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Cost Growth in Medicare: 1992 to 2006

Amitabh Chandra, Lindsay Sabik,
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4.1 Introduction

Expanding health insurance coverage and reducing the trajectory of cost growth are major goals of many health care reform proposals. While the problem of addressing cost growth in health care is often viewed as being separate from efforts to cover the uninsured, it is difficult to sustain a comprehensive insurance expansion when premiums for that program are growing substantially faster than tax receipts and incomes. Cost growth in health care is not a uniquely American phenomenon—Chandra and Skinner (2009) note that every other Organization for Economic Cooperation and Development (OECD) country has experienced substantial expenditure growth—but it has been particularly pronounced in the United States. This observation, combined with a deeper examination of how the United States differs from other OECD countries, led Garber and Skinner (2008) to conclude that U.S. healthcare was "uniquely inefficient."

In this chapter we study the sources of recent cost growth in American health care by focusing on the experience of the fee-for-service (FFS) portion of the Medicare program. Medicare is a social insurance program that covers 45 million Americans over the age of sixty-five and disabled persons

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regardless of age if they have received disability Supplemental Security Income (SSI) benefits for two years. It represents 13 percent of the Federal budget and accounts for one in five dollars of national health spending. Thirty percent of all hospital services, 20 percent of all prescription drug spending, and 20 percent of all physician care is paid for by Medicare (Kaiser Family Foundation 2009). Also, cost growth in Medicare is believed by many commentators to be the single largest threat to the long-term federal budget deficit (Orszag 2007; Congressional Budget Office [CBO] 2007). In 2009, Medicare was a $480 billion dollar program and its growth rate exceeded that of national income. The program comprises four parts: Part A (hospital insurance) pays for hospital care, skilled nursing stays, and hospice care; Part B covers physician services and hospital outpatient services; while Medicare Advantage (Part C) accounts for approximately 25 percent of total Medicare spending. Finally, Part D, the recently enacted prescription drug benefit, comprises 11 percent of Medicare spending.[1]

Cost growth in the Medicare program may or may not resemble cost growth in the Medicaid and commercial populations. The Medicare population is older than the general population, and while 20 percent of enrollees are under age sixty-five, they are largely eligible through the Social Security Disability Insurance (SSDI) program and are thus sicker than those covered by private insurance plans. Consequently, Medicare beneficiaries use a different set of services than the general population, leading to some differences in regional patterns of health care between the under-sixty-five and over-sixty-five.[2] On the one hand, Baker, Fisher, and Wennberg (2008) demonstrate that hospital-level resource use is similar between FFS Medicare and commercial insurers for chronically ill individuals in the end of life. On the other hand, there are a number of theoretical reasons to believe that Medicare's administratively set prices cause hospitals and physicians to offset pricing imperfections with increased utilization in the non-Medicare population. The ability of providers to offset the effects of Medicare's reimbursement policy probably varies with the competitiveness of local health care markets.

Regardless of whether Medicare's experience resembles that of other insurers, its size, dependency of general revenues, and role as a social insurance program makes it of interest in its own right. In this chapter we focus on cost-growth in the fee-for-service population (Parts A and B). Within the focus on Medicare, we pay particular attention to drivers of cost *growth* and distinguish these from drivers of the *level* of Medicare spending.

1. This latter percentage does not include prescription drug benefits provided by Medicare Advantage plans.

2. Unfortunately, the state-level data for medical spending in the under-sixty-five population exhibit lower quality than the detailed individual-level clinical data from the Medicare administrative records (Skinner et al. 2009; also see Cooper 2009).

4.2 Data and Methods

Data on Medicare reimbursements for 1992 to 2006 come from the Dartmouth Atlas of Healthcare and include per capita age-, sex-, and race-adjusted reimbursements for each of the 306 Hospital Referral Regions (HRRs) in the United States. They are based on data from the 5 percent Continuous Medicare History Sample (CMHS).[3] These data represent spending on all FFS Medicare beneficiaries over age sixty-five (unless otherwise noted, we exclude disabled beneficiaries under age sixty-five). We do not have claims data for Medicare HMOs, so spending on those enrollees is excluded. All reimbursements are adjusted for inflation using the Consumer Price Index (CPI) and are expressed in 2006 dollars (using the gross domestic product [GDP] deflator gave us similar results).

In addition to total Medicare reimbursements and Part A and Part B reimbursements, spending in the CHMS is broken down into subcategories including inpatient short stays; inpatient long stays; outpatient hospital services; medical and surgical care provided by physicians; diagnostic, lab, and X-ray services; durable medical equipment; home health services; hospice services; and skilled nursing facilities. The majority of payments to hospitals for inpatient care are categorized under hospital short stays. Reimbursements for long stays are generally made to long-term care hospitals, which must have an average Medicare length of stay greater than twenty-five days and are paid under a separate Medicare payment system. The outpatient hospital services category covers reimbursements to hospital emergency rooms and outpatient clinics under Medicare Part B. Since 2000 these have been paid under the outpatient Prospective Payment System (PPS) (as opposed to the physician services in the medical and surgical categories). The medical services category covers most "Evaluation and Management" codes in the Berenson-Eggers Type of Service (BETOS) classification system, including office and hospital visits and specialist visits. The surgical services category covers "Procedures" BETOS codes, although if the procedure was delivered in a hospital outpatient setting these would fall under outpatient hospital services. To clarify, Medicare's payment to a hospital for bypass surgery will be categorized under inpatient short-stay spending, but the physician's time for performing the surgery will be recorded under Part B procedures. The diagnostic, lab, and X-ray services category includes spending on services such as CT scans and MRIs that are not associated with an inpatient admission.

3. Reimbursement data for 1998 through 2000 overstated true Medicare spending due to double counting of some claims. After consultation with staff at the Centers for Medicaid and Medicare (CMS) we determined that these data should be deflated by 10 percent to estimate actual spending in those years. All results presented here include this adjustment. It is possible that the "bump" in utilization rates—which were not adjusted—observed during the late 1990s in figure 4.3 may reflect some of the double-counting that our 10 percent deflation is intended to correct.

We supplement this with data from the Area Resource File (ARF) on per capita income. Data from the ARF are available at the county level, so in situations where a county is covered by two HRRs we assign county characteristics by weighting according to the fraction of the HRR population overlapping each county. This is consistent with the strategy followed in Chernew et al. (2009).

First, we examine aggregate trends in Medicare spending, both overall and by category and calculate the cumulative percentage growth, average annual percentage growth, and total increase in per capita reimbursements for 1992 to 2006 and subgroups of this period. We examine changes in the rate at which different procedures and different categories of spending are responsible for cost-growth in Medicare. We consider how utilization, measured by the number of encounters, changes over this period within different service categories. Formally, we perform the following decomposition:

$$(1) \quad S_1 - S_0 = \sum_R \omega_{r1} S_{r1} - \sum_R \omega_{r0} S_{r0}$$

$$(2) \quad = \sum_R \omega_{r1}(S_{r1} - S_{r0}) + \sum_R S_{r0}(\omega_{r1} - \omega_{r0})$$

$$(3) \quad = \sum_R \omega_{r1}\left(\sum_P \eta_{rp1} S_{rp1} - \sum_P \eta_{rp0} S_{rp0}\right) + \sum_R S_{r0}(\omega_{r1} - \omega_{r0})$$

$$(4) \quad = \sum_R \omega_{r1}\left(\sum_P \eta_{rp1}(S_{rp1} - S_{rp0}) - \sum_P S_{rp0}(\eta_{rp1} - \eta_{rp0})\right) + \sum_R S_{r0}(\omega_{r1} - \omega_{r0})$$

where S_t is average spending in year t; S_{rt} is average spending in region r in year t; ω_{rt} is the proportion of all Medicare FFS enrollees in region r in year t; S_{prt} is average spending for procedure p in region r in year t; and η_{prt} is the number of claims per enrollee for procedure p in region r in year t. This allows us to decompose the change in Medicare spending into two components: (a) between-HRR changes due to changes in where the Medicare population lives, given by the second term in equation (2); and (b) within-HRR changes due to changes in spending per enrollee, given by the first term in equation (2). We can further decompose within-HRR spending changes (the first term in equation [4]) into changes in the number of encounters and changes in spending per encounter. We perform this decomposition for the entire 1992 to 2006 period as well as the 1998 to 2006 period.

