

Impact of Multitiered Copayments on the Use and Cost of Prescription Drugs among Medicare Beneficiaries

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Objectives. To assess the impact of multitiered copayments on the cost and use of prescription drugs among Medicare beneficiaries.

Data Sources. Marketscan 2002 Medicare Supplemental and Coordination of Benefits database and Plan Benefit Design database.

Study Design. The study uses cross-sectional variation in copayment structures among firms with a self-insured retiree health plan to measure the impact of number of copayment tiers on total and enrollee drug payments, number of prescriptions filled, and generic substitution. The study also assesses the effect of enrollee cost sharing on the cost and use of prescription medications for the long-term treatment of chronic conditions.

Data Collection Methods. We linked plan enrollment and benefit data with medical and drug claims for 352,760 Medicare beneficiaries with employer-sponsored retiree drug coverage.

Primary Findings. Medicare beneficiaries in three-tiered plans had 14.3 percent lower total drug expenditures, 14.6 percent fewer prescriptions filled, and 57.6 percent higher out-of-pocket costs than individuals in lower tiered plans. They also had fewer brand name and generic prescriptions filled, and a higher percentage of generics. The estimated price elasticity of demand for prescription drug expenditures was -0.23 . Finally, for maintenance medications used for the long-term treatment of chronic conditions, members in three-tiered plans had 11.5 percent fewer prescriptions filled.

Conclusions. Higher tiered drug plans reduce overall expenditures and the number of prescriptions purchased by Medicare beneficiaries. Beneficiaries are less responsive to cost sharing incentives when using drugs to treat chronic conditions.

Key Words. Prescription drugs, cost sharing, Medicare

One of the tools most frequently used by drug plans to manage utilization and spending among Medicare beneficiaries is multitiered formularies (Hoadley 2005). Multitiered formularies apply fixed enrollee copayment amounts to different types of prescription medications depending on payer preferences.

Tiered copayment formularies are designed to provide financial incentives for enrollees to use generic or preferred brand named drugs, curtail the use of drugs with little therapeutic value, and limit plan financial exposure. According to the Medicare Payment Advisory Commission (2006), most Medicare Part D plans used one of five tiering arrangements in 2006. Sixty-one percent of standalone drug plans and 68 percent of Medicare Advantage drug plans used the generic, preferred, and nonpreferred brand name structure; 30 percent distinguished only between brand name and generic drugs; and < 10 percent used a 25 percent coinsurance for covered drugs. About 60 percent of plans included a specialty tier in their formularies as well.

The purpose of this study is to evaluate the impact of multitiered formularies on the cost and use of prescription drugs among elderly Medicare beneficiaries using a sample of retiree health plans. The study uses cross-sectional variation in copayment structures among firms with a self-insured retiree health plan in 2002 to measure the impact of the number of tiers on total and enrollee drug payments, the number of prescriptions filled (both generic and brand name), and generic substitution. The study also assesses the effect of enrollee cost sharing on the cost and use of prescription medications for the long-term treatment of chronic conditions.

PRIOR RESEARCH

Most existing studies concur that multitiered copayment structures are an effective tool for managing plan payments (Nair et al. 2003; Rector et al. 2003; Gleason, Gunderson, and Gericke 2005; Gibson, Ozminkowski, and Goetzel 2005b). However, evidence suggests that multitiered plans may also limit access to prescription medications, with potentially harmful consequences for health outcomes, particularly for individuals suffering from chronic illnesses who rely on timely and consistent access to therapeutic treatments to manage their conditions. Motheral and Fairman (2001) and Fairman, Motheral, and Henderson (2003) examined drug use among workers whose employer switched from a two-tiered to a three-tiered plan relative to employees whose firm remained under the two-tiered benefit, and found that the switch to three-tiered plans led to a relative reduction in the use of prescription medications.

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Gibson, McLaughlin, and Smith (2005a) investigated prescription drug use and expenditures among employees whose firm introduced a second copayment tier for brand name drugs and also report a reduction in utilization of all types of drugs compared with that of workers whose firm did not alter the copayment structure, although the decline diminished over time as consumers adjusted their drug purchasing behavior.

