Consumer Response to Dual Incentives Under Multitiered Prescription Drug Formularies

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Objective: To decompose the overall effect of multitiered formularies on drug utilization and spending into the following 2 observed effects on consumer behavior: first, higher copayments on drug equivalents create an incentive to reduce the number of prescriptions, and, second, wider differential copayments between drug equivalents create an incentive to use a greater proportion of generics.

Study Design: We merged drug claims for 352 760 retired Medicare enrollees having employer-sponsored health insurance with benefit information. Our unit of analysis was the enrollee. We used cross-sectional variation in incentive-based formularies to compare the effects of increased copayment amounts for drug equivalents with those of increased copayment differentials between drug equivalents. The study sample may not be representative of the Medicare population.

Methods: Multivariate regression analysis using the 2002 MarketScan Medicare Supplemental and Coordination of Benefits database and Benefit Plan Design database.

Results: A 10% increase in copayments for drug equivalents was associated with a 1.3% reduction in total drug spending, a 16.0% increase in out-of-pocket expenditures, a 2.0% reduction in the number of prescriptions filled, and a 0.7% reduction in proportion of prescriptions filled with generics. A 10% increase in copayment differentials between drug equivalents was associated with a 1.0% reduction in total drug spending, a 4.1% increase in out-of-pocket expenditures, a 1.0% reduction in the number of prescriptions filled, and a 0.7% increase in proportion of prescriptions filled with generics.

Conclusion: Increasing copayment differentials between drug equivalents is as effective a strategy for reducing total drug spending as increasing copayment amounts for drug equivalents but better maintains access to prescription medications.

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Incentive-based formularies have become the most common tool for controlling health plan spending for prescription medications.[1,2] Almost three quarters of workers covered by employer-sponsored drug plans face incentive-based formularies. Incentive-based formularies are designed to control spending on prescription medications by assigning differential copayments or coinsurance rates to multiple classes, or tiers, of drugs based on the type of drug prescribed, contracts between plans and drug manufacturers and dispensing agents, and relative discount prices between brand-name drugs and generic equivalents.[3] Multitiered formularies are expected to reduce plan exposure and to lower spending by introducing incentives for consumers to use less expensive preferred brand-name drugs or generic equivalents when available, to limit their purchase and refill of prescriptions with minor or uncertain therapeutic value, and to shift some of the costs of purchased drugs from plan to consumer.[4]

Evidence shows that the implementation of incentive-based formularies has been successful in slowing the rate of growth in total drug spending per person per year.[5-8] Studies also demonstrate that more aggressive cost sharing lowers the number of prescriptions purchased.[9-15] The reduction in the number of drugs purchased raises concern about the effect of multitiered formularies on health outcomes, particularly among enrollees who rely on consistent and timely access to prescription medications for the treatment of chronic conditions. While these studies imply that access to medications may be harmed by enrollee cost sharing, they fail to consider the dual incentives created by multitiered formularies and to assess their conflicting effects on drug utilization and costs.

Incentive-based formularies create 2 incentives. First, by increasing the copayment amount for drug equivalents, multitiered plans are designed to promote more efficient use of prescription medications. By requiring members to pay a larger proportion of the costs of all drugs, plans assume that enrollees will curtail the consumption of unnecessary medications (and physicians will cease prescribing drugs with uncertain medical benefit[16,17]). Second, by widening the cost differential between drug equivalents, multitiered plans are intended to encourage the consumer to substitute cheaper generic drugs for more expensive brand-name drugs (and less expensive multisource brand-name drugs for their higher-priced equivalents). By requir-

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ing enrollees to pay more for brand-name drugs, plans hope that enrollees will be more willing to buy generic equivalents if they exist or will choose preferred brand-name drugs over nonpreferred brand-name drugs if generics are unavailable.

The effect of incentive-based formularies on access to medications and, ultimately, on health outcomes depends on the relative effect of each of these 2 incentives on consumer behavior. The first incentive, which we term an *absolute price effect*, is expected to achieve a reduction in overall drug spending by reducing the total number of prescriptions purchased. The second incentive, which we term a *relative price effect*, is expected to achieve a reduction in drug spending by substituting lower-cost generic or preferred brand-name drugs for more expensive drugs without necessarily affecting the total number of prescriptions filled.

