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# Effects of Medicare Part D Coverage Gap on Medication and Medical Treatment Among Elderly Beneficiaries with Depression

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## Abstract

**Context—**Maintenance antidepressant pharmacotherapy in late life prevents recurrent episodes of major depression. Medicare Part D's coverage gap ("gap") could increase the likelihood of reducing appropriate medication treatment, thereby exposing older adults to increased risk for relapse of depressive episodes.

**Objective—**To determine whether: beneficiaries reduce antidepressant use in the gap; the reduction in antidepressants is similar to the reduction in cardiovascular and anti-diabetic medications; the provision of generic coverage reduces the risk of medication reduction; and medical spending increases in the gap.

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**Author contributions:**
Dr. Zhang had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

**Previous and planned meeting presentations:**
Dr. Zhang presented an earlier version of this paper at the *15th NIMH Biennial Research Conference on the Economics of Mental Health: Comparative Effectiveness and Mental Health Care Financing* (September 27, 2010; Washington DC).
Dr. Zhang presented this paper at the *American Psychiatric Association* in the panel on "Health Care Reform and Mental Health Care Financing" organized by the National Institute of Mental Health (May 14, 2011; Honolulu, Hawaii).

**Conflicts of interest and financial disclosure:**
Drs. Lave and Zhang recently completed a study to evaluating the effects of high deductible health plan that was partially funded by Highmark Inc. Highmark Inc sells Part D products. Dr. Reynolds receives pharmaceutical supplies from BMS, Pfizer, Forest Laboratories, and Lilly in support of his NIH-sponsored research.

**Design—**Observational study, pre-post-with-a-comparison-group design.

**Setting and Patients—**5% random sample of US Medicare beneficiaries aged 65 and older with depression (n=65,223) enrolled in stand-alone Part D plans in 2007.

**Main Outcome Measures—**Antidepressant pharmacotherapy, physician, outpatient and inpatient spending.

**Results—**Being in the gap was associated with comparable reductions in the use of antidepressant, cardiovascular and anti-diabetic medications. Relative to the comparison group (those who had full coverage in the gap due to Medicare coverage or low-income-subsidies), the no-coverage group reduced their monthly antidepressant prescriptions by 12.1% (95% CI 9.9%–14.3%) from the pre-gap level, while they reduced cardiovascular and anti-diabetic drug usage by 12.9% and 13.4% respectively. Those with generic drug coverage in the gap reduced their antidepressant monthly prescriptions by 6.9% (95% CI 4.8%–9.1%); this decrease was entirely attributable to the reduction in brand-name antidepressants. Medicare spending on medical care did not increase for either group, relative to the comparison group.

**Conclusions—**The Medicare Part D's coverage gap was associated with modest reductions in use of antidepressants. Those with generic coverage reduced only brand-name drugs and did not switch from brand-name to generic drugs. The reduction in antidepressant use was not associated with increase in non-drug medical spending.

### Keywords

Medicare Part D; coverage gap; depression; older adults

## INTRODUCTION

Depression affects 13% of Medicare beneficiaries aged 65 and older, many of whom have co-existing chronic physical conditions.[1] Maintenance treatment of antidepressants in late-life depression has been shown to prevent recurrent episodes of major depression.[2] Thus, experts recommend two years of maintenance antidepressant pharmacotherapy to reduce recurrences even for patients whose index episodes represent their first lifetime bout of major depression.[2, 3] Because depression is highly prevalent and costly and because there is a large potential for quality improvement, the National Quality Forum has argued that the Centers for Medicare and Medicaid services (CMS) should give improvement in the quality of depression care its highest priority.[4]

Medicare Part D, implemented in 2006, provides prescription drug coverage to Medicare beneficiaries. Since Part D's implementation, medication treatment for beneficiaries with depression has improved.[5] However, the structure of the Part D benefit, particularly the coverage gap, imposes a serious risk for discontinuing maintenance antidepressant pharmacotherapy among senior beneficiaries.[6] For example, the standard Part D benefit in 2007 included an initial $265 deductible, an insured period during which the beneficiary paid 25 percent of drug spending between $265 and $2,400, a coverage gap in which the beneficiary paid 100 percent of spending until their total out-of-pocket spending reached a catastrophic limit of $3,850; and a catastrophic coverage period in which the beneficiary paid 5 percent.[7]

A few recent studies have investigated the effects of the coverage gap on medication use, but these studies either used pharmacy data from one local Medicare-Advantage Part D (MA-PD) plan or focused on beneficiaries with diabetes.[8–11] No study has reported on how the coverage gap affects medication use among aged beneficiaries with depression nationally.

In this paper, we examine how aged beneficiaries with major depression responded to the coverage gap and specifically whether they reduced antidepressant use more than their use of non-psychotropic drugs such as heart failure and oral anti-diabetic medications. In addition, we examine whether the provision of some generic coverage in the coverage gap protected them from the risks of reducing or discontinuing their antidepressant pharmacotherapy. Finally, we determine whether non-drug medical spending increased in the coverage gap if beneficiaries decreased their use of medications.

