

# The Effect of Transitioning to Medicare Part D Drug Coverage in Seniors Dually Eligible for Medicare and Medicaid

William H. Shrank, MD, MSHS,\* Amanda R. Patrick, MS,\* Alex Pedan, PhD,†  
Jennifer M. Polinski, MPH,\* Laleh Varasteh, RPh, MSE,† Raisa Levin, MS,\* Nan Liu, MS,† and  
Sebastian Schneeweiss, MD, ScD\*

**OBJECTIVES:** To evaluate medication use, out-of-pocket spending, and medication switching during the transition period for patients dually eligible for Medicaid and Medicare (dual eligibles).

**DESIGN:** Time-trend analysis, using segmented linear regression.

**SETTING:** Patient-level pharmacy dispensing data from January 2005 to December 2006 from a large pharmacy chain with stores in 34 states.

**PARTICIPANTS:** Dual eligibles aged 65 and older.

**MEASUREMENTS:** Changes in utilization, patient copayments, and medication switching were analyzed using interrupted time trend analyses. Utilization and spending were evaluated for five study drugs: clopidogrel, proton pump inhibitors (PPIs), warfarin, and statins (essential drugs covered by Part D plans) and benzodiazepines (not covered through Part D but potentially covered through Medicaid).

**RESULTS:** Drug use for 13,032 dual eligibles was evaluated. There was no significant effect of the transition to Medicare Part D on use of all study drugs, including the uncovered benzodiazepines. Cumulative reductions were seen in copayments for all covered drugs after implementation of Part D, ranging from 25% annually for PPIs to 53% for warfarin, but there was a larger increase in copayments, 91% annually, for benzodiazepines after the transition. The rate of switching medications was 3.0 times as great for the PPIs after implementation of Part D than before implementation, but there was no significant change in the other study drug classes.

**CONCLUSION:** These findings in a single, large pharmacy chain indicate that the transition plan for dual eligibles led to less medication discontinuation and switching than many

had expected. The substantially greater cost sharing for benzodiazepines highlights the importance of implementing a thoughtful transition plan when executing such a national policy. *J Am Geriatr Soc* 56:2304–2310, 2008.

**Key words:** Medicare Part D; prescription drug coverage; elderly; Medicaid; dual eligibles

Passage of the Medicare Part D drug benefit aimed to increase access to prescription drugs for America's seniors without coverage, but Part D affected more than just seniors who were previously inadequately insured. Many seniors who were dually eligible for Medicaid and Medicare (dual eligibles) experienced a change from state-run programs to a program developed by the federal government, funded jointly by federal and state governments, and administered by private plans. Approximately 6.6 million dually eligible seniors were automatically enrolled in a Medicare Part D prescription drug plan on January 1, 2006.<sup>1</sup> Little is known about how this change in coverage affected these dual eligibles.

Dual eligibles had the opportunity to select the Part D plan of their choice before January 1, 2006; those who did not enroll on their own were enrolled automatically in Part D to minimize gaps in coverage and to guarantee that low-income patients were enrolled in a plan with a low-income subsidy. Patients who were automatically enrolled were placed in plans with fully subsidized premiums, and medication copayments were subsidized for patients who reached the Part D coverage gap (the donut hole).<sup>2</sup> Patients who were not satisfied with the plan automatically selected for them had the opportunity to switch to another low-income subsidy plan.<sup>3</sup>

Despite efforts to simplify the transition to Part D, many researchers and policy experts expressed concern about how dual eligibles fared during their transition in coverage.<sup>4–6</sup> Before the transition to Part D, many Medicaid beneficiaries had generous drug coverage with few formu-

From the \*Division of Pharmacoepidemiology and Pharmacoeconomics, Department of Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts; and †ADHERIS Inc, Burlington, Massachusetts.

Address correspondence to William Shrank, MD, MSHS, Division of Pharmacoepidemiology and Pharmacoeconomics, Department of Medicine, Brigham and Women's Hospital, Harvard Medical School, 1620 Tremont Street (Suite 3030), Boston, MA 02120. E-mail: wshrank@partners.org

DOI: 10.1111/j.1532-5415.2008.02025.x

lary restrictions.<sup>7</sup> After the transition, the overwhelming majority of these patients found themselves enrolled in tiered pharmacy benefit plans that required differential copayments for some drugs and used new administrative barriers (e.g., prior authorization) to influence the use of others.<sup>8</sup> These changes led some dual eligibles to pay more for the same medications that they had previously been taking, and other dual eligibles may have been required to switch to specific medications preferred by the individual prescription drug plans.<sup>9</sup> To assist with these changes in coverage, more than half of the states required plans to relax formulary restrictions during the transition period in an effort to minimize medication discontinuation.<sup>4</sup> Surveys of dual eligibles indicate that there was substantial confusion at the time of transition as they dealt with new and often more restrictive formularies,<sup>10,11</sup> but little is known about whether the changes in coverage affected the use of essential medications or patients' out-of-pocket spending.

