

Employer Drug Benefit Plans and Spending on Prescription Drugs

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SPENDING ON OUTPATIENT PRESCRIPTION drugs has increased at double-digit rates for the past decade and is now the third largest component of health care expenses behind hospital care and physician services.¹ The growth in drug spending can be attributed to many factors, including new drugs with high prices, an aging US population, legislative mandates, and earlier diagnosis.^{2,3} Although drug spending remains less than 10% of health care expenditures nationally, the share is much higher (commonly 20% to 25%) for working-aged adults with low rates of hospitalizations.⁴

With spending rising so rapidly for working-aged adults, many employers and health insurance providers have changed their benefits packages to encourage less and lower-cost pharmaceutical use. Closed or highly restrictive formularies were one response, in which insurance providers would only cover certain drugs. However, excluding specific medications or therapeutic classes led to considerable dissatisfaction among patients and physicians.⁵ Many private health insurance plans now offer incentive-based formularies, in which drugs are placed in different tiers. Under these arrangements, most drugs are covered, but enrollees pay differing co-payments depending on the tier to which a drug is assigned. Two-tier plans are

For editorial comment see p 1773.

Context With drug spending rising rapidly for working-aged adults, many employers and health insurance providers have changed benefits packages to encourage use of fewer or less expensive drugs. It is unknown how these initiatives affect drug costs.

Objective To examine how innovations in benefits packages, such as those that include multitier formularies and mandatory generic substitution, affect total cost to insurance providers for generic and brand drugs and out-of-pocket payments to beneficiaries.

Design and Participants Retrospective study from 1997 to 1999 linking claims data of 420786 primary beneficiaries aged 18 through 64 years who worked at large firms (n = 25) with health insurance benefits that included outpatient drugs.

Main Outcome Measures Overall drug costs; generic, single-source brand, and multisource brand costs; and drug expenditures by health insurance providers and out-of-pocket costs for beneficiaries.

Results For a 1-tier plan with a \$5 co-payment for all drugs, the average annual spending was \$725 per member. Doubling co-payments to \$10 for all drugs reduced the annual average drug cost from \$725 to \$563 per member (22.3%, $P < .001$). Doubling co-payments in a 2-tier plan from \$5 for generics and \$10 for brand drugs to \$10 for generics and \$20 for brand drugs reduced costs from \$678 to \$455 (32.9%, $P < .001$). Adding an additional co-payment of \$30 for nonpreferred brand drugs to a 2-tier plan (\$10 generics; \$20 brand) lowered overall drug spending by 4% ($P < .001$). Requiring mandatory generic substitution in a 2-tier plan reduced drug spending by 8% ($P < .001$). Doubling co-payments in a 2-tier plan increased the fraction beneficiaries' paid out-of-pocket from 17.6% to 25.6%.

Conclusions Adding an additional level of co-payment, increasing existing co-payments or coinsurance rates, and requiring mandatory generic substitution all reduced plan payments and overall drug spending among working-age enrollees with employer-provided drug coverage. The reduction in drug spending largely benefited health insurance plans because the percentage of drug expenses beneficiaries paid out-of-pocket rose significantly.

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commonplace, with a higher co-payment for brand drugs. However, an increasing number of employers are offering 3-tier benefits with 3 co-payment levels. These plans typically set the lowest co-payment for generic drugs, the middle co-payment for formulary or preferred brands, and the highest co-payment for nonformulary brands. Another popular benefit design feature to reduce drug spending is mandatory generic substitution (MGS).

Prior studies suggest that increased patient cost-sharing and formulary re-

strictions reduce pharmaceutical use and costs.⁶⁻²¹ However, most of these studies examined elderly or Medicaid populations,^{7-10,13,16,17} involved small changes in co-payments and changes within a single plan,^{7,11,12,14,15,21} or preceded the introduction of novel prescription drug benefits such as multitier formularies and generic substitu-

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Table 1. Description of Benefit Packages and Most Common Coinsurance and Co-payments*

| Description | Coinsurance, % Single coinsurance rate for all drugs | Co-payment, Mean \$ | | |
|--------------------|---|---|---|--|
| | | 1-Tier Single co-payment for all drugs | 2-Tier Separate co-payments for generic and brand drugs† | 3-Tier Separate co-payments for generic, preferred brand, and nonpreferred brand drugs‡ |
| Type of drug | | | | |
| Generic | 30 | 6 | 5 | 5 |
| Preferred brand | 30 | 6 | 15 | 10 |
| Nonpreferred brand | 30 | 6 | 15 | 25 |

