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By Teresa B. Gibson, Sara Wang, Emily Kelly, Candace Brown, Christine Turner, Feride Frech-Tamas, Joseph Doyle, and Edward Mauceri

A Value-Based Insurance Design Program At A Large Company Boosted Medication Adherence For Employees With Chronic Illnesses

ABSTRACT This paper contributes to a small but growing body of evidence regarding the efficacy of value-based insurance design. In a retrospective, observational study of employees of a large global pharmaceutical firm, we evaluated how reduced patient cost sharing for prescription drugs for asthma, hypertension, and diabetes affected the use of these drugs and related medical services. We estimate that prescription medication use rose 5 percent per enrollee across the entire enrolled population. Increased use was most evident for patients taking cardiovascular medication. By the third year, adherence to cardiovascular medications was 9.4 percent higher, and patients realized cost savings over time. Overall, the program was mostly cost-neutral to the company, and there was no aggregate change in spending. However, we raise the prospect that this program may have saved the company money by reducing other medical costs.

Teresa B. Gibson (teresa
.gibson@thomsonreuters.com)
is director of health outcomes
at Thomson Reuters in Ann
Arbor, Michigan.

Sara Wang was a senior stat-
istician at Thomson Reuters in
Cambridge, Massachusetts,
when this research was
conducted.

Emily Kelly is a senior ana-
lytic consultant at Thomson
Reuters in Durham, North
Carolina.

Candace Brown is a consulting
manager at Thomson Reuters
in Roanoke, Virginia.

Christine Turner is a senior
director at Thomson Reuters
in Cambridge.

Feride Frech-Tamas is
director of evidence-based
medicine at Novartis
Pharmaceuticals Corporation,
in Hanover, New Jersey.

Joseph Doyle is executive
director of evidence-based
medicine managed markets
outcomes research at
Novartis Pharmaceuticals
Corporation.

Edward Mauceri was execu-
tive medical director of hu-
man resources and corporate
health at Novartis Pharma-
ceuticals Corporation when
this research was conducted.

Employers face a growing need to manage employee health effectively, with limited resources, and in an environment of rising health care costs and an increasing percentage of people with chronic conditions. Seeking ways to promote health and control costs, many employers increasingly look to an extensive body of evidence that suggests that high cost sharing keeps patients from taking prescribed medications as directed.

The seminal Health Insurance Experiment, conducted by the RAND Corporation between 1971 and 1982, found that patients facing higher out-of-pocket expenses reduced their use of both essential and less-essential care.[1] Similarly, for decades studies of the effects of cost sharing on prescription drug use have reported that higher levels of cost sharing are generally associated with reductions in medication use.[2–4] These reductions have come in the use of medications that are frequently overprescribed, such as anti-

biotics, but they have also been seen in the use of highly valuable medications used to treat chronic conditions, such as lipid-lowering statins.[2] The health effects of these declines in the use of high-value medications are cause for concern. If these medications are discontinued or used at subtherapeutic levels, the result may be increased use of medical services, higher medical spending, and additional complications.[5]

Of particular concern are structures that tie patient cost-sharing amounts to the cost of a drug, such as tiered copayment structures that assess a lower copayment for typically less costly generic medications and higher copayments for brand-name drugs. These cost structures do not reveal the clinical value of the drug to the patient.[6] Given the evidence about the effects of high cost sharing on patients' use of high-value services, innovative programs such as value-based insurance have been designed to align what patients pay for medications with their clinical benefit.[7]

The evidence regarding these programs appears to be promising. Pitney Bowes reduced patient cost sharing for brand-name drugs that treat diabetes, hypertension, and asthma by 30–80 percent per thirty-day prescription refill and held copayments below $20. The cost-sharing reduction was coupled with enrollment in a disease management program, which used information and education to encourage patients to improve health behavior related to chronic illness. The result was that the company realized reductions in medical and pharmacy costs over three years and achieved greater patient adherence to medication regimens over five years.[8]

Michael Chernew and colleagues estimated the one-year effects of a value-based insurance design program for five classes of medication in conjunction with disease management within a large employer's adult beneficiary population. They found that between 2004 and 2005, adherence to medication guidelines increased by 1.86–4.00 percentage points.[9] Such findings point to the potential benefits engendered by these programs.

Recently, Novartis Pharmaceuticals implemented a value-based insurance program for medications used to treat three chronic conditions: asthma, hypertension, and diabetes. The program was for employees and their dependents enrolled in the company's self-insured health benefit plan. Individuals in the asthma, hypertension, and diabetes cohorts had higher prescription drug costs, but those costs were offset by reduced medical costs for inpatient, outpatient, and emergency department services.[10]

In our own retrospective, observational study, presented here, we evaluated how reduced patient cost sharing for prescription drugs for asthma, hypertension, and diabetes within a large global pharmaceutical firm affected the use of those prescription drugs and related medical services. We agreed to the firm's request not to be identified. We focused on the effects of the benefit program on prescription drug use and on pharmacy and medical costs.

