A Family Decision-Making Model of Health Insurance Choices

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In this paper we evaluate the health insurance choices of families enrolled in a direct-contracting model developed by an employer purchasing alliance. This is the first study that has constructed an intra-family utility model of health plan choice. We construct individual utility functions by using stated preferences of individual family members and the attributes of different health benefit options. Conditional logit methods are used to estimate the weights for each family member's utility in the family utility function. We find that families are sensitive to changes in the tax-adjusted, out-of-pocket premium. In addition, families who have specific primary care physicians and high importance ratings for seeing these primary care physicians prefer the option that offers a potentially larger selection of physicians, compared to families with low importance ratings. We do not find that families select health benefit options based on the preferences of children or family members with a chronic illness.

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1. INTRODUCTION

Numerous studies have analyzed health insurance choices by consumers [Feldman et al., (1989); Short and Taylor, (1989); Barringer and Mitchell, (1994); Dowd and Feldman, (1994); Chernew and Scanlon, (1998); Cutler and Reber, (1998); Royalty and Solomon, (1998); Abraham, Vogt, and Gaynor, (2001); Beaulieu, (2002); Harris, Schultz, and Feldman, (2002); Strombom, Buchmueller, and Feldstein, (2002); see Scanlon, Chernew and Lave (1997) for a more extensive list]. Some of these studies deal with differences in single-person and family decisions by estimating separate choice equations for each, using fairly simple family demographics, such as presence of children and family income, to explain family decisions. However, we are not aware of any previous research that adequately addresses the selection of health plans by families. This study makes a significant contribution to the literature on health insurance decisions within families by estimating a family choice model for health benefit options that includes unique family characteristics, like measures of individual family member's preferences. It also provides a theoretically sound rationale for using interactions between family member characteristics and health plan attributes to explain health benefit option choice.[1]

An innovation in this study is that we are not just estimating a typical choice model. Instead, we try to solve a problem inherent in every family choice model: how to identify the separate contributions of individual preferences versus family aggregation weights. To solve this problem we construct individual utility functions by using stated preferences of individual family members, which enables us to estimate the aggregation weights of the family utility model.

[1] A shortcoming of studies that use interactions between individual characteristics and health plan attributes is their failure to provide a theoretically consistent model. For example, a few studies interact age or health status and premiums, but this implies that the marginal utility of income differs across age or health categories. We provide a rationale for heterogeneous responses by constructing an intra-family utility model of health benefit option choice.

This innovation in framing household decisions is significant to policy makers as well. It raises concerns about studies that fail to account for variance in preferences and outcomes within families, which may lead to poor policy design because policy conclusions are sensitive to the family model adopted. For example, policies aimed to increase health insurance coverage, or reduce the number of uninsured, need to be based on studies of intra-family decision-making, in order to understand why some families choose to cover certain family members but not others.

During the last two decades, extensive research on the economics of family behavior has advanced Samuelson's (1956) common preference model, which treats families as if they are maximizing a single household utility function, and Becker's (1974; 1981) benevolent dictator model. These advanced models include co-operative bargaining games (McElroy and Horney, 1981; Manser and Brown, 1979) and separate spheres models with non-co-operative threat points (Lundberg and Pollak, 1993) that allow individual family members to have different preferences and different outcomes. These studies have applied the collective family model to decisions about child support, child health, labor supply, and the effects of targeted transfers on household expenditures. However, to our knowledge, there are no studies that apply collective models to decisions about health insurance or health care and, furthermore, there are no studies that use direct measures of differences in preferences across family members.

In our study, we use a family utility model to analyze health benefit options chosen by family members in the Buyers Health Care Action Group's (BHCAG) "Choice Plus" program.[2] BHCAG is a health purchasing coalition consisting of approximately two-dozen self-insured employers in the Minneapolis-St. Paul area. BHCAG's Choice Plus program provides a unique opportunity to analyze family choice because it offers a standard set of benefits, non-overlapping

[2] Refer to Schultz (2001) and Harris et al. (2002) for analyses of health benefit plans chosen by single individuals enrolled in Choice Plus.

physician networks, and employee cost sharing. Standard benefits permit an analysis of choice as a function of price and quality and induce providers to differentiate themselves based on these characteristics. It also simplifies the choice process, making it easier for family members to compare providers on criteria such as price and quality rather than coverage. A second design feature of particular importance to our study is that BHCAG specifically prohibits primary care physicians from belonging to more than one benefit plan. Finally, most employers make level dollar contributions to premiums. This policy exposes families to the marginal difference in premiums for more expensive benefit plans. Hence, in some sense, the BHCAG program represents a return to the concept of a competitive health care system proposed almost 20 years ago by McClure (1982) and developed further by Enthoven (1988).

