MISPERCEPTION IN CHOOSING MEDICARE DRUG PLANS

Jeffrey R. Kling, Sendhil Mullainathan, Eldar Shafir, Lee Vermeulen, and Marian V. Wrobel*

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ABSTRACT

Government-supported services—from charter schools to health plans—increasingly allow consumers to choose among alternatives. While standard economic models emphasize the benefits of choice, laboratory evidence raises the possibility that people may struggle with complex choices. We study this tension in the context of Medicare Part D, where during the past 4 years over 26 million seniors have each chosen from at least 40 plans each. Background data suggests the potential for misperception: the majority of seniors was not well-informed about drug plans and did not seek personalized comparative information, despite its potential value. To test for misperception, we perform a field experiment focused on choice stability. We examine the extent to which choices change in response to a subtle alteration of the choice environment. A group of seniors enrolled in Medicare drug plans received carefully designed personalized cost information on different drug plans while a comparison group received information about how to access the Medicare website, where essentially the same information was available.

28 percent of the intervention group switched plans for the following year, compared to 17 percent of the comparison group. Average predicted costs for 2007 were about $100 lower for the intervention group as a whole and more than $200 lower for those potentially affected by the intervention. More than 70 percent of the comparison group underestimated their potential cost savings from switching plans. We interpret these and other study results as evidence of misperceived prices. Beyond these cost effects, which persist for several years, we observe little impact on consumer wellbeing. Moreover, the full negotiated drug cost was substantially lower in the intervention group, suggesting that interventions of this type could reduce both consumer and government cost.

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Jeffrey R. Kling
Congressional Budget Office
2nd & D Streets, SW
Washington, DC 20515
jeffrey.r.kling@gmail.com

Sendhil Mullainathan
Harvard University
1805 Cambridge Street
Cambridge, MA 02138
mullain@fas.harvard.edu

Eldar Shafir
Princeton University
Green Hall
Princeton, NJ 08544
shafir@princeton.edu

Lee Vermeulen
University of Wisconsin
600 Highland Ave, M/C 9475
Madison, WI 53792
lc.vermeulen@hosp.wisc.edu

Marian V. Wrobel
Mathematica Policy Research
955 Massachusetts Ave., Suite 801
Cambridge, MA 02139
mwrobel @mathematica-mpr.com

I. Introduction

Policy makers are increasingly incorporating consumer choice and competition into the provision of government services. Social security, school selection programs and prescription drug insurance are three of the most prominent examples where choice has been proposed or adopted. The rationale for including choice and competition is straightforward. Individuals have heterogeneous preferences over many basic services. Choice allows individuals to select those providers whose services best match their preferences. Competition then facilitates a menu of services being provided at the cost-efficient frontier. In fact, the design of the largest new social program of the last decade, Medicare Part D prescription drug insurance, relies heavily on consumers making choices.

The social benefits of choice depend upon consumers choosing well—being able to pick the service provider that best matches their needs. A large body of laboratory research, however, suggests people's choices deviate from the normative rational model.[1] We examine this tension in the context of Medicare Part D, where there are reasons to believe choices are difficult.[2] We are motivated by evidence that, when faced with complex prices, people appear to focus on the easily available, invariant components of prices. For example, an experiment with mutual fund prospectuses showed that subjects overwhelmingly failed to minimize fund fees even though this choice was clearly optimal in light of the experimental setting and structure of subjects' payments (Choi, Laibson, and Madrian, 2008).[3] In Medicare Part D the pricing schedule is complex, and there are many plans to choose from—at least 40 and often more. Prices include a

[1] See Kahneman and Tversky (2000) and Rabin (2000) for overviews.
[2] Many observers have argued that seniors face difficulties with plan choice. See, for example, Hanoch et al. (2009), Hoadley (2008) and Frank and Newhouse (2007).
[3] There are several other examples. Ausubel (1991) studies credit cards. Chetty, Looney and Kroft (2009) study the case of taxes. Gabaix and Laibson (2006) present a model of shrouded attributes. See Ellison (2006) and Della Vigna (2009) for reviews.

simple monthly premium, but also a per-prescription co-pay which depends on the drug, the formulary of the plan, the amount of year-to-date spending and the extent of plan coverage at different intervals of spending. The core of our paper is a field experiment to test a simple framework where people misperceive the prices they face: they comprehend the monthly fee but do not fully understand the impact of other components on the total annual out-of-pocket cost.

A key challenge we face—one affecting most studies on choice quality outside of mutual funds—is an inability to measure the full hedonic value of a plan. So, for example, a failure to pick the lowest cost prescription drug plan need not mean price misperception or choosing badly: people could simply be paying more for features they value. To overcome this, we focus on *choice stability*. Under the rational null hypothesis where people accurately perceive prices, people's choices should be stable to the provision of information they already have access to: simply giving data they have back to them should not materially affect their choices. Under the behavioral alternative, however, such choice environment effects could be large if they affect the extent of misperception.

We conducted a field experiment testing for choice stability on a sample of seniors choosing Part D plans. The experiment was conducted during an open enrollment period, where seniors had six weeks in which to change their drug plan for the following year. One group of seniors—the intervention group—was presented with personalized price information created by entering their drug data into Medicare's Plan Finder website. They saw the cost of all plans for their drug profile as well as how much they would save by switching to the lowest cost one. A comparison group was given only the address of this website. The distinction between the groups therefore is subtle: the comparison group had to actively visit a website (or call Medicare's toll-free number,

or seek information from a third party), whereas the intervention group had information delivered to them.[4]

We found large effects of this simple intervention. The intervention group switched plans 28 percent of the time, whereas the comparison group only did so 17 percent of the time. The average cost savings of the intervention—across the entire intervention group including non-switchers—was about $100 per year. As no more than half of the intervention group altered their plan choice because of the intervention, we estimated a lower bound of roughly $200 per affected person, or 14% of costs. We found substantially larger impact on the out-of-pocket component of costs than on the premium component.[5] These effects persisted over time. We did not find effects on consumer well-being.[6] Auxiliary evidence supports the notion of misperceived prices: more than 70 percent of the comparison group underestimated their potential cost savings from switching plans. From a policy perspective, the full negotiated cost was substantially lower in the intervention group, suggesting that both consumer and government cost could be reduced from interventions of this type.

These results provide specific lessons about Part D and a general caution for the role of choice in public services as a whole. For part D, the results suggest that misperception and choice instability are quantitatively a large problem. By implication, the competitive benefits of

[4] In a remarkable study, Hastings and Weinstein (2008) use a related design and find large impacts of providing test score information to parents choosing between schools. We cannot interpret their evidence as choice instability, however, since the cost of acquiring test score information was high. Those findings, therefore, may be due to the rational impact of information. Other evidence of choice instability is given by Hastings and Teieda-Ashton (2008), who show that presenting fees in pesos instead of annual percentage rate to financially illiterate Mexican workers affects their choice of funds in a privatized social security program.

[5] This is closely related to work by Abaluck and Gruber (2009), who also find that beneficiaries place more weight on plan premiums than they do on expected out-of-pocket costs, based on non-experimental cross-sectional discrete choice modeling of choices.

