

Online Appendix

**I. Details regarding the cost calculator for each person’s cost of each plan
in each year**

This appendix provides additional details about our approach to calculating what each person would have spent in each PDP available in his or her region in each year. The calculations differed somewhat for each year to incorporate changes in the standard benefit parameters (deductible, initial coverage limit, and catastrophic coverage limit) and due to changes in the types of additional benefits that were offered. For example, coverage of generic drugs during the deductible phase was not available at the launch of Part D but was in later years.

The CMS internal formulary files provide detailed information about which drugs (where a drug is defined by First DataBank’s Clinical Formulation ID (GSN_SEQNO)) and brand names were covered by each plan. We linked this information with the tier cost-sharing files to provide the patient OOP cost. Both of these files are part of the CMS Part D Plan Characteristic Files. Different versions of those files are available throughout the year, so we use the version as of December 31 because a vast majority of the within-year changes reflect corrections to ensure the files capture the plan as it was administered for the year. For a given drug in a given plan and year, the OOP costs differ by the pharmacy type (mail order or retail), the pharmacy status (in-network preferred, in-network not preferred, and out-of-network) and what benefit phase the individual was in at the time of filling the prescription (under the deductible, under the initial coverage limit, in the coverage gap, and above the catastrophic coverage limit), and the days’ supply dispensed (30 days or 90 days). One implication of this within-drug, within-plan variation in a drug’s price is that it is quite challenging to try to identify an individual’s plan based on the observed OOP price of the drugs they purchased. We combine the formulary files, the PDE data, and a pricing file created using a process described in Appendix II to build a file that lists every possible patient OOP price of every drug purchased by individuals in our sample for the given year. This linking between files is done by using First DataBank to crosswalk from the National Drug Code (NDC) on each claim to the Clinical Formulation ID (Generic Sequence Number) and brand name in the formulary files.

We use this file to determine what each person would have paid for each drug they purchased under each plan available in the region. To do this, we use each alternative plan's specific drug prices, as described in Appendix II, in conjunction with the information on the actual claim from the actual plan to determine which OOP cost should be used in each alternative plan. That is, to the extent possible, we held constant all of the claim-specific attributes across all plans, e.g., we assumed that if an individual purchased a drug from a mail order pharmacy on her actual plan, she would have used a mail order pharmacy under each alternative plan as well. In some cases this was not feasible, e.g., if the plan had no mail order pharmacies, and we imposed decision rules under the assumption that the individual would choose the closest best alternative. To the extent this is inaccurate, this approach yields underestimates of the true costs the individual would have incurred in alternative plans, yielding overestimates of above-minimum spending since it did not affect the estimated costs in the actual plan.

The PDE data provide the prescription fill date (known as the date of service), which we use to define the order of claims. This is essential to determine the benefit phase or phases, which we use in our cost calculator to estimate the OOP cost for the drug. We relied on CMS regulations that determined how beneficiaries would be moved through benefit phases, in conjunction with the plan-level characteristics file in cases where plans enhanced their coverage. Additional details are available from the authors and are evident in the statistical code used to develop and implement the cost calculator. In brief, for each person in each year, the cost calculator cycled through all of the individuals' claims in order of their fill date to create rolling totals for OOP costs and gross costs of covered drugs (where "covered" denotes drugs that advanced the "true OOP costs" for the purposes of determining the benefit phase), and OOP costs and gross costs of non-covered drugs (which by CMS rule cannot be used to advance the benefit phase). Particularly complex in this process was determining the OOP costs for claims that transitioned people across benefit phases. To confirm the accuracy of this calculation, we compared the calculated OOP and gross cost of the actual plan with the actual OOP and gross cost in the actual plan, as summarized from the PDE data. We find that our calculations were highly accurate, where after removal of a few outliers with implausible values we find correlation coefficients for calculated and actual gross spending of 1.0, and correlation coefficients for calculated and actual OOP spending of 0.92 in 2006 and 2007, 0.97 in 2008, 0.98 in 2009 and 0.97 in 2010.

