



**Congressional Budget Office**

**Background Paper**

**Factors Underlying the  
Growth in Medicare's Spending  
for Physicians' Services**

**June 2007**





**CBO**

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# Preface

Rising costs in Medicare, Medicaid, and other federal health-related programs represent the central long-term fiscal challenge facing the nation. The Congressional Budget Office (CBO) is therefore increasingly focusing on analyzing the causes of those rising costs and potential policy responses. This background paper examines one rapidly growing component of Medicare: spending for physicians' services under the Supplemental Medicare Insurance program, or Medicare Part B. CBO's analysis finds that much of the growth in spending is the result of increases in the volume and intensity of physicians' services rather than the result of changes in Medicare's payment rates. In keeping with CBO's mandate to provide objective, nonpartisan analysis, this report makes no recommendations.

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Loretta Lettner edited the report, and John Skeen proofread it. Maureen Costantino prepared the report for publication. Lenny Skutnik printed the initial copies, Linda Schimmel coordinated the print distribution, and Simone Thomas prepared the electronic version for CBO's Web site ([www.cbo.gov](http://www.cbo.gov)).



Peter R. Orszag  
Director

June 2007



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# Factors Underlying the Growth in Medicare's Spending for Physicians' Services

## Summary and Introduction

The central long-term fiscal challenge facing the nation involves rising costs in Medicare, Medicaid, and other federal health-related programs. The Congressional Budget Office (CBO) is therefore expanding its work in examining the rising costs within the nation's federal health programs as well as possible policy responses. One rapidly growing component of Medicare involves payments for physicians' services, which is the focus of this paper.

Medicare compensates physicians for services they provide under the Supplemental Medical Insurance program, or Medicare Part B, on the basis of a fee schedule that specifies payment rates for each type of covered service. Payment rates are calculated in three steps: First, the fee schedule stipulates relative value units (RVUs), which measure the resources required to provide a given service. Second, payments are adjusted to account for geographical differences in input prices. Third, a "conversion factor" translates the geographically adjusted RVUs for a particular service into a dollar amount.

Annual updates to payment rates are governed by a mechanism known as the Sustainable Growth Rate (SGR), which aims to control Medicare's outlays for physicians' services.<sup>1</sup> Established in the Balanced Budget Act of 1997 (Public Law 105-33) and implemented in 1998, the SGR formula operates by setting a target amount for such expenditures and adjusting payment rates to reflect differences between actual spending and spending targets (both of which are measured on an annual and a cumulative basis). If actual spending under the SGR does not deviate from the expen-

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1. For a more detailed discussion of the SGR mechanism, see Congressional Budget Office, *The Sustainable Growth Rate Formula for Setting Medicare's Physician Payment Rates*, CBO Economic and Budget Issue Brief (September 6, 2006).

diture targets, payment rates under the physician fee schedule are simply increased by the percentage change in the Medicare economic index, or MEI.<sup>2</sup> However, if actual spending is above the targets set by the SGR formula, the update to payment rates will be smaller than the increase in the MEI. If spending is below the targets, the update will be higher than the increase in the MEI. Those adjustments are designed so that, over a period of several years, cumulative spending will be brought into line with the cumulative expenditure target.

Annual updates to payment rates for physicians' services have varied widely in recent years, ranging from a minimum of about -5 percent (in 1999 and in 2002) to a maximum of roughly 5 percent (in 2000). (When adjusted to account for changes in the MEI, updates to payment rates have ranged from about -8 percent to 3 percent.) According to CBO's estimates, if provisions of current law remained unchanged, Medicare's payments to physicians would be reduced by about 10 percent in 2008 and by about 5 percent annually over the following several years. However, because lawmakers overrode the SGR mechanism between 2003 and 2007—replacing negative updates with small positive or zero updates—it is uncertain whether the SGR mechanism will be allowed to operate as specified.

Although updates to Medicare's payment rates have fluctuated since the SGR was established, spending for physicians' services under the fee schedule has increased steadily, rising by 79.2 percent between 1997 and 2005. Even after adjusting for changes in the cost of providing physicians' services—as measured by the Medicare economic index—and for growth in the number of beneficiaries enrolled in the program, spending on physicians' services has increased by 34.5 percent.<sup>3</sup>

### **Evaluating Changes in Program Spending**

In this background paper, CBO examines Medicare's payments to physicians over the period in which the SGR mechanism has been in place, in order to better understand and project future changes in program spending. The analysis focuses on three issues:

- First, it breaks down annual changes in spending into two components: those attributable to changes in the rates that Medicare pays physicians for their services and those attributable to changes in the volume and intensity of services

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2. The Medicare economic index measures changes in the cost of physicians' time and operating expenses; it is a weighted sum of the prices of inputs in those two categories. Most of the components of the index come from the Bureau of Labor Statistics. Changes in the cost of physicians' time are measured using changes in nonfarm labor costs. Changes in "all-factor" productivity are also incorporated into the index as a way of accounting for improvements in physicians' productivity. The productivity adjustment to the MEI reduces its rate of growth.

3. Between 1997 and 2005, the MEI rose by 23 percent, and enrollment in Medicare Part B grew by 8 percent. Together, those changes accounted for about 40 percent of the change in total spending during that period.

provided.<sup>4</sup> It then examines the relative importance of each component in explaining overall program growth.

- Second, it focuses on changes in the components of Medicare's payments rates for physicians' services, in order to assess the impact of such changes on spending growth over time.
- Third, the paper estimates the secular trend in the volume and intensity of services provided by physicians and considers the analytical issue of how physicians and beneficiaries respond to changes in Medicare's payment rates. Specifically, the analysis evaluates the portion of observed increases in the quantity of services provided to Medicare beneficiaries that is attributable to an underlying trend and the portion that is attributable to behavioral responses on the part of physicians and beneficiaries. (A behavioral response to a change in Medicare's payment rates might occur, for example, if physicians responded to a reduction in those rates by increasing the volume or intensity of their services in order to offset a potential decline in income; the opposite might occur if payment rates were increased. A behavioral response might also occur if changes in physicians' payment rates, which result in changes in beneficiaries' copayments, caused those beneficiaries to increase or decrease the amounts of services they required.)

This paper differs from previous research in a number of ways: It covers a greater number of years with persistent changes in payment rates (both positive and negative), which affected all physicians (and beneficiaries) who participated in the program. In addition, CBO's analysis was conducted at the aggregate level rather than at the individual physician or practice level; thus, it is more directly applicable to budgetary analysis.

### **Interpreting the Results**

The analysis finds that, between 1997 and 2005, the 34.5 percent observed growth in Medicare's per-beneficiary spending, as adjusted by the Medicare economic index, is explained by growth in the volume and intensity of physicians' services rather than by changes in Medicare's payment rates. In fact, the quantity of services that physicians provided during that period increased by slightly more (39.4 percent) than did Medicare's per-beneficiary spending on physicians' services. Conversely, after medical price inflation, as measured by the MEI, is taken into account, Medicare's payment rates for such services actually declined slightly during that period.

The decline in Medicare's payment rates during that period is attributable to SGR-related changes in the conversion factor. Those changes offset other factors in Medicare's pricing system that would have led to higher payment rates. In terms of the

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4. "Intensity" refers to the complexity of services utilized in delivering patient care. For example, use of a computerized axial tomography (CAT) scan rather than an x-ray would represent an increase in intensity.

quantity of services provided by physicians, CBO finds an annual trend of approximately 4 percent and a behavioral response that offsets 28 percent of the potential revenue change due to changes in payment rates. For example, if changes in payment rates alone—independent of the effects of a behavioral response—were to cause physicians' revenues to decline by \$1,000 per year, the analysis is consistent with physicians' recouping about \$280 of that projected loss by increasing the volume or intensity of their services. An analogous response was found with respect to increases in payment rates: Physicians were found to reduce the quantity of services they provided in response to higher payment rates. The results are also consistent with beneficiaries' responding to payment rate reductions by increasing their demand for physicians' services and responding to increases in payment rates by lowering their demand for physicians' services.

Of the 39.4 percent increase in the quantity of physicians' services that was observed between 1997 and 2005, most of the increase is attributable to the underlying trend in the quantity of services rather than the result of behavioral responses to changes in payment rates. Specifically, behavioral responses of physicians or beneficiaries to changes in Medicare payment rates account for only 1.4 percentage points of the 39.4 percent increase over those years, while the underlying trend increase—which captures continuing changes in medical practice over time, including the effects of changing treatment modalities and the prevalence of diseases—accounts for 38.8 percentage points of the quantity increase. (Other unexplained factors account for the remaining growth, -0.7 percent, in volume.)

## **Payments for Physicians' Services**

Medicare has used various methods to set payment rates for physicians' services, and to control year-to-year increases in those costs, since the program's inception. (See Box 1 for a brief history of Medicare's past efforts to control payments to physicians.) In this section of the paper, CBO describes the current method used to establish payment rates—the Medicare physician fee schedule—and how those rates are updated from year to year.

### **Medicare's Physician Fee Schedule: Setting Payment Rates**

The Medicare physician fee schedule is used to determine payment rates for about 7,500 services provided by physicians and paid for by the Medicare program.<sup>5</sup> Payments are calculated in three steps.