Exploiting variation in plan tiers among firms, Joyce et al. (2002) reported that higher tiered plans (and higher copayment amounts within tiers) were associated with a reduction in total spending per enrollee. In a follow-up study, Goldman et al. (2004) found higher copayments were associated with a reduction in days supply of drugs for people with chronic conditions. The reduction was most pronounced for brand name drugs, drugs with close over-the-counter substitutes, and drugs taken intermittently to treat symptoms. Multitiered plans have also been found to lead to lower rates of use and average total spending for drugs taken to treat chronic conditions such as diabetes (Roblin et al. 2005), arthritis (Briesacher et al. 2004), hypertension (Kamal-Bahl and Briesacher 2004), ulcers, high blood pressure and high cholesterol (Huskamp et al. 2003), and high cholesterol (Gibson et al. 2006).

Huskamp et al. (2005) also examined the change in demand behavior after an employer added a third tier, doubling the out-of-pocket copayment for nonpreferred brand name drugs, without changing the list of covered drugs. The researchers found a significant reduction in the demand for three-tier medications, but no change in the overall use of drugs in each therapeutic class. They also report only a modest increase in enrollee out-of-pocket payments, and posit that the higher copayments were partially offset by rebates achieved through greater bargaining power with drug manufacturers under multitiered formularies. The authors conclude that the introduction of a third tier for nonpreferred brand names induces a shift to lower tiered drugs and strengthens plans' ability to negotiate price discounts without reducing total number of prescriptions within a class.

Although much research has been conducted on the impact of multitiered copayment structures, most existing studies are based on actively working adults and the generalizability of their results to the Medicare population, who are much more likely to suffer from chronic conditions and rely on prescription medications to manage their illnesses, is unclear. In one of the few studies to focus on Medicare beneficiaries, Thomas et al. (2002) examined prescription drug claims for a range of employer-based retiree plans administered by a prescription benefits management firm. They found that more aggressive cost sharing, combined with other management strategies, were

associated with greater out-of-pocket spending, a shift to less-expensive medications (both generics and mail order purchases), and lower total prescription drug spending. Although the authors found no reduction in overall drug utilization in plans with more aggressive cost sharing, they suggest that this may be attributable to higher drug purchases associated with mail order incentives. Gilman and Kautter (2007) compared the effects of higher copayments for all drug equivalents versus wider differentials between tiers of drug equivalents among Medicare beneficiaries. The researchers found that, while both incentives lowered total drug spending, the latter change had a less deleterious impact on the number of drugs purchased as beneficiaries were incentivized to shift to generic substitutes.

ANALYTIC MODEL

The analytic model we used to evaluate the impact of multitiered formularies on the cost and use of prescription medications can be summarized in the following manner:

$$Y_{ij} = \alpha + \beta_1 X_i + \beta_2 M_j + \beta_3 P_j + \varepsilon_{ij}$$

where Y represents the outcome variables defined over individual i and plan j ; X represents an individual's set of demographic and health status characteristics; M represents a plan's medical benefits; P represents the plan's prescription drug benefits; and ε is the random error term.

The dependent variables are annual total and enrollee drug payments, number of prescriptions filled in total and by type of drug (generics versus brand names), and proportion of prescriptions filled also by type of drug (generics versus brand names). Total drug expenditures are measured by the ingredient cost as reported on the drug claim. The ingredient cost represents the negotiated discount off the average wholesale drug price net of sales tax and dispensing fee. Because sales tax and dispensing fee vary between retail and mail order purchases, excluding these price adjustments helps control for differences in total costs stemming from substitution of mail order for retail purchasing. Enrollee payments include copayments, plus deductible if applicable.

We normalize the number of prescriptions purchased by dividing the days supply of each prescription by 30 to adjust for the potential substitution of mail order for retail purchases. Higher cost sharing may induce enrollees to substitute mail order for retail drug purchases (Thomas et al. 2002). Because mail order purchases typically provide a longer days supply, failure to adjust

for the potential substitution between mail order and retail purchasing among higher tiered formularies may erroneously imply a lower prescription drug use rate among plans with more aggressive cost sharing. Converting prescriptions into 30-day units further adjusts for this substitution effect.

