

Expenditures for prescription drugs are not covered by Medicare and are thus a potential source of large out-of-pocket expenditures for elderly persons. This study, using a new data source, the 1990 Elderly Health Supplement to the Panel Study of Income Dynamics (PSID), demonstrates that, among elderly persons, insurance coverage for drugs reduces the fraction of household income spent on prescription drugs by 50 percent. Groups most likely to benefit from insurance coverage are elderly women and those with common chronic conditions, low incomes, and rural residences.

Key Words: Prescription drug use, Prescription drug expenditures, Vulnerable elderly populations

The Financial Burden of Prescription Drug Use Among Elderly Persons

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Outpatient prescription drugs are not covered by Medicare and are therefore a major source of out-of-pocket expenditures for elderly persons. Due to the potentially catastrophic nature of prescription drug expenditures, expansion of Medicare benefits has been proposed several times, but never implemented. The Medicare Catastrophic Act of 1988, which contained a prescription drug benefit, was passed into law but repealed before it ever became effective. Under recent health care reform initiatives, providing coverage for drugs was one of the most significant expansions of health benefits proposed for older Americans. These expansions, however, are no longer being considered.

Because drugs are currently not covered by Medicare, insurance coverage must be obtained from other sources. Some elderly persons (approximately 10%) qualify for Medicaid if their incomes and assets are low enough. The remainder who are insured (approximately 40% of elderly persons; Lillard, Rogowski, & Kington, 1996) receive insurance from former employers or purchase supplemental insurance. Because supplemental policies covering drugs are expensive, however, few elderly persons purchase them. Only 19% of elderly persons with a privately purchased policy have coverage for drugs. Most employer-provided policies, however (92%), do cover drugs (Long, 1994). Despite the existence of private insurance and Medicaid, half of the elderly population does not have any insurance coverage for prescription drugs.

The financial burden associated with prescription drug expenditures among elderly persons can be quite high. A study by Coughlin, Liu, and McBride (1992) showed that among severely disabled elderly persons, outpatient prescription drug costs account for over half of out-of-pocket expenditures for health care. This compares to only 20% spent on nursing home care for this patient population. Despite the potentially catastrophic nature of prescription drug expenses, little is known about the level of financial burden borne by elderly households for prescription drug purchases, and how insurance coverage may decrease that burden.

The literature has demonstrated, however, that the large potential burden of out-of-pocket expenditures may serve as a barrier to needed medications among elderly persons and possibly result in worse health outcomes. A growing number of studies suggest that policies such as limits on drug payments that reduce utilization of drugs may result in a range of behavioral responses that may have a clinical impact. For example, in a series of studies, Soumerai and colleagues have found that Medicaid drug restrictions led to reductions in the use of both "essential" drugs such as insulin and "nonessential" drugs (Soumerai, Avorn, Ross-Degnan, & Gortmaker, 1987), increased risks of nursing home admissions (Soumerai, Ross-Degnan, Avorn, McLaughlin, & Choodnovskiy, 1991), and increased use of mental health services among patients with schizophrenia (Soumerai, McLaughlin, Ross-Degnan, Casteris, & Bollini, 1994).

In this study, we analyze the role of private insurance in decreasing the level of financial risk among elderly households associated with prescription drug use. In addition, we identify vulnerable populations who would feel the most financial relief from prescription drug coverage under Medicare.

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Methods

Data

The study uses data from the Panel Study of Income Dynamics (PSID). The PSID is a nationally representative longitudinal survey of households conducted by the Survey Research Center (SRC), University of Michigan. Since 1968, the PSID has followed and interviewed annually a national sample that began with about 5,000 families and now includes over 21,000 individuals and 7,000 households. The core survey collects detailed information on income, work, unemployment, use of public programs, demographic information, and some measures of health and disability.