*Co-payments and coinsurance rates reported reflect the modal benefit in each type of plan in the study sample. Coinsurance rate is the percentage paid by the beneficiary.
 †Plan descriptions reflect common benefit designs, yet other definitions exist (some 2-tier plans place low-cost brand medications in the 1-tier and high-cost generics in the 2-tier).
 ‡Similarly, other types of 3-tier plans define the second and third tiers to include brand drugs without generic substitutes (single-source brands) and brand drugs with generic substitutes (multisource brands).

tion.⁶⁻¹² In this study, we use data for a wide array of employers and benefit designs to assess how multitier formularies, increased co-payments, and MGS requirements affect spending for generic and brand drugs and patients' out-of-pocket costs.

With incentive-based formularies, members pay differential co-payments or coinsurance rates based on the status of a drug (TABLE 1). In some plans, members pay a single co-payment for all drugs, a so-called 1-tier plan. To provide a financial incentive to purchase generic drugs, some plans charge different co-payments for brand and generics, with lower co-payments for the generics (2-tier plans). To encourage use of lower-cost brand medications, some plans further differentiate by adding a third co-payment for more expensive brand medications. In these 3-tier plans, generic drugs typically have the lowest co-payment, formulary or preferred brands have a mid-range co-payment, and nonformulary brands have the highest co-payment. Other variants of the 3-tier plan distinguish brand drugs without generic substitutes (single-source brands) and brand drugs with generic substitutes (multisource brands). Savings result from shifting members' drug use to generics or preferred brands, for which the health plans have negotiated favorable rates, and by increasing patients' cost-sharing for nonpreferred brands.⁵

Many health plans have adopted other tools to control drug spending such as MGS and coinsurance rates rather than fixed dollar co-payments per

prescription. Under MGS, members electing brand drugs over their generic equivalent generally must pay the generic co-payment plus the full difference in cost between the brand and generic drugs. Coinsurance rates, or percentage co-payments, are attractive to plans because they keep pace with rising drug costs. However, they are more difficult for patients to understand and lead to greater variation and uncertainty in out-of-pocket expenses.²²

METHODS

We assembled a unique data set linking health care claims to health plan benefits. Through a health benefits consulting firm, we obtained claims data from 1997 to 1999 for 35 private employers. The analysis excluded 10 employers with fewer than 1000 employees per health plan or with incomplete information on drug claims (eg, missing national drug codes). Of the 25 firms included in the study sample, most offered employees a choice of medical plans, and some plans changed benefits at the beginning of a calendar year. As a result, there were 55 unique medical or pharmacy benefit packages (ie, plans) and 75 plan-years of data since several plans have data for multiple years. Although employees typically had a choice of medical plans, only 2 firms had a choice of drug plans, thereby minimizing potential bias from selection of drug plans based on anticipated use. The study sample consisted of 702782 person-years of data on 420786 beneficiaries aged 18 to 64

years who were continuously enrolled in a plan for 1, 2, or 3 years. We excluded dependents and employees aged 65 years or older because we could not be sure that their drug utilization was not covered by other insurance.

Enrollment files included each person's age, sex, ZIP code of residence, and relationship to employee. Claims files captured all health care claims and encounters, including prescription drugs, inpatient, emergency, and ambulatory services. Drug claims included information on the type of drug (drug name, national drug codes, dosage, supply), place of purchase (retail or mail-order), and expenditures, including billed charges, negotiated discounts, excluded expenses, deductibles, co-payments and payments made by the employer, employee, and other third-party coverage. Data were also available on prescriptions costing less than the minimum drug co-payment. The medical claims included the same financial information, as well as the date of service, diagnosis and procedure codes, type of facility, and provider.

Plan Benefits

The claims data were linked with information about plan benefits. For each plan, we obtained photocopies of the summary of benefits provided by the firms to their employees and abstracted the benefit information. Because some benefit packages contained more detail than others, we coded information only when the plan specifically stated that a benefit was covered or excluded. The few discrepan-

cies were resolved by consensus. The drug benefit design features we coded included co-payments or coinsurance rates for both retail and mail-order pharmacies, generic substitution rules, and a list of drugs or drug classes excluded from coverage. Drugs not covered by the plans consisted primarily of lifestyle or cosmetic drugs such as sildenafil citrate and other discretionary medications for hair loss, weight reduction, and smoking cessation. The medical plan characteristics that we coded included individual plan deductibles, co-payments or coinsurance rates for physician office visits, and a binary indicator for enrollment in a managed care plan. No plans had a separate deductible for prescription drugs.

