

JANUARY 2011

**REPORT TO THE CONGRESS**

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Regional Variation  
in Medicare  
Service Use



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in Medicare  
Service Use

**MEDPAC** Medicare  
Payment Advisory  
Commission

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## Acknowledgments

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## **Executive summary**

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## Executive summary

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Regional variation in spending and service use among Medicare beneficiaries has long been an issue of interest among policymakers and health service researchers. There is little evidence that higher service use results in higher quality, and some argue that overall health care use and spending could be substantially reduced without harming quality if service use patterns of high-use regions were brought down to lower levels. Key questions in the debate are how to measure variation, how large the variation is, what drives variation, and what policies should be pursued.

We find that there is an important difference between regional variation in Medicare spending and regional variation in the use of Medicare-covered services. Regional variation in Medicare spending per beneficiary reflects many factors, including differences in beneficiaries' health status, Medicare payment rates, service volume (number of services), and service intensity (e.g., MRI vs. simple X-ray). In contrast, regional variation in the use of Medicare services reflects only differences in the volume and intensity of services that beneficiaries with comparable health status receive. We find that, although service use varies less than spending, the amount of service provided to beneficiaries still varies substantially. Specifically, service use in higher use areas (90th percentile) is 30 percent greater than in lower use areas (10th percentile); the analogous figure for spending is about 55 percent.

We find that regional variation is particularly high for post-acute sector services, such as home health; thus, those services contribute to overall variation disproportionately to their absolute dollar value. Nonetheless, areas that are high use in one sector (such as inpatient, ambulatory, and post-acute) tend to be high use overall, and all three sectors contribute to overall variation. We also find that areas with high service use among Medicare decedents (those who died during the year) tend to have high service use for nondecedents as well. In short, the pattern of high use often extends across different services and different groups of beneficiaries.

Additionally, we find that:

- Variation in service use is similar across metropolitan statistical areas (MSAs) and nonmetropolitan areas, and the average service use is close to the national average in both MSAs and nonmetropolitan areas.
- The level of service use has a slightly inverse relationship to growth in service use, although one can find examples of all combinations of level and growth.
- There is variation at other levels of geography such as areas within a state or among providers within an MSA.
- Regional variation also exists in the use of drugs in Medicare Part D. Specifically, drug use in higher use areas (areas in the 90th percentile) is about 20 percent greater than in lower use areas (areas in the 10th percentile).

What policies should be pursued in light of these findings is beyond the scope of this paper, which is meant only to inform policymakers on the nature and extent of regional variation in Medicare service use. However, we do note that at the extremes, there is nearly a twofold difference between the MSA with the greatest service use (the Miami, FL, MSA) and the MSA with the least service use (the LaCrosse, WI, MSA). Extremely high levels of service use in certain areas may be driven by overuse and, possibly, fraud and abuse. Additional policy measures may have to be taken in those areas beyond those used to address variation in general. ■

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**Regional variation in  
Medicare service use**

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## **Regional variation in Medicare Part A and Part B spending and service use**

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Regional variation in spending and service use among Medicare beneficiaries has been an issue of interest among policymakers and health service researchers (Fisher et al. 2003a, Fisher et al. 2003b, Gottlieb et al. 2010, Medicare Payment Advisory Commission 2009b, Zhang et al. 2010, Zuckerman et al. 2010). There is little evidence that higher service use results in higher quality, and some argue that overall health care use and spending could be substantially reduced without harming quality if service use patterns of high-use regions were brought down to lower levels (Baicker and Chandra 2004, Wennberg et al. 2002). We first look at variation in spending and service use and contrast the two. It is important to distinguish between spending and service use, because correctly identifying areas with high use is a necessary first step to decreasing use in those areas. We then investigate what may be driving the level of use in high-use areas by analyzing service use by decedents and nondecedents and by service sector (i.e., acute inpatient, ambulatory, and post-acute).

### **Data and method**

In our analysis, we use beneficiary-level program spending in fee-for-service (FFS) Medicare from the Beneficiary Annual Summary File (BASF)<sup>1</sup> and claims-level information from the Medicare Provider Analysis and Review file (MedPAR). We report on the raw spending listed in the BASF for Medicare beneficiaries. The data are aggregated by geographic area based on where the beneficiaries reside, not on where the services are provided. To determine service use, we first adjust the spending reported in these files for geographic differences in wages and special payments to some hospitals and physicians. We then adjust for beneficiaries' health status and demographics. [In a previous paper, we used different data sources and methods but arrived at very similar results (Medicare Payment Advisory Commission 2009a). Appendix A compares the results from the two data sources in detail and can be found online at [http://medpac.gov/chapters/Jan11\\_RegionalVariation\\_Appendix.pdf](http://medpac.gov/chapters/Jan11_RegionalVariation_Appendix.pdf).]

Regional variation in Medicare spending per beneficiary reflects many factors, including differences in beneficiaries' health status, Medicare payment rates, service volume (number of services), and service intensity (e.g., MRI vs. simple X-ray). Medicare pays different prices in different geographic areas because, for example, it takes into account that it is more expensive to hire a nurse in New York City than in rural Kansas. To understand differences in service use (i.e., differences in the volume and intensity of services that beneficiaries with comparable health status receive), we need to adjust spending data to remove factors such as differences in prices and health status. Otherwise, we could wrongly conclude that an area had high use when in fact it had high prices, a very ill population, or both.

### **Medicare spending**

We start with program spending at the beneficiary level reported in the BASF. For the analysis in this paper, we aggregate the data to metropolitan statistical areas (MSAs) and rest-of-state nonmetropolitan areas where the beneficiary resides. This level of aggregation is intermediate between counties, which can have very small populations and hence unstable spending data, and states, which can combine very different health care market areas and thus obscure important differences. We average three years of data (2006, 2007, and 2008) to minimize any remaining

instability due to areas having very few beneficiaries. For purposes of presentation, we weight each geographic area by its Medicare population.

