Geographic Variation in Out-of-Pocket Expenditures of Elderly Medicare Beneficiaries

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OBJECTIVES: To examine whether out-of-pocket expenditures (OOPEs) exhibit the same geographic variation as Medicare claims, given wide variation in the costs of U.S. health care, but no information on how that translates into OOPEs or financial burden for older Americans.

DESIGN: Retrospective cohort study.

SETTING: Data from the Health and Retirement Study linked to Medicare claims.

PARTICIPANTS: A nationally representative cohort of 4,657 noninstitutionalized, community-dwelling, fee-for-service elderly Medicare beneficiaries interviewed in 2006 and 2008.

MEASUREMENTS: The primary predictor was per capita Medicare spending quintile according to hospital referral region. The primary outcome was a self-reported, validated measure of annual OOPEs excluding premiums.

RESULTS: Mean and median adjusted per capita Medicare payments were $5,916 and $2,635, respectively; mean and median adjusted OOPEs were $1,525 and $779, respectively. Adjusted median Medicare payments were $3,474 in the highest cost quintile and $1,942 in the lowest cost quintile (ratio 1.79, $P < .001$ for difference).

In contrast, adjusted median OOPEs were not higher in the highest than in the lowest Medicare cost quintile ($795 vs $764 for a Q5:Q1 ratio of 1.04, $P = .42$). The Q5:Q1 ratio was 1.48 for adjusted mean Medicare payments and 1.04 for adjusted mean OOPEs (both $P < .001$).

CONCLUSION: Medicare payments vary widely between high- and low-cost regions, but OOPEs do not. J Am Geriatr Soc 62:1097–1104, 2014.

Key words: out-of-pocket expenditures; geographic variation; Medicare

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The use and costs of U.S. health care vary widely between geographic regions,[1,2] and some policy-makers believe that targeting high-cost areas could reduce spending without harming quality. Wage rate–standardized per capita Medicare payments vary more than twofold in different regions of the country,[3] but it is unclear whether higher-cost regions reap commensurate benefits. Most prior work has shown that higher-cost regions do not produce better results in a variety of areas, including access, mortality, process measures of quality, and patient satisfaction,[1,2,4] although debate is ongoing.[5–7] Despite the lack of apparent benefit associated with higher costs, public support to reduce spending in high-cost areas has been slow to materialize.

Although the effect of geographic variation in costs of care on quality of care is important, the direct financial consequences of healthcare choices also concern patients. Some researchers have found that more than half of all personal bankruptcies in 2007 were attributable to medical illness, with income loss and medical bills as contributors to these bankruptcies.[8] Others have documented substantial out-of-pocket medical expenditures (OOPEs) for Americans and a growth in the proportion facing burdensome OOPEs over time.[9–12] In spite of these findings, no research has examined to what extent geographic variation in costs of care directly affects patient finances and whether there is the same geographic variation in OOPEs.

Therefore, the current study sought to explore the association between geographic variation in costs of care and patients' financial burden from healthcare costs. For one relatively homogeneous and important group (community-dwelling, noninstitutionalized Medicare beneficiaries), two questions were addressed. First, what are the characteristics associated with higher OOPEs? Second, after controlling for these characteristics, how much do OOPEs differ between high- and low-cost regions, and how does this compare with geographic variation in Medicare payments?

METHODS

Conceptual Model

It was hypothesized that Medicare payments would affect OOPEs because of co-insurance, copayments, and deductibles. It is likely that several factors affect Medicare payments and OOPEs in a similar direction, including factors such as sex (female sex plausibly being associated with higher Medicare payments and thus higher OOPEs) and self-reported health (poor health plausibly being associated with higher Medicare payments and thus higher OOPEs).

It was hypothesized that several factors would affect OOPEs differently than they affect use, including net worth, income, and supplemental insurance. For example, those with higher net worth and income may use services that are paid solely out of pocket (not covered by Medicare), and thus their OOPEs may not correlate with their costs of care (defined as Medicare payments).

For those with supplemental insurance, higher Medicare spending also may not be associated with higher OOPEs. Prior work has found that supplemental insurance for Medicare beneficiaries is associated with higher Medicare Part A and B spending[13] and a faster rise in total Medicare spending,[14] but nearly 60% Medicare beneficiaries with Medigap have first-dollar coverage that covers all co-insurance and deductibles for Part A and B spending.[15]

Data Sources

The Health and Retirement Study (HRS) is an ongoing, nationally representative, longitudinal survey of more than 26,000 Americans aged 50 and older. Since the study's initiation in 1992, respondents have been interviewed every 2 years on a number of topics, including their wealth and health. Overall response rates for the 2006 and 2008 interviews were 89% and 88%.[16] Medicare claims data supplement survey data.

