ESTIMATING REGRESSION-BASED MEDICAL CARE EXPENDITURE INDEXES FOR MEDICARE ADVANTAGE ENROLLEES[1]

Anne E. Hall*

November 2014

ABSTRACT

I construct a disease-based medical expenditure index for Medicare Advantage (private plan) enrollees using data from the Medicare Current Beneficiary Survey from 2001-2009. I create the indexes by modeling total health-care expenditure as a function of each respondent's diagnoses. Total medical inflation for this population is found to be 5.7 percent annually. By comparison, medical inflation in the Medicare fee-for-service (FFS) population is 4.5 percent annually. The difference is partly due to differential reporting of drug and nondrug spending in the MCBS for FFS beneficiaries; once this is corrected for, inflation among FFS beneficiaries is 5.0 percent. The remaining difference results from drug spending increasingly more rapidly among Medicare Advantage enrollees. I show that their spending increases more because they benefited more on average from the introduction of Part D than FFS beneficiaries.

[1] I would like to thank Tina Highfill for outstanding research assistance and would also like to thank the following people for helpful comments and advice: Ana Aizcorbe, Ernie Berndt, Michael Chernew, David Cutler, Abe Dunn, Joe Newhouse, and Allison Rosen. The views expressed in this paper are solely those of the authors and do not necessarily reflect the views of the Bureau of Economic Analysis.

1. Introduction

Health care accounted for 17% of the economy in 2012 (Martin et al. 2014); the proper measurement of inflation and output in this sector are therefore of vital concern to policymakers and the public. Currently, the Bureau of Labor Statistics measures inflation in the medical sector by measuring the changes in service prices and in commodity prices. Research in the 1990s, however, that constructed expenditure indexes by measuring the change in the cost of treating a particular illness showed that inflation in health care appeared to be lower when measured at the disease level and when the value of improved health outcomes were taken into account (Cutler et al. 1998). This research led to a recommendation by the Committee on National Statistics of the National Research Council that government statistical agencies investigate methods for allocating health-care expenditures by disease and constructing new price indexes for health care (National Research Council 2010).

In response, some more recent research has investigated the effect on measured health-care inflation of disease-based price indexes (Aizcorbe and Nestoriak 2011, Aizcorbe et al. 2011, Dunn et al. 2012, Hall and Highfill 2013, Hall and Highfill 2014). Aizcorbe and Nestoriak 2011 and Dunn et al. 2012 used medical claims data for privately insured patients to create their indexes and Aizcorbe et al. 2011 used the Medical Expenditure Panel Survey. These three papers all used encounter-based methods for creating indexes, where spending is assigned to a condition by the diagnosis attached to a particular claim or event. Hall and Highfill 2014 examined the options for creating indexes for Medicare beneficiaries and noted that, while there is publicly available claims data for Medicare fee-for-service (FFS) beneficiaries that can be used to create indexes with an encounter-based method, no such data exist for Medicare

private plan ("Medicare Advantage") enrollees. Instead, they found that two options existed for that population: creating a regression-based index from the diagnosis and spending data in the Medicare Current Beneficiary Survey (MCBS) or creating an encounter-based index from the Medicare Advantage enrollees in the MEPS.

This paper follows the first option of creating a regression-based index with the MCBS for this population as the number of Medicare Advantage enrollees in the MCBS is considerably larger than the number in the MEPS, which only contains a few hundred Medicare Advantage enrollees per year. A regression-based medical expenditure index models annual spending as a function of each beneficiary's diagnoses that year, uses the coefficients on the diagnoses to divide up each beneficiary's spending among their conditions, and from those, creates average per-case expenditures that are inputs to a medical expenditure index. As such, it can be created with data that does not attach a diagnosis separately to each claim or event but instead only requires diagnosis and spending data at an annual level.

The MCBS is a survey conducted by the Center for Medicare and Medicaid Services on a representative sample of Medicare beneficiaries. The MCBS meets the data requirements of a regression-based expenditure index as it collects all of its respondents' medical spending and, in addition, conducts an annual in-person survey which includes questions about what diagnoses they have received over the past year. It also includes Medicare Part A and Part B claims for the FFS Medicare beneficiaries responding to the survey. For the Medicare private plan enrollees, the only available data, however, are the medical events, spending and diagnoses collected directly from the respondent.

The paper proceeds as follows. In section 2, I describe the Medicare Advantage program. In Section 3, I review the concept of a condition-based medical care expenditure index. In section 4, I discuss the MCBS: the spending and diagnosis data and an adjustment made to the data to allow for including hypercholesterolemia as one of the conditions in the indexes even though it is not in the MCBS survey until 2009. Section 5 discusses model selection criteria and selects a model of health-care spending as the basis for the medical care expenditure index. Section 6 shows and discusses the results of the index for overall medical inflation among Medicare Advantage enrollees and compares the index with one calculated for Medicare FFS beneficiaries, which proves to be somewhat lower. Section 7 reviews the possible reasons for why inflation is higher among Medicare Advantage enrollees than in Medicare FFS beneficiaries and finds that the principal reasons are the differential underreporting of drug spending by FFS beneficiaries in the MCBS and the expansion of prescription drug insurance among Medicare beneficiaries during this period, which Medicare Advantage enrollees benefited more from. Section 8 concludes.

2. Medicare Advantage

Medicare Advantage is the program through which private insurance plans contract with Medicare to provide health insurance to Medicare beneficiaries.[3] Medicare beneficiaries have the option of enrolling in one of the Medicare Advantage plans available in their geographic region if they choose; if they enroll in one, they continue to pay their Part B premium and may

[3] A program allowing private plans to provide health insurance to Medicare beneficiaries has existed in some form or another and under different names since the 1980s. In general, I will refer to this program throughout as "Medicare Advantage" although it did not acquire this name until 2003. In 2001 and 2002, the program was named "Medicare+Choice."

also pay a premium above that to the private plan. In return, they usually receive a richer set of benefits than the standard FFS Medicare benefit package. Medicare reimburses the plans on a capitated basis with a base geographic rate risk-adjusted for the beneficiary's demographics and previous diagnoses.

Since the Medicare Modernization Act of 2003 increased the growth rate of reimbursements to plans in the program, plans have increased their geographic coverage and benefit offerings and, as a result, enrollment in the program has greatly increased. Figure 1 shows the percent of MCBS respondents who have some group plan participation according to Medicare's administrative data from 2001 to 2009. As it shows, this percentage declines from about 18% in 2001 to 15% in 2003 then stays roughly flat until 2005 when it starts increasing, reaching 26% by 2008. Currently, the enrollment rate in Medicare Advantage stands at 30% (CBO 2014). Medicare Advantage enrollees therefore comprise a substantial and increasing percentage of Medicare beneficiaries.

In the 1990s, research showed that Medicare private plans enjoyed a selection advantage relative to FFS Medicare (Brown et al. 1993, Riley et al. 1996). Enrollees in Medicare private plans tended to have better health than FFS beneficiaries, even after adjusting for demographic differences. The selection difference appeared to result from insufficient risk adjustment of the capitation rate paid to Medicare private plans which gave the plans an incentive to market to and enroll healthier beneficiaries. In turn, once the enrollees developed serious health problems, they tended to disenroll and return to FFS Medicare. In general, therefore, the private plans were being paid more than their enrollees' expected health care costs. The

Medicare Modernization Act introduced two reforms to equalize selection in the two parts of Medicare and reduce the overpayment that both began to be phased in in 2004. First, risk adjustment of payments started to be based on enrollees' diagnoses, not just on their demographics, which made it more profitable to enroll and keep less healthy beneficiaries. Second, free disenrollment was removed and enrollees are only allowed to return to FFS Medicare once a year.

These reforms appeared to remove Medicare Advantage's favorable selection. Using the MCBS, McWilliams et al. (2012) find that the ratios of the percent of MA enrollees reporting fair or poor health to the percent of FFS beneficiaries reporting the same as well as the ratios of health-care utilization of MA enrollees to FFS beneficiaries all move up from significantly below one in 2001-2003 to be insignificantly different from one in 2006-2007.

