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MEDICARE PART D AND ITS EFFECT ON THE USE OF PRESCRIPTION DRUGS, USE OF OTHER HEALTH CARE SERVICES AND HEALTH OF THE ELDERLY

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ABSTRACT

We examine the effect of gaining prescription drug insurance as a result of Medicare Part D on use of prescription drugs, use of other medical services, and health for a nationally representative sample of Medicare beneficiaries. Given the heightened importance of prescription drugs for those with chronic illness, we provide separate estimates for those in poorer health. We find that gaining prescription drug insurance through Medicare Part D was associated with a 70% increase in the number of annual prescriptions, but that obtaining prescription drug insurance is not significantly related to use of other health care services or health, as measured by functional status and self-reported health. Among those in poorer health, we find that gaining prescription drug insurance was associated with a 60% increase in the number of annual prescriptions, and is not significantly related to use of other services or health.

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Introduction

The Medicare Modernization Act of 2003 (MMA) created a prescription drug benefit—Medicare Part D—for the elderly. The creation of Medicare Part D was motivated by the relatively large fraction of elderly without prescription drug coverage, the growing financial burden of prescription drug spending among the elderly, and the significant and growing clinical importance of prescription drugs. Around the time of passage of the MMA, approximately one-third of seniors did not have prescription drug insurance (see Table 1 in text; Khan and Kaestner 2009; Levy and Weir 2009). The lack of prescription drug coverage resulted in substantial out-of-pocket spending on prescription drugs; among the elderly without prescription drug insurance, 50% had annual out-of-pocket spending on prescription drugs of $1,200 or more in 2003 (Safran et al. 2005).[1] Considering that median income of the elderly at this time was approximately $16,000, out-of-pocket spending for prescription drugs represented a significant financial burden for a non-trivial share of the elderly population.[2] The financial burden was particularly large for those with low-incomes, and elderly persons with chronic diseases for which prescription drugs are essential to maintaining good health.

The financial uncertainty associated with the use of prescription drugs to treat illness suggests that Medicare Part D is likely to have had significant benefits for those without prescription drug insurance prior to Part D. In addition to the financial (insurance) benefits, Medicare Part D may have had significant health consequences, as the program likely increased access and use of prescription drugs that can improve health. However, Medicare Part D is a costly program. Part D provided a subsidy to all Medicare beneficiaries even though approximately two-thirds of Medicare enrollees had prescription drug benefits prior to creation of Part D and would have likely continued to have such benefits in the absence of Part D.[3] The universal nature of the subsidy significantly raised the cost of providing prescription drug

[1] These figures are for those who reported prescription drug use.
[2] The $16,000 figure is from EBRI Employee Benefit Research Institute Notes, Volume 28, No. 5, May 2007. http://www.ebri.org/pdf/notespdf/EBRI_Notes_05-2007.pdf, website last accessed May 12, 2010.
[3] Insurance market failures related to adverse selection provide a partial rationale for government intervention in the prescription drug insurance market, and is an explanation for why the government effectively mandated participation through the use of stiff financial penalties.

insurance to the "newly insured" because for each newly insured person, the government provided a subsidy to two other persons who already had insurance. Medicare Part D had a net-cost of approximately $50 billion in 2009, and a recent report from the U.S Department of the Treasury indicated that Medicare Part D has a projected, net present-value deficit (liability) of $7.2 trillion.[4]

The size and potential significance of Medicare Part D has generated interest in its effects. The overarching question is whether the benefits of the program justify the costs. Within this larger question is a narrower one of particular salience: what did Medicare Part D do for those who did not have, or would not have had, prescription drug insurance without it? While Part D benefits were extended to all Medicare enrollees, it was the group of seniors that lacked prescription drug insurance that were a central concern of policy makers and that motivated the creation of Part D. Evidence at the time suggested that elderly without prescription drug insurance were particularly likely to forego buying essential medications, and that this adversely affected their health and increased their use of other medical services (Soumerai et al. 2006; Piette et al. 2004; Adams et al. 2001).

In this paper, we provide an assessment of the effect of Medicare Part D on the previously uninsured. We examine the effect of gaining prescription drug insurance as a result of Medicare Part D on use of prescription drugs, use of other medical services, and health for a nationally representative sample of Medicare beneficiaries in the years 2000 to 2007. Given the heightened importance of prescription drugs for those with chronic illness, we provide separate estimates for those in poorer health. Importantly, our analysis of the effects of prescription drug insurance on the use of health care services other than prescription drugs will provide evidence on whether prescription drugs, on average, are a complement or substitute with other types of health care such as inpatient services. This is a question for which there is limited evidence, but great policy interest. Conventional wisdom maintains that the provision of prescription drug insurance will result in improved prescription drug adherence and less use of medical services that may substitute for prescription drugs. Similarly, our analysis of the effect of

[4] A Citizen's Guide to the 2009 Financial Report of the U.S. Government, http://www.fms.treas.gov/fr/09frusg/09frusg.pdf, website last accessed March 12, 2010.

Medicare Part D and prescription drug insurance on elderly health will add to a sparse literature concerned with this fundamental issue.

Results are as follows. For the entire sample, we find that gaining prescription drug insurance through Medicare Part D was associated with approximately a 70% increase in the number of annual prescriptions, but that obtaining prescription drug insurance is not significantly related to use of outpatient or inpatient services, functional status and self-reported health, although estimates are sometimes imprecise and we cannot rule out small beneficial effects. Among those in poorer health, we find that gaining prescription drug insurance was associated with approximately a 60% increase in the number of annual prescriptions. For this group too, we find relatively small associations between prescription drug insurance and outpatient or inpatient services, functional status and self-reported health.

Prescription Drug Insurance, Use of Prescription Drugs and Health Among the Elderly

Previous studies using representative samples of elderly, which are few, have produced a range of estimates of the effect of prescription drug insurance on prescription drug use.[5] Lillard et al. (1999) used a sample of older persons drawn from the 1990 wave of the Panel Study of Income Dynamics and found that prescription drug coverage (versus no coverage) increased the probability of any use of prescription drugs by 12%. Similarly sized estimates were reported by Yang et al. (2006) and Khan and Kaestner (2009), and both of these studies used a representative sample of Medicare beneficiaries from 1992 to 2000 (or 2001). Yang et al. (2006) reported that prescription drug insurance increased expenditures on prescription drugs by approximately 7% per year, and Khan and Kaestner (2009) reported that prescription drug insurance was associated with a 4% to 10% increase in the utilization of prescription drugs depending on the type and generosity of the coverage. In contrast, Shea et al. (2007) reported that

[5] We limit the review to studies that examined a representative sample of elderly and methods that accounted in some way for the non-random choice of prescription drug insurance, and we do not review studies of the effect of prescription drug insurance on elderly persons with specific illnesses (e.g., Stuart et al. 2004; Hsu et al. 2006; Tjia and Briesacher 2008; and Zhang et al. 2009).

prescription drug insurance is associated with a 50% increase in the number of prescriptions used among a sample of Medicare beneficiaries in 1999.

Other studies have focused on the effect of changes in cost sharing for elderly in specific prescription drug insurance plans. Johnson et al. (1997) and Hsu et al. (2006) examined changes in cost-sharing for those enrolled in Kaiser-Permanente managed care plans. Johnson et al. (1997) reported that a $2 (66%) increase in co-payment among members of Kaiser-Permanente Northwest Division (e.g., Portland and Seattle) between 1988 and 1990 resulted in an 8% decrease in prescription drug use. Hsu et al. (2006) examined the impact of benefit caps on prescription drug use among elderly enrolled in Kaiser-Permanente Northern California Division, and found that caps lowered expenditures on prescription drugs by 31%. Chandra et al. (2007) examined employees in the California Public Employees Retirement System and found that a doubling of co-payment from approximately $7 to $14 reduced drug utilization by 6% for PPO participants and 20% for HMO participants, although the latter patients had a lower baseline co-payment.

Recently, a few studies examined the effect of Medicare Part D on prescription drug use of all elderly. Lichtenberg and Sun (2007) and Yin et al. (2008) used a difference-in-difference approach limited to persons who purchased prescription drugs at Walgreens; Lichtenberg and Sun (2007) compared the elderly to non-elderly and Yin et al. (2008) compared the elderly to the near-elderly (ages 60 to 63). The results of these studies indicated that Medicare Part D was associated with between 5.9% (Yin et al. 2008) and 12.8% (Lichtenberg and Sun 2007) increase in prescription drug use of elderly. Madden et al. (2008) examined pre- to post-Medicare Part D changes in cost-related medication non-adherence (CRN) using a sample of Medicare enrollees from the Medicare Current Beneficiary Surveys of 2004 to 2006. They reported that there was a significant decrease in CRN between 2004 and 2006 with a larger decrease between 2005 and 2006 (22%) than between 2004 and 2005 (9%).