[6] In the narrowest conception, we are only testing for choice stability, without a presumption that the intervention improved welfare. The data on persistence of changes and lack of change in plan satisfaction or quality (despite significant cost reductions) suggest that individuals are better off as a result of the intervention. Of course, making that case fully would require a deeper understanding of the psychology of switching and some ability to evaluate other unobserved aspects of welfare.

allowing choice may be mitigated by consumer psychology.[7] More broadly, they illustrate the potential for choice errors to affect program efficacy.[8] In this case—as is likely in others—the complex pricing structure is especially likely to have led to misperception and undone some of the benefits of promoting choice. The results highlight the importance of careful attention to subtle aspects of program design. The complex price structure in Part D, for example, was a design feature; policy makers could have chosen simpler (or more complex) pricing schedules (as well as smaller or larger choice sets, etc.; Thaler and Sunstein 2008).

The rest of the paper is as follows. Section II provides a very brief background on Medicare Part D. Section III presents a conceptual framework for our analysis of plan choices. Section IV uses new data (two cross-sectional surveys, several audits of information sources) characterizing demand for and supply of information and knowledge of Medicare drug plans, and helps provide context for the experimental results. Section V describes the experiment, presents results, and discusses their implications in light of the conceptual framework and the policy context. Section VI concludes.

II. Medicare Part D

The Medicare prescription drug benefit was established as part of the Medicare Modernization Act of 2003, with coverage first beginning in January 2006. The drug benefit was

[7] Other research on Part D has examined the market structure and plan dimensions, such as the welfare impacts of limiting the number of Part D plans (Lucarelli, Prince, and Simon, 2008) and the willingness to pay for features such as gap coverage (Heiss, McFadden, and Winter 2007). The cost management strategies do appear to have encouraged people to switch to cheaper medications (Neuman et. al 2007). Utilization has increased, while seniors' expenditures have decreased (Yin et al 2008). About one-third of new public expenditure has crowded out previous private expenditure (Engelhardt and Gruber 2009). Other research has found that seniors have difficulty navigating insurance choices within Medicare (Gold, Achman, and Brown 2003; Hibbard 2001; McCormack and Garfinkel 2001).

[8] Generalizing from the case of Part D to other programs faces two hurdles. First, the choosers are elderly and some research suggests an impact of age on decision processes (e.g. Mather 2006). We found no differential treatment effects by age, however. Second, the program is relatively new and it is possible that errors will self-correct. While this is plausible, in our data we found no changes over time.

subsidized, with Medicare paying about three-quarters of the premium. Medicare beneficiaries were offered the opportunity to voluntarily enroll in drug coverage either through a free-standing plan (complementing fee-for-service health insurance through Medicare) or through a Medicare Advantage plan (often a health maintenance organization). At the outset and again at the end of each year during an open enrollment period, individuals typically chose from among 40-60 plans, depending upon where they lived.

Costs of plans included a monthly premium common to all beneficiaries of that plan and a personalized component that depended upon use. Under a standard plan for 2007 for drugs on the plan's formulary of covered medications, individuals paid 100% of the first $265, 25% of costs $266-$2400, 100% of costs $2401-$5401, and 5% of further amounts (where the total amount is determined by the quantity of prescriptions and their full prices negotiated by the plan). Other plans were offered that had cost-sharing over the initial range (that is, no deductible) and some had cost sharing over the middle range (that is, offered some coverage through the "doughnut hole"). Still other variants had cost sharing in the form of a fixed price per prescription (co-payments with amounts depending upon the specific tier into which the plan had classified a drug) rather than as a percentage of the cost.

The plans differed along a variety of dimensions in addition to cost, including coverage of drugs and dosage forms (formulary), utilization management tools (prior authorization, step therapy, quantity limitations), pharmacy accessibility, mail order discounts, customer service, and financial stability of insurer. With the large number of plans and the many dimensions to consider, making an informed choice was complicated. In particular, the costs of plans differ substantially depending upon individuals' drug profiles. Medicare offered assistance with predicting personalized costs in different plans over the Internet and via telephone. After the

introduction of the Part D benefit, the percentage of Medicare recipients with drug coverage increased from about 74 to 90 percent, although analysis suggests that many of those who remained uncovered would also have benefited if they were to have enrolled (Winter et. al, 2006).

III. Conceptual framework

To highlight key aspects of the choice among prescription drug plans, we start with a Perloff and Salop (1985) model of consumer preferences for differentiated products. In the standard model, there are n plans and a finite number of consumers L, each of whom has no monopsony power. Each consumer chooses the plan that maximizes her net surplus s_{il}, $= b_{il} - p_{il}$:

(1) $$S_l^* = \max_i s_{il}$$

s_{il} is the surplus of person l in the i-th plan, p_{il} is its price, and b_{il} is an element of the consumer's preference vector $\mathbf{b}_l = (b_{1l}, b_{2l}, \ldots, b_{nl})$. The b_{il} term measures the aggregated utility of plan-specific characteristics such as convenience, customer service, and other aspects of plan quality.

An alternative model posits that individuals do not choose based on actual price p_{il} but on their perception of the price, which we denote by $p'(C_{il})$. The word "perception" is used to emphasize a process that is potentially subjective and depends on the environment. C_{il} here denotes exogenous features of the choice environment that may affect the nature and extent of misperception.[9] The choice environment captures the way information is distributed and presented, which in psychologically richer models can affect actions and beliefs even beyond their effects on the effort required to collect and process information. This may include advertising or presentations which simplify the information set. The key assumption in what

[9] Perloff and Salop (1985) model the difference between true and perceived product characteristics as an additive error. We are being more specific in focusing on the perception of the price and its dependence on the choice environment.

follows is that we are focusing below on a specific instance of C_{il} which, normatively, should not affect the choice in (1). Thus, the consumer perceives surplus to be $s'_{il} = b_{il} - p'(C_{il})$ and maximizes this.

(2) $S_l'^* = \max_i s'_{il}$

How do we differentiate the model of misperception in (2) from the Perloff-Salop model in (1)? We form a test based on the idea that elements of C which do not affect $b_{il} - p_{il}$ cannot affect choices in (1) but could affect choices in (2). Specifically, we alter the choice environment by presenting the publicly available personalized price vector $\mathbf{p}_l=(p_{1l}, p_{2l}, \ldots, p_{nl})$ back to individuals. Presentation of this vector clearly could not affect choices if people (pre-intervention) were choosing according to equation (1) since the personalized price vector $\mathbf{p}_l$ was needed to implement that maximization in the first place. In this sense, we are simply measuring whether people were choosing coherently according to the full information price vector. We test for impact resulting from a difference in C by looking at the probability of an action (switching plans) and at the systematic outcome of that action (specifically, the senior's predicted costs in the 2007 plan).

We put further structure on the problem by separating the true price into two components ($p_{il} = x_i + y_{il}$). x_i is the common component of the price (premium) for the i-th plan that is the same for all consumers in a market. y_{il} is the individualized component of the price (out-of-pocket costs) for the i-th plan that depends in the individual's prescription drug use. The perceived price may differ from true price component x_i by the function $g(C_{il})$ that depends on the choice environment, and similarly from y_{il} by $h(C_{il})$. Thus, the consumer perceives the price to be:

(3) $p'_{il}(C) = (x_i + g(C_{il})) + (y_{il} + h(C_{il}))$.

We define price misperception as having perception of the price depend on the choice environment, or $g(C_{il}) + h(C_{il}) \neq 0$. Notice that price misperception here reflects an end state with no judgment passed on the process by which it is reached. For example, someone who simply failed to make use of the available information and chose arbitrarily would misperceive by our definition. It is meant to capture the notion that people are choosing as if they faced a different price vector than the actual one. In prescription drug plan choice, the information on the common component of the price is cheaper to obtain and simpler to present, since it does not depend on the multi-dimensional attributes of individual prescription use. We will therefore hypothesize that a change in the choice environment, such as proactively presenting price information, will have less impact on the common component than the perceived component of the perceived price–or formally that $|\mathrm{d}g(C)/\mathrm{d}C| < |\mathrm{d}h(C)/\mathrm{d}C|$.

