The Geography of Medicare

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Abstract

There is a great deal of geographic variation in Medicare Spending. For example, while the average medicare cost per beneficiary was around $5,200 in 1997, Medicare spending, adjusted for differences in regional prices and demographic composition, was about $8,000 per person in Miami, but only $3,500 in Minneapolis. In this paper, we explore the source of this variation. We find that a substantial amount can be explained by differences across areas in the health of the elderly population. This finding suggests that some of the geographic variation in medicare spending is efficient. But even accounting for differences in the health of the population, significant variation remains. We have been able to explain some of the remaining variation. The strongest factors are supply variables: for-profit hospitals and specialist physicians both increase Medicare spending. If these factors are exogenous, public policy may want to consider the supply of medical services more than it currently does. We do not find that expensive places spend a disproportionate amount on those near death.

The high cost of Medicare and impending bankruptcy of the Medicare trust fund guarantee that Medicare reform will play a prominent role in public policy over the next decade. While there is very little agreement on Medicare reform, one point is clear: making the program more efficient is a natural first step in overall reform.

There is substantial reason to doubt the efficiency of the current Medicare system. Because medical care is so complex, one would be surprised if a large government program, immune from competitive pressures, was operated efficiently. More quantitative evidence on the perceived inefficiency of Medicare comes from the dramatic variation in Medicare spending in different areas of the country. As has been noted most forcefully by Jack Wennberg and colleagues (Center for the Evaluative Clinical Sciences [CECS] 1998, and the references therein), the regional variation in Medicare outlays is enormous. In 1997, Medicare payments across metropolitan statistical areas (MSAs) averaged $5,182, with a standard deviation of $897 (N=315). Put another way, if all areas in the United States had the level of spending prevailing in the 10th percentile most expensive area, Medicare spending would fall by almost 30 percent. This type of reduction in the level of Medicare spending could substantially reduce the funding problem for Medicare (Jonathan Skinner and Elliott Fisher, 1997).

Just noting that Medicare spending varies regionally, of course, is not enough to guide policy. Regional spending differences may be efficient or inefficient, depending on their source. Regional spending differences by themselves also do not suggest a means to eliminate inefficiency. In this paper and a lengthier one (David M. Cutler, Louise Sheiner, and Jonathan Skinner, 1999), we examine the source of regional differences in Medicare spending and the impact of different policies on regional variation.

I. Explaining the Geographic Disparity in Medicare Spending

Three theories have been proposed to explain the wide regional variation in medical costs. The first theory is differences in illness. Illness differences may be due to short-term bad luck or long-term behavioral, environmental, or genetic factors. The second theory stresses differential demand for medical care conditional on illness. Demographic factors such as race and income, for example, are known to influence medical spending in controlled experiments (Joseph P. Newhouse et al., 1993). Insurance coverage might also affect medical spending, by altering demand or supply.

The third theory is that exogenous differences in the structure of medical care markets affect costs. Medical care is unlike other goods in that patients rely on physicians both to provide services and to recommend the services they need. As a result, physicians might have financial (or non-financial) incentives to recommend certain courses of treatment. For example, specialists might be more prone to recommend intensive treatments than generalists (Sheldon Greenfield et al., 1992). Differences in the training of physicians across regions might also affect treatment intensity.

We test these theories using data from the 1998 Dartmouth Atlas of Health Care (CECS, 1998). The Atlas contains information on Medicare spending and usage for 212 Hospital Referral Regions (HRRs).[1] We use spending data that are adjusted for regional price differences.[2] We match the Atlas data with demographic and other data that are available by MSA or state.

We start with the illness explanation. One version of this theory is that individuals have random illness probabilities, and high cost areas are simply areas where more adverse events randomly occur. If this is correct, areas with high costs would be transitorily, but not permanently, expensive. As Table 1 shows, however, variation in Medicare spending across areas is remarkably persistent. Fifteen years apart, the correlation of Medicare costs across MSAs is about .7, and even over 25 years the correlation is still .4. Transitory illness variation is not a major part of regional differences in Medicare costs.

