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IMPACT OF CONSEQUENCE INFORMATION ON INSURANCE CHOICE

Anya Samek
Justin R. Sydnor

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ABSTRACT

Insurance choices are often hard to rationalize by standard theory and frequently appear sub-optimal. A key reason may be that people are unable to map the cost-sharing features of plans to their distribution of financial consequences. We develop and experimentally test a decision aid that provides this mapping to simplify comparisons of plan options. In two experiments mirroring typical health insurance decisions, we find that when people choose plans using standard feature-based information, they violate dominance at high rates. Our distribution-based decision aid substantially reduces dominance violations, and also changes choice patterns in situations where there is no dominant option. Choice patterns under feature-based menus can be most easily rationalized by models of heuristic choices, such as minimizing premium or deductible. With the decision aid, though, significantly more people have choice patterns that are better explained by expected utility theory. We compare our distribution-based approach to an alternative of providing estimates of the expected value of costs, which is the most common decision-support available in most insurance markets. Providing expected values affects choices in a similar direction as our consequence-based approach, but in a more muted fashion, and is only about half as effective at reducing dominance violations.

Anya Samek
University of California, San Diego
Rady School of Management
Wells Fargo Hall
9500 Gilman Drive #0553
La Jolla, CA 92093-0553
and NBER
anyasamek@gmail.com

Justin R. Sydnor
Wisconsin School of Business, ASRMI Department
University of Wisconsin at Madison
975 University Avenue, Room 5287
Madison, WI 53726
and NBER
jsydnor@bus.wisc.edu

1 Introduction

Many recent studies have documented patterns of sub-optimal insurance choices that are difficult to reconcile with standard economic theories of insurance demand.[1] Consumers' poor understanding of insurance products are a likely driver of some of these patterns (Johnson et al., 2013; Loewenstein et al., 2013; Bhargava et al., 2017b; Handel et al., 2020). These challenges with understanding insurance call into question the value of expanding individuals' choice sets in insurance markets, which has been especially common in many health insurance markets (Ericson and Sydnor, 2017).

Typical insurance-choice environments are "feature based" in that they provide people with tables that show cost-sharing features, such as premiums, deductibles, co-insurance rates and maximum-out-of-pocket costs. However, standard theory suggests that to make a utility-maximizing choice, people need to know the distribution of final wealth outcomes for each plan. This requires a potentially cognitively challenging exercise of mapping plan features to out-of-pocket costs for some subjective distribution of beliefs about losses. (Bhargava et al., 2017b) suggest that this difficulty in mapping underlies some errors in plan choice. They show that providing people with information about the maximum and minimum spending in health plan options can reduce dominance violations.

In this study, we directly evaluate the extent to which errors are driven by the inability to map features to consequences and explore how decision aids can improve choice patterns. To do this, we develop and experimentally test a simple decision aid – a "consequence graph" – that does the mapping for people. We build and test the approach for the setting of health insurance, where much of the recent literature on insurance choice quality has focused, though the approach can generalize to other insurance settings. The graph plots the spending (premiums plus out-of-pocket costs) the individual can expect for each quantile of the ex-ante distribution of medical costs they face. For each plan a consequence graph is simply a line, which makes it possible to display the distributions for multiple plans on the same graph. The quantile approach provides information about the distribution of consequences for plans in a simplified way that does not require people to simultaneously integrate information about probabilities and consequences.

In two separate experiments, we present subjects with menus of plan options and vary whether we provide only feature-based information or include a graphical mapping of features to financial consequences. To assure that all subjects in our studies have common beliefs, subjects in all groups

[1] See for example: (Frank and Lamiraud, 2009), (Heiss et al., 2010), (Sydnor, 2010), (Abaluck and Gruber, 2011), (Schram and Sonnemans, 2011), (Sinaiko and Hirth, 2011), (Ericson and Starc, 2012), (Kling et al., 2012), (Zhou and Zhang, 2012), (Handel, 2013), (Johnson et al., 2013), (Loewenstein et al., 2013), (Atanasov and Baker, 2014), (Marzilli Ericson, 2014), (Handel and Kolstad, 2015), (Bhargava et al., 2017a), (Bhargava et al., 2017b), (Handel et al., 2020)

first see a distribution of medical spending possibilities. Hence, in theory, no new information is contained in the consequence information decision aid. An insurance-savvy participant should be able to generate a mapping from feature-based information to the consequence information.

We first conduct an incentivized laboratory experiment in which university student subjects make decisions on behalf of a fictitious person and receive payments based on the realized wealth minus medical spending of this person. This lab setting allows for a significant degree of control and limits the extent to which individual characteristics (such as liquidity constraints and subjective beliefs) affect choices. Next, we field a hypothetical-choice survey experiment with a representative sample of Americans in which subjects choose from more realistic menus of health insurance options with spending distributions estimated from their personal health-risk characteristics. The survey experiment relinquishes some control but includes a representative group of Americans (who are more likely to have experienced making health insurance decisions) and allows for a more natural investigation of preferences for health insurance. In both experiments, we included a number of menus where a higher-deductible option dominates. This situation is common in employer-sponsored health insurance settings and has been used as a test of choice quality in past literature (Handel, 2013; Bhargava et al., 2017b; Liu and Sydnor, 2018). We also include menus with no dominant options.

We find a dramatic difference in choice patterns by treatment in both studies. When subjects get only feature-based information about plans, they violate state-wise and second-order stochastic dominance at high rates. Providing information about consequences dramatically reduces these violations. In the laboratory experiment, violations of state-wise dominance drop from 40-60% under feature-based information to 10-20% under consequence information, and the changes are more pronounced for subjects with low health insurance literacy. In the survey experiment, consequence information reduces violations of state-wise dominance from 50% down to 24%, which is about as effective as increasing numeracy of subjects by 2.5 standard deviations.

We also introduce menus of options where the high-deductible option does not dominate but should be attractive for those without very high levels of risk aversion. Here the consequence information again has a strong effect on choice patterns, increasing the share choosing the high-deductible option by 19 percentage points. This is in line with (Handel and Kolstad, 2015) who found that more informed individuals are more likely to select a high deductible option. These results show that consequence information has an impact on choice even beyond the relatively simple case of highlighting situations of dominance.

There was one more surprising result that we had not anticipated. Our second experiment included a few menus where the lower deductible option provided substantially better risk protection and had

lower expected spending for many people. In these cases most subjects in all treatments selected the lower deductible option. However, we find that the consequence graph treatment actually decreased the share of people selecting the lower-deductible option. This suggests that for a subset of subjects, the decision aid generated behavior that appears more risk loving.

The experimental results show that the decision aid reduced violations of dominance and broadly affected choice patterns, but was this because it really helped people compare options more fully or did it simply bias people toward options with lower premiums? To investigate this question, we explore the extent to which the choices individuals made across the ten menus of options in our second experiment can be rationalized by different models of insurance choice. We consider simple heuristic decisions, such as choosing the option with lowest deductible or choosing the option with lowest premium. We also consider expected utility models with differing levels of constant-absolute-risk-aversion utility.

We find that our decision aid substantially changed which decision models are most consistent with choice patterns, shifting people from heuristic decision models toward choices consistent with risk-averse expected utility. With feature-based information, the majority had choice patterns consistent with simple heuristics, with the most common being choosing the lowest deductible or maximum out of pocket limit. With the consequence-graph decision aid, the fraction categorized as using heuristics falls sharply and the most common categorization becomes choices most consistent with some level of risk-averse expected utility. Among those who appear to be using a heuristic, the decision aid shifted people away from the coverage-based heuristic and toward a lowest-premium heuristic. Ultimately the results suggest that some people may have been biased toward lowest-premium choices by the decision aid, but that the dominant effect was to generate choices that were responsive to both premiums and coverage in a way that is more consistent with standard theory.

We also associate plan choice with risk preferences. In the laboratory experiment, we elicit risk preferences using a separate incentivized task. We find that measured risk preferences are completely uncorrelated with insurance decisions when subjects get only feature-based information about plans. When subjects get consequence information, there is a weak positive correlation.[2]

Our study is timely since the past several years has seen an increase in interest from both academics and employers in improving health insurance decisions. The most common approach is to provide expected value predictions. These are available in the Medicare Part D market and also on the Healthcare.gov exchanges that were set up as part of the Affordable Care Act.[3] Expected value

[2]We note, however, that even in the case of consequence information the correlation is very weak, which is consistent with a recent study by Jaspersen et al., 2019 showing that lottery-based measures of risk aversion correlate very poorly with insurance choices even in laboratory settings.

[3]See https://www.healthcare.gov/glossary/total-cost-estimate/

predictions were evaluated in (Kling et al., 2012), who found that providing consumers with personalized information about costs based on their expected prescription drug use increased plan switching for Medicare Part D participants.

To evaluate how consequence-graphs compare to expected-value predictions, we conduct a third treatment. In the hypothetical-choice survey, we evaluate the impact of showing the expected total health spending for each plan along with the standard feature table. We find that this treatment always affects choices in the same direction as the consequence graphs, but does about half as well in helping subjects avoid making sub-optimal choices. Similarly, we find that the decision models most consistent with choice patterns move in the same direction, but less sharply, with expected-value predictions than with consequence graphs. These results suggest that people respond to information about risk and the distribution of consequences for insurance more than they react to simple expected-value comparisons.

Our approach is related to another method of providing insurance decision aids that uses expected utility models to provide plan recommendations. A leading practical example of this approach is the company Picwell, which combines advanced predictions of the distribution of medical needs with an expected utility model to create personalized scoring for plans. (Bundorf et al., 2019) and (Gruber et al., 2020) show that this approach appears to improve Medicare plan decisions, particularly when the decision aid is provided to insurance agents. Relative to the Picwell-style approach of creating expected utility scores, our approach does not require us to make assumptions about individual risk preferences and displays only the information that theory assumes subjects need to make an informed decision.[4] Research will be needed to disentangle the relative benefits of these approaches and the extent to which they complement each other. Our results show, though, that it is feasible to provide individual-level decision aids that clarify risk consequences for insurance consumers.[5]

An important policy question is whether providing decision aids for insurance choices increases adverse selection (see Handel, 2013). Decision aids can increase adverse selection if they help to highlight the differential benefits of plan options by risk type, but they could also decrease it by making it easier for people to consider how plans interact with their risk preferences. The participants in our hypothetical-choice survey experiment had substantial variation in their medical spending risk and were provided personalized information about their likely distribution of spending needs. Consistent

[4]We are not aware of a commercial application that leverages this idea as fully as we do, but examples such as ALEX from Jellyvision go in this direction by providing personalized recommendations that show a few scenarios for spending possibilities.

[5]Our study is also related to a strand of literature that seeks to reduce complexity in other types of financial choices using decision aids. For example, (Brown et al., 2019) and (Samek et al., 2019) find that consequence information helps people value annuities. (Samek et al., 2016) shows that displaying interactive tables improves decisions in multi-attribute choice tasks.

with prior research, we find adverse selection under feature-based information: every $1,000 increase in expected total medical spending is associated with a 1.4 percentage point reduction in the likelihood of selecting the high deductible plan (relative to a mean probability of choosing the high deductible of 0.27). When we provide consequence information, we estimate that this slope more than doubles, though the interaction term is not precisely estimated. These findings complement the results of Gruber et al. (2020) who find a similar result when utility-model decision aids are provided to expert insurance agents. Consistent with Handel's (2013) conjectures, our results provide potentially the first empirical evidence that an individual-level decision aid increases adverse selection in health insurance.

An additional contribution of our paper is to systematically show that people have difficulty mapping cost-sharing features of plans to their consequences, even when they are given direct incentives to do so. These results drive home the point made in prior studies that observations of insurance choices in field data may not be directly informative about underlying risk preferences if people find insurance too complex, an argument that has been made in recent studies (Sydnor, 2010; Barseghyan et al., 2013; Handel, 2013; Handel and Kolstad, 2015; Baicker et al., 2015; Spinnewijn, 2017; Bhargava et al., 2017b). If choices with feature-based information were informative about underlying risk preferences over final wealth outcomes, then showing the final wealth outcomes directly should not affect choices. The fact that displaying consequence information without providing explicit plan recommendations substantially alters choices is strong evidence that insurance decisions are affected by a failure to understand how choices map to consequences.

In what follows, Section 2 explains the construction of our consequence information treatment. Section 3 describes the design and results of the first experiment. Section 4 discusses the design and results of the second experiment. Section 5 concludes.

2 Approach to Providing Information About Consequences

Consider an individual i who faces potential loss shocks s (e.g., total medical bills), with an individual-specific ex-ante cumulative density function F_i. An insurance plan j is associated with a premium cost c_j and a series of cost-sharing features that map the loss shocks into uninsured (i.e., "out of pocket") costs $\theta_j(s)$. The standard insurance demand model assumes that the individual's expected utility under a plan is given by:

$$U_{js} = \int u_i(w_i - c_i - \theta_j(s))dF_i(s)$$

where w_i denotes the individual's background wealth and u_i is a concave Bernoulli utility function over final wealth at the end of the contract term.

In the case of a setting like health insurance, calculating this expected utility requires an understanding of both the distribution of potential medical bills and the mapping of those shocks to out-of-pocket costs given plan features. Our approach to simplifying the information about insurance plan consequences is to provide the individual with information about their expected spending within each quantile of their ex-ante spending distribution. Let N denote a number of quantiles (e.g., N = 10 for deciles) and $\mu_{n,i,j}$ the expectation of the out of pocket costs for person i under plan j within the n^{th} quantile of their shock distribution. For simplicity, we include the premium costs c_j so that the μ values give the individual's expected total uninsured losses and costs if they end up in the n^{th} quantile of their shock distribution. If we provide the individual with this information, it allows for an approximation of the expected utility:

$$\widetilde{U}_{ij} = \sum_{n=1}^{N} \frac{1}{N} u_i(w_i - \mu_{n,i,j})$$

As N gets large and the quantiles become small, the approximation will converge to the true utility. The practical value of this approach is that it allows us to provide the individual with N equally likely values of expected spending that provide an approximation to the distribution of total costs the individual can expect under the plan. This eliminates the need to integrate both varying cost sizes and probabilities. As we show in Section 4 and 5, we use simple graphs, which we call "consequence graphs" to represent these distributions for different plans. In a consequence graph, the x-axis denotes the (equally likely) quantiles and the y-axis gives the $\mu_{n,i,j}$ values associated with that quantile for the individual.[6]

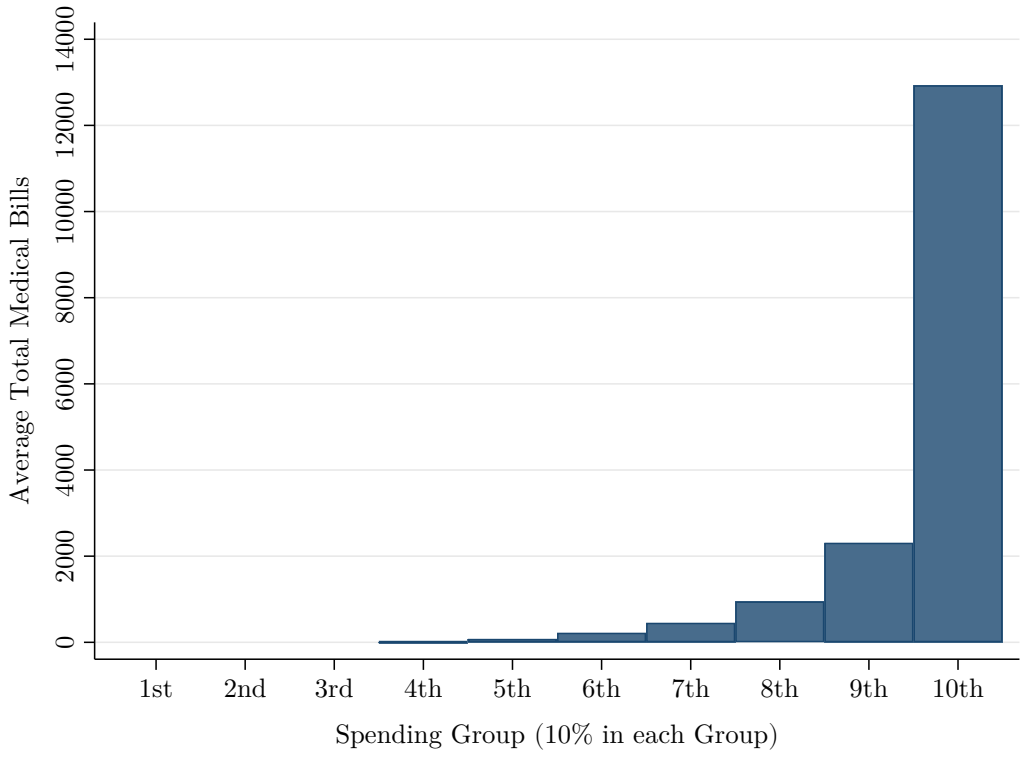
3 Laboratory Experiment with Incentivized Choice

3.1 Experimental Design

We conducted the laboratory experiment at the Behavioral Research Insights through Experiments (BRITE) lab at the University of Wisconsin, Madison in 2016. Instructions (available in Appendix B) were displayed on the screen and subjects moved through them at their own pace. Subjects were told to consider a fictional young adult named Jamie, who just started a new job and needed to select a health insurance plan from a menu of options provided by Jamie's employer. To exclude complexities related to differences in health network quality, subjects were instructed that all plan options provided the same access to doctors and hospitals. All subjects saw the information shown in Figure 1, which

[6] When describing these graphs to subjects in our experiments, we avoid the technical terms of quantiles and expectations and use more natural language to describe the graph.

