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Health Plan Choice and Information about Out-of-Pocket Costs: An Experimental Analysis

Many consumers are offered two or more employer-sponsored health insurance plans, and competition among health plans for subscribers is promoted as a mechanism for balancing health care costs and quality. Yet consumers may not receive the information necessary to make informed health plan choices. This study tests the effects on health plan choice of providing supplemental decision-support materials to inform consumers about expected health plan costs. Our main finding is that such information induces consumers to bear more risk, especially those in relatively good health. Thus our results suggest that working-age, privately insured consumers currently may be over-insuring for medical care.

Recent data suggest that 75% of workers in the United States are offered health insurance through their place of employment, and that more than half these workers are offered a choice of two or more insurance plans (McLaughlin 1999). Choosing a plan is obviously an important personal decision for consumers and their families. In addition, many health policy experts have argued that competition among health plans for subscribers may help contain rising health care costs and promote quality of care (e.g., Enthoven 1978; Dowd, Feldman, and Christianson 1996). Indeed, employers increasingly are demanding that employees take responsibility for their health insurance choices, for instance, by providing financial incentives to choose low-cost plans (Maxwell et al. 1998). Yet efficient competition requires not only that consumers are offered choices among competing plans, but also that they have the skills and information necessary for making informed choices (e.g., Dranove 1993; Scanlon, Chernew, and Lave 1997).

To this end, considerable effort has been invested in providing consumers with information on health plan quality. Prominent efforts to collect and disseminate such data include the National Committee on Quality Asssurance's Health Plan Employer Data and Information Set (HEDIS), and the Consumer Assessment of Health Plan Satisfaction (CAHPS®) program sponsored by the Agency for Health Care Policy and Research (now the Agency for Healthcare Research and Quality) (McGee et al. 1999). In addition, several states have published report cards that compare health plans on the results of member surveys or HEDIS measures, and the Federal Employees Health Benefits Program provides HEDIS and CAHPS information on participating health plans.

In contrast, with a few notable exceptions, rela-

tively little attention has been paid to enhancing consumers' ability to understand the potential cost implications of choosing alternative health plans. Each year during open enrollment period, consumers generally receive tables for available plans that list plan characteristics such as premium, deductible, copayments, benefit limits, stop-loss provisions, and rules for out-of-network coverage. However, research confirms that consumers have difficulty integrating these and other health plan characteristics in a way that facilitates meaningful comparisons across plans (e.g., Gibbs, Sangl, and Burrus 1996; Lubalin and Harris-Kojetin 1999). This, in turn, limits consumers' ability to assess health plan value (Mechanic 1989).

In this paper, we present the results of a study to develop and test the effects of decision-support materials to inform consumers about expected health plan costs. Specifically, we identified two cost presentation strategies outlined in previous research, and we developed decision-support materials based on these two strategies. We then assessed the effects of the decision-support materials on plan choice in a lab experiment, in which participants were assigned randomly to receive the sort of information typically available from employers (our control group) or that information plus one of the two sets of decision-support materials (the intervention groups). Participants then were asked to choose one of four alternative health plans offered to them.

Our results suggest that the supplemental decision-support materials significantly changed participants' choice of insurance plan. In particular, the materials induced participants to select cheaper and less comprehensive plans, and thus to bear more risk, especially among participants in relatively good health. Our results suggest that working-age, privately insured consumers, especially those in relatively good health, are currently over-insuring for medical care.

Background

Theoretical Framework

In economic models of labor demand, employers offer health insurance—as well as other benefits—to attract and retain particular types of workers (Pauly 1997). However, relatively little research has tried to explain how employers choose which plans to offer. Empirically, approximately 55% of workers are offered a choice of plans through their employer, ranging from 10% in firms with less than 100 workers to 90% in firms with 5,000 or more employees (McLaughlin 1999). Among those offered a choice, about

50% are offered two plans, 20% three plans, and 30% four or more plans (McLaughlin 1999).

In economic models of insurance choice, consumers are thought to consider a range of factors in selecting a health plan. These include: their own health risks; their economic circumstances; the likelihood and potential effects of financial loss resulting from health problems; and the characteristics of the health plans available to them, including cost, quality, breadth of coverage, flexibility, and convenience. Consumers are thought to estimate an expected utility for each available insurance plan and select the plan that maximizes expected utility (e.g., Feldstein 1983; Berki and Ashcraft 1980; Phelps 1997).

In this framework, we can describe person *i*'s utility from choosing health plan *j* as:

$$U_{ij} = X_i'\beta + P_j\theta + (X_i'P_j)'\delta + \epsilon_{ij} \qquad j = 1, \ldots, n$$

(1)

where X_i represents a vector of individual characteristics; P_j represents a vector of plan characteristics; X_iP_j is a vector of interaction terms between individual and plan characteristics; β, θ and δ are parameters to be estimated; and ϵ_{ij} represents random error. Then person *i* chooses plan *m* if:

$$U_{im} > U_{ij} \qquad \forall j \neq m \qquad (2)$$

To estimate expected out-of-pocket costs associated with particular plan choices—presumably an important component of P_j—consumers need to know the characteristics of each plan. This information is provided by insurers and employers in settings where consumers face a choice of two or more plans (McLaughlin, 1999). But consumers also need estimates of their health risks, and of the medical care use they could expect in particular circumstances. This information rarely is provided to consumers by employers or insurers and may be prohibitively expensive for individuals to assemble on their own. When it is provided, it is unlikely to be in a form that is easy to use. In its absence, and in the absence of information on other important factors such as plan quality, consumers may make different choices than they would if they were better informed (Berki and Ashcraft 1980; Sainfort and Booske 1996).

