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*Prepared for the Office of the Secretary of Defense*


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# Preface

Section 701 of the *National Defense Authorization Act for Fiscal Year 2000* requires the Secretary of Defense to establish an effective, efficient, and integrated pharmacy benefits program. As part of a program redesign effort, which will result in the establishment of a Uniform Formulary, the Department of Defense (DoD) is considering moving from a two-tiered copayment system to a three-tiered copayment system. To assist the DoD in assessing the potential implications of this policy change, the RAND Corporation used an existing data resource from the civilian sector to examine how beneficiaries with private drug coverage responded to similar changes in pharmacy benefits. The findings from this analysis can inform the DoD of the potential costs and benefits of adopting the proposed Uniform Formulary (UF).

This report covers research that was conducted from March through July 2003 on one of two phases of a research project on the proposed UF. A second report, scheduled for publication in 2004, will describe TRICARE Senior Pharmacy utilization during Fiscal Year 2002 and will examine determinants of the dispensing location, which influences pharmacy costs. The study findings reported here should be of interest to TRICARE Management Activity personnel and others with an interest in pharmacy benefit design.

This work was sponsored by the Assistant Secretary of Defense for Health Affairs. The project was carried out jointly by RAND Health's Center for Military Health Policy Research and the Forces and Resources Policy Center of the National Defense Research Insti-

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RAND routinely reviews and refines its quality assurance process and also conducts periodic external and internal reviews of the quality of its body of work. For additional details regarding the RAND quality assurance process, visit http://www.rand.org/standards/.

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# Summary

## Background

The military health system (MHS) has approximately 8.6 million eligible beneficiaries, including active-duty military personnel and their family members, retired military personnel and their family members, and surviving family members of deceased military personnel. In 2002, the Department of Defense (DoD) spent about $3 billion on outpatient pharmacy benefits. Like the private health care sector, the MHS has experienced a rapid growth in pharmaceutical expenditures. At the request of DoD, the RAND Corporation has undertaken two studies designed to help DoD shape their pharmacy benefit policy to control costs.

The U.S. Congress has identified the TRICARE pharmacy benefit as an area for reform. Section 701 of the *National Defense Authorization Act for Fiscal Year 2000* requires the Secretary of Defense to establish an effective, efficient, and integrated pharmacy benefits program. As part of a program redesign effort, which will result in the establishment of a Uniform Formulary (UF), the DoD is considering moving from a two-tiered copayment system to a three-tiered copayment system, which will increase the copayment for some classes and brands of medications. It is hoped that this move will give providers (acting in the interest of their patients) an incentive to prescribe lower-tier, less-costly options. To assist the DoD in assessing the potential implications of this policy change, RAND used an existing data resource to examine how beneficiaries with private drug

coverage responded to similar changes in pharmacy benefits. The findings from this analysis, presented in this report, can inform the DoD of the potential costs and benefits of adopting the proposed Uniform Formulary.

## Approach

To predict the effects on cost and utilization of changing the current two-tiered DoD formulary to a three-tiered one, we performed a quantitative analysis of pharmacy claims from a group of private-sector health plans that instituted a similar change in coverage. The purpose of this analysis was to assess the effect of the change in coverage on aggregate costs and utilization of several specific (high-cost) classes of medications and the changes in market share within those classes.

We assembled a unique data set linking health care claims to health plan benefits of 25 Fortune 500 employers for 1999 and 2000. The data were made available under license from Ingenix Inc., a unit of UnitedHealth Group that provides cost-management and benefit consulting services to employers, health plans, pharmaceutical manufacturers, and other groups. The data for these analyses included detailed information on insurance eligibility as well as information on medical and pharmacy claims for employees and retirees and their dependents.

The study sample consisted of 56,840 primary beneficiaries who were continuously enrolled in an employer-provided plan with drug coverage for two years. Because the Ingenix data do not support analysis of seniors age 65 and over, we focused on the behavioral responses of a pre-Medicare population age 45 to 64.

We compared the change in pharmacy costs and use in seven plans that added a third tier during our period of analysis with those in 13 plans that did not change drug benefits during the two-year period (six plans that remained two-tier and seven that had become three-tier plans before the start of our analysis period). We included only two- and three-tier plans because they correspond to the current

TRICARE drug benefit structure and the proposed copayment structure under the Uniform Formulary, respectively.

Our analysis assessed the effects of the benefit design (two-tier versus three-tier) and a number of beneficiary characteristics (such as demographics, illnesses, and type of health coverage) on three measures of the cost of providing pharmacy benefits: total yearly costs per beneficiary (costs to the payer plus costs to the beneficiary), total yearly payer costs per beneficiary, and total yearly enrollee costs per beneficiary.

To examine whether benefit design affects pharmacy costs and pharmacy use differentially across therapeutic drug classes, we performed analyses focusing on each of six high-cost therapeutic classes that together account for more than one-fourth of total drug expenditures: antidepressants, antihypertensives, non-steroidal anti-inflammatory drugs (NSAIDs), oral antihistamines, gastrointestinal agents, and oral hypoglycemics. Finally, we also assessed how copayment tiers affect demand for a particular drug by plotting changes in market shares (of 30-day-equivalent prescriptions and of total pharmacy expenditures) when a specific medication was moved from the second to the third tier.

## Results

Our research results can be summarized as follows:

- Total pharmacy expenditures, defined as plan expenditures plus beneficiary out-of-pocket expenditures, rose more than twice as fast in two-tier plans that did not add a third-tier than in two-tier plans that did add a third tier, although the difference was not statistically significant.
- Plan expenditures rose significantly faster in fixed two-tier plans than in new three-tier plans. The rate of growth in plan expenditures was 19–21 percent in the fixed two-tier plans, compared with 4–6 percent in the new three-tier plans.

- Beneficiary expenditures grew more rapidly in three-tier plans, both new and fixed, than in fixed two-tier plans. Copayment outlays by enrollees increased $7 per member per year during the first year in fixed two-tier plans, $27 per member per year in fixed three-tier plans, and $38 per member per year in new three-tier plans, although the differences were not statistically significant.
- Both total pharmacy expenditures and plan expenditures rose faster in fixed two-tier plans than in fixed three-tier plans, although the difference was seldom statistically significant.
- Adding a third tier was not associated with a significant change in the number of 30-day-equivalent prescriptions that are dispensed or the probability of any pharmacy use.
- The pattern observed in the aggregate analyses was observed for most high-cost therapeutic classes, but not for oral hypoglycemics and gastrointestinal drugs. The finding of no relationship between plan type and oral hypoglycemic expenditures is explained by the fact that none of the plans in our sample placed oral hypoglycemics in the third tier. We could not explain the finding related to gastrointestinal drugs.
- The introduction of a third tier had an even stronger effect on spending at mail-order pharmacies.
- Drug-level analyses showed no consistent relationship between changes in tier status and changes in market share. However, for specific medications in some plans, the fall in market share was precipitous after the drug was moved to the third tier.

## Conclusions, Limitations, and Policy Implications

If the DoD's experience in adopting the Uniform Formulary resembles that of the private-sector civilian plans we analyzed, the cost savings will be substantial. A 15-percentage-point reduction in the rate of growth in DoD spending, for example, would generate savings of nearly $200 million in the TRICARE Senior Pharmacy (TSRx) program in the first year. However, many factors affect the applica-

bility of these results to the TRICARE program; these factors should be carefully considered as the new benefit program is implemented:

- Many pharmacy benefit features other than the number of tiers and copayment levels (some of which are already incorporated into the TRICARE pharmacy benefit) affect pharmacy costs and use, but these factors could not be identified in the Ingenix data set.
- As a federal buyer, the DoD is generally able to negotiate better prices on pharmaceutical products than civilian firms, who are constrained by Medicaid best-price regulations.
- The Ingenix database does not provide information about manufacturer rebates; thus, our findings may underestimate cost savings; we assume manufacturers would be willing to grant such price concessions to the DoD.
- The proposed UF differs in a key respect from the reforms adopted by the civilian plans in that the UF would make non-preferred (third-tier) brands available through the TRICARE Mail Order Pharmacy (TMOP)[1] plan for a copayment of $22 for a 90-day supply, which would limit the utilization-dampening effect of adding a third tier, all other things remaining equal. However, DoD expenditures may decline if utilization shifts from costlier civilian pharmacies to the TMOP.
- For the DoD to achieve the cost savings realized by the civilian-sector employers we studied, the DoD will need to be as aggressive as the average employer in placing drugs in high-cost therapeutic classes in the third tier.

The limitations of this study include the following:

- Although our focus is on the TSRx program, our sample was limited to 45- to 64-year-olds because the Ingenix data set did not support analysis of elderly beneficiaries (age 65 and older).

[1] On March 1, 2003, the Department of Defense National Mail Order Pharmacy (NMOP) program changed to the TRICARE Mail Order Pharmacy (TMOP) program.

The elderly and pre-elderly appear to have similar demands for prescription drugs; however, they differ in other ways that might affect the applicability of our findings.

- The study was limited to a modest number of plans (20), although the number of beneficiaries was large.
- The finding of higher pharmacy spending in plans that had three tiers at the start of the study suggests that some employers may tailor benefits to employee demands.

This study has a number of policy implications for the DoD as well as others who are concerned with pharmacy benefit design:

- To achieve savings without adverse health consequences, the drugs in a particular class should be easily substitutable and thus distinguishable principally on the basis of price.
- The level of administrative restrictions and other financial incentives, such as those that encourage use of TMOP, will also impact the magnitude of savings.
- The transition to the new program raises another important issue. The principal concern here regards the potential for adverse health effects when patients switch from an effective medication to a medication they have not used in the past. To achieve the significant cost savings suggested in this study without adversely impacting health, the DoD Pharmacy & Therapeutics Committee should carefully consider the drugs and drug classes that it places in the nonpreferred third tier. The most heavily scrutinized drugs should be those in the costliest therapeutic classes, which account for a disproportionate share of expenditures.
- Recent growth in pharmacy spending has been largely due to the increased number of prescription drugs dispensed rather than rising drug prices. If this trend continues, changes in benefit structures are likely to play a larger role in reducing the *level* of drug spending than in slowing the *growth* in expenditures.
- TRICARE Management Activity (TMA) policymakers must also consider the critical question of whether lower pharmaceutical use resulting from higher patient cost-sharing adversely af-

fects clinical outcomes and overall medical spending. Several previous studies support concerns about adverse effects. Other studies, by contrast, suggest that the effects of prescription drug cost containment policies are mostly benign. Our study found that adding a third tier did not reduce the probability of pharmacy use, but further study is needed to determine if substitution from nonpreferred to preferred products resulted in adverse health outcomes.

At the time of this writing, Congress is considering enacting legislation to add a prescription drug benefit to the Medicare program. Our findings regarding the effect of multi-tier cost sharing on costs and utilization have implications not only for the TRICARE benefit but also for the Medicare drug benefit.

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# Acronyms

| | |
|---|---|
| ACE | angiotensin converting enzyme |
| AWP | average wholesale price |
| BCF | basic core formulary |
| CMS | Centers for Medicare & Medicaid Services |
| CY | Calendar year |
| DoD | Department of Defense |
| DSCP | Defense Supply Center Philadelphia |
| FDA | U.S. Food and Drug Administration |
| FY | fiscal year |
| GI | gastrointestinal |
| HMG CoA | 3-hydroxy-3 methylglutaryl co-enzyme A |
| ICD-9-CM | *International Classification of Diseases,* Ninth Revision, Clinical Modification |
| MHS | Military Health System |
| MTF | military treatment facility |
| NDAA | *National Defense Authorization Act* |
| NSAID | non-steroidal anti-inflammatory drug |
| OLS | ordinary least squares |
| p-value | probability value |
| P&T | Pharmacy & Therapeutics (Committee) |

| | |
|---|---|
| PDTS | Pharmacy Data Transaction System |
| Rx | Prescription |
| S.E. | standard error |
| TMA | TRICARE Management Activity |
| TMOP | TRICARE Mail Order Pharmacy (program) |
| TSRx | TRICARE Senior Pharmacy (program) |
| UF | Uniform Formulary |
| UW | unweighted |
| VA | Department of Veterans Affairs |
| W | weighted |

CHAPTER ONE

# Introduction

The Department of Defense (DoD) has long allowed elderly military retirees and their dependents to obtain pharmacy benefits from military treatment facilities (MTFs) with no copayment. The *National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2001* directed DoD to expand that benefit to include prescription drugs and medical supplies obtained through retail pharmacies and the DoD's TRICARE Mail-Order Pharmacy (TMOP) program for a nominal copayment. This new program, called TRICARE Senior Pharmacy (TSRx), was implemented on April 1, 2001.

Section 701 of the Act required the Secretary of Defense to establish an effective, efficient, and integrated pharmacy benefits program. A rule that was subsequently proposed and published in the *Federal Register* on April 12, 2002, recommended further that TRICARE's current two-tier copayment structure be replaced by a three-tier Uniform Formulary (UF) that would impose a $22 copayment for non-formulary name-brand (third-tier) medications. In addition, the proposed rule recommends that beneficiaries be allowed to obtain non-formulary agents from the TMOP and from retail (civilian) pharmacies.

To assist DoD in assessing the potential consequences of these policy changes on patterns of drug costs and use under TSRx, the RAND Corporation analyzed data on changes in prescription drug use and costs for a population with employer-sponsored prescription drug benefits plans that underwent similar changes. The data were from Ingenix Inc., a unit of UnitedHealth Group that provides cost-

management and benefit consulting services to employers, health plans, pharmaceutical manufacturers, and others. The aim of the study was to enable DoD to predict how moving from a two-tier pharmacy benefit structure to a three-tier structure would affect medication use and costs in aggregate (for all medications), for selected high-cost therapeutic drug classes, and for specific drugs.

The remainder of this report is organized as follows. Chapter Two provides background on the TRICARE pharmacy benefit and recent trends in pharmacy costs and use in the military and civilian populations. Chapter Three describes our data sources and methods. Chapter Four presents the results of a multivariate model designed to assess the impact of benefit design on pharmacy costs and use in the private sector. Chapter Five presents our conclusions and the implications for utilization and costs under the revised TRICARE pharmacy benefit.

CHAPTER TWO

# Background

The DoD pharmacy benefit covers virtually all U.S. Food and Drug Administration (FDA)–approved prescription medication classes. Exceptions include medications to treat cosmetic conditions resulting from the normal aging process, medications whose sole use is to stimulate hair growth, medications for investigational use, medications for obesity and/or weight reduction, medications for smoking cessation, and some prescription vitamins.

TRICARE beneficiaries can fill their prescriptions at any of four points of service: (1) MTF outpatient pharmacies; (2) the TMOP, currently administered by Express Scripts Inc.; (3) retail "network" pharmacies contracted by regional TRICARE contractors; and (4) out-of-network retail pharmacies. The MTFs and TMOP have closed formularies: They cannot dispense certain name-brand versions of drugs without proof of medical necessity. By contrast, retail pharmacies have open formularies: TRICARE will reimburse for all FDA-approved medications obtained from them (except those classes of drugs not covered by TRICARE).

The DoD Pharmacoeconomic Center estimates that DoD spent approximately $3 billion on outpatient pharmacy items[1] in FY 2002 for all DoD beneficiaries (that is, both active-duty and retired personnel and their dependents and survivors) (Remund, 2003). The

[1] "Outpatient pharmacy items" refers primarily to patient-administered medications and medical supplies such as diabetes test strips and glucometers. Medications administered by a physician, either in a hospital or clinic, usually are not included in outpatient pharmacy databases.

growth in pharmacy spending within DoD in the late 1990s was similar to that in the United States as a whole. Since FY 2000–FY 2001 however, military pharmacy spending has grown much more rapidly than has pharmacy spending by the nation as a whole (see Table 2.1). The acceleration in DoD pharmacy costs appears to be at least partly attributable to the introduction of the TSRx program in April 2001, which expanded access to prescription drugs and increased the number of beneficiaries by nearly 1.5 million (Davies, 2003b).

## The TRICARE Senior Pharmacy Program

The NDAA for FY 2001 authorized the TSRx program, which expanded the locations where elderly military retirees and their dependents and the surviving dependents of deceased military personnel could fill their prescriptions from MTFs only, from the TMOP, and from retail (civilian) pharmacies—both stand-alone pharmacies such

**Table 2.1**
**Growth in Pharmacy Spending**

| Year[a] | DoD | U.S. |
|---|---|---|
| 1996 | 7% | 11% |
| 1997 | 15% | 12% |
| 1998 | 13% | 14% |
| 1999 | 17% | 18% |
| 2000 | 22% | 15% |
| 2001 | 28% | 14% |
| 2002 | 47% | 13%[b] |

SOURCE: For DoD figures: Remund, 2003; for U.S. figures: Strunk, Ginsberg, and Gabel, 2002.

