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 RESEARCH BRIEF

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Effects of a Consumer Driven Health Plan on Pharmaceutical Spending and Utilization

Stephen T. Parente, Roger Feldman, and Song Chen

Objectives. To compare pharmaceutical spending and utilization in a consumer driven health plan (CDHP) with a three-tier pharmacy benefit design, and to examine whether the CDHP creates incentives to reduce pharmaceutical spending and utilization for chronically ill patients, generic or brand name drugs, and mail-order drugs.

Study Design. Retrospective insurance claims analysis from a large employer that introduced a CDHP in 2001 in addition to a point of service (POS) plan and a preferred provider organization (PPO), both of which used a three-tier pharmacy benefit.

Methods. Difference-in-differences regression models were estimated for drug spending and utilization. Control variables included the employee's income, age, and gender, number of covered lives per contract, election of flexible spending account, health status, concurrent health shock, cohort, and time trend.

Results. CDHP pharmaceutical expenditures were lower than those in the POS cohort in 1 year without differences in the use of brand name drugs. We find limited evidence of less drug consumption by CDHP enrollees with chronic illnesses, and some evidence of less generic drug use and more mail-order drug use among CDHP members.

Conclusions. The CDHP is cost-neutral or cost-saving to both the employer and the employee compared with three-tier benefits with no differences in brand name drug use.

Key Words. Health insurance, pharmaceutical cost and use, consumer driven health plans

For the last 15 years, pharmaceutical expenditures in the United States have increased faster than those in other major medical sectors. Insurers have introduced different strategies to moderate this cost explosion. One mechanism is to increase the financial participation of beneficiaries by adopting multi-tiered benefits with a lower copayment for generic drugs in the first tier, higher copayment for buyer-preferred brand name drugs in the second tier, and the highest copayment for nonpreferred drugs in the third tier (Schneeweiss et al. 2001). Three-tier benefits have been the dominant pharmaceutical benefit

1 design since 2002 (Curtiss 2002; Kaiser Family Foundation and the Health
2 Research and Education Trust, 2004).

3 A new form of insurance—consumer driven health plans (CDHP)—
4 provides an alternative approach to pharmacy benefits. The consumer is given
5 a fixed amount of dollars in an account that she can spend on medical care or
6 drugs. If that account is exhausted, the consumer pays out-of-pocket until a
7 deductible (usually \$3,000–\$4,000) is met. This approach has the potential to
8 make the consumer more knowledgeable of the prices of medications and
9 to purchase only medically necessary prescriptions. The CDHP also provides
10 Internet-based tools to help the consumer find lower prices if she is willing to
11 accept generic drugs or agrees to receive her medications by mail order.

12 This study provides a quasiexperimental evaluation of pharmaceutical
13 use and spending in a CDHP and 2 three-tier benefit plans. We examine one
14 large employer's experience using 1 year of baseline information and 3 years
15 of CDHP and three-tier data.

18 SIGNIFICANCE AND IMPACT

19 A growing number of studies have confirmed that increased cost sharing
20 reduces prescription drug utilization (Rector et al. 2003; Gibson, Ozminkow-
21 ski, and Goetzel 2005). Some studies have found that increased cost sharing is
22 associated with a higher proportion of prescriptions filled by generic drugs
23 (Nair et al. 2003). It has also been reported that increased cost sharing is related
24 to substitution of over-the-counter drugs and increased use of mail-order
25 pharmacy (Gibson et al. 2005).

26 Though evidence is mixed, cost sharing may reduce the use of essential
27 (health improving) drugs as well as nonessential drugs (Tamblyn et al. 2001;
28 Huskamp, Deverka, and Epstein 2005). Cost sharing may affect consumer
29 behavior in other ways such as reducing the adoption of new therapies, in-
30 creasing drug discontinuation, and reducing compliance (Gibson et al. 2005).

31 Little research has focused on prescription drug spending and utilization
32 in a CDHP. In previous work, we examined pharmacy use and expenditures
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for employees of a large firm that offered a CDHP in 2001 (Parente, Feldman, and Christianson 2004). We found that CDHP enrollees had lower pharmaceutical use and expenditures in 2001 and 2002 compared with those who chose a PPO or POS plan. Our recent study extended that analysis with 2003 claims data (Feldman, Parente, and Christianson 2007). The present study expands this work by examining not only gross measures of pharmacy expenditure and cost, but also utilization by those with chronic illnesses as well as comparisons of brand name and generic drug use in the CDHP and three-tier cohorts. In addition, we examine the impact of the CDHP on mail-order prescriptions. Finally, we significantly improve the robustness of our prior analyses using bootstrapping to provide a more thorough test of statistically significant differences among plan designs.

