

FEATURE ARTICLES

DO STATE COST CONTROL POLICIES REDUCE MEDICAID PRESCRIPTION DRUG SPENDING?

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ABSTRACT

We present the first systematic analysis of state policies limiting prescription drug access under Medicaid during 1990–2004, documenting their impact on states' Medicaid prescription spending growth. We see substantial variation in the number and type of policies used by states, but a clear upward trend in restrictions over time. Analysis of state level annual spending growth shows that these restrictions have in general helped contain Medicaid prescription drug costs and that some approaches, such as the use of preferred drug lists (PDLs) and tiered copayment systems, may have been more effective than others.

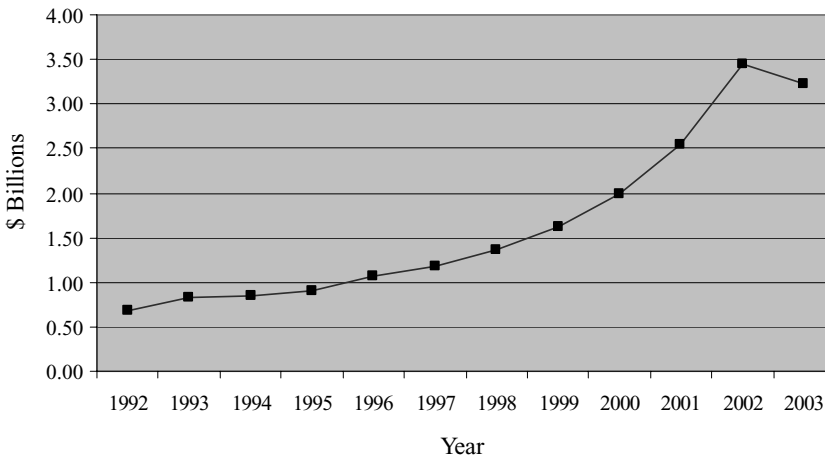
INTRODUCTION

Nearly 60 million low-income individuals receive their health insurance coverage through Medicaid, with the states and federal governments spending an estimated \$300 billion per year on the program. This makes Medicaid the largest single health insurance program in the United States (Congressional Budget Office (CBO), 2006). Medicaid program costs have increased dramatically in recent years, and current projections suggest that total costs will double over the next 10 years (CBO, 2006). Concerns about an impending fiscal crisis have led to increased attention to policies aimed at managing Medicaid costs.¹

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¹ See also Palmer (2006) and Baicker et al. (2008) for a discussion of the projected fiscal impact of entitlement programs including Medicaid.

FIGURE 1
Medicaid Prescription Drug Expenditures, 1992–2003



Source: Author calculations.

Spending on prescription drugs has been the fastest-growing expense category in Medicaid in recent years, with expenses growing on average over 16 percent per year between 2000 and 2004 (Holahan and Cohen, 2006). This rapid cost growth has resulted in prescription drug costs for state Medicaid programs in the neighborhood of \$30 billion per year (Holahan and Cohen, 2006). During the same time period, overall Medicaid spending grew a little over 9 percent per year (Holahan and Cohen, 2006). This growth rate differential has led to drug costs rising from 7 percent of total Medicaid expenditures in the early 1990s to over 14 percent in recent years.² These trends are displayed in Figures 1 and 2. Figure 1 shows annual nominal prescription drug expenditures and Figure 2 shows the annual share of total Medicaid costs accounted for by prescription drugs, for 1992–2003.

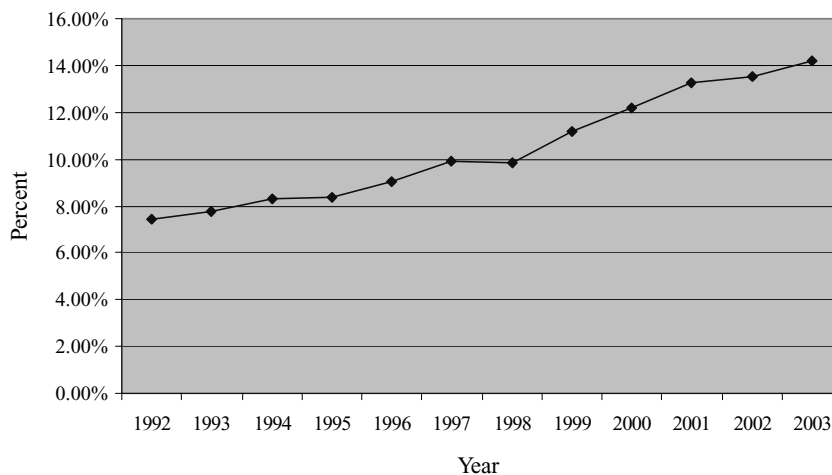
Policymakers' concerns about managing the use and costs of Medicaid prescription drug benefits have grown in response to these trends. Surveys of state Medicaid programs in 2000, 2003, and 2005 concluded that states had already introduced many policies to control their drug benefit costs, and the number of states implementing such policies has increased each study year (Crowley et al., 2005).³ In fiscal year 2005, 43 states

² Several papers document in more detail the growing costs of Medicaid prescription drug costs. Tepper and Lied (2004) show trends in Medicaid prescription use and costs for 1985 to 2001. Baugh et al. (2004) provide further breakdowns of this trend, showing for example that spending amounts are the highest for central nervous system drugs. The most detailed study of trends is Banthin and Miller (2006) who use Medical Expenditure Panel Survey 1996–2002 to look at usage of any Medicaid prescriptions as well as the number of drugs conditional on usage, by drug category as well as by population subgroups. They find that much of the growth comes from the use of certain drugs such as antidepressants and from the use of newer medications.

³ Federal rules do not require states to cover prescription drugs under their Medicaid plans, but all states currently provide this benefit to most Medicaid beneficiaries. Federal law sets minimum

FIGURE 2

Medicaid Prescription Drugs as Share of Total Medicaid Expenditures, 1992–2003



Source: Author calculations.

implemented policies to control Medicaid prescription drug costs. When asked whether states planned on adopting additional policies of this nature in 2006, 41 states indicated yes (Smith et al., 2005). The Medicaid Commission's 2005 report to the Secretary of the Department of Health and Human Services recommends several ways that states can further reform their pharmacy benefits, for example, by using a three-tiered copayment system (Medicaid Commission, 2005) by which drugs that have higher prices are charged higher copayments.

Yet, there has been no systematic documentation of states' use of Medicaid pharmacy restrictions,⁴ or any study of how these measures affect growth in Medicaid prescription drug costs.⁵ This is a deficiency in the literature because Medicaid pharmacy benefit restrictions are an important and growing phenomenon in the efforts to control state spending, and their effectiveness should be evaluated.⁶ It is also important because

requirements for prescription drug coverage for those states choosing to provide drug benefits, but states are allowed significant flexibility in administering their programs. Thus, the nature and stringency of state policies used to control prescription drug spending vary across states and over time.

⁴ Morden and Sullivan (2005) look at state prescription drug policies in 2004, and Crowley et al. (2005) update previous surveys in 2000 and 2003 with new data from 2005.

⁵ One study (Fischer and Avorn, 2003) calculated the *hypothetical* financial impact of states' greater use of generic drug policies and found that states could potentially realize an increase in savings by implementing these policies in their Medicaid program.

⁶ Examples include Texas and Kentucky's exclusion of the antipsychotic medication Zyprexa from their preferred drug lists; Koyanagi, Forquer, and Alfano (2005) research states' use of cost control policies on a selected group of psychiatric medications; and Lichtenberg (2005), Murawski and Abdelgawad (2005), and Virabhak and Shinogle (2005) looked at the effects of implementing preferred drug lists in a state.

several of these cost control tools are used by Medicare Part D plans, into which Medicare–Medicaid dual beneficiaries were moved beginning in 2006 (Gold, 2006; Hoadley et al., 2006).