Note that these three studies did not examine the effect of prescription drug insurance (versus no insurance) on use of prescription drugs, but were limited to an analysis of the effect of being eligible for, or enrolled in, Medicare Part D. Because approximately two-thirds of the elderly and an even greater

number of the non-elderly had prescription drug insurance prior to Part D, these analyses imply much larger effects on drug use of moving from uninsured to insured. For example, if we assume that 20% of the elderly moved from uninsured to insured as a result of Part D (see Zhang et al., 2009 who cite this figure and Table 1 in the text), then the results of these studies suggest that the effect of gaining insurance is the following: an increase in prescription drug use of 30% for Yin et al. (2008); an increase in prescription drug use of 65% for Lichtenberg and Sun (2007); and a decrease in CRN of 110% for Madden et al. (2008).[6]

The only study we are aware of that examined the effect of Medicare Part D on the uninsured is Zhang et al. (2009) who examined the impact of Part D among elderly enrolled in a Medicare Advantage plan in Pennsylvania. These authors found that moving from uninsured to insured was associated with a 74% increase in drug spending. Note that the estimates of the effect of prescription drug insurance in this study, and effects implied by the results in Lichtenberg and Sun (2007), Yin et al. (2008) and Madden et al. (2008) are much larger than those found in earlier, pre-Part D studies (except for Shea et al. 2007).

While the magnitude of the effect of prescription drug insurance on use of prescription drugs may be uncertain, few would argue with the general conclusion drawn from results reported in the past literature that prescription drug insurance is associated with an increase in use of prescription drugs. More uncertain is the effect of prescription drug use on the use of other health care services and health. Presumably, the goal of Medicare Part D is to provide elderly greater financial access to prescription drugs that are necessary to improve health. The evidence on this point is limited, and the results from previous study are inconsistent (Goldman et al. 2007). Briesacher et al. (2005), Soumerai et al. (1991) and Johnson et al. (1997) did not find any effect of prescription drug insurance, or a change in prescription co-payment, on hospitalization. Chandra et al. (2007) reported that an increase in co-payments for physician visits and prescription drugs increased the probability of hospitalization by 6%.

[6] Interestingly, there is a large difference in the implied effect of gaining prescription drug between Yin et al. (2008) and Lichtenberg and Sun (2007) even though they used the same data. Clearly, estimates are sensitive to the choice of comparison group (non-elderly or near-elderly). We limit our analysis to elderly.

Yang et al. (2006) found that prescription drug coverage decreased mortality slightly. Hsu et al. (2006) found that, among the elderly enrollees of Kaiser-Permanente Northern California Division, capping prescription drug benefits increased the probability of having glycated hemoglobin ≥8% by 23 percent. Khan et al. (2008) found that prescription drug insurance had no effect on self reported health or functional status of Medicare beneficiaries on average, but had some beneficial effect for chronically ill population. Finally, Zhang et al. (2009) using a sample of Medicare Advantage enrollees in Pennsylvania reported that gaining prescription drug use was associated with a 7% decline in medical (non-pharmacy) spending.[7]

This brief review of the literature has revealed the following. First, while there is consistent evidence that prescription drug insurance is associated with an increase in prescription drug use, the magnitude of the association remains in doubt because previous studies have produced a surprisingly wide range of estimates even for purportedly representative samples of elderly persons in similar time periods. Second, there are relatively few studies of the effect of prescription drug insurance on use of other medical services for representative samples of elderly, which is something noted by Goldman et al. (2007) in their often cited review article. Studies that have examined narrower samples such as those from a specific insurance plan have not produced a consistent set of findings. Third, there are even fewer studies that examined the effect of prescription drug insurance on health of a general population of elderly. This is a notable gap because it is not clear that prescription drug use will improve health even if it increases use of prescription drugs. The increased use of prescription drugs induced by insurance may be of marginal value, and may be associated with changes in behavior (e.g., diet and exercise) that offset the benefits of greater use. Moreover, evidence form clinical trials that link prescription drug use to improved health are almost always conducted on relatively small and unrepresentative samples that make generalizing the findings from these studies tenuous. Finally, there has been only one assessment of the

[7] The change in total medical spending was positive: $41 increase in monthly pharmacy and a $33 decrease in monthly medical spending (Zhang et al. 2009).

effect of Medicare Part D on the previously uninsured, and this study was limited to persons enrolled in a Medicare Advantage plan of a large Pennsylvania insurer (Zhang et al. 2009).

Overall, the previous literature concerned with the effect of prescription drug insurance on the use of prescription drugs, use of other medical services and health of the elderly is limited. Here, we begin to address this shortfall of evidence by examining the effect of prescription drug insurance using the plausibly exogenous change in prescription drug insurance engendered by Medicare Part D. We exploit the natural experiment of Medicare Part D to obtain quasi-experimental estimates of the effect of prescription drug insurance on prescription drug use, use of other medical services and health for a representative sample of elderly from the Medicare Current Beneficiary Survey (MCBS) from years 2000 to 2007.

Empirical Strategy

We exploited the natural experiment afforded by Medicare Part D, which was fully implemented in 2006, to estimate the effect of prescription drug insurance on use of prescription drugs, use of other medical services and health of the elderly. We used pooled, cross-sectional time-series data from the MCBS and multivariate regression methods in the context of an instrumental variables research design to obtain estimates of interest.

The outcomes of interest are prescription drug use, outpatient visits, inpatient visits, and health, as measured by functional status (Activities of Daily Living, Instrumental Activities of Daily Living) and self-reported health. Algebraically, using prescription drug use as an example, the regression model used in our analysis is the following:

$$PRES_{it} = \alpha + \phi_1 INSURED_{it} + \sum_{t=2001}^{2007} \beta_t YEAR_t + X_{it}\lambda + \nu_{it} \quad (1)$$

$$i = 1,\ldots, N$$

$$t = 2000,\ldots,2004,2006,2007$$

In equation (1), the number of prescription drugs used by person i in year t ($PRES_{it}$) depends on prescription drug insurance (*INSURED*), year effects ($YEAR_t$), and other measured demographic and socioeconomic factors (X_{it}) such as age, race, marital status and income. Note that we do not use data from 2005 because in 2005, prescription drug discount cards were available to Medicare beneficiaries, but we are unable to accurately identify who did or did not have a (subsidized) discount card. In addition, for some of the outcomes of interest, we have data only through 2006.[8]

The empirical challenge associated with equation (1) is that prescription drug insurance is not randomly chosen and those with prescription drug insurance may differ by measured and unmeasured characteristics from those without prescription drug insurance. For example, those with prescription drug insurance may be sicker and/or more risk averse than those without insurance, and both of these factors would likely affect prescription drug use. To address this problem, we use instrumental variables. We use variation in prescription drug insurance caused by the implementation of Medicare Part D to obtain estimates of the effect of prescription drug insurance on outcomes. Specifically, we estimate the following:

$$(2)\quad PRES_{it} = \alpha + \phi_1 \hat{INSURED}_{it} + \sum_{k=2}^{4} \phi_{2k} \hat{UNIN}_{kit} + \sum_{t=2001}^{2007} \beta_t YEAR_t + X_{it}\lambda + v_{it}$$

$$(3)\quad INSURED_{it} = \alpha + \sum_{k=2}^{4} \gamma_k \hat{UNIN}_{kit} + \sum_{t=2001}^{2007} \theta_t YEAR_t + \sum_{t=2001}^{2007} \sum_{k=2}^{4} \delta_{kt} (\hat{UNIN}_{kit} * YEAR_t) + X_{it}\lambda + v_{it}$$

Equation (2) is identical to equation (1) with two exceptions. Instead of actual prescription drug insurance, we use predicted prescription drug insurance in equation (2). Second, there is an additional variable in equation (2), $\hat{UNIN}_{kit}$, which is the predicted likelihood of being uninsured prior to Medicare Part D. This variable is constructed from observable characteristics (i.e., X_{it}) and it is measured as a set of dummy variables that indicate the quartile (k=1,2,3,4) of the distribution of the probability of being

[8] Information on prescription drug use comes from the MCBS Cost and Use data set, and the 2007 information is not yet available. Therefore, the analysis of prescription drug use, we limit the analysis to the years 2000 to 2006. Similarly, the analysis of hospitalization and outpatient visits are limited to the years 2000 to 2006.

uninsured prior to Part D that a elderly person belongs to. Detailed description of $\hat{UNIN}_{kit}$ is provided below. As we describe below, we predict the probability of being uninsured using combinations (interactions) of variables in the X_{it} vector, and because we do not include all these combinations in equation (1), we can estimate the main effect associated with the predicted probability of being uninsured ($\hat{UNIN}_{it}$). Including the predicted probability of being uninsured ($\hat{UNIN}_{it}$) in the primary model (second stage—equaton 2) is a parsimonious way to control for any non-linear combinations of the X_{it} variables that have been excluded.