2. STRUCTURE OF BHCAG AND CHOICE PLUS

The Buyers Health Care Action Group is an employer health benefit purchasing coalition. Formed in 1991, it is currently comprised of 28 companies, including some of the largest employers in Minnesota. These self-insured employers have approximately 250,000 employees and dependents eligible for employer-sponsored health insurance.

All BHCAG employers offer "Choice Plus," a point-of-service health insurance plan with out-of-network coverage. Employers may offer other managed care and indemnity plans, but most have selected Choice Plus as their sole health insurance plan. Prior to 1997, BHCAG contracted with a single health maintenance organization to operate Choice Plus. In 1997 BHCAG implemented a new approach designed to create a more competitive and cost-efficient system. The new approach utilizes direct contracting with provider networks. Under the new approach consumers choose among 'care systems' (health benefit *plans*), which are integrated

teams of providers of various structures (basically a primary care-centered health system with affiliated specialists, hospitals, and allied professionals), according to their cost, quality, and preference for physicians. About 95% of the primary care physicians in the Twin Cities contract with Choice Plus.

Care systems are grouped into three cost tiers (health benefit *options*), with a separate premium for each, but with standardized benefits and coverage across cost tiers and care systems. Each family member may select a different care system, which resolves problems for families who have different primary care physicians because BHCAG prohibits primary care providers from affiliating with multiple care systems. However, the family's out-of-pocket premium is determined by the cost tier containing the most expensive care system chosen by any family member. This means that the choice of cost tier is a family decision that, in theory, should be based on two factors: the out-of-pocket premium for each tier and whether or not care systems in that tier offer the primary care physicians desired by influential family members. Additionally, families have access to all physicians in the highest cost tier they select, as well as any physician in lower cost tiers. Hence, families who select the highest cost tier have a "license" to search for physicians across all cost tiers in the Choice Plus network. Our modeling and statistical analysis of family choices departs from prior studies in that it addresses these unique features of the BHCAG program.

3. CHOICE MODEL

The choice model is derived from the assumptions of utility maximization and rationality. We assume that a family will select a health benefit option that maximizes a family utility function. Although an individual family member may prefer a different alternative that

maximizes his or her personal utility, this is not necessarily the option chosen by the family. It is the family's utility that is maximized. The model's specification is as follows. Let **R** = $(Z_1,\ldots,Z_J)$ be a mutually exclusive and exhaustive set of *J* choice alternatives, where each alternative j is characterized by a vector of *m* value-relevant attributes, namely, $Z_j = (z_{j1}, \ldots, z_{jm})$. Let $Y_i = (y_{i1},\ldots, y_{in})$ be a vector of *n* attributes characterizing family members choosing from choice set **R**. For any such choice set **R**, and for any family described by the set of attributes Y_i, choice models generate a vector of choice probabilities $(Pr_{i1},\ldots,Pr_{iJ})$, where Pr_{ij} is the probability that a family characterized by Y_i will choose alternative Z_j from choice set **R**. The probabilities must sum to one.

We assume that each family maximizes their utility, choosing alternative j if $Pr(U_j \geq U_k$, for all $k \neq j$ elements of R), where U_j is the subjective utility of alternative Z_j to the family. For estimation purposes we assume that U_j is a function of the attributes of alternative Z_j, family attributes, Y_i, and a vector of *q* arithmetic combinations of Z_j and Y_i, $X_{ij} = (x_{1ij},\ldots, x_{qij})$ that could include simple attributes, transformations of attributes, or interactions of alternative-specific and individual attributes. For example, utility is considered to be a function of care system attributes such as price and member attributes such as importance of seeing a specific primary care physician. Thus, $U_j = G(Z_j, Y_i, X_{ij})$.

We hypothesize that the out-of-pocket premium for each health benefit option is a collective good – like the family's house. After the family pays for collective goods, each member receives a share of the remaining income, which they evaluate using a marginal utility of income metric. Unlike the out-of-pocket premium, the ability to see a specific primary care provider is a private good. We hypothesize that each family member places a higher value on the health benefit option that includes his or her primary care provider than on other benefit

options. Therefore, we can represent the utility of health benefit option j for family member i using the following economic model:

$$U_{ij} = s_i\gamma_{Yi}(Y - P_j) + \gamma_{Di} D_j + \gamma_{Xi}X_{ij} + V_j + e_{ij} \quad (1)$$

s_i is the share of net family income for family member i; γ_{Yi} is the person-specific marginal utility of income; Y is after-tax family income; P_j is the tax-adjusted, out-of-pocket premium for benefit plans in benefit option (cost tier) j; γ_{Di} is the person-specific marginal utility of convenient hours and locations of providers; D_j is the distance to the nearest clinic in benefit option j; γ_{Xi} is the person-specific marginal utility of seeing a particular primary care physician; and X_{ij} is an indicator for whether benefit option j guarantees access to i's primary care physician; V_j is the family-specific utility for unmeasured characteristics of benefit option j; and e_{ij} is the person-specific utility for unmeasured characteristics of benefit option j.

