

Medicare Costs and Utilization Among Beneficiaries in Rural Areas

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Key Findings

- In rural areas, Medicare spending and use of services among beneficiaries vary significantly.
- Rural, isolated areas tend to have the highest average total costs per beneficiary, compared with small town and micropolitan areas, as well as more inpatient stays and hospital outpatient visits.
- Rural, isolated areas had fewer physician visits and fewer physicians per capita than their larger rural counterparts.
- After sorting health care delivery areas by average cost per beneficiary, being in the highest-cost group was associated with more inpatient stays, outpatient visits, and skilled nursing facility days, but with lower physician visits than low and mid-cost groups.

Purpose

The purposes of this study were to: 1) assess the relationship between service utilization patterns and costs for rural Medicare beneficiaries across the rural continuum (i.e., in places where Medicare spending is highest, what services are most likely to be used?); 2) examine the relationships between rural beneficiaries' service utilization and health care delivery market structure; and 3) evaluate strategies and policies to address high costs in specific rural contexts.

Background and Policy Context

Ten percent of all Medicare beneficiaries account for 59% of all program expenditures.¹ Although studies have shown that high per-capita spending does not directly correlate with high-quality care,²⁻⁴ little attention has been paid to where the high-cost areas are in rural communities and what strategies can be used to effectively manage their spending patterns.

A Medicare Payment Advisory Commission (MedPAC) analysis of regional variation in Medicare service use found that average service use is similar across rural and urban areas, but varies significantly within rural and urban areas.⁵ Because costs vary based on local health care delivery market conditions, total costs are impacted by both amount of service use and variation in costs per unit of service. Therefore, it is important to understand the relationship between costs and service use to appropriately design and target financial incentives in a rural context.

Approach

Data come from the 2008-2010 Medicare Beneficiary Annual Summary Files (BASF), examined separately for each year, and consist of a 100% sample of all Medicare beneficiaries. The unit of analysis is rural hospital service areas (HSAs), which are based on groups of zip codes within which residents receive most of their hospitalizations.⁶ We focus on HSAs in this project in order to determine variation in cost and use by health care delivery market, rather than on the individual beneficiary level.

There are 3,436 HSAs in the BASF. Using Rural-Urban Commuting Area (RUCA) codes, we excluded urban and suburban HSAs (982 and 309, respectively), 52 rural HSAs with missing data, and 7 rural HSAs whose zip code data was not able to be matched to Medicare data. The

final sample included 2,086 HSAs: 673 micropolitan, 894 small town, and 519 isolated rural. We excluded individual beneficiaries who had died, were not enrolled in Medicare for at least 12 consecutive months, were enrolled in Medicare Advantage at any point during the study period, or who were dually-eligible at any point during the study period.

The key measures of interest were Medicare services use and cost. For each, we calculated annual risk-adjusted estimates for average beneficiaries of each HSA for each year of data. Using the average predicted cost, adjusting for the beneficiary case mix in each service area allowed us to compare costs and hold case mix constant. We based risk adjustments on age, gender, chronic conditions, and a fixed effect for HSA. We also included measures of community characteristics and health services availability for each HSA. Finally, we adjusted for geographic differences in Medicare costs using the CMS HSA-level Geographic Practice Cost Index.⁷

We identified sub-groups of low, moderate, and high-cost HSAs across all levels of rurality using two methods. First, an HSA was considered high cost if it was in the top quartile of costs in every year it was observed (2008-2010). Second, Ward's method⁸ was used to select clusters of HSAs by visit patterns (service use). After seeing which services clustered together, we named the groups according to the service type. Then, because cost is a function of service use, we grouped HSAs into low, moderate, and high-cost clusters using (a) inpatient stays,

(b) outpatient visits, (c) physician visits, and (d) skilled nursing facility (SNF) covered days. The amount of services was used because it reflects service utilization patterns, which affect total costs. Adjusted average total costs per beneficiary were calculated by summing the total of each individual service type. For all cost analyses, we adjusted for geographic variation in prices using the Geographic Practice Cost Index. We used chi-squared tests to determine significant differences in cost and service use by rurality and we used ordinary least squares regression to assess community-level correlates of being a high resource-use HSA.