Under the current provisions of the Affordable Care Act (ACA) the coverage gap will not be closed until 2020; thus, it is very important to analyze the impact of the gap on medication use, especially on maintenance pharmacotherapy for those with major depression.

## METHODS

### Data Source

We obtained data for a 5% random sample of Medicare beneficiaries who were continuously enrolled in stand-alone Part D plans (PDP) in 2007. These beneficiaries were all enrolled in fee-for-service plans. We identified our study population as those aged 65 and older who were diagnosed with depression in 2007. The study design was approved by the Institutional Review Board at the University of Pittsburgh.

We identified beneficiaries with depression using the CMS Chronic Condition Data Warehouse (CCW) definition: one claim between 1/1/2007–12/31/2007 with an ICD9 code 296.2–296.6, 296.89, 298.0, 300.4, 309.1, and 311.[1] From this population, we then excluded those with a 2007 diagnosis of bipolar disorder or schizophrenia because the medication regimens for depression for these groups often differ from those for people living with non-bipolar, non-psychotic major depression.[3]

### Setting and Study Population

Although the standard Part D benefit design has a coverage gap, some beneficiaries have some or full drug coverage in the coverage gap.[12] First, companies can modify the benefit design as long as their plans offer either “actuarially equivalent” or enhanced benefits compared with the standard benefit. For example, many plans eliminate deductibles, others cover some generic drugs or both generic and brand-name drugs in the coverage gap, and a few offer slightly modified thresholds for entering the coverage-gap or catastrophic coverage periods.[13] Second, some beneficiaries receive subsidies for their medication use from federal and state governments.[14] These beneficiaries have either Medicaid coverage or Part D low-income-subsidies, and therefore are not exposed to the coverage gap even when their pharmacy spending reaches the coverage-gap threshold.[14]

Thus, based on the types of coverage before and after the coverage gap threshold, we identified two study groups - a “no-coverage” group and a “generic-only” group - and one comparison group. The no-coverage group included those who had no coverage in the coverage gap; while the generic-only group included those with plans covering the generic drugs in the coverage gap. The comparison group consisted of beneficiaries whose coverage did not change before or after the coverage-gap threshold because they had either Medicaid coverage or low-income subsidies (“LIS”) for 12 months. The LIS group is used as a comparison group because its drug coverage remained unchanged, while beneficiaries in the other two groups had a sudden decrease in drug coverage. We used the comparison group to control for underlying trends in use. A small number (n = 559) of beneficiaries were enrolled in plans with both generic and branded coverage, but there were too few to draw any meaningful conclusions. Thus, we did not include them in the analyses.

## Study Design

We used a pre-post-with-a-comparison-group design to assess the impact of the coverage gap on medication and medical care use. This design relies on a difference-in-difference estimate; that is, it compares the pre- and within-gap change for each study group, relative to the pre- and within-gap change in the comparison group. This design does not require that the study and comparison groups have the same baseline characteristics, because it can adjust for unobserved factors if these factors did not change in the pre-gap and within-gap periods.[15] When different groups have similar baseline trends, the results can be unbiased.[15] We tested the baseline trends in both antidepressant use and overall medication use across three groups, and found no statistically-significant difference between each group comparison (data not shown).

We did not hypothesize that beneficiaries who went through the coverage gap and entered the catastrophic coverage period would reduce their medication use in the gap.[6] We conducted a regression analysis to test this hypothesis and the result indicated that those entering the catastrophic period did not change their medication use in the gap. Thus, for this study we focused on beneficiaries who entered the gap but did not go through it (this represented 80% of all beneficiaries with depression who entered the coverage gap and 34% of all beneficiaries with depression). Thus, each individual in our study sample had a pre-gap and a within-gap period.

To define the pre- and within-gap periods, we first identified the index date as the first day that the beneficiary's total drug spending reached the coverage gap threshold. The pre-gap period was defined as 1/1/2007 to the index date. The within-gap period was defined as the duration between the first day after the index date until 12/31/2007. We then calculated each outcome separately for the pre-gap and within-gap periods.

We compared the change in each outcome in the pre-gap and within-gap periods between each study group and the comparison group: no-coverage vs LIS, and generic-only vs LIS groups. We then used the *propensity score weighting* mechanism to balance each study group with the comparison group.

## Outcomes

We defined three main outcome variables to measure medication use in both pre-gap and within-gap periods: 1) probability of using any medication (1=used a medication; 0=did not use a medication), 2) mean number of monthly prescriptions filled per month; and 3) mean monthly pharmacy spending. For the 2nd outcome, we calculated the number of prescriptions filled, standardized by a 30-day supply (i.e., a prescription with 90-day supply would count as 3 monthly drugs), in both pre- and within-gap periods and then divided them by the number of months in each period to get the mean number of monthly prescriptions filled. We examined both the use of antidepressants as well as heart failure and oral anti-diabetic drugs (the list of drug classes is in the Appendix Table 1).

