

Pharmacy Benefit Caps And The Chronically Ill

Some U.S. retirees are vulnerable to high drug spending and might drop the use of beneficial drugs if their benefits are capped.

by **Geoffrey F. Joyce, Dana P. Goldman, Pinar Karaca-Mandic, and Yuhui Zheng**

ABSTRACT: In this paper we examine medication use among retirees with employer-sponsored drug coverage both with and without annual benefit limits. We find that pharmacy benefit caps are associated with higher rates of medication discontinuation across the most common therapeutic classes and that only a minority of those who discontinue use reinitiate therapy once coverage resumes. Plan members who reach their cap are more likely than others to switch plans and increase their rate of generic use; however, in most cases, the shift is temporary. Given the similarities between these plans and Part D, we make some inferences about reforms for Medicare. [*Health Affairs* 26, no. 5 (2007): 1333-1344; 10.1377/hlthaff.26.5.1333]

THE STANDARD MEDICARE PART D BENEFIT has a well-known gap in coverage, commonly referred to as the “doughnut hole.” Somewhere between 24 percent and 38 percent of eligible enrollees will reach the coverage gap in 2007, and about one-third of these beneficiaries are expected to reach the level at which catastrophic coverage begins.¹ As a result, beneficiaries with moderate-to-high drug expenses, particularly the chronically ill, will face gaps in coverage and higher out-of-pocket costs, which will alter their demand for drug therapies.

Part D’s implementation is too recent to enable direct observation of its impact. However, we can draw inferences from commercial plans that have imposed benefit caps. The most recent evidence on the impact of such caps comes from an analysis at Kaiser Permanente.² Members whose drug benefits were capped at \$1,000 had 31 percent lower pharmacy costs than comparable enrollees who were not subject to a cap, but the capped enrollees had higher rates of emergency department (ED) visits and nonelective hospitalizations. Elderly people who experience gaps in coverage report using fewer medications, are more likely to switch to

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generics or lower-cost medications, and rely more on drug samples from their physicians.³ Several questions still remain. For example, do patients reduce their use of medications equally across all therapeutic classes? And among those who stop, how quickly do they reinitiate drug therapy once coverage resumes in the next benefit year? These questions are of critical importance given the design of the standard Medicare drug benefit. The impact of a cap falls disproportionately on beneficiaries with moderate-to-high drug expenses, many of whom have chronic illnesses that require ongoing drug therapy.

For this study, we used longitudinal data from a large private employer to compare pharmacy use among retirees in capped and noncapped plans. The capped plans, with annual limits on plan drug spending of \$1,000 and \$2,500, provide insight to how Part D beneficiaries may respond to cycling in and out of coverage. We found that benefit caps were associated with higher rates of medication discontinuation across the most common therapeutic classes and that only a minority of those who discontinued use reinitiated therapy once coverage resumed. We discuss the implications of these findings for Medicare beneficiaries, particularly the chronically ill.

Study Data And Methods

We compared outpatient medication use among retirees who have employer-sponsored drug coverage with an annual spending limit for the plan of \$1,000 or \$2,500 with use among retirees in a noncapped plan. We examined pharmacy use before and after patients exceeded the cap and the degree to which they switched plans or stopped taking medications after exhausting their benefits. The data included three years of medical and pharmacy claims (2003–2005) on more than 60,000 retirees, most of whom were age sixty-five and older. The salient details are discussed below.

■ **Data.** The data come from a large private employer that offered retirees a choice of three health plans. The data include members in all fifty states and the District of Columbia, in 2003–2005. Geographically, 41 percent of retired enrollees reside in the South, 30 percent in the Northeast, 16 percent in the West, and 13 percent in the Midwest. The plans ranged in generosity from a low-deductible medical plan with no annual limit on prescription drugs to a high-deductible medical benefit with a \$1,000 annual limit on drug spending.