1,142 HSAs were grouped into the "low cost" cluster, 683 were grouped into the "moderate cost" cluster, and 261 were grouped into the "high cost" cluster

Results

Descriptive Statistics of HSAs by Rurality
Using averages per HSA, isolated, rural HSAs had the smallest populations, the highest percentage of residents over the age of 65, lowest percentage of Hispanic residents, and the lowest median income of the three area types studied (Table 1.) On average, they had more hospital beds per resident, but fewer hospitals, physicians,

Table 1. Descriptive statistics of HSAs by rurality

	Micropolitan		Small Town		Isolated Rural	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Population	43621.61	26193.44	19466.18	17048.33	8478.92	8527.27
Percent Over 65	14.65	3.23	16.32	3.44	19.34	4.83
Percent Hispanic	8.99	14.66	6.33	11.13	4.16	7.27
Percent Black	8.20	13.57	7.94	14.95	3.93	11.29
Median Income	42678.11	7768.87	40006.98	7445.39	38340.17	6529.38
Hospital Beds per 1,000	2.34	1.84	2.79	2.43	5.46	6.10
Number of Hospitals	1.07	0.37	1.01	0.39	0.95	0.28
Physicians per 10,000	13.35	6.70	10.80	5.72	9.29	6.13
PCPs per 10,000	6.10	2.27	6.30	2.61	6.72	4.44
Specialists per 10,000	7.25	5.10	4.50	4.23	2.56	3.62
Adjusted Total Summed Cost*	5183.12	597.13	5393.21	760.69	5818.51	825.46
Adjusted Inpatient Stays*	0.27	0.03	0.29	0.04	0.30	0.06
Adjusted Physician Visits*	3.66	0.75	2.98	0.96	2.43	1.01
Adjusted Outpatient Visits*	3.11	1.35	3.96	1.52	4.79	1.72
Adjusted SNF Days*	1.01	0.33	0.99	0.34	1.01	0.39

*For an average beneficiary in each rural HSA

and specialists per resident than the other areas studied. However, there were no differences by rurality in the number of primary care physicians per capita. Isolated rural HSAs had the highest total adjusted Medicare cost per beneficiary, as well as more variability in total costs, with more inpatient stays and outpatient visits than micropolitan and small town HSAs. Beneficiaries living in isolated, rural HSAs had, on average, fewer physician visits, but did not differ from micropolitan or small town HSAs in the number of SNF days.

Health Services Use by Cost Cluster in Rural HSAs

Table 2 shows the average risk-adjusted health services use by cost cluster for 2010. Beneficiaries in high-cost HSAs had, on average, more inpatient stays, more outpatient stays, and more days in SNFs than those in low and moderate-cost HSAs, but also fewer physician visits. This suggests that spending in high-cost clusters is more likely to be driven by facilities, rather than by individual physicians.

The average total annual Medicare cost of care for beneficiaries in high-cost HSAs was about 18% higher than the average in low-cost HSAs and 12% higher than the average in moderate-cost HSAs.

Prevalence of High-Cost Clusters by Rurality

Twenty-five percent of high-cost clusters were located in isolated, rural HSAs, 43% were in small town HSAs, and 32% were in micropolitan HSAs. Twenty-three percent of isolated, rural HSAs were in the highest-cost quartile in all three years of data

(“high cost”). This is substantially more than the percentages of high-cost micropolitan (less than 2%) or small town HSAs (8%), but it is important to note that the majority of rural HSAs were low or moderate-cost. Overall, less than eleven percent of all HSAs were in the high-cost cluster across all three years, 2008-10 (Figure 1).

Correlates of Total Cost and Service Use in Rural HSAs

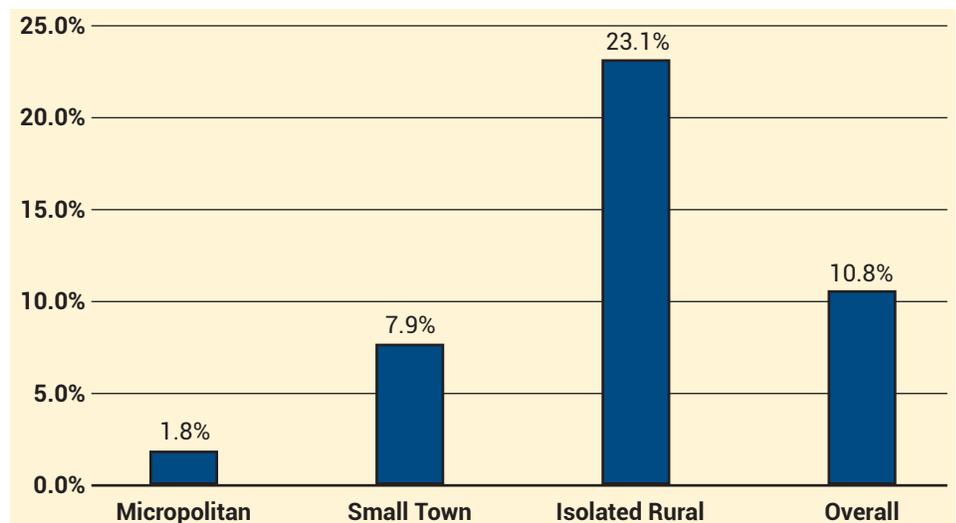
Having more hospital beds and physicians per capita was associated with higher total adjusted cost per beneficiary in ordinary least squares regression (Table 3). Also significantly associated with higher total costs were having a smaller population, an older population, a higher percentage