Electronically recorded pharmacy transactions for patients aged 65 and older enrolled in Medicaid before the implementation of Part D on January 1, 2006, were evaluated, and drug use, out-of-pocket spending and medication switching were assessed in dually eligible beneficiaries after the transition to Medicare Part D insurance.

## METHODS

The human subjects review boards of the Brigham and Women's Hospital approved the study.

In time-trend analyses using pharmacy dispensing data from before and after the implementation of Medicare Part D, how drug use and out-of-pocket spending were affected in the year after implementation were assessed.

### Data Sources and Study Population

Records of all prescription drugs dispensed to subjects aged 65 and older at a large pharmacy chain operating in 34 states from October 1, 2004, through March 31, 2007, were obtained. The database included unique deidentified subject numbers; patient ZIP codes; and for each dispensed drug, the out-of-pocket payment amount, the National Drug Code (NDC), and quantity dispensed. Drug prices were imputed as 80% of the average wholesale price for each NDC.<sup>7,12,13</sup> Patients who received drug coverage through Medicaid between January 1, 2005, and January 1, 2006, were identified in the database if Medicaid paid 80% or more of their transactions, at least in part. Considering that patients may use more than one pharmacy chain and data would be lost if they used another chain, it was required that patients had had minimal dispensing activity within the same pharmacy chain in the last quarter of 2004 and the first quarter of 2007.

### Study Drugs

Four classes of medication were selected for analysis that were covered by Part D: warfarin, 3-hydroxy-3-methylglutaryl (HMG) coenzyme A (CoA) receptor inhibitors (statins), proton pump inhibitors (PPIs), and clopidogrel. These classes included expensive (clopidogrel) and less-expensive but essential (warfarin) drugs and those used to treat symptomatic conditions (clopidogrel, PPIs), as well as drugs used to treat asymptomatic conditions (statins). For

all four classes, generic medications were available or became available during the study period. Three drugs became available as generics during the study period: pravastatin, simvastatin, and clopidogrel. A fifth class, benzodiazepines, which was explicitly excluded from Part D coverage, was also included; no plans with low-income subsidies covered benzodiazepines (although some higher-premium plans were permitted to add coverage for these medications), but because Medicaid programs cannot legally discriminate based on age, dual eligibles continued to be entitled to Medicaid prescription benefits if a drug was not covered under Part D. Thus, if a state covered the dual eligible's prescription for a benzodiazepine before January 1, 2006, it would continue to do so under Part D, for patients savvy enough to identify this source of coverage. Inclusion of benzodiazepines allows us to compare the effect of use in classes of medication for which the transition to Part D was specifically considered (warfarin, statins, PPIs, clopidogrel) and for drugs for which coverage in the transition period was poorly defined and coordinated (benzodiazepines).

### Study Outcomes

To estimate the effect of the introduction of the Part D drug coverage, drug use was calculated as days' supply of the medication recorded at dispensing and copayments in U.S. dollars per 30 days' supply for each calendar month from January 1, 2005, through December 31, 2006, in all subjects who were enrolled in Medicaid in 2005. Monthly rates of switching between drugs within the class and switching from branded to generic or generic to branded versions of the same drug were calculated. The numerator each month was the number of subjects switching, and the denominator was the total number of patients filling a prescription within that drug class in that month.

Dispensing information from July 1 through December 31, 2005 was used to characterize the study population including age; sex; region of residence (Appendix A); median income level and population density of residential ZIP code; number of different drugs used; and specific use of anticoagulants, loop diuretics, nitrates, and antidiabetic drugs. Using the dispensed prescription drugs during this time period, the Chronic Disease Score,<sup>14</sup> a summary measure of health status that has been shown to have reasonable validity, was also assessed.<sup>15</sup>

### Statistical Analysis

Segmented linear regression was used to estimate sudden changes in levels of monthly rates of drug use or out-of-pocket spending during three periods: (1) the year before implementation, (2) the first 2 months immediately after implementation of Part D (the transition period), and (3) during the remainder of the first year after implementation of Part D (stable Part D period).<sup>16</sup> The change in rate of drug use (the slope) in the period before implementation and in the stable Part D period was also evaluated. To estimate changes in level and slope attributable to the introduction of the Medicare Part D policy, regression models that included a constant term, a linear time trend (months 1–12 of 2005), and binary indicators and linear time trends for the transition and stable Part D periods were used.<sup>17</sup> To calculate cumulative changes in utilization and

out-of-pocket spending attributable to Part D in the year after implementation, the differences between the predicted values from the full regression model and those obtained by extrapolating the pre-Part D trend into the Part D period were summed. Details of the regression models are described in Appendix B.