Statistical Analysis

We estimated 2 sets of regression models: costs by type of drug (generic, single-source brand, or multisource brand) and drug costs paid by the health insurance plan and by the patient. Costs reflected total annual payments made by the enrollee (co-payments, deductibles, excluded expenses) and by all third-party payers (primary and secondary coverage, net of negotiated discounts) for outpatient prescription drug claims.

The main independent variables in both models were the drug benefit design features, including the plan's lowest co-payment at retail pharmacies and incremental co-payments for second- and third-tier drugs, if applicable. The model also included binary indicators for coinsurance plans and use of MGS rules. We did not include cost-sharing arrangements at mail-order pharmacies because they were highly correlated with retail co-payments and coinsurance rates. In addition, we did not include indicators for excluded drugs because there was little variation across plans and the excluded medications comprised only a small fraction of covered drugs.

The covariates included a set of variables to describe the medical benefits, including individual plan deductibles, co-payments or coinsurance rates for

physician office visits, and a binary indicator for enrollment in a managed care plan. Other covariates were age categories, sex, work status (active or retired), urban residence, and median household income in the ZIP code of residence. We controlled for observed differences in comorbid conditions based on *International Classification of Diseases, Ninth Revision (ICD-9)* diagnostic codes from the medical claims files. We identified individuals who were treated for any of 26 chronic conditions, such as hypertension, diabetes, congestive heart failure, asthma, and depression, and included a binary indicator for each condition. Last, the model also included binary indicators for the calendar year to control for time trends in prescription drug spending and prices.

Our statistical analyses used a 2-part model.²³ The first part of the model, including the entire study sample, used probit regression to estimate the probability that a member had at least 1 pharmacy claim. The second part of the model used a generalized linear model with a logarithmic link function to estimate the level of drug spending among members with at least 1 claim, for the outcome of interest. For example, we analyzed use of generic, multisource, and single-source drugs separately. We chose the generalized linear model because it predicted component drug expenditures better than the standard 2-part model that uses linear regression in the second part, but our conclusions were insensitive to this choice.^{24,25}

Simulations

We combined the 2 parts of the model to predict average annual drug spending by drug type and payer status under different plan/co-payment combinations. Specifically, we used estimates from the first part of the model to predict the probability of nonzero expenditures for each person under alternative benefit designs and co-payments. Similarly, we used the second part of the model to predict expenditures, conditional upon having at least 1 claim for

each person under each plan/co-payment combination. We calculated total expenditures as the product of the 2 parts of the model and averaged them over all individuals in the sample for each plan/co-payment combination.²³

The simulations used a predetermined set of co-payments that occurred frequently in our data and were representative of cost-sharing arrangements in private health insurance plans. Because the coinsurance plans in our sample lacked sufficient variation in coinsurance rates, we included a binary indicator for coinsurance in predicting drug expenditures for these plans. We assumed that 1-tier co-payment plans required MGS, but that other plans did not. We also compared drug spending with and without MGS in 2-tier co-payment plans. We adjusted the SEs for clustering of patients within plans. We also used the bootstrap to derive the SEs of the predictions and compute 95% confidence intervals (CIs).²⁶ STATA version 7 (STATA Corp, College Station, Tex) was used for statistical analyses and the 95% CI reflects .025 in each tail or $P \leq .05$.

RESULTS

Descriptive Data

The characteristics of the patients in the study were consistent with a working-age population (TABLE 2). About half (46.6%) were aged 45 years or younger, 63.9% were men, and more than 4 out of 10 were treated for 1 or more chronic health conditions.

