Incentive Formularies and Changes in Prescription Drug Spending

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Objectives: To examine the impact of incentive formularies on prescription drug spending shifts in formulary compliance, use of generic medications, and mail-order fulfillment in the year after introduction of a new pharmacy benefit strategy.

Study Design: Pre-post comparison study with matched concurrent control group (difference-in-differences analysis).

Methods: Study subjects were continuously enrolled patients from a single large health plan in the northeastern United States. Health plan administrative data were used to determine the total, health plan, and out-of-pocket spending in the year before and the year after the introduction of 12 different benefit changes, including 1 in which copayments decreased.

Results: Overall, changing from a single-tier or 2-tier formulary to a 3-tier formulary was associated with a decrease in total drug spending of about 5% to 15%. Plan spending decreased more dramatically, about 20%, whereas out-of-pocket spending that resulted from higher copayments increased between 20% and >100%. Changing to an incentive formulary with higher copayments was accompanied by a small but inconsistent decrease in use of nonformulary selections and a concomitant increase in both generic and formulary preferred utilization. Mail-order fulfillment doubled, albeit from a low baseline level.

Conclusions: Switching to incentive formulary arrangements with higher levels of copayments generally led to overall lower drug costs and vice versa. These effects varied with the degree of change, level of baseline spending, and magnitude of the copayments. Whether these effects are beneficial overall depends on potential health effects and spillover effects on medical spending.

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For author information and disclosures, see end of text.

Among the most common tools insurers use to reduce healthcare costs are incentive formularies, which promote the use of generic or preferred brand name medications through differential copayments. In recent years, incentive formularies have evolved through the addition of tiers and higher levels of copayments. As of 2005, almost 75% of commercially insured individuals had prescription drug coverage with an incentive formulary with 3 or more tiers, whereas a decade ago such coverage was rare.[1] Nonetheless, drug spending grew substantially over this time period.

Pharmaceutical companies attempt to influence the placement of their products in a preferred tier through price, including rebates to pharmacy benefit managers based on utilization levels of specific drugs. By shifting market share to preferred products, benefit managers can obtain higher rebates and thereby reduce their drug costs. A growing number of studies have examined the impact of higher prescription drug copayments on consumer behavior and spending, but none has incorporated rebates into the analyses. Instead, previous studies used data from paid claims. By omitting information on rebates, these data overstate drug spending. In addition, most previous studies of cost sharing for pharmaceuticals have a variety of methodologic flaws or limitations.[2-10] For instance, studies have been limited to a small number of benefit changes for a few companies, examined selected populations, been cross-sectional, or used nonequivalent comparison groups, including groups in different parts of the country or with different medical benefits.

In this study we used data on continuously enrolled patients from a single insurer that managed both medical and prescription drug benefits to estimate the impact of changes in drug benefit design on pharmaceutical use and spending. In all cases the changes in benefit structure were not under the control of the enrollee, but rather his or her employer. We examine 2 sets of outcomes: prescription drug spending, by both the health plan and member, and formulary compliance, including the use of generic medications and mail-order fulfillment.

METHODS

Overview

We assembled a dataset of complete pharmaceutical claims from January 1, 2000, through December 31, 2001, as well as demographic and benefit design information for 1.25 million continu-

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ously enrolled HMO/point-of-service (POS) members from the Northeast and mid-Atlantic regions of the health plan. Using these data we identified groups of enrollees whose pharmacy benefit structure changed on January 1, 2001, and matched these enrollees with others who maintained the identical benefit structure throughout the study period. We then compared prechange and postchange values for both groups using a difference-in-differences approach.

Study Population

Eligible enrollees were younger than age 64 years, had prescription drug coverage provided by the health plan (approximately 70% of HMO/POS enrollees), and were drawn from the 11 states in the Mid-Atlantic and Northeast areas where the health plan has its largest market penetration. We included states with a minimum of 10 000 enrollees to ensure adequate numbers of enrollees in each state. Because of potential selection bias in smaller firms, we eliminated enrollees associated with firms with fewer than 5 enrollees. Fifty-seven percent of the resulting study population were employed in firms with 100 or more employees.

Pharmaceutical Benefits and Claims

The health plan used a single national formulary for all enrollees, but individual employers could select from a menu of incentive-based formularies ranging from a single-tier formulary to a variety of 3-tier formularies that required higher copayments for medications in higher tiers.

We linked pharmaceutical claims data to an enrollment file that contained information on the employer group, benefit design, and standard demographic characteristics. From pharmaceutical claims we obtained medication name, dosage, days supplied, National Drug Code, place of purchase (retail vs mail order), and the amounts paid to the pharmacy by the health plan and the member through copayments. We categorized each drug prescribed over the 2-year period as generic, formulary preferred, or formulary nonpreferred based on observed copayments.