Table 2. Average cost and use per beneficiary by HSA cluster, 2010

	Cluster					
	Low Cost		Moderate Cost		High Cost	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Adjusted Inpatient Stays	0.28	0.04	0.29	0.04	0.30	0.05
Adjusted Outpatient Visits	2.66	0.72	4.87	0.72	6.77	0.79
Adjusted Physician Visits	3.69	0.64	2.56	0.85	1.63	0.46
Adjusted SNF Days	0.96	0.34	1.04	0.34	1.09	0.41
Adjusted Avg. Total Cost ^a	2647.73	313.91	2815.98	403.48	3211.87	426.46
Adjusted Inpatient Cost	2444.25	392.85	2528.26	456.66	2596.41	506.70
Adjusted Ambulatory Cost	1746.49	211.63	1897.66	265.91	2217.63	280.72
Adjusted Post-Acute Cost	816.76	325.56	793.15	309.70	829.61	292.23
Adjusted Other Cost	175.62	43.84	174.14	53.49	174.86	53.61
N	1142		683		261	

^aAdjusted average total cost is not the sum of all costs in the table; rather, it is the average total cost per beneficiary in each cluster. Different beneficiaries use different services, so the total cost is not calculated from the total of all services.

Figure 1. Percentage of HSAs in high-cost cluster, by rurality, 2008-2010^a



^aHSAs included in this figure were in the high-cost cluster across all three years, 2008-10.

of Black residents, a higher median income, and being located in an isolated rural or small town HSA.

Having more hospital beds per capita was associated with a higher rate of inpatient and outpatient visits, but a lower rate of physician visits and SNF days. In contrast, having more physicians per capita was associated with a lower rate of inpatient stays (although the effect size was very small) and SNF days. Smaller populations and isolated, rural locations were consistently associated with more inpatient stays, more outpatient visits, and fewer physician visits.

Conclusions and Implications

One explanation for rural, isolated HSAs having higher average Medicare costs may be limited access to physicians. It is possible that Medicare beneficiaries in remote areas seek care in costlier hospital settings because that is what is more readily available, owing, in part, to there being fewer physicians per capita. Still, we found that variation in physician supply by rurality was due almost entirely to differences in the availability of specialists; there were no differences by rurality in the supply of primary care physicians.

It is also possible that Medicare beneficiaries in high-cost clusters substitute hospital care (inpatient and outpatient) for routine physician services and that increasing access to physicians would be one means of reducing costs. Indeed, in our multivariate regression model, having more physicians per capita was associated with lower use of inpatient stays and SNF days. These results

Table 3. Predictors of Medicare total cost and services in rural HSAs, 2008-2010^a

