

Gains in medication affordability following Medicare Part D
are eroding among elderly with multiple chronic conditions

Abstract

Elderly Americans, especially those with multiple chronic conditions, face difficulties paying for prescriptions, resulting in worse adherence and discontinuation of therapy ("cost-related medication nonadherence" or CRN). We investigated whether the gains in medication affordability attributable to Medicare Part D implementation in January 2006 persisted during the six years that followed. Overall, we found continued incremental improvements in medication affordability in the early years of Part D (2007-2009), which then eroded during more recent years (2009-2011). Among elderly beneficiaries with four or more chronic conditions, we observed an increase in the prevalence of CRN from 14.4% in 2009 to 17.0% in 2011, reversing previous downward trends. Similarly, the prevalence of forgoing basic needs in order to purchase medicines among the sickest elderly decreased from 8.7% in 2007 to 6.8% in 2009, then rose to 10.2% in 2011. Our findings highlight the need for targeted policy efforts to alleviate the persistent burden of drug treatment costs in this vulnerable population.

Introduction

Elderly Americans typically have few financial resources available for prescription drugs.¹ High out-of-pocket drug costs are associated with worse adherence and medication discontinuation.² Such cost-related medication nonadherence (CRN) can lead to adverse health outcomes including worse health status and increased risk of hospitalization.³⁻⁵

Adequate adherence to medications is particularly important for seniors with multiple chronic conditions. Effective and efficient care for a growing elderly population with multiple chronic conditions is among the most important challenges the US health care system faces.⁶ Yet, older individuals with multiple chronic conditions are at especially high risk of CRN due to intensive medication use and high out-of-pocket costs.⁷

The Medicare Part D drug benefit was implemented in 2006 to increase economic access to medicines by decreasing beneficiaries' out-of-pocket drug expenditures.⁸ Early evaluations of Part D indicated modest but significant nationwide reductions in CRN and forgoing basic needs to pay for medicines in 2006,⁹ which were sustained in 2007.¹⁰ Improvements in ability to afford medicines were not consistent across subgroups.⁹⁻¹¹ In particular, improvements in CRN among elderly with four or more chronic conditions lagged behind improvements

for healthier beneficiaries.⁹ Nevertheless, Part D resulted in significant increases in prescription drug use and lower out-of-pocket drug costs among almost all subgroups of the Medicare population.¹²

In 2008, the US entered the worst economic recession since the Great Depression. Between 2007 and 2010, the housing market collapsed, financial markets sank into turmoil, and family incomes, home prices, and investment portfolio values fell;¹³ wealth for elderly households declined by approximately 20% between 2007 and 2009.^{14, 15} The recession and its aftermath left many elderly Americans facing unprecedented economic uncertainty.¹⁶ In addition, over the years following Part D implementation, changes in Part D plan benefits potentially introduced barriers to drug therapy and shifted costs onto patients.^{17, 18}

There have been no published reports on the prevalence of CRN among the multimorbid elderly in Medicare since 2008.^{10, 19} In this study, we evaluate recent national trends in CRN and spending less on basic needs to afford medicines among elderly beneficiaries by illness burden, and explore the extent to which improvements in affordable access to medications resulting from Part D persisted during subsequent years.

Methods

Data Source and Sample

We used the Access-to-Care (ATC) files of the Medicare Current Beneficiary Survey (MCBS), the principal national survey for Medicare beneficiaries. Administered by the Centers for Medicare and Medicaid Services (CMS), the MCBS is a longitudinal, nationally representative rotating panel survey of approximately 16,000 disabled and elderly Medicare enrollees, who are representative of 42.5 million beneficiaries nationwide. Respondents provide information on health care utilization, expenditures and sources of payments, health insurance coverage, health status and functioning, and a variety of demographic and behavioral factors.²⁰

The MCBS ATC files used in this study included the annual “always enrolled” beneficiary population, i.e., excluding individuals who newly enrolled in Medicare or died during a given calendar year. ATC data primarily consist of responses to the main fall interview, following a four-year panel survey design. The annual replenishment strategy replaces those who have completed survey participation, died, or been lost to follow-up, ensuring a representative sample in each calendar year. The average response rate across the study years (2006–2011) was 79.7% among first-time respondents and 67.0% among all

respondents. We included all community-dwelling elderly respondents (approximately 79% of the total, excluding persons under 65 years and those residing in long-term care facilities) from 2006 through 2011 (n = 70,067 person-years). Accounting for overlapping samples among years, the total number of individual respondents was 31,713.