Thus, three tests we use to distinguish the misperception model in (2) from the basic Perloff-Salop model in (1) measure whether presenting public information back to a consumer:

- Affects choice by increasing plan switching? Since C enters equation (2) but not (1), it cannot do so in the basic model.
- Affects choice by decreasing average predicted costs of the selected plan when the choice environment provides information about lower costs? Again, there would be no effect under the basic model in equation (1).
- Has less effect on the common component of predicted cost of the selected plan than the personalized component?

An alternative to price misperception is a rational cost of thinking model, where individuals know the true distribution of prices and that they can obtain information about the personalized prices of particular plans by exerting some costly effort through information acquisition and

processing. The three tests above can be used to reject the basic Perloff-Salop model, but do not distinguish between price misperception and cost of thinking models. A rational thinking cost model, however, assumes that individuals grasp the potential for differences among drug plans in terms of prices and other product features and make rational decisions about information seeking – implying that seniors should have unbiased estimates of the potential savings from switching from their current plan to the lowest cost plan. A rational thinking cost model would (unless augmented with memory loss) imply that individuals would make the same choices when presented at two points in time with the same alternatives. We explore these implications.

Although additional information can only improve individual welfare in a cost of thinking model, additional information does not necessarily improve welfare in the misperception model. For example, if individuals systematically overestimate the quality of low-cost plans, then clarity about prices could lead to sub-optimal choices of low-cost, low-quality plans. While our primary analysis focuses on misperception of prices, we also examine some aspects of consumer wellbeing to interpret the practical significance of our findings.

IV. Choice environment

In a world with misperception dependent on the choice environment, seniors may not be well-informed about prices and other product specifics. Hence, they may not respond rationally to all the information that, objectively, is available, and they may fail to recognize that they are enrolled in a sub-optimal plan. To develop evidence on these points, independent of our field experiment, we conducted phone and mail surveys of Medicare Part D free-standing prescription drug plan beneficiaries in early 2007. Results from the surveys are shown in Table 1.

While a significant majority of respondents to the phone survey knew that different plans were better for different people (82 percent) and that they could only change plans during open enrollment (74 percent), few had learned additional facts about the specific differences among plans. Only 37 percent knew that only some (rather than all) plans have a deductible. Only 55 percent knew that different plans have different co-payments for generic drugs, rather than all plans having the same co-payments.[10] According to both surveys, the leading sources of information that participants used to learn about drug plans were mailings from plans and mailings from Medicare; such material is not personalized and does not convey transparent information about out-of-pocket costs. The phone survey also indicated that more interactive forms of information gathering, such as in-person, phone, or internet, were each used by less than 15 percent of respondents. Less than 20 percent reviewed personalized plan comparisons. [11] Yet, in both surveys, we found that over 80 percent of participants were generally satisfied with their 2006 prescription drug plans. The percentage that switched plans between 2006 and 2007 was 10 and 15 percent in the phone and mail surveys respectively, slightly above the reported national rate of seven percent.[12] An additional 14 percent in the phone survey considered switching for 2007 but did not switch, which is consistent with the high levels of reported satisfaction.[13] In short, consistent with the misperception model, the majority of beneficiaries

[10] In survey data collected in 2005, just prior to the beginning of the first open enrollment period, Winter et al. (2006) also found low knowledge about the structure of the benefit and the potential for differences among plans.
[11] Our results are broadly consistent with the U.S. Department of Health and Human Services (2007), which reported results from a survey in January 2007 indicating that 85 percent of seniors were aware of the open enrollment period, 50 percent reviewed their current coverage, 34 percent compared plans, and 17 percent evaluated premiums, co-payments, and coverage.
[12] The national rate is for those not receiving the Low Income Subsidy (U.S. Department of Health and Human Services, 2007).
[13] Our survey results are similar to Heiss, McFadden, and Winter (2007), who reported that 82 percent rated their 2006 plan good or better, 18 percent considered switching for 2007 but did not, and 11 percent switched plans from 2006 to 2007. Unpublished results from the same survey indicated that 60 percent did not consider switching because they were happy with their plan while 18 percent "wanted to avoid the trouble of going through the plan comparison and choice process again," a fact that is consistent with thinking costs affecting some seniors.

was not well-informed, appeared to be content with their plan, and did not take full advantage of available information sources.

To better understand the information available in the existing choice environment and the costs of acquiring it, we audited five potential sources of advice on choosing a drug plan: the Medicare help-line (1-800-Medicare) (12 calls), state health insurance assistance programs (SHIPs) (5 calls), senior centers (8 visits), other telephone help-lines (12 calls), and retail pharmacies (88 visits). In our calls to 1-800-Medicare, customer service representatives consistently entered personalized drug information, identified a low cost plan, and offered to enroll the caller, drawing upon Medicare's website tool, the Prescription Drug Plan Finder. Our calls to SHIPs generated either referrals to Medicare or offers of similar assistance. Our visits to senior centers sometimes resulted in general discussions about the drug benefit or partial demonstrations of the Medicare website but never in comparative information in the hands of the auditor. A search for and audit of other sources of telephone advice indicated that few private-sector information sources had emerged.[14] In general, these sources were either not helpful or referred the caller to Medicare or another public-sector information source. In one noteworthy exception (a major pharmacy chain), the help-line offered personalized suggestions, using technology similar to Medicare's, and mailed a personalized report.[15]

A small fraction of pharmacies offered personalized in-store assistance with plan choice to auditors who walked in. In four of the 88 pharmacies audited, staff people made personalized plan suggestions based on a Plan Finder. In five pharmacies (all in one chain), a staff person

[14] A contributing factor may be Medicare policies, motivated by concerns about conflicts of interest that restrict the extent to which third parties can provide advice.

[15] In addition, a second major pharmacy chain offered an internet service in conjunction with a technology partner specializing in decision support systems. A code was developed to trigger the import of individual medications into the partner's Medicare Part D decision tool. Customers and pharmacy staff were able to produce personalized Medicare Part D Plan comparisons by entering these codes into the tool.

offered personalized plan information about the entire universe of available plans. Sixty-nine of the 88 pharmacies provided print materials, although our user testing indicated that these materials alone were not sufficient for seniors to understand the cost implications of plan choice even in very simple cases. In conclusion, seniors could acquire personalized assistance from Medicare with minimal effort, but seniors who sought information through other channels were not consistently assisted or even consistently directed to Medicare. Personalized information was readily available but not widely diffused, creating the potential for misperception in the existing choice environment.

V. Intervention in the choice environment

In order to test the misperception model, we designed a randomized experiment in which the intervention was a slight perturbation of the choice environment. Members of the intervention group received a one page cover letter showing (1) the individual's current plan and its predicted annual cost conditional on their personalized drug profile, (2) the lowest cost plan and its predicted annual cost, (3) the potential savings from switching to the lowest-cost plan, and (4) the date of the end of open enrollment, as well as a printout from the Medicare Plan Finder including costs and other data on all available plans. The comparison group received a general letter referring them to the Medicare website. Both groups received an informational booklet on how to use the site. The critical features of the intervention were that it neither contained new or difficult to acquire information nor reduced the effort required to change plans, but that it was designed using psychological principles known to promote action: a default option (the lowest cost plan), a clear statement of that option's benefits (potential savings), and a deadline.

