2007 and 2010.

b. Annual growth in per-beneficiary spending on durable medical equipment averaged -0.0 percent between 2007 and 2010.

c. "Physician" is defined as the sum of expenditures on evaluation and management, anesthesiology, imaging services, other procedures, and other services furnished in a physician's office.

d. "Other" includes spending on dialysis, payments to ambulatory surgical centers, spending on tests, and other services provided by carriers (including, for instance, ambulance and chiropractor services).

Figure 4.
Average Annual Growth in the Per-Beneficiary Volume of Services Delivered Under the Physician Fee Schedule, by Service Type, 2000 to 2005 Compared With 2007 to 2010, and the Share of Allowed Charges in 2010

(Percent)

| Share of Allowed Charges in 2010 (%) | 44.3 | 22.3 | 13.5 | 7.7 | 5.2 |
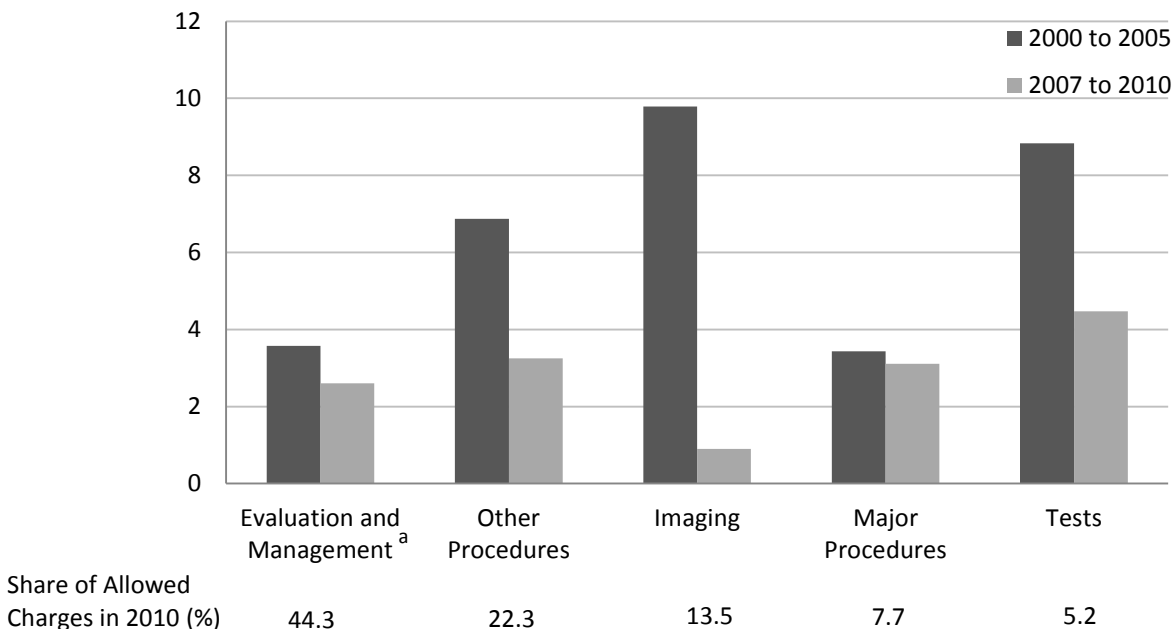
Source: Based on MedPAC, *A Data Book: Health Care Spending and the Medicare Program* (June 2012), Chart 7-8, p. 100. Share of allowed charges in 2010 provided in MedPAC, *Report on Medicare Payment Policy* (March 2013), Table 4-5, p. 102.

Note: For this figure, volume is units of service multiplied by relative value units from the physican fee schedule. Volume for all years is measured on a common scale, and the relative value units are those applicable in 2010.

a. The annual growth for the later period is measured only through 2009 because there was a change in payment policy for consultations.

the most expensive quintile, it was about $34,300. The growth rate of average spending for less expensive beneficiaries appears to have slowed most dramatically between the two study periods (see Figure 5). The growth in average spending for the most expensive quintile slowed, but by less than that for others.[17]

That steeper decline in spending growth for less expensive beneficiaries could reflect a number of factors, such as the rise in the share of beneficiaries who are working and for whom Medicare is a secondary

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[17] Between 2007 and 2010, a growing share of beneficiaries in our sample had no Medicare spending. In order to test whether that pattern was caused by our decision to measure the spending for all Medicare beneficiaries not enrolled in a private health plan in July, we examined whether that result persisted for elderly beneficiaries who were in the FFS portion of Medicare for all 12 months of the year (therefore, with FFS beneficiaries gaining entitlement partway through the year as well as those enrolled for part of the year in a private health plan both excluded). We found that it did. Three factors probably contributed to the increase in beneficiaries for whom there was no spending: the rising share of beneficiaries enrolled only in Part A, the indexing of the Part B deductible, and a true rise in the number of beneficiaries using no services. If we had defined spending quintiles only among beneficiaries with positive program spending, then spending growth from 2000 to 2005 would have still been fastest among beneficiaries with the lowest spending but from 2007 to 2010 would have been roughly the same across the groups.

Figure 5.
Annual Growth in Per-Beneficiary Spending for the Elderly in Parts A and B of Medicare, by Spending Quintile, 2000 to 2005 Compared With 2007 to 2010

(Percent)

| Share of Spending, 2010 (%) | 1.2 | 16.6 | 82.2 |
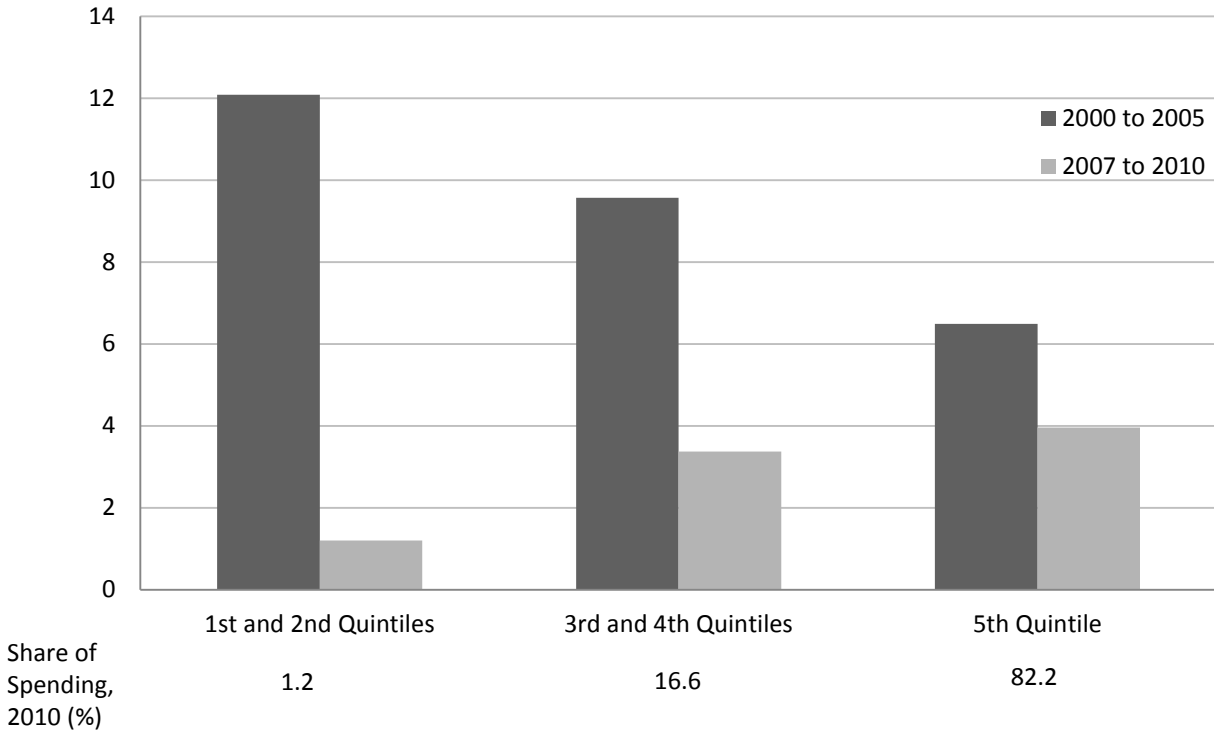
Source: Based on the Master Beneficiary Summary File, 2000-2010.

Notes: Estimates include spending on elderly beneficiaries who were enrolled in Part A or B in at least one month of the calendar year and who were not enrolled in a private health plan in July.

Figures do not include direct-to-provider payments or payments made by beneficiaries or third-party payers.

Beneficiaries were assigned to quintiles on the basis of the total amount of program spending incurred in the calendar year.

source of coverage. Nevertheless, because roughly 80 percent of the program's spending in 2010 was for people in the top quintile, most of the slowdown can be attributed to the change in spending growth for the highest-cost beneficiaries.

Inpatient services, skilled nursing facilities, and hospice services account for a large share of spending for beneficiaries in the most expensive quintile; the slowdown in spending growth for those services accounted for most of the slowdown within that group. By contrast, more than half of the slowdown in spending growth for the other 80 percent of beneficiaries was caused by reduced growth in spending on physicians' and hospital outpatient services.

Figure 6.

Average Annual Growth in Per-Beneficiary Spending for Fee-for-Service Medicare Beneficiaries, Based on State Spending in 2000, 2000 to 2005 Compared With 2007 to 2009

(Percent)
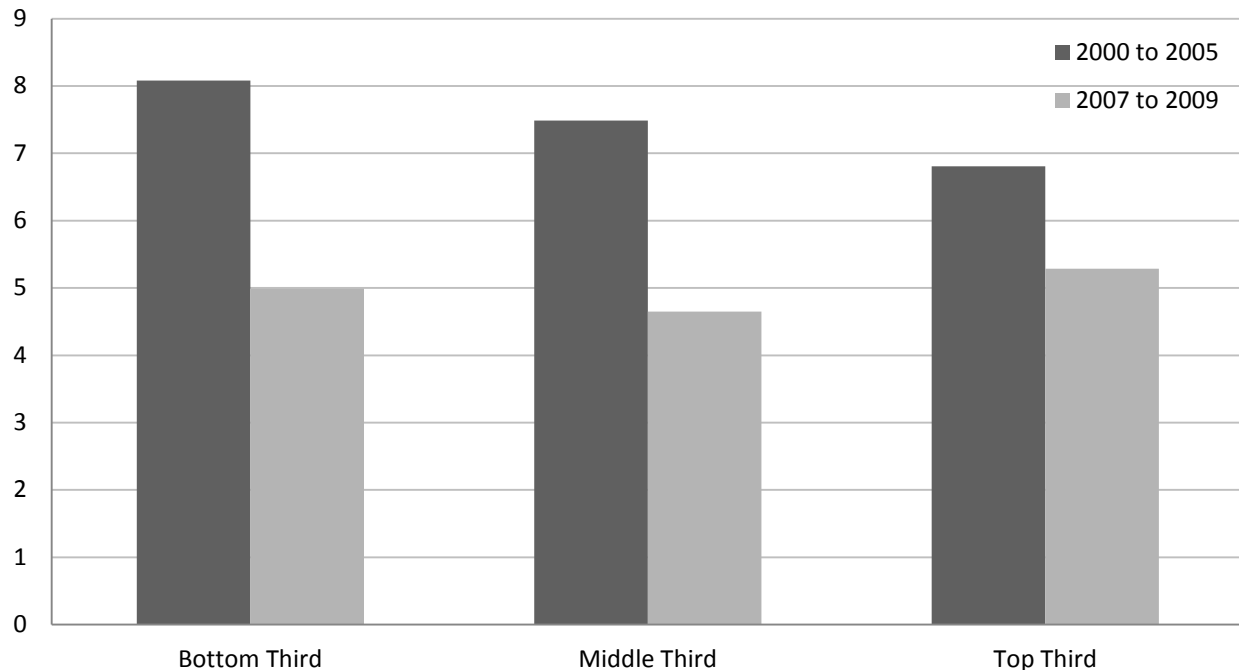
Source: Based on data provided by the Centers for Medicare and Medicaid Services, Office of the Actuary.

Notes: There were 51 observations (for 50 states and the District of Columbia). The 17 states with the lowest spending in 2000 were grouped into the "Bottom Third" category and so on.

Data were not available for calendar year 2010.

Regions

Some observers might have expected spending growth in states with previously high amounts of spending per beneficiary to have slowed down the most—perhaps because their health care systems had more inefficiency to eliminate. However, using the data available through 2009, we observed no such pattern in overall spending per beneficiary later in the decade, though it did occur earlier (see Figure 6).[18] Overall, states with higher per-beneficiary spending in 2000 experienced slower spending growth from 2000 to 2005 than did other states; that pattern suggests that high- and low-spending states regressed toward the national average between 2000 and 2005. But the rate of spending growth in low-spending states and high-spending states between 2007 and 2009 was roughly similar, suggesting that the slowdown, at least through 2009, was not concentrated in the higher-spending states. In fact, the states with the lowest levels of initial spending experienced the largest slowdown in spending growth between the early years of the decade and the later years.

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[18] Data on state-level spending for all FFS beneficiaries, which include spending under Part D and exclude spending under Part C, was provided by CMS's Office of the Actuary; the most recent year for which state-level spending data are available is 2009.

Figure 7.
Average Annual Growth in Per-Beneficiary Spending in Parts A and B of Medicare in Urban and Rural Areas, 2000 to 2005 Compared With 2007 to 2010

(Percent)
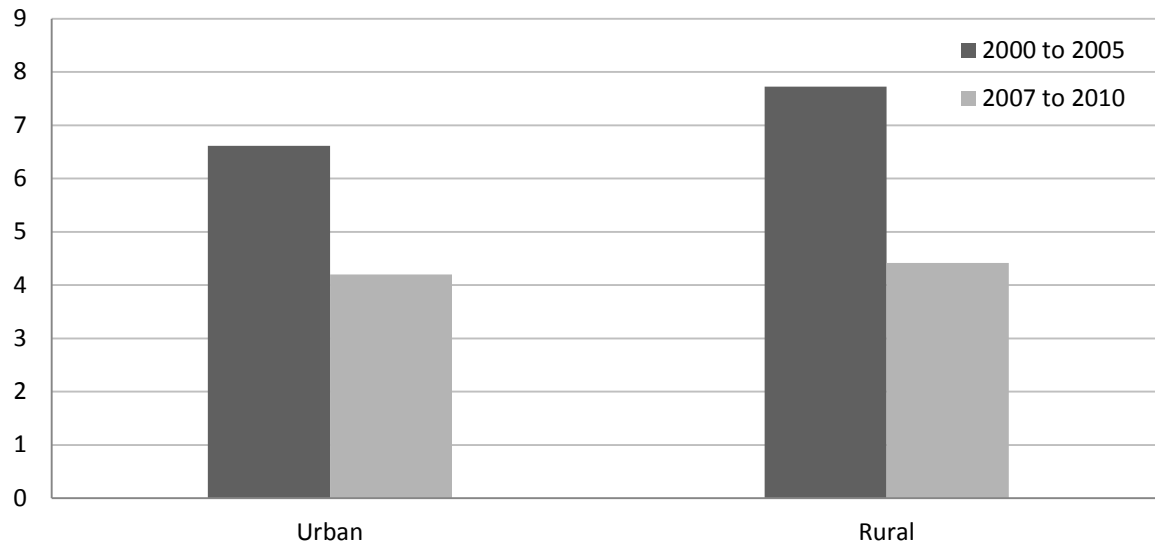
Source: Based on the Medicare and Medicaid Statistical Supplement, 2002, 2007, 2008, and 2011.

Note: Before 2005, a rural area of residence was defined as a metropolitan statistical area with fewer than 50,000 residents. Beginning in 2005, the urban/rural distinction became based on the Census Bureau's core-based statistical areas.

The slowdown in spending was also very similar in magnitude for both urban and rural counties (see Figure 7).

Thus, just as spending for elderly FFS beneficiaries slowed down broadly across services and beneficiaries with different costs, the reduction in FFS spending growth was also geographically widespread.

Quantifying the Extent to Which Changes in Payment Rates Contributed to the Slowdown

For most types of providers participating in Medicare, the Centers for Medicare and Medicaid Services (CMS) designates a base payment amount for providing a given service. Each year, that base payment is updated by a specified measure of inflation. For some services, the base payment is inflated by the growth in a defined set of labor and nonlabor inputs that constitute the service's "market basket"; for others, a measure like the consumer price index for all urban consumers (CPI-U) is used. That inflation measure can then be adjusted by the Congress through legislation; for instance, in many years between 2000 and 2010, lawmakers reduced the growth in payments for a service by specifying a payment update that was smaller than the growth in the cost of that service's market basket. In addition, CMS has the authority to

adjust the size of the update in certain cases. This discussion refers to the payment amount that results after the legislated adjustment as the "updated payment rate."[19]

We estimate that, all told, average growth in the updated payment rates in FFS Medicare was only slightly faster from 2000 to 2005 than from 2007 to 2010, so it can explain very little of the slowdown in spending growth. For most years between 2000 and 2010, we find that legislation mandated that growth in payment rates be smaller than that called for by the growth in input costs. In general, policies put into effect by the Balanced Budget Act of 1997 (and modified by subsequent legislation) reduced the growth in payment rates more between 2000 and 2005 than did policies affecting payment rates between 2007 and 2010. However, input prices, particularly those related to labor, grew faster in the early part of the decade.[20] On balance, average growth in payment rates programwide was similar to growth in the CPI-U from 2000 to 2005, as the rise in providers' input costs in excess of growth in the CPI-U was roughly offset by legislative restraints. From 2007 to 2010, on average, payment rates grew faster than the CPI-U.

In order to arrive at an estimate of the average growth in the updated payment rates in the FFS portion of Medicare, we estimated the annual growth in the updated payment rates for hospital inpatient services, services under the physician fee schedule, services provided in skilled nursing facilities, home health services, hospice services, hospital outpatient services, durable medical equipment, services provided by ambulatory surgical centers, and lab services. We calculated the growth in the payment rate for each service by combining the growth in the inflation factor with the effects of any legislation that caused the payment update to differ from growth in the inflation factor.[21] We also made assumptions about the cost

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[19] The actual payment that an individual provider receives for a specific service may be higher or lower than the updated payment rate, depending on the geographic location, type of provider, and a number of other factors. Here, for simplicity, we estimate the growth in the updated payment rate, on average for all services, for each year between 2000 and 2010 in order to determine the extent to which it contributed to the slowdown in spending growth; taking other legislated changes in payment policy into account, as well as certain regulatory actions taken by CMS, might yield a different estimate of average payment growth. In particular, lawmakers may have done more to restrain payment growth by means other than reducing the update in the later part of the decade; if so, our approach would have caused us to underestimate the effect of payment growth on Medicare spending.

[20] From 2000 to 2005, the CPI-U grew at an average rate of 2.5 percent per year; from 2007 to 2010, average growth was only 1.7 percent. Even more strikingly, average growth in the employment cost index was 3.6 percent per year from 2001 to 2005 and 2.2 percent per year from 2007 to 2010.

[21] To calculate an index of updated payment rates for hospital inpatient and physicians' services (accounting for 56 percent of the program's spending on elderly FFS beneficiaries in 2010), we used the Medicare trustees' historical estimates of the difference between the market basket increase and the actual payment update. See Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds, *2013 Annual Report of the Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds: 2013 Expanded and Supplementary Tables* (May 2013), http://go.usa.gov/bUZm.