Table 1 shows results similar to those of McWilliams et al. from the MCBS. It compares the percent of MA enrollees and FFS Medicare beneficiaries reporting fair or poor health, good health, and very good or excellent health in the three periods that will be used to create the medical care expenditure index: 2001-2003, 2004-2006, and 2007-2009. In 2001-2003, the percentage of MA enrollees reporting fair or poor health is 4 points lower than the percentage of FFS Medicare beneficiaries with the same level of overall health, and the percentage of MA enrollees reporting very good or excellent health is 3 points higher than the corresponding percentage of FFS Medicare beneficiaries. These differences are significant at a less than 0.001 level when tested with an unweighted t-test of differences between means. In the period 2007-

2009, the corresponding differences in health between beneficiary categories are less than a percentage point and are no longer statistically significant.

The shift in average health status of MA enrollees and the loss of MA's selection advantage will have to be taken into consideration when interpreting measured inflation among MA enrollees and I will return to this issue below.

3. Medical care expenditure indexes

The health-care sector comprises nearly a fifth of the US economy. However, as detailed in the report "Accounting for Health and Health Care" (National Research Council 2010), the currently available government statistics on health care do not provide much information on the return on this spending. In general, data sources such as the National Health Expenditure Accounts (constructed by the Center for Medicare and Medicaid Services) and the Consumer and Producer Price Indexes (constructed by the Bureau of Labor Statistics) track spending and price changes by payer and type of service. As health economists have noted for many years, however, it would be more meaningful to track spending, price changes, and outcomes by medical condition (Scitovsky 1967, Cutler et al. 1998, Berndt et al. 2002). The 2010 National Research Council report envisioned an ideal set of national health accounts that tied medical expenditures and other determinants of health (such as environment and health behaviors) to levels of population health as measured by both morbidity and mortality. However, it pointed to the need to divide up medical expenditure in a more meaningful way as the most pressing

issue. It proposes a treatment-of-disease based framework where changes in expenditure on episodes of specific medical conditions are measured over time.

The advantage of tracking spending and episode price changes by condition is that measuring in this way captures shifts in treatments across industries within health care due to technological improvements. For example, numerous surgeries have shifted from being performed in hospitals to being performed in outpatient clinics and other conditions have shifted from being treated by procedures or therapy to being treated with prescription drugs. To give an example, Shapiro et al. (2001) detail the technological change in the performance of cataract surgery from just after World War II to the late 1990s. During this time, the procedure evolved from requiring a weeklong stay in the hospital to being performed on an outpatient basis. An expenditure index that tracks the cost of a night's stay in a hospital would not capture this shift and would probably imply much higher inflation than an index that tracked the total costs of the treatment across industries. Other papers also constructed expenditure indexes for individual conditions and found similar results (Cutler et al. 1998, Berndt et al. 2002).

The next step for research in this area was to extend the treatment-of-disease framework to all spending and all medical conditions. The 2010 National Research Council report recommended that the Bureau of Economic Analysis investigate methods for allocating expenditures across conditions. As it discusses, there are two principal types of methods for doing this: encounter-based and person-based. Encounter-based methods assign spending for each health encounter (visit or prescription) to a condition and sum up over encounters for each person/condition to produce an episode cost. Episode costs can then be averaged over people to create an average

episode cost for each condition. Person-based methods use an econometric model to divide a person's annual medical spending among his or her diagnosed conditions that year.

The first papers to construct medical expenditure indexes aggregated across all conditions used encounter-based methods (Aizcorbe and Nestoriak 2011, Aizcorbe et al. 2011, Dunn et al. 2012). Hall and Highfill (2014) compared indexes created with an encounter-based method and a person-based method from data for FFS Medicare beneficiaries. As they note, encounter-based methods are a priori preferable to person-based methods because they are more transparent and do not require the introduction of econometric assumptions. However, encounter-based methods require a diagnosis to be attached to every health event in the data and not all datasets fill that requirement. Medical claims data have diagnosis codes attached to every doctor and hospital claims but generally do not have diagnoses for drug claims. The survey method in the MEPS is designed to attach diagnoses to as many events as possible and this data source comes closest to being the ideal for use of encounter-based methods. However, the MEPS does not contain a large number of Medicare Advantage beneficiaries (only a few hundred per year) and, as Hall and Highfill mention, it is probably preferable to use the MCBS for that population.

The MCBS does not attach diagnoses directly to survey-collected events and therefore would require the use of a person-based method, which relates a respondent's annual spending to his or her annual diagnoses with an econometric model. The disadvantage of this approach is that the use of an econometric model and its associated assumptions may introduce error and it is potentially less transparent than encounter-based approaches. However, its data requirements

are less stringent since it only requires spending and diagnoses at an annual level. Rosen et al. (2007) use a regression-based method to divide up patients' spending among diabetes and cardiovascular conditions.

As mentioned above, Hall and Highfill (2014) constructed both regression-based and encounter-based indexes on the same data for the entire Medicare population and for the FFS Medicare population alone. They found that correlations in the levels of expenditures assigned by each method were strong and positive but that there was almost no correlation in the growth rates of those expenditures between methods. Regression-based indexes generally produced slightly lower overall growth rates of medical inflation than encounter-based indexes and also tended to produce more extreme expenditure growth rates for individual conditions. They concluded that regression-based methods are a viable alternative but should only be used when necessary.

As mentioned in the introduction, however, Medicare Advantage enrollees form a substantial and increasing share of Medicare beneficiaries and accounting for their spending in a treatment-of-disease framework is an important and necessary task. At this point, however, there is no publicly available source of claims data for them and their representation in the MEPS is limited. This paper therefore turns to the MCBS with its limitations as a data source.

4. Data

The Medicare Current Beneficiary Survey (MCBS) is the annual survey of Medicare beneficiaries conducted by the Centers for Medicare and Medicaid Services (CMS) to track their health, medical care, and spending on medical care from all possible sources. The survey covers all Medicare beneficiaries: those enrolled in both fee-for-service (FFS) Medicare and in Medicare Advantage, who reside both in the community and in institutions, and who are entitled to Medicare for any reason, whether by age, disability or end-stage renal disease status. It uses stratified random sampling to represent the entire Medicare population for each year, averaging about 12,000 total beneficiaries and about 2100 Medicare Advantage enrollees annually during the period 2001-2009.

Sample beneficiaries are surveyed three times a year by an interviewer using a computer-assisted personal interviewing (CAPI) program. The CAPI program automatically directs the interviewer to the appropriate questions and performs general outlier analysis in real time. Questions range from basic demographic information to health status and health care utilization. Beneficiaries are asked to save supporting documentation for the interview, such as Explanation of Benefit forms, provider receipts, and prescription medicine bottles. For services covered by FFS Medicare, survey responses were matched with administrative bill data to adjust for under-reporting of services and payment errors. Non-covered services, such as prescription medicines, were reviewed and edited using a variety of methods developed by MCBS staff.

The MCBS uses several forms of imputations and adjustments to estimate total beneficiary spending on medical care. For example, for FFS beneficiaries, administrative claims data are used to supplement survey events reported with missing or incorrect payments. For this paper, a significant weakness of the survey involves the imputation for beneficiaries that die during the year, those with the greatest expenditures. The imputation process involves using a comparable "donor" beneficiary to substitute for some or all of the survey answers. In order to avoid using the donor information for deceased beneficiaries, I only include beneficiaries who do not pass away during the year. I also exclude non-elderly beneficiaries. The resulting annual sample size ranges from a low of about 1300 beneficiaries in 2003 to a high of about 2500 beneficiaries in each of 2008 and 2009. In order to increase the sample size in each regression, however, I pool the data into three-year groupings: 2001-2003, 2004-2006, and 2007-2009. Table 2 shows the sample sizes, average beneficiary characteristics and average spending for each three-year period.