A. Intervention descriptive statistics

Participants were University of Wisconsin Hospital patients interviewed by students from the UW-Madison School of Pharmacy in the fall of 2006 to elicit an inventory of prescription drug use and other baseline information prior to randomization. At the time of the study interview, participants reported regularly using an average of five and half medications. The study participants were all from Wisconsin, nearly all white, with an average age of 75. As shown in Table 2, about two-thirds were women, about two-thirds were married, and about half were college graduates. Relative to the national population of seniors, study participants were typical in terms of age and gender but were more likely to be married and were substantially better educated. A first follow-up survey, completed in early 2007, inquired about participants' plan choices for 2007 and their choice process. Combining all sources of attrition, 8.3 percent of those with baseline interviews in the intervention group had missing data in the 2007 survey, and 11.6 percent had missing data in the comparison group. Individual characteristics for the 406 individuals with complete data were similar for those assigned to the intervention and comparison groups, although the intervention group had a higher fraction age 75 or older and a higher fraction whose satisfaction with their 2006 plan was fair or poor, as shown in Table 2. A second follow-up survey, in early 2008, inquired about drugs used in 2007/2008, experiences in the 2007 plan, and plan choices for 2008; this survey resulted in a sample size of about 300.

There were 54 Medicare prescription drug plans available to beneficiaries in our Wisconsin sample. To assess the dispersion in predicted costs across plans for the same individuals, we compiled data on the predicted costs of every possible plan. Predicted cost is the estimated annual cost measure for 2007 computed by the Medicare Plan Finder for a given drug plan based on an individual's prescription drug use (as reported at the time of random assignment in fall

2006). The Plan Finder computed the out-of-pocket cost for each plan, assuming that the drugs entered would be taken for the full year of 2007. Table 2 shows that the predicted consumer cost of the 2006 plan in 2007 was about $2100 and the potential savings in 2007 from switching from an individual's 2006 plan to the lowest cost plan was about $500. The plans initially enrolled in for 2006 by the individuals in our sample were nearer the median cost plan than the lowest cost plan among those offered: the average rank was just below the 40th percentile. In sum, the cost differences among plans for a particular individual were substantial, and for most seniors there were many plans available with lower costs than those selected.

B. Impacts of choice environment change

Results for the three tests of the basic Perloff-Salop fully rational model discussed in section III, based on presentation of public information back to a consumer, are shown in Table 3. 28 percent of those in the group receiving the letter intervention switched plans between 2006 and 2007, compared to 17 percent in the comparison group.[16] The difference of 11 percentage points is found in a simple comparison of means. After controlling for covariates known at the time of random assignment (variables in the first ten rows of Table 2, including the age and plan ratings where there were some differences between the comparison and intervention groups as discussed above), the estimated difference is similar (10 percentage points). The probability of such a large difference occurring by chance under the null hypothesis of no effect of the intervention is very small, with p-values less than .005 for both specifications.

In panel C of Table 3, the average regression-adjusted decrease in predicted cost for the entire intervention group versus the comparison group was $103, where the average change in

[16] The switching rate in the comparison group is more than twice as high as the national average, which is likely related to the higher rates of drug utilization and the higher plan dissatisfaction in our sample.

predicted 2007 cost between the plan chosen for 2007 and the plan chosen for 2006 represents the savings from changing plans and is zero for those who remained in the same plan. Expressed in terms of the change relative to 2006, this decrease was an average of .064 log points, or about six percent. Again, the probability of such a large difference occurring by chance under the null was less than .005.

The average cost change for the entire intervention group versus the comparison group averages over people who were not affected by the intervention and those who potentially were affected. We defined the potentially affected as those who would have changed plans either if they were assigned to the intervention group or if they were assigned to the comparison group. To better understand the magnitude of impacts on this group, we estimated a lower bound of the impact on the potentially affected by dividing the overall effect of the intervention (the intent-to-treat point estimate) by the sum of the probabilities of changing plans in the intervention and comparison group. Intuitively, this estimate assumes that everyone who changed plans in the intervention group was affected and that a substantial share of the intervention group who did not change plans was also affected because they would have switched plans had they been in the comparison group. A full derivation appears in Appendix A. In panel D of Table 3, those potentially affected by the intervention had an average of at least 229 dollars in predicted cost savings. In relative terms, this represents predicted savings of .143 log points, or about 14 percent.

The consumer cost can be decomposed into the premium cost (with a comparison group mean of $392) and the out-of-pocket cost (with a comparison group mean of $1718). The impact of the intervention on the premium cost in panel C was $12, or about 3 percent. The impact on out-of-pocket cost in panel E was $91, or about 9 percent.

In sum, this evidence indicates that presenting public information back to consumers increased plan switching, decreased average predicted costs, and had less effect on the common component of predicted cost (the premium) than on the personalized (out-of-pocket) component. These results lead us to reject the basic Perloff-Salop model.

C. Misperception versus rational thinking costs

We explored two implications of the rational cost of thinking model, as discussed in section III, to distinguish it from the misperception model. We analyzed both projections of potential savings and the stability of stated preferences. [17]

We asked participants in the comparison group during the spring 2007 interview how much they thought they could save if they had chosen the least expensive plan. Of those who could give an estimate, more than 70 percent gave an underestimate, and the average underestimate was more than $400. These results on underestimation cast doubt on the idea that these individuals were using a cost of thinking model for plan choice, as having biased beliefs about the distribution of plan prices is not compatible with the assumptions needed for coherent decision-making with a rational cost of thinking approach. The underestimates are consistent with misperception of prices.

To assess stability of stated preferences, our spring 2008 survey presented seniors with several sets of plan characteristics including characteristics of the plan they had chosen for themselves. Following a technique developed by Bernartzi and Thaler (2002), the survey asked seniors to evaluate the choice between several pairs of unnamed drug plans based on cost measures, plan size, and Medicare quality ratings. In these questions, the cost information was

[17] Yet another rational explanation is that information on the letterhead of the University of Wisconsin was deemed different and more relevant than the same information from CMS, even when Medicare was cited as the source. While not trivial, the likely magnitude of this potential effect seems small relative to the realized cost savings.

similar to the information that the intervention group had received via the Medicare print-out; the enrollment and quality information were new. When seniors who had not chosen the lowest cost plan were asked to compare their 2007 plan to the lowest cost plan using this set-up, 37 percent of the comparison group preferred their 2007 plan. When seniors who had changed plans compared their 2007 plan to their 2006 plan, 35 percent of the comparison group preferred their 2007 plan. The results showing that many seniors did not choose their 2007 plan when it was reflected back to them are not consistent with a rational thinking cost model where information is retained once acquired, but are consistent with ongoing misperception.

D. Understanding mechanisms in the choice environment

The average time spent on all aspects of plan consideration and possible switching was 3 hours in the comparison group. Exploring seniors' choice process and knowledge, we found that several of the differences between the two groups supported the notion that the intervention worked through cognitive channels. These included statistically significantly greater percentages of intervention group members later reporting that they remembered receiving the materials, that they read them, and that they found them helpful. Within the black box of the intervention, we also examined the ways in which cost information affected choices.