This study is particularly relevant because value-based insurance design has been included in the Affordable Care Act, and insurers, including self-insured employers, are being encouraged to alter cost-sharing rates to promote the use of high-value services by patients.

Further, this study contributes to the small body of evidence on the efficacy of value-based initiatives[8–11] in several key ways. First, as did the previous studies, this study took a retrospective view of an experiment to assess the real-world impact of a value-based insurance intervention. Second, this study was unique in that it measured the value of the program across the entire enrolled population. Third, it compared experience from the value-based insurance intervention group to a well-matched comparison group of patients, drawn from the Thomson Reuters MarketScan Commercial Claims and Encounters Database, 2004–07. And it assessed whether the program added costs, saved costs, or was cost-neutral.

Study Data And Methods

THE INTERVENTION The value-based insurance program was implemented for employees and dependents enrolled in selected self-insured plans offered by the company on January 1, 2005, the beginning of the benefit year. In this program, lower levels of patient cost sharing were offered for asthma medications, selected cardiovascular medications typically used to treat hypertension, and diabetes medications.[12]

The program consisted of 10 percent coinsurance for retail prescriptions and 7.5 percent coinsurance for mail-order prescriptions used to treat these three conditions. The coinsurance percentage was calculated as a percentage of the total cost of the medication. Medications for conditions other than those included in the program were assessed 20 percent coinsurance for retail and 10 percent coinsurance for mail-order prescriptions. All prescriptions were subject to a minimum coinsurance amount of $10 and a maximum of $40. One exception was products manufactured by the pharmaceutical company being studied, which were not subject to cost sharing either before or after the program began.

General disease management programs for asthma, cardiac conditions, and diabetes were also implemented for enrollees in the company's indemnity and point-of-service plans in 2005 and were implemented across all of the company's self-insured plans in 2007. Information about the new programs was communicated to all employees in benefits newsletters and on the company intranet, starting in the fourth quarter of 2004.

STUDY DESIGN We used a pre-post design along with a matched comparison group to analyze program outcomes. The intervention-group employees affected by the value-based insurance program and a matched comparison group were evaluated in the year prior to implementation of the program in January 2005 and in each of the three subsequent years.

To measure the program's effects on the population, we evaluated prescription drug use and medical spending measures on a per person basis for all enrollees—ages 18–64—in the self-insured plans that were offering the value-based program during 2004–07. We followed enrollees

from the beginning of enrollment through the end of 2007 or their disenrollment. They had to be enrolled in the plan for a minimum of one year prior to their first quarter of enrollment during the post-implementation period (the index quarter) to allow us to measure health status, and had to be enrolled for at least two quarters during the post-implementation period (in other words, at least the index quarter and the next quarter). We did not apply any other criteria to the study sample.

Enrollees who did not use any medical services were included in the study. We also analyzed effects in the three cohorts of enrollees who were most affected by the value-based insurance program: those who filled two or more prescriptions in one of the medication classes (medications for asthma, cardiovascular disease, or diabetes) in 2004.

COMPARISON GROUP We selected the comparison group based on two levels of matching. First, we selected peer firms with similar workforce composition to the intervention firm and similar per enrollee medical and prescription drug spending trends prior to the study from all of the firms included in the Thomson Reuters MarketScan Database, 2004–07. This database represents the health care experience of enrollees in commercial health insurance plans sponsored by more than 100 large and medium-size employers in the United States. Four firms were empirically similar to the intervention firm in terms of demographic characteristics, employment status (active and retiree), employee status (hourly and salaried), plan types offered, geographic location, and spending trends prior to the study. These comparison firms represent current trends among firms with similar workforce composition. Firms in the comparison group did not implement value-based insurance design programs during the study period.

Second, we matched each value-based insurance plan enrollee one-to-one with a nonelderly adult enrollee within the four peer firms. We used a summarized propensity score to match individuals. We first estimated a propensity score—the probability of being in the intervention firm—based on several variables for each enrollee (age, sex, census region, urban or rural residence, relationship to the employee, median income within the ZIP code of residence, plan type, employee status, employment class, and health status). Then we matched comparison enrollees to program enrollees according to the value of the propensity score.

Matching was performed in a narrow range of propensity scores closest to the score for each program enrollee to obtain the best matches. Enrollees were also matched on the length of enrollment based on the number of quarters.

