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# Medication Costs, Adherence, And Health Outcomes Among Medicare Beneficiaries

Further evidence that a Medicare drug benefit should be targeted toward those who most need assistance in paying for medications.

## by Ramin Mojtabai and Mark Olfson

**ABSTRACT:** In a two-year period more than two million elderly Medicare beneficiaries did not adhere to drug treatment regimens because of cost. This poor adherence tended to be more common among beneficiaries with no or partial medication coverage and was associated with poorer health and higher rates of hospitalization. The risk for cost-related poor adherence was especially pronounced among lower-income beneficiaries with high out-ofpocket drug spending. We argue that this pattern of cost-related poor medication adherence should inform the design of Medicare prescription drug benefit legislation.

RIDLY RISING PRESCRIPTION DRUG COSTS have raised concerns over access for older Americans. Although Medicare covers most of the elderly, the traditional Medicare benefit package does not cover outpatient prescription drugs. Many beneficiaries have some drug coverage through employersponsored supplemental insurance, individually purchased Medigap plans, Medicare health maintenance organization (HMO) plans, or public programs such as Medicaid and state pharmacy programs. However, there has been a recent decline in these sources of supplemental coverage.<sup>1</sup> Approximately ten million Medicare beneficiaries have no prescription drug coverage.<sup>2</sup> Without governmental intervention, this number is likely to grow.

Despite widespread public attention to this issue, little information exists concerning the use of medications and health outcomes among Medicare beneficiaries without prescription drug coverage. Some evidence suggests that elderly beneficiaries who do not have drug coverage use fewer prescription drugs, forgo filling their prescriptions, skip doses, or use lower doses than prescribed, because of the cost of medications.<sup>3</sup> However, the association of cost-related poor medication adherence with health outcomes in representative samples of Medicare beneficiaries remains unexamined.

Ramin Mojtabai is an assistant professor of clinical psychiatry and Mark Olfson, an associate professor of clinical psychiatry, in the Department of Psychiatry, College of Physicians and Surgeons of Columbia University, and the New York State Psychiatric Institute.

In this paper we use data from a recent national household survey of older Americans to examine the association of prescription drug coverage with adherence to medications prescribed for various chronic conditions and the association of cost-related poor adherence with health outcomes. We also examine the prevalence of poor adherence among beneficiaries at different income levels and with different levels of out-of-pocket spending.

# **Study Methods**

■ Sample. The data come from the most recent wave (2000) of the Health and Retirement Study (HRS), an ongoing longitudinal survey of community-dwelling older Americans.<sup>4</sup> The HRS sampled household residents in the forty-eight contiguous states using a multistage area probability sampling design. The first wave of the HRS included participants born in 1931–1941. It was conducted in 1992 and has been repeated every two years since. In addition to the original cohort, new cohorts are added to provide coverage of the whole age range of U.S. elderly.<sup>5</sup> The response rate at the 1992 interview was 78 percent. Nonrespondent households were more likely to be white, married, in good physical and mental health, and currently working and were less likely to have public health insurance. Nonrespondents also had more financial assets and higher incomes. These factors were taken into account in computing analytic weights used here. A total of 19,581 participants were interviewed in 2000. We focus on the 10,413 participants age sixty-five and older who were enrolled in Medicare in 2000. Nearly four-fifths of the interviews were conducted by telephone and the rest in person.

**Assessment.** *Specific conditions and medication use.* We examined conditions that typically require continuous medication treatment: hypertension, arthritis, cardio-vascular disease (including heart attacks and angina), diabetes, psychiatric disorders, and lung disease (excluding asthma). For each condition, participants were asked whether a doctor had ever told them they had the condition, and whether they used medications for each condition.

Office visits, preventive services, and other interventions. Participants were asked about the number of visits to doctors' offices over the past two years. They also were asked if they had received preventive services during that time, including cholesterol testing, flu shots, mammography or Pap smears for women, and prostate examination for men. A scale was created by summing positive responses (score range, 0–3). Participants who indicated having a heart disease were asked if in the past two years they had received a special test or treatment of their heart "where tubes were inserted into veins or arteries (cardiac catheterization, coronary angiogram, or angioplasty)." They were also asked about heart surgery. Participants with lung disease were asked if they were receiving "respiratory therapy." Finally, respondents with hypertension and diabetes were asked if over the past two years they had "lost weight or followed a special diet" for their condition.