[a]Fiscal years for DoD spending; calendar years for U.S. spending.

[b]Growth in pharmacy spending in 2002 for the United States as a whole is based on data for only the first six months of 2002 compared with the first six months of 2001.

as CVS and Rite-Aid and those within stores such as Wal-Mart and Safeway. All uniformed services beneficiaries who turned 65 before April 1, 2001, are automatically eligible to use the TSRx benefit. Those who turned 65 on or after April 1, 2001, must be enrolled in Medicare Part B in order to use the TSRx benefit. Beneficiaries under the age of 65 are not eligible for the TSRx benefit, even if they are covered by Medicare.

As was the case before TSRx was implemented, elderly military retirees and dependents pay no copayment for pharmacy items obtained from MTFs. When a TSRx beneficiary uses the TMOP, generic items carry a $3 copay per prescription for up to a 90-day supply, and name-brand items carry a $9 copay per prescription for up to a 90-day supply. (The beneficiary does not pay for shipping or handling unless he or she wants expedited shipping.) Items obtained from in-network retail pharmacies carry a $3 copay per prescription for up to a 30-day supply of a generic item and a $9 copay per prescription for up to a 30-day supply of a name-brand item. Items obtained from out-of-network retail pharmacies carry a copay of $9 or 20 percent of the allowable charge, whichever is greater (see Table 2.2). The overwhelming majority of drug store chains are in-network; thus most seniors pay a maximum copay of $9.00 per prescription.

**Table 2.2**
**Current Copay Structure**

| | Generics | Brand Name |
|---|---|---|
| MTF | $0 | $0 |
| TMOP (up to a 90-day supply) | $3 | $9 |
| In-network retail (up to a 30-day supply) | $3 | $9 |
| Out-of-network retail | $9 or 20 percent of total cost (whichever is greater). Existing deductibles apply. | |

## The DoD Formulary System

Although TSRx enrollees can obtain TRICARE-covered drugs at MTFs, as well as through the additional dispensing locations described in the previous section, not all medications are readily available at each dispensing location. The DoD attempts to contain MTFs' pharmacy costs through a centralized formulary called the Basic Core Formulary (BCF). The BCF was established on April 27, 1998, by Health Affairs Policy 98-034, and is maintained by the DoD Pharmacy & Therapeutics (P&T) Committee, which reviews formulary contents quarterly. Currently, most drug classes in the formulary are open: No restrictions are placed on which brands MTFs can offer. However, two therapeutic classes are closed: HMG CoA (3-hydroxy-3 methylglutaryl co-enzyme A) reductase inhibitors (cholesterol-lowering drugs known as "statins") and nonsedating antihistamines. For these two classes, DoD attempts to limit costs system wide by mandating use of one or more preferred brands, a practice sometimes referred to as "committed-use" contracting.[2]

The TMOP formulary, which differs modestly from the BCF, is also determined by the DoD P&T Committee. TMOP provides non-preferred medications only if the provider demonstrates to the satisfaction of the mail-order contractor (Express Scripts Inc.) that such medications are medically necessary.[3] In addition, a small number of medications, including Cycloxygenase-2 (COX-2) inhibitors

[2] All MTF formularies and the TMOP must offer the preferred drug(s) within these classes and may not offer any non-preferred brands. Currently, non-formulary exceptions to MTF formularies require submission and approval of a special request.

[3] *Medical necessity* is determined based on a review of information provided by the beneficiary's provider. According to the DoD Pharmacoeconomic Committee's web site, "Reasons why a specific medication may be considered medically necessary include, but are not limited to: (1) an allergic reaction to the preferred or contracted medication, (2) a side effect or adverse reaction to the preferred or contracted medication, or (3) failure to achieve the desired effect with the preferred or contracted medication." Evidence of medical necessity is obtained from the provider who prescribed the medication.

(anti-inflammatories) and Viagra (sildenafil), require prior authorization before they can be dispensed through the TMOP.[4]

By law, in-network retail TRICARE pharmacies must have an open formulary. They must offer all FDA-approved medications (generics and name brands) except those explicitly excluded by TRICARE (e.g., cosmetic drugs) and must offer all name-brand products for the same copayment ($9 per prescription). However, the managed care contractor may require prior authorization for certain medications. For example, as of June 2003, the managed care support contractor for the TRICARE Northeast Region imposed a prior authorization requirement for Viagra; the systemic antifungals lamisil (terbinafine oral), Sporanox (itraconazole), and Loprox (ciclopirox); the antirheumatic biologic Enbrel (etanercept); the interleukin antagonist Kineret (anakinra); the topical anti-acne/anti-aging treatment Retin-A (tretinoin cream); and fertility agents.

Under the FY 2000 *National Defense Authorization Act*, which established Uniform Formulary parameters, the structure of the DoD formulary will be changed. According to DoD's proposed rule (*Federal Register,* 2002), the current two-tier copayment structure will be replaced by a three-tier structure, under which the copayment for non-formulary name-brand (third-tier) medications would be $22 (see Table 2.3). In addition, the proposed rule stipulates that non-formulary agents must be made available from the TMOP as well as from retail pharmacies. (In the current system, non-formulary drugs are available from retail pharmacies but are available through the TMOP only with proof of medical necessity.) TRICARE Manage-

[4] Prior authorization requirements are designed to ensure that certain drugs are used by targeted beneficiaries for whom the drugs are most cost effective and safe. For example, the TMOP does not provide Viagra to women, men under 18 years of age, patients receiving any form of nitrate therapy, patients with psychogenic erectile dysfunction, or patients with primary erectile dysfunction (i.e., history of inability to ever achieve an erection). Coverage is, however, provided for beneficiaries with organic erectile dysfunction (e.g., diabetes related, vascular related, or drug-induced organic dysfunction), organic erectile dysfunction that is a component of erectile dysfunction (e.g., mixed organic/psychogenic erectile dysfunction), or drug-induced erectile dysfunction where the causative drug cannot be altered or discontinued.

**Table 2.3**
**Proposed Copayment Structure**

| | Tier 1 (Generic) | Tier 2 (Preferred Brands) | Tier 3 (Non-Preferred Brands) |
|---|---|---|---|
| MTF | $0 | $0 | $0 |
| TMOP (up to a 90-day supply) | $3 | $9 | $2 |
| In-network retail (up to a 30-day supply) | $3 | $9 | $22 |
| Out-of-network retail | $9 or 20 percent of total cost (whichever is greater). Existing deductibles apply. | | $22 or 20 percent of total cost (whichever is greater). Existing deductibles apply. |

ment Activity (TMA), the agency that oversees TRICARE, anticipates that only a limited number of items will be deemed nonformulary (Davies, 2003a). Thus, beneficiaries will continue to pay no more than $9 per prescription for most name-brand products.

## Prices Paid by DoD for Outpatient Pharmacy Items

Pharmacy items dispensed through MTFs and the TMOP are purchased at prices negotiated by the Defense Supply Center Philadelphia (DSCP) and the Department of Veterans Affairs (VA) National Acquisition Center. According to the Congressional Research Service, DoD has estimated that prices negotiated by DSCP usually are 24 percent to 70 percent below average wholesale price (AWP) (Yacker, 1999). In contrast, in-network retail pharmacies that dispense to TRICARE beneficiaries are reimbursed at rates negotiated by TRICARE managed care support contractors. These rates typically are much closer to the AWP than are the prices negotiated by the DSCP. In principle, therefore, DoD could reduce its pharmacy acquisition costs by shifting prescribing from retail pharmacies to MTFs and/or the TMOP.

## Pharmacy Costs and Use in the Private Sector

As we have shown, civilian spending on medications has grown significantly over the past five years. The various mechanisms that employer-sponsored health plans have used to respond to this rise in costs may be instructive to DoD.

Imposing closed or highly restrictive formularies, which cover only certain classes of drugs, was one early response. However, excluding specific medications or therapeutic classes led to considerable dissatisfaction among patients and physicians (Penna, 2000). Most private health plans now offer incentive-based formularies, in which drugs are assigned to one of several tiers, based on their cost to the health plan, the number of close substitutes, and other factors (Gabel et al., 2002). Under these arrangements, almost all drugs are covered, but the magnitude of the copayment depends on the tier to which a drug is assigned. Like TRICARE, a few private plans provide two-tier pharmacy plans, with a higher copayment for name-brand drugs than for generics. However, the majority of employer-sponsored pharmacy benefit plans now include at least three copayment levels. These plans typically reserve the first tier for generics, the middle tier for preferred (on-formulary) brands, and the third tier for non-preferred (off-formulary) brands. A small but growing number of plans now include a fourth tier for "lifestyle" drugs such as anti-obesity drugs, baldness treatments, and fertility agents.

A number of studies indicate that adding a copayment tier or increasing copayments or the coinsurance rate substantially reduces health plan payments and overall drug spending. One study estimated that doubling copayments in a one-tier plan reduced annual spending per person by more than 20 percent (Joyce et al., 2002). A different group of researchers found that adding a third tier to the pharmacy benefit offered by a single preferred provider organization reduced the annual rate of increase in pharmacy spending by nearly one-third, with no adverse effects on medication rates in the first year (Motheral and Fairman, 2001). Recent studies on employer-based retiree plans found that more-aggressive cost-sharing requirements were associated with greater use of generic drugs and mail-order

pharmacies (Thomas et al., 2002). Another study of private plans found that tiered copayments were associated with a 6- to 13-percentage-point increase in the market share of preferred brands (Rector et al., 2003).

Although the rise of multi-tier cost sharing has been the most dramatic change in pharmacy benefit design in recent years, other cost-management approaches also are being used, including

- prior authorization requirements, particularly for medications that are prone to abuse, such as OxyContin (oxycodone HCl controlled-release) and Human Growth Hormone
- step therapy requirements, particularly for medications with close substitutes
- physician counter-detailing, whereby health plans send letters to doctors who are low prescribers of generics or distribute generic samples to physicians' offices
- direct-to-consumer counter-advertising, whereby health plans promote generics directly to beneficiaries
- incentives to use mail-order pharmacies, which reduce health plans' drug acquisition costs (due to volume discounts and increased generic substitution) and dispensing costs (due to automation and fewer prescriptions—most mail-order prescriptions provide a 90-day supply, whereas most retail prescriptions provide a 30-day supply).

## Summary

The purpose of this chapter was to provide background on the TRICARE pharmacy benefit and recent trends in pharmacy costs and cost-containment mechanisms in the military and civilian populations. The main points were as follows: DoD pharmacy expenses have been rising rapidly, in part because of the TSRx program; DoD currently uses a variety of mechanisms to restrict access to high-cost drugs, including a two-tier copayment system; DoD has proposed adding a third tier to its copayment structure; and many private

health insurance plans have moved from two tiers to three tiers in recent years, and their experience may be instructive to DoD.[5]

[5] Although "costs," "expenditures" and "expenses" have distinct meanings in most contexts, we use the terms in this report to reflect payments on outpatient prescription drugs.

CHAPTER THREE

# Data Sources and Methods

To gain insights about the potential effect of adding a third tier to the TRICARE pharmacy program, we performed a quantitative analysis of claims data for private-sector health plans, some of which instituted a similar change in coverage. The purpose of this research was to estimate the effect of introducing a third tier to a two-tier plan on pharmacy costs and utilization. We assessed the impact of the change in pharmacy benefit design on aggregate pharmacy costs and utilization and on costs and utilization within six specific high-cost therapeutic classes. We also examined how market shares were affected when one or more agents in a therapeutic class changed from preferred to non-preferred status within a plan.

## Data Sources

We assembled a unique data set linking health care claims to health plan benefits of 25 large (Fortune 500) employers. The data were made available under license from Ingenix Inc.

Data for these analyses are from calendar years 1999 and 2000 and include detailed information on insurance eligibility as well as medical and pharmacy claims for employees and retirees and their dependents. Beneficiary-level data on insurance eligibility include each beneficiary's age, gender, plan type (fee-for-service, preferred-provider organization, point-of-service organization, health maintenance organization), zip code of residence, and relationship to the

sponsor (that is, the insured or a dependent). Claim-level files capture all health care claims and encounters across all settings of care, including inpatient, emergency, and ambulatory services as well as claims for prescription drugs. Drug claims include information on the type of drug (drug name, National Drug Code, dose, number of days' supply); place of purchase (retail or mail-order); and expenditures, including billed charges, negotiated discounts (but not rebates), excluded expenses, deductibles, and copayments and payments made by the employer, employee, and other third-party coverage. Data are also available on prescriptions that cost less than the minimum drug copayment. The medical claims include the same financial information as the drug claims plus the date of service; the *International Classification of Diseases,* Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis and procedure codes; the type of facility; and the type of provider.

The claims data were linked with information about plan benefits. For each plan, RAND obtained photocopies of the summary of benefits provided by the employer to its employees and abstracted the benefit information. The drug benefit design features include copayments or coinsurance rates for both retail and mail-order pharmacies, generic substitution rules, and a list of drugs or drug classes excluded from coverage. Like TRICARE, most plans did not cover "lifestyle" or cosmetic drugs. The medical plan characteristics included individual plan deductibles, co-payments or coinsurance rates for physician office visits, and a binary indicator for enrollment in a managed care plan. No plans had a separate deductible for prescription drugs.

## Study Sample

The study sample consisted of 56,840 primary beneficiaries age 45 to 64 who were continuously enrolled in an employer-provided plan with drug coverage for two years.[1] We compared the change in

[1] To increase sample size and statistical power, some class-level analyses include beneficiaries enrolled in a plan for just one calendar year. These models include binary indicators for indi-

pharmacy costs and use in seven two-tier plans that added a third tier on January 1, 2000, with the change in pharmacy costs and use in 13 plans that did not change drug benefits during the two-year period between January 1, 1999, and December 31, 2000 (see Figure 3.1). We included only two- and three-tier plans because they correspond to the current TRICARE drug benefit structure and the proposed copayment structure under the Uniform Formulary, respectively.

We focused on the behavioral responses of a pre-Medicare population because the Ingenix data do not support analysis of seniors age 65 and older: Only three of the 13 retiree plans in our sample had a three-tier pharmacy benefit. Further, the average third-tier copayment in those plans was only $6 greater than the second-tier copayment—less than half the proposed difference between the second- and third-tier copayments in TRICARE.

Although we excluded elderly beneficiaries from the multivariate models, we compared the average medical expenditures and pharmacy expenditures of a group of elderly beneficiaries with those of 45- to 64-year-olds employed at the same firms (see Appendix A for more information).

Our study sample excluded four plans with a single copayment for all drugs (one-tier plans), one plan with coinsurance for prescription drugs, and several plans that changed the size of copayments but did not alter other aspects of the drug benefit, such as the number of tiers. We also excluded dependents because we could not ascertain that their drug utilization was covered only by the insurance plan in question. Although employees typically had a choice of medical plans, none of the firms in our sample offered a choice of drug plans, thereby minimizing potential bias from selection of drug plans based on anticipated use.

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viduals who entered or exited the plan at the beginning or at the end of the calendar year, respectively.

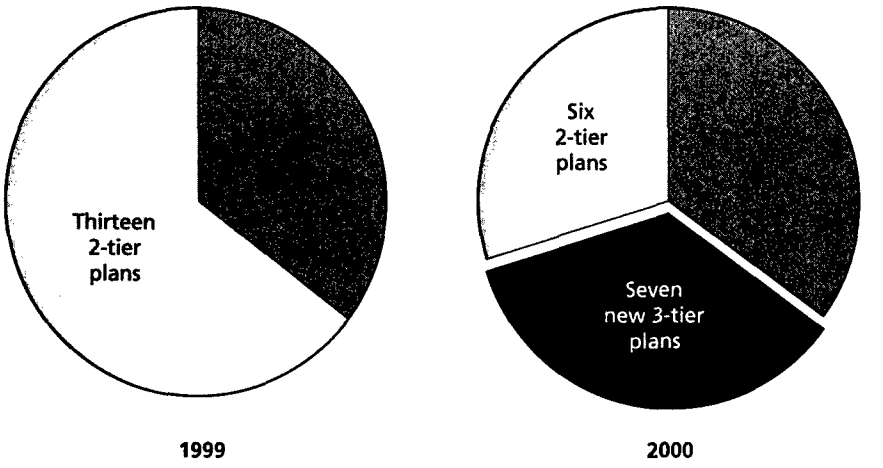


**Figure 3.1—Distribution of Pharmacy Benefits in 20 Employer-Provided Health Plans, 1999–2000**

SOURCE: Ingenix Inc. data for 1999–2000.

## Data Cleaning

The analysis excludes health plans with less than 1,000 enrollees in total and plans with incomplete information on drug claims (e.g. missing national drug codes). In a small percent of cases, pharmacy claims were deleted, recoded, or otherwise transformed to compensate for extreme outliers.

## Dependent and Explanatory Variables

In this section, we describe the dependent and explanatory variables that we used in our multivariate regression equations.