That is, the simple accounting framework allows us to determine how much of aggregate spending growth occurs because: (a) high-cost areas experience an expansion in their population ("between" growth), for ex-

ample, because relatively more elderly people move to Miami, a high-cost area; (b) there are more total procedures or encounters overall per enrollee; and (c) there is greater intensity (whether prices or services) per procedure or encounter. Our approach allows us to distinguish among these three groups, although we caution that there are other decompositions that could yield slightly different results.[4]

Next, we divide HRRs into quintiles based on the level of Medicare spending in 1992 and test for sigma convergence in (log) spending levels by 2006. In other words, we want to know whether the variance of regional spending shrunk over time. We estimate HRR-level regressions of rates of growth in Part A, Part B, and total Medicare spending on HRR-level covariates, including the age distribution of Medicare enrollees, adjusted mortality among FFS Medicare enrollees (a simple measure of illness), and per capita income. (Note that the HRR-level spending measures are already adjusted for age, sex, and race; thus, any impact of age on these measures will capture "spillover" effects; for example, if regions with a higher fraction of the very old practices a different style of care for all age groups.)

These regressions, which should not be given a causal interpretation, are designed to shed light on whether areas where Medicare spending grew faster were areas where mortality (a proxy for illness) or income were growing faster. Our focus on the role of income in predicting Medicare spending is motivated by the insights of Hall and Jones (2007), who argue that diminishing marginal utility from nonhealth consumption in the presence of higher incomes (and consequently, the value of life) will result in a greater share of income being spent on health care. Finding evidence of positive associations between spending, mortality, and income would provide prima facie evidence that there is *some* allocative efficiency behind Medicare spending growth, but would still fall far short of establishing optimality.

4.3 Results

4.3.1 Aggregate Trends in Medicare Enrollment and Spending

The two panels of figure 4.1 demonstrate that the total number of Medicare beneficiaries grew over the 1992 to 2006 period, with the number of enrollees under sixty-five years of age (who receive Medicare after being on the SSDI program for at least two years) experiencing the most enrollment growth. Panel B of figure 4.1 illustrates the share of beneficiaries in FFS versus Medicare managed care (a group for whom we do not have claims). The number of enrollees in traditional FFS Medicare declined through the

4. This arises because of an index number issue; $\omega_1 S_1 - \omega_0 S_1$ can also be written $\omega_1(S_1 - S_0) + S_0(\omega_1 - \omega_0)$.

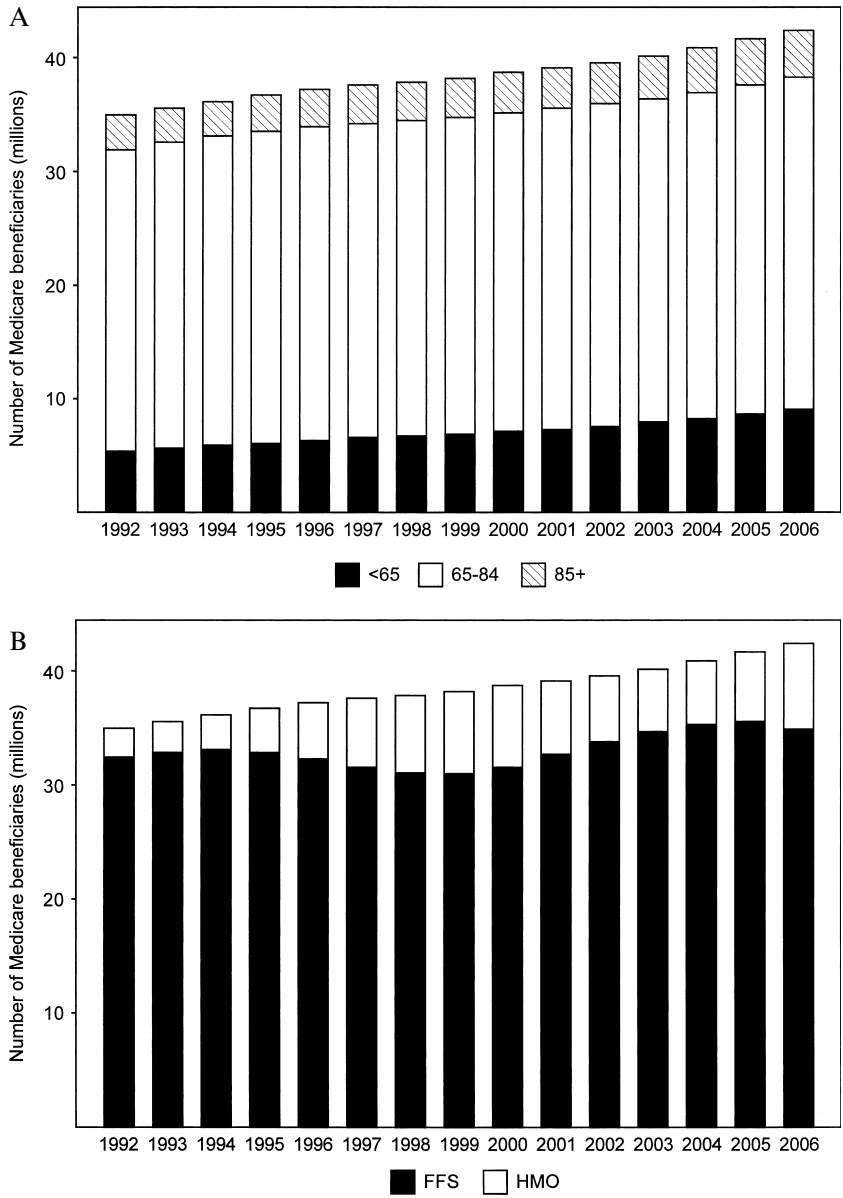


Fig. 4.1 Number of Medicare beneficiaries: *A*, over time; *B* in FFS and Medicare HMOs

first part of the period as enrollment in Medicare HMOs grew, although the share of beneficiaries in FFS has been growing since 2000. Total enrollment in Medicare will continue to grow in the coming decades as younger baby boomers age into eligibility.

Figure 4.2 illustrates trends in the categories of Medicare spending per enrollee: panel A breaks down growth into key subcategories of Part A spending, panel B does the same for Part B, and panel C for home health spending. We separate home health expenditures because they were charged to Part A prior to the Balanced Budget Act (BBA) of 1997, but have subsequently been charged to Part A or B depending on whether the care is provided in conjunction with a hospitalization. In panel A, the largest component of costs, spending on short stay hospitalizations, has remained relatively flat. In contrast, panel B shows large per enrollee spending growth in the two largest components, hospital outpatient services and physician medical care services, which more than doubled over the fourteen-year period. Reimbursements for home health grew quickly from 1992 to 1996, but rapidly dropped off after the Balanced Budget Act (BBA) of 1997 changed reimbursement rules for home health services.