The beneficiary-level covariates include age (65–74, 75–84, and 85 or older), sex, and health status. Health status is measured by each individual's risk score based on the hierarchical condition category, diagnostic cost group (HCC/DCG) model, originally developed for risk adjustment of Medicare managed care capitation payments (Pope et al. 2004). The HCC/DCG risk score is an expenditure-weighted index of a beneficiary's diagnoses that predicts the relative risk of future Medicare expenditures. The higher the risk score, the greater the likelihood of future health care expenditures, and hence poorer current health status. HCC/DCG risk scores are defined such that the average Medicare fee-for-service (FFS) beneficiary nationally would have the value of 1.00.

The plan-level covariates also include a continuous variable based on the copayment amount for professional services. Use of prescription medications is likely to be determined by access to physicians. If higher medical copayments create barriers to accessing physician services, then beneficiaries in plans with higher medical copayments may fill fewer prescriptions or have lower total drug expenditures. Finally, the model includes an indicator variable for individuals enrolled in plans with a three-tiered copayment. A positive value of the estimated coefficient on the three-tier indicator would indicate that beneficiaries in three-tiered plans have higher drug expenditures or fill more prescriptions than those in lower tiered plans, holding enrollee health status constant. A negative value would signify that enrollees in three-tiered plans have lower expenditures or purchase fewer drugs than their lower tiered counterparts.

The drug utilization and expenditure models are estimated using generalized least squares to adjust for firm-level correlation in the error terms. Expenditures and number of prescriptions are annualized by dividing by the proportion of the 12-month reporting period that an individual is enrolled in the retiree health plan. The models are estimated separately over claims for prescription medications used primarily for the long-term treatment of chronic conditions.

DATA SOURCES

Data were obtained from two databases compiled by Medstat's MarketScan data warehouse: the Medicare Supplemental and Coordination of Benefits

(COB) database and the Benefit Plan Design database. The Medicare Supplemental and COB database contains claims-level information on outpatient prescription drugs for retirees with Medicare supplemental insurance paid for by employers (Adamson, Chang, and Hansen 2006). Pharmacy claims report enrollee, plan, and total payment amounts; dispensing fee, ingredient cost, and average wholesale price; number of days supply; an indicator for whether the drug is generic, sole source brand name, or brand name with a generic substitute; and an indicator for whether the drug is predominantly used for the long-term treatment of chronic conditions.

Information on benefit characteristics of selected health plans in the Medicare Supplemental and COB database is contained in MarketScan's companion Benefit Plan Design database. The Benefit Plan Design database provides information on the plan's prescription drug benefits, including deductible amounts, coinsurance rates and copayment amounts, out-of-pocket maximums, and number of copayment tiers. Different copayment amounts are reported for retail versus mail order purchasing, network versus out-of-network pharmacy, generic versus brand name drug, and preferred/formulary versus nonpreferred/nonformulary drug if applicable. The Benefit Plan Design database extracts limited information on the structure of the medical benefit as well. We used an enrollment summary file with enrollee and plan identifiers to link claims with the plan under which the claimant was enrolled. Nonclaimants under sampled plans were also linked to their benefit structure. The enrollment file provides information on beneficiaries' demographic characteristics and dates of enrollment as well.

The study is based on retired Medicare beneficiaries and their dependent spouses age 65 years or older who received outpatient prescription drug coverage under an employer-sponsored retiree health plan. Actively working enrollees and those under the age of 65 are likely to use prescription medications differently from the elderly retired population and were excluded from our analysis. Each of the firms in our sample offered only one prescription drug plan, either a one-tiered plan or a three-tiered plan. Because each firm offered a single drug plan, the risk of bias caused by enrollees self-selecting into drug plans based on health status and prescription drug utilization is minimal. Further, most members remained enrolled throughout the 12-month period.