### Dependent Variables

The main focus of our analysis was to explain how pharmacy plan characteristics affect the cost of providing pharmacy benefits to bene-

ficiaries. We defined pharmacy costs in three ways: (1) total costs per beneficiary per year, including payments made by both the beneficiary (copayments, deductibles, excluded expenses) and all third-party payers; (2) plan costs per beneficiary per year, including payments by the payer but excluding payments by beneficiaries; and (3) enrollee costs per beneficiary per year, including payments by enrollees but excluding payments by plans. We also performed analyses of utilization, defined in two ways: (1) the number of 30-day-equivalent prescriptions per beneficiary per year[2] and (2) any pharmacy use, defined as a dichotomous variable where 1 = yes and 0 = no. We also examined mail-order costs and use, defined as total expenditures on outpatient prescription drugs obtained through the mail. The dependent variables selected for analysis are listed in Table 3.1.

### Explanatory Variables

The main independent variables in the multivariate models were the plan types. We included one dichotomous variable to represent plans that switched from two tiers to three and another dichotomous variable to represent fixed three-tier plans. Fixed two-tier plans were the reference group. We interacted these variables with a binary indicator for the year 2000 to assess differences in pharmacy spending or use in three-tier plans as compared with two-tier plans.

**Table 3.1**
**Dependent Variables Used in the Analysis**

| |
|---|
| Total annual pharmacy expenditures |
| Payments made by both beneficiaries and plans |
| Payments made by plans only |
| Payments made by beneficiaries only |
| Number of 30-day-equivalent prescriptions |
| Any pharmacy use (yes or no) |
| Total annual mail-order pharmacy expenditures |

[2] For these analyses, all pharmacy claims in excess of 30 days—typically mail-order transactions—were converted to their 30-day equivalents.

The other covariates included a set of variables to describe the beneficiary's medical and pharmacy benefits, including the medical deductible, the copayment or coinsurance rate for a physician office visit, a binary indicator for enrollment in a managed care plan, and a binary indicator for enrollment in a pharmacy plan with a mandatory generic substitution requirement. Other independent variables were age categories, gender, urban residence, median household income in the zip code of residence, and 28 binary indicators for chronic conditions (see Table 3.2). Chronic conditions were identified using an updated version of the Chronic Disease Score, which identifies conditions based on the prescription drugs that patients fill during the calendar year (von Korff, Wagner, and Saunders, 1992). We selected these variables, which are listed in Table 3.3, because they might be correlated with plan type as well as pharmacy costs.

**Table 3.2**
**Chronic Conditions Used as Independent Variables in the Analysis**

| | |
|---|---|
| Cystic fibrosis | Hyperlipidemia/hypercholesteremia |
| Human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) | Irritable bowel syndrome |
| Anxiety and tension | Liver failure |
| Asthma/chronic obstructive pulmonary disease | Malignancies |
| Bipolar disorder | Migraine headache |
| Cardiac disease | Pain and inflammation |
| Coronary artery/peripheral vascular disease | Parkinson's disease |
| Depression | Psychotic illness |
| Diabetes | Renal disease |
| Epilepsy | Rheumatoid arthritis/osteoarthritis |
| Gastric acid disorder | Thyroid disorder |
| Glaucoma | Transplant |
| Gout | Tuberculosis |

**Table 3.3**
**Covariates Included in Multivariate Models of Pharmacy Costs and Use**

| | |
|---|---|
| Patient and Area Characteristics | Indicators of 28 chronic diseases |
| Age (45–54 or 55–64) | Medical and Pharmacy Benefits |
| Gender (male or female) | Plan type (managed care or not) |
| Geographic region | Medical plan deductible |
| Median income in zip code | Office visit copayment/coinsurance |
| Urban residence (urban or not) | Mandatory generic substitution (yes or no) |

## Statistical Techniques

The goal of our analyses was to evaluate the impact of adding a third tier to a two-tier plan on pharmacy costs and utilization. To this end, we compared the change in pharmacy costs and utilization across different plans, a method known as "difference-in-differences." A useful framework for this approach is provided by Table 3.4, where $a_1$, $a_2$, $b_1$, $b_2$, $c_1$, and $c_2$ represent expenditures or utilization per beneficiary, per year, in each cell.

A simple test for the magnitude of the effect of adding a third tier is whether pharmacy spending or utilization in new three-tier plans declined between 1999 and 2000, which can be expressed as $a_2 - a_1 < 0$. This test is of limited value in an environment where pharmaceutical prices and per capita utilization of prescription drugs are rising rapidly.

**Table 3.4**
**Framework of Difference-in-Differences Methodology**

| | Costs/Utilization Per Member Per Year | |
|---|---|---|
| **Plan Type** | **1999** | **2000** |
| New three-tier | $a_1$ | $a_2$ |
| Fixed two-tier (Control) | $b_1$ | $b_2$ |
| Fixed three-tier (Control) | $c_1$ | $c_2$ |

A second simple test for the magnitude of the effect of adding a third tier is whether per-member pharmacy spending or utilization is lower in plans that added a third tier in 2000 than it is in two- and three-tier plans that did not change drug benefits, or $a_2 - b_2 < 0$ and $a_2 - c_2 < 0$. However, this test will provide a consistent estimate of the effect of adding a third tier only if there are no important differences between the plan types other than the change in drug benefits. For example, if the proportion of the population that has a serious chronic illness is significantly higher in plans that added a third tier in 2000 than in plans with fixed benefits, the estimates $a_2 - b_2$ and $a_2 - c_2$ would likely understate the cost-reducing effect of adding a third tier.

A superior test, the one we used in our analyses, is to determine whether the *increases* in per-member pharmacy expenditures and utilization were lower in plans that added a third tier in 2000 than in plans that did not change drug benefits—i.e., $(a_2 - a_1) - (b_2 - b_1) < 0$ and $(a_2 - a_1) - (c_2 - c_1) < 0$. These estimates are consistent under the assumption that the changes in pharmacy expenditures and utilization over time within a plan type (e.g., new three-tier plans) are uncorrelated with differences between that plan type and the comparison plan type (e.g., fixed two-tier plans), except with respect to the change in pharmacy benefits.

Similarly, we estimated the effect of adding a third tier on pharmacy spending and utilization in later years by comparing plans with a fixed three-tier benefit to plans with a fixed two-tier benefit. This comparison revealed whether plans that added a third tier prior to 1999, but did not change drug benefits between 1999 and 2000, experienced a lower rate of increase in pharmacy spending and utilization than two-tier plans with fixed benefits in 1999 and 2000—i.e., $(c_2 - c_1) - (b_2 - b_1) < 0$.

We implemented this approach by estimating the following equation:

$$(1) Y_{IJT} = \beta_0 + \beta_1 (\text{Yr2000}) + \beta_2 (\text{New three-tier}) + \beta_3 (\text{Fixed three-tier}) + \beta_4 (\text{Yr2000} \times \text{New three-tier}) + \beta_5 (\text{Yr2000} \times \text{Fixed three-tier}) + \beta_6 X_{IJT} + \beta_7 Z_{JT} + \beta_{IT}$$

where $Y_{IJT}$ is total pharmacy expenditures for person i, in plan j, in year t; Yr2000 is a binary indicator that equals 1 in the year 2000 and 0 otherwise; *New three-tier* is a binary indicator for plans that added a third tier in 2000; *Fixed three-tier* is a binary indicator for three-tier plans that did not change pharmacy benefits between 1999 and 2000; $X_{IJT}$ is the vector of patient and area characteristics described above; and $Z_{IJT}$ is a vector of the medical and pharmacy covariates described above.

The coefficient $\beta_1$ captures the average increase in pharmacy spending between 1999 and 2000 in fixed two-tier plans; the coefficients $\beta_2$ and $\beta_3$ measure the difference in the level of pharmacy spending in new three-tier plans and fixed three-tier plans, respectively, compared with fixed two-tier plans. The key parameter of interest is $\beta_4$, which is our adjusted estimate of the difference in pharmacy spending or use in new three-tier plans compared with fixed two-tier plans. The coefficient $\beta_5$ measures the difference in pharmacy spending or use in fixed three-tier plans compared with fixed two-tier plans.

## Model Specifications

We used a number of different model specifications, depending on which dependent variable was being assessed. When modeling expenditures, we used ordinary least squares (OLS), using the logarithmic transformation of expenditures to minimize the observed skewness of the data. We used negative binomial models when the dependent variable was the number of prescriptions.[3] We used a probit regression when the dependent variable was a binary indicator for any pharmacy use. These statistical techniques are summarized in Table 3.5.

[3] The negative binomial is a generalization of the Poisson model that is appropriate when there is overdispersion of the data (i.e., when the conditional variance of the distribution exceeds the conditional mean). By allowing for overdispersion, the negative binomial helps to account for unobserved heterogeneity among the individuals in the study.

**Table 3.5**
**Model Specifications**

| Dependent Variable | Model Specification |
|---|---|
| Total annual pharmacy expenditures | |
| Natural log of payments made by both beneficiaries and plans | OLS |
| Natural log of payments made by plans only | OLS |
| Natural log of payments made by beneficiaries only | OLS |
| Number of 30-day equivalent prescriptions | Negative binomial |
| Any pharmacy use (yes or no) | Probit |
| Total annual mail-order pharmacy expenditures | OLS |

We estimated every model, both unweighted and weighted, where the weight assigned to each individual was the reciprocal of the number of enrollees in the plan. This gave each plan equal weight and thus moderated the effects of larger plans. We adjusted the standard errors in all specifications for clustering of patients within plans (Huber, 1964; Berk, 1990).

## Class-Level Analyses

To examine whether benefit design affects pharmacy costs and use differentially across therapeutic drug classes, we performed analyses focusing on each of six high-cost therapeutic classes that together account for more than one-fourth of total drug expenditures: antidepressants, antihypertensives, non-steroidal anti-inflammatory drugs (NSAIDs), oral antihistamines, gastrointestinal agents, and oral hypoglycemics. We identified the set of drugs that belong to these classes based on the American Hospital Formulary System Pharmacologic-Therapeutic classification system.

## Drug-Level Analyses

We also assessed how copayment tiers affect demand for a particular drug by plotting changes in market shares when a specific medication was moved from the second to the third tier. For these analyses, market share was defined in two ways: share of 30-day-equivalent prescriptions and share of total pharmacy expenditures within the class. We relied on visual inspection of the plots rather than formal statistical tests to determine if tier shifts were associated with changes in market share. Drugs within four high-cost therapeutic classes—antihyperlipidemics, gastrointestinals, antihistamines, and Angiotensin Converting Enzyme (ACE) inhibitors—were the focus of this analysis. For the drug-level analyses only, we incorporated Ingenix data from 1998.[4]

[4] Due to time constraints, we used only 1999 and 2000 data in the multivariate analyses. Given our difference-in-differences framework, adding an additional year, 1998, would have made interpretation of the regression results more difficult.

CHAPTER FOUR

# Analysis Results

This chapter describes the results of our analyses of the effect of pharmacy benefit design changes on pharmacy use and costs. These results were generated by applying the analysis techniques described in the preceding chapter.

For exposition, we categorize pharmacy benefits into one experimental group and two sets of control groups. The experimental group consists of seven plans that added a third tier to their existing two-tier benefit on January 1, 2000 ("new three-tier plans"). We compare the change in pharmacy costs and use in these plans to those of two control groups: six two-tier plans that did not change their drug benefit between 1999 and 2000 ("fixed two-tier plans") and the seven three-tier plans that added a third tier prior to 1999 and did not change benefits between 1999 and 2000 ("fixed three-tier plans").

## Descriptive Statistics

Mean copayments in 2000 by type of plan are presented in Table 4.1 for our sample of 20 plans. Enrollees in fixed two-tier plans paid $5 on average for generic drugs and $15 for name-brand medications. In 2000, new three-tier plans had average copayments of $5, $13, and $26, for first, second, and third tiers, respectively. The $13 difference in average copayments between the second and third tiers in

**Table 4.1**
**Mean Copayments by Plan Type, 1999 and 2000**

| Type of Plan | Description | Generic Status of Drug | | |
|---|---|---|---|---|
| | | Generic | Preferred Brand | Nonpreferred Brand |
| Fixed two-tier (n = 6) | Separate copayments for generic and brand-name drugs | $5 | $15 | $15 |
| Fixed three-tier (n = 7) | Separate copayments for generic, preferred brand, and non-preferred brand drugs | $6 | $11 | $21 |
| New three-tier (n = 7) | Adds highest copay for nonpreferred brands | $5 | $13 | $26[a] |

SOURCE: Ingenix Inc. data, 1999–2000.

[a]The third-tier copayment in new three-tier plans averaged $26 in 2000; these plans did not have a third tier in 1999.

our sample is exactly equal to the difference in copayments between tiers two and three under the proposed Uniform Formulary (that is, $9 for second-tier drugs versus $22 for third-tier drugs).

## How Does Civilian Population Pharmacy Use Compare with Use by TRICARE Non–Active-Duty Beneficiaries?

Before we extrapolate the experience of the civilian sector to the TRICARE program, it is important to understand how the two beneficiary populations differ. A comparison between the Ingenix data from calendar year (CY) 2000 and Pharmacy Data Transaction System (PDTS) data for non-active-duty TRICARE beneficiaries from FY 2002 indicated that civilian beneficiaries age 45 to 64 with private drug coverage use more outpatient prescription drugs than does the average non-active-duty TRICARE beneficiary of similar age (in FY 2002). Further, the percentage of enrollees filling one or more prescriptions in the civilian sector (81 percent) is substantially larger than the percentage of TRICARE beneficiaries (54 percent) (see Table 4.2).

**Table 4.2**
**Pharmacy Use Among 45- to 64-Year-Olds in TRICARE and Private-Sector Plans**

| | Non-Active-Duty TRICARE Beneficiaries (FY 2002)[b] | Privately Insured Civilians (CY 2000) |
|---|---|---|
| Number of 30-day prescriptions, per member per year (PMPY) | 18 | 24 |
| % Generic[a] | 34 | 33 |
| % Single-source brand[a] | 51 | 55 |
| % Multi-source[a] brand | 15 | 13 |
| Number of 30-day prescriptions PMPY, conditional upon use | 33 | 30 |
| Users, percent | 54 | 81 |
| Male, percent | 50 | 59 |
| Average Age | 56 | 54 |

SOURCE: Data on TRICARE beneficiaries are from the PDTS for FY 2002. Data on pharmacy costs and use in the private sector are from Ingenix Inc., 2000.

[a]The PDTS may understate generic use and overstate brand use. This may occur when the DoD is able to purchase a brand-name drug at a lower unit cost than its generic equivalent (personal communication with Col. William Davies, DoD Pharmacy Program Director, 2003).

[b]Data excludes paper (hard-copy) pharmacy claims, which represent a very small fraction of total claims.

There are two plausible explanations for why pharmacy use is substantially higher in our sample of civilian beneficiaries with employer-sponsored coverage. One hypothesis is that TRICARE members are healthier on average than the comparable civilian population. If so, our ability to control for differences in case mix based on the number of chronic diseases will mitigate potential biases in the multivariate analyses. A second possibility is that TRICARE enrollees are more likely to have supplemental drug coverage. If that is so, then observed differences in pharmacy use would simply reflect the absence of pharmacy claims filed with other insurers rather than large differences in use that might limit our ability to draw inferences across military and civilian populations. These explanations are not mutually exclusive.

## How Do Pharmacy Costs and Use Differ by Type of Drug Benefit?

The impact of benefit design on pharmacy spending and use is presented in Table 4.3, unadjusted for differences in the characteristics

**Table 4.3**
**Average Pharmacy Spending and Use per Member, per Year, 1999**

| | New Three-Tier (n = 7) | Fixed Two-Tier (n = 6) | Fixed Three-Tier (n = 7) |
|---|---|---|---|
| Pharmacy Spending, PMPY | | | |
| Total | $809[a] | $704 | $1,086[a] |
| Plan | $632[a] | $526 | $844[a] |
| Patient | $177 | $177 | $242[a] |
| Pharmacy Use, PMPY | | | |
| Number of Prescriptions[c] | 18[a] | 16 | 23[a] |
| % Users | 74[b] | 73 | 84[b] |
| % Generic prescriptions | 33[b] | 29 | 35[b] |
| Average Cost per Prescription | $46 | $45 | $46 |
| Member Characteristics | | | |
| Age (years) | 53 | 53 | 53 |
| % Male | 70[b] | 75 | 43[b] |
| Number of chronic diseases | 1.4 | 1.4 | 1.9[b] |
| Area Characteristics | | | |
| % Northeast | 19[b] | 7 | 13[b] |
| % Midwest | 33[b] | 7 | 39[b] |
| % South | 34[b] | 72 | 41[b] |
| % West | 14 | 15 | 7[b] |
| % Urban area of residence | 64 | 64 | 8[b] |
| Median Household Income in Zip Code ($) | 34,468[a] | 36,185 | 36,987[a] |
| Plan Characteristics | | | |
| Number of enrollees | 15,615 | 7,844 | 33,381 |

SOURCE: Ingenix Inc. data, 1999. NOTES: Data are for enrollees age 45–64. Numbers may not sum to 100 due to rounding.