Our empirical strategy will be to construct U_{ij} rather than estimate it. This is done by using a combination of simplifying assumptions and survey responses for the key parameters in U_{ij}. Specifically, we assume the shares of net family income sum to one. Next, we assume that a key decision-maker's responses to a question on the importance of low premiums can be used as a proxy for the family's importance of low premiums, that is, $\gamma_{Yi} = \gamma_Y$[3]. The decision-maker's response to a question on the importance of convenient hours and locations of providers also serves as a proxy for the family's importance of this benefit option characteristic ($\gamma_{Di} = \gamma_D$). γ_{Xi} are

[3] We assume $\gamma_{Yi} = \gamma_Y$ because our survey asked for the preferences for low premiums only for the key decision-maker, not for each family member. We also asked a survey question for who made most of the decisions about money in 2-adult households. In 70%of these households, the employee and spouse had an equal say in money decisions and in another 21% the employee (who was usually the source for γ_Y) made most money decisions. Consequently, in as many as 91% of 2-adult families, the key decision-maker's preference for low premiums is probably a good proxy for at least the adult family members' preferences.

the decision-maker's proxy responses for each family member regarding the importance of seeing their own primary care physician; and X_{ij} is approximated with an indicator equal to one for alternative j. The key decision-maker was identified as the family member who was most knowledgeable about health insurance and medical care.

Once constructed, the individual utility functions are aggregated to determine total family utility. We assume that family utility for alternative j is invariant to family size.[4] Hence we add terms that represent the utility of income and calculate weighted averages of terms that represent the utility of characteristics of benefit option j. Each family member gets weights of w_{ij} that differ among family members and alternatives. For example, a child with asthma may count more than a healthy adult when determining the family's utility for a particular benefit option.

To illustrate this approach, we can write the family's utility from having at least one member enrolled in benefit option j as:

$$U_j = \Sigma s_i \gamma_{Yi} (Y - P_j) + \Sigma w_{ij} \gamma_{Di} D_j + \Sigma w_{ij} \gamma_{Xi} X_{ij} + \Sigma w_{ij} V_j + \Sigma w_{ij} e_{ij} \quad (2)$$

which reduces to:

$$U_j = \gamma_Y (Y - P_j) + \gamma_D D_j + \Sigma w_{ij} \gamma_{Xi} X_{ij} + V_j \quad (3)$$

The weights sum to 1.0 for each alternative, and s_i sum to 1.0 across family members. $\Sigma w_{ij} e_{ij} = 0$ because the weights are assumed to be independent of the error terms in the individual utility function.

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[4] Family utility from a particular health benefit option should increase if that option contains more characteristics preferred by family members, but it should not increase with family size, *per se*.

We specify the weight for family member i and alternative j as a function of an intercept term and of her personal characteristics:

$$w_{ij} = 1/N + \alpha_{1j}(K_i - \overline{K})/N + \alpha_{2j}(C_i - \overline{C})/N \qquad (4)$$

where $K_i = 1$ if family member is a child and $C_i = 1$ if the family member has a chronic health condition. $\overline{K}$ is the proportion of family members who are children and $\overline{C}$ is the proportion of family members with a chronic illness. In other words, each family member gets a "baseline" weight equal to 1/N, plus additions or subtractions depending on whether or not she has any special characteristics that merit a different weight. We consider being a child and having a chronic health problem as potential weight-altering characteristics.

In order to estimate the fundamental parameters, α_{1j} and α_{2j}, the weighted term in U_j can be rewritten as:

$$\Sigma\, w_{ij}\gamma_{Xi}X_{ij} = \Sigma\, \gamma_{Xi}X_{ij}/N + \alpha_{1j}\Sigma\, \gamma_{Xi}X_{ij}\,(K_i - \overline{K})/N + \alpha_{2j}\,\Sigma\, \gamma_{Xi}X_{ij}\,(C_i - \overline{C})/N \qquad (5)$$