Outcomes

Spending. To obtain plan and out-of-pocket pharmaceutical spending for each member month, we summed claims for each individual. For mail-order prescriptions, we determined the number of days supplied to the nearest month and the amount of the copayment. If a mail-order prescription spanned both years of the study, its expenditure was allocated to the year in which it was filled, and the spending and the copayment were apportioned equally to each month covered by the prescription. Combining retail and mail-order spending, average monthly pharmaceutical spending was calculated for the 12 months before and the 12 months after the switch in benefits.

Formulary Compliance and Mail-Order Fulfillment. We calculated the portion of filled prescriptions (standardized by days supply for chronic medications) for generic, formulary preferred, and formulary nonpreferred drugs, and the proportion of total prescription months fulfilled through mail order. Mail-order fulfillment allowed the enrollee to receive a 3-month supply of a drug for 2 copayments instead of 3 copayments.

Creating Matched Cohorts

We identified 7 cohorts of enrollees that had the same pharmaceutical benefit structure in 2000, with some portion of each cohort being switched to a different benefit structure on January 1, 2001. Thus, we could examine a full 12 months of utilization before and after the benefit switch. Among the 7 cohorts, we chose "treatment groups" from the largest 12 groups with a benefit change in 2001. We then matched each of these 12 groups with a comparison group. To do so, we used individuals in the 7 cohorts and estimated propensity score models predicting a change in benefit structure. As explanatory variables, we used state, employer size, and baseline demographic and enrollee clinical characteristics, as well as information on formulary compliance in the first time period. To measure clinical characteristics we used DxCG software, which creates a summary score of the patients' comorbidities (DxCG, Boston, Mass).[11] We matched each enrollee who switched benefits to an enrollee who did not switch based on the estimated propensity score. To ensure close matches, we required the estimated log-odds of a benefit change between an enrollee who switched and one who did not to be within 0.60 standard deviation. This value removes approximately 90% of the bias in estimates of effects due to differences in covariate distributions between "treatment" and comparison groups.[12] Exact matching of enrollees was required for state and age (in 5-year increments).

Accounting for Rebates

Because of its confidential and proprietary nature, rebate information has not been available for previous research studies. Without this information, however, the estimated levels of spending on pharmaceuticals are likely to be biased. Assuming that incentive formularies shift market share to preferred drugs, rebates differentially affect estimates of spending on preferred drugs relative to nonpreferred drugs. To protect the proprietary nature of rebate information, we use the "average" value of rebates per prescription for formulary

preferred products. Specifically, we apportioned the total dollar amount of rebates in aggregate equally to each filled prescription for a formulary product. The magnitude of the rebate was not related to the pharmacy benefit structure of the individual enrollee filling a prescription. This method assumes that the changes in utilization of brand formulary products within each cohort were consistently related to changes in rebates.

Analyses

To test the null hypothesis of no difference between the treatment and comparison group, we used a 2-sample *t* test for continuous variables and a χ^2 test for dichotomous variables. Our major interest, however, was in the differences between prechange and postchange use in our 2 groups. After matching on the basis of the propensity score, these differences were assessed using paired t tests for continuous variables and χ^2 statistics from generalized estimating equations for grouped (paired) binomial data.

RESULTS

About 600 000 members, or half of all continuously enrolled members, had 1 of the 7 unique pharmacy benefit structures in 2000 that we included in our study. Just over half of these members were female, and the average age was generally in the low thirties. Across the 7 cohorts, the proportion of members from employers with more than 3000 covered employees ranged from 34% to 100%. After matching, there were no statistically significant differences in any of the observed patient characteristics for any matched cohort (**Table 1**).

Changes in Spending

Prescription drug spending by the health plan (net of rebates) as well as total prescription drug spending for the matched cohorts is presented in **Table 2**. Columns 4-6 show plan spending for the baseline year (2000) and the intervention year (2001) as well as the difference in spending for the group that changed relative to its matched control group (labeled "difference-in-differences"). The subsequent columns present the same information for out-of-pocket spending (columns 7-9) and overall spending (columns 10-12). Each specific benefit change has its own matched control group; within group 1, for example, 2 different comparison populations (cohorts 1a and 1c) were used because each of these comparison populations was exactly matched with individuals in the relevant group that changed benefits.