## RESULTS

The sample included 13,032 dually eligible beneficiaries who used Medicaid as a source of drug coverage in 2005. The mean age  $\pm$  standard deviation of the sample was  $75.9 \pm 7.1$ , and the sample represented broad geographic diversity, although the northeast United States was not represented (Table 1). The overwhelming majority of dual eligible seniors (92%) had used more than four different medications in the 6 months before Part D, and sizable fractions had a chronic disease score of 4 or higher (59%) and used antidiabetic drugs (30%) or nitrates (15%).

**Table 1. Characteristics of 13,032 Dual Eligible Patients Who Continuously Filled Prescriptions in One Pharmacy Chain over the Study Period**

Characteristic	n (%)
<b>Patient age on December 31, 2005</b>	
66–70	3,599 (27.6)
71–75	3,325 (25.5)
76–80	2,740 (21.0)
$\geq 81$	3,368 (25.8)
Female	10,019 (76.9)
<b>Region</b>	
Northeast	0 (0.0)
South	2,634 (20.2)
Midwest	5,241 (40.2)
West	5,157 (39.6)
<b>Median income in ZIP code, \$*</b>	
< 20,000	376 (2.9)
20,000–39,999	6,667 (51.9)
40,000–59,999	4,598 (35.8)
$\geq 60,000$	1,217 (9.5)
<b>Population density per square mile*</b>	
< 160	3,163 (24.6)
160–650	2,089 (16.3)
651–2,520	2,965 (23.1)
$\geq 2,520$	4,641 (36.1)
<b>Number of different medications taken in 2005</b>	
0–3	1,040 (8.0)
$\geq 4$	11,992 (92.0)
<b>Chronic disease score in 2005</b>	
0–3	5,293 (40.6)
$\geq 4$	7,739 (59.4)
Use of anticoagulants	1,201 (9.2)
Use of loop diuretics or digoxin	897 (6.9)
Use of nitrates	1,892 (14.5)
Use of antidiabetic drugs	3,893 (29.9)

\* According to patient ZIP code of residence and national survey data. Information was missing for 174 patients.

The time trend analysis found little effect of the implementation of Medicare Part D on use of the study drugs (Figure 1). No statistically significant increases or decreases were seen in the use of PPIs, warfarin, clopidogrel, statins, or benzodiazepines after implementation of Part D (Table 2). Trends indicated increased use for all study drugs except benzodiazepines, for which there was a nonsignificant trend of lower use.