Drug coverage. Participants who indicated that they used medications were asked

whether all or some of the costs were covered by insurance. Based on responses, three categories of coverage were constructed: full, partial, and no coverage.

*Cost-related poor adherence.* Rating of cost-related poor adherence was based on one question. Respondents who reported using medications were asked whether during the past two years they had taken less than prescribed because of cost.

*Health ratings.* Change in the status of each condition was ascertained by asking participants whether each of their conditions had gotten worse, gotten better, or not changed since the last interview two years ago. Participants with hypertension and diabetes were also asked whether the condition was under control.

General physical symptoms were ascertained by asking participants about seven physical symptoms that had been persistent since the last interview: swollen feet, shortness of breath, dizziness, back pain, headache, severe fatigue or exhaustion, and wheezing. A scale was created by summing the positive responses (score range, 0–7). Depressive symptoms were assessed using a modified eightitem version of the Center for Epidemiologic Studies—Depression Scale (CES-D), developed for the HRS (score range, 0–8).<sup>6</sup> Overall perceived health was assessed by a five-point self-rated scale from "excellent" to "poor."

*Out-of-pocket spending and household income.* Participants who indicated that they used medications were asked about their monthly medication spending. Respondents who could not provide exact amounts were asked to provide estimates. Income was ascertained by asking about household income from various sources during the past year (1999). The relationship of income to the federal poverty level was assessed using the annual federal poverty guidelines for 2000.<sup>7</sup>

**Data analysis.** Data analysis was conducted in four stages. (1) Demographicspecific and insurance coverage-specific rates of medication use and out-of-pocket medication spending were calculated. (2) The association of prescription drug coverage with cost-related poor medication adherence was examined by binary logistic regression analyses. A three-tier measure of insurance coverage (full, partial, no coverage) was used to index depth of drug coverage. Age, sex, race, education, and household income were included in these regressions, to adjust for their potential confounding effects. Trends across levels of coverage were also assessed using the score test for trend of odds. (3) The association of cost-related poor medication adherence with health outcomes was examined, using binary logistic regression for dichotomous health outcomes, ordinal logistic regression for the ordinal measure of overall perceived health, and linear regression for continuous outcomes. Age, sex, race, household income, education, and out-of-pocket medication spending were included in these analyses to adjust for their potential effects. To adjust for the effect of overall access to health services, we included number of office visits and access to preventive services in all models predicting health outcomes. We also included weight control and special diet in models predicting outcomes of hypertension and diabetes, catheterization and heart surgery in the model predicting outcome of heart disease, and respiratory therapy in the model predicting outcome of lung disease.

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These analyses were conducted in the whole sample and repeated in the subsample of participants with incomes of 200 percent of poverty or below. (4) Finally, the prevalence of cost-related poor adherence in patients with various levels of income and out-of-pocket drug spending was examined using descriptive methods. In all analyses, frequency weights, strata, and primary sampling units were used to adjust the parameter estimates and their variances, using Stata 7.0.<sup>8</sup>

# **Study Results**

■ Sociodemographic characteristics. A majority of the sample was female, white, married, and not employed (Exhibit 1). The average age was 75.6 years (standard deviation = 7.4). Eighty-three percent (n = 8,704) took prescription medications. Thirteen percent of these (n = 1,320) had full medication coverage, and 61 percent (n = 5,132) partial coverage; the remaining 27 percent (n = 2,218) had no coverage (coverage information for thirty-four participants was missing). All numbers above are unweighted.

On average, Medicare beneficiaries who took medications spent \$73 per month on medications. Out-of-pocket drug spending varied among beneficiaries by supplemental coverage source (Exhibit 1). Beneficiaries who also had Medicaid coverage spent the least; those with individually purchased supplemental coverage and without any supplemental coverage (traditional Medicare) spent the most.

#### EXHIBIT 1

Medication Use And Monthly Out-Of-Pocket Spending On Medications Among A Sample Of Medicare Beneficiaries Age 65 And Older, According To Demographic Characteristics And Insurance Type, 2000

		Medication use			
Characteristic	Percent of Medicare beneficiaries (N = 10,413) <sup>a</sup>	Percent who take Rx drugs	Comparison of groups on Rx drugs (design- based F)	Monthly out-of- pocket spending on medications (among those taking Rx drugs)	
Sex					
Male	42%	80%		\$71	
Female	58	86	39.20****	75	
Age (years)					
65-74	51	80		61	
75-84	38	86		84	
85+	11	87	35.55****	85	
Race/ethnicity					
White	85	83		77	
Black	8	85		60	
Hispanic	4	81		38	
Other	3	80	1.75	37	
Education (years)					
Fewer than 12	32	84		66	
12	34	83		73	
More than 12	34	83	0.43	80	

#### **EXHIBIT 1**

#### Medication Use And Monthly Out-Of-Pocket Spending On Medications Among A Sample Of Medicare Beneficiaries Age 65 And Older, According To Demographic Characteristics And Insurance Type, 2000 (cont.)