We categorized benefits packages into coinsurance plans and 1-, 2- and 3-tier co-payment plans as described in Table 1. The 15 coinsurance plans in our sample had a single coinsurance rate for prescription drugs of 20% or 30%, with a mean of 27.3% (TABLE 3). Ten of these plans required MGS. Among plans with co-payments, the 15 1-tier plans had an average co-payment of \$6.67 (range, \$2-\$10). Two-tier plans (n=36) were the most prevalent benefit design in our sample; the average difference in co-payment between generic and brand drugs was about \$7. Two- and 3-tier plans had

Table 2. Selected Patient and Medical Plan Characteristics (N = 702 782)*

| Characteristic | No. (%) |
|---|-----------------|
| Patient | |
| Age, y | |
| 18-34 | 120 112 (17.1) |
| 35-44 | 207 473 (29.5) |
| 45-54 | 222 228 (31.6) |
| 55-64 | 175 417 (25.0) |
| Men | 448 754 (63.9) |
| Active worker | 571 555 (81.3) |
| Urban residence | 525 212 (74.7) |
| Household income in ZIP code, median (SD), \$ | 34 579 (12 291) |
| No. of chronic conditions | |
| 0 | 398 497 (56.7) |
| 1 | 179 116 (25.5) |
| 2 | 81 541 (11.6) |
| ≥3 | 43 628 (6.2) |
| Sample year | |
| 1997 | 117 233 (16.7) |
| 1998 | 306 599 (43.6) |
| 1999 | 278 950 (39.7) |
| Medical Plan | |
| Managed care plan | 430 469 (61.3) |
| Physician office visit co-payment† | |
| \$0-\$5 | 78 270 (17.3) |
| \$6-\$10 | 200 695 (44.4) |
| \$11-\$15 | 40 108 (8.9) |
| \$16-\$20 | 133 410 (29.5) |
| Plan deductible, individual | |
| \$0 | 514 874 (73.3) |
| \$1-\$100 | 126 075 (17.9) |
| \$101-\$200 | 22 369 (3.2) |
| >\$200 | 39 464 (5.6) |

*The sample consists of 702 782 person-years of data on 420 786 beneficiaries aged 18 to 64 years. For number of chronic conditions, individuals were identified who were treated for any of 26 chronic conditions based on *International Classification of Diseases, Ninth Revision* diagnostic codes (hypertension, congestive heart failure, diabetes, asthma, hypercholesterolemia, ulcer, depression, chronic obstructive pulmonary disease, allergic rhinitis, migraine, osteoarthritis, chronic sinusitis, anxiety, cardiac disease, vascular disease, epilepsy, gastric acid disorder, glaucoma, gout, hyperlipidemia, irritable bowel syndrome, malignancies, psychotic illness, thyroid disorder, rheumatoid arthritis, tuberculosis).

†Percentages are for those who have co-payments. Among the entire sample, 35.6% (250 299) have coinsurance.

similar co-payments in the first 2 tiers. However, the average co-payment for nonpreferred brands was \$23.56, nearly \$12 more than what members would typically pay for preferred brands. All plans with a single co-payment had MGS programs. In contrast, only 6 of the 45 multitier plans required MGS.

Unadjusted total drug spending was highest in single co-payment plans (TABLE 4). Annual mean spending was approximately \$150 higher per member in 1-tier plans than in coinsurance or 3-tier plans. The average number of prescriptions dispensed followed a similar pattern. The fraction of enrollees who filled 1 or more prescriptions was highest in 1-tier plans and lowest in coinsurance plans. The fraction of drugs dispensed as generic ranged from 33.2% in 2-tier plans to 38.7% in 1-tier plans.

Spending by Drug Type

TABLE 5 presents predicted annual drug spending per member within each type of drug plan and co-payment level. Increasing co-payments within a particular benefit design reduced spending significantly, controlling for other factors known to affect utilization. For example, increasing single fixed co-payments for all drugs from \$5 to \$10 reduced annual average drug spending from \$725 to \$563 per member (22.3% reduction, $P<.001$). Similarly, doubling co-payments in multitier plans reduced annual average drug spending by about one third (32.9% in 2-tier plans, 34.5% in 3-tier plans; $P<.001$).

Higher patient cost-sharing led to less spending on both generic and brand name drugs.

Adding co-payments also significantly reduced average drug spending. Changing from a single co-payment of \$5 to a 2-tier plan with co-payments of \$5 for generic and \$10 for brand drugs reduced average drug spending from \$725 to \$678 (6% reduction, $P<.001$). Similarly, changing from a single co-payment of \$10 to a 2-tier plan with co-payments of \$10 for generic and \$20 for brand drugs reduced average drug costs from \$563 to \$455 (19% reduction, $P<.001$). Adding another co-payment for nonpreferred brands reduced spending further, albeit more modestly. For example, adding a co-payment of \$5 or \$10 for nonpreferred brand drugs lowered overall drug spending an additional 2% to 4%, respectively ($P=.004$ and $P<.001$). Spending on brand drugs declined, while spending on generic drugs increased with the addition of a third tier. For instance, annual expenditures on generic drugs increased from \$71 to \$81 per member with the addition of an incremental co-payment of \$5 for nonpreferred brand drugs.