Figure 1: Distribution of Underlying Medical Bills in the Experiment



Notes: This information was shown to all subjects in the laboratory experiment prior to introducing the insurance choices. This displays average total medical bills for a young adult like Jamie split into 10 deciles (excluding premiums)

provides the distribution of total medical bills from which Jamie's total medical spending would be drawn.

The figure uses data for men and women ages 21-25 in the Medical Expenditure Panel Survey (MEPS) for years 2012 and 2013 and shows spending levels in deciles (excluding premiums).[7]

All subjects made choices from 4 different insurance plan menus twice. Half of the subjects (randomized at the individual level) first saw 4 insurance plan menus under the feature-table display and then under the consequence-graph display. The other half received the reverse order (consequence-graph display followed by feature-table display). This design allows us to evaluate choices both between subjects (using observations from the first display subjects saw) and within subjects (comparing decisions of the same subject for the same menu across displays).

Menus consisted of 4-6 plans, and either included one strictly dominant option, one second order

[7]MEPS (https://www.meps.ahrq.gov/mepsweb/) is commonly used source for analyzing the distribution of potential medical spending. Other work in this literature uses data from commercial claims databases, such as Truven MarketScan® and OptumLabsTM. See (Zuvekas, 2017) for a discussion of and comparison of expenditure estimates using these different data sources.

stochastically dominant option, or had no dominant options but all choices were rationalizable by standard theory (see Appendix A for plan details). The feature-tables showed features of each plan, including premium, deductible, coinsurance rate, and maximum out-of-pocket spending. Subjects also had the option of sorting the tables by up to two features. The consequence-graphs showed the total health spending for Jamie for each plan across the 10 expected total health spending deciles in Figure 1. Plans were represented as lines on the graph so they could be compared. Plans were labeled with colors or shapes, randomized across the two formats.[8]

Figure 2 shows an example of the information that was displayed for Menu 1, which had 4 plans and a state-wise dominant option (plan Purple). For the feature table, participants were shown the features of each plan. The consequence graph for this Menu shows that with the dominant Purple plan, the individual's costs are lower than all other plans in every scenario. In contrast, the Black plan in this example is dominated by all other plans. The Red and Blue plans in this example cross between the 6^{th} and 7^{th} decile of spending and do not have a clear dominance relationship to each other.

Subjects were incentivized based on Jamie's wealth level at the end of the year, which consisted of Jamie's salary (randomized between-subjects as either \$40,000 and \$60,000) minus the health insurance premium paid by Jamie (based on the subject's plan choice) minus any out-of-pocket medical spending Jamie had to pay for the year (determined via a random draw from Jamie's distribution of possible medical spending, and based on the subject's plan choice).[9] One of the 8 choices about health insurance was randomly selected to determine the payout. Jamie's wealth was translated to the subjects' payment as \$2 for every \$1,000 of Jamie's wealth.At the end of the experiment, we elicited risk aversion using the Eckel-Grossman risk elicitation task (Eckel and Grossman, 2002). Subjects selected one of 6 gambles (shown in Table A2 in Appendix A) that each had a 50% chance of having a better or worse outcome from two possible outcomes. Subjects were also asked 2 insurance literacy questions in which they were shown a plan menu and asked to manually calculate expected out-of-pocket spending for one medical spending quantile for one of the plans. They received \$0.50 for each correct answer. Finally, subjects indicated which display format they preferred and answered a short demographic questionnaire. Subjects earned \$24 on average for sessions that lasted about 30 minutes.

[8]In this way, a subject who selected say the "Black" plan in Menu 1 in table format may not be aware that this was the same plan as the "Diamond" plan in Menu 1 in the graph format. We further randomized the order of the menus the subjects saw within each of the display formats. We detect no effects of these randomizations.

[9]We randomized the size of the salary because ex-ante it was not clear whether the salary level would affect how people viewed the insurance options and the level of risk aversion the subjects would display. In practice, we detect zero difference in choice patterns across the salary level for any choice. As such, throughout we present results pooling across the two salary levels.

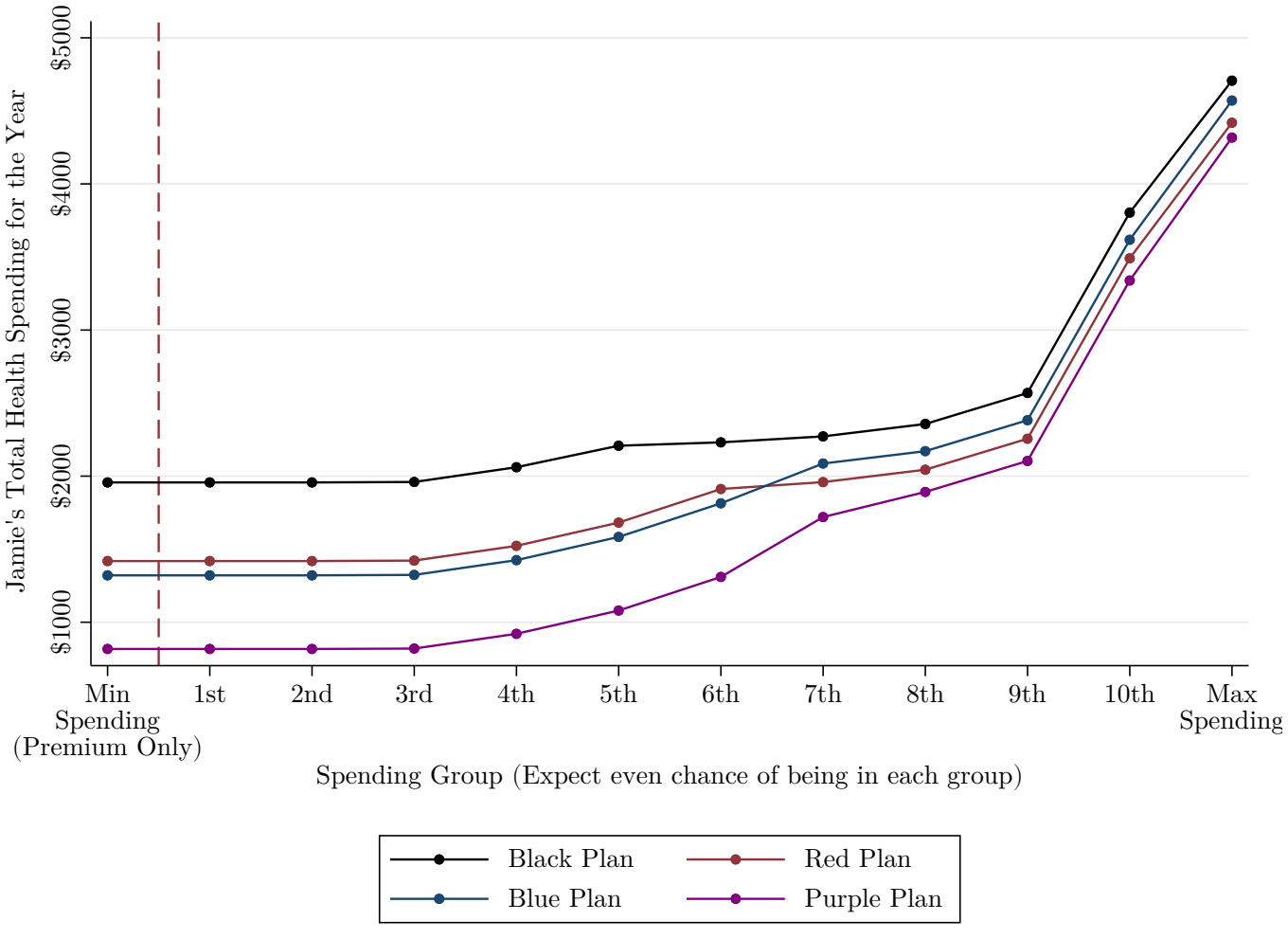
Figure 2: Displays in Experiment

Feature-Table

Plan Name	Annual Premium	Annual Deducible	Coinsurance Rate	Maximum Out of Pocket
Purple*	$817	$1,000	10%	$3,500
Blue	$1,321	$750	10%	$3,250
Red	$1,419	$500	10%	$3,000
Black	$1,957	$250	10%	$2,750

* Denotes the dominant option (Not shown to subjects)

Consequence Graph



Notes: This figure displays the feature-table (top panel) and consequence-graph (bottom panel) displayed to subjects in the laboratory experiment for Menu 1

3.2 Experiment Results

Two hundred and one university students participated in the laboratory experiment. Table A1 in Appendix A shows that we were balanced on subject observables (age, gender, and GPA) across the randomized order of whether the subject saw the feature-table or consequence-graph display first.

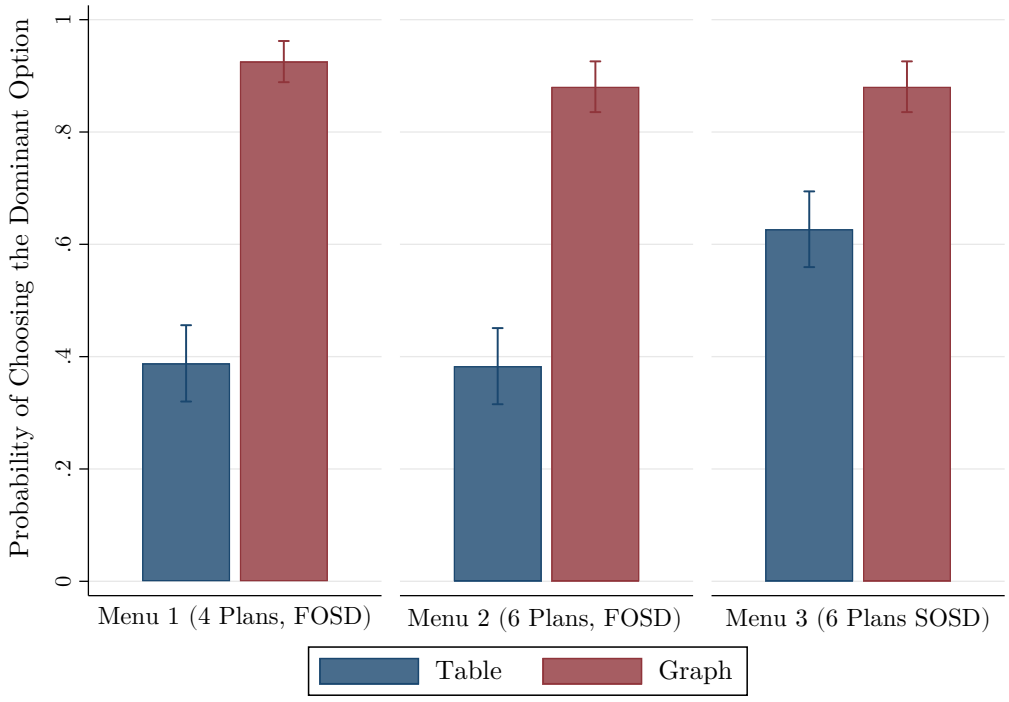
Figure 3 provides a bar chart that demonstrates the key finding of the experiment: the dominant option is chosen significantly more often under the consequence-graph display than under the feature-table display. Figure 3 reports on the probability of choosing the dominant option across the 3 menus in the experiment where a dominant option was available. For example, menu 1 was a 4-plan menu with a strictly dominant option, menu 2 was a 6-plan menu with a strictly dominant option and menu 3 was a 6-plan menu with a second-order stochastically dominant option.[10] The figure includes observations only from the first set of choices that subjects made (i.e., this is between-subjects analysis). We see that the consequence-graph statistically significantly increased the probability of choosing the dominant option from all menus. For example, in menu 1, only 39% of subject selected the dominant option under the feature-table display. In contrast, 93% of subjects selected the dominant option under the consequence-graph display. Similar patterns are observed for menus 2 and 3. Appendix A, Figures A1, A2, A3 and A4, provide detailed information about the distribution of choices for each menu.

In Table 1, we present regression analysis to quantify the magnitude and statistical significance of the differences in the choice patterns and explore interactions of display format with our measure of insurance literacy. The dependent variable is an indicator for selecting the dominant option from the menu versus the alternative of selecting any one of the other plans. We run simple ordinary least squares regressions separately for each menu and regress the indicator for dominant plan choice on a dummy variable for whether the choice was made in the consequence-graph display format. Here we use all of the data, i.e., two choices for each subject (one in each display format) for a total of 402 choices for 201 subjects. We account for the repeated measures by clustering the standard errors at the subject level. We also create an indicator variable *low insurance literacy*, which is equal to 1 for those (35% of subjects) who answered both insurance literacy questions incorrectly. Specifications (2), (4) and (6) include a control for insurance literacy and an interaction term of insurance literacy with display format.

As can be seen in Table 1, the coefficient on consequence-graph is positive and statistically significant (0.25-0.54, p-values<0.01) in all regressions, confirming that the consequence-graph statistically

[10] Another difference between menu 1 and menu 2 is that menu 1 kept the same co-insurance and out-of-pocket spending above the deductible, while menu 2 varied the co-insurance and out-of-pocket spending above the deductible across plans. Hence, we consider menu 2 more complex than menu 1

Figure 3: Choosing Dominant Option in the Experiment



Notes: This figure provides the probability of choosing the dominant option in the 3 menus in the experiment where one was available. Menu 1 includes 4 plans with one first order stochastically dominant option, Menu 2 includes 6 plans with one first order stochastically dominant option and Menu 3 includes 4 plans with one second order stochastically dominant option. The analysis is between-subjects and uses only the first time the menu is seen. Includes 95% confidence intervals.

significantly increases the likelihood of choosing the dominant option. The coefficient on low insurance literacy is negative (-0.11 to -0.22) and statistically significant (p-values<0.01 in menus 2 and 3, p-value of <0.10 in menu 1), implying that low insurance literacy is associated with a reduction of about 10-20 percentage points in the likelihood of selecting the dominant option. The reduction is lowest in menu 1, which is not surprising since this is also the menu that we anticipated would be the least complex. Since insurance literacy in our study is measured as ability to map features to consequences, this result also supports our hypothesis that people who have trouble with this mapping are least likely to be able to choose the dominant option, especially as the menu choices become more complex.

We also ask whether the consequence-graph treatment can help overcome low insurance literacy. The coefficient on the interaction term for low insurance literacy and consequence-graph display is positive (0.20 to 0.22) and statistically significant in menus 2 and 3 (p-values<0.05). This brings us to

Table 1: Regression Results for Experiment

	Menu 1 4 Plans, FOSD		Menu 2 6 Plans, FOSD		Menu 3 6 Plans, SOSD	
	(1)	(2)	(3)	(4)	(5)	(6)
Graph Display	0.54***	0.51***	0.50***	0.43***	0.25***	0.18***
	(0.05)	(0.06)	(0.02)	(0.04)	(0.03)	(0.04)
Low Literacy		-0.11*		-0.19***		-0.22***
		(0.06)		(0.06)		(0.07)
Low Ins. Literacy * Graph Display		0.07		0.20**		0.22**
		(0.07)		(0.08)		(0.08)
Constant	0.39***	0.43***	0.38***	0.45***	0.63***	0.70***
	(0.05)	(0.05)	(0.02)	(0.03)	(0.02)	(0.03)
Number Choices	402	402	402	402	402	402
Number Participants	201	201	201	201	201	201

Notes: This table shows the results of an Ordinary Least Squares (OLS) regression where the dependent variable is the indicator for choosing the dominant plan. This is a panel regression in which each individual appears twice and we cluster standard errors at the individual level. Participants were given two incentivized questions asking them to calculate out-of-pocket spending for a given plan and medical bill scenario – we define low insurance literacy as getting neither question right. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

an important result: when low insurance literacy is a problem, the consequence graph display appears to entirely off-set any disadvantage that this causes for plan choice. Further, this implies that the largest effects of the consequence-graph are concentrated among subjects with low insurance literacy.

For our final (fourth) menu in experiment 1, we moved away from having a natural benchmark for choice based on economic theory and instead presented a menu in which all options were rationalizable. This menu was designed so that each option would be preferred by an expected-utility-of-wealth maximizer with a constant absolute risk aversion (CARA) utility function for some range of risk aversion given the distribution of medical bills Jamie faced. There are two main take-aways from the results from this menu. First, as shown in Appendix A, the distributions of plan choices are similar across the feature-table and consequence-graph display (Wilcoxon Mann-Whitney test of distributions p-value=51). Second, although the overall choice shares are similar for the two display formats, only half of subjects selected the same plan across the two displays. Most of the others selected a plan that was one or two spots up or down the coverage-level ranking in this menu when comparing across display formats.