For services by skilled nursing facilities, home health agencies, hospices, hospital outpatient departments, ambulatory surgical centers, and laboratories and for durable medical equipment (altogether accounting for about 39 percent of the program's spending in 2010), we generally incorporated only reductions that lawmakers enacted by amending the Social Security Act. (Historical market basket updates for services subject to prospective payment are published by CMS; see Centers for Medicare and Medicaid Services, Market Basket Data, "Actual Regulation Market Basket Updates," http://go.usa.gov/j3wW.) For the roughly two-fifths of spending outside of the inpatient prospective payment system and the physician fee schedule, our composite index therefore did not include the effects of regulatory adjustments made by CMS, with two exceptions: First, we used the -1.1 percent update in fiscal year 2010 for skilled nursing facilities (affecting 9 percent of the program's spending for elderly beneficiaries that year), which CMS implemented in order to recoup expenditures incurred in 2006 as a result of changes in the reported case mix of patients in skilled nursing facilities. Second, we included the effect of the phaseout in the "budget neutrality adjustment factor" on payments for hospice services in fiscal years 2010 and 2011 (affecting 4 percent of spending for elderly FFS beneficiaries in 2010); the phaseout reduced the update by 0.7 and 0.8 percentage points in fiscal years 2010 and 2011, respectively.

of drugs covered under Part B for which Medicare reimburses physicians.[22] For the remainder of spending, which accounted for 2 percent of total Medicare spending for elderly FFS beneficiaries from 2000 to 2010, we assumed that payment rates grew at the rate of the CPI-U. We converted the updated payment rate for each service category into an index and then constructed a programwide composite index.[23] We computed what the average update to the base payment would have been for services provided to beneficiaries if the shares of the program's spending accounted for by each category had remained constant throughout the study period.

We estimate that growth in updated payment rates contributed only slightly more to annual spending growth from 2000 to 2005 (2.7 percentage points) than from 2007 to 2010 (2.5 percentage points) (see Table 1 on page 4). Thus, smaller payment updates (controlling for changes in the mix of services Medicare paid for over time) contributed very little—less than 0.2 percentage points—to the slowdown in spending growth between the two study periods.

That estimate does not take into account any effect that the updates to payment rates might have had on beneficiaries' demand for services or on providers' willingness to supply services, which are addressed later in the paper. Nor does the estimate capture other changes in payment policy, which were complex. For instance, CMS capped the annual per-beneficiary spending on outpatient rehabilitative therapy for parts of the periods examined.[24]

Quantifying the Extent to Which Reduced Demand by Beneficiaries Contributed to the Slowdown

A change in the quantity of Medicare-financed services sought by elderly beneficiaries could have occurred for various reasons. An increase in the out-of-pocket cost of a service faced by beneficiaries could have caused them to decrease the quantity demanded. In addition, certain underlying factors could

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For services operating on a fiscal year schedule (ones provided by skilled nursing facilities, hospices, home health agencies [before 2005], ambulatory surgical centers [before 2005]), we converted payment updates to a calendar year basis.

[22] Before 2004, physicians were reimbursed at 95 percent of the average wholesale price (AWP) for Part B drugs. In 2004, they were reimbursed at 85 percent of AWP and, beginning in 2005, were reimbursed at 106 percent of the average sales price (ASP) so that Medicare payments reflected an amount closer to physicians' acquisition costs for covered drugs. According to a 2005 report, the median difference between the AWP and the ASP for single-source brand-name drugs in the third quarter of 2004 was 26 percent. See Daniel R. Levinson, Department of Health and Human Services, Office of the Inspector General, *Medicaid Drug Price Comparison: Average Sales Price to Average Wholesale Price* (June 2005), http://oig.hhs.gov/oei/reports/oei-03-05-00200.pdf (357 KB). We are not aware of data that describe the historical growth in the AWP or ASP specifically. Therefore, on the basis of conversations with experts, we assumed that growth in the AWP between 2000 and 2005 was twice the rate of annual growth in the pharmaceutical preparation and manufacturing component of the producer price index (PPI), that the average ASP was 26 percent lower than the average AWP in 2005, and that the ASP grew at the same rate as the pharmaceutical preparation and manufacturing component of the PPI between 2005 and 2010. Given the small share of Medicare spending for which drugs under Part B account, the composite price index is not very sensitive to alternate assumptions about growth in drug prices.

[23] Each service's price index was weighted by the share of spending on elderly beneficiaries for which it accounted at the beginning of the two study periods. Spending weights were calculated using the cost and use component of the Master Beneficiary Summary File for 2000 through 2010, restricted to elderly FFS beneficiaries.

[24] Those caps were put in place from September 2003 to December 2003 and again in January 2006. Beginning in February 2006, the Congress directed CMS to implement a process by which beneficiaries with spending over the cap could gain an exception. Finally, the exceptions process expired in January 2010 before being reinstated in March 2010. Despite the expiration, the reinstatement allowed for the therapy caps exceptions process to operate continuously. See American Physical Therapist Association, "History of Medicare Therapy Caps" (October 2012), www.apta.org/FederalIssues/TherapyCap/History/.

have caused demand to shift, decreasing the quantity demanded at a given out-of-pocket cost to the beneficiary.

In fact, beneficiaries' out-of-pocket costs under the basic Medicare benefit do not appear to have grown at a faster rate from 2007 to 2010 than they did from 2000 to 2005 and, therefore, probably did not cause a greater decline in the quantity of services demanded later in the decade. We focused instead on five underlying factors that could have caused a change in beneficiaries' demand for services at a given cost:

- Changes in the age and health status of beneficiaries,

- Growth in the proportion of beneficiaries enrolled only in Part A,

- Growth in the use of prescription drugs,

- The financial crisis and economic downturn, and

- Changes in supplemental coverage.

We estimate that the first three of those factors—age and health status, enrollment only in Part A, and prescription drug use—altogether explain about 0.6 percentage points of the slowdown. Our econometric analyses did not reveal a significant relationship between demand for health care by Medicare's elderly FFS beneficiaries and financial and economic conditions. Finally, our limited qualitative analysis of changes in supplemental insurance, which reduces beneficiaries' cost-sharing responsibilities relative to the basic Medicare benefit, suggests that supplemental insurance cannot explain a large amount of the slowdown in spending growth. (See Table 1 on page 4.)

Our estimates are subject to considerable uncertainty, the sources of which are discussed throughout the section. Briefly, our estimates of the effect of the recession on spending growth were limited by the available data and did not account for any unmeasured changes in beneficiaries' preferences that may have resulted from the economic turmoil.[25] Our qualitative assessments of the effect of changing out-of-pocket costs and supplemental coverage were limited in scope and might have failed to include some changes in how those factors contributed to spending growth over the decade. Finally, there could be interactions between factors that our estimation strategy did not take into account.[26] Despite those caveats, however, we think that our estimates indicate that factors other than ones affecting beneficiaries' demand for care played an important role in explaining the slowdown in Medicare spending growth.

Out-of-Pocket Costs Under the Basic Medicare Benefit

If beneficiaries' out-of-pocket cost of care under the basic Medicare benefit grew more quickly from 2007 to 2010 than from 2000 to 2005, we would expect (all else being equal) that the growth in the quantity of services demanded would slow more in the later period than in the earlier period. We conclude that such

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[25] For instance, the index of consumer sentiment among the elderly fell sharply in 2008 and remained low through 2011; beneficiaries' attitudes might have changed in a way that affected the likelihood that they purchased Medicare services but that our statistical analyses could not measure. See "Surveys of Consumers" (Thomson Reuters and the University of Michigan, accessed July 15, 2013), www.sca.isr.umich.edu/.

[26] For instance, if younger beneficiaries accounted for the higher growth in prescription drug use, then simply adding the two effects would overstate the combined effect of those two changes (that is, the interaction effects would be negative). Likewise, if older beneficiaries—whose diminishing share of the population explains part of the slowdown—caused the increase in prescription drug use, then adding the two individual effects would understate the combined effect (that is, the interaction effects would be positive).

costs, on average, did not grow at a faster rate during the later period than during the earlier period. First, FFS beneficiaries' cost-sharing requirements under the basic Medicare benefit rose slowly and at similar rates in both periods, both in nominal terms and relative to the growth in Social Security benefits.[27] Second, the price of those outpatient services for which beneficiaries are required to pay a fixed percentage of the total cost (primarily physicians' and outpatient services paid for under Part B) grew at a similar rate throughout the decade; therefore, the nominal cost to beneficiaries for such services also grew at a similar rate throughout the decade.[28] Third, even though the sharp decline in economywide price inflation later in the decade meant that cost-sharing requirements grew slightly faster in real terms (with respect to growth in the CPI-U) from 2007 to 2010 than from 2000 to 2005, the consistently large share of elderly FFS beneficiaries with supplemental insurance (roughly 90 percent in 2010, according to our tabulations based on the Medicare Current Beneficiary Survey) would have substantially dampened any effect of such rising costs.

Changes in the Age and Health Status of Beneficiaries
The average age of the elderly FFS population began to decline even before the first baby boomers turned 65 in 2011; according to tabulations based on the Master Beneficiary Summary File, the share of elderly FFS beneficiaries age 65 to 70 grew from 31 percent in 2000 to 35 percent in 2010. Because Medicare spends less on younger beneficiaries over age 65 than on older beneficiaries in that group, the growing share of younger elderly beneficiaries resulted in slower growth in average spending per beneficiary, even though the growth in total spending increased as a result of an increase in enrollment growth.[29]

In addition to age, there are important trends in the health of the beneficiary population that could affect the need for health care services. We have limited ability to measure such changes, but we analyzed two indicators of potential health risks: obesity status and smoking history. According to the Medicare Current Beneficiary Survey (MCBS), the share of elderly FFS beneficiaries who were obese (with a body mass index of more than 30) rose from roughly 20 percent in 2000 to 27 percent in 2010.[30] Obese beneficiaries

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[27] The deductible for hospital inpatient services, as well as the daily coinsurance for inpatient care, grew at a fairly steady rate from 2000 to 2010; in both periods we studied, those cost-sharing requirements grew at an average annual rate that was 0.8 percentage points faster than that of Social Security cost-of-living adjustments. Although the annual deductible in Part B grew from $100 in 2004 (which it had been since 1991) to $131 in 2007 and to $155 in 2010, such a change would have constituted a large percentage increase in out-of-pocket spending (though a small dollar-amount increase) only for beneficiaries with low annual expenditures, who account for a very small share of total Medicare spending; therefore, we do not expect that the increase in the Part B deductible measurably affected spending growth. Finally, beneficiaries' premiums for Part B of Medicare grew more slowly from 2007 to 2010 than they did from 2000 to 2005, and the monthly base premium for Part D grew only $4.59 between 2007 and 2010; therefore, premium growth would not have led to more constrained household budgets over the 2007–2010 period relative to the effect of such growth between 2000 and 2005. See Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds, *2013 Annual Report of the Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds* (May 2013), Tables V.E1 and V.E2, http://go.usa.gov/bUZm.

[28] Beginning in late 2000, the dollar copayments for most hospital outpatient services were held constant in nominal terms, causing the percentage of the total cost of a service for which a beneficiary was responsible to fall. In the year that the copayment amount accounted for 20 percent of the total cost of the service, it would resume growing so as to remain at a 20 percent coinsurance rate. As a result, the average coinsurance rate for all hospital outpatient services in the FFS portion of Medicare fell over the course of the decade.

[29] CMS's Office of the Actuary projected in January 2013 that changes in the age distribution over the next 10 years would slow the average annual rate of growth in per-beneficiary spending by about 0.2 percentage points. See Richard Kronick and Rosa Po, "Growth in Medicare Spending Per Beneficiary Continues to Hit Historic Lows" (Office of the Assistant Secretary for Planning and Evaluation, Department of Health and Human Services, January 2013), http://go.usa.gov/j3fJ.

[30] Body mass index is defined as the ratio of a person's mass (in kilograms) to the square of his or her height (in meters).

between ages 65 and 77 cost the program, on average, 27 percent more in 2010 than did beneficiaries in that age range who were not obese.[31] However, because the share of elderly beneficiaries who were obese increased at a similar rate from 2000 to 2005 as from 2007 to 2010, we did not expect our analysis to show that the change in the prevalence of obesity could explain much of the difference in spending growth between those two periods.

The share of elderly beneficiaries who had ever smoked remained fairly constant over the decade, rising from about 56 percent in 2000 to 58 percent in 2010. Therefore, even though beneficiaries who had ever smoked cost slightly more than beneficiaries of similar age who had never smoked (on average in 2010, 13 percent more for 65 to 77 year-olds and 7 percent more for beneficiaries over age 78), we did not expect to find that changes in the prevalence of smoking history contributed much to the slowdown.[32]

We used two data sets to determine average spending and enrollment shares by age, obesity status, and smoking history from 2000 to 2010. We drew information on spending and the enrollment share by age from the MBSF and information on beneficiaries' age, obesity status, and smoking history from the MCBS. Using the MBSF, we assigned beneficiaries into three age groups: 65 to 70, 71 to 77, and 78 or older. We estimated what spending growth would have been if the share of beneficiaries in each of the three age categories had not changed and compared that hypothetical growth rate to the actual growth rate. The difference between those two rates equals the contribution of demographic change to spending growth. In order to account for interactions among age, obesity status, and smoking history, we then calibrated the MCBS estimates of spending and enrollment by those three factors to match the age categories from the MBSF. Again, we estimated the difference between the growth in actual spending and the hypothetical growth in spending if the distribution of beneficiaries by age, obesity status, and smoking history had not changed.

On the basis of those analyses, we reached these conclusions:

- A decline in the average age of the elderly population later in the decade explains roughly 0.2 percentage points of the slowdown in FFS Medicare spending.

- Altogether, changes in age, obesity status, and smoking history of the elderly FFS population explain roughly 0.3 percentage points of that slowdown (see Table 1 on page 4).

Thus, even though all three factors—age, obesity status, and smoking history—may be important in determining long-term growth in per-beneficiary spending, changes in obesity status and smoking history alone appear to explain only an additional one-tenth of a percentage point of the difference in spending growth between the 2000–2005 and the 2007–2010 periods.[33]

Patterns of enrollment in Medicare Advantage may also have affected the average age and health status of FFS beneficiaries over the periods examined: The share of Medicare beneficiaries enrolled in Medicare Advantage fell from 17 percent in 2000 to 14 percent in 2005, before rising rapidly to 25 percent in 2010.

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[31] The difference is smaller for beneficiaries over age 78. One reason for the smaller difference in spending between obese and nonobese beneficiaries over age 78 could be that, among older beneficiaries, having a high-cost terminal illness may be associated with weight loss.

[32] Those estimates vary in different years of the MCBS, reflecting the fact that they are based on relatively small sample sizes.

[33] It is possible that our measures of obesity and smoking did not pick up the full effects of those factors on the health status of and spending on the elderly.

Because a growing share of younger elderly beneficiaries entered Medicare Advantage upon becoming eligible for Medicare, a shrinking share entered the FFS portion of Medicare; therefore, the population of FFS beneficiaries remained relatively older than it would have if enrollment in Medicare Advantage had remained a constant share of Medicare enrollment overall. Our analysis accounted for that type of change in the age distribution. However, our analysis did not capture the extent to which Medicare Advantage's attracting lower-cost beneficiaries at any given age might have increased average spending in the FFS portion of Medicare.[34] Because lower-cost beneficiaries were more likely to enter Medicare Advantage and higher-cost beneficiaries were more likely to leave Medicare Advantage for FFS coverage, the rising share of beneficiaries in Medicare Advantage, all else being equal, probably caused average spending in the FFS sector to rise.[35]

Growth in the Proportion of Beneficiaries Enrolled Only in Part A

Many elderly FFS beneficiaries who are employed (or the spouse of an active worker) and have health insurance offered by a firm with 20 or more employees enroll only in Part A.[36] For those beneficiaries, Medicare does not cover Part B services and pays for only a share of the cost of services covered under Part A. The share of younger beneficiaries enrolled only in Part A is higher than the share of older beneficiaries, which is consistent with the view that those beneficiaries are more likely to have employment-based coverage: In 2010, 14 percent of 65 to 70 year-olds were enrolled only in Part A, as were 6 percent of 71 to 77 year-olds and 4 percent of beneficiaries age 78 or older.[37] Overall, the share of elderly beneficiaries enrolled only in Part A was fairly steady at 6 percent from 2000 to 2005 but climbed to around 7 percent in 2007 and to more than 8 percent in 2010.[38] Because Medicare's average spending on an elderly FFS beneficiary enrolled only in Part A is less than a tenth of its average spending for a beneficiary enrolled in both Parts A and B, a growing share of beneficiaries enrolled only in Part A would

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[34] Our cell-based analysis of changes in the health status of the population estimated the effect of the changing distribution of enrollees across age, obesity, and smoking history cohorts but did not take into account growth in average spending within each cohort. Evidence suggests that, even for beneficiaries with similar risk scores (which are calculated on the basis of demographic characteristics and medical diagnoses), enrollment rates in Medicare Advantage were higher among lower-spending beneficiaries, a phenomenon that would probably have caused faster growth in average spending within each cohort in the FFS portion of Medicare. Estimates of the extent of favorable risk selection into and out of Medicare Advantage vary widely. For example, see Joseph P. Newhouse and others, "Steps to Reduce Favorable Risk Selection in Medicare Advantage Largely Succeeded, Boding Well for Health Insurance Exchanges," *Health Affairs*, vol. 31, no. 12 (December 2012), pp. 2618–2628, http://dx.doi.org/10.1377/hlthaff.2012.0345; and Gerald F. Riley, "Impact of Continued Biased Disenrollment From the Medicare Advantage Program to Fee-for-Service," *Medicare & Medicaid Research Review*, vol. 2, no. 4 (2012), pp. E1–E17, http://go.usa.gov/jJyF.

[35] Spillover effects from the rising share of beneficiaries enrolled in managed care, discussed later, could have had a countervailing influence on FFS spending growth.

[36] There is a strong incentive for Medicare-eligible individuals to enroll in Part B when they first become eligible, because they will face a substantial late enrollment penalty if they subsequently enroll. Active workers (and spouses) with health insurance from a large firm do not face that penalty if they enroll in Part B when they retire (or obtain coverage from a small firm). Some retirees and some workers (and spouses of workers) with health insurance offered by a small firm also enroll only in Part A. Those individuals, however, are subject to the late enrollment penalty for Part B, so the decision to enroll only in Part A probably depends on their confidence that their insurer will continue to offer generous coverage of Part B services throughout their retirement.

[37] Those estimates represent the share of beneficiaries in July of the year referenced who were enrolled only in Part A. Although the estimated share of beneficiaries enrolled only in Part A in a given year might differ if the calculation was based on a different month, the proportional change in the share of beneficiaries over time should be consistent with the change calculated under this approach.