For the purposes of this paper, I only use spending on short-term care: medical provider services, hospital inpatient services, hospital outpatient services, and prescribed medicines. (The MCBS also tracks spending on long-term care, namely nursing homes, home health, and hospices, and it comprises about a third of Medicare beneficiaries' medical spending on average.) The National Research Council recommendation of studying medical spending on an episode-of-treatment basis, although it is not explicit, appears to only relate to spending on short-term care. In addition, previous papers generally only use doctor, hospital and prescription drug spending and I wish to be able to compare the results for Medicare Advantage.

The requirement for a regression-based index is a set of dummy variables that encode whether or not the respondent has been diagnosed with certain illnesses in the previous year. Diagnoses are collected once a year in the in-person survey portion of the MCBS. Beneficiaries had responses to one of two surveys in the dataset. If the beneficiary was residing in the community at the time of the survey, a community survey was administered directly to them which asked them about their diagnoses. The illnesses were defined verbally and in both medical and layman's terms ("hypertension/high blood pressure"). For a number of chronic illnesses (hypertension and Alzheimer's/dementia, for example), the beneficiary was asked if they had ever been diagnosed with the illness. Since these illnesses rarely go into remission, beneficiaries reporting that they had ever had these illnesses were coded as having had them in the past year.

If the beneficiary was institutionalized at the time of the survey, a facility survey was filled out by an institution staff member from the beneficiary's MDS assessment (a form on an inpatient's health conditions filled out quarterly by nursing homes receiving Medicare funding). The facility survey asks about a greater number of illnesses than the community survey but to pool both samples together, we were restricted to the illnesses asked about in the community survey. Appendix Table 1 lays out how community interview variables and facility interview variables were matched to define the diseases.

In the end, 21 conditions were defined, which are listed in Appendix Table 1. Included in those conditions are nine cardiovascular conditions (arteriosclerotic heart disease, hypertension, hypercholesterolemia, myocardial infarction, angina/coronary heart disease, other heart

conditions including valve problems, congestive heart failure, heart rhythm problem, and stroke). While cancers in different parts of the body were asked about separately in the survey, the prevalences of them were so low, I have grouped all cancers together as one condition. The remaining conditions are diabetes, arthritis (both rheumatoid and osteoarthritis), mental/psychiatric disorder, mental retardation, Alzheimer's/dementia, osteoporosis, broken hip, Parkinson's disease, emphysema/asthma/chronic obstructive pulmonary disorder (COPD), paralysis, and renal failure.

4.1 Hypercholesterolemia

Hypercholesterolemia is a condition with very high prevalence in the elderly. It is not, however, asked about in the MCBS community survey until 2009 and is never asked about in the facility survey. In order to create an expenditure index for this condition, therefore, I use the responses of the 2009 community survey to predict the presence of hypercholesterolemia in respondents in the years before 2009 and in the facility respondents in 2009. I model the diagnosis of hypercholesterolemia as a function of reported diagnoses of other conditions, demographics, health status, and geographic location with a probit equation and use the coefficients to predict hypercholesterolemia in the 2009 facility respondents and for the respondents in the surveys in the years before 2009. In addition, an adjustment is made to account for the secular rise in the diagnosis of hypercholesterolemia in the years leading up to 2009 based on the rise in the prevalence of the Clinical Classification System diagnosis code "Disorders of lipid metabolism" in the claims of FFS Medicare respondents in the MCBS. Table 3 shows the effect of this adjustment as it shows the mean prediction from the probit model by year, the trend in the FFS

claims, the multiplicative adjustment based on that trend made to the predictions from the probit model, and the final prevalence of hypercholesterolemia based on the adjustment. This predicted and adjusted prevalence of hypercholesterolemia rises steadily from about 49% in 2001 to 69% in 2009.

5. Modelling health-care spending as a function of diagnoses

As discussed above, in order to create a disease-based expenditure index, it is necessary to have average per-case expenditures for each condition. An index created with a regression requires modeling individual health-care expenditure as a function of each individual's diagnoses in order to recover average per-case expenditure from the coefficients. In this section, I discuss how to model an individual's health-care spending as a function of their diagnoses. I then compare a variety of models for Medicare Advantage enrollees and choose a few of the best fitting of them to create indexes from.

Modeling health-care spending is econometrically challenging. There is censoring at zero (no non-negative spending) with often a cluster of observations at zero. Spending is also typically heavily skewed with a long tail. The spending of Medicare Advantage enrollees exhibits all the typical characteristics of health-care spending. Figure 2 shows the distribution of health-care spending by Medicare Advantage enrollees in the 2001-2003 period. There is a cluster of observations with zero spending and a very long tail reaching out to around $400,000. The 95th percentile of this distribution, however, is $18,189 and to give a clearer picture of the main part of the distribution, Figure 3 shows only this lower 95%.

Table 4 compares several models of health-care spending on such criteria as predicted mean and median, mean absolute prediction error, root mean square error and the shape of the distribution of the residuals. In choosing these criteria, I am following the recommendation of Buntin and Zaslavsky (2004) who discuss in detail how to assess models of health-care spending.

When modeling with GLM, it is necessary to choose the appropriate variance function. This choice can be made with a Park test (Park 1966), which estimates the power of the relationship of the mean to the variance. The last column of Table 4 shows the results of Park tests run with the residuals and fitted values of each model; the resulting coefficients range from 1.61 to 1.79 and therefore all point to the variance proportional to mean squared (gamma-like) being the most appropriate function as they are closest to 2 in value. I therefore only report results from GLM models with the variance proportional to mean squared.

The models in Table 4 include two-part models; these are estimated by first estimating the probability of having any health-care spending as a function of each beneficiary's demographics: race, age and age squared, log income, education, Census division, ethnicity, gender, and residence in a skilled nursing facility (SNF) and then estimating spending as a function of each beneficiary's diagnoses only on those beneficiaries with positive spending.

The three specifications entail slightly different assumptions about the underlying model of health-care spending. Under OLS assumptions, the spending model can be written formally as:

$$y_{it} = \exp\left(\beta_{0t} + \sum_{j=1}^{J} \beta_{jt} D_{ijt} + \varepsilon_{it}\right)$$

where *i* indexes individuals, *j* indexes conditions, *t* indexes years, y_{it} is health expenditure of individual *i* in year *t,* and D_{ijt} is a dummy variable for whether person *i* has condition *j* in year *t.*

Under OLS assumptions, in a two-part model, the expectation of y_{it} given D_{ijt} is:

$$E\left[y_{it}\middle|D_{ijt}\right] = \varphi(X_{it}'\alpha) * \exp(\beta_{0t} + \sum_{j=1}^{J}\beta_{jt}D_{ijt})*\mathrm{E}(\exp(\varepsilon_{it}))$$

$\varphi(X_{it}'\alpha)$ is the CDF of the normal distribution applied to the parameters and variables from the first step of the two-step model; it is therefore the probability of y_{it} being greater than zero.

When calculating a predicted level of y_{it} from a log-transformed OLS model, $\mathrm{E}(\exp(\varepsilon_{it}))$ must be estimated. When creating predictions for the OLS model, I follow conventional practice by using the smearing factor proposed by Duan (1983): $\hat{S} = \frac{1}{n}\sum_{i=1}^{n}\exp(\hat{\varepsilon}_{it})$.

Under GLM assumptions, $E\left[y_{it}\middle|D_{ijt}\right] = \varphi(X_{it}'\alpha) * \mu(\beta_{0t} + \sum_{j=1}^{J}\beta_{jt}D_{ijt})$ where μ() is the inverse of the link function. With an identity link, μ() is the identity function, and with a log link, μ() is the exponential function:

Identity link: $E\left[y_{it}\middle|D_{ijt}\right] = \varphi(X_{it}'\alpha) *(\beta_{0t} + \sum_{j=1}^{J}\beta_{jt}D_{ijt})$

Log link: $E\left[y_{it}\middle|D_{ijt}\right] = \varphi(X_{it}'\alpha) *\exp(\beta_{0t} + \sum_{j=1}^{J}\beta_{jt}D_{ijt})$

In one-part models of spending, $\varphi(X_{it}'\alpha)$ is simply dropped from the definition of the expectation.