### **Translating Medicare spending to a measure of service use**

To arrive at a measure of service use, we first adjust for regional differences in prices and special payments to certain providers. Specifically, we adjust for:

- regional prices (measured by hospital wage indexes and geographic practice cost indexes);
- additional payments to hospitals above the standard rates in the inpatient prospective payment system, including graduate medical education, indirect medical education, and disproportionate share payments;
- additional payments to physicians above the standard rates in the physician fee schedule in physician scarcity areas and health professional shortage areas; and
- additional payments to rural hospitals above standard rates, including special payments for sole community hospitals, small rural Medicare-dependent hospitals, and critical access hospitals.

In adjusting for factors used to account for areas' differences in wages and special circumstances, such as the wage index and health provider shortage area payments, we are not dismissing them as unimportant. We must adjust for those factors to arrive at service use, but setting the appropriate levels for them involves important issues that deserve consideration in their own right. In previous reports, for example, we recommended changing the way Medicare computes the hospital wage index and special payments to teaching hospitals (Medicare Payment Advisory Commission 2007, Medicare Payment Advisory Commission 2009b).

We then adjust for demographics and beneficiaries' health status. Using a regression-based method, we conduct a beneficiary-level analysis with data for 100 percent of Medicare FFS beneficiaries (about 35 million records). These adjustments are summarized in the text box (pp. 14–16).

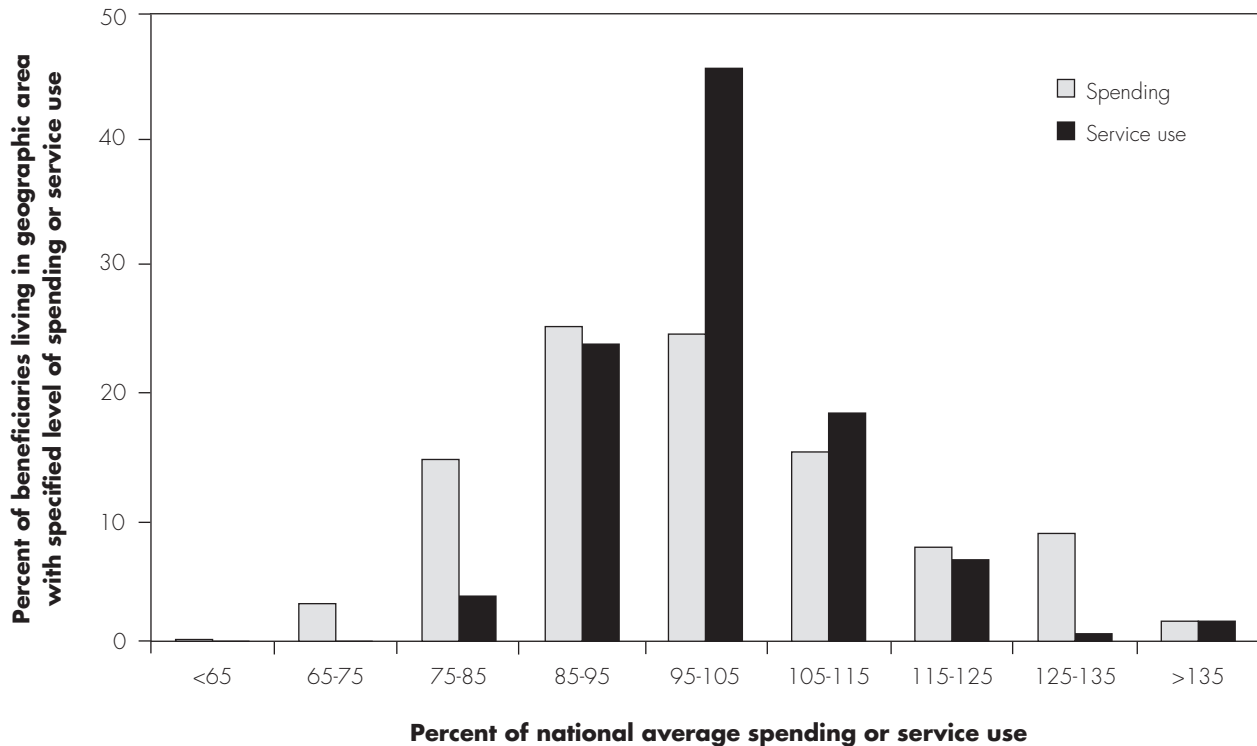
Together the adjustments produce a regional measure of service use that reflects regional differences in physician practice patterns, entrepreneurial tendencies, beneficiaries' predilection for seeking care (including differences in supplemental insurance, family support, and ease of access), and other factors. Our calculation of service use in each area relative to the national average can be found in Appendix B online at [http://medpac.gov/chapters/Jan11\\_RegionalVariation\\_Appendix.pdf](http://medpac.gov/chapters/Jan11_RegionalVariation_Appendix.pdf).

### **Variation in Medicare service use is less than variation in Medicare spending**

Service use has less regional variation than raw (unadjusted) spending (Figure 1). For example, 46 percent of FFS beneficiaries live in areas that have **service use** within 5 percent of the national average. In contrast, only about 25 percent of FFS beneficiaries live in areas where **raw spending** is within 5 percent of the national average (bars 95–105 in Figure 1). About 2 percent live in areas with service use more than 25 percent above the national average (last two dark bars in Figure 1) while about 10 percent live in areas with spending more than 25 percent above the national average (last two light bars in Figure 1).

**Figure 1**

**Service use has less variation than spending, but large differences remain**



Note: Spending is per capita Medicare Part A and Part B spending among fee-for-service beneficiaries in each area. Service use is per capita Part A and Part B service use among fee-for-service beneficiaries in each area. Areas are defined as metropolitan statistical areas for urban counties and rest-of-state nonmetropolitan areas for nonurban counties.