Outcome Measures

Since 2004, the MCBS fall interview has included a set of questions on the affordability of medications which were developed in collaboration with CMS, tested for reliability,²¹ and used in several studies by the research team.^{7, 9-11, 21, 22} The main outcomes for this study were cost-related medication nonadherence (hereafter referred to as CRN) and spending less on other basic needs to afford medicines (forgoing basic needs).^{21, 23, 24} We used our validated binary composite measure of CRN if a respondent answered yes/ever during the current year to any of the following questions: "did not fill a prescription because of cost?"; "skipped doses to make the medicine last longer?"; "taken smaller doses of a medicine to make the medicine last longer?"; "delayed filling prescription because of cost?"; or, "any medicines prescribed for you that you did not get" in combination with "reason you did not obtain the medicine was you thought it would cost too much". We also examined a separate

binary measure of having spent less money on food, heat, or other basic needs in order to have money for medicine.^{7, 9-11}

Statistical Analysis

We estimated the rates and 95% confidence intervals (CIs) of demographic and health characteristics of respondents. Covariates included previously validated predictors of CRN:^{7, 25} age and sex, in addition to self-reported income, race, health status,²⁶ and presence of specific diseases or conditions. Morbidities included cardiac disease, hypertension, diabetes, cancer, stroke, arthritis, dementia, psychiatric disorder (including depression), neurological disorder (excluding stroke), and pulmonary illness (including asthma and chronic obstructive pulmonary disease). We then calculated the unadjusted annual prevalence of CRN and spending less on basic needs with 95% CIs for all study years (2006-2011), as well as for 2004 and 2005 to illustrate pre-Part D levels. All survey analyses were weighted to represent the national population of community-dwelling elderly Medicare beneficiaries, using the annual cross-sectional survey weights provided in the MCBS.²⁷

To model changes in CRN and spending less on basic needs in the years since Part D implementation, we used logistic regression models. Dividing the study years into two periods, our models compared the odds of CRN and spending less on basic

needs between pairs of years (2009 vs. 2007, and 2011 vs. 2009), as well as the entire period (2011 vs. 2007). The year 2007 was the first for which the Part D benefit was fully implemented; 2009 was the first year following the financial market collapse in September 2008, which triggered public awareness of the economic crisis and steep declines in multiple indicators, including the unemployment rate, family income and wealth, and housing prices.²⁸⁻³⁰ During our final study period (2009 to 2011), external data suggest that scattered signs of economic recovery did not often translate into improved conditions for the elderly; rather, most indicators such as income and savings showed continued stagnation.^{16, 31-33}

As in previous reports,^{9, 10} our models controlled for interview sequence, demographic characteristics (sex, age, income, and race), and health status (number of morbidities and health status). We repeated these analyses separately for eight subgroups based on the number of chronic conditions (0-3 and ≥ 4), income ($< \$25,000$ and $\geq \$25,000$), and type of prescription drug coverage (Part D low-income subsidy, Medicare Advantage, stand-alone prescription drug plan, and non-Part D).^{7, 25} All analyses were conducted in STATA version 12 (StataCorp LP, College Station, TX). This study was reviewed and approved by the Human Subjects Committee of the Harvard Pilgrim Health Care Institute.

Results

Characteristics of Elderly Medicare Beneficiaries

The demographic and health characteristics of the community-dwelling elderly Medicare beneficiary population were similar across study years (**Exhibit 1**). The proportion reporting four or more conditions increased from 26.7% in 2007 to 27.6% in 2011. During the same period, the proportion enrolled in Medicare Part D increased, particularly for Medicare Advantage plans (20.1% to 25.3%), while non-Part D drug coverage plans became less common.

Unadjusted Changes in Medication Affordability

An estimated 14.9% of elderly beneficiaries experienced CRN in 2005, and 11.3% in 2007 after the full implementation of Medicare Part D (**Supplementary Appendix Exhibit 1**). Following a downward trend until 2009, when 10.2% of beneficiaries had CRN, the estimated prevalence of CRN subsequently increased to 10.8% in 2011. Similarly, the percentage of beneficiaries forgoing other needs to pay for medicines declined after Part D (8.8% in 2005 to 5.6% in 2007), reaching 4.0% in 2009. In 2011, 5.3% of elderly beneficiaries cut back on basic needs to afford medications.