Differences in plan choice at the individual level raise the question of whether either of the two display formats correspond more closely to a stable underlying preference for risk coverage. One potentially instructive exercise is to investigate how choices from this menu correlate with risk aversion that we elicited separately using the Eckel-Grossman gamble choice. As shown in Table A2 in Appendix A, there is substantial variation in the level of risk aversion (indicated by choice of gamble) that subjects displayed in the risk task.

We next correlate risk aversion as measured in the Eckel-Grossman gamble choice (with lower gamble choices implying higher risk aversion) with the level of coverage selected in menu 4 (where options with higher premiums have more coverage).[11]Under the feature-table display, we find a near zero correlation of risk aversion and choice (Spearman correlation coefficient:-0.02, p-value=0.78). In contrast, under the consequence-graph display, we detect a modest positive and statistically significant correlation between risk aversion and choice (Spearman correlation coefficient: 0.12, p-value=0.08). This implies that the difference in choices subjects made when choosing from the graph display versus the table display may have moved them in the direction of greater correspondence with their risk aversion as measured by the gamble choice. This also suggests that the observed changes in choice between feature-table and consequence-graph formats in this menu are not likely to be due to measurement error alone.

Finally, after subjects had made their choices, but before they found out their earnings, they were asked whether they preferred to make choices using the feature-table or the consequence-graph. Seventy-five percent of subjects stated that they preferred to make choices using the consequence-graphs, while the other 25% preferred the feature-tables.

4 Survey Experiment with Hypothetical Choices

The results of the incentivized laboratory experiment show that people can use the consequence graph information to avoid dominated options. We designed our survey experiment to expand on these results in a number of ways. First, we wanted to know whether the consequence graphs change behavior in a broader population. Second, we wanted to move to a more naturalistic choice environment because the incentivized laboratory experiment may abstract from important real-world motives that people have when selecting insurance plans. For example, while the standard insurance demand model outlined in Section 3 assumes that people have preferences only over the distribution of final wealth outcomes under insurance contracts, in reality people may also have preferences for the flow of spending throughout the year (see for example, Ericson and Sydnor, 2018). Third, while consequence graphs are a natural tool for helping people spot situations of state-wise dominance, there is a broader question of whether providing consequence information changes decisions in other cases where there are no dominant options. The hypothetical-choice survey experiment described in this section is designed to allow us to address all of these issues.

[11]While choices from this menu can, in theory, be mapped to a specific level of risk aversion under an assumption about the underlying utility, we prefer to remain agnostic about the specific utility function that best represents choice patterns. Instead, we use the choice from this table as a way of rank-ordering subjects by risk aversion.

4.1 Survey Design

We conducted the survey in 2017 using the Understanding America Study (UAS), which is a nationally-representative online panel managed at the University of Southern California.[12] Survey respondents earned $7 for approximately 13 minutes of their time. Instructions (available in Appendix C) were displayed on the screen and subjects moved through them at their own pace. Respondents were asked to imagine that they were choosing a health insurance plan for themselves. They were assured that all plans have the same access to doctors and hospitals, so the quality of care would be the same across plans.

We customized the information about medical risk for the respondents. They were first asked for their gender, age and self-reported health status. This information allowed us to classify individuals into one of 50 categories of risk types based on their combinations of age bracket, gender and health status.[13]Just as in the laboratory experiment, they next viewed a graph of their distribution of potential medical spending derived from MEPS data for people with this same categorization of age group, gender and self-reported health status. Participants were told (truthfully) that the distribution showed the frequency of different total amounts of medical bills for people in their same categories along these three dimensions.

When making their choices, all respondents saw a feature-table, since this is the most likely practical scenario for health insurance choice. By ensuring that subjects always have access to the insurance plan features, we also make it possible for subjects to express preferences over insurance features even when they are given consequence information in a way that our incentivized laboratory experiment design did not allow.

We randomized respondents to one of three treatments: feature-table only, feature-table plus consequence-graph and feature-table plus expected-value.[14]Respondents participated in only one of the three treatments. Prior to participation, all respondents received a short training exercise in which we showed examples of plans in the display format the respondent would ultimately see, asked

[12]In keeping with the recent norms in the profession of pre-registering field experiments, we pre-registered this survey with AsPredicted.org (see pre-registration plan 5372, anonymized link here: https://aspredicted.org/blind.php?x=m9ni37).

[13]We included 2 genders, 5 age brackets and 5 health statuses. Health status was split by the answer to the question "In general, compared to other people your age, would you say that your health is excellent, very good, good, fair or poor?"

[14]We attempted to create balance across the three treatments such that each of the 50 categories (age/gender/health status) of respondents was represented in each treatment. To do this, respondents were assigned sequentially within their category to each of treatments as they entered the survey. About 2/3 through the survey, new respondents were invited and the sequential order of assignment was reversed. This gave us about equal numbers of participants in each treatment, and allowed us to have at least one participant from each group in each treatment for most groups. We recognize that random assignment rather than sequential would have been preferred, however, this was not done due to a communication error with the programmer. The sequential assignment should not pose a problem, since as we document in the next section there are no major differences in the average demographic characteristics across groups.

Table 2: Plan Choices in Survey

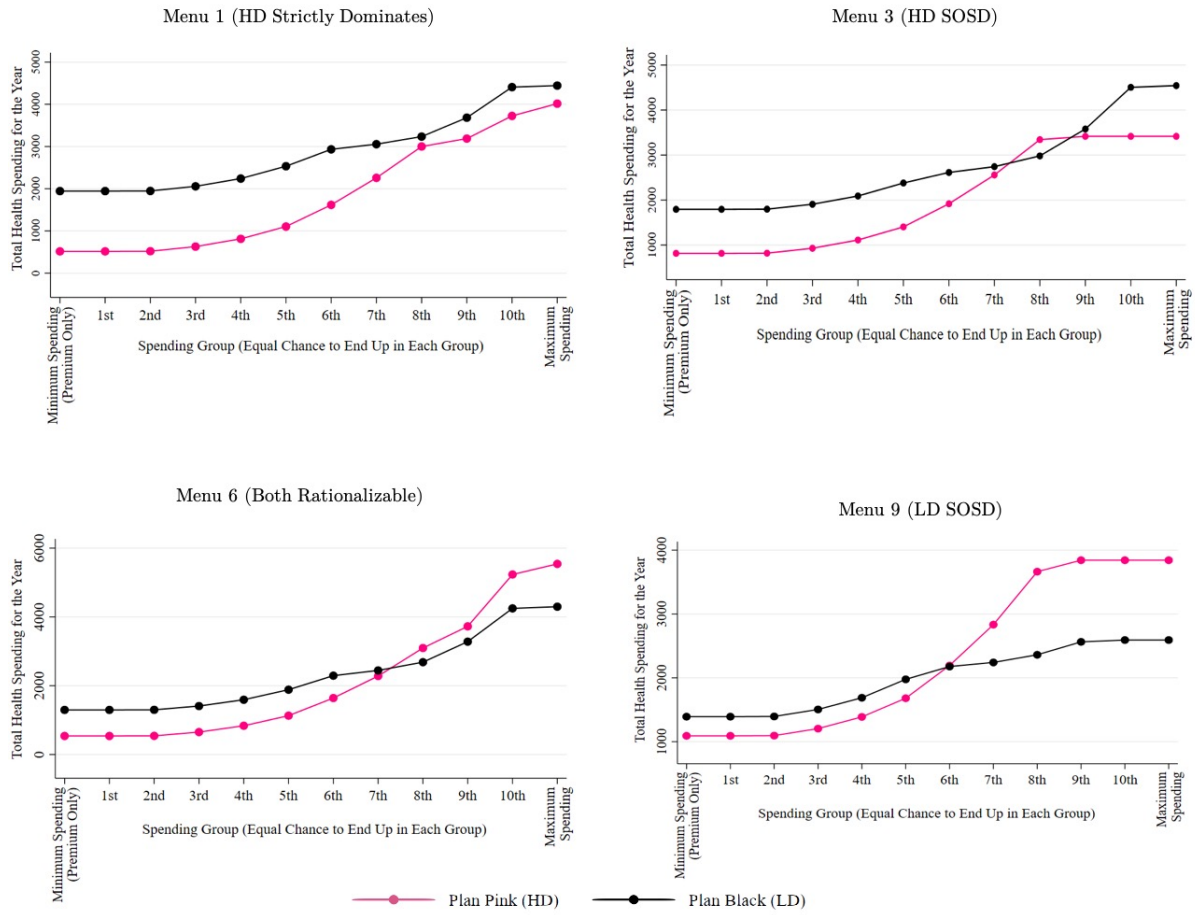
		Lower Deductible Plan (LD)				Higher Deductible Plan (HD)			
Analysis Menu Number	Menu	Premium	Deductible	Coins.	MOOP	Premium	Deductible	Coins.	MOOP
1	HD SWD	1944	1000	15%	2500	516	2500	5%	3500
2	HD SWD	1536	250	20%	2000	504	1300	20%	3000
3	HD SOSD	1794	750	20%	2750	816	2600	0%	2600
4	HD SOSD	1572	250	15%	1250	456	1600	20%	2100
5	Intermediate	1176	750	15%	2000	408	1750	20%	3000
6	Intermediate	1296	1000	20%	3000	540	2500	20%	5000
7	Intermediate	1860	500	20%	3500	576	3000	35%	6350
8	Intermediate	1920	500	20%	4000	1296	2000	30%	6000
9	LD SOSD	1392	750	10%	1200	1092	2500	25%	2750
10	LD SOSD	1884	0	15%	3750	1140	5000	20%	6350

Notes: This table describes the plan choices available to participants. Participants were shown each menu (with one low and one high deductible plan) in random order

questions about the plans, and provided the correct answers to the questions. In the treatment with consequence graphs, these questions verified that people were reading the graph correctly.

Respondents were asked to make decisions in 10 menus with 2 plans in each menu. The order of the menus and the names of the plans were randomized. Each menu featured an option with a higher deductible/lower premium and an option with a lower deductible/higher premium. We selected plan pairs using actual cost-sharing designs and employee premium costs of plans in employer sponsored menus from the Kaiser Family Foundation Survey of Employer Health Benefits based on a recent paper by Liu and Sydnor (2018). Our plans are not a representative sample of employer-sponsored health plan menus, but are realistic options that span the types of tradeoffs present in these menus. Table 2 provides a summary of the features of the plans and Figure 4 provides examples of consequence graphs for each type of menu. In menus 1-2 the high deductible plan was state-wise dominant. In menus 3-4 the high deductible plan was second order stochastically dominant for each of the 50 risk types. The example in Figure 4 shows that for these plans the premiums, maximum total spending, and expected spending were all lower with the HD option but there were some specific levels of total spending where the individual could save money with the LD plan. In menus 5-8 both choices were rationalizable, which resulted in a consequence graph where the two plan lines cross. In menus 9-10 the low deductible plan had substantially lower maximum out of pocket spending than the high deductible plan and therefore second order stochastically dominated for many risk types with at least modest expected total spending amounts.

Figure 4: Consequence-Graph Examples for Different Menus in Survey



Notes: This figure shows what the consequence (premium plus out of pocket costs for each group and plan) graphs for menus 1, 3, 6 and 9 looked like for a "woman, between 40 and 49, with self-reported 'good' health." In menu 1, HD strictly dominates. In menu 3, HD is the second order stochastically dominant option. In menu 6, both options are rationalizable. In menu 9, LD is the second order stochastically dominant option.

At the end of the survey, we elicited risk aversion using a hypothetical question about how much respondents would be willing to pay to avoid the chance of $3,000 worth of engine damage to a car worth $10,000. Due to time constraints, we were unable to elicit insurance literacy as we did in the laboratory experiment. However, because UAS respondents regularly answer surveys about a variety of topics, we supplemented our data with an existing measure of numeracy to proxy for insurance literacy. We also linked our data with UAS data on household demographic and socio-economic status, and to a separate incentivized risk elicitation previously fielded on the UAS.

4.2 Survey Results

4.2.1 Respondent Characteristics

Six hundred and ninety two respondents participated fully in the survey.[15] Table 3 describes the characteristics of the respondents by treatment and compares them to the Current Population Survey (CPS) of the same year. As seen in the left panel of Table 3, about half of the respondents were female and the average age of respondents was 45. Our sample is comparable to the CPS and we have a wide distribution of educational attainment levels and household incomes. Fifteen percent of respondents reported that their health status is excellent, 71% reported that their health status was good or very good, and 14% reported that their health status is poor. The right panel of Table 3 shows that for none of these characteristics could we reject the null hypothesis of equal means across randomized groups. However, we do see that those in the table-only were a little less likely to report excellent health and a little more likely to report poor health. Throughout our analysis below we include risk-group fixed effects, which should ensure that these slight imbalances are not affecting our results.

4.2.2 Treatment Effect Analysis

Figure 5 displays the share of high deductible plan choices, by menu and treatment, including 95% confidence intervals. The plans are ordered based on the relative attractiveness of the high deductible plan for an expected-utility maximizer with moderate risk aversion. We see that the share choosing the high deductible plan is mostly decreasing in menu number. In the feature-table only treatment, the high deductible plan is chosen about 50% of the time when it is the dominant plan, 27% of the time when there is no dominant option and only 10% of the time in the cases where the low-deductible option sometimes second-order stochastically dominates. This general downward slope in high deductible plan choice suggests people were responding to the parameter of plan options in the expected direction, meaning that participants were engaging thoughtfully with the options presented in the survey experiment.[16]

Our main result, clearly visible in Figure 5, is that the treatment adding the consequence-graph substantially increases the share choosing the high-deductible plan relative to the feature-table only

[15]The UAS panel consists of over 6,000 members. Our pre-registered goal for sample size was 600 respondents, evenly split between treatments (https://aspredicted.org/blind.php?x=m9ni37). Programmers selected 970 members to be invited to the survey, and 721 members responded to the survey in some capacity (74% response rate). 20 respondents started but did not complete the survey. We drop a further 9 respondents who did not give a choice for each of the 10 choice pairs (of these 7 did not have recorded choices for any of the 10 pairs).

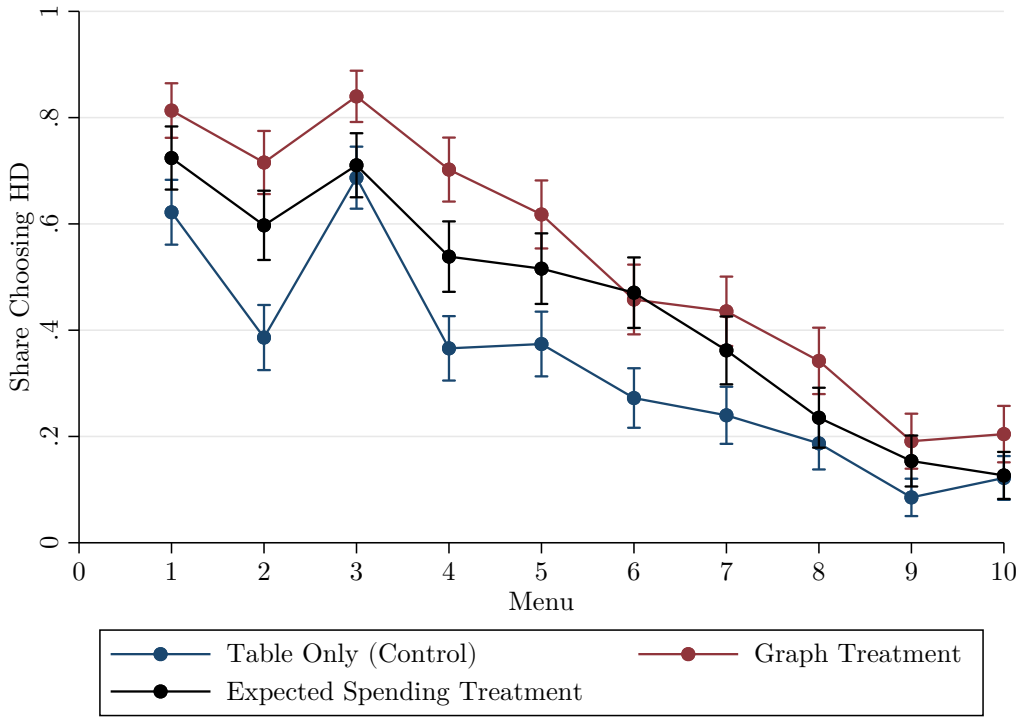
[16]The spike of high deductible choice in menu 3 for the feature-table only group could be due to the fact that this is the only case where the maximum out of pocket is higher for the low deductible versus the high deductible plan. This is likely a further sign that people were paying attention when making these choices.