We note that several authors (e.g., Marquis and Holmer 1996; Ellis 1989), have argued that prospect theory (Kahneman and Tversky 1979) may explain consumers' health insurance choices better than the standard expected utility framework does. However, their models retain the feature that individuals' choic-

es may change when information about the choices changes. In addition, the psychology literature on consumer decision making emphasizes the difficulty of considering large numbers of different product characteristics simultaneously; theory and research suggest that consumers may focus on a few characteristics considered particularly salient and de-emphasize the rest (e.g., Tybout 1994).

Previous Studies

Empirical studies of health plan choice indicate that consumers prefer higher quality, more flexibility, more comprehensive coverage, and greater convenience (e.g., Scanlon, Chernew, and Lave 1997). Most of the studies reviewed by Scanlon, Chernew, and Lave focus on consumers' willingness to trade these characteristics off against one another and against price. None of them addressed how different levels of information about health plan characteristics might affect plan choices, which is the focus here.

Sturman, Boudreau, and Corcoran (1996) examined the choices made by Dannon employees who were offered two health plans with different premiums, deductibles and coinsurance but otherwise identical features. Based on actual health care use in the subsequent year, the researchers calculated out-of-pocket costs for the chosen plan, as well as what costs would have been under the other plan. They reported that only a minority of employees—and far fewer than the employer had expected—chose the health plan that would have minimized their out-of-pocket costs in the subsequent year. On average, out-of-pocket costs were 17% higher than they would have been if all employees had chosen the cost-minimizing plan, although employees for whom the out-of-pocket cost difference was relatively high were significantly more likely to choose the cost-minimizing plan.

Sturman, Boudreau, and Corcoran (1996) speculate on the potential consequences of giving consumers decision-support information about out-of-pocket costs. We identified two published approaches for presenting such information to consumers: the "total cost" strategy (Francis 1996) and the "illness episode" strategy (Sofaer and Kenney 1989; Sofaer et al. 1990). Both strategies aim to provide participants with a basis for comparing the expected annual out-of-pocket costs of different plans. Specifically, in the total cost strategy, consumers are directed to consider various overall levels of health care use in the coming year (e.g., none, low, medium, and high). The total cost decision-support materials then provide infor-

mation on the total out-of-pocket costs that they can expect to pay in the coming year under each alternative health plan, for each level of use. In the illness episode strategy, consumers are directed to consider specific "episodes" of health care use they might experience in the coming year (e.g., various acute and chronic medical conditions). The illness episode decision-support materials provide information on the out-of-pocket costs associated with each episode and help consumers identify which episode or combination of episodes they might want to consider. The materials also help them calculate the total out-of-pocket costs that they can expect to pay in the coming year under each alternative health plan, for each combination of episodes they select.

To our knowledge, the effects of the total cost strategy on plan choice or other outcomes have not been systematically evaluated. Sofaer, Kenney, and Davidson (1992) evaluated the effects of providing illness episode material to Medicare beneficiaries on beneficiaries' supplemental insurance ("Medigap") coverage. Participants were assigned randomly to one of two sets of educational workshops on Medicare and Medigap. In one set, participants received illness episode materials comparing the out-of-pocket costs of alternative Medigap plans, but the workshops were otherwise identical. Participants were surveyed about their insurance coverage and other characteristics immediately before and immediately after the workshop, and three and nine months afterward. Sofaer, Kenney, and Davidson found that participants who received the illness episode materials were significantly less likely to have redundant Medigap coverage in the follow-up interviews; the effects of the materials on other aspects of insurance choice were not statistically significant.

Using data from the Medicare education workshops described in Sofaer, Kenney, and Davidson (1992), Davidson, Sofaer, and Gertler (1992) examined the possible effects on adverse selection of efforts to educate consumers about their health insurance choices. They looked at the relationship between participants' understanding of Medicare (which the workshop was intended to improve) and participants' insurance coverage. In addition, they examined whether the effects of Medicare knowledge differed by participants' health status. They found that less healthy participants with higher knowledge were more likely to have Medigap coverage or to be enrolled in a Medicare health maintenance organization (HMO) (vs. Medicare alone), while healthier participants with higher knowledge were less likely

to enroll in a Medicare HMO (vs. having Medigap coverage). Davidson, Sofaer, and Gertler did not evaluate the effects of the illness episode material per se.

Our study is thus the first to evaluate the effects of the total cost strategy on insurance choice, and of the illness episode strategy on consumers' primary insurance coverage. In addition, it is the first study to evaluate the effects of providing supplemental information on out-of-pocket costs in a working-age population.

Many previous studies have used consumers' stated, rather than revealed, preferences to assess a range of health policy issues, including various aspects of health plan choice (e.g., Mechanic, Ettel, and Davis 1989; Feldman and Dowd 1991; Marquis 1992; Marquis and Holmer, 1996; Spranca et al. 2000).

Methods

In this study, participants in a laboratory experiment received material summarizing hypothetical health plans and were asked to choose the plan they liked best. Participants were randomly assigned to receive either standard materials such as those typically provided to employees, or those materials plus one of two types of supplemental decision-support materials, described subsequently. All participants were asked to review the plan materials and choose one plan from the four available choices, as though they were choosing insurance for the coming year. For simplicity, the pricing and description of each hypothetical plan was for individual coverage, and participants were instructed to choose the plan they preferred for their own insurance coverage. Participants then completed a survey assessing their plan choice, opinions about the materials, and sociodemographic characteristics. All participants completed the survey, and item nonresponse was very low (under 2% for nearly all items).