We had initially speculated that individuals with relatively low knowledge of drug plans and drug costs and might have placed a high weight on name-recognition and popularity, as potential signals of quality, and chosen high enrollment plans in 2006. (For example, the plan with the highest national enrollment in 2006 was co-branded by the AARP, formerly the American Association of Retired Persons.) We hypothesized that when the intervention made personalized cost information available to individuals in these plans, they would be relatively more likely to

switch plans. We found the opposite result. Individuals in plans with market share of less than 15 percent were more likely to respond to the intervention by switching plans and enjoy greater cost savings among the potentially affected, as shown in Appendix Table A1. Ex post, the results are more consistent with the idea that large market share plans attracted members who directly valued a trusted brand or other non-cost attributes and were relatively less sensitive to personalized cost information.

For those who were affected, we found evidence that more aspects of the intervention mattered for decision-making than simply the identification of the lowest-cost plan. The intervention letter sent in the fall of 2006 named the plan with the lowest predicted consumer cost in 2007, based on reported prescription drug use, and gave the predicted cost and calculated the difference in cost relative to the 2006 plan. An attachment to the intervention letter also showed the predicted cost of each plan. We found that 9 percent of the intervention group switched specifically to the lowest cost plans while 20 percent switched to a different plan; in the comparison group these percentages were 2 percent (statistically significantly different from 9 percent) and 15 percent (not different from 20). This result is consistent with the idea that the intervention specifically caused seniors to consider the lowest cost plan, and also that seniors gave additional consideration to the personalized cost of plans other than the lowest-cost plan.

As a complement to the analysis of the impact of the intervention on switching rates and average predicted costs and to give more structure to the estimated effects, we also examined differences between the intervention and comparison groups in discrete choice models of plan selection. As a point of departure for this analysis, consider selecting a plan at random, which is equivalent to a discrete choice model with coefficients of zero on explanatory variables. The probability of plan selection from among 54 plans would be 1/54 = .019. In a conditional logit

model estimated using comparison group data only and controlling for individual fixed effects, predicted cost, and predicted cost squared, the predicted probability of choosing a plan in 2007 with the same price as that actually selected was .025, indicating some sensitivity to price.

We then enriched this basic model, in order to examine any effect of being the lowest cost plan (beyond what would be predicted by cost alone) and to analyze differences between the intervention and comparison groups in the sensitivity of plan selection to cost in general and to the lowest cost plan in particular. The enriched model also includes interactions of an intervention group indicator with predicted cost and predicted cost squared, an indicator for being the lowest cost plan for that individual, and the interaction of lowest cost plan with the intervention group indicator (as well as 2006 plan choice and plan fixed effects, which improve precision of the estimates and also cause plans selected by fewer than 2 individuals in the sample to drop out of this analysis). All explanatory variables in the model were known at the time of random assignment. The coefficient estimates from this model are shown in Table 4.

The results indicate that the intervention group is significantly more sensitive to cost than the comparison group. For the intervention group, the estimates in column 1 imply that a twenty-five percent decrease in predicted cost (say from $2043 to $1533, which is approximately from the 2007 average cost of the plan chosen in 2006 to the lowest cost plan in 2007—with marginal effects calculated as the sum of 1000 changes of 51.1 cents each) increased the odds of plan selection by 2.7. That is, it increased the probability of selection from .025 to .070. If that lower cost plan was also the lowest cost plan, the estimated odds ratio was 8.2, and the probability of selection further rose to .27. In the comparison group, a twenty-five percent decrease in predicted cost increased the probability of plan selection only from .025 to .040. If the lower cost plan was also the lowest cost plan, the probability of selection further rose only from .040 to .062 in the

comparison group. The test on the interaction term of the differential effect of the lowest cost plan in the intervention group relative to the comparison group generated a p-value of .09. A joint test on the cost and cost-squared interactions terms yielded a p-value of .09, while the joint test on all three cost interactions terms yielded a p-value of less than .005. This evidence is consistent with the effect of changes in the choice environment working through both increased sensitivity to the entire vector of costs for all plans and in particular to the lowest cost plan.

E. Impacts on consumer wellbeing

While our intervention focused on providing personalized cost information, a broader assessment of outcomes for seniors beyond immediate effect on costs is obviously needed to more fully ascertain the impact on consumer wellbeing of choices made. One way we broadly assessed choices was to measure through revealed preference whether individuals were sufficiently satisfied with their choices in 2007 to keep them for 2008 after receiving another opportunity to switch plans. 23 percent of the comparison group switched in 2008, and 20 percent of the intervention group switched—a statistically insignificant difference—implying that the intervention group was at least as satisfied as the comparison group overall.

Another important contributor to wellbeing is the persistence of potential savings. Since switching plans may involve some costs, continuation of savings for several years or more would contribute to wellbeing. Comparing results from our spring 2007 and spring 2008 follow-up surveys, we studied the persistence of the intervention impact over time in models of plan selection and on average costs. The estimates for prediction of 2008 plan selection in column 3 of Table 4 show that the interactions of cost with the intervention were somewhat smaller and the impact of the lowest cost plan was somewhat larger. These results imply that a twenty-five

percent decrease in predicted cost in 2007 and being the lowest cost plan in 2007 increased the estimated odds ratio to 9.9, i.e. the probability of selection rose from .025 to .40. These results are very similar to those in column 2, for 2007 plan selection limited to individuals for whom we observe 2008 data, where a twenty-five percent decrease in predicted cost and being the lowest cost plan increased the probability of selection from .025 to .38. The 2007 cost information provided in the intervention continued to have an effect of essentially the same magnitude on 2008 plan selection. Impacts of the intervention on average consumer cost are shown in Table 5 for different time periods. In terms of the point estimates, the impacts on actual 2007 consumer cost and predicted 2008 and 2009 consumer cost were similar to that for predicted 2007 consumer costs, although the standard errors were 4-6 times larger.[18] We interpret these results as being consistent with continued savings over time, and confirmation that savings did materialize when calculated based on actual drug use.

Our spring 2008 survey also collected self-reported information on experiences in the plan during 2007. Panel B shows there were no statistically significant differences in satisfaction with non-cost features or in overall plan ratings, although the point estimates go in the direction of relatively more dissatisfaction with non-cost features and less dissatisfaction overall for the intervention group. Analysis of other measures of administrative quality at the plan sponsor level also showed no impact. In sum, the consumer wellbeing of the intervention group appears to have been at least as high as the comparison group, but at lower cost.

[18] The actual 2007 and predicted 2008 and 2009 costs are based on drug list information collected in spring 2008, whereas predicted 2007 cost uses the fall 2006 baseline drug list. Since the fall 2006 data is used in the formation of the baseline covariates and in the predicted 2007 cost of the 2006 plan that is differenced away in the estimation, the estimates of predicted 2007 cost of the 2007 plan are much more precise. The outcomes derived from the spring 2008 drug list have much more variability in cost that is not removed by subtracting the predicted 2007 cost of the 2006 plan. The log point outcomes also show more instability in magnitude and sign, consistent with the imprecise nature of the 2008 and 2009 estimates.

F. Impacts on aggregate consumer and government costs

While it is clear that the intervention caused consumer cost to decline, this could in principle be due to cost-shifting or due to reduced payments made to drug manufacturers. Cost-shifting would involve higher costs paid by insurers, with people switching to plans that had their particular drugs on the plan formulary or otherwise obtaining more cost-sharing from the insurer. Reduced payments would involve lower costs paid by insurers, with plans negotiating lower prices for particular drugs or consumers using fewer or less expensive drugs. An important aspect of public policy decisions about interventions affecting plan choice in the Part D program is that any increases or decreases in insurer costs will also be partially passed on as cost changes to the government in the future. Medicare subsidies are determined by a formula tied to the enrollment-weighted national average of plans' cost for offering the drug benefit, as determined in a bidding process—with the government paying about three-quarters of national average costs. The plan bid reflects the plan's costs of offering the drug benefit, net of beneficiary cost-sharing and reinsurance. An intervention in one year that affects insurer costs will be reflected in subsequent plan bids. Medicare expenditures will increase or decrease as the national average bid increases or decreases.