We defined three variables to measure non-drug medical spending in the both pre-gap and within-gap periods: 1) physician spending, 2) outpatient spending, and 3) inpatient spending. We followed the formula provided by the CMS' contractor Research Data Assistance Center (ResDAC). Physician spending was calculated using Medicare Carrier file (claims data submitted by non-institutional providers, including physicians, physician assistants, clinical social workers, nurse practitioners, independent clinical laboratories, ambulance providers, and free-standing ambulatory surgical centers). Outpatient spending was calculated using outpatient claim file (claims data submitted by institutional outpatient providers, including hospital outpatient departments, rural health clinics, renal dialysis facilities, outpatient rehabilitation facilities, comprehensive outpatient rehabilitation facilities, and community

mental health centers). Inpatient spending only included spending for inpatient hospital services in the Medicare Provider and Analysis Review file (algorithms are available per request).

### Statistical Analysis

To implement propensity score weighting, we conducted a two-stage analysis. In the first stage, we ran two logistic regression models to predict the probability of being in a study group relative to the comparison group, controlling for age, sex, race, number of Elixhauser co-morbidities,[16] and prescription drug hierarchical condition category (RxHCC).[17] The RxHCC is the beneficiary risk adjuster used by CMS to adjust payment to plans for expected pharmacy costs.

In the second stage, we conducted a *difference-in-difference model with the inverse of the propensity score as a weight.*[18] This effectively assigned a higher weight to those individuals in the comparison group with characteristics similar to those in the study group. In this model, the dependent variable was the difference between the within-gap and pre-gap periods for each previously-defined outcome. Because the pre- and within- measures were likely to be correlated, the advantage of this approach over using two interrelated outcomes was that one could simply eliminate the correlated structure in the two outcomes. The key independent variable was the indicator for being in the study group relative to the comparison group. All the covariates used in calculating propensity scores were included in this model. In addition, we controlled for duration of time spent in the coverage gap in the model because the longer the beneficiary stayed in the gap the more likely he/she would change medication use

We conducted a sensitivity analysis by excluding those beneficiaries who had at least one nursing home stay funded by Medicare and the results remained similar (data not shown). All analyses were conducted using SAS software, version 9.2 (SAS Institute Inc, Cary, NC) and R: A Language and Environment for Statistical Computing, version 2.12.

## RESULTS

### Characteristics of the Study Population

Beneficiaries with depression were more likely to spend up to the coverage-gap threshold as their drug coverage improved. For example, among seniors with depression, 43.1% in the no-coverage, 69.2% in the generic-only, and 72.2% in the LIS group reached the gap threshold (P-value <0.05).

Table 1 reports each group's characteristics after the propensity score adjustment. After the adjustment, all characteristics used in calculating propensity scores were comparable (p-value>0.05) between each study group and the comparison group. On average, aged beneficiaries with depression have over 4 other coexisting medical conditions such as hypertension, heart failure and diabetes. In particular, in the study groups, about 60% also had hypertension, over 32% had heart failure, and 31% of the no-coverage group and 37% of the generic-only group had diabetes.

The mean length of time spent in the gap by the no-coverage group was 112 days, so the length in the pre-gap period was 365–112=253 days. The mean length of time spent in the gap by the LIS group was 128 days and that by the generic-only group was 136 days.

### Effects of the Coverage Gap on Medication Use

Tables 2–4 present the effects of the coverage gap on the use of antidepressant, heart failure, and oral anti-diabetic medications. These results were estimated from the difference-indifference model with the propensity-score weighting. There are four main findings:

First, in examining the use of "all antidepressant medications", having a gap in drug coverage was associated with a significant reduction in all measures of use in both the no-coverage and the generic-only groups.

Second, with the exception of the outcome "using any generic medication", those with no coverage reduced their use of medications more than those with generic-only coverage. For example, the no-coverage group reduced the number of monthly prescriptions for antidepressants by 12.1% (95% CI 9.9%–14.3%) while the generic-only group reduced it by 6.9% (95% CI 4.8%–9.1%).

Third, most of the reduction in antidepressant use came from the reduction in the number of brand-name drugs. Relative to the comparison group, the no-coverage group reduced the average number of monthly prescriptions for antidepressants by 0.09 (95% CI 0.07–0.11), or by 12.1% (95% CI 9.9%–12.1%), from the pre-gap level. About 77% of this reduction (0.07 out of 0.09) was attributed to lower use of brand-name antidepressants and 23% to lower use of generic antidepressant use. The findings for those with generic coverage were more pronounced: about 86 percent of the reduction in the use of overall antidepressants was attributed to the lower use of brand-name drugs.

Fourth, the pattern of the decrease in the use of heart failure and anti-diabetic drugs in the gap was similar to that for the use of antidepressants. Relative to the comparison group, those with no coverage reduced their monthly number of antidepressants by 12.1% (95% CI 9.9%–14.3%), while they reduced heart failure and anti-diabetic drug usage by 12.9% (95% CI 11.2%–14.7%) and 13.4% (95% CI 8.2%–18.6%) respectively.