Equation (3) is the model that we use to predict prescription drug insurance that is part of the instrumental variables procedure. The instruments are the interactions between the predicted likelihood of being uninsured prior to Part D and year dummy variables ($\hat{UNIN}_{kit} * YEAR_t$). Equation (3) is based on a difference-in-differences research design; the treatment and comparison groups are identified by the predicted likelihood of being uninsured prior to Medicare Part D. Those who are more likely to be uninsured prior to Medicare Part D will be more likely to gain prescription insurance as a result of Part D. Those in bottom quartile (reference category) have the lowest probability of being uninsured prior to Medicare Part D and are the least likely to be affected by Medicare Part D. Those in the top quartile are the most likely to be uninsured prior to Medicare Part D and are most likely to gain prescription drug insurance as a result of Medicare Part D. In addition to using quartiles of the probability of being uninsured prior to Medicare Part D, we estimate a model that uses a quadratic specification for the probability of being uninsured prior to Medicare Part D. This latter model is somewhat more restrictive than the quartile specification, but we note here that results do not differ across specifications and we report both sets of results below.

The identifying assumption of the instrumental variables approach is that, in the absence of Medicare Part D, changes in prescription drug use and other outcomes are the same for the treatment and comparison groups. While we cannot test this assumption definitively, we can provide some evidence of the validity of this assumption. Specifically, with respect to equation (3), we test whether the coefficients

on the interaction effects in years prior to 2006 (i.e., prior to Medicare Part D) are statistically significant. These interaction effects measure whether changes in prescription drug insurance are the same for the treatment and comparison group in years prior to Medicare Part D. We report the statistical tests related to this assumption below, but note here that we are unable to reject the null hypothesis that the pre-2006 interactions are jointly zero, which is evidence supportive of our research design. On the other hand, coefficients on the interaction terms between the predicted probability of being uninsured and the post-2005 year dummy variables are expected to be non-zero. We report these results below, but note here that this is indeed the case. The first stage correlation is very strong. Similar tests can be carried out with reference to equation (2). In this case, such tests are standard over identification tests associated with instrumental variables. We report the results of these below, but note here that we cannot reject the over identification restrictions in almost all cases.

It is important to note that the instrumental variables approach illustrated by equations (2) and (3) yields estimates of effects of prescription drug use on outcomes that are applicable to those who were affected by Medicare Part D (local average treatment effect-LATE). Our analysis of the probability of being uninsured prior to Medicare Part D, which we describe more fully below, indicates that age, education, income, race and region are all significant predictors of being uninsured. For example, those aged 65 to 69 have a predicted (marginal) probability of being uninsured of 0.29 whereas those aged 80 to 85 have a predicted probability of 0.37. White persons have a predicted probability of being uninsured of 0.32 and black persons have a predicted probability of being uninsured of 0.38. Those with a Bachelors degree have a predicted probability of being uninsured of 0.25 as compared to those with less than a high school degree who have a predicted probability of being uninsured of 0.41. Finally, as expected, there is a sharp gradient in the probability of being uninsured with income. Those in the lowest income category have a probability of being uninsured of 0.51 and those in the top income category have a probability of being uninsured of 0.23. In sum, those without prescription drug insurance prior to Medicare Part D tend to low-educated, low-income, black, older and more likely to come from some regions (e.g., east and west

south central) than others. Thus, our estimates of the effect of prescription drug coverage due to Medicare Part D pertain to persons with these characteristics.

Beyond the LATE nature of our approach, we also recognize the possibility that the IV approach is not strictly valid if there were general equilibrium effects associated with Medicare Part D, for example, if prices of prescription drugs change.[9] To the extent that prices of prescription drugs changed post-Part D, IV estimates will include both the effect of insurance and effect of price changes. Thus, the benefit of, and response to, gaining prescription drug insurance is less than if no price reduction had occurred. However, since the price effect also affected those who always had insurance, the general price decline will affect both groups and part of this effect will be differenced out of estimates. We note that all analyses of Medicare Part D including the intention to treat analyses of Lichtenberg and Sun (2007) and Yin et al. (2008) are subject to the same caveat.

In addition, there is the possibility that some elderly with prior prescription drug insurance switch plans (i.e., generosity) as a result of Medicare Part D. However, evidence presented in Levy and Weir (2009) suggest little such switching. Using data from the Health and Retirement Survey, Levy and Weir (2009) showed that was there was little "crowd out" of private, employer-sponsored insurance as a result of the creation of Medicare Part D. The incentives in Medicare Part D for employers to maintain prescription drug benefits appeared to be effective. We find similar results in our data (not reported). At a minimum, IV estimates will be measuring the effect of gaining coverage among those previously uninsured and the effect of any, arguably minor, change in generosity among those with prescription drug insurance.

To construct the predicted likelihood of being uninsured prior to Medicare Part D, we used the following regression model:

[9] Duggan and Scott (2010) concluded that Medicare Part D reduced prices of prescription drugs by between 13% and 20%.

$$UNIN_{it} = \mu + \sum_{t=2001}^{2003} \rho_t YEAR_t + X_{it}\pi + e_{it}$$

(4) $i = 1,...,N$

$t = 2000,2001,2002,2003$

In equation (4), the probability that person i in year t is uninsured prior to Medicare Part D—we used the years 2000 to 20003—depends on year effects and demographic and socioeconomic factors (X_{it}). We used a more complicated specification than that described in equation (4). Specifically, we included several interactions between the demographic and socioeconomic variables.[10] We constructed the predicted probability of being uninsured using the parameter estimates from equation (4) except for the estimates associated with year effects (i.e., we used the year 2000 mean level of uninsured). The predicted probability of being uninsured is equal to:

(5) $\hat{UNIN}_{it} = \hat{\mu} + X_{it}\hat{\pi}$.

Thus, our measure of the predicted likelihood of being uninsured prior to Medicare Part D is just a linear combination of (exogenous) demographic and socioeconomic characteristics. However, because we used a more complex function of the observable variables to predict the probability of being uninsured, we can include the predicted probability of being uninsured in equation (2)—it is not a perfect linear combination of the vector of variables included in that model. Including the predicted variable in the regression, as we do, is also a parsimonious way to control for these more complex interactions between the socioeconomic and demographic factors.

Data

Data for the analysis comes from the Medicare Current Beneficiary Survey (MCBS) from the years 2000 to 2007. We omit the year 2005 because of the availability, and significant use, of drug

[10] The model to predict uninsured included the following: age, education, marital status, race, income, rural status, region, current smoker, and former smoker, age by gender, marital status by gender, education by gender, marital status by race, income by race, rural status by race, current and former smoker by education, region by race, and region by education.

discount cards that were provided automatically to some Medicare enrollees (e.g., Medigap policy holders) and were available by purchase to others (Thomas et al. 2005). The MCBS data do not allow us to accurately identify whether a respondent had a drug discount card, and so we omit this year for analysis.[11] The MCBS is the only nationally representative survey that exclusively focuses on Medicare enrollees (aged 65 years and above, and disabled). Individuals are drawn using stratified random sampling from an enrollment list of persons entitled to Medicare on January 1st of that year. The stratified sampling ensures that the sample is representative of all geographical areas and age groups. Each year, a supplemental sample is added to account for attrition, maintain an average sample size of 12,000 individuals, and to ensure that the sample remains representative of the current Medicare population. We use a sample of non-institutionalized persons 65 to 85 years of age who have complete year information. We omit people who died during the year, and who were ever on Medicaid, not living in the community, or had end stage renal disease. The latter group is quite dissimilar to other respondents.[12] We also use a sub-sample of relatively sicker individuals, which we refer to as the chronically ill or poor health sample. These are persons who reported three or more chronic illnesses (e.g., hypertension, asthma, arthritis).