The V_j function is specified as:

$$V_j = \beta_{1j} + \beta_{2j}\,\text{Age} + \beta_{3j}\,Y + \beta_{4j}\,\text{Children} + e_j \qquad (6)$$

where "Age" is the age of the policyholder, Y is after-tax family income, "Children" is an indicator for any children in the family, and e_j is a random error term. By substituting the weights and V_j into U_j, and setting $X_{ij} = 1$ for alternative j, we get:

$$U_j = \eta_1\gamma_Y(Y - P_j) + \eta_2\gamma_D D_j + \beta_{1j} + \beta_{2j}\text{Age} + \beta_{3j}Y + \beta_{4j}\text{Children} + \eta_{3j}\Sigma\,\gamma_{Xi}/N + \alpha_{1j}\Sigma\,\gamma_{Xi}(K_i - \overline{K})/N + \alpha_{2j}\,\Sigma\,\gamma_{Xi}(C_i - \overline{C})/N + e_j \quad (7)$$

$$\Rightarrow \quad U_j = G(Y_i, Z_j, X_{ij})\lambda + e_j$$

A count of the parameters indicates that there are 2x(J-1) α coefficients and 4x(J-1) β coefficients to be estimated. α and β for one of the J alternatives are normalized to zero. In addition, we will estimate coefficients (η) for terms involving $\gamma_Y(Y- P_j)$, $\gamma_D D_j$, and $\Sigma\gamma_{Xi}/N$ because the survey responses for γ may not have the same scales as the marginal utilities of income, convenience, and provider choice.

We use conditional logit analysis to estimate the family utility function, based on the observed choice of benefit options. This method is motivated by a random utility function because there are errors in maximization due to imperfect perception and optimization, as well as errors due to unobserved relevant variables. The disturbance term is assumed to be independently and identically distributed with an extreme value distribution. Conditional logit estimates the effects of choice characteristics and individual characteristics on choice probabilities for families k=1,…,N as:

$$\Pr(kj) = \exp\{G_j(Y_k, Z_j, X_{kj})\lambda\} \,/\, \sum_{j=1}^{J} \exp\{G_j(Y_k, Z_j, X_{kj})\lambda\} \quad (8)$$

4. DATA

A telephone survey of randomly selected employees with Choice Plus coverage was conducted in February-April of 1998, immediately after the second open enrollment cycle under the new BHCAG initiative. Conducting the survey after the second open enrollment period was preferable because most BHCAG companies eliminated non-Choice Plus options and most established level-dollar premium contributions. Twenty firms were selected based on the number of employees expected to enroll in the Choice Plus program and the type of alternative insurance plans offered. Firms that offered point-of-service products that were similar to the Choice Plus plan were excluded. One of the 20 employers was dropped because its open enrollment period would not occur until April 1998, too late to be included in the survey. The remaining 19 firms were retained for the study.

To be eligible for the survey, employees had to be enrolled in Choice Plus (as determined from BHCAG's membership files) with no eligibility for dual or substitute coverage through other private or public health insurance programs. The sample was limited further to employees with dependents who were not eligible for coverage through a spouse or domestic partner. The person who was most knowledgeable about health insurance and medical care responded for the family. All employees were selected randomly but the samples were stratified to have a higher probability of drawing employees from small companies. The response rate was 96 percent, after screening out ineligible employees and those we were not able to locate (1,923 families were approached but 975 were ineligible).

5. EMPIRICAL SPECIFICATION AND DESCRIPTIVE STATISTICS

To specify the model we used information obtained from the decision-maker in the family who was most knowledgeable about health care. We asked this person whether family members have a primary care physician in their current care system and, if so, we asked him/her to rank the importance of seeing this primary care physician for each family member. This ranking was based on a 0 to 4 scale, with 4 representing very important. Attachment to physicians is an important factor in determining health plan enrollment. Hill (2000) found that families are more likely to select plans that contain physicians they visited in the past. Cost tier 3 should be more valuable for family members who have higher importance ratings for seeing their primary care physician because it permits family members to search for physicians in all cost tiers below tier 3. By paying the highest premium, family members are essentially given the freedom to find providers in any cost tier. As Table 1 shows, the importance of seeing their primary care physician is slightly higher for children than adults. We also asked the decision-maker to provide one rating for the entire family on the importance of enrolling in care systems with convenient hours and location and the importance of low monthly premiums, which were reported on a 1 to 10 scale, where 10 represents very important.