Overall, changing from a single- or 2-tier formulary to a 3-tier incentive formulary with concomitant higher copayments in the second and third tier was associated with a decrease in total drug spending of 5% to 15%. Plan spending decreased more, on the order of 20%, whereas out-of-pocket spending because of the higher copayments for the second and third tier increased between 20% and >100%. For example, group 1 started as a single-tier program with a $5 copayment for all medications. In 2001 cohort 1b switched to a 3-tier incentive formulary with copayments of $5, $10, and $25 for the respective tiers, and cohort 1d switched to a similar 3-tier program with higher copayments of $10, $15, and $30. When compared with the control group, average per member per month spending by the plan fell $7.20 for cohort 1b and $8.80 for cohort 1d (21% and 30%), whereas average per member per month out-of-pocket spending increased $3.80 and $5.10, respectively. Average total spending decreased $3.50 and $3.70, respectively ($P < .001$).

Group 6 began with a 3-tier incentive formulary. For group 6b, copayments increased for each tier, whereas for cohort 6d copayments fell for each tier. Compared with the control group, average per member per month spending by the health plan decreased $5.10 for cohort 6b and increased $7.20 for cohort 6d, the group with lower copayments. Similarly, average per member per month out-of-pocket spending increased $2.20 for cohort 6b and decreased $3.30 for cohort 6d. Symmetrically, total spending decreased $2.90 for cohort 6b and increased $3.90 for cohort 6d.

We also examined the time pattern of spending that resulted from changes in cost sharing. The change in spending began immediately with the introduction of the new benefit and remained stable over the course of the year (**Figure**).

Changes in Formulary Compliance and Mail-Order Fulfillment

Changing to an incentive formulary with higher copayments or more tiers was associated with a 1%-4% decrease in the use of nonformulary drugs and a concomitant increase in both generic and formulary preferred utilization (**Table 3**). The increase in generic and brand formulary utilization was inconsistent across the groups, suggesting little generic substitution, possibly because the difference in copayments between generic and formulary preferred agents was generally small (usually $5).

At baseline, use of mail-order fulfillment was low for all groups, ranging from 1% to 13%. Almost all of the instituted changes were accompanied by an approximate doubling in the use of mail-order fulfillment compared with use in the control population (**Table 4**).

Table 1. Study Subjects*

Group and Copayment Amounts in 2000	2001 Benefit Design	No. of Continuous Enrollees	Percent Large Employers (>3000)	Mean Age, y	Percent Female	Percent Dependent	Mean DxCG Score
Group 1: $5/$5/$5							
Cohort 1a	**$5/$5/$5**	**67 001**	**39**	**33**	**51**	**56**	**0.97**
Cohort 1b	$5/$10/$25	10 451	69	32	52	57	0.94
Cohort 1c	$10/$15/$30	1986	54	31	51	54	0.90
Group 2: $10/$10/$10							
Cohort 2a	**$10/$10/$10**	**71 529**	**38**	**33**	**51**	**54**	**0.98**
Cohort 2b	$10/$15/$30	42 810	90	32	55	54	0.97
Cohort 2c	$5/$10/$25	5106	94	29	50	58	0.86
Cohort 2d	$5/$15/$25	2691	100	30	51	47	0.88
Group 3: $10/$10/$15							
Cohort 3a	**$10/$10/$15**	**37 277**	**54**	**34**	**53**	**52**	**1.00**
Cohort 3b	$10/$15/$30	17 338	71	35	55	49	1.02
Group 4: $5/$5/$10							
Cohort 4a	**$5/$5/$10**	**54 756**	**47**	**34**	**53**	**49**	**1.02**
Cohort 4b	$5/$10/$25	10 211	65	32	52	56	0.93
Cohort 4c	$5/$15/$30	1943	99	36	58	41	1.08
Group 5: $5/$5/$10							
Cohort 5a	**$5/$5/$10**	**2835**	**100**	**32**	**50**	**56**	**0.92**
Cohort 5b	$5/$10/$25	6777	100	37	51	60	1.12
Group 6: $10/$15/$30†							
Cohort 6a	**$10/$15/$30**	**146 186**	**52**	**33**	**51**	**54**	**0.97**
Cohort 6b	$15/$20/$35	4487	30	33	55	51	0.99
Cohort 6c	$5/$10/$25	2808	84	33	54	58	0.99
Group 7: $5/$10/$25							
Cohort 7a	**$5/$10/$25**	**226 703**	**82**	**33**	**52**	**55**	**0.96**
Cohort 7b	$10/$15/$30	8913	63	32	50	54	0.95

*Control (no change) cohorts within each group are indicated in bold. Included are members with no claims. Discrepancies exist because of rounding.
†In contrast to other cohorts, prescription tiers switch from more expensive to less expensive when going from cohort 6a to cohort 6c.
NA indicates not applicable.