- First, the fee schedule specifies relative value units—which measure the resources required to perform a given service—for each of three cost components:

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5. The fee schedule is also used for services provided by certain nonphysician practitioners (such as physicians' assistants and nurse practitioners) and limited licensed practitioners (such as chiropractors, podiatrists, and optometrists).

- Physicians’ work expense, which is a measure of physicians’ time and skill and the intensity of the service provided;
- Physicians’ practice expense, which is a measure of average expenses related to the maintenance of a practice, such as office rents and employees’ wages;<sup>6</sup>
- Physicians’ malpractice cost, which is a measure of the average cost of malpractice insurance premiums.

On average, the physicians’ work expense component accounts for over 50 percent of a service’s relative value, the physicians’ practice expense component accounts for about 45 percent, and the malpractice expense component accounts for the remainder. The law requires that work RVUs be reviewed by the Centers for Medicare and Medicaid Services (CMS) every five years and, if necessary, revised to ensure the accuracy of payments under the fee schedule and to incorporate the changes in the resources needed to perform a service over time.<sup>7, 8</sup>

- Second, payment rates are adjusted to reflect regional differences in input costs. Geographic practice cost indices (GPCIs) adjust the three RVU components to account for regional differences in prices among 89 payment localities. By design, GPCIs have a national average value of 1: Areas with costs above the national average receive a GPCI greater than 1, and areas with costs below the national average receive a GPCI less than 1. Although the practice and malpractice expense GPCIs are set to fully account for regional differences, the work expense GPCI is set to reflect only a quarter of regional variations in wages. In effect, that provision limits

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6. Certain services are assigned separate practice expense RVUs on the basis of whether or not the services are provided at a “nonfacility” (for instance, a doctor’s office) or at a “facility” (such as a hospital).

7. There have been three five-year reviews, reflected in the work expense RVUs for the 1997, 2002, and 2007 fee schedules. RVUs may also be changed because of annual refinements or budget-neutrality adjustments.

8. The work expense RVUs have always been based on the resources that a physician uses to provide a service. In contrast, the practice expense and malpractice expense RVUs were initially based on historical charges and were switched to a resource-based methodology only in later years. The resource-based practice expense RVUs were phased in from 1999 to 2002, and the resource-based malpractice expense RVUs were instituted in 2000. By law, those changes had to be budget neutral: Total expenditures had to remain the same under the new resource-based method as they would have been according to the charge-based method. Consequently, budget neutrality implies that some services would receive higher payments while others would receive lower payments.

**Box 1.**

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**Past Efforts to Control Medicare's Payments to Physicians**

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Medicare's system of payments to physicians has evolved according to a distinct chronology. When Medicare was created in 1965, the program reimbursed physicians for their services on the basis of their charges, the method of payment then used by private insurers. In addition, Medicare permitted physicians to bill beneficiaries for the amount of the charge that exceeded the amount paid by Medicare, a practice known as balance billing. However, the charge-based reimbursement system gave physicians the incentive to increase their fees from year to year to boost their revenues, and those increases led to rapid growth in Medicare's expenditures.

As concerns about the program's rising costs grew, policymakers focused on restraining those fees by relating them to the Medicare economic index (MEI). In 1972, the government mandated that annual updates to Medicare's fees for physicians' services be limited to the increase in the MEI, a provision that was implemented in 1975. Tying increases in fees to growth in the MEI was not sufficient to keep total payments from rising, however. To counter such increases in expenditures, the Congress first froze fees (from 1984 to 1986) and then raised them by amounts specified in legislation (from 1987 to 1991).

Despite those actions, spending for physicians' services continued to grow throughout the 1980s. It became apparent that limitations on the growth of physicians' fees alone—without considering the volume and intensity of services that physicians provided—was not enough to control spending. Indeed, the program's payments per physician increased almost twice as fast as did the nation's economy during the 1980s. In 1992, in response to those developments, the Congress implemented the Medicare physician fee schedule, which bases payments for individual services on measures of the relative resources used by physicians to provide their services. The implementation of the fee schedule was intended to eliminate payment differences across services and geographic areas that were unrelated to resource costs. One thing the fee schedule itself was not designed to do, however, was control spending.

In an attempt to control total spending driven by increases in the volume and intensity of physicians' services, a mechanism was also created that linked annual updates to the fee schedule to the trend in total spending relative to a target. Under that approach, the conversion factor was to be updated annually to reflect increases in physicians' costs for providing care, as measured by the MEI, and adjusted by a factor to counteract changes in the volume and intensity of services provided per beneficiary. The first of those approaches, known

**Box 1.****Continued**

as the Volume Performance Standard (VPS), established a growth rate that was determined, in part, by the historical growth in the volume and intensity of physicians' services.

The method for applying the VPS was fairly straightforward—any excess spending relative to the target triggered a reduction in the update to the fee schedule two years later. But, because the VPS system depended heavily on the historical trend in the volume and intensity of physicians' services provided to Medicare beneficiaries, it led to updates to the fee schedule that were unstable. For instance, the decline in that trend in the mid-1990s led to large increases in Medicare's payment rates for physicians' services. Attempts to offset the budgetary effects of those increases by making successively larger cuts in payment rates further destabilized the update mechanism. Indeed, between 1992 and 1998 (the years that the VPS was in effect), the MEI varied from 2.0 percent to 3.2 percent, but the annual update to the fee schedule varied much more widely, from 0.6 percent to 7.5 percent.

Under the Balanced Budget Act of 1997, the VPS was replaced with a new volume-control mechanism that is still in effect—the Sustainable Growth Rate (SGR) system. Like the VPS, the SGR method uses a target to adjust future payment rates with the purpose of controlling growth in Medicare's expenditures for physicians' services. In contrast to the VPS, the target under the SGR mechanism is tied to growth in real (inflation-adjusted) per capita gross domestic product (GDP). The update under this approach is equal to the MEI adjusted by a factor that reflects actual spending relative to the target (measured on both an annual and a cumulative basis). (The VPS did not use cumulative spending.) Policymakers saw the SGR approach as having the advantages of objectivity and stability in comparison with the VPS. GDP growth provides an objective benchmark; moreover, changes in GDP from year to year have been considerably more stable (and generally smaller) than changes in the volume of physicians' services. Even so, updates under the SGR method have proven to be volatile as well.<sup>1</sup>

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1. This box is based on three sources. See Statement of Douglas Holtz-Eakin, Director, Congressional Budget Office, "Medicare's Physician Fee Schedule," before the Subcommittee on Health of the House Committee on Energy and Commerce, May 5, 2004; Government Accountability Office, *Medicare Physician Payments: Concerns About Spending Target System Prompt Interest in Considering Reforms*, GAO-05-85 (October 2004); and Congressional Research Service, *Medicare: Payments to Physicians*, CRS Report for Congress, RL31199 (updated January 2, 2007).

the downward adjustment of relatively low-cost rural areas and the upward adjustment of relatively high-cost urban areas. The law requires that GPCIs be reviewed by CMS at least every three years and revised, if necessary, in a budget-neutral manner.<sup>9</sup>

- Third, a conversion factor translates the geographically adjusted RVUs for a given service into a dollar payment amount.

The above three steps are summarized in the following formula, which is used by Medicare to calculate payment rates for physicians' services under the fee schedule:

$$\text{Fee schedule payment rate} = \text{conversion factor} \cdot (RVU_{w.e.} \cdot GPCI_{w.e.} + RVU_{p.e.} \cdot GPCI_{p.e.} + RVU_{m.e.} \cdot GPCI_{m.e.}), \quad (1)$$

where the subscripts denote the work expense, practice expense, and malpractice expense components. For example, in 2006 the conversion factor was \$37.8975. According to the fee schedule that year, participating physicians in New York City's borough of Manhattan received \$62.69 for each office visit made by a Medicare beneficiary. By contrast, the payment rate in Alabama for the same service was \$48.37. Similarly, treatment of a head injury in Manhattan was reimbursed at a rate of \$1,667.67 and \$1,271.93 in Alabama.<sup>10</sup>

In a number of circumstances, Medicare may adjust its payments for physicians' services on the basis of the characteristics of providers and other factors. For instance, nonparticipating physicians receive 95 percent of the payment established by the fee schedule. Physicians' assistants are also paid at a reduced rate, ranging from 65 percent to 85 percent of the rate allowed by the fee schedule. In addition, a number of adjustments to the fee schedule are applied to certain surgical procedures to account for variations within those procedures.<sup>11</sup> In an instance in which a physician submits a charge below that allowed by the fee schedule, the submitted charge becomes the actual payment rate for that service.

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9. Revisions to GPCIs are phased in over a two-year period if more than one year has passed since the last revision. There were revisions in 1995, 1998, 2001, 2004, and 2005. The Medicare Prescription Drug Improvement and Modernization Act of 2003, or MMA (P.L. 109-432), established a temporary floor of 1.0 for the work component GPCI from 2004 to 2006, as an additional means to increase payments to rural areas. The Tax Relief and Health Care Act of 2006 (P.L. 108-73) extends the GPCI floor for an additional year.

10. This example utilizes service codes 99213 for an office visit and 62010 for treatment of a head injury. The carrier number and locality codes for Manhattan are 00803 and 01, respectively; Alabama uses carrier number 00510 and locality code 00.

11. Those adjustments, applied by means of "modifiers," can be smaller or greater than one. For example, partial procedures are paid at a reduced rate, whereas procedures with complications are paid at a higher rate than the fee schedule amount.