We created a data file with one observation per enrollee per calendar quarter, starting either in the second quarter of 2004 or in the enrollee's first quarter of enrollment. This method captured medication use and spending measures for each enrollee in quarterly increments through the end of 2007 or their disenrollment. Information from the first quarter of 2004 was used to obtain days supplied from prescription fills that carried over into the second quarter of 2004.

MEASURES To evaluate prescription use, we calculated three measures. The first measure was the so-called user rate, or whether the enrollee filled a prescription in each specified medication class. We used this measure to determine whether the value-based insurance program was associated with a change in the percentage of enrollees filling prescriptions for medications included in the plan. The measure was a proxy for the percentage treated.

Second, we calculated whether each enrollee adhered to medication guidelines in the quarter. This measure, the percentage of days covered, was based on the percentage of days that an enrollee had his or her prescribed medication available within that quarter. We calculated the measure for each medication class in each quarter. For diabetes and cardiovascular medications, we considered patients to be adherent if they had medication on hand for at least 80 percent of the days in the quarter.[13] For asthma medications, where use can be episodic within a population, the adherence threshold was 50 percent.[14]

We also calculated a third measure that quantified the number of outpatient prescription drug fills. We used this to represent the quantity of prescription drugs demanded. We counted prescription fills as one for each thirty-day supply or less, and we converted this into thirty-day-supply equivalents for prescriptions when more than a thirty-day supply was obtained. For example, a prescription fill with a ninety-day supply of medication was counted as three prescription fills. We measured the number of fills by medication class for all medications in the program, and we also measured total prescription fills, including medications both in and not in the program.

We measured spending based on eligible charges for prescription drugs and inpatient and outpatient medical services. We selected charges as the basis of comparison to lessen the effects of differences between the program group and the comparison firms that could be due to discounting arrangements. Charges were more likely than payments to be equivalent

across firms and plans.

Spending was classified into program-related categories if any diagnosis code on the claim indicated asthma, diabetes, or cardiovascular services.[15] We focused on program-related spending, which included all three of these conditions, because it constituted about one-fifth of total, all-cause spending. For the disease cohorts, we focused on all-cause spending because the amount spent was significantly related to the conditions in the value-based insurance program.

STATISTICAL METHODS After we matched enrollees in the intervention group with those in the comparison group, we used multivariate generalized estimating equations to estimate the effects of the program on prescription use and spending in each quarter. The models identified two types of program effects: changes that occurred immediately and lasted over time; and changes that might develop over time.[16,17] (For

more details on the modeling, see the Appendix.)[18]

Results

We identified 25,784 enrollees in the value-based insurance program and 154,444 enrollees in the comparison firms who met all selection criteria. After propensity scoring, 25,065 enrollees in the value-based insurance design program (97.2 percent) were matched to enrollees in the comparison firms, for a total sample size of 50,130. Exhibit 1 shows selected characteristics of the individuals enrolled in the intervention and comparison groups before and after matching. The matched groups had very few differences that remained statistically significant at the 95 percent confidence level.

Almost three-quarters of the enrollees were age forty-four and younger, slightly more than

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EXHIBIT 1

Selected Demographic Characteristics For All Enrollees In The Value-Based Insurance Design (VBID) Program At A Large Employer And For A Comparison Group, 2004–07

Characteristic	Unmatched			Propensity-score matched		
	VBID employer	Comparison	p value	VBID employer	Comparison	p value
Number of enrollees	25,784	154,444		25,065	25,065	
AGE GROUP (YEARS)						
18–34	38.2%	40.9%	0.000	38.7%	39.1%	0.301
35–44	35.0	27.3	0.000	33.8	34.5	0.134
45–54	17.0	20.3	0.000	17.5	16.8	0.050
55–64	9.8	11.5	0.000	10.0	9.6	0.108
SEX						
Female	53.4%	55.0%	0.000	53.6%	54.1%	0.216
RELATION TO EMPLOYEE						
Self	53.6%	62.2%	0.000	55.1%	54.8%	0.484
Spouse	33.8	30.1	0.000	34.6	34.8	0.619
Dependent	12.6	7.7	0.000	10.3	10.4	0.714
REGION						
Northeast	51.6%	21.3%	0.000	50.3%	49.0%	0.003
North Central	14.4	14.7	0.261	14.8	15.5	0.023
South	24.3	34.9	0.000	25.0	25.9	0.012
West	9.5	26.2	0.000	9.7	9.4	0.237
Unknown	0.2	2.9	0.000	0.2	0.1	0.030
HEALTH PLAN TYPE						
Indemnity	6.2%	3.7%	0.000	6.3%	6.5%	0.382
POS	62.2	56.6	0.000	63.9	63.7	0.683
PPO	29.7	37.8	0.000	28.7	28.9	0.521
Missing	1.9	1.8	0.326	1.1	0.8	0.002
FOLLOW-UP						
Number of quarters	9.53	8.64	0.000	9.68	9.63	0.284
HEALTH STATUS (1 YEAR PRE-INTERVENTION PERIOD)						
CCI score	0.155	0.213	0.000	0.160	0.159	0.870
Number of PDGs	0.084	0.152	0.000	0.086	0.090	0.203

