

## ORIGINAL RESEARCH

# Personal and contextual factors that contribute to a higher out-of-pocket to total income ratio

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*Submitted: 10 June 2010; Revised: 17 September 2010; Published: 5 November 2010*

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*Rural and Remote Health 10: 1547. (Online), 2010*

**Available from: <http://www.rrh.org.au>**

## A B S T R A C T

**Introduction:** This analysis sought to define the out-of-pocket healthcare spending to total income ratio for rural residents, as well as to explore the impact of county-level factors that may contribute to urban–rural differences.

**Methods:** Three years of pooled data were utilized from the Medical Expenditure Panel Survey (2003–2005). The dependent variable was the ratio of total out-of-pocket healthcare spending to total income, at the household level. Unadjusted and adjusted analyses estimated the factors associated with this ratio, including rurality, socio-demographics, and county-level factors.

**Results:** The unadjusted analysis indicated that small adjacent and remote rural residents had higher out-of-pocket to total income ratios than urban residents. The adjusted multivariate analysis indicated that when other factors are held equal, rurality is no longer a significant factor. Other factors such as insurance type, healthcare utilization, and income, which differ significantly by rurality, are better predictors of the ratio.

**Conclusions:** The identification of factors that contribute to a higher ratio among some rural residents is necessary in order to better target interventions that will reduce this financial burden.

**Key words:** household income, out-of-pocket expenditures, USA.

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## Introduction

The rising cost of health care is often a concern among individuals seeking care in the USA, with the healthcare inflation rate outpacing the growth in personal incomes since 2000<sup>1</sup>. To compound the issue, the proportion paid by the individual has also grown as insurers shift to cost sharing mechanisms to reduce their expenses<sup>2,3</sup>. A higher out-of-pocket spending burden, as calculated by the ratio of out-of-pocket expenditures to total income, can be an indicator of underinsurance, and places an individual at risk for hardships such as deferring necessary medical care or the inability to pay debts due to their medical debt load<sup>4-12</sup>.

Previous studies have found that insurance coverage, sex, age, income, race/ethnicity, health status, and employment status all play a significant role in this increased burden<sup>6-12</sup>. Previous work has also indicated that individuals in rural areas are more likely to face a higher out-of-pocket spending burden than urban residents<sup>13,14</sup>, even after controlling for the listed factors. The reasons for this rural disparity may be due to the different characteristics of these rural counties themselves, and not patients' individual characteristics<sup>15,16</sup>.

In addition, these studies tend to rely on dichotomous rural definitions, based upon either the Metropolitan Statistical Area (MSA) designation of the county or the census bureau's definition of rural. Dichotomous rural definitions, while often utilized, are problematic for several reasons. Rural counties vary widely in population density, insurance rates, racial distributions, health resource availability and many other factors<sup>16</sup> that affect healthcare utilization and, subsequently, spending. Therefore, if the aggregated and imprecise dichotomous rural definitions are used without additional county-level contextual factors included, inappropriate conclusions regarding rural areas may result.

Thus, this analysis had two goals. The first is to further define the out-of-pocket healthcare spending to total income ratio for rural residents by utilizing a more precise and multi-

level definition of rurality. The second was to explore the impact of county-level factors that may contribute to the urban-rural differences, and may be affected by policy changes and interventions.

## Methods

This analysis pooled 3 years of Medical Expenditure Panel Survey (MEPS) data (2003, 2004, and 2005). The MEPS data, which are drawn from a subsample of the National Health Interview Survey, provides nationally representative estimates of healthcare utilization and expenditures among non-institutionalized residents. Data is obtained by interviewing the subjects then selectively supplemented by querying involved healthcare providers. All analyses were weighted to account for the complex structure of the sampling frame. Analyses were performed at the household level, with the demographic characteristics of the reference person for each household attributed to the entire family, and utilized for categorization, estimation, and weighting.