[a]Difference with fixed two-tier plan is statistically significant by an analysis of variance (ANOVA) test ($p \leq 0.05$).

[b]Difference with fixed two-tier plan is statistically significant by a chi-squared test ($p \leq 0.05$)

[c]30-day equivalent prescriptions.

of patients enrolled in each plan. In 1999, annual pharmacy spending averaged $809 per person in two-tier plans that added a third tier in 2000 (new three-tier plans). By contrast, mean spending in fixed two-tier plans was $704 per person. The difference in spending corresponds to about two additional prescriptions per member per year. Enrollees in the three plan types had similar demographic characteristics, although fixed two-tier plans were more heavily concentrated in the South. Despite higher spending overall in new three-tier plans, patient out-of-pocket expenses averaged $177 in both new three-tier and fixed two-tier plans.

Mean pharmacy spending in fixed three-tier plans in 1999 was $1,086, which is considerably higher than in the other plan types. The average enrollee in a fixed three-tier plan obtained 23 prescriptions in 1999, compared with only 16 in fixed two-tier plans and 18 in new three-tier plans. Some of the variation in pharmacy costs and use across plan types appears to be attributable to differences in patient demographics and health status: Enrollees in fixed three-tier plans differed from those in the two other plan types. For example, the prevalence of chronic illness among enrollees in fixed three-tier plans was 35 percent higher than among enrollees in the other plan types in 1999.[1]

Unadjusted pharmacy costs and utilization for the two years we studied (1999 and 2000) are shown in Table 4.4. Of the three plan types, new three-tier plans had the smallest increase in total pharmacy spending but the largest increase in the number of prescriptions. The most likely explanation is that enrollees in the plans that added a third tier were more likely than enrollees in the fixed plans to substitute low-cost medications for high-cost medications. Consistent with this explanation, the cost per prescription in new three-tier plans increased by $2.68 between 1999 and 2000, compared with increases of $5.50 and $3.63 in fixed two- and three-tier plans, respectively.

[1] The difference was statistically significant between fixed two-tier and fixed three-tier plans but not between fixed two-tier and new three-tier plans.

**Table 4.4**
**Average Pharmacy Costs and Use by Plan Type and Year, 1999–2000**

| | New Three-Tier (n = 7) | Fixed Two-Tier (n = 6) | Fixed Three-Tier (n = 7) |
|---|---|---|---|
| Total Pharmacy Spending (PMPY) | | | |
| 1999 | $809 | $704 | $1,086 |
| 2000 | $934 | $831 | $1,261 |
| Difference | $125 | $127 | $175 |
| % change (arithmetic) | 15.5 | 18.0 | 16.1 |
| % change (geometric)[a] | 9.1 | 15.6 | 17.4 |
| Plan Pharmacy Spending (PMPY) | | | |
| 1999 | $632 | $526 | $844 |
| 2000 | $716 | $630 | $987 |
| Difference | $84 | $104 | $143 |
| % Change (arithmetic) | 13.3 | 19.8 | 16.9 |
| % Change (geometric)[a] | 7.3 | 21.5 | 25.5 |
| Beneficiary Pharmacy Spending (PMPY) | | | |
| 1999 | $177 | $177 | $242 |
| 2000 | $218 | $201 | $274 |
| Difference | $41 | $23 | $32 |
| % change (arithmetic) | 23.2 | 12.4 | 13.2 |
| Number of Prescriptions[b] (PMPY) | | | |
| 1999 | 17.6 | 15.8 | 23.4 |
| 2000 | 19.2 | 16.6 | 25.2 |
| Difference | 1.6 | 0.8 | 1.8 |
| % change (arithmetic) | 9.1 | 5.1 | 7.7 |
| Cost per Prescription (PMPY) | | | |
| 1999 | $45.97 | $44.56 | $46.41 |
| 2000 | $48.65 | $50.06 | $50.04 |
| Difference | $2.68 | $5.50 | $3.63 |
| % change (arithmetic) | 5.8 | 12.3 | 7.8 |
| % Generic Prescriptions[b] | | | |
| 1999 | 32.4 | 29.9 | 34.3 |
| 2000 | 32.7 | 29.0 | 33.2 |

SOURCE: Ingenix Inc. data, 1999–2000.

NOTES: Data are for enrollees age 45–64.
Numbers may not sum to 100 due to rounding.

[a]We also report percentage changes in geometric means for total pharmacy spending and plan pharmacy spending because these data are highly skewed.

[b]30-day equivalent prescriptions.

Change in pharmacy spending for six high-cost therapeutic classes is shown in Table 4.5. Because the fraction of enrollees with one or more pharmacy claims in a therapeutic class varies significantly across plans, the dollar amounts reported in Table 4.5 reflect average annual spending per enrollee conditional upon use. Across all six therapeutic classes, pharmacy spending increased most slowly in two-tier plans that added a third tier in 2000. However, there was considerable variation across classes. Spending on antihypertensives actually declined in fixed two-tier plans among users of these medications, while rising modestly in three-tier plans. Expenditures on oral hypoglycemics rose at double-digit rates in the three plan types, but at a modestly slower rate in fixed two-tier plans. As discussed in the next section in the context of the multivariate analyses, this result is not surprising given that none of the three-tier plans placed oral hypoglycemic drugs in the third tier.

## Multivariate Analyses

As discussed in the preceding chapter, our analytic strategy was to compare the change in pharmacy spending and utilization between 1999 and 2000 in two-tier plans that added a third tier to those of two- and three-tier plans that did not change drug benefits during this time period. We adjusted for patient demographics, area characteristics, prevalence of chronic disease, and medical and pharmacy benefit design characteristics. Our multivariate analyses examined costs and utilization in the aggregate and within six high-cost therapeutic classes.

### Aggregate Analyses

The impact of drug benefit design on the growth in pharmacy spending between 1999 and 2000 is reported in Table 4.6. After adjusting for patient, plan, and area characteristics, overall spending on outpatient prescription drugs increased 13 to 15 percent in fixed two-tier plans (see Columns 1 and 2). This estimate is similar to national

**Table 4.5**
**Change in Pharmacy Costs for Selected Therapeutic Classes, 1999–2000**

| | Plan Type | | |
|---|---|---|---|
| Therapeutic Class | New Three-Tier (n = 7) | Fixed Two-Tier (n = 6) | Fixed Three-Tier (n = 7) |
| Antidepressant costs | | | |
| 1999 | $524 | $391 | $520 |
| 2000 | $547 | $439 | $552 |
| Difference | $23 | $48 | $32 |
| % change | 4.5 | 12.3 | 6.0 |
| Antihypertensive costs | | | |
| 1999 | $648 | $615 | $602 |
| 2000 | $684 | $598 | $645 |
| Difference | $36 | ($17) | $43 |
| % change | 5.7 | –2.7 | 7.1 |
| NSAID costs | | | |
| 1999 | $178 | $169 | $196 |
| 2000 | $225 | $218 | $245 |
| Difference | $47 | $49 | $49 |
| % change | 26.5 | 28.9 | 24.9 |
| Oral antihistamine costs | | | |
| 1999 | $232 | $168 | $194 |
| 2000 | $250 | $191 | $228 |
| Difference | $18 | $23 | $34 |
| % change | 7.7 | 13.6 | 17.4 |
| Gastrointestinal costs | | | |
| 1999 | $677 | $617 | $659 |
| 2000 | $691 | $640 | $673 |
| Difference | $14 | $23 | $14 |
| % change | 2.2 | 3.7 | 2.1 |
| Oral hypoglycemic costs | | | |
| 1999 | $745 | $686 | $685 |
| 2000 | $847 | $757 | $772 |
| Difference | $102 | $71 | $87 |
| % change | 13.6 | 10.3 | 12.7 |

NOTE: Dollar amounts reflect mean total spending per member per year, conditional upon having one or more pharmacy claims in the therapeutic class.

estimates of pharmacy spending growth in 2000 (see Table 2.1 in Chapter Two). With respect to total pharmacy spending, the growth rate in fixed two-tier plans was more than twice as high as the rate of growth in new three-tier plans, although the difference was not statistically significant ($p = 0.11$ in unweighted analysis; $p = 0.14$ in weighted analysis). With respect to plan pharmacy spending, the growth rate in fixed two-tier plans (19–21 percent) was three to five times higher than the growth rate in new three-tier plans (4–6 percent). This difference was statistically significant ($p = 0.00$ in unweighted analysis; $p = 0.00$ in weighted analysis). The introduction of a third tier was associated with increases in patient out-of-pocket expenses. Payments made by beneficiaries increased by $7–$10 in fixed two-tier plans compared with $37–$38 in new three-tier plans.[2]

Pharmacy spending in fixed three-tier plans increased somewhat more slowly than in fixed two-tier plans, suggesting that adding a

**Table 4.6**
**Predicted Increase in Pharmacy Spending by Plan Type, 1999–2000**

| | % Change in Total Spending (p-value) | | % Change in Plan Spending (p-value) | | Change in Beneficiary Spending per Member per Year (p-value) | |
|---|---|---|---|---|---|---|
| | (1) UW | (2) W[a] | (3) UW | (4) W[a] | (5) UW | (6) W[a] |
| Fixed two-tier | 13 | 15 | 19 | 21 | $10 | $7 |
| Fixed three-tier | 8 (0.19) | 8 (0.07) | 8 (0.04) | 13 (0.10) | $42 (0.09) | $27 (0.15) |
| New three-tier | 6 (0.11) | 6 (.14) | 6 (0.00) | 4 (0.00) | $37 (0.29) | $38 (0.17) |

SOURCE: Ingenix Inc. data, 1999–2000.

NOTE: UW = unweighted; W = weighted.

[a]Each plan receives equal weight in weighted regression models. P-values comparing fixed and new three-tier plans with fixed two-tier plans (the reference group) are in parentheses. Total spending reflects the sum of payments made by the health plan, the beneficiary, and other third-party payers.

[2] We estimated changes in beneficiaries' out-of-pocket expenses using untransformed expenditures because the data were not highly skewed.

third tier may reduce spending growth modestly in later years. However, in most specifications, this difference was not statistically significant (p-values range between 0.04 and 0.19).

Several covariates affected pharmacy spending. Total pharmacy expenses (plan expenditures plus beneficiary expenditures) for men were 15–24 percent lower than those for women after adjusting for other factors. Total pharmacy spending was inversely related to coinsurance rates for physician office visits, although total drug spending was similar in managed care and non-managed care plans. Pharmacy expenditures were modestly higher than average in the Midwest and South and in higher-income zip codes. Most of the coefficients in the models that took into account only plan spending were similar to the analogous model of total pharmacy spending.

The slower expenditure growth observed in new three-tier plans may be due to a reduction in the number of prescriptions or, alternatively, the substitution of generic and lower-cost brands for non–preferred-brand drugs. To investigate the composition of spending changes, we applied the difference-in-differences approach to the number of pharmacy claims. As discussed in Chapter Three, we used negative binomial models to estimate the impact of pharmacy design on numbers of prescriptions.

In contrast to our findings on expenditures, we found no significant difference in numbers of prescriptions by plan type (see Tables B.9 and B.10 in Appendix B). This finding suggests that slower growth in spending in three-tier versus two-tier plans was achieved by substituting generic and lower-cost name-brand medications for more expensive drugs rather than discontinuing use or failing to start drug therapy. In related probit analyses, we found no significant difference across plan types in changes in the likelihood of filing a pharmacy claim (see Tables B.7 and B.8).

We also examined the relationship between plan types and spending at mail-order pharmacies (see Tables B.11 and B.12). The results were similar to the relationship between plan types and spending at retail pharmacies, although even stronger. Spending at mail-order pharmacies increased by 11 percent to 12 percent between 1999 and 2000 in fixed two-tier plans. In contrast, expenses rose just

3 percent to 4 percent in fixed three-tier plans and 0 percent to 2 percent in new three-tier plans. Complete regression results of all these multivariate analyses are presented in Appendix B.

### Class-Level Analyses

The general pattern observed in the aggregate analyses was seen for most of the therapeutic classes we assessed (see Figure 4.1). In four of the therapeutic classes, total pharmacy spending increased most rapidly in fixed two-tier plans and most slowly in new three-tier plans. For example, total spending on antidepressants increased 15 percent in fixed two-tier plans versus 4 percent in new three-tier plans. Similarly, total spending on antihistamines increased by 20 percent in fixed two-tier plans and by just 5 percent in new three-tier plans. The coefficients in the models that assessed plan-only spending were similar. However, in most cases, the coefficients in both the total-spending and plan-spending models were not statistically significant at conventional levels.

These patterns were not evident for two of the therapeutic classes: gastrointestinal (GI) and oral hypoglycemic agents (i.e., antidiabetes drugs). The growth in total and plan-only spending on GI medications was highest in fixed two-tier plans, but, contrary to the aggregate results, it was lower in fixed three-tier plans than it was in new three-tier plans. We also found that copayment structure had no effect on total or plan spending for hypoglycemic agents. Although this finding surprised us initially, further analyses revealed that no oral hypoglycemic agents were placed in the third tier. There was no readily identifiable explanation in the case of GI drugs. Complete results of the weighted class-level regressions are in Appendix C.

### Drug-Level Analyses

In addition to aggregate and class-level analyses, we examined how market shares changed when specific agents were changed from preferred to non-preferred status within one or more plans. In some cases, switching a drug from second to third tier was associated with a sudden and dramatic change in market share. For example, one plan

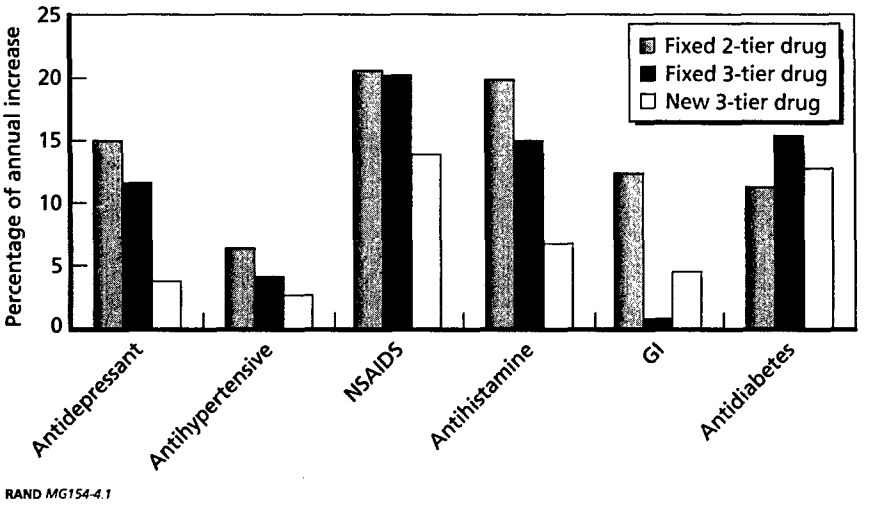


**Figure 4.1—Predicted Change in Total Pharmacy Spending by Therapeutic Class, 2000**

SOURCE: Ingenix Inc. data for 1999–2000.

saw Prilosec's (omeprazole's) proportion of prescriptions within the gastrointestinal class decline from about 70 percent in the month prior to the tier shift to about 40 percent (see Figure 4.2). The same plan saw Zocor's (simvastatin's) proportion of prescriptions in the antihyperlipidemic class decline from more than 30 percent to less than 15 percent within a few months of a change from preferred to non-preferred status. However, other plans saw little change in the market shares of omeprazole and simvastatin after moving them to the third tier (see Figure 4.3). Similarly, patterns of antihistamine use in two plans that moved Allegra (fexofenadine) to the third tier were similar to those observed in four plans that did not change fexofenadine's tier status (see Figure 4.4). When we defined market share in terms of total pharmacy expenditures rather than number of prescriptions, the results (not shown) were virtually the same. The inconsistent relationship between tier changes and market share observed for omeprazole, simvastatin, and fexofenadine was also

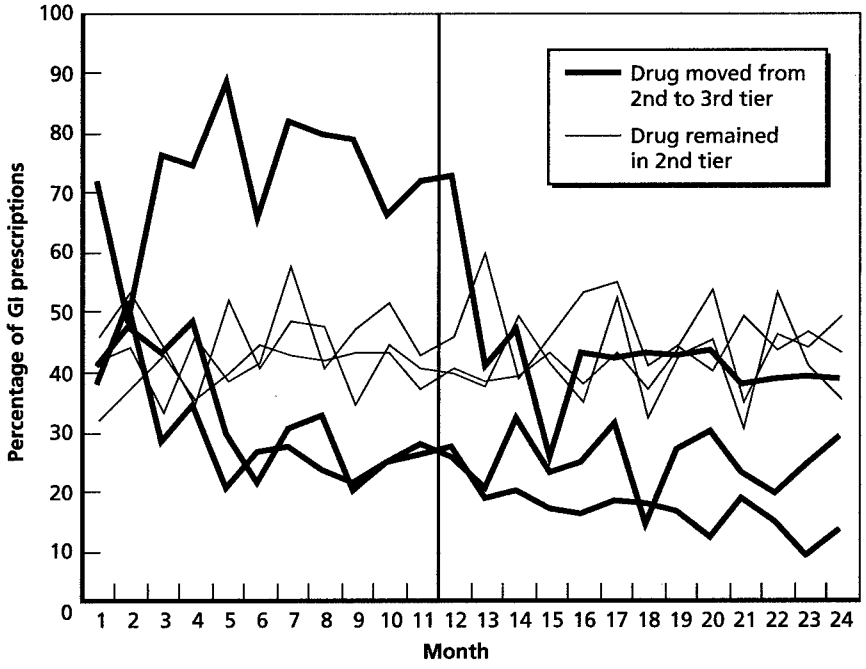


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**Figure 4.2—Effect of Moving Prilosec (Omeprazole) from Second to Third Tier**

observed for other drugs, including the antihyperlipidemic Lipitor (atorvastatin), the GI drug Prevacid (lansoprazole), and the antihistamine Zyrtec (cetirizine HCl) (results not shown).