CONCEPTUAL MODEL AND RESEARCH QUESTIONS

Economic theory predicts that when consumers pay the full price of a prescription drug and have information to assess the costs and benefits of the drug, they will consume the optimal amount, given their preferences and incomes. With prescription drug insurance, consumers pay a fraction of the full price and use more than they would have facing the full price (Pauly 1968). To control expenditure and utilization of prescription drugs, health plans are introducing cost sharing. Both the tiered system and CDHP assume that when higher cost sharing is applied, consumers will use fewer drugs or less-expensive substitutes.

Our hypotheses were: (1) three-tiered plans should steer enrollees toward generic drugs; (2) CDHP enrollees with chronic conditions should use more prescription medicines; and (3) CDHP enrollees will use more mail-order prescriptions. The rationale for hypothesis (1) is that three-tier designs explicitly favor generic drugs, unlike the CDHP, which imposes cost sharing equally across different drug tiers. Regarding hypothesis (2), we predict that CDHP enrollees with chronic conditions will have higher drug spending because they are more likely to exceed the CDHP deductible. The rationale for hypothesis (3) is that the CDHP encourages members to buy drugs through mail-order arrangements and provides them with price comparison information.

Because our hypotheses do not predict the potential of the CDHP to reduce overall pharmaceutical utilization and cost compared with three-tiered plans, we asked the following questions: did CDHP enrollees (4) fill fewer

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1 prescriptions, and (5) spend less on prescription drugs? Hypotheses (1)–(3) and
2 questions (4) and (5) form the basis for this study.
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5 6 DATA

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8 We analyzed health insurance claims and human resources data from a large
9 self-insured employer that introduced a CDHP with a Health Reimbursement
10 Arrangement in 2001. The employer previously offered a point-of-service
11 (POS) plan and a preferred provider organization (PPO), which it retained
12 when the CDHP was introduced. The POS and PPO both had three-tier
13 pharmacy benefits with the same copayments across tiers (\$10 for generic
14 medications, \$20 for brand-name formulary medications, and \$30 for non-
15 formulary medications), but they used different drug management systems.
16 The POS plan used a local formulary to operate its three-tier benefit while the
17 PPO used a national pharmaceutical benefit management firm. The firm's
18 medical and pharmacy benefits did not change between 2000 and 2003.

19 Employees were selected for three cohorts using a quasi-experimental
20 pre/post design: (1) enrolled in the POS plan from 2000 to 2003; (2) enrolled in
21 the PPO from 2000 to 2003; and (3) enrolled in the CDHP from 2001 to 2003,
22 after previously enrolling in either the POS or PPO in 2000 (Parente et al.
23 2004). The cohorts comprise 429 CDHP enrollees, 1,025 in the PPO, and
24 1,248 in the POS. Using a cohort design restricts the number of eligible
25 employees between 2000 and 2003 by nearly 70 percent. The advantage of
26 this restriction is that we can control for continuous enrollment and exposure
27 to three-tier or CDHP benefits.

28 We used Ambulatory Diagnostic Groups (ADGs) to account for case-
29 mix differences among the cohorts (Weiner et al. 1991). ADGs are based on
30 ICD9 diagnosis information from all medical claims for each person in the
31 baseline year of 2000. We constructed a case-mix score that was weighted
32 by the expected resource use associated with a given ADG. In addition, we
33 identified ADGs associated with chronic conditions and examined pharma-
34 ceutical utilization and expenditures separately for these contracts.

35 We also used ADGs to develop a measure of catastrophic “health
36 shocks” for the concurrent year. The presence of any ADG associated with an
37 acute major illness, traumatic injury, or cancer is recorded as a categorical
38 variable. The rationale for this variable is that some health care cost differ-
39 ences might be the result of random events, but their impact is so large they

1 need to be accounted for. Baseline case-mix would control for chronic illness
2 but would not account for these types of events.

3 The employer's human resources data identified the employee's
4 age, gender, wage income from the employer, contribution to flexible
5 spending account, and the number of lives in the contract including the
6 employee. We define pharmacy expenditures as the actual amount paid
7 by either the employer or the consumer through cost sharing arrange-
8 ments. Cost and utilization data reflect all covered contract members. Mail-
9 order prescriptions were identified with as those with > 30 days' supply of
10 the drug.