Each sampled individual is interviewed face-to-face three times per year for four years. After four years, the individual is retired from the survey and a new panel is added.[13] Data is released in two file formats, Access to Care and Cost and Use. Cost and Use provides detailed description of the respondent's insurance status including prescription insurance, health status, medication utilization, other health care utilization, and demographic and socioeconomic characteristics. Access to Care provides the same information except the utilization data. We used the Cost and Use files from 2000-2006 and Access to Care file for year 2007. These are the latest available data.

[11] The discount card program first became available on June 1, 2004 and was in operation for the full year of 2005.
[12] Reports by Kaiser Family Foundation and GAO suggest that there were transition issues for the Medicaid population (see http://www.kff.org/medicaid/upload/7454.pdf, website last accessed May 13, 2010). For this, and because Medicaid population is very different, we exclude these individuals from the analysis.
[13] Sample sizes are not large enough to exploit successfully the longitudinal data, particularly because of the necessity to omit 2005.

A particular strength of the MCBS is the validity checks performed by CMS. Respondents are asked to show receipts, bills, drug vials, and any related paperwork to document prescription drug use and drug insurance. The use of Computer Assisted Personal Interview program and prescription bills, vials, and bottles enhances the accuracy of the collected information during the interview process. After the interview, CMS uses the administrative claims database and other algorithms to clean, supplement, and validate the data. These validity checks have greatly reduced missing information and improved accuracy of the survey (Eppig and Chulis 1997).

MCBS respondents report up to five sources of non-Medicare insurance and prescription drug coverage. The respondent reported the start and stop dates of the insurance and whether this source of insurance provided prescription drug coverage. Based on this information, we assigned a person to insured or uninsured category for each month in the survey. If they had prescription drug insurance for at least six months in a year, we assign them to the insured category, although there is relatively little switching from insured to uninsured.[14]

As noted, we examine several dependent variables. Prescription drug use is measured by the self-reported, annual total number of prescription drugs dispensed.[15] Outpatient visits is the annual total number of outpatient visits. In addition to the total number of visits, we construct two dichotomous measures indicating 3 or more visits or 6 or more visits. Hospitalization is a binary variable indicating hospitalization in the last year. We also use self reported measures of health such as general health status, activities of daily living (ADL), and instrumental activities of daily living (IADL). General health status (excellent/very good/good/fair/poor) measures self reported health compared to individuals in the same age group. We also define good health as those with excellent or very good self-reported health and poor health as those with fair or poor self-rated health. ADL is composite score indicating problems in eating, dressing, bathing, walking, transferring into and out of a chair, and using the toilet. IADL represents

[14] The Access to Care file does not provide such detailed monthly information on prescription drug insurance. Therefore, for 2007 we assigned them to the insured or uninsured group using self reported insurance status. The two different data sources yield slightly different definitions for prescription drug coverage, however, these differences are small.

[15] The number of prescriptions is not normalized by supply (e.g., 30-day).

problems in making meals, using the phone, going shopping, managing money, and doing light and heavy housework. The scores on the ADL and IADL can range from 0 to 6. In some analyses we transform ADL and IADL into dichotomous variables indicating that the person has a 2 or more functional limitations, and we also combine ADL and IADL.

Regression analyses also include controls for demographic and socioeconomic characteristics including age, sex, race, education, urban residence, census region of residence, income, marital status, and smoking status. These variables are included in the models as categorical variables.

Results

Medicare Part D and Prescription Drug Insurance Coverage

We begin the presentation of results by demonstrating, as others have, that Medicare Part D had significant effects on prescription drug insurance, and that its effect was concentrated among those with a high predicted likelihood of being uninsured prior to 2006 when Medicare Part D was fully implemented (Levy and Weir 2009). Table 1 presents the mean rate of uninsured by year for the full sample and by quartile of the probability of being uninsured prior to Part D. The figures in Table 1 indicate a steep decline in the rate of uninsured between 2004 and 2007. Prior to 2006, there is relatively little trend in the rate of uninsured. More importantly, there are significant differences in the changes in the proportion uninsured for those more or less likely to be uninsured prior to Medicare Part D. Among those in the bottom quartile of the distribution of the probability of being uninsured prior to Part D, the change in the proportion uninsured between 2004 and 2006 (2007) was -11 percentage points. Among those in the top quartile of this distribution, the change in the proportion uninsured between 2004 and 2006 (2007) was -33 percentage points. For the entire sample, the proportion uninsured declined by approximately 20 percentage points between 2004 and 2006. Similar changes occur between 2004 and 2007. Finally, although we do not show it, we found little change in the type of prescription drug insurance, which is similar to Levy and Weir (2009). This is important because it supports the assumption of our empirical

approach, which assumes that Medicare Part D did not significantly affect those with prescription drug insurance prior to Part D.

We calculate difference-in-difference (DD) estimates of the effect of Medicare Part D on prescription drug insurance in Table 1 for the change in prescription drug insurance between 2004 and 2006 and between 2004 and 2007. The comparison group is those in the first quartile of the probability of being uninsured—i.e., those least likely to be uninsured prior to Part D. The DD estimates associated with the 4th minus 1st quartiles are -22 percentage points for 2004 to 2006 and -23 percentage points for 2004 to 2007. Both are statistically significant.

The descriptive information in Table 1 is consistent with results from a regression model predicting prescription drug insurance coverage. Table 2 presents selected estimates of equation (3), which is reproduced here for clarity:

$$(5)\quad INSURED_{it} = \alpha + \sum_{k=2}^{4} \gamma_k \hat{UNIN}_{kit} + \sum_{t=2001}^{2007} \theta_t YEAR_t + \sum_{t=2001}^{2007} \sum_{k=2}^{4} \delta_{kt} (\hat{UNIN}_{kit} * YEAR_t) + X_{it}\lambda + \nu_{it}$$

Estimates were obtained by Ordinary Least Squares (OLS) regression methods, and we present separate estimates for the entire sample and those in poorer health, which we define as those with three or more chronic illnesses. We refer to the latter group as the "chronically ill" sample. Standard errors are constructed allowing for non-independence within person (i.e., clustered on the individual).

For the complete sample, estimates in the left panel of Table 2 have a clearly identifiable pattern. The more likely a person was of being uninsured prior to Part D, as measured by the quartiles of the distribution of being uninsured, the more likely they were to gain prescription drug insurance subsequent to Medicare Part D (2006 and 2007). For example, estimates associated with being in the top quartile of the distribution of the probability of being uninsured are 0.23 in 2006 and 0.24 in 2007. Relative to those in the bottom quartile of the probability of being uninsured, those in the top quartile were approximately 23 percentage points more likely to gain prescription drug insurance subsequent to Part D. Note also, that these estimates are almost exactly equal to those reported in Table 1 in the columns labeled "Dif-in-Dif." Adjusting for covariates has little effect on estimates. A point to note about Table 2 is that the strong

correlation between the interaction terms in 2006 and 2007 demonstrate that the IV approach we employ is reasonable in terms of the correlation between the instrument (essentially the 2006 and 2007 interactions) and prescription drug insurance coverage. In the bottom panel, we report the results when the probability of being uninsured is specified using a quadratic form. These estimates are consistent with estimates using the quartile specification. Changes in prescription drug insurance are increasing significantly in the probability of being uninsured.

Estimates (not shown) associated with the interactions between the quartiles of the probability of being uninsured and the year dummy variables prior to 2006 are not statistically significant and small in magnitude. In Table 2, we report the p-value associated with the test that the pre-2006 interactions between the quartiles of the predicted probability of being uninsured and year dummy variables are jointly zero. The p-value for this test for the complete sample is 0.48 (and 0.40 for quadratic specification), and for the chronically ill sample 0.53 (0.21 for quadratic specification). This result provides support for the overall research design, which is based on the Medicare Part D natural experiment and the assumption that pre- to post-Medicare Part D, those in different quartiles of the distribution of the probability of being uninsured would have similar trends in outcomes.

For the chronically ill sample, estimates (right panel of Table 2) indicate a similar experience as that for the full sample. The more likely a chronically ill person was of being uninsured prior to Medicare Part D the more likely they were to gain prescription drug insurance subsequent to Part D. Estimates associated with being in the top quartile are 0.24 in 2006 and 0.27 in 2007.