		Medication use			
Characteristic	Percent of Medicare beneficiaries (N = 10,413) <sup>a</sup>	Percent who take Rx drugs	Comparison of groups on Rx drugs (design- based F)	Monthly out-of- pocket spending on medications (among those taking Rx drugs)	
Marital status Married or living as married All other <sup>b</sup>	57% 43	83% 83	0.12	\$ 71 75	
Employment Employed Not employed	11 89	74 84	41.04****	66 74	
Household income (compared to FPL) <sup>c</sup> <100% 100-199% 200-299% 300-399% 400%+	10 25 22 14 29	86 84 84 83 82	1.53	51 78 81 72 71	
Insurance coverage <sup>d</sup> Individually purchased supplemental Medicare HMO	30 24	84 82	1.44 2.28	110 58	
Only traditional Medicare Employer-sponsored supplemental	20 13	78 84	38.48**** 0.54	79 47	
Other employer-sponsored Medicaid	12 8	86 90	7.05** 31.50****	47 26	
CHAMPUS/VA/other governmental Total	2 100	86 83	0.82	30 73	

SOURCE: Authors' analysis of Health and Retirement Study data.

**NOTES:** CHAMPUS is Civilian Health and Medical Program of the Uniformed Services, now known as Tricare. VA is Department of Veterans Affairs.

<sup>a</sup> Unweighted number.

<sup>b</sup> Includes widowed, divorced, separated, and never married.

° FPL is federal poverty level (in 2000, income of \$8,350 per year for a household of one and \$11,250 per year for a household of two).

<sup>d</sup> Each insurance group was compared with all other groups combined. The percentages of people with various types of supplemental coverage add up to more than 100 percent because some are covered by multiple supplemental plans. \*\*p < .05 \*\*\*\*p < .001

■ Drug coverage and poor adherence due to cost. Chronic health conditions were common among Medicare beneficiaries (Exhibit 2). Forty-eight percent reported taking medications for hypertension, 27 percent for arthritis, 20 percent for heart disease, 13 percent for diabetes (both insulin and oral medications), 6 percent for psychiatric disorders, and 6 percent for lung disease. Overall, among 8,704 beneficiaries using medications for any conditions, 557 (7 percent) reported cost-related poor adherence. This corresponds with more than two million beneficiaries. As shown, lack of drug coverage was associated with cost-related poor adherence.

#### EXHIBIT 2 Association Of Medication Coverage And Cost-Related Poor Adherence In Medicare Beneficiaries Age 65 And Older Who Use Medications For Any Condition, 2000

	Percent with poor adherence because of cost, by Rx coverage level			Comparison across levels of Rx coverage	
Condition	No coverage	Partial coverage	Full coverage	Comparison of each level of coverage with the next (adjusted odds ratio) <sup>a</sup>	Score test for trend of odds (Chi square) <sup>b</sup>
Hypertension (n = $5,101$ )	11	5	4	0.46****	52.30****
Arthritis (n = $2,894$ )	17	9	7	0.45****	35.21****
Heart disease (n = 2,070)	17	7	4	0.34****	61.09****
Diabetes (n = 1,476)	14	8	5	0.46****	20.98****
Psychiatric disorder (n = 735)	25	12	5	0.33****	20.22****
Lung disease (n = 604)	22	12	9	0.46****	7.59***
Any condition (n = 8,704)	12	5	3	0.40****	125.34****

SOURCE: Authors' analysis of Health and Retirement Study data.

NOTE: All numbers (n) are unweighted.

<sup>a</sup>Adjusted odds ratio was obtained in logistic regression adjusting for age, sex, race, education, and income and for design elements.

<sup>b</sup> Adjusted for age, sex, race, education, and income.