Consequently, the payment rate (or the allowed charge) for a service can be expressed as the fee schedule payment rate and a summary adjustment factor:

$$\text{Payment rate} = \text{Fee schedule payment rate} \cdot \text{Adjustment factor.} \quad (2)$$

Again, the first term of the product equals the conversion factor times the adjusted RVUs. The second term represents the product of all adjustments made in each claim.<sup>12</sup> It should be noted that, unlike the first term of the product, this last factor is largely driven by physicians' behavior. In other words, treatment modality choices made by an individual physician can affect the payment rate for a service through the adjustment factor.

### **The Sustainable Growth Rate Formula: Updating Payment Rates**

Annual adjustments to payment rates are computed according to the Sustainable Growth Rate formula and are carried out by updating the conversion factor. That methodology has two components: an adjustment on the basis of the MEI and a so-called update adjustment factor that accounts for differences in actual spending and expenditure targets under the SGR mechanism.

- If actual spending under the SGR does not deviate from the expenditure targets, payment rates under the physician fee schedule are simply increased by the percentage change in the price of inputs, as measured by the MEI.
- If actual spending deviates from the expenditure targets, the update adjustment factor is calculated so that, over a period of several years, cumulative spending will be brought back in line with the cumulative expenditure target. If actual spending exceeds the targets, the update adjustment factor will be negative (that is, it will reduce the amount of the increase that would otherwise occur to reflect inflation); if actual spending is less than the targets, the update adjustment factor will be positive.

Specifically, updates to payment rates are computed by multiplying the MEI and the estimated adjustment factor. For 2007, the MEI was 2.1 percent and the update adjustment factor was -7 percent. Consequently, in 2007, payment rates for physicians were scheduled to decrease by 5 percent. However, the Tax Relief and Health Care Act of 2006 overrode the formula for 2007 and held payment rates constant at their 2006 level.

Recent annual updates in Medicare payment rates have varied widely. (See Table 1 for a list of conversion factor values expressed in nominal and MEI-adjusted dollars since 1997.) In 1997, there were three separate conversion factors for primary care services, surgical services, and other nonsurgical procedures. Starting in 1998, those conversion

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12. The data show that roughly 90 percent of the services have actual payment rates within \$1 of the fee schedule payment rates. Apart from the adjustments already mentioned, data errors also result in differences between fee schedule and actual payment rates.

**Table 1.**


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## Conversion Factors Used in Medicare's Fee Schedule for Physicians' Services, 1997 to 2007

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	In Nominal Dollars		In 2006 Dollars	
	Conversion Factor	Percentage Change from Previous Year	Conversion Factor	Percentage Change from Previous Year
1997 <sup>a</sup>	36.2410	n.a.	45.9403	n.a.
1998	36.6873	n.a.	45.4830	n.a.
1999	34.7315	-5.3	42.0679	-7.5
2000	36.6137	5.4	43.2834	2.9
2001	38.2581	4.5	44.2775	2.3
2002	36.1992	-5.4	40.8054	-7.8
2003 <sup>b</sup>	36.7856	1.6	40.2225	-1.4
2004	37.3374	1.5	39.6419	-1.4
2005	37.8975	1.5	38.9892	-1.6
2006	37.8975	0	37.8975	-2.8
2007	37.8975	0	37.1180	-2.1

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Source: Department of Health and Human Services, Centers for Medicare and Medicaid Services, "Final Rule: Medicare Program; Revisions to Payment Policies Under the Physician Fee Schedule," *Federal Register* (various years), available at [www.gpoaccess.gov/fr/index.html](http://www.gpoaccess.gov/fr/index.html).

Notes: The Medicare physician fee schedule is used to determine payments for about 7,500 services provided by physicians. Payments are calculated in three steps: First, the fee schedule specifies relative value units (RVUs), which measure the resources required to perform a given service. Second, physicians' fees are adjusted to reflect regional differences in costs using geographic practice cost indices. Third, a conversion factor translates the geographically adjusted RVUs for a given service into a dollar payment amount.

n.a. = not applicable.

- a. The figures displayed for 1997 are weighted averages of three separate conversion factors—primary care services (\$35.7671), surgical services (\$40.9603), and other nonsurgical procedures (\$33.8454)—which were consolidated in 1998.
  - b. The conversion factor for 2003 did not become effective until March 1 of that year. Claims filed for January and February 2003 were reimbursed using the 2002 fee schedule.
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factors were consolidated into a single conversion factor, resulting in higher payment rates in both nominal and real (MEI-adjusted) terms for primary care services and other nonsurgical procedures. From 1999 to 2001, the observed volatility tended to benefit physicians, with the conversion factor rising faster than the MEI. Since 2002, however, spending as measured by the SGR method has consistently exceeded targets established by the formula. Consequently, the conversion factor fell between 2001 and 2002. Between 2003 and 2007, lawmakers overrode the SGR mechanism, replacing negative updates with small positive or zero updates. Nevertheless, the conversion

factor did not keep up with the MEI over those years. In fact, the MEI-adjusted conversion factor in 2007 is below that of 1997.<sup>13</sup>

## **Trends in Medicare's Spending for Physicians' Services, 1997 to 2005**

Despite efforts to control costs, Medicare's spending on physicians' services has continued to increase rapidly. Between 1997 and 2005, per-beneficiary spending for physicians' services, as adjusted by the MEI, increased at an average rate of 3.8 percent per year, from \$1,615 to about \$2,172 in MEI-adjusted dollars, with 2006 as the base year (see Table 2).<sup>14, 15</sup> In contrast, per-beneficiary spending for other Medicare benefits—including coverage under Hospital Insurance (Part A) and other coverage provided under Supplemental Medical Insurance (Part B) but excluding Medicare Advantage (the program's managed care option)—grew at an average rate of 1.4 percent over the same period.<sup>16</sup> Except in 2002, when payment rates were reduced the most, with the conversion factor falling by 7.8 percent, the growth in Medicare's per-beneficiary spending for physicians' services, as adjusted by the MEI, has always been positive.

In the analysis that follows, recent growth in spending for physicians' services is apportioned to changes in payment rates and changes in the volume of physicians' services. The next section also discusses a number of sources that may influence the volume of physicians' services.

## **CBO's Decomposition Analysis**

This section describes the data sources and methodology that CBO used and presents decomposition results of the determinants of per-beneficiary physician spending between 1997 and 2005. More specifically, the decomposition analysis quantifies the impact of changes in payment rates and changes in the volume of physicians' services on the growth in Medicare's spending for those services.

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13. Annual changes in payment rates for physicians' services are mainly the result of updates in the conversion factor. In some years, there have been additional reasons for changes in payment rates arising from revisions to RVUs and GPCIs, and from budget-neutrality adjustments.
  14. Per-beneficiary spending is calculated using actual payment rates or Medicare allowed charges, which include both Medicare's share of payments and that paid by beneficiaries through cost sharing (in the form of deductibles and copayments). See Table A-1 in the appendix for Medicare's total spending for physicians' services and the number of beneficiaries enrolled in the program between 1997 and 2005.
  15. Using the consumer price index to control for inflation, rather than the MEI, does not change the above figures (or any of the analysis in this paper) in a significant way.
  16. The comparison includes spending for hospital inpatient care, skilled nursing facilities, hospice care, and home health services under Part A, as well as spending for other professional and outpatient ancillary services, and services provided in other facilities, under Part B.

**Table 2.****Trends in Medicare's per-Beneficiary Spending for Physicians' Services, 1997 to 2005**

	Per-Beneficiary Spending (In 2006 dollars)	Change from Previous Year (Percent)
1997	1,615	n.a.
1998	1,659	2.7
1999	1,711	3.1
2000	1,831	7.0
2001	1,980	8.1
2002	1,967	-0.6
2003	2,015	2.4
2004	2,126	5.5
2005	2,172	2.2
Change Between 1997 and 2005	557	34.5

Source: Congressional Budget Office based on analysis of the Centers for Medicare and Medicaid Services' Physician Standard Analytical Files, 1997 to 2005.

Notes: Medicare's spending for physicians' services is adjusted using the Medicare economic index (MEI), with 2006 as the base year. The MEI includes changes in the cost of physicians' time and operating expenses; it is a weighted sum of the price of inputs in those two categories. Changes in "all-factor" productivity are also incorporated into the index as a way of accounting for improvements in physicians' productivity.

Spending includes both Medicare's share of fees and that paid by beneficiaries through cost sharing (in the form of deductibles and copayments).

n.a. = not applicable.

**Data Sources**

The data set used in this analysis is constructed by combining Medicare claims for physicians' services and demographic data on beneficiaries with payment rates from the Medicare fee schedule. The analysis is based on data from 1997 to 2005. The resulting nine-year sample consists of roughly 2.7 million beneficiaries, with an average of approximately 300,000 beneficiaries per year and 27 procedures per beneficiary per year.