While facilitators were available in the lab setting to clarify what participants were being asked to do, they did not provide substantive guidance about the plan materials or choices, and there was no explicit educational or training component to the experiment. Participants were directed to spend 35 to 45 minutes reviewing the materials and 35 to 45 minutes completing the questionnaire. All participants received a pencil, paper, and an electronic calculator for use during the study. Each participant received $50 for participating in the experiment.

Table 1. Characteristics of study participants

	Study participants	U.S. population[a]	California population[a]
Age			
18–44	.69	.61	.60
45–64	.31	.39	.40
Education			
High school degree	.27	.35	.33
Some college	.38	.33	.31
College degree	.34	.32	.36
Race/ethnicity			
Non-Hispanic white	.57	.80	.76
Non-Hispanic black	.18	.10	.10
Hispanic	.15	.06	.09
Household income			
<$30,000	.20	.16	.14
$30,000–$80,000	.65	.55	.51
>$80,000	.15	.29	.35
Self-rated health			
Excellent	.27	.37	.32
Very good	.46	.36	.39
Good	.25	.22	.24
Fair	.02	.04	.04
Poor	—	.01	.01

[a] Source: Based on noninstitutionalized civilian population in March 1998 Current Population Survey, aged 18–64 with at least a high school diploma and private health insurance.

Participants

Participants were recruited by a commercial firm, Focus LA. We stipulated that participants needed to be aged 18 to 64; have at least a high school diploma; have private health insurance; live within 12 miles of Santa Monica; and not have participated in any other focus group activity in the prior six months. We also excluded people with vision or reading problems, those whose current job involved selling or buying health insurance, and those who were not fluent in English (because all the study materials were in English).

We included a total of 330 participants in the lab experiment. Since there was a slight variation in sample size across the 12 study cells, we weighted the sample to have an equal sample size in each cell. Such weighting facilitates evaluation of the intervention's impact, since the number of participants offered each choice set in each study arm is the same.

Participants were asked to provide information on a range of demographic characteristics, including age, race/ethnicity, education, combined family income in the previous year, and general health status. Characteristics of study participants are presented in Table 1. Control and intervention participants did not

Table 2. Experimental design

	Premium and benefits[a]	Plan type	CAHPS® satisfaction rating	Current provider in network?
Choice Set 1				
Plan 1	Low	PPO	Low	Yes
Plan 2	High	PPO	High	No
Plan 3	Low	HMO	Low	No
Plan 4	High	HMO	High	Yes
Choice Set 2				
Plan 5	Low	PPO	Low	No
Plan 6	High	PPO	High	Yes
Plan 7	Low	HMO	Low	Yes
Plan 8	High	HMO	High	No
Choice Set 3				
Plan 9	Low	PPO	High	Yes
Plan 10	High	PPO	Low	No
Plan 11	Low	HMO	High	No
Plan 12	High	HMO	Low	Yes
Choice Set 4				
Plan 13	Low	PPO	High	No
Plan 14	High	PPO	Low	Yes
Plan 15	Low	HMO	High	Yes
Plan 16	High	HMO	Low	No

[a] Defined in Table 3.

differ statistically or substantively with respect to demographic characteristics and health status, providing support for the effectiveness of the randomization. For reference, Table 1 also provides information on the United States and California populations aged 18 to 64 with a high school diploma and private health insurance.

Experimental Design

Hypothetical plan choices. We designed a set of hypothetical insurance plans. Plans varied along four dimensions: preferred provider organization (PPO) vs. health maintenance organization; "high" vs. "low" premium and benefits (premium and benefits did not vary independently); whether the plan's provider network included the participant's usual provider (participants were instructed to assume they currently had a usual provider whom they liked); and whether the plan was rated high or low, on average, along the dimensions of consumer health plan performance, measured by CAHPS. These characteristics can be permuted into 16 unique plans, summarized in Table 2.

Table 3 summarizes the cost and benefit characteristics of the hypothetical health plans. We created a standard package of benefits that was covered by each health plan, including inpatient and outpatient care, emergency and ambulance services, maternity care, outpatient mental health care, home health care, hospice care, medically necessary detox and outpatient substance abuse treatment, and immunizations. "Low" benefit plans covered just these benefits. "High" benefit plans covered six additional areas: prescription drugs, vision care, dental care, inpatient mental health care, prosthetics and orthotics, and other durable medical equipment. PPOs differed from HMOs in their coverage for out-of-network care. At each of the two levels of benefits, copayments and employees' premiums were higher in PPOs than HMOs. We designed the costs and benefits package to resemble those of private health plans currently offered in California (although little published detail is available on the insurance choices firms typically offer). Further details on our hypothetical plans are available from the authors.

To reduce the decision-making burden on participants, each participant was offered a choice of four different health plans. We note that available data suggest that firms typically offer fewer than four plan choices. Specifically, among workers offered employer-sponsored health insurance, approximately 45% are offered only one plan, 27% are offered two plans, 11% three plans, and 7% four or more plans (McLaughlin 1999).

