Morbidity Valuation, Benefit Transfer and Family Behavior*

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Chapter 1: Executive Summary

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Objective(s) of the Research Project:

The project estimates parents' willingness to pay to reduce their own and their children's risks of heart disease and tests whether a standard economic framework for modeling family behavior can be used to accurately value morbidity risk reductions and to improve methods for transferring health benefit estimates from adults to children. The model envisions altruistic, utility-maximizing parents and household production of morbidity risks. It extends prior work by allowing, in two-parent households, for each parent to have a distinct valuation for reducing the child's risk, and accounts for the preferences and risk beliefs of both parents in determining family willingness to pay to reduce risk. Key predictions of the model that are tested in the project are that: (1) the value of morbidity risk reduction to adults and children is equal to the marginal cost of risk reduction. (2) The value of morbidity risk reduction to children in two-parent families is determined as the sum of each parent's willingness to pay to reduce the child's risk. These predictions in turn imply that (3) a family's marginal rate of substitution between morbidity risk to a parent and to a child is equal to the corresponding ratio of marginal risk reduction costs. Empirical support for these predictions provides a basis for transferring estimates of benefits of reduced morbidity for adults to estimate benefits for children. Thus, a compelling case can be made to investigate the validity of these predictions because: (1) it is not feasible to conduct separate morbidity valuation studies for each of the large number of illness risks that have been associated with exposure to environmental hazards and (2) studies of adult willingness to pay for reduced morbidity, while scarce, still outnumber those for children. Additionally, testing the model furthers understanding of family behavior as well as the effects of environmental policy aimed at protecting human health. The project also investigates whether the distribution of income between parents in two-parent families influences resource allocations to children, a question with important implications for the effective design of policies to protect children's health. Finally, the research examines determinants of parents' beliefs about risks of heart disease faced by family members, compares subjective perceptions of risk to technical risk estimates, and investigates how risk beliefs respond to information.

Summary of Findings:

Research objectives were addressed by conducting a survey administered to a national sample of parents. Human research approvals are documented in Appendix A. The sample was drawn from the online research panel of Knowledge Networks, Inc. (KN). Members of the Knowledge Networks panel were recruited randomly by probability sampling and the panel is representative of the U.S. population. Further information about the KN panel and administration of the survey can be found in the report from KN, included as Appendix B of the final technical report.

Panel members were eligible to participate in the study if they were parents between the ages of 18 and 55 years old who had at least one biological child aged 6 to 16 years living in the home, as long as they had not previously had a heart attack or been diagnosed with coronary artery disease. Parents with a prior history of heart disease were excluded to focus on *ex ante* perception and valuation of risk. Children under age 6 years were excluded because parents in focus groups conducted during survey development expressed difficulty assessing and valuing heart disease risk for very young children.

Key elements of survey design were tested in a large pilot study administered to 815 parents in Orlando, Florida during December 2008 – February 2009. Following the pilot study, described in Chapter 3 of the final report, the final survey instrument was developed with the assistance of the cardiologist Dr. David Carpenter, and economists Dr. Wic Adamowicz, Dr. Marcella Veronesi, and Mr. David Zinner. The survey design was improved based on results from two professionally moderated focus groups of approximately one dozen parents each, conducted in Orlando in August and October, 2010. A pre-test with 25 KN panelists was conducted in November 2010. Finally, the survey was administered in two stages. In the first stage, the survey was administered to 505 parents drawn from the KN panel during December 2010. Data from this "soft launch" were used to make final adjustments in the levels of key experimental design parameters used to elicit willingness to pay to reduce heart disease risks. In the second stage, the survey was administered to 2650 parents drawn from the KN panel during January – March 2011.

In total, 3155 parents completed the survey in the two stages of administration during December 2010 – March 2011, including 501 single parents and 2654 married (or cohabitating) parents. Of the married/partnered parents, 966 observations are elements of matched pairs of spouses living with one another who completed the survey questionnaire on separate occasions (i.e., 483 matched pairs). For the 74% of parents with two or more children living at home, one child was randomly selected and designated as the sample child. Each parent in a matched pair was questioned about the same child, who was a biological child of both parents.

Sampling and survey research methods are described further in Chapter 4, which also summarizes the data collected. The text version of the computerized survey is included as Appendix C of the report, and summary statistics and definitions for all variables are presented in Appendix D.

The survey had two main purposes: (1) To obtain information about parents' perceptions of their own and their children's risks of being diagnosed with coronary artery disease, and (2) To elicit parents' willingness to pay to reduce risks of coronary artery disease for themselves and their children.

Parents made an initial estimate of the risk of a coronary artery disease diagnosis before age 75 years using an interactive scale similar to scales used in prior research. The scale depicted 100 squares in 10 rows and 10 columns. Each square was numbered, beginning with one in the upper left-hand corner through 100 in the lower right-hand corner. All 100 squares initially were colored blue. Parents re-colored squares from blue to red to represent amounts of risk. For example, a parent could use the computer mouse to indicate a risk level of 20 in 100 by selecting the square numbered 20 in the scale, causing all the squares from 1 to 20 to turn red. Beneath the scale, the level of risk was indicated by displaying the percentage of the 100 squares that were colored red. Parents could change additional blue squares to red if they wished to increase their risk estimate and could change red squares back to blue if they wished to reduce their risk estimate. Parents could make as many changes to the scale as desired before selecting the "Continue" button to record the final answer. After reviewing several examples illustrating how the scale represented amounts of risk and practicing with the use and interpretation of the scale, parents used it to estimate chances of getting heart disease before age 75, first for themselves and then for the sample child.

After making initial estimates of heart disease risk for themselves and their children, parents were provided with information about risk. First, parents were advised that the average person has about 27 chances in 100 of being diagnosed with coronary artery disease before age 75. Parents then were told that they and their children would probably not have the same risk as the average person, because chances of getting heart disease depend on six risk factors that are different for everyone: gender, smoking, current health status, family history, exercise, and diet. The survey elicited information from parents about each of these risk factors while also providing information about how the factors influence risk.

After reviewing information on heart disease risk factors, parents were given the opportunity to revise their initial risk estimates. Parents revised their own risk assessments about as frequently (approximately 45% of parents made revisions) as they revised their assessments of their children's risk. Downward revisions predominated.

To communicate with respondents about the timing of heart disease risks over the life cycle, the survey employed a graphical illustration of risk for all ages between the present and age 75. The illustration used a Gompertz hazard function to approximate the empirical (Kaplan-Meier) hazards estimated in the medical literature. The horizontal axis indicated years of age from the present to age 75. The vertical axis indicated risk of heart disease. The hazard function then showed the cumulative risk of contracting heart disease at any age from the present until age 75. The hazard function was constructed based on the revised assessment of risk, so that at age 75 the cumulative hazard shown on the graph was equal to the respondent's revised assessment of risk. When the respondent used the computer mouse to indicate a point on the hazard function above some given age, a text box would appear on the screen stating the risk of heart disease between the present and the selected age. A cumulative hazard graph was displayed for the parent and then for the child.

Parents valued reductions in heart disease risk by expressing purchase intentions for each of two hypothetical vaccines. One of the vaccines reduced risk for the parent and the other reduced risk for the child. The two vaccines were presented one at a time in random order. Parents were told that the vaccines would slow the build-up of fatty deposits in the arteries, would be taken by injection annually, and would provide additional protection from heart disease over and above the benefits that could be obtained from eating right and getting enough exercise. As the vaccines were described, their effectiveness was varied randomly across parents and children. Each parent was asked to read the description of each vaccine and then was shown the previously marked risk scales for herself or for her child, which now indicated the risk reduction that the vaccine would offer and the amount of risk remaining if the vaccine was purchased. Parents were also shown how the vaccine would shift the hazard function down, resulting in lower risks over time.

For the vaccine that would reduce the child's risk, parents were asked whether they would be willing to pay a randomly assigned price to put the child in the vaccination program for the first year. Parents answering affirmatively were asked a follow-up question about the certainty of their intention to purchase. A parallel procedure was used to elicit purchase intentions for the vaccine to reduce the parent's risk.

The last part of the survey asked married/partnered parents only to reconsider the decision regarding the child's vaccine contingent on a hypothetical redistribution of family income. A parent who indicated probable or definite intention to buy the vaccine for the child was assigned an increase in exogenous expenditure, and the spouse or partner was assigned an increase in income. For cases in which the respondent would not purchase the vaccine for the child or was uncertain about purchase intentions, the respondent was assigned an increase in income, and the spouse or partner was assigned an increase in exogenous expenditure. Parents were asked whether they would be willing to pay for the vaccine for the child, contingent on the altered distribution of family income. Few parents changed their decision about purchasing the vaccine for the child after the hypothetical redistribution of income.

Model: The data described above were analyzed using extensions of economic models of parental resource allocation that incorporate household production of health risks. The two models used differ according to whether the family considered is a two-parent family or a single-parent family. For two-parent families, the model represents an extension of a collective model of parental resource allocation that allows for two altruistic parents to differ in their perception of risk, their preferences for risk reduction, and their relative influence in making household decisions. The collective model also provides a basis for testing whether the distribution of income between parents affects resource allocation. For single-parent families, the model used is an extension of a unitary model of parental altruism. The major difference between this model and the collective model applied to two-parent families is the assumption of a single parental decision-maker, rather than two parents who share decision power.

Both models provide a foundation for theoretically consistent valuation of morbidity risks to parents and children. Each model predicts that family willingness to pay to reduce a risk equals the marginal cost of risk reduction. This prediction has two key implications that are tested in the empirical analysis. (1) The value of morbidity risk reduction to parents is equal to the marginal cost of reducing parent risk. (2) The value of morbidity risk reduction to children is equal to the marginal cost of reducing children's risk. These predictions in turn imply that (3) a family's marginal rate of substitution between morbidity risk to a parent and to a child is equal to the corresponding ratio of marginal risk reduction costs. The collective model applied to two-parent families further implies that family willingness to pay to reduce children's risk equals the sum of each parent's willingness to pay to reduce the child's risk.

Analysis: Empirical analysis focuses on testing the model predictions just described. Tests rest on an examination of stated preference values for the hypothetical vaccines. Use of stated preference data is controversial partly because respondents are often thought to overstate their purchase intentions when they do not actually have to pay. Two methods are employed to mitigate this problem of hypothetical bias. First, hypothetical willingness to pay responses are divided based on the follow-up question about the degree of certainty in respondents' purchase intentions. Prior research has shown that hypothetical bias can be eliminated by treating respondents who state that they would buy a good but are uncertain about their purchase intentions as non-purchasers. Second, econometric methods applied confine any systematic tendency to misstate willingness to pay in a regression constant term that plays no role in testing predictions of the models. In consequence, estimates presented avoid perhaps the most damaging criticism of the stated preference valuation method and research methods used support consistent estimation of willingness to pay to reduce risk. Additional empirical analysis documents important features of parents' subjective risk beliefs.

Results: Parents, whether single or married, were more likely to state that they would purchase vaccines that offered greater reductions in heart disease risk or that had lower prices. Thus, estimated willingness-to-pay increases significantly with the size of risk reduction, and estimates pass the basic "scope" test applied to stated preference data.

Empirical results are consistent with a Pareto efficient allocation of resources within the two-parent families. In other words, results are consistent with the hypotheses that (1) the value of morbidity risk reduction to parents is equal to the marginal cost of reducing parent risk; (2) the value of morbidity risk reduction to children is determined as the sum of each parent's willingness to pay to reduce the child's risk and equals the marginal cost of reducing the child's risk; and (3) parents' marginal rate of substitution between morbidity risk to a parent and to a child is equal to the corresponding ratio of marginal risk reduction costs. Initial findings bearing on the link between the distribution of resources within a two-parent family and the resulting allocation of resources are mixed, but it appears that a reallocation of resources from fathers to mothers may increase protection of children from health risk. These results, as well as estimates of willingness to pay to reduce heart disease risks among married (or cohabitating) parents, are discussed further in Chapter 6.

For single parents, empirical results are consistent with predictions of the unitary model of parental altruism. Thus, results support the hypothesis that the value of morbidity risk reduction for parents and for children is equal to the marginal cost of reducing risk. Test results and willingness-to-pay estimates for single parents are discussed further in Chapter 7.

Estimates of married mothers' willingness to pay to eliminate their own heart disease risk range from $215 to $240 annually, depending on subsample and model specification. Estimated annual willingness to pay of married fathers to eliminate risk ranges from $110 to $320. Married parents' willingness to pay to eliminate risk to one of their children is estimated as $140-$265 annually. Estimates of annual willingness to pay on the part of single parents, who are predominantly mothers, are somewhat lower. Specifically, estimates of single parents' willingness to pay to eliminate their own heart disease risk range from about $130 to $200 annually. Single parents' estimated annual willingness to pay to eliminate children's risk ranges from $100 to $130. (Standard errors for all of these values are presented in Chapters 6 and 7 of the final technical report.)

For both single and married parents, estimates of willingness to pay to reduce heart disease risks are somewhat lower than might be expected based on the degree of mortality risk associated with heart disease and estimates of the value of avoided mortality derived from the labor market. A possible explanation for this outcome is that the risk changes considered are much larger than those typically contemplated in studies from the labor market and that the marginal value of risk reduction declines as successive units of risk are removed.

The analysis of parents' subjective risk assessments reveals four features of interest. First, the average mother appears to have overestimated her risk, whereas the average father's assessment of his risk is relatively close to scientific estimates. Both mothers and fathers over-estimate risks faced by daughters and under-estimate risks faced by sons. Second, married mothers and fathers broadly agree on the risks faced by their children and parents in general believe that they face greater risk of contracting heart disease than do their children. Third, parents understand the qualitative relationship between important risk factors – including smoking, blood pressure, cholesterol, diabetes, overweight and obesity, family history of heart disease, exercise and diet – and risk of contracting coronary artery disease. Parents appear to under-estimate the quantitative increase in risk associated with diabetes, and under-estimate the extent to which risks for males exceed risks for females. Fourth, despite their relatively high degree of awareness of factors contributing to heart disease risks, parents' risk beliefs respond to information about risk. These results are discussed further in Chapters 5 and 6.

Further research using data collected in this project is ongoing. Current efforts focus on analysis of risk beliefs and on willingness to pay to reduce heart disease risks. Manuscripts will be prepared and submitted for publication in peer-reviewed journals.

Results suggest six policy implications. First, public programs to reduce morbidity risks faced by children may prove less effective than expected as parents respond to policy changes by reallocating family resources away from reducing children's risk.

Second, in two-parent families, willingness to pay to reduce children's morbidity risk reflects the preferences of both parents as well as their relative decision power. Third, public programs may be more effective in reducing children's risk if the programs induce a shift of family resources and decision power from fathers to mothers. Fourth, as long as persons outside the family do not display paternalistic altruism toward children and children's preferences are not counted, efficiency of parents' efforts to protect reduce children's morbidity risk is consistent with social efficiency. Fifth, existing estimates of reduced morbidity for adults can be more accurately transferred to children if policy makers consider the relative marginal costs of risk reduction for each. Sixth, although the prevalence of smoking, unhealthy diets, inactivity, obesity, elevated blood pressure and elevated cholesterol is not attributable to ignorance of the relationship between these risk factors and chances of developing heart disease, it may be possible to improve understanding of heart disease risks through carefully structured information programs.

Chapter 2: Parents' Perceptions and Valuations of Morbidity Risk to Family Members

1. Introduction

This chapter describes how the current project, RD-83326301-0 (*Improving methods for morbidity valuation and benefit transfer*), fits in the context of a sequence of three STAR grants received by the investigators. The three projects are linked by a common emphasis on valuation of reduced morbidity risk for adults and children and by similar theoretical frameworks and research designs. The chapter begins by reviewing briefly key results from the first two projects, R-82871701-0 (*Environmental risks to children's health: Parents' risk beliefs, protective behavior, and willingness-to-pay*) and RD-83159201-0 (*A consistent framework for valuing latent morbidity and mortality risks to adults and children*). It then discusses how development of the current research builds on results obtained in the previous two projects.

2. Environmental risks to children's health: Parents' risk beliefs, protective behavior, and willingness-to-pay

Research conducted under R-82871701-0 focused mainly on three questions (1) Is willingness to pay of parents to reduce their own and their children's risk of contracting skin cancer consistent with a standard model of resource allocation in the family? (2) What determines parents' subjective beliefs about their own and their children's risk of contracting skin cancer? (3) What protective actions do parents take to reduce risks of skin cancer to themselves and to their children?

These questions were addressed by collecting field data from two surveys. The first survey was conducted in Hattiesburg, Mississippi and the second was conducted by Knowledge Networks, Inc. (KN) using their nationally representative panel. The Hattiesburg sample consisted of 610 parents, each of whom had at least one biological child aged 3-12 years living at home. Biological parents were singled out for inclusion in the study because a child's skin cancer risk is partly determined by genetic characteristics inherited from parents (e.g., fairness of skin and sensitivity of skin to sunlight). Participants in the study were residents of the Hattiesburg, MS metropolitan statistical area and were initially identified by random digit dialing. Parents were offered a $25 payment for participating in the study. The survey was administered by computer.

KN collected parallel data from parents with at least one biological child between the ages of 3-12 years living at home using an instrument in which most of the questions were identical to those used in the Hattiesburg survey. KN's core resource is a representative panel of U.S. households that can be queried over the internet. Panel members are given inducements such as free Internet access in return for agreeing to complete short surveys on a regular basis. Surveys are administered by computer. The survey was completed by 644 eligible panelists.

At an early stage in both the Hattiesburg and KN surveys, one biological child aged 3-12 of each parent was randomly selected (if there was more than one child in this age range) and designated as the sample child. Parents made preliminary assessments of lifetime skin cancer risk using an interactive scale. The scale depicted

400 squares in 20 rows and 20 columns and all 400 squares were initially colored green. Parents changed green squares to red ones to represent amounts of risk. Parents used the risk scale to estimate lifetime chances of getting skin cancer, first for themselves and then for their sample child. After receiving information about average risks of skin cancer and about personal characteristics affecting risk, parents had the opportunity to revise their initial risks estimates using the same interactive scales. In both surveys, parents valued reduced risk of getting skin cancer by expressing willingness to pay for a hypothetical sun lotion. The product was described using labels designed to look like those on bottles of over-the-counter sun lotions. In the Hattiesburg survey, parents also were asked for their perception of the risk of dying from skin cancer, given the disease had been diagnosed, and expressed purchase intentions for a hypothetical sun lotion that would reduce conditional mortality risks.