Medicare claims data for physicians' services are obtained from the Physician Standard Analytical Files (SAFs) compiled by CMS. The SAFs contain final-action (non-rejected) claims for physicians' services for a 1 percent sample of Medicare beneficiaries enrolled in the fee-for-service sector of the program. The data consist of detailed claims information on procedures, payments, and providers, including the type of procedure, or Healthcare Common Procedure Coding System code; the submitted

charge; Medicare's allowed charge; the site of treatment; the provider type and specialty; and the provider's carrier number and locality code.<sup>17</sup>

Claims data are merged with the Medicare Denominator file, which includes basic demographic characteristics, such as each beneficiary's age, sex, race, and, if applicable, date of death. Each claim is further augmented with data from the fee schedule. The fee schedule, which is updated annually, lists all procedures covered by Medicare as well as the procedures' corresponding RVUs, and the conversion factor.<sup>18</sup> Lastly, GPCIs are added to each claim, using the carrier number and locality code.<sup>19</sup>

## Methodology

As stated in equations (1) and (2), payment rates governed by the fee schedule are calculated as the product of the conversion factor, the sum of the three RVU components adjusted by their corresponding GPCIs, and a summary adjustment factor. By separating the different components that make up the payment rate for each service provided by a physician, CBO's analysis can assess the importance of each component in explaining recent spending growth for physicians' services.

The effect of changes in prices and in the quantity of services on spending growth can be calculated by computing a decomposition of that growth into portions attributable to each of the two elements.<sup>20</sup> Specifically, changes in spending between years  $t$  and  $t+1$  are expressed as follows:

$$\begin{aligned}
 P^{t+1} \cdot Q^{t+1} - P^t \cdot Q^t &= (P^{t+1} \cdot Q^{t+1} - P^{t+1} \cdot Q^t) + (P^{t+1} \cdot Q^t - P^t \cdot Q^t) \\
 &= P^{t+1} \cdot (Q^{t+1} - Q^t) + (P^{t+1} - P^t) \cdot Q^t \\
 &= P^{t+1} \cdot \Delta Q + \Delta P \cdot Q^t,
 \end{aligned} \tag{3}$$

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17. A carrier is a private company that has a contract with Medicare to pay physicians and most other providers of Medicare Part B services. Carrier numbers and locality codes define geographic locations that determine, in part, Medicare payment rates for physicians' services through the use of GPCIs.

18. Services included in the claims data but not covered under the fee schedule are excluded. Anesthesia services are also excluded because they are reimbursed under a separate fee schedule. In addition, ambulatory surgical center claims and Railroad Retirement Board claims, neither of which is assigned to the physician payment localities, are excluded from the analysis.

19. For observations with invalid carrier or locality codes, values are imputed using zip codes from a 2002 CMS zip code to carrier file.

20. For clarity, the payment rate for a given service is referred to as price, or  $P$ , and volume and intensity are referred to as quantity, or  $Q$ . The rest of the paper refers to prices and payment rates interchangeably. Quantity and volume and intensity of physicians' services are used interchangeably as well.

where  $t$  denotes the year, which ranges from 1997 to 2004.<sup>21, 22</sup>

The first term in the decomposition captures changes in spending that are attributable to changes in quantity (or volume and intensity) and equals the difference in spending between years  $t$  and  $t+1$ , holding prices (or payment rates) constant. The second term accounts for changes in spending that are attributable to changes in prices. This term requires calculating what spending would have been in year  $t+1$  had quantities remained at year  $t$  levels.<sup>23</sup>

In order to isolate how the individual components of Medicare's prices affect spending, the above decomposition is modified as follows:

$$\begin{aligned}
P^{t+1} \cdot Q^{t+1} - P^t \cdot Q^t &= CF^{t+1} \cdot RVU^{t+1} \cdot adj^{t+1} \cdot Q^{t+1} - CF^t \cdot RVU^t \cdot adj^t \cdot Q^t \\
&= (CF^{t+1} - CF^t) \cdot RVU^t \cdot adj^t \cdot Q^t + CF^{t+1} \cdot (RVU^{t+1} - RVU^t) \cdot adj^t \cdot Q^t + \\
&\quad CF^{t+1} \cdot RVU^{t+1} \cdot (adj^{t+1} - adj^t) \cdot Q^t + CF^{t+1} \cdot RVU^{t+1} \cdot adj^{t+1} \cdot (Q^{t+1} - Q^t) \\
&= \Delta CF \cdot RVU^t \cdot adj^t \cdot Q^t + CF^{t+1} \cdot \Delta RVU \cdot adj^t \cdot Q^t + CF^{t+1} \cdot RVU^{t+1} \cdot \Delta adj \cdot Q^t + \\
&\quad CF^{t+1} \cdot RVU^{t+1} \cdot adj^{t+1} \cdot \Delta Q,
\end{aligned} \tag{4}$$

where  $CF$  represents the conversion factor;  $RVU$  is the sum of all RVU components adjusted by their respective GPCIs;  $adj$  is the adjustment factor; and  $Q$  is quantity of services. The first term corresponds to the share of spending growth explained by changes in the conversion factor. The other terms represent the share of spending growth attributable to changes in RVUs, changes in the adjustment factor, and changes in the quantity of physicians' services provided.

## Results

Table 3 and Table 4 summarize the results from the separate decompositions. Table 3 presents the results of a decomposition of the observed increase in spending for physicians' services into a fraction that can be attributed to changes in payment rates and a fraction that can be attributed to changes in the volume of physicians' services; Table 4 explores how changes in the components of payment rates affect that growth in spending.

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21. To calculate annual spending on physicians' services, payments made for all claims submitted in a given year are totaled. That is, rather than counting the number of services of each type and multiplying that number by an average price, each service is treated as unique in order to retain the variation in the different components of price. As previously mentioned, spending totals include Medicare's payments and beneficiaries' obligations in the form of deductibles and copayments.
  22. This decomposition can also be written as  $P^{t+1} \cdot Q^{t+1} - P^t \cdot Q^t = P^t \cdot \Delta Q + \Delta P \cdot Q^{t+1}$ . The main results of the paper remain unchanged when using the different reference period.
  23. In both terms, "counterfactual" spending is computed as per-beneficiary spending in year  $t+1$  with physicians' services set at year  $t$  levels, or  $P^{t+1} \cdot Q^t$ . Note that, while the conversion factor and the RVUs for year  $t+1$  are known, the adjustment factor in year  $t+1$  is not. Therefore, for each physician service, the adjustment factor in year  $t+1$  is estimated as the ratio of the sum of actual payments and the sum of fee schedule payment rates in year  $t$ .

**Table 3.**


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## Decomposition of Changes in Medicare's per-Beneficiary Spending for Physicians' Services, 1997 to 2005

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(Percent)

	Change in Spending Attributable to:		Change in Per-Beneficiary Spending
	Changes in the Price of Services	Changes in the Quantity of Services	
1997 to 1998	1.2	1.5	2.7
1998 to 1999	-0.6	3.7	3.1
1999 to 2000	3.8	3.2	7.0
2000 to 2001	2.2	6.0	8.1
2001 to 2002	-7.2	6.6	-0.6
2002 to 2003	-1.9	4.3	2.4
2003 to 2004	0.9	4.5	5.5
2004 to 2005	-1.8	4.0	2.2
Change Between 1997 and 2005	-4.9	39.4	34.5

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Source: Congressional Budget Office based on analysis of the Centers for Medicare and Medicaid Services' Physician Standard Analytical Files, 1997 to 2005.

Notes: Medicare's spending for physicians' services is adjusted using the Medicare economic index (MEI), with 2006 as the base year. The MEI includes changes in the cost of physicians' time and operating expenses; it is a weighted sum of the price of inputs in those two categories. Changes in "all-factor" productivity are also incorporated into the index as a way of accounting for improvements in physicians' productivity.

Spending includes both Medicare's share of fees and that paid by beneficiaries through cost sharing (in the form of deductibles and copayments).

In CBO's analysis, "price" refers to Medicare's allowed charge for a given service. "Quantity" refers to the volume and intensity of services provided.

Components may not add to totals because of rounding.

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Applying the decomposition to spending on physicians' services suggests that changes in the quantities of those services fully account for changes in spending between 1997 and 2005 (see Table 3). Changes in the quantity of physicians' services alone would have increased spending by 39.4 percent. A smaller reduction in payment rates (4.9 percent) offsets a portion of that increase, resulting in a net increase in spending of 34.5 percent.

Whereas the effect of changes in the quantity of services on spending was always positive over the sample years (ranging from 1.5 percent between 1997 and 1998 to 6.6 percent between 2001 and 2002), the effect of changes in prices on spending was considerably more variable (ranging from -7.2 percent in between 2001 and 2002 to 3.8 percent between 1999 and 2000.) Except for the 2001–2002 period, changes in the quantity of services more than compensated for any declines in prices, resulting in positive spending growth in all but that one year.

**Table 4.**

## Expanded Decomposition of Changes in Medicare's per-Beneficiary Spending for Physicians' Services, 1997 to 2005

(Percent)

	Change in Spending Attributable to Changes in the Components of Price				Change in Spending Attributable to Changes in the Quantity of Services	Change in Per-Beneficiary Spending
	Overall	Conversion		Adjustment		
		Factor	RVUs <sup>a</sup>	Factor		
1997 to 1998	1.2	0.2	0.5	0.6	1.5	2.7
1998 to 1999	-0.6	-7.5	7.0	-0.1	3.7	3.1
1999 to 2000	3.8	2.9	0.3	0.6	3.2	7.0
2000 to 2001	2.2	2.3	0.1	-0.2	6.0	8.1
2001 to 2002	-7.2	-7.8	0.3	0.3	6.6	-0.6
2002 to 2003	-1.9	-1.6	-0.2	-0.1	4.3	2.4
2003 to 2004	0.9	-1.4	2.1	0.3	4.5	5.5
2004 to 2005	-1.8	-1.6	-0.3	0.2	4.0	2.2
Change Between 1997 and 2005	-4.9	-14.1	8.5	0.7	39.4	34.5

Source: Congressional Budget Office based on analysis of the Centers for Medicare and Medicaid Services' Physician Standard Analytical Files, 1997 to 2005.