Notably, our results are very similar to the descriptive results reported by Levy and Weir (2009) in their analysis of data from the Health and Retirement Survey. To improve the comparison between our study and Levy and Weir (2009), we re-estimated equation (3) using a continuous index of the probability of being uninsured. The coefficient on the interaction between this index and the 2006 and 2007 year dummy variables was approximately 0.6, which indicates a take-up rate of Medicare Part D of approximately 60%, which is exactly the figure reported by Levy and Weir (2009).

Medicare Part D, Prescription Drug Insurance and Use of Prescription Drugs

Table 3 reports the average number of annual prescriptions by year and by quartile of the probability of being uninsured. For this outcome, we have data only through 2006. During the pre-Medicare Part D period, we observe a slightly rising number of annual prescriptions, but between 2004 and 2006 there is a significant increase in the use of prescription drugs. Notably the change in prescription drug use between 2004 and 2006 is largest for those most likely to be uninsured prior to 2006, and is increasing by quartile except for quartile 3. Difference-in-difference estimates are also presented in Table 3. These estimates are consistent with the hypothesis that those who were most likely to gain prescription drug insurance experienced the largest increases in prescription drug use, although estimates are not statistically significant except for the 4th versus 1st quartile comparison.

In Table 4, we present instrumental variables estimates of the effect of prescription drug insurance on annual use of prescription drugs for the entire sample (first column) and the sample of chronically ill (second column).[16] The top panel of Table 4 reports the instrumental variables estimates obtained using the quartile specification for the instruments (i.e., probability of being uninsured prior to Part D). For the full sample, the estimate of the effect of prescription drug insurance is 17.14 and for the sample of chronically ill the estimate is 20.62. Both estimates are highly significant. These effects are large; obtaining prescription drug insurance through Medicare Part D is associated with an increase in the number of annual prescription drugs of approximately 70% relative to the mean (75% relative to a standard deviation) for the full sample and 60% of the mean (90% relative to a standard deviation) for chronically ill persons. The magnitude of these estimates is similar to those reported in other studies related to Medicare Part D; for example, Zhang et al. (2009) found that moving from uninsured to insured was associated with a 74% increase in drug spending for Medicare Advantage enrollees in Pennsylvania.

The bottom panel of Table 4 reports instrumental variables estimates obtained using a quadratic specification of the instruments. Estimates are similar to those already reported; among the full sample

[16] We assessed whether the skewed nature of the distribution of prescription drug use affected estimates by estimating a non-instrumental variables version of equation (2) by OLS and Poisson (robust methods to construct standard errors). Estimates from the two methods were virtually identical suggesting that the skewed nature of distribution was not affecting estimates.

prescription drug insurance is associated with a 15.67 increase in prescriptions and among the chronically ill, prescription drug insurance is associated with a 19.26 prescription increase.

Results from tests assessing the validity of the instrumental variables approach are also presented in Table 4. We have already demonstrated that there is a very strong first stage correlation between the probability of being uninsured prior to Part D and the probability of gaining prescription drug insurance as a result of Medicare Part D, and p-values listed in Table 4 pertaining to this issue reflect this fact. More interesting are the tests of over identification. For the full sample, we cannot reject the over identification restrictions and p-values associated with these test are 0.25 (quartile specification) and 0.18 (quadratic specification). For the chronically ill sample, the p-values associated with the over identification tests are 0.26 (quartile) and 0.10 (quadratic). Overall, these results suggest that the instrumental variables approach is valid.

Medicare Part D, Prescription Drug Insurance and Use of Other Services

A prominent hypothesis related to prescription drug insurance is that the financial access to prescription drugs afforded by insurance results in greater and more appropriate (e.g., better adherence) use of prescription drugs, and that this increase in use has positive spillovers on the use of other services, for example, less use of inpatient services (Chandra et al. 2007; Zhang et al. 2009). Here, we examine whether prescription drug insurance is associated with a change in the probability of being hospitalized in the last year and the number of outpatient physician visits. For these outcomes, we only have data through 2006, as the 2007 data are not yet available.

Table 5 presents descriptive information. In the case of hospitalization, the figures in Table 5 suggest little change, if anything a slight decrease in the probability of hospitalization between 2000 and 2006, and difference-in-difference estimates are zero or close to zero. For outpatient visits, there is a slight increase in the number of visits over time and those more likely to be uninsured report more visits than those less likely to be uninsured (in every year). However, the change in outpatient visits between 2004 and 2006 is similar to the change in visits between earlier years. Difference-in-difference estimates are small and not statistically significant.

Table 6 presents instrumental variables estimates of the effect of prescription drug insurance on the probability of hospitalization and the use of outpatient services.[17] Before discussing estimates, we note that p-values associated with first stage results are highly significant, as expected, and that p-values associated with tests of over identification restrictions indicate that we cannot reject the exclusion restrictions in all cases.

For the full sample, estimates of the effect of prescription drug insurance on the probability of hospitalization are positive and not statistically significant. The magnitudes of estimate are modest; prescription drug insurance is associated with a three to four percentage point increase in the probability of hospitalization, which relative to the mean represents a 15 to 20 percent effect size. Our inability to reject an effect size of this magnitude suggests that we lack sufficient statistical power to detect reliably small to modest effects. It is clear from the size of the standard errors, that in the case of hospitalization we have insufficient statistical power to detect reasonably sized effects.

We measured outpatient visits in three ways: total number of visits; whether a person had 3 or more visits; and whether a person had 6 or more visits. For the full sample, estimates of the effect of prescription drug insurance on outpatient visits are not statistically significant and of modest magnitudes. For example, prescription drug insurance is associated with a 0.66 to 0.89 decrease in the number of outpatient visits; relative to the standard deviation of outpatient visits these effects sizes are approximately 10 percent. For this outcome too, we have limited statistical power although not as limited as in the case of hospitalization. Standard errors of estimates indicate that we could not reject effect sizes smaller than 2.5 outpatient visits, or approximately one-third of a standard deviation. Estimates associated with the other measures of outpatient visits (>2 or >5 visits) are approximately of the same relative (to mean) magnitudes and are not statistically significant.

Instrumental variables estimates of the effect of prescription drug insurance on the probability of hospitalization for chronically ill persons is 0.08, or approximately 33% of the mean, and not statistically

[17] In the case of outpatient visits, we also assessed whether estimates were sensitive to the estimation method (i.e., Poisson versus OLS) using the same approach as described in footnote 14.

significant. With respect to outpatient visits, estimates of the effect of prescription drug insurance on the number of outpatient visits are -0.64 and -1.80 and not statistically significant. These effect sizes are modest; 7 and 20 percent of a standard deviation respectively. Here too, the statistical power of the analysis is limited with standard errors indicating that we cannot reject reliably effects sizes of less than one-third of a standard deviation.

Medicare Part D, Prescription Drug Insurance and Self-rated Health

Arguably, the most important goal of subsidizing prescription drug insurance as in Medicare Part D is to provide the financial ability to purchase prescription drugs that maintain, or slow the deterioration, of the health of elderly persons. As noted there are few studies of this issue. We examine the association between prescription drug insurance and several measures of self-reported health created from three underlying variables: self-rated general health status, the number of activities of daily living limitations (ADL); and the number of instrumental activities of daily living limitations (IADL). ADL and IADL range from zero to six. For all measures of health, we have data that extend through 2007.

Table 7 presents descriptive information for ADLs, IADLs and general health status by year and quartile of the probability of being uninsured. Overall, there seems to be a slight improvement in functional status and general health over the 2000 to 2004 period. There is also evidence that those more likely to be uninsured prior to Part D have worse health than those less likely to be uninsured (in each year). Changes in functional status and general health between 2004 and 2006 and 2004 and 2007 are small—always less than 10% of a standard deviation (approximately 1.1) and not very different from year-to-year changes in earlier periods. Consistent with these facts, difference-in-difference estimates are small and not statistically significant with two exceptions. The 3rd minus 1st quartile difference-in-difference estimate with respect to IADLs and the 2006-2004 difference indicates that those more likely to obtain prescription drug insurance through Medicare Part D experienced a relative improvement in functional status (-0.11 DD estimate). The other significant estimate is the 4th minus 1st quartile for the 2007-2004 difference in general health status, which is positive indicating worsening health. Overall, the

descriptive evidence in Table 7 suggests little association between gaining prescription drug insurance and health.