This article provides the first systematic documentation and analysis of state policies limiting prescription drug access under Medicaid. We present an analysis of changes in states' Medicaid prescription drug policies over the period 1990–2004 and assess how these changes affect the growth in Medicaid prescription drug spending in the states during 1992–2003. Our focus is on state policies that have the most direct bearing on Medicaid beneficiaries' access to prescription drugs. These include copayments, prescribing limits, mandating the use of generic drugs, step-therapy requirements, prior authorization of drug use, and preferred drug lists (PDLs).⁷

Understanding the use and effectiveness of cost control policies is of particular importance because of their potential to reduce beneficiaries' access to needed prescriptions and the possible negative consequences of reduced access. Research has suggested that Medicaid beneficiaries perceive poorer access to prescription drugs than those with private insurance. Using data from 1994, Berk and Schur (1998) found that after controlling for health status, Medicaid beneficiaries have the same access to a usual source of care and a similar number of doctor visits as those with private coverage but are twice as likely to report not being able to obtain prescription drugs. This study found that 7 percent of those with Medicaid were unable to obtain a prescription drug when needed, compared to 2.9 percent of those with private coverage or 13.6 percent of those who had no coverage. Estimates based on the 2000 and 2003 Community Tracking Study (CTS) showed much higher percentages of people unable to afford prescription drugs, and similar disparities between Medicaid beneficiaries and the privately insured (Cunningham, 2005). Coughlin and Long (2005) analyzed data from the 1999 and 2002 National Survey of America's Families (NSAF) and found that Medicaid beneficiaries reported worse access compared to low-income insured individuals on two measures—access to dental benefits and prescription drugs. The authors infer that states' flexibility with the prescription drug benefit including an increase in cost containment policies has led to poorer access for Medicaid beneficiaries.⁸

Our article is organized as follows. The next section describes the construction of our data set documenting states' Medicaid prescription drug policies over time and uses those data to analyze trends in states' use of pharmacy benefit restrictions. We find an increased use of restrictions in nearly all areas, especially in utilization management policies, but substantial variation across states. The third section analyzes the effects of these state policies on the growth in state Medicaid prescription drug spending. We find that benefit restrictions have contained expenditure growth and that the newer

⁷ There are other efforts being made to control Medicaid drug costs that we do not discuss as they impact the cost per prescription to Medicaid rather than the number or type of medications used by patients. Examples are changes to the reimbursement formula from pharmaceutical companies and extension of the rebate program to Medicaid managed care. However, the effects of these policies are not reflected in the cost data that we employ in our analysis.

⁸ One study that found no differences in access is Elam (2004). Using 1996 Medical Expenditure Panel Survey data, this study found that Medicaid beneficiaries had about the same access to antidepressant drugs as those with private coverage.

utilization management policies have been most successful in this regard. The fourth section analyzes growth in total Medicaid spending to examine whether the reductions in Medicaid drug spending are offset by increases in other spending areas. We find that reductions in drug spending associated with pharmacy benefit restrictions appear to translate into reductions in overall spending as well. The final section summarizes and interprets these findings.

STATE MEDICAID PHARMACY BENEFIT RESTRICTIONS

We compile data from secondary and primary sources to analyze state Medicaid prescription drug policies over 1990–2004. We track the prevalence and stringency of each specific policy used by the states to control drug usage and cost, as well as the state’s overall policy approach.

Data

The primary source of information used in creating our policy database is *Pharmaceutical Benefits Under State Medical Assistance Programs*, a report published annually by the National Pharmaceutical Council (NPC) based on their surveys of states. Data on PDLs were not available in the NPC reports, but we were able to obtain these from the National Council of State Legislatures (NCSL) and confirmed the year of PDL implementation by searches of states’ Medicaid websites.

The NPC reports are available in hard copy (1992–1999) or Adobe (2000–2004) formats and are organized into tables of state comparisons of individual policy variables. We systematically coded and created a state by year database of regulations suitable for research from the raw NPC data tables. The data were checked against and supplemented with data from other published sources where available.⁹ Last, we created individual state profiles from the information we gathered and mailed this information to each state’s Medicaid office to verify their accuracy and gather information where there were gaps in our data. With some exceptions, we were able to gather data on each state policy for every year in the study period 1990–2004. Our database allows us to provide a more complete picture of policy trends and the combination of tools used at the individual state level in ways that were not possible earlier. For clarity of presentation we display data here for only four selected years: 1990, 1996, 2000, and 2004.¹⁰

Trends in States’ Use of Specific Policies

We analyze trends in states’ use of policies after separating them into four broad areas: copayments, prescribing limits, mandating use of generic or low-cost drugs, and prior authorization policies (including the use of PDLs).¹¹ Our data include 48 states plus the

⁹ Kaiser Family Foundation surveys of the states (Kaiser Commission on Medicaid and the Uninsured, 2001, 2003) provide the most comprehensive comparison sources.

¹⁰ We choose these years in order to report at relatively evenly spaced intervals, subject to the fact that our data span the period 1990 through 2004; we choose 1996 specifically because this is the first year that NPC reported information on tiered copayments and fail-first policies.

¹¹ In the sections that describe the Medicaid regulations regarding state pharmacy benefit policies, we draw heavily on Kaiser Reports (Kaiser Commission on Medicaid and Uninsured, 2001, 2003, 2005).

TABLE 1
States' Use of Medicaid Prescription Restrictions, Selected Years, 1990–2004

Policy	Number of States				Median Value			
	1990	1996	2000	2004	1990	1996	2000	2004
Any copayment	20	31	32	40	\$1.00	\$1.50	\$2.00	\$3.00
Tiered copayment	N/A	3	4	17		\$2.00	\$2.00	\$3.00
Limits on prescriptions per month	29	39	40	43	5	5	5	5
Limits on quantity per prescription	12	13	12	15	1 month	1 month	1 month	1 month
Mandatory generic substitution	12	27	33	41				
Any fail-first requirement	N/A	8	9	14				
Any prior authorization	40	40	43	49				
Preferred drug list (PDL)	N/A	0	0	30				

Source: Author calculations from NPC data. The 1990 prior authorization data are for 1991, first-year data are reported; 1996 is first year of reporting for fail-first data. Median values calculated from states that have the policy. Copayment amounts are the maximum copayment. Prescription quantity limits are typically expressed as number of days per prescription; median limit is expressed here in months. Data on tiered copayments, fail-first requirements, and PDLs are not available prior to 1996. Arizona and Tennessee are omitted from the table.

District of Columbia. We omit Arizona and Tennessee because their Medicaid programs are set up under waivers that allow them to differ along many dimensions relative to other states. We describe the trends for each policy in the sections that follow and present summary data in Table 1 on the prevalence of each policy over time.

Cost Sharing. Under current Medicaid law, states are permitted to implement “nominal” cost sharing for certain groups of beneficiaries. This has been defined as copayments between \$0.50 and \$3.00 per prescription, though the federal government¹² has granted waivers allowing cost-sharing levels up to \$5.00 per prescription.¹³ Copayments may be used to shift costs to beneficiaries and to direct them toward cheaper drugs. Federal laws that prevailed during the study period prevent states from denying a beneficiary access to a prescription because of failure to pay the copayment, but there is evidence that copayments are binding (Nelson et al., 1984; Stuart and Zacker, 1999), perhaps because of stigma costs involved in making such appeals to pharmacists. The Deficit Reduction Act

¹² State programs are overseen by the Centers for Medicare and Medicaid (CMS).

¹³ Copayments may vary with eligibility status and service provider. Under the law during the study period, cost sharing does not apply to drugs used by pregnant women and children.

of 2005 substantially increases the allowable scope of cost sharing and allows pharmacies to deny access to drugs for those who fail to pay copayments, beginning in 2006.¹⁴

The data in Table 1 demonstrate that prescription drug cost-sharing requirements have become increasingly prevalent over the study period: the number of states with cost-sharing has doubled since 1990. In 1990, 20 states required a copayment from beneficiaries to receive prescription drugs. By 2004, the number of states with copayment requirements had grown to 40, with 8 states adding copayments between 2000 and 2004.