In table 4.1, panel A, we see that total Medicare FFS spending has grown by approximately $3,000 per beneficiary since 1992, at an average growth rate of 3.2 percent annually (had we used the GDP price deflator the same quantity would have been 3.5 percent), with two-thirds of that increase resulting from the rise in spending on Part B services. The pace of growth varied over this period; overall spending grew at an average real rate of 3.8 percent per year from 1992 to 1999 (a seven-year period) and slowed to 2.7 percent per year from 1999 to 2006 (also seven years).[5] Growth in Part B spending was higher than growth in Part A spending in both periods. Among subcategories of Part A and Part B spending, reimbursements for inpatient short stays and skilled nursing facilities (SNF) had the highest absolute (dollar) growth during the earlier period, while outpatient hospital services and medical care services had the highest absolute growth during the latter period. White (2003) discusses the dramatic role of the new PPS system for SNF, which was adopted in mid-1998, in reducing payments to these facilities. Hospital outpatient services have been reimbursed under PPS from July 1, 2000 but their growth has, if anything, been higher even in the post-PPS era.

Examining percentage growth can be additionally informative, but

5. Both our level and growth numbers are lower than estimates from CBO (2007), since we include only FFS spending for beneficiaries over age sixty-five. The CBO estimates that total Medicare spending was $342 billion in 2005, while our estimate for over-sixty-five FFS enrollees is $225 billion, or about 66 percent of the CBO estimate (CBO 2007). Likewise, they estimate that per capita Medicare spending grew at a real rate of 3.8 percent annually from 1990 to 2005 while we estimate that it grew at an annual rate of 3.2 percent from 1992 to 2006. Thus, it should be noted that our results for FFS enrollees over age sixty-five understate total spending and may slightly understate growth as well.

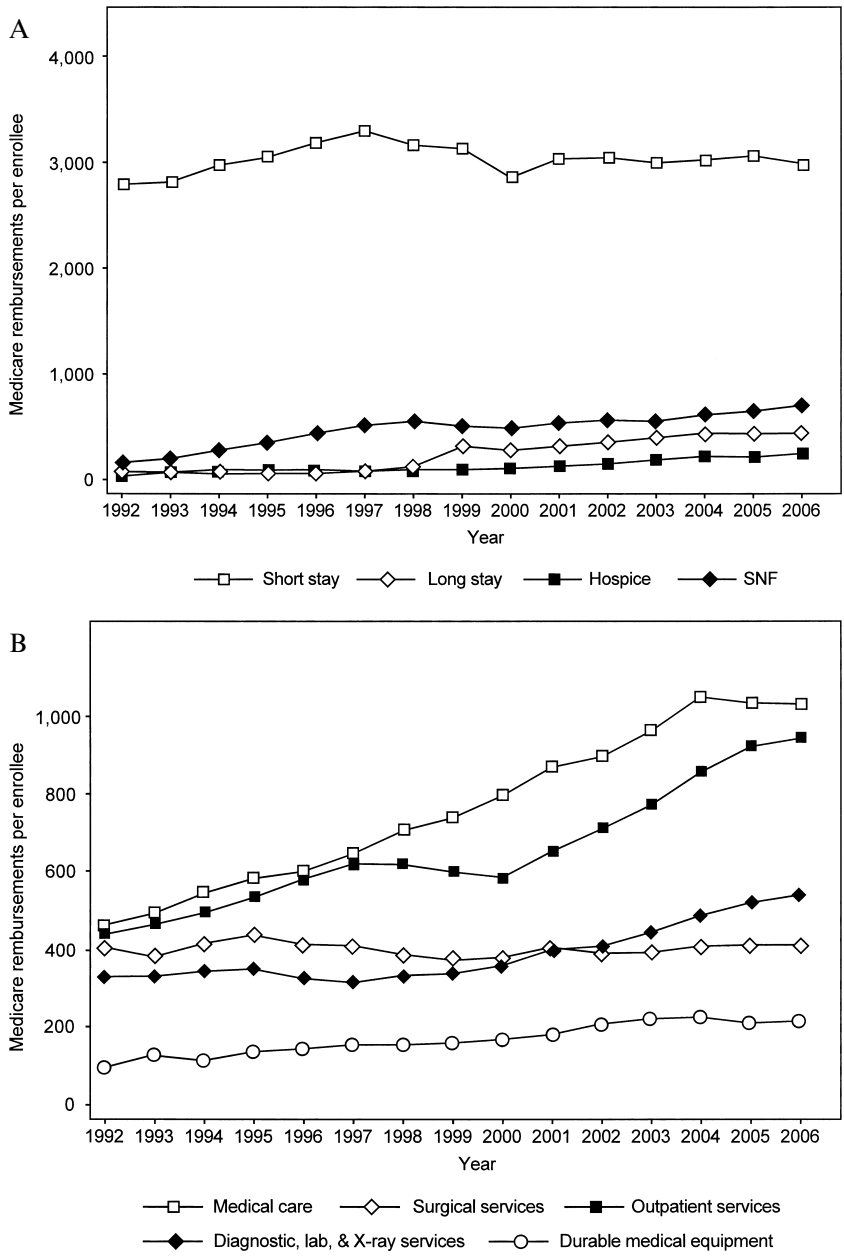


Fig. 4.2 Growth in Medicare spending by type of service: *A*, inpatient; *B*, outpatient and ambulatory care; *C*, home health

Note: All figures in 2006 dollars.

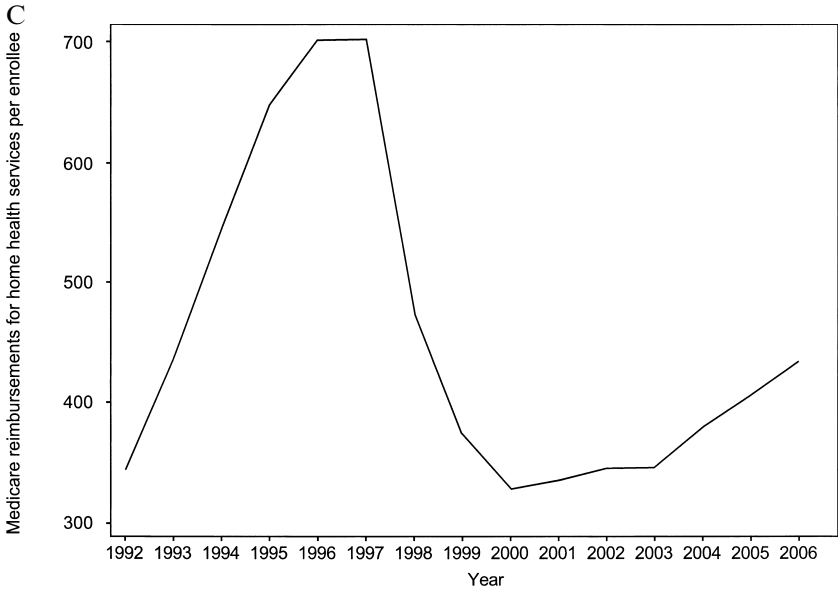


Fig. 4.2 (cont.)

categories with low initial levels of spending often will exhibit higher percentage increases, so categories identified in this way are unlikely to be lucrative targets for cost-saving policies. The category of durable medical equipment, which is often the focus of Medicare fraud investigations, shows considerable percentage growth of 137 percent, but its increase of $125 is only one-fifth as large as the $565 increase in medical care services, which has a lower growth rate of 122 percent. Reimbursements for hospice services and inpatient long stays exhibited the highest growth rates overall, more than three times the rate of all other categories, but, again, baseline spending for these categories was low.