Table 3. Cost structure and benefit coverage for four plan types

Plan type	Employee premium ($)	Employer premium ($)	Copay (in/out of network)	Annual deductible ($) (in/out of network)[a]	Annual out-of-pocket maximum ($)	Maximum lifetime limit ($)	Six added benefits[b]
Low PPO	50	200	$10/20%	0/250	2,500	1,000,000	No
High PPO	150	200	$10/20%	0/250	2,500	1,000,000	Yes
Low HMO	25	200	$5	0	N/A	1,000,000	No
High HMO	125	200	$5	0	N/A	1,000,000	Yes

[a] Deductible not required for prescription coverage or dental coverage (if applicable).
[b] Coverage for prescription drugs, dental care, vision care, durable medical equipment, corrective appliances, and inpatient mental health care.

Table 4. Costs using total cost strategy, Choice Set 1

	Cost by level of health care need ($)[a]				
	No need (20% of insured population)	Low need (20% of insured population)	Average need (40% of insured population)	High need (10% of insured population)	Very high need (10% of insured population)
All care in network					
Plan A	600	725	1,120	1,950	2,660
Plan B	1,800	1,825	1,850	1,910	2,030
Plan C	300	415	800	1,630	2,335
Plan D	1,500	1,515	1,530	1,590	1,705
All care out of network					
Plan A	600	905	1,360	2,370	4,130
Plan B	1,800	2,005	2,090	2,330	3,500
Plan C	300	605	1,180	2,910	8,780
Plan D	1,500	1,705	1,910	2,870	8,180

Note: Table shows approximate yearly out-of-pocket costs, including premiums, copays, deductibles, coinsurance, etc. Plans A and B are PPOs; Plans C and D are HMOs.

[a] Percentage of insured population with each level of health care need.

Although there are 1,820 unique ways to divide our 16 plans into sets of four, both practical and substantive concerns led us to test only four of these sets. Practically, we needed to be able to prepare printed material describing the choices offered to any given participant. Substantively, we wanted the choices to resemble the choices actual employees might face; for instance, the majority of firms offering choices offer one or more PPO or fee-for-service plans plus one or more HMOs, as we did here (McLaughlin 1999). We also wanted to ensure that each of the four plans offered to any given participant was different from the others, with no plan obviously inferior or superior, so that subjects would have to trade various plan characteristics against each other. This led us to create the four choice sets described in Table 2. The choice sets are symmetrical—meaning that for every plan dimension (i.e., type, benefit level, provider network, plan rating), every participant was offered two plans with one level of the dimension and two plans with the other level. Formally, this represents a fractional factorial experiment.

We adapted two alternative strategies for helping consumers understand expected out-of-pocket costs, described subsequently. The main goal of this experiment was to evaluate the effects of providing this material on participants' choice of health plan. To this end, we replicated the four choice sets in Table 2 three times: a control group, which received no supplemental material; and two intervention groups, each of which received one of the sets of supplemental materials. This created a total of 12 study cells, and participants were randomly assigned to one of these cells.

Decision-Support Strategies

We developed two distinct sets of decision-support materials, based on the principles of the total cost and illness episode strategies, respectively. Both sets of materials were intended to give participants a clearer sense of how much alternative health plans might actually cost them than if they used just the "standard" cost material that summarizes premium, deductibles, and other cost components.

"Total cost" material. In the total cost strategy, consumers considered various overall levels of health care need in the coming year: no use (so that the only out-of-pocket cost would be the monthly premium), "low" need (monthly premium, an annual checkup, one or two other outpatient visits), and so on. The decision-support materials helped consumers consider different levels of need. In particular, the materials suggested that consumers consider at least their current level of need if their health the next year were to be as they expect (since that provides a familiar point of reference), and their need if they were to experience some unanticipated—but plausible—health problem (since they are buying insurance).

Participants offered Choice Set 1 in the total cost study group received Table 4 along with supporting material; participants offered the other three choice sets in the total cost group received analogous materials reflecting the selections available to them. The materials presented five levels of health care need in the next year: no need, and "low," "average," "high," and "very high" need. The cells in Table 4 include the *total* annual out-of-pocket costs that a typical employee would pay, for each level of health

care need and for each available health plan. Supporting material outlined "typical" patterns of health care use at each level of need (this material is available by request from the authors).

Plans differ significantly in their coverage for out-of-network care, with obvious implications for out-of-pocket costs. To help participants understand these differences, we provided information under two scenarios: all annual care received within the respective plans' network (top panel of Table 4), and all care during the year received outside the network (bottom panel). These scenarios were intended to serve as bounds for the effect of in-network vs. out-of-network use.

Table 4 shows that the expected out-of-pocket costs differ across the four plan choices (the table presents results for Choice Set 1; patterns for the other choice sets are analogous). Some differences are obvious, particularly those due to monthly premium. However, as Table 4 illustrates, the relative ranking of the respective plans also depends on health care need. For instance, if participants' health care need in the next year were average or below, participants choosing the low benefit plans could expect to incur lower total out-of-pocket costs than participants choosing high benefit plans (assuming in-network care). However, if their need were high or very high, the costs of the low benefit plans would be higher than the costs of the high benefit plans. Based on the hypothetical materials, approximately 20% of users would experience sufficiently high health care need in the next year for the high premium/benefit plans to result in lower out-of-pocket costs. On average, individuals facing the population distribution of need given in Table 4 would pay about $700 per year for the more comprehensive insurance coverage in network.

While assessing the relative desirability of "low" vs. "high" premium/benefit plans may be most obvious, consumers also can use Table 4 to examine other plan dimensions. In particular, comparing the top and bottom panels of Table 4 illustrates the higher cost of out-of-network care, and especially that the cost of out-of-network care increases much more in HMOs (Plans C and D) than in PPOs (Plans A and B).