None of the six specifications in Table 4 other than a one-step model with OLS have obvious advantages or disadvantages. The two two-part GLM specifications have slightly lower root

MSE but their one-part counterparts and two-part OLS have residuals whose distributions appear slightly closer to the normal distribution.

In addition, there are other considerations outside the criteria in the table. As mentioned, GLM estimated with an identity function has the advantage that it directly produces average spending with the regression coefficients. As discussed in more detail in Hall and Highfill (2013), models estimated on a log transformation of spending require further assumptions to translate their results into average spending per condition. Another consideration is that bootstrapping confidence intervals requires robust convergence of the GLM models; this requirement turned out to rule out the two-step GLM model with an identity link. In the end, I report results from the one-step GLM model with an identity link as it performs reasonably well, converges reliably, and does not require additional assumptions to calculate average expenditure per case as the models that use logged spending do.

6. Inflation

Table 5 reports aggregate inflation as measured by a condition-based expenditure index based on a one-step GLM model of health-care spending with an identity link. The average spending per case for each condition was taken from the regression coefficients and spending for the different conditions were then aggregated together with prevalence weights to produce a Fisher index of expenditures. The table shows the annualized growth rate of the index in each period and also shows the overall annualized growth rate from 2001-2003 to 2007-2009. Bootstrapped percentile 95 percent confidence intervals are shown in italics. As the table

shows, medical inflation among Medicare Advantage enrollees is about 5.7 percent per year, with a 95 percent confidence interval of [4.0 percent, 7.4 percent].

Table 5 also reports the level of condition-based medical inflation among Medicare FFS beneficiaries as measured by a similar regression-based index. Overall inflation is more than a percentage point lower among Medicare FFS beneficiaries, at 4.5 percent annually. In addition, Hall and Highfill (2014) calculate a variety of condition-based expenditure indexes for Medicare beneficiaries based on both the MCBS and the Medical Expenditure Panel Survey (MEPS) and using a variety of methods. Inflation among all beneficiaries is 3.3 percent annually when based on the MCBS and 2.7 percent when based on the MEPS. In general, therefore, medical inflation among Medicare Advantage enrollees appears rather high compared to similar estimates for Medicare beneficiaries. I devote the rest of the paper to determining the reasons why inflation is higher among MA enrollees than Medicare FFS beneficiaries.

7. Why is inflation higher among Medicare Advantage enrollees?

To answer this question, I first separated total medical spending into drug and nondrug spending. Table 6 reports condition-based medical expenditure indexes that are calculated separately for nondrug and drug spending and for the two beneficiary categories. It shows that the higher inflation among MA enrollees is entirely in drug spending where inflation is measured to be 13.5 percent annually while inflation in drug spending among FFS beneficiaries is 8.1 percent annually. Inflation in nondrug spending is nearly the same in the two beneficiary

categories: 3.3 percent annually among MA enrollees and 3.6 percent among FFS Medicare beneficiaries.

There are three possible causes of higher inflation in drug spending among MA enrollees that I will discuss. The first potential cause is an issue with the MCBS, namely that all spending is underreported for MA enrollees but for FFS Medicare beneficiaries, only drug spending is underreported. I will show that correcting for this removes nearly half of the difference in inflation between MA enrollees and FFS beneficiaries.

The second potential cause is the shift in average health status among MA enrollees which was discussed above, in section 2. If the population of MA enrollees is changing to be less healthy relative to the FFS population, inflation among them might appear to be higher. However, I show that this shift plays almost no role in making inflation higher among MA enrollees.

Finally, the third potential cause is a differential response of MA enrollees to the introduction of Medicare Part D in 2006. If MA enrollees benefited more from the addition of prescription drug coverage to the standard Medicare package of benefits than FFS Medicare beneficiaries, their utilization of drugs would have risen more and their drug-based inflation would be higher. I show that MA enrollees did appear to benefit more from Part D than FFS Medicare beneficiaries and that differences in response to Part D account for the remainder of the difference in inflation between MA enrollees and FFS Medicare beneficiaries.

7.1 Differential reporting of drug and nondrug spending in MCBS for FFS beneficiaries

As discussed above, nondrug spending and medical events are collected differently for MA enrollees and FFS beneficiaries in the MCBS. All beneficiaries' nondrug spending and events are collected through the in-person survey. Nondrug spending and events for FFS beneficiaries are then matched and augmented with information from their Medicare Part A and Part B claims. The only source of information for MA enrollees, however, is the in-person survey. As the documentation for the MCBS notes, however, the process of matching survey-collected events to claims for FFS beneficiaries reveals that there is a considerable amount of underreporting in the survey. For example, the documentation for the 2005 MCBS reports that only 43% of events and 59% of spending reported in the claims were matched to a survey event.

It is therefore likely that nondrug events and spending for MA enrollees and drug events for all respondents in the MCBS are underreported to that extent. Table 7 reports the drug and nondrug shares of spending for both beneficiary categories. As it shows, prescription drugs constitute a higher share of spending for MA respondents in the MCBS than for FFS beneficiaries. It also shows that the drug share of spending is growing and the nondrug share of spending is shrinking over time for both categories of beneficiaries.

In general, if the underreporting of spending is random and the same across drug and nondrug spending, the measurement of growth rates in general and of inflation is not affected. The expenditure indexes for Medicare Advantage where both kinds of spending are measured in the same way are therefore likely to be accurate. However, the faster growth of drug spending

results in the understatement of medical inflation for FFS beneficiaries, since the share of the part of spending that is growing more quickly is underreported.

To correct for this, I take the separate expenditure indexes for drug and nondrug spending for FFS beneficiaries and reweight them with the Medicare Advantage shares of drug and nondrug spending to create a new index for overall medical inflation in FFS beneficiaries. The results are shown in Table 8. Reweighted medical inflation in FFS beneficiaries is 5.0 percent annually, higher by half a percentage point than the previous estimate. While it is still 0.7 percentage point below inflation for Medicare Advantage, correcting for the differential reporting of drug and nondrug spending of FFS beneficiaries in the MCBS removes nearly half the difference in medical inflation between MA enrollees and FFS beneficiaries.

7.2 Changes in average health of Medicare Advantage enrollees

As discussed in section 2, due to several policy reforms in the MA program, there was a shift in the average health status of MA enrollees and the difference in average health status between MA enrollees and FFS beneficiaries disappeared between the beginning and end of the period 2001-2009. If the population of MA enrollees is shifting to be relatively less healthy, medical inflation may be overstated if the shift is reflected by more intensive treatment of the conditions of sicker enrollees. Ideally, medical inflation is measured over time on patients of the same average health status.

However, changes in average health status turn out to play little role in the difference in inflation between MA enrollees and FFS beneficiaries. To see this, first recall from Table 6 that there is very little difference in nondrug inflation between the two beneficiary categories; in

fact, nondrug inflation is slightly lower for MA enrollees. If the changes in average health status were reflected in inflation, we would expect to see it reflected across drug and nondrug spending.

Secondly, the gap in drug inflation between MA enrollees and FFS beneficiaries exists even after expenditure indexes are calculated by health status. Table 9 shows separate expenditure indexes for drug spending calculated by health status and beneficiary category. Inflation in the drug spending of MA enrollees is at least two percentage points higher than that of FFS beneficiaries in each health status. Shifts in the average health status of MA enrollees therefore seem unlikely to be raising inflation among them relative to inflation among FFS beneficiaries.

7.3 The expansion of prescription drug coverage

At the beginning of the period under study, many Medicare beneficiaries did not have prescription drug insurance as it was not originally included in the standard package of Medicare benefits. Those who did received it from an outside source: as part of their employer-sponsored supplemental retiree insurance, through a Medicare private plan, through a Medigap supplemental plan, through the Medicaid program if they were eligible, or through some other source such as the Veterans' Administration. Table 10 shows that, in the first period 2001-2003, only 72 percent of FFS Medicare respondents in the MCBS report having prescription drug coverage.

