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Increased Use Of Prescription Drugs Reduces Medical Costs In Medicaid Populations

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ABSTRACT We used data on more than 1.5 million Medicaid enrollees to examine the impact of changes in prescription drug use on medical costs. For three distinct groups of enrollees, we estimated the effects of aggregate prescription drug use—and, more specifically, the use of medications to treat eight chronic noncommunicable diseases—on total nondrug, inpatient, outpatient, and other Medicaid spending. We found that a 1 percent increase in overall prescription drug use was associated with decreases in total nondrug Medicaid costs by 0.108 percent for blind or disabled adults, 0.167 percent for other adults, and 0.041 percent for children. Reductions in combined inpatient and outpatient spending from increased drug utilization in Medicaid were similar to an estimate for Medicare by the Congressional Budget Office. Moving forward, policy makers evaluating proposed changes that alter medication use among the nearly seventy million Medicaid recipients should consider the net effects on program spending to ensure that scarce federal and state health care dollars are allocated efficiently.

The prevalence of chronic disease is high in the Medicaid population. Over half of Medicaid enrollees have been diagnosed with at least one noncommunicable disease—such as hypertension, asthma, or depression—and nearly a third of them suffer from multiple noncommunicable diseases.[1] Pharmacotherapy plays a significant role in reducing morbidity and mortality and in preventing disease progression; as a result, it can lead to decreased use and cost of other medical services.

In 2012 the Congressional Budget Office (CBO) formally recognized the link between drug use and medical costs, concluding that a 1 percent increase in drug utilization results in a 0.20 percent reduction in spending on other types of medical care, such as emergency department visits and hospitalizations.[2] Because the CBO estimate was derived from peer-reviewed literature that focused on the elderly, the CBO applies this new assumption only when evaluating policies that affect drug use in Medicare. In its report, the CBO acknowledged the need for more research "to determine if such an offset [is] appropriate for changes affecting programs serving different populations—such as Medicaid beneficiaries or veterans—and what the magnitude of that offset might be."[2]

With nearly seventy million enrollees, Medicaid is the single largest health insurer in the United States, covering low-income individuals and families.[3] In 2013 Medicaid cost federal, state, and local governments $449 billion—and that figure is expected to grow over time, largely as a result of the program's expansion under the Affordable Care Act.[4] The program is a constant source of fiscal concern, and Medicaid directors are continually seeking ways to lower costs while maintaining the quality of the health care that vulnerable populations receive.

There have been proposed or implemented

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changes to pharmacy benefit design, such as increased patient cost sharing and formulary restrictions, which in turn may reduce prescription drug use. However, if that use is associated with medical cost offsets, then these changes may have unintended consequences. Moreover, without complete knowledge of the economic benefits of prescription drug use, policy makers cannot make informed decisions about how to efficiently allocate scarce health care dollars.

In this article we quantify the impact of prescription drug use on medical costs among Medicaid recipients. We derive medical cost offset estimates for aggregate drug use, as well as condition-specific medication use for a set of eight chronic noncommunicable diseases.

Previous Literature

The existing literature on medical cost offsets from prescription drug use generally follows two threads. First, several researchers explored the effects of drug coverage expansion under Part D for Medicare enrollees.[5–12] Most of the articles in this area reported reductions in spending on nonpharmacy medical services with greater prescription drug use. However, the magnitude of these offset estimates varied considerably, and the study samples were often geographically narrow.

Much of this work informed the CBO's offset estimate. Nonetheless, this research likely provides little insight into the expected impact of prescription drug use in populations such as Medicaid enrollees, which differ from Medicare beneficiaries in demographic and socioeconomic characteristics and in health status. Several studies by Stephen Soumerai and colleagues determined that policies restricting access to essential medications among Medicaid recipients largely prompted increases in medical services use, but this body of Medicaid-specific research is now over two decades old.[13]

The second thread in the literature, which has produced many more publications than the first, focuses on the relationship between medication adherence and health services utilization and costs. Most of these analyses have been specific to certain chronic conditions, and the overwhelming majority of findings suggest that adherence is associated with improvements in clinical and economic outcomes.[14]

As an example, Christopher Roebuck (one of this study's authors) and colleagues analyzed a sample of commercially insured enrollees with cardiovascular disease and determined that adherent patients exhibited savings of $3–$10 in nondrug medical spending for each additional $1 spent on medication.[15] Similarly, Bruce Stuart and coauthors demonstrated that Medicare savings in Parts A and B exceeded prescription drug costs for adherent people with diabetes in Part D.[16]