Higher co-payments for physician office visits had no effect on drug spending (data not shown). Also, total drug spending was similar in managed care and nonmanaged care plans, although use of brand drugs was modestly lower in managed care settings.

Spending by Payer

We also examined the share of drug spending borne by patients and all third-party payers under different cost-sharing arrangements (TABLE 6). Patient out-of-pocket spending did not change substantially within a specific benefit design, because the reduction in overall drug use due to higher patient cost-sharing largely offset the effects of higher co-payments per prescription. However, the fraction of drug costs borne by patients rose considerably. Doubling co-payments in 2- and 3-tier plans increased the fraction of drug expenses beneficiaries paid out-

Table 3. Mean Prescription Benefits Packages by Type of Prescription Plan*

| Plan Feature | Coinsurance Plans, %† (n = 15) | Type of Prescription Benefit Plan, Mean \$ | | |
|---|-----------------------------------|--|--------------------|-------------------|
| | | 1-Tier (n = 15) | 2-Tier (n = 36) | 3-Tier (n = 9) |
| Patient cost-share | | | | |
| Generic | 27.3 | 6.67 | 5.47 | 5.78 |
| Preferred brand | 27.3 | 6.67 | 12.51 | 11.78 |
| Nonpreferred brand | 27.3 | 6.67 | 12.51 | 23.56 |
| Mandatory generic substitution program, No. (%) | 10 (66.7) | 15 (100) | 5 (13.9) | 1 (11.1) |

*All means are computed at the plan level. The sample of 75 plan-years consists of 14 plans from 1997, 25 plans from 1998, and 36 plans from 1999. See Table 1 for a detailed description of benefit packages.

†All coinsurance plans have percentage co-payments of 20% or 30%.

of-pocket from 17.6% to 25.6% and 20.1% to 32.3%, respectively. Overall, patient out-of-pocket payments were highest in coinsurance plans and 3-tier plans with higher co-payments.

Impact of MGS

Mandatory generic substitution also lowered drug costs significantly (TABLE 7). Specifically, adding MGS in 2-tier plans reduced drug spending by \$36 to \$52 per person (8% reduction, $P < .001$), depending on the level of co-payments. Requiring MGS reduced expenditures on multisource and single-source brands, but had no appreciable effect on generic drug spending. However, separate analyses examining the number of prescriptions dispensed rather than drug spending found a modest increase in generic prescriptions and little change in total prescriptions with the addition of MGS.

COMMENT

The desire to control health care costs has led to considerable variation in how employers and health insurance providers structure formularies, design benefits, and provide incentives to both physicians and patients. We found that many of the tools used to influence pharmaceutical use were effective in reducing drug expenditures for working-age enrollees with employer-provided drug coverage. Adding an additional

level of co-payment, increasing existing co-payments or coinsurance rates, and requiring MGS all reduced health insurance plan payments significantly. Doubling patient co-payments lowered average drug spending by as much as one third (Table 5), reducing both the likelihood of having a claim and the level of spending conditional upon use. The reduction in drug spending largely benefited employers, as the fraction of drug costs borne by pa-

Table 4. Average Annual Prescription Drug Spending and Use by Plan Benefit for 1997-1999*

| | Type of Prescription Plan | | | | All Plans |
|-------------------------------------|---------------------------|--------|--------|--------|-----------|
| | Coinsurance | 1-Tier | 2-Tier | 3-Tier | |
| Total drug spending per member, \$ | 505 | 650 | 598 | 494 | 588 |
| No. of prescriptions per member | 9.8 | 12.3 | 11.1 | 9.4 | 11.1 |
| Users, % | 70.7 | 78.0 | 75.7 | 74.3 | 75.4 |
| Generic prescriptions per member, % | 35.1 | 38.7 | 33.2 | 36.3 | 35.9 |

*All means are unadjusted and computed at the individual level.