The most-recent Medicare claims data linked to the HRS that could be obtained (2006 and 2007) were used to determine annual Medicare spending for those in the cohort. The 2008 HRS was used to obtain self-reported OOPEs and decisions to cut back on medications due to costs in the 2 years before the 2008 interview (2006–07). The 2006 HRS provided information on baseline demographic characteristics, including the ZIP code used to assign each person in the cohort to a hospital referral region (HRR). It also provided data on the self-reported predicted probability that an individual would use up all of his or her savings in the next 5 years to pay for health care.

Study Population

The goal was to identify a cohort of noninstitutionalized, fee-for-service elderly Medicare beneficiaries for whom data existed on OOPEs and Medicare payments. The initial sample was 9,278 HRS respondents aged 65 and older on January 1, 2006, who had been interviewed in 2006 and had consented to providing linked Medicare data. Nine hundred twenty-five respondents who died before the 2008 survey and 280 who were alive in 2008 but did not respond to the 2008 survey were excluded; 436 respondents who had spent at least 30 days in a nursing home during the study period were excluded because nursing home and community-dwelling residents have different patterns of resource use;[17] 2,439 respondents who belonged to a health maintenance organization in 2006 or 2007 or who lacked continuous Part B coverage were excluded because they had incomplete spending information; and 524 respondents insured by a military healthcare plan in 2006 or 2008 were excluded because it was not known what proportion of their care Medicare providers had provided. After excluding 17 people with missing data, the final sample consisted of 4,657 fee-for-service Medicare beneficiaries in 233 HRRs.

Identification of Geographic Cost Quintiles

HRR-level data from the Institute of Medicine (IOM) on actual 2008 Medicare payments for fee-for-service Medicare beneficiaries aged 65 and older were used to identify spending quintiles.[18] The 306 HRRs were ranked nationally according to per capita Medicare spending, and then each HRR was placed into a cost quintile. For all fee-for-service Medicare beneficiaries in these HRRs (not just the 4,657 Medicare beneficiaries in the cohort), 2008 per capita Medicare spending averaged $9,061 ($7,038 (lowest quintile), $7,859, $8,384, $9,128, and $10,955 (highest quintile)). These cost quintiles were used as exogenous measures of intensity of resource use for the HRS cohort.

To assess whether geographic variation in intensity of resource use for all Medicare beneficiaries in the IOM analysis was associated with variation in Medicare spending by the HRS cohort, each person in the cohort was assigned to an HRR (and thus to one of the cost quintiles described above) based on ZIP code of residence in 2006 (8.4% of persons had a different ZIP code in 2008, and their mean OOPEs were not statistically different from those who did not move); 2006 and 2007 HRS-linked Medicare claims data (e.g., Medicare Provider Analysis and Review, outpatient, carrier, home health care, hospice, and durable medical equipment files) were then used to obtain per capita Medicare payments for the HRS cohort within each cost quintile.

Medicare payments for the HRS cohort were expected to be lower than those for Medicare beneficiaries in the nation as a whole (than IOM data), because beneficiaries who died between 2006 and 2008 and long-term residents of a nursing home were excluded. These exclusions included 925 decedents and another 436 institutionalized persons who did not die during the study period, together totaling approximately 15% of the base cohort of 9,278. Medicare payments for the HRS cohort also did not

account for annual growth in per enrollee Medicare spending (5% from 2006 to 2007, 6% from 2007 to 2008).[19]

Definition of Study Outcomes

The primary outcome was a self-reported measure of OOPEs in the 2 years before the 2008 interview (divided by 2 to annualize it). Estimates for OOPEs came from responses to questions about specific types of healthcare spending (hospital, nursing home, doctor visits, dental care, outpatient surgery, home health care, and special facilities such as outpatient rehabilitation).[20] For prescription drug spending, respondents are asked about their monthly spending during the previous 2 years; this estimate was multiplied by 12 to produce an annual estimate. The study was focused on exploring OOPEs directly related to healthcare use, so premiums were included only in sensitivity analyses. (The main findings were qualitatively similar; see Appendix 1.)