Table 3: Summary Statistics and Comparison to the CPS

			UAS Study			
Variable	(1) Total:UAS	(2) Total:CPS	(3) Table Only	(4) Table+Graph	(5) Table+Exp Val	(6) F-test P-Value
Female	0.54	0.53	0.55	0.53	0.53	0.91
Age(Years)	45.19 (0.46)	46.78 (0.05)	45.24 (0.749)	45.45 (0.82)	44.87 (0.83)	0.88
Educ: HS Degree or Less	0.27	0.41	0.26	0.28	0.28	0.95
Educ: Some College / No Degree	0.22	0.19	0.22	0.23	0.21	0.89
Educ: Associate Degree	0.14	0.10	0.14	0.14	0.14	1.00
Educ: Bachelor's Degree	0.23	0.20	0.25	0.23	0.21	0.53
Educ: Master's or Professional Degree	0.14	0.10	0.13	0.13	0.17	0.32
HH Income < $35K	0.32	0.23	0.30	0.33	0.34	0.60
HH Income $35K-$75K	0.32	0.53	0.33	0.34	0.30	0.61
HH Income > $75K	0.35	0.48	0.37	0.33	0.36	0.59
Currently Working	0.71	0.63	0.71	0.71	0.72	0.94
Currently Married	0.59	0.56	0.59	0.60	0.58	0.96
Household Size*	2.83 (0.05)	3.13 (0.00)	2.76 (0.09)	2.94 (0.10)	2.79 (0.09)	0.36
Excellent Self-reported Health Status	0.15	0.26	0.14	0.16	0.16	0.84
Very Good Self-reported Health Status	0.37	0.32	0.36	0.37	0.36	0.96
Good Self-reported Health Status	0.34	0.28	0.33	0.35	0.35	0.89
Fair Self-reported Health Status	0.10	0.10	0.11	0.09	0.09	0.76
Poor Self-reported Health Status	0.04	0.04	0.06	0.03	0.04	0.25
Expected Total Medical Spending ($)	3966.79 (115.96)		4207.34 (217.07)	3788.30 (177.55)	3880.75 (201.72)	0.31
Number of Observations	692	135715	246	225	221	

Notes: Column 1 shows the demographic characteristics of respondents in our baseline sample from the Understanding America Study.The UAS data throughout the paper are unweighted. The Current Population Survey data is tabulated in Column 2. The CPS data comes from the 2017 Annual Social and Economic Supplement and are weighted. The sample is limited to non-institutionalized respondents age 18 and older. Standard errors in parenthesis for non-binary variables. The p-value reported in Column 6 is from an F-test of joint significance of the treatment arms i.e Column 3 = Column 4 = Column 5. *Household size was not reported by 20 individuals. Therefore total observations used to calculate the means and standard errors for this variable is 672 (6 observations missing from column 3, 2 observations missing from column 4 and 12 observations missing from column 5).

Figure 5: Share Choosing High Deductible Plan in the Survey



Notes: This figure shows the share choosing the high deductible plan in the survey, by treatment and menu. Standard error bars represent 95% confidence intervals.

treatment. Table 4 provides additional support for this result.

In Table 4, we display the results of regressions in which the choice of high deductible plan is regressed on treatment dummies and age-gender-health status category fixed effects. The feature-table plus consequence-graph treatment increases the probability of choosing the high-deductible plan by 26 percentage points when the high deductible state-wise dominates and by 24 percentage points when it second-order-stochastically dominates. These effects are statistically significant at the 1% level.

The feature-table plus expected-value treatment also increases the likelihood of choosing the high-deductible plan relative to the feature-table only treatment. The effects are also statistically significant at the 1% level, but the magnitude is about half that of the feature-table plus consequence-graph treatment (15 percentage points when it state-wise dominates and 10 percentage points when it second-order-stochastically dominates). Post-estimation tests comparing the feature-table plus expected-value treatment to the feature-table plus consequence-graph treatment are statistically significant at the 1% level. This suggests that while simpler decision aids are useful, displaying the full distribution of

Table 4: Regressions of Treatment Effects in Survey

	Chose HD Plan			
	Menus 1 & 2	Menus 3 & 4	Menus 5 - 8	Menus 9 & 10
Graph Treatment	0.26***	0.24***	0.19***	0.09***
	(0.03)	(0.03)	(0.03)	(0.03)
Expected Spending Treatment	0.15***	0.10***	0.12***	0.03
	(0.03)	(0.03)	(0.03)	(0.02)
Health Group Fixed Effects?	Yes	Yes	Yes	Yes
Control Group Mean	0.50	0.53	0.27	0.10
Observations	1384	1394	2768	384
Number of Individuals	692	692	692	692
Adjusted R^2	0.085	0.050	0.086	.038

Notes: This table shows the results of OLS regressions with choice of high-deductible plan as the dependent variable. Standard errors are clustered at the individual level. We include health-group fixed effects since each health-group saw a different version of the graphs and expected spending levels based on the MEPS data.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

outcomes provides substantial additional value.

Our interventions affected choice patterns even when there was no dominant option. In menus 5-8 where both the high- and low-deductible plans were rationalizable, the feature-table plus consequence graph and feature-table plus expected-value treatments increase the choice of high-deductible plan by 19 and 12 percentage points respectively. These results suggest that both types of information make people more comfortable accepting the tradeoff of somewhat higher variance in spending for lower expected spending with the high deductible plan.

The results for menus 9-10 show a pattern we did not anticipate whereby the consequence graph increased the share of subjects selecting the high-deductible option. In these menus, the high-deductible option has substantially more risk and we anticipated that the consequence graph might help people better identify this differential. Instead, the consequence graph increased the share selecting the high deductible option by an average of 9 percentage points. The expected-value treatment also went in the same direction, increasing the fraction choosing the high deductible by an estimated 3 percentage points, but in that case we cannot reject the null hypothesis of no change relative to the feature-table only control group. These results could be consistent with some fraction of subjects having more risk-loving preferences and a desire to avoid premiums that they express more reliably when they have consequence information. Yet they might also suggest that the consequence graphs bias some participants towards focusing on minimizing premiums.[17]

Taken together, the results show that the consequence-graph treatment substantially altered choice

[17]For example, some users rather than comparing the entire line in a consequence graph across plans may pick a spot toward the left or middle and make a point-wise comparison of plans. That type of behavior will typically bias people toward selecting plans with lower premiums.

patterns relative to feature-table only information, but leave open some questions about whether the changes represent an "improved" consideration of options. The results on avoidance of dominance provide the most straight-forward normative test of the decision aids and suggest that in these cases the consequence graphs may substantially improve choices. In the next subsections, we explore the results more fully to try to better understand how the decision aids affected choice patterns.

4.2.3 Interactions with Numeracy and Risk Aversion

In this section, we consider how our treatments interact with numeracy and risk preferences. The results on numeracy are presented in Table 5, which regresses choice of high-deductible plan on numeracy score (standardized) and numeracy-treatment interaction terms. First, we find that numeracy is positively associated with the likelihood of choosing the high-deductible plan by 10 percentage points in menus 1-4 when it is the dominant plan and by 7 percentage points in menus 5-8 when both the high- and low- deductible plans are rationalizable (both p-values<0.01). This suggests that in general, greater numeracy is associated with greater likelihood of choosing the dominant plan.

Table 5: Regressions with Interactions for Numeracy in Survey

	Chose HD Plan		
	Menus 1 - 4	Menus 5 - 8	Menus 9 & 10
Graph Treatment	0.26***	0.20***	0.09***
	(0.03)	(0.03)	(0.03)
Expected Spending Treatment	0.13***	0.12***	0.03
	(0.03)	(0.03)	(0.02)
Numeracy (Z-Score)	0.10***	0.07***	0.00
	(0.02)	(0.03)	(0.02)
Numeracy * Graph	-0.05	-0.02	-0.03
	(0.03)	(0.04)	(0.03)
Numeracy * Expected Spending	-0.01	-0.03	-0.06**
	(0.03)	(0.03)	(0.03)
Health Group Fixed Effects?	Yes	Yes	Yes
Control Group Mean	0.52	0.27	0.10
Observations	2768	2768	1384
Number of Individuals	692	692	692
Adjusted R^2	0.097	0.096	.046

Notes: This table shows the results of OLS regressions with choice of high-deductible plan as the dependent variable. Standard errors are clustered at the individual level. We include health-group fixed effects since each health-group saw a different version of the graphs and expected spending levels based on the MEPS data. Numeracy is measured in a prior survey. We transform numeracy to a z-score so that the coefficient can be interpreted as the effect of a one-standard-deviation increase in numeracy. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Regressions with Interactions for Risk Aversion When Both Plans are Rationalizable in Survey

	Chose HD Plan: Menus 5 - 8		
	Measure of Risk Aversion:		
	WTP for Repair Repair	Max WTP (Losing Token)	Combined
Graph Treatment	0.19***	0.20***	0.20***
	(0.03)	(0.04)	(0.04)
Expected Spending Treatment	0.11***	0.13***	0.13***
	(0.03)	(0.04)	(0.04)
Risk Aversion (Z-Score)	-0.05**	-0.01	-0.07*
	(0.02)	(0.02)	(0.03)
Risk Aversion * Graph	-0.04	-0.04	-0.04
	(0.03)	(0.04)	(0.05)
Risk Aversion * Expected Spending	-0.03	0.04	-0.02
	(0.03)	(0.04)	(0.06)
Health Group Fixed Effects?	Yes	Yes	Yes
Control Group Mean	0.27	0.26	0.26
Observations	2768	2072	2072
Number of Individuals	692	518	518
Adjusted R^2	0.105	0.115	0.127

Notes: This table shows the results of OLS regressions with choice of high-deductible plan as the dependent variable. Standard errors are clustered at the individual level. We include health-group fixed effects since each health-group saw a different version of the graphs and expected spending levels based on the MEPS data. In each of Columns 1-3, we use a different measure of risk aversion: 1) the hypothetical wilingness to pay for insurance elicited in the survey, 2) the incentivized willingness to pay elicited in a related experiment and appended to the data and 3) an average of the two methods. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The coefficients on the numeracy-treatment interaction term are slightly negative and only one is statistically significant, which provides suggestive evidence that our treatments are more effective for low numeracy respondents. This is in line with the laboratory experiment, where we saw a much more robust heterogeneous treatment effect.

In Table 6, we next look at the association of plan choice with risk preferences in menus 5-8 where either plan choice was rationalizable by some level of risk aversion. Similar to the laboratory experiment, here we are interested in whether risk preferences are predictive of plan choice. In Table 6, we report on three regressions in which the dependent variable is high-deductible plan choice. The independent variables are treatment dummies, risk preference (standardized) and risk preference-treatment interaction terms. Across the three columns, we vary whether we measure risk preferences by 1) the hypothetical willingness to pay for a repair elicited in our survey, 2) the incentivized willingness to pay for insurance in a related experiment previously fielded on the survey panel, and 3) an average

of these two measures. As expected, we find suggestive evidence that greater risk aversion leads to a decreased likelihood of choosing the high deductible plan. The interaction with the information treatments generally goes in the same direction we found in the lab experiment where the information treatment strengthens the correlation between risk aversion and choice. However, that interaction is not precisely estimated and we cannot reject a null hypothesis of no interaction with measured risk aversion.

4.3 Interactions with Selection by Health Status

We next consider how the information treatments interacted with selection into health plans based on health status (i.e., adverse selection). A major advantage of the hypothetical choice survey is that it used a representative panel of consumers and therefore had decent variation in health status and age. In Table 7 we estimate how selection of the high-deductible option correlated with baseline expected total medical spending, determined by the individual's age, gender and self-reported health status, and how that correlation was affected by the information treatments.

Consistent with patterns of adverse selection documented in prior literature, under feature-based information respondents with greater expected health spending were less likely to select the high deductible option. This is especially true in menus 5-8 where both options are potentially rationalizable. The effect size for those menus implies that a $10,000 increase in expected spending (essentially going from very low to very high expected health spending) is associated with a 14 percentage point reduction in the likelihood of selecting the high deductible option. If we translate this into a dollar effect, we estimate that in these menus those who selected the high-deductible option had around$800 lower expected total spending than those who selected the low-deductible option. There is much more modest adverse selection for those seeing feature-based information in menus 1-4 where the high-deductible option dominated and no pattern of selection by health type in menus 9-10.

The provision of consequence information systematically increased the degree of selection by health type, as evidenced by the negative coefficients for the interaction terms in Table 7. In menus 5-8 where there was meaningful adverse selection in the baseline feature-only display, we see that the correlation between expected health spending and deductible choice more than doubles, though the estimated interaction term is not precisely estimated. When translated to a dollar effect, we estimate that there is around a $150 greater differential in expected spending between those choosing low and high deductible plans under the consequence information, though the confidence interval on this difference is very large. The effects for the expected-value treatment go in similar directions but are somewhat less pronounced than the effects of the consequence-information treatment.

Table 7: Regressions with Interactions for Expected Spending in Survey

	Chose HD Plan		
	Menus 1 - 4	Menus 5 - 8	Menus 9 - 10
Graph Treatment	0.27***	0.26***	0.18***
	(0.05)	(0.06)	(0.05)
Expected Spending Treatment	0.16***	0.17***	0.03
	(0.05)	(0.05)	(0.05)
ES ($ 10,000s)	-0.05	-0.14**	-0.00
	(0.06)	(0.06)	(0.05)
ES * Graph Treatment	-0.06	-0.20*	-0.23***
	(0.10)	(0.10)	(0.08)
ES * Expected Spending Treatment	-0.10	-0.11	0.01
	(0.09)	(0.09)	(0.10)
Control Group Mean	.52	.27	.10
Observations	2768	2768	1384
Number of Individuals	692	692	692
Adjusted R^2	0.049	0.049	0.019

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table shows the results of OLS regressions with choice of high-deductible plan as the dependent variable. Standard errors are clustered at the individual level. We include a measure for expected spending (ES) as measured by the expected spending of the individual's health-group (in ten thousands).

Table 8: Probability of Choosing the HD plan in menus 9 and 10 where LD is often SOSD in Survey

	Expected Savings with LD plan instead of HD				
	Overall	< 0	0-250	250-500	> 500
Graph Treatment	0.09***	0.20**	0.16***	0.08*	0.00
	(0.03)	(0.08)	(0.05)	(0.04)	(0.04)
Expected Spending Treatment	0.04	0.09	0.06	0.03	-0.01
	(0.03)	(0.07)	(0.05)	(0.04)	(0.04)
Control Group Mean	.10	.12	.10	.10	.10
Observations	1384	180	378	379	447
Adjusted R^2	0.011	0.029	0.026	0.004	-0.004

Notes: This table shows the results of regressing choosing the high deductible plan in menus 9 or 10 on the treatment variables, divided by the expected savings from choosing the low deductible plan over the high deductible plan. Results are based on the full analysis sample of 692 subjects. Standard errors are clustered at the individual level.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The other notable effect in Table 7 is that the consequence information generated substantial selection by health status in menus 9-10. In Table 8 we explore this pattern further, looking at how the information treatments affected selection of the high deductible option in these menus by splitting the sample into subgroups with different expected cost differentials between the two options. We find that the increased selection of the high deductible option in menus 9-10 is concentrated among

healthier individuals whose expected savings with the low deductible is small or negative. For less healthy individuals, where selecting the high deductible option would likely be a large mistake, there is no effect of the information treatment. These patterns help clarify the puzzling findings of a positive effect of the consequence information on high-deductible choice in menus 9-10. The fact that there was no effect for those with high expected spending suggests that the information treatment was not simply biasing everyone toward choosing premium-minimizing plans.

4.4 Analysis of Decision Models that Best Fit Choice Patterns

The choices subjects made across 10 different menus of options in this study also give us the ability to analyze which decision models are most consistent with choice patterns. This allows us to further analyze the way in which the information treatments shifted choices by mapping them to changes in decision models.

We consider a number of possible decision models. First, people may be employing simple heuristics, such as choosing the plan with the lowest deductible or lowest out of pocket limit or choosing the plan with the lowest premium. These heuristics will generate choice patterns that are not responsive to the variation in attractiveness of the options across our 10 choice menus. Second, people may be choosing in ways that are responsive to coverage and prices and are broadly consistent with expected utility theory for some level of risk aversion. At different levels of risk aversion, individuals will be predicted to switch from selecting high-deductible to low deductible options at different points across the 10 menus, with the switch point dependent both on risk aversion and on the individual's risk type. Finally, people may be randomly choosing between the two options in each case, which would create a prediction of fifty percent likelihood of choosing each option regardless of the menu. The fact that we have decisions across ten menus for each person means that we can analyze which of these models is most consistent with patterns at the individual level. Of course, real choices will likely not perfectly align with any of these model predictions, but our interest is knowing which of these is most consistent with choice patterns and how this varies across our treatments.

We operationalize this by generating the set of predicted probabilities of selecting the high deductible option across the ten menus for each individual in each decision model. All of the models, except random choice, are deterministic and generate a probability of 1 or 0 for choosing the high deductible option, while the predicted probability is equal to 0.5 for each menu in the random-choice model. For the heuristic models the predictions do not vary across individuals.[18] For expected utility,

[18]The only variation across menus in the heuristic models we consider comes for the heuristic of choosing the lowest out-of-pocket limit, which predicts choosing the higher-deductible option in menu 3 but the lower-deductible in all other menus. The deductible heuristic predicts always choosing the lower deductible, while the premium heuristic predicts

we generate predictions at the individual level under different levels of risk aversion. We use a constant absolute risk aversion (CARA) utility function and consider absolute risk aversion coefficients ranging from strong risk aversion to risk neutrality (i.e., expected-value maximization) to strong risk-loving preferences.[19]

We then calculate the mean absolute error between the individual's actual choice of the higher deductible option and the model's predicted probabilities across the ten menus. The model with the lowest mean absolute error is the one we consider most consistent with the individual's choice patterns. The different levels of CARA risk aversion often make the same predictions for the individual, so we bundle them together and simply consider whether some level of CARA risk aversion is the best fitting model. There are also at times ties between different models at the individual level. To simplify the exposition we break ties by prioritizing across models in the following order: risk neutrality, some level of risk aversion in the CARA model, lowest out-of-pocket limit heuristic, lowest deductible heuristic, lowest premium heuristic, some level of risk lovingness in the CARA model, and random choice. The distribution of "best fitting model" is slightly sensitive to these assumptions, but the qualitative findings across our treatments are the same regardless of the ordering used for tie breaking.