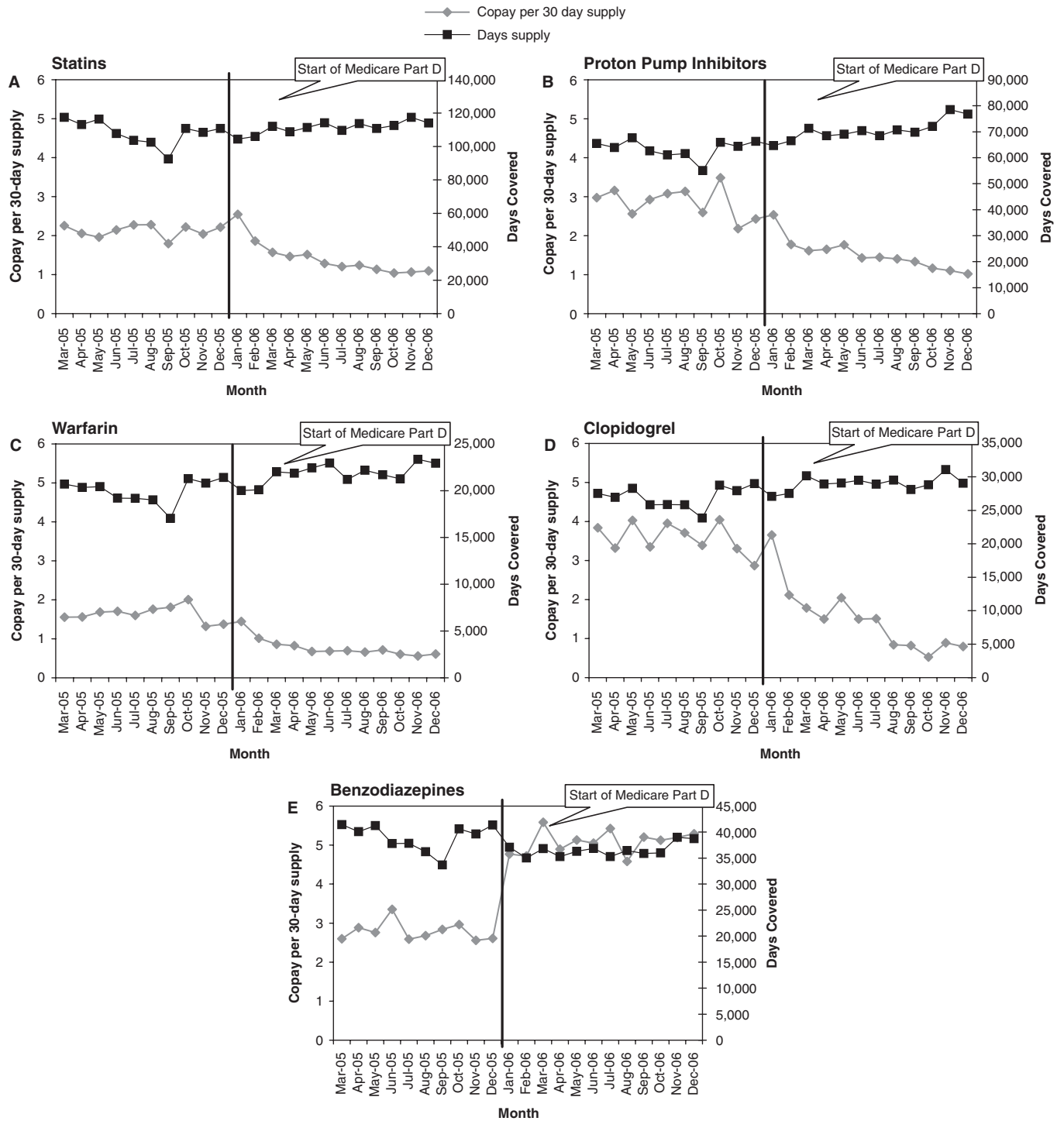
Significant changes in copayments occurred with the implementation of Part D (Table 2). For warfarin, there was a \$0.41 drop in copayment requirements per month at the time of implementation, with no immediate change in PPIs, clopidogrel, or statins. In the remainder of the year after implementation, statin, warfarin, and clopidogrel copayments decreased. Cumulative copayments decreased from January to December 2006 in all covered drugs, ranging from 25% for PPIs to 53% for warfarin. These reductions reduced annual cumulative out-of-pocket expenses for dual eligibles by \$6.<sup>14</sup> for PPIs, \$6.62 for statins, \$10.58 for warfarin, and \$18.42 for clopidogrel.

However, there was a large and statistically significant increase in copayment levels for benzodiazepines; copayments increased 91% after transition, raising cumulative out-of-pocket costs by \$28.99 annually for benzodiazepines.

An evaluation of medication-switching behavior within drug classes found mixed results (Figure 2). A 2.99% (95% confidence interval (CI) = 1.34–4.65%) greater rate of switching (from one brand to another within the class, from brand to generic, or from generic to brand) was found in PPIs after implementation of Part D than the baseline switching rate. No changes in switching rates that were temporally associated with implementation of Part D were seen in the other classes evaluated. All changes were modest when compared with the brisk 10.6% increase in switching in the statins that coincided with the month that simvastatin became available as a generic, a change that did not coincide with the implementation of Part D. Even greater rates of switching were seen when clopidogrel became available as a generic, with switching rates greater than 20% in the first month after entry.

## DISCUSSION

To the authors' knowledge, this study is the first empirical evaluation of prescription drug use, costs, and switching in dual eligibles during the transition from Medicaid drug coverage to Medicare Part D drug coverage based on pharmacy dispensing data. Many researchers and policy experts have expressed concerns about how shifting drug coverage may have adversely affected prescription drug use and increased patient out-of-pocket spending while requiring dual eligibles to switch their medications,<sup>10,11,18</sup> but this evaluation of electronic pharmacy transaction data did not corroborate these concerns. For the drugs covered by Part D that were evaluated, statins, warfarin, clopidogrel, and PPIs, no statistically significant reduction in drug use at the time of the transition to Medicare Part D was found. Trends of lower out-of-pocket drug spending for these classes were also found, with significant reductions in spending for warfarin in the transition period and reductions in out-of-pocket expenses for warfarin, clopidogrel, and statins over