While the adherence literature is relatively large and comprehensive, there are very few studies focused on the Medicaid population: one study on congestive heart failure;[17] two on schizophrenia;[18,19] and two on childhood asthma.[20,21] The literature on the value of adherence offers only tangential evidence of medical cost offsets from medication use, and converting results from adherence studies to pertain to prescription drug use is not straightforward.[22]

Study Data And Methods

STUDY SAMPLE This study used 100 percent Medicaid Analytic eXtract data for three years (2008, 2009, and 2010) from eleven states (California, Connecticut, Florida, Illinois, Indiana, Louisiana, New Hampshire, New Mexico, New York, Ohio, and Virginia) under a Data Use Agreement with the Centers for Medicare and Medicaid Services (CMS).[23,24] The Medicaid Analytic eXtract files are derived from the Medicaid Statistical Information System and contain detailed eligibility information, as well as claims data on long-term care and use of inpatient and outpatient services and prescription drugs.[25]

To construct a longitudinal, patient-level analytical data set with complete information about health services utilization and cost, we applied several exclusion restrictions. First, because managed care claims are routinely prepaid or capitated, individuals enrolled in Medicaid managed care were excluded. With two exceptions—prepaid dental care and primary care case management—enrollees were required to be covered exclusively by fee-for-service Medicaid plans.

Second, Medicaid enrollees who were also eligible for Medicare at any time during the three-year study period were excluded because Medicare claims were not requested. Similarly, members with other private health insurance or enrollees in separate (that is, non-Medicaid) Children's Health Insurance Programs (CHIP) were also excluded because of a lack of complete claims.

Third, individuals without full Medicaid benefits were excluded. Fourth, patients residing in long-term care facilities were excluded because their prescription drug claims were often not included in the data.

Finally, individuals were required to be continuously enrolled in Medicaid throughout the three-year study period. However, since Medicaid eligibility is determined monthly and enrollees may temporarily lose coverage, we allowed

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up to thirty days without coverage in any given calendar year.

After we imposed these restrictions, the resulting panel data set included three annual observations for each of 1,552,116 Medicaid enrollees. These enrollees were further segmented into three groups according to their basis of eligibility: blind or disabled (384,936 adults), other adults (166,243), and children (1,000,937).

STUDY VARIABLES We constructed four Medicaid cost measures for use as dependent variables: total nondrug costs, inpatient costs, outpatient costs, and other costs. Online Appendix Table 1 describes the types of services included in each of these outcomes.[26]

Costs were derived from allowed amounts on claims data. Prescription drug use—the key independent variable—was operationalized as the number of prescriptions filled, adjusted to thirty-day equivalents using the days' supply field to account for mail order and other ninety-day prescriptions.

We constructed a single variable for all prescription drug fills and also segmented drug use by indication for eight noncommunicable diseases: hypertension, dyslipidemia, diabetes, asthma or chronic obstructive pulmonary disease, depression, schizophrenia or bipolar disorder, seizure disorder, and gastroesophageal reflux disease. The remaining prescriptions were grouped into an "all other drug fills" category. Appendix Table 2 lists the therapeutic classes included in each of these condition-specific categories of prescription drug use.[26]

In addition to prescription drug use, we used a set of covariates in the regression models discussed below: sex, age, race/ethnicity, state, enrollment in primary care case management, being in foster care, and Medicaid maintenance assistance status. Additionally, six measures of health services supply—merged by county using the 2008–10 Area Health Resources Files—were employed as explanatory variables.[27] These measures were the numbers of federally qualified health centers, skilled nursing facilities, community mental health centers, hospital beds, general practitioner physicians, and specialist physicians per 10,000 county residents.

To control for overall patient health status, the Charlson Comorbidity Index was constructed using diagnosis codes included in the Medicaid claims data.[28,29]

STATISTICAL ANALYSIS To obtain estimates of the effect of prescription drug use on medical costs, we used multivariate regression methods. As with all nonrandomized observational studies, obtaining unbiased estimates of the key independent variable's causal impact on the dependent variable is challenging because of potential confounding from unmeasured determinants. For example, if patients who use medication are also more likely to exercise and eat a healthy diet, then not controlling for this healthy behavior would induce bias.