Out-of-pocket expenditures and the financial burden they place on Medicare beneficiaries were quantified in several ways. In addition to examining mean and median OOPEs, mean OOPEs were estimated as a proportion of household income. The proportion of respondents with nonpremium OOPEs > 5%, 10%, and 20% of income were also examined (and the proportion of respondents with premium plus nonpremium OOPEs > 5%, 10%, and 20% of income in Appendix 1). Prior work has defined premium plus nonpremium OOPEs as burdensome when they exceed 10–20% of income.[9]

Statistical Analyses

To answer the first research question (patient factors associated with OOPEs), sociodemographic characteristics associated with OOPEs in the cohort were identified. It was expected that poorer and sicker people would spend a larger proportion of their income on health care.[9,10,21,22] For each characteristic (e.g., age group, sex), differences in mean OOPEs were tested for using analysis of variance. All analyses incorporated HRS's respondent-level weights in 2006 to account for the survey design of the HRS.

Before the main research question was addressed, the sample was stratified according to geographic cost quintile, and the characteristics of the HRS cohort in 2006 were described to compare with prior literature. Differences were tested for using chi-square tests.

To answer the main research question (whether median OOPEs varied across geographic cost quintiles and whether the pattern was similar to Medicare payments), multivariate quantile regression models were run that controlled for the independent variables: age, sex, race and ethnicity, and characteristics in the HRS that might affect OOPEs through mechanisms other than use (net worth in 2006, income in 2006, and supplemental insurance (excluding long-term care insurance) in 2008 or since the 2006 interview). Five separate multivariate models were created, one for each quintile, using only respondents living in each quintile. The entire sample was then used to predict median OOPEs for each person as if they lived in each quintile, so as to keep demographic characteristics the same when making predictions. Unadjusted analyses are also reported in Appendix 1.

Nonparametric bootstrapping with replacement was used to test for the statistical significance of differences in median values for OOPEs (or Medicare payments) in the highest versus lowest cost quintiles. Bootstrapping was also used to assess whether the ratio of Medicare payments between the highest and lowest cost quintiles was significantly different from the ratio of OOPEs between the highest and lowest cost quintiles.

All statistical analyses were conducted using Stata 11.0 (StataCorp, College Station, TX). The University of Michigan Health Sciences and Behavioral Sciences institutional review board approved the HRS, and the institutional review boards at the University of Michigan and Harvard University determined this study to be exempt from ongoing review.

RESULTS

Median OOPEs were generally higher for those with greater income, wealth, and education and for those in poorer health (Table 1). Median OOPEs were about twice as high in those with more as in those with less education and in those in the highest as in those in the lowest income tertile. In addition, mean OOPEs were approximately 50% higher in those in fair health than in those in excellent health. OOPEs were more likely to be a financial burden (make up more than 10% of household income) for non-Hispanic blacks and those with less education. Appendix 1 Table S2 contains analogous results for OOPEs including premiums.

In general, few significant differences were found in socioeconomic characteristics across the geographic cost quintiles (Table 2). Although residents of the highest cost quintile tended to be less educated and sicker (consistent with results of a previous study),[1] these differences were not statistically significant in the current study cohort. Residents of the highest cost quintile were more likely to be non-Hispanic black (13%) than residents of the lowest cost quintile (1%) (P = .003). Rates of supplemental insurance coverage did not differ across cost quintiles.

In the main empirical results, regional cost quintiles were associated with large differences in Medicare payments, but not with OOPEs (Table 3). In adjusted analyses, median per capita Medicare payments were larger in the highest than in the lowest cost quintiles ($3,474 vs $1,942, for a ratio of 1.79; P < .001 for difference). Adjusted median OOPEs did not differ between the highest and lowest cost quintiles ($795 vs $764, for a ratio of 1.04; P = .42 for difference) and did not increase monotonically. The difference between the two ratios (1.79 for median Medicare payments in the highest vs lowest cost quintiles, 1.04 for median OOPEs in the highest vs lowest cost quintiles) was statistically significant (P < .001). For adjusted mean Medicare payments, the Q5:Q1 ratio was 1.48 (P < .001); for mean OOPEs, the Q5:Q1 ratio was 1.04 (P < .001). The difference between these two ratios was statistically significant (P < .001). Results were similar in unadjusted analyses and in unadjusted and adjusted sensitivity analyses with premium plus nonpremium OOPEs (Appendix 1 Tables S3 and S4). Unadjusted nonpremium and total (premium plus nonpremium) OOPEs were also examined as a percent of income, but no statistically

Table 1. Annualized Out-of-Pocket Expenditures (OOPEs) for the Health and Retirement Study Cohort