Because conversations about the role of Medicare in the federal budget focus on projections of increases in total expenditures (per beneficiary spending multiplied by the number of beneficiaries), in table 4.1, panel B, we report growth in total Medicare spending (that is, we account for increases in per beneficiary spending and the number of Medicare beneficiaries). The reported patterns of growth in total Medicare spending are similar to per beneficiary patterns, though overall growth in total spending is naturally higher during part of the period when Medicare enrollment is increasing more rapidly.

Table 4.2 shows the decomposition of the changes in Medicare spending into within-HRR (spending) changes and between-HRR (population location) changes, and the further decomposition of within-HRR changes into changes in spending per encounter and changes in the number of

Table 4.1 **Growth in Medicare spending by type of service**

	1992	1999	2006	1992–1999			1999–2006			1992–2006		
	Medicare reimbursements per capita			Cumulative percentage growth	Average annual percentage growth	$ increase per capita	Cumulative percentage growth	Average annual percentage growth	$ increase per capita	Cumulative percentage growth	Average annual percentage growth	$ increase per capita
						A Per capita						
Total	5,331	6,854	8,304	29.6	3.8	1,579	20.2	2.7	1,394	55.8	3.2	2,973
Part A	3,404	4,179	4,536	22.9	3.0	780	8.4	1.2	352	33.2	2.1	1,132
Part B	1,927	2,675	3,767	41.4	5.1	799	38.2	4.7	1,041	95.5	4.9	1,840
Inpatient short stays	2,793	3,156	2,979	12.2	1.7	340	–4.9	–0.7	–154	6.7	0.5	186
Inpatient long stays	63	116	442	400.1	25.9	253	39.5	4.9	125	597.7	14.9	379
Outpatient services	436	615	942	37.2	4.6	162	57.3	6.7	343	115.8	5.6	506
Medical care services	465	705	1,030	59.4	6.9	276	39.1	4.8	290	121.7	5.9	565
Surgical services	405	382	410	–7.9	–1.2	–32	9.8	1.3	37	1.1	0.1	5
Diagnostic, lab, and X-ray services	328	332	537	2.2	0.3	7	60.1	7.0	202	63.7	3.6	209
Durable medical equipment	92	153	217	71.3	8.0	65	38.4	4.8	60	137.1	6.4	125
Home health services	345	474	434	8.9	1.2	31	15.5	2.1	58	25.8	1.7	89
Hospice services	34	80	234	148.1	13.9	50	179.1	15.8	150	592.6	14.8	200
Skilled nursing facilities	160	558	690	212.0	17.7	340	37.8	4.7	189	329.9	11.0	530

						B Total						
Total	153.6	183.0	233.0	18.4	2.4	28.3	28.1	3.6	51.1	51.7	3.0	79.4
Part A	98.1	111.6	127.3	12.3	1.7	12.1	15.6	2.1	17.1	29.8	1.9	29.2
Part B	55.5	71.4	105.7	29.2	3.7	16.2	47.3	5.7	33.9	90.4	4.7	50.2
Inpatient short stays	80.5	84.3	83.6	2.5	0.4	2.0	1.3	0.2	1.1	3.9	0.3	3.1
Inpatient long stays	1.8	3.1	12.4	356.9	24.2	6.5	48.7	5.8	4.1	579.5	14.7	10.6
Outpatient services	12.6	16.4	26.4	25.4	3.3	3.2	67.7	7.7	10.7	110.2	5.5	13.9
Medical care services	13.4	18.8	28.9	45.6	5.5	6.1	48.3	5.8	9.4	115.9	5.7	15.5
Surgical services	11.7	10.2	11.5	–15.8	–2.4	–1.9	17.0	2.3	1.7	–1.5	–0.1	–0.2
Diagnostic, lab, and X-ray services	9.5	8.9	15.1	–6.6	–1.0	–0.6	70.7	7.9	6.2	59.4	3.4	5.6
Durable medical equipment	2.6	4.1	6.1	56.5	6.6	1.5	47.5	5.7	2.0	131.0	6.2	3.5
Home health services	9.9	12.6	12.2	–0.5	–0.1	0.0	23.2	3.0	2.3	22.5	1.5	2.2
Hospice services	1.0	2.1	6.6	126.7	12.4	1.2	197.5	16.9	4.4	574.5	14.6	5.6
Skilled nursing facilities	4.6	14.9	19.4	185.1	16.1	8.6	46.9	5.6	6.2	318.7	10.8	14.7

Note: All reimbursement figures in 2006 dollars.

Table 4.2 **Medicare spending decompositions**

	Within (spending change)				
	Change in spending per encounter	Change in number of encounters	Total within HRR	Between (population change)	Total change Within + Between
		A 1992–2006			
Inpatient short stays	72.2	132.1	204.3	–48.7	155.5
Inpatient long stays	–28.9	297.8	268.9	–2.6	266.3
Outpatient services	80.2	365.0	445.2	–2.8	442.3
Medical care services	289.7	255.5	545.2	–11.0	534.2
Surgical services	–163.6	174.9	11.3	–2.9	8.3
Diagnostic, lab, and X-ray services	75.3	112.7	188.0	–4.3	183.7
Durable medical equipment	–45.4	150.7	105.3	–1.0	104.4
Home health services	168.8	–203.4	–34.6	1.0	–33.6
Hospice services	1.5	138.1	139.6	–0.9	138.7
Skilled nursing facilities	209.0	228.0	437.0	–2.0	435.0
Total	658.7	1651.5	2310.2	–75.3	2234.8
		B 1998–2006			
Inpatient short stays	336.0	–369.1	–33.0	–5.1	–38.2
Inpatient long stays	62.5	136.7	199.3	0.5	199.8
Outpatient services	282.9	25.2	308.1	–0.9	307.2
Medical care services	160.5	125.8	286.3	3.5	289.8
Surgical services	–6.1	35.7	29.6	1.5	31.1
Diagnostic, lab, and X-ray services	151.6	19.0	170.6	2.7	173.3
Durable medical equipment	17.2	38.6	55.8	0.7	56.4
Home health services	169.0	–154.4	14.7	1.6	16.3
Hospice services	28.6	111.3	139.9	0.6	140.5
Skilled nursing facilities	140.3	–14.9	125.5	2.1	127.6
Total	1342.6	–45.9	1296.7	7.0	1303.7

Notes: The HRRs with missing data on encounters and/or reimbursements are treated as zeros in calculating decomposition (primarily affects HSP, LS; 5 HRRs missing SNF data for 1992 period); population share is 1992, 1998, or 2006 level; baseline spending, number of encounters, and spending per encounter are 1992–1994, 1998–2000, and 2004–2006 averages.

encounters.[6] Over the entire 1992 to 2006 period and the latter part of the period from 1998 onwards, almost all of the increase in spending was driven by within-HRR growth (table 4.2, panel A). That is, not surprisingly, changes in spending resulted from increases in spending per enrollee within HRRs, rather than from the migration of a larger fraction of enrollees into high-spending regions. Considering total Medicare spending over the entire 1992 to 2006 period, about half the growth in per beneficiary spending was due to increases in the number of encounters, and one-fifth was due to greater intensity or reimbursement for a given encounter. However, if we look only at the most recent years, the relative importance of these factors shifts: panel B demonstrates that greater spending per encounter (which may reflect increased treatment intensity as well as higher reimbursement levels for the same services) is the key driver of cost growth from 1998 to 2006. Of particular interest is the recent growth in the use of diagnostic and laboratory services.[7]

To explore these findings in more detail, we were interested in learning whether cost growth (in terms of numbers of encounters) was being driven more by an increased number of beneficiaries receiving services (treatment expansion) or an increase in the amount of services provided to a given beneficiary (treatment intensity). Figure 4.3 reports the trends in the share of enrollees using three services that exhibit rapid cost growth and are covered by the Part B program. Increases in spending on medical care services and diagnostic, lab, or x-ray services are primarily driven by increases in treatment intensity, as the number of encounters per capita is growing more quickly than the percent of beneficiaries using those services. For hospital outpatient services, however, the treatment expansion (percent of enrollees using services) and intensity (number of per capita encounters) are growing at similar rates, suggesting that treatment expansion plays a larger role in the increase in spending on outpatient services.