The Medicare Modernization Act of 2003 greatly expanded prescription drug benefits for Medicare beneficiaries. The expansion started in 2004 with the prescription drug discount card program and was completed in 2006 with the introduction of Medicare Part D, a prescription

drug insurance program that all Medicare beneficiaries were eligible to enroll in. As Table 10 shows, in the last period of 2007-2009, after Part D took effect, 91 percent of FFS Medicare respondents in the MCBS report having prescription drug coverage, a difference of nearly twenty percentage points from the first period.

Is the high drug inflation of MA enrollees explained by an increase in drug utilization to the introduction of Part D? The answer to this question is not entirely straightforward. Before Part D took effect, most Medicare private plans offered prescription drug coverage as part of the extra benefits they offered. As Table 10 shows, 92 percent of MA enrollees in the period 2001-2003 report having prescription drug coverage. However, the prescription drug coverage of Medicare private plans may not have been very generous. Hall (2011) reports that less than half of Medicare private plans offering drug coverage in 2001 and 2002 offered brand-name drug coverage and that the mean annual coverage limit of brand-name drug coverage was only $500. By contrast, Part D plans are required to offer brand-name drug coverage and have no coverage limit. Table 11 shows median drug spending by prescription drug coverage status and health status over time. In the initial period, Medicare private plan enrollees, although the vast majority of them report having prescription drug coverage, have relatively low prescription drug spending. The only category of prescription drug coverage with lower drug spending than MA enrollees is FFS respondents who report having no prescription drug coverage at all. This relationship holds across health statuses so it is not driven by the health advantage of Medicare private plan enrollees. In 2001-2003, Medicare private plan enrollees in fair or poor health have lower median prescription drug spending than Medicare FFS beneficiaries with employer-sponsored drug coverage who are in good health. The low prescription drug spending of MA

enrollees (even those in fair or poor health) taken together with the statistics reported in Hall (2011) suggests that their drug coverage was, in fact, sparse and that the introduction of Part D may have increased their coverage and therefore their utilization and spending substantially.

The introduction of Part D has already been shown to increase the drug utilization and spending of Medicare beneficiaries significantly. Two kinds of papers have looked at the question of how much of an effect Part D had. The first examines the effect of Part D on the spending and utilization of all Medicare beneficiaries, using the near-elderly as a control. Lichtenberg and Sun (2007) find that Part D raised relative utilization of drugs by the elderly 13 percent, Ketcham and Simon (2008) find that it raised relative utilization by around 5 percent, and Yin et al. (2008) find that it raised relative utilization by about 6 percent. These estimates are made across all elderly, including those who already had generous prescription drug coverage, so they would form a floor for the likely effect of Part D on the drug utilization of Medicare Advantage enrollees.

The second type of paper uses the MCBS as a data source and estimates the effect of gaining Part D solely on Medicare beneficiaries who gained drug coverage as a result of the expansion based on answers in the MCBS about the possession of drug coverage. Kaestner and Khan (2009) found that drug utilization expanded by 70 percent among those who gained coverage from Part D. Dunn and Shapiro (2014) also find that Part D has a significant and positive effect on drug expenditures as part of their analysis. Both of these papers treat drug coverage as a dummy variable and count Medicare private plan enrollees as having drug coverage before Part D. As discussed above, however, Part D may have increased the level of drug coverage for these

beneficiaries considerably. These estimates therefore are a ceiling on the likely effect of Part D on the drug utilization of Medicare private plan enrollees.

Part D therefore likely raised the drug utilization of Medicare private plan enrollees somewhere between 5 and 70 percent above what their utilization would have been without the coverage expansion. In order to see if Part D alone could have accounted for the greater drug inflation of Medicare Advantage enrollees, I lowered their drug spending in 2006 and after by one-third (which is equivalent to Part D having a utilization effect of 50 percent) and then recalculated the condition-based medical expenditure for drug spending.

I then compared it to a condition-based medical expenditure index calculated from the drug spending of Medicare FFS beneficiaries who have employer-sponsored prescription drug insurance. As Table 11 shows, these beneficiaries had the highest drug spending in the first period of all prescription drug coverage categories across health statuses. They also have an annual growth rate between the first and third periods in their median drug spending of only 5 to 7 percent, while the other categories mostly saw double-digit growth in their spending. These beneficiaries therefore probably had generous drug coverage before the introduction of Part D and were the least affected by it; they may therefore serve as a comparison group.

Table 12 shows the results of this comparison. Unadjusted inflation in drug spending among Medicare Advantage enrollees was 13.5 percent but when drug spending is reduced by one-third in 2006 and after, inflation in drug spending for the enrollees is now only 3.4 percent. Inflation in drug spending among Medicare FFS beneficiaries with drug coverage as part of their employer-sponsored supplemental retiree insurance is virtually the same as the adjusted drug

inflation, at 3.3 percent. The introduction of Part D therefore appears to account for the remainder of the excess inflation of Medicare Advantage enrollees over that of Medicare FFS beneficiaries.

While other categories of prescription drug coverage also appear to have benefited from the expansion of Part D judging by the growth rates of their median drug spending, FFS beneficiaries with employer-sponsored drug coverage make up one-third of FFS beneficiaries so their lower inflation holds the inflation estimate for all FFS beneficiaries down to about 8 percent, as shown in Table 6.

8. Conclusion

I have a created a condition-based medical expenditure index for Medicare Advantage enrollees based on a generalized linear model of health-care spending with an identity link which estimates condition-based inflation from 2001-2003 to 2007-2009 among them to be 5.7 percent per year, with a 95 percent confidence interval of 4.0 percentto 7.4 percent. This estimate lies towards the higher end of previous condition-based estimates of medical inflation in Medicare beneficiaries. Hall and Highfill (2014) found that regression-based indexes based on a log model of spending for all Medicare beneficiaries and for FFS Medicare beneficiaries produced slightly lower annual inflation estimates ranging from 3.3 percent to 4.5 percent and a regression-based index based on a model with an identity link for FFS beneficiaries produces an estimate of inflation of 4.5 percent.

I then analyze why inflation is higher among Medicare Advantage enrollees than among FFS beneficiaries. There turn out to be two reasons. The first is that drug spending is differentially underreported in the MCBS among FFS beneficiaries since the nondrug spending and events collected from them in the survey are supplemented with information from their Medicare claims. Since drug spending grows faster than nondrug spending during this period, the differential underreporting of drug spending among FFS beneficiaries results in an artificially low inflation estimate. When this is corrected for by reweighting separate drug and nondrug indexes for FFS beneficiaries with the Medicare Advantages shares of drug and nondrug spending, inflation among FFS beneficiaries is found to be 5.0 percent annually. The underreporting therefore accounts for nearly half of the difference in inflation estimates between Medicare Advantage enrollees and FFS beneficiaries.

The second reason is the expansion of prescription drug coverage during this period with the introduction of Medicare Part D and Medicare Advantage enrollees' higher utilization response to it. Although the vast majority of Medicare Advantage enrollees had prescription drug coverage before the advent of Part D, the pattern of their drug spending and previous research both suggest that their coverage was not very generous and that Part D would have represented a considerable coverage increase for them. Based on estimates in the literature of the drug utilization impact of Part D on Medicare beneficiaries, I reduce the drug spending of Medicare Advantage enrollees in 2006 and after by one-third and recalculate the condition-based medical expenditure index based on drug spending. Drug-based inflation after this adjustment is now nearly the same as inflation for Medicare FFS beneficiaries with employer-spnosored prescription drug insurance who had relatively generous coverage throughout the

whole period; the expansion of prescription drug coverage may therefore be assumed to account for the rest of the difference in inflation between MA enrollees and FFS beneficiaries.

References

Aizcorbe, A., R. Bradley, R. Greenaway-McGrevy, B. Herauf, R. Kane, E. Liebman, S. Pack, and L. Rozental (2011). Alternative Price Indexes for Medical Care: Evidence from the MEPS Survey. BEA working paper. http://www.bea.gov/papers/pdf/MEPS_Draft_012011.pdf.