In 1990 the PSID data were supplemented in order to collect detailed information on health status, insurance, and health care costs of elderly respondents. These data were collected in a telephone and a mail-in survey. The telephone survey contained information on medical care utilization, costs of care, and sources of payment. These are disaggregated across a number of cost categories, including prescription drugs. Data on the utilization and costs of each of these services were collected for the 12 months prior to the PSID telephone interview and were self-reported. The response rate in the telephone survey was 99%.

Information on insurance coverage and health status was contained in the mail-in survey. Insurance coverage data includes information on the types of insurance policies held as well as the types of service (such as prescription drugs) covered by those policies. Health status was measured through a set of questions on general health perceptions, functional status, mental health, role functioning, medical conditions, and health behaviors. These questions were primarily based on the Medical Outcomes Study (MOS) Short Form 36 (Stewart et al., 1992). The response rate for the mail-in survey was 74%.

Analytic Measures

The analyses were performed on elderly persons aged 66 and older. We restricted the sample of elderly persons in this way because the health supplement measures health care use and expenditures for a period 12 months prior to the survey. For persons aged 66 and older we observed expenditures during a period in which basic health insurance coverage (Medicare) was continuous. We also excluded individuals (32) who were institutionalized for the entire year prior to the survey. The sample size is 996 elderly individuals. Estimations and mean values are weighted to reflect the original 1968 sampling weights for families initially included in the panel with corrections for selective attrition from the panel between 1968 and 1990 and nonresponse to the mail-in survey (see Appendix, Note 1).

Expenditures for prescription drugs as well as out-of-pocket amounts represent annual expenditures. We measure the financial burden associated

with prescription drug use as the ratio of out-of-pocket expenditures to household income. Household income includes all pretax income for the head of household and spouse, as well as any other members of the household. Financial burden does not have a normal distribution. Instead, there are some elderly persons with very high levels of burden (the distribution has a long right tail). To adjust for this, we use the log of burden as the dependent variable in the estimations.

Measures of prescription drug use and expenditures in the PSID compare favorably with those in other surveys. For instance, in the 1987 National Medical Expenditure Survey (NMES), 82 percent of persons aged 66 and older reported any use of prescription drugs. This compares to 85 percent in the PSID. Expenditure amounts are also comparable although the PSID estimates are somewhat higher than the NMES (see Appendix, Note 2). It is difficult to compare dollar amounts across the two surveys because both prescription drug prices and the amount of drugs used have risen over time. Dollar amounts in the PSID, which was fielded in 1990, are higher than those in the 1987 NMES, even after conversion to constant dollars. Because expenditures have a long right tail, the appropriate comparison is the geometric mean. Among elderly persons aged 66 and older with prescription drug use, the geometric mean expenditure in the PSID is \$320 compared to \$219 in the NMES in 1990 constant dollars. The PSID mean is, however, within one standard error of the NMES mean. The discrepancies may be due to the rise in consumption of drugs over time or differences in the degree of underreporting in the two surveys. There is some debate as to the degree of underreporting in the NMES (Berk, Schur, & Mohr, 1990, 1991; Congressional Budget Office, 1989; Moeller & Mathiowetz, 1989, 1991). Because of the respondents' experience in answering surveys and the structure of the survey questions, the PSID may have less underreporting.

The presence of private insurance and whether that insurance covered prescription drugs were determined from the Health Supplement. Coverage by Medicaid was determined by state eligibility criteria. The models estimated include coverage by eligibility criteria as opposed to actual coverage, as the use of actual coverage creates endogeneity problems for the statistical estimates. Actual Medicaid eligibility may be attained as a result of high medical expenditures through a process in which family income is spent down to meet state income requirements. The eligibility measure we use avoids endogeneity bias.

Health status is measured in several dimensions. General health status is measured based on 5 MOS Short Form 36 health status questions, each with 5 potential levels. A value of 25 on the general health status scale indicates the poorest outcome and 5 the best outcome. This measure has been found to be valid and reliable, with a Cronbach alpha of 0.86. The survey respondents were also asked to report on the presence of a number of chronic conditions.