The hypothesized effects of the 2 incentives are summarized in Table 1. By increasing the price paid by consumers for drug equivalents, consumers' real income is reduced, and the absolute price effect is assumed to lead to a reduction in total drug spending and a reduction in the number of prescriptions filled. Given that demand for prescription medications is fairly inelastic,[18] the absolute price effect should also lead to an increase in enrollee out-of-pocket expenditures and, assuming the relative price of drug equivalents remains constant, should have little effect on the proportion of prescriptions filled with generics. By widening the difference in prices between drug equivalents, the relative price effect should also reduce total drug spending. However, by encouraging reliance on generics, it should have a smaller effect on the total number of prescriptions purchased. Assuming that effective drug equivalents are available at no additional cost, an increase in the copayment for a brand-name drug relative to its generic equivalent should have little effect on out-of-pocket expenditures and, in fact, may lower enrollee spending as consumers substitute generics for brand-name equivalents.

The objective of this study was to decompose the overall effect of incentive-based formularies on drug utilization and spending into its absolute and relative price effects. The absolute price effect is measured by a change in drug use and spending for a given change in the copayment amount for drug equivalents. The relative price effect is measured by a change in drug use and spending for a given change in the copayment differential between drug equivalents. The decomposition analysis is intended to identify strategies for containing drug costs without undermining access to medications.

Table 1. Hypothesized Effect of Absolute and Relative Price Effects

Variable	Total Payments	Enrollee Payments	No of Prescriptions Filled	% of Prescriptions Filled With Generics
Absolute price effect	↓	↑	↓	—
Relative price effect	↓	↓	—	↑

— indicates no major hypothesized effect.

METHODS

Sources of Data

The primary data source was the 2002 MarketScan Medicare Supplemental and Coordination of Benefits database. This file provides outpatient drug event data for beneficiaries and for their Medicare-eligible dependents with employer-sponsored supplemental insurance. The following pharmacy claims data are included: enrollee, plan, and total paid amounts; dispensing fee, ingredient cost, and average wholesale price; the number of days' supply; and an indicator for generic drugs and an indicator for drugs used to treat chronic conditions. Information on benefit design was obtained from MarketScan's Benefit Plan Design database. This file offers information on the number of tiers and the copayment amount for each tier, plus information on other forms of cost sharing such as deductibles, coinsurance rates, and out-of-pocket maximums. If applicable, separate copayments are reported for mail order and for out-of-network drug purchases. The file characterizes medical benefits as well. Finally, an enrollment summary file provides information on enrollees' demographic characteristics and dates of enrollment. Plan and enrollee identifiers allow each pharmacy bill to be linked to an individual and a plan.

Plan Benefit Design

The sample consists of 5 plan categories, each with a different copayment structure for prescription drugs. Two plan categories have a 1-tier system (with $5 and $10 copayments), and 3 plan categories have a 3-tier system (with $5/$15/$25, $10/$15/$30, and $10/$25/$35 copayments) (Table 2). For our sample of elderly Medicare beneficiaries, there were no 2-tier plans in the MarketScan database. Each firm in our sample offered only 1 copayment structure for retail purchases, eliminating the risk of bias caused by enrollees' self-selecting into plans based on health status

and drug utilization patterns. However, evidence suggests that firms may design their drug benefit based on the health status and service needs of their retirees.[19] For instance, firms with older retirees or retirees with known and significant medical conditions requiring maintenance medications may adopt more aggressive cost sharing as a way of limiting plan payments. Our data show that retirees enrolled in 3-tier plans seem to be sicker than those enrolled in 1-tier plans. To test for firm-level selection, we ran our models with and without the health status control variable, and the results were similar, suggesting that remaining bias after adjusting for observable health status is likely to be small.

Table 2. Plans by Prescription Drug Copayment Tier and Amount

Plan Category	No. of Tiers	No. of Enrollees	Copayment Amount, $		
			Generic	Brand-name Preferred	Brand-name Nonpreferred
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

Sample is restricted to retired Medicare beneficiaries and their dependent spouses age 65 years and older who receive outpatient prescription drug coverage under an employer-sponsored retiree-health plan (n= 352 760).
Plans may vary in terms of their other drug or medical benefits.
Copayment amount based on drug purchases at retail network pharmacies.

Sampled Beneficiaries

The sample includes 352 760 elderly Medicare enrollees with employer-sponsored retiree drug coverage. The study is based on retired Medicare beneficiaries and their dependent spouses 65 years and older who receive prescription drug coverage under an employer-sponsored health plan. Actively working enrollees and those younger than 65 years are likely to use prescription medications differently from the older retired population and are therefore excluded from the analysis. Most members remained enrolled for all 12 months, and more than 90% of enrollees submitted at least 1 pharmacy claim.