[38] The share of beneficiaries enrolled only in Part A probably would have grown faster between 2007 and 2010 if not for the adverse labor market conditions brought on by the recession; the share of elderly Americans employed, which grew steadily between 2000 and 2008, remained roughly flat from 2008 to 2010 at 16 percent, before continuing to climb again in 2011, according to statistics by the Bureau of Labor Statistics. In that sense, the recession contributed to faster spending growth In Medicare by limiting some beneficiaries' opportunity to remain in the labor market instead of taking up full Medicare coverage.

cause the growth in average per-beneficiary spending to decrease. Therefore, the extent to which the share of enrollees with only Part A coverage grew more quickly from 2007 to 2010 than from 2000 to 2005 can explain some of the slowdown in spending growth—by our estimate, about 0.2 percentage points of that slowdown after the effects of the changing age distribution are accounted for (see Table 1 on page 4).

Two factors caused the uptick in growth in this category of beneficiary later in the decade: the growing share of younger elderly beneficiaries in the program and the growing share of elderly FFS beneficiaries within each age group enrolled only in Part A. Because younger beneficiaries are more likely to retain their employers' insurance as their primary source of coverage and therefore enroll only in Part A, the influx of younger beneficiaries alone caused the overall share of elderly beneficiaries enrolled only in Part A to rise. In our previous demographic analysis, we already accounted for the effect of the changing age profile; the post-2007 growth in the share of younger elderly beneficiaries accounted for 0.2 percentage points of the slowdown. Meanwhile, the share of enrollment only in Part A within each age category rose as well; for instance, the share of 65 to 70 year-old beneficiaries enrolled only in Part A grew from 10 percent to 14 percent between 2000 and 2010. In order to estimate the additional effect on spending growth of increasing enrollment only in Part A *within* each age group—that is, the contribution of such enrollment *in excess* of the effect of aging—we used a cell-based approach similar to that applied in the demographic analysis described above.

As before, we used the MBSF to assign beneficiaries to three age cells to estimate what spending growth would have been from 2000 to 2005 and from 2007 to 2010 if the share of beneficiaries in each of the three age categories had remained constant. We then compared that hypothetical growth rate to the actual growth rate to find the contribution of the changing age composition. We then split each age category into those enrolled only in Part A and those enrolled in both Parts A and B and repeated the analysis to determine that the combined effect of aging and enrollment only in Part A slowed growth by slightly more than 0.4 percentage points more from 2007 to 2010 than from 2000 to 2005. Because we had estimated that the aging of the elderly FFS population alone contributed 0.2 percentage points of the slowdown in spending, we conclude that the rise in enrollment only in Part A, controlling for changes in the age distribution, can explain an additional 0.2 percentage points.

Changes in the Use of Prescription Drugs

The use of prescription drugs affects people's health and their need for medical services covered under Parts A and B. An analysis by CBO indicates that a 1 percent increase in prescription drug utilization is associated with a 0.2 percent reduction in nondrug medical spending in that year.[39,40] On the basis of our analysis of survey data, we estimate that the growth in prescription drug use was only slightly faster in the later period and therefore can explain only 0.1 percentage points of the slowdown (see Table 1 on page 4).

We used the Prescribed Medicine Events File in the MCBS to estimate prescription drug utilization among noninstitutionalized beneficiaries in 2000, 2005, 2007, and 2010.[41] We measured prescription drug

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[39] See Congressional Budget Office, *Offsetting Effects of Prescription Drug Use on Medicare's Spending for Medical Services*, (November 2012), www.cbo.gov/publication/43741.

[40] With the implementation of Part D in 2006, the average level of drugs consumed by beneficiaries increased substantially. See Becky Briesacher and others, "Medicare Part D and Changes in Prescription Drug Use and Cost Burden: National Estimates for the Medicare Population, 2000–2007," *Medical Care*, vol. 49, no. 9 (2011), pp. 834–841, http://dx.doi.org/10.1097/MLR.0b013e3182162afb.

[41] As in Briesacher (2011), we restricted our analysis to beneficiaries who were living in the community the entire year; before 2006, no information on prescription drug utilization was collected for institutionalized beneficiaries. As with our other analyses, we included the records of all elderly beneficiaries who were not enrolled in a private health plan in July of the given year.

utilization as the number of filled prescriptions of oral solid pills (weighted by the average number of pills per filled prescription) plus the number of other types of filled prescriptions (assuming no change over time in quantity per filled prescriptions) per beneficiary in a given year.[42] We estimate that, between 2000 and 2005, average prescription drug utilization by elderly FFS beneficiaries living in the community grew by 2.6 percent annually; from 2007 to 2010, that growth was about 2.9 percent.[43]

Using CBO's published elasticity, we estimate that growth in prescription drug utilization reduced the average annual growth in spending in Parts A and B by about 0.5 percentage points per year from 2000 to 2005 and by about 0.6 percentage points from 2007 to 2010, contributing 0.1 percentage point to the spending slowdown in Parts A and B studied here.

Our estimate excludes any ongoing effects that the increase in drug use that accompanied the implementation of Part D in 2006 may have had on medical spending growth later in the decade; if the one-time shift in drug use did contribute to slower spending growth over several years, our estimate would understate the contribution of higher drug use to the slowdown. However, research on the effects of drug utilization on medical spending has generally not attempted to estimate effects over multiple years; therefore, we have no basis for estimating such an ongoing effect on Medicare spending.

The Financial Crisis and Economic Downturn
Medicare spending might be expected to be affected by the economic downturn because, as economists think of health care, it is a so-called normal good; namely, all else being equal, as real incomes rise at the aggregate and household levels, more health care is likely to be consumed.[44] The relationship between income growth and private health care spending has been borne out in analyses that are relevant to the experience of the recent recession. For example, CMS's Office of the Actuary has found that average growth in real per capita disposable personal income over five years is "highly influential" in predicting the growth in private health care spending in the United States.[45]

But, for several reasons, we might expect Medicare beneficiaries' demand for health care to be less sensitive to the business cycle than that of the nonelderly:

- First, beneficiaries keep their basic Medicare coverage regardless of economic conditions, so an economic downturn does not affect their insurance status the way it might affect nonelderly

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[42] Estimates of utilization growth are sensitive to the measure chosen for the analysis. According to MCBS data, the average number of filled prescriptions per beneficiary grew by about 3 percent per year from 2000 to 2005 and by 0 percent per year from 2007 to 2010. Our estimate accounts for the fact that the average size of prescriptions filled by elderly beneficiaries remained roughly flat between 2000 and 2005 and grew from 2007 to 2010.

[43] Beginning in 2006, MCBS matched beneficiaries' records of self-reported prescription drug "fills" to Part D drug claims. In 2010, for instance, there were prescription fills that were reported by survey respondents but were not in the Part D claims (40 percent), some prescription fills that were not self-reported but were in the Part D claims (about 24 percent), and some prescription fills that were both self-reported and on the Part D claims (36 percent). When estimating the growth in prescription drug use from 2007 to 2010, we included records that were not self-reported but were in the Part D claims; excluding those produces a slightly lower estimate of growth in the number of prescription fills over those years.

[44] That expected positive relationship between income growth and health care spending has been shown to be true for total health care spending over the long term. A recent study estimated that income growth explained 27 percent to 43 percent of the long-term growth in real per capita health care spending. See Sheila Smith, Joseph Newhouse, and Mark Freeland, "Income, Insurance, and Technology: Why Does Health Spending Outpace Economic Growth?" *Health Affairs*, vol. 28, no. 5 (September/October 2009), pp. 1276–1284, http://dx.doi.org/10.1377/hlthaff.28.5.1276.

[45] See Centers for Medicare and Medicaid Services, Office of the Actuary, "Projections of National Health Expenditures: Methodology and Model Specification" (July 28, 2011), p. 11, http://go.usa.gov/j3f3. Private health care spending is the sum of out-of-pocket spending, expenditures for private health insurance, and spending by other private sources.

workers'. (According to the Office of the Actuary's analysis, the most recent recession's "impact on insurance enrollment was one of the most influential contributors to the slower growth in national health expenditures, compared to previous recessions.")[46]

- Second, about five out of six elderly beneficiaries were not in the labor force between 2000 and 2010, meaning that job losses during the recession could have affected only a small share of beneficiaries.[47]

- Third, about 90 percent of elderly FFS beneficiaries had some form of supplemental insurance throughout the decade, which lowered their out-of-pocket costs for covered services. Even though beneficiaries might have spent a relatively large share of their income on premiums for supplemental insurance coverage, we estimate that, between 2008 and 2010, the median out-of-pocket spending for an elderly individual in the FFS portion of Medicare (excluding premiums but including any out-of-pocket spending on a spouse) was less than 5 percent of that individual's or couple's income.[48] Therefore, we would not expect a sudden loss of income or a decline in the value of assets to have had a large effect on a beneficiary's ability to purchase Medicare-financed services, even though it might have affected his or her ability to purchase services besides health care.

We adopted two approaches to quantifying the contribution of the recent recession to the slowdown in Medicare spending growth. One approach was to estimate the relationship between aggregate macroeconomic trends and the program's spending growth over time, asking whether the historical relationship between the two would have predicted the slowdown. Second, we estimated the effects of changes in wealth and income on elderly beneficiaries' use of health care services; if beneficiaries experiencing declines in wealth or income used fewer services than other beneficiaries, then we would be able to attribute some of the slowdown in spending growth to the recession. We conclude that, all told, changes in beneficiaries' income or wealth did not seem to affect their use of health care services.

Have slowdowns in per-beneficiary FFS spending coincided with past economic downturns? Several researchers have performed time-series analyses of national data and estimated a positive lagged relationship between economic growth and growth in private or total national health care spending. A comparable analysis for Medicare, when applied to per-beneficiary spending for all FFS beneficiaries, produces no evidence of a relationship between income growth and spending.[49] A visual examination of historical Medicare spending confirms that finding: Spending growth has not slowed during past

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[46] See Micah Hartman and others, "National Health Spending In 2011: Overall Growth Remains Low, but Some Payers and Services Show Signs of Acceleration," *Health Affairs*, vol. 32, no. 1 (January 2013), pp. 87–99, http://dx.doi.org/10.1377/hlthaff.2012.1206.

[47] Based on tabulations of the March Supplement to the Current Population Survey for all elderly Medicare beneficiaries. If institutionalized beneficiaries were included, the figure would be higher.

[48] Based on self-reported out-of-pocket spending in the National Institute on Aging's Health and Retirement Study. The mean share of spending was closer to 10 percent, as some beneficiaries' families reported out-of-pocket costs that were a very large share, and in some cases more than 100 percent, of total household income. Our estimate reflects only spending on cost sharing and does not include premiums for basic Medicare or supplemental insurance.

[49] We predicted annual growth in CPI-U-deflated FFS spending as a function of lagged growth in real GDP per capita and inflation, following the approach presented in Kaiser Family Foundation, "Assessing the Effects of the Economy on the Recent Slowdown in Health Spending" (April 2013), http://tinyurl.com/lo3sgh3. We also replicated the Kaiser Family Foundation study's finding of a strong and statistically significant correlation between lagged GDP growth and national health expenditures; we found a similar relationship when predicting growth in private health care expenditures. When using that approach to estimate growth in Medicare expenditures, we found no significant relationship across various time periods between fiscal years 1979 and 2012.

recessions, and the current slowdown began before the most recent financial crisis and economic downturn (see Figure 1 on page 2).

However, using time-series analyses to estimate the effect of economic growth on health care spending suffers some serious limitations, particularly when applied to Medicare spending growth. In addition to the usual challenges associated with drawing conclusions from very few data points, the Medicare program has changed dramatically over the past several decades in ways that are difficult to control for in time-series analyses. The introduction of various prospective payment systems throughout the 1980s and 1990s, the inception of the physician fee schedule, and changes to beneficiaries' cost-sharing requirements all fundamentally altered the nature of Medicare spending. Such changes in policy, as well as the changes in underlying patterns of care delivery, probably affected spending growth in a way that such analyses cannot control for, thereby potentially confounding the estimate of the relationship between Medicare spending growth and the business cycle.

Analysis of the program's spending by state allows us to more comprehensively control for unobserved factors in specific years, like the effects of Medicare policy changes, while exploiting cross-state variation in economic conditions.[50] We followed the approach of McInerney and Mellor, who used similar state-level data to find that a 1 percentage-point *increase* in unemployment was associated with a 0.45 to 0.66 percentage-point *increase* in real growth in per-beneficiary Medicare spending over the whole program (including managed care).[51] That effect, they found, varied among services: The effect for hospitals was about a 0.7 percentage-point increase; for nursing homes, roughly 1.8; and for physicians, statistically weakest and equal to roughly 0.3. Those results suggest that higher unemployment during the recession stimulated *faster*, not slower, growth in Medicare spending.

We replicated McInerney and Mellor's approach using expenditures on all FFS beneficiaries and a specification that, like theirs, controlled for state- and year-specific factors that might have caused spending to fluctuate for reasons unrelated to economic growth.[52] We found that a 1 percentage-point increase in statewide unemployment was associated with a 0.52 percentage-point *increase* in per-beneficiary FFS spending growth in that state—a result that was significantly different from zero at a 5 percent level and similar in magnitude to McInerney and Mellor's estimated effect on spending growth for the entire Medicare program (see Table 2).[53] However, we found no evidence of a relationship between per-beneficiary spending growth among all FFS beneficiaries and factors related to the employment and income growth of elderly Americans. For example, at the state level, growth in FFS spending was unrelated to the unemployment rate among the elderly and growth in the average income of

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[50] Spending and enrollment data on FFS beneficiaries were provided by CMS's Office of the Actuary. In the public release of the State Health Expenditure Accounts, FFS and Medicare managed care expenditures are combined. See Centers for Medicare and Medicaid Services, "Health Expenditures by State of Residence" (2011), http://go.usa.gov/jJVA. State-level unemployment data are collected by the Bureau of Labor Statistics, and state-level income data are collected by the Bureau of Economic Analysis. We calculated state-level rates at which adults were uninsured using the March Supplement to the Current Population Survey.

[51] Melissa Powell McInerney and Jennifer M. Mellor, "State Unemployment in Recessions During 1991−2009 Was Linked to Faster Growth in Medicare Spending," *Health Affairs,* vol. 31, no. 11 (November 2012), pp. 2464–2473, http://dx.doi.org/10.1377/hlthaff.2012.0005. The authors' data combine fee-for-service and managed care spending.

[52] We controlled for state-fixed effects, year dummies, state-specific time trends, and state-year per capita disposable income. We used the CPI-U to deflate Medicare spending and income. Given that we found a similar-sized result with our reduced specification, it seems likely that the controls we used were adequate for the purpose of isolating the effect of a rise in unemployment on Medicare spending growth.

[53] Our estimates predict that real growth in spending per FFS beneficiary would have been about 1.5 percentage points *lower* between 2007 and 2010 than growth from 2000 to 2005 if unemployment had been the same and no other factors had changed.

Table 2.

Regression Coefficients Predicting Growth in Logged Real Spending Per Beneficiary in the Fee-for-Service Portion of Medicare at the State Level, 1991 to 2009

	Economywide Factors				Demand-Side Factors			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unemployment Rate	0.52***							
	(0.00)							
Share of Adults Uninsured		0.06						
		(0.15)						
Share of Adults Uninsured or on Medicaid			0.05					
			(0.25)					
Five-Year Moving Average of Growth in Logged Real Disposable Personal Income Per Capita				0.01				
				(0.89)				
Unemployment Rate Among the Elderly					0.06			
					(0.26)			
Employment Rate Among the Elderly						-0.04		
						(0.50)		
Annual Growth in Logged Real Income of Elderly Americans[a]							-0.01	
							(0.42)	
Five-Year Moving Average of Growth in Logged Real Income of Elderly Americans[a]								-0.00
								(0.96)
Observations	918	918	918	918	918	918	918	918
R-squared	0.78	0.77	0.77	0.77	0.77	0.77	0.77	0.77

Source: Based on data from the Centers for Medicare and Medicaid Services, Office of the Actuary; Bureau of Labor Statistics; Bureau of Economic Analysis; and State Health Access Data Assistance Center.

Notes: *** = p<0.01.

P-values in parentheses.

Coefficients estimated with ordinary least-squares regressions controlling for state fixed-effects, year dummies, state-specific time trends, and real per capita disposable income.

a. The average income of the elderly was measured as the average household income per person for elderly Americans. Results were similarly insignificant when using growth in the income of Medicare beneficiaries as the independent variable.

elderly Americans.[54] Those findings suggest that growth in spending for elderly beneficiaries does not vary with factors affecting beneficiaries' income. (Later in the paper, we evaluate whether high unemployment causes providers to deliver more services to FFS beneficiaries, concluding that evidence of such a response by providers is mixed.)

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[54] We calculated household income per person for each elderly person in the CPS and then calculated the average of that measure of income within a state. That way, any shift in seniors' living arrangements, such as a rise in the share of the elderly living with adult children, would be accounted for in our measure of income growth.

In addition, we analyzed the National Health Interview Survey (NHIS) to determine whether, between 1999 and 2010, beneficiaries reported higher rates of delaying care during periods of higher unemployment. Controlling for beneficiaries' characteristics, we estimate that a 1 percentage-point increase in the regional unemployment rate was weakly associated (p-value = 0.06) with a 0.06 percentage-point increase in the likelihood that an elderly beneficiary in either the fee-for-service portion of Medicare or in a private health plan under Medicare Advantage delayed care because of cost. However, we found no such relationship among elderly beneficiaries in the FFS portion of Medicare specifically. Given the large size of our pooled sample of NHIS respondents (about 81,000 elderly respondents in the FFS portion of Medicare), the lack of a measurable relationship probably derives from differences between those two segments of the program rather than from imprecision in the testing. In addition, higher regional unemployment did not appear to significantly affect elderly FFS beneficiaries' likelihood of hospitalization or the number of times they visited the doctor.

Did elderly beneficiaries suffering large losses of assets or income use fewer services? In addition to testing the relationship between the business cycle and aggregate Medicare spending data, we used the National Institute on Aging's Health and Retirement Study (HRS) to examine whether, at various points in the past decade, elderly FFS beneficiaries who suffered significant financial losses tended to use fewer health care services. We found no significant relationship between the utilization of health care and declines in beneficiaries' housing values or income; we found a very small effect, after a lag, from changes in the value of liquid assets on the number of doctor's visits.

The HRS interviews respondents once every two years, asking about their use of health care since the prior interview as well as their holdings of assets that year and their household income the year before. We examined variation in several measures of health care use during the preceding two years: whether the respondent was hospitalized and, if so, how many times; whether the respondent underwent outpatient surgery; and how many times the respondent visited a doctor. Our key independent variables predicting those outcomes in the modeling were two-year changes in the following: the real gross value of a beneficiary's primary residence, the real value of the household's liquid assets, and household income (expressed as a percentage of the federal poverty level [FPL] as defined by the Census Bureau).[55] We defined "liquid assets" as the value of household wealth held in IRAs (individual retirement accounts) or Keogh accounts, stocks, cash savings, certificates of deposit, and bonds.