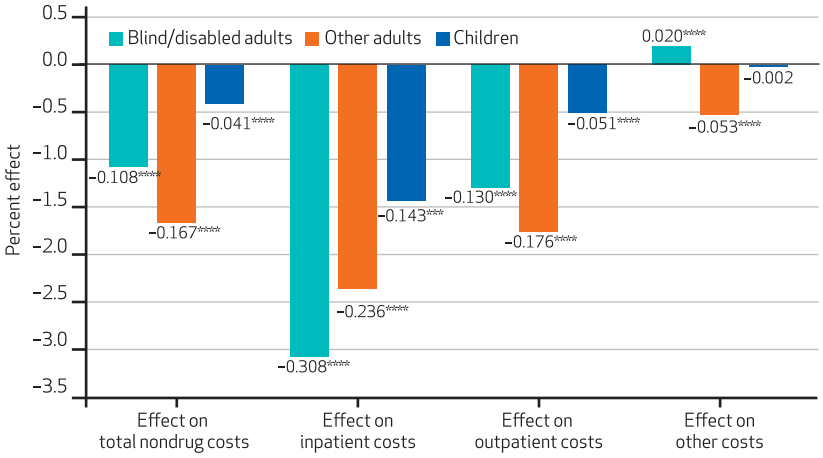
To address this issue, several steps were taken. First, all models included potential confounders where those confounders were measurable (such as general health status). Second, the longitudinal data allowed for the inclusion of person-level fixed effects in the models, which eliminated the influence of time-invariant observed or omitted characteristics.[30] Finally, since adverse health events (such as heart attacks) might prompt increases in prescription drug use, we used one-year lags of drug fills (instead of contemporaneous fills) to circumvent this potential reverse causality.[31,32]

For each Medicaid cost outcome measure, we estimated two separate models. The first used the aggregate measure for all prescription fills as the key explanatory variable, and the second model incorporated the condition-specific drug fill variables. These analyses were repeated for all three Medicaid groups: blind or disabled adults, other adults, and children. Additional details regarding the econometric analysis are provided in the Appendix.[26]

LIMITATIONS Two significant limitations of our study should be noted. First, because of the need to fully measure and analyze medical costs, we narrowed our sample to Medicaid enrollees in fee-for-service plans only. Future research should investigate whether or not our findings are generalizable to the much larger population of recipients of Medicaid managed care.

EXHIBIT 1

Effect Of A 1 Percent Increase In Prescription Drug Use On Medicaid Costs, 2008–10



SOURCE Authors' analysis of Medicaid Analytic eXtract data. **NOTES** Elasticities indicate the percent change in the dependent variable resulting from a 1 percent change in the independent variable. They are calculated at the mean number of drug fills among users. ***$p \leq 0.01$ ****$p \leq 0.001$

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Second, although we took several steps to minimize potential confounding, our fixed-effects modeling approach did not rule out bias due to unobserved variables that varied over time and were correlated with both prescription drug use and medical costs. However, based on results from a sensitivity analysis that we conducted (see the Appendix),[26] we have high confidence in our research design.

Study Results

DESCRIPTIVE STATISTICS All variable means for 2010 for each of the three groups are reported in Appendix Table 3,[26] and some are discussed briefly in this section. Of the study population, 25 percent were blind or disabled adults, 11 percent were other adults, and 64 percent were children. In the blind or disabled group, 46 percent were male, and the average age was forty-six years. The group of other adults was younger (with an average age of thirty-six) and overwhelmingly female (86 percent), as we expected given Medicaid eligibility rules. In the group of children, there were equal numbers of males and females, and the average age was ten years.

Although the study included eleven states, several dominated the three study groups. Forty-five percent of the blind or disabled adults were from California, and 60 percent of the other adults and 51 percent of the children were from Illinois.

As noted above, the analysis included enrollees in fee-for-service Medicaid plans only. An exception to this rule was primary care case management, in which a physician is paid a small monthly fee to manage and approve patient care, but claims are still adjudicated on a fee-for-service basis. Most of the other adults (72 percent) and children (74 percent) in the study were in this type of plan. Also noteworthy is the fact that one in ten children was in foster care.

States may opt to provide Medicaid coverage to certain people who might not otherwise be eligible under federally mandated criteria. As examples, in our study nearly one-third of the other adults qualified for Medicaid because they were medically needy, and over two-thirds of children received coverage because they met state-specific poverty definitions, which are more liberal than the federal definition.

As one would expect, the blind or disabled adults had higher Medicaid costs than the other adults and the children. Of the $19,225 in total costs incurred on average by the blind or disabled adults, $8,054 (42 percent) was for other (not inpatient or outpatient) services such as residential care, personal care services, adult day care, home health, and transportation. The other adults had average total costs of $4,131, whereas the children averaged just $1,853 per year.