Characteristic	OOPEs			Proportion with OOPEs, %[c]		
	Median, $	Mean, $	Household Income, Mean %	> 5% of Household Income	> 10% of Household Income	> 20% of Household Income
All	760	1,525	6	25	12	4
Age[a]						
65–70	776	1,324	4	17	8	3
71–75	756	1,497	7	24	11	4
76–80	784	1,558	5	27	10	3
> 80	740	1,758	7	31	17	8
Sex[b]						
Male	780	1,493	4	18	8	2
Female	750	1,545	7	29	14	6
Race and ethnicity[a]						
Non-Hispanic white	820	1,593	6	25	11	4
Non-Hispanic black	480	1,300	8	32	18	8
Hispanic	390	945	4	19	13	4
Other	180	618	4	20	10	5
Education, years[a]						
< 12	480	1,133	6	27	13	6
12	750	1,496	6	27	13	5
> 12	970	1,794	6	22	10	3
Household income, $[a,b]						
< 23,416	450	1,109	10	37	21	9
23,416–45,410	900	1,686	5	27	12	4
> 45,410	960	1,772	2	10	3	0
Net worth, $ [a]						
< 110,000	445	1,053	6	29	16	6
110,000–440,000	800	1,548	5	27	13	5
> 440,000	1,000	1,927	6	18	7	3
Self-reported health[a,b]						
Excellent	620	1,284	11	15	8	3
Very good	750	1,339	4	18	7	2
Good	809	1,583	5	24	12	4
Fair	776	1,771	7	34	18	8
Poor	694	1,560	7	37	21	6
Supplemental insurance						
No	750	1,611	8	28	14	5
Yes	776	1,492	5	24	11	4

[a]$P < .05$ for difference in mean OOPEs.

[b]$P < .05$ for difference in mean OOPEs as a percentage of household income.

[c]For all characteristics, $P < .05$ for difference in proportion with OOPEs > 5% of income, proportion with OOPEs > 10% of income, and proportion with OOPEs > 20% of income.

significant trend was found across geographic cost quintiles (Figure 1 and Appendix 1 Figure A1). Finally, no statistically significant differences were found in the proportion of people with OOPEs of more than 20% of income across cost quintiles after adjusting for age, sex, race and ethnicity, supplemental insurance, income, and net worth (results not displayed).

DISCUSSION

The authors are unaware of previously existing research on the association between geographic variation in healthcare use and patient financial burdens from healthcare costs. The results of the current study document a contrast between geographic variation in cost of care and geographic variation in OOPEs for most Medicare beneficiaries. Adjusted median Medicare payments were 79%

higher in high- than low-cost regions and by design increased monotonically, but adjusted median OOPEs did not follow the same pattern.

Medicare's benefit structure may in part explain the contrast between large geographic variation in Medicare payments and considerably smaller geographic variation in OOPEs (across Medicare cost quintiles). In many instances, Medicare protects beneficiaries from high expenditures. For example, there is a single deductible for hospital care provided during the first 60 days of each benefit period. Thus, OOPEs may be comparable for beneficiaries with a single short hospital stay and those with several prolonged hospitalizations. In contrast, Medicare payments would vary widely between these two scenarios.

The broad prevalence of other types of insurance, including employer sponsored insurance, Medigap, and Medicaid, may also explain the current study's findings.

Table 2. Characteristics of the Health and Retirement Study Cohort According to Regional Cost Quintile

Characteristic	All	Q1 (Low Cost)	Q2	Q3	Q4	Q5 (High Cost)	P-Value
HRRs, n	233	38	47	47	45	56	
Per capita Medicare payments for all Medicare beneficiaries, 2008, mean $[a]	9,061	7,038	7,859	8,384	9,128	10,955	
HRS cohort, n	4,657	551	1,003	1,075	520	1,508	
Age, %							
65–70	31	30	33	34	32	28	.49
71–75	27	25	32	24	29	26	
76–80	19	22	16	20	18	19	
> 80	23	23	19	22	21	27	
Sex, %							
Male	39	44	38	40	40	37	.15
Female	61	56	62	60	60	63	
Race and ethnicity, %							
Non-Hispanic white	82	95	84	84	80	75	.003
Non-Hispanic black	10	1	11	12	10	13	
Hispanic	1	1	2	1	1	1	
Other	6	2	3	3	9	10	
Education, years, %							
< 12	26	19	26	27	24	28	.62
12	37	37	37	37	35	36	
> 12	38	44	36	36	41	36	
Household income, $, %							
< 23,416	33	26	32	30	31	40	.23
23,416–45,410	33	34	34	36	33	31	
> 45,410	33	40	34	33	36	30	
Net worth, $, %							
< 110,000	34	26	35	30	35	37	.29
110,000–440,000	33	31	34	37	31	31	
> 440,000	33	43	31	33	35	31	
Self-reported health, %							
Excellent	9	8	9	9	10	8	.30
Very good	29	32	30	30	28	26	
Good	33	36	33	31	35	34	
Fair	23	21	22	21	21	25	
Poor	7	4	6	8	6	7	
Supplemental insurance, %	72	75	74	73	71	69	.29