In addition, we studied hospital discharge data to examine changes in the distribution of conditions being treated. Trends in discharges for major procedures are depicted in the two panels of figure 4.4. We created two panels to provide separate scales for procedures that were relatively more rare. Procedure rates for CABG (bypass), carotid endarterectomy, and hip fracture remained relatively flat or declined, while discharges for back surgery, hip replacement, knee replacement, and PCI (percutaneous coronary interventions, which includes angioplasty) increased substantially. Some of

6. Our total change in spending number is less than the total per beneficiary growth presented in table 4.3 because spending in the categories for which we have data does not account for 100 percent of Medicare spending, so we are unable to account for the entire change over this period through this decomposition. However, we are able to account for the majority of the growth in spending and consider what drives growth within each category.

7. One potential determinant of these services is local malpractice pressure (see Baicker, Fisher, and Chandra 2007).

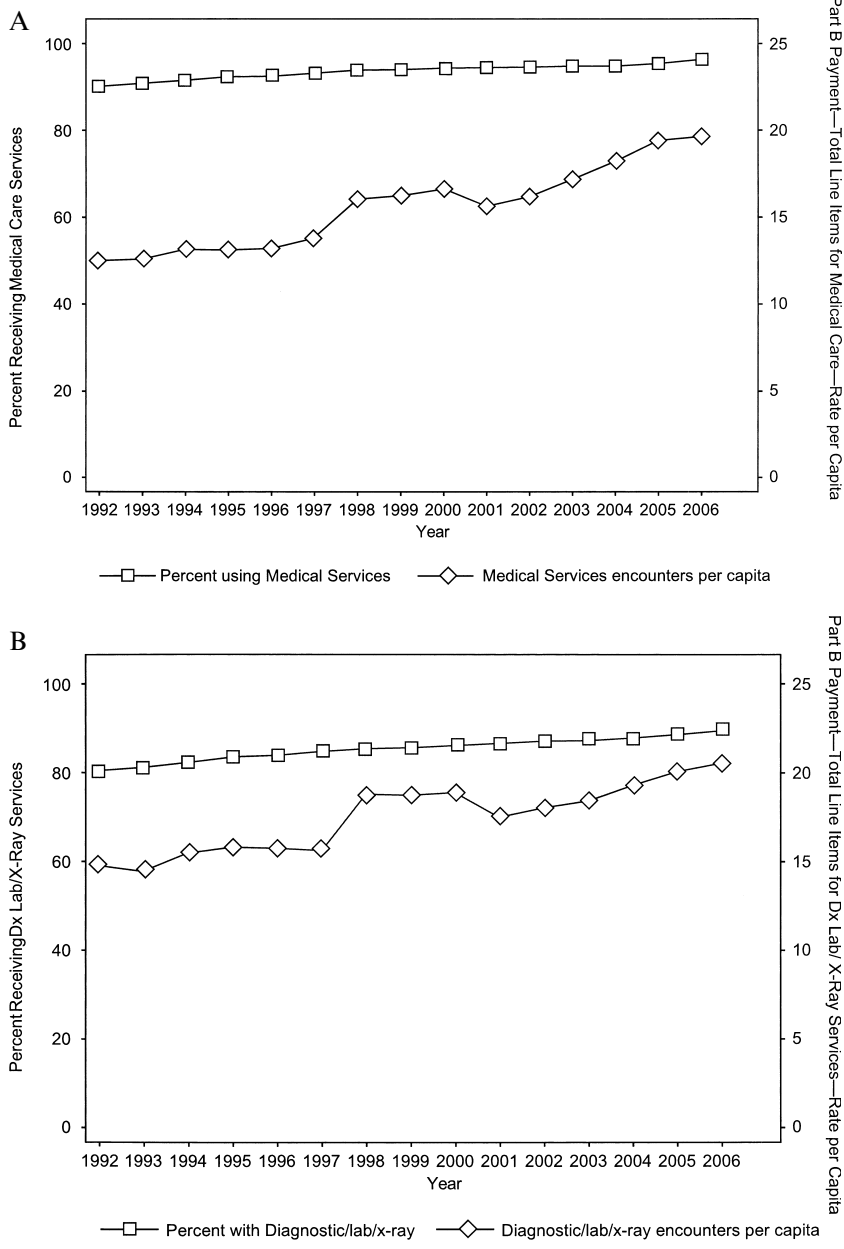


Fig. 4.3 Growth in Medicare utilization by type of service: *A*, medical care; *B*, diagnostics; *C*, outpatient

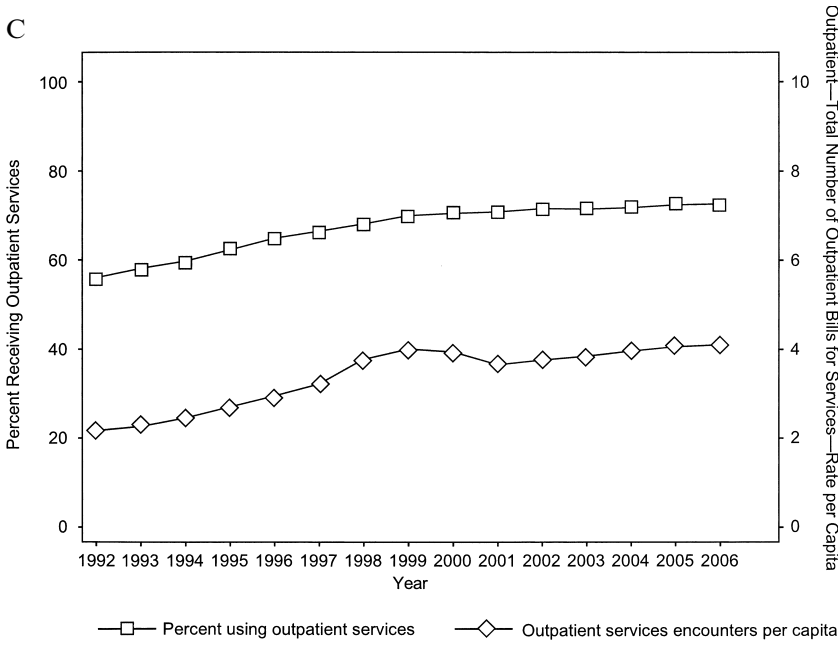


Fig. 4.3 (cont.)

the increase in PCI reflects a substitution away from bypass, but in general, it also reflects the greater use of this procedure in patients with stable coronary disease. We noted a falling incidence of heart attacks in Medicare beneficiaries, probably because younger cohorts of beneficiaries have better management of hypertension and cholesterol, in addition to lower rates of smoking, as noted by Ford et al. (2007).

This suggests that the increase in PCI was largely in patients with stable coronary disease. The Clinical Outcomes Utilizing Revascularization and Aggressive Drug Evaluation (COURAGE) trials examined the benefits from PCI in this population on the margins of both survival and quality of life. Boden and the COURAGE Trial Research Group (2007) did not find that PCI dominated optimal medical therapy as an initial management strategy on the margins of survival and other major cardiovascular events. In subsequent work by Weintraub, Boden, and the COURAGE Trial Research Group (2008) PCI was not found to improve patient outcomes in the domains of angina frequency and treatment satisfaction, but there were small improvements in the quality of life that disappeared by thirty-six months. The increase in PCI can also be interpreted in the context of work by Cutler and Huckman (2003), who note that angioplasty offers lower per unit costs, but can raise total costs because it can be offered to a much larger group of patients than bypass surgery.