Illness also has a permanent component. Rates of smoking, obesity, exercise, and hypertension, for example, all differ across areas, and these will lead to permanent differences in health. To test the importance of these factors, we relate spending to several measures of illness. We first include rates of adverse risk factors: the share of people in each MSA who are current or former smokers, and the shares of people in the state who are obese, hypertensive, and sedentary. We also include a measure of illness constructed by the Dartmouth group, which is based on the rate of hospitalization for five conditions for which hospitalization is a reasonable proxy for the incidence of disease,[3] and HRR-specific age-adjusted mortality rates. Finally, we add a number of variables related to the timing and causes of death. Previous research has shown that the cost of death declines significantly with age at death (James Lubitz and Gerald Riley, 1993) and variations in the share of the population dying at a young age will also capture variations in underlying health status. We include state-specific elderly mortality rates by 5-year age groups, as well as the state-specific share of deaths occurring in each 5-year age group, the share of deaths by MSA from each of several factors: cancer, liver failure, infectious disease, and chronic obstructive pulmonary disease, and the square of the percentage of Medicare beneficiaries in each HRR who die each year.[4]

To control for regional demographics, we include the share of the elderly population that is black, Hispanic, and female, and the share of the overall population that is rich (above $100,000), poor (below $15,000), and uneducated (less than 9 years of school).[5]

All of the elderly are insured through Medicare, so there is no variation in this across areas.[6] Insurance coverage for the non-elderly population varies greatly, however. We include the share of the non-elderly population in managed care as an explanatory variable. Managed care enrollment might affect care for the elderly by changing the technology that is available, norms about appropriate practice, or the demand for medical services (Laurence Baker and Martin Brown, 1997; Cutler and Sheiner,

1998). We have also estimated models including the share of the population that is uninsured, but this variable was not related to Medicare spending.

Finally, we include a number of measures of medical care supply. One factor that might influence spending is the percent of hospital beds that are in for-profit institutions, not-for-profit institutions, and government-owned institutions (Frank Sloan et al., 1998). In addition, many people have pointed to overall bed supply, physician supply, proximity to medical schools, and specialization rate among physicians as determinants of medical spending (CECS, 1998). The key issue in analyzing these variables is whether they are exogenously determined. Areas with greater levels of illness or greater demand for services would naturally have more medical resources than areas where people are healthier. To determine the exogenous component of demand, we have attempted to instrument for these supply variables (see Cutler and Sheiner, 1999). It is difficult to find reasonable instruments for supply that are not correlated with long-run differences in demand, however.[7] In this paper, therefore, we do not present instrumental variable estimates. We instead analyze the importance of supply variables only after controlling for measurable differences in illness and demand across areas. To the extent that we have captured demand differences fully, our supply variables will indicate the effect of exogenous supply variation on demand. More likely, the coefficients on the supply variables will be upper bound estimates of the true effect of supply on medical costs.

Figure 1 shows summary measures for regional variation in spending. The first column shows the distribution of spending without any adjustments. The second column adjusts for illness differences across areas. Illness clearly matters for medical spending; the R^2 of a regression of spending on various measures of illness is 66 percent. As Figure 1 shows, very high spending areas are frequently characterized by sicker populations. But illness is far from the only important factor. Even with the illness variables the standard deviation of residual spending is $510 (compared to $869 without the

illness variables).

The first column of Table 2 shows regressions of spending on illness variables (not reported) and demographics. Demographic factors help explain some of the remaining spending variation. The most important demand factors are the share of elderly who are Hispanic (a 1 percentage point increase raises spending by $35 per person) and women (a 1 percentage point increase in the share of the elderly who are women raises spending by about $100 per person). It is important to note that the Medicare spending on the left-hand-side of our regressions are already standardized for age-sex-and race differences (although not Hispanic). The effect of the percent of elderly who are women then is an indirect one; it is likely correlated with illness, as a population with a lot of women is one where men have died young. Adding demographic factors raises the R^2 of the regression to 70 percent, and the standard deviation of the residual falls to $472. Figure 1 shows a substantial further compression of the spending distribution.

The second column adds insurance coverage and the supply variables which we believe are less likely to be endogenously determined: the share of hospital beds in for-profit and government institutions, medical residents per capita, and the share of physicians who are specialists.[8] Being in an MSA with significant managed care enrollment lowers reimbursement, but not significantly. This is consistent with our previous work (Cutler and Sheiner, 1998), which found that HMOs reduced spending from very high levels to about average levels. Table 2 shows that without controls for prior spending, areas with substantial managed care enrollment had spending slightly below average.

Areas with more for-profit hospital beds have higher reimbursement than areas with more not-for-profit hospital beds; the effect is $680 per person if all hospital beds were for-profit. Areas with a greater share of specialists also have higher Medicare reimbursement. This effect is quite large: $6,300 per person if all physicians moved from generalist to specialist. Having more medical residents does not have a significant impact on reimbursement. Including these variables raises the R^2 to 75 percent,

and lowers the standard deviation of the residual to $436.

Finally, column 3 adds the bed supply and physicians per capita to the regression. These variables are the most likely to be endogenous, since they are the inputs to the process for which we are measuring reimbursements. After controlling for all the other variables, both of these variables are positively related to reimbursement. But they do not increase the R^2 tremendously (80 percent). While this R^2 is quite high, the unexplained component of spending is large as well; the standard deviation of the residual is still $390.