Under a pure cost-shifting hypothesis, there would be no impact of the intervention on plans' net acquisition costs for prescription drugs, although total consumer cost would be lower. An alternative hypothesis is that consumers choose plans with lower acquisition costs for their particular drugs. For analysis of these issues, we collected data on the full negotiated prices of each drug and used this as an approximation of the acquisition cost of the drugs for that plan. This approximation has some error, as these negotiated prices do not fully represent plans' actual net acquisition costs—primarily because we have not obtained data on rebates (retrospective

payments from drug manufacturers to plans based on volumes) and other price concessions to insurance companies given by drug producers. Here we are assuming no rebates or other concessions, although they may be quite significant in driving differences in net acquisition costs among plans. With acknowledgement of these caveats, the results are shown in the last row of Table 5.

The intervention reduced 2009 full negotiated cost by $931, and 2009 total consumer cost (out-of-pocket prescription payments plus premiums) by $139. For context, the mean cost in the comparison group is $3922 for full negotiated versus $2395 for total consumer. Thus, both in absolute dollars and as a proportion of the mean of the comparison group, the impact was larger for full negotiated cost than for total consumer cost. Our preferred interpretation of these results, given the caveats previously discussed and the imprecision of the estimates, is that the results reject the null hypothesis of pure cost shifting, which would have implied no impact on full negotiated cost. A literal interpretation of the point estimate of the impact on 2009 full negotiated cost would be that the potential cost savings to the government from an intervention of this type are quite large. While our estimates of impacts on full negotiated cost are substantial, an accurate and precise point estimate of the impact on net acquisition costs is not possible due to data limitations and more fundamentally to our sample size.

If Medicare were to consider an intervention of the type studied in this paper, the implementation costs to Medicare would be quite low—on the order of $2 per individual—because Medicare already has administrative data on previous drug use and would not need to collect those data from individual beneficiaries. The results indicating lower full negotiated prices in the intervention group suggest that the intervention lowers average insurer costs, and that plan bids and Medicare costs would be lower in future years—suggesting that an

intervention of this type would likely be at least cost-neutral for the government. Estimation of the magnitude of potential Medicare savings, however, would require data beyond that available in this study. Also, the market for drug plans has matured since the time of our study, although it is unclear whether choices are now more or less robust as seniors' greater knowledge and experience may or may not offset errors caused by choices made early in the program that have not been re-considered and updated in light of changing drug needs and plan benefits.

Our basis for extrapolation to consumer costs savings is more solid than for government costs. The most important difference between our sample and a national sample is that the potential savings is about 50 percent higher in our sample than in a national sample (as in Domino et al. (2008) and in a small sample of pharmacy data we examined).[19] However, our subgroup analysis in Appendix Table A1 found that the intervention impacts were essentially the same in relative terms for groups with lower and higher potential savings. Those volunteering to participate in our study may have been initially less satisfied with their plan than a national sample, but the impacts are quite substantial even for those who rated their 2006 plan good or better. Also, while our sample is quite highly educated, impacts are at least as large for the less educated—consistent with the notion that any limits in comprehending information by less-educated groups are offset by the marginal value of information to these groups. Finally, we note that in our study letters were preceded by an interview, which would not occur at the national level. The rate at which people would open and read intervention letters from Medicare is uncertain. If letters were opened at a 20% lower rate than in our study and impacts in the general population among those opening the letters were half as large as in our study, we project that

[19] The potential savings from changing to the lowest cost plan, as a share of current expenditure, was similar or lower in the study sample than in a sample of drug profiles created using claims from a national pharmacy chain. Our interpretation is that the study sample had relatively high levels of prescription drug use (consistent with being drawn from a list of patients with recent clinical visits) but that our sample was typical in terms of the relative potential savings from switching plans.

sending letters to 10 million current members of Part D standalone drug plans during open enrollment would amount to total consumer savings on the order of $400 million.

VI. Conclusion

This study analyzed choice among Medicare drug plans using a conceptual framework of misperceived prices, which was contrasted with a simple Perloff-Salop model of rational choice and a model of rational thinking costs incorporating imperfectly estimated prices due to costs of acquiring and analyzing price information. The misperception model permits consumers to be sensitive to the choice environment and to the subtle ways that information is presented, which go beyond the content of the information or the costs of acquiring it.

This study used data from phone and mail surveys of seniors, an audit of sources of drug plan information, and an experiment. The audit confirmed that the effort required to acquire comparative cost information from Medicare was indeed minimal, reinforcing the notion that the savings generated by the experiment were large relative to the costs of acquiring the information. The independent phone and mail surveys of seniors indicated that the majority of seniors were not particularly well informed about drug plans or particularly diligent users of information sources but were nonetheless content with their choices.

In our experiment, a randomly selected group of seniors received carefully designed letters based on information available on the Medicare website while another randomly selected group was simply referred to the website. The misperception model—unlike the Perloff-Salop model—predicts that consumers may respond to presentations of publicly available drug plan price information by changing plans and reducing their costs, and it further predicts that any reductions in costs will likely be concentrated in hard-to-perceive out-of-pocket payments at the

pharmacy rather than the easier-to-perceive premium costs. Three main results of the experiment were consistent with the misperception model and reject the basic Perloff-Salop model. Relative to the comparison group, the intervention group had higher rates of changing plans (28 percent vs. 17 percent) and lower predicted costs ($103 for the sample as whole), with the cost savings relatively concentrated in the less-obvious out-of-pocket costs rather than the more transparent premium costs.

In our comparison group, more than 70 percent underestimated their potential savings. Stated preferences were not stable, with comparison group members frequently indicating subsequent preference for available plans they had not selected. We interpret this pattern of results as being more consistent with a misperceived price model than a rational cost of thinking model.

Our preferred explanation emphasizes the potential for altering price perceptions through changes in the choice environment. Study results are consistent with seniors having under-invested in information-gathering in part because they under-estimated the potential for differences among plans. Once choices had been made, not only did misperception of prices persist, but confirmation and status-quo biases (the tendency to stick with one's existing opinions and choices) and transactions costs, albeit low, led to high rates of satisfaction and low rates of change. Our intervention, while modest, challenged these tendencies by altering price and market perceptions, countering confirmation bias (by showing the savings available), and providing an alternative default (the lowest cost plan). Our results suggest that the mechanisms underlying the intervention impact increased sensitivity to plan cost in general, and to the lowest cost plan highlighted in the letter in particular, both beyond what would have been predicted by cost alone.

Encouraging people to focus on prices might cause them to make choices that under-weighted other non-pecuniary benefits. However, evidence suggests that overall consumer

wellbeing was at least as high in the intervention group as in the comparison group. The rate of switching in the intervention group one year after the intervention was no higher than in a comparison group. The impact of the intervention on second year choice and cost was substantial. There was no discernable diminution of quality or satisfaction.