SOURCE Authors' analysis of value-based insurance design program data and the Thomson Reuters MarketScan Database. **NOTES** POS is point-of-service. PPO is preferred provider organization. CCI is Charlson Comorbidity Index. PDG is psychiatric diagnosis group.

half were women, and slightly more than half were employees (as opposed to spouses or dependents). Half lived in the Northeast region of the United States. Close to two-thirds were enrolled in a point-of-service plan, and nearly 90 percent were salaried versus hourly workers. The average time of enrollment in the study—including follow-up—was more than two years (9.6 quarters) following the index date. (See Appendix Exhibit 1 for a full comparison.)[18]

The program and comparison groups were no different based on spending measures, or on approximately half of the prescription use measures in the index quarter (Appendix Exhibit 2).[18] Where there were differences in the prescription use rates, patients in the value-based insurance program had slightly lower rates of use. In the aggregate, the user rate of any medication included in the program did not vary between the intervention group and the comparison group.

SPENDING TRENDS Spending trends from the employer and the employee perspective are illustrated in Exhibit 2. Quarterly prescription drug spending per enrollee for medications covered by the program rose at a greater rate in the program group than in the comparison group after program implementation. Actual spending in the fourth quarter of 2007, the last quarter measured, was $68 per capita for those enrolled in the value-based insurance program. That was $17 higher per capita than in the comparison group. Actual quarterly spending (in 2007 dollars) for medical services and prescription drugs com-

bined largely overlapped for the program and the comparison groups. However, after implementation, the combined spending trend in the program group declined, and the trend in the comparison group rose slightly.

MULTIVARIATE ANALYSIS The multivariate results (Exhibit 3 and Appendix Exhibit 3)[18] show the predicted effects of the value-based insurance program on all enrollees, not just those with diabetes, asthma, and cardiovascular conditions. The user rate for any medication in the program—the combination of the three medication classes—was unchanged in the first year and rose over time. There were no significant changes in user rates for asthma or diabetes medications. The user rate for cardiovascular drugs rose in the first year and continued to rise over time.

Adherence increased for asthma, cardiovascular, and any program medication over time. For asthma, adherence was not statistically significant until the third year. The rise in adherence for cardiovascular medications was significant starting in the first year and increased by the third year. Adherence to diabetes medications decreased in the first year, but the trend in adherence improved over time.

In the first year after program implementation, the number of prescription fills was marginally significant. This effect grew with time. By the third year, the number of prescription fills had risen over pre-intervention levels. This increase was driven by cardiovascular medications, where the number of fills rose by 15.78 percent in

EXHIBIT 2

Prescription Drug And Medical Expenditures Related To Value-Based Insurance Design (VBID), In Firm Participating In VBID And Matched Comparison Group, 2004–07
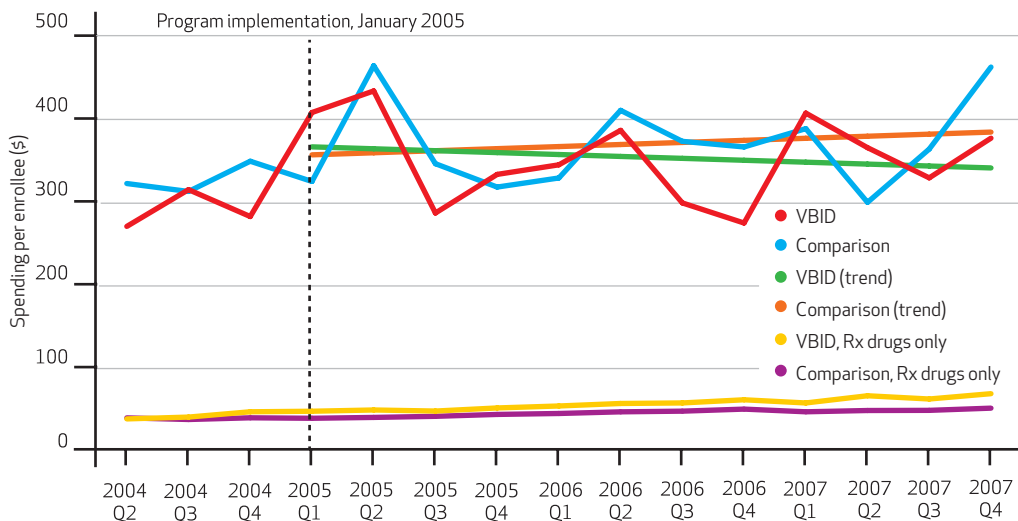
SOURCE Authors' analysis of value-based insurance design program data and the Thomson Reuters MarketScan Database.