II. What Does More Spending Buy?

Spending in different areas is not the only factor of interest. We also want to know what that spending buys. What do high spending areas get that low spending areas do not? Our data already takes out the effects of price differences across areas. Therefore, the remaining spending variation must result from either increased numbers of patients treated or increased intensity of treatment conditional on receiving care.[9] Empirically, the first of these is more important than the second. Total discharges have a higher correlation with spending (ρ=.77) than does average cost per discharge (ρ=.46). Total discharges is strongly related to illness, however. Residual spending variation after controlling for health and demographics is about equally related to total discharges and to costs per discharge. People in high spending areas are both hospitalized more and treated more intensively when they are hospitalized.

We have started to examine the conditions for which high spending places hospitalize people. One theory, stressed by CECS (1998) is that expensive places hospitalize more for conditions which may not require hospitalization (for example, conditions which can also be treated on an out-patient basis). Initial analysis suggests that expensive places hospitalize more for every condition, although we are still examining how the degree of "excess" hospitalization varies with professional uncertainty about practice standards (see Cutler, Sheiner, and Skinner, 1999).

We have also explored whether areas are expensive because they spend a disproportionate amount on those near death. About one-third of Medicare spending is used by people in the last 6 months of life (Lubitz and Riley, 1993), and the overuse of life-extending technology has often been criticized as a source of wasteful medical spending. Interestingly, we find that while expensive places do indeed spend more on those in the last 6 months of life than other places, they do not do so disproportionately. The correlation between overall spending and the share of spending on those in the last year of life is actually negative (-.18).

III. Implications

Variation in the health status of the elderly population accounts for a significant part of the geographic variation in Medicare spending. Spending differences associated with differences in illness are not a source of inefficiency. Nonetheless, significant variation in Medicare spending remains. Even accounting for differences in demographics and the illness of the population, Medicare reform that brought Medicare spending down to the level of the 10th percentile most expensive area would reduce the overall level of Medicare by 15 percent, still enough to greatly improve Medicare's long-run fiscal imbalances.

Of course, it is necessary to understand the source of this variation before labeling it as inefficient and design policies to eliminate it. We have been able to explain some of the remaining variation. The strongest factors are supply variables: for-profit hospitals and specialist physicians. If one believes these factors are exogenous, public policy may want to consider the supply of medical services more than it currently does. There is likely also a role for insurance coverage. Our earlier work, supported here, shows that managed care enrollment moves areas from being high cost to being only average or a little below average in spending. But, even after these factors are controlled for, substantial spending variation remains. It is important to understand these other factors to decide on the efficiency

of Medicare.

Even without full knowledge, however, our results have implications for Medicare reform. In reforming Medicare, policy discussion frequently focuses on *distributional* issues -- who should pay, and how much should they pay? A more important place to start, however, may be with *efficiency* concerns: how can we get the level of services that is appropriate but not more? Examining this second question may be more fruitful than pursuing just the first.

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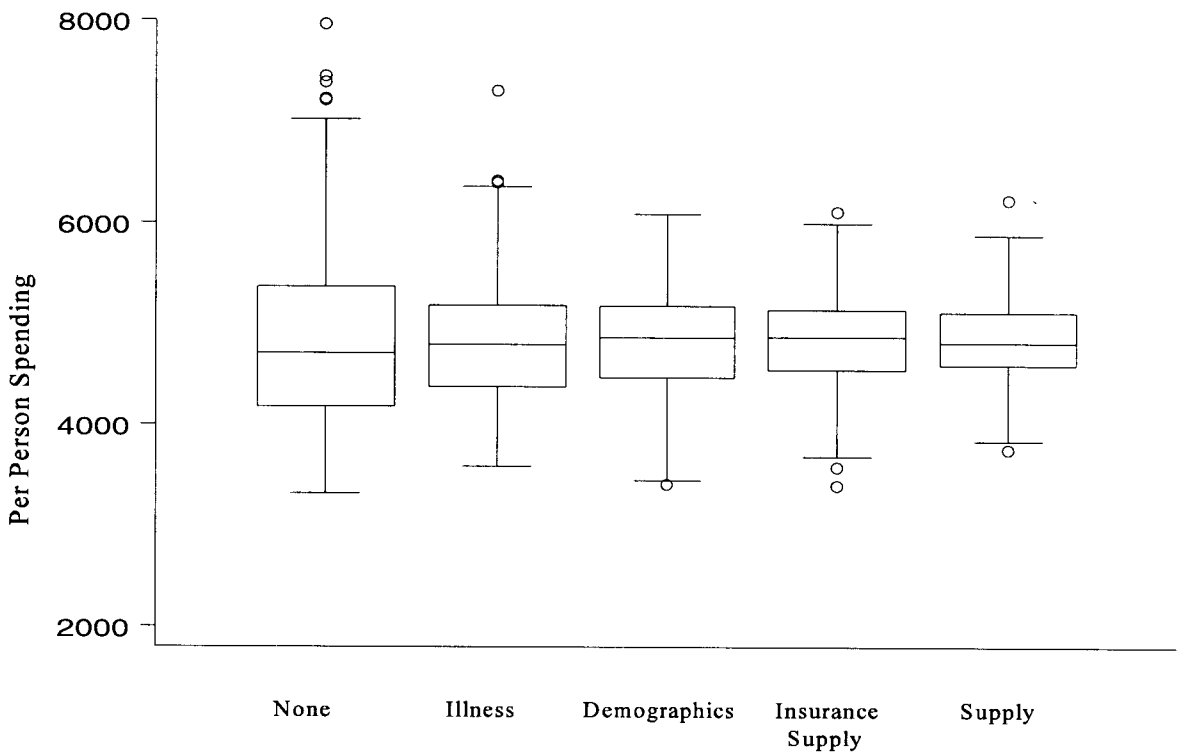
Figure 1: Medicare Spending by Region