DISCUSSION

Our study has several notable findings. Increasing copayment levels and the use of multitier incentive formularies decreased spending compared with spending in a concurrent control group across a diverse variety of benefit types and benefit changes; conversely, decreasing copayment level increased the spending. The magnitude of the change in spending was related to the degree of change in cost sharing as well as to the number of tiers. Brand nonformulary utilization fell a modest amount. Mail-order fulfillment increased by a factor of at least 2, albeit from a relatively low baseline level. Finally, changes in costs occurred immediately after the introduction of the new benefit and remained stable over the entire subsequent year.

Our study is notable (1) for examining a large and diverse number of benefit changes that varied according to the number of tiers and copayment amounts, including a change that lowered copayments, and (2) for using carefully matched concurrent comparison groups selected from a cohort of more than 1.25 million enrollees. To minimize confounding due to

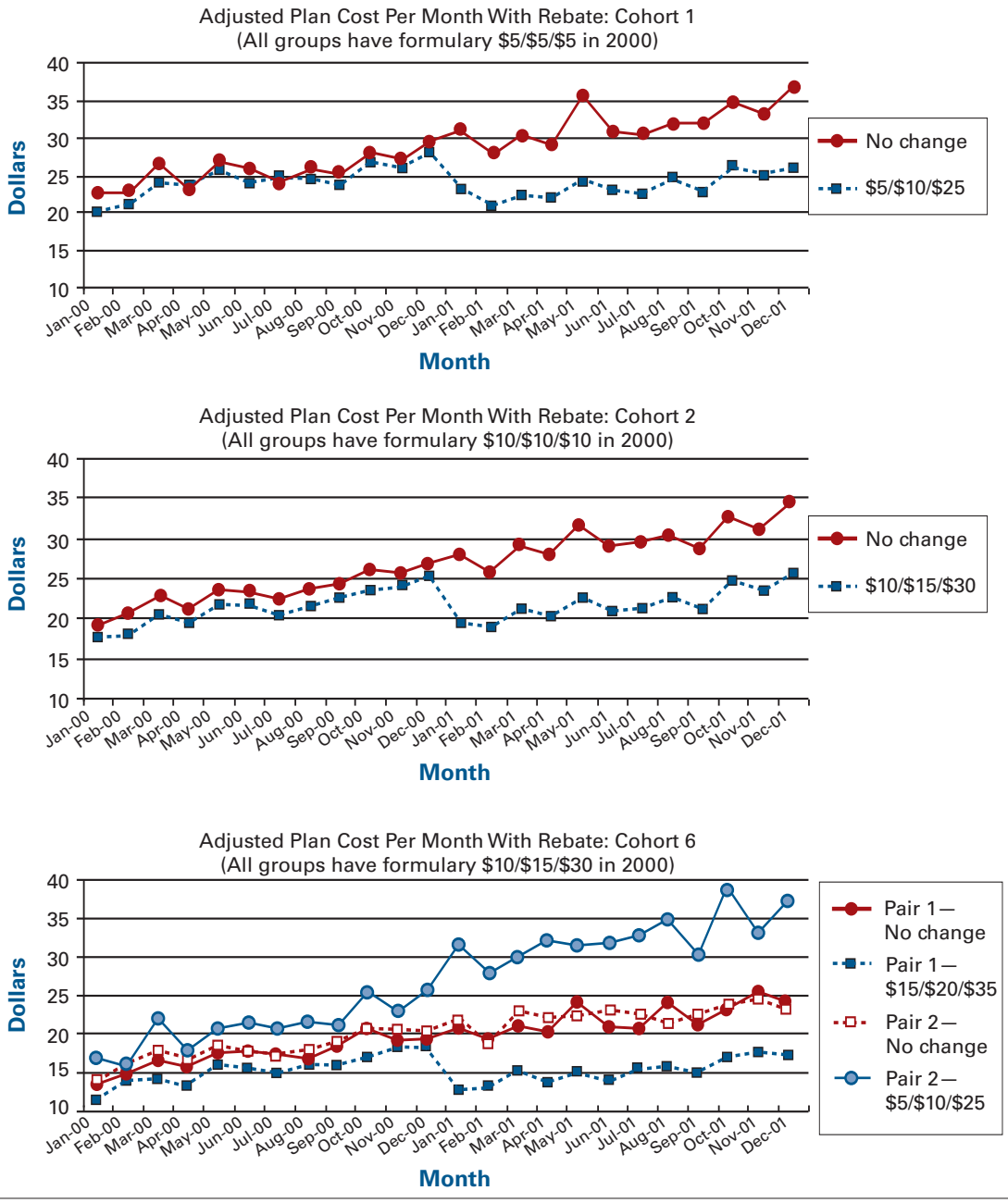
Table 2. Adjusted Changes in Overall Prescription Drug Spending in Propensity Score–Matched Cohorts*