Model

To decompose the overall effect of multitiered formularies into absolute and relative price effects, we created the following 2 plan-level variables: a copayment amount variable and a copayment differential variable. The *copayment amount variable* was defined as the tier-1 copayment amount for each plan. It measures between-plan variation in copayments for a similar class of drugs (eg, generics) and thus captures the absolute price effect of incentive-based formularies. The *copayment differential variable* was defined as the ratio between the mean of the tier-2 and tier-3 copayments and the tier-1 copayment. It approximates the relative difference in copayments between generics and their brand-name equivalents and thus captures the relative price effect of multitiered formularies. The copayment differential for 1-tier plans necessarily took the value of 1.

We included several covariates, including age and sex, to control for variation in drug utilization and spending. We also used enrollees' medical claims to derive a health status index based on the Diagnostic Cost Group Hierarchical Coexisting Condition Categories algorithm developed by Medicare to risk adjust managed care capitation payments.[20] The Diagnostic Cost Group Hierarchical Condition Categories risk score uses demographic characteristics and diagnoses from hospital inpatient, hospital outpatient, and physician office settings to predict the relative risk of future expenditures, with a higher risk score indicating a worse health status. Including enrollee-level covariates helps control for firm-level selection. The model also includes a variable based on the copayment for professional medical services. If medical copayments create barriers to accessing physician services, enrollees in plans with higher medical copayments may have fewer drugs prescribed.

The dependent variables are as follows: (1) annual total drug payments, (2) annual enrollee out-of-pocket drug spending, (3) the number of prescriptions filled, and (4) proportion of prescriptions filled with generic drugs. Total drug expenditures were measured by the ingredient cost, which represents the negotiated discount from average wholesale drug prices net of any sales tax and dispensing fees. Because sales tax and dispensing fees vary between retail and mail-order purchases, excluding them helps control for differences in costs stemming from the substitution of mail order for retail purchasing.[21] We also normalized the number of prescriptions by dividing days' supply by 30. Higher cost sharing may induce enrollees to substitute mail order for retail drug purchases. Because mail-order purchases provide longer days' supply, failure to adjust for potential substitution between mail order and retail purchasing among higher-tiered programs may erro-

neously suggest a lower prescription drug use rate among plans with more aggressive cost sharing. Enrollee payments include copayments, plus any deductible if applicable.

Estimation Technique

The models were estimated using generalized least squares to adjust for firm-level correlation in the error terms. The dependent variables (except for proportion of prescriptions filled with generic drugs) were annualized by dividing by the proportion of the 12-month period an individual was enrolled in the plan. Because of the large sample size and the high proportion of drug claimants, expenditure models were estimated on actual (nonlogged) US dollars over all enrollees. Nonclaimants were assigned a value of $0. The unit of analysis was the individual.

Table 3. Sample Characteristics by Type of Prescription Drug Copayment Tier

Variable	1-Tier Plans	3-Tier Plans
No. of enrollees	288 677	64 083
Age, y		
65-74	55.4	47.4*
75-84	34.4	39.7*
≥85	10.2	12.9*
Sex		
Male	41.4	38.1*
Female	58.6	61.9*
HCC/DCG risk score	0.93	0.99*
% of enrollees with a drug claim	90.7	89.4*
Average no. of prescriptions per enrollee	45.5	37.9*
Generic	17.7	16.6*
Brand name	27.8	21.3*
Average drug expenditures, $		
Total expenditures	2188	1823*
Enrollee expenditures	245	469*

Sample is restricted to retired Medicare beneficiaries and their dependent spouses age 65 years and older who receive outpatient prescription drug coverage under an employer-sponsored retiree health plan (n = 352 760).
A higher HCC/DCG risk score indicates poorer health status.
Drug use and cost are annualized and adjusted for length of enrollment.
Drug use is standardized per 30-day supply.
Payment based on ingredient costs. Ingredient costs represent the discount from the AWP or the cost of the drug to the consumer net of dispensing fee and any sales tax
Enrollee payment includes the deductible plus copayment amount.
*Indicates significance of 1% level.
HCC/DCG indicates hierarchial coexisting condition/diagnostic cost group; AWP, average wholesale price.