Note: The center line in each column is the median. The box shows the interquartile range. The upper extension is the largest data point less than the 75th percentile plus 1.5 times the interquartile range. The lower extension is the smallest data point greater than the 25th percentile minus 1.5 times the interquartile range. Data points outside this range are plotted individually.

Table 1: The Correlation of Medicare Spending Across MSAs

	Spending in		
Spending in	1970	1982	1997
1970	1.000		
1982	.687	1.000	
1997	.387	.713	1.000

Note: Correlations are based on 312 observations.

Table 2: Explaining Medicare Spending Across Areas

Independent Variable	(1)	(2)	(3)
Demographics			
% black	-815	-953	-1666*
	(984_	(891)	(795)
% Hispanic	3430**	3668**	3326**
	(1274)	(1420)	(1224)
% female	-9886**	-6837**	-8090**
	(3797)	(3200)	(3059)
% poor	1535	1699	-291
	(1316)	(1229)	(1135)
% rich	2503	2588	-1554
	(2812)	(2681)	(2315)
% < 9 years of school	-349	-708	-856
	(1363)	(1244)	(1127)
Insurance			
%HMO	—	-355	-323
		(284)	(273)
Supply			
% beds for-profit	—	683*	597*
		(371)	(333)
% beds government	---	241	292*
		(193)	(172)
% MDs who are specialists	---	6312**	5426**
		(1613)	(1409)
Residents / million population	—	1014	867
		(1071)	(1095)
Beds / 1000 population	---	---	399**
			(95)
Physicians / 100,000 population	---	---	6.2**
			(1.2)
R^2	.705	.749	.798
σ_ε	$472	$436	$390

Note: All regressions use 212 observations and control for the illness variables described in the text.

Notes

1. HRRs are created by grouping zip codes into geographic units where a preponderance of hospital admissions occur. They do not correspond exactly to MSAs, although the match in many cases is close.

2. The price adjustment is based on costs outside of the medical sector, to eliminate endogeneity concerns. Price differences account for a much smaller fraction of the variation in Medicare spending (only about 30 percent) than differences in the quantity of services.

3. These conditions are hospitalizations for hip fracture, heart attacks, strokes, gastrointenstinal bleeding, and surgery for lung or colon cancer.

4. The Dartmouth measure already includes the percentage of deaths. Using the mortality data assumes that variation in illness and death rates are exogenous. In future work, we will explore how the mortality structure is related to medical spending.

5. The share of the population that is poor might reflect increased illness.

6. Some of the elderly also have supplemental insurance or Medicaid. Unfortunately, we do not have data on supplemental insurance. We estimated models with the share of the elderly in managed care but found that the non-elderly share in managed care had a more important effect on spending. In addition, related the elderly share in managed care to spending in the fee-for-service Medicare program is difficult because of selection issues.

7. For example, hospital beds per capita in 1990 are strongly related to beds per capita in 1970, but this may just reflect long-run differences in illness across areas.

8. Rosemary Stevens (1989) relates the current distribution of hospital ownership to social and cultural factors at the turn of the century. Medical schools also date from this time, and the distribution of specialists across areas is strongly related to the presence of medical schools.

9. For example, Medicare payment to hospitals is made on a Diagnosis Related Group (DRG) basis: a hospital receives a fixed amount of money determined by the patient's diagnosis and major procedures performed (for example, a heart attack treated with bypass surgery versus one treated without surgery). Thus, higher spending must result from either more patients admitted to a hospital or patients admitted being treated with more intensive methods.