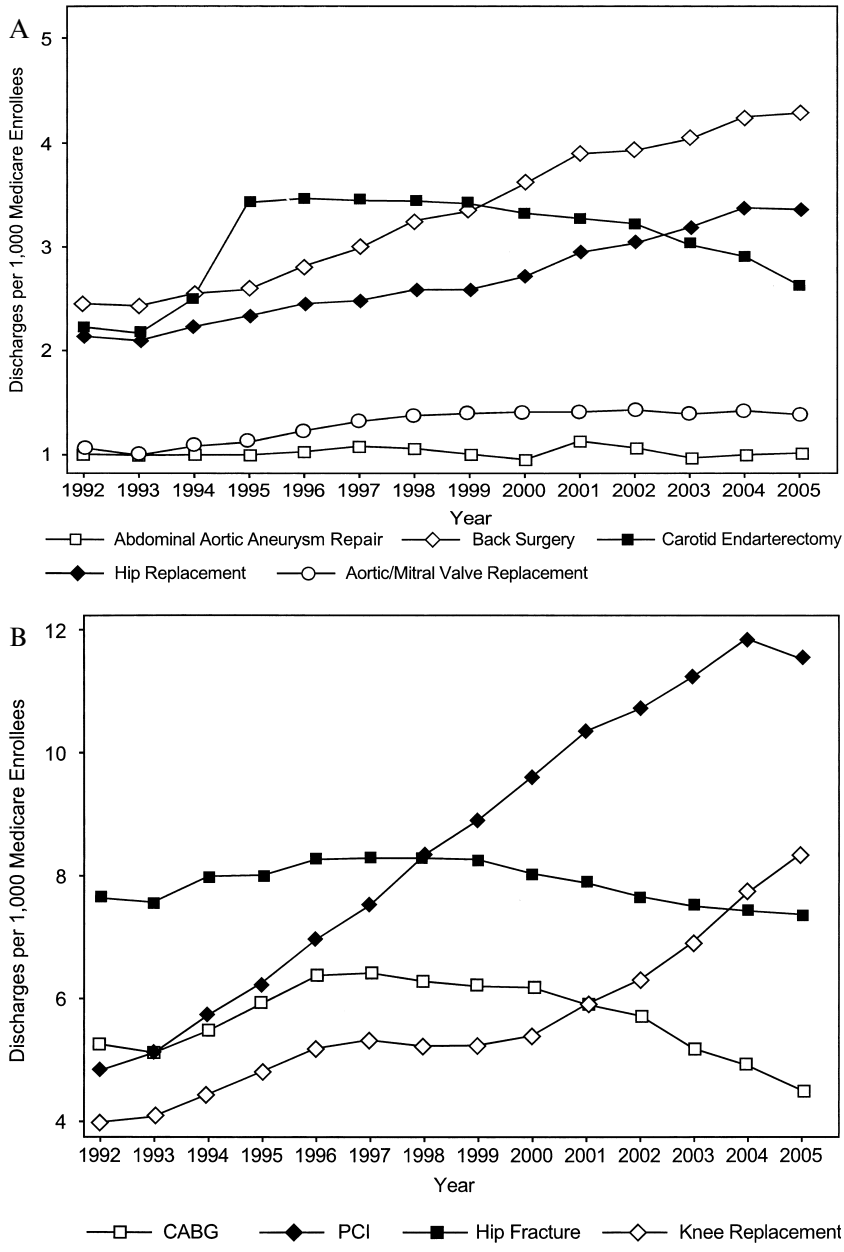


Fig. 4.4 Medicare discharges per 1,000 enrollees, by service category: A, less common procedures; B, more common procedures

4.3.2 Geographic Variation in Cost Growth

A large literature in medicine and economics notes the presence of large geographic variation in Medicare spending (e.g., Fisher et al. 2003a, 2003b). But with the exception of the work of Fisher, Bynum, and Skinner (2009), less is known about whether high-spending regions are the highest growing ones. In our analysis we find considerable variation in the rates of spending growth across HRRs. For Part A spending, the average annual growth rate was 1.9 percent among the slowest growing 20 percent of HRRs, while the fastest growing quintile grew at an average annual rate of 2.7 percent. Growth in Part B was higher across HRRs than growth in Part A, with the slowest growing quintile experiencing an average annual growth rate of 4.4 percent and the fastest growing quintile growing at an average rate of 6.1 percent. This 2 percentage point-difference in average annual growth rates is economically significant: at 4 percent spending will double in eighteen years, but at 6 percent it will double in only twelve years. Despite these differences in spending growth rates, we note that the dollar increase in spending has been remarkably stable across all levels of initial spending. Figure 4.5 illustrates trends in Medicare reimbursements by quintile of spending in 1992, where quintile 1 had the lowest level of spending in 1992 and quintile 5 the highest. The dollar increases in spending are identical across the quintiles for both Part A and Part B. The high percentage rates of growth among the high growth HRRs are largely driven by their lower baseline spending. As seen in figure 4.5, average annual percent growth rates monotonically decrease across quintiles as baseline spending increases. The pattern of spending growth is very similar across HRRs with different levels of baseline spending, leading us to conclude that high-cost areas do not necessarily experience higher or lower growth in specific characteristics of health care spending.

The implication of equal growth in the dollar amount of Medicare spending should be a compression in relative spending, or a smaller degree of (relative) regional variation across the United States. We can test this hypothesis by comparing the standard deviation of the population-weighted log expenditures in earlier and later time periods. The standard deviation in expenditures for 1992 was 0.19, which grew until reaching a maximum of 0.21 in 1996 (in part because some HRRs experienced much more rapid growth in home health care); since then it has declined, so that in 2006 it is equal to 0.16. (The difference between 1992 and 2006 is significant at the 5 percent level.) Between 1992 and 2006, the standard deviation for Part A spending has fallen from 0.19 to 0.17, and for Part B services it has fallen from 0.21 to 0.17. This result is consistent with the CBO finding that the extent of regional variation has moderated somewhat over time (CBO 2008).

That said, several HRRs are clear outliers in their rates of Medicare cost growth—some are high cost and exhibit high growth rates. Panel A of figure 4.6 shows trends in Part B spending in two HRRs with among the highest