### Effects of the Coverage Gap on Non-drug Medical Spending

Table 5 presents results on the effect of the coverage gap on non-drug medical spending, broken-down by physician, outpatient and inpatient spending. The discontinuation in drug use in the gap did not lead to the increase in the non-drug medical use. The probability of hospitalization was lower in the within-gap period compared to the pre-gap period in all three groups, because on average the within-gap period was shorter than the pre-gap period. However, rates of hospitalizations fell more in the no-coverage and generic-only groups, relative to the LIS group. Physician spending also declined in the within-gap compared to the pre-gap period. Thus, after controlling for the comparison group, the gap was not associated with an increase in medical spending.

## COMMENT

The major finding in this paper is that, when faced with a full gap in drug coverage, beneficiaries with depression reduced antidepressant use by 12.1% per month in the coverage gap, similar to their reduction in the use of heart failure drugs (12.9%), and oral anti-diabetic drugs (13.4%). This reduction in use is also similar to the reduction in overall use of drugs found in other studies.[6]

We also found that most of the reduction in drug use came from the reduction of brand-name drugs. This result was stronger for those with generic coverage in the gap. Those with generic drug coverage reduced their antidepressant use by 6.9%, entirely attributable to reduction in use of brand-name antidepressants. There was no evidence that those with

generic coverage shifted from brand-name to generic drugs in the coverage gap. There was no evidence of any cost increases in non-drug medical use and spending – this is partially due to the average short follow-up period between reaching the gap and the start of the next yearly cycle.

Our pre-post study design with a comparison group mitigates but might not eliminate the possible effects of selection biases due to unobserved characteristics. This design does not require that baseline characteristics in the comparison group to be similar with the study group. We further used the propensity score weighting to balance the observed characteristics and the difference-in-difference approach adjusted for unobserved, time-unvarying factors, between study and comparison groups.

To our knowledge, ours is the first study to evaluate the impact of the coverage gap using the national Part D data for beneficiaries with depression. [6, 10, 11, 19] Compared to the overall elderly Medicare population, the magnitude of the coverage gap effects among elderly beneficiaries with depression is similar.[6] We did not observe increase in non-drug medical spending partially due to the short follow-up period;[18] whether spending would increase in the following year would depend in part on whether spending on drugs rebound when coverage resumes.

If patients discontinue their appropriate medications abruptly, they could be placing themselves at risk for medication withdrawal effects and for relapse or recurrence.[3] If they do not notice any effects, they might decide not to resume taking antidepressant medication. Thus, a gap in drug coverage could place older adults in harm's way, as a result of disruptions in appropriate maintenance antidepressant pharmacotherapy.[2, 3]

Even under the current provisions of the ACA, in the next 10 years, beneficiaries still need to pay a substantial amount while in the gap and they will stay in the gap for a long period before their cumulative out-of-pocket spending reaches the catastrophic threshold (e.g., $4550 in 2010). Facing such high out-of-pocket cost in this period could impose potential harm for beneficiaries, especially those with mental disorders. Our findings reinforce the necessity to evaluate the unique benefit design of Medicare Part D in order to create the best approach to cover the essential medications for beneficiaries whose total drug spending exceeds the coverage gap threshold.

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## Table 1

Characteristics of Elderly Beneficiaries with Depression Who Entered the Coverage Gap But Did not Go Through it in 2007 after the Propensity Score Weighting *

| Variable | No-Coverage vs LIS | | | Generic-Only vs LIS | | |
|---|---|---|---|---|---|---|
| | No Coverage (n=7650) | LIS (n=11537) | P value | Generic Only (n=2989) | LIS (n=11537) | P value |
| Female sex, % | 78.6 | 78.4 | 0.57 | 79.7 | 79.7 | 1.00 |
| Race, % | | | | | | |
| Non-Hispanic White | 82.1 | 82.4 | 0.43 | 78.9 | 78.5 | 0.32 |
| African American | 6.7 | 6.6 | 0.48 | 7.6 | 8.0 | 0.17 |
| Hispanic | 8.0 | 8.3 | 0.43 | 10.2 | 10.2 | 0.94 |
| Asian | 1.7 | 1.7 | 0.78 | 1.9 | 2.1 | 0.26 |
| Age, % | | | | | | |
| 65–74 | 35.8 | 36.6 | 0.12 | 37.8 | 37.7 | 0.82 |
| 75–84 | 37.6 | 37.5 | 0.88 | 35.2 | 35.9 | 0.19 |
| ≥ 85 | 26.6 | 25.9 | 0.12 | 27.0 | 26.4 | 0.24 |
| Prescription drug risk score, mean | 1.09±0 | 1.1±0 | 0.17 | 1.1±0.01 | 1.1±0 | 0.99 |
| CMS-HCC risk, mean | 1.49±0.01 | 1.51±0.01 | 0.22 | 1.5±0.02 | 1.51±0.01 | 0.67 |
| No. Elixhauser comobidities, mean | 4.49±0.03 | 4.56±0.03 | 0.08 | 4.58±0.05 | 4.62±0.03 | 0.53 |
| Time spent in the gap, mean | 114.8±0.73 | 128.3±0.61 | <.001 | 136.5±1.25 | 128.6±0.61 | <.001 |
| 25$^{th}$ percentile | 61 | 77 | | 80 | 79 | |
| Median | 115 | 132 | | 140 | 132 | |
| 75$^{th}$ percentile | 165 | 178 | | 192 | 178 | |
| Diagnosed chronic conditions, % | | | | | | |
| Hypertension | 60.7 | 61.6 | 0.06 | 59.8 | 61.9 | <.001 |
| Hyperlipidemia | 35.8 | 27.6 | <.001 | 34.0 | 27.7 | <.001 |
| AMI | 2.0 | 1.7 | 0.05 | 1.2 | 1.8 | <.001 |
| COPD | 20.7 | 24.6 | <.001 | 20.3 | 24.8 | <.001 |
| Heart failure | 32.2 | 36.6 | <.001 | 32.9 | 37.6 | <.001 |
| Diabetes | 31.2 | 39.3 | <.001 | 36.8 | 40.2 | <.001 |
| RA/OA | 38.3 | 41.5 | <.001 | 37.7 | 42.1 | <.001 |