The dependent variable for this analysis was the ratio of out-of-pocket healthcare expenditures to total household income, expressed as a percentage. Total out-of-pocket expenditures included all expenses related to the provision of health care, and was calculated by summing these expenses paid by each member of the household. Premiums were excluded from expenditures because of the manner in which they are expended; for a vast majority of individuals, these premiums are paid via payroll deduction (or as a deduction from Social Security). Also, the premium amount paid is not related to actual utilization, but is fixed. Thus, the inelasticity of the premium cost, combined with its dissociation from actual utilization of health care, led to the premium costs from out-of-pocket spending estimates being excluded from the present study. Household income was calculated by summing the income of all members of a household unit.

The main independent variable of interest was the rurality of the household's residence. This was defined according to the



2003 Urban Influence Codes (UIC), developed by United States Department of Agriculture<sup>17</sup>. Rurality was subdivided into 4 categories: (i) Urban (UIC Codes 1 & 2) included counties that have significant metropolitan areas; (ii) Micropolitan (UIC Codes 3, 5 & 8) included counties that had a town with 10 000 to 49 000 residents; (iii) Small Adjacent (UIC Codes 4, 6 & 7) included counties with a town of 2500 to 9999 residents; and (iv) Remote (UIC Codes 9, 10, 11 & 12) included counties with towns of less than 2000 residents. 'All Rural' was defined as the aggregate of Micropolitan, Small Adjacent, and Remote rural counties.

Additional independent variables of interest were chosen according to Anderson's Model of Health Services Use<sup>18</sup>. This model describes predisposing characteristics that interact with enabling characteristics and an individual's perceived need for healthcare services, which will determine if that individual seeks services. For this analysis, the predisposing characteristics were obtained from the head of household, and attributed to all members of the household. These included sex, race/ethnicity (White, African American, Hispanic, and Other), age group (19-44, 45-64, >65 years), and self-reported health status (very good/good/excellent vs fair/poor). The enabling characteristics include employment status (employed vs unemployed), insurance status and type (Private health maintenance organization (HMO), Private Non-HMO, Medicare, Medicaid, Uninsured, and Other), having a usual source of care, having prescription drug insurance coverage, and poverty level (expressed as a percent of the federal poverty level).

Because earlier works found a significant affect of living in a rural area (ie rural residents had a higher out-of-pocket to income ratio<sup>13,14</sup>, several county-level variables were included in an attempt to discover those factors contributing to rural differences. These variables included the number of hospital beds per county, expressed in quartiles; Health Professional Shortage Area (HPSA) designation (full county, partial county, or none); and the percent of the population employed in white collar occupations. Finally, a dichotomous indicator was included indicating if a member

of the household had at least one inpatient visit during the year.

The initial analysis estimated the distribution of the sample's characteristics and county-level characteristics, by levels of rurality. Differences across rurality were tested using Wald  $\chi^2$  tests. Subsequent analyses estimated the median household income, out-of-pocket spending, and ratio by the levels of rurality and selected characteristics. These differences were tested using Wilcoxon rank-sum tests for independence, while pair-wise comparisons were tested using Tukey's adjustment.

The multivariate ordinary least squares regression analysis used the ratio variable as the dependent variable, with rurality as the main independent variable of interest. Because the ratio of out-of-pocket expenditures to income was not normally distributed, the dependent ratio variable was log-transformed for the modeling. The predisposing, enabling, and county-level variables were included in both models as the independent factors. The unadjusted and bivariate analyses utilized SAS-Callable SUDAAN (RTI International; Research Triangle Park, NC, USA), while the multivariate analyses utilized STATA-IC v10.0 (StataCorp LP; College Station, TX, USA).

## Results

More than 83% of the households in this analysis lived in urban areas; of the almost 17% who lived in rural areas, a majority lived in Micropolitan rural areas (Table 1). The heads of household for the sample were predominately female, white, between 19 and 45 years, in good or better health, privately insured, had prescription drug coverage, were employed, and had incomes greater than 300% of the federal poverty level. When compared with urban, rural heads of household were more likely to be male, white, older, in poorer health, to have publically funded insurance, not to have prescription drug coverage, to have incomes less



than 400% of poverty, unemployed, or to have an inpatient stay.

The distribution of the sample by county-level characteristics is shown (Table 1); all measures differed by levels of rurality. Notably, more rural households resided in counties with fewer hospital beds, with a higher percentage of white-collar occupations, or that were a partial HPSA.