The table also shows an increasing use of tiered copayment systems that require higher copayments for brand name drugs. In 1996 (the first year data on this measure are available) only three states charged differential copayments for brand-name and generic drugs. By 2004, 17 states employed a tiered copayment system. The vast majority of states adopting the tiered systems have done so since 2000, when only four states used tiered copayments.

In addition to introducing new cost-sharing requirements, states have greatly increased the levels of prescription drug copayments since 1990 (Table 1). In 1990, 18 of the 20 states with cost-sharing had payment levels of \$1.00 or less. In 2004, only 5 of the 39 states with cost-sharing had copayments of \$1.00 or less, 18 had copayments ranging up to \$3.00 and 4 states went to \$5.00. The median of the highest allowed copayment requirement among states with cost-sharing tripled during this time period, rising from \$1.00 in 1990 to \$3.00 in 2004. Even after taking into account inflation, this amounts to a 210 percent real increase in the median (maximum) copayment amount.¹⁵ In states with tiered copayment systems, the difference in amounts required for brand versus generic drugs has increased over time. In both 1996 and 2000, the median copayment amount for brand-name drugs among states that used a tiered system was \$2.00, whereas the median copayment for generics was \$0.50 in both years. By 2004, the median copayment for brand-name drugs was \$3.00 and that for generics was \$1.00.

Prescribing Limits. States have much flexibility in how prescription drugs are dispensed in their Medicaid programs. Medicaid federal law states only that benefits such as prescription drugs must be provided so they are “sufficient in amount, duration and scope to reasonably achieve their purpose” (Crowley et al., 2005). Federal regulations also allow states to place appropriate limits on quantities per prescription and other utilization control methods.

Although most states impose prescribing limits (defined as restrictions on the quantity of medication in one prescription or the number of prescriptions per month), there is variation in the specific nature and the extent. Only a few states impose limits on how many prescriptions per month a beneficiary may receive, and the use of this policy has changed little over the study period. In 1990, 12 states limited the number of prescriptions per month, and in 2004, 15 states impose such limits (see Table 1).¹⁶ Limiting the quantity of pills in each prescription is a more commonplace policy, and its use has increased since

¹⁴ See <http://ccf.georgetown.edu/pdfs/recontable020906.pdf>, accessed July 2006.

¹⁵ Inflation adjustments were undertaken using the Consumer Price Index.

¹⁶ New York imposes no monthly limit, but the state does impose an annual limit of 40 prescriptions per beneficiary. This limit may be overridden with physician approval.

1990. In 1990, 29 states placed limits on how many pills are allowed in each prescription; this number grew to 43 states in 2004. However, a large number of states introduced these limits between 1990 and 1996 rather than in more recent periods. In both 1996 and 2000, around 40 states placed limits on the quantity of pills per prescription.¹⁷ Table 1 demonstrates, moreover, that among states with prescribing limits the stringency of the restrictions has remained fairly constant over time.

Generic and Low-Cost Drugs. Medicaid law requires states to cover all FDA-approved medications by pharmaceutical manufacturers who have rebate agreements with the federal government. However, states may require or encourage the use of generic medications, in ways beyond the use of tiered copayment systems already discussed.¹⁸ States may also require physicians to prescribe the lowest cost multisource drug first. Often called “fail-first” or step therapy requirement, this policy requires an individual to use and “fail” on a particular drug—the lowest cost one—before Medicaid allows a higher priced alternative.

Analysis of the data reveals that generic drug policies are receiving increased attention from the states. As summarized in Table 1, in 1990 only 12 states required that physicians prescribe generics when available. By 2004 this number had grown to 41 states. The period between 2000 and 2004 saw a large increase in states mandating generics—from 33 states in 2000 to 41 in 2004.

The data in Table 1 also reveal that states use “fail-first” policies less frequently than other generic drug policies, but have increased the use of these policies in recent years. In 1996 (the first year data are available for this measure) only 8 states had such a policy in place. By 2004 this number had grown to 14.

Prior Authorization Policies. States have the flexibility to require prior authorization of drugs within their Medicaid prescription drug programs. Under these laws, states may require that physicians request and receive permission before a particular drug can be prescribed and dispensed.¹⁹ Sometimes a prior authorization program works in conjunction with a “formulary” or “preferred drug list (PDL).” A PDL is a list of drugs available to Medicaid beneficiaries without prior authorization. All other drugs require prior authorization or approval by the state Medicaid office. By law, even a drug not on a state’s PDL must be made available through a request for prior approval made by a physician to the state. PDLs are required to include all drugs made by manufacturers with rebate agreements in effect with the Centers for Medicare and Medicaid Services (CMS). There are some exceptions to this rule such as the ability to exclude a certain high-cost drug from the PDL if it already contains a similar drug.

¹⁷ Twenty-two states also report limits on the number of refills per prescription in the 2004 NPC survey, and this number has not changed much since 1990. Moreover, many of the refill limits apply only over a time period, such as five refills per 6-month period, and are used in conjunction with quantity limits of 30-day supplies per prescription.

¹⁸ States may also offer pharmacists an incentive fee to distribute generic drugs. These policies are used less often by the states, with only six states having such a policy in 2004. These policies may also indirectly affect beneficiary access to brand name drugs.

¹⁹ If states operate a prior authorization program, they must provide a response within 24 hours of a request for a prescription drug and must provide a 72-hour emergency supply of the medication.

TABLE 2
Policy Stringency by State, Selected Years, 1990–2004

Stringency Measure	Mean Value for All States			
	1990	1996	2000	2004
Number of policies from set of five older policies	2.32	3.08	3.27	3.83
Number of policies from set of eight total policies	N/A	3.22	3.47	5.10
Utilization restriction index (Index 1)	4.43	6.67	8.13	17.23
Cost-sharing index (Index 2)	\$9.22	\$14.94	\$16.12	\$29.65

Source: Author calculations from NPC and MEPS data.

Table 1 shows that prior authorization programs have been prevalent among the states throughout the study period: 40 states had prior authorization programs in 1991 (first year data are available on this measure) and 49 states had a program in place in 2004. However, PDLs are a new phenomenon that states have rapidly adopted during the past 5 years. Because the implementation of a PDL often (but not always) comes with a considerable lag after a state legislature authorizes its development, our data report the implementation dates rather than the authorization dates. In 2000, no states had yet implemented a PDL. In 2001, only 2 states (Florida and Georgia) had implemented a PDL.²⁰ By 2004 fully 30 states had PDL programs in place.

Trends in the Scope of State Restrictions

One measure of a state's overall activism in controlling Medicaid prescription drug access is the number of policies in place. We examine five important policies for which we have data over the entire study period: copayments, generic substitution, limits on number of prescriptions, limits on quantity per prescription, and the use of prior approval. We also consider three additional policies for which we only have data for later years: tiered copayments, fail-first policies, and PDLs. Table 2 compares states' use of these policies in 1990, 1996, 2000, and 2004.²¹ The table shows the mean number of policies in place per state in each year of our analysis.

The comparisons in the figure demonstrate a substantial upward trend in states' prescription drug access restrictions over time. Among the five older policies, the mean number of policies per state in 1990 was 2.32. By 2004, the mean number of policies per state was 3.83. Adding data on states' adoption of the three newer policies (tiered copays, fail-first, PDLs) also shows increasing use over time. We observe that when states adopt new policy tools, they tend to do so without substantially reducing their use of other policies. On average, a state had 3.08 of the 5 older policies in place in 1996,

²⁰ Michigan had authorized but not implemented a PDL in 2001. Data were compiled by the authors from information on state PDL passage obtained from the National Council of State Legislators (NCSL) found at <http://www.ncsl.org/programs/health/medicaidrx.htm>, with implementation dates determined from states' Medicaid websites. Tennessee also has a PDL but is not included in our data set.