Aizcorbe, A. and N. Nestoriak (2011). Changing mix of medical care services: Stylized facts and implications for price indexes. *Journal of Health Economics* 30(3), 568-74.

Berndt, E., A. Bir, S. Busch, R. Frank, and S. Normande (2002). The Medical Treatment of Depression, 1991-1996: Productive Inefficiency, Expected Outcome Variations, and Price Indexes. *Journal of Health Economics* 21(3), 373-96.

Brown, R., D. Clement, J. Hill, S. Retchin, and J. Bergeron (1993). Do health maintenance organizations work for Medicare?. *Health Care Financing Review* 15(1), 7-23.

Buntin, M. and A. Zaslavsky (2004). Too much ado about two-part models and transformation? Comparing methods of modeling Medicare expenditures. *Journal of Health Economics* 23(3), 525-42.

Congressional Budget Office (2014). The 2014 Long-Term Budget Outlook. http://www.cbo.gov/sites/default/files/cbofiles/attachments/45471-Long-TermBudgetOutlook_7-29.pdf.

Cutler, D., M. McClellan, J. Newhouse, D. Remler (1998). Are Medical Prices Declining? Evidence from Heart Attack Treatments. *Quarterly Journal of Economics* 113(4), 991-1024.

Duan, N. (1983). Smearing estimate: a nonparametric retransformation method. *Journal of the American Statistical Association* 78, 605-10.

Dunn, A., E. Liebman, S. Pack, and A. Shapiro (2010). Medical Care Price Indexes for Patients with Employer-Provided Insurance: Nationally-Representative Estimates from MarketScan Data. BEA working paper. http://www.bea.gov/papers/pdf/medical_care_expenditure_indexes_dunn.pdf.

Dunn, A. and A. Shapiro (2014). Does Health Insurance Improve Health Outcomes? The Effects of Medicare Part D on Mortality. BEA working paper.

Hall, A. (2011). Measuring the Return on Government Spending on the Medicare Managed Care Program. *The B. E. Journal of Economic Analysis & Policy* 11(2).

Hall, A. and T. Highfill (2013) A Regression-Based Medical Care Expenditure Index for Medicare Beneficiaries. BEA working paper. http://www.bea.gov/papers/pdf/a_regression_base_medical_care_expenditure_index_for_medicare.pdf.

Hall, A. and T. Highfill (2014). Calculating Disease-Based Medical Care Expenditure Indexes for Medicare Beneficiaries: A Comparison of Method and Data Choices. BEA working paper.

http://www.bea.gov/papers/pdf/calculating_disease_based_medical_care_expenditure_indexes_for.pdf.

Kaestner, R. and N. Khan (2009). Medicare Part D and its Effect on the Use of Prescription Drugs and Use of Other Health Care Services of the Elderly. *Journal of Policy Analysis and Management* 31(2): 253-79.

Ketcham, J. and K. Simon (2008). Medicare Part D's Effects on Elderly Drug Costs and Utilization. *American Journal of Managed Care* 14(11), 14-22.

Lichtenberg, F. and S. Sun (2007). The Impact of Medicare Part D On Prescription Drug Use By The Elderly. *Health* Affairs 26(6), 1735-44.

Martin, A., M. Hartman, L. Whittle, A. Catlin and the National Health Expenditure Accounts Team (2014). National Health Spending in 2012: Rate Of Health Spending Growth Remained Low For The Fourth Consecutive Year. *Health Affairs* 33(1), 67-77.

McWilliams, J., J. Hsu and J. Newhouse (2012). New Risk-Adjustment System Was Associated With Reduced Favorable Selection In Medicare Advantage. *Health Affairs* 31(12), 2630-40.

National Research Council (2010). *Accounting for Health and Health Care: Approaches to Measuring the Sources and Costs of Their Improvement.* Washington, DC: The National Academies Press.

Riley, G., C. Tudor, Y. Chiang, and M. Ingber (1996). Health status of Medicare enrollees in HMOs and fee-for-service in 1994. *Health Care Financing Review* 17(4), 65-76.

Rosen, A., D. Cutler, D. Norton, H. Hu and S. Vijan (2007). The Value of Coronary Heart Disease For The Elderly. *Health Affairs* 26(1), 111-23.

Scitovsky, A. (1967). Changes in the costs of treatment of selected illnesses, 1951-1965. *American Economic Review,* 57(5), 1182-95.

Shapiro, I., M. Shapiro, and D. Wilcox (2001). Measuring the value of cataract surgery. In D. Cutler and E. Berndt (eds.), *Medical Care Output and Productivity* (National Bureau of Economic Research Studies in Income and Wealth Series, vol. 62, pp. 411-38). Chicago, IL: University of Chicago Press.

Yin, W., A. Basu, J. Zhang, A. Rabbani, D. Meltzer, and G. Alexander (2008). The effect of the Medicare Part D prescription benefit on drug utilization and expenditures. *Annals of Internal Medicine,* 148(3), 169-77.