**Figure 1.** Use of and patient copayment for selected essential drugs (A) statins, (B) proton pump inhibitors (PPIs), (C) warfarin, (D) clopidogrel, and (E) benzodiazepines of dual-eligible seniors. The January and February 2005 datapoints were omitted from this figure, because dispensings received in the previous 1 to 2 months affects days covered. Dispensing data from the end of 2004 were not analyzed, so there was not an accurate measure of days covered in January and February 2005.

the remainder of 2006. These findings did not extend to benzodiazepines, a class of medications not covered under Medicare Part D, which had a poorly defined plan for coverage after implementation of Part D. Congress’s decision not to include benzodiazepines led to a nonsignificant trend of lower use, and patients who used these drugs paid significantly more out of pocket.

The implementation of Medicare Part D stimulated less medication switching than had been feared. Almost five times greater switching in the PPI class was found immediately upon implementation, but there is convincing evidence to suggest that all medications in this class have similar efficacy<sup>17,19–21</sup> and little reason to believe that this would lead to adverse health outcomes. It is likely that this

**Table 2. Changes in Utilization and Copayment Trends Under Medicare Part D for Selected Medication Groups**

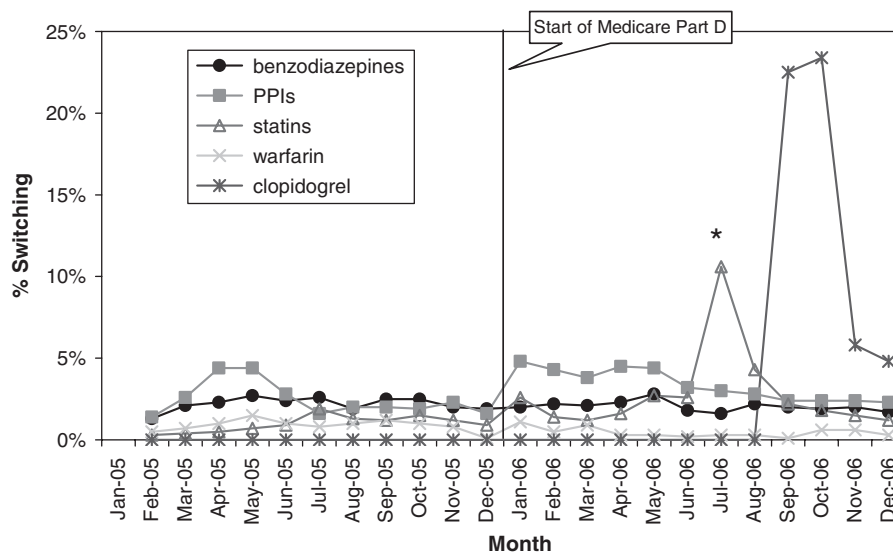
Medication Group	Transition Period (January 2006–February 2006)	Stable Part D Period (March 2006–December 2006)		Total (January 2006–December 2006)
	Change in Level (95% CI)	Change in Level (95% CI)	Change in Slope (95% CI)	Cumulative Change, n (%)
<b>Utilization, days covered</b>				
Statins	1,406 (–10,455–13,267)	8,801 (–4,310–21,912)	1,397 (–540–3,333)	153,679 (13)
PPIs	2,838 (–3,951–9,627)	5,308 (–1,769–12,385)	925 (–113–1,963)	100,372 (13)
Warfarin	–150 (–2,502–2,202)	1,653 (–798–4,105)	17 (–343–376)	16,984 (7)
Clopidogrel	–271 (–3,070–2,528)	1,566 (–1,352–4,483)	–99 (–527–329)	10,644 (3)
Benzodiazepines	–2,881 (–7,622–1,860)	–2,290 (–7,776–3,196)	368 (–456–1,191)	–12,117 (–3)
<b>Copayments, \$</b>				
Statins	0.16 (–0.18–0.49)	–0.49 (–0.83––0.15)	–0.04 (–0.09–0.00)	–6.62 (–28)
PPIs	–0.27 (–0.86–0.33)	–0.57 (–1.17–0.03)	0.00 (–0.08–0.09)	–6.15 (–25)
Warfarin	–0.41 (–0.74 to –0.08)	–0.84 (–1.17 to –0.51)	–0.03 (–0.08–0.02)	–10.58 (–53)
Clopidogrel	–0.39 (–1.18–0.41)	–1.34 (–2.14 to –0.54)	–0.09 (–0.21–0.02)	–18.42 (–51)
Benzodiazepines	2.03 (1.52–2.54)	2.47 (1.96–2.99)	0.00 (–0.07–0.08)	28.99 (+91)

All comparisons are relative to the 2005 baseline trends.  
CI = confidence interval; PPIs = proton pump inhibitors.

switching caused the lower spending that was found without causing changes in overall utilization. In the other classes evaluated, switching rates were not significantly different before and after implementation of Part D. The lack of switching after implementation may have been due to state regulations requiring drug plans to assist patients with coverage during the transition period and the inclusive coverage offered by many plans for these classes of essential medications.