Notes: The Medicare physician fee schedule is used to determine payments for about 7,500 services provided by physicians. Payments are calculated in three steps: First, the fee schedule specifies relative value units (RVUs), which measure the resources required to perform a given service. Second, physicians' fees are adjusted to reflect regional differences in costs using geographic practice cost indices. Third, a conversion factor translates the geographically adjusted RVUs for a given service into a dollar payment amount.

Medicare's spending for physicians' services is adjusted using the Medicare economic index (MEI), with 2006 as the base year. The MEI includes changes in the cost of physicians' time and operating expenses; it is a weighted sum of the price of inputs in those two categories. Changes in "all-factor" productivity are also incorporated into the index as a way of accounting for improvements in physicians' productivity.

Spending includes both Medicare's share of fees and that paid by beneficiaries through cost sharing (in the form of deductibles and copayments).

In CBO's analysis, "price" refers to Medicare's allowed charge for a given service. "Quantity" refers to the volume and intensity of services provided.

Components may not add to totals because of rounding.

a. In this analysis, "RVUs" refer to geographically adjusted RVUs.

Focusing next on the individual components of payment rates, the results indicate that updates to the conversion factor between 1997 and 2005 would have resulted in a 14.1 percent reduction in spending had the adjusted RVUs, the adjustment factor, and the quantity of physicians' services remained at 1997 levels (see Table 4). In most years, changes in RVUs explain only a small portion of the overall change in spending. That is as expected because most RVU changes were intended to have a negligible impact on spending. An exception occurred in 1999, when CMS eliminated a temporary adjustment factor to RVUs, which had effectively reduced physician work expense RVUs by 8.3 percent.<sup>24</sup> So removing that adjustment amounted to an increase in RVUs in 1999 as compared to 1998 levels. Also, in 2004, the Medicare Prescription Drug Improvement and Modernization Act of 2003 established a floor of 1.0 in the GPCI work component, effectively increasing adjusted RVUs between 2003 and 2004. Lastly, the adjustment factor played a negligible role in explaining spending changes, accounting for 2 percent (0.7 percent of the 34.5 percent) of the estimated increase in spending between 1997 and 2005.

In this specification, the change in spending that is attributable to changes in the conversion factor and to changes in RVUs may be interpreted as the share of spending growth attributable to changes in the components of payment rates that are exogenous to physicians. Changes in the conversion factor and RVUs cannot explain the observed growth in physician spending between 1997 and 2005. It should be noted that the analysis in Table 4 captures the extent to which changes in prices directly affect spending but not their indirect effect through changes in the level of physicians' services. As previously discussed, physicians may respond to changes in prices by adjusting the quantity of services they provide, and beneficiaries by adjusting the quantity they demand. Therefore, the estimated impact of changes in the quantity of physicians' services reported in Table 4 may be driven in part by changes in prices.

## Discussion

The decomposition results suggest that changes in the quantity of services are largely responsible for changes in spending for physicians' services between 1997 and 2005. Consequently, it is useful to examine the underlying reasons for the increase in the volume of physicians' services. Those factors include the secular trend in spending for physicians' services, behavioral responses to changes in payment rates, and changes in market conditions.<sup>25</sup>

**Secular Trend in Spending.** Recent research has shown that a key determinant of the underlying upward trend in spending for medical care is an increase in the use of medical services. In particular, increases in the prevalence of diseases and medical innovation as well as changes in treatment modalities have been major contributors to

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24. That adjustment had been put in place in 1997 for the purpose of offsetting increases in spending that arose from the five-year review of work expense RVUs.

25. Because the analysis is done at the per-beneficiary level, the observed changes in spending cannot be attributed to changes in enrollment levels.

spending growth.<sup>26</sup> The estimate of the secular trend in the empirical analyses in the next section includes the impact of changes in the demographic characteristics of beneficiaries and in the volume of services—both existing and newly covered services—covered by Medicare.

Changes in the demographic characteristics of the Medicare fee-for-service population can affect the volume of services provided by physicians because the use of medical services varies across different demographic groups. For example, the volume of services may increase if the composition of beneficiaries shifts toward groups (such as older beneficiaries) that use more services. Over the nine-year period analyzed in this paper, the demographic composition of the population changed only slightly. The percentage of beneficiaries that were 65 years old and younger increased, while the percentage of beneficiaries ages 65 to 74 decreased. There was a small shift toward nonwhite beneficiaries and male beneficiaries and a lower prevalence of beneficiaries who died during the year. (Table A-2 in the appendix presents demographic characteristics of the sample in 1997 and 2005; Table A-3 shows average monthly spending on the basis of demographic characteristics for the same years.) CBO's analysis shows that demographic changes had a negligible impact on the growth in spending between 1997 and 2005. More specifically, had the demographic composition of beneficiaries remained at 1997 levels, MEI-adjusted per-beneficiary spending in 2005 would have been \$2,135 rather than \$2,172, the level of actual spending.<sup>27, 28</sup>

Changes in the services covered by Medicare can also affect the volume of services that physicians provide. That is, changes in spending are partly determined by the addition of both newly covered services (such as colorectal cancer screening and pelvic examinations, which were added to the list of Medicare covered services by the Balanced Budget Act of 1997) and new medical treatments. A comparison of actual Medicare spending on physicians' services over the 1997–2005 period with spending that included only those physicians' services available in 1997 suggests that new and newly covered services may explain some of the increase in Medicare spending over that period. In fact, per-enrollee MEI-adjusted physician spending growth between 1997 and 2005 is 18.6 percent when including only physicians' services that were

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26. See, for example, Kenneth E. Thorpe, "The Rise in Health Care Spending and What to Do About It," *Health Affairs*, vol. 24, no. 6 (November/December 2005), pp. 1436–1445; and Department of Health and Human Services, Centers for Medicare and Medicaid Services, *Review of Assumptions and Methods of the Medicare Trustees' Financial Projections* (prepared by the 2000 Technical Review Panel on Medicare Trustees Reports, December 2000), available at [www.cms.hhs.gov/ReportsTrustFunds/downloads/TechnicalPanelReport2000.pdf](http://www.cms.hhs.gov/ReportsTrustFunds/downloads/TechnicalPanelReport2000.pdf).

27. In order to assess the impact of demographic changes on spending, the sample is divided into 48 such categories: age (4), sex (2), race (3), and death (2). Then, predicted per-beneficiary spending in 2005 is computed holding the demographic composition as it was in 1997.

28. Those figures are based on changes in the distribution of Medicare enrollees with positive spending. Replicating this analysis using changes in demographic characteristics of all Medicare enrollees yields similar results.

covered by Medicare in 1997, compared with growth of 34.5 percent for all services—those covered in 1997 and any newly covered services in 1998 to 2005—as reported above. (See Table A-4 in the appendix for these estimates.) It should be emphasized that estimating the impact of new services on spending for physicians’ services is challenging because relying on additions to the Medicare physician fee schedule to identify that effect may lead to both overestimates and underestimates. The impact of new and newly covered services is overestimated to the extent that new service codes replace old ones. By contrast, this impact is underestimated when new and newly covered services operate within old service codes.<sup>29</sup>

**Behavioral Impact of Changes in Payment Rates.** The observed increases in spending that are attributable to changes in the quantity of physicians’ services may also be affected by changes in Medicare’s fee schedule to the extent that beneficiaries and physicians respond to changes in payment rates. Physicians may respond to changes in those rates by adjusting the quantity of services supplied. In addition, the demand for physicians’ services may also vary with changes in payment rates because beneficiaries are financially responsible for a portion of the payment rate in the form of cost sharing. Given the significant changes in payment rates to physicians over the 1997–2005 period, that so-called volume offset could account for some share of the change in Medicare’s spending.

**Marketwide Conditions.** Although the analysis that follows cannot account for changes in marketwide conditions because of data limitations, those variations may also partially explain the observed changes in Medicare’s spending for physicians’ services. Specifically, the volume of spending for physicians’ services may be influenced by changes in market-level characteristics, such as shifts in the level of enrollment in health maintenance organizations (HMOs) and changing rates of reimbursements made by private payers.

Medicare’s HMO enrollment rates increased steadily in the 1990s, rising from 4 percent in 1990 to 16 percent in 2000. However, enrollment declined between 2000 and 2003 but then rose again between 2003 and 2004.<sup>30</sup> Changes in enrollment in Medicare HMOs could result in changes in the characteristics of beneficiaries in the fee-for-service population and, therefore, could affect spending for physicians’ services. In addition, because the cost containment features of HMOs tend to steer physicians toward a specific practice style, changes in HMO enrollment could influence the volume of services they provide to Medicare patients.

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29. Additionally, new and newly covered services can also have an impact on the volume of existing services. For example, the addition of preventative services to the Medicare fee schedule could lead to increases in office visits as well as any follow-up treatment, but it could also decrease some services as a result of the early detection of certain conditions or illnesses.