Tables 8 and 9 presents estimates of the effect of prescription drug insurance on functional status (Table 8) and general health (Table 9). Tests associated with the validity of the instrumental variables approach are overwhelmingly supportive. First stage correlations between the instruments and prescription drug insurance are strong. Moreover, tests of over identification restrictions usually indicate that we cannot reject the restrictions. The exception is self-reported general health for the full sample; in this case over identification tests reject the null hypothesis.

Estimates in Table 8 and 9 are never statistically significant. With respect to functional status all estimates, for both the full and chronically ill samples, are positive, which points toward worsening functional status, and relatively small—10 to 15 percent of mean of dichotomous outcomes and of the standard deviation for other outcomes (ADL, IADL, ADL+IADL). However, we note that we have limited ability to detect small effects, as magnitudes of standard errors imply that we cannot reject reliably effect sizes smaller than one-third of a standard deviation (or of the mean). Estimates in Table 9 are also relatively small, not statistically significant, and mixed in terms of sign of the association (relative to beneficial outcomes). The similar caveat with respect to statistical power applies to these estimates.

Conclusions

The growing clinical and financial importance of prescription drugs motivated the creation of a prescription drug benefit for elderly under Medicare Part D. While Medicare Part D is for all seniors, it was those who lacked prescription drug insurance prior to Part D that was of central concern to policymakers. In this paper, we assessed the effects of Medicare Part D on this group who tend to be low-educated, low-income, black and older than the average elderly person. Specifically, we obtained estimates of the association between prescription drug insurance provided by Medicare Part D (versus no coverage) on the use of prescription drugs, use of outpatient and inpatient services, and health, as

measured by functional status and general health ratings. We also quantified the change in prescription drug insurance coverage that resulted from Medicare Part D.

To obtain the estimates of interest, we exploited the natural experiment afforded by Medicare Part D and the fact that most elderly had prescription drug insurance prior to Medicare Part D. This enabled us to compare changes in outcomes between those more or less likely to gain prescription drug insurance as a result of Medicare Part D. We then used these differential responses to Medicare Part D to identify the effect of prescription drug insurance on outcomes. We provided substantial evidence that this empirical approach was valid.

We found that prescription drug insurance is associated with a significant increase in the use of prescription drugs. Estimates suggest that gaining prescription drug coverage through Medicare Part D was associated with approximately a 70% (relative to mean) increase in the use of prescription drugs for the general population of elderly, and a 60% (relative to mean) increase in the use of prescription drugs for those in poorer health (chronically ill sample). In absolute terms, prescription drug insurance was associated with a larger increase in prescription drug use among those in poorer health. Our estimates are in line with the only other study that we are aware of that examined this same question; Zhang et al. (2009) reported that gaining prescription drug insurance through Medicare Part D was associated with a 74% increase in spending on prescription drugs for enrollees in a Medicare Advantage plan in Pennsylvania.

It is not surprising to find that prescription drug insurance is associated with an increase in prescription drug use, although the magnitude of the increase may be somewhat surprising. Arguably the more interesting questions are whether this relatively large increase in prescription drug use associated with gaining prescription drug insurance was associated with changes in the use of other health care services and changes in health. To investigate this issue we examined the association between prescription drug insurance and the use of outpatient services, hospitalization, functional health and general health status for the general population of elderly and for those who reported several chronic illnesses.

Overall, we found little evidence that prescription drug insurance was strongly associated with outpatient services, hospitalization, functional status and general health. Estimates of associations between prescription drug insurance and these outcomes were usually small—10 to 15 percent of the mean or of a standard deviation—and not statistically significant. In addition, in most cases, signs of estimates of the effect of prescription drug insurance were not consistent with a decrease use in inpatient and outpatient services, or of an improvement in health, as suggested by conventional wisdom. Indeed, in the case of functional status (ADL and IADL), every estimate was positive suggesting that prescription drug insurance was associated with worsening functional health. Similarly, it was always the case that prescription drug insurance was associated with a higher probability of being admitted to the hospital, and most estimates indicate that prescription drug insurance was associated with an increase in the probability of having a relatively large number of outpatient visits. However, for most outcomes, we lacked the statistical power to detect reliably effect sizes less than 33 percent of a standard deviation or of the mean. Thus, we cannot reject that prescription drug insurance was associated with improvements in health or decreases in the use of inpatient services of approximately 15 to 20 percent of mean, but we can reject larger, beneficial effects for these outcomes.

We can compare the change in spending on prescription drugs implied by our estimates with potential changes in non-pharmacy medical spending using estimates of the effect of prescription drug insurance on the use of other services and health. Estimates suggest that use of prescription drugs increased by approximately 60% for those who gained coverage as a result of Medicare Part D. We assume that gaining prescription drug coverage was associated with a similar increase in spending on prescription drugs. According to the Centers for Medicare and Medicaid Services (CMS), average spending on prescription drugs among elderly was $1600 per person in 2004.[18] We assume that spending on prescription drugs for those without insurance was 70% of average spending, which is consistent with the pre-Medicare Part D ratio of prescription drug use of the uninsured to the average of the sample.

[18] See http://www.cms.gov/NationalHealthExpendData/downloads/2004-age-tables.pdf, last accessed August 5, 2010.

Using these assumptions, we estimate that spending on prescription drugs increased by approximately $670 per person per year as a result of gaining prescription drug coverage through Medicare Part D.[19] Data from CMS also indicate that average spending on hospital and physician services was $8400 per person in 2004. If we assume that those without prescription drug insurance spent the same amount on these services as the average, and that prescription drug insurance improved health and reduced spending on these services by 20%, which is the largest potential improvements that our estimates imply for outcomes we measured, then spending on these services would decrease by approximately $1200. If we assume a 10% improvement instead of 20%, then spending on these services would decrease by approximately $600. In sum, our estimates suggest that the increase in prescription drug spending as a result of Part D would most likely result in a net increase in total spending on health care. The upshot of this discussion is that while our estimates are relatively imprecise, they are suggestive that the increase use of prescription drugs associated with gaining prescription drug insurance as a result of Medicare Part D is not likely to produce a net gain, although estimates do not rule out that possibility.

Our results are similar to those reported in Zhang et al. (2009) who conducted an analysis of the effects of Medicare Part D and prescription drug insurance for a sample of Medicare Advantage enrollees in Pennsylvania, and reported that prescription drug insurance was associated with a reduction in non-pharmacy spending. However, Zhang et al. (2009) reported that prescription drug insurance was still associated with an increase in total spending, as the increase in spending on prescription drugs was greater than the decrease in other types of spending. This finding is consistent with the most likely scenario based on our findings. Moreover, the lower spending on non-pharmacy services reported by Zhang et al. (2009) was only in the second year of Medicare Part D. Finally, the reduction in non-pharmacy spending was quite small—7 percent—and consistent with our calculations above that suggest that gaining prescription drug insurance as a result of Medicare Part D is most likely associated with an increase in total spending on health care.

[19] The $670 (actually $672) is obtained by multiplying $1600 by 0.7 (uninsured spending) multiplied by 0.6 increase in use as a result of gaining coverage [$672=($1600*0.7)*0.6].

The findings from our study raise questions as to the value of the large increase in prescription drug use that was associated with prescription drug coverage gained through Medicare Part D. Taken at face value (i.e., using point estimates), these results suggest that much of the additional use of prescription drugs that results from gaining prescription drug insurance is relatively low value in terms of offsetting benefits from less use of other services and better health. While we acknowledge the limitations of our health measures and the limited statistical power of our analyses, the absence of any strong evidence (again point estimates) that health improved as a result of gaining prescription drug coverage should at a minimum, motivate much more study of the issue. It is an issue of central importance to assessing the efficacy of Medicare Part D and there is insufficient exiting evidence to inform policy.