The claims data captured all health care claims and encounters, including prescription drugs and inpatient and ambulatory services. Pharmacy claims included the type of drug, drug name, national drug code, dosage, days supplied, place of purchase (retail or mail order), payments by patients and health plans, type of drug dispensed (generic, multisource brand, single-source brand), type of pharmacy (retail, mail order), and type (new, refill). We used medical claims to identify comorbid conditions based on *International Classification of Diseases*, Ninth Revision (ICD-9), diagnostic codes recorded from hospitalizations, physicians' offices,

home care agencies, and outpatient facilities such as outpatient hospital clinics. Enrollment records allowed us to track who was eligible for services as well as basic demographics (age, sex, three-digit ZIP code of residence, and relationship to sponsoring employee).⁴

We merged the claims data with information about plan benefits. For each plan year, we obtained copies of the summary benefit design. Abstracted drug benefit details included copayments or coinsurance rates for both retail and mail-order pharmacies, maximum out-of-pocket payments per prescription, and annual limits on drug spending by the plan. Characteristics of the medical benefit included individual and family deductibles, patient cost-sharing arrangements, and annual out-of-pocket maximums.

■ **Defining the cap.** The annual benefit cap was based on the plan's share of prescription drug costs. For example, if a thirty-day prescription cost \$100 and the member had a \$25 copayment, the plan would pay the remaining \$75 if the patient had not exceeded the cap. Only the \$75 paid by the plan would be applied to the cap. We computed an index date for members in the capped and noncapped plans based on the date on which cumulative plan spending reached the cap level.

■ **Defining high-cost users.** We calculated cumulative plan payments and patients' out-of-pocket costs directly from the pharmacy claims. We defined *high-cost users* as members with annual plan spending of \$2,400 or more in the \$2,500 cap plan or \$950 or more in the \$1,000 cap plan.⁵ We focused on members with drug spending of these amounts to identify members most likely to be affected by the cap. We compared their pharmacy use before and after reaching the cap with the use of a control group of similar high-cost users in the noncapped plan—that is, enrollees with plan spending of at least \$950, or \$2,400 in the plan without an annual dollar limit.

■ **Classifying drugs.** We used a common classification scheme—the 2004 *Red Book* published by Thomson—to associate each drug with a therapeutic class. We combined several classes used to treat the same chronic disease. Antihypertensives included angiotensin-converting enzyme (ACE) inhibitors, calcium-channel blockers, diuretics, beta blockers, alpha-beta blockers, and angiotensin II receptor blockers (ARBs). Cardiac drugs included all of the antihypertensive agents as well as anti-arrhythmic agents, cardiac glycosides, anticoagulants, and cardiac drugs not elsewhere classified. Antidiabetic drugs included sulfonylureas and other oral agents including metformin and glitazones. Insulin was not included since injectables often have different benefits. Anti-ulcerants included histamine-2 receptor antagonists and proton-pump inhibitors (PPIs), as well as other gastrointestinal drugs not elsewhere classified. Antidepressants included selective serotonin reuptake inhibitors (SSRIs) and tricyclic drugs. Nonsteroidal anti-inflammatories (NSAIDs) included the COX-2 inhibitors.

■ **Medication discontinuation and resumption.** To better understand how plan members respond to a cap, we compared rates of medication discontinuation

and reinitiation among high-cost users in the \$2,500 cap plan and the noncapped plan. We defined *discontinuation* by comparing the count of unique drugs used by a member in the ninety days prior to his or her index date (cap date) and up to ninety days after the cap. For example, a member taking three different cardiac drugs prior to reaching the cap but only one drug after the cap would be categorized as having discontinued one or more medications within the class. Among those who stopped taking a drug, we computed the number of unique drugs they used in the first ninety days after coverage resumed in the next year, to determine whether or not they reinitiated use within the class. We also compared the use of generic drugs among high-cost plan members before and after reaching the cap relative to that of similar members without a cap.

■ **Multivariate analysis.** Our primary dependent variable is the total number of days supplied of medication in a therapeutic class during the month (covered days). For example, if a patient filled a new, thirty-day prescription for a statin on 21 April 2003, we would include ten days for April and twenty days for May. We compared trends in covered days by therapeutic class for high-cost users in the \$2,500 cap plan with trends for similar retirees in the noncapped plan, controlling for individual specific characteristics and patient risk. We used generalized estimating equation models to control for differences in patient characteristics (age, sex, marital status, urban residence, census region) and comorbid conditions.⁶ We included binary indicators for the most common comorbid conditions based on the presence of ICD-9 diagnostic codes in the medical claims: essential hypertension, hyperlipidemia, heart disease, stroke, depression/psychotic illness, gastric acid disorder, asthma, rheumatoid arthritis, allergic rhinitis, and ulcer. The models also included a set of monthly time dummies, a binary indicator of enrollment in a capped plan, and a set of interactions between monthly time dummies and the binary indicator of being in a capped plan. These interaction terms allowed for differential monthly trends between the capped and noncapped plans. The results from these models were then used to predict monthly prescription drug use for members in the \$2,500 cap plan relative to similar high-cost members in the noncapped plan for each of six therapeutic classes.