Between 2007 and 2011, elderly beneficiaries with non-Part D prescription drug coverage had consistently lower rates of CRN

and spending less on basic needs than those participating in Medicare Part D (**Exhibit 2**). The risk of foregoing basic needs to afford medications among beneficiaries receiving the low-income subsidy was higher than that among other coverage groups. We observed similar increases in both measures across all major prescription drug coverage categories between 2009 and 2011.

Changes in Medication Affordability by Morbidity Burden

Across all study years, elderly with multiple chronic conditions had more problems affording their medications than other elderly (**Exhibit 3**). In 2005, prior to Part D, an estimated 20.3% of elderly beneficiaries with four or more chronic conditions experienced CRN. In the early years following the initial Part D impact,⁹ both measures of economic barriers to paying for medicines continued to decline slightly: the prevalence of CRN decreased from 15.1% in 2007, after Part D, to 14.4% in 2009. However, this trend reversed in subsequent years, rising to 17.0% in 2011. Similarly, the percentage of sicker beneficiaries forgoing other needs to pay for medicines declined after Part D implementation (12.3% in 2005 to 8.7% in 2007). These declines subsequently continued under Part D until the outcome reached its lowest point in 2009 (6.8%). However, by 2011, the prevalence of forgoing basic needs had risen again to 10.2% of sicker beneficiaries.

Among elderly beneficiaries with three or fewer chronic conditions, prevalence of CRN also declined sharply following Medicare Part D implementation (from 15.7% in 2005 to 9.9% in 2007), and continued declining until 2009, leveling off in subsequent years. The prevalence of spending less on basic needs declined from 7.6% in 2005 to 4.5% in 2007 and 2.9% in 2009, rising slightly to 3.5% in 2011.

Adjusted Changes in Medication Affordability

Exhibit 4 shows the changes in CRN and spending less on basic needs over time estimated using multivariate models. The direction of change between 2007 and 2009 for both outcomes was consistently downward for all groups. Then, between 2009 and 2011, the prevalence of affordability problems remained fairly stable among elderly beneficiaries with three or fewer chronic conditions, while the sickest elderly experienced pronounced increases. The odds of CRN among elderly beneficiaries with four or more conditions increased significantly by 20% between 2009 and 2011 (OR: 1.20, 95% CI: 1.03, 1.40) (**Supplemental Appendix Exhibit 2**). Similarly, we detected a significant increase in the odds of forgoing basic needs in order to purchase medicines between 2009 and 2011 (OR: 1.54, 95% CI: 1.30, 1.82), reversing the previous downward trends (OR 2009 vs. 2007: 0.81, 95% CI: 0.67, 0.99).

An examination of the full 6-year period of observation confirms that early gains were reversed among the sickest beneficiaries. Elderly beneficiaries with four or more chronic conditions had significantly worse outcomes in 2011 compared to 2007 (CRN OR: 1.18, 95% CI: 1.02, 1.36; forgoing basic needs OR: 1.25, 95% CI: 1.04, 1.51). We also observed that the prevalence of foregoing basic needs to afford medications among the sickest elderly in 2011 was no longer significantly better than the level reported in 2005, *prior to Part D implementation* (OR 2011 vs. 2005: 0.86, 95% CI: 0.72, 1.04). By contrast, there was no reversal among the healthier group. Those with fewer conditions had significantly better outcomes in 2011 as compared to 2007, though their improvements appeared to occur mainly between 2007 and 2009.

We did not detect any significant changes in either measure when comparing 2007 to 2011 in subgroup analyses (**Exhibit 4; Supplemental Appendix Exhibit 3**).

Discussion

In this study, we investigated recent national trends in CRN and forgoing other basic needs to pay for medicines among elderly Medicare beneficiaries. Strikingly, we found that financial barriers to prescription drug therapy represent a continuing problem for the sickest Medicare beneficiaries, who are at higher risk of CRN due to illness burden, intense medication needs, and high out-of-pocket costs.⁷ For the first time since 2004, when affordability indicators were added to a nationally representative survey of elderly Medicare beneficiaries, a trajectory of improvements in both CRN and forgoing basic needs reversed course around 2009: drug affordability deteriorated significantly in subsequent years among the sickest elderly. In 2011, elderly individuals with four or more chronic conditions were worse off in terms of both outcomes than they had been in 2007. In fact, the risk of foregoing basic needs among this key group in 2011 was not significantly better than it had been prior to Part D, suggesting that both the original Part D impact and interim improvements may have been eliminated.