The median household incomes, out-of-pocket spending, and ratio by selected characteristics of the head of each household are displayed (Table 2). Overall, income was higher among whites, those in good or better health, those with private non-HMO insurance, those with prescription drug insurance, and those with a usual source of care. Out-of-pocket spending was higher among whites, those in fair to poor health, those with Medicare, those with prescription drug insurance, and those with higher incomes. The ratios were higher for households whose head were white, in fair or poor health, had Medicare, lacked prescription drug coverage, or had lower incomes as a percent of poverty. In general, out-of-pocket spending was higher, as was the spending to income ratio, among those households with at least one inpatient visit.

Several differences were noted by levels of rurality. Overall, rural households had lower median household incomes, but not significantly different out-of-pocket spending or ratios than urban residents (Table 2). Differences did exist, however, when levels of rurality were considered; households in small adjacent and remote rural counties had lower incomes, and higher ratios, than urban households. Urban-rural differences for income, out-of-pocket spending, and the ratios also existed across race/ethnicity, health status, insurance type, poverty levels, usual source of care, and utilization.

The multivariate results identified the factors significantly associated with the out-of-pocket spending to total income ratio. In this adjusted analysis, households who lived in rural counties, regardless of type, were not more likely to have a higher out-of-pocket to total income ratio than any other

household. Factors associated with a lower ratio included non-White race, being in excellent to good health, having Medicaid, having prescription drug insurance, and having a usual source of care. Factors associated with a higher ratio included older age, not being employed, not having a private HMO insurance plan, being below 400% of the federal poverty limit, and having at least one inpatient visit in the year. None of the county-level variables, however, were significant (Table 3).

## Discussion

This analysis sought to further examine the higher out-of-pocket to total income ratios previously documented among rural residents<sup>13,14</sup>. While a higher ratio was found among small adjacent and remote rural residents, this difference did not persist when other factors were accounted for in the multivariate models. Notably, demographic characteristics including race/ethnicity and age, health status, healthcare utilization, and insurance type, and not the rural location in and of itself, were found to be associated with the spending ratio.

The type of insurance coverage was a significant factor, in both the unadjusted and adjusted analyses. The unadjusted analysis estimated large ratios among those with Medicare and Medicaid, with private HMO plans having the lowest. After holding other factors equal, however, patients with Medicaid had ratios that were lower than those with Private HMO type plans. All other insurance types were more likely to have higher ratios, indicating the protective effect of managed care on out-of-pocket spending. It is also worth noting that uninsured individuals were slightly more likely to have higher ratios, despite their low out-of-pocket spending levels. Uninsured households' out-of-pocket spending was only 16% that of insured households (Table 2), in large part due to the dramatically lower rates of utilization (data not shown). Thus, these data suggest that the uninsured lowered their burden (as measured by the ratio) by reducing their utilization and subsequent out-of-pocket spending.