Study Results

Exhibit 1 summarizes the salient characteristics of the three plans. They ranged in generosity and varied along a number of other dimensions as well, including annual out-of-pocket maximums (which did not apply to prescription drugs) and coinsurance rates for medical services. Prescription drug coverage remained unchanged in the noncapped plan and the \$2,500 cap plan from 2003 to 2005 (data not shown). However, for the high-deductible plan, there was a considerable change from 2003 to 2004, including removal of a \$1,000 deductible for prescription drugs, a change in coinsurance rates, and a \$1,000 cap on annual plan drug spending. Therefore, the high-deductible plan was a \$1,000 cap plan only in 2004

EXHIBIT 1
Health Plan Options For Retirees Of A Large Private-Sector Employer, 2003–2005

Feature (individual coverage)	No cap (low)	\$2,500 cap (medium)	\$1,000 cap (high)
Medical			
Deductible	\$507	\$1,000	\$2,000
Annual OOP maximum ^a	\$3,042	\$4,000	\$4,500
Coinsurance	20%	20%	30%
Prescription drugs			
Annual cap	None	\$2,500	\$1,000
Generics ^b	35%	35%	50%
Formulary brands ^c	35%	35%	50%
Nonformulary brands ^d	60%	60%	50%

SOURCE: Authors' summary of plan descriptions provided by a large private employer to its retirees.

NOTE: There was no out-of-pocket (OOP) maximum per prescription in the \$1,000 cap plan.

^a Does not apply to prescription drugs.

^b OOP maximum per prescription of \$35 for noncapped and \$2,500 cap plans.

^c OOP maximum per prescription of \$70 for noncapped and \$2,500 cap plans.

^d OOP maximum per prescription of \$140 for noncapped and \$2,500 cap plans.

and 2005, not in 2003. The noncapped and \$2,500 cap plan had 35 percent coinsurance for generic and formulary brand drugs and 60 percent coinsurance for nonformulary brand drugs (Exhibit 1). Both plans had the same out-of-pocket maximum per prescription. However, the \$2,500 cap plan had a \$2,500 limit on annual plan drug spending. The \$1,000 cap plan was the least generous, with 50 percent coinsurance on all drugs (generic, formulary, and nonformulary brands) and no out-of-pocket maximum per prescription. Deductibles and out-of-pocket maximums for medical services increased modestly in 2004 but were unchanged in 2005 (data not shown). The premiums associated with each plan were not available.

Exhibit 2 shows the characteristics of the enrollees in the noncapped plan and the \$2,500 cap plan and of those who exceeded the cap level of spending in 2004 (high-cost users). Enrollees in the \$2,500 cap plan differed modestly from those in the noncapped plan. They were slightly older, were more likely to be married, and had higher rates of comorbid conditions. These differences were attenuated, however, when we compared enrollees who were high-cost users of prescription drugs, defined as those with annual plan drug spending of at least \$2,400. In contrast, those enrolled in the least generous plan (\$1,000 cap) were very different from members in the other two plans (data not shown). For example, less than 4 percent of enrollees in the \$1,000 cap plan were receiving treatment for diabetes, compared with 9 percent in the \$2,500 cap plan and 15 percent in the noncapped plan. Rates of heart disease, hypertension, and several other conditions follow a similar pattern.⁷

Exhibit 3 shows the distribution of plan drug spending in the \$1,000 and \$2,500

EXHIBIT 2
Demographic And Health Characteristics Of Enrollees In Noncapped Plan Versus \$2,500 Cap Plan, 2004