"Illness episode" material. In the illness episode strategy, consumers considered specific types of health care need they might experience in the coming year. The decision-support material helped consumers identify which "episode" or combination of episodes they want to consider; as in the total cost strategy,

the materials directed them to consider the set of episodes that would occur if their health next year were as they expect, and a set of episodes that might occur if they were to experience some unanticipated but plausible health shock.

Specifically, participants in the illness episode group who were offered Choice Set 1 received Table 5, along with supporting material; participants offered the other three choice sets received analogous materials reflecting the choices available to them. We directed participants to consider a range of different "episodes" of health care need. For this study, we selected episodes ad hoc to include relatively prevalent conditions and a mix of acute and chronic problems. The supporting material directed participants to consider these episodes as broadly representative of the range of episodes they might experience, so participants who wanted to consider the costs of a particular condition that was not listed were directed to consider the episode in Table 5 that seemed most similar in terms of health care needs.

The cells in Table 5 include the annual out-of-pocket costs that a typical employee would pay for the care received for each episode listed in the table, under each of the health plans available to them. Supporting material outlined "typical" patterns of health service use for each episode of care (this material is available by request from the authors). As in the total cost case, we sought to provide information on the expected out-of-pocket costs of in-network (top panel) and out-of-network (bottom panel) use. In the illness episode material, this information is provided for each episode.

The total cost material directly provides participants with an estimated bottom line, that is, their expected total annual out-of-pocket costs (including premium) for health care in the next year under varying scenarios. Although the purpose of the illness episode material is to help participants reach this same bottom line, participants must arrive at the overall total by summing across whatever episodes of care they select. Given the very large number of possible permutations across the 10 episodes listed in Table 5, there is no way to provide participants with a bottom line using printed material. Instead, we provided illness episode participants with worksheets to calculate their expected total annual out-of-pocket costs under each available plan, given their choice of episodes (sample worksheets are available by request from the authors).

Utilization and costs. The utilization patterns and health care costs underlying our total cost and illness

Table 5. Costs using illness episode strategy, Choice Set 1

	Costs by plan ($)			
	Plan A	Plan B	Plan C	Plan D
Annual premium	600	1,800	300	1,500
All care for episode in network				
Annual checkup	10	10	5	5
Bronchitis	40	15	35	10
Broken arm	90	40	75	25
Appendicitis	80	30	70	20
Asthma	420	30	410	20
Pregnancy and delivery	280	110	230	60
Colon cancer	420	80	390	50
Heart attack	1,040	50	1,020	30
Trauma from car crash	190	115	140	65
Dental care	550	200	550	200
All care for episode out of network[a,b]				
Annual checkup	20	20	100	100
Bronchitis	50	25	130	105
Broken arm	130	80	410	350
Appendicitis	680	630	3,160	3,110
Asthma	440	50	600	210
Pregnancy and delivery	1,180	1,010	5,180	5,010
Colon cancer	2,380	2,040	10,460	10,120
Heart attack	1,680	690	4,400	3,410
Trauma from car crash	1,690	1,615	8,090	8,015
Dental care	550	200	550	200

Note: Table shows approximate yearly out-of-pocket costs associated with various episodes of care.
[a] HMOs do not cover out-of-network use of physician and hospital services.
[b] Assume annual deductible has been met.

episode material were designed to be realistic. In addition, the patterns of health care use underlying both cost presentation strategies did not vary by insurance plan. Actual health service use for a given health problem clearly varies somewhat by insurance plan (e.g., Manning et al. 1987); however, it is unclear how to incorporate such behavioral responses into the cost presentation strategies appropriately. Sofaer and her colleagues implemented the illness episode material using the same assumption, justifying the utilization patterns they illustrated as clinically appropriate (Sofaer and Kenney 1989; Sofaer et al. 1990).

Hypotheses

Given the theory and previous research findings, we have two main hypotheses:

Hypothesis 1. Providing consumers with decision-support materials on the expected annual out-of-pocket costs of different health plans will change their health plan choices. These shifts should be strongest with regard to price and the scope of benefits, since the supplemental materials most obviously illustrate the relationship between these characteristics and expected out-of-pocket costs. However, it is difficult to know a priori what direction these changes will take, since we do not know whether consumers currently are over-insuring or under-insuring. Finally, to the extent that the supplemental materials illustrate the relationship between expected out-of-pocket costs and plan characteristics such as quality or type (PPO/HMO), the materials also may change consumers' demand for those characteristics. We test this hypothesis by examining whether access to the cost materials changes the demand for certain plan characteristics in the lab experiment. We use two-tailed tests to reflect our uncertainty about the direction of possible effects.

Hypothesis 2. The effects of the decision-support materials on health plan choices will differ by consumers' health status, increasing adverse selection. As Davidson, Sofaer, and Gertler (1992) suggest, "those who perceive their probability of loss to be high will try to selectively enroll in plans which minimize their out-of-pocket expenses while maximizing their coverage" (p. 1024). Indeed the cost material is intended to make it easier for consumers to do this—as well as to choose their preferred level of insurance. Using a two-tailed test, we test this hypothesis by examining whether access to the supplemental cost materials changes the demand for high premium/benefit plans among consumers in relatively poor health in the lab experiment.