Several factors likely reversed the early gains in medication affordability following Part D implementation, and disproportionately affected the sickest elderly. The severe

economic downturn in the US shrank incomes, asset values, and wealth for all age groups including the elderly. Elders also had high rates of mortgage delinquency, which has been associated with CRN.⁴⁴ It is very likely that new economic strains affected the ability of elderly beneficiaries with multiple chronic conditions to afford their medications. During the same period, the zero cost-of-living adjustment (COLA) in social security may have also affected medication affordability.⁴⁵

In addition, there is evidence of reduced drug coverage generosity among Part D plans in recent years.¹⁸ Over our observation period, more Part D plans have begun to charge deductibles and adopted tiered formularies. Plans have also generally increased patient copayments within tiers, reduced the proportion of medications covered by their formularies, and more frequently applied restrictions such as prior authorization requirements.^{17, 48} While these benefit changes may have been designed to steer patients toward less expensive medications, they may also have had the effect of introducing barriers to drug therapy and shifting the overall drug cost burden toward patients, particularly those with multiple chronic conditions.

We investigated whether the recent worsening trends in

medication affordability could be attributed to changes in beneficiaries' type of prescription drug coverage, and found that there were similar increases across all major coverage sources. It is therefore unlikely that Part D plan changes alone were responsible for rising problems of access to medications. Indeed, published reports documented similar reductions in generosity more generally in US health insurance, which potentially compounded the effect of the economic downturn.^{49, 50} Such changes across the healthcare system could explain why elderly Americans are reporting persistent affordability problems while news reports simultaneously exclaim that "[total US] spending on prescription drugs fell for the first time on record".⁵¹

We found that beneficiaries who participated in the Part D program had a higher risk of CRN than other beneficiaries. The Affordable Care Act (ACA) has begun to broaden access to public and private health insurance and improve Medicare Part D coverage. Specifically, by 2020, CMS will gradually phase out the Medicare Part D coverage gap (or "doughnut hole") in which beneficiaries who have reached a defined total drug spending threshold must then pay 100% out of pocket until they reach a "catastrophic" level.

Given the constant evolution of policies affecting the Medicare population, policymakers and researchers must closely monitor trends in affordability such as those we highlight here, and support more in-depth investigation of the underlying causes. Policymakers should also consider additional strategies to help the sickest beneficiaries, who clearly remain burdened by medication costs. Policy options include increased outreach to and participation in the Part D low-income subsidy for qualified individuals in need.⁵⁵ Beneficiaries may also need more assistance in selecting a Part D plan that fits their medical and financial circumstances, given reports that they often choose plans that require more out-of-pocket spending than necessary.⁵⁷ Programs focusing on clinicians and pharmacists can help patients mitigate excessive costs, for example, by substituting lower-cost therapies with comparable benefit-harm profiles.⁵⁶ Increasing low-income subsidy enrollment and assisting beneficiaries with better choices can potentially improve affordability for Medicare beneficiaries in all current coverage categories.

The findings of this study should be interpreted in light of its limitations. We are able to describe recent reversals in affordability, but the data do not permit us to definitively determine the root causes. For example, data on

actual drug utilization and out-of-pocket spending by MCBS respondents are not yet available for the most recent years of observation, and the recession literature does not clearly pinpoint the timing of harms as they affected specific population segments, such as the elderly. In addition, self-reports could be subject to reporting and recall biases. Nevertheless, the affordability measures used in our study have been validated^{21, 23, 24} and used extensively in previous studies,^{7, 9-11, 22, 58} and we expect potential misreporting of CRN behavior to be consistent over time.

Perhaps unsurprisingly, we detected more statistically significant changes in our measure of cutting back on basic needs to afford medications, as compared to the CRN measure. This suggests that the basic needs question may be a more direct measure of patients' economic hardship and more sensitive to changes in financial circumstances over time. CRN addresses specific clinical behaviors that are subject to influences beyond economic hardship, such as ongoing health system efforts to increase adherence and providers' ability to adapt regimens to patients' economic circumstances. In tandem, these measures have demonstrated their sensitivity and utility as a barometer of medication affordability in a stable survey population.