Prescription drug use was highest among blind or disabled adults, with fifty prescriptions filled per year, compared to twenty for other adults and six for children. Among blind or disabled adults, 42 percent used medication for hypertension, 35 percent for depression, and 30 percent for gastroesophageal reflux disease. The most commonly treated condition for other

EXHIBIT 2

Effect Of Increased Use Of Prescription Drugs On Medicaid Costs For Blind Or Disabled Adults, 2008–10

	Effect of a 1% increase in Rx drug use	
Condition of drug fills	**Elasticity (%)**	***p* value**
EFFECT ON TOTAL NONDRUG COSTS		
Hypertension	−0.032	0.001
Dyslipidemia	0.005	0.521
Diabetes	0.006	0.635
Asthma or COPD	−0.011	0.198
Depression	0.009	0.171
Schizophrenia or bipolar disorder	−0.030	0.000
Seizure disorder	−0.007	0.358
Gastroesophageal reflux disease	−0.032	0.000
Other	−0.003	0.000
EFFECT ON INPATIENT COSTS		
Hypertension	−0.061	0.025
Dyslipidemia	0.053	0.065
Diabetes	0.049	0.211
Asthma or COPD	−0.011	0.682
Depression	0.063	0.008
Schizophrenia or bipolar disorder	−0.084	0.007
Seizure disorder	−0.033	0.283
Gastroesophageal reflux disease	−0.061	0.011
Other	−0.007	0.000
EFFECT ON OUTPATIENT COSTS		
Hypertension	−0.012	0.364
Dyslipidemia	−0.005	0.549
Diabetes	−0.004	0.710
Asthma or COPD	−0.008	0.334
Depression	−0.004	0.626
Schizophrenia or bipolar disorder	−0.019	0.018
Seizure disorder	−0.010	0.256
Gastroesophageal reflux disease	−0.044	0.000
Other	−0.004	0.000
EFFECT ON OTHER COSTS		
Hypertension	0.009	0.109
Dyslipidemia	−0.006	0.196
Diabetes	−0.001	0.882
Asthma or COPD	0.007	0.155
Depression	0.000	0.942
Schizophrenia or bipolar disorder	−0.010	0.121
Seizure disorder	0.009	0.078
Gastroesophageal reflux disease	−0.001	0.772
Other	0.000	0.003

SOURCE Authors' analysis of Medicaid Analytic eXtract data. **NOTES** There were 384,936 blind or disabled adults from eleven states (listed in the text). Elasticities indicate the percent change in the dependent variable resulting from a 1 percent change in the independent variable. They are calculated at the mean number of drug fills among users. COPD is chronic obstructive pulmonary disease.

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adults was depression (23 percent); for children, it was asthma or chronic obstructive pulmonary disease (11 percent).

EFFECTS OF AGGREGATE PRESCRIPTION DRUG USE ON MEDICAL COSTS To present the effects of drug use on Medicaid costs in a manner that is consistent with the CBO's estimate, we transformed coefficients from the multivariate models into elasticities.[33] A relative measure, the elasticity gives the percent change in the dependent variable resulting from a 1 percent change in the independent variable. Exhibit 1 shows the estimated impact of aggregate prescription drug use (calculated at its mean) on each of the four cost measures.

Among blind or disabled adults, a 1 percent increase in drug use was associated with a 0.108 percent decrease in total nondrug costs (Exhibit 1). The estimated effect was greater for other adults (a 0.167 percent decrease), and somewhat smaller, yet still significant, for children (a 0.041 percent decrease).

Across all three groups, spending for inpatient and outpatient services was more sensitive to changes in medication use, compared to other spending. The largest elasticity (a decrease of 0.308 percent) was for inpatient costs among blind or disabled adults, followed by inpatient costs for other adults (a decrease of 0.236 percent). All of these estimates were highly significant.[34] The effects on other costs were modest in magnitude, as well as mixed in direction and significance.

EFFECTS OF CONDITION-SPECIFIC PRESCRIPTION DRUG USE ON MEDICAL COSTS In general, estimated effects showed a negative relationship between drug use and medical spending, although many of the findings did not reach our strict significance level ($p \leq 0.01$).[33] Among blind or disabled adults, three condition-specific effects on total nondrug costs were significant (Exhibit 2). Specifically, a 1 percent increase in the use of medication for schizophrenia or bipolar disorder was associated with 0.030 percent lower costs, and the medical cost offsets were 0.032 percent for both hypertension and gastroesophageal reflux disease drug fills. In general, the direction and significance of these effects persisted in the inpatient cost models. A notable exception was that inpatient costs among antidepressant users were 0.063 percent higher with a 1 percent increase in condition-specific fills.

Among other adults, the results were very similar to those among blind or disabled adults, but generally larger in magnitude (Exhibit 3). Increased use of hypertension and gastroesophageal reflux disease medications again was associated with reductions in total nondrug costs (0.074 percent and 0.062 percent, respectively). Condition-specific effects were similar in the outpatient models, but not significant in the inpatient models.