Data from the two surveys were analyzed using an extension of a unitary model of parental altruism that incorporates household production of latent health risks. The model envisions a "family" composed of one altruistic parent and a selfish child. Because the model includes only one parent, possible divergent interests between parents in a family are not considered. (This is the "unitary" perspective.) Because only one child is included in the model, the analysis focuses on how parents allocate resources between themselves and their children, rather than on how parents make tradeoffs among different children. The model demonstrates that the parent's marginal rate of substitution between her child's and her own latent health risk equals the ratio of marginal costs of a risk-reducing market good (e.g., sun lotion) that both parent and child consume. The ratio of marginal costs is not expected to equal unity because the technologies used to produce perceived risk reduction may differ between the parent and the child and, even if the technologies are the same, levels of perceived risk faced by the two people may differ.

Empirical analysis focused mainly on testing implications of the unitary altruism model based both on stated preference values for the hypothetical sun lotion and on actual use of sun protection products. Three key results were obtained.

First, stated preference values from the Hattiesburg survey support altruism. Although stated preference valuation is a controversial method of obtaining willingness to pay to reduce environmental risks, it supports consistent estimation of parents' marginal rates of substitution between health risks to themselves and corresponding health risks to their children. Consistent estimation of marginal rates of substitution was made possible by: (1) allowing for both systematic and random errors in parents' stated willingness to pay for the sun lotion and (2) randomly assigning skin cancer risk reductions offered by sun lotion to the sample of parents. Together, these innovations imply that the skin cancer risk reductions assigned were orthogonal both to parent characteristics and to errors parents may make in stating their willingness to pay for the sun lotion. To test altruism, estimated marginal rates of substitution were compared to corresponding ratios of marginal skin cancer risk reduction costs. The survey had been designed to facilitate this comparison. Test results supported the economic interpretation of altruism developed from the interaction of preferences and constraints. The main implications of this outcome are that: (1) public programs to reduce environmental risks faced by children will turn out to be less effective than expected because parents will respond by making less effort themselves, (2) parents' marginal rates of substitution between health risks to themselves and their children is not a "one-size-fits-all" constant because relative marginal costs of risk reduction will vary with the type of risk, the age of the child, and other factors, (3) existing benefit estimates for adults can be more accurately transferred to children if policy makers consider the relative marginal costs of risk reduction for each (Dickie and Gerking 2006, 2007, 2009a).

Second, stated preference values obtained in the survey that KN conducted in 2005 to support the skin cancer research were not consistent with those from the Hattiesburg survey. In contrast to results obtained in Hattiesburg, the hypothesis that parents are willing to pay more for a large risk reduction than for a small risk reduction could not be rejected at conventional significance levels using data from the 2005 KN survey. Several systematic explanations for the difference in outcomes from the two surveys were tested and rejected, pointing to the conclusion that the KN survey simply did not "take" in that parents did not distinguish between large and small skin cancer risk reductions in making purchase decisions for the hypothetical sun lotion. Unfortunately, this outcome is consistent with findings from an earlier study of worker preferences for job risk reductions conducted for the investigators by KN (Dickie and Gerking 2006). These findings suggest that effective use of the KN panel for children's health valuation surveys requires (1) that the survey design devote significant attention to maintaining respondent engagement and (2) the use of a larger sample size that that employed here.

Third, further empirical estimates from both surveys indicated that parents' perceptions of skin cancer risks are predictably related to key risk factors and to protective actions taken for themselves and for their children. Moreover, the estimated marginal rate of substitution between parent and child risk, based on parents' actual use of sunscreen lotion for themselves and their children, was found to be consistent with altruism. These results suggest that parents make decisions in a manner consistent with simple models of parental altruism and thus offer support for using these models to transfer benefit estimates from adults to children (Dickie and Gerking 2006, 2009a).

3. A consistent framework for valuing latent morbidity and mortality risks to adults and children

The main objective of research conducted under RD-83159201-0 was to develop and implement a theoretically consistent framework for estimating willingness to pay to reduce morbidity and mortality risks to parents and children that may be the outcome of exposure to environmental hazards. Research emphasized valuation of morbidity risk reduction for children because additional information in this area would lead to more accurate estimation of health benefits for policy purposes. Mortality risk was treated because the framework developed viewed death as a possible consequence of illness.

Research was designed drawing on lessons learned in the prior skin cancer grant discussed above. Consistent treatment of morbidity and mortality risk rested on splitting unconditional death risk into the product of two components: (1) the unconditional risk of becoming ill and (2) the conditional risk of death given illness.

Building on empirical support for altruism in the skin cancer grant, morbidity and conditional mortality risks are incorporated into an extension of a traditional unitary model in which parents may take precautions to reduce risks both for themselves and for their children. This aspect allows altruism to be tested in a second context. The model also supports additional tests because it allows, but does not require, morbidity and conditional mortality risk to be perfect substitutes. As the term is used here, “perfect substitutes” means that an individual is indifferent to alternative combinations of morbidity and conditional mortality risks that leave unconditional mortality risk unchanged. A key result from the model is that parents are willing to pay an identical amount for equal percentage reductions in mortality risk to themselves and to their children if: (1) parents view morbidity risk and conditional mortality risk as perfect substitutes and (2) parents use the same good (e.g., a vaccine) to reduce their own and their children’s morbidity risk and the same good (e.g., a different vaccine) to reduce their own and their children’s conditional mortality risk.

The model was tested empirically using stated preference data obtained a field study of leukemia risks to parents and their children (Dickie and Gerking 2009b). As in R-82871701-0, econometric methods isolated any systematic tendency to misstate willingness to pay in a regression constant term that played no role in the analysis. Data were collected in a field study conducted in Orlando, FL between December 2008 and February 2009. Parent respondents were drawn from a list of more than 20,000 residents of the Orlando area maintained by the market research firm Insight Orlando, Inc. Parents were contacted by dialing telephone numbers randomly selected from this list and were asked whether they had children living at home between the ages of 1 and 16 years. If so, they were asked if they would be willing to come to the Insight Orlando office, conveniently located close to the intersection of three major expressways near the Orlando International Airport, to participate in a federally-funded, computer-assisted survey dealing with health risks to parents and their children. Prospective participants were told that they would receive $40 for completing the survey instrument. Prior to administering the instrument, a preliminary version was tested using one-on-one interviews with 24 parents who took the survey in May 2008. The instrument was revised in light of focus group input and pretested with 68 subjects in early December 2008.

The sample analyzed consisted of 815 parents. Similar to the skin cancer field study, questions focused on the parent and one child aged 1-16 years. For the 68% of parents with two or more children living at home, one child was randomly selected and designated as the sample child. Parents estimated lifetime risk of contracting leukemia using an interactive scale that depicted 1000 squares arranged in 25 rows and 40 columns. Each square was numbered such that square number 1 appeared in the lower left-hand corner, square number 1000 appeared in the upper right-hand corner, and squares numbered with multiples of 25 ran along the top row. All 1000 squares initially were colored blue. Parents changed squares from blue to red to represent amounts of risk. Beneath the scale, the level of risk was indicated by displaying the number and the percentage of the 1000 squares that were colored red. Two important features of the risk scale were that parents could indicate any level of risk by selecting a single square in the scale, and could change their answer as many times as desired before recording their final answer.

Parents were given an opportunity to revise their estimates about the chances of getting leukemia after considering information about this disease. Also, parents provided their perceptions of five-year conditional mortality risk from leukemia given that a doctor had diagnosed this disease. Parents were unaware that they would be asked about the chance of dying from leukemia when they answered the previously described questions about getting this disease. Perceptions of conditional mortality risk of leukemia given a diagnosis of this disease were elicited using the previously described risk scale. Finally, parents valued leukemia risk reductions by expressing purchase intentions for hypothetical vaccines that would reduce either the risk of getting leukemia or the conditional risk of dying from the disease after diagnosis. The vaccines were described as similar to newly developed vaccines against cervical cancer.

Estimates obtained provide additional support for parental altruism and broadly suggest that parents view morbidity risk and conditional mortality risk as perfect substitutes both for themselves and for their children (Dickie, Gerking and Veronesi 2011). This finding has several implications. First, it suggests that people see unconditional mortality risk as the object of utility and maximize utility by equating the marginal costs of equal percentage reductions in risk of illness and conditional risk of death given illness. Because marginal costs of reducing the two risk components are equated, willingness to pay is identical for equal percentage reductions in risk of illness and risk of death given illness, so willingness to pay for a reduction in unconditional mortality risk is the same no matter which of the two risk components is responsible for the change. Practical implications of this result are that: (1) the value of a statistical life is invariant to whether a change in morbidity risk or conditional mortality risk is contemplated and (2) people place a separate value on reducing the risk of illness (morbidity), apart from its role in reducing the risk of death.

Second, the parent's willingness to pay for equal percentage reductions in unconditional mortality risk to herself and to her child may be identical, depending on the intra-family consumption of risk-reducing goods, even if the parent does not view mortality risk to herself and mortality risk to her child as perfect substitutes. This outcome may have practical value to policy-makers in that it may be possible to identify situations where a previously estimated value of reduced mortality risk for adults can be transferred to children. Third, methods developed can be extended to investigate whether two sources of mortality risk (e.g., an auto accident and cancer) are perfect substitutes. Finally, estimates obtained suggest that parents' willingness to pay for reduced risk of mortality from leukemia is smaller than corresponding values found in many labor market studies. A possible explanation for this outcome is that the risk changes underlying the estimates presented are much larger than those generally contemplated in other studies, particularly those from the labor market. This outcome is consistent with the notion that the marginal value of risk reduction declines as successive units of risk are removed.

4. *Morbidity valuation, benefit transfer and family behavior*

Research for RD-83326301-0 extends the prior two projects by testing whether parents' resource allocations are consistent with unitary, collective, or non-cooperative models of family behavior, while developing estimates of parents' willingness to pay to reduce risks of heart disease faced by family members. Previous studies of parents' valuation of children's health have relied almost exclusively on the unitary model of household decision-making, in which parents allocate resources as if maximizing a single utility function. But the unitary model has two major shortcomings. (1) Much evidence exists that rejects implications of the model (Browning and Chiappori 1998). (2) The model does not account for possible differences between preferences of a child's parents, a potentially important factor in design and analysis of policies affecting children (Blundell, Chiappori and Meghir 2005).

These shortcomings highlight the importance of testing an alternative model for examining effects of environmental policy on members of family households (Evans et al. 2010). Alternatives to unitary models can be distinguished depending on whether or not they assume cooperation between family members. The model of collective rationality (Chiappori 1988; Apps and Rees 1988) assumes that household members with different preferences cooperate to allocate resources efficiently. In contrast to the unitary model, the collective model predicts that redistribution of resources within the family affects decision power and thus resource allocation. Non-cooperative models do not predict efficiency and produce varying predictions about effects of redistribution on allocation (Browning, Chiappori and Lechene 2009).

Research under RD-83326301-0 focuses on testing predictions of these models of parental resource allocation in the context of parents' willingness to pay to reduce their own and their children's risks of heart disease. Testing the predictions of alternative models of family resource allocation bears on the design and economic evaluation of public programs to protect children's health. As discussed more fully in Chapter 6 of this report, the competing models have different implications for the measurement and interpretation of economic benefits of reducing children's morbidity risk, for benefit transfer, and for the effectiveness of public programs aiming to protect children's health. Research also examines determinants of parents' beliefs about risks of heart disease faced by family members, compares subjective perceptions of risk to technical risk estimates, and investigates how risk beliefs respond to information.

5. *Conclusions*

The investigators have received three STAR grants focused on valuation of environmental health risks to children. Each project is built around a similar theoretical framework and similar empirical methods. The completed skin cancer grant found empirical support for a simple model of parental altruism toward children. This result implies that: (1) public programs to reduce environmental risks faced by children will turn out to be less effective than expected because parents will respond by making less effort themselves; (2) parents' marginal rates of substitution between health risks to themselves and their children is not a "one-size-fits-all" constant because relative marginal costs of risk reduction will vary with the type of risk, the age of the child, and other factors, and (3) existing benefit estimates for adults can be more accurately transferred to children if policy makers consider the relative marginal costs of risk reduction for each.

The completed leukemia project also supported parental altruism and found that parents view morbidity risk and conditional mortality risk as perfect substitutes both for themselves and for their children. These results imply that: (1) the value of a statistical life is invariant to whether a change in morbidity risk or conditional mortality risk is contemplated, and (2) parents place a separate value on reducing the risk of illness (morbidity), apart from its role in reducing the risk of death. Results also suggest that it may be possible to identify situations where a previously estimated value of reduced mortality risk for adults can be transferred to children.

Finally, the current heart disease research extends the two preceding projects by testing whether parents' resource allocations are consistent with unitary, collective, or non-cooperative models of family behavior, while developing estimates of parents' willingness to pay to reduce risks of heart disease faced by family members. The remainder of this report focuses on the development and results of research conducted for RD-83326301-0. Chapter 3 describes a large pilot study undertaken to test survey and sampling methods, and discusses how conclusions drawn from the pilot study led to three modifications in the research design that had been proposed initially. Each modification has been documented in prior annual reports. Chapter 4 presents an overview of research methods ultimately adopted and the data collected. Key featurs of parents' subjective beliefs about heart disease risk are examined in Chapter 5. Tests of competing models of family resource allocation and estimates of willingness to pay to reduce heart disease risks for parents and children are presented in Chapters 6 and 7.

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Chapter 3: Pilot Study

1. Introduction

This chapter describes a large pilot study undertaken to test survey and sampling methods for the heart disease research. The purposes of the pilot study were as follows. (1) To test methods used to introduce and explain the risk scales used to elicit perceived risks of heart disease. (2) To test the actual-payment and hypothetical-payment heart disease prevention programs originally proposed for elicitation of willingness to pay to reduce heart disease risks. (3) To test the performance of the contractor proposed for use in the final survey, with regard to the ability to recruit an adequately representative sample of parents and the ability to host the administration of the survey. The pilot study consisted of one-on-one cognitive interviews with 24 parents, a pre-test with 68 parents, and a field study with 815 parents.

Conclusions drawn from the pilot study led to three modifications in the research design that had been proposed initially. Each modification has been documented in prior annual reports. Specifically, the original proposal envisioned estimating willingness-to-pay based on both stated-preference and revealed-preference methods (i.e., based on both stated purchase intentions and actual purchases of goods to reduce heart disease risk). These methods were to be applied in a field study administered by the research firm Insight Orlando, Inc., to a sample of 1500 parents in Orlando, Florida. However, efforts to estimate willingness-to-pay using actual purchases were unsuccessful in the pilot study, and Insight Orlando went out of business. Consequently, model predictions are tested and willingness-to-pay estimated using data collected from a stated preference survey administered by Knowledge Networks to a national sample of over 3000 parents.

A central element of the pilot study, as mentioned above, was to test the use of both stated-preference and revealed-preference methods to elicit willingness to pay to reduce heart disease risk. As originally envisioned, the stated-preference and revealed-preference valuation procedures were to be designed in a parallel manner to support comparisons of responses. Each parent would be offered an opportunity to enter a hypothetical heart disease prevention program, and later in the survey, an actual prevention program. The programs would reduce risks of heart disease for adults and children. In the stated-preference section, parents would be asked hypothetically whether they would be willing to pay an assigned price to enter the program. But parents wishing to enter the actual program would be told that the cost would be deducted from their participation payment.

After making the purchase decision, parents who had elected to purchase the treatment would be informed that the program consists of regular consumption of walnuts (Feldman 2002) at a rate of about an ounce of walnuts five times weekly. Parents who chose to enroll in the program would later be told that they could keep their entire participation payment and would be given a small package of walnuts at the conclusion of the experiment. For research purposes it is not necessary to collect the money after participants have made the commitment to spend it.

Consumption of walnuts is associated with reductions in heart disease risk factors in at least five controlled, clinical dietary intervention studies (Sabate et al. 1993, Abbey et al. 1994, Chisolm et al. 1998, Zambon et al. 2000, Almario et al. 2001). Walnut consumption is associated with reduced heart disease incidence in four large prospective cohort studies (Fraser, Lindstead and Beesman 1995, Kushi et al. 1996, Hu et al. 1998, Albert et al. 1998). Also, consumption of walnuts creates fewer problems with joint benefits and costs than other actual behaviors that reduce risk, such as dietary restrictions, weight loss, exercise and smoking cessation, all of which potentially involve significant time and/or disutility costs.

2. One-on-one cognitive interviews

An initial test of the pilot field survey was conducted by recruiting 24 parents from the list of more than 20,000 residents of the Orlando area maintained by Insight Orlando. Each participant took the initial draft of the computerized heart disease survey in the presence of a professional moderator. The investigators observed each of these sessions from behind a two-way mirror and spoke to most of the participating parents afterwards. Participants were encouraged to think aloud while responding to survey questions and to discuss the survey experience with the moderator during and at the conclusion of the survey. Finally, each participant completed a short written questionnaire consisting of about two dozen questions after finishing the survey. Results of the interviews and questionnaire contributed to significant improvements in survey design including (1) presentation of additional examples to clarify the use of the risk scales that were employed to elicit parents' perceptions of heart disease risks; (2) changes in the actual-payment heart disease prevention program; and (3) numerous changes in question wording.

In the tested version of the survey, respondents were told that reductions in heart disease risk could be achieved by regular consumption of an unnamed "food item." Respondents were not told that the "food item" represented walnuts, because the objective was to discover the value of heart disease risk reductions rather than to estimate the demand for walnuts. Respondents were told that most people enjoy eating the food item, few people are allergic to it, and that it could be eaten as a snack or used as an ingredient in salads, main dishes or desserts.

This approach met with great resistance among subjects, nearly all of whom were unwilling to purchase an unnamed food item without knowing exactly what it was. Others indicated that they did not come to the site for the purpose of buying groceries, or that they would prefer to shop around to obtain price information before buying. These results motivated a complete revision of the description of heart disease prevention in the pilot field study, which employed a "dietary supplement" in place of a "food item."

3. The pilot field study

Following revision of the survey instrument in light of results of the one-on-one interviews, a large pilot study was conducted. The pilot was conducted by recruiting 907 parents from the list of more than 20,000 residents of the Orlando area maintained by the market research firm Insight Orlando, Inc., that the investigators had proposed using to implement the final survey. The pilot study was feasible because the heart disease questions were added on to the leukemia risk survey that the investigators conducted for RD-83159201-0. Thus recruiting and administration of the leukemia survey and heart disease pilot occurred simultaneously during December 2008 – February 2009.

Parents who participated in the pilot field study were contacted by dialing phone numbers randomly selected from the list maintained by Insight Orlando and were asked whether they had children living at home between the ages of 1 and 16 years. If so, they were asked if they would be willing to come to the Insight Orlando office, conveniently located near the intersections of three major expressways near the Orlando International Airport, to participate in a federally-funded, computer-assisted survey dealing with health risks to parents and their children. Prospective participants were told that they would receive $40 for completing the survey. Respondents completed the survey in 23 minutes on average.