Figure 1
Share of elderly Medicare beneficiaries enrolled in a private plan

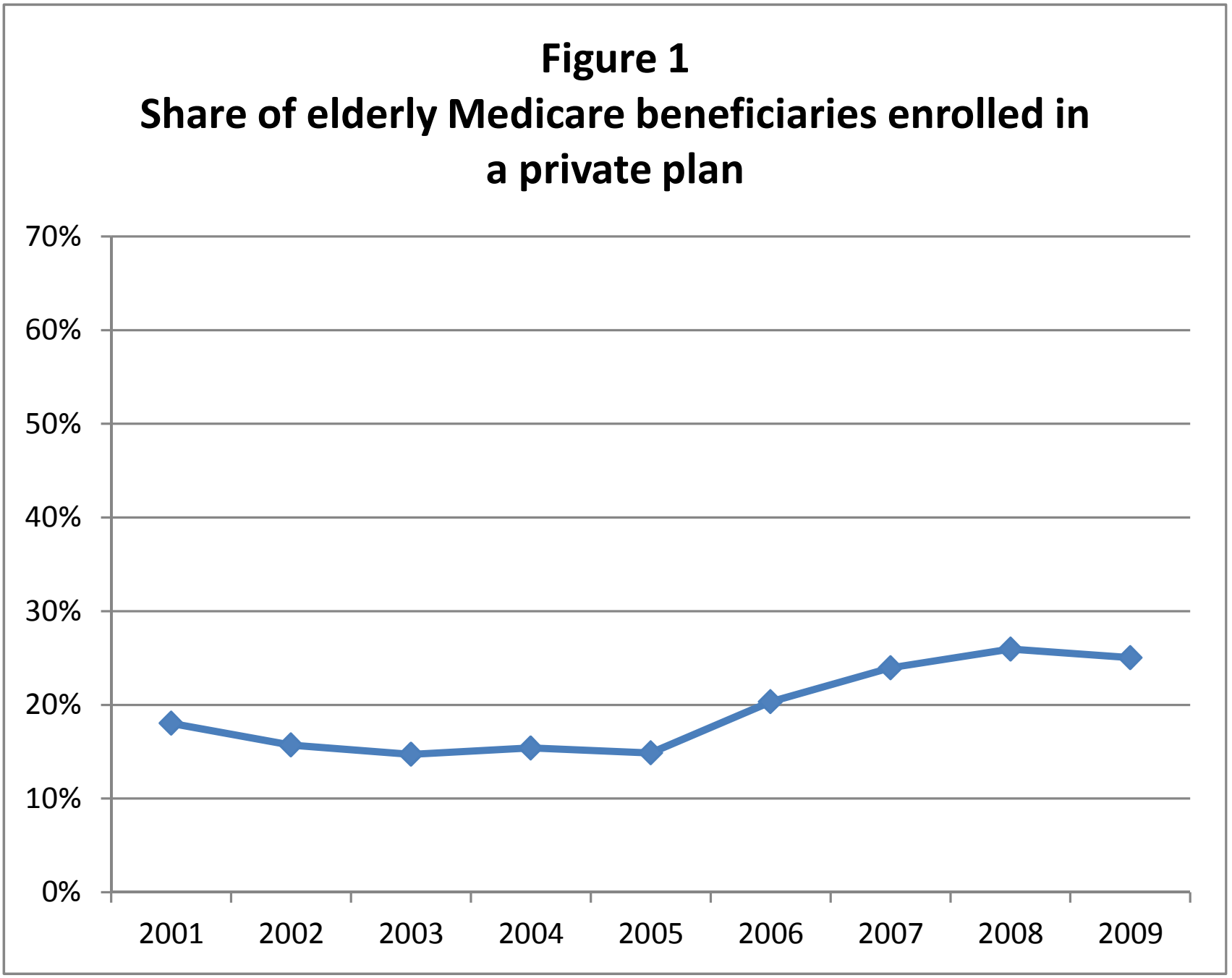

Figure 2

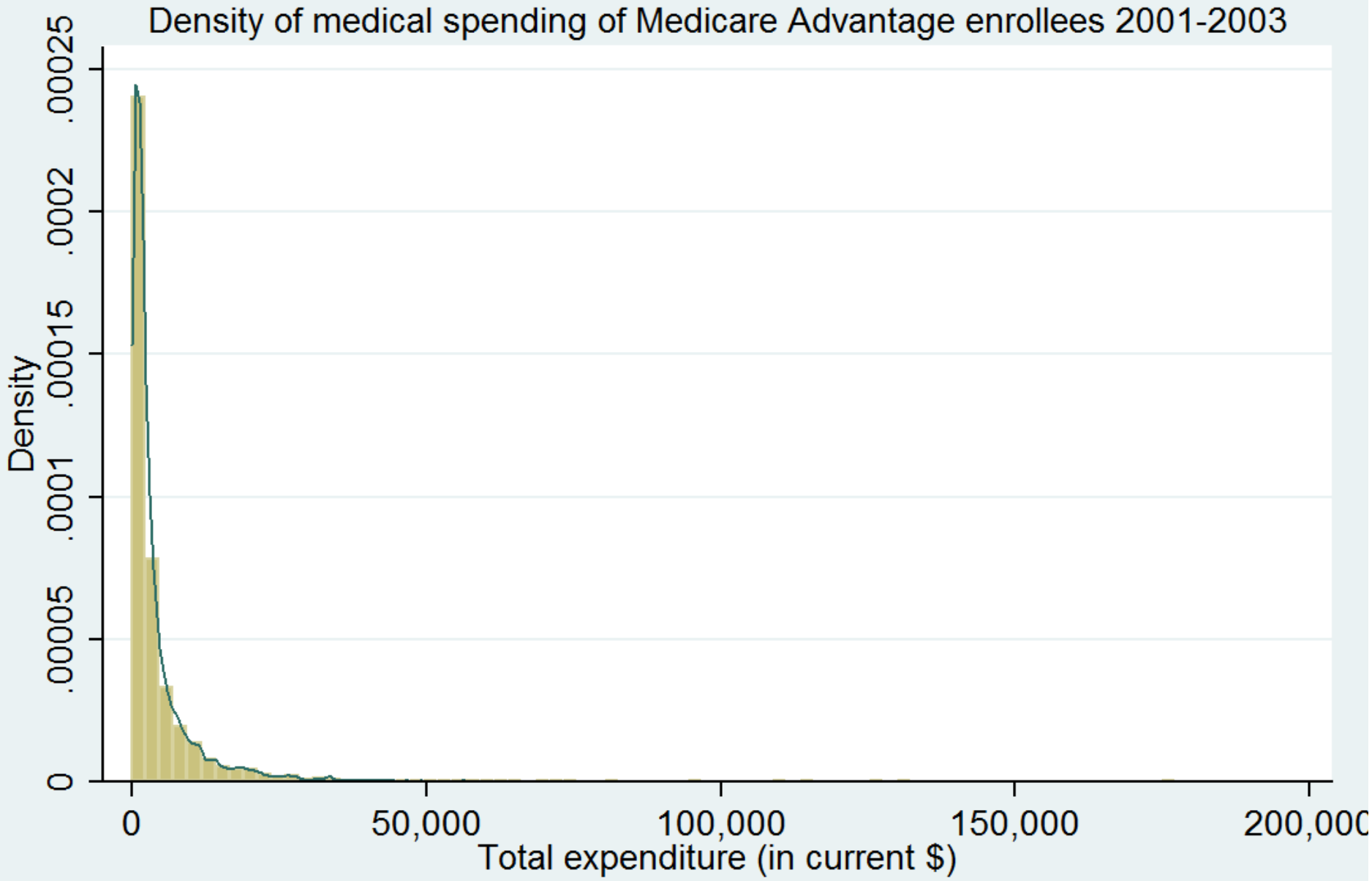
Density of medical spending of Medicare Advantage enrollees 2001-2003
Density
0
.00005
.0001
.00015
.0002
.00025
0
50,000
100,000
150,000
200,000
Total expenditure (in current $)

Figure 3


Density of medical spending (lower 95%) of
Medicare Advantage enrollees 2001-2003
Density
0
.0001
.0002
.0003
.0004
0
5,000
10,000
15,000
20,000
Total expenditure (in current $)

Table 1

Differences in self-reported health status between beneficiary categories

Percent reporting	Medicare Advantage	Medicare FFS	Difference in percentage points
2001-2003			
"Fair" or "poor" health	18.7%	22.9%	-4.2***
"Good" health	34.0%	33.1%	0.8
"Very good" or "excellent" health	47.3%	44.0%	3.4***
2004-2006			
"Fair" or "poor" health	19.1%	20.7%	-1.6*
"Good" health	34.6%	33.1%	1.5
"Very good" or "excellent" health	46.4%	46.2%	0.2
2007-2009			
"Fair" or "poor" health	20.8%	20.4%	0.4
"Good" health	32.7%	32.6%	0.1
"Very good" or "excellent" health	46.5%	47.0%	-0.5

Note: ***=Difference is significant at a less than 0.001 percent level when tested with an unweighted t-test of differences between means. *=Difference is significant at a level between .01 and .05 percent.

Table 2

Average Medicare Advantage enrollee characteristics and spending by three-year period

Period	Number of respondents	Mean health-care spending	Percent female	Mean age	Percent nonwhite	Percent college graduate
2001-2003	4,774	$4,654.07	59.7%	75.1	16.1%	13.6%
2004-2006	4,721	$5,572.37	60.7%	75.7	16.3%	14.4%
2007-2009	6,661	$6,799.75	56.4%	75.1	17.7%	15.9%

Note: statistics are weighted with MCBS sample weights.

Table 3

Predicting hypercholesterolemia among Medicare Advantage enrollees

Year	Predicted prevalence in Medicare Advantage enrollees	Prevalence of "Disorders of lipid metabolism" among FFS Medicare beneficiaries	Adjustment made to pre-2009 predictions of hypercholesterolemia among Medicare Advantage enrollees	Adjusted prevalence of hypercholesterolemia in Medicare Advantage enrollees
2001	68.1%	41.8%	0.72	48.7%
2002	68.3%	45.8%	0.78	53.5%
2003	68.1%	48.4%	0.83	56.4%
2004	69.4%	52.4%	0.90	62.2%
2005	70.0%	54.1%	0.93	64.8%
2006	69.4%	55.1%	0.94	65.5%
2007	69.4%	56.6%	0.97	67.3%
2008	69.7%	57.4%	0.98	68.5%
2009	69.2%	58.4%		69.2%