EXHIBIT 3

Estimated Annual Effects Of Value-Based Insurance Design (VBID) Program For All Enrollees

	Percentage-point change (standard error)		
	Year 1	Year 2	Year 3
ADHERENCE			
Asthma medications	−0.03	0.13	0.29*
	(0.091)	(0.122)	(0.169)
Diabetes medications	−0.21***	−0.16*	−0.12
	(0.066)	(0.097)	(0.139)
Cardiovascular medications	0.72***	1.36***	1.99***
	(0.167)	(0.230)	(0.321)
Any VBID medication	0.49***	1.14***	1.80***
	(0.183)	(0.251)	(0.349)
USERS			
Asthma medication	−0.02	−0.03	−0.04
	(0.157)	(0.186)	(0.247)
Diabetes medication	−0.11	−0.08	−0.05
	(0.077)	(0.114)	(0.162)
Cardiovascular medication	0.45**	1.09***	1.73***
	(0.182)	(0.255)	(0.357)
Any VBID medication	0.25	0.84***	1.43***
	(0.224)	(0.293)	(0.403)
NUMBER OF PRESCRIPTION DRUG FILLS			
Asthma medications	−1.21%	3.87	9.21
	(0.033)	(0.043)	(0.060)
Diabetes medications	0.83	3.73	6.71
	(0.047)	(0.064)	(0.089)
Cardiovascular medications	5.74***	10.65***	15.78***
	(0.021)	(0.029)	(0.041)
Any VBID medication	3.04*	7.53***	12.22***
	(0.017)	(0.023)	(0.033)
Total	−0.97	1.95*	4.96***
	(0.008)	(0.011)	(0.015)
VBID EXPENDITURES			
Prescription drug	0.15	8.06	16.59
	(0.044)	(0.075)	(0.114)
Medical	34.14	20.89	8.94
	(0.294)	(0.221)	(0.236)
Both prescription drug and medical	28.13	17.85	8.40
	(0.249)	(0.190)	(0.205)

SOURCE Authors' multivariate analysis of value-based insurance design program data and the Thomson Reuters MarketScan Database. **NOTE** Estimated effects are in comparison to the pre-intervention period and the comparison-group trends. *$p \leqslant 0.10$ **$p \leqslant 0.05$ ***$p \leqslant 0.01$

the third year; asthma and diabetes fills remained unchanged over time. There were no statistically significant effects on program-related spending in any year.

PATIENT COHORTS For the diabetes ($n = 275$ value-based insurance design; 275 comparison), asthma ($n = 833$ value-based insurance design; 833 comparison), and cardiovascular ($n = 1,765$ value-based insurance design; 1,765 comparison) patients who filled at least two prescriptions in the year before the value-based insurance design program was implemented, the effects for patients with asthma and diabetes followed similar trends. There was an initial decline in adherence, followed by a nonsignificant

increase in adherence. In these two patient groups, total spending—medical plus prescription drug—was no different from the comparison group after program implementation (see Appendix Exhibit 4).[18]

Notably, in the cardiovascular group there was a significant increase in adherence to cardiovascular medications and the number of prescription fills. The effect grew with time for both adherence and prescription fills. Per enrollee total spending for prescription drugs plus medical services within the cardiovascular group showed a significant, gradual decline over time.

For the cardiovascular group, the predicted effects of the value-based insurance design program are displayed in Exhibits 4 and 5. There was significantly higher adherence to cardiovascular medications in each year for program enrollees compared to the predicted level of adherence without the program (Exhibit 4). The difference in spending was not significant in the first year after program implementation (Exhibit 5). However, we estimated that average spending was $2,122 lower in the enrolled group in the second year after program implementation and $3,722 lower in the third year.