Figure 6 and Table 9 show the distribution of best fitting decision models across the experimental treatment groups. None of the subjects in any treatment are best described by the random-choice model. Subjects who saw the feature-table only had choice patterns that most often could be best explained by heuristics (56.5%, see Figure 6), typically the heuristics for minimizing out-of-pocket limit (28%, see Table 9) or deductible (25%, see Table 9). Around 32% of these subjects had choice patterns most consistent with some level of risk aversion and another 9% were best described as risk neutral.

The consequence-graph treatment dramatically shifted the best fitting models, reducing the share best described by heuristic models to 29% and increasing the share best described by risk-averse expected utility to 45% and expected-value maximization to 19%. Within the heuristics, we see the consequence graph shifting people away from the coverage-based heuristics and toward the lowest-premium heuristic. An increased share of people in the consequence-graph treatment have patterns consistent with risk-loving preferences. All of these directional patterns are the same for subjects in the table plus expected-spending treatment, but just more muted than what we see for the consequence-graph treatment.

always choosing the higher deductible.

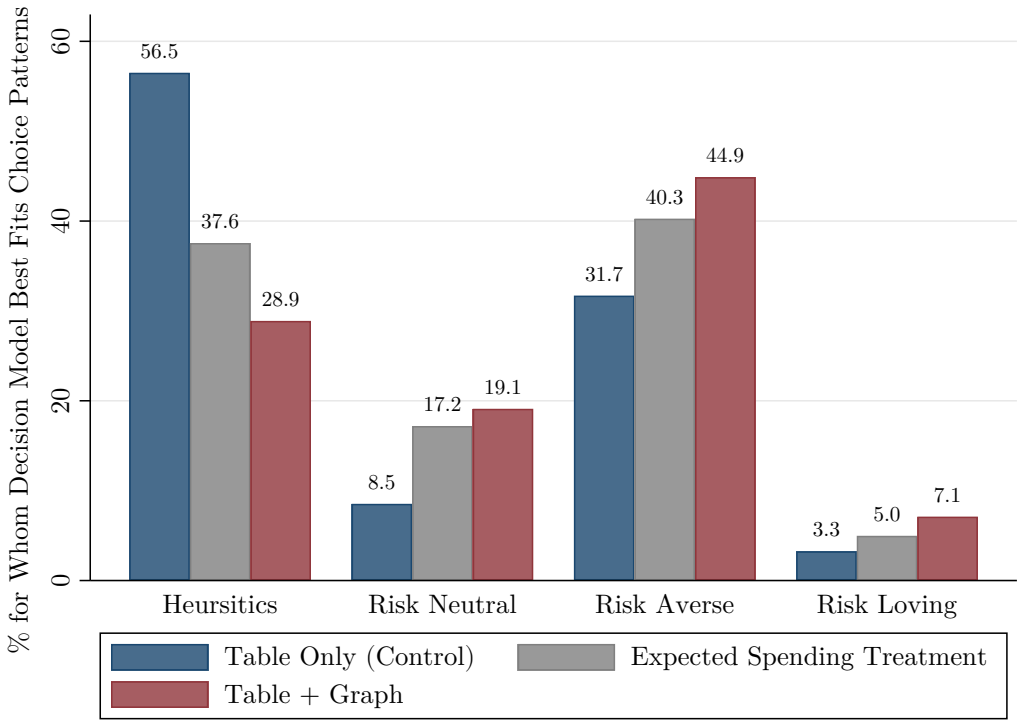
[19] We consider CARA risk aversion coefficients ranging from 0.009 (strong risk aversion) to -0.009 (strong risk loving) in steps of 0.001.

Table 9: Decision Model that Minimizes Absolute Errors Between Predicted Choice and Observed Choice in Survey

	Treatment Group		
	Table Only (%)	Table + Graph (%)	Table + Expected Spending (%)
Risk Neutral (Lowest Expected Value)	8.54	19.11	17.19
Some Risk Averse CARA Level	31.71	44.89	40.27
Heuristic: Lowest Out-Of-Pocket Limit	28.46	11.11	16.29
Heuristic: Lowest Deductible	24.80	8.00	15.84
Heuristic: Lowest Premium	3.25	9.78	5.43
Some Risk Loving CARA Level	3.25	7.11	4.98
Random Choice	0.00	0.00	0.00

Notes: This table shows the results of OLS regressions with choice of high-deductible plan as the dependent variable. Standard errors are clustered at the individual level. We include health-group fixed effects since each health-group saw a different version of the graphs and expected spending levels based on the MEPS data. In each of Columns 1-3, we use a different measure of risk aversion: 1) the hypothetical wilingness to pay for insurance elicited in the survey, 2) the incentivized willingness to pay elicited in a related experiment and appended to the data and 3) an average of the two methods

Figure 6: Share for Whom Decision Model Best Fits Choice Patterns in Survey



Notes: This graphs shows the fraction of subjects whose choice patterns across the ten menus of options in the survey experiment can be best described by each of the decision model categories. Categorization is based on selecting the model with the lowest average absolute error between predicted probability of selecting the higher-deductible option and the actual decision. The Heuristics category includes the following heuristics: select lowest out-of-pocket limit, select lowest deductible, and select lowest premium. The Risk Averse category includes CARA utility models with absolute risk aversion coefficients of 0.001 to 0.009 in steps of 0.001. The Risk Loving category includes CARA utility models with absolute risk aversion coefficients of -0.001 to -0.009 in steps of 0.001.

Table 10: Mean Absolute Errors Between Predicted Choice and Observed Choice by Treatment Assignment in Survey

	Treatment Group		
	Table Only	Table + Graph	Table + Expected Spending
Individual-Level Best Model	.10	.09	.10
Risk neutral (lowest expected value)	.48	.32	.38
Risk Averse CARA Level: r = 0.0004	.39	.29	.32
Risk Averse CARA Level: r = 0.001	.34	.30	.33
Heuristic: Lowest Out-Of-Pocket Limit	.30	.46	.40
Heuristic: Lowest Deductible	.33	.53	.44
Heuristic: Lowest Premium	.67	.47	.56
Risk Loving CARA Level: r = -0.0004	.56	.38	.46
Risk Loving CARA Level: r = -0.001	.64	.45	.54
Random Choice	.50	.50	.50

Notes: This table shows the mean average absolute error between predicted and observed choice of the high deductible option across the 10 menus in the survey experiment for different decision models. The individual-level best model corresponds to the categorizations in Table 9. This table can be interpreted as showing the fraction of decisions that the model predicts incorrectly across individuals.

In Table 10 we show the average mean absolute error both when we give each person their best fitting model and when we instead impose a particular model across all individuals. We show results here for moderate risk aversion (CARA r = 0.0004), which is similar to what has been estimated in prior studies of insurance choice (e.g,. Handel 2013) and high risk aversion (CARA r = 0.001) as well as the same negative (risk loving) r values.

On average, the best fitting models have absolute error rates of 10%, implying that they make a wrong prediction in one of the ten choice menus. The average error rates across each of the models are naturally higher if imposed on the entire population. For those who saw the feature table only, the lowest average mean absolute error comes from the lowest out-of-pocket limit heuristic (30%), then the lowest deductible heuristic (33%), but is also followed closely by the very high risk aversion (CARA r = 0.001) model at 34%. For subjects in the consequence-graph treatment, the lowest average mean absolute error comes from the moderate risk aversion (CARA r = 0.0004) at 29%, followed closely by higher risk aversion and risk neutrality.

Overall, we conclude from this analysis that the consequence-graph treatment shifted choice patterns away from heuristic choices focused on lower deductibles and out-of-pocket limits and toward decisions consistent with risk aversion or risk neutrality. There was also a subset of people for whom seeing the consequence-graphs appeared to bias them toward lower premium options, but the dominant effect was to move people toward patterns more consistent with standard expected utility theory.

5 Conclusion

We conducted an incentivized laboratory experiment and a hypothetical choice survey to evaluate the value of decision-aids that automatically map plan features to their financial consequences. We found substantial differences in choice patterns when study participants had access to the consequence-graphs. Without access to the consequence-graphs, respondents made substantial mistakes, choosing dominated plans even when a state-wise dominant plan was available. On the other hand, the participants who viewed consequence-graphs were significantly less likely to violate dominance. In our second study we also documented that overall patterns of choices under consequence graphs are more consistent with expected utility theory.

Our results contribute to a growing body of literature exploring how poor understanding of insurance affects choice patterns in health insurance. Relative to the prior literature, our study provides the clearest evidence yet that insurance choices in standard display formats – where options are almost always presented as a menu of plan features – are affected by subjects having a low ability to map plan features to a distribution of final wealth consequences. If people were able to do that mapping, we should not have seen differences in plan choice across display formats.

A growing literature on insurance choice uses naturally occurring data on insurance choice to infer consumers' risk preferences. This literature relies on the standard assumption that utility is measured over final wealth states, our result that individuals cannot do this mapping illustrates a fundamental flaw in this body of work. Namely, unless we help people better understand the consequences of their health insurance choices, they are not making selections based on utility over the distribution of final wealth states.

The consequence-graph approach we introduce in this paper may provide a way of simplifying and clarifying health insurance options in settings where people are asked to select between plans with different cost-sharing tradeoffs. The primary challenge to using this approach in practice is that it requires one to use a distribution of expected medical spending, and hence the consequence-graph will be specific to the individual. However, choice platforms for health insurance are already making some headways in this regard. The benefit of the consequence graph approach relative to approaches that provide only expected spending levels is that it allows the decision-maker to see the distribution of spending consequences they face, and hence retains and clarifies information about the amount of variance in spending and not just the average spending level. As we see from the results of our hypothetical choice survey, providing the expected spending amount without information about the variance is only half as effective at improving choice.

There are some reasons for caution in using consequence graphs and some limitations to our study. For example, our results suggest that the concerns raised by Handel (2013) that decision aids could increase adverse selection are likely relevant for choices with consequence graphs. The magnitude of these adverse selection effects is hard to pin down with the smaller samples in our study and will depend on the exact menu of options being considered in practice. The ultimate welfare effects of reducing choice errors with decision aids relative to leaving standard choice menus or removing choice entirely will depend on the setting and are beyond the scope of our paper.

Another potential issue with consequence graphs for health insurance choice in the field is that they clarify the distribution of final wealth states people face, but not the flow of spending. Although most models of insurance choice in the economics literature use the expected-utility-of-final-wealth formulation, it is likely that the flow of spending is also of import to consumers. If consequence graphs push people toward decisions based on final wealth states, they could be detrimental to welfare if true preferences incorporate features that depend on not just the overall level of spending for the year but also the flow of that spending. This may be especially important for people with liquidity constraints, behavioral hazard that causes them to under-utilize medical services that require out-of-pocket costs (Baicker et al., 2015), or whose experienced utility incorporates reference dependence (Kőszegi and Rabin, 2007). We see this as an important area for future research.

Finally, drawing practical implications of this approach likely requires testing further adaptations to the consequence-graph display. For example, it may be that different display formats or instructions could reduce the bias toward selecting minimum-premium plans that appears to arise for a smaller subset of participants. In settings other than health insurance, where people face small chances of largrickson losses (e.g., property insurance) the use of quantile-based graphs may also not be optimal. We believe our study highlights that decision aids that focus on effectively displaying the distribution of consequences people face with insurance options are a positive direction for practical applications and continued research.

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Appendix A: Additional Tables and Figures for the Laboratory Experiment

Table A1: Summary Statistics for Experiment

Variable	(1) Tables	(2) Graphs	(3) Total	(4) P-Value
Age	21.173	21.363	21.259	0.222
	(0.092)	(0.125)	(0.076)	
Female	0.773	0.681	0.731	0.151
	(0.040)	(0.049)	(0.031)	
GPA	3.414	3.370	3.394	0.400
	(0.035)	(0.039)	(0.026)	
Expects to Use Some Healthcare Next Year	0.536	0.549	0.542	0.854
	(0.048)	(0.052)	(0.035)	
Number of Individuals	110	91	201	

Notes: The table reports the mean background characteristics of the participants in the two groups. The p-value reported in the last column is from a t-test of the difference in means for those who saw the the standard display first i.e Column 1 versus those who saw consequence graph display first i.e Column 2. Order of first display type was randomized. Standard errors reported in parenthesis.

Table A2: Eckel-Grossman Results

Choice (50-50 Gamble) (1)	Low Payoff (2)	High Payoff (3)	Implied CRRA range (4)	Percent Choosing (5)
1	7	7	3.46<r	13.43
2	6	9	1.16<r<3.46	17.91
3	5	11	0.71<r<1.16	28.86
4	4	13	0.50<r<0.71	6.97
5	3	15	0<r<0.50	20.9
6	0.5	17.5	r<0	11.94
Observations				201

Notes: This table reports the Eckel-Grossman risk elicitation task results. The gambles are arranged in linearly ascending order of expected returns. Column 4 shows the relative risk aversion bounds where the utility function is assumed to be a constant relative risk aversion utility function of the form $U(x) = \frac{x^{1-r}}{1-r}$ where x is the wealth of the individual and r corresponds to the coefficient of relative risk aversion. Column 5 shows the percentage of the total sample that selected each of the gambles.

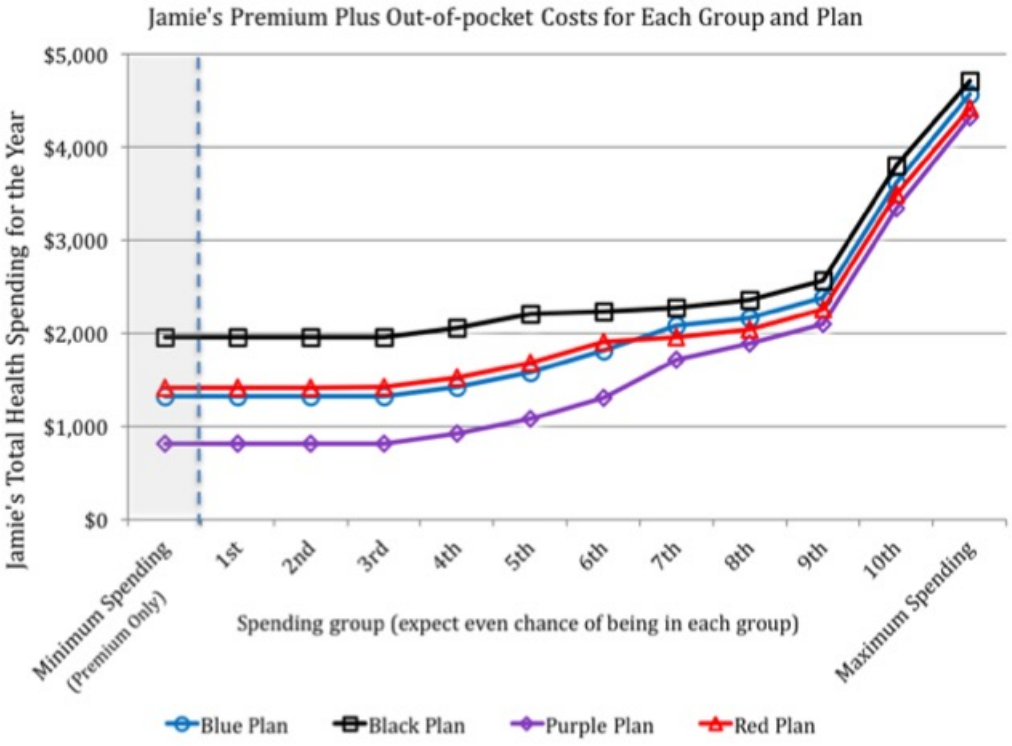
Figure A1: Plan Choices and Results of Menu 1 (State-wise Dominant Option, Four Plan Choices)

Feature-Table Display

Plan Name	Annual Premium	Annual Deductible	Coinsurance Rate	Maximum Out of Pocket
Purple*	$817	$1,000	10%	$3,500
Blue	$1,321	$750	10%	$3,250
Red	$1,419	$500	10%	$3,000
Black	$1,957	$250	10%	$2,750

* Denotes the dominant option (Not shown to subjects)