Table 4

Comparisons of models of spending as a function of diagnoses

Model	Predicted mean	Predicted median	Mean absolute prediction error	Root mean square error	Skewness of residuals	Kurtosis of residuals	Park test coefficient
1-part GLM gamma identity	$5,899.53	$4,933.92	$4,982.25	1.28	0.70	6.63	1.78
1-part GLM gamma log	$6,136.97	$4,737.02	$5,183.71	1.28	0.68	6.51	1.79
1-part OLS log	$7,446.65	$5,030.93	$6,055.21	1.58	-1.82	9.95	1.89
2-part GLM gamma identity	$5,852.61	$4,920.45	$4,962.52	1.17	1.23	6.99	1.74
2-part GLM gamma log	$6,069.80	$4,737.92	$5,145.49	1.18	1.21	6.87	1.78
2-part OLS log	$6,551.95	$4,819.87	$5,417.99	1.22	-0.35	4.16	1.80
Actual mean and median	$5,898.69	$2,711.58	**Value for normal distribution:**		0	3	

Table 5

Annualized growth rates of condition-based medical expenditure indexes

	Medicare Advantage			Medicare FFS		
Period	**Point estimate**	**CI: Lower bound**	**CI: Upper bound**	**Point estimate**	**CI: Lower bound**	**CI: Upper bound**
2001-2003 to 2004-2006	5.0%	*1.8%*	*8.8%*	5.3%	*3.8%*	*7.0%*
2004-2006 to 2007-2009	5.5%	*2.6%*	*8.5%*	3.2%	*2.0%*	*4.5%*
2001-2003 to 2007-2009	5.7%	*4.0%*	*7.4%*	4.5%	*3.7%*	*5.4%*

Notes: 1. Based on one-step models of health-care spending estimated with GLM with an identity link. 2. Bootstrapped percentile 95% CIs (confidence intervals) reported.

Table 6

Annualized growth rates of condition-based medical expenditure indexes: nondrug and drug spending

		Medicare Advantage			Medicare FFS		
		Point estimate	CI: Lower bound	CI: Upper bound	Point estimate	CI: Lower bound	CI: Upper bound
Nondrug spending	**2001-2003 to 2004-2006**	2.9%	*-1.3%*	*7.9%*	4.4%	*3.0%*	*6.3%*
	2004-2006 to 2007-2009	3.3%	*-0.4%*	*7.1%*	2.6%	*0.8%*	*3.9%*
	2001-2003 to 2007-2009	3.3%	*1.3%*	*5.8%*	3.6%	*2.8%*	*4.7%*
Drug spending	**2001-2003 to 2004-2006**	12.9%	*8.7%*	*16.1%*	9.2%	*8.2%*	*10.3%*
	2004-2006 to 2007-2009	10.1%	*7.9%*	*12.5%*	5.5%	*4.4%*	*6.5%*
	2001-2003 to 2007-2009	13.5%	*11.4%*	*15.4%*	8.1%	*7.4%*	*8.8%*

Table 7

Nondrug and drug shares of medical spending of Medicare beneficiaries in the MCBS

	Medicare Advantage		Medicare FFS	
Period	**Nondrug**	**Drug**	**Nondrug**	**Drug**
2001-2003	75.0%	25.0%	80.5%	19.5%
2004-2006	69.0%	31.0%	77.7%	22.3%
2007-2009	65.3%	34.7%	76.4%	23.6%

Table 8

Effect of re-weighting medical expenditure index for FFS population

		Medicare Advantage	Medicare FFS	Medicare FFS, reweighted
Overall	**Level**	1.34	1.27	1.30
	Annualized growth rate	5.7%	4.5%	5.0%
Nondrug	**Level**	1.20	1.22	
	Annualized growth rate	3.3%	3.6%	
Drug	**Level**	1.81	1.49	
	Annualized growth rate	13.5%	8.1%	

Table 9

Condition-based medical expenditure indexes for drug spending by beneficiary category and health status

	Medicare Advantage	Medicare FFS	Difference in percentage points
Fair or poor health	14.4%	11.0%	3.5
Good health	11.7%	9.7%	2.0
Very good or excellent health	13.0%	8.4%	4.6

Table 10

Rates of drug coverage by Medicare beneficiary category

Period	Medicare Advantage	Medicare FFS
2001-2003	92%	72%
2004-2006	95%	78%
2007-2009	98%	91%

Note: Respondents are counted as having drug coverage if they report that at least one of their supplementary health plans includes drug coverage. In 2006 and after, they are also counted as having drug coverage if Medicare's administrative records indicate that they are enrolled in Part D.

Table 11
Median drug spending by drug coverage category and health status

	Medicare Advantage	Medicare FFS with employer-sponsored drug coverage	Medicare FFS with Medicaid drug coverage	Medicare FFS with other drug coverage	Medicare FFS without drug coverage
Health status="fair" or "poor"					
2001-2003	$1,351	$2,334	$1,947	$1,587	$1,189
2004-2006	$1,918	$2,890	$2,761	$2,341	$1,594
2007-2009	$2,777	$3,032	$3,753	$2,916	$1,437
Annualized growth rate	17.6%	5.0%	15.5%	15.8%	11.4%
Health status="good"					
2001-2003	$918	$1,588	$1,388	$1,136	$789
2004-2006	$1,307	$2,079	$1,926	$1,560	$1,070
2007-2009	$1,941	$2,125	$2,744	$1,912	$659
Annualized growth rate	18.6%	5.6%	16.3%	12.4%	11.8%
Health status="very good" or "excellent"					
2001-2003	$484	$997	$1,043	$673	$446
2004-2006	$858	$1,442	$1,492	$1,002	$558
2007-2009	$1,100	$1,429	$1,502	$1,273	$347
Annualized growth rate	21.2%	7.2%	7.3%	16.3%	8.4%

Table 12
Effect on drug expenditure index of adjusting post-Part D drug spending of Medicare Advantage enrollees downward by one-third

Beneficiary category	Average annual growth rate of drug expenditure index (2001-2003--2007-2009)
Medicare Advantage, unadjusted	13.5%
Medicare Advantage, adjusted	3.4%
Medicare FFS with employer-sponsored drug insurance	3.3%

Appendix Table 1

List of medical conditions and associated MCBS questionnaire variables

Medical conditions	Community interview variable	Facility interview variable
Hardening of arteries/arteriosclerotic heart disease*	OCARTERY	ASHD
Hypertension	D_HBP	HYPETENS
Hypercholesterolemia (2009 only)	D_CHOLES	n/a
Myocardial infarction/Heart attack	D_MYOCAR	MYOCARD and must have inpatient event in past year
Angina/CHD*	D_CHD	CRDVTYPE
Other heart conditions, valve problem	D_OTHHRT or D_VALVE	CARDIOV and CRDVTYPE=”NO”
Congestive heart failure	D_CFAIL	HRTFAIL
Heart rhythm problem	D_RHYTHM	CARDDYSR
Stroke/transient ischemic attack (TIA)	D_STROKE	STROKE or TIA
Cancer	D_CSKIN or D_CANCER and one or more of (OCCLUNG, OCCCOLON, OCCBREST, OCCPROST, OCCOVARY, OCCSTOM, OCCCERVX, OCCKIDNY, OCCBRAIN, OCCTHROA, OCCBACK, OCCHEAD, OCCFONEC, OCCBLAD, OCCUTER, OCCOTHER)	CNRSKIN or CNRLUNG or CNRBOWEL or CNRBREAS or CNRPROST or CNROVARY or CNRCERVI or CNRSTOMA or CNRBLADD or CNRUTERU or CNROTHER
Diabetes	OCDIABTS	DIABMEL
Arthritis	OCARTHRH or D_ARTHRD	ARTHRIT
Mental/psychiatric disorder	D_PSYCH	ANXIETY or DEPRESS or MANICDEP or SCHIZOPH
Mental retardation (excl. Alzheimer’s/dementia)	OCMENTAL	MENTAL
Alzheimer’s/dementia	OCALZHMR	ALZHMR or DEMENT
Osteoporosis	OCOSTEOP	OSTEOP
Broken hip	D_BRKHIP	HIPFRACT
Parkinson’s	OCPARKIN	PARKNSON
Emphysema/asthma/chronic obstructive pulmonary disease (COPD)	OCEMPHYS	EMPCOPD or ASTHMA

Paralysis in past year	D_PPARAL	HEMIPLPA or PARAPLEG or QUADPLEG
Renal failure	ESRD	RENTFAIL