**Table 1: Characteristics of the head of household, by county type**

Characteristic	Location				
	Total	Urban	Micropolitan	Small Adj.	Remote
Households <i>n</i>	38 799	31 420	4727	1556	1096
Households %	100	83.2	11.0	3.3	2.6
Predisposing characteristics					
Race/ethnicity					
White	71.1	68.6	82.9*	80.3*	91.1*
African American	11.8	12.7	6.9	11.2*	4.3*
Hispanic	11.3	12.6	5.6	5.9*	2.5*
Other Race	5.8	6.2	4.6	2.6*	2.2*
Sex					
Male	49.5	49.0	50.3	54.4*	55.9*
Female	50.5	51.0	49.7	45.6*	44.2*
Age (years)					
19–44	47.6	49.0	40.7	40.8*	39.7*
45–64	33.9	33.6	34.4*	38.1*	37.0*
>65	18.5	17.5	24.9*	21.2*	23.3*
Enabling characteristics					
Self-reported health status					
Excellent/ Very good/Good	84.8	85.6	81.5*	79.6*	80.2*
Fair/ Poor	15.2	14.4	18.5*	20.4*	19.8*
Employed	72.5	73.8	66.2*	65.1*	67.8*
Federal poverty level, %					
<100%	12.5	12.1	14.3*	15.5*	15.6*
100–299%	18.9	17.8	23.1*	27.6*	24.6*
300–399%	30.8	30.4	31.6*	35.0*	34.3*
>400%	37.8	39.7	31.0*	21.9*	25.6*
Insurance Status/Type					
Private Insurance--HMO	22.5	24.7	11.9*	13.9*	9.2*
Private Insurance–Non HMO	32.2	31.7	35.4*	31.9*	34.6*
Medicare	18.7	17.5	25.3*	22.1*	23.6*
Medicaid	7.8	7.5	9.0*	10.1*	9.6*
Uninsured	12.8	12.6	12.8*	16.1*	16.2*
Other	6.1	6.1	5.6*	6.1*	6.8*
Rx Drug coverage	64.1	65.7	57.1*	56.5*	51.9*
Has a usual source of care	80.8	80.3	82.0*	81.9*	88.7*
Inpatient hospital visits	9.3	8.8	12.0*	11.4*	13.1*
County based variables					
Hospital bed to population Ratio, Quartiles					
>4.34/1000	7.5	6.4	6.4*	26.7*	23.4*
2.37–4.34 / 1000	26.5	27.4	22.3*	30.8*	9.2*
0.92–2.36 / 1000	45.5	47.4	45.0*	10.0*	31.1*
< 0.92 / 1000	20.6	18.9	26.3*	32.6*	36.2*
HPSA Status					
Not a HPSA	18.7	17.3	30.2*	8.4*	29.4*
Partial HPSA	78.1	81.4	66.5*	54.1*	53.7*
Full HPSA	3.1	1.3	3.3*	37.5*	16.9*
White collar employment (Q)					
>56.2	6.2	1.9	22.5*	52.1*	18.1*
50.9–56.2	10.5	5.0	39.9*	43.0*	24.2*
46.2–50.8	15.3	14.6	20.4*	4.5*	30.5*
<46.2	67.9	78.5	17.1*	0.4*	27.2*

Adj, adjacent; HMO, P.Ins, private insurance; HPSA, Health Professional Shortage Area; Q, quartiles; Rx, prescription.

\* Significantly different from urban,  $p < 0.05$

**Table 2: Mean household income, mean out-of-pocket expenditures, and mean ratio, by rurality and selected characteristics**