Table 5. Predicted Average Annual Prescription Drug Spending per Member by Drug Type and Type of Prescription Plan*

| Drug Type | Mean \$ (95% Confidence Interval) | | | | | | | |
|---------------------|-----------------------------------|--------------------|---------------|---------------------------------|----------------------------------|--|---|--|
| | Coinsurance | 1-Tier Co-payment† | | 2-Tier Co-payment | | 3-Tier Co-payment | | |
| | | \$5 | \$10 | \$5 for Generic, \$10 for Brand | \$10 for Generic, \$20 for Brand | \$5 for Generic, \$10 for Preferred Brand, \$15 for Nonpreferred Brand | \$10 for Generic, \$20 for Preferred Brand, \$30 for Nonpreferred Brand | |
| All drugs | 542 (531-553) | 725 (706-744) | 563 (550-577) | 678 (666-690) | 455 (438-472) | 666 (652-680) | 436 (423-449) | |
| Generic | 66 (63-69) | 91 (87-95) | 69 (66-72) | 71 (68-74) | 41 (38-44) | 81 (77-85) | 53 (48-58) | |
| Single-source brand | 417 (409-425) | 571 (552-592) | 448 (436-456) | 534 (524-544) | 367 (353-381) | 518 (506-530) | 343 (324-360) | |
| Multisource brand | 59 (57-61) | 63 (61-65) | 46 (45-48) | 73 (71-75) | 47 (45-48) | 67 (65-69) | 40 (37-43) | |

*Total expenditures reflect the sum of generic, single-source (brand drug without generic substitute), and multisource (brand drug with generic substitute) prescription drug spending. All estimates are in 1999 dollars and exclude 3.2% of prescriptions and 5.6% of drug expenditures with missing national drug codes.

†Expenditures for 1-tier plans assume mandatory generic substitution because all 1-tier plans in the sample require it. Predicted expenditures for all other plans assume no mandatory generic substitution.

Table 6. Share of Annual Prescription Drug Spending per Member by Payer Status and Type of Prescription Plan*

| Payer Expenses | Mean \$ (95% Confidence Interval) | | | | | | | |
|-----------------------|-----------------------------------|--------------------|---------------|---------------------------------|----------------------------------|--|---|--|
| | Coinsurance | 1-Tier Co-payment† | | 2-Tier Co-payment | | 3-Tier Co-payment | | |
| | | \$5 | \$10 | \$5 for Generic, \$10 for Brand | \$10 for Generic, \$20 for Brand | \$5 for Generic, \$10 for Preferred Brand, \$15 for Nonpreferred Brand | \$10 for Generic, \$20 for Preferred Brand, \$30 for Nonpreferred Brand | |
| All payers | 542 (531-553) | 725 (706-744) | 563 (550-577) | 678 (666-690) | 455 (438-472) | 666 (652-680) | 436 (423-449) | |
| Health plan | 403 (394-412) | 602 (581-623) | 437 (423-450) | 559 (549-570) | 339 (322-356) | 532 (519-546) | 295 (276-314) | |
| Patient out-of-pocket | 139 (133-145) | 123 (114-132) | 126 (116-136) | 119 (115-123) | 116 (102-129) | 134 (130-138) | 141 (122-159) | |
| Out-of-pocket, % | 25.6 | 16.9 | 22.3 | 17.6 | 25.6 | 20.1 | 32.3 | |

*Total expenditures reflect the sum of health plan and patient expenses. All estimates are in 1999 dollars and exclude 3.2% of prescriptions and 5.6% of drug expenditures with missing national drug codes.

†See dagger footnote of Table 5.

Table 7. Impact of Mandatory Generic Substitution on Annual Prescription Drug Spending per Member in 2-Tier Plans*

| Drug Type | Mean \$ (95% Confidence Interval) | | | |
|---------------------|--|---------------|---|---------------|
| | 2-Tier (\$5 for Generic, \$10 for Brand) | | 2-Tier (\$10 for Generic, \$20 for Brand) | |
| | Without MGS | With MGS | Without MGS | With MGS |
| All drugs | 678 (666-690) | 626 (613-639) | 455 (438-472) | 419 (389-439) |
| Generic | 71 (68-74) | 71 (68-74) | 41 (38-44) | 41 (38-44) |
| Single-source brand | 534 (524-544) | 500 (488-512) | 367 (353-381) | 343 (327-359) |
| Multisource brand | 73 (71-75) | 55 (54-57) | 47 (45-48) | 35 (32-38) |

*MGS indicates mandatory generic substitution. See asterisk footnote of Table 5.

tients increased significantly. We also found evidence that requiring MGS was an alternative to adding an additional level of co-payment. All 1-tier plans in our sample required MGS; in contrast, less than 1 in 7 multitier plans imposed it.