For this analysis, we include only those conditions that are likely to require treatment with prescription drugs and have a high degree of frequency of occurrence in the elderly population (at least 10%). Eight conditions met these criteria: arthritis, hypertension, allergies, heart failure, angina, chronic obstructive pulmonary disease, ulcers, and diabetes. In addition, we measured comorbidities by the presence of two or more of these conditions.

Income is measured in the core PSID data. The income-to-need ratio is calculated using the federal poverty threshold as defined in the P-60 Reports from the U.S. Census Bureau. This ratio represents the level of family income in relation to the poverty threshold. The following ranges are used to define income groups based on the income-to-need ratio: poor (ratio of 1 or less), near poor (1 to 1.25), low income (1.25 to 2), middle income (2 to 4), high income (above 4). Wealth is measured in the 1989 Wealth Supplement to the PSID and represents total wealth, including housing and the value of all assets owned by members of the household. Elderly persons are classified as living in an urban area if their county of residence is in a metropolitan statistical area (MSA).

Statistical Analyses. — In the multivariate analyses, we estimate a standard three-part model. In the first stage, the probability of use of drugs is estimated using the logit procedure. Conditional on use, we then estimate the probability of having an out-of-pocket expenditure. Finally, conditional on having an out-of-pocket expenditure, the level of burden is estimated using ordinary least squares. For expositional clarity the second equation is not presented (see Appendix, Note 3).

An important estimation issue in these equations is the potential endogeneity of insurance coverage. Lillard et al. (1996) have demonstrated that once

health status is controlled for, health insurance is not endogenous in the estimation of drug use and expenditures among elderly PSID respondents. In addition, because errors are likely to be correlated among members of the same household, we adjust the standard errors for intra-family correlation (Huber, 1967).

Results

Descriptive Analyses

Among elderly persons who use prescription drugs, a large fraction of their cost (67%) is paid for out of pocket, resulting in an average of 3.1% of household income being spent on out-of-pocket expenses for drugs. Some elderly households, however, have very high levels of expenditure and financial burden. For instance, 3.4% of elderly persons have total annual expenditures that exceed \$2000; and 1.0% spend in excess of \$2000 out of pocket. The resulting distribution of financial burden is also highly skewed, as shown in Figure 1. Whereas 55% of elderly persons who use drugs spend 1% or less of their household income on prescription drugs, 7% spend at least 10%. One percent spend over one quarter of their household income. The latter all have at least one common chronic condition.

Expenditures for drugs and the associated financial burden vary considerably within groups of the elderly population. For instance, as shown in Table 1, persons with insurance spend more (\$870 compared with \$585) on drugs but have lower out-of-pocket amounts (\$229 compared with \$443) than those without private insurance. The resulting level of burden is quite different for the two groups, with 1.4% of household income spent on drugs when insurance is present compared with 4.3% when it is not. Thus, elderly persons with private insurance