Despite the absence of enrollee choice between drug plans within a firm, companies may structure their benefits based on the health status and service needs of their retirees. Firms with older retirees or retirees with known and significant medical conditions may adopt more aggressive cost sharing

programs as a way of limiting plan payments. Our data show that retirees in three-tiered drug plans are sicker than those in one-tiered plans. The inclusion of enrollee demographic and health status covariates was intended to control for observable firm-level selection. To test for selection, we also ran the models with and without the risk scores and obtained similar results, suggesting that any bias remaining after adjusting for health status is likely to be small. Moreover, because of the homogeneity of employers (and their retirees) in the MarketScan database, we do not expect firm-level selection to be substantial. Over two-thirds of the beneficiaries in our sample were retired nonsalaried employees of large unionized firms in the manufacturing and durable goods industry based in metropolitan areas of six states. Moreover, employers exhibited no preference for varying drug benefits to specific types of retirees within the firm. Nonetheless, if firms with high-cost retirees disproportionately choose multitiered plans in ways unaccounted for in our model, the dampening effect of enrollee cost sharing incentives on drug use and spending will be underestimated. Our results should therefore be interpreted as lower-bound estimates of the impact of enrollee cost sharing on drug spending and use.

DESCRIPTIVE RESULTS

Table 1 presents the distribution of the study sample by beneficiary characteristic for each of the two types of plans. The study includes 352,760 Medicare beneficiaries, with 82 percent enrolled in a one-tiered plan and 18 percent in a three-tiered plan. Members of three-tiered plans were more likely to be older, female, and a dependent spouse of the retired employee. Moreover, three-tiered plan enrollees exhibited a higher mean risk score than those in one-tiered plans, although both groups had lower mean risk scores than Medicare FFS beneficiaries nationally. The average risk score for beneficiaries in one-tiered plans was 0.93, compared with 0.99 in three-tiered plans. Using the HCC/DCG index as a measure, beneficiaries in three-tiered plans were on average 6 percent sicker than beneficiaries in one-tiered plans. Between-plan differences in beneficiary characteristics were statistically significant at the one percent level.

Table 2 summarizes the copayment structure for the prescription drug plans in our study. Two plan categories (A and B) used only one tier and required a \$5 and \$10 copayment for all prescription medications, respectively. Three plan categories (C–E) used three tiers with copayment amounts

Table 1: Sample Characteristics by Prescription Drug Plan Copayment Tier

	<i>One-Tiered Plans</i>	<i>Three-Tiered Plans</i>
Number of enrollees in sample	288,677	64,083
Percent of total enrollees (%)	81.8	18.2
Age (%)		
65–74	55.4	47.4***
75–84	34.4	39.7***
85 or older	10.2	12.9***
Gender (%)		
Male	41.4	38.1***
Female	58.6	61.9***
Relation to retiree (%)		
Retired employee	74.3	71.8***
Spouse	25.7	28.2***
HCC/DCG risk score	0.93	0.99***

Notes: Higher HCC/DCG risk score indicates poorer health status.

***Significant at 1% level.

Source: Authors' analysis of MarketScan Medicare Supplemental and Benefit Plan Design databases, 2002.

HCC/DCG, hierarchical condition category, diagnostic cost group.

ranging from \$5 to \$10 for generic drugs, from \$15 to \$25 for formulary or preferred brand names, and from \$25 to \$35 for nonpreferred or nonformulary brand names. The number of beneficiaries in each plan category declined with the number of tiers and the amount of the copayments. The one-tiered plan category with the lowest copayment amount had 233,563 enrollees. The three-tiered plan category with the highest copayment amounts had only 47 enrollees.

Table 2: Prescription Drug Plans by Copayment Tier and Amount

<i>Plan Category</i>	<i>Number of Tiers</i>	<i>Number of Enrollees</i>	<i>Copayment Amounts (\$)</i>		
			<i>Generic</i>	<i>Brand Name Preferred</i>	<i>Brand Name Nonpreferred</i>
A	1	233,563	5	5	5
B	1	55,114	10	10	10
C	3	47,092	5	15	25
D	3	16,944	10	15	30
E	3	47	10	25	35

Note: Copayment amounts based on drug purchases at retail network pharmacies.