The body of research evaluating the impact of Medicare Part D provided unequivocal evidence of population-level decreases in out-of-pocket costs and increased medication use following its implementation in 2006.^{12, 59} Nevertheless, using data on a nationally representative sample of Medicare beneficiaries, we provide updated evidence that many elderly Americans face persistent, and indeed, worsening, economic barriers to prescription drug therapy. Our finding that the gains in medication affordability among elderly with multiple chronic conditions following Part D were later lost during a period of both economic downturn and benefit changes highlights a pressing need to find new ways to ensure economic access to drug treatment for vulnerable Medicare beneficiaries.

Endnotes

1. Briesacher BA, Ross-Degnan D, Wagner AK, et al. Out-of-pocket burden of health care spending and the adequacy of the Medicare Part D low-income subsidy. *Med Care*. Jun 2010;48(6):503-509.
2. Goldman DP, Joyce GF, Zheng Y. Prescription drug cost sharing: associations with medication and medical utilization and spending and health. *JAMA*. Jul 4 2007;298(1):61-69.
3. Heisler M, Langa KM, Eby EL, Fendrick AM, Kabeto MU, Piette JD. The health effects of restricting prescription medication use because of cost. *Med Care*. Jul 2004;42(7):626-634.
4. Soumerai SB, McLaughlin TJ, Ross-Degnan D, Casteris CS, Bollini P. Effects of Limiting Medicaid Drug-Reimbursement Benefits on the Use of Psychotropic Agents and Acute Mental Health Services by Patients with Schizophrenia. *N Engl J Med*. 1994;331(10):650-655.
5. Soumerai SB, Ross-Degnan D, Avorn J, McLaughlin T, Choodnovskiy I. Effects of Medicaid drug-payment limits on admission to hospitals and nursing homes. *N Engl J Med*. Oct 10 1991;325(15):1072-1077.
6. Vogeli C, Shields AE, Lee TA, et al. Multiple chronic conditions: prevalence, health consequences, and

- implications for quality, care management, and costs. *J Gen Intern Med*. Dec 2007;22 Suppl 3:391-395.
7. Soumerai SB, Pierre-Jacques M, Zhang F, et al. Cost-related medication nonadherence among elderly and disabled medicare beneficiaries: a national survey 1 year before the medicare drug benefit. *Arch Intern Med*. Sep 25 2006;166(17):1829-1835.
 8. Kaiser Family Foundation. The Medicare Prescription Drug Benefit: A Fact Sheet. 2012;
<http://www.kff.org/medicare/upload/7044-13.pdf>. Accessed January 7, 2013.
 9. Madden JM, Graves AJ, Zhang F, et al. Cost-related medication nonadherence and spending on basic needs following implementation of Medicare Part D. *JAMA*. Apr 23 2008;299(16):1922-1928.
 10. Madden JM, Graves AJ, Ross-Degnan D, Briesacher BA, Soumerai SB. Cost-related medication nonadherence after implementation of Medicare Part D, 2006-2007. *JAMA*. Oct 28 2009;302(16):1755-1756.
 11. Zivin K, Madden JM, Graves AJ, Zhang F, Soumerai SB. Cost-related medication nonadherence among beneficiaries with depression following Medicare Part D. *Am J Geriatr Psychiatry*. Dec 2009;17(12):1068-1076.

12. Briesacher BA, Zhao Y, Madden JM, et al. Medicare part D and changes in prescription drug use and cost burden: national estimates for the Medicare population, 2000 to 2007. *Med Care*. Sep 2011;49(9):834-841.
13. Jesse Bricker, Arthur Kennickell, Kevin B. Moore, John Sabelhaus. Changes in US Family Finances from 2007 to 2010: Evidence from the Survey of Consumer Finances. *Federal Reserve Bulletin*. 2012;98(2).
14. Jesse Bricker, Brian Bucks, Arthur Kennickell, Traci Mach, Moore K. *Surveying the Aftermath of the Storm: Changes in Family Finances from 2007 to 2009*. Washington DC: Divisions of Research and Statistics and Monetary Affairs, Federal Reserve Board;2011.
15. Virginia P. Reno, Veghte B. *Economic Status of the Elderly in the United States*. Washington, DC: National Academy of Social Insurance;2010.
16. AARP Public Policy Institute. *Boomers and the Great Recession: Struggling to Recover*2012.
17. Neuman P, Cubanski J. Medicare Part D Update - Lessons Learned and Unfinished Business. *N Engl J Med*. 2009;361(4):406-414.
18. Kaiser Family Foundation. Data Spotlight: Medicare Part D - A First Look at Part D Plan Offerings in 2013. 2013; <http://www.kff.org/medicare/upload/8375.pdf>.