Source: MedPAC analysis of 2006–2008 beneficiary-level Medicare spending from the Beneficiary Annual Summary File and Medicare inpatient claims.

Another way to consider the variation is that service use is 30 percent higher for beneficiaries in the area at the 90th percentile compared with beneficiaries in the area at the 10th percentile; the corresponding figure for raw spending is 55 percent (Table 1, p. 6). At the extremes, service use is nearly two times greater in the highest area than in the lowest area, whereas spending in the highest area is more than 2.5 times that in the lowest area.

The average distance from the national mean [per member per month (PMPM)] is about \$60 under the service use measure compared with about \$100 under the raw spending measure (Table 1). (To determine the average distance from the mean for each area, we calculated the absolute difference in dollars between the area and the national mean. We then calculated the mean of those absolute differences.) Because we have constructed service use to equal the same sum of dollars as spending, the means of both distributions are equal and the values for the average difference from the mean are directly comparable.

Similar calculations can also be made adjusting just for prices and special payments. The result falls between measures calculated using raw spending and service use. Specifically, the ratio of the 90th to the 10th percentile is 1.44 and the average difference from the mean is \$86. Stated another way, about 17 percent of the total variation in spending is explained by prices and special payments.

**Table 1****Service use has less regional variation than spending, but large differences remain**

Measure of variation across areas	Spending	Service use
Ratio of 90th to 10th percentile	1.55	1.30
Ratio of maximum to minimum	2.61	1.84
Average distance from the mean (PMPM) (mean = \$791)	\$104	\$61

Note: PMPM (per member per month). Spending is per capita Medicare Part A and Part B spending among fee-for-service beneficiaries in each area. Areas are defined as metropolitan statistical areas for urban counties and rest-of-state nonmetropolitan areas for nonurban counties. Service use is per capita Part A and Part B service use among fee-for-service beneficiaries in each area.

Source: MedPAC analysis of 2006–2008 beneficiary-level Medicare spending from the Beneficiary Annual Summary File and Medicare inpatient claims.

**Regional variation in service use is similar among decedents and nondecedents**

We have examined how regional variation in medical use differs for two subsets of Medicare beneficiaries: those who died in the calendar year of analysis (decedents) and those who did not die (nondecedents). We combine all decedents in the calendar year and compute a monthly average use for each beneficiary, taking into account the number of months the beneficiary was in FFS.

As expected, we find that service use for decedents is much greater, more than nine times, than that of nondecedents. However, the variation across areas is quite similar. The ratio of the 90th to the 10th percentile for decedents is 1.33 and for nondecedents it is 1.29. The coefficient of variation is almost equal: 0.12 for decedents and 0.11 for nondecedents. Relative service use for decedents and nondecedents is highly correlated (the correlation coefficient is 0.82); that is, areas with high use for decedents also tend to have high use for nondecedents, although this statement is not true for every area. One can conclude that for the most part the patterns of care for nondecedents carry over to the care for decedents; that is, practice patterns and related factors tend to be similar for both populations in an area. The finding that variation in service use for nondecedents is similar to variation for all FFS beneficiaries mitigates the concern that higher service use is being driven by unusually high spending on decedents. In fact, in the two highest use areas—where service use is about 40 percent higher than the national average, service use by nondecedents is proportionally even greater—about 50 percent higher than the national average for nondecedents.

**Regional variation in service use by sector**

Thus far, our analysis of geographic variation has focused on total medical service use in FFS Medicare (i.e., Medicare Part A and Part B services). In this section, we examine regional variation in medical use by sector to try to understand what drives regional variation. The BASF and our analysis of the MedPAR file allow us to look at regional variation for 10 sectors: short-term hospital inpatient,<sup>2</sup> inpatient psychiatric, hospital outpatient (OPD) (which includes rural



health clinics), carrier [physician, ambulatory surgical center (ASC), and lab combined], durable medical equipment (DME), hospice, home health, skilled nursing facility (SNF), long-term care hospital (LTCH), and inpatient rehabilitation facility (IRF). For purposes of analysis, we create three composite sectors, which include all the above sectors except DME and hospice:

- The acute inpatient composite sector combines the short-term inpatient and psychiatric sectors to account for psychiatric patients being treated in hospitals without separate psychiatric units.
- The ambulatory sector combines the physician, ASC, and lab sectors with the OPD sector because there may be substitution across those sectors.
- The aggregate post-acute sector combines home health and the SNF, LTCH, and IRF sectors to account for substitution across the latter three sectors. This issue is particularly important when some sectors are not present in a geographic area—for example, not all areas have an IRF or LTCH.

For each sector, we rerun the regression model and recalculate the weights for each variable. In essence, this calculation creates a sector-specific health status adjuster. For example, metastatic cancer has a much greater coefficient for total service use than it does for post-acute service use. Thus, our results by sector will differ from those that would be obtained by using a beneficiary's hierarchical condition category risk score to adjust sector spending for health status.