Consequence Graph Display



Results for Menu 1

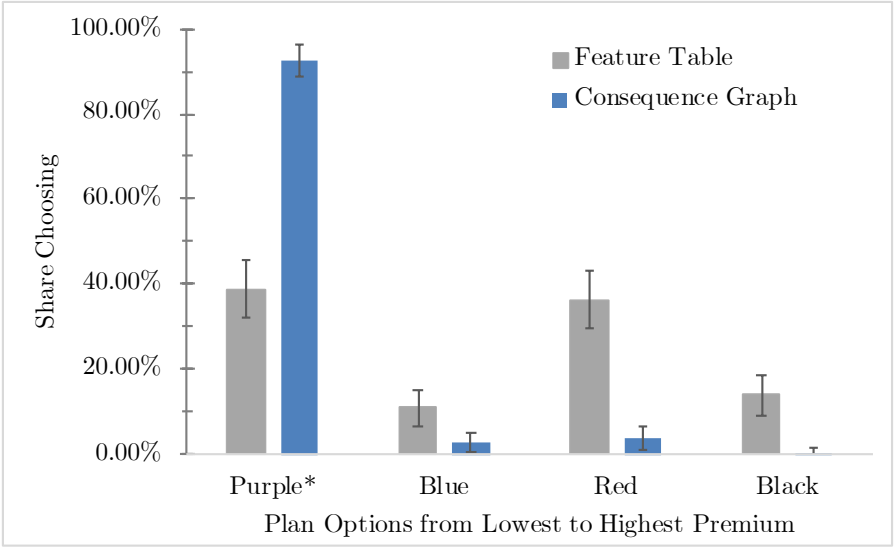


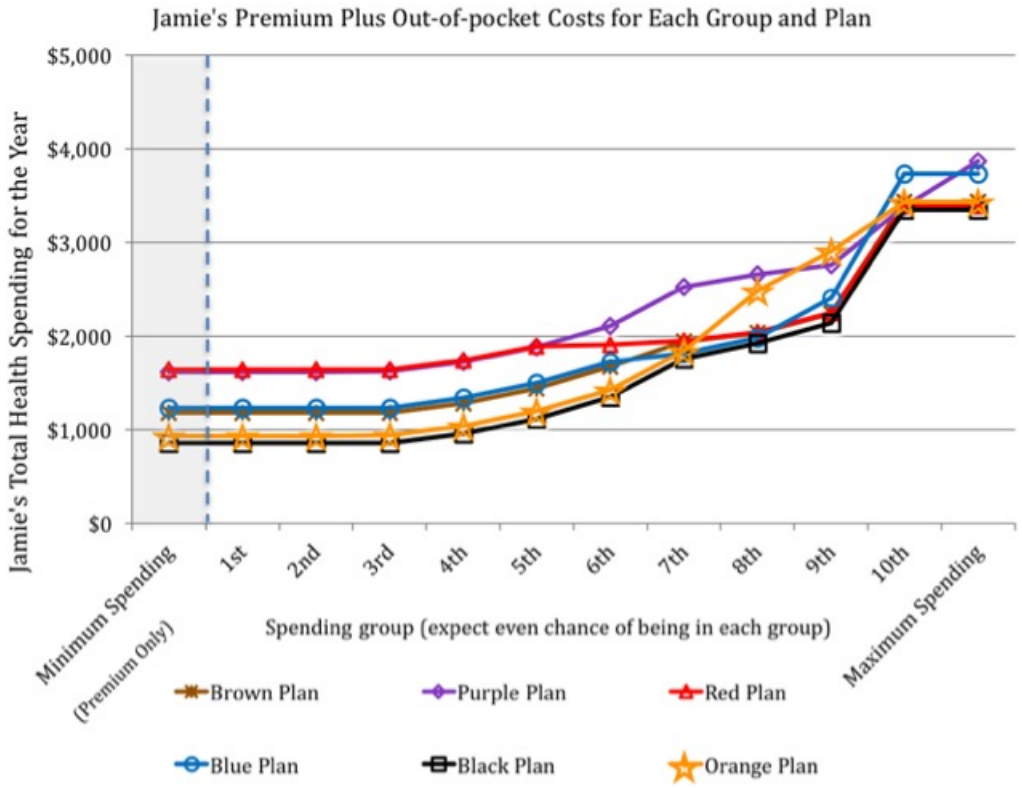
Figure A2: Plan Choices and Results of Menu 2 (State-wise Dominant Option, Six Plan Choices)

Feature-Table Display

Plan Name	Annual Premium	Annual Deductible	Coinsurance Rate	Maximum Out of Pocket
Black *	$851	$1,000	10%	$2,500
Orange	$932	$1,500	20%	$2,500
Brown	$1,177	$750	10%	$2,250
Blue	$1,231	$500	20%	$2,500
Purple	$1,616	$1,000	5%	$2,250
Red	$1,635	$250	10%	$1,750

* Denotes the dominant option (Not shown to subjects)

Consequence Graph Display



Results for Menu 2

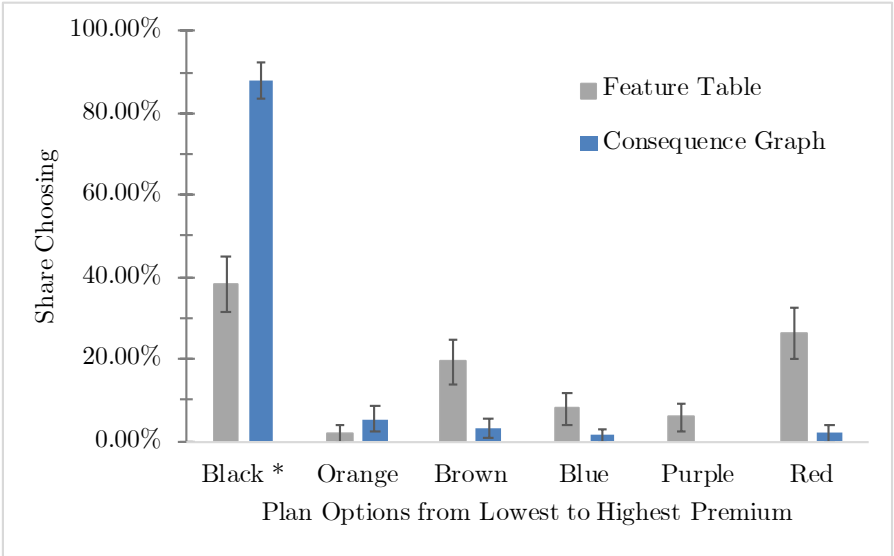


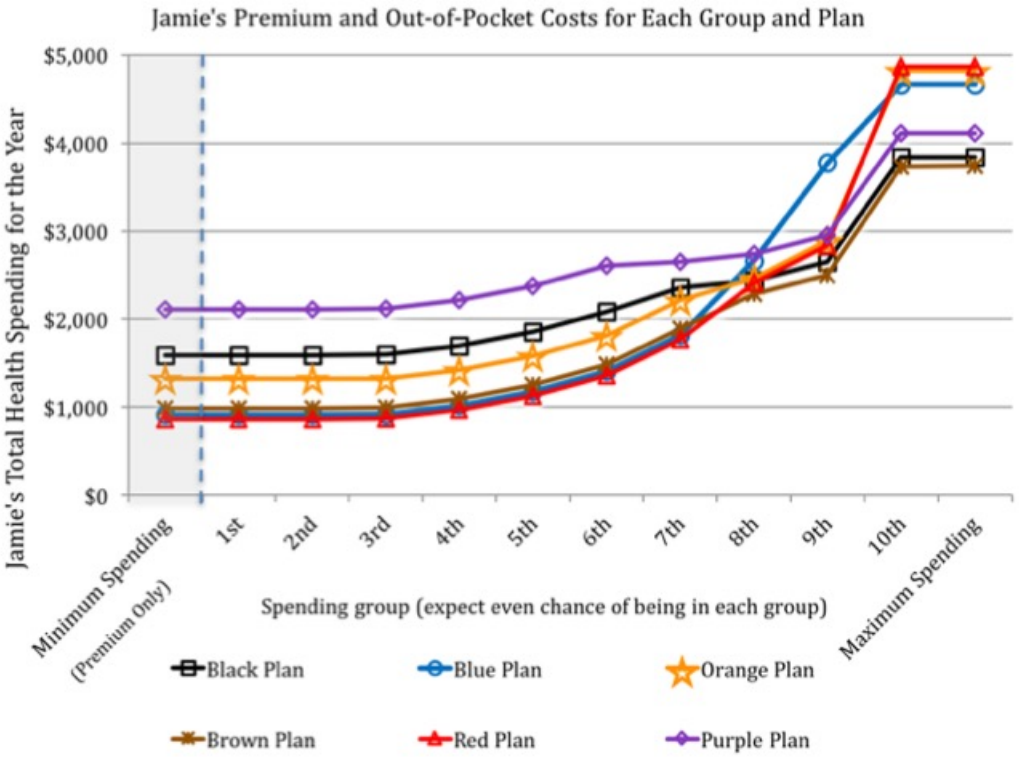
Figure A3: Plan Choices and Results of Menu 3 (Second Order Stochastically Dominant Option, Six Plan Choices)

Feature-Table Display

Plan Name	Annual Premium	Annual Deductible	Coinsurance Rate	Maximum Out of Pocket
Red	$863	$1,500	20%	$4,000
Blue	$913	$2,750	10%	$3,750
Brown *	$988	$1,250	10%	$2,750
Orange	$1,317	$1,000	20%	$3,500
Black	$1,589	$750	10%	$2,250
Purple	$2,113	$500	10%	$2,000

* Denotes the dominant option (Not shown to subjects)

Consequence Graph Display



Results for Menu 3

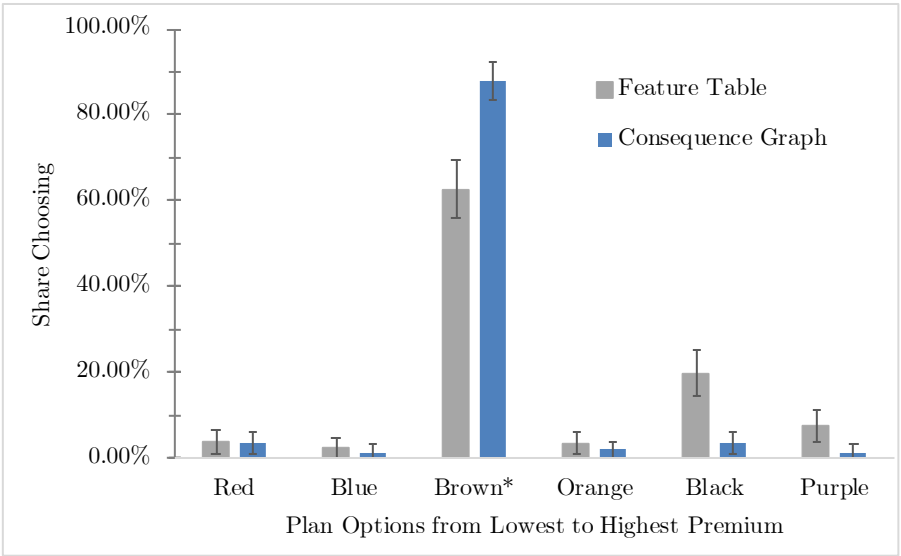


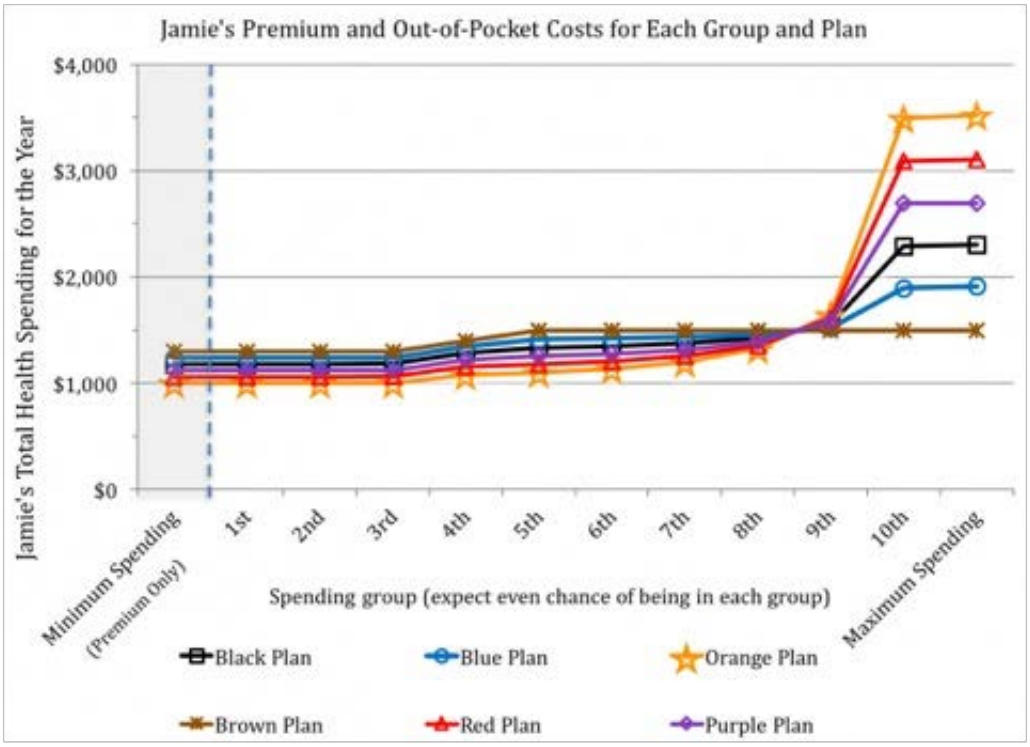
Figure A4: Plan Choices and Results of Menu 4 (Second Order Stochastically Dominant Option, Six Plan Choices)

Feature-Table Display

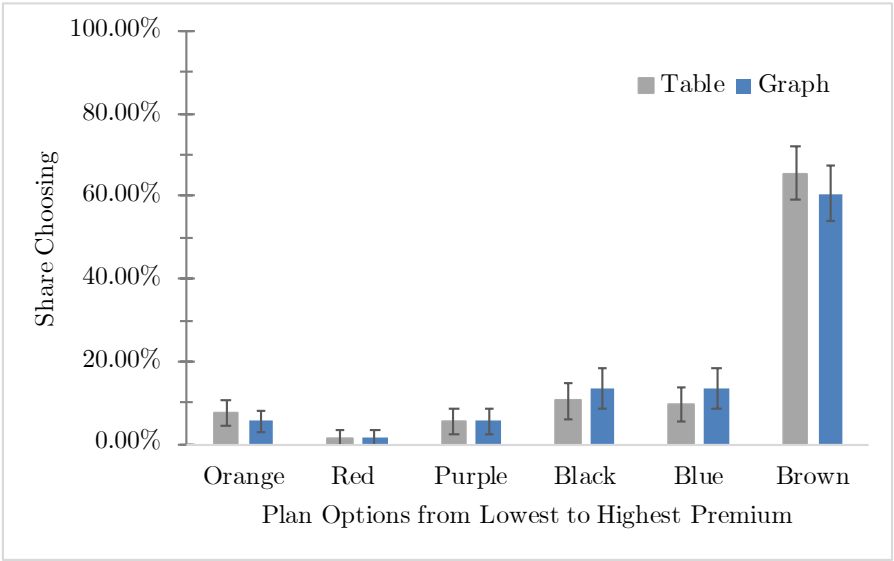
Plan Name	Annual Premium	Annual Deductible	Coinsurance Rate	Maximum Out of Pocket
Orange	$1,000	$75	15%	$2,525
Red	$1,059	$100	12%	$2,050
Purple	$1,119	$125	9%	$1,575
Black	$1,179	$150	6%	$1,125
Blue	$1,238	$175	3%	$675
Brown*	$1,295	$200	0%	$200

* Denotes the dominant option (Not shown to subjects)

Consequence Graph Display



Results for Menu 4



Appendix B: Laboratory Experiment Instructions and Questions

Today's Study: Simulation of Choosing Health Plan Options as a New Employee

Thank you for participating in our study. Today we are going to ask you to take part in a simulation about choosing health insurance as a new employee. You will be making choices on behalf of a hypothetical person named Jamie. Your payment for the study will depend partly on your decisions and partly on Jamie's health outcomes.

Jamie's situation: Jamie just graduated from college and has recently started a new job. Jamie's job comes with health insurance benefits, but Jamie has a choice of health plan options. The choices affect two types of payments for Jamie.

Premium: Jamie has to pay part of the cost for the health plan. This is the amount of money Jamie pays for sure for the year for health coverage. These payments are made by equal paycheck withdrawals over the course of the year.

Out-of-pocket costs: People with health insurance generally still have to pay for part of the medical costs they generate when they go to the doctor. These payments are made only if Jamie needs to get medical care, and come from insurance features such as co-pays and deductibles.

Today you will see some information about options for Jamie in a few scenarios and will be asked to make choices for Jamie.

Please read carefully. There are a few checks embedded in the survey to verify that you are reading fully.

The Possible Medical Spending (Doctor and Hospital Bills) Jamie Might Have for the Year

To make decisions for Jamie, it is helpful to know something about Jamie's possible healthcare needs. We have collected data on recent annual (yearly) medical expenses for a sample of young adults.