30. See Kaiser Family Foundation, *Trends and Indicators in the Changing Health Care Marketplace*, “Section 2: Health Insurance Enrollment,” Exhibit 2.17 (publication no. 7031, updated February 8, 2006), available at [www.kff.org/insurance/7031/index.cfm](http://www.kff.org/insurance/7031/index.cfm).

Changes in physicians' payment rates in the private-payer market can also affect Medicare's spending for physicians' services by altering relative profit margins. Assuming that physicians are able to substitute privately insured patients for Medicare patients, changes in private fees may have an effect on Medicare spending. For example, in years when Medicare payment rates fall relative to those rates paid by private insurers, physicians may choose to shift away from Medicare patients to privately insured patients in order to reduce income losses. Private claims data are not widely available, but there is some evidence that, on average, the ratio of Medicare to private-payer fees has grown from about 70 percent in 1996 to roughly 83 percent in 2005.<sup>31</sup>

The next section presents the mechanisms by which changes in payment rates can elicit changes in volume or behavioral responses and reviews the research examining that effect. Then, a methodology is introduced that aims to measure the secular trend in spending for physicians' services and to determine the degree to which behavioral responses to changes in payment rates account for the observed growth in Medicare spending for physicians' services.

## **The Effects of Changes in Payment Rates on the Volume of Physicians' Services: Existing Evidence**

There are two paths by which the volume of physicians' services could be affected by recent changes in payment rates:

- First, because beneficiaries generally pay 20 percent of the approved amount for covered services (in excess of the annual deductible), changes in payment rates directly affect beneficiaries' out-of-pocket costs. Thus, patients may demand more care when physicians' payment rates are reduced because their cost sharing (in the form of deductibles and copayments) is lower, and vice versa.<sup>32</sup>
- Second, physicians may respond to changes in payment rates by adjusting the supply of services they provide to Medicare beneficiaries. Under a standard economic model that treats the physician as a profit-maximizing firm, a decline in payment rates leads to a decline in the quantity of services provided; increases in payment rates have the opposite effect. An alternative model incorporates the notion that, in response to lower payment rates, physicians may exert influence over the demand

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31. See Medicare Payment Advisory Commission, *Report to the Congress: Medicare Payment Policy*, "Section 2B: Physician Services" (March 2007), available at [www.medpac.gov/publications/congressional\\_reports/Mar07\\_EntireReport.pdf](http://www.medpac.gov/publications/congressional_reports/Mar07_EntireReport.pdf).

32. Evidence from the RAND Health Insurance experiment supports the notion that patients respond to different cost-sharing schemes. For a summary of the results of the RAND experiment, see Joseph P. Newhouse, *Free for All? Lessons from the RAND Health Insurance Experiment* (Cambridge, Mass.: Harvard University Press, 1993). It should be noted, however, that a vast majority of fee-for-service Medicare beneficiaries have supplemental coverage. Thus, any behavioral response may be weakened, given that some beneficiaries are not responsible for the full change in payment rates.

for their services in order to replace some or all of their lost income; analogously, they may reduce the quantity of their services if payment rates increase.<sup>33</sup> (That phenomenon is termed demand inducement.) The effect of a reduction in payment rates on the volume of physicians' services depends on the relative size of the "income effect" and the "substitution effect." The income effect generates a volume offset, as physicians compensate for their loss in income by increasing the volume of services they provide. The substitution effect, in contrast, results in decreasing volume, as physicians substitute (relatively higher paying) private-payer patients for Medicare patients. This effect is magnified to the extent that physicians are able to substitute nonwork activities (or leisure) for labor. Thus, when the income effect dominates the substitution effect, reductions in payments rates would be expected to result in an increase in the supply of physicians' services. Conversely, in cases in which the substitution effect is larger than the income effect, reductions in payment rates would be expected to result in a decline in the volume of physicians' services.

Studies that evaluate behavioral responses to changes in Medicare payment rates typically focus on three key empirical questions: What is the direction of the behavioral response? What is the magnitude of that response? And, is the response similar for decreases and increases in payment rates? (In other words, is the behavioral response symmetric?) A number of studies attempt to answer those questions by analyzing certain sets of medical procedures that have been affected by changes in payment rates. In general, the studies estimate elasticities based on regression analyses of changes in the quantity of services provided on changes in the prices of those services.<sup>34</sup> (Elasticities measure the sensitivity of the volume of physicians' services to changes in payment rates for those services.)

Previous studies of the effects of changes in Medicare payment rates on the level of services that physicians provide yield mixed evidence of a behavioral response. Those studies can be divided into two categories:

- More recent studies generally tend to explicitly follow a framework developed by Thomas McGuire and Mark Pauly—in their *Journal of Health Economics* paper—by estimating a supply function as suggested by the theoretical model. This line of research has been more likely to find a positive relationship between changes in payment rates and changes in the volume of services provided.<sup>35</sup>

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33. See Thomas G. McGuire and Mark V. Pauly, "Physician Response to Fee Changes with Multiple Payers," *Journal of Health Economics*, vol. 10 (1991), pp. 385–410.

34. Measuring the behavioral response of physicians' services is not straightforward because those services are heterogeneous, ranging from a simple office visit to a complicated procedure. One solution to this problem has been to convert those services into RVUs, which provides a homogeneous measure of quantity. Similarly, converting Medicare fees into allowed Medicare payment per RVU provides a measure of price.

35. See, for example, Jack Hadley and James D. Reschovsky, "Medicare Fees and Physicians' Medicare Service Volume: Beneficiaries Treated and Services per Beneficiary," *International Journal of Health Care Finance Economics*, vol. 6, issue 2 (2006), pp. 131–150.

- Older empirical studies tend to find that physicians respond to reductions in payment rates by increasing the volume of their services, with elasticities ranging from  $-0.2$  to  $-0.4$ .<sup>36</sup> In other words, a 1 percent reduction in payment rates would lead to a 0.2 percent to 0.4 percent increase in the volume of services provided. Some studies also show that certain specialties are more likely or better able to respond to changes in payment rates. In general, surgery appears to be the most responsive to such changes. One study estimated an elasticity of  $-0.83$  for surgical specialty groups.<sup>37, 38</sup>

Among those studies that find a negative relationship between changes in payment rates and changes in the volume of services, evidence on the symmetry of the volume response is mixed. For example, one study found no evidence of asymmetric responses, leading the authors to conclude that the volume response is symmetric.<sup>39</sup> In contrast, a study by CMS's Office of the Actuary concluded that physicians respond asymmetrically to changes in payment rates. In particular, that study found a statistically significant positive volume response to price decreases of 31 percent ( $p < 0.05$ ) and a negative response of 13 percent to increases in payment rates, although the latter estimate was not statistically different from zero ( $p = 0.35$ ).<sup>40</sup> On the basis of those findings, CMS adjusted its estimate of the volume offset downward, from 50 percent to 30 percent, for reductions in payment rates only. In the case of increases, CMS has continued to assume no volume offset.

The analysis that follows estimates the impact of a behavioral response in conjunction with the underlying trend in the volume of physicians' services on changes in spend-

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36. The empirical literature has not addressed the extent to which the observed relationship between changes in payment rates and changes in volume is the result of beneficiaries responding to fee changes. In addition, because of data availability restrictions, the majority of the empirical research has not explicitly accounted for substitution across Medicare and private services.

37. Nguyen Xuan Nguyen and Frederick William Derrick, "Physician Behavioral Response to a Medicare Price Reduction," *Health Services Research*, vol. 32, no. 3 (August 1997), pp. 283–298.

38. See also Stephen Zuckerman, Stephen A. Norton, and Diana Verrilli, "Price Controls and Medicare Spending: Assessing the Volume Offset Assumption," *Medical Care Research and Review*, vol. 55, no. 4 (December 1998), pp. 457–483. The study estimates behavioral responses to fee changes over a seven-year period (1986 to 1992) across services and specialties. Pooling all service types, specialties, and years, the authors estimate a volume offset of 17 percent. The regressions for different service types suggest statistically significant volume offsets, ranging from  $-0.61$  for procedures and  $-0.16$  to  $-0.25$  for tests and imaging. For evaluation and management services, whose fees increased on average during this period, the authors estimate a volume offset of  $-0.27$ . Other results are consistent with previous research in that behavioral responses are largest for surgical specialties and obstetrics ( $-0.54$  to  $-0.75$ ) and smaller for cardiology and urology ( $-0.32$ ). No effects are seen in gastroenterology or ophthalmology. Unexpectedly, regression results for internal medicine suggest an elasticity of  $0.24$ .

39. *Ibid.*

40. Centers for Medicare and Medicaid Services, "Physician Volume and Intensity Response," Office of the Actuary memorandum (August 13, 1998), available at [www.cms.hhs.gov/ActuarialStudies/downloads/PhysicianResponse.pdf](http://www.cms.hhs.gov/ActuarialStudies/downloads/PhysicianResponse.pdf). This study is based on Medicare claims data from 1994 to 1996.

ing. The behavioral response is regarded from a systemwide perspective, with a focus on the budgetary implications of changes in payment rates for physicians' services due to that response. For this purpose, the manner in which a new level of services or spending is realized is not the key question addressed here. That is, the analysis does not attempt to identify the source of the behavioral response (to the extent that such a response exists).