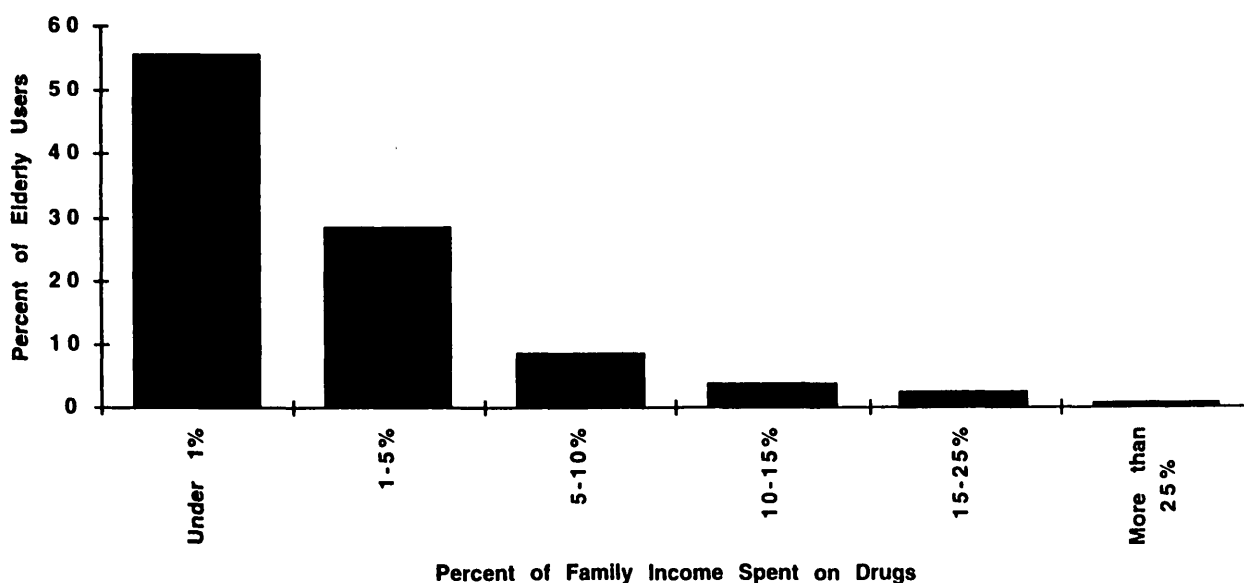


Figure 1. Percent of family income spent on out-of-pocket expenditures for prescription drugs among elderly users.

Table 1. Annual Prescription Drug Expenditures Among Elderly Persons by Demographic Characteristics

	N	Percent With Any Use	Among Users		
			Total Drug Expenditures	Out-of-Pocket Drug Expenditures	Percent of Family Income Spent on Out-of-Pocket Drugs
Overall age	996	85	702	355	3.1
66–69	315	81	775	281	1.5
70–74	284	84	786	327	2.5
75–79	211	88	753	480	4.6
80–84	121	83	637	383	4.6
85+	65	92	388	278	2.7
Education					
<12 years	481	85	715	406	4.5
12 years	323	86	751	308	2.3
>12 years	192	84	590	330	1.6
Gender					
Male	377	82	617	357	2.8
Female	619	87	750	354	3.3
Place of residence					
Urban	689	84	750	356	2.8
Rural	307	87	594	355	3.8
Race					
White	728	84	673	329	2.7
Black	251	88	615	205	1.9
Private insurance					
No drug insurance	641	82	585	443	4.3
Has drug insurance	355	91	870	229	1.4

Note. The sample consists of elderly persons aged 66 and older.

coverage for drugs have financial burden levels that are three times lower than those without.

Similarly, as shown in Table 2, poor, near poor, and low income households have much higher levels of burden (between 5.4 and 5.9%) than middle and higher income households (1.6 and 0.6%, respectively). On average, lower income individuals have burden levels more than three times as high as middle income elderly persons and almost 10 times as high as high income elderly. This is related not only to income, but to the presence of private health insurance. As income rises, the likelihood of having private insurance that covers drugs also rises. Both of these effects combine to make burden higher for lower income households. Recent health reform proposals included provisions for a phased-in drug benefit among elderly persons based on income. These results show that phasing in benefits for lower income elderly persons would provide benefits for those with the highest current levels of burden related to the purchase of drugs.

Elderly persons with common chronic conditions are also vulnerable to high financial burdens. Those without chronic conditions spent an average of \$353 on drugs compared with \$762 for elderly persons with one of the eight common chronic conditions listed. Drug expenditures include all drugs taken, even those related to other conditions. The out-of-pocket amounts were more than twice as large for persons with common chronic conditions (\$385 compared with \$182) and the burden level 2.5 times

as high. The presence of a second common chronic condition, while raising total expenditures to \$827 annually, had little additional effect on out-of-pocket expenses or burden levels.

Among elderly persons with common chronic conditions, those with diabetes had the highest levels of burden, spending an average of 4.1% of household income on out-of-pocket expenses for drugs. The average amount spent out of pocket was \$468. Elderly individuals with heart failure, angina, and ulcers also have high financial burdens with an average of 3.7 to 3.9% of household income spent on drugs. Those with heart failure spent an average of \$452 on out-of-pocket drug expenses; those with angina, \$533; and those with ulcers, \$471.