While the intervention could have shifted costs from consumers to insurers (and ultimately to the government), the evidence suggests instead that net acquisition costs of insurers were reduced through some combination of switching to cheaper drugs, filling fewer prescriptions, and/or receiving lower negotiated prices for the drugs used at the outset. The results suggest that a large-scale intervention of this type would likely result in savings or no net cost to the government, while reducing consumer cost substantially with no reduction in consumer wellbeing.

Together with an emerging body of work on fragile choices and the importance of context, this study underscores that policy makers seeking to utilize choice and competition in provision of services can benefit from careful attention to the design of the environment in which individuals obtain information and make choices. One future policy option would be for the government to facilitate a private market for comparative information as a way to reach additional users and to foster innovation, although careful regulation would be needed.[20]

This study highlights four areas for further research. One is very concrete work on the design of clear, actionable information about Medicare drug plans or other health insurance coverage choices. This preliminary work shows the potential for information to have an effect, but the study intervention incorporated multiple features including partnership with a trusted hospital,

[20] Among the challenges would be the need to work through the relative roles of government and third party intermediaries, to minimize the potential for plans to capture the market for advice, to respect individual privacy, to provide information that balanced cost and other considerations, and to hold beneficiaries' well-being as the greatest value. Such a program could involve elements such as one-on-one counseling and the ability for beneficiaries and their advisors to manually update an automatically generated drug list.

the priming effect of an in-person interview, a behaviorally sensitive letter, the full Medicare print-out, and a mailing that both communicated personalized information about potential savings and raised general awareness about the potential for savings and the nature of the variation among plans. Additional work could unbundle these effects, with potential implications for the design of larger scale programs, and could explore the effects of quality as well as cost information. Tools for creating more sophisticated price information could also be developed that would incorporate, for example, forecasts of changes in drug use, rather than simply assume that next year's use will be the same as the previous year's use.

Another area for further research is the role of product and information markets in misperception. It is striking that, despite the apparent value of personalized comparative information, few third parties emerged to provide it, or even to highlight its potential value and steer seniors towards Medicare and its local partners. The actual provision of information may have been impeded by CMS regulations that constrained the role of third parties and by the effort involved in working with seniors one-on-one, although third parties with access to drug histories can provide personalized information relatively efficiently.

A third area involves the potential response of insurance firms to broader provision of personalized price information. For example, if the information provided assumed last year's drug use is the same as next year's drug use, then firms would have strong incentives to cut prices on drugs used for short periods and increase prices on drugs used for long periods in order to encourage individuals to perceive their prices to be lower than they would actually be. In contexts of increased price salience, there would also be greater incentives for firms to cut costs which could lead to lower overall quality of service.

A fourth area for more conceptual research is the interaction between misperception and other forms of market failure at both the theoretical and the more practical level. In the case of Medicare drug plans, the private and public optima may differ, and misperception may actually counteract market failure by reducing the extent of adverse selection and contributing to the success of the voluntary insurance market. Market functioning could be harmed if all plans with more than basic coverage attract only those who most benefit from them (with these plans then becoming too expensive and being dropped), or if all individuals chose one low-cost provider who then obtained enough market power to keep out new entrants and also set monopolist prices in future periods. Alternatively, as noted above, misperception may unambiguously reduce social welfare if its practical result is that seniors choose plans that, on average, have higher costs than those they would have chosen if more informed, thereby increasing the overall cost of programs such as Medicare Part D.

Appendix A: Derivation of Upper and Lower Bounds on Effects on the Potentially Affected

The notion of being affected by the intervention involves an unobserved counterfactual of what would have happened if an individual had been randomly assigned to the other group. To be precise, it is helpful to use some notation. Define A as an indicator of being potentially affected by the intervention, where A involves the counterfactual and cannot be directly observed. Define D as an observed indicator for switching plans, and Z as an indicator for assignment to the intervention group. Define $Y = Y^{07} - Y^{06}$, Y_1 as the potential outcome if an individual were assigned to the intervention group, Y_0 as the potential outcome if an individual were assigned to the comparison group. The causal effect of the intervention is then Y_1-Y_0**.**

There would be a causal effect for any individual who would have chosen a plan with a different predicted cost in the intervention group than in the comparison group. These situations include having the intervention cause someone to switch to a lower cost plan ($Y_1<0$; $Y_0=0$), having the intervention cause someone who was going to choose a more expensive plan to not switch ($Y_1=0$; $Y_0>0$), and other cases (anytime $Y_1 \neq Y_0$). A special case is when someone would not switch plans regardless of the intervention, so there is no effect on cost. The upper bound on probability of this special case occurs when everyone who switches plans in one group would have switched if assigned to the other group (1- max{E[D | Z=1], E[D | Z=0]}). The lower bound on the probability of this special case occurs when no one who switches plans in one group would have switched if assigned to the other group (1- {E[D | Z=1] + E[D | Z=0]}). Intuitively, we can use the lower bound on the fraction of zeros included in the estimate of the average cost change for the entire intervention group versus the comparison group in order to calculate a lower bound on the average cost change for those who potentially were affected by the intervention. This bound is based on the derivation in equation (A1).[21]

(A1) $E[Y^{07} - Y^{06} \mid Z=1] - E[Y^{07} - Y^{06} \mid Z=0]$

$= E[Y_1 \mid Z=1] - E[Y_0 \mid Z=0]$

$= E[Y_1 - Y_0]$

$= E[Y_1 - Y_0 \mid A=1]Pr(A=1) + E[Y_1 - Y_0 \mid A=0]Pr(A=0)$

$= E[Y_1 - Y_0 \mid A=1]Pr(A=1) + 0$

$\leq E[Y_1 - Y_0 \mid A=1]\{E[D \mid Z=1] + E[D \mid Z=0]\}$

[21] The first line of equation A1 is the difference in observed outcomes between the intervention and comparison groups. The second line uses the definition of potential outcomes. The third line uses the independence of potential outcomes from randomly assigned groups. The fourth line uses the definition of conditional expectation. The fifth line uses the definition of C, where $Y_1 - Y_0 = 0$ when C=0. The sixth line uses the lower bound described in the text, where Pr(C=0) = 1-Pr(C=1) <= 1- {E[S | Z=1] + E[S | Z=0]}.

We can now calculate an expression based on (3) for a lower bound on the average cost change for those who were potentially affected by the intervention, shown in equation (A2).[22]

(A2) $E[Y_1-Y_0|A=1] \geq \{E[Y^{07}-Y^{06} \mid Z=1]- E[Y^{07}-Y^{06} \mid Z=0]\} / \{E[D \mid Z=1] + E[D \mid Z=0]\}$

In this paper's application, the lower bound point estimates and standard errors simply rescale the intent-to-treat estimates by $1/\{E[D \mid Z=1] + E[D \mid Z=0]\}$. There is a small amount of negative covariance between the estimation of average cost differences and switching rates, and accounting for this slightly reduces the standard errors; for simplicity, this adjustment is not included in the results shown.

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[22] This approach is similar to that used by Imbens and Angrist (1994) to estimate a local average treatment effect (LATE), where those who did not comply and take up the treatment offer are assumed to have been unaffected. However, LATE also involves an assumption of monotonicity and an exclusion restriction, and neither of these are needed for (A1). If being treated were defined as being caused to switch plans, then monotonicity would be violated if the intervention caused some people to not switch who would have otherwise switched and the exclusion restriction would be violated if those in the comparison group who would have switched without the intervention nevertheless had their plan choice affected by the intervention. Our intuition is that the exclusion restriction does not hold in this application but monotonicity probably does. If we were to assume monotonicity holds but not impose the exclusion restriction, then we would rescale the results by $1/E[S \mid Z=1]$ instead of $1/\{E[S \mid Z=1] + E[S \mid Z=0]\}$, and would result in point estimates about 1.6 times larger.