RESULTS

Table 3 summarizes the sample distribution by type of prescription drug plan. Eighty-two percent of the sample was enrolled in a 1-tier plan and 18% in a 3-tier plan. Members of 3-tier plans were more likely to be older and female. Moreover, 3-tier plan enrollees had higher mean risk scores than those in 1-tier plans, although both groups had lower risk scores than the average Medicare beneficiary nationally. Ninety-one percent of all enrollees in 1-tier plans submitted at least 1 claim, compared with 89% of those in 3-tier plans. However, individuals in plans with more aggressive cost sharing filled fewer prescriptions on average than those in plans with lower cost sharing, even after controlling for days' supply. Beneficiaries in 1-tier plans filled on average 45.5 prescriptions within the year, compared with 37.9 prescriptions among 3-tier enrollees. The mean total drug costs in 1-tier plans were $2188, compared with $1823 in 3-tier plans. In contrast, the mean enrollee drug payments in 3-tier plans were almost double the amount paid by beneficiaries in 1-tier plans: enrollees in 1-tier plans paid on average $245 per year, compared with $469 among those in 3-tier plans. The plan-level differences were significant at the 1% level.

The regression results are given in Table 4. The data show that total drug expenditures decline with age. This finding can be attributed to several possible factors, including shrinking financial resources among older persons for prescription drugs, increased use of drugs administered in inpatient settings, and greater reliance on generic substitutes as beneficiaries age. Less surprisingly, women and individuals with worse health status spend more on prescription medications than their male and less severely ill counterparts. Although these groups purchased more prescriptions, higher drug spending among women is also partly explained by a lower reliance on generic substitutes. In contrast, those with poorer health status spend more on prescription medications despite a greater reliance on generics.

The effects of higher copayment amounts (absolute price effect) and of wider copayment differentials (relative price effect) are given in the last 2 rows of Table 4. An increase in the absolute price for drug equivalents and an increase in the relative price between drug equivalents result in a reduction in total payments. However, the source of the savings differs. The savings from an increase in the copayment amount are achieved mainly through a reduction in the number of prescriptions filled, while the savings from an increase in the copayment differential are achieved through greater reliance on generic drugs, as well as a reduction in the number of prescriptions filled. In fact, widening the copayment

Table 4. Impact of Absolute and Relative Price Effects of Multitiered Formularies on Cost and Use of Prescription Drugs

	Total Payments	Enrollee Payments	No. of Prescriptions Filled	% of Prescriptions Filled With Generics
Intercept	1920 (30.20)*	408 (113.36)*	42.9 (0.63)*	36.1 (1.38)*
Age				
75-84 years	–255 (29.90)*	–7 (4.00)	–1.0 (0.22)*	3.4 (0.25)*
85 years or older	–818 (90.55)*	38 (16.89)	–9.2 (1.11)*	7.7 (0.57)*
Female	312 (21.02)*	60 (19.81)*	8.1 (0.65)*	–2.7 (0.27)*
HCC/DCG risk score	786 (10.68)*	91 (25.99)*	12.4 (0.15)*	2.0 (0.05)*
Medical copays	–11 (2.01)*	2 (4.01)	–0.1 (0.03)*	0.1 (0.04)
Absolute copay amount	–47 (4.55)*	76 (19.30)*	–1.4 (0.11)*	–0.4 (0.26)
Relative copay amount	–144 (8.10)*	80 (10.56)*	–3.1 (0.14)*	1.7 (0.17)*

Dependent variables are annualized (except for percent generic), adjusted for length of enrollment, and standardized for 30-day supply.
Sample is restricted to retired Medicare beneficiaries and their dependent spouses age 65 years and older who receive outpatient drug coverage under an employer-sponsored retiree health plan (n = 352 760).
For percent generic model, sample is restricted to users of presciption medications.
Payment based on ingredient cost, which represents the discount from the AWP or the cost to the consumer net of dispensing fee and any sales tax.
Enrollee payment includes the deductible plus copayment amount.
Standard errors adjusted for firm-level clustered data. Models are weighted by the eligibility fraction.
HCC/DCG indicates hierarchial coexisting condition/diagnostic cost group; AWP, average wholesale price.
*Indicates significance of 1% level.

differential increases the proportion of prescriptions filled with generics.

To compare the relative magnitudes of the absolute and relative price effects, the regression results were used to simulate the following 2 equal changes: a 10% increase in the copayment amount and a 10% increase in the copayment differential. The results, summarized in Table 5, show that increasing the copayment amount for drug equivalents and increasing the copayment differential between drug equivalents are broadly similar in their effectiveness in achieving total drug savings. A 10% increase in the copayment amount resulted in a 1.3% reduction in total drug spending, compared with a 1.0% savings generated by a 10% increase in the copayment differential. Given the inelastic demand for prescription medications, raising the price of drug equivalents resulted mainly in a transfer of costs from the plan to the consumer. A 10% increase in the copayment amount for drug equivalents increased out-of-pocket expenditures by 16.0%. In contrast, as consumers are incentivized to shift to generic substitutes, a 10% increase in the copayment differential between drug equivalents increased out-of-pocket spending by only 4.1%.