²¹ Data on prior authorization policies in 1991 is reported in the 1990 count of policies.

and only 3.22 of the 8 total policies. By 2004, this average had grown to 5.10 of the 8 policies compared to 3.83 of the 5 older policies.

One shortcoming of using a simple count of policies is that it assumes each type of restriction is equally stringent. Ideally we would want to create some weighting system that puts greater emphasis on policies that are more binding. For example, a prescription drug quantity limit might be more binding than a fail-first policy if beneficiaries typically take a large number of drugs but few of them are brand-name drugs. We also might want to measure the stringency of copay levels used in a state in terms of how much that implies a typical person would have to pay. Ideally we would create these indexes by measuring the impact of each state's set of cost control policies on a representative national population of Medicaid beneficiaries (currently exposed to no cost containment restrictions). We could then use this measure to capture the restrictiveness of the cost control policies in each state, and it would be more meaningful than a simple count of policies. Based on this intuition we create two indexes of states' policy restrictiveness.

Index 1 measures prescription utilization constraints that an average individual may be subject to under a certain state's Medicaid policy in a certain year. It is calculated as the sum of the number of prescription drugs an average individual takes that exceeds the state's prescription limit per month (if any), plus the total number of brand-name drugs he/she takes if the state has a PDL, fail-first or generic substitution law (each considered separately). This sum measures the cumulative number of prescription drug restrictions to which a person might be subject by the Medicaid program.

Index 2 measures the potential prescription drug cost-sharing burden faced under a state's Medicaid rules by an average individual in a given year. It is calculated by applying the maximum copayment amount a state may require times the number of prescription drugs that the average individual takes. If a state has a tiered copayment in place, a different copayment is applied to branded and generic drugs. The copayments on each drug are summed to form the total cost-sharing amount for the average individual.

Although we would ideally calculate these indexes for the Medicaid population not currently subject to these restrictions, there is no such counterfactual in the real world. Since in real life the use of drugs by currently Medicaid-insured individuals is possibly "contaminated" by the actual impact of Medicaid pharmacy restrictions, we use a nationally representative population of those who are privately insured to construct Index 1 and Index 2. Although this sample is not ideal because private insurance may also carry prescription restrictions, and the health status of privately insured individuals is likely to differ from those on Medicaid, we know that these individuals certainly did not face the restrictions imposed by Medicaid.²² It is also clearly an improved way to capture

²² It is clear that we should not use the Medicaid population in a certain state to simulate the impact of the policies since they have already been exposed to the policy. Similar policies may also be used by private sector individuals but it is highly unlikely that the same policies are used in a given state's Medicaid and private policies as the private market's use of policies is generally not varying by state but rather by the type of policy. As there is no way to obtain a population not subject to any prescription drug controls in these times, we believe that using the private sector population is the most appropriate for this measure given no reason to believe that there is a correlation with a state's Medicaid policies and our national sample of privately insured individuals.

variation in policies across states relative to a simple count. Furthermore, there is precedent for this kind of approach in the health insurance literature as our measure of stringency of each state's policy is similar in spirit to the measures Currie and Gruber pioneered in 1996 for summarizing the stringency of Medicaid eligibility rules for women and children.

We use data from the Medical Expenditure Panel Survey (MEPS) household survey, a nationally representative data set on the health care use and expenditures of the civilian noninstitutionalized population. Supplementary files of the MEPS provide detailed information on respondent prescription drug use. We draw a random sample of 1000 privately insured adults from the 2002 MEPS survey.²³ We retain data on the individual's prescription drug usage, including drug name, quantity, dosage, and duration of use. To construct our indexes we assume that all of these 1000 individuals live in a certain state/year (e.g., New York in 1992) and calculate the hypothetical impact of the relevant Medicaid pharmacy benefit restrictions on each individual. After calculating the Index values for each individual, we construct values for each state and year by calculating the average value of each Index for the state-year pair (e.g., NY 92). We repeat this exercise for each state and year. The result is an index that varies at the state by year level. Thus, the state by year values of Index 1 and Index 2 reflect the extent of state pharmacy restrictions relative to other states and years, subject to the caveats above. We believe that these indexes serve as an additional validity check on other ways we measure a state's policy environment in this article.

Because we do not have detailed data on state policies as they apply to individual drugs, these index variables are somewhat crude approximations. For example, copayment amounts in some states may vary by drug or avenue of Medicaid eligibility. Additionally, only select individual drug classes are subject to fail-first requirements or prior authorization, and we do not have detailed lists of the drugs that appear on PDLs for our entire sample period. Nonetheless, we can observe the number and type (brand vs. generic) of drugs an individual takes and use this information in conjunction with the state policies to determine the maximum copayment amount an individual would face, and the potential utilization restrictions they could face, if they lived in each state in each year. Table 2 reports the mean value of Index 1 and Index 2 across states in each year of our analysis. Consistent with our data on the counts of policies per state, the table shows an increase in state policy restrictions over the study period, particularly since 2000.

DO STATE RESTRICTIONS REDUCE PRESCRIPTION DRUG SPENDING?

Our analysis of data from 1990 to 2004 shows that states now employ a much larger set of restrictions to control Medicaid prescription drug expenditures than they did in the past and that this trend has intensified since 2000. Despite these general trends, the data demonstrate considerable variation across the states—in the specific policies used, in the scope of benefit restrictions, and in the extent of policy changes over time.

²³ Results are extremely similar using a random sample of 1,000 privately insured individuals of any age, a random sample of adults of any insurance status, and a random sample of adult Medicaid beneficiaries. Results are also similar if data are taken from the 1996 MEPS rather than the 2002 MEPS.

Whether these benefit restrictions as a whole or in some combinations are effective in reducing states' expenditures is a critical question for policy, but we have little evidence to date. This is presumably due to the lack of a systematic compilation of state policies and to the difficulties of separating out their effect on state expenditures from the numerous other factors that may be operating simultaneously. A variety of studies have examined the effects of state Medicaid pharmacy benefit restrictions but have generally analyzed the effect of a single policy rather than a state's overall policy environment and often use data from only one or two states.²⁴ Most of these studies also focus on the effects of a policy on drug access or usage rather than on state expenditures. There is in fact very little work looking at the impact of Medicaid policy changes on state Medicaid spending.

Related Literature

In one of the earliest studies, Nelson et al. (1984) used time-series Medicaid claims data for nearly 18,000 beneficiaries in South Carolina and found an 11 percent drop in average monthly prescriptions following the 1977 implementation of a \$0.50 copayment. This decline was significantly greater than in the comparison state of Tennessee that did not have cost sharing.

Using the 1992 Current Medicare Beneficiary Survey, Stuart and Zacker (1999) examined the impact of Medicaid copays ranging between \$0.50 and \$3.00 in 38 states. They found that elderly and disabled Medicaid beneficiaries residing in copayment states had lower rates of prescription drug use than their counterparts in noncopayment states. After controlling for demographic and state policy differences, they found that the disparity is due primarily to a reduced likelihood of filling any prescription, and that the disparity was greatest for beneficiaries in fair or poor health.

Additional studies have looked at the effects of limiting the number of prescriptions per month for Medicaid beneficiaries (Soumerai et al., 1991; Soumerai et al., 1994; Martin and McMillan, 1996). These studies have found that prescription limits were associated with a decreased usage of drugs and increased hospital admissions. Martin and McMillan (1996) looked at a 1991 Georgia policy that reduced monthly reimbursable prescriptions from six to five. They utilized a quasi-experimental, retrospective, 12-month interrupted time-series analysis and found that prescription drug usage fell by 9.9 percent and beneficiaries had altered prescription drug regimens with potential for clinical consequences.