\*\*\*p<.01 \*\*\*\*p<.001

■ Association of poor adherence and health outcomes. We found cost-related poor medication adherence to be related to adverse health outcomes (Exhibits 3–5). Participants with cost-related poor adherence were more likely than those without it to perceive their overall health as poor (23 percent versus 10 percent, respectively) and to have been hospitalized (43 percent versus 33 percent). They also were more likely to report that their health got worse over the past two years (44 percent versus 30 percent); to report more general physical symptoms (2.4 [SD=1.9] versus 1.4 [SD=1.5]); to report worsening of hypertension (7 percent versus 3 percent); to report that hypertension was not controlled (7 percent versus 3 percent); to report worsening of heart disease (21 percent versus 11 percent) and arthritis (49 percent versus 40 percent); and to report higher depressive symptoms (mean CES-D score of 4.5 [SD=2.0] versus 3.5 [SD=2.5]). Repeating analyses in the subgroups with income of 200 percent of poverty or less produced similar results (data not shown), with the exception that results for worsening of arthritis and depressive symptoms did not reach statistical significance.

**Relationships between drug spending and adherence across income groups.** We also found cost-related poor adherence to be associated with income level and out-of-pocket spending for drugs (Exhibit 6). Whereas only 7 percent of all Medicare beneficiaries using medications reported cost-related poor adherence, more than 20 percent of low-income beneficiaries with out-of-pocket drug spending of \$1,000 or more did so.

EXHIBIT 3
Association Of Cost-Related Poor Adherence With Global Measures Of Health Status
In Medicare Beneficiaries Using Medications For Any Condition, 2000

Variable	Overall perceived health (adjusted odds ratio) <sup>a,b</sup>	Health got worse (adjusted odds ratio)ª	General physical symptoms (beta)°	Hospitalization in past two years (adjusted odds ratio) <sup>a</sup>
Cost-related poor adherence	1.86****	1.75****	0.82****	1.49****
Age	1.02****	1.04****	0.02****	1.03****
Male	1.15***	0.99	-0.20****	1.27****
Black	1.53****	0.81**	0.00	1.08
Hispanic	1.16	0.94	-0.38****	0.96
Other race/ethnicity	1.24	0.96	0.04	1.14
Household income, in \$10Ks	0.97****	0.98**	-0.02****	0.99
Education	0.87****	0.94****	-0.08****	0.96****
Out-of-pocket Rx spending Average number of office	1.10***	1.07***	0.04***	1.09***
visits per month	2.52****	2.07****	0.37***	2.37****
Access to preventive services	0.87****	0.99	-0.01	0.99

SOURCE: Authors' analysis of Health and Retirement Study data.

<sup>a</sup> Adjusted odds ratio obtained in logistic regression.

<sup>b</sup> Since self-rating of health was conducted on an ordinal scale, analyses were conducted using ordinal logistic regression. <sup>c</sup> Beta is the regression coefficient obtained in the ordinary least squares analysis (intercept = 1.20). It shows the quantitative

effect that each of the variables has on the variable "general physical symptoms."

\*\*p<.05 \*\*\*p<.01 \*\*\*\*p<.001

#### **EXHIBIT 4**

#### Association Of Cost-Related Poor Adherence With Change In Hypertension And Diabetes Among Medicare Beneficiaries Using Medications For These Conditions, 2000

Variable	Hypertension got	Hypertension not	Diabetes got	Diabetes not
	worse (adjusted	controlled (adjusted	worse (adjusted	controlled (adjusted
	odds ratio)	odds ratio)	odds ratio)	odds ratio)
Cost-related poor adherence	1.76**	1.92***	1.44	1.39
Age	1.00	0.98	0.99	0.96**
Male	0.63***	0.73	1.09	0.93
Black	1.03	1.68**	1.05	1.00
Hispanic	1.47	1.68	1.42	0.80
Other race/ethnicity	0.84	3.18***	0.72	0.80
Household income, in \$10Ks	1.00	0.96	1.03	0.95
Education	0.95	0.99	1.01	0.93**
Out-of-pocket spending on medications Average number of office visits per month	1.02 1.13**	1.01 1.19***	1.05 1.47**	1.06 1.09
Access to preventive services	0.94	0.81	0.96	0.95
Weight control and diet	1.22	1.45	1.38	1.59

SOURCE: Authors' analysis of Health and Retirement Study data.

NOTE: Adjusted odds ratios obtained in logistic regression.