Table 1 presents descriptive statistics for the variables used in the empirical model. A key variable in the model is the employee's monthly out-of-pocket premium for each cost tier, which varies across employers. Monthly premiums for 1998 were collected from each employer. Because all employees in the sample are eligible for 'Section 125' status that allows pretax payment of premiums, the out-of-pocket premium varies by income. Theoretically, the current tax structure insulates consumers from the true price of health care. Royalty and Solomon (1999) and Dowd et al. (2001) found employees with 'Section 125' plans make choices on the

basis of pretax premiums. Therefore, tax-adjusted premiums are constructed to reflect real out-of-pocket expenses. Self-reported income is used to calculate average standard deductions and exemptions for each income category. Using net income (gross income minus deductions and exemptions), federal and state tax rates are determined. In addition, social security and disability taxes are calculated. A tax rate is then computed for each individual and is used to adjust premiums. Average tax rates are used as proxies for individuals with missing income information. The average tax-adjusted monthly premiums are $44.32, $58.52, and $73.83 for cost tiers 1, 2 and 3, respectively.

We interacted the premium importance measure, which represents marginal utility of income, with the tax-adjusted, out-of-pocket premium for each cost tier. We hypothesize that families will be sensitive to out-of-pocket premium differences across cost tiers, especially those families with high importance ratings for low premiums.

Because the care systems in Choice Plus offer a standard set of benefits, medical providers have an incentive to differentiate themselves on the basis of quality. We included one objective measure of service quality in the model: the distance to clinics in each cost tier. Distance is measured from the centroid of each family's residence zip code to the centroid of the zip code for the nearest clinic in each care system. The average minimum distance is then calculated for each cost tier.

We interacted the distance measure with the importance weight for enrolling in a care system with convenient hours and location. We hypothesize that families will prefer care systems with clinics that are located close to their home, and that this preference should be greater for families with a high importance weight for convenience.

To estimate the family aggregation weights, we interacted the individual weights (w_{ij}) with the primary care importance measure (γ_{Xi}) and a cost tier indicator (X_{ij}) that captures a family member's access to his or her physician.[5] Our main hypothesis is that families will give more weight to children and chronically ill members who have specific primary care physicians and high importance ratings for seeing these physicians. Thus, these families are more likely to select the highest cost tier (benefit plan option), because members can always gain access to their physician, because it gives them a license to search for physicians across all cost tiers.

The model also includes a number of variables, such as household income, age of the policyholder, and whether dependent children are present, to control for unobserved differences in families' preferences. Self-reported gross household income is measured as a continuous variable divided by 1,000. The average household income for the entire sample is $55,778. A dummy variable is constructed to identify families (approximately 22 percent of the total sample) who failed to report household income because it is likely to be missing non-randomly. We also included a dummy variable for whether the family contained any children to measure the effect of the presence of a children's hospital in cost tier 3. We interacted the indicator for any children with the out-of-pocket premium variable and the distance variable to capture any potential differences in premium and distance sensitivity between families with and without children. We include these interaction terms because the discrepancy between the importance ratings and the true marginal utility of the alternatives may be different for families with and without children. Because family income does not vary across cost tiers, we did not interact it with the premium

[5] Note that w_{ij} contain the indexes for children and chronically ill family members.

importance measure. The health status of each family member, measured by the prevalence of a chronic health problem, is captured in the weighting function, w_{ij}.[6]

The dependent categorical variable designates the highest cost tier selected by any family member. There are 25 care systems in the Choice Plus program in 1998, and each is grouped into one of three cost tiers. Cost tier 3 has the largest enrollment followed by cost tier 2. We estimated the model treating cost tier 3 as the omitted alternative.

6. RESULTS

Table 2 presents the coefficients and statistical significance of the conditional logit estimates. Table 3 presents the average elasticities by cost tier, including weighted-average elasticities (weighted by enrollment in each cost tier). The coefficients and elasticities are relative to the omitted alternative, cost tier 3. Age, income, missing income, and presence of children enter the model as control variables.

The estimates of premium elasticities are consistent with previous studies of health plan choice: in general, families have negative premium elasticities. However, by interacting premiums with the family preference ranking for the importance of low premiums and whether the family included children, our construction of the intra-family utility model allows heterogeneous family responses to price. The average out-of-pocket premium elasticity for families without children is -0.81 (computed at the mean of the premium importance variable). This suggests that a $5 increase in after-tax, monthly out-of-pocket premiums decreases the probability of selecting a particular cost tier by approximately 7%. For families with children, the total out-of-pocket premium elasticity (derived by summing the elasticities for the two premium interaction terms) is –0.16, suggesting that a $5 increase in premiums would lead to a

[6] Chronic health conditions include diabetes, asthma, hypertension, cancer, pregnancy, heart disease, or depression.

decrease in the choice probability by only 1.4%. Thus, families with children are less price-sensitive than families without children.