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Table 1
Proportion of Medicare Enrollees without Prescription Drug Insurance
By Likelihood of Being Uninsured Prior to Medicare Part D

	2000	2001	2002	2003	2004	2006	2007	2006-2004	Dif-in-Dif	2007-2004	Dif-in-Dif
Full Sample	0.33	0.32	0.31	0.31	0.31	0.11	0.11	-0.20		-0.20	
1st Quartile Predicted Uninsured	0.16	0.17	0.15	0.16	0.17	0.06	0.06	-0.11		-0.11	
2nd Quartile Predicted Uninsured	0.25	0.24	0.23	0.25	0.26	0.08	0.10	-0.18	-0.06*** (0.02)	-0.16	-0.04** (0.02)
3rd Quartile Predicted Uninsured	0.34	0.32	0.33	0.31	0.31	0.13	0.12	-0.18	-0.07*** (0.02)	-0.19	-0.08*** (0.02)
4th Quartile Predicted Uninsured	0.53	0.52	0.51	0.50	0.50	0.17	0.17	-0.33	-0.22*** (0.02)	-0.33	-0.23*** (0.02)

Source: MCBS Survey Cost and Use File 2000-2006 and MCBS Access to Care File 2007
Notes: Uninsured is defined as probability of uninsured prior to Medicare Part D and is a function of demographic and socioeconomic characteristics and their interactions. There is some inconsistency among the figures because of rounding.
*0.05 < p-value <=0.10; ** 0.01 < p-value <=0.05; *** p-value <=0.01

Table 2
Estimates of the Effect of Medicare Part D on the Probability of Having Prescription Drug Insurance

Quartile Specification	Full Sample	Chronically Ill
2nd Quartile Uninsured*Year 2006	0.06***	0.07***
	(0.02)	(0.02)
3rd Quartile Uninsured*Year 2006	0.08***	0.08***
	(0.02)	(0.02)
4th Quartile Uninsured*Year 2006	0.23***	0.24***
	(0.02)	(0.03)
2nd Quartile Uninsured*Year 2007	0.05**	0.07***
	(0.02)	(0.02)
3rd Quartile Uninsured*Year 2007	0.09***	0.10***
	(0.02)	(0.02)
4th Quartile Uninsured*Year 2007	0.24***	0.27***
	(0.02)	(0.03)
P-Value, Joint Test of Significance, Year 2006-2007 Interactions	0.00	0.00
P-Value, Joint Test of Significance, Pre-Year 2006-2007 Interactions	0.48	0.53
Quadratic Specification		
Predicted Uninsured*Year 2006	0.10	0.18
	(0.16)	(0.19)
Predicted Uninsured Sq.*Year 2006	0.70***	0.66**
	(0.23)	(0.29)
Predicted Uninsured*Year 2007	0.10	0.19
	(0.15)	(0.19)
Predicted Uninsured Sq.*Year 2007	0.78***	0.74***
	(0.21)	(0.27)
P-Value, Joint Test of Significance, Year 2006-2007 Interactions	0.00	0.00
P-Value, Joint Test of Significance, Pre-Year 2006 Interactions	0.40	0.21
Number of Observations	41631	23166

Source: MCBS Survey Cost and Use File 2000-2006 and MCBS Access to Care File 2007
Notes: Dependent variable is whether person has prescription drug insurance. Estimates are from an OLS (linear probability) regression. Reference category is 1st Quartile Uninsured. Covariates are: female, age dummy variables, race categories, marital status, income categories, education categories, rural, smoking status, and year fixed effects. Robust standard errors (clustered on person) are in parentheses.
*0.05 < p-value <=0.10; ** 0.01 < p-value <=0.05; *** p-value <=0.01

Table 3
Number of Annual Prescriptions of Medicare Enrollees By Likelihood of Being Uninsured Prior to Medicare Part D

	2000	2001	2002	2003	2004	2006	2006-2004	Dif-in-Dif
Full Sample	24.32	25.02	25.76	26.57	26.59	32.00	5.41	24.32
1st Quartile Predicted Uninsured	21.90	22.88	24.04	24.09	24.38	29.31	4.93	
2nd Quartile Predicted Uninsured	24.08	25.29	25.10	26.42	25.90	31.46	5.56	0.63 (1.36)
3rd Quartile Predicted Uninsured	24.89	25.26	26.70	27.70	26.66	30.85	4.19	-0.74 (1.32)
4th Quartile Predicted Uninsured	26.05	26.39	26.07	28.09	29.64	37.08	7.44	2.51* (1.47)

Source: MCBS Survey Cost and Use File 2000-2006 and MCBS Access to Care File 2007.
Notes: Uninsured is defined as probability of uninsured prior to Medicare Part D and is a function of demographic, socioeconomic characteristics and their interactions. There is some inconsistency among the figures because of rounding. *0.05 < p-value <=0.10; ** 0.01 < p-value <=0.05; *** p-value <=0.01

Table 4
Estimates of Effect of Prescription Drug Insurance on Annual Number of Prescription Drugs

Quartile Specification	Full Sample OLS-IV	Chronically Ill OLS-IV
Prescription Drug Insurance	17.14*** (5.01)	20.62*** (6.79)
P-Value, Joint Test of Significance, Excluded Instruments in First Stage	0.00	0.00
P-Value, Over Identification Restrictions	0.25	0.26
Quadratic Specification		
Prescription Drug Insurance	15.67*** (4.73)	19.26*** (6.25)
P-Value, Joint Test of Significance, Excluded Instruments in First Stage	0.00	0.00
P-Value, Over Identification Restrictions	0.18	0.10
Number of Observations	34538	19291
Mean (Std. Dev.) of Dep. Var. for Uninsured in 2003	23.49 (21.95)	32.59 (23.49)

Source: MCBS Survey Cost and Use File 2000-2006.
Notes: Reference category is 1st Quartile Uninsured. Covariates are: female, age categories, race categories, marital status, income categories, education categories, rural, smoking status , and year fixed effects. Robust standard errors (clustered on person) are in parentheses.
*0.05 < p-value <=0.10; ** 0.01 < p-value <=0.05; *** p-value <=0.01

Table 5
Probability of Hospitalization and Number of Annual Outpatient Visits of Medicare Enrollees
By Likelihood of Being Uninsured Prior to Medicare Part D

Hospitalization	2000	2001	2002	2003	2004	2006	2006-2004	Dif-in-Dif
Full Sample	0.18	0.18	0.18	0.18	0.16	0.16	0.00	
1st Quartile Predicted Uninsured	0.16	0.16	0.14	0.15	0.14	0.13	-0.01	
2nd Quartile Predicted Uninsured	0.18	0.19	0.18	0.18	0.16	0.18	0.02	0.02 (0.02)
3rd Quartile Predicted Uninsured	0.18	0.18	0.21	0.18	0.16	0.16	0.00	0.00 (0.02)
4th Quartile Predicted Uninsured	0.18	0.20	0.19	0.19	0.19	0.18	-0.01	-0.01 (0.02)
Annual Outpatient Visits								
Full Sample	3.53	3.75	3.87	4.00	3.93	4.09	0.16	
1st Quartile Predicted Uninsured	2.91	3.22	3.46	3.52	3.47	3.66	0.19	
2nd Quartile Predicted Uninsured	3.57	3.72	3.53	3.82	3.85	4.09	0.24	0.05 (0.43)
3rd Quartile Predicted Uninsured	3.42	3.77	4.17	4.24	4.10	4.14	0.04	-0.14 (0.43)
4th Quartile Predicted Uninsured	4.13	4.23	4.30	4.40	4.34	4.53	0.19	0.00 (0.44)

Source: MCBS Survey Cost and Use File 2000-2006
Notes: Uninsured is defined as probability of uninsured prior to Medicare Part D and is a function of demographic and socioeconomic characteristics and their interactions.
*= 0.05 < p-value <=0.10; **= 0.01 < p- value <=0.05; ***= p-value <=0.01

Table 6
Estimates of Effect of Prescription Drug Insurance on the Probability of Hospitalization and Number of Outpatient Visits

	Full Sample				Chronically Ill Sample			
	Hospitalization	Outpatient Visits	Outpatient Visits>2	Outpatient Visits>5	Hospitalization	Outpatient Visits	Outpatient Visits>2	Outpatient Visits>5
Quartile Specification	OLS-IV	OLS-IV	OLS-IV	OLS-IV	OLS-IV	OLS-IV	OLS-IV	OLS-IV
Prescription Drug Insurance	0.03	-0.89	0.06	0.05	0.08	-0.64	-0.01	0.10
	(0.06)	(1.35)	(0.08)	(0.07)	(0.09)	(1.81)	(0.10)	(0.10)
P-Value, Joint Test of Significance, Excluded Instruments in First Stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P-Value, Over Identification Restrictions	0.22	0.80	0.87	0.20	0.32	0.38	0.50	0.72
Quadratic Specification								
Prescription Drug Insurance	0.04	-0.66	0.02	0.05	0.08	-1.80	-0.04	0.03
	(0.06)	(1.21)	(0.08)	(0.06)	(0.08)	(1.58)	(0.10)	(0.09)
P-Value, Joint Test of Significance, Excluded Instruments in First Stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P-Value, Over Identification Restrictions	0.36	0.91	0.42	0.83	0.70	0.68	0.28	0.50
Number of Observations	34538	34538	34538	34538	19291	19291	19291	19291
Mean (Std. Dev.) of Dep. Var. for Uninsured in 2003	0.18	4.06 (7.30)	0.43	.020	0.24	5.23 (8.15)	0.53	0.29