Other studies that have examined the impact of state pharmacy benefit restrictions on program costs (not access to drugs) include several on prior authorization restrictions.²⁵ Bloom and Jacobs (1985) used a pre-post design in West Virginia of the drug cimetidine, which decreased in use after prior authorization was required; Kotzan et al. (1993) looked at Georgia data and use of H2 blockers and NSAIDs and found that use of

²⁴ A comprehensive review of the literature on the impact of pharmacy benefit restrictions in private and public insurance programs is contained in Hoadley (2005).

²⁵ Some studies have examined the effect of other Medicaid pharmacy benefit program features. Maximum allowable cost (MAC) lists are lists of generic drugs and maximum reimbursements for them similar to the federal upper limit (FUL) list. MAC lists are either more inclusive or list lower prices than the FUL list. Abramson et al. (2004) report that states with MAC lists said they saw lower cost growth.

these drugs decreased after prior authorization was required; and Smalley et al. (1995) found similar effects of prior authorization for NSAIDs in Tennessee Medicaid claims. Dranove (1989) and Moore and Newman (1993) found evidence that the use of Medicaid formularies substantially changes prescribing behavior, a finding echoed in recent work by Murawski and Abdelgawad (2005) on Medicaid PDLs.

In summary, from the literature above and from several published reviews (MacKinnon and Kumar, 2001; Soumerai, 2004; Soumerai et al., 1993; Hoadley, 2005), there is evidence that copayments, prescribing limits and utilization management strategies reduce Medicaid beneficiaries' use of drugs. These studies shed light on the impact of state restrictions on drug usage and access but are of limited scope and in many cases employ a research design that has been subject to criticism (MacKinnon and Kumar, 2001; Soumerai, 2004). Nor do they tell us the combined effect of the current extent and scope of restrictions on state Medicaid prescription expenditures.

Our systematic collection of policy data that covers all states over a long time period allows us to test the implications of state pharmacy benefit restrictions for prescription drug expenditure growth using a rigorous research design. We combine our data on state policies with data on each state's annual Medicaid prescription drug expenditures and characteristics of the state Medicaid population, obtained from the CMS. Using multivariate regression analysis, we examine whether a state's use of prescription drug benefit restrictions has reduced the pace at which prescription drug expenditures have grown, after controlling for other influences on these expenditures.

Data

The data set used to test our hypotheses is composed mainly of information made publicly available by CMS (formerly the Health Care Financing Administration (HCFA)). The key outcome variable is the cost of prescription drugs under the Medicaid program in each year and state. States reported their annual total Medicaid prescription drug expenditures (as well as other program data) by state and by year until 1998 through what was known as the HCFA-2082 form.²⁶ CMS then compiled these data by state and year 1991–1998 and released the output to researchers. Since January 1999, as a result of the 1997 Balanced Budget Act (BBA), it became mandatory for states to submit data quarterly at the micro level (person-level enrollment and claims data) to CMS, which then creates these aggregates themselves using the Medicaid Statistical Information System (MSIS).²⁷

The MSIS data also contain measures of the total number of beneficiaries, total Medicaid costs, and the number of beneficiaries with any Medicaid drug utilization that year. Medicaid data from this source have been widely used by researchers studying the Medicaid program and its expenses, including Baugh et al. (2004), Liska et al. (1997), Holahan and Liska (1997), Ku and Garrett (2000), Holahan and Garret (2001), Holahan and Bruen (2003), and Holahan and Ghosh (2005). The Urban Institute has examined

²⁶ The official name was "Statistical Report on Medical Care: Eligibles, Recipients, Payments and Services."

²⁷ Several states had been submitting micro-level data to CMS using the MSIS system even prior to 1999.

these data carefully over a long period and note several details of which one must be cautious (e.g., Bruen, 2000, discusses the use of the Medicaid prescription drug data in detail, suggesting that one drops certain states due to noted problems in their reporting).²⁸ Their work also speaks to the external validity of these data; e.g., the estimates of the elasticity of Medicaid enrollment to the state unemployment rate derived from the Current Population Survey and the HCFA-2082 reports are very comparable (Appendix Table 1 in Dorn, Smith, and Garrett, 2005).

Prescription drug spending data provided by CMS are nominal dollars, reported by federal fiscal year (October–September) and represent gross amounts prior to the receipt of rebates by manufacturers.²⁹ These reports specifically exclude any patient copayments, measuring only the amount that was paid by the state Medicaid system to the pharmacy.³⁰ These only cover enrollees for whom Medicaid pays the pharmacy claim (thus excludes those covered by fully capitated managed care plans). If prescriptions are provided to a Medicaid patient during a hospital stay, those expenses are included in the inpatient hospital claim, thus these are only outpatient prescription expenses. Similarly, in most states medications provided in nursing homes are included in the nursing home's reimbursement rate. As Medicaid restrictions do not apply in an inpatient setting (e.g., since something like a fail-first or prior-approval approach is not feasible) and do not apply to capitated managed care plans, these features of the data set are not problematic for our study.

As Banthin and Miller (2006) point out, it is important to control for the nature of the population enrolled in Medicaid when looking at trends in Medicaid prescription drug outcomes over time. Accordingly, we account for several features of a state's Medicaid population in our analysis. States generally do not require fully capitated managed care entities that serve Medicaid beneficiaries to submit a breakdown of the costs to the states. Other forms of Medicaid managed care, such as primary care case management (PCCM), still involve pharmacy claims being paid by the state. Therefore, we control for the level of *fully capitated managed care penetration* in the state/year in our analysis. We expect that as states expand programs to cover more enrollees (in ways not picked up

²⁸ For example, they note that there are four states (Arizona, Tennessee, Hawaii, and Oklahoma) that report no prescription drug recipients in 1990 and 1997. In addition, Ku and Bruen (1999) note that Oregon's reporting of the number of enrollees in the HCFA-2082 forms has shown some inconsistency since 1994 and recommend robustness checks on results obtained from these data after dropping these states. We conduct these tests and report the results in the third section of this article.

²⁹ This is the appropriate cost measure for this study, which investigates only the effect of policies that attempt to control consumer drug usage. If rebates are incorporated in the cost measure, the pharmacy benefit restrictions variables may inadvertently pick up the effect of rebate agreements that are contemporaneously enacted. On the other hand, a policy such as required generic substitution may mean that the rebates also decrease, so that the cost savings that appear to result to the program may be overstated. We are grateful to an anonymous referee for pointing this out.

³⁰ These payments represent the total cost of the medications and do not take into account the Federal Matching Assistance Percent of the total costs that the federal government will refund to the states.

by the other controls), costs would naturally rise and thus we incorporate data on the *number of people receiving benefits under the Medicaid program*. Prescription drug use tends to be much higher among the elderly and disabled, and their costs may have also grown at a faster rate (Baugh et al., 2004). For these reasons, we take into account the *percentage of a state's Medicaid beneficiaries that are elderly*, and the *percentage that are blind or disabled*. All of the Medicaid population measures also come from CMS. We obtain most of these from the 2082-MSIS forms. The fraction enrolled in Medicaid managed care programs also comes from CMS but from a different reporting system.³¹

To account for other time-varying differences across states that may affect the characteristics of the Medicaid population, we also include the state's *unemployment rate*, *population density*, and the *number of physicians per capita* in each model. The unemployment rate comes from the Bureau of Labor Statistics, state population data come from the U.S. Census, and the number of physicians comes from the American Medical Association, as reported in various editions of the U.S. Statistical Abstract.

Because of some missing data for early years, we do not use 1991 information. As our growth rates are calculated from base year to next, the final data set for analysis thus covers 1993–2003 and contains observations on 49 states (excluding Arizona and Tennessee, including District of Columbia). Summary statistics are provided in Table 3.