Our sample, statistical methods, and sensitivity analyses are described in detail in the technical appendix. In brief, we used regression analysis to estimate the effect of a proportional change in the value of a beneficiary's household assets or income on the amount of health care services utilized. We used two strategies to identify a causal effect. First, we controlled for a number of characteristics that also determine health care utilization, like a beneficiary's age and health status. Second, we restricted our sample to beneficiaries whose assets or income were probably not affected by a sudden deterioration in health. In particular, when we tested the effect of a decline in liquid assets and income on health care utilization, we restricted our analysis to beneficiaries who had been retired for a few years in order to exclude those who may have left the workforce because of a health problem, which would result in higher

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[55] The HRS queries respondents about prior-year income; for example, respondents in the 2008 and 2010 waves (or rounds of interviews) were asked about their 2007 and 2009 income, respectively.

health care spending and a drawing down of liquid assets and substantial reduction in income. (Beneficiaries who were not retired are included in our housing value regressions.)[56,57]

The recent recession substantially affected elderly beneficiaries' housing wealth. Whereas about 40 percent of home-owning elderly FFS beneficiaries included in the HRS (excluding those who moved) reported losses in the real gross value of their primary residence between 2004 and 2006, nearly 75 percent experienced losses between 2008 and 2010.[58] Elderly FFS beneficiaries in the HRS reported a broad distribution of percentage changes in the real gross value of their primary residence during the collapse of the housing bubble; the median percentage change for a beneficiary who owned the same home from 2008 to 2010 was about an 8 percent loss (see Figure 8).[59] The financial crisis also affected beneficiaries' liquid assets. For all elderly FFS beneficiaries whose household owned liquid assets in 2004, we observed a median decline in the real value of such assets of 6 percent between 2004 and 2006; that amount is consistent with the typical extent to which retired individuals draw down their assets. However, the median decline in liquid assets between 2008 and 2010 among elderly FFS beneficiaries who owned liquid assets in 2008 was larger—11 percent—as one would expect given the financial crisis.[60] Finally, the median change in real household income (as a percentage of the FPL) among elderly FFS beneficiaries in the HRS was about a 2 percent loss between 2005 and 2007 and about a 5 percent loss between 2007 and 2009.[61]

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[56] We refreshed the sample with each new wave of interviews in the HRS. For example, we included every beneficiary as an observation in 2010 that met the requirements for the sample, as described in Table A-2 of the technical appendix, as of that wave, regardless of whether he or she met those requirements in prior or subsequent waves. For instance, if a respondent moved primary residences between 2004 and 2006, he or she would be not be included as an observation in 2006 and 2008 for the housing value sample but would be in 2010.

[57] In a sensitivity analysis, we also excluded beneficiaries who became newly diagnosed with a medical condition, as described in the technical appendix.

[58] Roughly 80 percent of elderly FFS beneficiaries in the HRS reported owning a home in 2010; a similar share of elderly heads of households owned a home in the 2010 Survey of Consumer Finances.

[59] Figures reported here exclude beneficiaries for whom gross housing values were imputed. In the HRS, the real mean value of elderly FFS beneficiaries' homes fell by roughly 20 percent between 2006 and 2010. That proportional decline is substantially smaller than the decline reported in the S&P (Standard & Poor's) Case-Shiller 20-City Home Price Index but roughly consistent with the decline observed between the 2007 and 2010 Surveys of Consumer Finances. Survey respondents may report smaller fluctuations in the value of their homes than are reflected in actual transaction prices.

[60] The value of liquid assets among elderly FFS beneficiaries in the HRS shows less aggregate fluctuation than other published measures of household finances. As with home values, that comparative stability may be due to survey respondents' tendency to underreport changes in the value of their financial assets. In addition, elderly beneficiaries might have had a smaller share of their total financial assets in the stock market; as a result, the significant declines in stock values might have had a smaller effect on elderly beneficiaries' finances.

[61] The median change of -5.2 percent in income as a percentage of the FPL between 2007 and 2009 represents a slightly larger loss than the change in real income observed for households led by elderly Americans in the Survey of Consumer Finances. Between 2007 and 2009, households headed by people ages 65 to 74 exhibited a median loss in real income of 4 percent, and households headed by people age 75 or older, a loss of 1 percent. Part of that discrepancy is due to the fact that the growth in the FPL for one- and two-person "elderly households" exceeded growth in the CPI-U from 2007 to 2009 by slightly more than half a percentage point. In addition, the HRS measure of household income as a percentage of the FPL includes income from all household members but excludes capital gains and losses; the lost income of other household members, as well as the exclusion of capital gains, could explain why the median decline in income as a percentage of the FPL among HRS respondents, at the median, was greater. See Jesse Bricker and others, "Surveying the Aftermath of the Storm: Changes in Family Finances From 2007 to 2009," Finance and Economics Discussion Series Paper No. 2011-17 (Board of Governors of the Federal Reserve System, March 2011), http://go.usa.gov/js49. See also "Poverty Thresholds" (Census Bureau, accessed July 12, 2013), http://go.usa.gov/js4A.

Figure 8.
Median Percentage Change Over Two Years in Real Household Wealth or Income for Selected Elderly Americans in the Fee-for-Service Portion of Medicare, in the Health and Retirement Study, 2004 to 2010

(Percent)
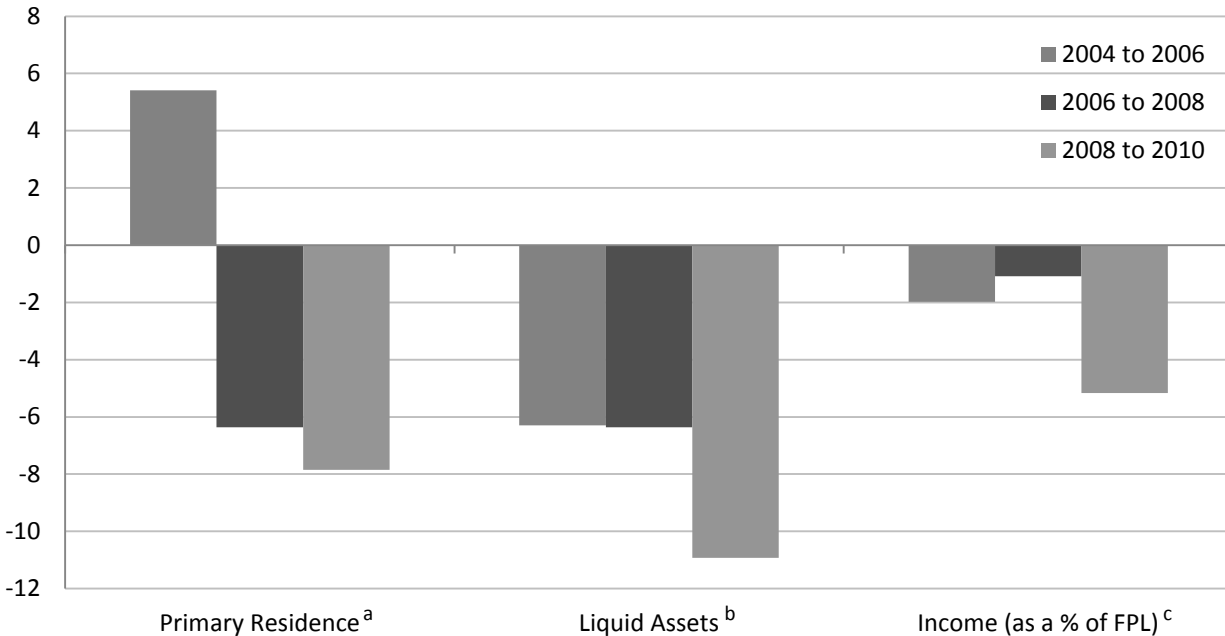
Source: Based on the Health and Retirement Study, RAND File Version L.

Note: FPL = federal poverty level; FFS = fee for service.

a. Sample is restricted to elderly homeowners in the FFS portion of Medicare who did not move primary residences.

b. Sample is restricted to elderly FFS beneficiaries who initially owned some liquid assets.

c. Sample is restricted to elderly FFS beneficiaries. The Health and Retirement Study queries respondents about their prior-year income; therefore, figures reported for 2008 to 2010 in fact refer to the change in income from 2007 to 2009.

The statistics presented here (in Figure 8) are for all elderly FFS beneficiaries in the HRS in a given wave who owned a home or held liquid assets. It is important to note that our main regression results pertaining to the effect of changes in liquid assets and income are based on samples that are restricted to a subset of beneficiaries that, on average, exhibited smaller losses in such assets. That discrepancy is primarily due to our exclusion of beneficiaries who were not retired or who were recently retired, who probably had a larger share of their financial assets affected by declines in stock values. As described in the technical appendix, we tested the sensitivity of our results to a variety of alternative samples, including ones that included beneficiaries who were not retired or who were recently retired.

From examining the cross-sectional relationship of a decrease in gross housing value, liquid assets, and household income on beneficiaries' health care utilization, we determined these results:

- A change in housing value was not associated with a change in health care utilization.

- A change in liquid assets had a very small effect, after a lag, on the number of visits to the doctor; a 10 percent loss of liquid assets between 2006 and 2008, all else being equal, was associated with about a 1 percent decrease in the expected number of doctor's visits between 2008 and 2010.

- A loss in income (as a percentage of the FPL) did not have significant bearing on the likelihood of outpatient surgery or the volume of doctor's visits for retired elderly beneficiaries across all specifications of our model.

Results were robust in a wide variety of sensitivity analyses, including those not restricted to the retired population. (For detailed results, see Tables A-3, A-4, and A-5 of the appendix.)

Our ability to draw conclusions from such data is limited by several factors, many of which we attempted to address in sensitivity analyses. First of all, our estimates of the relationship between changes in wealth or income and the use of health care are fairly imprecise, making it difficult to completely rule out small effects. The wide confidence intervals surrounding our estimates result from the relatively small sample sizes and the presence of measurement error (in self-reported asset values, imputed income values, and self-reported health care utilization).[62,63] Second, we may not have included sufficient controls or restricted our sample enough to fully account for endogeneity in our measure of the change in liquid assets and income. Although we controlled for worsening health status and restricted our sample to beneficiaries who had been retired since the prior HRS wave, it is possible that a prior or concurrent health problem would have caused beneficiaries to spend down assets while using more health care in a way that we did not account for.[64] Third, our regressions for liquid assets and income excluded beneficiaries who were recently or not yet retired. That restriction of the sample, though useful in identifying exogenous changes in our independent variables, excluded many of the younger elderly beneficiaries, who may have changed their use of health care more in response to losses of assets or income.[65] Fourth, we did not investigate possible interactions between changes in different types of assets and income. Finally, our measures of health care utilization might not have fully encompassed the types of reductions in utilization that led to lower spending growth. In the future, it would be useful if researchers conducted similar analyses with HRS data linked to Medicare claims, using the same characteristics of beneficiaries in order to better understand the relationship between changes in wealth or income and Medicare spending.

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[62] We would expect that the larger sample size, exclusion of imputed values, and substantial variation in the change in home values over the years covered by our sample would increase the statistical power of our regressions for housing values relative to those for liquid asset and income. However, the presence of outlier values in each regression sample, combined with reporting errors in the independent and dependent variables, inflates the standard errors. For example, when respondents reporting more than 100 doctor's visits over two years are excluded, standard errors on the coefficients of interest are smaller.

[63] In order to determine whether the null finding in our income regressions was being driven by measurement error caused by including imputed values, we conducted a sensitivity analysis in which we measured the change in the combined real income of the respondent and spouse, excluding values that were imputed. As with the main results, we found no significant relationship between changes in income and the use of health care.

[64] In order to further address that concern, we conducted a sensitivity analysis in which we excluded beneficiaries who received a new diagnosis of a serious condition since the prior wave; the results were similar to those reported above.

[65] Results were not sensitive to the test of including in the sample beneficiaries who were not retired; however, an effect of reduced assets or income on health care utilization could be masked by beneficiaries whose change in wealth or income is endogenous to health problems.

How do the estimated effects for Medicare compare with those for the private sector? This paper's findings about Medicare contrast with the relationship between private health care spending and the business cycle. CMS's Office of the Actuary estimates that slower growth in real disposable income per capita results in a decline in the growth of private health care spending per capita over many years. In addition, a number of studies have indicated that the recession contributed substantially to the slowdown in total national health care spending.

Specifically, the Office of the Actuary estimates that growth in private personal health care spending per capita has an elasticity of 1.54 with respect to the five-year average growth in real disposable income per capita.[66] Applying that elasticity to the slowdown in income growth that occurred during the recession would account for a large share of the difference in growth in private health care spending between the 2000–2005 and 2007–2010 periods.

Recent analyses have produced a fairly broad range of estimates of the recession's contribution to the slowdown in national health care spending. Two studies compared the actual slowdown with the slowdown that models based on historical relationships would have predicted. The first study compared growth in total health care spending from 2001 to 2003 (8.8 percent) with growth from 2008 to 2012 (4.2 percent) and found that the model would have predicted a slowdown that was 77 percent as large as what actually occurred.[67] The second study compared actual growth in total health care spending from 2003 to 2012 with growth that the Office of the Actuary had projected in 2004. After adjusting for certain aspects of the projection, the historical model used in this case would have predicted a slowdown that was 37 percent as large as what actually occurred.[68] Although some of the divergence in the studies' estimates stems from the difference in the way the authors measured the slowdown, their findings reflect the fact that, historically, the business cycle has had a substantial effect on total health care spending.

A third study took a different approach. Examining spending growth for employees continuously insured at large private firms from 2007 to 2011, the study found that a reduction in the comprehensiveness of benefits, which the authors attributed to the recession, explained roughly one-fifth of the slowdown in health care spending growth between 2009 and 2011.[69] That finding complements both the recent studies examining the slowdown in national health care spending and our analysis of Medicare spending growth. Similar to the other recent studies, that study found that the weak economy, insofar as it caused benefits to become less comprehensive in 2010, explained some of the slowdown in the growth of private health care spending in that year. Like our analysis of elderly beneficiaries in the FFS portion of Medicare, the study suggested that the slowdown in health care spending for another population with fairly stable insurance

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[66] The Office of the Actuary controlled for relative medical price inflation, growth in the government's spending on health care, and a historical time trend. See Centers for Medicare and Medicaid Services, Office of the Actuary, "Projections of National Health Expenditures: Methodology and Model Specification" (July 28, 2011), p. 11, http://go.usa.gov/j3f3.

[67] See Kaiser Family Foundation, "Assessing the Effects of the Economy on the Recent Slowdown in Health Spending" (April 2013), http://tinyurl.com/lo3sgh3.

[68] See David M. Cutler and Nikhil R. Sahni, "If Slow Rate of Health Care Spending Growth Persists, Projections May Be Off by $770 Billion," *Health Affairs*, vol. 32, no. 5 (May 2013), pp. 841–850, http://dx.doi.org/10.1377/hlthaff.2012.0289.

[69] Comprehensiveness of insurance benefits was measured by computing the average per-service amount that a plan's enrollees paid out of pocket for emergency department visits, outpatient visits, brand-name prescriptions, and hospital admissions. See Alexander J. Ryu and others, "The Slowdown In Health Care Spending In 2009–11 Reflected Factors Other Than the Weak Economy and Thus May Persist," *Health Affairs*, vol. 32, no. 5 (May 2013), pp. 835–840, http://dx.doi.org/10.1377/hlthaff.2012.1297.

coverage and income was caused, at least in part, by difficult-to-observe factors that were not related to the recession.

Changes in Supplemental Coverage

Beneficiaries with supplemental insurance coverage face a lower out-of-pocket cost when consuming Medicare-financed services than do those without such insurance. Two types of changes to supplemental coverage could help explain the slowdown in Medicare spending. First, if enrollment in supplemental plans grew more slowly or decreased in the 2007–2010 period relative to what occurred in the 2000–2005 period, we would expect slower spending growth (all else being equal). But the share of elderly FFS beneficiaries with supplemental coverage was fairly steady, between 89 percent and 91 percent, throughout the decade.[70]

Second, if such plans were less comprehensive (that is, on average, they covered a smaller share of beneficiaries' cost-sharing responsibilities under basic Medicare coverage) during the later period than in the earlier period, we would similarly expect slower growth. A change in the distribution of enrollment among the various types of supplemental insurance is one factor that might affect plans' average comprehensiveness; if beneficiaries moved into a type of supplemental insurance that was less comprehensive, then we might expect spending growth to slow. According to our analysis, the composition of beneficiaries' supplemental insurance did change somewhat over the decade: The share of elderly FFS beneficiaries covered by employment-based insurance grew from 38 percent in 2000 to 41 percent in 2005 and from 45 percent in 2007 to 46 percent in 2010.[71] Meanwhile, the share enrolled in self-purchased supplemental, or medigap, plans shrank, from 36 percent to 35 percent between 2000 and 2005 and from 33 percent to 30 percent between 2007 and 2010; among all beneficiaries with medigap coverage, enrollment in the plans with no cost-sharing requirements for beneficiaries grew from 59 percent in December 2006 to 63 percent in December 2010.[72] Meanwhile, the share of elderly FFS beneficiaries enrolled in Medicaid was fairly consistent, varying between 11 percent and 13 percent throughout the decade.

We conclude that the effects of changes in enrollment in supplemental insurance plans on spending growth were fairly small, although we were not able to quantify precisely the share of the slowdown such changes explain. A recent study found that between 1992 and 2005, controlling for other characteristics of beneficiaries, medigap coverage was associated with slightly faster growth in Medicare spending than

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[70] Estimates are based on the Medicare Current Beneficiary Survey. As with our analysis of the MBSF, the sample here includes beneficiaries who were not in a private health plan in July of the given year; but unlike that analysis, this one restricted the sample to beneficiaries who were eligible for Medicare coverage for the full 12 months of the year. The type of coverage beneficiaries reported for most months of the year is the type we recorded for them; beneficiaries with both a medigap and an employment-based plan in a given month were coded as having a medigap plan.

[71] That rise in employment-based coverage among elderly FFS beneficiaries, which contradicts reports of a long-term decline in the number of employers offering such coverage, can probably be explained by two factors. First, the share of all elderly Medicare beneficiaries enrolled in the FFS portion of the program fell between 2005 and 2010; therefore, even if the share of all elderly Medicare beneficiaries with employment-based supplemental coverage remained constant, the share of FFS beneficiaries with such coverage could increase. Second, beneficiaries who entered Medicare in the mid- to late-1990s were more likely than subsequent entrants to have employment-based supplemental insurance, and as the share of enrollment for which that cohort accounted grew, so too did the share of elderly FFS beneficiaries with employment-based supplemental insurance.

[72] See America's Health Insurance Plans, Center for Policy Research, *Trends in Medigap Policies, December 2004 to December 2006* (March 2008), www.ahip.org/pdfs/MedigapTrendReport.pdf (PDF, 342 KB), and "*Trends in Medigap Coverage and Enrollment, 2010–2011*" (July 2011), www.ahip.org/Medigap-2011.aspx (PDF, 704 KB).

was employment-based coverage.[73] Therefore, the fact that a smaller share of enrollees had medigap policies between 2007 and 2010 (31 percent) than between 2000 and 2005 (36 percent) could have contributed somewhat to the slowdown. That the share of medigap enrollees with no cost-sharing requirements rose between 2007 and 2010 probably diminished any effect that the lower share of medigap enrollment had on spending growth.