### **Regional variation in service use differs by sector**

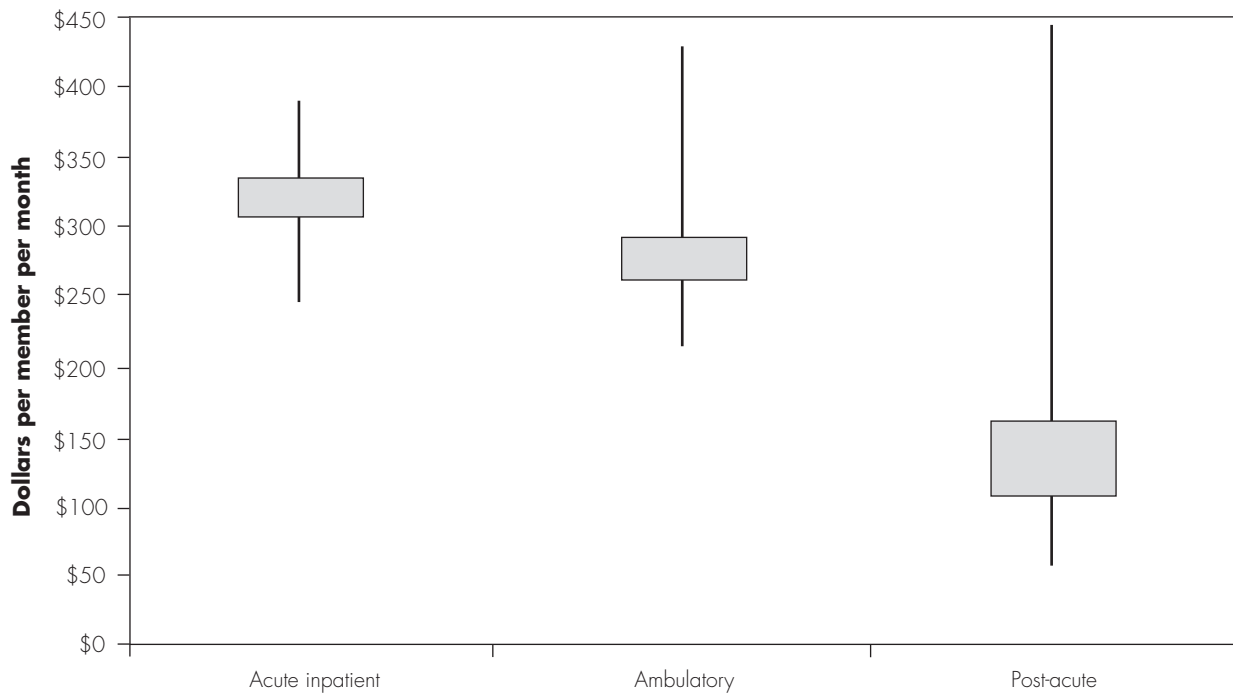
Figure 2 (p. 8) shows the variation in service use for the composite sectors across MSAs in dollars per member per month.<sup>3</sup> The 25th percentile to the 75th percentile of the distribution for each sector is indicated by a box and vertical lines extend to the extreme values. The post-acute sector has the greatest variation among the sectors, ranging from about \$60 in the lowest use area to almost \$450 in the highest use area. The range between the 25th percentile and the 75th percentile is also much wider for the post-acute sector than it is for the other two sectors. The inpatient sector, although it has higher average spending than the other two sectors, shows smaller variation, ranging from about \$250 to almost \$400.

Because of its wide variation, the post-acute sector has an effect on the overall variation disproportionate to its dollar value. For example, removing post-acute use from total use reduces the average difference from the mean from \$61 to \$37—that is, by about 40 percent even though post-acute is less than 20 percent of the total. The variation in use of post-acute services is particularly evident at the top and bottom of the distribution. At the top 10th percentile of areas ranked on total service use, use of post-acute services is about \$198 PMPM, compared with \$99 PMPM at the bottom 10th percentile.

Table 2 (p. 9) illustrates the contribution to variation of each of the composite sectors. The ratio of the 90th percentile to the 10th percentile is about 2.0 for the post-acute sector and about 1.2 for the inpatient and ambulatory sectors. Looking at the maximum and minimum values, post-acute exhibits the widest variation with a ratio of almost 8. The average distance from the mean is larger for the post-acute care sector than for the other two sectors, even though the average service use (PMPM) is lower for post-acute than for the inpatient or the ambulatory sector. Nonetheless, it is

**Figure 2**

**The post-acute sector exhibits the greatest variation**



Note: Figure shows maximum, 75th percentile, 25th percentile, and minimum of the distribution of per capita service use in each sector across areas. Areas are defined as metropolitan statistical areas for urban counties and rest-of-state nonmetropolitan areas for nonurban counties.

Source: MedPAC analysis of 2006–2008 beneficiary-level Medicare spending from the Beneficiary Annual Summary File and Medicare inpatient claims.

important to address variation in each of these sectors and not just the high-cost inpatient sector or the high-variation post-acute sector.

**Service use is positively correlated between sectors**

We also find positive correlation between composite sectors. We find a correlation of 0.26 between inpatient and ambulatory services, 0.35 between inpatient and post-acute care, and 0.39 between ambulatory and post-acute care. This finding suggests that these services tend to be higher (or lower) in the same geographic locations rather than substituting for one another. In contrast, the two subsectors of ambulatory services—outpatient services and the combination of ASC, physician, and lab services—have a negative correlation of  $-0.54$  with one another. This correlation suggests that they can be substitutes; for example, a beneficiary could choose to have a clinic visit in a hospital outpatient department or an office visit in a physician’s office.

Use in each of these three sectors is highly correlated with total service use: 0.65 for inpatient, 0.67 for ambulatory, and 0.85 for post-acute. This finding is not surprising because each is a component of total service use. The post-acute sector, which has the greatest variation, also has the greatest correlation with total service use.

**Table 2****The post-acute sector exhibits the greatest variation**

<b>Measure of variation across areas</b>	<b>Acute inpatient</b>	<b>Ambulatory</b>	<b>Post-acute</b>
Ratio of 90th to 10th percentile	1.22	1.24	2.01
Ratio of the maximum to the minimum	1.59	2.01	7.97
Average distance from the mean (PMPM)	\$18	\$20	\$34

Note: PMPM (per member per month). Areas are defined as metropolitan statistical areas for urban counties and rest-of-state nonmetropolitan areas for nonurban counties. Service use is per capita service use by sector among fee-for-service beneficiaries in each area.

Source: MedPAC analysis of 2006–2008 beneficiary-level Medicare spending from the Beneficiary Annual Summary File and Medicare inpatient claims.

**Additional findings on service use**

Our analysis leads to three additional observations about Medicare service use.