\*\*p < .05 \*\*\*p < .01

#### **EXHIBIT 5**

#### Association Of Cost-Related Poor Medication Adherence With Change In Heart And Lung Disease, Arthritis, And Psychiatric Disease Among Medicare Beneficiaries Using Medications For These Conditions, 2000

Variable	Heart disease got worse (adjusted odds ratio) <sup>a</sup>	Lung disease got worse (adjusted odds ratio) <sup>a</sup>	Arthritis got worse (adjusted odds ratio) <sup>a</sup>	Psychiatric disease got worse (adjusted odds ratio) <sup>a</sup>	Depressive symptoms (beta) <sup>b</sup>
Cost-related poor adherence	1.81**	1.22	1.36**	0.97	0.57***
Age	0.99	0.99	1.00	1.00	-0.00
Male	0.76**	1.24	0.90	0.74	-0.04**
Black	0.64**	0.88	0.72	0.82	0.21
Hispanic	0.27**	0.24**	0.74	0.65	-0.25
Other race/ethnicity	1.13	0.35	0.65****	0.22	-0.88
Household income, in \$10Ks	0.96	1.04	0.98	0.99	-0.04**
Education years	0.97	0.97	0.98	0.94	-0.08***
Out-of-pocket spending on medications Average number of office visits per month	1.01 1.30**	1.00 1.31	1.03 1.55****	1.33** 1.20	0.10 0.45****
Access to preventive services	0.91	0.76**	0.99	1.08	-0.29**
Weight control and diet	1.52**	_ <sup>c</sup>	_c	_c	_ <sup>c</sup>
Cardiac catherization in past 2 years Heart surgery in past 2 years Receives respiratory therapy	2.32**** 1.78** _°	_c _c 1.48	_c _c	_c _c	_c _c

SOURCE: Authors' analysis of Health and Retirement Study data.

<sup>a</sup> Adjusted odds ratios obtained in logistic regression.

<sup>b</sup> Beta is the regression coefficient obtained in the ordinary least squares analysis (intercept = 5.69). It shows the quantitative effect that each of the variables has on the variable "depressive symptoms."

° Not in the regression model.

\*\**p* < .05 \*\*\**p* < .01 \*\*\*\**p* < .001

# **Discussion And Policy Implications**

More than two million Americans with Medicare coverage had cost-related poor adherence with their medications in 2000. Our results further show that Medicare beneficiaries with higher out-of-pocket medication spending reported higher rates of cost-related poor adherence, which, in turn, adversely affected their health outcomes. Our study also shows that low-income beneficiaries with higher out-of-pocket spending for drugs were especially vulnerable to costrelated poor adherence.

■ Limitations. This study had several limitations. First, all measures are based on self-reports. Second, our data are cross-sectional. Caution is required in inferring causal relationships from such data. Third, we focused on poor adherence with medications that the participant had already purchased and was using. Another likely effect of lack of drug coverage would be to forgo purchasing prescribed drugs altogether. Therefore, our estimates of the effect of prescription drug coverage on poor adherence are likely conservative. Finally, we did not attempt to assess directly

#### **EXHIBIT 6**

Association Of Poor Medication Adherence With Household Income (As A Percentage Of The Federal Poverty Level) And Yearly Out-Of-Pocket Drug Spending Among Medicare Beneficiaries Taking Medication For Any Condition, 2000



SOURCE: Authors' analysis of data from the Health and Retirement Study.

the impact of medication insurance coverage on health outcomes because the potential effects of adverse selection would make the results difficult to interpret.<sup>9</sup> People in poorer health simply tend to buy more coverage. Hence, the effect of coverage on health cannot be separated from the effect of health on coverage. Focusing on cost-related poor adherence allowed us to bypass these reciprocal associations and assess the impact of financial barriers to needed medications on health outcomes.

■ Implications for designing a Medicare drug benefit. This study adds to mounting evidence of the need for a Medicare prescription drug benefit. However, there are few empirical data, beyond overall cost estimates, to guide development of a specific plan. There seems to be a consensus that any such plan should target those in most "need." However, there is little consensus about how to define "need."<sup>10</sup>

Cost-related poor medication adherence may inform the definition of "need" and provide a justification for prescription drug coverage. We believe that efficient benefit design should give priority to people who without such coverage would be at highest risk of delaying or forgoing the purchase of necessary medications. Thus, an efficient plan should include a sliding-scale copayment schedule, referenced to income and spending, that reduces copayment to zero for the lowest-income beneficiaries with high out-of-pocket spending.<sup>11</sup>

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