19. Harrold LR, Briesacher BA, Peterson D, et al. Cost-related Medication Nonadherence in Older Patients with Rheumatoid Arthritis. *J Rheumatol*. Feb 2013;40(2):137-143.
20. Centers for Medicare and Medicaid Services (CMS). *Technical Documentation for the Medicare Current Beneficiary Study*. Baltimore, MD2002.
21. Pierre-Jacques M, Safran DG, Zhang F, et al. Reliability of new measures of cost-related medication nonadherence. *Med Care*. Apr 2008;46(4):444-448.
22. Nekhlyudov L, Madden J, Graves AJ, Zhang F, Soumerai SB, Ross-Degnan D. Cost-related medication nonadherence and cost-saving strategies used by elderly Medicare cancer survivors. *J Cancer Surviv*. Dec 2011;5(4):395-404.
23. Safran DG, Neuman P, Schoen C, et al. Prescription drug coverage and seniors: findings from a 2003 national survey. *Health Aff (Millwood)*. Jan-Jun 2005;Suppl Web Exclusives:W5-152-W155-166.
24. Safran DG, Neuman P, Schoen C, et al. Prescription drug coverage and seniors: how well are states closing the gap? *Health Aff (Millwood)*. Jul-Dec 2002;Suppl Web Exclusives:W253-268.

25. Briesacher BA, Gurwitz JH, Soumerai SB. Patients at-risk for cost-related medication nonadherence: a review of the literature. *J Gen Intern Med*. Jun 2007;22(6):864-871.
26. DeSalvo KB, Fan VS, McDonnell MB, Fihn SD. Predicting Mortality and Healthcare Utilization with a Single Question. *Health Serv Res*. 2005;40(4):1234-1246.
27. Becky A. Briesacher, Jennifer Tjia, Chyke A. Doubeni, Yog Chen, Sowmya R. Rao. Methodological Issues in Using Multiple Years of the Medicare Current Beneficiary Survey. *Medicare & Medicaid Research Review*. 2012;2(1):E1-E20.
28. United States Senate Permanent Subcommittee on Investigations. Wall Street and the Financial Crisis: Anatomy of a Financial Collapse: Majority and Minority Staff Report. Washington, DC2011.
29. Hall RE. Why Does the Economy Fall to Pieces after a Financial Crisis? *The Journal of Economic Perspectives*. 2010;24(4):3-20.
30. Dominguez KME, Shapiro MD. Forecasting the Recovery from the Great Recession: Is This Time Different? *National Bureau of Economic Research Working Paper Series*. 2013;No. 18751.
31. Malay Majmundar and Steering Committee on the Challenges of Assessing the Impact of Severe Economic Recession on

the Elderly. *Assessing the Impact of Severe Economic Recession on the Elderly: Summary of a Workshop*: The National Academies Press; 2011.

32. United States Government Accountability Office. *Income Security: Older Adults and the 2007-2009 Recession*. Washington, DC2011.
33. AARP Public Policy Institute. *Recovering from the Great Recession: Long Struggle Ahead for Older Americans*. 2011; http://assets.aarp.org/rgcenter/ppi/econ-sec/insight50_recovering.pdf. Accessed March 27, 2013.
34. Wolff JI, Starfield B., Anderson G. Prevalence, expenditures, and complications of multiple chronic conditions in the elderly. *Archives of Internal Medicine*. 2002;162(20):2269-2276.
35. Aitken M, Berndt ER, Cutler DM. Prescription Drug Spending Trends In The United States: Looking Beyond The Turning Point. *Health Affairs*. January/February 2009 2009;28(1):w151-w160.
36. Huskamp HA, Deverka PA, Epstein AM, Epstein RS, McGuigan KA, Frank RG. The Effect of Incentive-Based Formularies on Prescription-Drug Utilization and Spending. *N Engl J Med*. 2003;349(23):2224-2232.
37. Smith C, Cowan C, Heffler S, et al. National Health Spending In 2004: Recent Slowdown Led By Prescription

Drug Spending. *Health Affairs*. January 1, 2006
2006;25(1):186-196.