Responses from the first 68 subjects could not be included because Insight Orlando initially deviated from recruitment protocols. It was impossible to distinguish the respondents who had been legitimately recruited from those who had not, forcing the exclusion of all of the first 68 subjects from the sample. After resolving the misunderstanding regarding recruitment procedures with Insight Orlando, the investigators closely monitored subsequent recruiting efforts to insure compliance with protocols. The pause in recruitment while this issue was resolved allowed the investigators to make further improvements to the survey instrument by treating the discarded 68 observations as a pre-test. These changes focused mainly on programming enhancements that improved the graphical presentation of information and the transition between questions in the computerized survey.

Of the 839 respondents known to have been recruited legitimately, 3 did not answer the question about the number of children in their family, 10 were ineligible because they responded that no children lived with them between the ages of 1 and 16 years, 6 failed to answer correctly a simple question testing understanding of risk concepts needed to complete the survey, despite being given two attempts to do so, and 5 did not complete most of the survey. Excluding these respondents left 815 observations available for analysis.

About two-thirds (68.5%) of the 815 responding parents reported their race/ethnicity as white, not Hispanic, 14% as black, not Hispanic, 15% as Hispanic, and a small percentage as members of other races. Over three-quarters of participating parents were female (77.9%), over half were employed full-time (56%), and about one-fifth were employed part-time (19.9%). About two-fifths of parents (41%) were college graduates or held advanced degrees, while the highest schooling attainment for about one-fifth (21.6%) of parents was high school graduation. About 71% of households included more than one person receiving income, with a median household income of $62,500 annually. Median age of parents was 45 years. Survey questions focused on the parent and one child aged 1-16 years. For the 55% of parents with two or more children in this age range living at home, one child was randomly selected and designated as the sample child. Roughly half (52.8%) of the sample children were male and the median age of sample children was 10.5 years.

After a few initial questions to verify eligibility, determine household size, the age and gender of the parent and sample child, and their relationship (biological, adopted, step, foster child or other), the survey introduced the risk scales used to elicit parents' perceptions of risk. Each scale depicted 1000 squares in 25 rows and 40 columns. The squares were numbered, with the numerals 1-25 appearing in the 25 squares in the farthest left-hand column, beginning with '1' in the bottom, left-hand square. The second column was likewise numbered 26-50, and this pattern continued through the square in the upper right-hand corner, numbered 1000. All 1000 squares initially were colored blue. Blue squares were changed to red to represent amounts of risk. Beneath the scale, the level of risk was indicated by displaying the number and the percentage of the 1000 squares that were colored red.

Parents were shown four examples of scales representing risk levels of 25%, 50%, 75% and 100% and were told the relationship between these percentages and "chances in 1000." Then, parents were given an example of a driver whose risk of a serious automobile accident was 333 in 1000, or 33.3%, and were told, "You can show this amount of risk by clicking on the number 333 in the scale. Please click on number 333 in the scale now." Two important features of the risk scale were that parents could indicate any level of risk by clicking on only one square in the scale, and could change their answer as many times as desired before moving on in the survey. Thus, as just indicated, a respondent could show a risk level of 333 in 1000 by using the computer mouse to select the square numbered 333. Upon doing so, all squares numbered from 1 through 333 would change colors from blue to red, and the risk level of 333 in 1000, or 33.3% would be shown numerically beneath the scale. If the parent mistakenly selected the square numbered 360, all squares from 1-360 would be colored red. Subsequently clicking the square numbered 330 would change the squares from 331-360 back to blue, leaving only 330 of 1000 squares colored red. Finally selecting the square numbered 333 would achieve the desired result, and the parent could then select the "Continue" button to proceed through the survey.

After respondents successfully used the risk scale to show the 33.3% risk, they were given a second example of a driver with a risk of 10 in 1000, or 1%, and were told, "Please show this by marking the scale below." Following successful completion of that task, parents were asked to identify which of the two drivers had the greater chance of getting into an auto accident, and 11.5% of respondents provided the wrong answer. These respondents then were shown the risk scales for the two drivers a second time, and again were asked which driver had the greater risk. The 6 respondents who failed to answer correctly on the second try were next shown a screen instructing them to see the survey administrator, who paid them $40, thanked them for their participation and sent them away.

The risk scales were used to elicit heart disease risk perceptions. Although RD-83326301-0 focuses on morbidity risk, the pilot study examined the (unconditional) risk of dying from heart disease. This perspective was taken because coronary artery disease is a chronic condition and respondents had not been screened for a prior diagnosis.

Parents first estimated chances of dying from heart disease for themselves and then did so for their sample child. Parents were given an opportunity to revise their risk estimates after considering information about heart disease. They were informed of the risk faced by the average person in the United States and told that a person's risk may differ from this average because of factors including cigarette smoking, general health, family history of heart disease, existing health conditions, and diet. Parents answered questions about their own and their sample child's exposure to these risk factors. They then had the opportunity to revise their initial estimates of the risk of dying from heart disease, both for themselves and for their sample child. The methods used to elicit parents' perceptions of their own and their children's heart disease risks appear to work as intended.

Frequency distributions of parents' subjective assessments of the risk of dying from heart disease are presented in Table 3-1. There is considerable variation in risk estimates, with some parents believing that dying from heart disease is impossible and one believing that it is inevitable. Parents on average estimated that their own lifetime risk of dying from heart disease was greater than that of their sample child, 330 vs. 226 chances in 1000, a difference that is significant at 1% in a matched samples test. About 41% of parents revised their own and their children's heart disease risk estimates, and about two-thirds of revisions were downward. Revised risk estimates averaged about 286 chances in 1000 for parents and about 181 chances in 1000 for children. The difference in mean revised risk estimates between parents and children is significant at 1% in a matched samples test.

The final portion of the pilot survey tested potential methods for valuation of reduced heart disease risk using both hypothetical and actual payment mechanisms. Parents first valued reductions in perceived risk of dying from heart disease by expressing purchase intentions for a hypothetical dietary supplement. The supplement was described as similar to a vitamin and would be taken once weekly. Effectiveness of the supplement was varied randomly across respondents. One of four descriptions of the supplement randomly assigned to each respondent. The descriptions assigned risk reductions of 10% or 50% (from the revised assessments of heart disease mortality risk) for the parent and the child. Parents were asked to read the description of the supplement and were shown their previously marked risk scales, indicating the risk reduction the supplement would offer and the amount of risk remaining if the supplement were taken regularly. Parents were told that they could buy the supplement while shopping for groceries and that it would not be covered by insurance and then were asked "Would you be willing to pay $X to buy enough of the supplement to last you and your child one month?" The cost ($X) was varied randomly over five values ($2, $4, $9, $19, $38). These prices were chosen to match those used in the actual willingness-to-pay elicitation.

The survey then proceeded to elicit willingness-to-pay using an actual payment mechanism by telling parents that a supplement like the one they just considered really did exist, except that the risk changes and price would be different. Another one of the four descriptions of effectiveness of the supplement was randomly assigned. Parents again were asked to read the description and were shown the previously marked risk scales, indicating the risk reduction the supplement would offer and the amount of risk remaining if the supplement were taken regularly. Respondents were told that they could buy a one-month supply of the supplement from the survey administrator for $X, and another of the five prices was randomly assigned to the respondent. The prices were chosen to make the supplement cost less than the $40 participation payment respondents would receive, so that all respondents would have a means of purchasing the supplement if desired. Respondents were advised that, “If you choose to buy the supplement, $X will be deducted from your $40 participation amount. This means that you get the supplement plus $Y when you are finished.” The value of $Y was computed as $40 less the price of the supplement. Respondents also were told, “If you do not choose to buy the supplement, you will get the full $40 participation amount that you were promised, but you do not get the supplement.” Parents then were asked, “Do you want to have $X deducted from your $40 participation payment to buy enough of the supplement to last you and your child one month?”

About 85% of parents indicated that they would be willing to pay for the supplement when the question was asked hypothetically. This outcome suggests that the prices used were too low relative to the risk reductions considered. Purchase intentions that vary little between respondents tend to be less informative about marginal valuations of risk reductions than purchase intentions with greater variation. On the other hand, only 20% of parents were willing to buy the supplement when the purchase price was to be deducted from their participation payment.

As indicated in the proposal, the cost of the supplement was not actually deducted from participation payments of parents who indicated that they would buy it. Rather, each respondent was debriefed upon completing the survey and collecting their participation payment. Debriefing focused on the respondent’s decision as to whether to buy the supplement under the actual payment mechanism. Respondents also were informed that “taking the supplement” amounted to “eating five ounces of walnuts” each week while holding total calories and fat calories consumed constant; were provided with information on the health benefits associated with walnut consumption; and were offered a complimentary one-serving package of walnuts.

During debriefing, many parents reported that they did not purchase the supplement because they did not come to the survey site to buy health-promoting products or to receive medical advice. Others indicated that they would have to consult a physician, investigate possible interactions of the supplement with medications currently taken, or have more information before buying the supplement. Parents were particularly wary of purchasing a dietary supplement for their children without more information and/or consultation with a physician. In summary, debriefing of respondents revealed that purchase decisions in the actual payment design did not reflect valuations of heart disease risk reductions so much as uncertainty about the supplement presented in the survey.

Reactions parents reported during debriefing appear to be reflected in results of a bivariate probit regression used to summarize parents’ purchase intentions for the dietary supplement. One equation is used to explain whether parents indicated that they would buy the supplement in the original hypothetical question and the other equation is used to explain whether parents indicated that they would buy the supplement in the subsequent question involving actual payment. Covariates in each equation measure the proportionate risk reduction offered to the parent and the child, coded as 0.1/0.4, and the cost of the supplement in dollars/month. Bivariate probit is used to allow for a nonzero correlation of disturbances between the equations for hypothetical and actual purchase decisions.

Maximum likelihood estimates of the bivariate probit model are presented in Table 3-2. The estimated disturbance correlation is approximately 0.4 and statistically significant at the 1% level, indicating an efficiency gain from estimating the two equations together. Coefficients of the cost of the supplement are negative and significant at the 1% level, suggesting that parents were more likely to agree to buy the supplement at lower prices than at higher prices. However, three of four coefficients of proportionate risk change variables are not significantly different from zero at conventional levels, indicating that parents' purchase intentions were unrelated to the magnitude of the risk reduction offered by the dietary supplement.

4. Conclusions

The pilot study was conducted to test the performance of the contractor proposed for use in the final survey and to test key survey elements, especially risk communication and willingness-to-pay elicitation. The proposed survey contractor went out of business at the end of the pilot study. Risk scales and other risk communication methods were improved following initial testing and worked well in the main pilot study. The proposed method of eliciting willingness-to-pay was revised after initial testing but performed poorly in the main pilot study, and appears simply unworkable. Use of an unnamed "food item" or a dietary supplement as the mechanism to reduce risk evidently will not be successful. If respondents were told that the risk reductions considered are achieved through consumption of walnuts, however, their responses would simply reflect the demand and market price of walnuts, rather than the demand for heart disease risk reduction. An additional problem arises because the stated-preference and revealed-preference elicitation procedures must be parallel to support comparisons between actual and hypothetical purchase decisions. The resulting need to keep the price of the risk-reducing good below the incentive payment for survey participation induces too great a willingness to purchase the good in the hypothetical elicitation. Consequently the proposed use of walnuts and comparison of actual and hypothetical purchase intentions for risk-reducing goods was abandoned. In summary, implementation of the pilot study led to a revised research plan in which model predictions would be tested and willingness-to-pay estimated using data collected from a stated preference survey administered by Knowledge Networks to a national sample.

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Table 3-1. Pilot Study: Parents' Perceived Unconditional Risk of Dying from Heart Disease.

N=815.

	Risk of Dying from Heart Disease (Initial)		Risk of Dying from Heart Disease (Revised)	
Chances in 1000	**Parents**	**Children**	**Parents**	**Children**
0	4	6	3	5
1 - 49	112	173	78	146
50 – 99	58	77	45	81
100 - 149	71	106	80	149
150 - 199	29	46	55	76
200 - 249	57	68	128	132
250 - 299	74	70	93	72
300 - 349	59	67	85	50
350 - 399	23	24	25	17
400 - 449	33	30	38	22
450 - 499	8	11	10	9
500 - 549	133	81	88	37
550 - 599	12	3	8	2
600 - 649	33	14	17	2
650 - 699	12	6	7	1
700 - 749	16	9	7	1
750 - 799	37	11	20	3
800 - 849	17	3	10	3
850 - 899	8	0	4	0
900 - 949	10	6	7	4
950 - 999	8	4	7	3
1000	1	0	0	0
Mean	330.23	295.91	286.29	180.70
Std. Dev.	253.42	207.87	212.52	160.16

Table 3-2. Pilot Study: Parents' Purchase Intentions for Dietary Supplement to Reduce Heart Disease Risks. Bivariate Probit Maximum Likelihood Coefficient Estimates (Standard Errors).

Covariate	Hypothetical	Actual
Proportionate Risk Change, Parent	0.864**	0.323
	(0.297)	(0.246)
Proportionate Risk Change, Child	0.251	-0.184
	(0.290)	(0.247)
Cost	-0.025**	-0.029**
	(0.004)	(0.004)
Constant	1.235**	-0.352**
	(0.134)	(0.127)
Disturbance correlation	0.399**	
	(0.094)	
Log likelihood	-717.087	
Number of Observations	815	

* Significant at the .05 level.
** Significant at the .01 level.

Chapter 4: Survey and Sampling Methods for the Main Study

1. Introduction

This chapter describes the survey research methods and data collected for RD-83326301-0. Section 2 outlines the development and pre-testing of the survey instrument following the pilot field study. Second 3 discusses sampling methods and basic demographic data about the sample. Section 4 reviews the survey design and provides summary statistics for key variables.

Additional documentation is provided in appendices. Appendix A documents approvals for human research. Appendix B consists of the final report from Knowledge Networks. Appendix C presents the text version of the computerized survey instrument. Appendix D provides summary statistics and definitions for variables.

2. Survey development and pre-testing

Following analysis of data collected from the pilot field study discussed in Chapter 3, the survey instrument was revised extensively with the assistance of the cardiologist Dr. David Carpenter, and economists Dr. Wic Adamowicz, Dr. Marcella Veronesi, and Mr. David Zinner. Each of these individuals participated at no cost to EPA. Carpenter is a cardiologist at SUNY-Albany who has extensive research experience in environmental health. His input was instrumental in improving the way the survey communicates with respondents about heart disease risks. The revised questionnaire elicits heart disease risk information in a structured way that helps respondents organize their thoughts. Dr. Carpenter's input also was important in improving the elicitation of information about heart disease risk factors from respondents. The economists developed numerous improvements to the survey instrument, particularly with regard to the elicitation of willingness-to-pay.

In addition to improvements in risk communication and willingness-to-pay elicitation, the questionnaire was revised to include a new component that focuses respondents' attention on how heart disease risks tend to rise over time, from the present through age 75 years. Also, the revised instrument includes a trial of an experiment that, if successful, would support a test between different models of family decision-making with respect to children's health. These features of the questionnaire are described in Section 4 of this chapter.

Knowledge Networks, Inc., (KN) programmed the revised questionnaire for computerized administration and provided an Internet address where the survey could be accessed for testing. Two focus groups were conducted using a professional focus group moderator and parents recruited locally in the Orlando, Florida area. One of the investigators attended each session, in which parents completed the questionnaire using desktop personal computers, and then participated in a moderated group discussion.

Eleven parents participated in the first session in late August of 2010. In addition to numerous comments and suggestions about details, six major points emerged. First, the hypothetical risk-reducing intervention used to elicit willingness to pay to reduce heart disease risk did not work as intended. In that version of the survey, the risk-reducing intervention consisted of a medically supervised prevention program that would involve dietary changes and exercise coupled with annual medical tests. The idea behind this was to use a hypothetical intervention that would match closely actual behaviors that could be used to reduce risks of heart disease. But pre-test respondents did not believe that the program added much value to actions that anyone could choose to take at any time, such as consulting a physician, exercising more and eating a healthier diet. They also felt strongly that the description of the program did not provide enough information for making a judgment about it. Second, it was evident that the prices used for the risk-reducing intervention were too high.

Third, parents in the first focus group wanted to be given quantitative information about the relationship between heart disease risk factors and levels of risk. The tested version of the survey provided only qualitative information. The survey indicated, for example, that risks were higher for persons with high blood pressure than for persons with normal blood pressure. Parents wanted to know *how much* higher. Fourth, the method used to elicit respondents' perceptions of the risk of death from heart disease caused confusion among the parents. Fifth, participants expressed difficulty assessing and valuing heart disease risk reductions for very young children. The survey version tested included parents of children aged 1-16 years.

Sixth, a trial version of an experimental, hypothetical redistribution of income between parents in two-parent families did not appear to work as intended. The redistribution reduced income of one parent while increasing income of the other parent by an equal amount, so that total family income remained constant. Such a redistribution would create an ideal situation for testing between competing models of parental resource allocation. However, parents focused on the fact that family income was constant and ignored the redistribution of income between spouses.

To address issues raised in the first focus group session, the risk-reducing intervention used to elicit willingness-to-pay was changed to consist of a medically supervised program involving annual tests and a weekly pill. More information was provided about the hypothetical program than in the earlier version. Prices were lowered. The age range of children was raised to 6-16 years. Risk information was provided in quantitative terms for many heart disease risk factors, as described in Section 4 of this chapter. The method of eliciting subjective assessments of the risk of death from heart disease was changed to mirror the method the investigators had successfully used in R-82871701-0 and RD-83159201-0. Finally, the hypothetical redistribution of income was reorganized so that some parents would see an increase in family income while others would see a decrease.

Following these revisions, a second focus group session was conducted with 12 subjects in early October of 2010. Respondents indicated that the survey was too long (median completion time was 32 minutes) and provided numerous detailed comments. The main issues emerging concerned elicitation of willingness to pay to reduce heart disease risk. Respondents objected to taking a pill on a regular basis, and 11 of 12 indicated that they would prefer an annual vaccine. Citing the fact that advertisements for prescription drugs include lengthy disclaimers about possible side effects, subjects indicated that the assertion that the pill had no serious side effects made them doubt the credibility of the entire exercise. They further suggested that the description should (1) include more evidence that the risk-reducing intervention was both safe and effective, (2) address why someone should purchase a risk-reducing program when risks could be managed through diet and exercise, and (3) address why someone might want to start on the program now when heart disease typically emerges later in life. Subjects also suggested that they would want objective feedback that the risk-reducing intervention was working as claimed, and that the prices were too high.

To address issues raised by the second focus group, the risk-reducing intervention was modified to consist of a medically supervised program including an annual vaccine and an annual medical exam that would provide updated information about an individual's risk. The description of the program was revised to include a more substantive discussion of effectiveness and side effects, of incremental benefits relative to diet and exercise, and of benefits of starting risk-reducing efforts sooner rather than later. Attributing some minor side effects to the vaccine does not interfere with estimating willingness to pay to reduce heart disease risk or with testing key hypotheses of the research project because of the empirical research design adopted (see Chapter 6). Also, prices for the vaccine/prevention program were lowered and overall survey length was reduced.