11 METHODS

12 The distributions of drug utilization and expenditure in populations are
13 skewed since a large proportion of people use no prescriptions. We estimated
14 probit equations for the probability of using any pharmaceutical product
15 (or having any expense) during the year:

$$16 \Pr ob(Rx > 0) = \alpha_0 + \alpha_1 X_i + \alpha_2 C_i + \alpha_3 TC_i + e_i, \quad (1)$$

17 where X_i represents a vector of person i variables influencing use, C_i repre-
18 sents health plan choices, T represents each year after the introduction of
19 the CDHP, and e_i is a random error. The coefficient α_3 represents the CDHP
20 effect on prescription drug use or spending. We estimated separate effects for
21 each year the CDHP was offered.

22 Second, we estimated regression models for pharmaceutical cost and
23 utilization among those with positive cost or utilization. Using expenditures as
24 an example, these models are

$$25 \ln(\text{covered expenditure} | \text{expenditures} > 0) \\ 26 = \beta_0 + \beta_1 X_i + \beta_2 C_i + \beta_3 TC_i + e_i, \quad (2)$$

27 where X_i , C_i , and T are defined as in equation (1). The models account for
28 repeated observations on individuals and tests of statistical significance are
29 based on robust standard errors.

30 Following the estimation, we computed the predicted probability of use/
31 expenditure and the conditional values for each contract as if they had been
32 enrolled in each health plan. The conditional values were obtained from a
33 smearing retransformation. We then multiplied the results to arrive at uncon-
34 ditional predictions. Standard errors of the predictions were obtained by

bootstrapping 500 iterations of the model. With the additional bootstrapping component, this approach is identical to our previous analysis of CDHP cost and utilization (Parente et al. 2004).

RESULTS

Table 1 presents descriptive statistics for the baseline year 2000. The three cohorts had similar ages but the CDHP had the highest proportion of males (64 percent). One of the largest differences was employee income: the CDHP had the greatest share (38 percent) of employees with income above the firm's

Table 1: Descriptive Statistics

Study Population Attributes Cohorts in 2000	Sample Mean		
	CDHP (n = 429)	PPO (n = 1,025)	POS (n = 1,248)
Demographics			
Employee age (in years)	40.7*	42.0***	39.6
Percent male (%)	64*	54	57
Case-mix index of employee's contract	6.55	7.13	6.83
Income distribution			
<25th percentile of employer (%)	10***	26	29
Between 25th and 75th percentile of employer (%)	52	45	52
>75th percentile of employer (%)	38***	29	19
Number of covered lives including the employee			
FSA election = 1, else 0	0.43***	0.21	0.23
Health shock = 1, else = 0	0.36	0.41	0.41
Dependent variables			
Rx expenditure	\$811.10	\$1,051.07	\$943.49
Prescriptions filled	17.09	22.32**	18.94
Brand scripts filled	7.45	10.66***	7.56
Generic scripts filled	9.65**	11.66	11.38
Generic scripts filled	9.65**	11.66	11.38
Chronic contract scripts	9.68	14.51***	10.99
Nonchronic contract scripts	7.41	7.81	7.95
Mail-order scripts	0.33***	0.04***	0.92

* $p < .05$; ** $p < .01$; *** $p < .001$.

Using POS as the comparison group.

CDHP, Consumer Driven Health Plan; PPO, preferred provider organization; POS, point of service.

1 75th percentile compared with the POS (19 percent) and the PPO (29 percent).
 2 The CDHP had the lowest baseline illness burden at 6.55 per contract
 3 compared with the PPO (7.13) and POS (6.83). POS enrollees used more
 4 mail-order prescriptions in the base year than the other cohorts.

5 CDHP and PPO impacts on pharmacy expenditure and prescriptions
 6 are reported in Table 2. The results are based on a simple OLS regression
 7 where subscribers with zero expenditure or cost are coded as “1” and includ-
 8 ed. Although CDHP subscribers experienced less pharmacy expenditure in
 9 2001 and 2002 than POS, these findings are not statistically significant. The
 10 only significant CDHP differences from the POS were less utilization of any
 11 scripts and generic prescriptions in 2002. The PPO had less brand and generic
 12 drug utilization than the POS in later years. The CDHP population had con-
 13 siderably more mail-order prescription use than the other cohorts.