There is also a possibility that, among beneficiaries enrolled in employment-based plans or Medicaid, the average comprehensiveness of benefits declined between 2007 and 2010 more than it declined between 2000 and 2005. Though little is known about changes in the average comprehensiveness of either such type of supplemental coverage, we again conclude that any changes in benefit design probably explain only a small share of the slowdown. For example, a recent study found that, from 2009 to 2010, one-fifth of the slowdown in the growth in health care spending for commercially insured people under age 65 could be explained by reductions in the average comprehensiveness of their health insurance.[74] If we assume that changes in the comprehensiveness of employment-based supplemental insurance of elderly FFS beneficiaries followed a similar pattern and can therefore explain one-fifth of the slowdown in Medicare spending growth for those beneficiaries between 2009 and 2010, we could explain less than 0.1 percentage point of the slowdown between our two study periods.[75]

In sum, the share of Medicare beneficiaries with supplemental insurance between 2000 and 2010 was fairly stable. Although we lack the data to make a quantitative estimate of the contribution of changes in supplemental coverage to the slowdown in spending growth, we expect that any such effect, if measured, would be small.

Assessing Changes in the Delivery of Care to Beneficiaries

Given the large share of the slowdown in spending growth left unexplained by our analysis of factors affecting beneficiaries' demand for services, it is likely that changes in the delivery of care played a role. We examined a number of ways in which care delivery may have changed and evaluated the likelihood that each could help to explain why spending growth slowed later in the decade:

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[73] See Ezra Golberstein and others, "Supplemental Coverage Associated With More Rapid Spending Growth for Medicare Beneficiaries," *Health Affairs*, vol. 32, no. 5 (May 2013), Technical Appendix, http://dx.doi.org/10.1377/hlthaff.2012.1230.

[74] The study found that the effect persisted in 2011. See Alexander J. Ryu and others, "The Slowdown In Health Care Spending In 2009–11 Reflected Factors Other Than the Weak Economy and Thus May Persist," *Health Affairs*, vol. 32, no. 5 (May 2013), pp. 835–840, http://dx.doi.org/10.1377/hlthaff.2012.1297.

[75] If we apply that one-fifth reduction to the roughly one-half of the beneficiary population with employment-based supplemental insurance, we would be able to explain about 10 percent of the slowdown in Medicare spending between 2009 and 2010. That is, rather than falling from 4.7 percent in 2009 to 2.1 percent in 2010, growth in per-beneficiary spending would have been 2.4 percent in 2010 if the benefits in employment-based plans had held constant. That outcome would have yielded a 3.9 percent average growth rate from 2007 to 2010, slightly less than 0.1 percentage point faster than the 3.8 percent growth rate actually observed. That rough estimate assumes that the comprehensiveness of employment-based supplemental insurance declined at a constant rate over the decade in every year with the exception of 2010. If, for instance, the comprehensiveness of such plans increased between 2000 and 2005, then the decline in generosity from 2009 to 2010 would explain more of the slowdown. We also assumed that beneficiaries with employment-based supplemental insurance experienced the same proportional reduction in spending growth as did other Medicare beneficiaries; if spending growth declined more for beneficiaries with employment-based insurance than it did for other beneficiaries, then the decline in the comprehensiveness of those plans would explain a larger share of the slowdown.

- Providers shifted toward caring for patients in less intense and less costly ways over the course of the decade. To the extent that that trend accelerated in the later part of the decade, it would have caused spending growth to slow in those years.

- In contrast, we estimate that changes in what physicians "coded," or recorded under Medicare's fee schedule, as the intensity of the care they delivered during evaluation and management (E&M) visits contributed consistently to spending growth throughout the decade but no differently in the later years than in the earlier years.

- Other changes that could have slowed the growth in spending include more efficient care management, a reduction in the rate of adoption of new cost-increasing technologies, or an increase in the rate of cost-decreasing process innovations. However, the evidence that changes in care management occurred on a scale that would have significantly affected overall spending growth is scant, and more research on the rate of technology adoption and process innovations is needed to determine what role they may have played in causing the slowdown.

- In addition, providers may have begun to reduce the growth in the number of services delivered in the course of caring for a patient in ways that are difficult to measure but important in slowing spending growth.

- Though a reduction in the access to care for beneficiaries could have caused spending growth to slow, we conclude that providers did not constrain beneficiaries' ability to obtain services in a way that can help to explain the slowdown.

Although we cannot offer a quantitative estimate of the contribution of specific changes in care delivery to the slowdown in spending growth, such changes probably were important in explaining the share of the slowdown not accounted for by our quantitative analyses of factors affecting demand.

Lower-Cost Sites of Service and Health Care Practitioners

In investigating changes in the delivery of care that could have contributed to the slowdown, we examined the decline in utilization of hospital inpatient services, an increase in the use of nurse practitioners and physician assistants to provide services, and changes in the settings in which beneficiaries receive care near the end of life.

Inpatient Services. Much of the decline in spending growth for inpatient services, which accounted for a large share of the reduction in spending growth for the highest-cost elderly FFS beneficiaries, came from a reduction in the rate of hospital admissions per beneficiary toward the end of the decade. Per-beneficiary rates of surgical discharge, which grew slightly from 2000 to 2005, fell by an average annual rate of nearly 10 percent from 2007 to 2010. Similarly, rates of medical discharges for ambulatory care-sensitive conditions and other medical discharges declined more from 2007 to 2010 than they did earlier in the decade (see Figure 9).[76,77]

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[76] Discharge rates are a measure of hospital admissions per beneficiary in a year. "Ambulatory care-sensitive" conditions are defined by the Agency for Healthcare Research and Quality as diagnoses for which hospital admissions can be avoided, at least in part, through high-quality outpatient care. See Agency for Healthcare Research and Quality, *Healthcare Cost and Utilization Project (HCUP): Appendix B, National Healthcare Quality Report, 2008* (October 2008), http://go.usa.gov/j3GY.

Figure 9.
Annual Growth in the Number of Hospital Discharges Per Beneficiary in the Fee-for-Service Portion of Medicare, by Type of Discharge

(Percent)
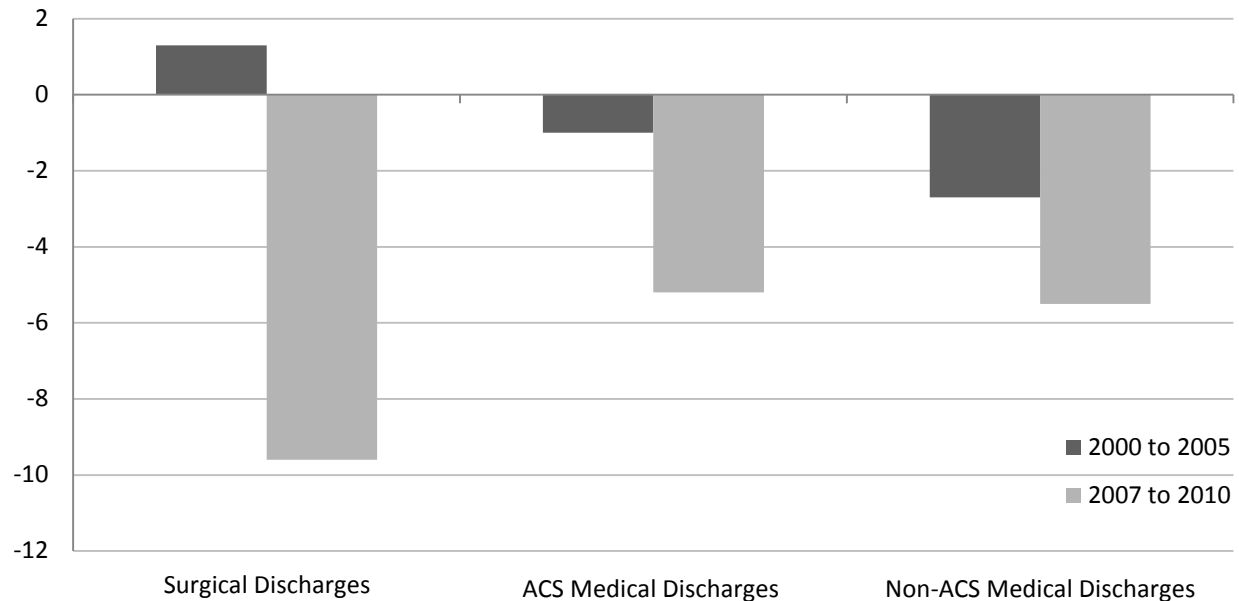
Source: Based on data compiled by the Dartmouth Atlas of Health Care.

Notes: The Agency for Healthcare Research and Quality defines ambulatory care-sensitive (ACS) conditions as a group of diagnoses for which a hospital admission can be avoided, at least in part, through high-quality outpatient care.

Changes in the age distribution of the Medicare population are not controlled for in the figures shown.

Why have hospital admissions declined so much? Some of the decline is the result of demographic shifts in the Medicare population discussed earlier: The rising share of beneficiaries who are young and who therefore use fewer hospital inpatient services caused the rate of hospital admissions to fall. In addition, part of the reduction in admissions is explained by a shift in services—particularly surgical services—from the inpatient to outpatient settings. Because of improvements in technology and changes in treatment patterns, a number of procedures that would have previously entailed an inpatient admission are now performed as single-day outpatient procedures, either in hospital outpatient departments or ambulatory care surgical centers. However, that trend has been ongoing for decades; the extent to which it explains some of the slowdown would depend on whether it has accelerated in recent years.[78] In addition, there has been a steep rise in the number and length of "observation stays" per beneficiary in recent years; rather than admitting a beneficiary to its inpatient unit, a hospital can place him or her in its outpatient unit under "observation."[79] To the extent that outpatient care acts as a substitute for inpatient admissions,

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[77] Some of the decline in the rate of surgical discharges in the FFS portion of Medicare could be a result of an overall reduction of surgery among beneficiaries; however, the magnitude of the decline suggests that some of it can be explained by a shift toward outpatient procedures. Changes in the age mix of the Medicare population (though not controlled for in Figure 9) also may have contributed to the change in discharge rates.

[78] Coronary angioplasties are one example of a service that was increasingly performed in an outpatient setting toward the end of the decade. See ObjectiveHealth, "The Transition to Outpatient of Coronary Angioplasty (PTCA)" (infographic, 2012), http://tinyurl.com/nqv4hvc.

[79] See Zhanlian Feng and others, "Sharp Rise in Medicare Enrollees Being Held in Hospitals for Observation Raises Concerns About Causes and Consequences," *Health Affairs,* vol. 31, no. 6 (June 2012), pp. 1251–1259,

it decreases per-episode costs for Medicare: first, at the point of care, and second, by reducing the number of beneficiaries eligible for subsequent care in skilled nursing facilities.[80] If, however, beneficiaries are more likely to use care in an outpatient setting that they would have forgone if it had been available only in the inpatient setting, the shift to outpatient procedures could cause spending growth to increase.

Physicians' Services. There is some evidence that certain services provided by physicians were increasingly delivered in a lower-cost manner as well, though not necessarily at a rate that could explain an important share of the slowdown through 2010. One factor affecting spending is the rising share (albeit from a very low level) of such services provided by nurse practitioners and physician assistants. According to our tabulation of Medicare claims, the share of the program's payments for physicians' services utilized by elderly FFS beneficiaries that was directed to those caregivers rose from 0.5 percent in 2000 to 1.1 percent in 2005 and 1.9 percent in 2010.[81]

Because physicians are paid more than nurse practitioners and physician assistants, a substitution from seeing the former to seeing the latter two would reduce the growth of Medicare spending. Under an assumption that such substitution was occurring during the 2000s, the growth in the share of payments directed to nurse practitioners and physician assistants caused growth in the average per-service cost of physicians' services to slow very slightly and at a fairly consistent rate over the decade.[82] However, total spending growth on physicians' services might have increased if visits to nurse practitioners and physician assistants occurred in addition to, rather than as substitutes for, doctor's visits. Because we cannot identify the share of increased use of nurse practitioners and physician assistants that substituted for doctor's visits, we did not attempt to quantify any corresponding contribution to the slowdown in Medicare's spending growth over the course of the decade.

End-of-Life Care. Beneficiaries at the end of life account for a disproportionate share of Medicare's total spending, and it is possible that the care they received became less intense toward the end of the decade. The use of hospice services at the end of life rose dramatically—from 22 percent of dying elderly FFS beneficiaries in 2000 to 42 percent in 2009. Over the same period, the share of deaths occurring in acute care hospitals, which are higher-cost settings than hospices, fell from 33 percent to 25 percent.[83]

However, the increased use of hospice services did not necessarily reduce the growth in Medicare spending on beneficiaries at the end of life because some of the increase in those services may have

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http://dx.doi.org/10.1377/hlthaff.2012.0129. Some of the rise in observation stays is probably due to the implementation of the Medicare Recovery Audit Contractor (RAC) Program, which, beginning in 2006 on a nationwide basis, allowed CMS to recoup payments deemed inappropriate; a hospital receiving payments for an inpatient admission that is subsequently determined to have been unnecessary would be required to return such payments.

[80] Although a shift away from inpatient admissions may reduce Medicare's spending, it can often increase out-of-pocket costs for beneficiaries. Beneficiaries are responsible for at least 20 percent of the payment for hospital outpatient services. Moreover, Medicare does not pay for postacute services for beneficiaries who do not spend at least three nights in the hospital in an inpatient setting. As a result, observation stays are often much more costly for beneficiaries than inpatient admissions.

[81] The rise in the share of services provided could have been driven in part by the increased use of retail clinics, which are staffed primarily by nonphysicians, by the elderly during our study period. See Ateev Mehrotra and Judith R. Lave, "Visits to Retail Clinics Grew Fourfold From 2007 to 2009, Although Their Share of Overall Outpatient Visits Remains Low," *Health Affairs*, vol. 31, no. 9 (September 2012), pp. 2123–2129, http://dx.doi.org/10.1377/hlthaff.2011.1128.

[82] We estimate that the average cost to Medicare of physicians' services was only 0.3 percent lower in 2010 than it would have been if the share of such services delivered by nurse practitioners and physician assistants was the same as the share in 2000.

[83] See Joan M. Teno and others, "Change in End-of-Life Care for Medicare Beneficiaries: Site of Death, Place of Care, and Health Care Transitions in 2000, 2005, and 2009," *Journal of the American Medical Association*, vol. 309, no. 5 (February 2013), pp. 470–477, http://dx.doi.org/10.1001/jama.2012.207624.

occurred in addition to care that beneficiaries would have received at home, in nursing facilities, or in the hospital. The rising share of hospice stays shorter than three days (5 percent in 2000 and 10 percent in 2009) and the higher rate of use of intensive care units in the final 30 days of life (24 percent in 2000 and 29 percent in 2009) further reinforce the notion that some of the increased use of hospice services did not result in less intensive end-of-life care overall. If the growth in the use of hospice services by beneficiaries at the end of life contributed, on net, to faster Medicare spending growth, then the substantial growth in hospice spending early in the decade (roughly 20 percent per year from 2000 to 2005) followed by tempered growth in later years (roughly 6 percent per year from 2007 to 2010) helps explain some of the slowdown in spending growth studied here (see Figure 3 on page 10).

Coding Intensity

When billing Medicare for a service, providers indicate the severity of the patient's condition through the codes that they use. Though we did not investigate coding trends in all types of services, we examined trends in billing for evaluation and management visits for all FFS beneficiaries. The share of those visits that were billed as "moderate-severe" or "highly complex" rose fairly consistently from 2000 to 2010 (see Figure 10).[84] Unlike the other factors discussed in this section, changes in coding intensity for E&M visits appear to have contributed to faster spending growth. However, because the trend was fairly consistent over the entire period, those changes in coding can explain little to none of the slowdown in spending growth studied here. It is important to note, though, that different trends may have existed for other services.

Care Management for the Highest-Cost Beneficiaries

Savings from improved care management are most likely to be realized among high-cost beneficiaries, many of whom have multiple chronic conditions, undergo major procedures, or are at the end of life.[85] One indication of improved care management for sick beneficiaries is the decline in the hospitalization rate among beneficiaries with ambulatory care-sensitive conditions. The acceleration in the reduction in admissions of patients with ambulatory care-sensitive conditions, from -1.0 percent per year from 2000 to 2005 to -5.2 percent per year from 2007 to 2010, may suggest that beneficiaries increasingly had their care managed in a way that resulted in fewer hospitalizations (see Figure 9).[86] Fewer hospitalizations can, but do not necessarily, result in less Medicare spending.[87]

However, other evidence suggests that some aspects of care for high-cost beneficiaries did not become better managed later on in the decade. Beneficiaries with multiple chronic conditions have a higher likelihood of a costly hospital readmission, and the readmission rate for Medicare beneficiaries was fairly

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[84] Although some of that growth in coding intensity could reflect true underlying trends in patients' health, much of the change probably reflects evolving coding practices. Had the distribution of E&M visits in 2010 been the same as in 2000, we estimate that the average Medicare payment per visit in 2010 would have been 12 percent lower.

[85] For example, Medicare demonstrations of disease management and care coordination were most effective in reducing hospitalizations among high-risk enrollees. See Randall S. Brown and others, "Six Features of Medicare Coordinated Care Demonstration Programs That Cut Hospital Admissions of High-Risk Patients," *Health Affairs*, vol. 31, no. 6 (June 2012), pp. 1156–1166, http://dx.doi.org/10.1377/hlthaff.2012.0393.

[86] That trend may also be caused in part by changes in the age distribution among Medicare patients; the influx of younger patients later in the decade played some role in causing the rate of hospitalizations for patients with ambulatory care-sensitive conditions to decline more quickly.

[87] For example, a wellness program targeting nonelderly patients generated savings by reducing hospital admissions for certain conditions, but those savings were roughly offset by an increase in spending on services outside of the inpatient setting. See Gautam Gowrisankaran and others, "A Hospital System's Wellness Program Linked to Health Plan Enrollment Cut Hospitalizations but Not Overall Costs," *Health Affairs*, vol. 32, no. 3 (March 2013), pp. 477–485, http://dx.doi.org/10.1377/hlthaff.2012.0090.

Figure 10.