Characteristic	All			Urban			Micro			SmAdj			Remote		
	Incomes	Out-of-Pocket	Ratios	Incomes	Out-of-Pocket	Ratio	Incomes	Out-of-Pocket	Ratios	Incomes	Out-of-Pocket	Ratios	Incomes	Out-of-Pocket	Ratios
Total	36,249	615	1.48	37,998	593	1.38	31,335*	729	2.02	27,410*	747	2.20*	29,630*	781*	2.36*
Race/ethnicity															
White	41,582	804	1.75	44,183	793	1.64	34,308*	830	2.15	30,053*	898	2.55*	30,589*	876	2.51*
African American	23,910	274	0.97	24,699	276	0.94	15,306*	302	1.64	18,576*	197	1.05	15,985*	157	0.67
Hispanic	24,925	230	0.78	25,391	230	0.77	21,754	256	0.89	22,989	197	0.75*	11,429*	241	1.45
Health status															
Ex/v good/good	39,999	573	1.30	41,180	555	1.22	34,962*	661	1.76	31,742*	684	1.82*	32,331*	742	1.94*
Fair/poor	19,638	913	3.76	20,332	882	3.48	18,315*	1,092*	4.99	15,920*	1,122*	5.87	16,162*	1,057	5.06
Insurance type															
P.Ins-HMO	65,095	1,092	2.98	65,892	1,066	2.97	59,355	1,396	3.09	52,788	1,356	3.48	51,009	1,218	2.81
P.Ins-Non-HMO	67,752	1,316	3.56	69,997	1,307	3.43	5,976	1,333	3.37	51,996	1,372	6.20	54,495	1,435	4.94
Medicare	35,960	2,336	12.63	37,315	2,328	12.50	31,387	2,345	12.53	27,563	2,322	14.75	34,212	2,518	14.70
Medicaid	13,618	669	8.07	13,800	662	8.16	1,853	636	7.94	14,085	796	7.70	15,447	809	6.85
Uninsured	28,285	868	6.60	28,939	848	6.36	5,686	860	7.22	23,643	1,147	7.01	26,462	1,032	10.00
Rx drug insurance															
Yes	49,920	689	1.30	50,835	669	1.25	45,219	788	1.70	37,889*	816	1.95	43,287	899	1.81*
No	18,043	455	2.20	18,336	430	2.01	16,199*	606	3.05	17,157*	529	2.85*	18,593	561*	3.54*
Federal poverty level, %															
<100	6,671	227	3.21	6,662	215	2.95	6,634	264	3.51*	6,660	259	3.64	7,048	447*	6.08
100-299	16,176	443	2.45	16,207	418	2.31	15,634*	517*	2.96	17,688	664*	3.35*	16,146	567*	3.38*
300-399	33,250	603	1.68	33,249	559	1.57	33,421	806	2.11	33,408	844	2.15	34,800	905*	2.34
≥ 400	75,952	876	1.07	76,445	846	1.02	71,194*	1,056	1.38	68,553*	973*	1.40	69,381*	1,041	1.46
Usual source of care															
Yes	44,593	776	1.61	46,998	759	1.51	38,120*	839	2.02	31,422*	794	2.15*	35,407*	956	2.47*
No	29,394	193	0.60	29,400	188	0.57	27,248*	223	0.78	29,450	259	0.75	25,137	260	0.70
Inpatient visit															
Yes	26,733	1,283	4.08	27,620	1,223	3.66	25,314*	1,643	5.9	20,156*	1,255	5.28	22,576*	1,517	5.88
No	37,413	565	1.34	38,948	550	1.26	32,574*	640	1.78	28,272*	683	1.95*	30,675*	713*	2.09*

Ex/v good/good, Excellent/very good/good, HMO, P.Ins, private insurance; Rx, prescription; SmAdj, small adjacent  
Significantly different from urban/  $p < 0.05$

**Table 3: Estimates of factors associated with the out-of-pocket healthcare spending to total household income ratio ( $r^2 = 0.3027$ )**

Factor	Beta estimate	Standard Error	P Value
<b>Location</b>			
Urban (reference)	–	–	–
Micropolitan rural	0.007	0.044	0.881
Small Adjacent rural	0.020	0.074	0.785
Remote rural	0.060	0.054	0.268
<b>Predisposing characteristics</b>			
Race / Ethnicity			
White (reference)	–	–	–
Afr. Am.	-0.498	0.032	<0.001
Hispanic	-0.462	0.035	<0.001
Other Race	-0.382	0.044	<0.001
Female	0.163	0.019	<0.001
Age group (years)			
19–44 (reference)	–	–	–
45–64	0.538	0.022	<0.001
≥65	0.502	0.050	<0.001
Excellent to Good Health Status	-0.427	0.025	<0.001
Not Employed	0.363	0.032	<0.001
<b>Enabling Characteristics</b>			
Insurance status			
Private Insurance--HMO (ref.)	–	–	–
Private Insurance–Non HMO	0.158	0.028	<0.001
Medicare	0.531	0.058	<0.001
Medicaid	-1.035	0.068	<0.001
Uninsured	0.090	0.046	0.052
Rx Drug coverage	-0.093	0.032	0.004
Percent of Federal Poverty Limit			
<100	1.833	0.048	<0.001
100-299	0.992	0.025	<0.001
300-399	0.552	0.022	<0.001
≥400 (reference)	–	–	–
Usual source of care	-0.403	0.031	<0.001
At least 1 inpatient visit	0.498	0.030	<0.001
Year			
2003 (reference)	–	–	–
2004	-0.023	0.019	0.231
2005	-0.043	0.020	0.031
<b>County-level variables</b>			
Hospital bed to population ratio, quartiles			
>4.34/1000 (reference)	–	–	–
2.37–4.34/1000	-0.025	0.045	0.575
0.92–2.36/1000	0.003	0.047	0.956
<0.92/1000	0.043	0.050	0.389
HPSA Status			
Not a HPSA (reference)	–	–	–
Partial HPSA	-0.026	0.027	0.338
Full HPSA	0.058	0.057	0.307
White collar employment quartiles			
>56.2	0.049	0.048	0.315
50.9–56.2	0.001	0.037	0.971
46.2–50.8	0.020	0.027	0.451
<46.2 (reference)	–	–	–

HPSA, Health Professional Shortage Area.