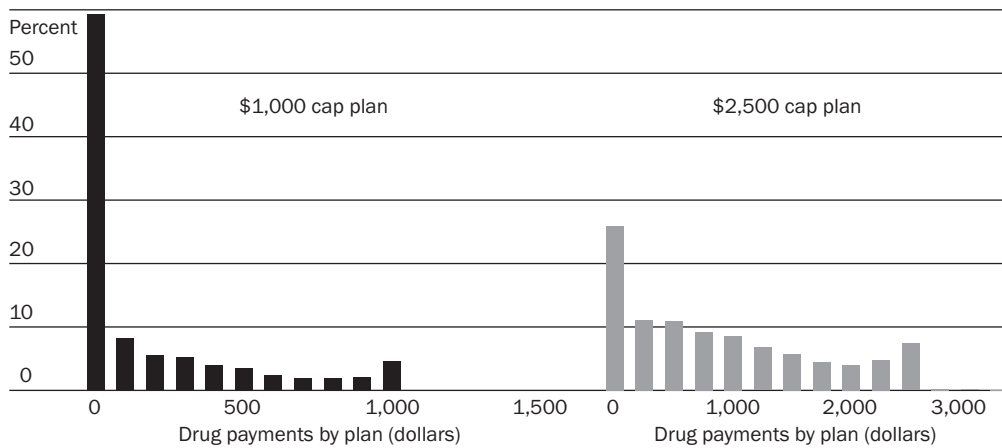
	All members			High-cost users ^a		
	No cap	\$2,500 cap	p value	No cap	\$2,500 cap	p value
Sample size (N)	16,635	33,528		3,880	3,423	
Age (years)	68	71	0.00	69	72	0.00
Male	55.3%	55.3%	0.94	53.1%	51.4%	0.19
Married	64.0	87.6	0.00	70.8	91.3	0.00
Urban	98.7	98.8	0.36	98.8	99.0	0.46
Census region						
South	42.1%	41.4%	0.15	47.3%	45.0%	0.08
Northeast	31.8	30.5	0.00	27.8	29.7	0.11
Midwest	10.6	13.0	0.00	9.5	10.6	0.19
Health conditions						
Hypertension	34.0%	31.3%	0.00	43.1%	43.1%	0.98
Cholesterol	13.0	13.0	0.99	16.9	17.0	0.89
Heart disease	20.1	15.7	0.00	35.4	33.6	0.12
Diabetes	14.7	8.8	0.00	32.5	26.1	0.00
Stroke	4.1	2.9	0.00	7.6	7.6	1.00
Depression	1.9	0.9	0.00	3.8	2.2	0.00
Gastric acid disorder	4.7	3.7	0.00	8.8	7.2	0.02
Asthma	3.1	1.9	0.00	7.4	5.0	0.00

SOURCE: Authors' calculations from medical and pharmacy claims data for two retiree health plans.

^aBeneficiaries with plan drug spending of \$2,400 or more in 2004.

cap plans in year 2004. More than 6 percent of enrollees reached the \$1,000 cap and 10 percent reached the \$2,500 cap in 2004. These fractions increased to 7 percent and 13 percent, respectively, in 2005. Among those who reached the \$1,000

EXHIBIT 3
Distribution Of Plan Drug Payments In Retiree Plans With Annual Benefit Limits Of \$1,000 And \$2,500, 2004



SOURCE: Authors' calculations from pharmacy claims data for two retiree health plans.

NOTE: Distributions of drug payments of \$1,100–\$1,500 in the \$1,000 cap plan and of \$2,750–\$3,250 in the \$2,500 cap plan do not appear because of scale.

cap in 2004, 25 percent exhausted their benefits by July, 50 percent by September, and 75 percent by October (data not shown). Time to reach the cap was slightly later in the \$2,500 cap plan. Overall, the median member who exceeded the cap in these plans had a coverage gap of 75 to 120 days.

Two important issues in assessing the potential long-term effects of a cap are the degree to which members switch plans after exhausting their benefit and the likelihood of reaching the cap in subsequent years if they remain. As shown in Exhibit 4, we found high rates of plan switching as well as persistently high drug spending among those who remained in the plan. For example, more than 43 percent of members who reached the \$1,000 cap in 2004 switched to a plan with a higher cap (31.5 percent) or no cap (12.0 percent) in 2005. Switching rates were much lower in the \$2,500 cap plan but were four times higher among those who reached the cap in 2004 (12.6 percent versus 3.2 percent). Among members who exhausted their benefits in 2004 but did not switch plans, about 70 percent reached their cap in 2005 (results not shown).