[a]From the Institute of Medicine's Hospital Referral Region (HRR)-level data on actual 2008 Medicare payments for fee-for-service Medicare beneficiaries aged 65 and older enrolled in Part A and B.

Table 3. Adjusted[a] Annualized Medicare Payments and Out-of-Pocket Expenditures (OOPEs) for the Health and Retirement Study Cohort According to Geographic Cost Quintile

Type of Expenditure	Cost Quintile, $						Q5:Q1	P-Value (Q5 vs Q1)
	All	Q1 (Low Cost)	Q2	Q3	Q4	Q5 (High Cost)		
Medicare payments[b]								
Median	2,635	1,942	2,515	2,575	2,805	3,474	1.79	< .001
Mean	5,916	4,546	5,586	5,996	5,283	6,731	1.48	< .001
OOPEs								
Median	779	764	782	819	1,049	795	1.04	.42
Mean	1,525	1,461	1,488	1,461	1,784	1,525	1.04	< .001

[a]Adjusted for age, sex, race and ethnicity, net worth in 2006, income in 2006, and supplemental insurance (excluding long-term care insurance) in 2008 or since the 2006 interview. Cost quintile is based on Medicare payments for fee-for-service Medicare beneficiaries aged 65 and older.
[b]From HRS-linked Medicare claims data for the HRS cohort.

Approximately 72% of this HRS sample was covered by supplemental insurance. The effect of supplemental insurance on OOPEs can be difficult to extract precisely because of potential endogeneity; individuals expecting higher use are more likely to buy supplemental insurance.[23]

Results from this study complement prior research on OOPEs of Medicare beneficiaries.[9,17,24–29] For example,
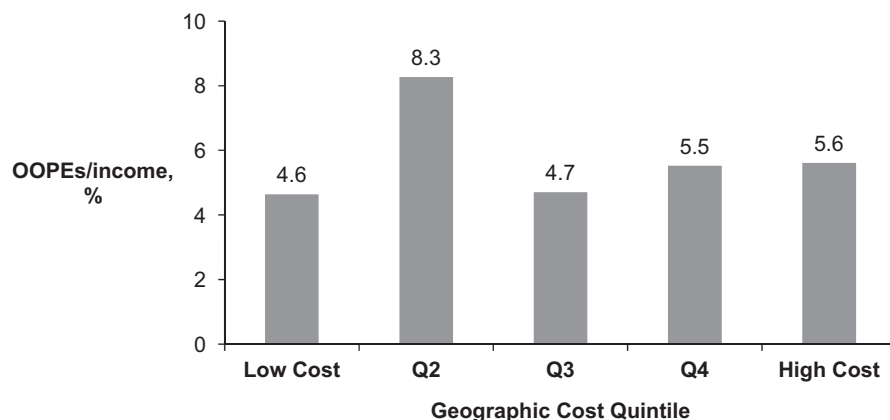
Figure 1. Unadjusted mean out-of-pocket expenditures (OOPEs)/income according to geographic cost quintile. $P = .68$ for trend. Cost quintile is based on Medicare payments for fee-for-service Medicare beneficiaries aged 65 and older.

the findings of higher OOPEs in non-Hispanic whites and those with higher income or worse health are consistent with previous work that relied on OOPEs as reported in the Medicare Current Beneficiary Survey (MCBS).[9] Nevertheless, none of these studies examined the association between geographic variation in costs of care and OOPEs.