Statistical Methods

Our estimation method follows directly from our conceptual framework. Following our design, individuals were offered four plans, and there were four distinct sets of people: those who were offered plans 1 to 4, 5 to 8, 9 to 12, and 13 to 16 from Table 2, respectively. Under the standard assumption that the error terms in equation 1 follow the extreme value distribution, the probability of choosing plan *m* in choice set S_k is:

$$\Pr(choice_i = Plan_{mk})$$

$$= \Pr(U_{imk} > U_{ijk}, \, \forall \, j \in S_k, j \neq m)$$

$$= \frac{e^{P_{m}{}'\theta + (X_i{}'P_m)'\delta}}{\sum\limits_{j \in S_k} e^{P_j{}'\theta + (X_i{}'P_j)'\delta}} \tag{3}$$

Then equation 1 can be estimated using a conditional logit framework (e.g., McFadden 1973; Train et al. 1987). Specifically, we create 16 dummy variables to reflect the 16 plan choices:

$$c_{ij} = \begin{cases} 1 & \text{if person } i \text{ chose plan } j, \\ 0 & \text{otherwise} \end{cases}$$

$$j = 1, \ldots, 16 \tag{4}$$

and four dummy variables to reflect the four choice sets:

$$s_{ik} = \begin{cases} 1 & \text{if person } i \text{ was offered choice set } k, \\ 0 & \text{otherwise} \end{cases}$$

$$k = 1, \ldots, 4 \tag{5}$$

The likelihood function for modeling plan choice is then given by:

$$\ln L = \sum_i \left[\sum_{j=1}^{16} c_{ij}{}^*[P_j{}'\theta + (X_i{}'P_j)'\delta] \right.$$

$$- s_{i1} \ln \sum_{j=1}^{4} \exp[P_j{}'\theta + (X_i{}'P_j)'\delta]$$

$$- s_{i2} \ln \sum_{j=5}^{8} \exp[P_j{}'\theta + (X_i{}'P_j)'\delta]$$

$$- s_{i3} \ln \sum_{j=9}^{12} \exp[P_j{}'\theta + (X_i{}'P_j)'\delta]$$

$$\left. - s_{i4} \ln \sum_{j=13}^{16} \exp[P_j{}'\theta + (X_i{}'P_j)'\delta] \right] \tag{6}$$

which we estimate using maximum likelihood methods.

The *P* vector includes indicators for each of the four plan characteristics, that is, dummy variables indicating whether the plan was high premium/benefit, was a PPO, had high satisfaction ratings, and included the participants' usual provider. We also created a dummy variable indicating whether the participant received supplemental cost materials, and included interactions between this variable and the four plan characteristics. In exploratory analyses, we controlled for total cost and illness episode materials separately; in general, the two types of materials had substantively and statistically similar effects on plan choice. For expositional convenience, and to facilitate analysis of interactions, we pooled participants receiving total cost and illness episode materials into a single intervention group in this study. (Preliminary analyses suggested that the two types of materials had substantively similar effects.)

We did not control for sociodemographic characteristics in our main models, given the randomized design and the multiple terms associated with each individual characteristic in the conditional logit framework. However, following Hypothesis 2, we also estimated a model including five additional terms: interactions between health status (excellent/very good vs. good or fair) with the four plan characteristics, and a three-way interaction between health status, receipt of supplemental cost materials, and whether the plan had high premiums/benefits. In principle, equation 6 also can be extended to include interactions between various plan characteristics. Given our implementation of the fractional factorial design, however, not all possible interactions between the four plan dimensions are identified in the conditional logit framework. We discuss this issue in more detail subsequently.

We note that conditional logit models impose an assumption commonly called "independence of irrelevant alternatives" (IIA). In our context, the IIA assumption implies that participants' order of preference for a subset of *n* plans would not be altered if they were offered additional plans—although it imposes no restrictions on how participants would rank the additional plan(s) relative to each of the original *n*. This may not be realistic in practice, and researchers have suggested alternative methods for modeling insurance choice (e.g., Feldman et al. 1989). However, the goal of this study is to evaluate the effects of the supplemental cost materials on plan choice, rather than demand for various plan characteristics per se, and this objective seems unlikely to be affected by the IIA assumption. For comparison, we

Table 6. Conditional logit estimates of plan choice

	Model 1		Model 2		Model 3	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
PPO	−.156	.110	−.251	.186	−.159	.258
High premium/benefits	.710*	.131	1.235*	.266	1.191**	.476
High CAHPS® satisfaction rating	.932*	.131	1.164*	.266	1.155*	.367
Includes usual provider	.712*	.118	.706*	.199	.346	.266
Cost materials * PPO	—	—	.141*	.231	.139	.237
Cost materials * High premium/benefits	—	—	−.733**	.308	.029	.570
Cost materials * High CAHPS® rating	—	—	−.291	.309	−.291	.314
Cost materials * Usual provider	—	—	.009	.248	−.002	.250
Excellent/very good health * PPO	—	—	—	—	−.127	.250
Ex/VG health * High premium/benefits	—	—	—	—	.065	.542
Ex/VG health * High CAHPS® rating	—	—	—	—	.007	.333
Ex/VG health * Usual provider	—	—	—	—	.519**	.259
Cost materials * Health * High premium/benefits	—	—	—	—	−1.013	.645
Log likelihood	−393.529		−390.399		−384.729	

* Coefficient is statistically significant at $p < .01$.
** Coefficient is statistically significant at $p < .05$.

also present the actually observed marginal distributions for intervention and control participants.