14 Table 3 presents the results of our two-part model with tests for the
 15 significance of differences in relation to the POS plan. In contrast to Table 2,
 16 the CDHP cohort has lower costs (– 30.4 percent in 2001 to – 19.5 percent in
 17 2003). Of these, the – 30.4 percent difference for 2001 is statistically signifi-
 18 cant. In addition, brand name drug use is consistently higher in the PPO
 19 population compared with the POS. Generic drug use is lower in both the
 20 CDHP and PPO compared with the POS plan with the greatest differences in
 21 2002. Prescription drug use by chronically ill patients in the CDHP and PPO is
 22 lower and statistically different from the POS cohort in 2002. Mail-order pre-
 23 scription use by CDHP enrollees was larger, but not statistically different from
 24 the POS cohort from 2001 to 2003. However, compared to the PPO cohort,
 25 the CDHP enrollee mail order was larger and a statistically significant differ-
 26 ence. In contrast, the PPO cohort’s mail-order consumption was significantly
 27 less than the POS cohort from 2000 to 2003.

30 SPECIFICATION TESTS

31 We suspect that the variance in pharmaceutical expenditures is positively
 32 related to the level of expenditures due to substantial differences in prescrip-
 33 tion drug treatment plans. For example, a patient treated for seizure disorders
 34 could take medications that cost from \$5 to \$500 per month depending on the
 35 compound and availability of a generic substitute. A physician may work with
 36 the patient to find the appropriate dosing and chemical compounds that could
 37 lead to a high degree of variation. A Breusch–Pagan/Cook–Weisberg test
 38 (using *STATA* 9.0) rejected the assumption of homoskedasticity. To gauge the
 39

Table 2: Impact of CDHP and PPO on Pharmacy Cost and General Utilization Compared with POS Cohort

	Parameter						
	Log Expenditures	Log Scripts	Log brand Scripts	Log Generic Scripts	Log Chronic Scripts	Log Chronic Scripts	Log Mail Order Scripts
Intercept	1.787*** (0.113)	- 0.098 (0.060)	- 0.823*** (0.061)	- 0.191*** (0.058)	- 1.677*** (0.081)	1.579*** (0.074)	0.490*** (0.108)
Plan year 2001 = 1, else 0	0.455*** (0.081)	0.220*** (0.043)	0.215*** (0.044)	0.129*** (0.041)	0.174*** (0.058)	0.046 (0.053)	0.093* (0.056)
Plan year 2002 = 1, else 0	0.590*** (0.081)	0.494*** (0.043)	0.292*** (0.044)	0.526*** (0.041)	0.316*** (0.058)	0.178*** (0.053)	0.173*** (0.056)
Plan year 2003 = 1, else 0	0.837*** (0.081)	0.424*** (0.043)	0.165*** (0.044)	0.471*** (0.041)	0.460*** (0.058)	- 0.036 (0.053)	0.115* (0.057)
CDHP plan = 1, else 0	- 0.395*** (0.115)	- 0.129** (0.062)	0.047 (0.062)	- 0.169*** (0.059)	- 0.073 (0.083)	- 0.057 (0.076)	0.057 (0.116)
PPO plan = 1, else 0	- 0.091 (0.088)	0.061 (0.047)	0.233*** (0.047)	- 0.085* (0.045)	0.069 (0.063)	- 0.008 (0.058)	0.317 (0.305)
CDHP in 2001 = 1, else 0	- 0.170 (0.162)	- 0.022 (0.087)	0.003 (0.088)	- 0.099 (0.083)	- 0.071 (0.117)	0.049 (0.107)	0.254 (0.139)
CDHP in 2002 = 1, else 0	- 0.020 (0.162)	- 0.146* (0.087)	- 0.048 (0.088)	- 0.272*** (0.083)	0.007 (0.117)	- 0.154 (0.107)	0.236* (0.137)
CDHP in 2003 = 1, else 0	0.186 (0.162)	0.128 (0.087)	0.110 (0.088)	0.079 (0.083)	0.075 (0.117)	0.053 (0.107)	0.275* (0.137)
PPO in 2001 = 1, else 0	0.059 (0.123)	- 0.035 (0.066)	0.000 (0.067)	- 0.048 (0.063)	0.026 (0.089)	- 0.061 (0.081)	- 0.276 (0.402)
PPO in 2002 = 1, else 0	0.149 (0.124)	- 0.283*** (0.066)	- 0.128* (0.067)	- 0.359*** (0.063)	- 0.026 (0.089)	- 0.256*** (0.081)	0.152 (0.456)
PPO in 2003 = 1, else 0	0.102 (0.123)	- 0.120* (0.066)	- 0.065 (0.067)	- 0.134*** (0.063)	- 0.129 (0.089)	0.009 (0.081)	- 0.229 (0.349)