There was less change in benzodiazepine use after Part D implementation than might have been expected, especially considering the substantial increase in out-of-pocket spending requirements for these medications (an average

cumulative increase of almost \$30 per benzodiazepine user). A large and convincing body of evidence indicates a strong relationship between out-of-pocket cost requirements and prescription drug use for many classes of chronic and acute medications used to treat symptomatic and asymptomatic conditions alike.<sup>15–22</sup> Some of the stability of use of benzodiazepines may have been due to efforts by state Medicaid programs to continue to provide benefits for this class for dual eligibles, which allowed some patients to continue to purchase benzodiazepines. The findings of the current study also raise some concern that previous studies examining the relationship between copayments and drug use may not apply to controlled substances. Further eval-



**Figure 2.** Monthly probabilities of switching between drugs. Switching includes switching between distinct generic entities and switching between branded and generic versions of a single drug. The July 2006 datapoint for statins, attributable to the entrance of generic simvastatin onto the market, was omitted from the statistical analysis. Similarly, dates after August were omitted for clopidogrel, because generic clopidogrel became available in September. PPI = proton pump inhibitor.

uation of this relationship, and the relevant cost cutoffs that affect behavior, is warranted for this class of medications.

The fact that prescription drug activity from a single pharmacy chain was evaluated limit these findings. The chain has broad representation in the south, west and mid-west United States but has no clients in the Northeast. Although it is likely that that this chain serves a representative sample of patients, further evaluation in other chains would be useful. A limited sample of medication classes that are generally used chronically were evaluated, and the findings may not be generalized to acute, short-term medications. Use of pharmacy data also has limitations. Some patients may have filled prescriptions at different pharmacies. Although continuous use indicated by filling at least one prescription in the last quarter of 2004 and the first quarter of 2007 at the study pharmacy was required, not all prescriptions may have been filled at the chain. However, it would be expected that the transition to Part D might have led some patients to switch their pharmacies, which suggests that drug use may have been even greater after implementation of Part D than the data would indicate, and the findings may be conservative.

Results of the net effects of Part D on dual eligibles who were Medicaid beneficiaries throughout 2005 are described. Some patients may have chosen to enroll in a Medicare Advantage program at the time of Part D introduction and would have been lost for this analysis. The authors are not aware of any evidence that there was a significant increase in Medicare Advantage enrollment at the time of Part D auto-enrollment. Similarly, some dual eligibles may have chosen to enroll in another private or employer-sponsored source of insurance at the time of Medicare Part D implementation; it is unlikely that there was significant migration of this poor, elderly population to private insurance. Additionally, some of the difficulties associated with the transition may have been delayed several months as states required plans to assist in covering previously covered drugs during the transition period, although the time-trend analyses evaluated changing drug use, costs, and spending over the year after implementation, which should have been enough time to identify meaningful changes in the outcomes of interest.

These findings have important implications for the Medicare Part D program. The Centers for Medicare and Medicaid Services and individual states automatically enrolled dually eligible beneficiaries into Part D programs with a low-income subsidy and required participating Medicare Part D plans to assist in coverage at the point of the transition. Despite concerns that these efforts were insufficient to protect dual eligibles during the transition, these findings suggest that these efforts were effective. A prespecified plan for the transition led to less medication discontinuation and switching than many had expected, but a less-organized transition occurred for the benzodiazepine class, leading to higher costs, suggesting that the careful consideration of transition complexities was instrumental in maintaining adequate coverage for the essential covered medications evaluated. Further study of benzodiazepine use after the passage of recent legislation relaxing restrictions on benzodiazepine coverage would be informative.

These findings also can ease concerns about the difficulty in transition whenever new prescription drug policies

are implemented. Fear about medication discontinuation and adverse health outcomes are often invoked as a reason to obstruct new policy implementation. As we continue to try to identify improved prescription drug coverage designs, we must be willing to implement and test new coverage strategies. These findings suggest that thoughtful preparation for transition to new coverage designs and use of strategies to ease the burden of transition may serve as an effective means of protecting patients without impeding progress.