Source: Authors' analysis of MarketScan Medicare Supplemental and Benefit Plan Design databases, 2002.

Unadjusted mean drug use and expenditures by type of plan are shown in Table 3. The results reveal a high proportion of prescription drug users in both types of plans. Ninety-one percent of all enrollees in one-tiered plans submitted at least one claim for prescription medication in 2002, compared with 89 percent of those in three-tiered plans. However, individuals in plans with more aggressive cost sharing filled fewer prescriptions on average than those in plans with lower enrollee cost sharing, even after converting the number of prescriptions to 30-day supplies. Beneficiaries in one-tiered plans filled on average 45.5 prescriptions over the 12-month period, compared with 37.9 prescriptions among three-tier enrollees. The higher consumption level among one-tiered plan members applies equally to generics, sole source brand names, and brand names with generic equivalent. However, beneficiaries in one-tiered plans used a lower proportion of generics and a higher proportion of brand names than their three-tiered counterparts. On average, 38.9 percent of all drugs purchased by enrollees in one-tiered plans were generic, compared with 43.8 percent among three-tiered plan enrollees.

Plan-level differences in total and enrollee payments are evident as well. Average annual drug costs for beneficiaries in one-tiered plans were \$2,188, compared with \$1,823 among members of three-tiered plans. However, despite 20 percent higher total expenditures, average out-of-pocket spending

Table 3: Average Annual Prescription Drug Use and Spending by Plan Copayment Tier

	<i>One-Tiered Plans</i>	<i>Three-Tiered Plans</i>
Percent of enrollees with drug claim (%)	90.7	89.4***
Number of prescriptions per enrollee	45.5	37.9***
Generic	17.7	16.6***
Brand name	27.8	21.3***
Sole source brand name	23.6	18.5***
Brand name with generic equivalent	4.2	2.8***
Proportion of prescriptions filled with generic (%)	38.9	43.8***
Average drug expenditures (\$)		
Total expenditures	2,188	1,823***
Plan expenditures	1,943	1,354***
Enrollee expenditures	245	469***
Percent enrollee out-of-pocket expenditures (%)	11.1	25.7***

Notes:

***Significant at 1% level.

Source: Authors' analysis of MarketScan Medicare Supplemental and Benefit Plan Design databases, 2002.

among enrollees in one-tiered plans was nearly half the amount paid by beneficiaries in three-tiered plans. Enrollees in one-tiered plans paid on average \$245 per year, compared with \$469 in out-of-pocket expenditures among those in three-tiered plans. As a result of higher total expenditures and lower enrollee payments, out-of-pocket spending among enrollees in one-tiered plans accounted for only about 10 percent of total drug costs, compared with over one-quarter of total expenditures among those in less generous three-tiered plans.

MULTIVARIATE RESULTS

Table 4 presents the results from our multivariate regressions. The results show that drug use and spending are negatively correlated with age. Beneficiaries between the ages of 75 and 84 years spent \$252 less and filled approximately one less prescription than their 65–74-year-old counterparts, while beneficiaries age 85 years or older spent \$814 less and filled nine fewer prescriptions than the youngest group. The very old consumed fewer of both brand name and generics. Total drug use and spending are positively associated with being female and with poorer health status. Women spent \$309 more for prescription medications and filled eight more prescriptions than men. Similarly, a unit increase in the HCC/DCG risk score is associated with \$784 higher total drug payments and 12.4 additional prescriptions. Women and those in poor health consumed more of both brand name and generics. At the same time, the very old, males, and those in poorer health are more likely to rely on generic substitutes for meeting their prescription drug needs. Medical copayments are negatively correlated with drug use (brand names and generics) and spending, but have no effect on proportion of generics.