**Variation in service use is similar across MSAs and nonmetropolitan areas**

The average service use values for MSAs and for nonmetropolitan areas are both close to the national average. Specifically, for MSAs it is 100.5 percent of the national average; for nonmetropolitan areas it is 98.4 percent of the national average. (In contrast, unadjusted spending averages about 3 percent above the mean for MSAs and 9 percent below the mean for nonmetropolitan areas.) That service use on average is so close across MSAs and across nonmetropolitan areas is an important finding in itself, and it reinforces the importance of looking at service use and not just unadjusted spending. In addition, wide variation in use underlies both averages. MSA service use values range from 25 percent below the national average to 40 percent above the national average. Similarly, nonmetropolitan service use values range from 25 percent below the national average to 29 percent above the national average. In short, variation is not solely an MSA phenomenon. There is variation across both MSAs and nonmetropolitan areas, and there are both MSAs and nonmetropolitan areas near the top of the distribution and near the bottom of the distribution.

**Level of service use has a slightly inverse relationship to growth in service use**

To examine the relationship between areas' level of service and level of growth, we compared the level of service use in 2006 with the level of service use in 2008 to determine a growth rate from 2006 to 2008. We found a slightly negative correlation—that is, an inverse relationship—between the areas' level of service use and level of growth. This finding indicates that, on average, higher use areas tend to have lower growth rates and lower use areas tend to have higher growth rates, although one can find examples of all combinations of level and growth.

**There is variation at other levels of geography**

Variation in service use exists at other levels of geography. Thus far, we have examined variation across the nation; however, there is also variation within states and within MSAs. For example,

among areas (MSAs and the statewide nonmetropolitan area) in Pennsylvania, per beneficiary service use is 32 percent higher in the highest use area than in the lowest use area. We also note that there is variation among providers within MSAs. For example, using an episode-based methodology, within the Phoenix MSA in 2005–2006, cardiologists' resource use for similar episodes of care varied from 47 percent below the mean at the 10th percentile to 90 percent above the mean at the 90th percentile (Houchens 2010).

## **Unique factors may drive extreme levels of service use**

Many factors drive service use, such as differences in physician practice patterns and care decisions and differences in beneficiaries' predilection for seeking care (including differences in supplemental insurance). But service use among areas could differ for more idiosyncratic reasons as well. At the extremes, the MSAs with the greatest service use (Miami, FL, and McAllen, TX) have almost twice the level of service use as areas with the lowest service use (nonmetropolitan Hawaii and the LaCrosse, WI, MSA).

The lowest use areas exhibit very low use of the post-acute sector, commonly about half of the national average. For example, we find service use in LaCrosse is moderately low for inpatient and ambulatory (about 80 percent of the national average) and particularly low for post-acute (less than 50 percent) and for home health within post-acute (about 25 percent). Hawaii shows a similar pattern.

In areas with very high levels of service use, factors such as physician practice patterns and beneficiaries' predilection for care may drive service use above average, but different factors may account for the most extreme reported service use in areas like the Miami, FL, and McAllen, TX, MSAs. Service use in these MSAs was almost 40 percent higher than the national average.

### **Home health use in the McAllen, TX, MSA**

The McAllen, TX, MSA has very high service use in the post-acute care sector—3.2 times the national average (home health use is almost 7 times the national average). Use in the ambulatory sector is high as well—1.2 times the national average. However, use in the inpatient sector (which is considered less discretionary) is about 0.9 times the national average. Some have attributed high use in more discretionary services to the entrepreneurial nature of the health care system in McAllen. For example, as Atul Gawande wrote in his *New Yorker* article on Medicare spending in McAllen, there has been an explosion of home health agencies in McAllen and their marketing tactics could encourage overuse (Gawande 2009).<sup>4</sup>

### **DME and home health in Miami-Dade, FL**

Very high use of DME and home health and dramatic swings in that use is evident in Miami-Dade, FL. For example, Table 3 shows at the county level DME and home health spending per capita for four neighboring counties in south Florida. DME spending per capita in Miami-Dade was \$2,043 in 2006—about 10 times as high as in Collier County, 5 times as high as in Broward County, and nearly 8 times the national average. By 2008, DME spending decreased significantly in Miami-Dade, although it was still well above spending in the surrounding counties and almost three times the national average.

**Table 3****Spending for DME and home health varies widely in contiguous Florida counties**

Area	DME spending per capita		Home health spending per capita	
	2006	2008	2006	2008
South Florida county				
Broward	\$394	\$321	\$1,002	\$1,390
Collier	207	202	305	395
Miami–Dade	2,043	828	2,591	5,318
Monroe	237	210	237	334
National	263	282	392	488

Note: DME (durable medical equipment). Spending data are annualized for beneficiaries with either Part A or Part B coverage for at least one month during 2006. The results are not adjusted for differences in beneficiaries' health status or prices.

Source: MedPAC analysis of 2006 and 2008 CMS Beneficiary Annual Summary Files.