Among children, significant medical cost offsets emerged for diabetes and gastroesophageal reflux disease medications (Exhibit 4). A 1 percent increase in diabetes medication fills was associated with a 0.239 percent decrease in total nondrug costs and 0.708 percent lower inpatient costs. A 1 percent increase in gastroesophageal

EXHIBIT 3

Effect Of Increased Use Of Prescription Drugs On Medicaid Costs For Other Adults, 2008–10

	Effect of a 1% increase in Rx drug use	
Condition of drug fills	**Elasticity (%)**	***p* value**
EFFECT ON TOTAL NONDRUG COSTS		
Hypertension	−0.074	0.007
Dyslipidemia	−0.041	0.199
Diabetes	−0.055	0.308
Asthma or COPD	0.029	0.158
Depression	0.018	0.259
Schizophrenia or bipolar disorder	−0.047	0.084
Seizure disorder	0.005	0.860
Gastroesophageal reflux disease	−0.062	0.001
Other	−0.012	0.000
EFFECT ON INPATIENT COSTS		
Hypertension	−0.071	0.257
Dyslipidemia	−0.135	0.103
Diabetes	−0.031	0.803
Asthma or COPD	0.011	0.847
Depression	0.049	0.275
Schizophrenia or bipolar disorder	−0.094	0.172
Seizure disorder	0.016	0.830
Gastroesophageal reflux disease	−0.088	0.054
Other	−0.015	0.000
EFFECT ON OUTPATIENT COSTS		
Hypertension	−0.083	0.000
Dyslipidemia	−0.003	0.891
Diabetes	−0.049	0.122
Asthma or COPD	0.026	0.042
Depression	0.003	0.674
Schizophrenia or bipolar disorder	−0.028	0.050
Seizure disorder	−0.011	0.406
Gastroesophageal reflux disease	−0.058	0.000
Other	−0.012	0.000
EFFECT ON OTHER COSTS		
Hypertension	−0.013	0.677
Dyslipidemia	0.001	0.979
Diabetes	−0.091	0.088
Asthma or COPD	0.052	0.049
Depression	0.023	0.295
Schizophrenia or bipolar disorder	−0.009	0.832
Seizure disorder	0.082	0.056
Gastroesophageal reflux disease	−0.021	0.454
Other	−0.004	0.000

SOURCE Authors' analysis of Medicaid Analytic eXtract data. **NOTES** There were 166,243 other adults (that is, not blind or disabled) from eleven states (listed in the text). Elasticities indicate the percent change in the dependent variable resulting from a 1 percent change in the independent variable. They are calculated at the mean number of drug fills among users. COPD is chronic obstructive pulmonary disease.

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reflux disease medication fills was also associated with reductions in total nondrug and inpatient costs (0.069 and 0.376, respectively).

The complete set of parameter estimates from all models is provided in Appendix Tables 4–9.[26] Additionally, since they may be of interest to policy makers, results from state-specific models of the impact of aggregate prescription drug use on medical costs are presented in Appendix Table 10.[26]

Discussion And Policy Implications

When the CBO formally recognized that increased prescription drug use is associated with reductions in medical costs, it allowed for more accurate analysis of the impacts of health policies that affect medication utilization. Economic evaluations of health services must consider all costs and benefits from the societal perspective. For example, when assessing the feasibility of substance abuse treatment programs, policy makers account not only for the potential improvement in patients' clinical outcomes—and the associated decreases in their use of health services—but also for the economic benefits of reduced criminal activity, increased worker productivity, and enhancements in educational attainment.[35]

Using a more complete evaluation methodology that captured the impact of increased prescription drug use on nondrug medical costs, the CBO lowered its estimate of the cost of closing the Medicare Part D coverage gap by $35 billion over the ten-year period 2013–22. However, since the medical cost offset estimate provided by the CBO pertains to Medicare beneficiaries, it is not germane to other populations.

Furthermore, that estimate applies to aggregate prescription drug use and thus does not make it possible to evaluate policies that might affect condition-specific medication use. Indeed, in its report the CBO stressed the need for more investigation. Covering almost seventy million people at a cost of nearly half a trillion dollars annually, Medicaid is most in need of research on the medical cost offsets from medication use.

We examined the impact of prescription drug utilization on medical costs in Medicaid. We found that a 1 percent increase in overall medication use led to reductions in total nondrug spending of 0.108 percent for blind or disabled adults, 0.167 percent for other adults, and 0.041 percent for children (Exhibit 1). These offsets were driven by reductions primarily in inpatient spending and secondarily in outpatient spending—a pattern that persisted across separate analyses for the three groups.

Medical cost offsets differed substantially by specific medication use for eight noncommunicable diseases. Increased use of drugs for hypertension, schizophrenia or bipolar disorder, and gastroesophageal reflux disease was associated with reductions in medical costs among blind or disabled and other adults. For children, significant offsets were observed for diabetes and gastroesophageal reflux disease medications.