More importantly, the regression results reveal that enrollees in three-tiered plans had lower total drug expenditures and filled fewer prescriptions than individuals in one-tiered plans after controlling for demographic characteristics, health status, and medical copayments. On average, enrollees in three-tiered plans incurred \$313 less in total drug expenses and filled 6.7 fewer prescriptions than those in one-tiered plans (representing a 14.3 and 14.6 percent reduction in cost and use, respectively). At the same time, however, members of three-tiered plans had higher out-of-pocket expenditures than those in one-tiered plans. Average annual out-of-pocket spending for prescription medications was \$141 higher among beneficiaries in three-tiered plans compared with individuals in one-tiered plans (representing a 57.6 per-

Table 4: Impact of Multitiered Drug Copayments on Use and Cost of Prescription Medications

	Expenditures (\$)		Number of Prescriptions			Percent of Prescriptions (%)		
	Total	Enrollee	Total	Brand Name	Generic	Brand Name	Generic	
Intercept	1,526 (25.95)***	68 (12.55)***	32.2 (0.38)***	20.8 (0.34)***	11.2 (0.07)***	63.7 (0.31)***	35.7 (0.30)***	
Age								
75-84 years	-252 (32.57)***	-12 (7.47)	-0.9 (0.31)***	-1.6 (0.35)***	1.0 (0.05)***	-3.0 (0.25)***	3.4 (0.22)***	
85 years or older	-814 (94.87)***	-47 (23.95)**	-9.0 (1.26)***	-7.7 (1.14)***	-0.5 (0.16)***	-6.8 (0.57)***	7.8 (0.52)***	
Female	309 (22.37)***	63 (23.33)***	8.0 (0.69)***	5.9 (0.41)***	2.0 (0.26)***	2.8 (0.32)***	-2.8 (0.29)***	
HCC/DCG risk score	784 (11.38)***	92 (26.67)***	12.4 (0.17)***	5.8 (0.18)***	5.9 (0.09)***	-2.7 (0.10)***	2.1 (0.07)***	
Medical copayments	-22 (3.36)***	20 (1.09)***	-0.5 (0.06)***	-0.3 (0.05)***	-0.2 (0.01)***	0.0 (0.04)	0.0 (0.04)	
Three-tiered drug copayment plan	-313 (70.19)***	141 (22.41)***	-6.7 (1.02)***	-5.8 (1.24)***	-0.9 (0.32)***	-4.4 (1.82)**	4.3 (1.74)**	

Notes:

***Significant at 1% level.

**Significant at 5% level.

Source: Authors' analysis of MarketScan Medicare Supplemental and Benefit Plan Design database, 2002. HCC/DCG, hierarchical condition category, diagnostic cost group.

cent increase). The lower number of drug purchases among beneficiaries in three-tiered plans applies to both generic and brand name drugs. Members of three-tiered plans filled 5.8 fewer prescriptions for brand name drugs and approximately one fewer prescription for generic drugs per year than those in one-tiered plans. However, three-tiered plans were also associated with an average 4.4 percentage point reduction in the proportion of total prescriptions filled with brand name drugs and a 4.3 percentage point increase in the proportion of total prescriptions filled with generic drugs. The regression results thus indicate that more aggressive cost sharing is associated with a reduction in the absolute number of generic (and brand name) drugs purchased, but, within those prescriptions purchased, a shift toward generic substitutes. Finally, these results yield a price elasticity of demand for prescription drug expenditures of -0.23 , indicating that a 10 percent increase in the out-of-pocket price of prescription drugs would lead to a 2.3 percent reduction in consumer drug spending. Except where noted, all of the multivariate results reported above from Table 4 are statistically significant at the 5 percent level or lower.