The simulation further highlights that increasing the copayment differential has less of an adverse effect on access to prescription medications. A 10% increase in the copayment differential between drug equivalents reduces the number of prescriptions filled by 1.0%, compared with a 2.0%

Table 5. Decomposing the Absolute and Relative Price Effects of Multitiered Formularies

Variable	% Change Due to 10% Increase in Absolute Copayment	% Change Due to 10% Increase in Relative Copayment
Total payments	–1.3	–1.0
Enrollee payments	16.0	4.1
No. of prescriptions filled	–2.0	–1.0
% of prescriptions filled with generics	–0.7	0.7

Take-away Points

The results of this study show that focusing on cost-sharing differentials between tiers (as opposed to raising all copayment amounts) and linking them to lower-priced drug equivalents is a similarly effective strategy for reducing drug spending but does a better job of maintaining access to prescription medications.

- Most existing studies indicate that multitiered formularies reduce total drug expenditures and the number of prescriptions purchased.
- However, most studies fail to decompose the overall effect of multitiered formularies into its absolute price effect (ie, an increase in copayments for all drug equivalents) and its relative price effect (ie, an increase in the copayment differential between drug equivalents).
- Understanding the dual incentives of multitiered copayment structures helps identify new opportunities for designing drug formularies based on value.

reduction in purchased prescriptions associated with a 10% increase in the copayment amount for drug equivalents (Table 5). These results suggest that consumers are better able to maintain their prescription medication utilization pattern by substituting less expensive generics for more costly brand-name drugs. A 10% increase in the copayment differential between drug equivalents increases the proportion of total drugs filled with generic substitutes by 0.7%, whereas a 10% increase in the copayment amount for drug equivalents actually reduces the proportion of drugs filled with generics by 0.7%, although this was not statistically significant.

DISCUSSION

By shifting more of the cost of prescription medications onto the consumer, incentive-based formularies are designed to lower drug spending and to limit plan exposure. However, underlying multitiered formularies are 2 incentives with different and conflicting effects on consumer behavior, namely, an incentive to reduce the number of prescriptions purchased and an incentive to use a greater proportion of generic substitutes. The results of this analysis suggest that the second of these incentives (ie, a change in the copayment differential between generics and brand-name equivalents or between preferred and nonpreferred brand-name equivalents) provides a similarly effective strategy for reducing total drug spending but better maintains access to essential medications.[22] The findings indicate that increasing the copayment amount for drug equivalents reduces utilization of prescription medications and passes much of the cost of prescription medications onto consumers. In contrast, by encouraging generic substitution, increasing the copayment differential between drug equivalents reduces total drug spending, with less of an adverse effect on the number of drugs purchased or on out-of-pocket spending.

The study illustrates that how incentive-based formularies are structured has a major effect on access to prescription medications. By focusing on differences in copayment amounts between tiers and by structuring those tiers around drugs with generic substitutes, plans may be better able to control spending without creating barriers to medication access. Furthermore, by showing that consumers are willing to alter their consumption behavior in response to relative price incentives, the study lends support to recent recommendations for replacing price-based formularies (in which copayments are tied to the price of the drug) with value-based formularies (in which copayments are tied to the cost-effectiveness or therapeutic value of the drug).[22-25] By building value-based measures of drug equivalents into copayment structures, plans may be better able to lower costs, maintain access, and improve therapeutic outcomes.

Several limitations of this study should be noted. First, some plans offered alternative cost-sharing options for mail order and for out-of-network purchases. Plans also varied along other cost-containment dimensions such as deductibles, out-of-pocket maximums, formularies, utilization review, and prior authorization, as well as in their controls on medical service use and costs. Although we control for differences in some of these mechanisms, the full range of utilization management strategies is likely to influence drug consumption in ways not accounted for in our model. Second, MarketScan's retiree sample is drawn primarily from large unionized firms in the manufacturing and durable goods industries located in a few states. Furthermore, sampled beneficiaries have employer-sponsored supplemental health insurance with a prescription drug benefit. Although the findings help illustrate the relative effect of absolute versus relative price effects under incentive-based formularies, they may not be generalizable to the Medicare population. Third, firms are likely to design health plan benefits around the medical needs of their retirees, and unobservable firm-level selection might cause an underestimation of the effect of relative price incentives. Fourth, the sample was drawn before the implementation of Medicare Part D. The availability of prescription drug coverage under Medicare affects the consumption behavior of beneficiaries and the offer rate and design of retiree health benefits by employers in ways that need to be addressed.

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