Our results can be compared to the CBO's estimate of the medical cost offsets from prescription drug use, albeit with caveats. First, Medicare

EXHIBIT 4

Effect Of Increased Use Of Prescription Drugs On Medicaid Costs For Children, 2008–10

	Effect of a 1% increase in Rx drug use	
Condition of drug fills	**Elasticity (%)**	***p* value**
EFFECT ON TOTAL NONDRUG COSTS		
Hypertension	−0.007	0.859
Dyslipidemia	−0.167	0.333
Diabetes	−0.239	0.000
Asthma or COPD	−0.031	0.059
Depression	−0.020	0.256
Schizophrenia or bipolar disorder	0.003	0.879
Seizure disorder	−0.058	0.044
Gastroesophageal reflux disease	−0.069	0.002
Other	−0.007	0.000
EFFECT ON INPATIENT COSTS		
Hypertension	−0.073	0.653
Dyslipidemia	−0.140	0.759
Diabetes	−0.708	0.000
Asthma or COPD	−0.181	0.022
Depression	−0.156	0.149
Schizophrenia or bipolar disorder	−0.199	0.053
Seizure disorder	−0.287	0.094
Gastroesophageal reflux disease	−0.376	0.000
Other	−0.008	0.097
EFFECT ON OUTPATIENT COSTS		
Hypertension	0.013	0.496
Dyslipidemia	0.028	0.764
Diabetes	−0.118	0.066
Asthma or COPD	−0.004	0.627
Depression	−0.005	0.767
Schizophrenia or bipolar disorder	0.011	0.550
Seizure disorder	−0.047	0.112
Gastroesophageal reflux disease	−0.017	0.240
Other	−0.011	0.000
EFFECT ON OTHER COSTS		
Hypertension	0.036	0.200
Dyslipidemia	−0.285	0.034
Diabetes	0.050	0.464
Asthma or COPD	−0.011	0.230
Depression	−0.010	0.775
Schizophrenia or bipolar disorder	0.018	0.581
Seizure disorder	0.010	0.794
Gastroesophageal reflux disease	0.036	0.013
Other	−0.001	0.073

SOURCE Authors' analysis of Medicaid Analytic eXtract data. **NOTES** There were 1,000,937 children from eleven states (listed in the text). Elasticities indicate the percent change in the dependent variable resulting from a 1 percent change in the independent variable. They are calculated at the mean number of drug fills among users. COPD is chronic obstructive pulmonary disease.

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and Medicaid insure dissimilar populations. Medicare beneficiaries are predominantly elderly, while most Medicaid recipients are poor. These differences are reflected in enrollees' medical conditions, use of health services, and spending. Therefore, one would not necessarily expect the impact of a change in prescription drug use to be the same in both programs.

Second, coverages in Medicare and Medicaid, while overlapping, are not identical. Both programs cover prescription drugs and inpatient and outpatient care. However, Medicaid covers many ancillary services that Medicare does not. This point is made evident by the fact that almost half of total Medicaid spending for the blind or disabled adults in our study was for residential care, personal care services, adult day care, home health, and transportation—spending not likely to be sensitive to medication use.

With these caveats in mind, the CBO's figure is best compared to a blend of our inpatient and outpatient medical cost offset estimates from overall prescription drug use. If we calculate the mean of these offset estimates—weighted according to the magnitude of inpatient and outpatient spending—we find that 1 percent increases in prescription drug utilization were associated with decreases in blended inpatient and outpatient medical spending of 0.207 percent for blind or disabled adults, 0.197 percent for other adults, and 0.069 percent for children. Interestingly, our estimates for both adult Medicaid groups are nearly identical to the CBO estimate of 0.20 percent for Medicare.

We believe that the estimates presented in this article will be of critical use in evaluating Medicaid policies that affect prescription drug use. As an example, states have recently been afforded more latitude in designing their Medicaid pharmacy benefits. For instance, increasing patient cost sharing for medication is being used as a way to decrease drug expenditures.[36] This strategy indeed may lower pharmacy costs by reducing prescription drug use—the extent to which it does so will depend on the elasticity of demand for pharmaceuticals.[37] However, raising copayments will also lead to increases in medical costs, thereby at least partially eclipsing the savings in pharmacy spending.