## ACKNOWLEDGMENTS

**Conflict of Interest:** The study was funded by a grant from the Robert Wood Johnson Foundation Changes in Health Care Financing and Organization (HCFO) Initiative and from the National Institute of Mental Health (RO1-MH 079175). Dr. Shrank is supported by a career development award from the National Heart, Lung, and Blood Institute (K23HL090505-01). The authors have no conflicts of interest to report.

**Author Contributions:** Study concept and design: Patrick, Schneeweiss, Shrank, Pedan, Polinski, Liu, Varasteh, Levin. Acquisition of data: Schneeweiss, Pedan, Liu, Varasteh. Analysis and interpretation of data: Patrick, Schneeweiss, Shrank, Pedan, Polinski, Liu, Varasteh, Levin. Drafting of the manuscript: Shrank. Critical revision of the manuscript for important intellectual content: Patrick, Schneeweiss, Shrank, Pedan, Polinski, Liu, Varasteh, Levin. Statistical expertise: Schneeweiss, Patrick, Shrank. Administrative, technical, or material support: Patrick, Schneeweiss, Shrank, Pedan, Polinski, Liu, Varasteh, Levin. Study supervision: Shrank, Schneeweiss.

**Sponsor's Role:** The sponsor had no role in the development of the research plan, the analysis of the data, the interpretation of the results, or the writing or editing of the manuscript.

## REFERENCES

1. The Henry J. Kaiser Family Foundation. Medicare Prescription Drug Coverage Among Medicare Beneficiaries: Data Update. The Henry J. Kaiser Family Foundation [on-line]. Available at <http://www.kff.org/medicare/upload/7453.pdf> Accessed October 10, 2007.
2. The Henry J. Kaiser Family Foundation. Benefit Design and Formularies of Medicare Drug Plans: A Comparison of 2006 and 2007 Offerings 11/14/2006 [on-line]. Available at <http://www.kff.org/medicare/7589.cfm> Accessed October 10, 2007.
3. Centers for Medicare and Medicaid Services. Medicare Modernization Act. 2007 Final Guidelines—Formularies. CMS Strategy for Affordable Access to Comprehensive Drug Coverage. Guidelines for Reviewing Prescription Drug Plan Formularies and Procedures [on-line]. Available at [http://www.amcp.org/data/nav\\_content/Final%20CY%202007%20Formulary%20Guidance.pdf](http://www.amcp.org/data/nav_content/Final%20CY%202007%20Formulary%20Guidance.pdf) Accessed April 20, 2006.
4. Smith V, Gifford K, Kramer S et al. The Transition of Dual Eligibles to Medicare Part D Prescription Drug Coverage: State Actions During Implementation. Results from a 50-State Snapshot. Health Management Associates and Kaiser Commission on Medicaid and the Uninsured [on-line]. Available at <http://www.kff.org/medicaid/upload/7467.pdf> Accessed October 10, 2007.
5. Elliott RA, Majumdar SR, Gillick MR et al. Benefits and consequences for the poor and the disabled. *N Engl J Med* 2005;353:2739–2741.
6. United States Government Accountability Office. Report to Congressional Requesters: Medicare Part D, Challenges in Enrolling New Dual-Eligible Beneficiaries. May [on-line]. Available at <http://www.gao.gov/new.items/d07272.pdf>.
7. Henry J Kaiser Family Foundation. Medicaid Benefits: Online Database: Henry J. Kaiser Family Foundation [on-line]. Available at [http://www.kff.org/medicaid/benefits/state\\_main.jsp](http://www.kff.org/medicaid/benefits/state_main.jsp) Accessed October 29, 2007.