The unadjusted analysis found that those who had a usual source of care had significantly higher ratios; not surprisingly, a usual source of care is also strongly associated with a higher number of office-based visits and inpatient hospital visits (data not shown), which can increase out-of-pocket costs. However, those with a usual source of care were also more likely to be in poorer health, which was a significant contributor in the final model. Thus, after controlling for health status and actual utilization, having a usual source of care was associated with lower ratios, indicating a protective effect of provider continuity and care coordination.

It was surprising that none of the county-level variables were found to be significant contributors to the spending ratio. The fact that rurality of the county was not significant, despite other studies showing a significant effect<sup>13,14</sup>, may be due to two factors. First, we utilized county-level variables in the analysis to try to account for the county-level effects that would contribute to the ratio. We had hypothesized that counties with more hospital beds would have higher spending due to more inpatient visits; HPSA-designated counties would have lower spending due to lower utilization; and that counties with higher white collar employment rates would have lower spending due to more generous healthcare benefits (ie lower out-of-pocket sharing). The fact that these hypotheses were not upheld indicates that the other factors, such as actual utilization and insurance type are more important than these county-level variables. Secondly, the log-transformed dependent variable, which was not utilized in previous works, may account for the difference in the outcomes.

These results indicate potential interventions that may alleviate increased financial burdens. Lower out-of-pocket payments, and thus lower ratios, may be achieved by reducing utilization (either office based visits or inpatient visits), particularly if that utilization is unnecessary (such as non-acute visits to the emergency department). These types of visits are common when primary care providers are not available, as is the case in HPSA areas. Additional program

implementations, particularly in underserved areas, may entail the using of electronic visits (such as email disease and medication management), the use of telephone communications, or even the more extensive telemedicine programs that are being tested throughout the country. These programs may be useful in reducing the out-of-pocket payment burden for patients as well as extending existing providers (such as physicians, physician extenders, advanced practice nurses, and pharmacists) to better care for their patient population<sup>19-21</sup>.

The recent passage of the US *Patient Protection and Affordable Care Act* (2010) will put many of these concepts to the test. Provisions within this act will effectively lower out-of-pocket healthcare spending for some groups, either through reduce copayments, deductibles, or increased spending caps. Also, by encouraging uptake of insurance via mandates, Medicaid expansion, and increased coverage options individuals who previously did not have insurance will begin to carry coverage, effectively reducing their out-of-pocket spending burden at the point of care. It remains to be seen, however, how effective this legislation will be on spending ratios.

This analysis was limited by several factors. First, the characteristics of the head of household were applied to the entire household, which may be inappropriate if the members of the household are not similar demographically to the head. In a homogenous demography, this assumption would not be problematic; however, in the current society, households of mixed race/ethnicity, educational levels, employment statuses, and ages are not uncommon. In addition, it was decided not to include premium expenses in the calculations. It is possible that these premium costs would affect healthcare seeking behavior; however, their exclusion assumes an indirect relationship that is mirrored in previous studies<sup>13,14</sup>. Premium costs may serve as a proxy for the generosity of the healthcare plan itself, because plans with higher premiums may have lower out-of-pocket responsibilities. Thus, it would be ideal to include other variables related to the insurance market, type and generosity





of benefits, out-of-pocket responsibilities, and managed care penetration of the area.

Despite these limitations, this analysis found that living in a rural area, in and of itself, was not associated with a higher healthcare spending burden, as measured by the ratio of out-of-pocket healthcare expenditures to total income. Rather, other factors such as income, health status, insurance type, provider availability and continuity, and service utilization were strongly associated with the ratio, explaining the lack of adjusted urban/rural differences.

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