* Plus-minus values are means±SE.

Abbreviations: LIS = low-income-subsidies; AMI = Acute Myocardial Infarction; COPD = Chronic obstructive pulmonary disease; RA/OA = Rheumatoid arthritis/osteoarthritis.

All numbers in the table are adjusted using inverse propensity score weights. Propensity scores were calculated using logistic regression models that predict the probability of being in a study group relative to the comparison group, controlling for age, sex, race, number of Elixhauser comorbidities, and prescription drug hierarchical condition.

**Table 2**

The Impact of the Coverage Gap on **Antidepressant** Use among Elderly Beneficiaries Diagnosed with Depression in 2007

| | | Unadjusted Data* | | Diff-in-Diff Coverage Gap Effects† | | % Change, Diff-in-Diff Effects/Pre-Gap Values‡ | |
|---|---|---|---|---|---|---|---|
| | | Pre-Gap | Within-Gap | Estimate | 95% CI | % | 95% CI |
| ***Probability of Using an Antidepressant*** | | | | | | | |
| All | No-coverage | 0.81 | 0.63 | −0.05 | (−0.06, −0.03) | −5.6 | (−7.1, −4.1) |
| | Generic-only | 0.83 | 0.72 | −0.03 | (−0.05, −0.02) | −4.1 | (−5.6, −2.5) |
| | LIS | 0.80 | 0.70 | Reference | | | |
| Brand-name | No-coverage | 0.40 | 0.27 | −0.06 | (−0.07, −0.05) | −14.2 | (−16.9, −11.6) |
| | Generic-only | 0.37 | 0.27 | −0.04 | (−0.05, −0.03) | −11.0 | (−14.1, −7.8) |
| | LIS | 0.30 | 0.24 | Reference | | | |
| Generics | No-coverage | 0.56 | 0.43 | 0.00 | (−0.02, 0.01) | −0.9 | (−3.0, 1.3) |
| | Generic-only | 0.62 | 0.55 | −0.01 | (−0.02, 0.01) | −1.3 | (−3.4, 0.8) |
| | LIS | 0.62 | 0.53 | Reference | | | |
| ***No. of Monthly Prescriptions for Antidepressants*** | | | | | | | |
| All | No-coverage | 0.75 | 0.57 | −0.09 | (−0.11, −0.07) | −12.1 | (−14.3, −9.9) |
| | Generic-only | 0.86 | 0.71 | −0.06 | (−0.08, −0.04) | −6.9 | (−9.1, −4.8) |
| | LIS | 0.78 | 0.70 | Reference | | | |
| Brand-name | No-coverage | 0.29 | 0.19 | −0.07 | (−0.08, −0.06) | −23.6 | (−26.9, −20.3) |
| | Generic-only | 0.29 | 0.19 | −0.06 | (−0.07, −0.05) | −20.3 | (−24.0, −16.7) |
| | LIS | 0.22 | 0.19 | Reference | | | |
| Generics | No-coverage | 0.46 | 0.38 | −0.02 | (−0.04, −0.01) | −4.9 | (−8.0, −1.8) |
| | Generic-only | 0.58 | 0.52 | 0.00 | (−0.02, 0.02) | −0.1 | (−2.9, 2.7) |
| | LIS | 0.56 | 0.51 | Reference | | | |
| ***Monthly Pharmacy Spending for Antidepressants*** | | | | | | | |
| All | No-coverage | 40 | 26 | −8.29 | (−9.38, −7.21) | −20.8 | (−23.5, −18) |
| | Generic-only | 44 | 31 | −6.63 | (−7.83, −5.43) | −15.0 | (−17.8, −12.3) |
| | LIS | 35 | 30 | Reference | | | |