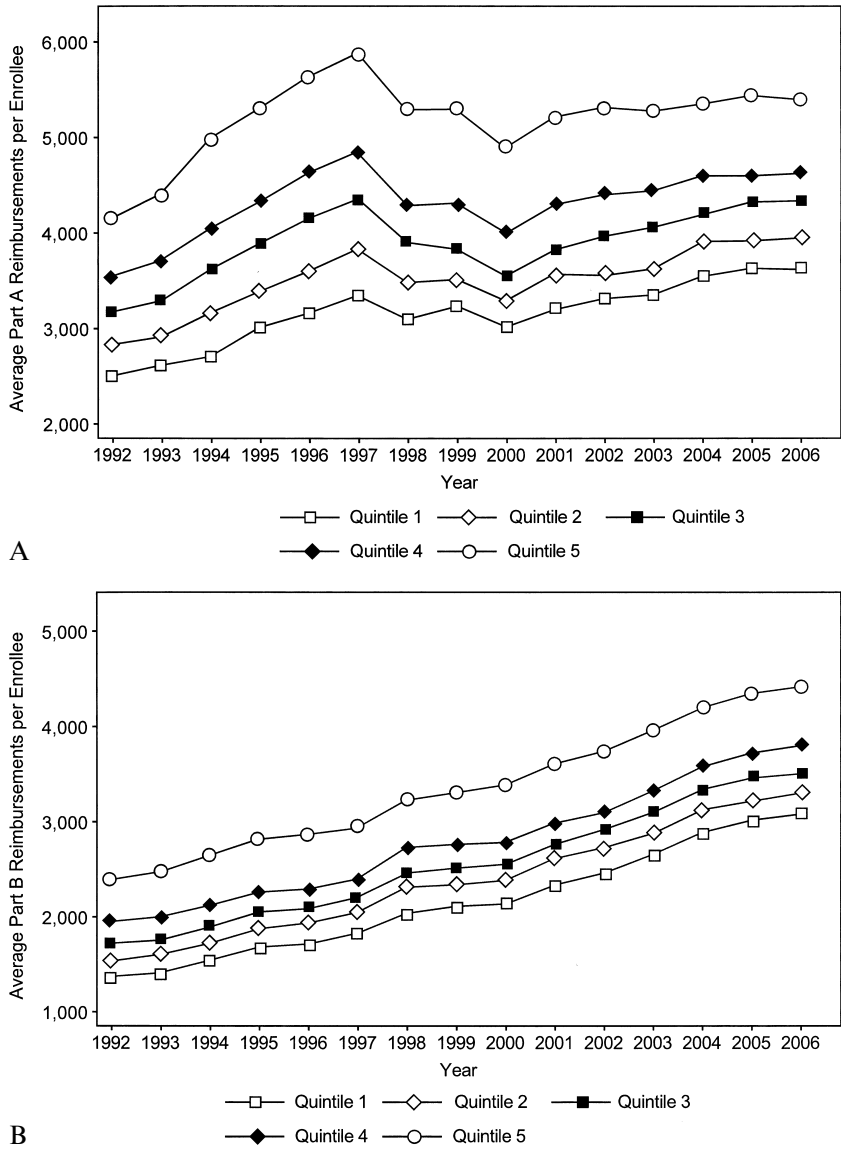
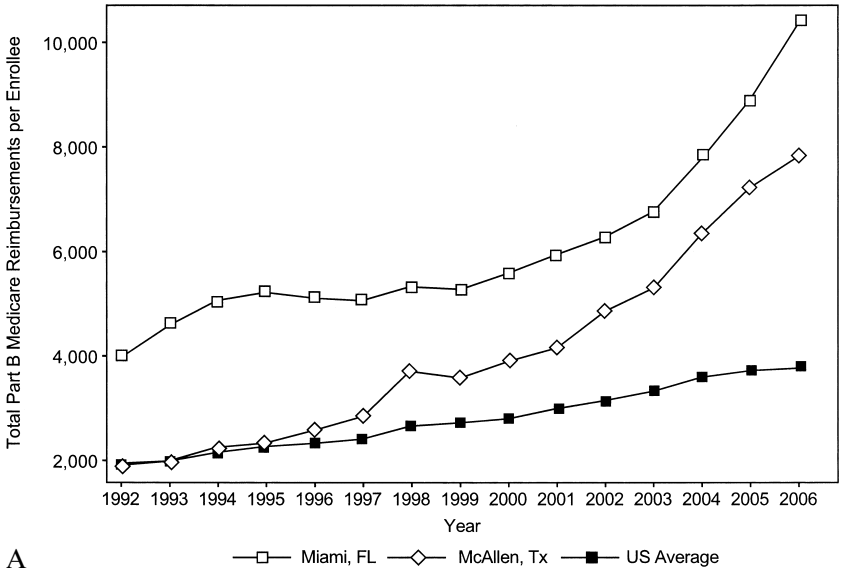
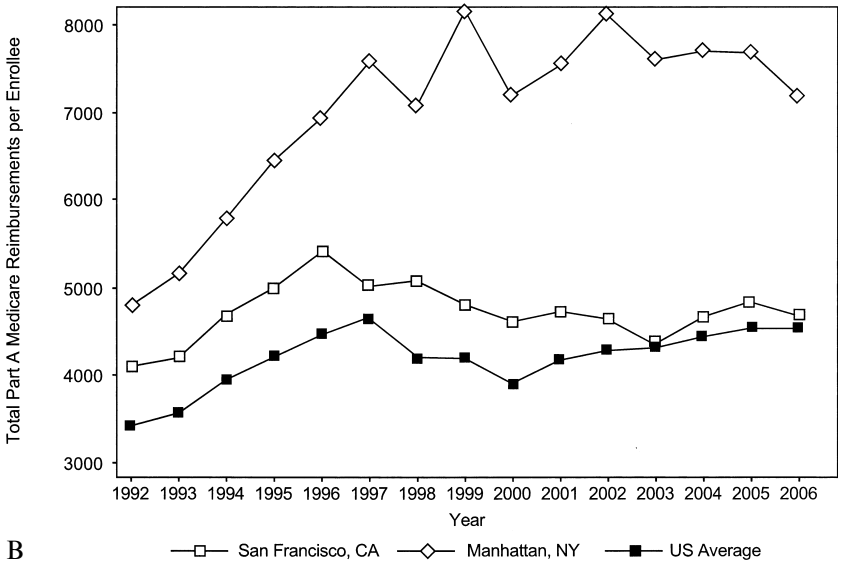


Fig. 4.5 Part A and Part B spending growth by quintile of 1992 spending: A, Part A spending; B, Part B spending

Note: Average growth rates for panel A: Q1 = 2.68, Q2 = 2.42, Q3 = 2.28, Q4 = 1.93, Q5 = 1.90. Average growth rates for panel B: Q1 = 6.06, Q2 = 5.54, Q3 = 5.22, Q4 = 4.83, Q5 = 4.44. All figures in 2006 dollars.



A



B

Fig. 4.6 Spending in selected high- and low-growth HRRs: A, high-growth HRRs; B, low-growth HRRs

Note: All figures in 2006 dollars.

Part B growth rates: Miami, Florida, and McAllen, Texas (we picked these HRRs because their practice style has been discussed at length by commentators such as Gawande [2009]). Miami started the period as one of the highest-cost HRRs and has grown at a considerably higher rate than other HRRs, particularly since 1999. McAllen, on the other hand, was near the U.S. average cost in the early 1990s, but has experienced growth far above the U.S. average and ended the period as one of the highest-cost HRRs. There are also outliers on the side of being low-cost places; as figure 4.6, panel B shows, Manhattan experienced high growth in Part A spending, while San Francisco's rate of growth was significantly below the U.S. average.

4.3.3 Factors Associated with Changes in Spending

Table 4.3 presents results from HRR fixed effects regressions, which are designed to shed light on the determinants of spending increases. The outcome variable, spending growth in each HRR, was measured by the difference in log average per beneficiary reimbursements between the beginning and the end of each time period. Separate regressions were performed for Part A, Part B, and total Medicare reimbursements. The time periods measured were from 1992 to 1993 to 2003 to 2004 (long term) and from 1999 to 2000 to 2003 to 2004 (short term). We pooled data for two years to relieve concerns about mean-reversion. The HRR fixed effects control for all unchanging attributes of these areas, including persistent differences in local price levels and illness. Additionally, the inclusion of HRR fixed effects also implies that differences in the initial level of spending are not confounding the analysis. This is important in light of the previous discussion where higher growth rates were noted in HRRs with low initial spending levels.

In the results reported in table 4.3, we see that higher mortality rates are significantly associated with lower growth in Part A spending and higher growth in Part B spending over the long term (1992 to 2004). A 10 percent increase in mortality rates (within an HRR) is associated with a 5 percent decrease in Part A spending, but a corresponding increase (5.6 percent) in Part B spending. Due to these countervailing effects, changes in mortality are not significantly associated with changes in total Medicare spending. Also, the link between mortality and spending is not significant over the short term (1999 to 2004). Our interpretation of these results is that while changes in patient illness surely predict spending at the individual level, changes in area-level mortality do not predict area-level increases in spending.