## Summary

Our analyses of Ingenix Inc. data focused on the impact of pharmacy design changes—primarily the introduction of a third tier to a two-tier plan—on pharmacy costs and utilization. Our results can be summarized as follows:

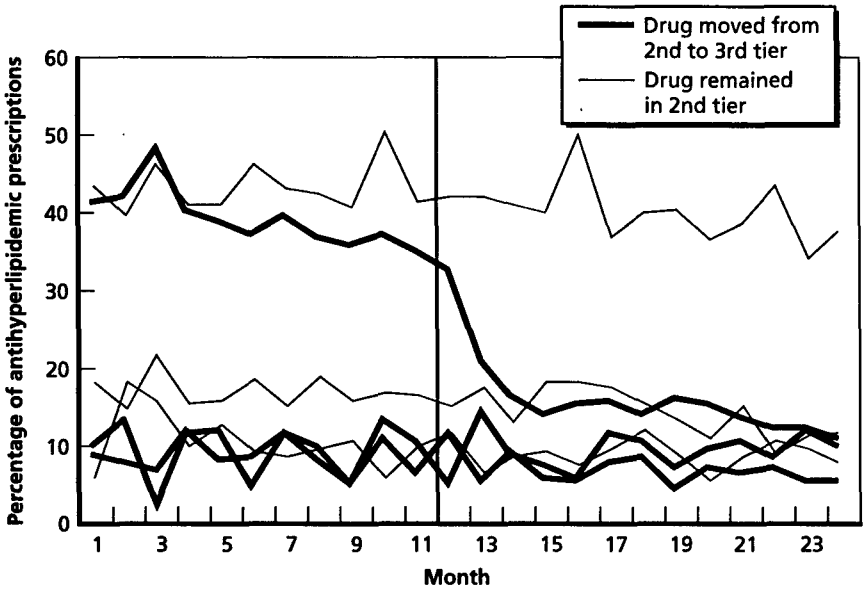


**Figure 4.3—Effect of Moving Zocor (Simvastatin) from Second to Third Tier**

- Total pharmacy expenditures rose more than twice as fast in two-tier plans that did not add a third tier as they did in two-tier plans that added a third tier, although the difference in expenditures between the two types of plans was not statistically significant ($p = 0.11$ in weighted analysis; $p = 0.14$ in unweighted analysis).
- Plan expenditures rose significantly faster in fixed two-tier plans than in new three-tier plans ($p = 0.00$ in both weighted and unweighted analyses). The rate of growth in plan expenditures was 19–21 percent in the fixed two-tier plans compared with 4–6 percent in the new three-tier plans.
- Beneficiary expenditures grew more rapidly in three-tier plans, both new and fixed, than in fixed two-tier plans. Copayment outlays by enrollees increased $6 per member per year during the first year in fixed two-tier plans, $23 per member per year in

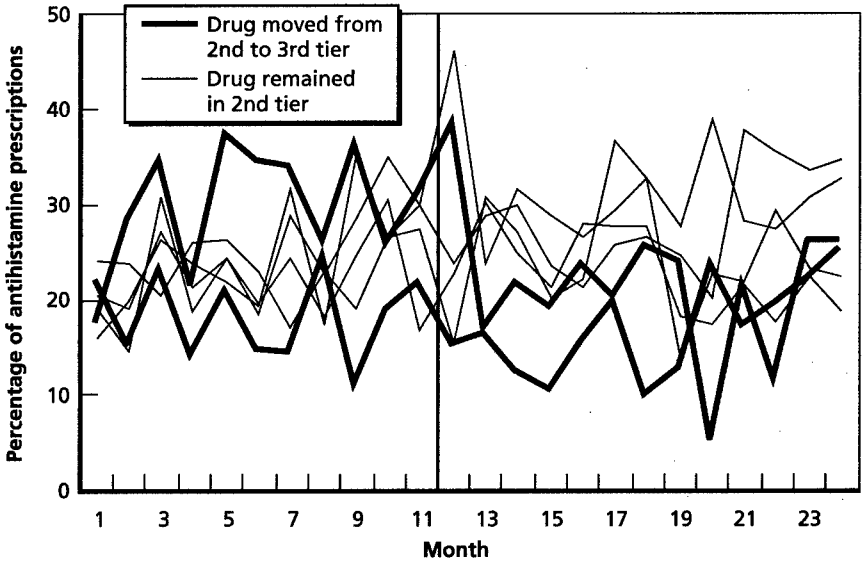


**Figure 4.4—Effect of Moving Allegra (Fexofenadine) from Second to Third Tier**

fixed three-tier plans, and $37 per member per year in new three-tier plans, although the differences in out-of-pocket expenditures across plan types were not statistically significant.

- Both total pharmacy expenditures and plan expenditures rose faster in fixed two-tier plans than in fixed three-tier plans, although the difference between the two types of plans was seldom statistically significant (p-values ranged between 0.04 and 0.19 depending on the specification).
- Adding a third tier was not associated with a significant change in the number of 30-day-equivalent prescriptions dispensed ($p = 0.90$ in unweighted analysis; $p = 0.87$ in weighted analysis) or with a significant change in the probability of any pharmacy use ($p = 0.13$ in unweighted analysis; $p = 0.11$ in weighted analysis).
- The pattern observed in the aggregate analyses was observed in most high-cost therapeutic classes with the exception of oral hypoglycemics (antidiabetes drugs) and gastrointestinal drugs. The

finding of no relationship between plan type and hypoglycemics expenditures is explained by the fact that none of the plans in our sample placed oral hypoglycemics on the third tier. We could not explain the finding related to gastrointestinals.

- The introduction of a third tier had an even stronger effect on spending at mail-order pharmacies.

Drug-level analyses showed no consistent relationship between changes in tier status and changes in market share. However, market share for several specific medications in some plans fell precipitously after the drug was moved to the third tier.

CHAPTER FIVE

# Conclusions and Policy Implications

In this study, we analyzed claims data from civilian-sector health insurance companies to assess the effects on costs and utilization of adding a third tier to a two-tier pharmacy benefit. If the experience in adopting the Uniform Formulary resembles that of the private-sector civilian plans we analyzed, cost savings will be substantial. A 15-percentage point reduction in the rate of growth in DoD spending, for example, would generate savings of nearly $200 million in the TSRx program in the first year alone.

## Generalizability

There are many factors that affect the applicability of these results to the TRICARE program. These factors should be carefully considered as the new benefit program is implemented.

First, there are many pharmacy benefit features other than the number of tiers and copayment levels that affect pharmacy costs and use but could not be observed in the Ingenix Inc. data set. Examples include prior authorization requirements, step therapy requirements, whether the formulary is open or closed, and the ease with which such restrictions can be bypassed. Our analyses would not capture changes in these policies implemented by private sector firms between 1999 and 2000. As discussed in Chapter Two, the TRICARE pharmacy benefit currently incorporates some of these administrative restrictions. MTFs and the TMOP have closed formularies, whereas

Express Scripts, Inc. (which administers the TMOP) and managed care support contractors use prior authorization requirements for certain drugs dispensed through the TMOP and retail pharmacies, respectively. These restrictions are likely to result in cost savings, particularly in closed classes of drugs such as antihyperlipidemics. At the same time, it appears that some of the civilian plans we analyzed also used some form of controls. Two of the three plans that moved simvastatin from the second tier to the third tier had low use of simvastatin both before and after the tier switch. It is possible that these two plans replaced an administrative restriction on simvastatin, such as a prior authorization requirement, with a higher copayment. If the current TRICARE program manages the pharmacy program more aggressively than the Ingenix two-tier plans did in 1999, savings observed in the Ingenix data will overstate savings that can be captured by DoD, all other things remaining equal.

Second, as a federal buyer, DoD is generally able to negotiate better prices than civilian firms, who are constrained by Medicaid best-price regulations. This factor, too, suggests that adding a third tier will yield smaller savings for DoD than for the private sector, all other things being equal.

Third, the Ingenix database does not provide information about rebates given to employers by pharmaceutical manufacturers. Insofar as the introduction of a third tier causes beneficiaries to switch from non-preferred drugs (for which manufacturers generally do not provide rebates) to preferred drugs (for which manufacturers generally do provide rebates), our estimates, which do not take rebates into account, will understate the actual savings achieved by private-sector plans. Our understanding is that DoD does not receive rebates from pharmaceutical companies, but to the extent that manufacturers are willing to give private companies rebates in exchange for favorable tier placement, we would expect them to be willing to grant price concessions to DoD. Thus, the failure to capture rebate data may cause us to understate the potential savings that would be realized by introducing a third tier, all other things being equal.

Fourth, the proposed UF differs in a key respect from the reforms adopted by the civilian plans whose data we analyzed, in that it

would make non-preferred (third-tier) brands available through the TMOP for a copayment of $22 for a 90-day supply. (Non-preferred brands currently cannot be obtained through the TMOP without proof of medical necessity.) Thus, if the proposed rule is implemented as is, beneficiaries who now obtain non-preferred brands through retail pharmacies for $9 per 30-day-equivalent prescription will be able to obtain them through the TMOP for $7.33 per 30-day-equivalent prescription—*without* proof of medical necessity. Clearly, the introduction of non-preferred brands to the TMOP with a copay of $22 per 90-day prescription would limit the utilization-dampening effect of adding a third tier, all other things remaining equal. However, DoD expenditures may decline if utilization shifts from civilian pharmacies to the TMOP, where DoD's drug acquisition costs are lower.

Fifth, it is important to emphasize that to achieve the cost savings realized by the civilian-sector employers we studied, DoD will need to be as aggressive as the average employer in placing drugs in high-cost therapeutic classes in the third tier. If DoD places fewer high-cost brand-name drugs in the third-tier than does the average private plan, DoD's savings will likely be smaller than those observed in the Ingenix data, all other things being equal. Conversely, if DoD makes extensive use of the third tier, its savings may be larger than those observed in the private plans.

The first two considerations suggest that our estimates of pharmacy cost savings are higher than what can be achieved by DoD. The third consideration suggests that our estimates are too low. The last two considerations suggest that our estimates may be either too high or too low, depending on the amount of the TMOP copayment, the degree to which utilization shifts to the mail-order pharmacy, and the degree to which DoD's P&T Committee makes use of the third tier. In sum, the net effect of these factors is difficult to ascertain.

## Study Limitations

In considering our findings, the reader should keep the study's limitations in mind.

First, our sample was limited to 45- to 64-year-olds because the Ingenix data set did not support analysis of elderly beneficiaries age 65 and older. Although elderly people are sicker, on average, than younger people, it appears that the demand for prescription drugs is similar in pre-elderly and elderly populations after adjusting for differences in health status (see Appendix A for a discussion on how pharmacy costs and use differ across age groups). However, there are other differences between the elderly and pre-elderly that we were not able to control for statistically. Elderly beneficiaries, for example, have lower incomes and higher wealth, on average, than younger people. Their lower incomes may make them more sensitive to financial incentives, whereas their higher wealth may make them less so. Our analyses controlled for the median household income in the zip code of residence, but this variable is unlikely to capture variation in economic resources across beneficiaries. On balance, we believe the behavioral response of 45- to 64-year-old enrollees to changes in copayments is likely to be similar to that of elderly beneficiaries. If so, our estimates can be extrapolated to the TSRx program.

Second, the study had limited statistical power because of the small number of plans in our study sample. Although the plans in our sample are large—averaging nearly 3,000 enrollees age 45 to 64—differences in pharmacy costs are estimated from microdata on only 20 distinct health plans. Nonetheless, this study is among the largest ever conducted that has assessed the effects of pharmacy benefit design changes among non-elderly patients in private health plans.

Third, higher pharmacy spending in fixed three-tier plans suggests that some employers may tailor benefits to their employees' demand for prescription drugs. For example, firms with older or sicker workers may be more aggressive in adopting a three-tier benefit if the level of drug spending or the growth in plan expenditures is higher than the industry norm. The potential correlation between drug benefits and drug spending could affect our estimates in several ways.

Our analyses are likely to understate the true effects of adding a third tier if plans that adopt this structure experience above-average growth in drug spending both before and after the change. This situation might occur if the set of patients and providers in these plans has a greater propensity to use prescription drugs in the treatment of medical conditions. In contrast, our analytic approach will overstate the impact of adding a third tier if the growth in pharmacy spending prior to the change is a result of factors that are unlikely to persist over a long period of time. In that case, slower growth in pharmacy spending in later years may reflect a regression to the mean rather than the effects of increased patient cost sharing.[1]

Fourth, the aggregate-level and class-level results suggest that cost savings arising from the introduction of a third tier are achieved via beneficiaries' switching from high-cost to low-cost drugs. However, our drug-level analyses did not show a consistent relationship between tier changes and changes in market share within four high-cost therapeutic classes. It is possible that changes in unobserved pharmacy benefit design characteristics, such as prior authorization requirements and/or step therapy requirements, confounded the drug-level results. Changes in such policies between 1999 and 2000 would bias the aggregate- and class-level results if the changes were not evenly distributed by plan type.

Finally, the validity of our analysis depends on the completeness and quality of the Ingenix Inc. data. We devoted considerable attention to adjudicating problem claims. In addition, we conducted a number of quality assurance checks such as comparing medical and pharmacy use in each plan to national averages. However, we could not compare our administrative records with patients' medical records. We should also note that the claims data are collected primarily for financial reasons and thus provide greater insight from a payer's perspective than from a provider's perspective.

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[1] We could not control for selection into health plans because we did not know the full range of choices offered to employees. However, none of the firms in our sample offered employees a choice of drug plans, which minimizes any potential bias from employees selecting drug benefit designs that suit their particular needs or preferences.

## Policy Implications

This study has several policy implications for the DoD and other policymakers, including those at the Centers for Medicare & Medicaid Services (CMS) who are charged with designing a drug benefit for Medicare beneficiaries. The principal attraction of a three-tier pharmacy structure is the potential to reduce pharmacy costs, and we demonstrated that civilian plans that have implemented benefit structures similar to those proposed by DoD have achieved significant savings in the year following such a change. Furthermore, this reduction in costs was achieved without significant reductions in the likelihood of pharmacy use or the number of prescriptions received.

Thus, it appears that the main effect of three-tier benefit structures is to reduce spending on pharmaceuticals by reducing prices without affecting utilization of potentially needed medications. Within this generally favorable finding of reducing cost without noticeable changes in quality, DoD has a number of choices that it must make to implement the program. For example, to achieve savings without adverse health consequences, the drugs in a particular class should be easily substitutable and thus distinguishable principally on the basis of price. Furthermore, the level of administrative restrictions and other financial incentives, such as those that encourage use of the TMOP, will also affect the magnitude of savings. Another important choice is how to transition to the new program. The principal concern here regards the potential for adverse health effects when patients switch from an effective medication to a medication they have not used in the past.

To achieve the significant cost savings suggested in this study without adversely affecting the health status of beneficiaries, the DoD P&T Committee should carefully consider the drugs and drug classes that it places in the non-preferred third tier. Criteria for selection include the availability of suitable substitutes, the level of spending on the class overall and on the specific drugs in particular, and potential unintended consequences from switching medications. The most heavily scrutinized drugs should be those in the costliest therapeutic classes, which account for a disproportionate share of expenditures.