| | | Unadjusted Data* | | Diff-in-Diff Coverage Gap Effects† | | % Change, Diff-in-Diff Effects/Pre-Gap Values‡ | |
|---|---|---|---|---|---|---|---|
| | | Pre-Gap | Within-Gap | Estimate | 95% CI | % | 95% CI |
| Brand-name | No-coverage | 30 | 19 | −7.98 | (−9.02, −6.95) | −27.0 | (−30.5, −23.5) |
| | Generic-only | 30 | 19 | −7.05 | (−8.22, −5.88) | −23.4 | (−27.3, −19.5) |
| | LIS | 21 | 19 | Reference | | | |
| Generics | No-coverage | 10 | 7 | −0.31 | (−0.76, 0.14) | −3.0 | (−7.3, 1.3) |
| | Generic-only | 14 | 11 | 0.42 | (−0.15, 0.99) | 3.0 | (−1.1, 7.1) |
| | LIS | 14 | 11 | Reference | | | |

*These are average numbers in the pre-gap and within-gap periods, but they are unadjusted raw data.

†"Diff-in-Diff Coverage Gap Effects" are adjusted estimates from the difference-in-difference model with the inverse of propensity score as a weight. The estimates measure changes in outcomes between within-gap and pre-gap periods in each study group, relative to the changes in outcomes in the comparison group ("Reference").

‡"% Change" is calculated using "Diff-in-Diff Coverage Gap Effects" divided by pre-gap values. Abbreviations: LIS = low-income-subsidies; this is the comparison group.

**Table 3**

The Impact of Coverage Gap on **Heart Failure Medication** Use and Spending among Elderly Beneficiaries Diagnosed with Depression in 2007

| | | Unadjusted Data* | | Diff-in-Diff Coverage Gap Effect† | | % Change, Diff-in-Diff Effects/Pre-Gap Values‡ | |
|---|---|---|---|---|---|---|---|
| | | Pre-Gap | Within-Gap | Estimate | 95% CI | % | 95% CI |
| ***Probability of Using a Drug*** | | | | | | | |
| All | No-coverage | 0.88 | 0.72 | −0.05 | (−0.05, −0.04) | −5.2 | (−6.2, −4.2) |
| | Generic-only | 0.91 | 0.80 | −0.04 | (−0.05, −0.03) | −4.6 | (−5.7, −3.6) |
| | LIS | 0.90 | 0.82 | Reference | | | |
| Brand-name | No-coverage | 0.65 | 0.40 | −0.05 | (−0.07, −0.04) | −8.2 | (−10.1, −6.3) |
| | Generic-only | 0.66 | 0.45 | −0.06 | (−0.08, −0.05) | −9.7 | (−11.8, −7.6) |
| | LIS | 0.60 | 0.42 | Reference | | | |
| Generics | No-coverage | 0.75 | 0.64 | −0.02 | (−0.03, −0.01) | −2.3 | (−3.7, −1.0) |
| | Generic-only | 0.79 | 0.73 | −0.02 | (−0.03, −0.01) | −2.2 | (−3.6, −0.7) |
| | LIS | 0.81 | 0.75 | Reference | | | |
| ***No. of Monthly Prescriptions*** | | | | | | | |
| All | No-coverage | 1.79 | 1.33 | −0.23 | (−0.26, −0.20) | −12.9 | (−14.7, −11.2) |
| | Generic-only | 2.04 | 1.63 | −0.18 | (−0.21, −0.14) | −8.7 | (−10.4, −7.0) |
| | LIS | 1.90 | 1.66 | Reference | | | |
| Brand-name | No-coverage | 0.71 | 0.36 | −0.15 | (−0.17, −0.13) | −21.1 | (−23.4, −18.7) |
| | Generic-only | 0.78 | 0.40 | −0.14 | (−0.16, −0.13) | −18.6 | (−21.1, −16.2) |
| | LIS | 0.61 | 0.39 | Reference | | | |
| Generics | No-coverage | 1.08 | 0.97 | −0.08 | (−0.11, −0.06) | −7.6 | (−10.0, −5.1) |
| | Generic-only | 1.27 | 1.23 | −0.03 | (−0.06, 0.00) | −2.6 | (−4.9, −0.2) |
| | LIS | 1.29 | 1.27 | Reference | | | |
| ***Monthly Pharmacy Spending*** | | | | | | | |
| All | No-coverage | 65 | 40 | −12.10 | (−13.38, −10.82) | −18.7 | (−20.7, −16.7) |
| | Generic-only | 72 | 47 | −11.39 | (−12.86, −9.92) | −15.8 | (−17.8, −13.7) |

| | | Unadjusted Data* | | Diff-in-Diff Coverage Gap Effect† | | % Change, Diff-in-Diff Effects/Pre-Gap Values‡ | |
|---|---|---|---|---|---|---|---|
| | | Pre-Gap | Within-Gap | Estimate | 95% CI | % | 95% CI |
| | LIS | 62 | 49 | Reference | | | |
| Brand-name | No-coverage | 49 | 25 | −10.44 | (−11.64, −9.25) | −21.5 | (−24.0, −19.1) |
| | Generic-only | 53 | 27 | −10.26 | (−11.64, −8.88) | −19.5 | (−22.1, −16.9) |
| | LIS | 43 | 28 | Reference | | | |
| Generics | No-coverage | 16 | 15 | −1.66 | (−2.23, −1.08) | −10.3 | (−13.9, −6.7) |
| | Generic-only | 20 | 20 | −1.13 | (−1.81, −0.45) | −5.8 | (−9.3, −2.3) |
| | LIS | 20 | 21 | Reference | | | |

*These are average numbers in the pre-gap and within-gap periods, but they are unadjusted raw data.