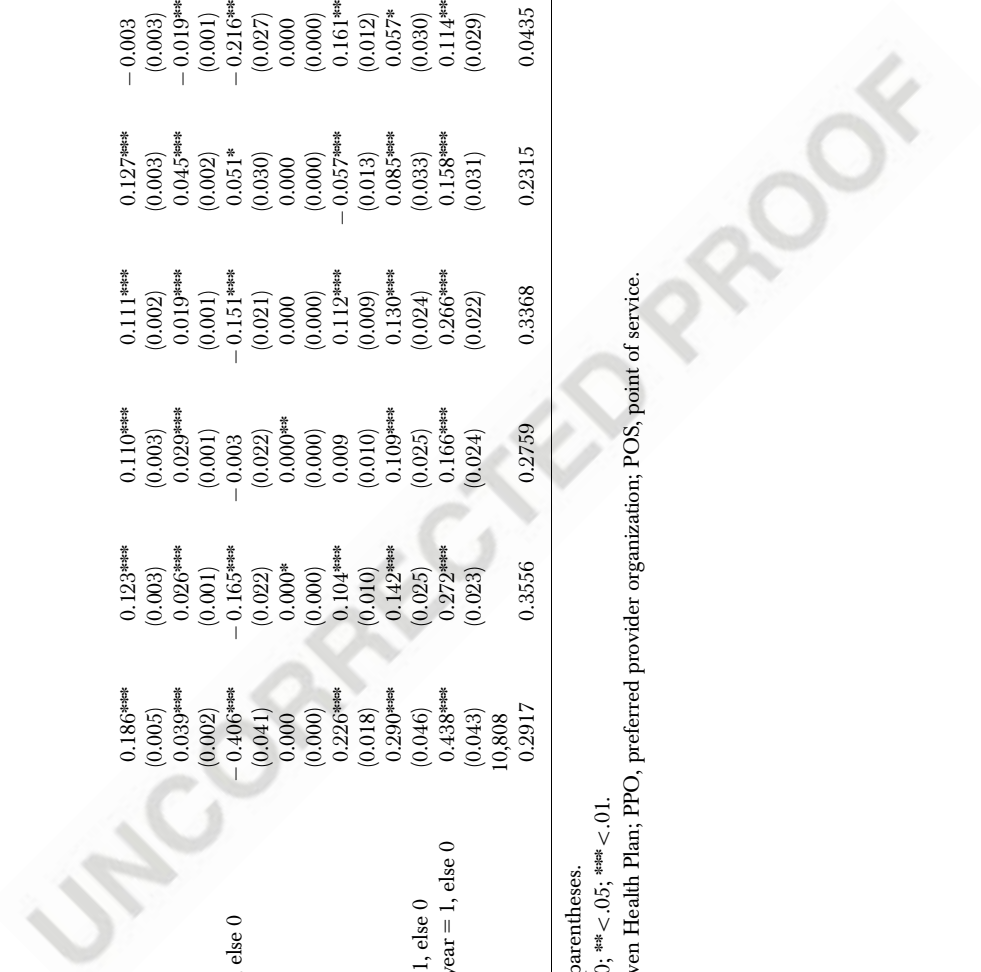
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Illness burden in 2000	0.186*** (0.005)	0.123*** (0.003)	0.110*** (0.003)	0.111*** (0.002)	0.127*** (0.003)	-0.003 (0.003)	0.025*** (0.004)
Subscriber age (years)	0.039*** (0.002)	0.026*** (0.001)	0.029*** (0.001)	0.019*** (0.001)	0.045*** (0.002)	-0.019*** (0.001)	0.015*** (0.002)
Subscriber is Male = 1, else 0	-0.406*** (0.041)	-0.165*** (0.022)	-0.003 (0.022)	-0.151*** (0.021)	0.051* (0.030)	-0.216*** (0.027)	0.040 (0.036)
Income (\$)	0.000 (0.000)	0.000* (0.000)	0.000** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Covered contract lives	0.226*** (0.018)	0.104*** (0.010)	0.009 (0.010)	0.112*** (0.009)	-0.057*** (0.013)	0.161*** (0.012)	-0.030* (0.016)
Contributes to flexible Spending account = 1, else 0	0.290*** (0.046)	0.142*** (0.025)	0.109*** (0.025)	0.130*** (0.024)	0.085*** (0.033)	0.057* (0.030)	0.033* (0.036)
Catastrophic shock in year = 1, else 0	0.438*** (0.043)	0.272*** (0.023)	0.166*** (0.024)	0.266*** (0.022)	0.158*** (0.031)	0.114*** (0.029)	0.011 (0.036)
Observations	10,808						
Adjusted R ²	0.2917	0.3556	0.2759	0.3368	0.2315	0.0435	0.1468