The Share of Established Office or Outpatient Evaluation and Management Visits in the Fee-for-Service Portion of Medicare, by Coded Intensity, 2000 to 2010

(Percent)
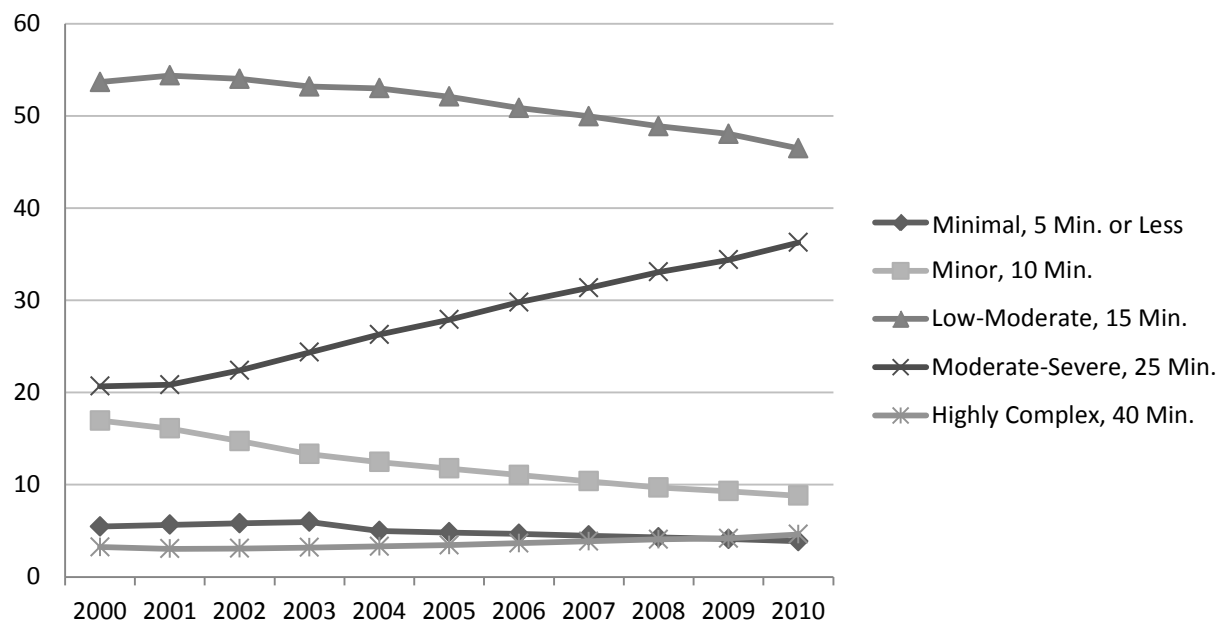
Source: Based on the Part B National Summary Data File.

stable throughout our study period and did not begin to fall until 2012.[88,89] Also, although the average number of doctor's visits in the last six months of life remained roughly the same between 2007 and 2010, at 29 per beneficiary, the share of beneficiaries seeing 10 or more physicians in the last six months of life grew from 36 percent in 2007 to 42 percent in 2010.[90]

Cost-Increasing Technology

The introduction of new, expensive medical technologies has contributed significantly to increasing health care costs over the past several decades.[91] Not all technologies result in higher Medicare spending, but many do.[92] Therefore, a slowdown in the rate of overall adoption of new technologies later in the decade or a shift in the net effect of those new technologies away from increasing costs would have

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[88] See Bernard Friedman, H. Joanna Jiang, and Anne Elixhauser, "Costly Hospital Readmissions and Complex Chronic Illness," *Inquiry*, vol. 45, no. 4 (December 2008), pp. 408–421, http://dx.doi.org/10.5034/inquiryjrnl_45.04.408.

[89] See Karen E. Joynt and Ashish K. Jha, "Thirty-Day Readmissions—Truth and Consequences," *New England Journal of Medicine*, vol. 366, no. 15 (April 2012), http://dx.doi.org/10.1056/NEJMp1201598; and Council of Economic Advisers, *Economic Report of the President* (March 2013), p. 176, http://go.usa.gov/j3GQ.

[90] See David C. Goodman and others, "Tracking Improvement in the Care of Chronically Ill Patients: A Dartmouth Atlas Brief on Medicare Beneficiaries Near the End of Life" (June 2013), www.dartmouthatlas.org/publications/reports.aspx.

[91] See Sheila Smith, Joseph Newhouse, and Mark Freeland, "Income, Insurance, and Technology: Why Does Health Spending Outpace Economic Growth?" *Health Affairs*, vol. 28, no. 5 (September/October 2009), pp. 1276–1284, http://dx.doi.org/10.1377/hlthaff.28.5.1276.

[92] See Amitabh Chandra and Jonathan S. Skinner, "Technology Growth and Expenditure Growth in Health Care," Working Paper 16953 (National Bureau of Economic Research, April 2011), www.nber.org/papers/w16953.

contributed to slower spending growth after 2007. It is difficult to measure the pace at which new technologies are adopted and even more challenging to determine their effect on spending. Although some researchers have suggested that the development and deployment of new medical technologies slowed later in the decade, little has been done to formally document evidence of such a trend.[93]

One measure of the pace of technological innovation is the number of applications filed per year at the U.S. Patent and Trademark Office for medical device patents.[94] The number nearly doubled between 1998 and 2007, growing steadily at a rate of 8 percent annually in those years, before declining in 2008 and 2009 during the recession.[95] Given the lag between patent filing and approval, followed by the time until commercialization, that decline in patent activity probably had no effect on Medicare spending growth through 2010.

But even if the development of new technologies did not slow in a way that affected spending growth in the years we studied, medical providers may have purchased fewer new technologies. Total national investment in new structures and equipment in the health care sector grew at an average annual rate of 4 percent in real terms from 2000 to 2005 but contracted at a real rate of 2 percent per year between 2007 and 2010.[96] It is difficult to determine the extent to which any single factor caused the growth in health care investment to slow later in the decade: Reduced access to capital brought about by the financial crisis, falling revenues for providers because of a reduction in private health care spending, a decrease in the number of new technologies developed, or a shift in providers' views about the future returns from such investments all could have contributed. Regardless of the cause, such a slowdown in investment may have contributed to the slowdown in Medicare spending growth.

However, quantifying the effect of such changes on spending growth is especially challenging and beyond the scope of this paper. In order to assess the impact of such changes, one would have to identify the rate of deployment of new technologies as well as the average effect on Medicare spending. Future work on the issue will be critical in developing a fuller understanding of the slowdown's causes and persistence.

Cost-Decreasing Process Innovations

Innovations in the process of care delivery might have reduced the growth in spending. Beginning in October 2008, CMS instituted a policy that reduced payments to hospitals for some patients who acquired certain hospital-acquired conditions.[97] That change in payment policy, as well as ongoing process improvements, contributed to substantial reductions in central (intravenous) line infections, surgical site

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[93] See David M. Cutler and Nikhil R. Sahni, "If Slow Rate of Health Care Spending Growth Persists, Projections May Be Off by $770 Billion," *Health Affairs*, vol. 32, no. 5 (May 2013), pp. 841–850, http://dx.doi.org/10.1377/hlthaff.2012.0289.

[94] The number of patents filed provides a better measure of the pace of innovation than the number of patents granted, since the latter measure is based in part on administrative developments at the U.S. Patent and Trademark Office.

[95] Based on data from the U.S. Patent and Trademark Office.

[96] Based on growth in the "Structures and Equipment" component the National Health Expenditure Accounts, deflated by growth in the CPI-U. That measure includes "the value of new construction put in place" as well as the "value of new capital equipment (including software) purchased or put in place by the medical sector." See Centers for Medicare and Medicaid Services, Office of the Actuary, "National Health Expenditures Accounts: Methodology Paper, 2011" (2013), http://go.usa.gov/j4BB.

[97] Specifically, if a patient acquired an identified condition that, prior to the policy's enactment, would have resulted in a higher payment to the hospital, Medicare would no longer pay the hospital that higher rate. See Centers for Medicare and Medicaid Services, "Hospital-Acquired Conditions" (September 2012), http://go.usa.gov/j3f9.

infections, and invasive MRSA (methicillin-resistant staphylococcus aureus) infections through 2010.[98] Although the direct savings to Medicare from that policy were small, such trends could indicate broader changes in practice patterns that could have reduced the growth in the cost of care for the people with the highest Medicare expenditures.

In addition, the prevalence of electronic medical records grew substantially during our later study period.[99] Such technology may have mixed effects on spending as it is rolled out. On the one hand, the implementation of electronic medical records may reduce duplicative treatments and improve care coordination; on the other hand, such records may facilitate providers' documentation of the severity of beneficiaries' medical conditions, thus resulting in higher payments.

Other Reductions in the Intensity and Cost of Care Provided

The discussion of changes in how care was delivered, thus far, has not addressed the extent to which providers, in given settings and for given types of patients, might have begun to simply reduce, or slow the growth of, the volume and intensity of the services they provided. The heightened public focus on cost containment discussed in the next section, both in the provider community and among patients, might have led to slower growth in the number of services delivered to beneficiaries in the course of their care. As with the other factors discussed in this section, the scale on which such changes occurred and their effects on spending growth are extremely difficult to quantify and probably varied greatly across services and providers.

Beneficiaries' Access to Care

In addition to changes in the type of care beneficiaries receive, a decrease in the willingness of providers to treat beneficiaries at all would have contributed to lower spending growth later in the decade. But there is little evidence of such a trend, as elderly beneficiaries reported that access to care remained consistently high between 2007 and 2010. According to telephone surveys sponsored by MedPAC, such beneficiaries did not experience any change in the frequency of delays in obtaining an appointment with a doctor. Moreover, the share of beneficiaries indicating that they had "no problem" finding a primary care physician rose from 70 percent in 2007 to 79 percent in 2010, and beneficiaries' ability to find a specialist did not change over the period.[100] Such trends are consistent with the growth in the share of physicians participating in Medicare from 2007 to 2010: The share of general practitioners participating in the program grew from 89 percent in 2007 to 92 percent in 2010, and the share of each type of specialist participating in the program grew during those years as well.[101] In addition, relying on the National Health Interview Survey, we found no evidence that elderly FFS beneficiaries' use of emergency

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[98] Those data reflect infection rates among all patients, not just Medicare beneficiaries. See Department of Health and Human Services, "National Targets and Metrics: Monitoring Progress Toward Action Plan Goals: A Mid-Term Assessment" (accessed June 20, 2013), http://go.usa.gov/jAvk.

[99] See Vaishali Patel and others, "Variation in Electronic Health Record Adoption and Readiness for Meaningful Use: 2008–2011," *Journal of General Internal Medicine* (February 2013), http://dx.doi.org/10.1007/s11606-012-2324-x. See also, Chun-Ju Hsiao and Esther Hing, *Use and Characteristics of Electronic Health Record Systems Among Office-Based Physician Practices: United States, 2001–2012*, Data Brief No. 111 (National Center for Health Statistics, December 2012), www.cdc.gov/nchs/data/databriefs/db111.htm.

[100] See Medicare Payment Advisory Commission, *Report to the Congress: Medicare Payment Policy* (March 2011), p. 77, http://medpac.gov/documents/Mar11_EntireReport.pdf (5.8 MB).

[101] See Centers for Medicare and Medicaid Services, *Data Compendium 2011*, Table VI.8, http://go.usa.gov/j4ce.

departments, which can indicate poor access to primary care, was higher or growing from 2007 to 2010 relative to earlier in the decade.

Assessing Factors Affecting Providers' Incentives

A variety of factors may have caused providers to change their practice patterns in ways that affected the growth in Medicare spending. Those factors include:

- The rate of change in Medicare's payment rates,

- The effect of the economic downturn on private demand for health care,

- Spillover effects from greater enrollment in managed care, and

- A growing public focus on cost containment.

Changes in payment rates may have caused providers to deliver fewer services, but we did not attempt to quantify any possible effect on spending growth. In contrast, by reducing private demand for health care services, the economic downturn may have increased providers' incentives to treat Medicare patients, though our statistical analyses did not confirm the mechanism through which such an effect might have occurred. Finally, the rise in the share of Medicare beneficiaries enrolled in managed care, as well as the heightened public focus on health care spending growth and the uncertainty generated by the prospect of health reform, might have caused providers to slow the expansion of services provided to patients later in the decade. Future research is needed to determine what effects those factors might have had on Medicare's spending growth and whether, on net, they made important contributions to the slowdown studied here.

Changes in Medicare's Payment Rates

Earlier, we estimated that average annual payment updates in the FFS portion of Medicare were slightly lower from 2007 to 2010 than they were from 2000 to 2005. At first glance, the similar growth rates during the two periods would suggest that payment updates had little effect on providers' behavior. However, two factors might have affected providers' incentives to supply services to Medicare beneficiaries. On the one hand, as a result of legislation, average growth in the payment rates was somewhat slower than growth in input prices (as measured by statutorily defined market baskets) in the early part of the decade and less so in the later part of the decade. If, as a result, providers' margins (that is, the difference between revenues and costs) for treating Medicare patients decreased less between 2007 and 2010 than between 2000 and 2005, then providers might have had a greater incentive to increase their volume of care in the later period.[102] On the other hand, there is some evidence that average growth in Medicare's payment rates was slower than growth in private health insurance payments in the later part of the decade.[103] If Medicare's payments to providers became smaller relative to private insurers' payments

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[102] Such a response would imply that providers' supply curve slopes upward; that is, as the profit earned on a service increases, a provider performs more of that service. If a Medicare provider's supply curve slopes downward, then the smaller difference between input cost growth and payment growth would have caused a decline in volume growth from 2007 to 2010. An analysis of the elasticity of the supply of services among Medicare providers is beyond the scope of this paper.

[103] For example, according to the Health Care Cost Institute, the average price paid by private insurers for an inpatient surgical admission grew by 6 percent in 2010, considerably faster than the growth in the Medicare payment. That measure of prices does

between 2007 and 2010, some providers would have had a growing incentive to shift services away from Medicare beneficiaries in those years.

We did not attempt to quantify the net effect of those changes in relative payment rates on the volume and intensity of services provided to beneficiaries. Increases in payment rates varied substantially across different types of providers, and different types of providers probably responded differently to those changes. For instance, within the physician fee schedule, imaging is one service in which deep cuts to payment rates, enacted as part of the Deficit Reduction Act of 2005, might have precipitated a steep decline in the growth of volume (see Figure 4 on page 11). However, there are countervailing examples: The substantial reduction in the price at which Medicare reimbursed physicians for drugs covered under Part B in 2005 was associated with an increase in the overall volume of Part B drug claims, although the trends in volume differed among medical specialties.[104]

The Economic Downturn

Earlier, we showed that higher unemployment was associated with faster growth in FFS spending per beneficiary. In order to test for the possibility that, in response to reduced demand from privately insured patients, providers increased the volume of services delivered to Medicare beneficiaries, we examined the relationship between Medicare spending and other measures of private demand for services that vary across states. First, we used the same state data from 1991 to 2009 to regress FFS Medicare spending growth on the share of 19 to 64 year-olds with no health insurance coverage. We found no statistically significant relationship between the two (see Table 2 on page 25).[105] Similarly, the share of the adult population that was uninsured or enrolled in Medicaid was not related to Medicare spending growth. Second, we found that lagged growth in personal disposable income, which was highly correlated with growth in private health care spending, was also unrelated to spending growth in the FFS portion of Medicare at the state level.

The lack of a direct effect of proxies for private demand for health care on FFS spending growth makes the significant relationship between unemployment and spending growth difficult to explain. Adults' lack of insurance, Medicaid enrollment, and lagged income growth may be inadequate proxies for the demand for health care from privately insured patients or may affect demand in a way that we have not captured in

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not account for any changes in the mix of cases; assuming that the average medical severity of cases paid for by private insurers grew between 2009 and 2010, then the true difference between the growth in prices paid by private insurers and Medicare prices would have been smaller. See Health Care Cost Institute, *Health Care Cost and Utilization Report: 2010* (May 2012), www.healthcostinstitute.org/2010report.

[104] Whereas oncologists provided more chemotherapy services in 2005 than in 2004, urologists and infectious disease specialists administered fewer drugs in their offices. See Medicare Payment Advisory Committee, *Effects of Medicare Payment Changes on Oncology Services* (January 2006), www.medpac.gov/documents/Jan06_Oncology_mandated_report.pdf (6.2 MB), and *Impact of Changes in Medicare Payments for Part B Drugs* (January 2007), www.medpac.gov/documents/Jan07_PartB_mandated_report.pdf (1.2 MB).

[105] To estimate state uninsurance rates for adults by year, we used the March Supplement of the Current Population Survey. For the health insurance variables, we used survey weights produced by the State Health Access Data Assistance Center and data accessed at the Minnesota Population Center, Integrated Public Use Microdata Series, www.ipums.org. See State Health Access Data Assistance Center, *SHADAC-Enhanced Current Population Survey Health Insurance Coverage Estimates: A Summary of Historical Adjustments* (2009), http://tinyurl.com/lbr2hu4.

our specifications.[106] Therefore, although there is some evidence that adverse labor market conditions may stimulate faster Medicare spending growth, the mechanism of such an effect remains unclear.

Spillover Effects from Higher Enrollment in Managed Care

Providers may have adjusted their practice patterns in response to the rapid growth in the share of Medicare beneficiaries enrolled in managed care later in the decade. The share of all Medicare beneficiaries in Medicare Advantage, excluding those in private fee-for-service plans, rose from 16 percent in 2007 to 21 percent in 2010.[107] Some researchers have found that increased rates of HMOs' (health maintenance organizations') penetration in the market cause lower spending in the FFS portion of Medicare through a number of "spillover" effects; for instance, as providers receive a larger share of payments from managed care plans, they may adjust their approach for patients not enrolled in such plans in a way that results in reduced utilization.[108] Many studies testing for such spillovers exploit geographic variation in the market penetration of managed care, but they struggle to assert a causal effect of HMO enrollment because it is difficult to discern if a region's spending levels affect the share of beneficiaries enrolling in managed care or vice versa. Although the literature has not reached a consensus, two recent studies that take advantage of plausibly exogenous changes in Medicare's payment policy both found substantial reductions in FFS beneficiaries' use of services as a result of HMOs' increased penetration in the market.[109] Those findings suggest that the rising enrollment in managed care plans could explain some of the slowdown in growth in FFS spending.

A Public Focus on Cost Containment

With spending for health care rising as a share of the economy, attention to cost containment has grown among members of the medical profession, policy analysts, and the press. That greater public focus may have motivated providers to offer certain tests and procedures less frequently in the course of caring for patients, although the effect is highly uncertain. For instance, the decline in the growth of imaging services in Medicare referenced above has also been ascribed to public campaigns to reduce overuse of those services.[110] Along similar lines, the large number of medical societies participating in the American Board of Internal Medicine Foundation's "Choosing Wisely" campaign, which identifies frequently overused and unnecessary treatments, highlights providers' growing focus on reducing unnecessary

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[106] In addition, the lack of a statistically significant relationship between the share of adults without insurance and growth in Medicare spending could be in part due to measurement error in the survey-derived estimates of rates of insurance.

[107] Tabulations based on data in Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds, *2013 Annual Report of the Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds* (May 2013), Table IV.C1, http://go.usa.gov/bUZm.

[108] For a full discussion of the pathways by which increased market penetration by managed care might affect spending for beneficiaries with other coverage, see Laurence Baker, "Managed Care Spillover Effects," *Annual Review of Public Health*, vol. 24 (May 2003), pp. 435–456, http://dx.doi.org/10.1146/annurev.publhealth.24.100901.141000. Although certain spillovers could cause FFS spending to slow, others could cause it to accelerate; for instance, if providers lose revenues as a result of rising enrollment in managed care, they could seek to recoup those losses by increasing utilization among the less constrained FFS beneficiaries.

[109] See Michael Chernew, Philip DeCicca, and Robert Town, "Managed Care and Medical Expenditures of Medicare Beneficiaries," *Journal of Health Economics*, vol. 27, no. 6 (December 2008) pp. 1451–1461, http://dx.doi.org/10.1016/j.jhealeco.2008.07.014; and Katherine Baicker, Michael Chernew, and Jacob Robbins, "The Spillover Effects of Medicare Managed Care: Medicare Advantage and Hospital Utilization," Working Paper 19070 (National Bureau of Economic Research, May 2013), www.nber.org/papers/w19070.

[110] See Medicare Payment Advisory Commission, *Report to the Congress: Medicare Payment Policy* (March 2012), p. 103, http://medpac.gov/documents/Mar12_EntireReport.pdf (5.8 MB).

procedures.[111] Many such initiatives began after our study period, and determining the extent to which providers respond to such public campaigns by adjusting practice patterns is difficult. Nevertheless, it is possible that some of the changes in care delivery discussed earlier in the paper were a result of such public efforts to reduce spending growth.