†"Diff-in-Diff Coverage Gap Effects" are adjusted estimates from the difference-in-difference model with the inverse of propensity score as a weight. The estimates measure changes in outcomes between within-gap and pre-gap periods in each study group, relative to the changes in outcomes in the comparison group ("Reference").

‡"% Change**"** is calculated using "Diff-in-Diff Coverage Gap Effects" divided by pre-gap values. Abbreviations: LIS = low-income-subsidies; this is the comparison group.

**Table 4**

The Impact of Coverage Gap on **Oral Anti-diabetic Medication** Use and Spending among Elderly Beneficiaries Diagnosed with Depression in 2007

| | | Unadjusted Data* | | Diff-in-Diff Coverage Gap Effect† | | % Change, Diff-in-Diff Effects/Pre-Gap Values‡ | |
|---|---|---|---|---|---|---|---|
| | | Pre-Gap | Within-Gap | Estimate | 95% CI | % | 95% CI |
| ***Probability of Using a Drug*** | | | | | | | |
| All | No-coverage | 0.15 | 0.12 | −0.01 | (−0.02, −0.01) | −8.7 | (−12.4, −4.9) |
| | Generic-only | 0.20 | 0.17 | −0.02 | (−0.03, −0.02) | −11.0 | (−14.5, −7.5) |
| | LIS | 0.22 | 0.19 | Reference | | | |
| Brand-name | No-coverage | 0.06 | 0.04 | −0.01 | (−0.01, 0.00) | −14.3 | (−22.1, −6.6) |
| | Generic-only | 0.08 | 0.05 | −0.01 | (−0.01, 0.00) | −7.4 | (−14.7, −0.1) |
| | LIS | 0.09 | 0.06 | Reference | | | |
| Generics | No-coverage | 0.13 | 0.10 | −0.01 | (−0.01, 0.00) | −5.6 | (−10.1, −1.1) |
| | Generic-only | 0.18 | 0.15 | −0.01 | (−0.02, −0.01) | −8.4 | (−12.5, −4.4) |
| | LIS | 0.19 | 0.17 | Reference | | | |
| ***No. of Monthly Prescriptions*** | | | | | | | |
| All | No-coverage | 0.17 | 0.12 | −0.02 | (−0.03, −0.01) | −13.4 | (−18.6, −8.2) |
| | Generic-only | 0.25 | 0.19 | −0.03 | (−0.04, −0.01) | −10.3 | (−14.6, −6.0) |
| | LIS | 0.25 | 0.21 | Reference | | | |
| Brand-name | No-coverage | 0.05 | 0.02 | −0.01 | (−0.02, −0.01) | −24.6 | (−33.8, −15.4) |
| | Generic-only | 0.06 | 0.03 | −0.01 | (−0.02, −0.01) | −17.5 | (−26.1, −8.9) |
| | LIS | 0.07 | 0.04 | Reference | | | |
| Generics | No-coverage | 0.12 | 0.10 | −0.01 | (−0.02, 0.00) | −8.9 | (−15.1, −2.7) |
| | Generic-only | 0.18 | 0.16 | −0.01 | (−0.02, −0.01) | −7.9 | (−12.8, −3.0) |
| | LIS | 0.19 | 0.17 | Reference | | | |
| ***Monthly Pharmacy Spending*** | | | | | | | |
| All | No-coverage | 8 | 5 | −1.62 | (−2.28, −0.97) | −19.4 | (−27.1, −11.6) |
| | Generic-only | 11 | 7 | −2.05 | (−2.85, −1.25) | −18.1 | (−25.1, −11.0) |

| | | Unadjusted Data* | | Diff-in-Diff Coverage Gap Effect† | | % Change, Diff-in-Diff Effects/Pre-Gap Values‡ | |
|---|---|---|---|---|---|---|---|
| | | Pre-Gap | Within-Gap | Estimate | 95% CI | % | 95% CI |
| | LIS | 12 | 9 | Reference | | | |
| Brand-name | No-coverage | 7 | 4 | −1.47 | (−2.10, −0.83) | −22.0 | (−31.5, −12.5) |
| | Generic-only | 9 | 4 | −1.72 | (−2.49, −0.94) | −19.6 | (−28.4, −10.8) |
| | LIS | 9 | 6 | Reference | | | |
| Generics | No-coverage | 2 | 1 | −0.16 | (−0.29, −0.03) | −9.2 | (−16.5, −1.9) |
| | Generic-only | 3 | 2 | −0.33 | (−0.48, −0.18) | −12.8 | (−18.5, −7.2) |
| | LIS | 3 | 2 | Reference | | | |

*These are average numbers in the pre-gap and within-gap periods, but they are unadjusted raw data.