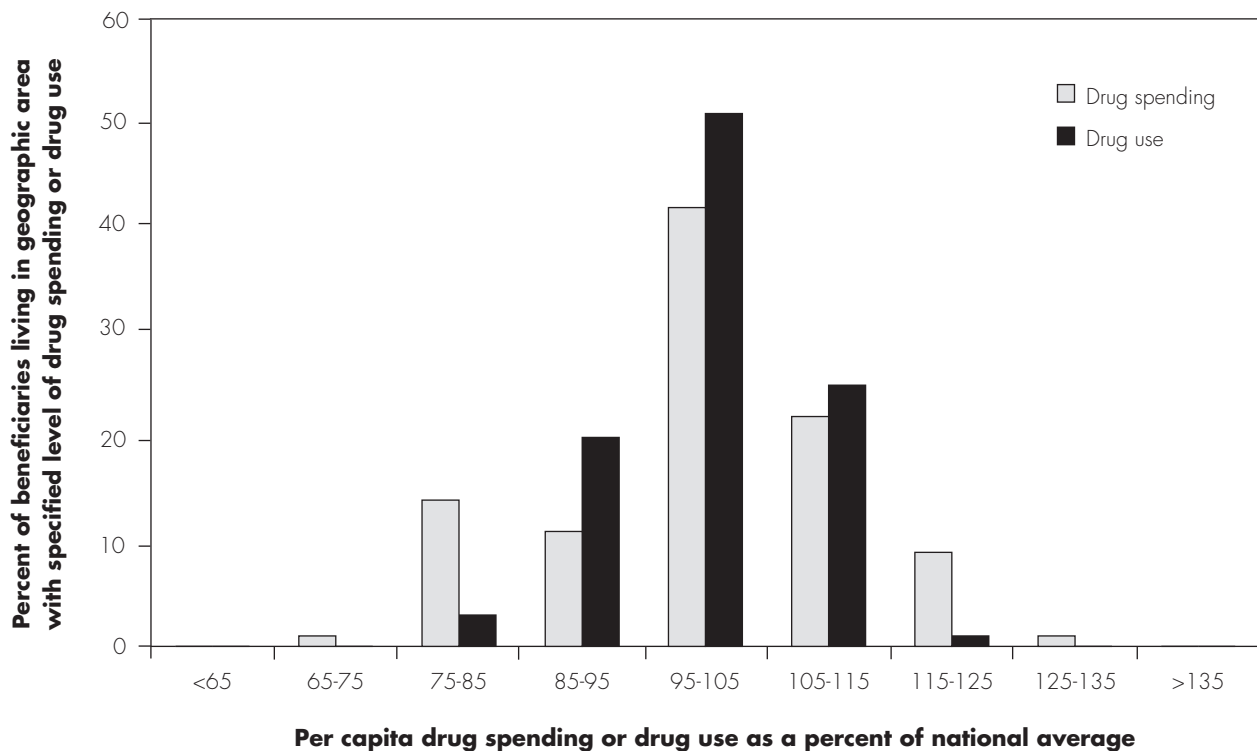
However, over the same time, per capita spending on home health in Miami–Dade doubled. It increased from \$2,591 in 2006, to \$5,318 by 2008. It also increased in neighboring counties. An explanation for these dramatic swings is that after an antifraud task force went to work in Miami in March 2007, claim amounts submitted for DME in south Florida decreased by 63 percent in one year (Morris 2010). However, as Lewis Morris, chief counsel for the Department of Health and Human Services Office of Inspector General (OIG), recently testified:

Health care fraud also migrates—as law enforcement cracks down on a particular scheme, the criminals may shift the scheme (e.g., suppliers fraudulently billing for DME have shifted to fraudulent billing for home health services) or relocate to a new geographic area (Morris 2010).

Variation at the level found in Miami–Dade cannot be explained by simple differences in practice patterns, prices, or health status. Rather, it is likely evidence of fraud, as is suggested by the many OIG reports on the topic (Office of Inspector General 2007a, Office of Inspector General 2007b, Office of Inspector General 2009a, Office of Inspector General 2009b). As such, policy actions to address high use in areas such as Miami may need to include additional efforts beyond those taken to address variation in other high-use areas.

## Regional variation in drug use

In the previous sections, we focused on regional variation in medical service use for FFS Medicare (i.e., Medicare Part A and Part B services). In this section, we examine regional variation in prescription drug use for drugs covered under Medicare Part D.

**Figure 3****Drug use varies less than drug spending for Part D enrollees**

Note: Drug spending is average gross drug spending among Part D enrollees. Drug use is average gross drug spending among Part D enrollees adjusted for prices and beneficiary characteristics. Areas are defined as metropolitan statistical areas for urban counties and rest-of-state nonmetropolitan areas for nonurban counties.

Source: MedPAC analysis of 2007 and 2008 beneficiary-level prescription drug event data.

## Data and method

To examine the variation in drug use among beneficiaries enrolled in Part D, we use 2007 and 2008 prescription drug event (PDE) data, adjusted for regional differences in prices.<sup>5</sup> The PDE data include all payments to pharmacies for drugs covered by Part D, including payments by plans, beneficiaries, and directly from Medicare through the low-income cost-sharing subsidy that provides help to beneficiaries with low income and assets. (This analysis differs from our analysis of Part A and Part B services in the previous sections, which did not include beneficiary cost sharing.) For our analysis, we used gross drug spending—that is, all payments to pharmacies for covered drugs, excluding dispensing fees and sales tax.

We first analyze data for all Part D enrollees—that is, beneficiaries enrolled in stand-alone prescription drug plans (PDP) or in Medicare Advantage–Prescription Drug plans (MA–PD)—about 60 percent of Medicare beneficiaries.<sup>6</sup> Most of the remaining beneficiaries have prescription drug coverage from other sources, such as their employers, that is at least as generous as the Part D benefit, but we have no spending data on those sources.

**Table 4****Drug use has less regional variation than drug spending, but differences remain**

Measure of variation	Drug spending	Drug use
Ratio of 90th to 10th percentile	1.39	1.21
Ratio of maximum to minimum	2.14	1.68
Average distance from the mean (PMPM)	\$20	\$12

Note: PMPM (per member per month). Drug spending is average gross drug spending among Part D enrollees. Drug use is per capita drug use among Part D enrollees in each area. Areas are defined as metropolitan statistical areas for urban counties and rest-of-state nonmetropolitan areas for nonurban counties.

Source: MedPAC analysis of 2007 and 2008 beneficiary-level Medicare spending from prescription drug event data.