Table 5 presents similar estimates to assess the effect of enrollee cost sharing on the cost and use of maintenance medications used primarily for the long-term treatment of chronic conditions. The results indicate that beneficiaries are less responsive to enrollee cost sharing incentives when consuming maintenance medications. Average total drug spending for maintenance medications among three-tiered plan enrollees was \$136 lower than among their one-tiered counterparts (representing a 12.5 percent reduction). The average number of prescriptions filled for the treatment of chronic conditions among members of three-tiered plans was 3.3 less than the number filled by enrollees in one-tiered plans (representing an 11.5 percent reduction). On average, beneficiaries in three-tiered plans filled 3.5 fewer brand name maintenance medications compared with enrollees in one-tiered plans. The estimated effect of three-tiered plans on the number of generic maintenance medications was not statistically different from zero. As a result, the proportion of maintenance medications filled with brand name drugs was 5.5 percentage points lower among three-tiered plan enrollees than among those in one-tiered plans, and 5.9 percentage points higher for generic substitutes. These results thus indicate that beneficiaries suffering from chronic conditions are less willing to curtail drug purchases in the face of higher copayments, but more willing to meet their drug needs through generic substitutes than individuals taking drugs for the treatment of temporary or episodic conditions. Except where noted, all of the multivariate

Table 5: Impact of Multitiered Drug Copayments on Use and Cost of Medications Used for Long-Term Treatment of Chronic Conditions

	Expenditures (\$)		Number of Prescriptions		Percent of Prescriptions (%)		
	Total	Enrollee	Total	Brand Name	Generic	Brand Name	Generic
Intercept	930 (20.66)***	49 (4.99)***	22.7 (0.30)***	14.2 (0.27)***	8.3 (0.04)***	64.8 (0.22)***	34.6 (0.25)***
Age							
75-84 years	-79 (14.27)***	-1 (4.08)	-0.1 (0.15)	-0.9 (0.19)***	1.3 (0.08)***	-4.4 (0.18)***	4.9 (0.21)***
85 years or older	-394 (40.59)***	-27 (17.14)	-5.7 (0.63)***	-5.3 (0.60)***	-0.2 (0.10)**	-9.3 (0.52)***	10.5 (0.58)***
Female	-10 (6.59)	19 (8.36)**	2.4 (0.33)***	2.4 (0.17)***	-0.1 (0.15)	3.7 (0.31)***	-3.7 (0.29)***
HCC/DCG risk score	285 (5.65)***	42 (12.60)***	6.6 (0.07)***	3.1 (0.10)***	3.0 (0.08)***	-3.0 (0.11)***	2.1 (0.12)***
Medical copayments	-9 (1.55)***	12 (0.62)***	-0.3 (0.03)***	-0.1 (0.03)***	-0.1 (0.01)***	0.2 (0.05)***	-0.1 (0.05)***
Three-tiered drug copayment plan	-136 (28.25)***	91 (12.85)***	-3.3 (0.53)***	-3.5 (0.81)***	0.3 (0.38)	-5.5 (2.16)**	5.9 (2.13)***

Notes:

***Significant at 1% level.

**Significant at 5% level.

Source: Authors' analysis of MarketScan Medicare Supplemental and Benefit Plan Design database, 2002.

HCC/DCG, hierarchical condition category, diagnostic cost group.

results reported above from Table 5 are statistically significant at the 5 percent level or lower.

DISCUSSION

Spending under the Medicare prescription drug program is forecasted to reach nearly \$600 billion dollars over the 2004–2013 period (Congressional Budget Office 2005). Cost containment measures employed by drug plan sponsors will be important for determining both federal outlays and access to prescription medications among beneficiaries. The structure of multitiered formularies and beneficiaries' responsiveness to their cost sharing incentives will do much to determine the success of Medicare Part D prescription drug plans and to ensure future access to essential medications among the Medicare population. Our study represents one of the few analyses to date on the impact of multitiered copayment plans on the use and cost of prescription drugs for the Medicare population.

Our results show that for Medicare beneficiaries, higher tiered copayment plans are associated with fewer total prescriptions purchased and lower overall drug spending, even after controlling for observable differences in health status and the potentially offsetting effects of mail order substitution. Our study also provides evidence that Medicare beneficiaries are less responsive to cost sharing incentives when purchasing maintenance medications for the long-term treatment of chronic conditions, implying that multitiered plans may induce more efficient use of drug resources without sacrificing access to essential medications. Our study showed that three-tiered formularies led to a smaller percentage reduction in the purchase of maintenance medications compared with all prescription drugs and a greater shift to generic substitutes. These results indicate that elderly beneficiaries, particularly those suffering from chronic conditions, may be more likely to maintain drug utilization patterns under multitiered formularies than the nonelderly population in part through a greater reliance on generic equivalents.