The current study has several important limitations. First, the results and their implications are not generalizable to all older Americans, because the cohort was limited to community-dwelling, noninstitutionalized Medicare beneficiaries with fee-for-service coverage. Individuals who died between 2006 and 2008 and those who were institutionalized were excluded. In a 2-year sample, these two excluded groups would comprise approximately 15% of the population of older Americans. Second, OOPEs are self-reported in the HRS, but HRS data on OOPEs have been used in prior research, and they are comparable with data from the MCBS and the Medical Expenditure Panel Survey.[26,30] Third, total nonpremium OOPEs and geographic variation in total Medicare payments were examined; it is possible that individual components of OOPEs, such as prescription drug spending, are weakly associated with geographic variation specific to certain types of expenditures (e.g., Part D spending). Fourth, 72% of the HRS sample had supplementary insurance, whereas prior reports of MCBS have cited that approximately 90% of noninstitutionalized fee-for-service Medicare beneficiaries have such coverage.[31] The reason for this difference could not be identified, but there is no reason why HRS data should be less accurate.[32] Fifth, information was not available on levels of supplemental insurance, which vary. During the study time frame, almost two-thirds of Medicare beneficiaries with Medigap chose two supplemental insurance plans with very generous coverage.[33] Finally, with the study data, not all of the factors that might modify the association between geographic cost quintiles and OOPEs could be controlled for, which may explain in part why the results for OOPEs were not monotonic.

In summary, consistent with prior studies, wide geographic variation was found in Medicare payments. In contrast, OOPEs varied much less across Medicare cost quintiles. It is plausible that Medicare's benefit structure and the prevalence of generous supplemental insurance coverage provides a leveling in OOPEs for many Americans, but the concomitant challenge is that protection against higher OOPEs also reduces the incentive that older Americans have to limit healthcare use or to support policies that aim to do so.

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APPENDIX 1

To complete sensitivity analyses that used premium plus nonpremium out-of-pocket expenditures (OOPEs), premiums were estimated in the following way. The Health and Retirement Study (HRS) includes a series of questions about enrollment in private insurance plans (excluding long-term care insurance, Part D insurance, Medicaid and Medicare health maintenance organizations, Veterans Affairs insurance, and Medicaid), and self-reported premiums for such plans. In the current study sample, 3,057 (66%) had at least one additional private insurance plan. Because only 167 (4%) in the cohort had more than one private insurance plan, premiums were included for the first additional private insurance plan only. If the first additional private insurance plan also covered a respondent's spouse, the premium was divided by two to obtain an individual estimate. To this, Medicare Part B premiums from publicly available rates for 2007 were added. Because most Medicare beneficiaries do not pay for Part A and because monthly premiums for Part D were small (national average of approximately $26 per month in 2006) (Neuman P and Cubanski J, *NEJM*, 2009), these values were not included in the premium estimates.

HRS respondents self-report exact monthly premium amounts and, if unable to do this, provide the upper and lower bounds for premium estimates. For HRS respondents without an additional insurance plan in 2008, the premium value was set to zero. For those who reported a monthly premium of a reasonable upper bound of $300 or less (the upper limit for monthly Medigap premiums found at www.medicare.gov), that value was used. If the exact 2008 premium provided was more than $300, the 2006 premium was used (if it was ≤ $300). Otherwise, the value was imputed using a model in which premium was regressed on race, sex, age, self-reported health status, and census region.

For respondents who did not provide an exact premium but confirmed that their premium was within a range of values, an exact amount was imputed. If the lower limit of the range provided was $300 or less, we estimated the premium as that value midway between the lower and upper limit (fixing the maximum upper limit at $300). If the lower limit of the range provided was > $300, data from 2006 were examined. If an exact premium < $300 had been reported in 2006, that amount was used. Otherwise, the premium was imputed using the regression model described above.

In the cohort, 1,568 (34%) had no additional insurance plan and a premium of zero (Table S1). Another 2,442 (52%) had a premium of $300 or less. Another 270 (6%) stated that the lower bound of their premium payment was < $300, and the value between the lower and upper bounds was picked to estimate an exact premium. For 182 respondents (4%), exact premium values provided in 2006 were used. For the remainder (195, 4%), premiums were imputed using the regression model described above.

SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Table S1. Premium Imputations for First Additional Insurance Plan.

Table S2. Annualized Out-of-Pocket Expenditures with Premiums, by Cohort Characteristics.

Table S3. Unadjusted Annualized Medicare Payments and Non-Premium OOPEs for the HRS Cohort, by Geographic Cost Quintile.

Table S4. Annualized Medicare Payments and OOPEs including Premiums for HRS Cohort, by Geographic Cost Quintile.

Figure S1. Unadjusted Mean Total (Premium plus Non-Premium) Out-of-Pocket Expenditures/Income, by Geographic Cost Quintile.

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