Standard errors are in parentheses.

P-value notation: * < .10; ** < .05; *** < .01.

CDHP, Consumer Driven Health Plan; PPO, preferred provider organization; POS, point of service.



1 Table 3: Marginal Impact of CDHP and PPO Compared with POS Based
 2 on a Two-Part Model Estimation of Regression Adjusted Means

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Health Plan Cohorts	2000	2001 (% Change)	2002 (% Change)	2003 (% Change)
Rx expenditure	\$ 906.69	\$ 1,052.40	\$ 1,281.97	\$ 1,697.11
	- 18.2%	- 30.4%	- 22.2%	- 19.5%
Prescriptions filled	18.21	21.46	24.04	28.84
	- 5.0%	- 4.2%	- 21.2%	5.9%
Brand scripts filled	7.72	10.14	10.55	10.43
	3.5%	12.1%	3.7%	14.6%
Generic scripts filled	10.01	10.39**	12.63	17.47
	- 11.6%	- 18.6%	- 34.2%	- 1.4%
Chronic contract scripts	10.21	12.27	14.80	21.55
	- 8.5%	- 14.9%	- 24.4%	8.9%
Non-chronic contract scripts	7.34	8.69	8.70	8.69
	- 6.1%	1.4%	- 24.5%	0.1%
Mail order scripts	0.38**	1.34	1.58	1.57
	- 58.8%	11.8%	18.1%	31.0%
POS cohort N= 1,248				
Rx expenditure	\$ 1,108.81	\$ 1,512.46	\$ 1,647.99	\$ 2,107.42
Prescriptions filled	19.16	22.39	30.51	27.23
Brand scripts filled	7.46	9.05	10.16	9.09
Generic scripts filled	11.33	12.77	19.19	17.73
Chronic contract scripts	11.15	14.42	19.58	19.79
Nonchronic contract scripts	7.82	8.57	11.52	8.68
Mail order scripts	0.92	1.20	1.34	1.20
PPO cohort N= 1,008				
Rx expenditure	\$ 1,012.07	\$ 1,491.72	\$ 1,834.71	\$ 2,120.19
	- 8.7%	- 1.4%	11.3%	0.6%
Prescriptions filled	20.44	23.37	24.13	25.86
	6.7%	4.4%	- 20.9%	- 5.0%
Brand scripts filled	9.30	11.60**	11.23**	10.83**
	24.8%	28.2%	10.4%	19.1%
Generic scripts filled	10.58	11.18**	12.26**	14.56**
	- 6.6%	- 12.5%	- 36.1%	- 17.8%
Chronic contract scripts	11.82	15.18	15.51**	16.89
	6.0%	5.3%	- 20.8%	- 14.7%
Nonchronic contract scripts	8.19	8.31	8.31	8.78
	4.8%	- 3.1%	- 27.9%	1.2%
Mail order scripts	0.02	0.03**	0.03**	0.07**
	- 97.4%	- 97.7%	- 97.9%	- 93.8%

Notes: Regressions adjusted by annual trends, health plan choice, health plan choice interacted with annual trends, age gender, income, number of covered lives in contract, use of an healthcare flexible spending account.

Estimates are based on a two part model.

**Estimates are significant at the .05 level.

CDHP, Consumer Driven Health Plan; PPO, preferred provider organization; POS, point of service.

1 impact of heteroskedastic errors we estimated a full generalized least squares
2 regression model, forcing homoskedasticity and zero autocorrelation across the
3 three panels. We found little change in the standard errors of the coefficients.

4 We also were concerned about omitted variable bias. However, a Ram-
5 sey RESET test did not reject the hypothesis that there were no omitted
6 variables in the pharmaceutical expenditure equation.