Following these revisions, a pre-test was administered by KN during November 2010 to 25 parents drawn from their panel. The major issue emerging from the pre-test was that several of the panelists raced through the survey. For example, one respondent completed the survey in nine minutes. Such a rapid pace would almost certainly make it impossible for a respondent to consider thoughtfully the questions posed and their answers. Other respondents appeared to have completed the survey with one or more interruptions of significant duration, making it difficult to maintain continuity of concentration.

Four steps were taken to address these problems. (1) The first screen in the questionnaire following the explanation of research advised respondents that: "The questions in the survey require more thoughtful consideration from you than some other surveys. Therefore, please complete the survey at a time when you can give it your full attention and when you can complete it in one sitting. We thank you in advance for your time and your careful attention to this survey." Before proceeding, respondents had to indicate agreement with the statement, "I agree to give the survey my full attention and to complete it in one sitting." See Figure 4.0a. (2) Reminders exhorting respondents to consider questions and answers thoughtfully were included at other points in the survey. Figure 4.0b shows an example. (3) KN agreed to provide information on the amount of time respondents spent on each question. (4) The planned sample size was increased by 10%.

As a final precaution, the survey was fielded in two stages. In the first stage, KN conducted a "soft launch" during December of 2010 by administering the survey to 505 parents drawn from the KN panel. The second stage consisted of the main study of 2650 parents drawn from the KN panel.

The main purpose of the soft launch was to test the risk changes and prices associated with the hypothetical vaccination program used to elicit willingness to pay to reduce heart disease risks. The survey describes one vaccine to reduce the parent's risk and another to reduce risk for a child. As the vaccines are described, their effectiveness is varied randomly across parents and children. In the version of the survey tested in the soft launch, parents would experience risk reductions of 10%, 35%, or 70% of their subjectively assessed risk level. Children would experience risk reductions of 40%, 65%, or 90% of the risk level that parents believed their children faced. Prices for the vaccines were randomly chosen from the values $5, $10, $20, $40, $80 per year. Based on preliminary analysis of data from the soft launch, the investigators decided to use risk changes of 10% or 70% for parents and 20% or 80% for children. This change increased the contrast in effectiveness between vaccines offering larger and smaller risk changes. Also, the set of prices was changed by eliminating the $5 price and replacing it with $160.

The only other change made to the survey following the soft launch was a slight alteration in the implicit interest rates used in a question to elicit information about time preferences for money. Respondents are asked whether they would prefer $100 in one month, or a larger amount in 13 months. The larger amount is computed as a multiple of $100 with the multiple randomly varied over respondents. The smallest multiple used in the soft launch (1.025) was eliminated, and a new multiple was added as the largest value (1.80).

The remainder of this chapter summarizes data from the soft launch and the main study. In all cases except the summary of willingness-to-pay responses, data from the soft launch and main study are pooled. Additional data documentation, including means and definitions of all variables, is provided in Appendix C.

3. Sampling, Response Rates and Demographic Data

3.1 The Knowledge Networks Panel

The final version of the questionnaire was administered to a national sample of parents drawn from KN's online research panel during January – March 2011. Details of sampling and survey administration are contained in the field report from KN, included as Appendix B.

The KN panel is representative of the US population and its members were recruited randomly by probability sampling. The sample frame is the universe of US residential addresses from the US Postal Service Delivery Sequence File. This frame sample frame covers about 97% to 99% of US households and includes cell-phone-only households, households with listed and unlisted telephone numbers, non-telephone households, and households with and without Internet access. Probability-based random samples of addresses are drawn from the sample frame, and the corresponding households are invited to join the panel through a series of mailings. When a telephone number can be matched to an address, KN also employs intensive non-response conversion efforts using professional telephone interviewers (Dennis 2010a, 2010b).

KN panel members typically complete two to four surveys monthly (Dennis 2010b). They receive an e-mail invitation to participate in a survey and are provided with a link to the Internet address of the survey questionnaire. Households are provided with Internet access and hardware if necessary. Panelists earn reward points for regular participation in surveys as well as additional incentives for completing surveys that require more than 20 minutes or involve some additional inconvenience. In these ways panel members earn in-kind giveaways and monetary payments. According to KN, rewards for regular participation in surveys typically are worth about $5/month, and rewards for surveys that are longer than 20 minutes duration are $5 to $10 each.

3.2 Sample Selection and Response Rates

Panel members were eligible to participate in the heart disease field study if they were parents between the ages of 18 and 55 years old who had at least one biological child aged 6 to 16 years living in the home, as long as they had not previously had a heart attack or been diagnosed with coronary artery disease. Parents with a prior history of heart disease were excluded to focus on ex ante perception and valuation of risk. Children under age 6 years were excluded because parents in focus groups expressed difficulty assessing and valuing heart disease risk for very young children.

Panel members were invited to complete a screener to determine their eligibility for the study. Among panel members initially contacted, 58% completed the screener, and 71% of those met eligibility criteria and completed the main survey questionnaire. A total of 3155 parents completed the survey, including the soft launch. Table 4.1 shows the sample distribution of parents by marital status, including 501 single parents and 2654 married (or cohabitating) parents. Of the married/partnered parents, 966 observations are elements of matched pairs of spouses living with one another who completed the survey questionnaire on separate occasions (i.e., 483 matched pairs). Parents in the matched pairs were recruited one at a time by inviting the second parent to complete the screener after a completed survey was obtained from the first parent in the pair. Among panel members who were the second parent contacted in a pair, 81% completed the screener and 89% of those met eligibility criteria and completed the main survey instrument. The soft launch included mainly single parents in order to reserve as large a sample of matched parents as possible for the main study.

Computing a response rate for the survey requires accounting both for the selection of members of the KN panel and for the completion rate of the specific survey. Two response rates are calculated below, based on the detailed description of response metrics for online panels provided by Callegaro and DiSogra (2008). The calculated response rates apply to the sample composed of all single parents, all unmatched married parents, and the first parent sampled from a matched pair, representing 85% of the total sample.

Recruitment of KN panelists is an ongoing process, not a discrete event. A recruitment cohort is defined as the sample of addresses used in the recruitment mailing at a specific point in time (DiSogra and Callegaro 20xx). If at least one member of the household agrees to join the panel, the household is counted as recruited.

Parents in the study sample are members of different recruitment cohorts. A recruitment rate (*RECR*) was computed for each cohort represented in the study sample and each case was assigned the recruitment rate for its cohort. The average recruitment rate for the study sample is 17.4% (*RECR = 0.174*).

After agreeing to join the panel, a potential panelist must complete a "profile" survey that collects basic demographic data. A household is considered "profiled" if at least one member completes the profile survey. A "profile rate" (*PROR*) was computed for each cohort represented in the study sample and each case was assigned the profile rate for its particular cohort. The average profile rate for the study sample is 55.8% (*PROR = 0.558*).

The first cumulative response rate (*CUMRR1)* accounts for the recruitment, and profile rates together with the study completion rate of 58.2% (*COMR = 0.582*). The first cumulative response rate for the study is 5.7%.

$$\begin{aligned} CUMRR1 &= RECR \times PROR \times COMR \\ &= 0.174 \times 0.558 \times 0.582 \\ &= 0.0565. \end{aligned}$$

The second cumulative response rate (*CUMRR2*) incorporates retention of panel members over time. Only those who remain active participants on the panel are available for selection into the study sample. A retention rate (*RETR*) was computed for each cohort represented in the study sample and each case was assigned the retention rate for its cohort. The average retention rate for the study sample is 28.0% (*RETR = 0.280*). The second cumulative response rate for the study is 1.6%.

$$\begin{aligned} CUMRR2 &= RECR \times PROR \times RETR \times COMR \\ &= 0.174 \times 0.558 \times 0.280 \times 0.582 \\ &= 0.0158. \end{aligned}$$

Comparisons of response rates of KN surveys to response rates of one-time surveys should recognize that a random-digit dialed telephone sample or a mail sample is different in nature from the KN panel. Members of a one-time telephone or mail sample have completed one survey at one time. In contrast, the KN panel is composed of people recruited at different times who must complete a profile survey and respond to many surveys over time. These features are reflected in the recruitment, profile, and retention rates used above.

3.3 Characteristics of the Study Sample

The median parent completed the questionnaire in 27 minutes. Only 10% of parents completed the survey in less than 15 minutes, suggesting that efforts to encourage parents to consider the questions and their answers thoughtfully had some impact in reducing the number of panelists who raced through the survey. Survey duration exceeded one hour for 25% of parents, indicating that a substantial fraction may have failed to fulfill their commitments to complete the survey in one sitting.

Survey questions focused mainly on the responding parent and one biological child. For the 81% of parents with two or more biological children aged 6-16 years living at home, one child was randomly selected and designated as the sample child. Each parent in a matched pair was questioned about the same child, who was a biological child of both parents. Average age of sample children was 11 years and 51% were male.

Among the total of 3155 parents, 79% were white, 7% were African-American, and 8% were Hispanic; 53% had graduated from a four-year college or university; average age was 42 years and median family income was between 70 and 80 thousand dollars annually. About 90% of fathers were employed, compared to 66% of mothers. In the sample of unmatched married parents, 69% of parents are mothers and nearly all of the sampled single parents are mothers. Table 4.2 presents more detail on demographic characteristics of the sample, along with a comparison to demographic characteristics of the US population.

4. Survey Design and Data

4.1 Survey Introduction

The text version of the computerized survey instrument is included as Appendix C. After respondents agreed to give the survey their full attention and to complete it in one sitting, the survey began with questions to verify eligibility, identify the sample child, and make some standard demographic/economic inquiries. The introductory section of the survey concluded with a rough assessment of respondents' time preferences for money. Parents were asked to imagine that they had won a $100 prize. They could receive the $100 in one month, or a larger amount in thirteen months. In the main study, the larger amount was randomly assigned as one of the values $105, $110, $120, $140, $180 (representing simple annual interest rates of 5, 10, 20, 40 and 80 percent). In the soft launch, the value of $102 was included and the value of $180 was not used.

Responses of parents surveyed in the soft launch and the main study to the question about time preferences for money are summarized in Figure 4.1. As expected, the proportion of parents who say that they would prefer receiving a larger prize in 13 months instead of a $100 prize in one month increases as the larger/later amount increases. Results in Figure 4.1 suggest a median discount rate of between 40% and 80% per year, which is quite high relative to market rates. A probit regression to explain preference for the delayed prize in terms of the larger/later amount yielded the following estimates and standard errors:

$$\begin{array}{l} -3.0370 + 0.0185(Later\_amount) \\ (0.1259) \quad (0.0093) \end{array}$$

These results imply that the average parent would be indifferent between receiving $163.95 in 13 months and receiving $100 in one month, for a mean discount rate of about 64%.

4.2 Elicitation of Perceived Risks

Parents made an initial estimate of the risk of a coronary artery disease diagnosis before age 75 years using an interactive scale similar to that used in prior research (Corso, Hammitt, and Graham 2001, Dickie and Gerking 2007, Dickie, Gerking and Veronesi 2011, and Krupnick et al. 2002). The scale depicted 100 squares in 10 rows and 10 columns. Each square was numbered, beginning with one in the upper left-hand corner through 100 in the lower right-hand corner. All 100 squares initially were colored blue. Parents re-colored squares from blue to red to represent amounts of risk. For example, a parent could use the computer mouse to indicate a risk level of 36 in 100 by selecting the square numbered 36 in the scale, causing all the squares from 1 to 36 to turn red. Beneath the scale, the level of risk was indicated by displaying the percentage of the 100 squares that were colored red. Parents could change additional blue squares to red if they wished to increase their risk estimate and could change red squares back to blue if they wished to reduce their risk estimate. Parents could make as many changes to the scale as desired before selecting the "Next" button to record the final answer.

Parents practiced using the risk scale before making estimates of the risk of getting heart disease. First, they were shown four examples of scales representing risk levels of 25%, 50%, 75% and 100% and were told the relationship between these percentages and "chances in 100." Second, parents were asked to use the risk scales to represent the chances of experiencing an automobile accident for each of two hypothetical people, Mr. A, a relatively careless driver who had 33 chances in 100 of an accident and Ms. B, a relatively safe driver who had a 1% chance of an accident. Respondents then were asked which of these two people had the lesser chance of having a car crash, and 12% of parents wrongly answered that Mr. A had the lower risk. All of these respondents got the correct answer when given a second chance at the question after additional review of the risk scales. Examples of the practice risk scales are shown in Figures 4.2.

Third, parents used the risk scale to estimate the lung cancer risk associated with cigarette smoking. "Think about a group of 100 average or typical smokers, who smoke cigarettes for all of their adult lives. How many smokers out of 100 do you think would get lung cancer?" See Figure 4.3a and 4.3b. After using the risk scale to indicate their estimate of the lung cancer morbidity risk of smoking, parents were asked to consider a group of 100 smokers who had been diagnosed with lung cancer. Respondents were advised that some smokers diagnosed with lung cancer live longer than five years and others die within five years. Parents then used the scale to assess the conditional mortality risk of lung cancer in response to the question, "Out of 100 smokers who are diagnosed with lung cancer, how many do you think would die of lung cancer within five years of being diagnosed?" See Figure 4.3c.

Questions about lung cancer risk perceptions were included in the survey for several reasons. Considering lung cancer first gave respondents an opportunity to practice using the risk scale to assess risks of a life-threatening illness before turning to the case of coronary artery disease. Also, similarly worded questions about lung cancer risks have been asked in several surveys conducted over the past half century (Baghal 2011). Similarity between responses obtained here and responses obtained in other recent surveys would provide some evidence that risk beliefs of parents in the sample are representative of risk beliefs of the general adult population. Finally, an investigation of parents' beliefs about smoking risks is warranted because smoking is a risk factor for heart disease, environmental tobacco smoke threatens children's health (Agee and Crocker 2007), and some researchers have suggested that smokers and non-smokers have different preferences. Specifically, conceptual models of rational choice (e.g., Fuchs 1986; Becker and Mulligan 1997) suggest that cigarette smokers have higher rates of time preference than nonsmokers. Empirical evidence from labor market studies (e.g., Viscusi and Hersch 2001; Grafova and Stafford 2009; Scharff and Viscusi 2010), studies of risk taking behavior across different types of risks (e.g., Hersch and Viscusi 1998; Dohmen et al. 2009), and recent surveys (e.g., Khwaja, Sloan, and Salm 2006; Khwaja, Sloan, and Wang 2009; Ida and Goto 2009) generally supports this view as well as the broader perspective that smokers are more tolerant of risk than nonsmokers

Parents' assessments of lung cancer risks are summarized in Figure 4.3d. The questions about lung cancer and smoking were not changed after the soft launch, and the figure represents responses from parents in both the soft launch and the main study. As shown, there is considerable variation in subjective risk assessments. The median (and mode) for the risk of getting lung cancer and the conditional risk of dying from the disease are 50 chances in 100. The average parent believes that 51 smokers out of 100 will contract lung cancer, and that 55 of 100 smokers who have lung cancer will die of the disease within five years of diagnosis. The actual risk of contracting lung cancer from smoking is below 20% (Baghal 2011, Viscusi 1991, 2002) and the actual conditional mortality risk of lung cancer is in the range of 80-90% (American Cancer Society 2010, Ries et al. 2003). Thus, the typical parent substantially over-estimates the risk of getting lung cancer from smoking while substantially under-estimating the conditional risk of dying from lung cancer. If an estimate of parents' implied beliefs about the unconditional lung cancer mortality risk smoking is computed as the product of the morbidity risk and the conditional mortality risk estimates, the estimate would imply that the average parent believes that about 30 in 100 smokers will die of lung cancer. Results obtained for parents' estimates of the risk of getting lung cancer from smoking fall in line with results obtained in other recent surveys (Baghal 2011).

The survey included questions needed to classify respondents as *never smokers* (who have not smoked or have smoked fewer than 100 cigarettes in their lives), *former smokers* (who have smoked at least 100 cigarettes but have not smoked in the past month and indicate that they have quit smoking altogether), or *current smokers* (who have smoked at least 100 cigarettes during their lives and have not quit altogether). Approximately two-thirds of parents are never-smokers, two-fifths are former smokers, and the remaining 12 percent are current smokers. On average, current smokers see the lung cancer risk of smoking as lower than do former smokers, who see the risk as lower than do never smokers. These differences are significant at the 1% level in a two-tail test. The qualitative differences in subjective risk assessments by smoking status found here are broadly consistent with previous studies (Baghal 2011, Viscusi 1991). At the 1% level, the mean assessment of conditional death risk is lower among current smokers than among former and never smokers, but mean assessments of conditional death risk of former and never smokers are indistinguishable.

4.3 Perceived Risks of Coronary Artery Disease

After addressing smoking and lung cancer, the survey turned to the elicitation of beliefs about risks of coronary artery disease. Parents first answered a few questions about familiarity with heart disease. Most parents indicated that they were aware of heart disease; 92% said that they had heard or read about coronary artery disease, 76% knew someone personally who had had it, 69% had thought about the possibility that they themselves might get it, and 34% had thought about the possibility that one of their children might get it. After answering these questions parents used the risk scale to estimate chances of getting heart disease before age 75, first for themselves and then for the sample child. See Figures 4.4a and 4.4b.

Parents' assessments of heart disease risks are summarized in Figure 4.4c. As shown, there is considerable variation in parents' subjective risk assessments both for themselves and for their children, with inter-quartile ranges of initial assessments spanning about 30 percentage points for parents and 35 percentage points for children. Median perceived risks are 32 in 100 for parents and 25 in 100 for children.

Parents had the opportunity to revise their initial estimates of the risk of getting heart disease after reviewing information about the disease. Parents were shown their initial risk assessments as previously marked on the risk scales and could revise their assessments if desired. Roughly 45% of parents revised their own risk assessment, with just over half of revisions being downward. Risk assessments for children were revised by 47% of parents, with 63% of revisions being downward. Median revised risks are 29 chances in 100 for parents and 20 in 100 for children. As shown, the inter-quartile range of risk assessments shrinks after receipt of information. To the extent that a reduction in dispersion indicates an increase in information, parents appear to be more informed about heart disease risks after reviewing the information included in the survey. The information provided to parents is described next.

4.4 Information about Risk of Coronary Artery Disease

After making initial estimates of heart disease risk for themselves and their children, parents were provided with information about risk. Both quantitative and qualitative risk information was provided. Recall that parents in focus groups had indicated a preference for quantitative risk estimates. Quantitative risk information was based on estimates obtained from Framingham Heart Study data (Lloyd-Jones et al. 1999, Lloyd-Jones et al. 2006, and Wilson et al. 1998). The Framingham Heart Study is an ongoing effort begun in 1948 with the goal of identifying factors that contribute to cardiovascular disease, by following a large group of participants over time. Over 2000 articles have been published in peer-reviewed medical journals using data from the study. Qualitative risk information provided to parents was based on the same sources as well as on information from the U.S. government (US DHHS 2005, 2008) and the American Heart Association (Lichtenstein et al. 2006).