38. Engelhardt GV, Gruber J. Medicare Part D and the Financial Protection of the Elderly. *American Economic Journal: Economic Policy*. 2011;3(4):77-102.
39. Millett C, Everett CJ, Matheson EM, Bindman AB, Mainous AG, 3rd. Impact of Medicare Part D on seniors' out-of-pocket expenditures on medications. *Arch Intern Med*. Aug 9 2010;170(15):1325-1330.
40. Schneeweiss S, Patrick AR, Pedan A, et al. The Effect Of Medicare Part D Coverage On Drug Use And Cost Sharing Among Seniors Without Prior Drug Benefits. *Health Affairs*. March/April 2009 2009;28(2):w305-w316.
41. United States Department of Labor - Bureau of Labor Statistics. *Recession of 2007-2009*. Washington, DC2012.
42. Gellad WF, Huskamp HA, Li A, Zhang Y, Safran DG, Donohue JM. Use of prescription drug samples and patient assistance programs, and the role of doctor-patient communication. *J Gen Intern Med*. Dec 2011;26(12):1458-1464.
43. Zhang J, Yin W, Sun S, Alexander GC. The Impact of the Medicare Part D Prescription Benefit on Generic Drug Use. *Journal of General Internal Medicine*. 2008/10/01 2008;23(10):1673-1678.

44. Alley DE, Lloyd J, Pagn JA, Pollack CE, Shardell M, Cannuscio C. Mortgage Delinquency and Changes in Access to Health Resources and Depressive Symptoms in a Nationally Representative Cohort of Americans Older Than 50 Years. *American Journal of Public Health*. 2011/12/01 2011;101(12):2293-2298.
45. Penner RG. Medicare Premiums and Social Security's Cost-of-Living Adjustments. 2011.
46. McElliot S, Li P, Schwartz J, Doshi J. Use and Choice of Biologic Therapies in Medicare Patients with Rheumatoid Arthritis: Relationship with Cost-sharing and Utilization Management Tools. Paper presented at: CMS 2012 - Medicare Prescription Drug Benefit Symposium. Available at: <http://www.cms.gov/Medicare/Prescription-Drug-Coverage/PrescriptionDrugCovGenIn/index.html?redirect=/PrescriptionDrugCovGenIn/>.
47. Swenson T. Plan Benefit Generosity, Adherence to Statins and Hospitalizations under Medicare Part D. Paper presented at: CMS 2012 - Medicare Prescription Drug Benefit Symposium2012.
48. Hoadley J, Hargrave E, Merrell K. *Medicare Part D Formularies, 2006-2011: Update to Chartbook: A study* conducted by staff from NORC at the University of Chicago, Georgetown University, and Social & Scientific

Systems, Inc., for the Medicare Payment Advisory Commission;2011.

49. Roehrig C, Turner A, Hughes-Cromwick P, Miller G. When the Cost Curve Bent ,Â Pre-Recession Moderation in Health Care Spending. *N Engl J Med*. 2012;367(7):590-593.
50. Truffer CJ, Keehan S, Smith S, et al. Health Spending Projections Through 2019: The Recession,Âs Impact Continues. *Health Affairs*. February 4, 2010 2010.
51. US Spending on Traditional Prescription Drugs Fell in 2012 for First Time on Record. *New York Times*2013.
52. Zhang Y, Donohue JM, Newhouse JP, Lave JR. The Effects Of The Coverage Gap On Drug Spending: A Closer Look At Medicare Part D. *Health Affairs*. March 1, 2009 2009;28(2):w317-w325.
53. Li P, McElligott S, Bergquist H, Schwartz JS, Doshi JA. Effect of the Medicare Part D Coverage Gap on Medication Use Among Patients With Hypertension and Hyperlipidemia. *Annals of Internal Medicine*. 2012;156(11):776-784.
54. Office CB. Costs under Medicare's Prescription Drug Benefit and a Comparison with the Cost of Drugs under Medicaid Fee-for-Service. 2013;
http://www.cbo.gov/sites/default/files/cbofiles/attachments/44366_AcademyHealth-Cook-6-2013.pdf. Accessed June 28, 2013.

55. Soumerai S. Fix the Medicare Drug Benefit. *Newsweek* 2007; <http://www.thedailybeast.com/newsweek/2007/12/01/cures-for-an-ailing-system.html>. Accessed July 1, 2013.
56. Alexander GC, Casalino LP, Meltzer DO. Physician strategies to reduce patients' out-of-pocket prescription costs. *Archives of Internal Medicine*. 2005;165(6):633-636.
57. Zhou C, Zhang Y. The Vast Majority Of Medicare Part D Beneficiaries Still Don't Choose The Cheapest Plans That Meet Their Medication Needs. *Health Affairs*. October 1, 2012 2012;31(10):2259-2265.
58. Bambauer KZ, Safran DG, Ross-Degnan D, et al. Depression and cost-related medication nonadherence in Medicare beneficiaries. *Arch Gen Psychiatry*. May 2007;64(5):602-608.
59. Polinski JM, Kilabuk E, Schneeweiss S, Brennan T, Shrank WH. Changes in drug use and out-of-pocket costs associated with Medicare Part D implementation: a systematic review. *J Am Geriatr Soc*. Sep 2010;58(9):1764-1779.