However, it is difficult to assess whether the lower drug use and spending associated with higher-tiered plans reflect barriers to access or gains in efficiency. If foregone prescriptions evidenced under three-tiered plans have little or no therapeutic value, reductions in drug use may represent an improvement in the allocation of health care resources. Similarly, lower total drug spending observed under three-tiered plans may represent either a reduction in the use of drugs with little medical benefit or the substitution of lower-priced

generics for higher-priced brand named drugs. In cases where generics are therapeutically equivalent, the reliance on generic drugs under three-tiered formularies represents an improvement in efficiency.

In addition, we estimate a price elasticity of demand for prescription drugs of -0.23 , which is broadly consistent with previous studies. The results from research on the privately insured population under age 65 show that drug demand responds strongly to price, with the elasticity of demand generally ranging from -0.30 to -0.40 (Pauly 2004). However, some studies report lower elasticities. For example, Gibson, McLaughlin, and Smith (2005a) report a price elasticity among working adults of -0.04 , but their estimates are based on a change in the copayment amount for brand name drugs only. When estimated over brand name drugs with a therapeutic substitute, the researchers obtain a price elasticity of -0.27 , which is roughly equivalent to the one found in this study.

The price elasticity of demand derived from our study is also consistent with estimates used to predict the impact of early Medicare Part D proposals on federal expenditures. The Congressional Budget Office (2004) used an elasticity of -0.30 to forecast the cost of early Medicare outpatient prescription drug proposals, which was partly based on their internal analysis of Medicare Current Beneficiary Survey data on Medicare beneficiaries' drug spending. Goldman, Joyce, and Malkin (2002), relying on evidence from the Rand health insurance experiment, used a price elasticity of -0.27 to simulate drug expenditures among Medicare beneficiaries under different scenarios. The authors also derived a drug price elasticity among the elderly of -0.25 based on evidence reported in Lillard et al. (1999). Overall, the authors concluded that the literature suggested an elasticity range of -0.20 to -0.35 for the Medicare population, which is consistent with our results.

The study has several limitations. First, the sample is not representative of the Medicare population nationally. The study is based on elderly retired beneficiaries who received outpatient prescription drug benefits under an employer-sponsored health plan. Moreover, sampled retirees are drawn from large unionized firms in the manufacturing and durable goods industry in urban areas of highly industrial states. Second, plans may differ in other medical and drug benefits in ways that influence drug use and spending. For example, several plans in our sample had formularies for encouraging members to use network pharmacies or mail order drug purchasing. Plans may also differ in deductibles and out-of-pocket maximums, as well as in type of drugs covered within therapeutic classes. While we attempt to control for some of these confounding policies by using dispensing fees to measure costs and

converting prescriptions to 30-day supplies, the small number of firms in our study prevents us from controlling fully for variation in benefits.

Finally, our study relies on a cross-sectional design, an approach with known challenges such as the potential for bias due to unobserved heterogeneity and the associated difficulties establishing a causal link between multitiered formularies and prescription drug spending in the presence of selection (Kamal-Bahl and Briesacher 2004; Gaynor, Li, and Vogt 2006). However, a cross-sectional design has often been used to analyze drug formularies (e.g., Joyce et al. 2002; Thomas et al. 2002; Briesacher et al. 2004; Goldman et al. 2004). Individual-level selection is not an issue in our study because each firm offered only one drug plan, and firm-level selection should be minimal given broad similarities between firms (and their retirees). We control for observable firm-level selection by including the HCC/DCG risk score, which measures differences in beneficiary health status. However, unobservable firm-level selection will cause us to underestimate the effect of multitiered formularies on prescription drug use and spending. Our results should therefore be interpreted as lower-bound estimates of the impact of tiering.

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