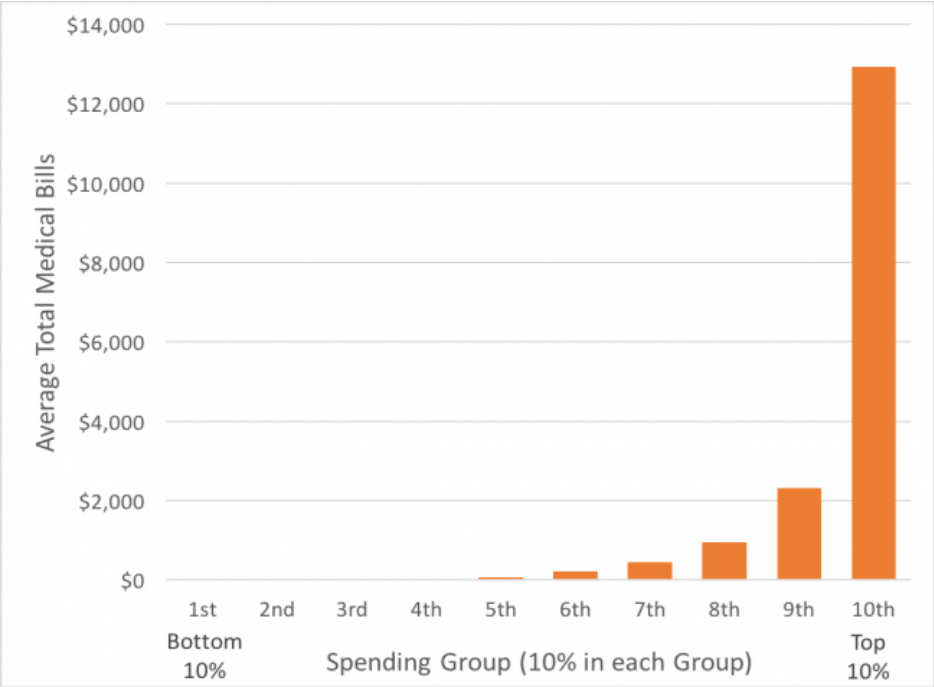
These total medical expenses include charges for doctors, hospitals, specialists, etc. This amount includes both charges that get covered by insurance and those that have to be paid out of pocket. However, insurance premiums are not included in this amount.

The graph below shows the annual medical expenses for this sample of young adults sorted from lowest spending to highest spending. We have grouped people into 10 equal-sized

groups, so each group has 10% of the people. Each orange bar shows the average medical expenses for people in that group.

For example, the graph tells us that 40% of people (the bottom 4 groups) have basically no medical expenses for the year, while 10% of people (the top group) have an average of almost $13,000 in medical expenses.

For Jamie, we will randomly select one of the adults we have in our sample and Jamie will have the same medical expenses as that randomly selected person.



Let's test to make sure the graph makes sense to you. If someone from the 9th group was randomly selected, we would expect their medical expenses for the year to be around:

- ❍ $0 (1)
- ❍ $500 (2)
- ❍ $2,000 (3)
- ❍ It is not possible to tell (4)
- ❍ Not sure (5)

Answer: Yes, we would expect someone from group 9 to have about $2,000 in medical expenses for the year. A copy of the graph is at your station for you to refer to throughout this study.

How Jamie's Outcome and Your Payment Are Determined

Your payment for participating in the study today will be based on the amount of money Jamie has at the end of the simulated year after taking into account salary and any healthcare costs.

Jamie's income situation: Jamie will earn a salary of $${e://Field/salary_display} for the year and have $${e://Field/budget_display} in spending that must be paid (rent and other bills) leaving Jamie with $${e://Field/discretionary_display} in discretionary income.

Jamie's health-care spending:

Plan premium: From Jamie's discretionary income, Jamie will also have to pay some amount of premium (cost) for health insurance. The premium Jamie pays will depend on the plan you choose for Jamie.

Out-of-pocket costs: Jamie may also have to pay out-of-pocket costs for some health care. A random person from the sample of adults whose medical expenses are shown in the graph at your station will be selected. Jamie will have the same medical expenses (i.e., hospital/doctors bills) as that person. How much out-of-pocket cost these medical expenses create for Jamie will depend on the health plan you chose for Jaime. Some plans will have more insurance coverage than others and those plans will lead to smaller out-of-pocket costs for Jamie.

How your payment is affected by Jamie's outcome: Your payment will be based on Jamie's final discretionary money, after subtracting Jamie's total healthcare spending (premiums + out of pocket spending) for the year. Specifically, for every $1,000 in discretionary income Jamie has left over after paying for health care (premiums and out-of-pocket costs), you will receive $2.

Example: Again, Jamie starts with $${e://Field/discretionary_display} in discretionary income. Suppose the plan you choose for Jamie has a premium of $1,000. Further, suppose that due to the random draw of medical costs and the plan you chose, Jamie ends up with an additional $800 in out-of-pocket spending for health costs. In that case, Jamie would spend $1,800 for all health costs and have $${e://Field/example_leftover} in final discretionary income. Since you earn $2 for every $1,000 in final income, your payment would be: $${e://Field/example_leftover} * ($2 / $1,000) = $${e://Field/example_display}

How your choices will count for payment: You will make several health insurance decisions for Jamie, but only one of these decisions will be selected to be paid out at the

end of the study. We will randomly select one of the choices, so please make each choice carefully, as each has a chance to be the one that determines your payment.

Q73 The Affordable Care Act or ACA contains a range of provisions, some of which have broad support and others which are more controversial. This question, though, is not about that. Instead it is simply a check to make sure you are still reading carefully. If you are, please leave this question blank. That's right, do not select one of the options and simply click the arrow to proceed to the next page.

- Strongly agree (1)
- Somewhat agree (2)
- Neutral (3)
- Somewhat disagree (4)
- Strongly disagree (5)

A Note About Plan Options

All plans have the same access to doctors/hospitals: When choosing a health insurance plan for Jamie, remember that all plans offer the same access to doctors and hospitals and coverage for procedures. So the quality of care will be the same for all of the plans. This means that the only difference between the plans is their yearly cost (i.e, premium) and the amount Jamie pays out-of-pocket for Jamie's medical expenses. Some plans may be better values than others: Some plans may have good value because they have both low premiums and cover most medical expenses. Other plans may have poor value because they have high premiums and still leave Jamie exposed to a lot of out-of-pocket spending when Jamie gets sick. Finally, others may present a mix with either low premium and high out-of-pocket costs or high premium and low out-of-pocket costs. All amounts are yearly amounts: When we describe the premium for a plan, we will give the total yearly premium for the plan -- not a monthly amount. All other plan features are similarly described at the yearly level. Keep that in mind when making your decisions, and remember that your payment will be affected by the amount of total health spending (premiums + out-of-pocket costs) Jamie must make for the year.

Which plan do you choose for Jamie?

The graph below shows four/six health plans. While these plans have different costs and features, they all offer Jamie the same access to good doctors and hospitals.

What the graph shows:

1. Premium for the plan. This is the first dot in the graph for each plan and is the minimum possible total health spending Jamie could have for the year if you choose that plan for Jamie.
2. Expected total spending (premium + out of pocket) Jamie would have for each of the 10 groups of medical expenses Jamie could end up in. Each dot shows Jamie's premium + out-of-pocket spending with that plan if Jamie has the average medical bills of people in that group.
3. Maximum possible spending. This is the most Jamie could possibly have to pay in the worst-case scenario (premium + maximum possible out-of-pocket spending) with that plan.

[PLAN DISPLAY HERE]

Given the information above, which plan would pick for Jamie?

- ❍ Purple (1)
- ❍ Blue (2)
- ❍ Red (3)
- ❍ Black (4)

[ITERATE THROUGH GRAPH/TABLE MENUS]

<u>Calculating Total Costs</u>

Let's check your understanding of how the plans work. On this page we show you a medical spending amount for Jamie and ask you to calculate how high Jamie's total costs (premium plus out-of-pocket) would be for two different plans. These calculations can be difficult, but please do your best. If you can accurately calculate the amounts, you will get a bonus paid on top of your other earnings from today.

Suppose that Jamie experiences $10,000 in medical bills for the year. How much would Jamie spend in total (premium plus out-of-pocket) if Jamie purchased a particular health

insurance plan? If your response is within $10 of the correct amount for that plan, you will earn an additional $0.50 (per response).

Plan Name	Annual Premium	Annual Deductible	Coinsurance	Maximum Out of Pocket Expenditure
Black	$851	$1,000	10%	$2,500
Blue	$1,231	$500	20%	$2,500
Brown	$1,177	$750	10%	$2,250
Orange	$932	$1,500	20%	$2,500
Purple	$1,616	$1,000	5%	$2,250
Red	$1,635	$250	10%	$1,750

Annual Premium: Your cost for insurance. You pay part of this cost with each paycheck throughout the year.
Annual Deductible: Amount of medical bills you must pay for during the year before insurance begins to pay.
Coinsurance: Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.
Maximum Out of Pocket: This amount includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills.

If Jamie purchased the Black plan, how much would Jamie pay in total (premium plus out-of-pocket)? Please only enter numbers (no commas, dollar signs, etc.).

If Jamie instead purchased the Orange plan, how much would Jamie pay in total (premium plus out-of-pocket)? Please only enter numbers (no commas, dollar signs, etc.).

Choose a Gamble Option

The gamble options: In this part of the study you will select from among six different gambles the one gamble you would like to play. The six different gambles are listed below. You must select one and only one of these gambles. Each gamble has two possible outcomes (Event A or Event B) with the indicated probabilities of occurring. Your compensation for this part of the study will be determined by: 1) which of the six gambles you select; and 2) which of the two possible events occur.

For example: If you select gamble 4 and Event A occurs, you will be paid $4. If Event B occurs, you will instead be paid $13. For every gamble, each event has a 50% chance of occurring. Some participants will be randomly selected to play their chosen gamble: At the end of the study, 1 out of every 4 participants will be randomly selected by the computer to have their chosen gamble pay out. If you are one of the selected participants for this section at the end of the study, the computer will select a random number between 1 and 100 (each equally likely) to determine which event occurs. If the

random number is between 1 and 50, Event A will occur. If the number is between 51 and 100, Event B will occur.

Q112

Gamble	Event	Payoff	Probabilities
1	A	$7	50%
	B	$7	50%
2	A	$6	50%
	B	$9	50%
3	A	$5	50%
	B	$11	50%
4	A	$4	50%
	B	$13	50%
5	A	$3	50%
	B	$15	50%
6	A	$0.50	50%
	B	$17.50	50%

Make your gamble selection below.

- Gamble 1 (1)
- Gamble 2 (2)
- Gamble 3 (3)
- Gamble 4 (4)
- Gamble 5 (5)
- Gamble 6 (6)

For each of the following statements, please indicate the likelihood that you would engage in the described activity or behavior if you were to find yourself in that situation. Provide a rating from Extremely Unlikely to Extremely Likely.

	Extremely Unlikely (1)	Unlikely (2)	Neither Likely nor Unlikely (3)	Likely (4)	Extremely Likely (5)
Betting a day's income on the outcome of a sporting event. (1)	❍	❍	❍	❍	❍
Investing 10% of your annual income in a new business venture. (6)	❍	❍	❍	❍	❍
Taking a skydiving class. (2)	❍	❍	❍	❍	❍
Bungee jumping off a tall bridge. (3)	❍	❍	❍	❍	❍

We would appreciate if you could share any thoughts on the strategy or strategies you used to select insurance options in this survey. This question is optional, but may help us to better understand how people make decisions.

How many economics experiments have you participated in before this one?

What is your age (in years)?

What is your gender?

❍ Male (9)

❍ Female (10)

❍ Other / prefer not to state (11)

Your primary major is associated with which school?

- ❍ College of Agriculture and Life Sciences (1)
- ❍ School of Business (2)
- ❍ School of Education (3)
- ❍ College of Engineering (4)
- ❍ School of Human Ecology (5)
- ❍ School of Journalism and Mass Communication (6)
- ❍ College of Letters and Sciences (7)
- ❍ School of Medicine and Public Health, School of Nursing, or School of Pharmacy (8)
- ❍ School of Public Affairs (9)
- ❍ School of Social Work (10)
- ❍ Undecided (11)

What is your approximate GPA?

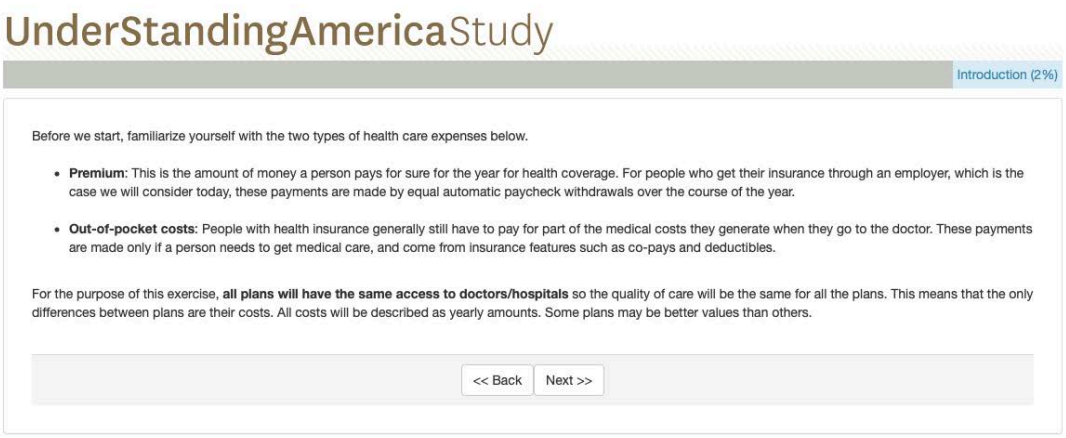
Which of the following best reflects your expectations about your own healthcare usage for the next year?

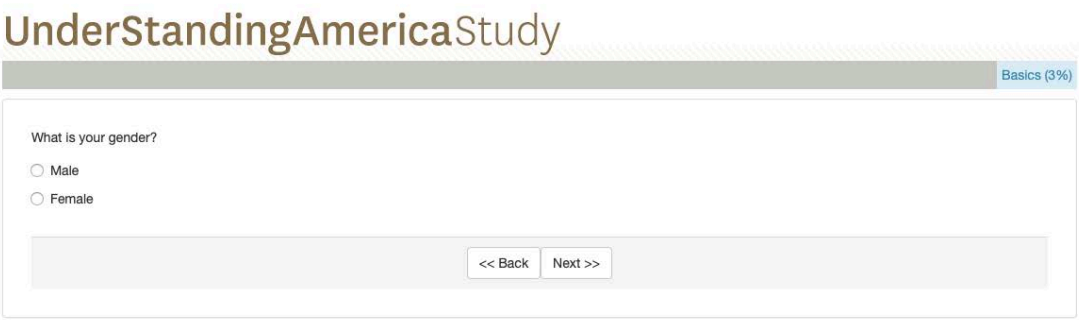
- ❍ No healthcare usage (1)
- ❍ Routine annual physical only (2)
- ❍ A few minor visits to primary care or specialists (3)
- ❍ Moderately frequent visits or costly procedures (4)
- ❍ Substantial healthcare needs (costly procedures, surgeries, or treatments) (5)

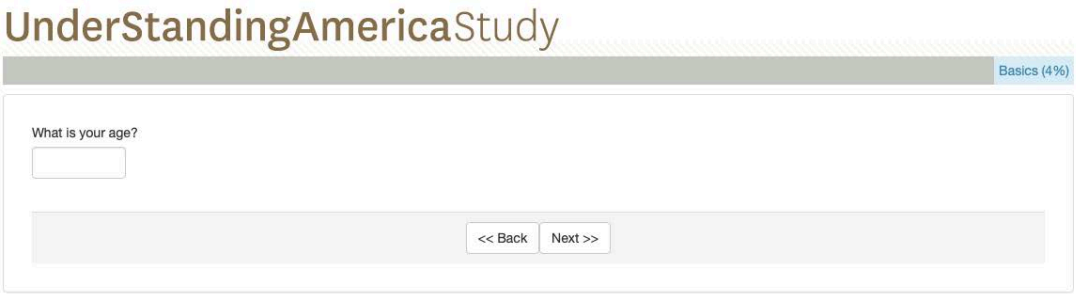
Your Payment

[PROVIDE INFORMATION ABOUT EARNINGS IN ALL PARTS]

Appendix C: UAS Survey Experiment Instructions and Questions







UnderStandingAmericaStudy

Explanation (8%)

Making Hypothetical Health Plan Choices for Yourself

Now, you will make a series of hypothetical health insurance decisions for yourself. Assume that you have a new job that comes with health insurance benefits, and you have a choice of health plan options.

We know that many people have family coverage for their insurance. For this study, though, we want you to think about a health plan that would just cover you and suppose that any other members of your family have their own good coverage.

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UnderStandingAmericaStudy

Explanation (10%)

The Medical Spending (Doctor and Hospital Bills) You Might Have for the Year

To make decisions for yourself, it is helpful to know something about your possible health care needs. We have collected data on recent annual (yearly) medical expenses for people with a similar background as yours - women between 18-29 years old.

Please answer the next question so we can provide a more accurate projection of your health care needs in the next year.

In general, compared to other people of your age, would you say that your health is excellent, very good, good, fair or poor?