Furthermore, the heightened focus on cost containment was accompanied by the prospect of significant health care reform later in the decade. The uncertainty generated by the potential policy changes being discussed may have deterred some providers from investing in new devices or facilities, ultimately resulting in slower spending growth in those years.

Considering the Persistence of the Slowdown

There is ample historical experience of declines in Medicare spending growth being followed by resurgences. For example, a double-digit percentage-point decline in annual per-beneficiary spending growth between 1981 and 1986 was followed by a modest rebound in the late 1980s. Similarly, the steep drop in growth during the late 1990s was followed by a return to the previous rate of growth by 2001.

However, each of those declines was driven in part by substantial legislated changes in the Medicare program: The introduction of prospective payment systems for hospital inpatient services in the mid-1980s and the Balanced Budget Act of 1997 played a role in the slowdowns, and in the case of the late 1990s, the Balanced Budget Refinement Act of 1999 was partially responsible for the resurgence in growth. The current slowdown cannot be so easily ascribed to a set of changes in payment policy or program structure. As described above, legislation governing payment rates probably did slightly *less* to restrain growth in the second part of the decade than it did earlier on. Instead, the recent reduction in the growth of Medicare spending appears to have been driven by a wide and complex array of factors.

Measurable factors that would cause only short-term changes, including those associated with the financial crisis and economic downturn, do not appear to explain much of the slowdown. First, although inflation was lower and input prices grew more slowly in the second part of the decade, the average payment rate to providers in that period grew faster than the CPI-U—whereas, from 2000 to 2005, the growth in the average payment rate programwide was similar to growth in the CPI-U. Second, we did not find evidence to suggest that beneficiaries' considerable loss of wealth and reduced income growth significantly affected their collective demand for care. Third, it is not clear whether the recession played a role in reducing the rate at which providers purchased new, cost-increasing technologies. Finally, and in contrast, some evidence suggests that high unemployment during the recession *boosted* providers' incentives to deliver services to Medicare beneficiaries by reducing the demand for care in the private sector, though we could not empirically confirm the mechanisms by which unemployment might have had such an effect. Each of the analyses yielding those conclusions is subject to considerable uncertainty. In addition, we may not have measured some ways in which the recession affected the level and growth of spending in the years we studied.[112] Nevertheless, our estimates suggest that the recession, particularly as it affected beneficiaries financially, was not an important contributor to the slowdown in spending

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[111] See "Choosing Wisely" (accessed June 20, 2013), www.choosingwisely.org/.

[112] For instance, financial worries among beneficiaries, independent of the actual change in wealth or income they experienced during the recession, might have dampened their use of health care services. In addition, uncertainty among providers about the economic recovery might have diminished investment in new technologies.

growth, which implies that a return to high rates of economic growth alone would probably not boost Medicare spending growth.

Other changes we quantified that would tend to be persistent—including changes in the age and health status of the population, the use of prescription drugs, and rates of enrollment only in Part A—also appear to have had small effects during the period we examined. In addition, trends in supplemental coverage do not appear large enough to explain much of the slowdown in spending growth.

In this working paper, although we do not measure the effect of changes in providers' behavior on spending growth, we present some evidence to suggest that such changes may explain an important share of the slowdown. Given the uncertainty surrounding such evidence, predicting whether those factors will fade over the next several years or persist in affecting the rate of spending growth in the long term is especially difficult. For instance, providers might continue to innovate in care management for the costliest beneficiaries and feel continuing pressure to reduce costs, but the shift toward the greater use of lower-cost ambulatory care may reach a natural limit in the near future.[113]

Similarly, other factors that we did not measure or were not yet in effect could slow spending growth in the medium term. For example, providers' responses to growth in payment rates that is less than the growth in their input costs could become more pronounced, which could reduce Medicare spending by curtailing beneficiaries' access to care in the future more than we observed during our study period. Furthermore, beneficiaries' access to care could be reduced as the medical workforce responds to the increase in the demand for care from the nonelderly population that will probably result from the expansion of Medicaid and individual private coverage beginning in 2014.[114] In addition, although there is little evidence that changes in care management influenced spending growth during the period we examined, such changes may affect growth in the future as providers learn ways to coordinate care that reduce spending.

Historically, technology has been an important driver of cost growth over the longer term. More research is needed to determine whether technological innovation and adoption slowed in recent years. Even if slower adoption of technology contributed to the slowdown in spending growth, the continuation of such a trend and its effect on spending growth is uncertain. Given the enormous financial investment in research and development for health care technology, cost-increasing technologies will probably continue to be introduced in the coming years, which would contribute to strong spending growth. However, a continued focus on cost containment in health care spending may shift research and investment toward

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[113] For instance, a recent study found that preventable spending on acute care for the most expensive beneficiaries in 2010 constituted only a small share of the total spending on their care, suggesting that future improvements in outpatient care for those beneficiaries may yield limited savings. See Karen E. Joynt and others, "Contribution of Preventable Acute Care Spending to Total Spending for High-Cost Medicare Patients," *Journal of the American Medical Association*, vol. 309, no. 24 (June 2013), pp. 2572–2578, http://dx.doi.org/10.1001/jama.2013.7103.

[114] Although researchers agree that the demand for services will grow with the coverage expansion, there is little consensus on the capacity of providers to boost productivity in response. See Adam N. Hofer, Jean Marie Abraham, and Ira Moscovice, "Expansion of Coverage Under the Patient Protection and Affordable Care Act and Primary Care Utilization," *Milbank Quarterly*, vol. 89, no. 1 (March 2011), pp. 69–89, http://dx.doi.org/ 10.1111/j.1468-0009.2011.00620.x; Elbert S. Huang and Kenneth Finegold, "Seven Million Americans Live in Areas Where Demand for Primary Care May Exceed Supply by More Than 10 Percent," *Health Affairs*, vol. 32 no. 3 (February 2013), pp. 614–621, http://dx.doi.org/10.1377/hlthaff.2012.0913; and Linda V. Green, Sergei Savin, and Yina Lu, "Primary Care Physician Shortages Could Be Eliminated Through Use of Teams, Nonphysicians, and Electronic Communication," *Health Affairs*, vol. 32, no. 1 (January 2013), pp. 11–19, http://dx.doi.org/10.1377/hlthaff.2012.1086.

the development of technologies and techniques that reduce not only the cost of certain services but also the overall cost of caring for a patient. Certainly, structural shifts in the rate at which technologies are introduced and the types of technologies that are introduced could have persistent effects on the rate of spending growth in Medicare.

In sum, our understanding of the causes of the slowdown in Medicare spending growth between 2000 and 2010, as well as the likelihood of those factors' persistence, remains incomplete. Nevertheless, we can say that the slowdown appears to have been driven in substantial part by factors that were not related to the economic recession's effect on beneficiaries' demand for services; some of the other influences on Medicare spending that could have contributed to the slowdown, such as changes in how care is delivered to beneficiaries, might hold down spending growth for many years. Indeed, the duration of the slowdown in spending and its span, both before and after the recession, imply that medium-term and perhaps long-term factors are affecting the growth of Medicare spending. The fact that growth fell even further in 2011 and 2012 for the fee-for-service portion of Medicare would indicate that at least some of the causes of the slowdown in prior years persisted and perhaps deepened. Consistent with that view, the Congressional Budget Office has lowered its projection of spending growth in the FFS portion of Medicare over the next few years relative to earlier forecasts. Whereas CBO projected in August 2010 that growth in FFS spending per beneficiary would average 3.1 percent per year between 2010 and 2020, it projected in May 2013 that annual growth would average 1.9 percent between those years.[115] As further analysis of more recent years of Medicare spending emerges and analysts' understanding of the slowdown improves, those insights can inform future projections.

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[115] The two projections rely on CBO's judgments regarding spending growth as well as the agency's economic projections at those points in time. Both baselines incorporated the impact of the sustainable growth rate (SGR) mechanism, which governs Medicare's payment rates for physicians, as specified in current law at the time; in August 2010, the SGR called for a sharp decrease in payment rates in 2011, and in May 2013, the SGR called for a sharp reduction in rates in 2014.

Technical Appendix:
The Data, Methods, and Sensitivity of Our Analysis

In this appendix, we describe the data, methods, and sensitivity of our analysis of health care utilization. We used the RAND Health and Retirement Study (HRS) Data File, which included RAND's imputations of wealth, income, and medical expenditures for beneficiaries from 1992 to 2010, combined with some variables from the basic HRS file.[116]

Data

The HRS is a biennial panel survey of the over-50 population. The study provides national measures for the elderly living in the community; although respondents continue to be interviewed once they enter nursing homes, the survey zero-weights those interviewees (along with others who are institutionalized). Thus, our summary statistics and weighted regression results exclude nursing home residents, many of whom have very few assets and would not be affected by a shock to housing values.

We drew our sample from the 2006, 2008, and 2010 waves of the HRS. Because our regressions include lagged measures of variables that require information from the previous two waves and 2002 was the first wave for which RAND imputed household income as a percentage of the federal poverty level (FPL), 2006 was the first wave for which we could run our model. There were 16,633 person-year observations of elderly Americans who had been in the fee-for-service (FFS) portion of Medicare for two consecutive waves (see Table A-1).

Dependent Variables
We examined variation in four measures of health care utilization (dependent variables): whether the respondent was hospitalized or underwent outpatient surgery between HRS waves, and how many times the respondent had a doctor's visit or a hospital admission between HRS waves. Roughly 34 percent of elderly FFS beneficiaries reported being hospitalized since the prior wave, and 25 percent underwent outpatient surgery.[117] Beneficiaries averaged almost 12 doctor's visits between waves, and the average number of hospital admissions was about 0.6 per enrollee (see Table A-1).[118]

Key Independent Variables
We examined the effect on health care utilization of three different measures of change in a beneficiary's household finances (key independent variables):

1. The log change in the gross value of the household's primary residence between waves.

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[116] *RAND Center for the Study of Aging, RAND HRS Data, Version L (RAND, Santa Monica, Calif., December 2011).*

[117] MedPAC found, on the basis of administrative data, that about 22 percent of Part A beneficiaries experienced at least one inpatient hospitalization in fiscal year 2010. See Medicare Payment Advisory Commission, *A Data Book: Health Care Spending and the Medicare Program* (June 2012), p. 70, www.medpac.gov/documents/Jun12DataBookEntireReport.pdf (4.3 MB). There are at least two reasons the HRS reports a higher number: First, it estimates a two-year hospitalization rate. Second, some HRS respondents might not have distinguished between outpatient care and a hospital admission.

[118] Respondents are asked specifically about doctor's visits occurring outside of an inpatient hospital stay. Some HRS respondents did not offer the precise number of doctor's visits they had in the prior two years.

2. The proportional change in value of the household's liquid assets between waves (using an arc-elasticity-like measure). Liquid assets are the value of household wealth held in IRAs (individual retirement accounts) or Keogh accounts, stocks, cash savings, certificates of deposit, and bonds. They exclude defined-contribution retirement accounts such as 401k and 403b accounts.

3. The proportional change in household income (expressed as a percentage of the FPL) between waves.[119]

The measures of home value and liquid assets were deflated by the consumer price index for all urban consumers (CPI-U).

The wealth and income variables in the RAND HRS files rely on a combination of self-reported and imputed data. Significant reporting or imputation error would bias our estimates of the effect of financial changes on health care utilization toward zero. In order to reduce the presence of reporting error in our housing value regressions, we excluded observations with home values that declined from a value of more than $10,000 to a value of less than $100. In addition, we reduced the presence of imputation error by excluding from our housing value regressions all observations with imputed home values.[120] For the liquid asset regressions, there were very few respondents for whom the ownership and value of IRAs or Keogh accounts, stocks, cash savings, certificates of deposit, and bonds were all unimputed. Therefore, we did not exclude respondents for whom RAND imputed nonownership in a certain asset class; however, we did exclude individuals with positive imputed values, on the basis of the judgment that imputation methods for ownership would be less variable across waves than for the actual asset values. The imputation of income as a percentage of the FPL relies on a large number of variables; restricting our analysis to observations in which no income variables were imputed would have diminished the sample size too drastically. Therefore, for our main regressions, we included imputed values of income as a percentage of the FPL in our sample testing the relationship between the change in income and health care utilization.

Covariates

We controlled for a number of characteristics of beneficiaries that might affect the amount of health care utilized. Those included time-invariant characteristics like sex, race/ethnicity, and educational attainment. In addition, we controlled for the prior-wave value of several time-varying characteristics. We interacted age with self-reported health status, where age was an indicator for whether a beneficiary was in a five-year age band and health status was either good (excellent, very good, or good) or poor (fair or poor). In addition, we controlled for whether the beneficiary had any functional limitations or was depressed according to an eight-item questionnaire evaluating mental health. We also controlled for measures of insurance coverage in addition to Medicare, including whether the beneficiary had Medicaid coverage and whether he or she had supplemental coverage in the prior wave. We included an indicator for the Census division (among nine) a beneficiary lived in when interviewed.

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[119] The HRS asks respondents about prior-year income; thus, our income measures lag one year behind our utilization measures.

[120] Asset and income imputations in Version L of the RAND HRS file do not consider the previous wave's asset and income values; therefore, differences in imputed values between waves might have introduced significant measurement error.

We also controlled for changes in health status that could have affected both health care utilization and a household's finances: specifically, whether a beneficiary reported that his or her health worsened in the prior four years, as well as whether his or her spouse's health had worsened in those years.[121]

Finally, we controlled for both linear and squared measures of beneficiaries' household wealth or income lagged two waves, as well as the change in wealth or income experienced between the prior two waves. Initial wealth might have affected health care utilization as well as the proportional change in wealth experienced during the recession.[122] In addition, there was substantial serial correlation in wealth and income among HRS respondents; between 2002 and 2010, larger gains in home value, liquid assets, and income as a percentage of the FPL over a two-year period were all strongly associated with smaller gains in the following period. Because beneficiaries might have made decisions about consumption on the basis of both prior and concurrent changes in wealth, it was important to control for the prior period's observed changes.

Summary statistics for each of our regression samples are presented in Table A-1.

Sampling Restrictions

In order to identify elderly beneficiaries continuously enrolled in the FFS portion of Medicare, we restricted our sample to individuals over age 65 who reported being in Medicare but not in an HMO (health maintenance organization) for two consecutive waves. There are three potential limitations to that approach: A beneficiary could have left the FFS portion of the program for an HMO and returned within two years, some beneficiaries might have inaccurately reported whether they were enrolled in an HMO, and someone may have been enrolled in a private FFS plan. Nevertheless, we considered our approach to be an appropriate way to restrict our analysis to the beneficiary population of interest.

We attempted to identify the effect of an exogenous shock in beneficiaries' finances on health care utilization. In addition to controlling for factors that may confound the relationship between a change in finances and health care utilization, we employed a number of sampling restrictions that would exclude beneficiaries for whom a change in health status might have affected wealth or income. For the housing value regressions, we restricted our sample to beneficiaries who had not changed their primary residence for the four years over which we measured the change in home value, in order to exclude beneficiaries who might have sold their home in order to finance medical spending in response to a health shock. For the liquid asset and income regressions, we wanted to exclude beneficiaries for whom a health shock would have affected household earnings and therefore restricted our sample to beneficiaries who, along with their spouse (if there was one), described themselves as retired with zero earnings over the prior four years. Because retired beneficiaries with little or no supplemental coverage could presumably increase their rate of drawing down assets in response to a health shock, we controlled for changes in health status since the prior two waves and tested only for a relationship between those independent variables and the more discretionary health services (doctor's visits and outpatient surgery). Nonetheless, our ability to

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[121] The HRS asks respondents in each wave if they have ever been diagnosed with high blood pressure, diabetes, cancer, lung disease, heart disease, stroke, psychiatric problems, and arthritis. We controlled for self-reported changes in health status rather than for a beneficiary's receiving a new diagnosis because the latter requires having been seen by a doctor. Therefore, we were concerned that such a variable would be endogenous with our dependent variables and bias our results.

[122] For instance, high-income households suffered larger proportional losses in income during the recession than all other households (though the same was not necessarily true among only elderly households). See Jesse Bricker and others, "Survey the Aftermath of the Storm: Changes in Family Finances from 2007 to 2009," Finance and Economics Discussion Series Paper No. 2011-17 (Board of Governors of the Federal Reserve System, March 2011), http://go.usa.gov/js49.

assert causal inference from our liquid asset and income regressions is weaker than our ability to do so for the housing value regressions.

In addition, each regression excluded individuals with very low or negative assets and income because it was unlikely that the consumption of health care by beneficiaries with few assets would be affected by even a large proportional reduction in wealth. For the home value and liquid asset regressions, we restricted our sample to beneficiaries with total household assets, excluding the value of a secondary residence, that exceeded $25,000 (in 2010 dollars) in the prior two waves. For the regressions for income as a percentage of the FPL, we restricted our sample to beneficiaries with household income above the federal poverty level. Those restrictions are summarized in Table A-2.

Analysis

The null hypothesis for the statistical analysis was that an exogenous change in household finances was not related to a beneficiary's level of health care utilization. We tested four specifications of our model in order to estimate such a relationship. The first included a single measure of the change in the value of assets or income that is positive for gains in value and negative for losses. That specification tested for a symmetric effect of changes in wealth or income. The second specification assigned a zero value to beneficiaries who did not lose wealth or income and, for those who did lose asset value or income, replaced the loss with its absolute value. The coefficient on that variable represents the effect of a loss of wealth or income relative to experiencing no such loss. The third specification was similar to the first, except that it included the amount of health care services used between the prior two waves; by including a lagged measure of utilization, we estimated the relationship between a change in wealth or income and the difference in utilization between waves. The final specification was similar to the second but also included the lagged measure of health care utilization.

A beneficiary's likelihood of hospitalization and outpatient surgery were predicted using a cross-sectional logistic regression; the number of doctor's visits were predicted using a negative binomial regression; and the number of hospital admissions were predicted using a zero-inflated negative binomial regression, where the logistic regression was estimated as a function of a beneficiary's self-reported health status and change in health status.[123]

Regression results are summarized in Tables A-3, A-4, and A-5. For the liquid asset and income regressions, we report only coefficients from models predicting the likelihood of undergoing outpatient surgery and the number of doctor's visits. Unlike with home values, which are almost certainly exogenous to the amount of health care a beneficiary utilizes, we could not be sure that we properly identified changes in liquid assets or income that were unrelated to serious adverse health events resulting in hospitalization. Because outpatient surgeries and doctor's visits are often more discretionary than hospitalizations, one can plausibly argue that such utilization is therefore less likely to drive a beneficiary's decision to spend down his or her wealth (thus depleting liquid assets and reducing income).

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[123] We chose negative binomial regressions, rather than Poisson, to model doctor's visits because of dispersion in the variable; the dispersion parameter for each model was significantly different from zero, indicating that the negative binomial was preferred. We chose a zero-inflated negative binomial regression to model hospital admissions in recognition of the fact that, barring significant ill health, most beneficiaries would not be admitted to the hospital. Vuong tests on unweighted regressions of hospital admissions indicated that the zero-inflated model was preferred. In every specification reported, observations were assigned HRS weights.