Group and Copayment Amounts in 2000	2001 Benefit Design	No. of Enrollees in Analysis	Average Monthly Prescription Spending by Plan in 2000	Average Monthly Prescription Spending By Plan in 2001	Difference-in-Differences (Relative to Control)	Average Monthly OOP Prescription Spending in 2000	Average Monthly OOP Prescription Spending in 2001	Difference-in-Differences (Relative to Control)	Average Total Monthly Prescription Spending in 2000	Average Total Monthly Prescription Spending in 2001	Difference-in-Differences (Relative to Control)
Group 1: $5/$5/$5											
Cohort 1a	**$5/$5/$5**	**8440**	**$26**	**$32**		**$3.10**	**$3.40**		**$28.70**	**$35.40**	
Cohort 1b	$5/$10/$25	8440	$24	$24	($7.20)†	$3.00	$7.10	$3.80†	$27.40	$30.70	($3.50)†
Cohort 1c	**$5/$5/$5**	**1930**	**$21**	**$26**		**$2.80**	**$3.10**		**$23.50**	**$29.30**	
Cohort 1d	$10/$15/$30	1930	$16	$13	($8.80)†	$2.50	$7.90	$5.10†	$18.40	$20.50	($3.70)†
Group 2: $10/$10/$10											
Cohort 2a	**$10/$10/$10**	**18 427**	**$23**	**$30**		**$6.10**	**$6.80**		**$29.60**	**$36.80**	
Cohort 2b	$10/$15/$30	18 427	$22	$22	($6.10)†	$6.30	$10.60	$3.70†	$27.80	$32.60	($2.40)†
Cohort 2c	**$10/$10/$10**	**5054**	**$19**	**$24**		**$5.20**	**$5.70**		**$24.50**	**$29.40**	
Cohort 2d	$5/$10/$25	5054	$18	$20	($2.40)†	$5.00	$6.20	$0.70†	$23.30	$26.40	($1.70)‡
Cohort 2e	**$10/$10/$10**	**2647**	**$18**	**$23**		**$5.10**	**$5.60**		**$23.60**	**$28.70**	
Cohort 2f	$5/$15/$25	2647	$17	$19	($3.20)‡	$4.70	$8.20	$3.00†	$22.00	$27.00	($0.10)
Group 3: $10/$10/$15											
Cohort 3a	**$10/$10/$15**	**16 166**	**$25**	**$32**		**$7.30**	**$7.90**		**$31.90**	**$39.50**	
Cohort 3b	$10/$15/$30	16 166	$24	$25	($5.20)†	$7.00	$11.20	$3.50†	$30.50	$36.40	($1.70)†
Group 4: $5/$5/$10											
Cohort 4a	**$5/$5/$10**	**9421**	**$23**	**$30**		**$3.70**	**$4.00**		**$27.10**	**$33.70**	
Cohort 4b	$5/$10/$25	9421	$22	$23	($5.10)†	$3.50	$6.80	$3.00†	$25.30	$29.80	($2.10)§
Cohort 4c	**$5/$5/$10**	**1943**	**$33**	**$41**		**$4.70**	**$5.20**		**$37.60**	**$46.50**	
Cohort 4d	$5/$15/$30	1943	$34	$33	($9.80)†	$5.00	$13.00	$7.50†	$39.00	$45.70	($2.30)
Group 5: $5/$5/$10											
Cohort 5a	**$5/$5/$10**	**1442**	**$28**	**$34**		**$6.10**	**$6.80**		**$33.90**	**$40.70**	
Cohort 5b	$5/$10/$25	1442	$37	$35	($7.60)	$7.30	$9.70	$1.70†	$43.80	$44.80	($5.90)
Group 6: $10/$15/$30‖											
Cohort 6a	**$10/$15/$30**	**4487**	**$18**	**$22**		**$8.50**	**$10.10**		**$26.00**	**$32.40**	
Cohort 6b	$15/$20/$35	4487	$15	$15	($5.10)†	$8.30	$12.10	$2.20†	$23.80	$27.30	($2.90)†
Cohort 6c	**$10/$15/$30**	**2808**	**$18**	**$23**		**$9.90**	**$11.30**		**$28.00**	**$34.00**	
Cohort 6d	$5/$10/$25	2808	$21	$33	$7.20†	$12.50	$10.60	($3.30)†	$33.60	$43.30	$3.90§
Group 7: $5/$10/$25											
Cohort 7a	**$5/$10/$25**	**8900**	**$21**	**$28**		**$6.80**	**$7.80**		**$28.00**	**$36.10**	
Cohort 7b	$10/$15/$30	8900	$18	$19	($5.80)†	$5.90	$9.30	$2.50†	$24.00	$28.70	($3.40)†