Exhibit 5 summarizes the relative changes in drug use for high-cost users in the \$2,500 cap plan relative to similar users in the noncapped plan, for each of the six therapeutic classes.⁸ We report predicted changes in covered days derived from multivariate models, although the unadjusted means tell a similar story. Monthly utilization is benchmarked to April 2003 levels, since we did not capture members' stock of medications at the end of 2002 (which would carry over into the first quarter of 2003). The differences in use between members with and without a cap were much larger in the last quarter of the year, as a larger proportion of enrollees exhausted their benefits. By December of each year, use of antidepressants, antihypertensives, antihyperlipidemics, and antidiabetic agents was 15–28 per-

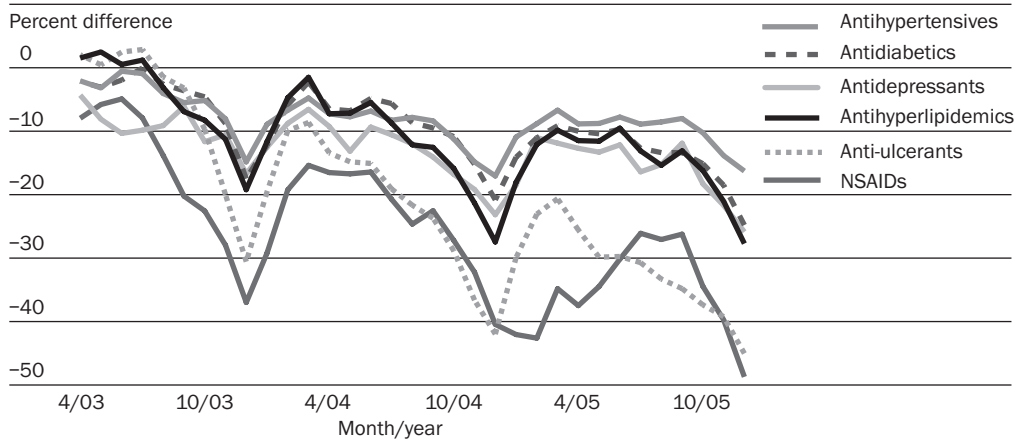
EXHIBIT 4
Distribution Of Plan Enrollment In 2005 By Plan And Level Of Drug Spending In 2004

2004 plan	2005 plan		
	\$1,000 cap	\$2,500 cap	No cap
\$1,000 cap			
Hit cap	56.5%	31.5%	12.0%
Did not hit cap	87.5	9.7	2.8
\$2,500 cap			
Hit cap	0.3	87.1	12.6
Did not hit cap	1.6	95.2	3.2
No cap			
Hit cap ^a	0.7	3.1	96.1
Did not hit cap	2.7	7.2	90.2

SOURCE: Authors' calculations from medical and pharmacy claims data for two retiree health plans.

NOTE: Data reflect the percentage of beneficiaries enrolled in each plan in 2005 based on their plan and level of drug spending in 2004.

^a Beneficiaries with plan drug spending of \$2,400 or more in 2004.

EXHIBIT 5**Predicted Differences In Monthly Prescription Drug Use (Covered Days) In \$2,500 Cap Versus Noncapped Plan, By Therapeutic Class, April 2003–December 2005**

SOURCE: Authors' analysis of pharmacy claims data for two retiree health plans.

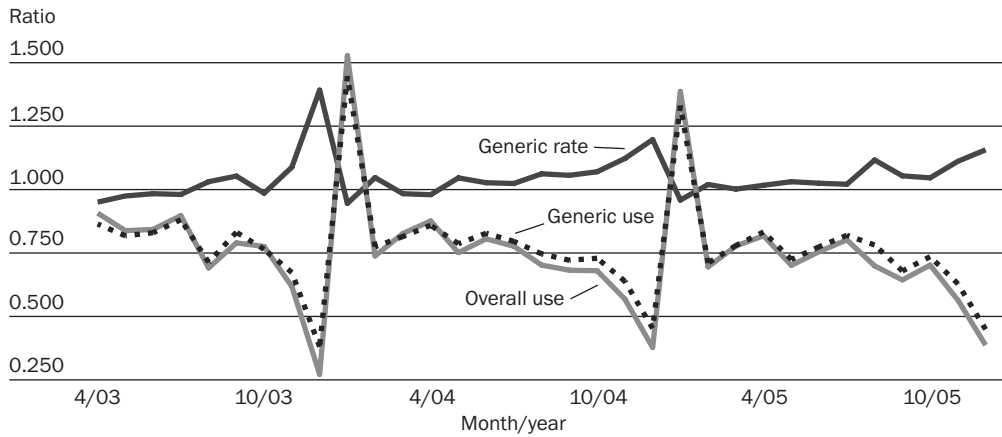
NOTES: The data span three years (2003–2005). Because we did not observe each plan member's stock of medications at the end of 2002, we could not reliably measure the supply of medications in the first quarter of 2003. For this reason, we benchmarked use in the two plans to the level observed in April 2003. NSAID is nonsteroidal anti-inflammatory drug.