In the second column of each set of regressions, we add log per capita income as a regressor. We find that within-HRR changes in income and mortality are largely orthogonal to each other; the coefficients on mortality barely change with the inclusion of income. Over both the long term and the short term, increases in income are associated with decreases in Part A reimbursements (a 10 percent increase in income is associated with a 3 percent decrease in Part A spending). There is no association observed with

Table 4.3 **Results from HRR fixed-effects regressions of growth in Part A and Part B reimbursements on HRR mortality and income**

	ln(Part A reimbursements)		ln(Part B reimbursements)		ln(Total reimbursements)	
			1992/1993–2003/2004			
ln(Mortality)	–0.472***	–0.491***	0.563***	0.567***	–0.0605	–0.0739
	(0.17)	(0.17)	(0.14)	(0.14)	(0.14)	(0.14)
ln(Per capita income)		–0.283**		0.0592		–0.203*
		(0.13)		(0.11)		(0.10)
HRR FE	Yes	Yes	Yes	Yes	Yes	Yes
Age composition	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.85	0.86	0.98	0.98	0.96	0.96
Average baseline reimbursement	$3,481		$1,953		$5,434	
			1999/2000–2003/2004			
ln(Mortality)	0.201	0.234	0.258*	0.270*	0.289*	0.313*
	(0.21)	(0.21)	(0.15)	(0.15)	(0.16)	(0.16)
ln(Per capita income)		–0.238**		–0.0826		–0.173*
		(0.12)		(0.085)		(0.092)
HRR FE	Yes	Yes	Yes	Yes	Yes	Yes
Age composition	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.63	0.64	0.96	0.96	0.89	0.89
Average baseline reimbursement	$4,024		$2,742		$6,767	

Notes: Standard errors in parentheses; regressions and means weighted by HRR population.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Part B reimbursements, and the coefficient on total reimbursements is only marginally significant. We do not view this evidence as a definitive rejection of the Hall and Jones (2007) hypothesis—that health care is a luxury good (or more specifically, has higher marginal utility associated with it relative to nonhealth consumption)—but neither do these regressions provide strong support for the hypothesis that health care spending is driven largely by community-level income levels. Note that the HRR fixed effects account for between 74 percent and 96 percent of the variation depending on the time period considered and the spending category. Thus, regional spending patterns exhibit a high degree of stability over time; except for regions like McAllen, high-spending HRRs in 1992 also tend to be high-spending in 2006, and conversely.

Next, we examine the role of one potential explanation for increases in Medicare spending: fraud and its closely related cousin, financial entrepreneurship by hospitals and physicians. Some providers have overstated patients' medical conditions while others have billed for services that were

Table 4.4 **Coefficients from regressions of change in Medicare reimbursements on change in home health spending before and after the BBA of 1997**

Dependent variable	No covariates	Including covariates
Part A	–0.0962**	–0.102**
	(0.040)	(0.044)
Part B	0.0789***	0.0704***
	(0.016)	(0.015)
Outpatient services	–0.0600***	–0.0738***
	(0.022)	(0.022)
Medical care services	–0.00179	0.0260
	(0.020)	(0.019)
Surgical services	0.154	0.0329
	(0.10)	(0.12)
Diagnostic, lab, and X-ray services	0.00837	0.0231
	(0.038)	(0.037)
Durable medical equipment	0.302***	0.155***
	(0.032)	(0.029)

Notes: Standard errors in parentheses. Each line cell represents coefficient from separate regression, where the dependent variable is ln (change in category 1992–2006) and the independent variable of interest is ln (HH change) = ln(difference between 96–97 (peak) average and 00–01 (trough)). Regressions including covariates control for age distribution, adjusted mortality, and income in the HRR, where values of the covariates are averages for 1992–1993 (baseline).

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

unnecessary or never delivered in the first place (General Accounting Office [GAO] 1981, 1986, 1996, 2009). One marker of the degree to which financial entrepreneurship occurred in an area is the HRR-level reduction in home health reimbursements after the BBA of 1997 revised rules to reduce wasteful home health reimbursements (McCall et al. 2001). Under this assumption, HRRs with the largest drops in home health spending were also the most likely to be those that had been profiting from the previously loose rules governing home health reimbursement. Panel C of figure 4.2 illustrates this phenomena nationally: 1996 and 2000 represent the peak and trough, respectively, of average home health spending across the United States but there is regional variation in the size of the home health contraction. To investigate the association between financial entrepreneurship among providers and overall changes in Medicare spending within HRRs, we regressed the change in reimbursements for different categories of spending on the change in home health reimbursements from the pre-BBA to the post-BBA years. Table 4.4 presents the coefficients on change in home health spending from separate regressions for each spending category, both with and without adjustments for age, mortality, and income. Part B reimbursements grew significantly more in HRRs that experienced a larger post-BBA drop in

home health reimbursements. Each additional 10 percent decrease in home health spending over the BBA period (1996 to 2001) is associated with 0.8 percent greater increase in Part B spending and a 3 percent greater increase in durable medical equipment spending over the long term (1992 to 2006). As previously noted, durable medical equipment is frequently the target of Medicare fraud investigations and is one of the few service categories with little or no risk to the patient from overprovision. Therefore, it seems possible that the boom and bust of home health expenditures provides a useful marker of regions that tend to "innovate" in areas of medicine with high profit margins but uncertain effects on health.

4.4 Discussion

In this analysis we have offered a simple taxonomy of the sources of cost growth in Medicare. Cost growth in this program is largely the consequence of increases in spending on Part B services, mainly medical care and outpatient services. In recent years, growth has been driven more by increases in reimbursement levels for each encounter rather than in the number of encounters. Several expensive treatments—CABG, carotid endarterectomy, and hip fracture—experienced declines in use, while a number of typically discretionary services—back surgery, knee and hip replacement—experienced increases as well. These trends may be due to the entry of younger, healthier cohorts into Medicare, but our trends are robust to controlling for the age composition of the local health care market.

We failed to find an association between changes in income and changes in Medicare reimbursement. It is possible that Medicare's prospective reimbursement structure may introduce a wedge between patients' ability to get the care that they demand as a result of higher incomes, but it should be noted that reimbursement for many services covered by Part B of the Medicare program are not "capped" or subject to any form of capitation. However, even for these Part B services we detected no association between increases in income and increases in use of services. Future work should examine whether non-Medicare spending might reveal an income effect, but that analysis is beyond the scope of this chapter.

Both low and high spending regions (based on initial 1992 level of spending) grew by similar dollar amounts, suggesting that cost growth in health care diffuses in a relatively uniform pattern, and that over time the extent of across-regional variability might decline slightly over time. Still, the degree of persistence in spending levels across regions is high, suggesting that their determination may in part be the consequence of other factors that evolve slowly over time, such as the composition of the physician workforce (Baicker and Chandra 2004) or the organizational structure of hospitals (and hospital beds) in the region. Even within this relative uniformity, we find outliers: costs increased strikingly in McAllen, Texas, and Miami,

Florida, while costs lag behind the average growth rates in San Francisco and San Diego.

One important limitation of our analysis is that we do not measure the benefits of increased spending and emphasize that these may be large relative to the size of the increase in costs. As we discuss, it is very difficult to quantify improvements in health that extend beyond mortality, such as gains in patient satisfaction and reductions in side effects. Because many treatments work on these margins and are expensive does not automatically mean that they are without value. But our focus on costs can help guide the search for where the benefits must be found if the increased spending is viewed as being socially optimal.

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