For example, the top nine therapeutic classes—antidepressants, antihyperlipidemics, antiulcerants, oral hypoglycemics, narcotic painkillers, antihypertensives, antiarthritics, oral antihistamines, and antipsychotics—accounted for more than half of the growth in U.S. retail sales in 2001 (National Institute of Health Care Management Research and Educational Foundation, 2002).

Recent growth in pharmacy spending has been largely due to the increased number of prescription drugs dispensed rather than rising drug prices (Dubois et al., 2000; Berndt, 2001). In this environment, a change in benefit structure will play a larger role in reducing the level of drug spending than in slowing the growth in expenditures. A one-time reduction in the level of drug spending will generate continuous cost savings to DoD in future years. However, reducing the growth in spending will occur only if benefit designs ultimately limit the development of newer drugs or lead to ever-increasing reductions in spending.

TMA policymakers must also consider the critical question of whether lower pharmaceutical use resulting from higher patient cost-sharing adversely affects clinical outcomes. Although our study was not designed to evaluate health outcomes, several previous studies support concerns about adverse effects. One study found an increase in thrombotic vascular complications when patients switched from simvastatin to fluvastatin after the government of New Zealand increased copayments for simvastatin (Thomas and Mann, 1998). Soumerai and colleagues found that a stringent limit in New Hampshire on the number of prescription drugs dispensed per month had negative effects on physical and mental well-being (Soumerai et al., 1987; Soumerai et al., 1991; Soumerai et al., 1994). Tamblyn et al. (2001) found that increased cost-sharing for prescription drugs among elderly and low-income Canadians led to reductions in the use of essential drugs and higher rates of serious adverse events and emergency department visits.

Other studies, by contrast, suggest that the effects of prescription drug cost containment policies are mostly benign. Schneeweiss et al. (2002) found that an increase in copayments for the most-expensive ACE inhibitors (resulting from the adoption of "reference

pricing" in which payers set a ceiling price for medications that exhibit similar therapeutic benefits) did not cause patients to stop treatment for hypertension or result in higher health care utilization. Foulke and Siepler (1990) demonstrated that switching from the anti-ulcer drug ranitidine to cimetidine resulted in dramatic cost savings while maintaining clinical outcomes. Ganz and Saksa (1997) found that switching between two versions of an antihypertensive agent, long-acting nifedipine, reduced costs and did not adversely affect health outcomes. Dearing et al. (1998) noted a similar effect with a therapeutic switch from long-acting nifedipine to felodipine. Patel et al. (1999) found no significant differences in the percentage of patients meeting cholesterol targets before and after a change from pravastatin to lovastatin. In addition, they found no differences in quality-of-life measures, patient satisfaction, or medication tolerance.

Both the U.S. House and U.S. Senate are considering separate bills to add a prescription drug benefit to Medicare. Both proposals appear to allow multitier cost sharing, although it is uncertain to what degree such financial incentives will be encouraged. Our work offers some insight to lawmakers about how multitier cost-sharing arrangements will affect utilization and costs.

Our analyses focus solely on pharmaceutical expenditures. In so doing, we purposefully ignore how the generosity and structure of drug benefits affect spending on other types of services. In the private sector, drugs are often assigned to tiers based on ingredient cost and manufacturer rebates rather than clinical outcomes (Penna, 2000). As a result, health plans and plan sponsors may be designing prescription benefit packages that reduce the costs of pharmaceuticals but increase overall medical care costs. Both DoD and CMS should consider pharmacy costs and utilization in this larger context.

## Summary

Our study shows that two-tier civilian plans experienced a statistically significant, substantial reduction in the growth rate of their pharmacy expenditures following the introduction of a third tier on January 1,

2000. While it is possible that the reductions in cost were accompanied by adverse health effects, there was no reduction in the number of prescriptions dispensed or the probability of any pharmacy use. The effects of the proposed Uniform Formulary on DoD pharmacy expenditures may not mirror the effects observed in the civilian sector. Ultimately, the rate of DoD pharmacy spending growth will depend not only on whether a third tier is added but also on how aggressively DoD uses that third tier and the effects of making nonpreferred brands available through the TMOP.

APPENDIX A

# Relationship Between Pharmacy Costs and Age

Given the paucity of three-tier pharmacy benefits among our sample of retiree plans, our analyses focus on younger adults (age 45–64) rather than older adults (age 65 and over) with employer-provided drug coverage. This focus on a younger population led us to ask the following question: How do pharmacy costs and use differ across the two age groups? As anticipated, older adults with private drug coverage use substantially more prescription medications than do younger adults (see Table A.1). Seniors with employer coverage are more likely to fill a prescription, use generic drugs, and have higher average use than are beneficiaries age 45 to 64.

Higher drug expenditures in older populations are largely attributable to differences in health status. Persons age 65 and older have higher rates of chronic illness than do younger adults, and once an individual has been treated for congestive heart failure, cancer,

**Table A.1**
**Average Outpatient Prescription Drug Use and Costs, by Age**

| | Age 45–64 | Age 65+ |
|---|---|---|
| Number of Prescriptions (30-day equivalent) | 24 | 38 |
| % Enrollees with one or more prescription (Rx) claims | 81 | 86 |
| % Prescriptions Filled with Generic Drugs | 33 | 37 |
| Average Rx Spending, PMPY | $1,194 | $1,360 |

SOURCE: Ingenix Inc. data for 2000.

diabetes, or many other serious conditions, he or she is likely to have higher-than-average medical and pharmacy expenditures in future years (Garber, MaCurdy, and McClellan, 1997). The impact of chronic illness on average medical spending is shown in Figure A.1 for our sample of adults. Within all age groups, medical spending rises monotonically with the number of chronic illnesses. For example, average annual medical expenditures are under $2,000 per member for adults age 45 (with no or one chronic illness), about half as much as for those with three chronic illnesses and one-quarter as much as for those with five chronic illnesses. Moreover, medical spending rises with age, conditional on the number of chronic conditions. Adults age 45 to 64 with three chronic conditions spend about 40 percent less per year on medical services than do similar adults aged 75 and older. Clearly, some of the difference in medical spending across age groups is attributable to the types and severity of chronic diseases affecting older and younger adults. Nonetheless, age appears to have an independent effect on the demand for medical care.

In contrast to spending on medical services, spending on outpatient prescription drugs is largely a function of health status. Persons

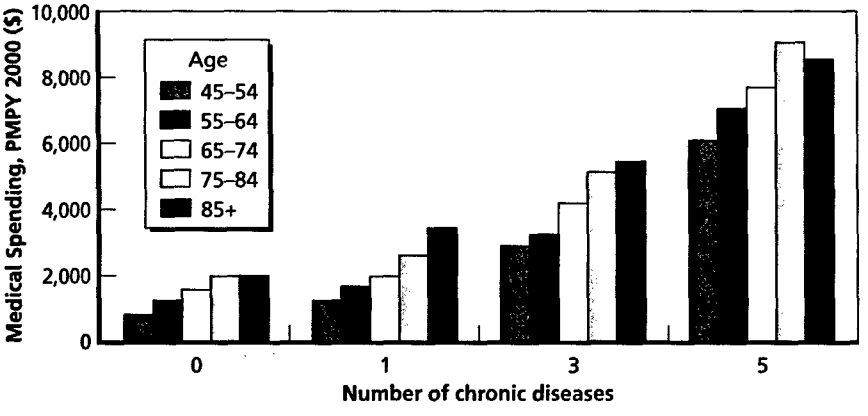


**Figure A.1—Medical Care Spending by Age and Health Status**

SOURCE: Ingenix Inc. data for 2000.

age 65 and older use significantly more prescription medications than privately insured adults age 45 to 64. However, prescription drug expenses are fairly constant across age groups after controlling for the prevalence of chronic disease (see Figure A.2). This suggests that the demand for prescription drugs is similar in pre-Medicare and Medicare populations after adjusting for differences in health status.

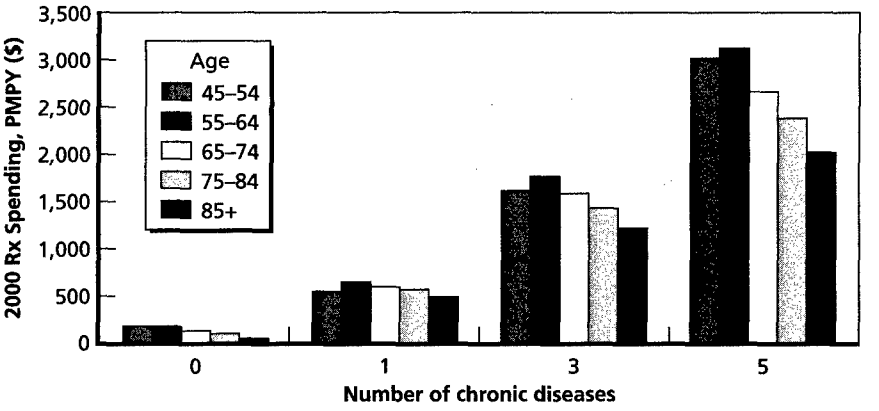


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**Figure A.2—Pharmacy Spending by Age and Health Status**

SOURCE: Ingenix Inc. data for 2000.

APPENDIX B

# Results of Multivariate Regressions: Aggregate Analyses

The tables on the following pages present the complete regression results of the multivariate analyses discussed in Chapter Four.

**Table B.1**
**Regression Results of Change in Total Pharmacy Spending**

| Variable | Estimate | S.E. | t-statistic | P > t-statistic |
|---|---|---|---|---|
| Year 2000 | 0.134 | 0.019 | 7.07 | 0.000 |
| New 3-tier | 0.155 | 0.070 | 2.21 | 0.041 |
| Fixed 3-tier | 0.114 | 0.073 | 1.56 | 0.136 |
| New 3-tier × Year 2000 | –0.073 | 0.043 | –1.70 | 0.107 |
| Fixed 3-tier × Year 2000 | –0.056 | 0.042 | –1.35 | 0.194 |
| Mandatory generic substitution | –0.094 | 0.021 | –4.51 | 0.000 |
| Age 55–64 | 0.083 | 0.038 | 2.21 | 0.040 |
| Male | –0.147 | 0.039 | –3.72 | 0.002 |
| Median household income | 0.002 | 0.000 | 3.57 | 0.002 |
| Urban area | –0.001 | 0.014 | –0.04 | 0.966 |
| Plan deductible | 0.000 | 0.000 | –1.33 | 0.200 |
| Managed care organization | –0.004 | 0.049 | –0.08 | 0.937 |
| Physician office visit copay | 0.002 | 0.012 | 0.17 | 0.868 |
| Physician office visit coinsurance rate | –0.017 | 0.018 | –0.90 | 0.378 |
| Physician office visit coinsurance (0 = no; 1 = yes) | 0.421 | 0.440 | 0.96 | 0.352 |
| Midwest | 0.068 | 0.043 | 1.57 | 0.133 |
| South | 0.104 | 0.026 | 3.92 | 0.001 |
| West | –0.027 | 0.049 | –0.55 | 0.591 |
| Intercept | 4.905 | 0.192 | 25.50 | 0.000 |

NOTES: The dependent variable is the natural log of total pharmacy spending per member per year. The model also includes 28 binary indicators for prevalence of chronic diseases.

S.E. = standard error.

**Table B.2**
**Weighted Regression Results of Change in Total Pharmacy Spending**

| Variable | Estimate | S.E. | t-statistic | P > t-statistic |
|---|---|---|---|---|
| Year 2000 | 0.150 | 0.025 | 6.07 | 0.000 |
| New 3-tier | 0.120 | 0.051 | 2.35 | 0.030 |
| Fixed 3-tier | 0.047 | 0.053 | 0.88 | 0.389 |
| New 3-tier × Year 2000 | –0.088 | 0.057 | –1.55 | 0.139 |
| Fixed 3-tier × Year 2000 | –0.069 | 0.036 | –1.91 | 0.073 |
| Mandatory generic substitution | –0.117 | 0.016 | –7.47 | 0.000 |
| Age 55–64 | 0.128 | 0.025 | 5.10 | 0.000 |
| Male | –0.240 | 0.030 | –8.09 | 0.000 |
| Median household income | 0.002 | 0.001 | 2.61 | 0.018 |
| Urban area | –0.014 | 0.026 | –0.53 | 0.602 |
| Plan deductible | 0.000 | 0.000 | –1.08 | 0.296 |
| Managed care organization | 0.048 | 0.036 | 1.34 | 0.198 |
| Physician office visit copay | 0.001 | 0.009 | 0.14 | 0.893 |
| Physician office visit coinsurance rate | –0.035 | 0.016 | –2.22 | 0.040 |
| Physician office visit coinsurance (0 = no; 1 = yes) | 0.707 | 0.326 | 2.17 | 0.044 |
| Midwest | 0.095 | 0.038 | 2.50 | 0.022 |
| South | 0.133 | 0.025 | 5.40 | 0.000 |
| West | –0.026 | 0.044 | –0.60 | 0.554 |
| Intercept | 4.842 | 0.140 | 34.63 | 0.000 |

NOTE: The dependent variable is the natural log of total pharmacy spending per member per year. The model also includes 28 binary indicators for prevalence of chronic diseases.

**Table B.3**
**Regression Results of Change in Plan Spending**

| Variable | Estimate | S.E. | t-statistic | P > t-statistic |
|---|---|---|---|---|
| Year 2000 | 0.187 | 0.025 | 7.54 | 0.000 |
| New 3-tier | 0.140 | 0.145 | 0.96 | 0.348 |
| Fixed 3-tier | 0.128 | 0.168 | 0.76 | 0.455 |
| New 3-tier × Year 2000 | –0.128 | 0.037 | –3.46 | 0.003 |
| Fixed 3-tier × Year 2000 | –0.109 | 0.050 | –2.17 | 0.044 |
| Mandatory generic substitution | –0.067 | 0.050 | –1.34 | 0.197 |
| Age 55–64 | 0.120 | 0.044 | 2.73 | 0.014 |
| Male | –0.079 | 0.026 | –2.97 | 0.008 |
| Median household income | 0.001 | 0.001 | 1.82 | 0.086 |
| Urban area | 0.000 | 0.019 | 0.00 | 0.997 |
| Plan deductible | –0.001 | 0.001 | –1.01 | 0.325 |
| Managed care organization | –0.175 | 0.152 | –1.15 | 0.266 |
| Physician office visit copay | 0.001 | 0.016 | 0.09 | 0.927 |
| Physician office visit coinsurance rate | 0.026 | 0.018 | 1.44 | 0.167 |
| Physician office visit coinsurance (0 = no; 1 = yes) | –0.357 | 0.468 | –0.76 | 0.456 |
| Midwest | 0.137 | 0.052 | 2.64 | 0.017 |
| South | 0.115 | 0.032 | 3.60 | 0.002 |
| West | –0.038 | 0.056 | –0.67 | 0.511 |
| Intercept | 4.492 | 0.336 | 13.38 | 0.000 |

NOTE: The dependent variable is the natural log of plan spending per year. The model also includes 28 binary indicators for prevalence of chronic diseases.

**Table B.4**
**Weighted Regression Results of Change in Plan Spending**

| Variable | Estimate | S.E. | t-statistic | P > t-statistic |
|---|---|---|---|---|
| Year 2000 | 0.211 | 0.027 | 7.70 | 0.000 |
| New 3-tier | 0.138 | 0.103 | 1.33 | 0.199 |
| Fixed 3-tier | 0.032 | 0.124 | 0.26 | 0.796 |
| New 3-tier × Year 2000 | –0.168 | 0.049 | –3.43 | 0.003 |
| Fixed 3-tier × Year 2000 | –0.083 | 0.048 | –1.73 | 0.101 |
| Mandatory generic substitution | –0.087 | 0.049 | –1.78 | 0.093 |
| Age 55–64 | 0.153 | 0.029 | 5.25 | 0.000 |
| Male | –0.143 | 0.035 | –4.13 | 0.001 |
| Median household income | 0.002 | 0.001 | 1.68 | 0.110 |
| Urban area | –0.013 | 0.034 | –0.39 | 0.700 |
| Plan deductible | 0.000 | 0.000 | –0.91 | 0.373 |
| Managed care organization | –0.049 | 0.126 | –0.39 | 0.702 |
| Physician office visit copay | 0.001 | 0.015 | 0.07 | 0.942 |
| Physician office visit coinsurance rate | 0.005 | 0.016 | 0.32 | 0.753 |
| Physician office visit coinsurance (0 = no; 1 = yes) | 0.058 | 0.385 | 0.15 | 0.881 |
| Midwest | 0.133 | 0.038 | 3.45 | 0.003 |
| South | 0.112 | 0.030 | 3.68 | 0.002 |
| West | –0.076 | 0.055 | –1.37 | 0.187 |
| Intercept | 4.320 | 0.278 | 15.53 | 0.000 |

NOTE: The dependent variable is the natural log of plan spending per year. The model also includes 28 binary indicators for prevalence of chronic diseases.