*Control (no change) cohorts within each group are indicated in bold. Included are members with no claims. Discrepancies exist because of rounding.
†Pairwise differences in prescription spending between control and each intervention cohort in the same group are significant at $P < .001$.
‡Pairwise differences in prescription spending between control and each intervention cohort in the same group are significant at $P < .05$.
§Pairwise differences in prescription spending between control and each intervention cohort in the same group are significant at $P < .01$.
‖In contrast to other cohorts, prescription tiers switch from more expensive to less expensive when going from cohort 6c to cohort 6d.
OOP indicates out-of-pocket.

differences between local healthcare markets and characteristics of the health plan benefit, all members were drawn from a single region of the country with identical formulary and medical coverage from a single health plan over the entire period of the study. In addition, we matched each enrollee to a control enrollee from the same state on the basis of a propensity score model that included individual demographic characteristics, a measure of overall health status, and employer group characteristics. Thus, we minimized the possibility that the results we observed were due to confounding or selection bias. Finally, to our knowledge, this is the first study of pharmaceutical cost sharing that accounts for rebates. Doing

Figure 1. Monthly Health Plan Spending for 3 Illustrative Cohorts*



*All benefit changes occurred on January 1, 2001. In the bottom panel, pair 1 refers to cohorts 6a and 6b; pair 2 refers to cohorts 6c and 6d.

so slightly increases the magnitude of the effect on total spending and enrollee out-of-pocket spending.

A number of recent studies have examined the relationship between incentive formularies and overall drug spending with a range of results.[2-4,6,8,13,14] In a widely cited study, Joyce and colleagues analyzed cross-sectional differences in prescription drug spending in a sample of 25 firms with a variety of different pharmaceutical benefit arrangements.[6] Similar to our results, they found that enrollees in 3-tiered plans had lower total prescription drug spending and that such plans shifted cost from the insurer to the enrollee. Their results, however, differ from ours in 2 important ways. First, their estimated effect sizes are considerably greater; they estimate predicted spending in 2- or 3-tier plans with substantially higher copayments (eg, $10/$20 or

Table 3. Adjusted Changes in Generic, Brand Formulary, and Brand Nonformulary Shares*

Group and Copayment Amounts in 2000	2001 Benefit Design	No. of Enrollees in Analysis	Generic Prescription Share in 2000, %	Brand Formulary Prescription Share in 2000, %	Brand Nonformulary Prescription Share in 2000, %	Difference-in-Differences (Relative to Control), %		
						Generic	Brand Formulary	Brand Nonformulary
Group 1: $5/$5/$5								
Cohort 1a	**$5/$5/$5**	**4366**	**35.4**	**44.7**	**19.9**			
Cohort 1b	$5/$10/$25	4366	34.4	45.6	20.1	3.5†	0.3	–3.8†
Cohort 1c	**$5/$5/$5**	**944**	**39.9**	**40.9**	**19.2**			
Cohort 1d	$10/$15/$30	944	39.2	42.4	18.4	–1.3	2.7	–1.4
Group 2: $10/$10/$10								
Cohort 2a	**$10/$10/$10**	**9672**	**34.0**	**48.1**	**17.9**			
Cohort 2b	$10/$15/$30	9672	35.3	49.8	14.9	1.9†	–1.0‡	–0.9†
Cohort 2c	**$10/$10/$10**	**2393**	**37.3**	**45.3**	**17.4**			
Cohort 2d	$5/$10/$25	2393	35.7	45.2	19.1	4.0†	0.7	–4.6†
Cohort 2e	**$10/$10/$10**	**1337**	**35.5**	**43.8**	**20.8**			
Cohort 2f	$5/$15/$25	1337	37.0	42.9	20.1	–0.1	1.4	–1.3
Group 3: $10/$10/$15								
Cohort 3a	**$10/$10/$15**	**8431**	**32.7**	**48.1**	**19.2**			
Cohort 3b	$10/$15/$30	8431	33.8	47.5	18.7	0.3	0.8	–1.0†
Group 4: $5/$5/$10								
Cohort 4a	**$5/$5/$10**	**4914**	**34.0**	**47.6**	**18.5**			
Cohort 4b	$5/$10/$25	4914	35.1	46.4	18.5	1.0‡	0.4	–1.3§
Cohort 4c	**$5/$5/$10**	**1135**	**32.6**	**45.2**	**22.3**			
Cohort 4d	$5/$15/$30	1135	36.0	48.1	15.9	3.6†	–2.5‡	–1.0§
Group 5: $5/$5/$10								
Cohort 5a	**$5/$5/$10**	**784**	**32.2**	**43.4**	**24.4**			
Cohort 5b	$5/$10/$25	784	33.9	46.5	19.6	0.9	2.8%‡	–3.6†
Group 6:	$10/$15/$30‖							
Cohort 6a	**$10/$15/$30**	**2124**	**35.4**	**48.6**	**16.0**			
Cohort 6b	$15/$20/$35	2124	38.0	45.7	16.3	–0.1	0.4	–0.3
Cohort 6c	**$10/$15/$30**	**1581**	**34.1**	**49.7**	**16.1**			
Cohort 6d	$5/$10/$25	1581	35.5	47.7	16.7	–0.5	0.2	0.3
Group 7: $5/$10/$25								
Cohort 7a	**$5/$10/$25**	**4343**	**37.2**	**46.1**	**16.7**			
Cohort 7b	$10/$15/$30	4343	37.4	45.8	16.8	–0.1	0.9	–0.8