## **CBO's Regression Analysis**

When evaluating policy proposals related to changes in Medicare payment rates for physicians' services, the Congressional Budget Office projects spending on the basis of assumptions regarding the secular trend in spending for physicians' services and any behavioral response that accompanies changes in payment rates. Toward that end, this section attempts to distinguish the underlying trend over time in the quantity of physicians' services from the changes in services that result from behavioral responses to changes in Medicare's payment rates. It should be emphasized that the analysis does not attempt to identify the individual determinants of volume growth as discussed in the previous section. Instead, it aims to validate a range of estimates for the secular trend in spending for physicians' services and the behavioral response to changes in payment rates consistent with recent changes in the fee schedule and spending.

### **Methodology**

The approach uses data that are added up to the national level—the same level of aggregation that is used for budget projections of spending on physicians' services and for evaluations of the budgetary consequences of changing the update factor for physicians' payment rates.<sup>41</sup> Specifically, the analysis finds the values of the secular trend and the behavioral response that minimize the sum of the squares error of the difference between actual and predicted spending. Predicted spending in year  $t + 1$  is given by:

$$\text{Predicted spending}^{t+1} = (1 + G) \cdot P^{t+1} \cdot Q^t + R \cdot (P^{t+1} \cdot Q^t - P^t \cdot Q^t), \quad (5)$$

where  $(1 + G)$  represents the secular trend in the quantity of services that are provided by physicians and  $R$  is the behavioral response parameter for changes in Medicare's payment rates. The first term captures predicted spending in period  $t + 1$ , with payment rates updated according to the fee schedule in year  $t + 1$  and quantities increased by a trend factor  $(1 + G)$ . The second term captures the behavioral response to changes in payment rates. This response,  $R$ , is based on changes in payment rates between years  $t$  and  $t + 1$ .

Solving this minimization problem is equivalent to estimating an ordinary least squares regression, where the dependent variable is actual spending in year  $t + 1$  and

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41. This analysis employs the same data as that used in the decomposition analysis presented earlier.

**Table 5.**


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## Summary of Regressions of Medicare's Actual per-Beneficiary Spending on Predicted per-Beneficiary Spending

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Predicted Spending	Actual Spending per Beneficiary	
	Model 1: Impose Symmetric Behavioral Responses	Model 2: Allow for Asymmetric Behavioral Responses
Trend in Quantity of Services Provided (1 + G)	1.042 * (0.005) [1.030, 1.054]	1.036 * (0.008) [1.014, 1.058]
Behavioral Response	-0.279 (0.150) [-0.647, 0.088]	n.a.
Behavioral Response to Increases in Payment Rates	n.a.	0.113 <sup>a</sup> (0.465) [-1.083, 1.309]
Behavioral Response to Decreases in Payment Rates	n.a.	-0.434 (0.231) [-1.029, 0.161]
$R^2$	0.99	0.99

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Source: Congressional Budget Office based on analysis of the Centers for Medicare and Medicaid Services' Physician Standard Analytical Files, 1997 to 2005.

Notes: Medicare's spending for physicians' services is adjusted using the Medicare economic index (MEI), with 2006 as the base year. The MEI includes changes in the cost of physicians' time and operating expenses; it is a weighted sum of the price of inputs in those two categories. Changes in "all-factor" productivity are also incorporated into the index as a way of accounting for improvements in physicians' productivity.

Spending includes both Medicare's share of fees and that paid by beneficiaries through cost sharing (in the form of deductibles and copayments).

Under the assumption of symmetric behavior (Model 1), physicians and beneficiaries are constrained to exhibit similar volume response to either payment rate increases or decreases. The asymmetric response assumption (Model 2) allows for differing behavioral responses to both positive and negative changes in payment rates.

Estimated standard errors appear in parentheses. Estimated 95 percent confidence intervals appear in brackets.

\*= $p < 0.01$

n.a. = not applicable.

- a. This estimate implies that an increase in Medicare's payment rates to physicians is associated with an increase in spending of a greater percentage than the increase in payment rates.
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the independent variables are given by the predicted spending specification in equation (5). The regressions include two specifications. In the first specification (Model 1), the behavioral response is constrained to be the same for both reductions and increases in payment rates—a symmetric response. In a second specification (Model 2), the symmetry restriction is relaxed, and the behavioral response is allowed to differ according to whether payment rates increase or decrease.<sup>42</sup> (See Table 5 for estimates of the quantity trend ( $G$ ) and the behavioral response ( $R$ ).)<sup>43</sup>

## Results

Two key findings are illustrated in Table 5: The minimization problem identifies a sizable positive underlying trend in the use of physicians' services, and it indicates that changes in payment rates appear to affect the behavior of physicians and/or beneficiaries. The estimate of the secular trend in the quantity of services ranges from 3.6 percent to 4.2 percent and is statistically significant in both models. In Model 1, where the behavioral response is assumed to be symmetric, the response coefficient equals -0.279 ( $P = 0.11$ ). In other words, a change in payment rates that would increase or decrease spending by \$1,000 would be potentially offset by a change in the quantity of services provided that would yield a corresponding decrease or increase in spending

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42. In order to test the symmetry assumption, the model is modified so that spending in year  $t+1$  is regressed on  $(1+G) \cdot P^{t+1} \cdot Q^t + D \cdot R_I \cdot (P^{t+1} \cdot Q^t - P^t \cdot Q^t) + (1-D) \cdot R_D \cdot (P^{t+1} \cdot Q^t - P^t \cdot Q^t)$ . In this specification,  $D$  equals 1 when payment rates fall between years  $t$  and  $t+1$ , and 0 otherwise;  $R_I$  and  $R_D$  are the coefficients for the estimates of the behavioral response when payment rates increase and decrease, respectively. The symmetry assumption is evaluated by a statistical comparison of the estimates for  $R_I$  and  $R_D$ .

43. Given the possibility that the behavioral response may not be observed immediately, a different specification is also modeled, where the behavioral response is a function of changes in payment rates between years  $t$  and  $t+1$  and years  $t-1$  and  $t$ . In other words, predicted spending in year  $t+1$  is given by: Predicted spending <sup>$t+1$</sup>  =  $(1+G) \cdot P^{t+1} \cdot Q^t + R \cdot (P^{t+1} \cdot Q^t - P^t \cdot Q^t) + R_{-1} \cdot (P^t \cdot Q^{t-1} - P^{t-1} \cdot Q^{t-1})$ , where  $R$  is the behavioral response parameter between years  $t$  and  $t+1$  and  $R_{-1}$  is the behavioral response parameter for changes in payment rates between years  $t-1$  and  $t$ . Regression results for this specification do not support the hypothesis that a lagged response exists. The coefficient on  $R_{-1}$  equals 0.131 and is statistically insignificant. The rest of the coefficients remain quantitatively similar and of the same statistical significance as those shown in Table 5. That result may not be surprising because Medicare's physician fee schedule is available to physicians well in advance of the start of the year. Furthermore, to the extent that beneficiaries are less aware of the changes, this evidence may support the notion that the behavioral response estimated is driven by physicians and not by beneficiaries.

**Table 6.**

## Summary of the Effect of Changes in the Prices and Quantity of Physicians' Services on Medicare's per-Beneficiary Spending, 1997 to 2005

(Percent)

	Change in Spending Attributable to Changes in the Components of Price				Change in Spending Attributable to Changes in the Quantity of Services				Change in per-Beneficiary Spending
	Conversion		Adjustment		Overall	Secular Trend <sup>b</sup>	Behavioral Response <sup>b</sup>	Residual <sup>b</sup>	
	Overall	Factor	RVUs <sup>a</sup>	Factor					
1997 to 1998	1.2	0.2	0.5	0.6	1.5	4.2	-0.3	-2.3	2.7
1998 to 1999	-0.6	-7.5	7.0	-0.1	3.7	4.2	0.2	-0.6	3.1
1999 to 2000	3.8	2.9	0.3	0.6	3.2	4.2	-1.1	0.0	7.0
2000 to 2001	2.2	2.3	0.1	-0.2	6.0	4.2	-0.6	2.4	8.1
2001 to 2002	-7.2	-7.8	0.3	0.3	6.6	4.2	2.0	0.4	-0.6
2002 to 2003	-1.9	-1.6	-0.2	-0.1	4.3	4.2	0.5	-0.4	2.4
2003 to 2004	0.9	-1.4	2.1	0.3	4.5	4.2	-0.3	0.6	5.2
2004 to 2005	-1.8	-1.6	-0.3	0.2	4.0	4.2	0.5	-0.7	2.2
Change Between 1997 and 2005	-4.9	-14.1	8.5	0.7	39.4	38.8	1.4	-0.7	34.5

Source: Congressional Budget Office based on analysis of the Centers for Medicare and Medicaid Services' Physician Standard Analytical Files, 1997 to 2005.

Notes: The Medicare physician fee schedule is used to determine payments for about 7,500 services provided by physicians. Payments are calculated in three steps: First, the fee schedule specifies relative value units (RVUs), which measure the resources required to perform a given service. Second, physicians' fees are adjusted to reflect regional differences in costs using geographic practice cost indices. Third, a conversion factor translates the geographically adjusted RVUs for a given service into a dollar payment amount.

Medicare's spending for physicians' services is adjusted using the Medicare economic index (MEI), with 2006 as the base year. The MEI includes changes in the cost of physicians' time and operating expenses; it is a weighted sum of the price of inputs in those two categories. Changes in "all-factor" productivity are also incorporated into the index as a way of accounting for improvements in physicians' productivity.