Source: MCBS Survey Cost and Use File 2000-2006
Notes: Reference category is 1st Quartile Uninsured. Covariates are: female, age categories, race categories, marital status, income categories, education categories, rural, smoking status, and year fixed effects. Robust standard errors (clustered on person) are in parentheses. *0.05 < p-value <=0.10; ** 0.01 < p-value <=0.05; *** p-value <=0.01

Table 7
Number of Instrumental Activities of Daily Living (IADLs) and Activities of Daily Living (ADLs)
of Medicare Enrollees By Likelihood of Being Uninsured Prior to Medicare Part D

ADLs	2000	2001	2002	2003	2004	2006	2007	2006-2004	Dif-in-Dif	2007-2004	Dif-in-Dif
Full Sample	0.47	0.46	0.46	0.45	0.42	0.43	0.42	0.01		0.00	
1st Quartile Predicted Uninsured	0.34	0.37	0.37	0.38	0.33	0.38	0.31	0.05		-0.02	
2nd Quartile Predicted Uninsured	0.43	0.44	0.44	0.43	0.44	0.44	0.38	0.00	-0.04 (0.05)	-0.06	-0.05 (0.04)
3rd Quartile Predicted Uninsured	0.52	0.47	0.51	0.46	0.44	0.44	0.46	0.00	-0.05 (0.05)	0.02	0.03 (0.05)
4th Quartile Predicted Uninsured	0.56	0.54	0.52	0.52	0.48	0.46	0.54	-0.02	-0.06 (0.05)	0.06	0.07 (0.05)
IADLs											
Full Sample	0.60	0.60	0.62	0.57	0.55	0.55	0.57	0.00		0.02	
1st Quartile Predicted Uninsured	0.41	0.44	0.47	0.44	0.41	0.45	0.43	0.04		0.02	
2nd Quartile Predicted Uninsured	0.55	0.58	0.60	0.54	0.58	0.55	0.53	-0.03	-0.06 (0.06)	-0.05	-0.06 (0.05)
3rd Quartile Predicted Uninsured	0.64	0.61	0.68	0.60	0.63	0.56	0.61	-0.07	-0.10* (0.06)	-0.02	-0.03 (0.06)
4th Quartile Predicted Uninsured	0.78	0.75	0.72	0.67	0.60	0.66	0.71	0.06	0.02 (0.06)	0.11	0.08 (0.06)
General Health Status											
Full Sample	2.59	2.57	2.56	2.54	2.51	2.50	2.54	-0.01		0.03	
1st Quartile Predicted Uninsured	2.39	2.38	2.40	2.40	2.40	2.39	2.36	-0.01		-0.04	
2nd Quartile Predicted Uninsured	2.54	2.51	2.47	2.46	2.47	2.46	2.48	-0.01	0.01 (0.04)	0.01	0.05 (0.05)
3rd Quartile Predicted Uninsured	2.58	2.62	2.60	2.57	2.53	2.52	2.57	-0.01	-0.01 (0.05)	0.04	0.08 (0.05)
4th Quartile Predicted Uninsured	2.81	2.76	2.76	2.73	2.68	2.65	2.78	-0.03	-0.02 (0.06)	0.10	0.13** (0.05)

Source: MCBS Survey Cost and Use File 2000-2006 and MCBS Access to Care File 2007.
Notes: Uninsured is defined as probability of uninsured prior to Medicare Part D and is a function of demographic, socioeconomic characteristics and their interactions.*= 0.05 < p-value <=0.10; **= 0.01 < p-value <=0.05; ***= p-value <=0.01

Table 8
Estimates of Effect of Prescription Drug Insurance on the Number of Instrumental Activities of Daily Living (IADLs) and Activities of Daily Living (ADLs)

	Full Sample					Chronically Ill Sample				
	ADL	ADL>1	IADL	IADL>1	IADL+ ADL	ADL	ADL>1	IADL	IADL>1	IADL+ ADL
Quartile Specification	OLS-IV	OLS-IV	OLS-IV	OLS-IV	OLS-IV	OLS-IV	OLS-IV	OLS-IV	OLS-IV	OLS-IV
Prescription Drug Insurance	0.07	0.01	0.03	0.02	0.10	0.14	0.03	0.11	0.02	0.26
	(0.14)	(0.04)	(0.16)	(0.04)	(0.28)	(0.21)	(0.06)	(0.24)	(0.07)	(0.42)
P-Value, Joint Test of Significance, Excluded Instruments in First Stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P-Value, Over Identification Restrictions	0.45	0.18	0.57	0.52	0.52	0.13	0.06	0.78	0.90	0.36
Quadratic Specification										
Prescription Drug Insurance	0.08	0.02	0.03	0.02	0.11	0.18	0.05	0.17	0.04	0.36
	(0.14)	(0.04)	(0.16)	(0.04)	(0.27)	(0.20)	(0.06)	(0.23)	(0.06)	(0.40)
P-Value, Joint Test of Significance, Excluded Instruments in First Stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P-Value, Over Identification Restrictions	0.50	0.51	0.41	0.70	0.50	0.38	0.22	0.77	0.95	0.58
Number of Observations	41591	41591	41580	41580	41573	23143	23143	23131	23131	23129
Mean (Std. Dev.) of Dep. Var. for Uninsured in 2003	0.44	0.10	0.58	0.12	1.02	0.65	0.16	0.88	0.19	1.53
	(1.04)		(1.22)		(2.08)	(1.23)		(1.45)		(2.46)

Source: MCBS Survey Cost and Use File 2000-2006Source: MCBS Survey Cost and Use File 2000-2006
Notes: Reference category is 1st Quartile Uninsured. Covariates are: female, age categories, race categories, marital status, income categories, education categories, rural, smoking status, and year fixed effects. Robust standard errors (clustered on person) are in parentheses.
*0.05 < p-value <=0.10; ** 0.01 < p-value <=0.05; *** p-value <=0.01

Table 9
Estimates of Effect of Prescription Drug Insurance on Health Status

	Full Sample			Chronically Ill Sample		
	General Health	Good Health	Poor Health	General Health	Good Health	Poor Health
Quartile Specification	OLS-IV	OLS-IV	OLS-IV	OLS-IV	OLS-IV	OLS-IV
Prescription Drug Insurance	-0.09	0.03	-0.01	0.04	-0.06	-0.06
	(0.14)	(0.07)	(0.05)	(0.17)	(0.08)	(0.07)
P-Value, Joint Test of Significance, Excluded Instruments in First Stage	0.00	0.00	0.00	0.00	0.00	0.00
P-Value, Over Identification Restrictions	0.11	0.51	0.06	0.21	0.87	0.53
Quadratic Specification						
Prescription Drug Insurance	-0.01	0.00	0.00	0.11	-0.09	-0.01
	(0.13)	(0.06)	(0.05)	(0.16)	(0.07)	(0.07)
P-Value, Joint Test of Significance, Excluded Instruments in First Stage	0.00	0.00	0.00	0.00	0.00	0.00
P-Value, Over Identification Restrictions	0.00	0.14	0.01	0.20	0.52	0.63
Number of Observations	41487	41487	41487	23074	23074	23074
Mean (Std. Dev.) of Dep. Var. for Uninsured in 2003	2.53 (1.05)	0.49	0.17	2.85 (1.03)	0.36	0.25

Source: MCBS Survey Cost and Use File 2000-2006 and MCBS Access to Care File 2007

Notes: Reference category is 1st Quartile Uninsured. Covariates are: female, age categories, race categories, marital status, income categories, education categories, rural, smoking status, and year fixed effects. Robust standard errors (clustered on person) are in parentheses.

*0.05 < p-value <=0.10; ** 0.01 < p-value <=0.05; *** p-value <=0.01