Our method for estimating drug use in each area parallels the method we used to estimate medical service use from the BASF file (see text box, pp. 14–16), although there are no special payment adjustments (e.g., IME) akin to Medicare Part A and Part B. We adjusted the gross drug spending for price differences across areas and calculated the average monthly spending for each beneficiary by dividing total spending for each beneficiary by the number of months enrolled in a Part D plan. We used a regression-based method to estimate the area-specific effects, controlling for variations in demographic characteristics (i.e., age, gender, institutionalized status, low-income subsidy status) and health status.<sup>7</sup>

**Regional variation in drug use is less than variation in drug spending**

Drug use (i.e., drug spending adjusted for variations in prices, demographic characteristics, and health status) has less variation than unadjusted drug spending for Part D enrollees. For example, Figure 3 shows that 51 percent of Part D enrollees had drug **use** within  $\pm 5$  percent of the national average compared with 42 percent for drug **spending**. In addition, at the extremes, no areas had drug use greater than 125 percent of the national average and only 3 percent of beneficiaries lived in areas with drug use less than 85 percent of the national average.

Adjusting drug spending for variations in prices, demographic characteristics, and health status reduces variations across areas. As shown in Table 4, drug spending in high-use areas (the area at the 90th percentile) is 39 percent higher than in low-use areas (the area at the 10th percentile). Drug use in the high-use area is 21 percent higher than in the low-use area. At the extremes, drug use in the highest use area is about 1.7 times that in the lowest use area. ■



## Adjusting spending in the Beneficiary Annual Summary File

**W**e use two data sources for our analysis: the Beneficiary Annual Summary File (BASF) and the Medicare Provider Analysis and Review file (MedPAR).

We use the BASF to compute an area's per capita Medicare spending. We compute Medicare program spending and do not include beneficiaries' payments for cost sharing. If there were systematic regional differences in cost-sharing amounts resulting from different mixes of services, those differences would not be reflected in our data. In the BASF, data are aggregated to the beneficiaries' area of residence, not to where the services are provided.

For all services other than hospital inpatient, we obtained beneficiary-level spending data from the BASF. We adjusted the spending data on the BASF for geographic differences in regional prices [geographic practice cost indexes (GPCIs) for physicians and hospital wage indexes (HWIs) for all other providers] and additional payments to physicians located in health professional shortage areas and physician scarcity areas based on the location of the beneficiary. We also adjusted for special outpatient and skilled nursing payments for critical access hospitals. Unlike hospital inpatient services (discussed below), we do not address the issue of border crossing for these services. This approach could result in some overestimation of service use in rural areas if patients received their ambulatory care or post-acute care in higher priced urban areas. However, we believe this issue is smaller for these services than for inpatient service, especially with regard to physician services. For example, it is plausible that patients are less likely to travel long distances for physician services than for inpatient care. In addition, the payment areas represented by GPCIs (89 payment areas) in the physician payment system tend to be larger than the payment areas (about 420 payment areas) in the inpatient payment system. Finally, statute limits the geographic variation in GPCIs by requiring a floor of 1.0 on the physician work component of the GPCI and requiring that the work component of the GPCIs reflect only 25 percent of the actual variation in input prices.

We use the MedPAR to compute service use for hospital inpatient care. To determine service use, for each inpatient claim, we multiply the relative weight for the claim's diagnosis related group by the national standardized rate to create an estimated payment for the claim that excludes the effects of adjustments for regional prices. We summed these results from the claims to the beneficiary level to create an estimate of adjusted inpatient service use for each beneficiary. Some hospitals receive additional payments in the form of graduate medical education, indirect medical education, and disproportionate share and special payments to sole community hospitals, Medicare-dependent hospitals, and critical access hospitals. We remove the effects that these special payments have on variation in spending by calculating the national per beneficiary amount of these special payments and adding it to each beneficiary's adjusted inpatient service use. Finally, we adjust the inpatient service use to include outlier payments and adjustments for transfer cases. For our outlier adjustment, the effects of regional differences in input prices are removed.

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## Adjusting spending in the Beneficiary Annual Summary File (cont.)

We use claims data as the source for inpatient services because beneficiaries frequently obtain inpatient care in locations where the HWI used to adjust inpatient payments for geographic differences in wages is different from the HWI of their area of residence. Use of the claims data allows us to directly attribute use of inpatient services and avoids having to adjust spending on inpatient services for the “border crossing” that more often occurs with inpatient care. We could not have made the appropriate adjustment using the BASF data on inpatient services.

We sum the priced-adjusted inpatient spending from the claims with the price-adjusted spending for other services from the BASF to estimate total price-adjusted spending for each beneficiary. We create monthly price-adjusted spending for each beneficiary by dividing the total price-adjusted spending by the number of months the beneficiary participated in fee-for-service (FFS) Medicare.

We then adjust price-adjusted spending for regional differences in health using a regression-based method. [In a previous paper, we adjusted spending for regional differences in health status by dividing per capita spending in each area by the area’s average risk score from the CMS–hierarchical condition category (CMS–HCC) risk-adjustment model taken over all FFS beneficiaries in the area.] In our regression, the dependent variable is a beneficiary’s monthly FFS spending that has been adjusted for regional prices and additional payments (described above). Explanatory variables include:

- demographic variables such as age and sex,
- all 70 conditions in the CMS–HCC risk-adjustment model based on diagnoses from the previous year,<sup>8</sup>
- other beneficiary-level factors in the CMS–HCC model such as disability, dual eligible, or institutional status, and
- an indicator of the beneficiary’s area of residence.

We define areas as metropolitan statistical areas for urban counties and rest-of-state nonmetropolitan areas for nonurban counties, which resulted in 409 areas.

The result of the regression is coefficients on the demographic variables, the 70 conditions, the other factors in the CMS–HCC model, and the 409 areas. We assume the error term in the regression is white noise and has an expected mean of 0.

We use results from this regression to estimate per capita service use in each area as follows:

- We create a national average spending amount by multiplying each coefficient estimate—except for the regional indicators—by the mean value of each variable and

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## Adjusting spending in the Beneficiary Annual Summary File (cont.)

summing these products. This calculation has the effect of removing the variation in service use resulting from population characteristics, such as demographic characteristics and health status.

- We add each area's coefficient from the regression to the national average spending amount. The result is our measure-of-service use for each area.