Similar consequences might emerge under any plan design change that prompts reductions in medication use, such as the implementation of requirements for prior authorization, step therapy, or both. Not accounting for these spending offsets would lead to inefficient resource allocation decisions.[38]

Conclusion

We believe that our study, as a complement to the CBO's work on Medicare, helps strengthen economic evaluations of Medicaid. Federal and state policy makers who are considering legislation that would affect prescription drug use among Medicaid recipients can now more accurately assess the legislation's budgetary impacts. Medicaid program administrators can make use of this information in the plan design process and when deciding on the adoption of relevant interventions, such as those that address medication adherence. Much more research is needed to expand and improve upon this knowledge base to help ensure that Americans' scarce health care dollars are spent wisely. ■

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NOTES

1 Decker SL, Kostova D, Kenney GM, Long SK. Health status, risk factors, and medical conditions among persons enrolled in Medicaid vs uninsured low-income adults potentially eligible for Medicaid under the Affordable Care Act. JAMA. 2013; 309(24):2579–86.

2 Hayford T, Buntin M. Offsetting effects of prescription drug use on Medicare's spending for medical services [Internet]. Washington (DC): Congressional Budget Office; 2012 Nov [cited 2015 Jul 30]. Available from: http://www.cbo.gov/sites/default/files/43741-MedicalOffsets-11-29-12.pdf

3 Henry J. Kaiser Family Foundation. Total monthly Medicaid and CHIP enrollment [Internet]. Menlo Park (CA): KFF; c 2015 [cited 2015 Jul 30]. Available from: http://kff.org/health-reform/state-indicator/total-monthly-medicaid-and-chip-enrollment/

4 Hartman M, Martin AB, Lassman D, Catlin A, National Health Expenditure Accounts Team. National health spending in 2013: growth slows, remains in step with the overall economy. Health Aff (Millwood). 2015; 34(1):150–160.

5 Chandra A, Gruber J, McKnight R. Patient cost-sharing and hospitalization offsets in the elderly. Am Econ Rev. 2010;100(1):193–213.

6 Gaynor M, Li J, Vogt WB. Substitution, spending offsets, and prescription drug benefit design. Forum Health Econ Policy. 2007;10(2).

7 Hsu J, Price M, Huang J, Brand R, Fung V, Hui R, et al. Unintended consequences of caps on Medicare drug benefits. N Engl J Med. 2006; 354(22):2349–59.

8 Kaestner R, Khan N. Medicare Part D and its effects on the use of prescription drugs and use of other health care services of the elderly. J Policy Anal Manage. 2012;31(2): 253–79.