**Table B.5**
**Regression Results of Change in Beneficiary Spending**

| Variable | Estimate | S.E. | t-statistic | P > t-statistic |
|---|---|---|---|---|
| Year 2000 | 0.046 | 0.021 | 2.24 | 0.038 |
| New 3-tier | –0.167 | 0.239 | –0.70 | 0.495 |
| Fixed 3-tier | –0.715 | 0.270 | –2.65 | 0.016 |
| New 3-tier × Year 2000 | 0.052 | 0.086 | 0.61 | 0.550 |
| Fixed 3-tier × Year 2000 | 0.365 | 0.089 | 4.09 | 0.001 |
| Mandatory generic substitution | –0.180 | 0.068 | –2.64 | 0.017 |
| Age 55–64 | –0.042 | 0.040 | –1.05 | 0.308 |
| Male | –0.239 | 0.058 | –4.11 | 0.001 |
| Median household income | 0.002 | 0.001 | 1.52 | 0.145 |
| Urban area | 0.035 | 0.036 | 0.97 | 0.344 |
| Plan deductible | 0.000 | 0.001 | –0.28 | 0.783 |
| Managed care organization | 0.616 | 0.259 | 2.37 | 0.029 |
| Physician office visit copay | –0.047 | 0.028 | –1.65 | 0.117 |
| Physician office visit coinsurance rate | –0.100 | 0.027 | –3.75 | 0.001 |
| Physician office visit coinsurance (0 = no; 1 = yes) | 1.463 | 0.649 | 2.26 | 0.037 |
| Midwest | –0.091 | 0.068 | –1.33 | 0.201 |
| South | 0.122 | 0.052 | 2.33 | 0.031 |
| West | –0.010 | 0.047 | –0.21 | 0.836 |
| Intercept | 4.557 | 0.478 | 9.54 | 0.000 |

NOTE: The dependent variable is the natural log of beneficiary spending per year. The model also includes 28 binary indicators for prevalence of chronic diseases.

**Table B.6**
**Weighted Regression Results of Change in Beneficiary Spending**

| Variable | Estimate | S.E. | t-statistic | P > t-statistic |
|---|---|---|---|---|
| Year 2000 | 0.046 | 0.020 | 2.30 | 0.034 |
| New 3-tier | –0.175 | 0.197 | –0.89 | 0.387 |
| Fixed 3-tier | –0.496 | 0.243 | –2.05 | 0.056 |
| New 3-tier × Year 2000 | 0.087 | 0.091 | 0.96 | 0.350 |
| Fixed 3-tier × Year 2000 | 0.122 | 0.102 | 1.20 | 0.247 |
| Mandatory generic substitution | –0.194 | 0.081 | –2.39 | 0.028 |
| Age 55–64 | 0.021 | 0.043 | 0.49 | 0.632 |
| Male | –0.360 | 0.038 | –9.55 | 0.000 |
| Median household income | 0.003 | 0.001 | 3.07 | 0.007 |
| Urban area | –0.032 | 0.035 | –0.92 | 0.372 |
| Plan deductible | 0.000 | 0.001 | –0.32 | 0.749 |
| Managed care organization | 0.502 | 0.270 | 1.86 | 0.080 |
| Physician office visit copay | –0.042 | 0.034 | –1.23 | 0.234 |
| Physician office visit coinsurance rate | –0.099 | 0.031 | –3.23 | 0.005 |
| Physician office visit coinsurance (0 = no; 1 = yes) | 1.391 | 0.796 | 1.75 | 0.098 |
| Midwest | –0.068 | 0.079 | –0.86 | 0.399 |
| South | 0.201 | 0.046 | 4.32 | 0.000 |
| West | 0.027 | 0.043 | 0.62 | 0.543 |
| Intercept | 4.508 | 0.572 | 7.89 | 0.000 |

Note: The dependent variable is the natural log of beneficiary spending per year. The model also includes 28 binary indicators for prevalence of chronic diseases.

**Table B.7**
**Probit Regression Results of Change in Probability of Pharmacy Use**

| Variable | Estimate | S.E. | z-statistic | P > z-statistic |
|---|---|---|---|---|
| Year 2000 | 0.080 | 0.034 | 2.32 | 0.021 |
| New 3-tier | 0.140 | 0.031 | 4.49 | 0.000 |
| Fixed 3-tier | 0.326 | 0.046 | 7.05 | 0.000 |
| New 3-tier × Year 2000 | 0.065 | 0.043 | 1.53 | 0.127 |
| Fixed 3-tier × Year 2000 | –0.004 | 0.055 | –0.08 | 0.936 |
| Mandatory generic substitution | –0.093 | 0.020 | –4.65 | 0.000 |
| Age 55–64 | 0.174 | 0.024 | 7.36 | 0.000 |
| Male | –0.233 | 0.023 | –10.25 | 0.000 |
| Median household income | 0.003 | 0.001 | 2.32 | 0.020 |
| Urban area | –0.055 | 0.015 | –3.70 | 0.000 |
| Plan deductible | 0.000 | 0.000 | –3.39 | 0.001 |
| Managed care organization | –0.118 | 0.028 | –4.28 | 0.000 |
| Physician office visit copay | 0.017 | 0.006 | 2.89 | 0.004 |
| Physician office visit coinsurance rate | 0.023 | 0.009 | 2.66 | 0.008 |
| Physician office visit coinsurance (0 = no; 1 = yes) | –0.345 | 0.194 | –1.78 | 0.076 |
| Midwest | 0.007 | 0.085 | 0.08 | 0.936 |
| South | 0.168 | 0.097 | 1.74 | 0.082 |
| West | –0.197 | 0.198 | –1.00 | 0.319 |
| Intercept | 0.549 | 0.094 | 5.82 | 0.000 |

NOTE: The dependent variable is a binary indicator for whether the beneficiary had at least one pharmacy claim in the calendar year.

**Table B.8**
**Weighted Probit Regression Results of Change in Probability of Pharmacy Use**

| Variable | Estimate | S.E. | z-statistic | P > z-statistic |
|---|---|---|---|---|
| Year 2000 | 0.079 | 0.033 | 2.39 | 0.017 |
| New 3-tier | 0.160 | 0.028 | 5.61 | 0.000 |
| Fixed 3-tier | 0.319 | 0.058 | 5.54 | 0.000 |
| New 3-tier × Year 2000 | 0.080 | 0.050 | 1.61 | 0.108 |
| Fixed 3-tier × Year 2000 | 0.078 | 0.070 | 1.12 | 0.265 |
| Mandatory generic substitution | –0.081 | 0.030 | –2.72 | 0.007 |
| Age 55–64 | 0.189 | 0.028 | 6.86 | 0.000 |
| Male | –0.269 | 0.033 | –8.06 | 0.000 |
| Median household income | 0.005 | 0.001 | 4.40 | 0.000 |
| Urban area | –0.102 | 0.036 | –2.82 | 0.005 |
| Plan deductible | 0.000 | 0.000 | –3.28 | 0.001 |
| Managed care organization | –0.141 | 0.045 | –3.14 | 0.002 |
| Physician office visit copay | 0.017 | 0.010 | 1.62 | 0.106 |
| Physician office visit coinsurance rate | 0.027 | 0.010 | 2.70 | 0.007 |
| Physician office visit coinsurance (0 = no; 1 = yes) | –0.421 | 0.252 | –1.67 | 0.095 |
| Midwest | 0.044 | 0.058 | 0.75 | 0.454 |
| South | 0.244 | 0.068 | 3.60 | 0.000 |
| West | –0.089 | 0.117 | –0.76 | 0.447 |
| Intercept | 0.454 | 0.150 | 3.03 | 0.002 |

NOTE: The dependent variable is a binary indicator for whether the beneficiary had at least one pharmacy claim in the calendar year.

**Table B.9**
**Negative Binomial Regression Results of Change in Number of 30-Day Prescriptions**

| Variable | Estimate | S.E. | z-statistic | P > z-statistic |
|---|---|---|---|---|
| Year 2000 | 0.030 | 0.027 | 1.12 | 0.261 |
| New 3-tier | 0.095 | 0.047 | 1.99 | 0.046 |
| Fixed 3-tier | 0.099 | 0.069 | 1.43 | 0.153 |
| New 3-tier × Year 2000 | –0.005 | 0.039 | –0.12 | 0.903 |
| Fixed 3-tier × Year 2000 | –0.013 | 0.046 | –0.28 | 0.782 |
| Mandatory generic substitution | –0.051 | 0.019 | –2.65 | 0.008 |
| Age 55–64 | 0.092 | 0.017 | 5.36 | 0.000 |
| Male | –0.338 | 0.054 | –6.23 | 0.000 |
| Median household income | 0.003 | 0.000 | 5.75 | 0.000 |
| Urban area | –0.033 | 0.009 | –3.62 | 0.000 |
| Plan deductible | 0.000 | 0.000 | –2.12 | 0.034 |
| Managed care organization | –0.056 | 0.042 | –1.34 | 0.180 |
| Physician office visit copay | 0.009 | 0.008 | 1.12 | 0.261 |
| Physician office visit coinsurance rate | –0.015 | 0.020 | –0.77 | 0.442 |
| Physician office visit coinsurance (0 = no; 1 = yes) | 0.461 | 0.436 | 1.06 | 0.291 |
| Midwest | 0.081 | 0.036 | 2.23 | 0.026 |
| South | 0.104 | 0.036 | 2.91 | 0.004 |
| West | –0.011 | 0.056 | –0.19 | 0.850 |
| Intercept | 1.506 | 0.147 | 10.24 | 0.000 |

NOTE: The dependent variable is the count of 30-day equivalent pharmacy claims per year. The model also includes 28 binary indicators for prevalence of chronic diseases.

**Table B.10**
**Weighted Negative Binomial Regression Results of Change in Number of 30-Day Prescriptions**

| Variable | Estimate | S.E. | z-statistic | P > z-statistic |
|---|---|---|---|---|
| Year 2000 | 0.013 | 0.025 | 0.53 | 0.594 |
| New 3-tier | 0.053 | 0.046 | 1.16 | 0.246 |
| Fixed 3-tier | –0.043 | 0.075 | –0.57 | 0.571 |
| New 3-tier × Year 2000 | 0.009 | 0.055 | 0.17 | 0.867 |
| Fixed 3-tier × Year 2000 | 0.016 | 0.037 | 0.44 | 0.662 |
| Mandatory generic substitution | –0.069 | 0.024 | –2.91 | 0.004 |
| Age 55–64 | 0.099 | 0.014 | 7.15 | 0.000 |
| Male | –0.461 | 0.042 | –11.06 | 0.000 |
| Median household income | 0.003 | 0.001 | 4.47 | 0.000 |
| Urban area | –0.051 | 0.021 | –2.46 | 0.014 |
| Plan deductible | 0.000 | 0.000 | –1.86 | 0.063 |
| Managed care organization | –0.034 | 0.038 | –0.89 | 0.374 |
| Physician office visit copay | 0.000 | 0.014 | –0.01 | 0.990 |
| Physician office visit coinsurance rate | –0.019 | 0.020 | –0.96 | 0.338 |
| Physician office visit coinsurance (0 = no; 1 = yes) | 0.388 | 0.442 | 0.88 | 0.379 |
| Midwest | 0.131 | 0.043 | 3.03 | 0.002 |
| South | 0.123 | 0.036 | 3.46 | 0.001 |
| West | –0.002 | 0.046 | –0.05 | 0.963 |
| Intercept | 1.617 | 0.207 | 7.81 | 0.000 |

NOTE: The dependent variable is the count of 30-day equivalent pharmacy claims per year. The model also includes 28 binary indicators for prevalence of chronic diseases.

**Table B.11**
**Regression Results of Change in Total Mail-Order Pharmacy Spending**

| Variable | Estimate | S.E. | t-statistic | P > t-statistic |
|---|---|---|---|---|
| Year 2000 | 0.111 | 0.005 | 23.60 | 0.000 |
| New 3-tier | 0.072 | 0.063 | 1.14 | 0.269 |
| Fixed 3-tier | 0.120 | 0.083 | 1.45 | 0.167 |
| New 3-tier × Year 2000 | –0.119 | 0.047 | –2.50 | 0.023 |
| Fixed 3-tier × Year 2000 | –0.079 | 0.012 | –6.75 | 0.000 |
| Mandatory generic substitution | 0.089 | 0.068 | 1.31 | 0.210 |
| Age 55–64 | 0.049 | 0.039 | 1.25 | 0.229 |
| Male | 0.043 | 0.023 | 1.87 | 0.079 |
| Median household income | 0.000 | 0.001 | 0.18 | 0.860 |
| Urban area | –0.008 | 0.010 | –0.79 | 0.444 |
| Plan deductible | 0.000 | 0.000 | –0.09 | 0.933 |
| Managed care organization | –0.090 | 0.100 | –0.90 | 0.381 |
| Physician office visit copay | 0.011 | 0.013 | 0.89 | 0.388 |
| Physician office visit coinsurance rate | 0.005 | 0.011 | 0.49 | 0.633 |
| Physician office visit coinsurance (0 = no; 1 = yes) | 0.031 | 0.271 | 0.11 | 0.911 |
| Midwest | 0.117 | 0.075 | 1.56 | 0.139 |
| South | 0.046 | 0.050 | 0.90 | 0.379 |
| West | 0.027 | 0.051 | 0.53 | 0.600 |
| Intercept | 5.373 | 0.206 | 26.12 | 0.000 |

NOTE: The dependent variable is the natural log of total mail-order pharmacy spending per member per year. The model also includes 28 binary indicators for prevalence of chronic diseases.

**Table B.12**
**Weighted Regression Results of Change in Total Mail-Order Pharmacy Spending**

| Variable | Estimate | S.E. | t-statistic | P > t-statistic |
|---|---|---|---|---|
| Year 2000 | 0.122 | 0.014 | 8.63 | 0.000 |
| New 3-tier | 0.083 | 0.055 | 1.52 | 0.148 |
| Fixed 3-tier | 0.154 | 0.069 | 2.23 | 0.041 |
| New 3-tier × Year 2000 | –0.103 | 0.047 | –2.19 | 0.043 |
| Fixed 3-tier × Year 2000 | –0.085 | 0.018 | –4.68 | 0.000 |
| Mandatory generic substitution | 0.069 | 0.058 | 1.18 | 0.257 |
| Age 55–64 | 0.089 | 0.022 | 3.96 | 0.001 |
| Male | 0.075 | 0.023 | 3.33 | 0.004 |
| Median household income | 0.002 | 0.001 | 1.74 | 0.101 |
| Urban area | –0.036 | 0.022 | –1.66 | 0.117 |
| Plan deductible | 0.000 | 0.000 | 0.04 | 0.969 |
| Managed care organization | –0.046 | 0.083 | –0.56 | 0.584 |
| Physician office visit copay | 0.019 | 0.013 | 1.46 | 0.163 |
| Physician office visit coinsurance rate | 0.003 | 0.009 | 0.36 | 0.721 |
| Physician office visit coinsurance (0 = no; 1 = yes) | 0.206 | 0.279 | 0.74 | 0.472 |
| Midwest | 0.137 | 0.073 | 1.88 | 0.078 |
| South | 0.068 | 0.048 | 1.41 | 0.178 |
| West | –0.011 | 0.045 | –0.24 | 0.815 |
| Intercept | 5.057 | 0.209 | 24.20 | 0.000 |

NOTE: The dependent variable is the natural log of total mail-order pharmacy spending per member per year. The model also includes 28 binary indicators for prevalence of chronic diseases.

APPENDIX C

# Results of Multivariate Regressions: Class-Level Analyses

The tables on the following pages present the complete results of the weighted class-level regressions discussed in Chapter Four.