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Table 1. Information on choices from nationally representative samples, early 2007

	Phone Survey (1)	Mail Survey (2)
At least somewhat satisfied with 2006 plan	.85	.83
Switched plans from 2006 to 2007	.10	.15
Read at least some of Annual Notice of Change	.57	.86
Ever reviewed mailings for plan choice	.53	
Ever had in-person contact for plan choice	.14	
Ever had phone contact for plan choice	.07	
Ever used internet for plan choice	.04	
Ever reviewed side-by-side comparison for choice	.34	
Ever reviewed personalized information for choice	.18	
Knows that not all plans have a deductible	.37	
Knows plans have different co-payments for generics	.55	
Sample size	348	1430

Table 2. Descriptive statistics for 2007 Wisconsin survey respondents

	Comparison (1)	Intervention (2)	Difference (3)
Female	.63	.64	.01
			(.05)
Married	.67	.63	-.04
			(.05)
High school graduate	.94	.95	.01
			(.02)
College graduate	.47	.48	.01
			(.05)
Post-college graduate	.20	.16	-.05
			(.04)
Age 70+	.78	.85	.07
			(.04)
Age 75+	.45	.56	.11*
			(.05)
4+ Medications	.61	.66	.04
			(.05)
7+ Medications	.29	.33	.05
			(.05)
2006 plan fair or poor	.26	.35	.09*
			(.05)
Potential savings from lowest cost plan	520	533	13
			(62)
Predicted consumer cost of 2006 plan in 2007	2126	2113	12
			(175)
Average percentile rank of 2006 plan in predicted 2007 consumer cost	37	41	4
			(3)

Notes. Potential savings from lowest cost plan is the predicted 2007 consumer cost difference between 2006 plan and lowest-cost plan. Sample size is 197 in the comparison group and 209 in intervention group. * = p-value <.05

Table 3. Average differences between intervention and comparison groups

A. Plan change	
Probability of switching between 2006 and 2007	.098*
	(.041)
B. Predicted consumer cost change	
$Y^{07} - Y^{06}$	-103*
	(37)
$\ln(Y^{07}/Y^{06})$	-.064*
	(.017)
C. Premium change	
$PREM^{07} - PREM^{06}$	-12
	(13)
$\ln(PREM^{07}/PREM^{06})$	-.034
	(.029)
D. Predicted consumer cost change lower bound for those affected by intervention	
$Y^{07} - Y^{06}$	-229*
	(83)
$\ln(Y^{07}/Y^{06})$	-.143*
	(.038)
E. Predicted out-of-pocket cost change	
$OOP^{07} - OOP^{06}$	-91*
	(36)
$\ln(OOP^{07}/OOP^{06})$	-.088*
	(.039)

Notes. Intervention impact estimates regression-adjusted using: indicators for gender, married, high school graduate, college graduate, post-graduate, age<70, age<75, 4+ medications, 7+ medications, drug insurance rated fair or poor in 2006. Y^{07}: predicted 2007 consumer cost of plan chosen for 2007. Y^{06}: predicted 2007 consumer cost of plan chosen for 2006. Sample size is 406 (except for 396 in the second row of panel D, due to missing values from zero out of pocket cost). Standard errors in parentheses. * = p-value <.05.

Table 4. Conditional logit analysis of plan selection.

	2007 (1)	2007 (2)	2008 (3)
2007 consumer cost/1,000	-1.18 (.75)	-1.78 (1.05)	-1.63 (.88)
2007 (consumer cost/10,000)^2	7.69 (6.99)	13.85 (8.90)	14.52 (7.63)
2007 lowest cost plan	.46 (.60)	.34 (.80)	-.46 (.73)
2007 consumer cost/1,000 * intervention	-1.46 (.94)	-1.10 (1.25)	.011 (1.11)
2007 (consumer cost/10,000)^2 * intervention	6.92 (8.53)	4.91 (10.68)	-10.33 (10.95)
2007 lowest cost plan * intervention	1.16 (.68)	1.71 (.89)	3.04* (.82)
N	12719	7101	7101
p-value on H_0: cost * intervention = cost^2 * intervention = 0	.09	.41	.15
p-value on H_0: lowest cost plan * intervention = cost * intervention = cost^2 * intervention = 0	.00	.02	.00

Notes. Conditional logit models estimated with individual fixed effects. Additional coefficients not shown in the table were estimated for the 2006 choice and for each plan; the estimation sample is therefore limited to plans selected by at least 2 individuals in the sample and to individuals choosing a plan selected by at least two individuals. 7 observations with predicted consumer costs > $20k were dropped. In column 1, there are 401 individuals, 32 plans, and 113 missing cost observations. In columns 2 and 3, there are 265 individuals, 27 plans, and 54 missing cost observations. * = p-value<.05.

Table 5. Impacts for 2008 survey respondents, by outcome

A. Consumer costs in dollars	
Predicted 2007 consumer cost (2007 plan)	-112*
	(48)
Actual 2007 consumer cost (2007 plan)	-111
	(217)
Predicted 2008 consumer cost (2008 plan)	-73
	(169)
Predicted 2009 consumer cost (2008 plan)	-137
	(169)
B. Quality	
Proportion dissatisfied with quality, non-cost features	.032
	(.033)
Proportion rating overall plan as fair or poor	-.026
	(.041)
C. Full negotiated cost in dollars	
Predicted 2009 full negotiated cost (2008 plan)	-931*
	(369)

Notes. All estimates regression-adjusted using the same vector of covariates as in Table 3. Costs are differences from predicted 2007 consumer cost of the 2006 plan. Predicted 2007 costs based drugs used in fall 2006. Predicted 2008 and 2009 costs based on drugs used in spring 2008. Sample size is 283 in rows 1-3, 237 in rows 4 and 7, and 302 in rows 5-6.

Appendix Table A1. Analysis of impacts between 2006 and 2007, by subgroups

	Switching probability		Lower bound impact on predicted cost		N
	Comparison	Intervention	Dollars	Log points	
	(1)	(2)	(3)	(4)	(5)
A. Sponsor share of sample in 2006					
≤ .15	.141	.333~	-559*	-.324*	142
			(203)	(.065)	
> .15	.180	.252	-65	-.073	264
			(64)	(.047)	
B. Dollar potential savings					
≤ $400	.145	.217	-88*	-.143*	216
			(45)	(.064)	
> $400	.195	.350~	-323*	-.137*	190
			(141)	(.048)	
C. Satisfaction rating of 2006 plan					
Fair, Poor, or unknown	.235	.370	-278	-.189*	124
			(171)	(.062)	
Good, Very good, or Excellent	.144	.235~	-192*	-.122*	282
			(85)	(.050)	
D. Education					
Not college graduate	.154	.284~	-295*	-.146*	213
			(147)	(.057)	
College graduate	.183	.280	-196*	-.146*	193
			(80)	(.053)	

Notes. All subgroups are defined on characteristics known prior to random assignment. Dollar potential savings = predicted 2007 consumer cost of 2006 plan - predicted consumer cost of least expensive plan in 2007. ~ = p-value <.05 on difference between columns 1 and 2. Columns 3 and 4 estimated using method in Table 3, panel E. Standard errors in parentheses. * = p-value <.05.