Average Risk. Parents were first advised that the average person has about 27 chances in 100 of being diagnosed with coronary artery disease before age 75. The average risk was illustrated using a risk scale showing the 27% risk level next to the risk scales that parents had marked for themselves and their children. For example, a parent who had assessed her own risk as 36/100 and her child's risk as 28/100 would have seen a display like the one shown in Figure 4.5.

Risk Factors. Parents then were told that they and their children would probably not have the same risk as the average person, because chances of getting heart disease depend on six risk factors that are different for everyone: gender, smoking, current health status, family history, exercise, and diet. The survey elicited information from parents about each of these risk factors while also providing information about how the factors influence risk.

Gender. Parents were told that heart disease risk is higher for the average male than for the average female, and risk levels by gender were illustrated by showing two risk scales side-by-side, one marked with the average male's risk level (35%) and the other marked with the average female's risk level (19%). See Figure 4.6a.

Risk beliefs by gender are summarized in Figure 4.6b. Results suggest that parents are not fully cognizant of the large gender disparity in risk of contracting coronary artery disease before age 75 years. Parents' median assessment of their own risk is fairly similar between men (32/100 initially) and women (30/100 initially), in contrast to the medical evidence indicating a large difference in risk. Similarly, both mothers and fathers make similar median initial estimates of risk for sons as for daughters (24 chances in 100). Initial assessments are more variable for boys than for girls as indicated by the larger inter-quartile range for boys.

Smoking. Respondents were advised that risks of contracting coronary artery disease before age 75 were higher for smokers than for non-smokers. The risk levels of these two groups were illustrated by showing two risk scales side-by-side, one marked with the average non-smoker's risk (21%) and the other marked with the average smoker's risk (28%). See Figure 4.7a. Parents' risk beliefs by current smoking are summarized in Figure 4.7b. (The sample prevalence of current smoking is 12% for both mothers and fathers; smoking status of children was not assessed.) As shown, smokers see their risks of heart disease as higher than do non-smokers, although both groups appear to over-estimate risk.

As the responding parent proceeded through the sections of the survey reviewing risk factors, a checklist would be displayed to note progress. Each time a section was completed and a new section begun, an updated checklist like the one displayed in Figure 4.8a was displayed.

Current Health. Current health status was assessed in several ways in the survey: subjective evaluation of health; presence of high blood pressure, high cholesterol, or diabetes; and body mass index. Parents were asked for overall subjective evaluations of their own health and their children's health using the standard excellent-very good-good-fair-poor rating scale. As shown in Figure 4.8b, the modal parent rated his or her own health as very good and the child's health as excellent.

Fathers then were asked, "Have you ever been told by a doctor or health professional that you need to do something (like take medication, stop smoking, change your diet, or exercise more) to lower your blood pressure?" For mothers, the question began, “Except during pregnancy, have you ever been told….,” and the rest of the question was the same as for fathers. Those answering in the affirmative were asked whether they were currently taking medication for high blood pressure. Parents also were asked whether their children had received medical advice to lower their blood pressure. As shown in Table 4.3, about one quarter of parents have been advised to do something to reduce their blood pressure, and about half of those are on blood pressure medication.

Parents were then advised that high blood pressure increases risk of coronary artery disease, and two risk scales were displayed side-by-side for comparison. The left hand scale showed 18 of 100 squares colored red with the caption, “Optimal blood pressure (less than 120/80): Average risk is 18%.” The right-hand scale showed 43 of 100 squares colored red with the caption, “Very high blood pressure (more than 160/100): Average risk is 43%.” See Figure 4.9a.

Perceived risks by blood pressure status are presented in Figure 4.9b for parents only; children are not examined in this context because fewer than 3% of children are reported to have been advised to reduce their blood pressure. Perceived risk is substantially higher among parents who have received medical advice to reduce blood pressure than among parents who have not. Perceived risk also is higher among parents on blood pressure medication than among parents not on medication. The median parent’s revised assessment of risk lies below the initial assessment for each blood pressure category.

After viewing the risk scales by blood pressure, parents were asked whether a doctor or health professional had told them to do something to lower their cholesterol. Those answering affirmatively were asked whether they were currently taking medication for high cholesterol. Parents also were asked whether the child had received medical advice to reduce cholesterol. As shown in Table 4.3, about one quarter of parents have been advised to do something to reduce their cholesterol, and about one third of those are taking cholesterol medication.

Parents then were told that, “People with high cholesterol levels face higher risk of coronary artery disease, while people with normal cholesterol face lower risk.” In the now familiar procedure, two risk scales were displayed side-by-side to illustrate the difference in risk. The left hand scale showed 18 of 100 squares colored red with the caption, “Optimal total cholesterol (less than 180 mg/dL): Average risk is 18%.” The right-hand scale showed 37 of 100 squares colored red with the caption, “Very high total cholesterol (more than 240 mg/dL): Average risk is 37%.” See Figure 4.10a.

Perceived risks by cholesterol status are presented in Figure 4.10b for parents only; children are not examined in this context because fewer than 3% of children are reported to have been advised to reduce their cholesterol. The median parent who has been advised to take action to reduce his or her cholesterol sees higher risk than the median parent who has not. Similarly, parents who are taking cholesterol medication see higher risk than those who are not on medication. The median parent revised his or her risk estimate downward after receiving information, regardless of cholesterol status.

Next, fathers were asked, “Has a doctor or health professional ever told you that you have diabetes?” For mothers, the question began, “Except during pregnancy, has a doctor…," and the rest of the question was the same as for fathers. Parents who reported a diagnosis of diabetes were asked the age at which the disease was first diagnosed, with responses in 10-year intervals, and were asked whether they currently took medication for diabetes. Parents also were asked whether their children had been diagnosed with diabetes, and those answering affirmatively were asked whether their children were taking medication for diabetes. Table 4.3 reports that 5% of parents have been diagnosed with diabetes and about three quarters of those parents are taking medication for the disease. Fewer than 1% of sample children are diabetic. Although it is not shown in the table, 143 of the 158 diabetic parents were diagnosed at age 21 or older.

Parents then were advised that people with diabetes are at much higher risk of coronary artery disease than people without the disease. Two risk scales were displayed; the left-hand scale showed average risks without diabetes (23%) and the right-hand scale showed average risks with diabetes (62%). See Figure 4.11a.

Parents' risk assessments by diabetes diagnosis and medication are summarized in Figure 4.11b. Children are not considered here because of the rarity of diabetes among sample children. There is a marked increase in perceived risk among diabetics and among those taking medication for diabetes relative to persons without the disease. The distribution of risk assessments for diabetics and for diabetics on medication shifts to the right after receiving information, as indicated by the increase in the risk assessments at the first and third quartiles.

Parents then were advised that weight in relation to height, or body mass index (BMI), was a risk factor for coronary artery disease. They were asked to report height in inches and weight in pounds for themselves and for the sample child. Height was reported in two-inch intervals and weight was reported in 10-pound intervals. From these data a body mass index was estimated for each parent and child. In view of the tendency to under-report body weight (Chou, Grossman and Saffer 2004), the computation of BMI was based on the lower endpoint of the reported height interval, and the upper endpoint of the reported weight interval. As shown in Table 4.3, the average BMI of parents was just under 30 (median=28), the dividing line between "overweight" and "obese." The average BMI of children was about 22 (median=21). Frequency distributions of BMI for parents and children are shown in Figure 4.12.

Parents were told, "Based on your height and weight your Body Mass Index or BMI is approximately X," with the value of X determined by the computation just described. "Although BMI is not a perfect indicator, heart disease risks are higher for adults with BMI of 25 or above, and highest for adults with BMI 30 or above." Risk levels by BMI were illustrated by displaying three risk scales showing average risks for adults with BMI < 25 (21%), for adults with BMI between 25 and 30 (24%), and for adults with BMI > 30 (32%). A BMI of 25-29 indicates overweight and a BMI of over 30 indicates obesity. See Figure 4.13a.

Parents' risk beliefs by BMI category are presented in Figure 4.13b. Results suggest a general awareness that heart disease risks increase with BMI. For each BMI category, the median revised risk assessment is less than the median initial assessment. The inter-quartile range shrinks after receipt of information, for each BMI category.

Parents also were told the BMI computed for the sample child. They were given age- and gender-specific information about the qualitative relationship between children's BMI and heart disease risks, but were told that "there is not enough data to tell *how much* higher the risk is for children" with high BMI.

Following the extensive coverage of health risk factors, parents were told, "The last three risk factors are family history, exercise and diet. We can't use the risk scales to tell you specifically *how much* these factors affect the average person's risk. But they are still important in determining whether a person will get coronary artery disease." See Figure 4.14a.

Family History. Parents were asked whether any of their blood relatives had ever had a heart attack or been treated for coronary artery disease, and 54% responded affirmatively. They also were asked to consider the child's other biological parent, and were asked whether that parent or any of that parent's blood relatives had ever had a heart attack or been treated for coronary artery disease. Children are classified as having a family history of heart disease if a parent had the disease or if either parent's blood relatives have had the disease, resulting in 67% of sample children having a family history. As shown in Figure 4.14b, risk assessments for parents increase markedly in the presence of a family history of heart disease, and risk assessments for children increase somewhat more modestly.

Exercise. Parents were told about recommendations from the US government and American Heart Association "that adults in normal good health should get at least 5 hours weekly of moderate physical activity (such as brisk walking), or at least 1 hour weekly of vigorous activity (such as jogging) or some equivalent combination of moderate and vigorous activity." Each parent then was asked to indicate whether he or she got less than, about as much as, or more than these recommended amounts of exercise. Similarly, parents were advised that of government and AHA recommendations that children get an hour of physical activity daily, including vigorous activity three times weekly, and were asked to rate their children's exercise relative to this recommendation. Frequency distributions of reported exercise are shown in Figure 4.15, indicating that about half of parents get less exercise than recommended, whereas more than half of children get as much or more exercise than recommended.

Risk beliefs by adequacy of exercise, shown in Figure 4.16, suggest that parents believe that exercise reduces heart disease risks. Interestingly, receipt of information is associated with a larger reduction in dispersion of risk estimates for those who get adequate exercise than for those who do not. This suggests that the information provided reduced the uncertainty in risk assessments for persons who get adequate exercise.

Diet. The last risk factor considered was diet. Parents were asked for a subjective evaluation of the healthiness of their own and their children's diets. As shown in Figure 4.17, most parents believe that family diets are "somewhat healthy." Parents were then advised that the US government and AHA recommend that adults eat 4-5 cups of fruits and vegetables daily, and were asked whether they typically ate less than, about as much as, or more than the recommended amount. Similarly, parents were advised of recommendations for fruit and vegetable consumption of children and were asked to rate their children's consumption relative to recommendations. Figure 4.18 reveals that the modal parent and modal child consume too little of fruits and vegetables relative to recommended amounts. Figure 4.19 suggests that parents see a connection between fruit and vegetable consumption and heart disease risk.

4.5 Consequences of Coronary Artery Disease

Following the treatment of risk factors for coronary artery disease, parents had the opportunity to revise their initial risk assessments as previously described. Subsequently the survey turned to examining the consequences of contracting heart disease. Parents were told to imagine that they had been diagnosed with coronary artery before age 75, and were asked to estimate the chances in 100 of dying within five years of the diagnosis. Parents were unaware that they would be asked about the chance of dying from heart disease when they answered the previously described questions about the risk of getting this disease. Estimates of conditional mortality risk were obtained for the parent and child using the previously described risk scale, as shown in Figure 4.20a.

Figure 4.20b summarizes parents' beliefs about the conditional mortality risk of heart disease. Although there is substantial variability in assessments of conditional mortality risk, parents recognize that the disease can be fatal. The median assessments of conditional death risk are 26 chances in 100 for parents, and 22 chances in 100 for children.

The survey also included a brief section on possible consequences of contracting heart disease other than mortality, to help respondents imagine what life would be like if diagnosed with this disease. Respondents were asked whether chest pain, shortness of breath, activity limits, and the need for more medical treatment and medication could follow diagnosis of coronary artery disease. After each of these questions, respondents were advised that each outcome was in fact a common consequence of heart disease. However, most parents already were aware of these facts. For each consequence considered, over 90% of parents recognized it as a potential outcome of heart disease.

4.6 Timing of Heart Disease Risks

To communicate with respondents about the timing of heart disease risks over the life cycle, the survey employed a graphical illustration of risk for all ages between the present and age 75. The illustration used a Gompertz hazard function to approximate the empirical (Kaplan-Meier) hazards estimated by Lloyd-Jones et al. (1999) and Lloyd-Jones et al. (2006). The horizontal axis indicated years of age from the present to age 75. The vertical axis indicated risk of heart disease. The hazard function then showed the cumulative risk of contracting heart disease at any age from the present until age 75. The hazard function was constructed based on the revised assessment of risk, so that at age 75 the cumulative hazard shown on the graph was equal to the respondent's revised assessment of risk.

Specifically, the hazard function is built from the function $G(a)$, where a is an index that runs from current age to age 75 years, and where

$$G(a) = 100\left\{1 - \exp\left[\left(\frac{1-\exp\left(0.06\left(a-q\right)\right)}{1-\exp\left(0.06\left(75-q\right)\right)}\right)\ln(1-R)\right]\right\}.$$

In this equation, $q = \max\{40, \text{ Current Age}\}$ and R denotes the revised assessment of risk rescaled to the unit interval. The value of 0.06 was chosen to calibrate the function to the hazards presented by Lloyd-Jones et al.

If the current age of the parent is at least 40 years, the function $G(a)$ represents the hazard. For children and for parents younger than age 40 years, the hazard function graphed is

$$F(a) = \begin{cases} 0 & \text{for Current Age } \leq a < 40 \\ G(a) & \text{for } 40 \leq a \leq 75 \end{cases}.$$

This procedure was adopted because Lloyd-Jones et al. (1999) report a risk of coronary artery disease before age 40 years of only 1.2% for men and 0.2% for women.

Parents were shown the hazard functions representing their own risks and their children's risks over time, along with explanatory text. See Figures 4.21a(i) for the parent and 4.21b(i) for the child. When the respondent used the computer mouse to indicate a point on the hazard function above some given age, a text box would appear on the screen stating the risk of heart disease between the present and the selected age. This feature of the hazard functions is illustrated in Figures 4.21a(ii) and 4.21a(iii) for the parent, and in Figures 4.21b(ii) and 4.21b(iii) for the child.

4.7 Valuing Reductions in Heart Disease Risks

Parents valued reductions in heart disease risk by expressing purchase intentions for two hypothetical vaccines that would reduce heart disease risks. One of the vaccines reduced risk for the parent and the other reduced risk for the child. The two vaccines were presented one at a time in random order.

Parents were told that the vaccination program was not yet available and would become only after extensive testing had shown it to meet the same strict approval process used for other medications. The description indicated that the vaccines would slow the build-up of fatty deposits in the arteries; would be taken by injection annually in conjunction with a medical exam with a doctor of their choosing; would provide additional protection from heart disease over and above the benefits that could be obtained from eating right and getting enough exercise; and would be more beneficial when started at younger ages. Parents were told that possible side effects included soreness in the arm, fatigue and slight stomach upset and that these effects generally disappeared in 1-2 days. Many elements of the description of the vaccines were developed based on the focus group input described previously.

As the vaccines were described, their effectiveness was varied randomly across parents and children, so that parents in the main study would experience risk reductions of 10% or 70% of their revised risk assessment, and children would experience risk reductions of 20% or 80%. In the soft launch, risk reductions were 10%, 35% or 60% for parents and 40%, 65% or 90% for children. Each parent in a matched pair was assigned the same percentage risk reduction for the child. Parents were told that risk reductions would be larger for children because the vaccination program produced greater benefits the earlier in life that it was initiated. Correspondingly the risk reduction assigned to each parent was smaller than the risk reduction assigned to the child.

Each parent was asked to read the description of each vaccine and then was shown the previously marked risk scales for herself or for her child, which now indicated the risk reduction that the vaccine would offer and the amount of risk remaining if the vaccine was purchased. In this way parents received information about vaccine effectiveness in terms of both percentage and absolute risk reductions. Figures 4.22a and 4.22b show examples of risk scales representing risk reductions of 20% for the child and 10% for the parent.

Parents were also shown how the vaccine would shift the hazard function down, resulting in lower risks over time. The graph was constructed based on the assumption that the vaccine would reduce risk proportionately in each year. Each parent was asked to use the cursor to indicate points on the hazard functions. This would cause a text box to appear that would indicate the cumulative risk at the chosen age with or without the vaccine. In this way parents could evaluate the risk reduction for each year of age between the present and age 75 years. See Figures 4.23a(i) through 4.23b(iii).

For the vaccine that would reduce the child's risk, parents were asked, "Would you be willing to pay $P to put your child in the heart disease vaccination program for the first year?" In the main study the value of $P was randomly chosen from the five values $10, $20, $40, $80, $160, whereas in the soft launch the price was randomly chosen from $5, $10, $20, $40, $80. Each parent in a matched pair was assigned the same price. Parents were asked to consider that putting the child in the vaccination program would mean that they would have less money to pay for other family members to participate and to buy all other things. Also, parents were advised to consider that the full prevention benefit of the vaccine would occur only if the child continued to participate in the program in future years.

Parents who indicated that they were willing to pay $P were asked a follow-up question about the certainty of their intention to purchase: "You said that you would pay $P for your child to be in the heart disease prevention program for the first year. If the program was actually available, how certain are you that you would really do this?" Three answer options were provided to allow respondents to indicate whether they were uncertain, or would probably or definitely pay. Numerous studies have shown that hypothetical bias can be eliminated by treating respondents who are not very certain of their intention to pay as if they were not willing to pay (Blumenschein et al. 1998, 2001, 2008, Champ et al. 1997, Champ and Bishop 2001).

A parallel procedure was used to elicit purchase intentions for the vaccine to reduce the parent's risk. The price of the vaccine for the parent was the same as the price for the child.

Parents' purchase intentions for vaccines to reduce heart disease risks are summarized in Figure 4.24a and 4.24b. In these figures, parents who responded positively to the initial willingness to pay question are considered to have expressed intention to purchase a vaccine, regardless of the certainty of intention that was expressed in the follow-up question. Figure 4.24a pertains to the soft launch and Figure 4.24b pertains to the main study. In the soft launch, there was a general tendency for the proportion of parents who said that they would buy the vaccine to increase as the size of risk reduction increased or the price decreased. At some prices, however, there was little or no increase in stated purchase intentions between the intermediate and largest risk reduction considered. The 90% risk reduction for children appears particularly problematic in this regard, perhaps because parents viewed such a large risk reduction as implausible. Also, stated purchase intentions were quite high at the lowest price of $5 and remained relatively high even at the highest price of $80.