*Control (no change) cohorts within each group are indicated in bold. Included are only those paired members with claims in both 2000 and 2001. Discrepancies exist because of rounding.
†Pairwise differences in prescription spending between control and each intervention cohort in the same group are significant at $P < .001$.
‡Pairwise differences in prescription spending between control and each intervention cohort in the same group are significant at $P < .05$.
§Pairwise differences in prescription spending between control and each intervention cohort in the same group are significant at $P < .01$.
‖In contrast to other cohorts, prescription tiers switch from more expensive to less expensive when going from cohort 6c to cohort 6d.

$10/$20/$30) to be more than 30% less than spending in a 1-tier plan with a low copayment ($5). Our results demonstrate a much more modest decrease in spending of less than 10%. Second, they found that the absolute amount of out-of-pocket spending did not vary appreciably according to benefit type, but that the share of total spending borne by the patient increased. By contrast, we found that out-of-pocket spending associated with most of the benefit changes increased by 50% or more,

Table 4. Adjusted Change in Mail-Order Share*

Group and Copayment Amounts in 2000	2001 Benefit Design	No. of Enrollees in Analysis	Mail-order Prescription Share in 2000, %	Mail-order Prescription Share in 2001, %	Difference-in-Differences (Relative to Control), %
Group 1: $5/$5/$5					
Cohort 1a	**$5/$5/$5**	**4366**	**1.2**	**1.3**	
Cohort 1b	$5/$10/$25	4366	2.7	6.3	3.6†
Cohort 1c	**$5/$5/$5**	**944**	**1.0**	**1.2**	
Cohort 1d	$10/$15/$30	944	1.8	3.6	1.7
Group 2: $10/$10/$10					
Cohort 2a	**$10/$10/$10**	**9672**	**2.8**	**3.4**	
Cohort 2b	$10/$15/$30	9672	3.6	10.4	6.2†
Cohort 2c	**$10/$10/$10**	**2393**	**2.7**	**4.1**	
Cohort 2d	$5/$10/$25	2393	3.1	10.8	6.3†
Cohort 2e	**$10/$10/$10**	**1337**	**3.0**	**3.2**	
Cohort 2f	$5/$15/$25	1337	1.8	6.3	4.3†
Group 3: $10/$10/$15					
Cohort 3a	**$10/$10/$15**	**8431**	**2.6**	**2.7**	
Cohort 3b	$10/$15/$30	8431	3.1	6.5	3.2†
Group 4: $5/$5/$10					
Cohort 4a	**$5/$5/$10**	**4914**	**2.2**	**2.1**	
Cohort 4b	$5/$10/$25	4914	2.8	4.7	2.0†
Cohort 4c	**$5/$5/$10**	**1135**	**1.5**	**1.3**	
Cohort 4d	$5/$15/$30	1135	5.1	10.9	6.1†
Group 5: $5/$5/$10					
Cohort 5a	**$5/$5/$10**	**784**	**13.0**	**14.5**	
Cohort 5b	$5/$10/$25	784	11.0	16.0	3.4‡
Group 6: $10/$15/$30§					
Cohort 6a	**$10/$15/$30**	**2124**	**3.9**	**7.3**	
Cohort 6b	$15/$20/$35	2124	1.8	8.7	3.5†
Cohort 6c	**$10/$15/$30**	**1581**	**7.3**	**9.8**	
Cohort 6d	$5/$10/$25	1581	11.5	15.1	1.2
Group 7: $5/$10/$25					
Cohort 7a	**$5/$10/$25**	**4343**	**5.9**	**6.9**	
Cohort 7b	$10/$15/$30	4343	5.7	7.4	0.6