- ○ Excellent
- ○ Very good
- ○ Good
- ○ Fair
- ○ Poor

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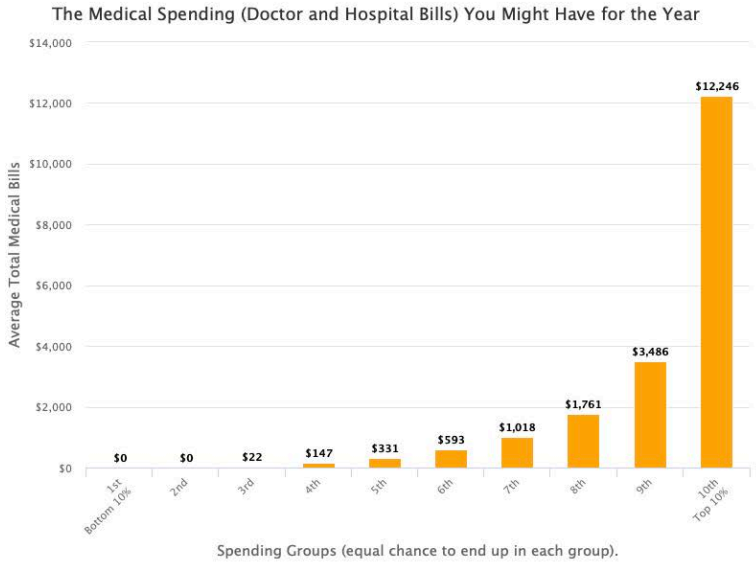
UnderStandingAmericaStudy

Explanation (12%)

The Medical Spending (Doctor and Hospital Bills) You Might Have for the Year

We have collected data on recent annual (yearly) medical expenses for people like you: women between 18-29, with very good self-reported health status. This amount includes both charges that get covered by insurance and those that have to be paid out of pocket. However, insurance premiums are not included in this amount.

The graph below shows the annual medical expenses for this sample of people like you sorted from lowest spending to highest spending. We have grouped people into 10 equal-sized groups, so each group has 10% of the people. Each orange bar shows the average medical expenses for people in that group.



For example, the graph tells us that 1 out of 10 people like you will have good health luck this year and end up in the lowest spending group (1st group). These people would on average have $0 medical bills for the year. On the other hand, 1 out of 10 people like you will have bad health luck and end up in the highest spending group (10th group), with an average of $12,246 medical bills for the year.

If someone from the 9th group were randomly selected, we would expect their medical expenses for the year to be around:

$

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UnderStandingAmericaStudy

Explanation (13%)

The Medical Spending (Doctor and Hospital Bills) You Might Have for the Year

Your Possible Medical Spending

Not quite. We would expect someone from group 9 to have $3,486 in medical expenses for the year.

A copy of the graph will be available via the link in the top right for you to refer to throughout the study. You can try clicking it now. The link is called: Your Possible Medical Spending.

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Understanding Your Health Plan Options

The table below shows two health plans available to you. While these plans have different costs and features, they all offer you the same access to good doctors and hospitals.

Plan Name	**Annual Premium** (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	**Annual Deductible** (Amount of medical bills you must pay during the year before insurance begins to pay.)	**Coinsurance** (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	**Maximum Out Of Pocket** (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Orange	$1,920	$500	20%	$4,000
Plan Black	$1,296	$2,000	30%	$6,000

Before we ask you to choose plans, let's make sure you understand the information in the table.

Which plan has the lowest annual premium - you pay part of this cost with each paycheck throughout the year?

- ○ Orange
- ○ Black
- ○ More than one plan with the same lowest level

In which plan is the amount of medical bills you have to pay out-of-pocket before insurance begins to pay lowest?

- ○ Orange
- ○ Black
- ○ More than one plan with the same lowest level

Which plan has the lowest share of medical bills after your total spending has hit the deductible?

- ○ Orange
- ○ Black
- ○ More than one plan with the same lowest level

Which plan has the lowest maximum amount you could pay in out-of-pocket costs?

- ○ Black
- ○ Orange
- ○ More than one plan with the same lowest level

Understanding Your Health Plan Options

✅ Yes, Plan Black has the lowest annual premium. Find the lowest number in the column called "Annual Premium".

✅ Yes, Plan Orange has the lowest amount of medical expenses you have to pay during the year before insurance begins to pay. Find the lowest number in the column called "Annual Deductible".

❌ Not quite, Plan Orange has the lowest share of medical bills after your total spending has hit the deductible. Find the lowest number in the column called "Coinsurance."

❌ Not quite, Plan Orange has the lowest total amount you could pay in out-of-pocket costs. Find the lowest number in the column called "Maximum Out Of Pocket."

Plan Name	**Annual Premium** (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	**Annual Deductible** (Amount of medical bills you must pay during the year before insurance begins to pay.)	**Coinsurance** (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	**Maximum Out Of Pocket** (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Orange	$1,920	$500	20%	$4,000
Plan Black	$1,296	$2,000	30%	$6,000

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Understanding Your Health Plan Options

Plan Name	Annual Premium (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	Annual Deductible (Amount of medical bills you must pay during the year before insurance begins to pay.)	Coinsurance (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	Maximum Out Of Pocket (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Orange	$1,920	$500	20%	$4,000
Plan Black	$1,296	$2,000	30%	$6,000

The graph below provides additional information about the two health plans available to you.

What the graph shows:

- **Premium for the plan**. This is the first dot in the graph for each plan and is the minimum possible total health spending you could have for the year if you choose that plan for you.
- **Expected total spending (premium + out of pocket)** you would have for each of the 10 equally-likely spending groups you could end up for the year.
- **Maximum possible spending**. This is the most you could possibly have to pay in the worst-case scenario (premium + maximum possible out-of-pocket spending) with that plan.

Which plan has the lowest total health spending if you end up in the 1st spending group?

- ○ Black
- ○ Orange
- ○ More than one plan with the same lowest level

Which plan has the lowest total health spending if you end up in the 5th spending group?

- ○ Black
- ○ Orange
- ○ More than one plan with the same lowest level

Which plan has the lowest total health spending if you end up in the 10th spending group?

- ○ Black
- ○ Orange
- ○ More than one plan with the same lowest level

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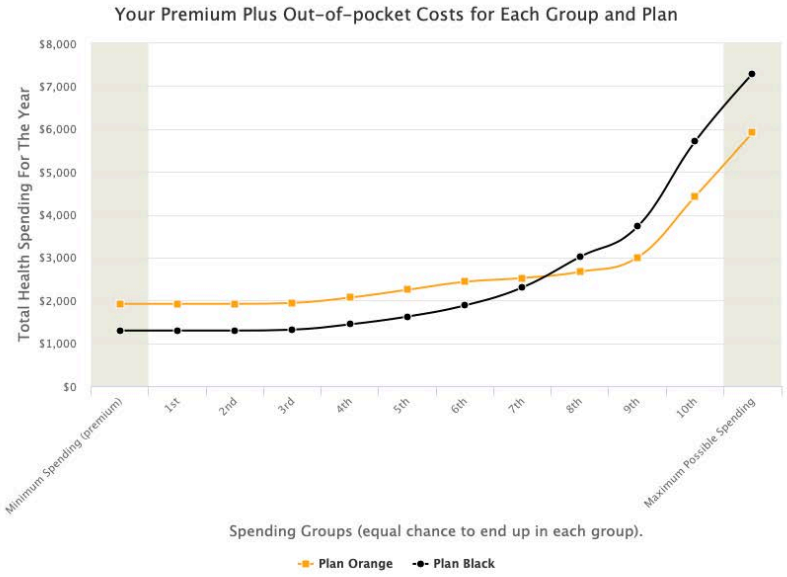
Understanding Your Health Plan Options

Not quite.

First look at the x-axis for the 1st spending group and roll your mouse over the graph above it. The 1st spending group will light up. You will see that the total health spending for Plan Black is lower than Plan Orange for this group.

Next continue moving your mouse to the right until you are over the 5th spending group, which will light up. You will see that the total health spending for Plan Black is lower than Plan Orange for this group.

Finally, continue moving your mouse to the right until you are over the 10th spending group, which will light up. You will see that the total health spending for Plan Orange is lower than Plan Black for this group.



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Making Your Health Plan Choices

Now we will ask you to make several health plan choices. Each of the following screens will show you information about two health plan options. Please select the one you would want if this were a real choice for you. Some of the plans may be better value for you than others.

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Making Your Health Plan Choices

Your Possible Medical Spending

The table and graph below show **two health plans** available to you. While these plans have different costs and features, they all offer you the same access to good doctors and hospitals.

Plan Name	Annual Premium (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	Annual Deductible (Amount of medical bills you must pay during the year before insurance begins to pay.)	Coinsurance (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	Maximum Out Of Pocket (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Orange	$1,920	$500	20%	$4,000
Plan Black	$1,296	$2,000	30%	$6,000

Which plan do you choose for yourself?

- ○ Plan Orange
- ○ Plan Black

Making Your Health Plan Choices

Your Possible Medical Spending

The table and graph below show **two health plans** available to you. While these plans have different costs and features, they all offer you the same access to good doctors and hospitals.

Plan Name	Annual Premium (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	Annual Deductible (Amount of medical bills you must pay during the year before insurance begins to pay.)	Coinsurance (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	Maximum Out Of Pocket (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Orange	$1,920	$500	20%	$4,000
Plan Black	$1,296	$2,000	30%	$6,000

Which plan do you choose for yourself?

- ○ Plan Orange
- ○ Plan Black

Making Your Health Plan Choices

Your Possible Medical Spending

The table and graph below show **two health plans** available to you. While these plans have different costs and features, they all offer you the same access to good doctors and hospitals.

Plan Name	Annual Premium (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	Annual Deductible (Amount of medical bills you must pay during the year before insurance begins to pay.)	Coinsurance (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	Maximum Out Of Pocket (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Orange	$1,920	$500	20%	$4,000
Plan Black	$1,296	$2,000	30%	$6,000

Which plan do you choose for yourself?

- ○ Plan Orange
- ○ Plan Black

Making Your Health Plan Choices

Your Possible Medical Spending

The table and graph below show **two health plans** available to you. While these plans have different costs and features, they all offer you the same access to good doctors and hospitals.

Plan Name	Annual Premium (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	Annual Deductible (Amount of medical bills you must pay during the year before insurance begins to pay.)	Coinsurance (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	Maximum Out Of Pocket (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Orange	$1,920	$500	20%	$4,000
Plan Black	$1,296	$2,000	30%	$6,000

Which plan do you choose for yourself?

- ○ Plan Orange
- ○ Plan Black

Making Your Health Plan Choices

Your Possible Medical Spending

The table and graph below show **two different health plans**.

Plan Name	Annual Premium (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	Annual Deductible (Amount of medical bills you must pay during the year before insurance begins to pay.)	Coinsurance (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	Maximum Out Of Pocket (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Red	$1,140	$5,000	20%	$6,350
Plan Brown	$1,884	$0	15%	$3,750

Which plan do you choose for yourself?

- ○ Plan Red
- ○ Plan Brown

Making Your Health Plan Choices

Your Possible Medical Spending

The table and graph below show **two different health plans**.

Plan Name	**Annual Premium** (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	**Annual Deductible** (Amount of medical bills you must pay during the year before insurance begins to pay.)	**Coinsurance** (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	**Maximum Out Of Pocket** (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Black	$816	$2,600	0%	$2,600
Plan Pink	$1,794	$750	20%	$2,750

Which plan do you choose for yourself?

- ○ Plan Black
- ○ Plan Pink

Making Your Health Plan Choices

Your Possible Medical Spending

The table and graph below show **two different health plans**.

Plan Name	**Annual Premium** (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	**Annual Deductible** (Amount of medical bills you must pay during the year before insurance begins to pay.)	**Coinsurance** (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	**Maximum Out Of Pocket** (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Black	$816	$2,600	0%	$2,600
Plan Pink	$1,794	$750	20%	$2,750

Which plan do you choose for yourself?

- ○ Plan Black
- ○ Plan Pink

Making Your Health Plan Choices

Your Possible Medical Spending

The table and graph below show **two different health plans**.

Plan Name	**Annual Premium** (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	**Annual Deductible** (Amount of medical bills you must pay during the year before insurance begins to pay.)	**Coinsurance** (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	**Maximum Out Of Pocket** (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Green	$1,392	$750	10%	$1,200
Plan Blue	$1,092	$2,500	25%	$2,750

Which plan do you choose for yourself?

- ○ Plan Green
- ○ Plan Blue

Making Your Health Plan Choices

Your Possible Medical Spending

The table and graph below show **two different health plans**.

Plan Name	Annual Premium (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	Annual Deductible (Amount of medical bills you must pay during the year before insurance begins to pay.)	Coinsurance (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	Maximum Out Of Pocket (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Brown	$1,572	$250	15%	$1,250
Plan Purple	$456	$1,600	20%	$2,100

Which plan do you choose for yourself?

- ○ Plan Brown
- ○ Plan Purple

Making Your Health Plan Choices

Your Possible Medical Spending

The table and graph below show **two different health plans**.

Plan Name	Annual Premium (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	Annual Deductible (Amount of medical bills you must pay during the year before insurance begins to pay.)	Coinsurance (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	Maximum Out Of Pocket (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Purple	$540	$2,500	20%	$5,000
Plan Green	$1,296	$1,000	20%	$3,000

Which plan do you choose for yourself?

- ○ Plan Purple
- ○ Plan Green

Making Your Health Plan Choices

Your Possible Medical Spending

The table and graph below show **two different health plans**.

Plan Name	Annual Premium (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	Annual Deductible (Amount of medical bills you must pay during the year before insurance begins to pay.)	Coinsurance (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	Maximum Out Of Pocket (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Pink	$576	$3,000	35%	$6,350
Plan Blue	$1,860	$500	20%	$3,500

Which plan do you choose for yourself?

- ○ Plan Pink
- ○ Plan Blue

Making Your Health Plan Choices

Your Possible Medical Spending

The table and graph below show **two different health plans**.

Plan Name	Annual Premium (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	Annual Deductible (Amount of medical bills you must pay during the year before insurance begins to pay.)	Coinsurance (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	Maximum Out Of Pocket (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Black	$1,176	$750	15%	$2,000
Plan Red	$408	$1,750	20%	$3,000

Which plan do you choose for yourself?

- ○ Plan Black
- ○ Plan Red

Making Your Health Plan Choices

Your Possible Medical Spending

The table and graph below show **two different health plans**.

Plan Name	Annual Premium (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	Annual Deductible (Amount of medical bills you must pay during the year before insurance begins to pay.)	Coinsurance (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	Maximum Out Of Pocket (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Blue	$516	$2,500	5%	$3,500
Plan Red	$1,944	$1,000	15%	$2,500

Which plan do you choose for yourself?

- ○ Plan Blue
- ○ Plan Red

Making Your Health Plan Choices

Your Possible Medical Spending

The table and graph below show **two different health plans**.

Plan Name	Annual Premium (Your cost for insurance. You pay this total amount through equal paycheck withdrawals during the year.)	Annual Deductible (Amount of medical bills you must pay during the year before insurance begins to pay.)	Coinsurance (Your share of medical bills after your total spending has hit the deductible. Insurance covers the remaining share.)	Maximum Out Of Pocket (This includes the deductible and shows the total amount you could pay in the year out-of-pocket for medical bills)
Plan Green	$1,536	$250	20%	$2,000
Plan Orange	$504	$1,300	20%	$3,000

Which plan do you choose for yourself?

- ○ Plan Green
- ○ Plan Orange

Some Additional Questions

When you were making plan choices today which did you pay more attention to: the information in the tables or the graphs?

- ○ Much more attention to graphs
- ○ Somewhat more attention to graphs
- ○ About equal attention to graphs and tables
- ○ Somewhat more attention to tables
- ○ Much more attention to tables

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Some Additional Questions

Suppose you have a car that is worth $10,000 and is no longer covered by warranty. You find out that it has a design flaw that in 1 out of 10 cases will cause an engine problem, which will cost $3,000 to fix. You have the choice to do a repair that will fix the flaw and avoid the risk of the $3,000 engine damage. What is the most you would be willing to pay for that repair?

$0 $3,000

Or type in:

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Some Additional Questions

Some people think that it is best for people to have many options for their health insurance coverage, while others think it is better for there to be a limited number of choices about health insurance. Which best describes your feelings?

- Strongly prefer few options
- Somewhat prefer few options
- Feel similar about either
- Somewhat prefer many options
- Strongly prefer many options

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Some Additional Questions

Suppose you knew you would need a medical procedure at the end of the year that would cost you $500. You could either pay that $500 at the time of the procedure or you have an option to have the total amount withdrawn from your paycheck automatically in equal amounts during the year to cover the cost. Which best describes your feeling about these two options?

- Strongly prefer to pay full amount at time of procedure
- Somewhat prefer to pay the full amount at the time of procedure
- Feel similar about both options
- Somewhat prefer to have the cost withdrawn from paychecks
- Strongly prefer to have the cost withdrawn from paychecks

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Wrapping Up (99%)

Could you tell us how interesting or uninteresting you found the questions in this interview?

- ○ Very interesting
- ○ Interesting
- ○ Neither interesting nor uninteresting
- ○ Uninteresting
- ○ Very uninteresting

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UnderStandingAmericaStudy

Wrapping Up (100%)

Do you have any other comments on the interview? For example, did you have any problems viewing the tables and graphs? Please type these in the box below. (If you have no comments, please click next to complete this survey.)

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