Findings

Choice of Plan Characteristics

Table 6 presents parameter and standard error estimates for our models of plan choice. The last row presents information on the joint significance of the covariates in predicting participants' health plan choice; each model has significant explanatory power. In Model 1, participants do not have a statistically significant preference between PPOs and HMOs, but they do significantly prefer high (vs. low) premium/benefit plans, high (vs. low) rated plans, and—consistent with experimental instruction—plans that include their usual provider. Model 2 indicates that the supplemental cost materials significantly altered participants' demand for high premium/benefit plans but had no statistically significant effect on participants' demand for other plan characteristics. Model 3 evaluates the interaction between health status, supplemental cost materials, and various plan characteristics. The health by cost material by high premium/benefit interaction term is negative and large, suggesting that the cost materials reduced demand for high premium/benefit plans more among participants in relatively good health; however, this interaction term is not statistically significant at conventional levels ($p = .11$).

Interpreting the magnitude of the estimated coefficients is difficult. To aid interpretation, Table 7 presents simulated probabilities of choosing plans with

particular characteristics, based on Model 2 in Table 6. Specifically, we used the parameter estimates to simulate the distribution of participants across the 16 plans under the assumptions of the conditional logit framework, that is, that each individual could choose from the full set of 16 plans. For this reason, we identify these results as being based on "unrestricted choices." Specifically, we predicted the probability that participant i would choose plan m:

$$\widehat{\Pr}(choice_i = Plan_m) = \frac{e^{P_m'\hat{\theta}+(X_i'P_m)'\hat{\delta}}}{\sum_{j=1}^{16} e^{P_j'\hat{\theta}+(X_i'P_j)'\hat{\delta}}} \quad (7)$$

We simulate these probabilities first under the assumption that each participant was not offered the supplemental cost materials, then again assuming they had received the materials; we then averaged predictions across participants to generate the results in the table.

Table 7 shows that the supplemental cost material significantly shifted participants from high premium/

Table 7. Effects of supplemental cost materials on demand for plan features

Fraction choosing plan with particular feature	Control group	Intervention group
PPO	.437	.473
High premium/benefits	.775	.623
High CAHPS® satisfaction rating	.762	.705
Includes usual provider	.670	.672

Note: Based on estimates of Model 2 in Table 6.

Table 8. Effects of supplemental cost materials by health status

Fraction choosing high premium/benefit plan	Control group	Intervention group
Excellent/Very good health	.778	.568
Good/fair health	.767	.772

Note: Based on estimates of Model 3 in Table 6.

benefit plans to plans with lower premiums and less comprehensive benefits. Under the assumptions of our model, demand for high benefit/premium plans fell by 20% (from 78% to 62%) due to the materials. We note that the actual observed fraction of respondents choosing a high premium/benefit plan was 16% lower among intervention participants relative to controls (72% among controls vs. 60%, $p < .05$). The predicted effect of the supplemental materials is larger under the conditional logit model because that model makes the choice of any single plan characteristic (i.e., premium/benefit level) independent of the choice of the other three.

Table 8 presents analogous simulations for Model 3 in Table 6, testing Hypothesis 2. The results suggest that the effect of the cost materials differed substantially by participants' health status: demand for high premium/benefit plans fell around 25% among participants in "excellent" or "very good" health, but actually rose somewhat for participants in "good" or "fair" health. As previously, however, the underlying interaction coefficient is not statistically significant at conventional levels. Overall, demand for high premium/benefit plans was higher for respondents in good/fair health, as we would expect (77%, vs. 63% among respondents in excellent/very good health; $p < .05$).

Trade-offs between Premium/Benefits and Plan Quality

One strength of our design is that the relationship between premium/benefits and CAHPS satisfaction ratings varied, much as it might in the real world. As Table 1 shows, half our participants were offered choice sets in which the high premium/benefit plans had high CAHPS satisfaction ratings and the low premium/benefit plans had low ratings (which we call "concordant"); the other half were offered choice sets in which premium/benefits and satisfaction scores were inversely related (which we call "discordant"). Spranca et al. (2000), using an analogous design but focusing specifically on testing the effects of providing CAHPS materials, found that partici-

pants' preferences for high premium/benefit plans were the same when participants were offered a concordant choice set as when they received no CAHPS materials. Most participants in these conditions preferred the high premium/benefit plan. When participants were offered a discordant choice set, however, their preference for high premium/benefit plans fell substantially.

We thus were interested in examining whether our main finding—that the supplemental cost materials reduced demand for high cost/premium plans—depends on whether participants are offered concordant choices. Specifically, when choices are concordant, individuals who choose cheaper plans are compromising both benefits and quality; when choices are discordant, they gain high quality when they give up high benefits.

Given our design, an interaction term between premium/benefit and CAHPS rating is not identified in the conditional logit framework (since all participants received either concordant or discordant choices). To test for this interaction, we therefore stratify by concordance status and estimate models analogous to equation 6; we then test whether the demand for high premium/benefit plans differs in the two models.

Parameter and standard error estimates of these models are presented in Table 9. Based on these results, we calculate that 86% of participants chose high premium/benefit plans under concordance vs. 46% under discordance ($p < .05$), consistent with Spranca et al. (2000). Supplemental cost materials decreased demand for high premium/benefit plans: under concordance, 92% of controls and 80% of intervention participants chose high premium/benefit plans ($p < .05$), while 52% of controls and 41% of intervention participants did so under discordance. However, we cannot reject the hypothesis that the effect of the cost materials on demand for high premium/benefit plans is independent of concordance status.