8. Hoadley J, Hargrave E, Cubanski J et al. An In-Depth Examination of Formularies and Other Features of Medicare Drug Plans. The Henry J Kaiser Family Foundation. April [on-line]. Available at <http://www.kff.org/medicare/upload/7489.pdf> Accessed October 10, 2007.
9. Levinson D. Dual Eligibles' Transition: Part D Formularies' Inclusion of Commonly Used Drugs. In: Department of Health and Human Services, Office of the Inspector General, Washington, DC [on-line]. Available at <http://oig.hhs.gov/oei/reports/oei-05-06-00320.pdf> Accessed April 21, 2008.
10. Hall J, Kurth N, Moore J. Transition to Medicare Part D: An early snapshot of barriers experienced by younger dual eligibles with disabilities. *Am J Manage Care* 2007;13:14–18.
11. West JC, Wilk JE, Muszynski IL et al. Medication access and continuity: The experiences of dual-eligible psychiatric patients during the first 4 months of the Medicare prescription drug benefit [see comment]. *Am J Psychiatry* 2007;164:789–796.
12. Thomson Corporation. Drug Topics Red Book. Montvale, NJ: Thomson Healthcare Inc., 2006.
13. Medicaid Pharmacy—Actual Acquisition Cost of Generic Prescription Drug Products. (A-06-01-00053) dated March 14, 2002 [on-line]. Available at <http://www.oig.hhs.gov/oas/reports/region6/60100053.pdf> Accessed April 21, 2008.
14. Von Korff M, Wagner EH, Saunders K. A chronic disease score from automated pharmacy data. *J Clin Epidemiol* 1992;45:197–203.
15. Schneeweiss S, Seeger JD, Maclure M et al. Performance of comorbidity scores to control for confounding in epidemiologic studies using claims data. *Am J Epidemiol* 2001;154:854–864.
16. Wagner AK, Soumerai SB, Zhang F et al. Segmented regression analysis of interrupted time series studies in medication use research. *J Clin Pharm Ther* 2002;27:299–309.
17. McDonagh MS, Carson M, Helfand M. Drug Effectiveness Review Project. Drug Class Review on Proton Pump Inhibitors [on-line]. Available at [http://www.ohsu.edu/ohsuedu/research/policycenter/customcf/derp/product/PPI\\_Final\\_Report\\_update%204.pdf](http://www.ohsu.edu/ohsuedu/research/policycenter/customcf/derp/product/PPI_Final_Report_update%204.pdf) Accessed October, 10, 2007.
18. Neuman P, Strollo MK, Guterman S et al. Medicare prescription drug benefit progress report: Findings from a 2006 national survey of seniors. *Health Aff (Millwood)* 2007;26:w630–w643.
19. Shrank WH, Hoang T, Ettner SL et al. The implications of choice: Prescribing generic or preferred pharmaceuticals improves medication adherence for chronic conditions. *Arch Intern Med* 2006;166:332–337.
20. Briesacher BA, Gurwitz JH, Soumerai SB. Patients at-risk for cost-related medication nonadherence: A review of the literature. *J Gen Intern Med* 2007;22:864–871.
21. Goldman DP, Joyce GF, Zheng Y. Prescription drug cost sharing: Associations with medication and medical utilization and spending and health. *JAMA* 2007;298:61–69.
22. Schneeweiss S, Patrick AR, Maclure M et al. Adherence to statin therapy under drug cost sharing in patients with and without acute myocardial infarction: A population-based natural experiment. *Circulation* 2007;115:2128–2135.

---

## APPENDIX A: STATES ACCORDING TO REGION

---

**Northeast:** Connecticut, Maine, Massachusetts, New Jersey, New Hampshire, New York, Pennsylvania, Rhode Island, and Vermont.

**South:** Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia (plus the District of Columbia), Alabama, Kentucky, Mississippi, Tennessee, Arkansas, Louisiana, Oklahoma, and Texas.

**Midwest:** Ohio, Indiana, Michigan, Illinois, Wisconsin, Iowa, Kansas, Missouri, Minnesota, Nebraska, South Dakota, and North Dakota.

**West:** Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, and Wyoming.

---



---

## APPENDIX B: DETAILS OF THE REGRESSION MODELS

---

**Analyses of the effect of Medicare Part D introduction on level and trends of copayments and days supply dispensed among Medicaid patients:**

$$\text{Outcome} = \beta_0 + \beta_1 \times \text{time} + \beta_2 \times \text{transition period indicator} + \beta_3 \times \text{post Part D indicator} + \beta_4 \times \text{time post Part D} + e$$

Outcomes were days of drug supply available to Medicaid patients, copayment per 30 day supply, and percentage of cohort members switching to a different drug each month.

### Cumulative changes in utilization or copayments

To calculate changes in utilization or copayments under Part D (from January 2006 to August 2006) from the extrapolated baseline trend without Part D, the area between the predicted values from was calculated Models A and B below. Model A was fitted including all datapoints from January 2005 through August 2006. Model B was fitted for the pre-period (January 2005 to December 2005) and used to project what would have happened in January 2006 through December 2006 in the absence of Medicare Part D.

$$\text{Model A: Copayment/30 days' supply (or days' supply)} = \text{Copayment/30 days' supply (or days' supply)} = \beta_0 + \beta_1 \times \text{time} + \beta_2 \times \text{transition period indicator} + \beta_3 \times \text{post Part D indicator} + \beta_4 \times \text{time post Part D} + e$$

$$\text{Model B: Copayment/30 days' supply (or days' supply)} = \beta_0 + \beta_1 \times \text{time} + e$$


---