Discussion

In 2005 a large global pharmaceutical company with its US headquarters in New Jersey implemented a value-based insurance design program that used reduced cost sharing to promote the use of medications for asthma, diabetes, and cardiovascular conditions among its insured population of employees and dependents. Overall, we found that aggregate use for all medications covered by the program rose by a modest amount in response to this change. There was no increase in program-related spending. Therefore, the program was cost-neutral, a result similar to simulation findings of the impact of a value-based insurance design program reported by Chernew and colleagues.[19]

As patient spending for program medications declined, use and medication costs rose, but overall costs remained the same. Nonetheless, the effects of the value-based insurance design program were evident for cardiovascular medications, with a significant increase in medication adherence and prescription fills when measured across all enrollees.

Among the group taking cardiovascular medication who filled at least two prescriptions in the pre-intervention period, there was also a significant increase in medication adherence and prescription fills. After the program was implemented, there was a decline in medical costs, resulting in a cost savings in the second and third

years. In the asthma and diabetes groups, there was no increase in adherence or fills, and the value-based insurance program was cost-neutral.

One of the primary lessons learned in this evaluation is that time is an important factor. In many cases the program effects grew with time. Patients and their providers may need time to respond to the program, and to determine which are the best high-value medication treatments for their conditions. In addition, higher use rates showed that a larger percentage of patients were using the medications covered by the program. The higher rates suggest that patients may be willing to fill medications covered by the program earlier in the course of treatment if they are enrolled in plans that promote high-value medications.

In two of the medication classes—drugs for treating diabetes and asthma—there was a slight initial decline in adherence, which suggests that the value-based insurance might have had differential effects on each of the medication classes. For diabetes, this decline could also be associated with a larger number of patients trying medication therapy, as opposed to lifestyle modification, and subsequently discontinuing the therapy. However, we did not see a significant increase in user rates for diabetes.

Also, changes from oral medication to insulin could be difficult to measure in claims data and may account for this decline. Additionally, the group taking diabetes medications, who filled prescriptions in the pre-intervention period, was relatively healthy and compliant before the program was implemented. About 60 percent of these patients had a "percent days covered" that exceeded 80 percent. Thus, there may have been less of an opportunity for improvement.

Asthma, on the other hand, is a disease that is often episodic and not persistent, so variations in asthma severity and variable need for medications may have played a role in the results. Only 20.6 percent of patients in the asthma medication group had a "percent days covered" exceeding 80 percent in the pre-intervention period. We applied a days-covered threshold of 50 percent for asthma to accommodate episodic use or seasonality. Because sample sizes were small in both cohorts, additional data would be required to provide a more definitive conclusion.

We found a 4.7 percent increase in adherence for cardiovascular medications in the first year; Chernew and colleagues reported a 3.5–4.5 percent increase. Our results for the diabetes group were lower than those reported by Chernew and colleagues, who reported a significant increase in adherence.[9]

EXHIBIT 4

Predicted Annual Effects Of The Value-Based Insurance Design (VBID) Program On Adherence To Cardiovascular Medications In The Cardiovascular Cohort
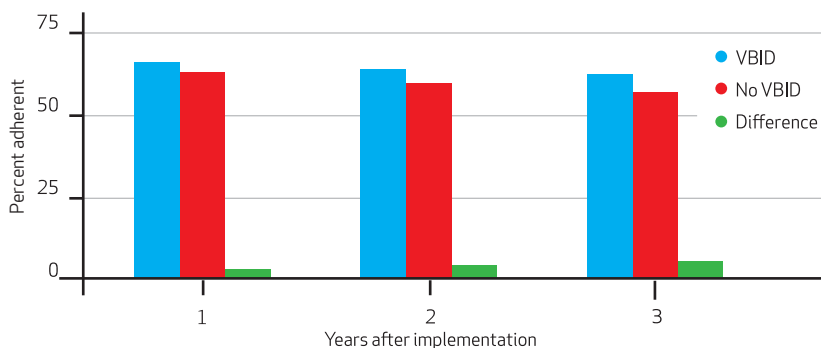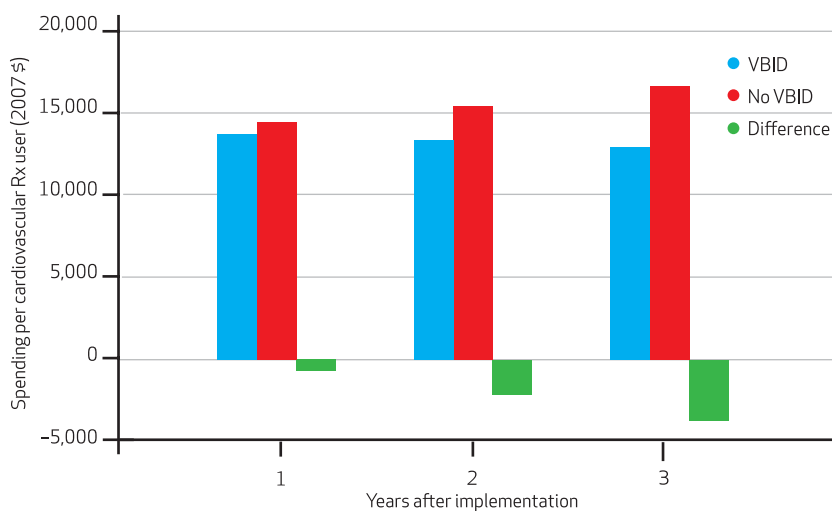