Drug expenditures also differ significantly by race. Blacks have lower total and out-of-pocket expenditures than whites. Although total expenditures for blacks are about 96% as high as for whites, out-of-pocket amounts are significantly lower, only 65% as high. This is undoubtedly because blacks are disproportionately Medicaid eligible, and thus have very small copayment amounts. They also have much lower incomes, only slightly more than half as high on average as for whites. Despite lower incomes, because out-of-pocket amounts are so low, the burden level for blacks is not as high as for whites: 1.9% of family income spent on drugs compared to 2.7%.

Elderly women have higher levels of burden than men (3.3% of household income spent on drugs

Table 2. Annual Prescription Drug Expenditures Among the Elderly by Chronic Medical Conditions, Number of Comorbidities, and Income

	N	Percent of Population	Percent With Private Insurance That Covers Drugs	Percent With Any Use	Among Users		
					Total Drug Expenditures	Out-of-Pocket Drug Expenditures	Percent of Family Income Spent on Out-of-Pocket Drugs
Medical conditions							
Arthritis	603	61	41	90	798	391	3.6
Hypertension	429	40	43	96	759	371	3.0
Allergies	296	30	42	88	890	340	3.4
Heart failure	114	11	42	93	1277	452	3.9
Angina	106	12	45	96	1231	533	3.7
Chronic obstructive pulmonary disease	112	12	39	94	1153	304	2.5
Ulcers	108	10	40	90	1231	471	3.9
Diabetes	123	11	44	94	1214	468	4.1
Comorbidities							
None of the above	185	19	38	64	353	182	1.4
One or more of the above	811	81	42	90	762	385	3.4
Two or more of the above	586	56	43	93	827	372	3.1
Income							
Poor	164	12	18	89	729	261	5.8
Near poor	79	8	27	91	605	371	5.4
Low income	201	20	26	86	1024	567	5.9
Middle income	319	33	50	81	604	328	1.6
High income	233	26	60	86	582	260	0.6

Note. The sample consists of elderly persons aged 66 and older.

compared with 2.8%) although they have the same out-of-pocket expenditures. This is true because household income is lower for older women than older men. The level of burden is lower for more educated persons, reflecting both higher retirement incomes and a higher prevalence of private insurance. Elderly persons living in rural areas also have higher levels of financial burden: 3.8% of family income spent on drugs compared to 2.8% for elderly persons living in urban areas.

Financial burden levels also increase with age up until age 85 (see Appendix, Note 4). For 66- to 69-year-olds the average amount of household income spent on drugs is 1.5%. This compares to 4.6% for persons aged 80–84. The increase in burden with age may be related to several factors, including the increased use of drugs with age, and the fact that private insurance levels are lower among the very old.

Multivariate Analyses

The levels of financial burden on elderly households associated with prescription drug use are clearly related to a number of factors, including insurance coverage, income, and health status. In addition, differences exist across sociodemographic groups. In order to determine the effects of each of these factors, many of which are correlated, we performed a multivariate analysis. The estimation results are shown in Table 3.

As shown in the first column of Table 3, insurance coverage for drugs has a strong effect on the proba-

bility of using prescription drugs. The presence of private supplemental insurance, whether it covers drugs or not, also affects use, but this effect is only significant at the 90% level. For persons with a private supplemental policy that does not cover drugs, the adjusted odds of use is 2.061. This effect is likely related to having private coverage for physician visits. For elderly persons with a private policy that covers prescription drugs, the adjusted odds of use is 4.393. Once insurance and health status have been controlled for, there are no significant differences in the adjusted odds of use across income groups.