As discussed previously, the risk reductions and prices were revised for the main study in light of results from the soft launch. Specifically, the number of risk reductions included in the design was reduced from three to two for both parents and children, to increase the contrast between smaller and larger risk reductions. The 90% risk reduction for children was abandoned. Finally, the lowest price was removed from the design and the highest price was increased to $160, because stated preference data tend to be more informative when the overall proportion of respondents stating positive purchase intentions is close to one-half.

As shown in Figure 4.24b, parents in the main study were more likely to state that they would purchase vaccines that offered larger risk reductions or that had lower prices. This indicates that results pass the basic tests for validity of stated preference valuations, sensitivity to size of risk reduction and sensitivity to price. Figure 4.25 summarizes responses to the follow-up question about certainty of intention to purchase vaccines to reduce heart disease risks. Responses are pooled over all risk changes and all prices using data from both the soft launch and the main study. About 58% of parents indicated that they would not buy the vaccine to reduce their own risks of heart disease, and about 54% of parents said that they would not buy the vaccine to reduce the child's risk. About 5-6% percent of parents indicated on follow-up that they were uncertain about their purchase intentions, 22-24% indicated that they would "probably" buy the vaccine, and 15-16% indicated that they would "definitely" buy the vaccine if it were available. Willingness-to-pay responses are analyzed further in Chapter 6.

Parents also were asked why they would or would not choose to participate in the vaccination program for themselves and for their sample children. Parents were offered a list of possible reasons, including "some other reason," and could select all that applied. The answer options and responses are summarized in Table 4.4. Among parents who stated that they were willing to pay for a vaccine, the modal reason was that the risk reduction was worth the expense. Three-quarters of parents who said that they would purchase the vaccine to reduce their own risk agreed with this reason, along two-thirds of parents who said that they would purchase the vaccine to reduce the child's risk. Half of parents who would purchase the vaccine for the child indicated that starting to reduce heart disease risk when young was a reason; one-third of parents gave this as a reason for buying the vaccine to reduce their own risk. A third of those who said they would buy the vaccine for the child said that they would spend "whatever it takes" to reduce the child's risk, compared to just over one-eighth who gave this as a reason for buying the vaccine to reduce the parent's risk.

Among parents who stated that they were not willing to pay for a vaccine, the modal reason, given by half of parents, was that one could reduce heart disease risk without the program. A quarter of parents who did not buy a vaccine indicated that they were not that worried about heart disease risk, and one-fifth indicated that they did not believe that the program would work as described. Parents who declined the vaccine to reduce the child's risk said that the risk was too far in the future to worry about in one-fourth of cases. This reason was offered in about one-sixth of cases in which the vaccine to reduce the parent's risk was declined.

After expressing purchase intentions for the vaccine to reduce the child's risk, married and cohabitating parents were asked whether they thought that their spouse or partner would agree with their decision about the child's vaccine. The anticipated agreement was quite high, with 93% of parents indicating an expectation that the spouse or partner would agree with the decision. Decision-making among married parents was examined further in the final part of the survey.

4.8 Decision-making among Married Parents

The last part of the survey examined resource allocation decisions among married or cohabitating parents only. This portion of the survey was not administered to single parents.

Married/partnered parents were reminded that the child would have to stay on the vaccination program for many years to get the full benefit of the program. The survey then pointed out that during that time, the family's financial situation might change. Parents were then asked to consider whether their decision about the child's possible participation in the vaccination program would change, given a hypothetical change in income. The income change consisted of a hypothetical redistribution of income between spouses that would result in an increase or decrease in total family resources available for consumption and risk reduction efforts.

A parent who had indicated probable or definite intention to buy the vaccine for the child was assigned an increase in exogenous expenditure, and the spouse or partner was assigned an increase in income. The changes in expenditure and income were described as follows: "Suppose that you personally had a new expense. For example, suppose that you felt obligated to give financial help to a relative on your side of the family, or that you had an expensive medical procedure, or that you lost money on an investment that you personally had made. Suppose that the total cost to you is $X per year, for the next year." The value of $X was randomly assigned as either 2% or 10% of the total family income reported by the respondent. "At the same time, suppose that your (spouse/partner) unexpectedly received an additional $Y of income per year for the next year." The value of $Y was randomly assigned as either 50% smaller or 50% larger than $X.

Thus, family income would increase in about half of cases and decrease in about half of cases. Parents then were asked, "If you had extra expense of $X per year and your spouse (partner) had extra income of $Y per year, for the next year, would you be willing to pay $P for your child to enroll in the prevention program for the first year?"

For cases in which the respondent would not purchase the vaccine for the child or was uncertain about purchase intentions, the respondent was assigned an increase in income, and the spouse or partner was assigned an increase in exogenous expenditure. The descriptions of the income and expenditure increases reversed the roles of respondent and spouse relative to the descriptions given above. Overall, only 13% of parents changed their decision about purchasing the vaccine for the child after the hypothetical redistribution of income. Responses to the hypothetical redistribution of income are analyzed in Chapter 6.

Married and partnered parents also were asked who took primary responsibility for making health care decisions for the child. About 73% of parents reported that they and their spouses or partners shared responsibility, 23% indicated that they took primary responsibility, and the remaining 5% said that their spouses or partners were the main decision makers. Finally, the survey asked parents for the largest amount of money they would be willing to spend on themselves during one month, without consulting their spouse or partner. The median amount reported was $100 for both men and women.

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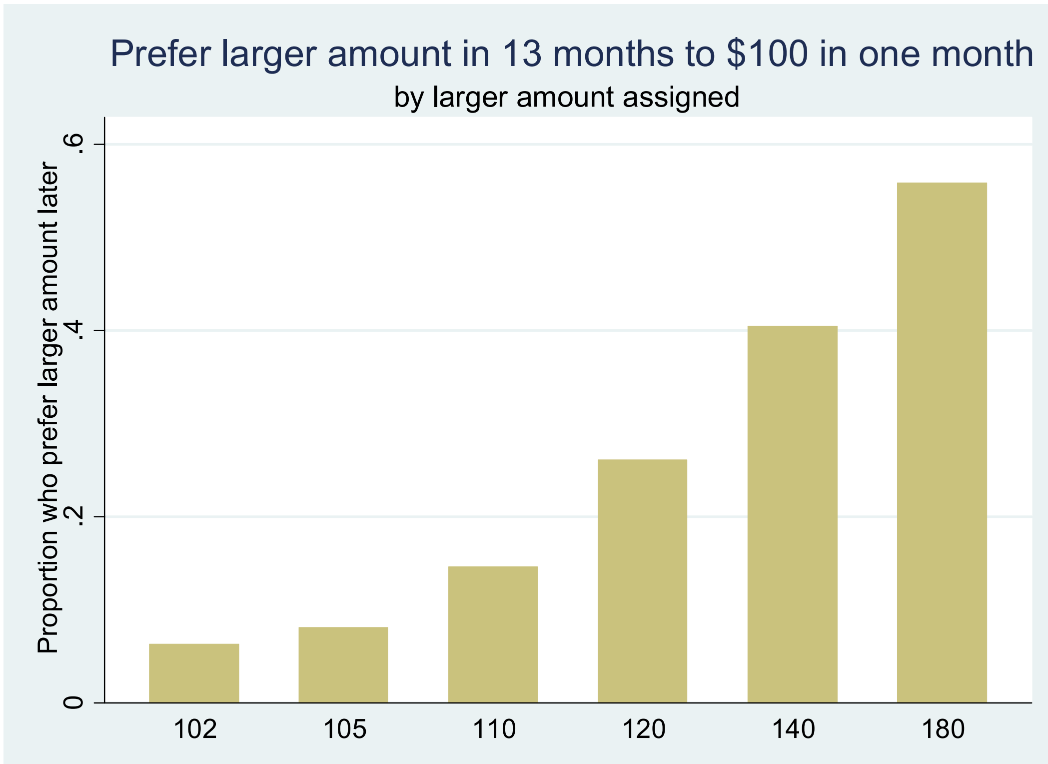
Figure 4.0a. Initial Screen after "Explanation of Research."

> The questions in the survey require more thoughtful consideration from you than some other surveys. Therefore, please complete the survey at a time when you can give it your full attention and when you can complete it in one sitting. We thank you in advance for your time and your careful attention to this survey.
>
> I agree to give the survey my full attention and to complete it in one sitting. ☑

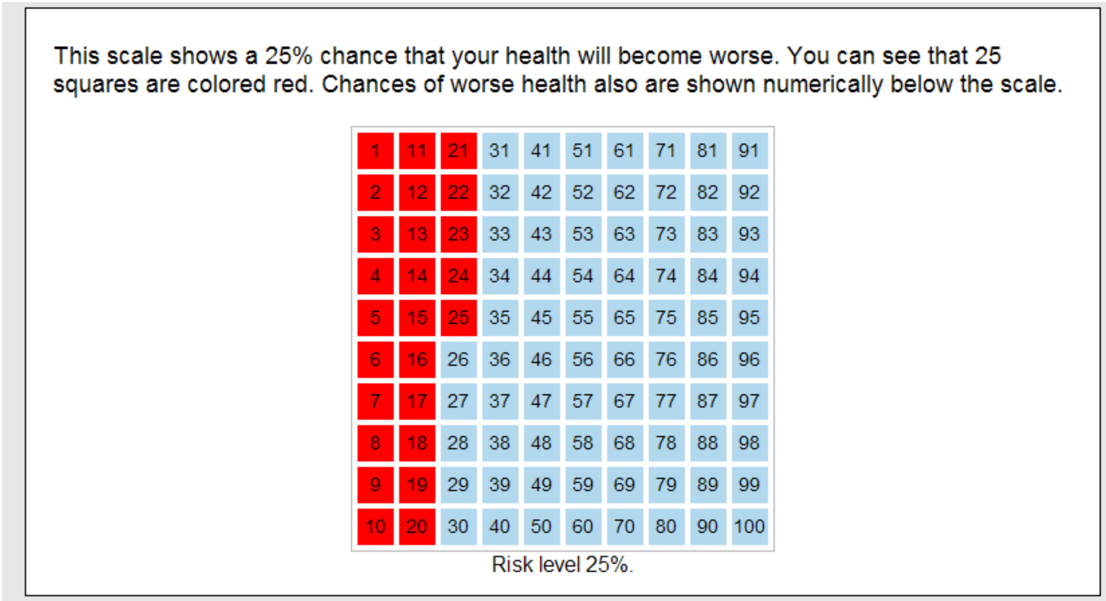
Figure 4.0b. Example of Reminder Encouraging Thoughtful Attention.

> In the remainder of this survey, we'll ask questions about you and about this child – your biological child aged 11 years old who lives with you.
>
> We ask you that you take your time in answering these survey questions and read carefully all the information given to you.

Figure 4.1. Parents' Time Preferences for Money.
Proportion of parents who would prefer to receive the larger amount on the horizontal axis in 13 months instead of $100 in one month. (Note: one larger amount randomly assigned to each respondent.)



Figures 4.2. Examples of Practice Risk Scales.



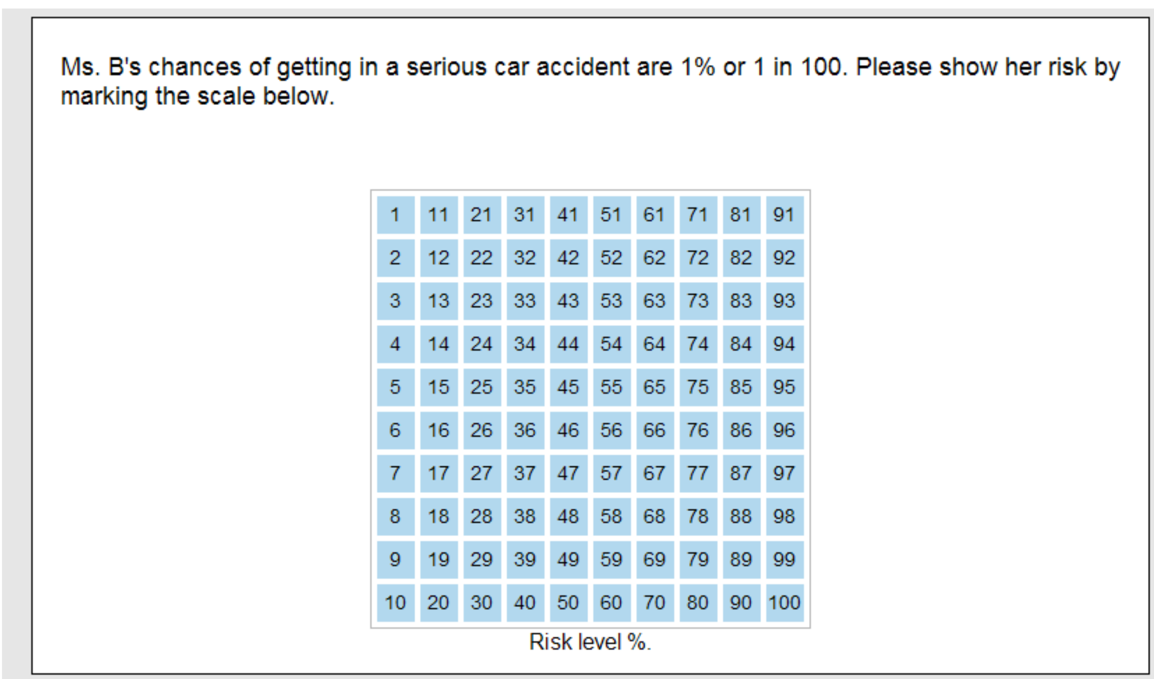
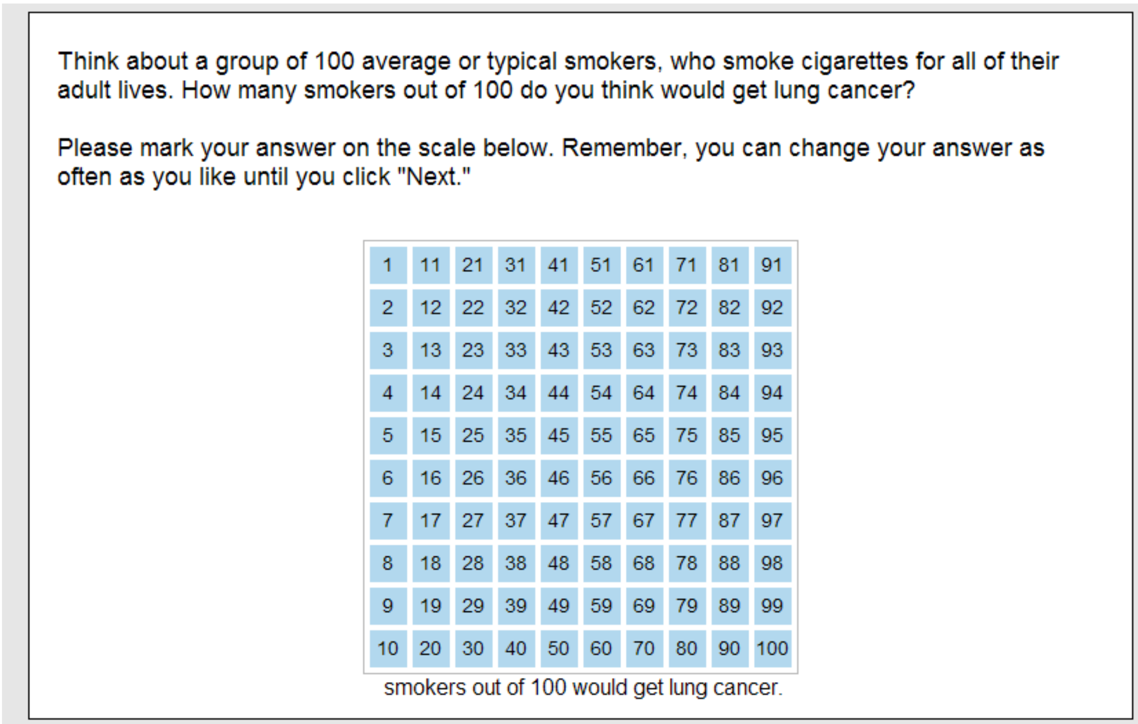


Figure 4.3a. Risk Scale Used to Elicit Parents' Perceptions of Lung Cancer Risks of Smoking.


Think about a group of 100 average or typical smokers, who smoke cigarettes for all of their adult lives. How many smokers out of 100 do you think would get lung cancer?

Please mark your answer on the scale below. Remember, you can change your answer as often as you like until you click "Next."

1	11	21	31	41	51	61	71	81	91
2	12	22	32	42	52	62	72	82	92
3	13	23	33	43	53	63	73	83	93
4	14	24	34	44	54	64	74	84	94
5	15	25	35	45	55	65	75	85	95
6	16	26	36	46	56	66	76	86	96
7	17	27	37	47	57	67	77	87	97
8	18	28	38	48	58	68	78	88	98
9	19	29	39	49	59	69	79	89	99
10	20	30	40	50	60	70	80	90	100

smokers out of 100 would get lung cancer.

Figure 4.3b. Example of Risk Scale Used to Elicit Parents' Perceptions of Lung Cancer Risks of Smoking, Showing Response of 51 of 100 Smokers Getting Lung Cancer.