cent lower among members in capped versus noncapped plans. The relative reductions in use were much larger for two classes with broadly available over-the-counter substitutes (NSAIDs and anti-ulcerants).⁹ However, these differences narrowed greatly once coverage resumed in the next year. For example, by March 2004, utilization differed by less than 10 percent for five of the six therapeutic classes. Put another way, the trends by therapeutic class clearly indicate relatively severe reduction in use at the end of the year for those in the capped plan, followed by increases when coverage is renewed.

Exhibit 6 shows monthly trends in the use of all drugs and generic drugs in the \$2,500 cap and the noncapped plan.¹⁰ Rates of generic use (generic prescriptions/total prescriptions) were similar across capped and noncapped plans in the first three quarters of the year but began to diverge in the last quarter, as more members approached the cap. It is important to note that the relative increase in the generic rate in the \$2,500 cap plan versus the noncapped plan reflects not greater use of generic drugs, but rather a relatively smaller decline in generic use relative to brand-name drug use. Although the generic rate was much higher in the capped plan by the end of each year, it fell to the level of generic usage in the noncapped plan once coverage resumed in January.

To better understand the behavioral responses to a cap, we examined medication discontinuation and reinitiation once coverage resumed (Exhibit 7). The percentage of high spenders in the capped plan who discontinued treatment differed by therapeutic class, ranging from 15 percent for those on antihyperlipidemic drugs to 28 percent for those taking cardiac drugs. A similar pattern is observed in the noncapped plans. Most striking, however, is that for every therapeutic class,

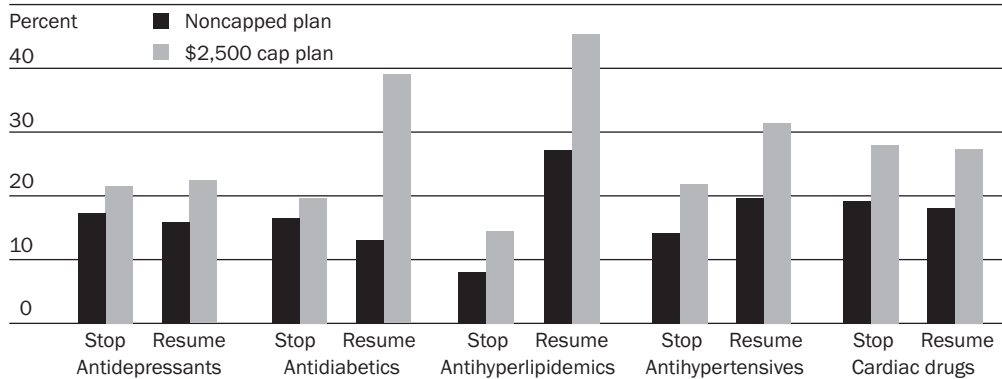
EXHIBIT 6
Ratio Of Monthly Generic And Total Drug Use In \$2,500 Cap Versus Noncapped Plan, April 2003–December 2005



SOURCE: Authors' analysis of pharmacy claims data for two retiree health plans.
NOTES: The generic rate is defined as the monthly number of thirty-day equivalent generic prescriptions divided by the total number of thirty-day equivalent prescriptions.

discontinuation was much more likely for those in the capped plans. The largest discrepancies were for cardiac drugs and antihypertensives, where the fraction of high spenders who discontinue therapy is about eight percentage points higher in the capped plan. Of course, patients discontinue therapy for many reasons. However, if the cap is playing a role, we would expect to see higher rates of resumption