Methods

We assume that the annual growth rate in a state's Medicaid prescription drug expenditures is determined by policy actions taken to control spending growth, by both fixed and time-variant characteristics of the state, and by national time trends that affect all states.³² We test our hypotheses about how a state's adoption of policies affects expenditure growth with an empirical model specified in the following way:

³¹ CMS reports data from 1995 onward showing the percent of the Medicaid population in managed care. As some forms of managed care do not include prescription drugs (i.e., PCCM type managed care), while others do (fully capitated managed care), this means that it is important to know enrollment by type of managed care for the purposes of this study. CMS reports from 1995 onward in older style Adobe Acrobat format the enrollment numbers in different managed care contracts (and their capitation status) by state, county, and plan name. A typical year contains about 60 pages of data. These pages were scanned, hand-edited, and then aggregated to the state level to compute the percent of the Medicaid population in fully capitated managed care. For data from 1991 to 1995, hard-copy tables from CMS were entered into a database and processed in a similar manner.

³² This study design follows the literature that has looked at the effect of state policies on the growth of costs in other programs, for example, state workers compensation programs (Danzon and Harrington, 2001). Annual growth rates are also the typical outcome in analyses of the growth in general Medicaid expenditures (e.g., Holahan and Liska, 1997; Holahan and Bruen, 2003).

TABLE 3
Descriptive Statistics of Regression Variables, 1993–2003

Variable	Mean	Std. Dev.
Annual pct growth state prescription drug expenditures	0.16	0.11
Annual pct growth state Medicaid expenditures	0.10	0.11
Annual pct growth state Medicaid beneficiaries	0.06	0.14
Annual pct growth beneficiaries over 65	0.02	0.15
Annual pct growth disabled and blind beneficiaries	0.06	0.12
Annual change in pct beneficiaries in capitated mgd care	0.04	0.16
State unemployment rate	5.03	1.37
State population density	334.14	1,215.03
Number of physicians per capita in state	238.63	83.55
Total number of policies in state	3.45	1.23
State has four or more policies	0.45	0.50
State requires generic substitution	0.62	0.49
State has any copayment	0.65	0.48
State has tiered copayment	0.11	0.31
State has limits on number of prescriptions per month	0.25	0.43
State has limits on quantity per prescription	0.83	0.38
State has preferred drug list	0.07	0.25
State has any fail-first restrictions	0.11	0.31
State has any prior authorization	0.83	0.38
State index of utilization restrictions (Index 1)	8.29	5.93
State index of cost-sharing restrictions (Index 2)	17.11	14.81
Number of observations	533	

$$\begin{aligned}
\Delta Expenditures_{st} = & \alpha + \beta_1 Restrictions_{st} + \beta_2 \Delta CapitulatedManagedCarePenetration_{st} \\
& + \beta_3 \Delta MedicaidRxPopulation_{st} + \beta_4 \Delta Elderly_{st} + \beta_5 \Delta Disabled_{st} \\
& + \beta_6 PopulationDensity_{st} + \beta_7 UnemploymentRate_{st} \\
& + \beta_8 PhysiciansperCapita_{st} + State_s + Year_t + State * Time_{st} + e_{st}
\end{aligned} \tag{1}$$

where subscript s stands for a state and t stands for a year. Our dependent variable is the annual percentage growth rate in Medicaid prescription drug expenditures $(Expenditures_{st} - Expenditures_{st-1})/Expenditures_{st} - 1$. Our key independent variables measure the set of pharmacy benefit restrictions ($Restrictions_{st}$) described previously in our study. We use alternative specifications to look at the general and specific effects of different types of policies described earlier.

Studies of the effects of state policies must be careful to consider the source of identification (Soumerai, 2004). In a study design that compares outcomes in one state before

and after it implements a policy, researchers could inadvertently attribute the effect of some other phenomenon that occurs in that state during those years to be the effect of a policy. Looking at a cross section of states at a point in time is also not ideal because differences in outcomes between states with and without policies could obviously reflect other underlying differences between states. In our approach, we minimize these concerns by using information both across states and over time for almost all states.

We include state fixed effects in all models to account for the fact that different states may be on permanently different growth trajectories. (For example, larger states may be more efficient due to economies of scale and thus see lower cost growth rates than smaller states.) We also take account of the fact that in certain years, the entire nation may face cost shocks. Studies that focus just on one state cannot separate out these effects. We include year fixed effects in all our models to capture the effect of national phenomena that may affect drug spending (e.g., the introduction of a new drug or the adoption of a new treatment protocol).

Although state fixed effects account for the fact that states may be growing at different rates during this time period, they do not account for the possibility that these growth rates themselves may change over time due to some other trends in the state (that may be spuriously correlated with the enactment of a policy). To the extent that a state's Medicaid program changes in composition in ways relevant for costs, the characteristics of the state Medicaid program, population, and economic conditions may be important determinants of cost growth. We include several time-varying state controls to account for this, as discussed above.

To account for the possibility that other unmeasured state trends (e.g., industrial decline) could be correlated with the timing of policies, in some model specifications we include a separate linear time trend for each state. In this specification, our identification comes from a very robust study design in which we test whether a state that adopts a policy sees a change in its annual pattern of expenditure growth relative to the nation as a whole, relative to the state's underlying growth rate that is common across all years, and relative to anything else that may be happening in the state that may cause its growth rate to increase or decrease linearly over time relative to other states.

Results

We first estimate Equation (1) with each state's policy actions measured as counts of policies. Our first specification includes the total number of policies in place in each state and year. Our second model specification includes a 0–1 dummy variable with 1 indicating that a state has four or more policies. This approach follows recent work by Cunningham (2005) using the CTS to look at whether state restrictions in the 2000/01–2003 period have affected beneficiaries' perceived access to needed medications.

The results from this estimation are presented in Table 4. The first column of the table presents estimates using the total count of policies without control variables, as a crude look at whether trend differences suggestive of policy effects are visible in the raw data. The second and third columns report these estimates with control variables, and with state linear time trends, respectively. The final two columns of the table report estimates using the indicator for whether a state has four or more policy restrictions, without and with state linear time trends, respectively. All specifications include state and year

TABLE 4

State Medicaid Prescription Drug Expenditure Growth, 1993–2003, Models With Policy Counts

Dependent Variable = Rx Expenditure(<i>t</i>)/Rx Expenditure(<i>t</i> –1) – 1					
Explanatory Variable	(1) No Controls	(2) Controls Only	(3) Controls and Trends	(4) Controls Only	(5) Controls and Trends
Total number of policies	–0.0131** 0.0061	–0.0188*** 0.0062	–0.0260*** 0.0081		
Four or more policies				–0.0256** 0.0124	–0.0233 0.0166
Pct change in Medicaid beneficiaries		0.2302*** 0.0798	0.2008*** 0.0598	0.2311*** 0.0819	0.1992*** 0.0611
Pct change in beneficiaries over age 65		0.1211* 0.0657	0.1195** 0.0589	0.1232* 0.0662	0.1189** 0.0588
Pct change in beneficiaries who are disabled		0.0444 0.0826	0.0186 0.0747	0.0428 0.0843	0.0187 0.0754
Change in pct beneficiaries in capitated managed care		–0.0767** 0.0327	–0.0710** 0.0334	–0.0770** 0.0332	–0.0712** 0.0337
State and year fixed effects	Yes	Yes	Yes	Yes	Yes
Linear state time trends	No	No	Yes	No	Yes
R ²	0.0304	0.2965	0.3774	0.2877	0.3654
N	533	533	533	533	533

Note: Robust standard errors appear below the coefficient estimates. All models include an intercept term. Models with control variables also include the unemployment rate, population density, and physicians per capita.

*Statistically significant at 10 percent confidence level.

**Statistically significant at 5 percent.

***Statistically significant at 1 percent.

fixed effects. Standard errors are reported below coefficients; statistically significant coefficients are indicated with asterisks.