**Table C.1**
**Regression Results of Change in Spending on Antidepressants**

| | % Change in Total $ | | % Change in Plan $ | | % Change in Beneficiary $ | |
|---|---|---|---|---|---|---|
| **Variable** | **Estimate** | **S.E.** | **Estimate** | **S.E.** | **Estimate** | **S.E.** |
| Year 2000 | 0.15 | 0.06 | 0.27 | 0.06 | –0.70 | 3.18 |
| New 3-tier | 0.33 | 0.12 | 0.50 | 0.15 | –3.84 | 20.96 |
| Fixed 3-tier | 0.07 | 0.06 | 0.22 | 0.08 | –50.34 | 21.27 |
| New 3-tier × Year 2000 | –0.11 | 0.09 | –0.26 | 0.11 | 15.77 | 13.58 |
| Fixed 3-tier × Year 2000 | –0.03 | 0.06 | –0.18 | 0.06 | 13.80 | 4.01 |
| Mandatory generic substitution | –0.21 | 0.06 | –0.27 | 0.09 | –17.97 | 9.14 |
| Age 55–64 | –0.30 | 0.03 | –0.31 | 0.04 | –14.66 | 2.65 |
| Male | –0.09 | 0.03 | –0.13 | 0.03 | –7.57 | 2.70 |
| Median household income | 0.01 | 0.00 | 0.01 | 0.00 | 0.22 | 0.11 |
| Urban area | 0.03 | 0.04 | 0.04 | 0.03 | 3.50 | 2.01 |
| Plan deductible | 0.00 | 0.00 | 0.00 | 0.00 | –0.03 | 0.06 |
| Managed care plan | –0.06 | 0.07 | –0.13 | 0.09 | 55.65 | 23.93 |
| Physician office visit copay | –0.01 | 0.02 | –0.02 | 0.02 | –6.71 | 3.37 |
| Physician office visit coinsurance rate | –0.01 | 0.02 | 0.00 | 0.04 | 1.31 | 2.54 |
| Physician office visit coinsurance (0 = no; 1 = yes) | 0.09 | 0.55 | –0.09 | 0.87 | –101.28 | 72.26 |
| Midwest | –0.01 | 0.06 | –0.02 | 0.07 | –16.14 | 8.03 |
| South | –0.06 | 0.08 | –0.09 | 0.09 | –14.35 | 5.48 |
| West | –0.09 | 0.08 | –0.11 | 0.08 | –7.74 | 5.17 |
| Entry—enrolled in 2000 only | 0.08 | 0.02 | 0.08 | 0.03 | 4.53 | 1.82 |
| Exit—enrolled in 1999 only | 0.01 | 0.04 | 0.03 | 0.06 | 2.92 | 2.75 |
| Count of chronic diseases | 0.04 | 0.01 | 0.04 | 0.01 | 1.96 | 0.92 |
| Intercept | 5.39 | 0.17 | 5.27 | 0.16 | 164.95 | 41.61 |

NOTES: The dependent variable is the natural log of beneficiary spending on antidepressants per year.

S.E. = standard error.

**Table C.2**
**Regression Results of Change in Spending on Antihypertensives**

| | % Change in Total $ | | % Change in Plan $ | | % Change in Beneficiary $ | |
|---|---|---|---|---|---|---|
| **Variable** | **Estimate** | **S.E.** | **Estimate** | **S.E.** | **Estimate** | **S.E.** |
| Year 2000 | 0.07 | 0.03 | 0.07 | 0.03 | 0.12 | 5.95 |
| New 3-tier | 0.06 | 0.08 | 0.08 | 0.09 | –4.84 | 19.42 |
| Fixed 3-tier | –0.10 | 0.09 | 0.00 | 0.12 | –73.53 | 14.61 |
| New 3-tier × Year 2000 | –0.04 | 0.05 | –0.06 | 0.04 | 16.86 | 13.17 |
| Fixed 3-Tier × Year 2000 | –0.02 | 0.05 | –0.05 | 0.05 | 14.04 | 6.80 |
| Mandatory generic substitution | 0.04 | 0.03 | 0.03 | 0.04 | –5.37 | 11.16 |
| Age 55–64 | 0.14 | 0.02 | 0.18 | 0.03 | –1.94 | 4.02 |
| Male | 0.12 | 0.03 | 0.14 | 0.03 | 1.24 | 1.59 |
| Median household income | 0.00 | 0.00 | 0.01 | 0.00 | 0.37 | 0.11 |
| Urban area | –0.05 | 0.03 | –0.06 | 0.03 | 1.02 | 1.49 |
| Plan deductible | 0.00 | 0.00 | 0.00 | 0.00 | –0.07 | 0.07 |
| Managed care plan | –0.01 | 0.06 | –0.11 | 0.11 | 40.43 | 23.25 |
| Physician office visit copay | –0.02 | 0.02 | –0.01 | 0.02 | –10.86 | 4.80 |
| Physician office visit coinsurance rate | 0.02 | 0.02 | 0.03 | 0.02 | 3.01 | 3.39 |
| Physician office visit coinsurance (0 = no; 1 = yes) | –0.65 | 0.52 | –0.55 | 0.51 | –185.25 | 107.71 |
| Midwest | –0.01 | 0.02 | 0.03 | 0.03 | –26.10 | 9.77 |
| South | –0.08 | 0.02 | –0.06 | 0.03 | –21.36 | 7.04 |
| West | –0.09 | 0.04 | –0.11 | 0.05 | –16.10 | 6.83 |
| Entry—enrolled in 2000 only | –0.04 | 0.02 | –0.04 | 0.02 | 0.73 | 3.02 |
| Exit—enrolled in 1999 only | –0.02 | 0.03 | –0.03 | 0.04 | –2.51 | 2.38 |
| Count of chronic diseases | 0.03 | 0.00 | 0.04 | 0.00 | 0.16 | 0.48 |
| Intercept | 6.11 | 0.26 | 5.70 | 0.25 | 242.69 | 52.82 |

NOTE: The dependent variable is the natural log of beneficiary spending on antihypertensive drugs per year.

**Table C.3**
**Regression Results of Change in Spending on Non-Steroidal Anti-Inflammatory Drugs**

| | % Change in Total $ | | % Change in Plan $ | | % Change in Beneficiary $ | |
|---|---|---|---|---|---|---|
| **Variable** | **Estimate** | **S.E.** | **Estimate** | **S.E.** | **Estimate** | **S.E.** |
| Year 2000 | 0.21 | 0.07 | 0.24 | 0.07 | 3.00 | 2.71 |
| New 3-tier | 0.01 | 0.13 | –0.19 | 0.26 | 0.83 | 11.56 |
| Fixed 3-tier | -0.03 | 0.14 | 0.06 | 0.26 | –31.26 | 12.65 |
| New 3-tier × Year 2000 | –0.07 | 0.10 | 0.02 | 0.09 | 5.58 | 5.43 |
| Fixed 3-tier × Year 2000 | 0.00 | 0.07 | 0.03 | 0.07 | 5.87 | 3.21 |
| Mandatory generic substitution | –0.04 | 0.07 | –0.21 | 0.12 | –8.65 | 5.21 |
| Age 55–64 | 0.27 | 0.04 | 0.42 | 0.07 | 2.11 | 3.20 |
| Male | –0.28 | 0.04 | –0.24 | 0.07 | –6.61 | 2.09 |
| Median household income | 0.00 | 0.00 | 0.00 | 0.00 | 0.09 | 0.07 |
| Urban area | –0.24 | 0.02 | –0.22 | 0.02 | –4.27 | 2.65 |
| Plan deductible | 0.00 | 0.00 | 0.00 | 0.00 | –0.02 | 0.05 |
| Managed care plan | –0.05 | 0.11 | –0.32 | 0.32 | 38.65 | 19.06 |
| Physician office visit copay | 0.03 | 0.02 | 0.10 | 0.05 | –6.10 | 2.86 |
| Physician office visit coinsurance rate | 0.01 | 0.02 | –0.05 | 0.04 | 0.94 | 1.99 |
| Physician office visit coinsurance (0 = no; 1 = yes) | 0.14 | 0.45 | 2.19 | 1.22 | –87.74 | 58.23 |
| Midwest | 0.46 | 0.07 | 0.48 | 0.16 | 15.04 | 9.32 |
| South | 0.38 | 0.07 | 0.45 | 0.13 | 12.25 | 8.62 |
| West | 0.27 | 0.07 | 0.19 | 0.09 | 16.54 | 8.66 |
| Entry—enrolled in 2000 only | 0.02 | 0.04 | -0.05 | 0.04 | 0.84 | 1.65 |
| Exit—enrolled in 1999 only | 0.05 | 0.02 | 0.03 | 0.03 | –0.70 | 2.42 |
| Count of chronic diseases | 0.18 | 0.01 | 0.22 | 0.01 | 3.26 | 1.12 |
| Intercept | 3.14 | 0.27 | 1.75 | 0.81 | 88.24 | 28.68 |

NOTE: The dependent variable is the natural log of beneficiary spending on NSAIDs per year.

**Table C.4**
**Regression Results of Change in Spending on Antihistamines**

| | % Change in Total $ | | % Change in Plan $ | | % Change in Beneficiary $ | |
|---|---|---|---|---|---|---|
| **Variable** | **Estimate** | **S.E.** | **Estimate** | **S.E.** | **Estimate** | **S.E.** |
| Year 2000 | 0.20 | 0.02 | 0.22 | 0.02 | 1.36 | 1.66 |
| New 3-tier | 0.36 | 0.11 | 0.38 | 0.13 | 1.60 | 7.12 |
| Fixed 3-tier | 0.05 | 0.07 | 0.15 | 0.08 | –24.24 | 8.41 |
| New 3-tier × Year 2000 | –0.13 | 0.08 | –0.14 | 0.08 | 8.24 | 5.21 |
| Fixed 3-tier × Year 2000 | –0.05 | 0.03 | –0.05 | 0.03 | 6.10 | 1.89 |
| Mandatory generic substitution | –0.19 | 0.09 | –0.12 | 0.11 | –12.33 | 3.35 |
| Age 55–64 | 0.07 | 0.04 | 0.08 | 0.04 | –2.95 | 1.32 |
| Male | –0.07 | 0.03 | –0.07 | 0.04 | –1.44 | 0.85 |
| Median household income | 0.01 | 0.00 | 0.00 | 0.00 | 0.15 | 0.06 |
| Urban area | –0.03 | 0.01 | –0.06 | 0.02 | –0.40 | 1.35 |
| Plan deductible | 0.00 | 0.00 | 0.00 | 0.00 | –0.01 | 0.03 |
| Managed care plan | 0.20 | 0.05 | 0.20 | 0.07 | 19.69 | 8.41 |
| Physician office visit copay | 0.01 | 0.01 | 0.00 | 0.02 | –1.88 | 0.90 |
| Physician office visit coinsurance rate | –0.05 | 0.05 | –0.06 | 0.05 | –0.58 | 0.68 |
| Physician office visit coinsurance (0 = no; 1 = yes) | 1.11 | 1.07 | 1.26 | 1.12 | –9.83 | 18.33 |
| Midwest | 0.15 | 0.07 | 0.19 | 0.08 | 0.45 | 4.72 |
| South | –0.02 | 0.05 | 0.02 | 0.05 | 0.20 | 2.89 |
| West | 0.25 | 0.04 | 0.31 | 0.04 | 5.29 | 3.00 |
| Entry—enrolled in 2000 only | 0.02 | 0.03 | –0.01 | 0.04 | 0.81 | 1.18 |
| Exit—enrolled in 1999 only | –0.04 | 0.03 | –0.02 | 0.04 | 1.00 | 1.61 |
| Count of chronic diseases | 0.00 | 0.01 | 0.04 | 0.01 | 0.73 | 0.30 |
| Intercept | 3.99 | 0.20 | 3.74 | 0.18 | 59.02 | 15.77 |

NOTE: The dependent variable is the natural log of beneficiary spending on antihistamines per year.

**Table C.5**
**Regression Results of Change in Spending on Gastrointestinal Drugs**

| | % Change in Total $ | | % Change in Plan $ | | % Change in Beneficiary $ | |
|---|---|---|---|---|---|---|
| **Variable** | **Estimate** | **S.E.** | **Estimate** | **S.E.** | **Estimate** | **S.E.** |
| Year 2000 | 0.12 | 0.03 | 0.17 | 0.04 | 1.81 | 4.01 |
| New 3-tier | 0.10 | 0.06 | 0.03 | 0.12 | 10.29 | 28.18 |
| Fixed 3-tier | 0.03 | 0.05 | 0.11 | 0.09 | –53.51 | 29.68 |
| New 3-tier × Year 2000 | –0.08 | 0.07 | –0.08 | 0.07 | 9.60 | 14.11 |
| Fixed 3-tier × Year 2000 | –0.11 | 0.05 | –0.17 | 0.05 | 9.31 | 4.46 |
| Mandatory generic substitution | –0.03 | 0.03 | –0.11 | 0.08 | –1.18 | 12.23 |
| Age 55–64 | 0.06 | 0.02 | 0.10 | 0.02 | –7.45 | 3.07 |
| Male | 0.04 | 0.03 | 0.09 | 0.04 | –4.76 | 3.51 |
| Median household income | 0.00 | 0.00 | 0.00 | 0.00 | 0.43 | 0.20 |
| Urban area | –0.10 | 0.03 | –0.07 | 0.03 | –3.75 | 3.41 |
| Plan deductible | 0.00 | 0.00 | 0.00 | 0.00 | –0.06 | 0.10 |
| Managed care plan | 0.10 | 0.04 | –0.10 | 0.12 | 78.80 | 38.68 |
| Physician office visit copay | 0.00 | 0.01 | 0.03 | 0.02 | –14.20 | 6.41 |
| Physician office visit coinsurance rate | –0.02 | 0.03 | –0.03 | 0.03 | 3.50 | 4.18 |
| Physician office visit coinsurance (0 = no; 1 = yes) | 0.32 | 0.58 | 0.98 | 0.61 | –230.74 | 132.41 |
| Midwest | 0.04 | 0.04 | 0.07 | 0.05 | –11.90 | 14.97 |
| South | –0.03 | 0.04 | –0.02 | 0.05 | –15.09 | 10.08 |
| West | –0.08 | 0.07 | –0.15 | 0.08 | –10.52 | 10.45 |
| Entry—enrolled in 2000 only | 0.00 | 0.02 | –0.01 | 0.03 | 1.82 | 3.28 |
| Exit—enrolled in 1999 only | –0.10 | 0.03 | –0.10 | 0.02 | 2.02 | 3.34 |
| Count of chronic diseases | 0.10 | 0.01 | 0.10 | 0.01 | 2.35 | 0.70 |
| Intercept | 5.32 | 0.13 | 4.71 | 0.24 | 236.91 | 72.11 |

NOTE: The dependent variable is the natural log of beneficiary spending on gastrointestinal drugs per year.

**Table C.6**
**Regression Results of Change in Spending on Antidiabetic Drugs**

| | % Change in Total $ | | % Change in Plan $ | | % Change in Beneficiary $ | |
|---|---|---|---|---|---|---|
| **Variable** | **Estimate** | **S.E.** | **Estimate** | **S.E.** | **Estimate** | **S.E.** |
| Year 2000 | 0.11 | 0.05 | 0.15 | 0.05 | 6.21 | 10.67 |
| New 3-tier | 0.07 | 0.07 | 0.13 | 0.10 | –9.75 | 20.17 |
| Fixed 3-tier | –0.04 | 0.08 | 0.11 | 0.11 | –73.00 | 16.10 |
| New 3-tier × Year 2000 | 0.01 | 0.07 | –0.03 | 0.06 | 17.14 | 17.68 |
| Fixed 3-tier × Year 2000 | 0.04 | 0.06 | –0.01 | 0.06 | 14.88 | 11.99 |
| Mandatory generic substitution | –0.09 | 0.05 | –0.04 | 0.03 | –31.49 | 10.90 |
| Age 55–64 | 0.05 | 0.03 | 0.06 | 0.03 | –4.53 | 3.25 |
| Male | 0.09 | 0.02 | 0.09 | 0.02 | –0.67 | 2.44 |
| Median household income | 0.01 | 0.00 | 0.01 | 0.00 | 0.74 | 0.28 |
| Urban area | –0.11 | 0.04 | –0.12 | 0.05 | 1.50 | 2.69 |
| Plan deductible | 0.00 | 0.00 | 0.00 | 0.00 | –0.06 | 0.07 |
| Managed care plan | 0.10 | 0.07 | 0.02 | 0.12 | 49.06 | 24.98 |
| Physician office visit copay | 0.02 | 0.01 | 0.03 | 0.01 | –6.85 | 3.46 |
| Physician office visit coinsurance rate | 0.00 | 0.02 | 0.00 | 0.02 | 1.78 | 4.31 |
| Physician office visit coinsurance (0 = no; 1 = yes) | 0.27 | 0.46 | 0.31 | 0.42 | –109.17 | 100.35 |
| Midwest | 0.13 | 0.09 | 0.18 | 0.09 | –26.22 | 14.32 |
| South | 0.03 | 0.08 | 0.03 | 0.09 | –18.26 | 11.27 |
| West | –0.11 | 0.09 | –0.11 | 0.10 | –22.97 | 11.34 |
| Entry—enrolled in 2000 only | –0.04 | 0.05 | –0.06 | 0.05 | 1.30 | 5.43 |
| Exit—enrolled in 1999 only | –0.08 | 0.05 | –0.08 | 0.06 | –1.29 | 3.91 |
| Count of chronic diseases | 0.05 | 0.01 | 0.06 | 0.01 | –0.21 | 0.74 |
| Intercept | 5.32 | 0.10 | 4.87 | 0.17 | 192.89 | 31.56 |

NOTE: The dependent variable is the natural log of beneficiary spending on antidiabetic drugs per year.

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