EXHIBIT 7
Proportion Of High-Cost Users Who Stopped Taking One Or More Prescription Drugs In 2004 After Reaching \$2,400 In Plan Spending (Stop), And Proportion Who Reinitiated Use Of One Or More Drugs Within Each Class In The First Ninety Days After Coverage Resumed In 2005, Conditional On Ever Having Stopped Taking One Or More Drugs In 2004 (Resume), In Noncapped And \$2,500 Cap Plans



SOURCE: Authors' analysis of medical and pharmacy claims data for two retiree health plans.
NOTE: The generic rate is defined as the monthly number of thirty-day equivalent generic prescriptions divided by the total number of thirty-day equivalent prescriptions.

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in the capped plan once the year ends and benefits resume. In fact, we do observe such a pattern, with patients who discontinued therapy also more likely to resume in the capped plans.

Discussion

Our findings suggest that capping benefits is disruptive to drug therapy for many chronically ill patients. Benefit caps are associated with higher rates of medication discontinuation across the most common therapeutic classes, and only a minority of patients who discontinue use reinitiate therapy in the first three months after coverage resumes. These results are consistent with a growing body of evidence about the impact of limits on prescription drug use. Stephen Soumerai and colleagues compared Medicaid patients in New Hampshire—for whom the program had imposed a three-drug limit per patient per month—with those in New Jersey, where no such cap was introduced.¹¹ They found a 35 percent reduction in drug use relative to the control group. For patients on psychotropic medications, they found that the cap led to a 15–49 percent reduction in the use of these drugs. A 2002 survey of Medicare beneficiaries from another health plan with annual prescription drug benefit caps of \$750–\$1,200 indicates that elderly patients who exhaust their benefits use fewer medications, are more likely to switch to generics or lower-cost drugs, and rely more on drug samples from physicians than those who do not exhaust those benefits.¹² Two other studies found that patients exceeding the cap were two to three times more likely to discontinue a medication and disenroll from the plan.¹³

If cost containment policies have adverse effects, those effects are likely to be magnified among low-income groups, whose high rates of chronic health problems and low incomes might result in more price-sensitive behavior. Although beneficiaries with average drug spending will face only modest gaps in coverage, those with moderate-to-high drug expenses, particularly the chronically ill, will face longer gaps in coverage and pay a higher fraction of their costs out of pocket.¹⁴

Much more work needs to be done to understand how beneficiaries selectively enroll in capped and noncapped plans based on their health status. Clearly there is differential selection by health risk—we see younger and healthier people enrolling in capped plans—and high rates of disenrollment from the less generous plans. This selection likely induced some bias into our results, but selection almost certainly does not explain the dramatic cyclical patterns we observed.

We may understate the full impact of a cap if members in capped plans smooth their consumption over the course of the year. Evidence from the RAND Health Insurance Experiment suggests that people behave myopically in purchasing

health care service, failing to adjust demand as they become more likely to exceed their deductible.¹⁵

The evidence clearly suggests that patients are responsive to the cost-sharing arrangements in prescription drug plans, even among the chronically ill. Benefit caps act in a manner consistent with other cost-sharing features; however, little is known about the dynamics of these changes. Those reaching the cap are more likely to stretch use, switch to generics, and ask their physician for samples.¹⁶ Other options for reducing out-of-pocket costs include enrolling in a pharmacy assistance program (public and private), using a spouse's coverage, or obtaining medications from lower-cost pharmacies (such as Internet pharmacies) and large retailers (such as Wal-Mart) that might not be captured in claims data.

We may overstate the impact of a cap if the pharmacy claims do not capture all prescriptions after a member exceeds the cap—that is, out-of-system drug use. Although we cannot quantify the extent of underreporting, there is some indirect evidence, both theoretical and empirical, to suggest that it is likely to be small. First, the reductions in pharmacy use that we observed are consistent with prior studies. Second, most drug benefits administered by pharmacy benefit managers (PBMs) generate savings to consumers by negotiating price discounts with manufacturers and lower dispensing fees and markups from retail pharmacies. Thus, members have an incentive to purchase drugs through the plan even after exhausting their benefits. Third, the vast majority of enrollees who reached the cap in our study filled at least one prescription after exceeding the cap, typically at a pharmacy they had used earlier in the year. This suggests that only a small fraction of beneficiaries who reached the cap stopped filling all of their prescriptions through the plan.