Health status is an important determinant of use in a number of dimensions. Persons in poor general health are significantly more likely to use drugs (see Appendix, Note 5). Controlling for general health status, elderly persons with hypertension have significantly higher adjusted odds of use, a ratio of 4.354. Elderly persons with allergies have lower adjusted odds of use (a ratio of 0.532) although this effect is only significant at the 90% level. Although this result is somewhat counterintuitive, it may be related to the fact that many allergies are treated with over-the-counter medications. The presence of comorbidities (having two or more common chronic conditions) increases the adjusted odds of use by 2.341. Again, this effect is also significant, but only at the 90% level.

Once income, insurance, and health status were controlled for, the only significant determinant of use of services was education. Elderly persons who had

Table 3. Determinants of Prescription Drug Use and Financial Burden Among Elderly Persons

	Probability of Any Use of Drugs ^a	Amount of Financial Burden From Drug Use ^b		Probability of Any Use of Drugs ^a	Amount of Financial Burden From Drug Use ^b
Intercept	-1.593 (1.647)	-7.426** (1.003)	Low income	0.006 (0.400)	1.950** (0.261)
Sociodemographic			Middle income	-0.444 (0.310)	1.076** (0.148)
Age	0.011 (0.019)	0.003 (0.011)	Health Status		
Female	0.048 (0.261)	0.084 (0.236)	General health status	0.208** (0.039)	0.070** (0.016)
Black	-0.504 (0.405)	-0.463** (0.210)	Chronic Conditions		
Education: less than 12 years	-0.587** (0.261)	0.017 (0.178)	Arthritis	0.147 (0.300)	0.014 (0.254)
Urban	-0.209 (0.270)	0.191 (0.154)	Hypertension	1.471** (0.366)	0.381** (0.135)
Log wealth	-0.054 (0.056)	0.030 (0.033)	Allergies	-0.632* (0.349)	-0.018 (0.143)
Wealth missing	-0.551 (0.706)	0.210 (0.402)	Heart failure	-0.474 (0.473)	0.195 (0.184)
Married	-0.440 (0.288)	-0.178 (0.202)	Angina	0.814 (0.580)	0.444** (0.197)
Insurance			Chronic obstructive pulmonary disease	0.373 (0.453)	0.020 (0.185)
Private insurance	0.723* (0.381)	0.128 (0.238)	Ulcers	-0.543 (0.517)	-0.047 (0.174)
Private insurance covers drugs	0.757** (0.263)	-0.800** (0.148)	Diabetes	-0.153 (0.590)	0.458** (0.164)
Medicaid eligible	0.425 (0.580)	-0.426 (0.312)	Presence of two or more chronic conditions	0.851* (0.505)	0.077 (0.276)
Income			Log likelihood =		
Poor	0.162 (0.532)	2.240** (0.284)		-323.65	R ² = 0.410
Near poor	0.106 (0.693)	1.904** (0.357)		N = 996	N = 720

Note. The sample consists of elderly persons aged 66 and older. Parentheses contain the standard error adjusted for intrafamily correlation.

^aCoefficients are from a logit estimation.

^bFinancial burden is measured as the ratio of out-of-pocket expenditures for drugs to family income. Coefficients are from an ordinary least squares regression.

* $p < .10$; ** $p < .05$.

not completed high school were less likely to have used prescription drugs than those who had completed high school (an adjusted odds ratio of 0.56).

Conditional on having an out-of-pocket expenditure, the second column in Table 3 demonstrates that the financial burden (as measured by the fraction of household income spent on out-of-pocket expenses for drugs) is primarily determined by insurance coverage, income, and health status. For instance, controlling for income and health status, elderly persons with private policies that cover drugs have only half the level of financial burden of those with no private insurance. Financial burden also falls with income levels. Controlling for insurance and health status, poor elderly persons have burden levels that are almost 10 times as large, and near poor and low income elderly persons seven times as large as individuals with high incomes.

Poor health status is also associated with higher burden levels. The scale of general health is highest

for the poorest health status and runs in value from 5 to 25. For a person with the poorest health status, the burden level is four times higher than for an elderly person in the best health. Controlling for general health status, burden is significantly higher for some types of chronic conditions such as hypertension, angina, and diabetes. The presence of two or more chronic conditions, however, has little additional effect on financial burden.