Exhibit List

Exhibit 1 - Characteristics of community-dwelling elderly Medicare beneficiaries in 2007, 2009, and 2011.

Exhibit 2 - Prevalence of CRN and spending less on basic needs among the overall population of community-dwelling elderly Medicare beneficiaries by prescription drug coverage category (2007-2011).

Exhibit 3 - Prevalence of CRN and spending less on basic needs among community-dwelling elderly Medicare beneficiaries by burden of chronic conditions (2004-2011).

Exhibit 4 - Changes in CRN and spending less on basic needs among overall and sub-groups of community-dwelling Medicare beneficiaries.

Exhibit 1 - Characteristics of community-dwelling elderly Medicare beneficiaries in 2007, 2009, and 2011.

Characteristics	%		
	2007 (n = 12,190)	2009 (n = 11,393)	2011 (n = 11,600)
Female sex	56.4	56.1	56.3
Age groups			
65-74	50.8	52.2	53.0
75-84	36.5	34.3	33.3
≥85	12.7	13.5	13.6
Income, <\$25,000 ^a	49.6	46.1	43.8
Black race	7.7	7.9	8.0
Number of morbidities			
0-3	73.3	73.3	72.4
≥4	26.7	26.7	27.6
Self-reported health status			
Excellent, very good, or good	78.7	81.0	80.7
Fair or poor	21.3	19.0	19.3
Prescription drug coverage ^b			
Part D: Low-Income Subsidy	13.9	13.2	14.0
Part D: Medicare advantage plan	17.1	20.0	21.2
Part D: Stand-alone drug plan	22.8	23.2	24.2
Non-Part D coverage	42.9	40.0	37.1
None	3.3	3.4	3.5

Source: Authors' analysis.

Notes:

^a MCBS variable, not adjusted for inflation.

^b Estimated using a combination of self-reported and CMS administrative data, available in the MCBS ATC. Presented hierarchically, such that beneficiaries with a mix of coverage types are counted in the category appearing first. "Non-Part D coverage" includes employer-sponsored drug coverage for current or retired workers, Tricare for veterans, self-purchased plans, and other public and private coverage sources; non-Part D sources above may not all qualify as "creditable". (Reference: Centers for Medicare and Medicaid Services (CMS). What is creditable coverage? 2006; <http://www.cms.gov/Medicare/Prescription-Drug-Coverage/CreditableCoverage/Downloads/whatiscreditablecoverage.pdf>. Accessed March 13, 2013.)

Exhibit 4 – Changes in CRN **(A)** and spending less on basic needs **(B)** among overall and sub-groups of community-dwelling Medicare beneficiaries (See Supplemental Appendix Exhibit 1 for details).

(A) Cost-related medication nonadherence

		Adjusted OR (95% CI) ^a		
		<u>Period 1</u>	<u>Period 2</u>	<u>Overall</u>
Group	No. ^b	2009 vs. 2007	2011 vs. 2009	2011 vs. 2007
Elderly	69,697	0.90	1.05	0.95
No. of morbidities				
0-3	49,650	0.86	0.97	0.83*
≥4	20,047	0.98	1.20*	1.18*
Income, US\$				
<25,000	34,776	0.94	0.99	0.94
≥25,000	34,889	0.84	1.12	0.95

(B) Spending less on basic needs

Elderly	69,656	0.71**	1.34**	0.96
No. of morbidities				
0-3	49,629	0.65**	1.18	0.77*
≥4	20,027	0.81*	1.54**	1.25*
Income, US\$				
<25,000	34,748	0.78**	1.25*	0.98
≥25,000	34,876	0.57**	1.60**	0.90

Source: Authors' analysis.

Notes:

^a Adjusted for younger age, female sex, non-white race, income <\$25,000, poor health, survey participation, and having 4 or more morbidities.

^b Numbers of person-years in subgroups do not necessarily add up to overall number of observations. Numbers vary with response rates and availability of data on subgroups.

* P<0.05

** P<0.001