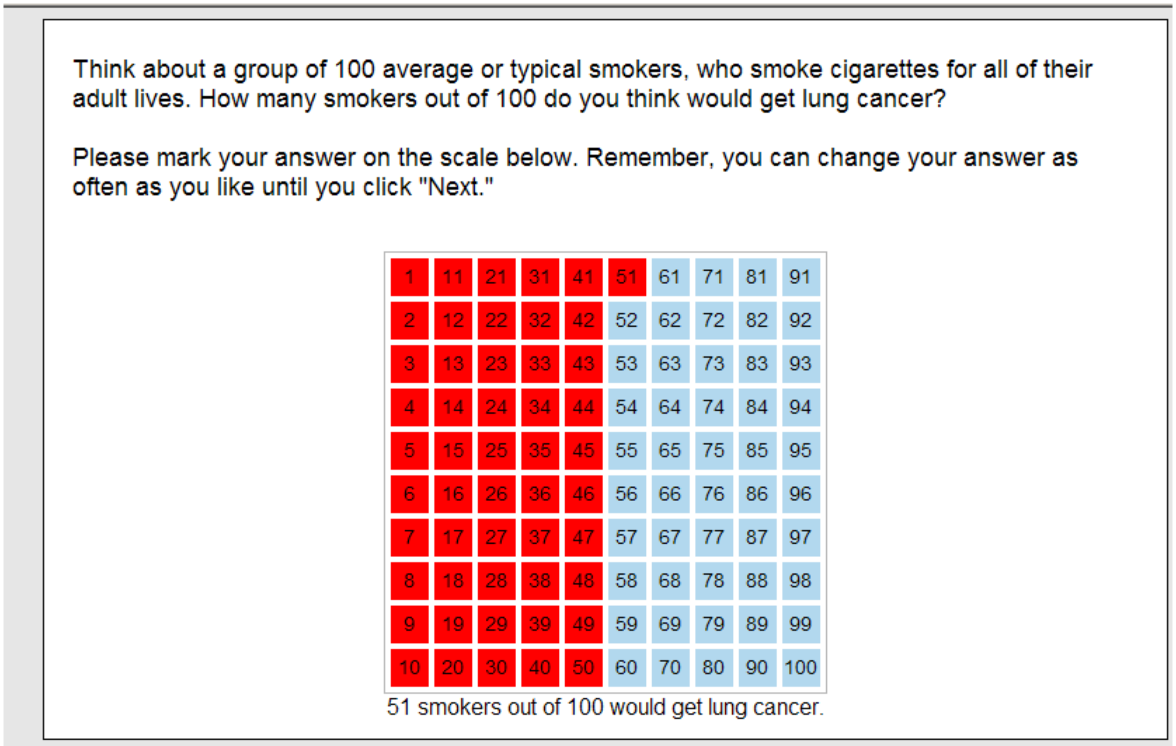


Figure 4.3c. Example of Risk Scale Used to Elicit Parents' Perceptions of Conditional Death Risk from Lung Cancer, Showing Response of 55 Deaths per 100 Diagnosed.

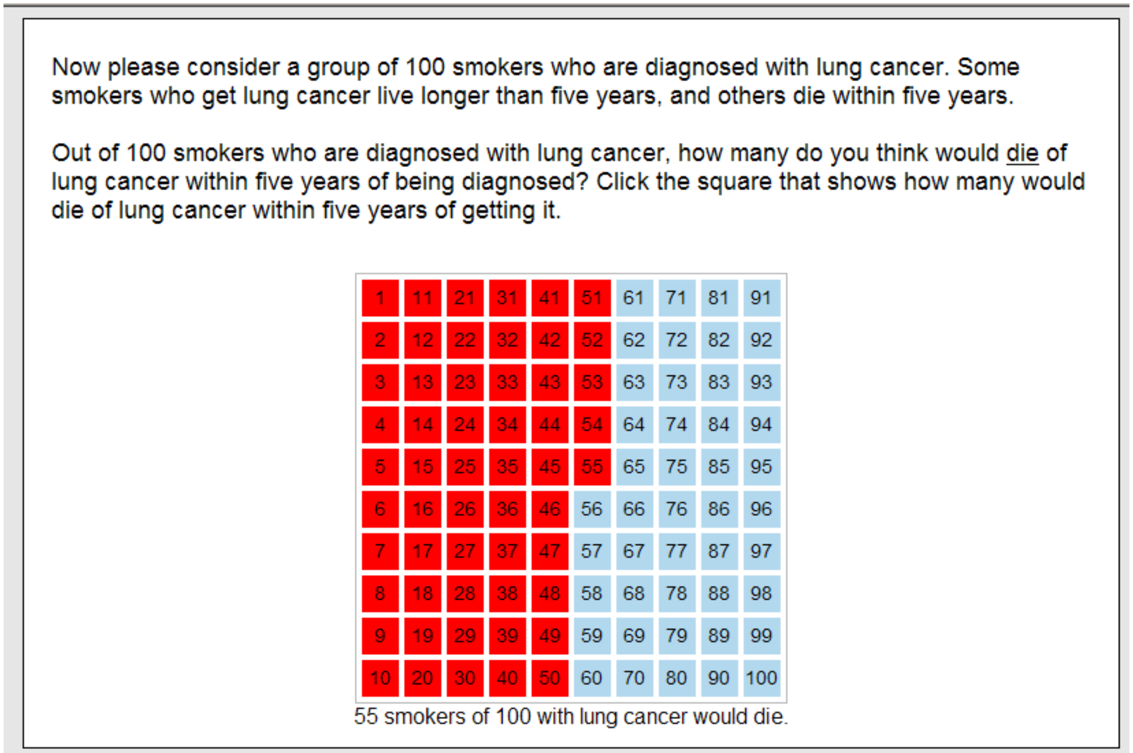
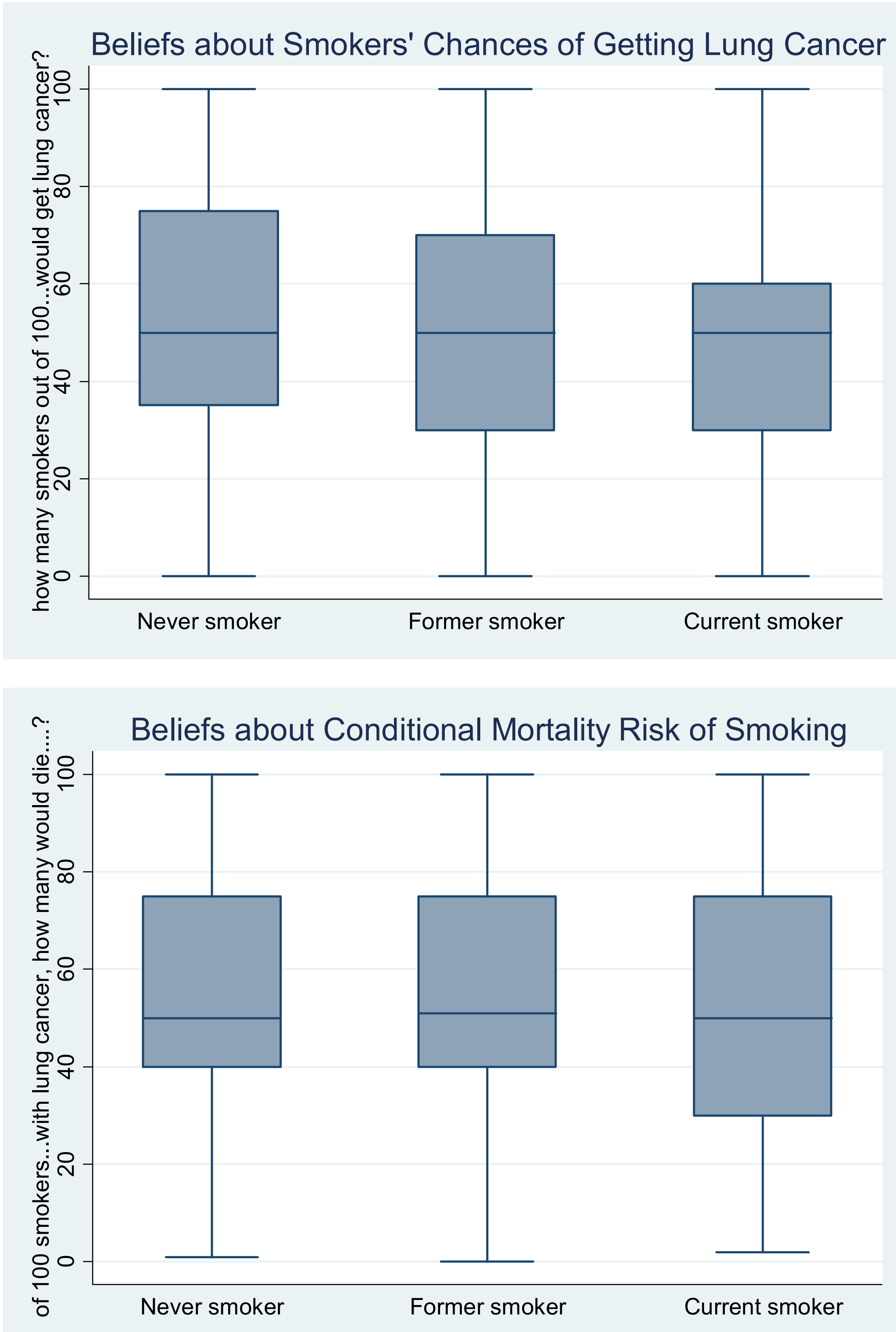


Figure 4.3d. Parents' Perceptions of Lung Cancer Risks of Smoking.



Note for Figure 4.3d. The figure shows a “box-and-whisker plot.” The top and bottom of each box denote the value of risk assessments at the 75th and 25th percentiles, respectively, while the horizontal line in the interior of the box shows the median. The top and bottom of each “whisker” (the vertical lines bisecting the boxes) denote the largest and smallest sample values lying within 1.5 inter-quartile ranges of the third and first quartiles, respectively, provided this value lies within the range (0 to 100) of the risk assessment. Outliers are defined as values greater than 1.5 IQ ranges above the third quartile or smaller than 1.5 IQ ranges below the first quartile. Outliers, if any, are shown by small dots above or below the whiskers.

Figure 4.4a. Risk Scale Used to Elicit Subjective Assessments of Risk of Heart Disease for Parent.

How many chances in 100 do you think you have of getting coronary artery disease before you reach age 75? Please mark the scale to show your answer.

1	11	21	31	41	51	61	71	81	91
2	12	22	32	42	52	62	72	82	92
3	13	23	33	43	53	63	73	83	93
4	14	24	34	44	54	64	74	84	94
5	15	25	35	45	55	65	75	85	95
6	16	26	36	46	56	66	76	86	96
7	17	27	37	47	57	67	77	87	97
8	18	28	38	48	58	68	78	88	98
9	19	29	39	49	59	69	79	89	99
10	20	30	40	50	60	70	80	90	100

Risk level % chance of heart disease.

Figure 4.4b. Example of Risk Scale Used to Elicit Subjective Assessments of Parent Risk, Showing Response of 36 Chances in 100.

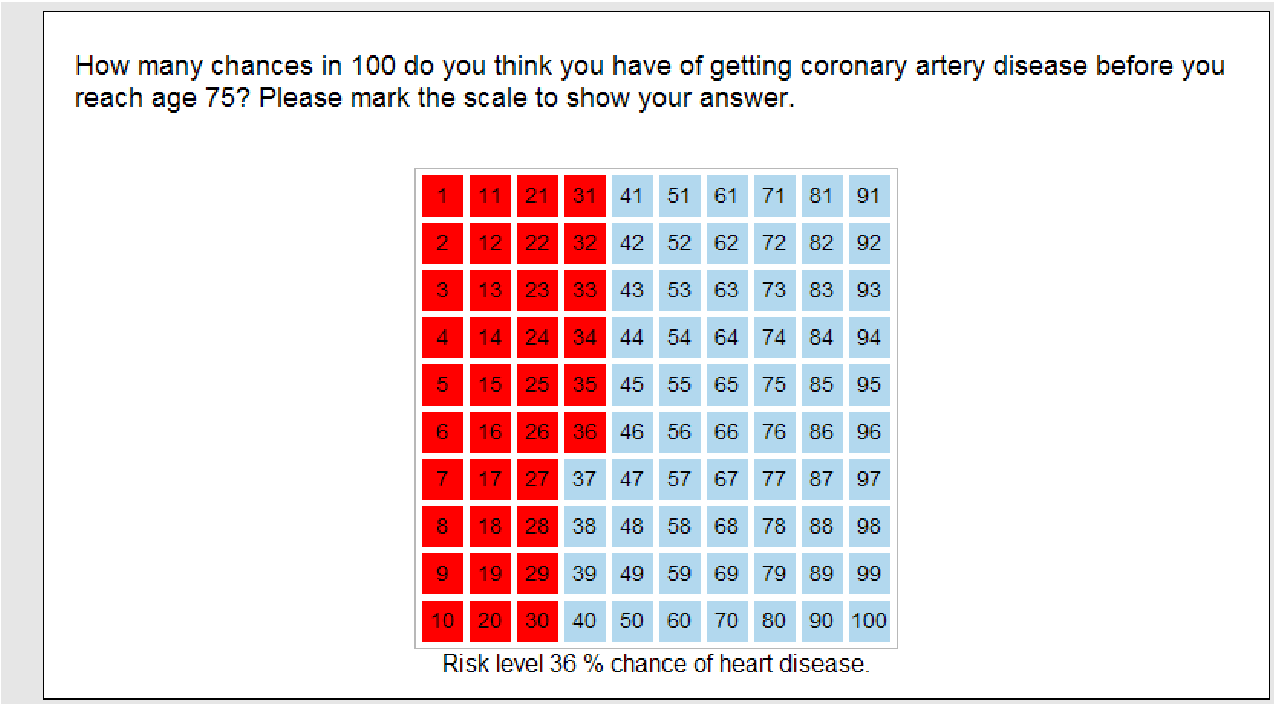
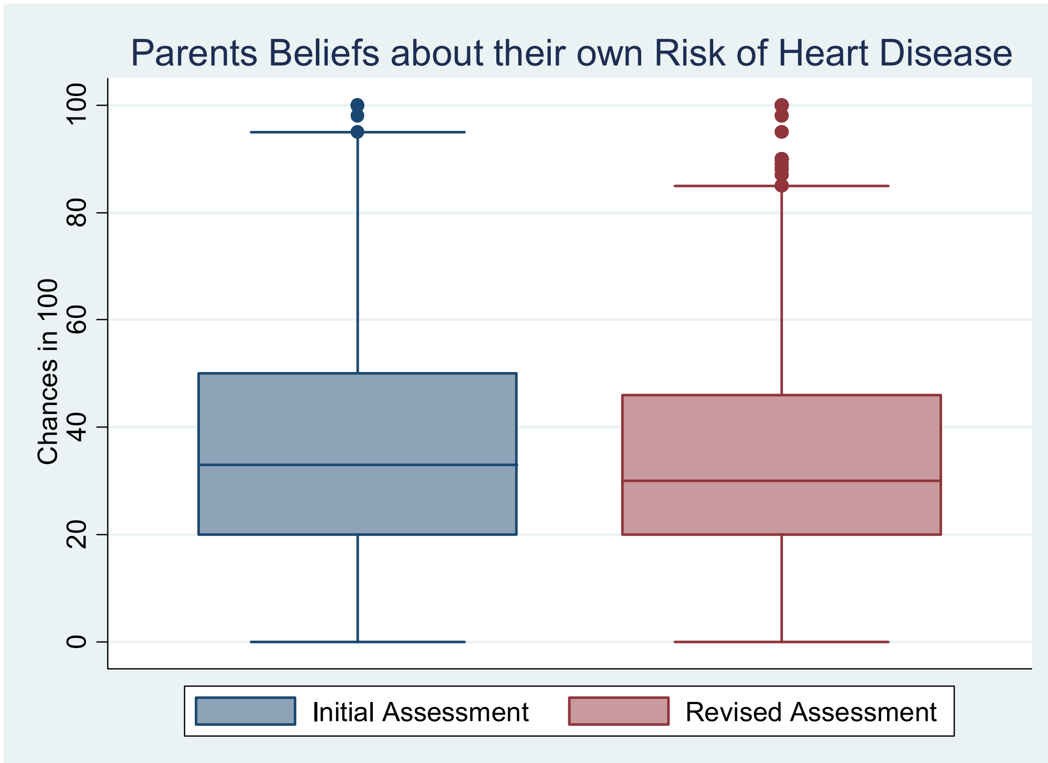


Figure 4.4c. Parents' Assessments of Risks of Getting Heart Disease.



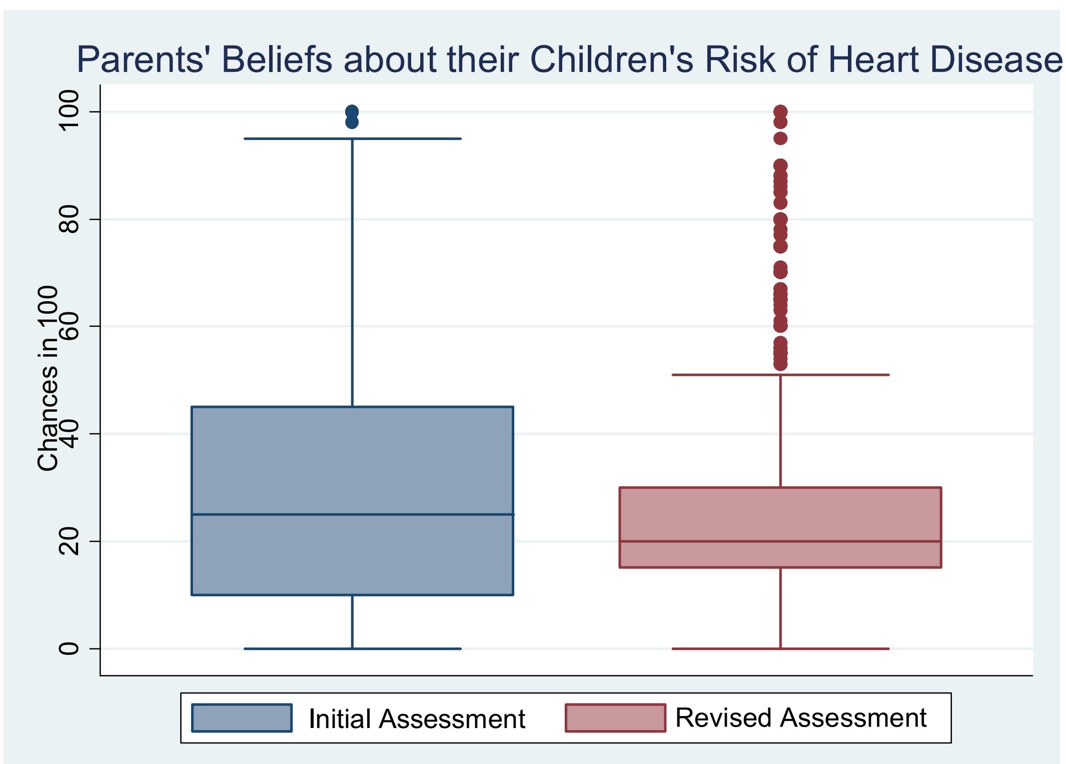


Fig 4.5. Display of Perceived and Average Risks.