Once income, insurance, and health status are controlled for, among persons with an out-of-pocket expenditure, burden levels are only significantly affected by race. Blacks had significantly lower burden levels than whites.

It is somewhat surprising that estimated Medicaid status did not affect either use or burden significantly because one would expect it to increase the use of drugs and expenditures. It may be that the copayment amounts, although very small, have a dampening effect on demand. This would be con-

sistent with the finding by Nelson, Reeder, and Dickson (1984) that showed use was sensitive to copayment amounts as low as 50 cents. The variable may also be subject to measurement error as Medicaid eligibility instead of actual Medicaid coverage was used in the estimating equations due to potential endogeneity bias.

Discussion

Insurance coverage for drugs serves to significantly decrease the financial burden associated with prescription drug purchases. Controlling for other factors known to affect burden, such as health status and income, elderly persons with private insurance covering drugs had burden levels only half as high as those without private supplements. This holds true despite an induced demand effect, in which overall levels of prescription drug spending are higher in the presence of insurance coverage for their purchase. Thus, recent health care reform proposals to expand Medicare to cover prescription drugs would have had a significant effect on decreasing the financial burden associated with drug use among the elderly. However, these expansions are no longer being considered.

Currently, prescription drugs remain one of the most significant gaps in Medicare coverage for older Americans. These expenditures may be potentially catastrophic. For instance, 1% of elderly households spend at least a quarter of their household income on prescription drugs. Yet, little is known about which groups of the elderly population are most at risk for high out-of-pocket expenditures. This study identified several vulnerable groups of elderly persons. Elderly persons with common chronic conditions have levels of financial burden that are 2.5 times as high as those without these conditions and spend an average of 2.5 to 4.1% of household income on prescription drugs. This group is also vulnerable to catastrophic expenditures. All of the elderly persons who spend at least a quarter of their household income on drugs are chronically ill.

Other vulnerable groups include low income elderly persons, those living in rural areas, and elderly women. On average, lower income individuals have burden levels more than three times as high as middle income elderly persons and almost ten times as high as high income elderly persons. This is related not only to income, but also to the presence of private health insurance. As income rises, the likelihood of having private insurance that covers drugs also rises. Both of these effects combine to make burden higher for lower income households.

Elderly women have financial burden levels that are 20% higher than men, primarily because many are widowed and live in households with low incomes. Rural elderly persons have burden levels 35% higher than elderly persons who live in urban areas. Financial burden also increases with age, being three times as high for elderly persons aged 75 to 84 compared with those aged 66 to 69. Thus,

insurance coverage for prescription drugs under Medicare would benefit certain vulnerable elderly populations including persons with chronic conditions, as well as elderly women, those with low incomes, and those living in rural areas.