7 Finally, our difference-in-differences approach may not be appropriate if
8 the CDHP and comparison cohorts already were experiencing different
9 trends in pharmacy use/spending prior to offering the CDHP. The largest
10 observed difference in employee demographics among the cohorts was the
11 contract-holder's wage income. Therefore, a plausible explanation for differ-
12 ent trends might be that higher-income employees already had different
13 trends of drug use/spending. To investigate this possibility, we interacted in-
14 come with the time trend. We found no significant differences in the trend of
15 pharmacy use/spending for employees with different wage incomes. This test
16 does not rule out different trends based on other interactions.

17 18 DISCUSSION

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20 Interpreting the findings with respect to our study hypotheses, we find some
21 support for our first hypothesis that three-tiered plans steer enrollees toward
22 generic drugs. This result suggests that CDHP cost sharing does not favor
23 generic drugs to the extent found in three-tier benefits, which provide a
24 substantial price reduction for generic drugs. However, we note differences
25 among the three-tier designs where the PPO cohort used more brand name
26 drugs and fewer generic drugs than the POS cohort. Interestingly, the results
27 suggest that CDHP enrollees continued to use brand name drugs and de-
28 creased their consumption of generic drugs in the second year. These reduc-
29 tions did not persist into the third year suggesting that CDHP enrollees
30 subsequently updated their prescription use patterns.

31 Our findings do not support the second hypothesis that CDHP enrollees
32 with chronic conditions would use more prescription medicines than the other
33 plan designs. This is surprising since most of the chronically ill CDHP enrollees
34 were over the deductible and faced no cost sharing restrictions. One possibility
35 is that the prospect of cost sharing led those with chronic illnesses to limit their
36 drug purchases before reaching the deductible. In other work, we have found
37 this behavior among all CDHP subscribers (Feldman and Parente 2007).

38 Our third hypothesis that CDHP enrollees would use more mail-order
39 prescriptions than other cohorts was supported in all 3 years, but the results

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1 were not statistically different from the POS cohort, but these statistically
2 different from the PPO population. We interpret this finding as a suggestive
3 response by consumers to reduce pharmaceutical expenditures. Since brand
4 name drugs are available by mail order, this may have been a way to conserve
5 costs on low-volume, high-cost brand name prescriptions.

6 With respect to our research questions, CDHP enrollees spent some-
7 what less for prescription drugs than the POS cohort with three-tier benefits,
8 even though the POS plan used a very restrictive formulary. This result was
9 statically significant in the first year the CDHP was offered (2001). A significant
10 decrease in CDHP prescriptions also occurred in 2002. One explanation may
11 be the way the CDHP “balance billed” the insured in the early part of the
12 second year for pharmaceuticals consumed during the first year. These were not
13 paid as part of the deductible when the service occurred. In effect, the employer
14 gave the insured an interest-free loan on pharmaceutical expenditures.

15 Beyond our research questions, we found that cost and utilization of
16 PPO enrollees was not significantly different from the POS plan. This is sur-
17 prising since the POS plan used a more restrictive formulary.

18 The study has two limitations. First, it is based on one employer and is
19 not generalizable to other CDHPs. However, the use of one employer controls
20 for variation in employer-specific benefit designs as well as price variations
21 that are not commonly available in multiemployer research.

22 Second, some of the results for the POS and PPO plans might be due to
23 changes in drug benefit management that we could not measure. For example,
24 annual negotiations with PBMs could lead the employer to place different
25 drugs on the preferred list. This would affect the prices faced by POS and PPO
26 enrollees, but not CDHP enrollees. We addressed this limitation by using a
27 multi-year cohort design, where the effects of changes in benefits are con-
28 trolled by interactions of time indicators with cohort membership. We also
29 were informed by the employer that almost no changes in benefit design
30 occurred between 2001 and 2004.

31 CONCLUSION

32 Drug spending in the CDHP is cost-neutral to cost-saving compared with
33 three-tier benefits with no major differences in brand name drug use. We find
34 limited evidence of less drug consumption by CDHP enrollees with chronic
35 illnesses, and some evidence of less generic drug use and more mail-order
36 drug use among CDHP members. As the CDHP market evolves, the empir-