The premium elasticities also change at different values of the premium importance variable. Families who rate the importance of low premiums as 10 (very important) have an average premium elasticity of –1.17 (no children) and –0.21 (with children). However, for families with premium importance ratings of 5, the average premium elasticities are –0.57 (no children) and 0.08 (with children). Hence, families who place less value on low premiums are less sensitive to increases in premiums, especially so for families with children.

The coefficient on the interaction of minimum distance with the ranking for convenience is negative and statistically significant, with an average elasticity of -0.28 (computed at the mean of the convenience importance variable). Hence the probability of selecting a cost tier would decline by approximately 12.5% if the average minimum distance to clinics increased by 5 km. This effect is much greater for cost tier 1. The probability of selecting cost tier 1 declines by 25% when the average minimum distance to clinics increases by 5 km. Because many of the care system clinics in cost tier 1 are located outside of the metropolitan area, an increase in distance would make them even less accessible.

Families with high average importance ratings for primary care physicians are less likely to select cost tier 2. For example, if the importance rating increases by one point, the probability of selecting cost tier 2 decreases by approximately 11%. This is a reasonable finding because families gain the privilege of searching for any physician across all tiers if they select cost tier 3.

The estimated coefficients that determine an individual's weight in the family utility function, α_{1j} and α_{2j}, were generally not statistically significant. The only marginally significant importance coefficient (with a negligible marginal effect) was the child index for cost tier 1

(α_{11}). We hypothesized that these families would be more likely to select cost tier 3, which gives greater license to find specific physicians.[7] However, the estimated coefficient is *opposite* in sign to what we predicted, implying that families with children who prefer specific primary care physicians are more likely to select cost tier 1 rather than cost tier 3.

Our findings generally suggest that the importance ratings of children and family members with chronic conditions do not receive more weight in determining the highest cost tier chosen by the family. In other words, it appears that each family member receives equal weight, with no deviations based on special characteristics. This finding may not be unique. For instance, Hill (2000) finds that the number of primary care physicians in each health plan who specialize in treating children play only a small to negative role in predicting health plan enrollment for families. However he did not analyze an intra-family utility model.

One possible explanation for the lack of significance of these coefficients would be a lack of intra-family covariance between the constructed importance weights and the indices for children and chronic conditions.[8] In order to investigate this possibility we analyzed the intra-family covariance structure and found statistically significant relationships between the weights and the indices. Based on these results it appears that our constructed variables have sufficient variation to obtain significant parameter estimates.

Other statistically significant coefficients include the policyholder's age, which is negative for cost tier 2, implying that families with older policyholders are less likely to select cost tier 2. Similarly, families with higher household income are less likely to select cost tier 2. The estimated parameter for the dummy variable representing whether the family has any

[7] We also estimated an alternative model that included indices for the percent of children under age 7 and whether the wife is of childbearing age. These weights were not statistically significant so the results are not presented.

children is not statistically significant, thus (ceteris paribus) it does not appear that families with children are more likely to select cost tier 3, which contains a children's hospital. The insignificant results for cost tier 1 parameters are likely due to low enrollment in that tier.

We also estimated a random-parameter logit (RPL) model as an alternative to the conditional logit model. RPL introduces heterogeneity into the means of the estimated parameters for premium, distance, and importance of primary care physicians as a function of the children and chronic condition indices. We hypothesized that families' responsiveness to premiums, distance, and importance measures would vary, based on family composition and the health status of individual members. However, the estimated parameters from the RPL model were not statistically significant and after several different specifications we found that the empirical model was not robust. Thus we did not use this estimation technique to acquire estimates of our parameters.

To compare our results with models that are traditionally estimated in the health plan choice literature, we estimated a cost tier choice model that treats the family as a single unit, excluding individual family members' preferences. The 'whole family' model includes after-tax monthly premiums, premiums interacted with a dummy variable indicating families with children, average minimum distance, distance interacted with presence of children, and control variables for family income, age, children, and the percentages of family members with a chronic condition and primary care physicians. The 'whole family' model does not include the importance of low premiums, the importance of convenience, or the importance of a primary care provider, as these types of preference variables are typically unavailable to researchers conducting health plan choice studies. The results are reported in Tables 4 and 5. We find no

[8] The fundamental parameters, ε_{1j} and ε_{2j}, are identified entirely from the intra-family covariance between the constructed importance weights and the indicators for children and chronic conditions.

premium effect (the premium elasticity is positive but not statistically significant), implying that excluding the preferences of families and individual family members may result in underestimating the premium elasticities. Finding no premium effect in this model may be due to the large number of families enrolled in the most expensive benefit option and little out-of-pocket premium variation across health benefit options within many of the firms. Our intra-family model allows for heterogeneity in premium responses by using the families' preferences for low premiums. This gives us more variation (information) and increases our ability to estimate the premium elasticities.