Because our adjustment for health status is based on each beneficiary's diagnoses as reported on claims, there is a concern that beneficiaries in high-use areas will receive more diagnoses in a year than will beneficiaries in low-use areas (Song et al. 2010). Therefore, beneficiaries in high-use areas may appear "sicker" than they would if they lived in a low-use area. Our approach to health status adjustment may be influenced by that phenomenon; to the extent that it is, use in higher use areas will be underestimated in our approach and variation will appear to be smaller. That is, our approach may overadjust for health status. On the other hand, not adjusting for health status at all would lead to an error in the other direction, as areas with a sicker population would be overestimated and variation would appear greater. The beneficiary-level regression approach we use in this paper to adjust for health status is likely to overadjust to a smaller degree than the approach we used in our previous paper, which divided regional service use by the area's average risk scores from the CMS-HCC. The regression approach has a smaller overadjustment because some regional differences in diagnosis coding will be reflected in the coefficients on the regional indicators. That is, variation that may have been attributed to health status in the previous method instead will be attributed to specific metropolitan statistical areas or nonmetropolitan areas. Thus, the problem of overadjusting high-use areas will be smaller. Because there is no agreed upon measure for health status readily available from administrative data, we think that on balance, adjusting for health status as we do in this paper is a good compromise between no adjustment and using the risk scores from the CMS-HCC. ■

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## Endnotes

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- 1 BASF is a beneficiary-level file that contains enrollment, eligibility, and summarized information about Medicare service use and spending. In addition, the file contains the condition categories and the chronic conditions data warehouse flags.
- 2 Short-term hospital inpatient includes hospitals paid under the inpatient prospective payment system and those paid in other ways, such as critical access hospitals, Maryland hospitals, children’s hospitals, and cancer hospitals.
- 3 The extreme high values for some of the individual sectors are much greater than the extreme values for overall service use or the composite sectors. For example, the home health sector is almost 7 times the national average at the upper extreme. Hospice also shows very wide variation, in part because the lowest use areas are so low, 0.1, and the high is 2.6.
- 4 As the article states: “I spoke to a marketing rep for a McAllen home-health agency who told me of a process uncannily similar to what Powell found in biotech. Her job is to persuade doctors to use her agency rather than others. The competition is fierce. I opened the phone book and found seventeen pages of listings for home-health agencies—two hundred and sixty in all. A patient typically brings in between twelve hundred and fifteen hundred dollars, and double that amount for specialized care. She described how, a decade or so ago, a few early agencies began rewarding doctors who ordered home visits with more than trinkets: they provided tickets to professional sporting events, jewelry, and other gifts. That set the tone. Other agencies jumped in. Some began paying doctors a supplemental salary, as ‘medical directors,’ for steering business in their direction. Doctors came to expect a share of the revenue stream.” (Gawande 2009). The pattern of high spending on home health in McAllen has been evident for some time (Berenson 2003).
- 5 Factors used to adjust for variation in prices across regions are based on analysis done by Acumen, LLC, for the Commission. In any given year, regional variation in drug prices ranged from 1 to 2 percentage points below the national average to 1 to 3 percentage points above the national average so that the adjustment had minimal effect on the estimates of drug use across regions. These prices are arrived at through negotiations between Medicare Part D plans and pharmacies and do not reflect manufacturer rebates.
- 6 We included beneficiaries who are eligible because of end-stage renal disease in this analysis. Those beneficiaries were excluded in the analysis of Part A and Part B to keep it comparable to our earlier analysis using data from the Office of the Actuary, which does not include those beneficiaries. Because we control for end-stage renal disease status in the regression for drug use, its influence on our estimate of regional variation for drug use should be small.

- 7 We used condition categories from CMS's prescription drug hierarchical condition category (RxHCC) model and applied the hierarchies that CMS has established for the model. We separately adjusted for the low-income subsidy status, institutionalized status, whether a person has end-stage renal disease, and number of months enrolled in Part A and Part B of Medicare.
- 8 We applied the disease hierarchies that CMS has established for the CMS-HCC model. For example, the CMS-HCC has five categories for diabetes, but only the most costly category is applicable if a beneficiary has diagnoses that fit into more than one of those diabetes categories.

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## **About MedPAC**

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## The Commission

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The Medicare Payment Advisory Commission (MedPAC) is an independent congressional agency established by the Balanced Budget Act of 1997 (P.L. 105–33) to advise the U.S. Congress on issues affecting the Medicare program. In addition to advising the Congress on payments to health plans participating in the Medicare Advantage program and providers in Medicare’s traditional fee-for-service program, MedPAC is also tasked with analyzing access to care, quality of care, and other issues affecting Medicare.

The Commission’s 17 members bring diverse expertise in the financing and delivery of health care services. Commissioners are appointed to three-year terms (subject to renewal) by the Comptroller General and serve part time. Appointments are staggered; the terms of five or six Commissioners expire each year. The Commission is supported by an executive director and a staff of analysts, who typically have backgrounds in economics, health policy, and public health.

MedPAC meets publicly to discuss policy issues and formulate its recommendations to the Congress. In the course of these meetings, Commissioners consider the results of staff research, presentations by policy experts, and comments from interested parties. (Meeting transcripts are available at [www.medpac.gov](http://www.medpac.gov).) Commission members and staff also seek input on Medicare issues through frequent meetings with individuals interested in the program, including staff from congressional committees and the Centers for Medicare & Medicaid Services (CMS), health care researchers, health care providers, and beneficiary advocates.

Two reports—issued in March and June each year—are the primary outlets for Commission recommendations. In addition to annual reports and occasional reports on subjects requested by the Congress, MedPAC advises the Congress through other avenues, including comments on reports and proposed regulations issued by the Secretary of the Department of Health and Human Services, testimony, and briefings for congressional staff.

The Commission’s goal is to achieve a Medicare program that ensures beneficiary access to high-quality care, pays health care providers and health plans in a manner that is fair and rewards efficiency and quality, and spends tax dollars responsibly.



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