Spending includes both Medicare's share of fees and that paid by beneficiaries through cost sharing (in the form of deductibles and copayments).

In CBO's analysis, "price" refers to Medicare's allowed charge for a given service. "Quantity" refers to the volume and intensity of services provided.

Components may not add to totals because of rounding.

- a. In this analysis, "RVUs" refer to geographically adjusted RVUs.
- b. Estimates from the empirical (symmetric) model are used to distinguish the effect of the separate components of changes in quantities on changes in spending. The secular trend captures changes in spending due to increases in the use of medical services. The behavioral response measures the effect of a change in payment rates in the behavior of physicians and beneficiaries. The residual captures unexplained factors including errors in measuring spending that cause the empirical model to fall short of explaining all of the changes in physician spending over time.

of roughly \$280. That estimate falls within the range of estimates of the previous literature that finds a behavioral response.<sup>44</sup>

In Model 2, where the behavioral response is allowed to vary according to whether payment rates are expected to increase or decrease, the separate estimates of the behavioral responses are 0.113 for increases in payment rates ( $P = 0.82$ ) and -0.434 for decreases ( $P = 0.12$ ), potentially indicating an asymmetric response. The lack of precision in the estimates (as indicated by the large standard errors) is such that neither is E. statistically different from zero. Moreover, a frequently used statistical test (an F-test) cannot reject the equality of the two parameters (symmetry).<sup>45</sup>

Although those estimates of the behavioral response are consistent with other published estimates, the analysis is limited in three ways. First, even when the analysis encompasses more years than previous studies do, it is still based on only nine years of data. Second, the lack of data on private fees precludes an examination of their potential impact on Medicare's spending for physicians' services.<sup>46</sup> Lastly, one question that cannot be answered by this analysis is whether the observed behavioral response is driven by physicians' responses or by those of beneficiaries.<sup>47</sup>

## Discussion

The results presented in Table 5 can be used to estimate the separate effects of the underlying trend in the volume of services provided and the behavioral response on spending growth. Those estimates are calculated by applying the regression point estimates from Model 1 in Table 5 to the decomposition analysis above (based on equation (4)). The results, shown in Table 6, indicate that the secular trend in volume explains the vast majority of the change in spending attributable to changes in quantity. The impact of behavioral responses to changes in payment rates on spending is much smaller in size and reaches its highest value in the 2001–2002 period, when payment rates were reduced the most. The residual source of change in quantity affecting spending is also small. That residual captures unexplained factors including errors in the measuring of spending that cause the empirical model to fall short of explaining all of the changes in spending for physicians' services over time.

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44. In order to test whether the results are driven by years in which increases in spending were higher than in other years—1999 to 2001—Model 1 is run without these observations. Although such a test relies on only five years of aggregate data, the results are both quantitatively and qualitatively similar to those of the full sample.

45. Also, that the behavioral responses could be opposite in sign is difficult to accept because that would imply the conclusion that Medicare payment rates for physicians' services happen to be at the level that minimizes the quantity of services.

46. To the extent that private and Medicare fees are correlated, the omission of private fees in the estimated models could result in biased behavioral response estimates.

47. As mentioned in the text, in terms of budgetary implications, the source of the behavioral response is irrelevant.

## Conclusion

CBO's analysis shows that the recent growth in per-beneficiary Medicare expenditures for physicians' services, as adjusted by the MEI, can be largely explained by increases in the volume and intensity of services provided. The analysis estimates a positive annual trend of about 4 percent in the volume and intensity of physicians' services. Notwithstanding the overall growth in physician spending over the 1997–2005 period, the conversion factor—the main mechanism that determines changes in Medicare's payment rates for physicians' services—actually declined by 14 percent over that period (in MEI-adjusted dollars).

An additional question is whether changes in payment rates affect spending indirectly through a so-called behavioral response. The empirical analysis presented here suggests a behavioral response of roughly 28 percent (symmetric) in a direction opposite to the change in payment rates (decreases in payment rates are associated with increases in volume, and increases in payment rates are associated with decreases in volume), which is consistent with the range of estimates of the previous literature. In explaining changes in spending, however, the behavioral response accounts for only a small fraction of that change—1.4 percentage points of the 34.5 percent increase in spending).

It is unclear whether the estimated behavioral response will apply in the future, as the projected cuts in payment rates may be significantly different from those on which this analysis is based. That is, the estimated behavioral response shown in this paper is based on payment rates varying from year to year and changing in different directions, but future changes—if the SGR mechanism is followed—are expected to persist in the direction of reducing payment rates, which could lead to behavioral responses that are qualitatively and quantitatively different.

# Appendix

The tables in this appendix offer background statistics supporting the Congressional Budget Office's analysis.

**Table A-1.**

## Trends in Medicare's Spending for Physicians' Services and in Program Enrollment, 1997 to 2005

	Spending		Enrollment	
	Total Spending (Billions of 2006 dollars)	Percentage Change from Previous Year	Number of Beneficiaries (Millions)	Percentage Change from Previous Year
1997	50.5	n.a.	31.2	n.a.
1998	50.6	0.3	30.5	-2.4
1999	51.5	1.9	30.1	-1.2
2000	55.6	7.8	30.4	0.8
2001	61.9	11.3	31.2	2.9
2002	63.5	2.7	32.3	3.4
2003	66.7	5.0	33.1	2.4
2004	71.4	7.0	33.6	1.5
2005	73.4	2.8	33.8	0.6

Source: Congressional Budget Office based on analysis (for spending) of the Centers for Medicare and Medicaid Services' Physician Standard Analytical Files, 1997 to 2005, and on enrollment figures from that agency's Office of the Actuary.

Notes: Medicare's spending for physicians' services is adjusted using the Medicare economic index (MEI), with 2006 as the base year. The MEI includes changes in the cost of physicians' time and operating expenses; it is a weighted sum of the price of inputs in those two categories. Changes in "all-factor" productivity are also incorporated into the index as a way of accounting for improvements in physicians' productivity.

Spending includes both Medicare's share of payment rates and that paid by beneficiaries through cost sharing (in the form of deductibles and copayments).

n.a. = not applicable.

**Table A-2.**

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**Demographic Characteristics of Medicare Beneficiaries,  
1997 and 2005**

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(Percent)

	1997	2005
Age		
Under 65	14.8	18.6
65 to 74	43.8	39.9
75 to 84	30.8	30.3
85 and over	10.7	11.3
Race		
Black	8.6	9.5
Other	4.5	5.1
White	86.9	85.4
Sex		
Female	59.3	58.2
Male	40.7	41.8
Death Occurred During Year		
No	93.7	94.1
Yes	6.3	5.9

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Source: Congressional Budget Office based on analysis of the Centers for Medicare and Medicaid Services' Physician Standard Analytical Files and Denominator Files, 1997 and 2005.

Note: Percentages in each category may not add to 100 percent because of rounding.

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**Table A-3.**


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**Medicare's per-Beneficiary Monthly Spending for Physicians' Services, by Program Participants' Demographic Characteristics, 1997 and 2005**

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(Dollars)

	1997	2005
Age		
Under 65	165	205
65 to 74	150	194
75 to 84	184	241
85 and over	186	230
Race		
Black	185	225
Other	181	228
White	164	212
Sex		
Female	157	208
Male	179	223
Death Occurred During Year		
No	137	185
Yes	592	683

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Source: Congressional Budget Office based on analysis of the Centers for Medicare and Medicaid Services' Physician Standard Analytical Files and Denominator Files, 1997 and 2005.

Notes: Medicare's spending for physicians' services is adjusted using the Medicare economic index (MEI), with 2006 as the base year. The MEI includes changes in the cost of physicians' time and operating expenses; it is a weighted sum of the price of inputs in those two categories. Changes in "all-factor" productivity are also incorporated into the index as a way of accounting for improvements in physicians' productivity.

Spending includes both Medicare's share of payment rates and that paid by beneficiaries through cost sharing (in the form of deductibles and copayments).

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**Table A-4.**


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## Impact of Changes in Covered Services on Medicare's per-Beneficiary Spending, 1997 to 2005

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(Dollars)

	All Services	Services Covered in 1997	Percentage of Total	New Services Available After 1997	Percentage of Total
1997	1,615	1,615	100	0	0
1998	1,659	1,616	97	43	3
1999	1,711	1,657	97	54	3
2000	1,831	1,749	96	81	4
2001	1,980	1,874	95	106	5
2002	1,967	1,836	93	132	7
2003	2,015	1,867	93	149	7
2004	2,126	1,926	91	200	9
2005	2,172	1,916	88	257	12

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Source: Congressional Budget Office based on analysis of the Centers for Medicare and Medicaid Services' Physician Standard Analytical Files, 1997 to 2005.

Notes: Medicare's spending for physicians' services is adjusted using the Medicare economic index (MEI), with 2006 as the base year. The MEI includes changes in the cost of physicians' time and operating expenses; it is a weighted sum of the price of inputs in those two categories. Changes in "all-factor" productivity are also incorporated into the index as a way of accounting for improvements in physicians' productivity.

Spending includes both Medicare's share of payment rates and that paid by beneficiaries through cost sharing (in the form of deductibles and copayments).

The category "Services Covered in 1997" refers to services eligible for reimbursement that year under Medicare's physician fee schedule. After 1997, the fee schedule was expanded to include additional services.

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