The estimates in the first column of Table 4, without control variables, are akin to plotting the state cost growth trends over time and showing a trend break after the adoption of the policies. These estimates show that even when we control only for a fixed national year effect and state fixed effects, increasing the total number of benefit restrictions appears to reduce expenditure growth by about 1.3 percent, and this effect is statistically significant.

In the models that control for other state characteristics, both with and without linear state time trends, the coefficient on the number of policies remains negative and

statistically significant. In these models, the estimated coefficient is -0.0188 and -0.0260 , respectively, indicating that states who adopted one additional policy saw annual expenditure growth reduced by about 2 to 2½ percentage points below what it otherwise would have been. The final two columns of Table 4 show that in states and years in which four or more policies are employed, prescription drug expenditure growth is also slower. In the model with controls and state fixed effects only, the four-plus policy indicator is statistically significant and the results suggest that annual expenditure growth is lowered by 2.6 percent; however, when linear state time trends are added to the models this policy measure loses statistical significance.

One might expect that different policies will have different effects on expenditure growth. Thus, the results in Table 4 could mask substantial heterogeneity in the impact of each restriction. To account for this we examine the effects of state benefit restrictions when each individual policy variable is included in the model. One concern in estimating models that include all of the policy variables is that there could be a high degree of multicollinearity between them. Our analysis of state actions did not point to a systematic clustering of policy activity, but we nevertheless examined the correlation matrix between the state policies and saw that the policy variables are not highly collinear: the correlation coefficient between any two laws does not exceed 0.28, and on average it is 0.08 in absolute terms. In part to counter multicollinearity concerns, and to capture state differences in policy stringency, we also estimate models that include our constructed stringency indexes (Index 1 and Index 2) as the measures of states' Medicaid restrictions.

The estimation results for these models are reported in Table 5. As in the previous table, our first model includes only the policy variables to explore whether raw trend differences suggest significant policy effects. The models in columns 2 and 3 add control variables and state linear time trends, respectively. The estimates incorporating our constructed Index measures are reported in column 4 and column 5, first with only control variables and then with state linear time trends. All models include state and year fixed effects.

The first column of Table 5 shows that when we control only for a fixed national year effect and state fixed effects, all of the policies have a negative effect on states' prescription drug expenditure growth, but only the effect of tiered copayments is statistically significant and that is only marginally so. The estimates with controls included, reported in column 2, show similar results but now the effects of PDLs and prior authorization are statistically significant. When linear state time trends are included (column 3) prior authorization becomes statistically insignificant but the effect of PDLs is strengthened and that of tiered copayments becomes statistically significant again. The estimated effects of these latter variables are also the largest. With state time trends included, the coefficient estimates suggest that the use of PDLs reduces states' annual prescription drug expenditure growth rates an average of 5.7 percent, and tiered copayments reduce annual expenditure growth rates by 5.5 percent.

The final two columns of Table 5 present the results from estimating the models using the two policy stringency index variables that we developed from the MEPS data. The estimates show that higher index values are associated with lower prescription drug expenditure growth, consistent with the results from previous specifications. Although the estimated effects of increasing each index by 1 point are much smaller, the effect of Index 1 (index of utilization restrictions) is statistically significant in both the models

TABLE 5

State Medicaid Prescription Drug Expenditure Growth, 1993–2003, Models With Policies or Index Measures

Dependent Variable = Rx Expenditure(<i>t</i>)/Rx Expenditure(<i>t</i> –1) – 1					
Explanatory Variable	(1) No Controls	(2) Controls Only	(3) Controls and Trends	(4) Controls Only	(5) Controls and Trends
Generic substitution	–0.0071 0.0108	–0.0205 0.0128	–0.0186 0.0188		
Limits on number of prescriptions	–0.0123 0.0153	–0.0095 0.0212	–0.0129 0.0316		
Limits on quantity per prescription	–0.0010 0.0143	0.0008 0.0174	–0.0059 0.0198		
Preferred drug list	–0.0243 0.0183	–0.0362* 0.0202	–0.0571** 0.0275		
Any fail first requirement	–0.0008 0.0149	–0.0138 0.0190	–0.0195 0.0262		
Any copayment	–0.0074 0.0153	–0.0078 0.0173	–0.0126 0.0288		
Tiered copayment	–0.0166 0.0151	–0.0307 0.0210	–0.0547** 0.0247		
Any prior authorization	–0.0390*** 0.0147	–0.0335** 0.0152	–0.0271 0.0219		
Utilization restrictions (Index 1)				–0.0036*** 0.0012	–0.0044*** 0.0016
Cost-sharing restrictions (Index 2)				–0.0112* 0.0006	–0.0012 0.0009
Pct change in Medicaid beneficiaries		0.2290*** 0.0804	0.2011*** 0.0604	0.2338*** 0.0789	0.2026*** 0.0593
Pct change in beneficiaries over age 65		0.1212* 0.0669	0.1195** 0.0597	0.1224* 0.0659	0.1186** 0.0595
Pct change in beneficiaries who are disabled		0.0397 0.0823	0.0166 0.0746	0.0471 0.0831	0.0266 0.0763
Change in pct beneficiaries in capitated managed care		–0.0715** 0.0338	–0.0692** 0.0343	–0.0774** 0.0327	–0.0735** 0.0332

(continued)

TABLE 5
(Continued)

Dependent Variable = Rx Expenditure(<i>t</i>)/Rx Expenditure(<i>t</i> -1) - 1					
Explanatory Variable	(1)	(2)	(3)	(4)	(5)
	No Controls	Controls Only	Controls and Trends	Controls Only	Controls and Trends
State and year fixed effects	Yes	Yes	Yes	Yes	Yes
Linear state time trends	No	No	Yes	No	Yes
R ²	0.1616	0.3006	0.3825	0.3006	0.3793
N	533	533	533	533	533

Note: Robust standard errors appear below the coefficient estimates. All models include an intercept term. Model with control variables also include the unemployment rate, population density, and physicians per capita.

*Statistically significant at 10 percent confidence level.

** Statistically significant at 5 percent.

*** Statistically significant at 1 percent.

without and with state time trends. Index 2 (index of cost-sharing burden) is marginally significant, but only in the model without state time trends.

In the models in both Tables 4 and 5, several of the control variables relating to the state Medicaid populations are significant, including growth in the total number of beneficiaries and growth in those over age 65, which are both positively related to prescription expenditure growth. The change in the fraction of beneficiaries enrolled in capitated managed care plans is also statistically significant and is negatively related to prescription expenditure growth. The coefficient estimates for state unemployment rate, population density, and number of physicians per capita are not reported in the tables since these are rarely statistically significant. Moreover, sensitivity analysis shows that omitting or including these variables has no effect on the estimated effects of the state policies.

Robustness Checks

Our key results remain largely the same in all models estimated, although there are some differences regarding which coefficients reach statistical significance depending on whether state linear time trends are included. The qualitative story that emerges from the estimates is that states' pharmacy benefit restrictions tend to decrease prescription drug expenditure growth, and utilization management policies including PDLs and tiered copayments tend to have the greatest impact.

To test the robustness of these effects, we examined different ways of entering the policy measures in the models (not reported in the tables). For example, we entered the count of policies in each of the four distinct restriction categories (cost sharing, generics, prescribing limits, prior authorization) rather than the total number of policies. We also tried entering the number of more traditional limits policies (cost sharing and prescribing limits) versus the number of utilization management policies used by the state, as well as entering the number of older policies as a count of state restrictions in combination

with the newer policies (tiered copays, fail first, and PDLs) entered as individual dummy variables.

In running our robustness tests we also specified both our dependent variables and control variables in different ways (not reported in the tables). We ran alternative models in which the dependent variable is the log of expenditure growth ($\ln(\text{Cost}_t/\text{Cost}_{t-1})$) rather than the percentage growth. We also ran models in which we experimented with different subsets of the control variables.