There is optimism among some health insurance plans and providers that requiring larger co-payments on nonpreferred brands will dampen the rapid growth in drug spending. We found that this benefit had modest effects. Adding a third tier with incremental co-payments of \$10 reduced drug expenditures by only 4%. This effect is smaller than reported elsewhere for a single preferred provider organization that changed from a 2-tier benefit with co-payments of \$7 and \$12 to a 3-tier plan with co-payments of \$8, \$15, and \$25.²¹ While some of the discrepancy between studies can be explained by the dollar difference in co-payments, the potential savings from a 3-tier benefit depend on many other factors, including the formulary structure (how drugs are classified) and utilization patterns within a plan.⁵

The differences in drug spending are likely to be driven by patient, not provider, behavior. Physicians are generally not familiar with the costs of the medications they prescribe.²⁷ Moreover, the patients in our study had generous drug coverage with modest differences in co-payments for alternative medications. Modest differences in out-of-pocket cost for a subset of a provider's patients are unlikely to induce significant changes in physician-prescribing patterns.

Debate over the effects of cost-containment strategies often fail to distinguish between the level of drug spending and growth in spending. The rapid increase in pharmaceutical spending from 1987 to 1993 was due both to rising drug prices and to higher per capita utilization. However, since 1994, the growth in spending has been largely due to increased utilization.⁴ If this trend continues, increased patient cost-sharing will play a larger role in reducing the level of drug spending than slowing the growth in expenditures.

Our analysis has several limitations. First, we examined a working-age population with employer-provided drug coverage. Thus, our findings may not generalize to lower-income groups or the elderly population. However, our findings reflect behavioral responses of more than 400 000 enrollees to a wide range of drug and medical benefits.

Second, some plans imposed higher co-payments or coinsurance rates for drugs dispensed at out-of-network pharmacies. We did not control for this feature in our analysis because this information was not consistently reported in the benefits package. In addition, we had no information on use of over-the-counter medications, which could potentially mitigate the effects of increased patient cost-sharing.

Third, we could not assess the full impact of extremely high co-payments. In our sample, the mean difference in co-payments was \$6.50 between generic and brand drugs and \$12 between preferred and nonpreferred brands, with a maximum of \$15. There-

fore, we could not reliably predict the effect of a plan with co-payments in excess of \$30. Although such high co-payments were unusual in our data, they are increasingly becoming more common as costly new drugs and biotech agents enter the market.^{28,29}

Finally, we could not control for selection of health insurance plans because we did not know the full range of choices offered to employees. Most of the firms in our sample offered employees a choice of medical plans, which typically included a managed care and indemnity option. However, in all but 2 firms there was no choice of drug plan, which minimizes any potential bias from employees selecting benefit package designs that suit their particular needs or preferences. Furthermore, reestimating the models without these plans did not change our results.

A large fraction of the increase in drug spending in 2000 was due to higher expenditures on a small number of drugs and drug categories.³ Where drugs are placed in the formulary will substantially affect utilization patterns and costs. Currently, drug classification is often a function of ingredient cost and manufacturer rebates rather than clinical outcomes.⁵ As a result, pharmacy benefit managers and their sponsors may be designing prescription benefit packages that reduce the costs of pharmaceuticals but increase overall medical costs.

There is little evidence about whether lower pharmaceutical use resulting from higher patient cost-sharing adversely affects clinical outcomes. Several studies have found that spending caps and formulary restrictions reduced use of both essential and nonessential medications among low-income and elderly populations.^{8-10,16,19,20} However, few studies have found a consistent link between higher co-payments and patients' health, particularly among persons with employer-provided coverage whose drug spending comprises a much smaller percentage of their income. A recent study of reference pricing for angiotensin-converting enzyme inhibitors, in which insurance covers the cost up to the ref-

erence price and patients pay the extra cost of more expensive medications in a class, found little evidence that patients stopped treatment for hypertension or that health care costs increased.³⁰ Future research should examine the impact of benefit design on a wide range of therapeutic classes and whether changes in drug spending affect medical care utilization and overall

health care costs of different patient populations.

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