SOURCE Authors' multivariate analysis of value-based insurance design program data and the Thomson Reuters MarketScan Database. NOTE Percentage of medication users adherent denotes at least 80 percent of days covered.

To our knowledge, this study is the first to adopt an all-enrollee view of a value-based insurance design program; previous studies have focused solely on the effects on users within the medication classes.[7–11] This value-based insurance design program was designed to provide lower cost sharing to enrollees using these classes of medications. Enrollees did not need to qualify for the program based on characteristics such as condition, disease severity, or participation.[20] This study adopted a broad view of the program's effects, including initiation of use, which may be more limited in a qualification-

EXHIBIT 5

Predicted Annual Effects Of The Value-Based Insurance Design (VBID) Program On Total Prescription Drug And Medical Spending In The Cardiovascular Cohort

SOURCE Authors' multivariate analysis of value-based insurance design program data and the Thomson Reuters MarketScan Database.

based value-based insurance design program.

We did not have clinical data. Although we did not see immediate effects using administrative measures, clinical effects such as changes in glucose levels, blood pressure, and lung functioning might have occurred. Because these are chronic conditions, it is reasonable to assume that additional economic and clinical benefits could accrue beyond the three-year study period.

The value-based insurance design effects reported here are based on an average of two groups: those with disease management programs implemented in 2005 and those with such programs implemented in 2007. We did not assess the effects of disease management separately from the value-based insurance effects, because the disease management program was introduced by plan type. In contrast, value-based insurance was introduced across all plans. Furthermore, selection bias into plans with or without disease management might have occurred.

One feature of the plan design was the offer of zero-cost medications both before and after program implementation for company-branded prescription products. If, as in many plans, the insurance design program had reduced the price of these medications, instead of offering them at no cost, then the effects would most likely be larger than those reported here. Because these no-cost medications constituted about one-fifth of the medications dispensed before the implementation of the value-based insurance program, the effects we found are particularly remarkable.

In addition, the incentive for mail-order medications (7.5 percent coinsurance versus 10 percent for medications not in the value-based insurance design program) was relatively small, which could also have contributed to the smaller effect size. In any case, we believe that this evaluation provides important information to payers considering value-based insurance design, because it showed significant effects of the program on medication use, particularly cardiovascular medications.

The estimated program effects were those differing from contemporaneous trends in the comparison group. We selected firms and patient populations based on demographic characteristics to construct a well-matched comparison group and to estimate effects. However, we note that the comparison group had increasing patient cost sharing over time—a common practice

People enrolled in the program significantly improved their adherence to medication regimens.

for large employer plans during the study period.[21]

Value-based insurance design approaches might not have effects for acute illnesses similar to those for the chronic conditions studied here. In addition, future research should have a longer post-intervention follow-up period, to fully evaluate the effects of value-based insurance design approaches that use benefit-design attributes to promote the use of high-value services. Future research should investigate the differential effects of value-based insurance design on the use of mail-order and retail medications and should analyze the effects on both inpatient and outpatient specific medical services.

Conclusion

In summary, this value-based insurance design program applied to all enrollees who took prescription medications for three chronic conditions—asthma, diabetes, and cardiovascular disease—and was not targeted to those with a diagnosis of a single, specific illness or those enrolled in a disease management program. Thus, it cast a wider net than previous similar studies, and it covered the whole self-insured population of the company, not just a subset.

In a three-year evaluation, we found that people enrolled in the program significantly improved their adherence to medication regimens and that costs for the company were revenue-neutral. We could not capture program costs outside of prescription spending. However, by improving access to high-value prescription treatments and improving compliance, this program may have saved the company money by reducing other medical costs. ■

NOTES

1 Keeler EB. Effects of cost sharing on use of medical services and health. J Med Pract Manag. 1992;8:317–21.

2 Gibson TB, Ozminkowski RJ, Goetzel RZ. The effects of prescription drug cost sharing: a review of the evidence. Am J Manag Care. 2005;11:730–40.

3 Goldman DP, Joyce GF, Zheng Y. Prescription drug cost sharing: associations with medication and medical utilization and spending and health. JAMA. 2007;298(1): 61–9.