9 McWilliams JM, Zaslavsky AM, Huskamp HA. Implementation of Medicare Part D and nondrug med-

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ical spending for elderly adults with limited prior drug coverage. JAMA. 2011;306(4):402–9.
10 Shang B, Goldman DP. Prescription drug coverage and elderly Medicare spending [Internet]. Cambridge (MA): National Bureau of Economic Research; 2007 Sep [cited 2015 Jul 30]. (NBER Working Paper No. 13358). Available from: http://www.nber.org/papers/w13358.pdf
11 Stuart BC, Doshi JA, Terza JV. Assessing the impact of drug use on hospital costs. Health Serv Res. 2009;44(1):128–44.
12 Zhang Y, Donohue JM, Lave JR, O'Donnell G, Newhouse JP. The effect of Medicare Part D on drug and medical spending. N Engl J Med. 2009;361(1):52–61.
13 For a thorough review of these studies, see Soumerai SB. Benefits and risks of increasing restrictions on access to costly drugs in Medicaid. Health Aff (Millwood). 2004; 23(1):135–46.
14 For a recent comprehensive literature review on this topic, see Boswell KA, Cook CL, Burch SP, Eaddy MT, Cantrell CR. Associating medication adherence with improved outcomes: a systematic literature review. Am J Pharm Benefits. 2012;4(4):e97–108.
15 Roebuck MC, Liberman JN, Gemmill-Toyama M, Brennan TA. Medication adherence leads to lower health care use and costs despite increased drug spending. Health Aff (Millwood). 2011;30(1):91–9.
16 Stuart B, Davidoff A, Lopert R, Shaffer T, Shoemaker JS, Lloyd J. Does medication adherence lower Medicare spending among beneficiaries with diabetes? Health Serv Res. 2011;46(4):1180–99.
17 Esposito D, Bagchi AD, Verdier JM, Bencio DS, Kim MS. Medicaid beneficiaries with congestive heart failure: association of medication adherence with healthcare use and costs. Am J Manag Care. 2009;15(7): 437–45.
18 Gilmer TP, Dolder CR, Lacro JP, Folsom DP, Lindamer L, Garcia P, et al. Adherence to treatment with antipsychotic medication and health care costs among Medicaid beneficiaries with schizophrenia. Am J Psychiatry. 2004;161(4):692–9.
19 Weiden PJ, Kozma C, Grogg A, Locklear J. Partial compliance and risk of rehospitalization among California Medicaid patients with schizophrenia. Psychiatr Serv. 2004;55(8):886–91.
20 Camargo CA Jr, Ramachandran S, Ryskina KL, Lewis BE, Legorreta AP. Association between common asthma therapies and recurrent asthma exacerbations in children enrolled in a state Medicaid plan. Am J Health Syst Pharm. 2007;64(10):1054–61.
21 Herndon JB, Mattke S, Evans Cuellar A, Hong SY, Shenkman EA. Anti-inflammatory medication adherence, healthcare utilization and expenditures among Medicaid and Children's Health Insurance Program enrollees with asthma. Pharmacoeconomics. 2012;30(5): 397–412.
22 Adherence is routinely measured as the proportion of days covered, and concomitant medication use and therapeutic switching is ignored. Moreover, many studies use an indicator variable for adherence based upon a generally accepted threshold of 80 percent of days covered. Adherence results, therefore, cannot answer questions regarding offsets because adherence metrics cannot readily be transformed into drug utilization measures. Also, adherence research focuses on condition-level treatment. Thus, findings cannot be easily aggregated to form a single estimate of medical cost offsets from overall drug use.
23 The states were chosen for geographic diversity and to maximize sample size in fee-for-service plans. We originally obtained data on fourteen states. However, after exclusion restrictions were applied, Alabama, Pennsylvania, and Washington were dropped because of insufficient cell sizes.
24 In addition to CMS's review and approval of the Data Use Agreement, oversight was provided by Chesapeake Institutional Review Board, in Columbia, Maryland.
25 CMS.gov. Medicaid Analytic eXtract (MAX) general information [Internet]. Baltimore (MD): Centers for Medicare and Medicaid Services; [last modified 2015 Jul 27; cited 2015 Jul 30]. Available from: http://www.cms.gov/Research-Statistics-Data-and-Systems/Computer-Data-and-Systems/MedicaidDataSourcesGenInfo/MAXGeneralInformation.html
26 To access the Appendix, click on the Appendix link in the box to the right of the article online.
27 Health Resources and Services Administration. Area Health Resources Files (AHRF) [Internet]. Rockville (MD): HRSA; [cited 2015 Jul 30]. Available from: http://ahrf.hrsa.gov/
28 Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis. 1987; 40(5):373–83.
29 Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. J Clin Epidemiol. 1992;45(6):613–19.
30 Cameron AC, Trivedi PK. Microeconometrics: methods and applications. Cambridge: Cambridge University Press; 2005.
31 Because of the wide range of medication use observed in the data and to allow for nonlinear relationships with medical costs, we entered the drug fill measures into the ensuing models using a quadratic functional form. Including both linear and squared terms of these variables was also empirically supported by results from the RESET test. See Ramsey JB. Tests for specification errors in classical linear least-squares regression analysis. J R Stat Soc Series B Methodol. 1969;31(2):350–71.
32 For an in-depth discussion of the reverse causality issue, see Stuart B, Loh FE, Roberto P, Miller L. Incident user cohorts for assessing medication cost-offsets. Health Serv Res. 2014;49(4):1364–86.
33 Standard errors were constructed using robust methods and clustered by individual. See White H. A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. Econometrica. 1980;48(4):817–38.
34 Out of an abundance of caution, we confine our discussion of results to those whose p values were ≤ 0.01. Since the condition-specific models tested a family of nine hypotheses, one might be concerned about type I error (that is, the multiple comparisons problem). Under the most conservative adjustment approach, these results would still be significant ($p \leq 0.10$).
35 French MT, Drummond MC. A research agenda for economic evaluation of substance abuse services. J Subst Abuse Treat. 2005;29(2): 125–37.
36 Kaiser Commission on Medicaid and the Uninsured. Premiums and cost-sharing in Medicaid [Internet]. Washington (DC): KFF; 2013 Feb [cited 2015 Jul 30]. Available from: https://kaiserfamilyfoundation.files.wordpress.com/2013/02/8416.pdf
37 Roebuck MC. Essays on the economics of prescription drugs: price elasticity of demand and impact of adherence [dissertation]. Baltimore (MD): University of Maryland, Baltimore County; 2012.
38 One must also take into account the legislatively mandated discounts that Medicaid receives on drugs: Pharmaceuticals purchased under Medicaid are subject to a minimum rebate and a best-price provision, which together ensure that state Medicaid programs pay some of the lowest drug prices in the country. As part of the Affordable Care Act, the minimum rebate was raised to its current level of 23.1 percent of the average manufacturer's price for brand-name drugs and 13 percent for generic ones. See Spatz ID. Health reform accelerates changes in the pharmaceutical industry. Health Aff (Millwood). 2010;29(7):1331–6.

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