Sensitivity Analyses

We conducted a number of sensitivity analyses in order to examine whether our regression results were being driven by certain modeling decisions. Our key findings were robust across a variety of specifications and sampling changes.

Testing Different Estimators

Some have found that a Poisson estimator with White standard errors is more robust than a negative binomial estimator.[124] Our reported results use a negative binomial estimator and a zero-inflated negative binomial estimator to test for an effect of a change in wealth or income on doctor's visits and hospital admissions, respectively. The same regressions, when estimated using a Poisson estimator with White standard errors, yielded nearly identical results of a noneffect of a change in housing value.

Relaxing the Restriction Defining Continuous Enrollment by FFS Medicare Beneficiaries

Our reported regression results include only beneficiaries who identified themselves as being enrolled in the fee-for-service portion of Medicare in both the prior wave and the current wave. That approach, while consistent with the study population of the paper, reduced the sample size substantially by removing beneficiaries who were enrolled in Medicare Advantage for at least one of two waves or who did not respond to the question on HMO participation. For the housing value regressions, relaxing the restriction increased our sample size by over 50 percent but did not meaningfully change the estimated coefficients. However, the inclusion of all elderly Medicare beneficiaries did improve the estimates' precision: Whereas the FFS-only sample showed no relationship between housing values and the likelihood of hospitalization, the sample of all Medicare beneficiaries exhibited a small positive effect of a gain in home value on the likelihood of hospitalization. That result was not significant across every specification, particularly when controlling for prior-period hospitalization. In addition, the result was not robust to the restriction of removing the roughly 2 percent of the sample whose home values fluctuated between waves by a factor greater than 3, responses that often appeared to be implausible and the result of reporting error. A change in the value of beneficiaries' household liquid assets was not significantly related to health care utilization: The small lagged effect estimated in Table A-4 did not hold for the entire Medicare population. Finally, our income regressions produced an estimate of a small lagged effect of a gain in income on the likelihood of undergoing outpatient surgery and, as before, no effect on doctor's visits with a p-value below 5 percent.

Relaxing the Restriction Requiring Three Consecutive Waves of Retirement

Our reported regression results for liquid assets and household income as a percentage of the FPL are based on a sample of beneficiaries who, along with their spouses (when applicable), had been retired for the prior two waves as well as the current wave. As noted above, that restriction resulted in the exclusion of some younger, recently retired beneficiaries from the sample. When testing for a relationship between the change in liquid assets or household income as a percentage of the FPL on health care utilization for a sample that included beneficiaries regardless of retirement status, we similarly found no significant relationship.

Relaxing the Restriction of the Waves Selected

We selected waves of the HRS primarily on the basis of data availability: Given that income as a percentage of the FPL was first imputed by RAND for the 2002 wave, our income regressions containing

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[124] See Jeffrey M., Wooldridge, *Econometric Analysis of Cross Section and Panel Data*, 2nd ed. (Massachusetts Institute of Technology, 2002), p. 657, http://tinyurl.com/n66saal.

lags could not begin until the 2006 wave. Other papers draw data from more waves of the HRS.[125] When running our same regressions for housing values and liquid assets beginning with the 2002 wave, we again found no significant effect of a change in housing values on health care utilization and, in some specifications, a small lagged effect of a change in liquid asset values on the number of doctor's visits.

Limiting the Sample to Beneficiaries Who Received No New Diagnoses Between Waves

As discussed before, there was some concern that our sample restrictions for the liquid asset and income regressions did not adequately control for the possibility that some retired beneficiaries would spend down their financial assets more quickly in response to a health shock. The HRS asks respondents if they have ever been diagnosed with high blood pressure, diabetes, cancer, lung disease, heart disease, stroke, psychiatric problems, and arthritis. In order to test the relationship between changes in liquid assets or income and health care utilization for beneficiaries who experienced no concurrent health shock, we ran our regressions on the sample of beneficiaries who reported no new diagnoses since the prior wave. As with our reported results, a change in assets or income did not appear to be significantly related to beneficiaries' utilization of outpatient surgery or doctor's visits.

Using the Measure of Income That Combines the Respondent's and Spouse's Income

In order to address a concern that measurement error introduced by RAND's imputation of household income as a percentage of the FPL could mask a possible relationship between income changes and utilization, we reran the income regressions using the combined income of the respondent and spouse (if there was one) and excluded imputed values. As with measures of the gross home value and liquid assets, we deflated that measure of income by the CPI-U. In addition to the other restrictions used to construct the sample for the income regressions, we excluded respondents whose status as a couple changed between waves. Not only are events like widowhood, divorce, and marriage typically associated with changes in a beneficiary's utilization of health care, but they can also be associated with abrupt changes in income.[126] Those additional sample restrictions yielded a much smaller sample (n=1,534), which, although leading to slightly inflated standard errors (and therefore larger p-values), did not produce estimates of coefficients very different from the main regression results.

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[125] Goda and others pool the 2002–2010 waves, while Decker and others use data from 1993 to 2005. See Gopi Shah Goda, John B. Shoven, and Sita Nataraj Slavov, "Does Widowhood Explain Gender Differences in Out-of-Pocket Medical Spending Among the Elderly?" *Journal of Health Economics*, vol. 32, no. 3 (2013), pp. 647–658, http://dx.doi.org/10.1016/j.jhealeco.2012.10.011; and Sandra L. Decker and others, "Health Service Use Among the Previously Uninsured: Is Subsidized Health Insurance Enough?" *Health Economics*, vol. 21, no. 10 (October 2012), pp. 1155–1168, http://dx.doi.org/10.1002/hec.1780.

[126] For example, see Gopi Shah Goda, John B. Shoven, and Sita Nataraj Slavov "Does Widowhood Explain Gender Differences in Out-of-Pocket Medical Spending Among the Elderly?" *Journal of Health Economics*, vol. 32, no. 3 (2013), pp. 647–658, http://dx.doi.org/10.1016/j.jhealeco.2012.10.011.

Table A-1.
Summary Statistics for Various Regression Samples of Beneficiaries

	All Continuing Beneficiaries[a]	Housing Value Regression Sample[b]	Liquid Asset Regression Sample[b]	Income Regression Sample[b]
Dependent Variables				
Share that were hospitalized, *t-2* to *t*	0.34	0.32	0.35	0.36
Share that underwent outpatient surgery, *t-2* to *t*	0.25	0.26	0.27	0.26
Mean number of doctor's visits, *t-2* to *t*	11.6	11.4	12.1	11.8
Mean number of hospital admissions, *t-2* to *t*	0.59	0.53	0.63	0.64
Key Independent Variables				
Share of elderly FFS beneficiaries in each regression sample	1.00	0.48	0.16	0.49
Average log change in gross value of primary residence, *t-2* to *t*		-0.03		
Average arc-elasticity change in value of liquid assets, *t-2* to *t*			-0.14	
Average arc-elasticity change in income (as percentage of FPL), *t-3* to *t-1*				-0.05
Covariates				
Male	0.42	0.48	0.42	0.37
Non-Hispanic White	0.88	0.93	0.95	0.92
Hispanic	0.04	0.02	0.01	0.02
Other	0.08	0.05	0.04	0.06
Less than high school diploma	0.20	0.14	0.16	0.19
High school graduate	0.38	0.38	0.38	0.40
Some college	0.21	0.22	0.24	0.21
College graduate	0.22	0.27	0.22	0.20
Age 65 to 69, good health	0.14	0.17	0.08	0.06
Age 65 to 69, poor health	0.05	0.04	0.02	0.03
Age 70 to 74, good health	0.20	0.24	0.19	0.15
Age 70 to 74, poor health	0.06	0.05	0.05	0.05
Age 75 to 84, good health	0.30	0.32	0.38	0.35
Age 75 to 84, poor health	0.11	0.09	0.12	0.14
Age 85 plus, good health	0.09	0.07	0.11	0.15
Age 85 plus, poor health	0.05	0.03	0.05	0.07
Health worsened between *t-4* and *t-2*	0.28	0.26	0.29	0.30
Health worsened between *t-2* and *t*	0.31	0.28	0.33	0.33
Spouse's health worsened between *t-4* and *t-2*[c]	0.16	0.17	0.17	0.16
Spouse's health worsened between *t-2* and *t*[c]	0.16	0.18	0.17	0.16
No functional limitations, *t-2*	0.85	0.88	0.85	0.83
Not depressed, *t-2*	0.88	0.91	0.90	0.87
Covered by Medicaid in *t-2*	0.06	0.01	0.03	0.04
Covered by supplemental insurance in *t-2*	0.73	0.80	0.81	0.77
Number of Observations[d]	16,633	7,908	2,528	7,972

Source: Based on the Health and Retirement Study, RAND File, Version L.

Notes: t refers to the year in which the respondent was interviewed. Thus, if interviewed in the 2010 wave, t-4 is 2006 and t-2 is 2008.

FFS = fee for service.

a. Estimates include survey respondents who were over age 65 at the time of being interviewed, who were enrolled in Medicare and not an HMO (health maintenance organization) in both the prior wave and the current wave, and who were (in the current wave) not institutionalized.

b. Sample definition is described in Table A-2.

c. Equals zero if the spouse responded and did not experience worse health, did not respond, or if the respondent did not have a spouse.

d. The number of observations includes respondents who had missing values for certain covariates.

Table A-2.
Sampling Restrictions in Housing Value, Liquid Assets, and Income Regressions

	Housing Value	Liquid Assets[a]	Income
Restrictions on Sample of Respondents			
Elderly and enrolled in FFS portion of Medicare in *t-2* and *t*	Yes	Yes	Yes
Homeowners who did not change their primary residence between *t-4* and *t*	Yes	No	No
Beneficiaries with more than $25,000 in household net worth in *t-4* and *t-2*	Yes	Yes	No
Beneficiaries with some liquid financial assets in *t-4* and *t-2*	No	Yes	No
Beneficiaries with income above the federal poverty level in *t-5* and *t-3*	No	No	Yes
Beneficiaries who, along with spouse (if partnered), are retired in *t-4*, *t-2*, and *t*	No	Yes	Yes
Data Restrictions			
Restrict to unimputed measures of assets or income in *t-4*, *t-2*, and *t*	Yes	Yes[b]	No

Notes: Samples are pooled cross-sections across the 2006, 2008, and 2010 waves of the RAND Health and Retirement Study.

t refers to the year in which the respondent was interviewed. Thus, if interviewed in the 2010 wave, t-4 is 2006 and t-2 is 2008.

FFS = fee for service.

a. Liquid assets refer to the value of household wealth held in IRAs (individual retirement accounts) or Keogh accounts, stocks, cash savings, certificates of deposit, and bonds.

b. If a beneficiary had a positive imputed value for any type of liquid assets, they were excluded from the sample; if RAND imputed one of those asset classes as a zero value, then the beneficiary remained in the sample.

Table A-3.
Estimated Effects of a Change in the Gross Value of a Primary Residence on the Utilization of Health Care Services by Elderly FFS Beneficiaries Over the Previous Two Years

DV: Hospitalized in Previous Two Years (Odds ratios)

	(1a)	(1b)	(1c)	(1d)
Log-diff change in home value, *t-4* to *t-2*	0.93	0.91	0.93	0.91
	(.82, 1.06)	(0.81, 1.03)	(0.82, 1.05)	(0.81, 1.03)
Log-diff change in home value, *t-2* to *t*	1.13		1.12	
	(.97, 1.32)		(0.95, 1.32)	
Log-diff loss in home value, *t-2* to *t*		0.86		0.87
		(0.69, 1.05)		(0.70, 1.09)
Hospitalized, *t-4* to *t-2*			2.60***	2.59***
			(2.29, 2.94)	(2.29, 2.94)
n	7,597	7,597	7,592	7,592

DV: Underwent Outpatient Surgery in Previous Two Years (Odds ratios)

	(2a)	(2b)	(2c)	(2d)
Log-diff change in home value, *t-4* to *t-2*	0.98	0.98	1.01	1.01
	(0.85, 1.13)	(0.86, 1.12)	(0.87, 1.17)	(0.88, 1.16)
Log-diff change in home value, *t-2* to *t*	0.95		0.97	
	(0.81, 1.11)		(0.82, 1.13)	
Log-diff loss in home value, *t-2* to *t*		1.11		1.09
		(0.90, 1.36)		(0.88, 1.34)
Underwent outpatient surgery, *t-4* to *t-2*			2.11***	2.11***
			(1.86, 2.39)	(1.86, 2.39)
n	7,590	7,590	7,582	7,582

DV: Number of Doctor's Visits in Previous Two Years (Incidence rate ratios)

	(3a)	(3b)	(3c)	(3d)
Log-diff change in home value, *t-4* to *t-2*	1.00	1.01	1.00	1.00
	(0.94, 1.07)	(0.95, 1.07)	(0.94, 1.05)	(0.95, 1.06)
Log-diff change in home value, *t-2* to *t*	0.98		0.97	
	(0.90, 1.08)		(0.90, 1.04)	
Log-diff loss in home value, *t-2* to *t*		1.03		1.01
		(0.90, 1.17)		(0.91, 1.13)
Number of doctor's visits, *t-4* to *t-2*			1.03***	1.03***
			(1.02, 1.03)	(1.02, 1.03)
n	7,329	7,329	7,158	7,158

DV: Number of Hospital Admissions in Previous Two Years (Incidence rate ratios)

	(4a)	(4b)	(4c)	(4d)
Log-diff change in home value, *t-4* to *t-2*	0.95	0.95	0.98	0.96
	(0.86, 1.05)	(0.86, 1.04)	(0.89, 1.08)	(0.88, 1.06)
Log-diff change in home value, *t-2* to *t*	1.04		1.06	
	(0.93, 1.17)		(0.94, 1.20)	
Log-diff loss in home value, *t-2* to *t*		0.92		0.94
		(0.78, 1.08)		(0.79, 1.12)
Number of hospital admissions, *t-4* to *t-2*			1.40***	1.40***
			(1.34, 1.47)	(1.34, 1.47)
n	7,591	7,591	7,582	7,582

Source: Based on the Health and Retirement Study (HRS), RAND File, Version L.

Notes: 95% confidence intervals in parentheses. Standard errors clustered at the household level.

*** = $p<0.01$, ** = $p<0.05$, * = $p<0.1$.

Controls (not shown) included for various beneficiary-level characteristics and year dummies.

Samples are pooled cross-sections across the 2006, 2008, and 2010 waves of the HRS.

t refers to the year in which the respondent was interviewed. Thus, if interviewed in the 2010 wave, t-4 is 2006 and t-2 is 2008.

FFS = fee for service.

Table A-4.

Estimated Effects of a Change in the Value of Liquid Assets on the Utilization of Health Care Services by Elderly FFS Beneficiaries over the Previous Two Years

DV: Underwent Outpatient Surgery in Previous Two Years (Odds ratios)

	(1a)	(1b)	(1c)	(1d)
Arc-elasticity change in liquid assets, *t-4* to *t-2*	1.03	1.03	1.02	1.03
	(0.89, 1.19)	(0.90, 1.19)	(0.88, 1.19)	(0.89, 1.19)
Arc-elasticity change in liquid assets, *t-2* to *t*	0.99		0.97	
	(0.87, 1.13)		(0.85, 1.12)	
Arc-elasticity loss in liquid assets, *t-2* to *t*		0.99		1.02
		(0.82, 1.20)		(0.84, 1.23)
Underwent outpatient surgery, *t-4* to *t-2*			2.12***	2.12***
			(1.73, 2.60)	(1.73, 2.60)
n	2,476	2,476	2,476	2,476

DV: Number of Doctor's Visits in Previous Two Years (Incidence rate ratios)

	(2a)	(2b)	(2c)	(2d)
Arc-elasticity change in liquid assets, *t-4* to *t-2*	1.11**	1.10**	1.09**	1.08**
	(1.01, 1.20)	(1.01, 1.20)	(1.01, 1.18)	(1.00, 1.17)
Arc-elasticity change in liquid assets, *t-2* to *t*	1.01		1.03	
	(0.95, 1.08)		(0.97, 1.09)	
Arc-elasticity loss in liquid assets, *t-2* to *t*		1.00		0.98
		(0.89, 1.12)		(0.90, 1.08)
Number of doctor visits, *t-4* to *t-2*			1.03***	1.03***
			(1.02, 1.03)	(1.02, 1.03)
n	2,391	2,391	2,336	2,336

Source: Based on the Health and Retirement Study (HRS), RAND File, Version L.

Notes: 95% confidence intervals in parentheses. Standard errors clustered at the household level.

*** = $p<0.01$, ** = $p<0.05$, * = $p<0.1$.

Controls (not shown) included for various beneficiary-level characteristics, and year dummies.

Samples are pooled cross-section across the 2006, 2008, and 2010 waves of the HRS.

t refers to the year in which the respondent was interviewed. Thus, if interviewed in the 2010 wave, t-4 is 2006 and t-2 is 2008.

FFS = fee for service.

Table A-5.

Estimated Effects of a Change in the Household Income (as a Percentage of the FPL) on the Utilization of Health Care Services by Elderly FFS Beneficiaries Over the Previous Two Years

DV: Underwent Outpatient Surgery in Previous Two Years (Odds ratios)

	(1a)	(1b)	(1c)	(1d)
Arc-elasticity change in income (as a % of FPL), *t-5* to *t-3*	1.15*	1.16**	1.12	1.14*
	(0.99, 1.33)	(1.01, 1.34)	(0.97, 1.30)	(0.98,1.32)
Arc-elasticity change in income (as a % of FPL), *t-3* to *t-1*	1.06		1.06	
	(0.94,1.20)		(0.93, 1.19)	
Arc-elasticity loss in income (as a % of FPL), *t-3* to *t-1*		0.88		0.89
		(0.73,1.06)		(0.74,1.07)
Underwent outpatient surgery, *t-4* to *t-2*			2.11***	2.11***
			(1.86, 2.39)	(1.86,2.39)
n	7,604	7,604	7,596	7,596

DV: Number of Doctor's Visits in Previous Two Years (Incidence rate ratios)

	(2a)	(2b)	(2c)	(2d)
Arc-elasticity change in income (as a % of FPL), *t-5* to *t-3*	1.03	1.05	1.01	1.02
	(0.96,1.11)	(0.97,1.13)	(0.93,1.09)	(0.95,1.10)
Arc-elasticity change in income (as a % of FPL), *t-3* to *t-1*	1.02		1.02	
	(0.96,1.09)		(0.96,1.09)	
Arc-elasticity loss in income (as a % of FPL), *t-3* to *t-1*		0.92		0.93
		(0.83,1.03)		(0.84,1.03)
Number of Doctor's Visits, *t-4* to *t-2*			1.02***	1.02***
			(1.02, 1.03)	(1.02, 1.03)
n	7,221	7,221	6,965	6,965

Source: Based on the Health and Retirement Study (HRS), RAND File, Version L.

Notes: 95% confidence intervals in parentheses. Standard errors clustered at the household level.

*** = $p<0.01$, ** = $p<0.05$, * = $p<0.1$.

Controls (not shown) included for various beneficiary-level characteristics and year dummies.

Samples are pooled cross-sections across the 2006, 2008, and 2010 waves of the HRS.

t refers to the year in which the respondent was interviewed. Thus, if interviewed in the 2010 wave, t-5 is 2005 and t-3 is 2007.

FFS = fee for service.

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