4 Roemer MI, Hopkins CE, Carr L, Gartside F. Copayments for ambulatory care: penny-wise and pound-foolish. Med Care. 1975;13(6): 457–66.

5 Kozma CM, Reeder CE, Lingle EW. Expanding drug formulary coverage: effects on utilization of related services. Med Care. 1990;28(10): 963–77.

6 Chernew ME, Rosen AB, Fendrick AM. Value-based insurance design. Health Aff (Millwood). 2007;26(2): w195–203. DOI: 10.1377/hlthaff .26.2.w195.

7 Fendrick AM, Smith DG, Chernew ME, Shah SN. A benefit-based copay for prescription drugs: patient contribution based on total benefits, not drug acquisition cost. Am J Manag Care. 2001;7(9):861–7.

8 Mahoney JJ. Value-based benefit design: using a predictive modeling approach to improve compliance. J Manag Care Pharm. 2008; 14(6 Suppl B):3–8.

9 Chernew ME, Shah MR, Wegh A, Rosenberg SN, Juster IA, Rosen AB, et al. Impact of decreasing copayments on medication adherence within a disease management environment. Health Aff (Millwood). 2008;27(1):103–12.

10 Kelly EJ, Turner CJ, Frech-Tamas F, Doyle JJ, Mauceri EG. Value-based benefit design and healthcare utilization in asthma, hypertension, and diabetes. Am J Pharm Benefits. 2009;1(4):217–21.

11 Mahoney JJ. Reducing patient drug acquisition costs can lower diabetes health claims. Am J Manag Care. 2005;11(5 Suppl):S170–6.

12 Asthma medications included short-acting beta agonists, long-acting inhaled beta agonists, leukotriene modifiers, inhaled corticosteroids, methylxanthines, and mast cell stabilizers, as well as any combination of these drugs. Cardiovascular medications included angiotensin-converting enzyme (ACE) inhibitors, alpha- and beta-blockers, calcium channel blockers, angiotensin II receptor blockers (ARBs), diuretics, central alpha-2 agonists, and aldosterone receptor blockers. Diabetes medications included insulin and oral hypoglycemics.

13 Briesacher BA, Andrade SE, Fouayzi H, Chan A. Comparison of drug adherence rates among patients with seven different medical conditions. Pharmacotherapy. 2008;28(4): 437–43.

14 As a sensitivity analysis, we also calculated the threshold at 80 percent.

15 Diagnosis codes and diagnosis-related groups (DRGs) were based on the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM), codes for asthma (ICD-9-CM 493.x; DRG 96, 97, 98), diabetes (ICD-9-CM 250.x; DRG 294, 295), and diseases of the circulatory system (ICD-9-CM 301.x– 459.x), where x is any digit 0–9 that represents a valid diagnosis code. Excluded from that range were codes 430.x–438.x and some other codes (for example, 403.x, for hypertensive chronic kidney disease). Also included were many codes in the range 745.x–747.x (for bulbus cordis anomalies, anomalies of cardiac septal closure, other congenital anomalies of the heart, and other congenital anomalies of the circulatory system). Additional codes included those indicating carditis, pericarditis, endocartitis, or myocarditis; peripheral circulatory disorders; injuries to the heart; complications as a result of cardiac devices; and other cardiovascular diagnoses. DRGs included most of those in major diagnostic category 5, diseases and disorders of the circulatory system. The complete list is available upon request.

16 Romano PS, Roos LL, Jollis JG. Adapting a clinical comorbidity index for use with ICD-9-CM administrative data: differing perspectives. J Clin Epidemiol. 1993;46(10):1075–9.

17 Ashcraft ML, Fries BE, Nerenz DR, Falcon SP, Srivastava SV, Lee CZ. A psychiatric patient classification system: an alternative to diagnosis-related groups. Med Care. 1989; 27(5):543–57.

18 To access the Appendix, click on the Appendix link in the box to the right of the article online.

19 Chernew ME, Juster IA, Shah M, Wegh A, Rosenberg S, Rosen AB, et al. Evidence that value-based insurance can be effective. Health Aff (Millwood). 2010;29(3):530–6.

20 Fendrick AM, Chernew ME, Levi GW. Value-based insurance design: embracing value over cost alone. Am J Manag Care. 2009;15(10 Suppl): S277–83.

21 Kaiser Family Foundation, Health Research and Educational Trust. Employer health benefits: 2009 annual survey [Internet]. Menlo Park (CA): KFF; 2009 Sep [cited 2010 Apr 8]. Available from: http:// ehbs.kff.org/pdf/2009/7936.pdf