Discussion and Conclusions

Our results show strong support for Hypothesis 1: providing supplemental information on the expected out-of-pocket costs associated with competing health plans for different patterns of health care significantly changes consumers' choice of health plan. The main effect is on demand for the relatively comprehensive and expensive plans, which fell 10 to 20 percentage points as a result of the supplemental material. This effect seems fairly large, especially considering that the intervention consisted solely of providing the

Table 9. Conditional logit estimates of plan choice, by type of choice set

	Concordant choice sets		Discordant choice sets	
	Coefficient	Standard error	Coefficient	Standard error
PPO	−.443*	.262	−.077	.266
High premium/benefits	2.405*	.468	.071	.264
Includes usual provider	.697*	.282	.730*	.282
Cost materials * PPO	.607**	.324	−.305	.333
Cost materials * High premium/benefits	−1.029**	.527	−.445	.333
Cost materials * Usual provider	−.196	.345	.218	.360
Log likelihood	−177.066		−209.717	

* Coefficient is statistically significant at $p < .01$.
** Coefficient is statistically significant at $p < .05$.

supplemental decision support materials rather than actually changing plan attributes. We also find support for Hypothesis 2: it appears that providing supplemental cost materials may facilitate adverse selection, by shifting relatively healthy participants into plans with lower premiums and less comprehensive benefits and shifting less healthy participants in the opposite direction slightly. Finally, we find no consistent evidence that the supplemental cost materials reduce demand for high premium/benefit plans more when plan cost and ratings are discordant.

Overall, these results suggest that consumers, particularly those in relatively good health, currently may be over-insuring against negative health shocks. This is consistent with Feldstein (1973), who argued that consumers are over-insured for medical care (although for different reasons, that is, due to the tax subsidy for employer-provided health insurance), with speculation by Sturman, Boudreau, and Corcoran (1996) on the likely effects of providing exactly the type of information tested here, and with evidence from other settings that people may over-insure in the face of uncertainty about risk (e.g., Johnson et al. 1993).

The choices our research participants faced differed in a number of important ways from those of real choices that consumers face, and our findings should be interpreted accordingly. Most generally, the magnitude and direction of the effects of the supplemental materials on plan choice are specific to the hypothetical plans we developed, and to the way they were combined to create choice sets. In practice, competing plans may be more or less similar to one another than the plans we offered participants, and this may affect the extent to which consumers' preferences change when they are offered supplemental cost materials.

A second issue is that study participants were not actually choosing a health plan for the coming year,

and there are a number of reasons to believe that participants may act differently in such simulations than in the real world (Spranca et al. 2000). Most obviously, the process for evaluating real plan choices may differ from what participants did in the lab, although it is difficult to guess a priori how this might change our results. Perhaps more importantly, our laboratory participants were not already enrolled in any of the hypothetical plans they were being offered. Previous researchers have documented inertia in health plan choice, suggesting that it is easier to affect consumers' choices when they are initially choosing a plan than subsequently (e.g., Neipp and Zeckhauser 1985). This suggests that introducing supplemental total cost or illness episode material will have a weaker effect among current employees—who already are enrolled in a health plan—than among new employees or among employees whose current plan will not be available in the next period (and who thus must switch). This may help account for the differences between our findings and those of Sofaer, Kenney, and Davidson (1992), since the participants in that study already had specific insurance coverage. At the same time, there also is evidence that consumers are willing to switch plans in response to relatively modest differences in premiums, at least when benefit packages (and possibly provider networks) vary little across the competing plans (Buchmueller and Feldstein 1997).

A third difference from the real world is that participants were instructed to choose individual coverage, when in reality many of them would be choosing family coverage. To the best of our knowledge, employees rarely are permitted to choose different employer-sponsored plans for themselves and other family members, so they would need to choose the best plan for the family as a whole. Decisions about individual and family coverage, respectively, would differ due to variation in health need across individ-

uals vs. across families, or to differences in individual vs. family premiums/benefits across plans. As a result, it is difficult to know a priori how our results would have differed if we had incorporated family coverage. On a related point, many consumers also can choose whether to obtain coverage through their spouse's employer, but it is logistically difficult to incorporate this choice into the total cost or illness episode materials.

Finally, our sample of participants, while demographically and economically diverse, is not a representative random sample from any population. As an illustration, two-thirds of our participants were currently enrolled in an HMO, and HMO members were significantly more likely to choose one of the hypothetical HMO plans. Participants drawn from areas with less HMO enrollment may well have allocated themselves differently across the hypothetical PPO and HMO plans, with unknown effects on participants' preferences for other plan characteristics. In sum, our substantive findings are internally valid—since the receipt of supplemental material was randomly assigned—but not automatically generalizable.

Previous research has indicated that people find currently available health plan material confusing and do not feel that they are making well-informed choices (Gibbs, Sangl, and Burrus 1996). Employers who offer health insurance choices thus may find that employees value the supplemental decision-support material even if it has little effect on their actual choice of health plan, because it may make them feel more confident about their choices. We are examining participants' attitudes toward the decision-support materials separately.

However, even if consumers would like to use these decision-support materials, they may not have the opportunity. Employers must believe that such materials benefit their firms in order to offer them. Presumably employee satisfaction with the materials would be a benefit in its own right. More direct benefits could arise if employees' choice of cheaper and less comprehensive plans reduced employers' cost of providing health insurance, or if those employees who chose to bear more risk stayed healthier due to reduced moral hazard. At the same time, as others have pointed out (Davidson, Sofaer, and Gertler 1992), materials that improve consumers' understanding of health plan costs or other features may increase whatever risk selection already is taking place when employers offer meaningful health plan choices. Those who would argue—as we are inclined to do—that consumers can benefit from decision-support information about health plan costs, quality, and other characteristics thus face the challenge of evaluating the consequences for employers and insurance markets of introducing such information.

Notes

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