	Coefficient (Standard Error)				
	Total Cost	Inpatient Stays	Outpatient Visits	Physician Visits	SNF Days
Number of Hospitals	15.637 (-1.18)	0.003 (-1.75)	0.071 (-1.45)	-0.121** (-4.09)	-0.051** (-3.79)
Hospital Beds per 100	2.971* (-2.44)	0.001** (-9.27)	0.028** (-6.16)	-0.008** (-2.86)	-0.003* (-2.10)
Physicians per 10,000	3.120** (-4.25)	-0.000** (-3.67)	-0.003 (-1.22)	0.015** (-9.48)	-0.002** (-2.68)
Geographic Practice Cost Index	-1254.248** (-6.00)	0.033 (-1.26)	3.329** (-4.25)	-0.501 (-1.06)	0.512* (-2.41)
% Population > 65	3.894** (-3.06)	-0.001** (-5.31)	0.030** (-6.42)	-0.007* (-2.33)	0.007** (-5.49)
% Population Black	1.982** (-4.12)	0.000** (-4.28)	-0.001 (-0.57)	-0.001 (-0.88)	0.001* (-2.50)
% Population Hispanic	-2.376** (-4.98)	-0.000** (-2.75)	-0.011** (-6.41)	0.002 (-1.46)	0.000 (-0.76)
Median Income (10,000s)	130.670** (-16.7)	0.000 (-0.25)	-0.165** (-5.73)	0.300** (-17.26)	0.047** (-5.84)
<i>Population size (Reference: >30,000)</i>					
< 7,500	311.170** (-17.43)	0.019** (-8.54)	1.026** (-15.63)	-0.521** (-13.13)	-0.025 (-1.40)
7,500 to 15,000	172.865** (-12.09)	0.013** (-7.41)	0.587** (-11.17)	-0.333** (-10.50)	-0.041** (-2.82)
15,000 to 30,000	63.545** (-5.43)	0.003* (-1.99)	0.346** (-8.05)	-0.205** (-7.89)	-0.043** (-3.66)
<i>Rurality (Reference: Micropolitan)</i>					
Small town	38.621** (-3.5)	0.006** (-4.06)	0.306** (-7.56)	-0.224** (-9.16)	-0.009 (-0.84)
Isolated rural area	67.392** (-4.43)	0.010** (-5.12)	0.420** (-7.54)	-0.359** (-10.65)	-0.028 (-1.82)
<i>Year (Reference: 2008)</i>					
2009	266.245** (-28.38)	-0.007** (-5.60)	0.262** (-7.61)	0.197** (-9.49)	-0.023* (-2.42)
2010	236.298** (-25.19)	-0.019** (-16.59)	0.135** (-3.93)	0.230** (-11.08)	-0.010 (-1.01)
N	6252	6252	6252	6252	6240

^aCoefficients were calculated from ordinary least-squares regression models predicting total cost, plus four types of service utilization: inpatient stays, outpatient visits, physician visits, and SNF days.

*p<0.05
**p<0.01

build on findings from the 2013 Institute of Medicine (IOM) report, which found that geographic variation in Medicare spending was largely driven by inpatient and post-acute stays, across both urban and rural areas (IOM, 2013).⁹

While our measures of cost and use are adjusted for age and chronic conditions, there may be additional, unobserved socio-demographic characteristics that place rural, isolated HSAs at particular risk of being in high cost and high use categories. Additionally, residents of remote areas may live farther from their support networks (e.g., family, friends, and caregivers), perhaps leading them to rely more heavily on formal health care services. Also, because they often have farther to travel to access services, they may either wait to seek care until their health is worse than their counterparts in more densely populated rural areas, or they, or their providers, may tend toward providing more services and achieving a higher standard of health before they are sent home.

Policy Implications

One potential strategy to address longer travel distances would be to foster the use of community health workers, incentivized to coordinate care between hospitals and providers and residents living in remote rural areas. Community health workers could assist with home health care and reduce the need for hospital stays or post-acute

institutionalized support, as well as reduce the need for ambulatory services.¹⁰ These initiatives may also benefit the community economically by creating more jobs at the local level, assuming that community health workers are recruited to serve the communities in which they live. A policy lever to encourage coordination between hospitals and local physicians or clinics would be to require Medicare beneficiaries to select a provider or provider group as a primary care provider who can manage post-acute care use. These policies would need to be sensitive to contextual differences between individuals as well as groups of rural providers.

Conclusion

While traditional studies of geographic variation in medical expenditures focus on the person as the unit of analysis, this study's unit of analysis is the HSA. Using this approach, isolated, rural beneficiaries were more likely to be in the highest-cost cluster, while micropolitan beneficiaries were more likely to be in the lowest-cost cluster. Reform efforts alleviating the need for high cost hospital and post-acute services may help pave the way toward the provision of more cost-effective care in remote rural areas. Future research should continue to explore within-rural differences and to better understand the role of socio-demographics in predicting cost and use in rural areas in order to design targeted policies and interventions. Further, research should attempt to better understand the role

of community health workers and non-physician healthcare workforce (e.g., physician assistants and nurse practitioners) in geographic variation in cost and use. ■

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Funded by the Federal Office of Rural Health Policy
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This study was supported by the Federal Office of Rural Health Policy (FORHP), Health Resources and Services Administration (HRSA), U.S. Department of Health and Human Services (HHS) under PHS Grant No. 5U1CRH03717. The information, conclusions and opinions expressed in this policy brief are those of the authors and no endorsement by FORHP, HRSA, or HHS is intended or should be inferred. For more information, contact Carrie Henning-Smith (henn0329@umn.edu).

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