All models produced qualitatively similar results for the policy variables. Different specifications suggest slightly different conclusions in terms of the individual policies, but in general it appears that states that have enacted more policies and those that use select utilization management policies such PDLs and tiered copayment systems have seen significantly slower prescription expenditure growth rates over the study period. Although estimates of the effects of these individual policies are not as robust to specification changes as those using counts of policies, the set of utilization management policies as a whole (prior authorization, generic substitution, tiered copays, fail first, and PDLs) and the set of the newest such policies (tiered copays, fail first, and PDLs) are jointly statistically significant in most of the models we estimated.

Another set of robustness checks we undertook are based on advice from Urban Institute publications regarding states for which their quality checks produced concern. These states are Oregon, Hawaii, and Oklahoma (in addition to Tennessee and Arizona, which we also dropped because of their waiver programs). When these states are dropped from the models, the results in Table 4 for the total count of policies and the dummy variable for four or more policies remain similar, as do those for the index variables reported in Table 5. However, the effects attributable to individual policies in Table 5 changes: the PDL effect becomes half the size in magnitude and not statistically significant, whereas the prior authorization dummy is now statistically significant even with the state time trends included. In addition, fail-first policies are significantly and negatively related to prescription cost growth when state time trends are included, but tiered copayments are not. Thus, the models with policy counts or indexes are more robust to this check than is the model with the separate dummy variables for policies.

Overall, the results from all specifications are consistent in showing that state pharmacy benefit restrictions have reduced Medicaid prescription drug expenditure growth in a statistically and economically significant manner. Thus, this simple econometric exercise lends support to the idea that states are seeing reductions in prescription drug expenditures after enacting pharmacy benefit restrictions in their Medicaid programs.

DISCUSSION

Analysis of state data from 1990 to 2004 shows that states now employ a much larger set of restrictions on prescription drug access under Medicaid than they did in the past. This trend has intensified since 2000 as states have faced increasing budgetary pressures overall and in their Medicaid programs. The extent to which these new restrictions are effective in changing prescribing behavior and reducing costs is a critical question for the states.

Our analysis of Medicaid drug expenditure growth suggests that these policies appear to be successful in reducing the growth of drug spending. A remaining concern is that state

policy restrictions may reduce the rate of growth of Medicaid drug expenditures but fail to reduce overall Medicaid spending. If prescription drug expenditure reductions are achieved by reducing access to essential medications, then other health care expenditures may rise. Two reviews of the literature conclude that the effects of Medicaid pharmacy benefit restrictions on other Medicaid costs remain largely unknown (Soumerai, 2004; Soumerai et al., 1993), but recent research on states' use of Medicaid PDLs shows mixed evidence on their effectiveness from a total program perspective (Lichtenberg, 2005; Virabhak and Shinogle, 2005; Wilson, Axelsen, and Tang, 2005) and the degree to which they increase physicians' administrative costs (Ketcham and Epstein, 2006).

To examine whether states' prescription drug restrictions have the unintended effect of raising total Medicaid spending, we estimate a version of Equation (1) using total Medicaid service expenditures rather than prescription drug expenditures. Data on each state's Medicaid expenditures in each year is obtained from the HCFA-2082 form for 1992–1998 and from the CMS MSIS for 1999–2003, along with the data on prescription drug expenditures. Total Medicaid expenditures represent total expenditures on services (including both state and federal shares), but no administrative costs.

Because our models do not take into account the full array of policy changes that might affect total Medicaid expenditures over this time period, we estimate these models using only the policy count and index variables rather than trying to separately estimate the effects of specific prescription drug restrictions. In this way, we provide evidence of whether states that enacted more policies or more restrictive policies saw immediate increases in other expenditures that led to higher total spending growth overall.

Table 6 reports the results of estimation. As in the previous tables, the model in the first column includes only the count of total policies and state and year fixed effects; the estimate suggests a negative but not statistically significant relationship between states' larger number of prescription drug controls and annual Medicaid spending growth. The same result obtains when other explanatory control variables are included in the model (second column). Similarly, the dummy variable for states and years in which four or more policies are employed is negative but not significantly related to overall expenditure growth (third column). The model in the final column of Table 6 that includes the index variables shows that both are negatively related to annual spending growth, and the cost-sharing policy Index is marginally significant. As might be expected if prescription drug restrictions lead to some increase in use of other health services, the parameter estimates for the policy measures in Table 6 tend to be smaller than in the models for Medicaid prescription drug spending.

All models reported in the table include state and year fixed effects but exclude state time trends. When linear state time trends are included, the estimated policy effects remain negative and of the same magnitude, but generally of even lesser statistical significance. Overall, we interpret the results as suggesting that states which imposed greater restrictions on prescription drug access did not see increases in overall Medicaid spending growth, and may have seen decreases.

CONCLUSIONS

This study presents the first systematic description and analysis of state policies limiting prescription drug access under Medicaid during 1990–2004, documenting their impact

TABLE 6

State Total Medicaid Expenditure Growth, 1993–2003, Models With Policy Counts or Index Measures

Dependent Variable = Expenditure(<i>t</i>)/Expenditure(<i>t</i> - 1) - 1				
Explanatory Variable	(1) No Controls	(2) Controls Only	(3) Controls Only	(4) Controls Only
Total number of policies	-0.0025 0.0056	-0.0053 0.0049		
Four or more policies			-0.0040 0.0118	
Utilization restrictions (Index 1)				-0.0008 0.0011
Cost-sharing restrictions (Index 2)				-0.0010* -0.0006
Pct change in Medicaid beneficiaries		0.3192*** 0.0721	0.3200*** 0.0725	0.3196*** 0.0720
Pct change in beneficiaries over age 65		0.0708 0.0568	0.0713 0.0514	0.0693 0.0562
Pct change in beneficiaries who are disabled		0.0408 0.0711	0.0408 0.0717	0.0442 0.0715
Change in pct beneficiaries in capitated managed care		-0.0531** 0.0254	-0.0529** 0.0254	-0.0530** 0.0255
State and year fixed effects	Yes	Yes	Yes	Yes
Linear state time trends	No	No	No	No
R ²	0.1402	0.3601	0.3774	0.3633
N	533	533	533	533

Note: Robust standard errors appear below the coefficient estimates. All models include an intercept term. Models with control variables also include the unemployment rate, population density, and physicians per capita.

*Statistically significant at 10 percent confidence level.

** Statistically significant at 5 percent.

*** Statistically significant at 1 percent.

on states' Medicaid prescription spending growth. The data show considerable variation across the states in the specific policies used, in the extent and scope of policy restrictions, and in the extent of policy changes over time. We see substantial variation in the number and type of policies used by states but a clear upward trend in restrictions over time.

We conduct a differences-in-differences analysis of states' annual prescription drug expenditure growth, examining whether the rate of growth is different after state policies are enacted compared to before, in a state that enacted a policy compared to ones that did not, including controls for state, year, and state time trend effects and for Medicaid program characteristics. Estimation results support the hypothesis that benefit restrictions reduce the rate of prescription expenditure growth and do not contribute to higher Medicaid spending growth overall. The specific restrictions that significantly reduce cost growth are PDLs and—in some specifications—tiered copayments and prior authorization. However, results for these individual policies are not robust to as many specification changes as are the results using various measures of policy counts or stringency.

It is important to note that our study considers only the effects of pharmacy benefit restrictions on Medicaid costs and not on access to drugs, health status, or the costs imposed on physicians.³³ Further research into the impact of the new prescribing hurdles on beneficiary health and health care usage is needed. Research into these questions is important to provide clearer understanding of the efficacy of cost and utilization controls in Medicaid prescription drug programs and in Medicare Part D since many of the same controls have been adopted there. The variation in pharmacy benefit restrictions across states and over time provide fertile ground for research into the impact of state policies on these outcomes.

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³³ We also do not look at the effects of rebate arrangements, multistate discounting, and related strategies with which states are recently experimenting.

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