†"Diff-in-Diff Coverage Gap Effects" are adjusted estimates from the difference-in-difference model with the inverse of propensity score as a weight. The estimates measure changes in outcomes between within-gap and pre-gap periods in each study group, relative to the changes in outcomes in the comparison group ("Reference").

‡"% Change" is calculated using "Diff-in-Diff Coverage Gap Effects" divided by pre-gap values. Abbreviations: LIS = low-income-subsidies; this is the comparison group.

**Table 5**

The Impact of the Coverage Gap on **Non-drug Medical** Use and Spending among Elderly Beneficiaries Diagnosed with Depression in 2007

| | | Unadjusted Data* | | Diff-in-Diff Coverage Gap Effects† | | % Change, Diff-in-Diff Effects/Pre-Gap Values‡ | |
|---|---|---|---|---|---|---|---|
| | | Pre-Gap | Within-Gap | Estimate | 95% CI | % | 95% CI |
| ***Probability of Using a Medical Service*** | | | | | | | |
| Physician | No-coverage | 1.00 | 0.88 | 0.00 | (−0.01, 0.00) | −0.4 | (−1.2, 0.3) |
| | Generic-only | 1.00 | 0.92 | 0.00 | (−0.01, 0.00) | −0.4 | (−1.2, 0.5) |
| | LIS | 0.99 | 0.92 | Reference | | | |
| Outpatient | No-coverage | 0.81 | 0.58 | −0.04 | (−0.05, −0.02) | −4.3 | (−6.1, −2.5) |
| | Generic-only | 0.80 | 0.67 | −0.02 | (−0.04, 0.00) | −2.6 | (−4.6, −0.5) |
| | LIS | 0.81 | 0.67 | Reference | | | |
| Inpatient | No-coverage | 0.35 | 0.18 | −0.02 | (−0.04, −0.01) | −6.8 | (−11.4, −2.1) |
| | Generic-only | 0.35 | 0.22 | −0.04 | (−0.06, −0.02) | −10.9 | (−16.3, −5.6) |
| | LIS | 0.33 | 0.20 | Reference | | | |
| ***Monthly Medical Spending*** | | | | | | | |
| Physician | No-coverage | 431 | 389 | −37.54 | (−58.49, −16.60) | −8.7 | (−13.6, −3.9) |
| | Generic-only | 465 | 426 | −29.54 | (−51.49, −7.60) | −6.4 | (−11.1, −1.6) |
| | LIS | 373 | 368 | Reference | | | |
| Outpatient | No-coverage | 174 | 165 | −26.33 | (−45.40, −7.25) | −15.1 | (−26.1, −4.2) |
| | Generic-only | 205 | 205 | −13.89 | (−35.07, 7.29) | −6.8 | (−17.1, 3.6) |
| | LIS | 197 | 203 | Reference | | | |
| Inpatient | No-coverage | 665 | 553 | −29.12 | (−100.10, 41.86) | −4.4 | (−15.1, 6.3) |
| | Generic-only | 756 | 616 | −83.69 | (−167.19, −0.20) | −11.1 | (−22.1, 0.0) |
| | LIS | 669 | 600 | Reference | | | |

*These are average numbers in the pre-gap and within-gap periods, but they are unadjusted raw data.

†"Diff-in-Diff Coverage Gap Effects" are adjusted estimates from the difference-in-difference model with the inverse of propensity score as a weight. The estimates measure changes in outcomes between within-gap and pre-gap periods in each study group, relative to the changes in outcomes in the comparison group ("Reference").

‡"% Change" is calculated using "Diff-in-Diff Coverage Gap Effect" divided by pre-gap values. Abbreviations: LIS = low-income-subsidies; this is the comparison group.

## Appendix Table 1

Drug Classes Used to Treat Depression, Heart Failure and Diabetes

| Chronic Medical Illnesses | Major Drug Classes |
|---|---|
| Depression | Antidepressants include all Selective Serotonin Reuptake Inhibitors (SSRIs), Serotonin/Noradrenaline Reuptake Inhibitors (SNRIs), tricyclic antidepressants, Alpha-2 Receptor Antagonists (NaSSA), MAO Inhibitor Nonselective & irreversible, Norepinephrine & Dopamine Reuptake Inhibitors (NDRIs), Serotonin-2 Antagonist-Reuptake Inhibitors (SARIs) and the combination drugs. |
| Heart failure | Angiotensin-Converting Enzyme inhibitors (ACEi), Angiotensin II Receptor Blockers (ARB), beta blockers, Calcium Channel Blockers, diuretics, vasodilators, digoxin |
| Diabetes (oral medications) | sulfonylurea, thiazolidinediones, alpha glucosidase inhibitors, biguanides & combinations, meglitinides, amylinomimetic, and incretin therapy |