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1 ical evidence “engaging the consumer” in prescription drug coverage appears
2 to be plausible, but not yet overwhelming.
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11 party firm, T3Health LLC was retained to collect the human resources and
12 claims data from the principal employer and the three health plans involved
13 in the study. Primary ownership of the data is with the employer due to
14 their self-insurance contracts with the three health plans involved in the study.
15 T3 Health LLC signed a Business Associate agreement with the employer to
16 serve as their agent for collecting confidential data from all sources,
17 developing a non-traceable study identification number, deleting any person
18 health information from the files and then providing limited-use data to the
19 University of Minnesota researchers. T3 Health LLC’s services were paid for
20 by the Robert Wood Johnson Foundation and Pfizer as a sub-contractor to the
21 University’s master contract. Finally, three sets of 4-way confidentiality
22 statements were signed by the University’s principal investigator, the
23 employer, the health plan providing claims data and the trusted third party.
24

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31 *Disclaimer:* The research presented in this article is the product of the
32 researchers only and does not represent the views of the associated employer,
33 health plans and financing organizations.
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36 REFERENCES

37
38 Curtiss, F. R. 2002. “Perspectives: Drugs, PPOs, Tiered Cost Share for Beneficiaries
39 and Consumer Preferences.” *Journal of Managed Care Pharmacy* 8: 177–80.

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- 1 Feldman, R., and S. T. Parente. Enrollee Incentives in Consumer Directed Health
2 Plans. Presented at the 6th World Congress of the International Health Eco-
3 nomics Organization, Copenhagen, Denmark, July 9, 2007.
- 4 Feldman, R., S. T. Parente, and J. Christianson. 2007. "Consumer Directed Health
5 Plans: New Evidence on Cost & Utilization." *Inquiry* 44 (1): 26-40.
- 6 Gibson, T. B., R. J. Ozminkowski, and R. Z. Goetzel. 2005. "The Effects of Prescription
7 Drug Cost Sharing: A Review of the Evidence." *American Journal of Managed Care*
8 11: 730-740.
- 9 Huskamp, H. A., P. A. Deverka, A. M. Epstein, et al. 2005. "Impact of 3-tier Formu-
10 laries on Drug Treatment of Attention-Deficit/Hyperactivity Disorder in Chil-
11 dren." *Archive of General Psychiatry* 62: 435-41.
- 12 Kaiser Family Foundation and the Health Research and Education Trust (2004). Em-
13 ployer Health Benefits 2004 Annual Report. Available at: [http://www.kff.org/](http://www.kff.org/insurance/7148/index.cfm)
14 [insurance/7148/index.cfm](http://www.kff.org/insurance/7148/index.cfm). Accessed April 16, 2006.
- 15 Nair, K. V., P. Wolfe, R. J. Valuck, M. M. McCollum, J. M. Ganther, and S. J. Lewis.
16 "Effects of a 3-tier Pharmacy Benefit Design on The Prescription Purchasing
17 Behavior of Individuals with Chronic Disease." *Journal of Managed Care Pharmacy*
18 2003; 9: 123-33.
- 19 Parente, S. T., R. Feldman, and J. B. Christianson. "Evaluation of the Effect of a
20 Consumer-Driven Health Plan on Medical Care Expenditures and Utilization."
21 *Health Services Research* 2004; 39: 1189-210.
- 22 Pauly, M. V. 1968. "The Economics of Moral Hazard: Comment." *American Economic*
23 *Review* 58: 531-537.
- 24 Rector, T. S., M. D. Finch, P. M. Danzon, M. V. Pauly, and B. S. Manda. 2003. "Effect
25 of Tiered Prescription Copayments on the Use of Preferred Brand Medications."
26 *Medical Care* 41: 398-406.
- 27 Schneeweiss, S., M. Maclure, A. M. Walker, P. Grootendorst, and S. B. Soumerai. 2001.
28 "On the Evaluation of Drug Benefits Policy Changes with Longitudinal Claims
29 Data: The Policy Maker's Versus the Clinician's Perspective." *Health Policy* 55:
30 97-109.
- 31 Tamblyn, R., R. Laprise, J. A. Hanley, et al. Adverse Events Associated with Pre-
32 scription Drug Cost-Sharing Among Poor And Elderly Persons." *Journal of the*
33 *American Medical Association* 2001; 285: 421-9.
- 34 Weiner, J. P., B. H. Starfield, D. M. Steinwachs, and L. M. Mumford. "Development
35 and Application of a Population-oriented Measure of Ambulatory Care Case-
36 Mix." *Medical Care* 1991; 29: 452-72.

37 SUPPLEMENTARY MATERIAL

38 The following material is available for this article online:

39 **Appendix SA1:** Author matrix.

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