One important feature that can substantially influence an individual's OOP costs for a given plan is not captured in the formulary files or any other plan

information files. The underlying drug prices for a given drug are determined by the plans, depending on their negotiations with pharmacies as well as drug manufacturers. These underlying prices influence individuals' OOP spending through two primary ways. First, in many instances, individuals' OOP costs are set as a percent of gross costs. This occurs under the deductible, where the individual typically pays 100%, as well as within the coverage gap and beyond the catastrophic coverage limit for most plans, and for some plans even within the initial coverage limit where they rely on coinsurance rather than copays. Second, gross spending is used to determine whether the claim causes the individual to exceed the initial coverage level, i.e., whether he has entered the coverage gap. Consequently, differences in gross costs alone can determine whether the individual enters the coverage gap, which even all else equal would have substantial effects on the individual's total OOP cost for a plan. One implication of this is that entering the gap is not a person-by-year level variable, but rather at the person-by-plan-by-year level, e.g., a person who entered the gap in her actual plan may not have entered the gap in some of the alternative plans due to differences in gross drug prices.

We rely on the 100% PDE data from all individuals (unconditional on meeting our sample criteria) to develop an accurate, underlying price of every drug filled in a year for every plan available in that year. For each prescription we calculate the unit price by dividing the total price by the units. To account for implausible values for the units or prices, if the unit price fell beyond the 5th or 95th percentile of nationwide prices for a given Clinical Formulation ID and brand name, we assigned the median nationwide price. We then average the unit prices for each combination of contract ID, pharmacy type (mail or retail), brand name to distinguish between brands and generics, and Clinical Formulation ID, each of which includes multiple NDCs. We group by contract ID because the prices are determined at the parent organization level and typically do not vary across plans within a contract ID.

For the most common drugs, this process yields an accurate measure of the average unit price in every plan. For less common drugs, and in plans with small enrollments, we rely on a series of imputations to determine the relevant price. First, if the retail pharmacy price was missing, we impute using the corresponding mail order price, and vice versa. If this does not assign a price, we impute by multiplying the market-wide average price for the pharmacy type (retail or mail) by a contract ID price index. For example, if this index shows that the contract ID prices average 20% above the nationwide average, then this drug's price for the given contract ID and pharmacy type is set to 20% above its average across

all other contract IDs for the pharmacy type. Finally, if no price index is available for a plan, which could occur for plans with no enrollees, we simply assigned the average unit price for the drug.

II. Means of variables not reported elsewhere, 2006-2010

	2007	2008	2009	2010
Above-minimum spending if stay in the status quo plan (\$)	267.8	256.5	309.7	297.1
Female (percent)	63.0	63.3	63.0	62.3
Race, using Research Triangle Institute method				
White	93.01	92.98	92.95	92.92
Black	3.34	3.25	3.19	3.13
Hispanic	2.06	2.08	2.08	2.07
Asian	0.99	1.04	1.08	1.12
Other	0.55	0.59	0.65	0.68
Unknown	0.05	0.06	0.05	0.08
Age in 2010	79.7	78.9	77.9	76.8
Total reimbursements for				
Hospital inpatient stays	2952	2902	2945	2968
Physician services	3172	3147	3293	3433
All other non-drug spending	2860	2998	3215	3396
Gross drug spending	2337	2003	2058	2049
Number of				
Inpatient admissions	0.3	0.3	0.3	0.3
Outpatient visits	4.4	4.2	4.3	4.4
Skilled Nursing Facility covered days	1.4	1.5	1.5	1.5
Physician office visits	8.5	8.1	8.2	8.8
Currently Diagnosed with (percent)				
Alzheimer's Disease, Related Disorders, or Senile Dementia	8.90	9.27	9.38	9.34
Acute Myocardial Infarction	0.78	0.77	0.72	0.73
Atrial Fibrillation	10.07	9.56	9.83	10.10
Cancer	8.05	7.79	7.83	7.81
Cataract	31.31	29.05	28.58	27.82
Chronic Kidney Disease	16.57	15.28	15.01	14.67
Chronic Obstructive Pulmonary Disease	10.65	10.79	11.87	12.91
Depression	9.98	9.43	9.49	9.45
Diabetes	9.38	9.58	10.07	10.46
Glaucoma	26.40	24.56	25.31	25.74
Heart Failure	13.67	12.90	13.05	13.03
Hip / Pelvic Fracture	0.82	0.84	0.80	0.77
Ischemic Heart Disease	36.28	33.90	33.97	33.67
Osteoporosis	16.27	16.29	16.53	16.33
Rheumatoid Arthritis / Osteoarthritis	23.99	23.40	23.81	24.05
Stroke / Transient Ischemic Attack	3.98	3.80	3.77	3.67
Moved regions (percent)	0.26	0.13	0.14	0.14
Forced switch due to plan closure (percent)	0.00	0.08	0.09	0.12
Prior months of experience on a PDP without low income subsidy	12.0	21.1	31.0	40.0