It is worth noting that the 2007 Part D standard benefit is different from the capped plans in our and others' studies in that Part D coverage resumes after the beneficiary has incurred an additional \$3,051 in total spending. Whether this additional benefit—which might affect 10–15 percent of the population—will result in different behavioral patterns is an open question.

THE CHALLENGE FOR MEDICARE is to make patients more sensitive to the cost of treatment without encouraging them to forgo cost-effective care. For example, an increasing number of plans provide coverage for most generic drugs within the doughnut hole—clearly a promising trend with little additional cost.¹⁷ A more challenging question is whether Part D could be redesigned at the same actuarial cost but with continuous coverage. For example, higher cost sharing in the form of copayments that are constant throughout the year could result in better long-term clinical outcomes.

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NOTES

1. Estimates of the fraction of Part D beneficiaries who will reach the coverage gap in 2007 and beyond vary widely. Government estimates tend to be on the lower end of this range, whereas consumer groups and patient surveys report higher fractions.
2. J. Hsu et al., "Unintended Consequences of Caps on Medicare Drug Benefits," *New England Journal of Medicine* 354, no. 22 (2006): 2349–2359.
3. C.W. Tseng et al., "Cost-Lowering Strategies Used by Medicare Beneficiaries Who Exceed Drug Benefit Caps and Have a Gap in Drug Coverage," *Journal of the American Medical Association* 292, no. 8 (2004): 952–960.
4. These data were provided to us through an ongoing arrangement with Ingenix Inc., a benefits consulting firm.
5. A considerable fraction of beneficiaries had cumulative plan drug spending between \$950 and \$999 in the \$1,000 cap plan and between \$2,401 and \$2,499 in the \$2,500 cap plan.
6. K.Y. Liang and S.L. Zeger, "Longitudinal Data Analysis Using Generalized Linear Models," *Biometrika* 73, no. 1 (1986): 13–22.
7. Some of the variation in disease prevalence may be attributable to differences in the generosity of insurance coverage—that is, more-generous coverage increases the likelihood of diagnosis and treatment.
8. The analyses presented in Exhibit 5 compare changes in monthly pharmacy use in the \$2,500 cap plan and the noncapped plan. We excluded the \$1,000 cap from these analyses because the plan has different levels of cost sharing for prescription drugs, and those benefits changed in 2004.
9. The use of NSAIDs fell precipitously in all three plans starting in the fourth quarter of 2004 in response to warnings on the safety of COX-2 inhibitors. However, the reduction in use was much larger among members in capped plans than others.
10. The generic rate is simply the fraction of prescriptions filled as generic.
11. S.B. Soumerai et al., "Effects of a Limit on Medicaid Drug-Reimbursement Benefits on the Use of Psychotropic Agents and Acute Mental Health Services by Patients with Schizophrenia," *New England Journal of Medicine* 331, no. 10 (1994): 650–655.
12. Tseng et al., "Cost-Lowering Strategies."
13. T.S. Rector, "Exhaustion of Drug Benefits and Disenrollment of Medicare Beneficiaries from Managed Care Organizations," *Journal of the American Medical Association* 283, no. 16 (2000): 2163–2167; and E.R. Cox et al., "Medicare Beneficiaries' Management of Capped Prescription Benefits," *Medical Care* 39, no. 3 (2001): 296–301.
14. B. Stuart, L. Simoni-Wastila, and D. Chauncey, "Assessing the Impact of Coverage Gaps in the Medicare Part D Drug Benefit," *Health Affairs* 24 (2005): w167–w179 (published online 19 April 2005; 10.1377/hlthaff.w5.167).
15. J.P. Newhouse and the Insurance Experiment Group, *Free for All? Lessons from the RAND Health Insurance Experiment* (Cambridge, Mass.: Harvard University Press, 1993).
16. Tseng et al., "Cost-Lowering Strategies."
17. An increasing percentage of Part D plans are offering some coverage in the doughnut hole. In 2006, only 6 percent of Part D prescription drug plans (PDPs) provided coverage in the doughnut hole; by 2007, 27 percent covered use of most generic drugs in the gap.