*Control (no change) cohorts within each group are indicated in bold. Included are only those paired members with claims in both 2000 and 2001. Discrepancies exist because of rounding.
†Pairwise differences in prescription spending between control and each intervention cohort in the same group are significant at $P < .001$.
‡Pairwise differences in prescription spending between control and each intervention cohort in the same group are significant at $P < .05$.
§In contrast to other cohorts, prescription copayment switch from more expensive to less expensive when going from cohort 6c to cohort 6d.

with several out-of-pocket shares more than doubling. These differences potentially stem from methodologic differences. In particularly, Joyce et al did not follow a population that changed benefits, but rather inferred changes in spending based on cross-sectional analyses, which creates the possibility of bias because of problems controlling for all potential confounding variables.

Motheral and Fairman, using methods closer to ours, examined effects of switching from a 2-tier to a 3-tier benefit compared with a control population that did not switch

Take-away Points

The impact of incentive formularies on prescription drug spending was determined by examining a large and diverse number of benefit changes, including 1 that lowered copayments, in a single large health plan.

- Changing from a single-tier or 2-tier formulary to a 3-tier formulary was associated with a decrease in total drug spending of about 5%-15%.
- Changing to an incentive formulary with higher copayments was accompanied by a small but inconsistent decrease in the use of nonformulary selections and a concomitant increase in both generic and formulary preferred utilization.
- These findings differ from some prior research in that smaller responses to changes in patient copayments were demonstrated across a wide variety of benefit designs.

benefits.[8] They found a 7% decrease in overall expenditures, which is more consistent with our results than those of Joyce et al. Similarly, Gibson and colleagues, using data from the mid-1990s, analyzed the effect of an increase in copayments at a single firm compared with a control firm and found that utilization decreased by approximately 10%, but unlike our results this effect seemed to moderate with time.[3] Our study is therefore consistent with these latter 2 studies in showing a modest impact on overall spending.

We add to these findings by demonstrating consistent findings across a range of copayment changes. Furthermore, the symmetric result of increased spending associated with a decrease in copayments, a new result, lends more weight to our findings.

There are potential counterbalancing effects on health of increased consumer cost sharing for drugs. Prior research demonstrates that incentive formularies are associated with increased discontinuation rates and decreased consistency of use, which raises health concerns.[5,15] However, the increased utilization of generic and preferred medications that we observed may result in increased medication adherence.[16] Thus, although some studies suggest potentially deleterious effects on health from increased cost sharing, the direction and overall magnitude of this effect are not clear.

The prior literature on substitution effects is mixed. Consistent with some other studies, we found increases in the use of generic and brand formulary medications at the expense of nonformulary products, although the magnitude of these effects was relatively small.[9,17-20] However, other studies observed no change in generic fill rates.[8,21] Only a single prior study examined the substitution of mail order for retail fulfillment and its findings are consistent with ours.[20]

Our study is subject to several limitations. First, we studied commercially insured enrollees of a single large health plan in a single region of the country. Therefore, our results may not generalize to the elderly, the poor, or to other regions. Second, our study was limited to a single year of follow-up after the introduction of the new pharmacy benefit. Over that year the observed effects did not change, but they might in the future. Third, our analysis did not adjust for clustering within employer group. That was because we were most interested in differences between matched pairs from different employers. Nonetheless, the result was a possible underestimation of standard errors associated with within-employer effects. Finally, although this is the first study that we are aware of to incorporate rebate information, to maintain confidentiality, rebates were averaged across prescriptions, although in reality they vary by drug class.

CONCLUSION

In conclusion, we found that a switch to incentive formulary arrangements with higher levels of copayments generally led to overall lower drug costs and vice versa. The size of the effects varied with the degree of change, the level of baseline spending, and the magnitude of the copayments. Our study also showed modest behavioral changes related to the adoption of the formulary.

Although incentive formularies reduce prescription drug spending, they may not be beneficial overall depending on potential health effects and spillover effects on medical spending. Further research is needed to understand the full effects on costs of increased drug copayments by examining medical spending as well as describing more completely the potential impacts on health.

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