References

- Berk, M., Schur, C., & Mohr, P. (1990). Using survey data to estimate prescription drug costs. *Health Affairs*, 9, 146-156.
- Berk, M., Schur, C., & Mohr, P. (1991). Prescription drug reporting: the authors respond. *Health Affairs*, 10, 211-214.
- Congressional Budget Office. (1989). *Updated estimates of Medicare's catastrophic drug insurance program*. Washington, DC: Author.
- Coughlin, T., Liu, K., & McBride, T. (1992). Severely disabled elderly persons with financially catastrophic health care expenses: Sources and determinants. *The Gerontologist*, 32, 391-403.
- Hill, M. S. (1992). *The panel study of income dynamics: A user's guide*. Newbury Park, CA: Sage.
- Huber, P. J. (1967). The behavior of maximum likelihood estimates under non-standard conditions. *Proceedings of the Fifth Berkeley Symposium on Mathematical Statistics and Probability*, 1, 221-233.
- Lillard, L., Rogowski, J., & Kington, R. (1996). *Demand for prescription drugs in the Medicare population (DRU-1343-NIA)*. Santa Monica, CA: RAND Corporation.
- Long, S. (1994). Prescription drugs and the elderly: Issues and options. *Health Affairs*, Spring II, 157-174.
- Moeller, J., & Mathiowetz, N. (1989). Prescription medicines: A summary of use and expenditures by Medicare beneficiaries (DHHS pub. no. PHS 89-3448). Rockville, MD: National Center for Health Services Research and Health Care Technology Assessment, Public Health Service.
- Moeller, J., & Mathiowetz, N. (1991). Correcting errors in prescription drug reporting: A critique. *Health Affairs*, 10, 210-211.
- Morgan, J. N. (1991). *A panel study of income dynamics procedures and tape codes 1988 interviewing year Wave XXI, a supplement, volume 1*. Ann Arbor, MI: Survey Research Center, University of Michigan.
- Nelson, A., Reeder, C., & Dickson, M. (1984). The effect of a Medicaid drug copayment program on the utilization and cost of prescription services. *Medical Care*, 22, 724-736.
- Soumerai, S. B., Avorn, J., Ross-Degnan, D., & Gortmaker, S. (1987). Payment restrictions for prescription drugs under Medicaid: Effects on therapy, cost, and equity. *New England Journal of Medicine*, 317, 550-556.
- Soumerai, S. B., McLaughlin, T. J., Ross-Degnan, D., Casteris, C., & Bollini, P. (1994). Effects of limiting Medicaid drug-reimbursement benefits on the use of psychotropic agents and acute mental health services by patients with schizophrenia. *New England Journal of Medicine*, 331, 650-655.
- Soumerai, S. B., Ross-Degnan, D., Avorn, J., McLaughlin, T. J., & Choodnovsky, I. (1991). Effects of Medicaid drug-payment limits on admission to hospitals and nursing homes. *New England Journal of Medicine*, 325, 1072-1077.
- Stewart, A. L., Sherbourne, C., Hays, R. D., Wells, K. B., Nelson, E. C., Kamberg, C. J., Rogers, W. H., Berry, S. H., & Ware, J. E., Jr. (1992). Summary and discussion of MOS measures. In A. L. Stewart & J. E. Ware (Eds.), *Measuring functioning and well-being: The medical outcomes study* (pp. 345-371). Durham, NC: Duke University Press.

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Appendix

Notes

1. The creation of the weight follows the procedures for correction for attrition reported in the PSID User's Guide except that logit estimations were used rather than CART (Morgan, 1991).

2. Self-reports of prescription drug expenditures may be subject to some underreporting. In the analyses we use out-of-pocket expenditures, which should be less subject to reporting bias than total expenditures because they represent costs actually incurred by the respondent. The respondents in this survey are experienced in reporting detailed economic data, having provided information to the PSID for 22 years. Their reports of income, also a variable

subject to reporting bias, have been found to be of high quality (Hill, 1992). Thus, the out-of-pocket dollar amounts in the 1990 Health Supplement should be of similarly high quality. Total expenditure may be subject to some under-reporting, as are all self-reported surveys, such as the 1987 National Medical Expenditure Survey (NMES). However, unlike other surveys, the PSID prompted panel members by payer type, beginning with out-of-pocket payments to maximize the accuracy of response.

3. Conditional on use, the probability of having an out-of-pocket expenditure is entirely determined by the

structure of the prescription drug benefit, if any. We cannot observe benefit structures directly in the PSID, only their correlates, making this equation of little practical interest.

4. Many of the oldest respondents are excluded in this analysis due to residence in a nursing home. Thus, the remaining population over age 85 may be disproportionately healthy.

5. The adjusted log odds of use increases by .208 for each point increase on the scale of poor health.

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For applications contact:

Joanne Ludwig, Secretary, NFGR North American Committee.
Telephone: (973) 503-8611; fax: (973) 503-7212.

Deadline for submissions: October 1, 1997. No late applications will be considered.
Recipients will be announced by November 30, 1997.