The estimated parameters from the 'whole family' model for the control variables, age of policyholder and income, are similar in significance and sign to our intra-family choice model. The estimated parameter for the percentage of family members with a primary care physician suggests that families are less likely to select cost tier 2 (compared with cost tier 3) as more family members identify with a certain provider. This is consistent with our earlier finding that families with higher average importance weights for seeing their primary care physician are less likely to select cost tier 2.

7. CONCLUSION

We know of no other study that estimates a family model of health plan choice. Hence, we developed a model that started with the assumption that each family member derives utility from his or her choice. This assumption was followed by estimation of a weighting system that attaches a weight to each family member's utility. For example, family members with a chronic health problem may get more weight than those without a health condition. The difficulty with estimating such a model is that one has to observe either the individual family member's

preferences or the weights that are used to aggregate them. This problem is inherent in every choice model involving public goods. One contribution of this study is the innovative method we developed to try to solve the problem. We did not observe the weights but we had measures of individual family member's preferences and family-level preferences. Using these measures, along with health benefit plan and family attributes, we estimated a conditional logit model for the choice of a health benefit option.

We found that families are sensitive to changes in the tax-adjusted, out-of-pocket premium. Families with children are more likely to select the expensive health benefit option while families without children are more likely to select lower cost benefit options. In addition, families who identify specific primary care physicians and have high importance ratings for seeing these primary care physicians are more likely to select benefit option 3 compared to families with low importance ratings. This supports our hypothesis that benefit option 3 should be more valuable for people who have a primary care physician because by paying the highest premium they get a license to search across all health benefit options for specific physicians. We do not find support for our hypothesis that families give more weight to preference ratings of children or members with a chronic illness.

Comparing our intra-family utility model estimates with results from a more traditional specification of household plan choice, we find that excluding the preferences of families and individual family members may result in underestimates of premium elasticities. This sheds light on the importance of including information on individual family members in health plan choice studies. It also emphasizes the need to understand household decision-making regarding health insurance issues in order to create sound health policy regarding cost-sharing and premium subsidies.

In our opinion, health insurance surveys have not paid enough attention to the data needed to estimate models of family decision-making nor to how the questions should be asked. Although BHCAG may be unique in its design, the problem of intra-family decision-making is not. A common example occurs in gatekeeper health plans, where each family member chooses a primary care physician or a physician group to manage their medical care. We believe future research should focus on family decision-making in order to understand how families make decisions about health care coverage and health care providers.

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Table 1: Sample Summary Statistics

	Mean	Std.Dev.
Out-of-pocket, tax-adjusted premium	58.85	31.80
Tier 1	44.32	25.74
Tier 2	58.52	28.93
Tier 3	73.83	33.15
Importance of low premiums (1-10)	7.58	2.31
Average minimum distance (km)	11.08	32.64
Importance of convenience (1-10)	8.84	1.44
Family size	3.21	1.18
Children (0,1)	0.70	0.46
Income	55778.10	54178.10
Missing income (0,1)	0.22	0.42
Age of policyholder (years)	42.49	10.01
Chronic condition (0,1)	0.35	0.48
Importance of pcp (0-4)	2.53	1.42
Adults	2.43	1.72
Children	2.70	1.60
	Frequency	
Number of families	914	
Enrollment		
Tier 1	65 (7.11%)	
Tier 2	414 (45.3%)	
Tier 3	435 (47.6%)	

Table 2: Conditional Logit Coefficients: Model 1

	Coeff.	Std.Err.	t-ratio	P-value
Premium * Premium Importance	-0.0028**	0.0013	-2.2428	0.0249
Premium * Children	0.0226*	0.0136	1.6645	0.0960
Distance * Convenience Importance	-0.0035**	0.0014	-2.4535	0.0141
Distance*Children	-0.0018	0.0018	-0.9810	0.3266
Tier 1 Constant	-2.5401**	0.9573	-2.6536	0.0080
Tier 1 * Children	0.5654	0.5300	1.0668	0.2861
Tier 1 * Age	0.0022	0.0164	0.1319	0.8950
Tier 1 * Income	-0.0003	0.0029	-0.0993	0.9209
Tier 1 * Missing Income	0.2365	0.3826	0.6181	0.5365
Tier 1 * Average Importance of PCP	0.1028	0.1063	0.9676	0.3332
Tier 1 * Importance of PCP*Child Index[a]	0.4168*	0.2196	1.8977	0.0577
Tier 1 * Importance of PCP*Chronic Cond. Index[b]	-0.0822	0.7051	-0.1166	0.9072
Tier 2 Constant	1.6066***	0.4729	3.3973	0.0007
Tier 2 * Children	-0.1843	0.2702	-0.6822	0.4951
Tier 2 * Age	-0.0169**	0.0086	-1.9707	0.0488
Tier 2 * Income	-0.0066***	0.0021	-3.1475	0.0016
Tier 2 * Missing Income	-0.9166***	0.2424	-3.7815	0.0002
Tier 2 * Average Importance of PCP	-0.1843***	0.0524	-3.5182	0.0004
Tier 2 * Importance of PCP* Child Index	0.1378	0.1832	0.7519	0.4521
Tier 2 * Importance of PCP*Chronic Cond. Index	0.5446	0.3729	1.4603	0.1442
Log-Likelihood	-703.23			
Chi-Squared	114.15			

***significant at .01 **significant at .05 *significant at .10

[a]The Child Index is $(K_i - \overline{K})/N$, where K_i=1 if family member is a child and $\overline{K}$ is the proportion of family members who are children.

[b]The Chronic Condition Index is $(C_i - \overline{C})/N$, where C_i = 1 if the family member has a chronic health condition and $\overline{C}$ is the proportion of family members with a chronic illness.

Table 3: Conditional Logit Elasticities Model 1

	Cost Tier				
	1	**2**	**3**	**Average**	**Weighted Average**
Premium * Premium Importance	-0.888	-0.677	-0.862	-0.809	-0.780
Premium * Children	0.713	0.577	0.654	0.648	0.623
Distance * Convenience Importance	-0.549	-0.056	-0.224	-0.276	-0.171
Distance*Children	-0.197	-0.021	-0.079	-0.099	-0.061
Children	0.372	-0.074		0.149	-0.013
Age	0.085	-0.400		-0.158	-0.334
Income	-0.015	-0.216		-0.116	-0.189
Missing Income	0.043	-0.120		-0.039	-0.098
Average Importance of PCP	0.237	-0.276		-0.020	-0.206
Importance of PCP*Child Index	0.025	0.005		0.015	0.008
Importance of PCP*Chronic Cond. Index	-0.002	0.005		0.002	0.004

Table 4: Conditional Logit Coefficients for 'Whole Family' Specification: Model 2

	Coeff.	Std.Err.	t-ratio	P-value
Premium	0.0047	0.0165	0.2847	0.7759
Premium * Children	-0.0005	0.0188	-0.0286	0.9772
Distance	-0.0431***	0.0145	-2.9811	0.0029
Distance*Children	-0.0047	0.0172	-0.2746	0.7836
Tier 1 Constant	-1.2100	0.9713	-1.2457	0.2129
Tier 1 * Children	-0.0364	0.5964	-0.0610	0.9514
Tier 1 * Age	-0.0039	0.0157	-0.2493	0.8032
Tier 1 * Income	-0.0019	0.0032	-0.5813	0.5611
Tier 1 * Missing Income	0.1713	0.3880	0.4415	0.6589
Tier 1 * Chronic Conditions	-0.9242	0.6803	-1.3585	0.1743
Tier 1 * Primary Care Physicians	0.2560	0.3972	0.6443	0.5194
Tier 2 Constant	2.0591***	0.4963	4.1486	0.0000
Tier 2 * Children	-0.5141	0.3141	-1.6369	0.1017
Tier 2 * Age	-0.0165**	0.0083	-1.9794	0.0478
Tier 2 * Income	-0.0072***	0.0021	-3.4037	0.0007
Tier 2 * Missing Income	-0.8571***	0.2395	-3.5780	0.0003
Tier 2 * Chronic Conditions	-0.2132	0.3386	-0.6297	0.5289
Tier 2 * Primary Care Physicians	-0.6869***	0.1972	-3.4831	0.0005
Log-Likelihood	-729.27			
Chi-Squared	112.54			

***significant at .01 **significant at .05 *significant at .10

Table 5: Conditional Logit Elasticities Model 2

	Cost Tier				
	1	**2**	**3**	**Average**	**Weighted Average**
Premium	0.193	0.151	0.181	0.175	0.168
Premium * Children	-0.017	-0.014	-0.015	-0.015	-0.015
Distance	-0.752	-0.079	-0.297	-0.376	-0.231
Distance*Children	-0.058	-0.006	-0.022	-0.029	-0.017
Children	-0.024	-0.206		-0.115	-0.181
Age	-0.154	-0.390		-0.272	-0.358
Income	-0.098	-0.238		-0.168	-0.219
Missing Income	0.032	-0.112		-0.040	-0.092
Chronic Conditions	-0.123	-0.017		-0.070	-0.031
Primary Care Physicians	0.169	-0.292		-0.062	-0.229