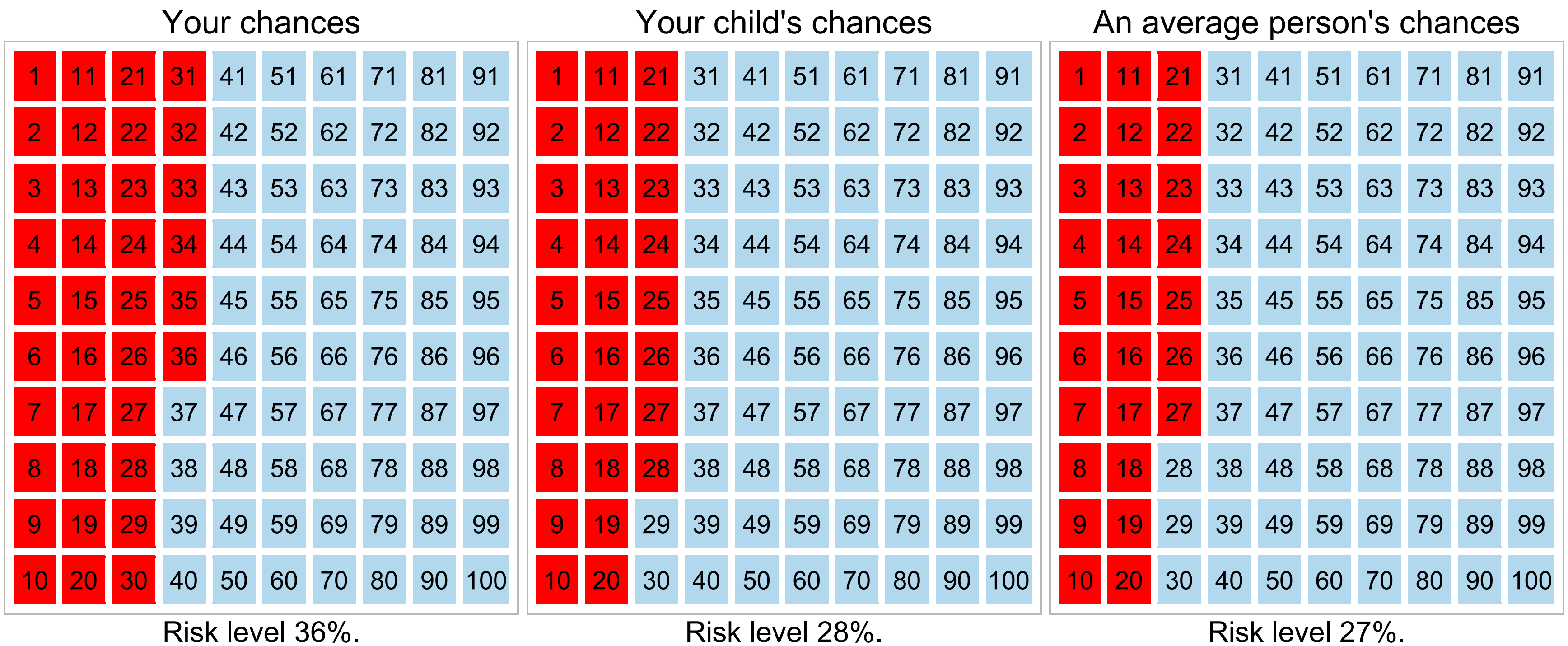


Figure 4.6a. Display of Average Risks by Gender.

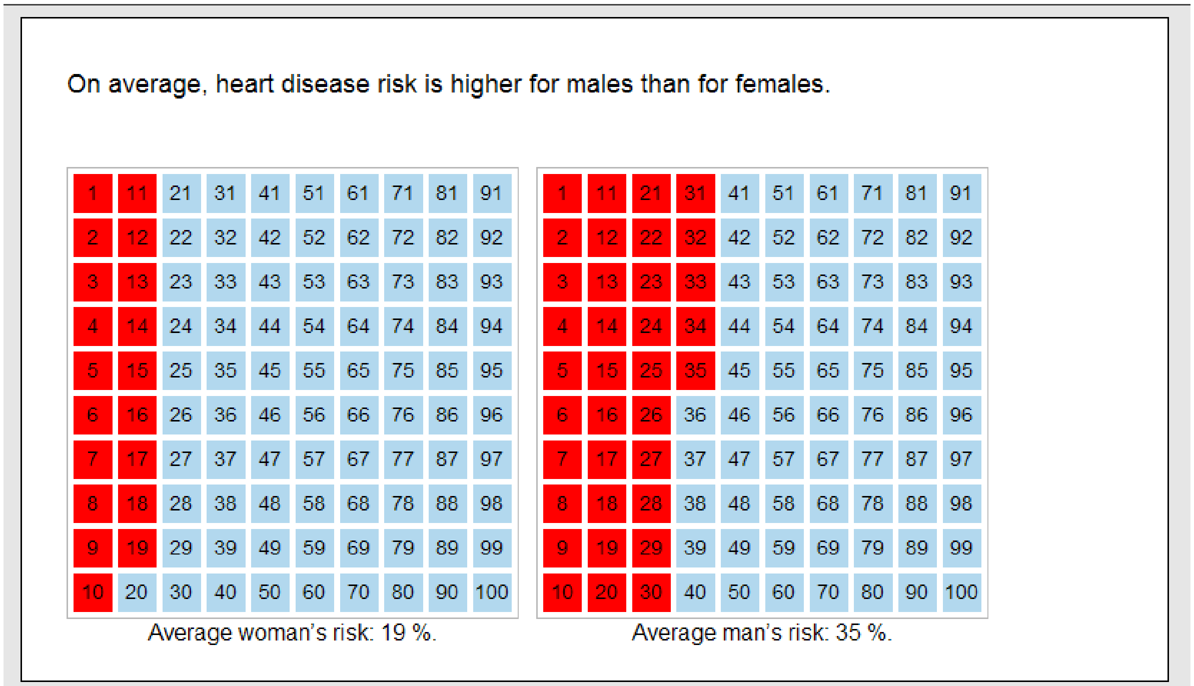
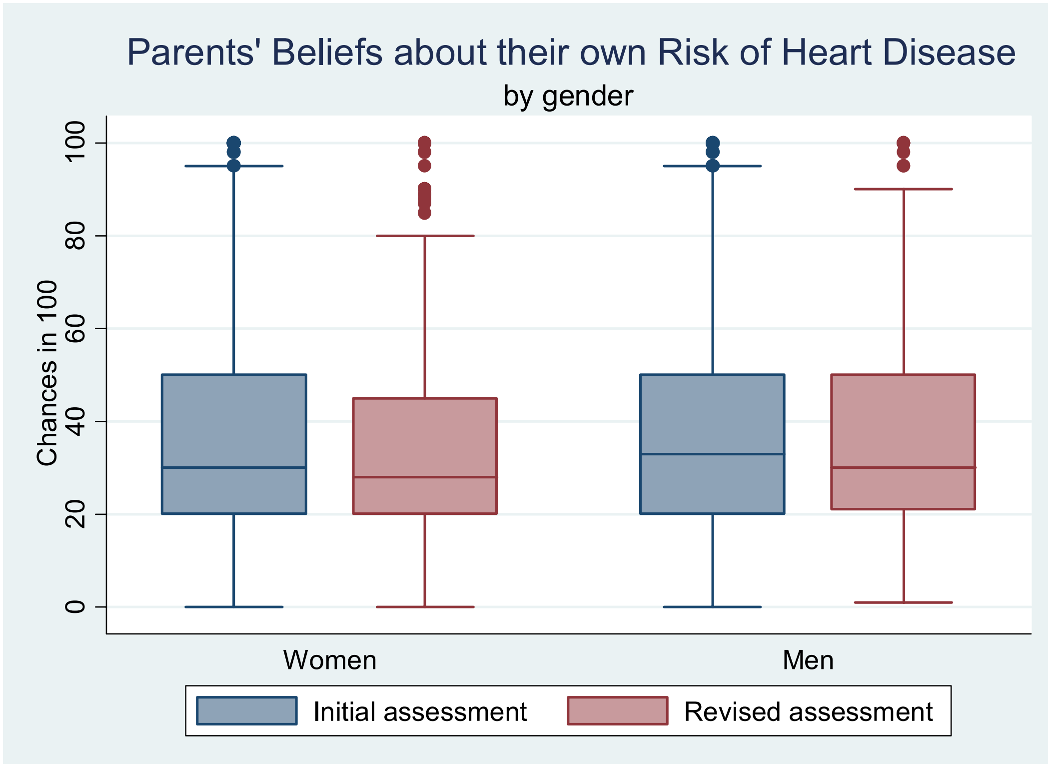


Figure 4.6b. Parents' Risk Beliefs by Gender.



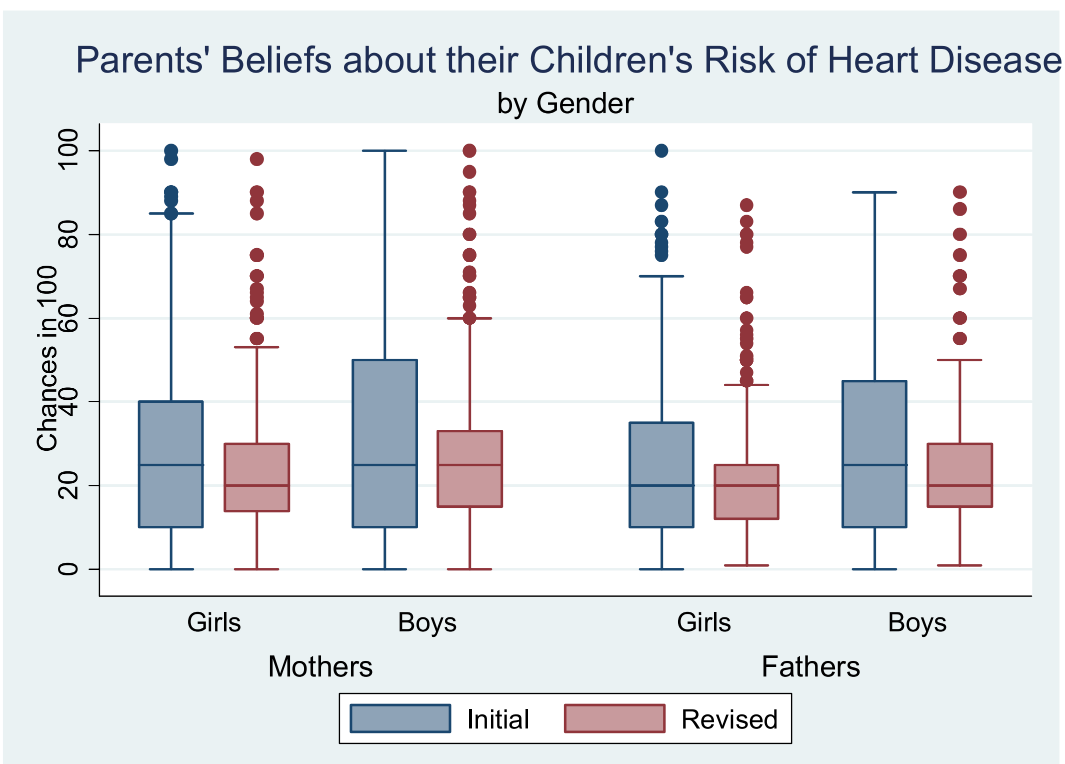


Figure 4.7a. Display of Risk Information by Smoking Status.

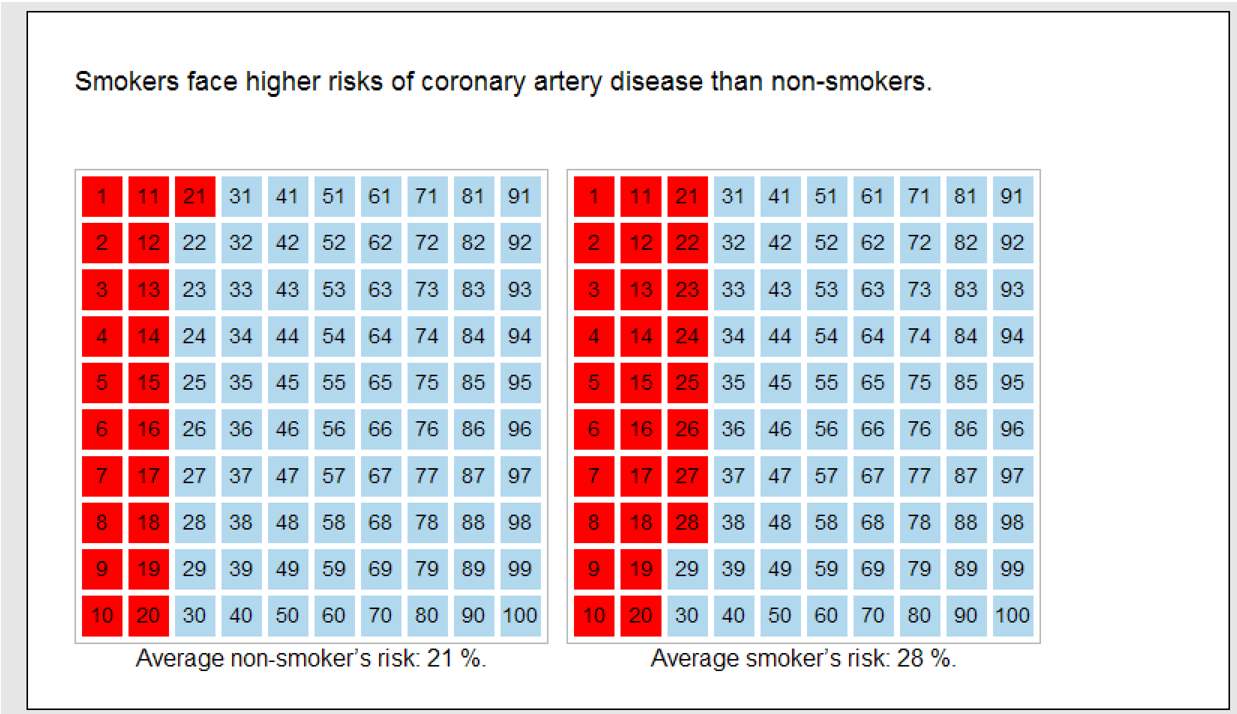


Figure 4.7b. Parents' Risk Beliefs by Smoking Status.

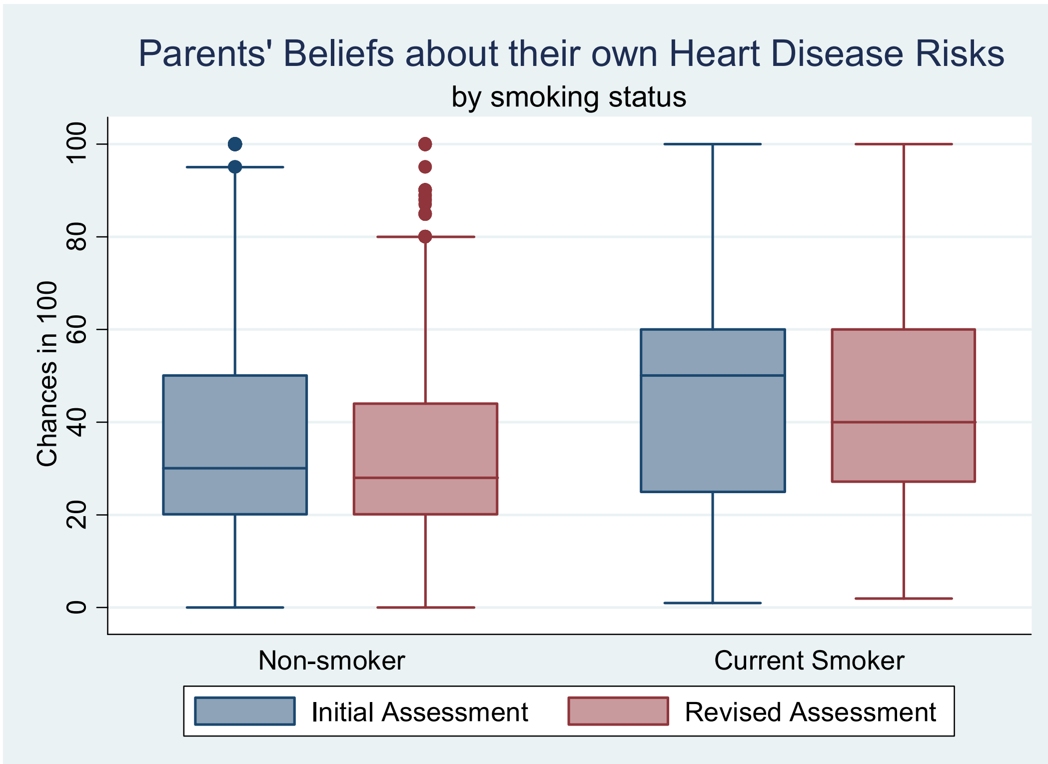


Figure 4.8a. Introductory Screen to "Current Health Status" Section Showing Checklist Used to Indicate Progress through Examination of Risk Factors.

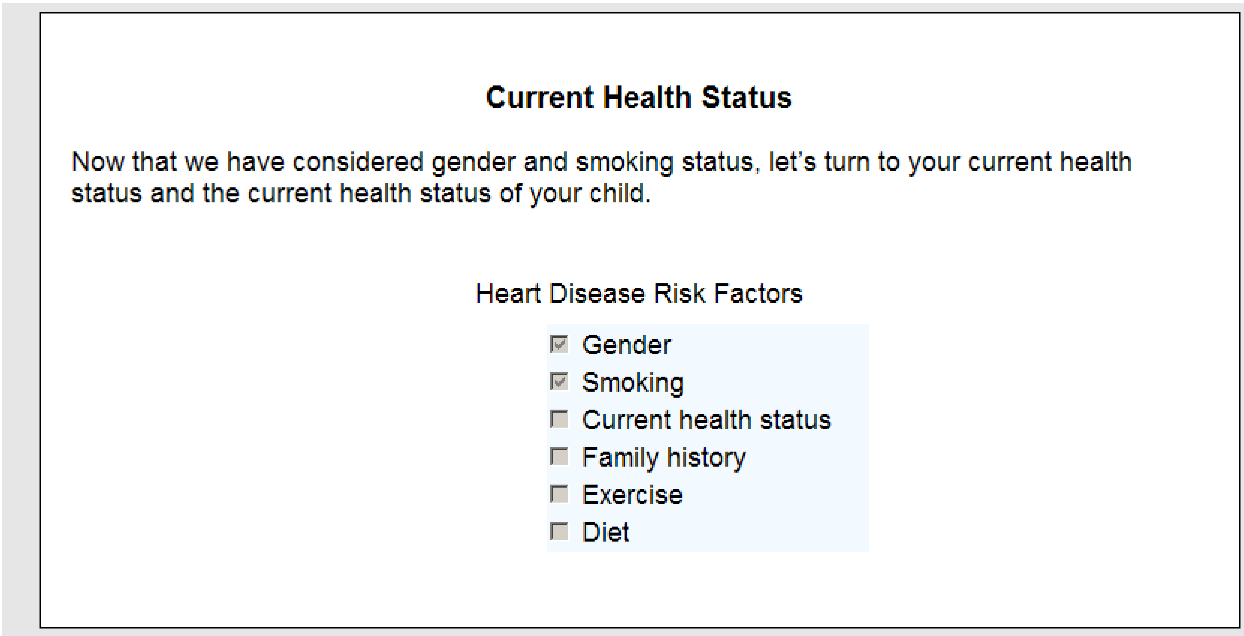
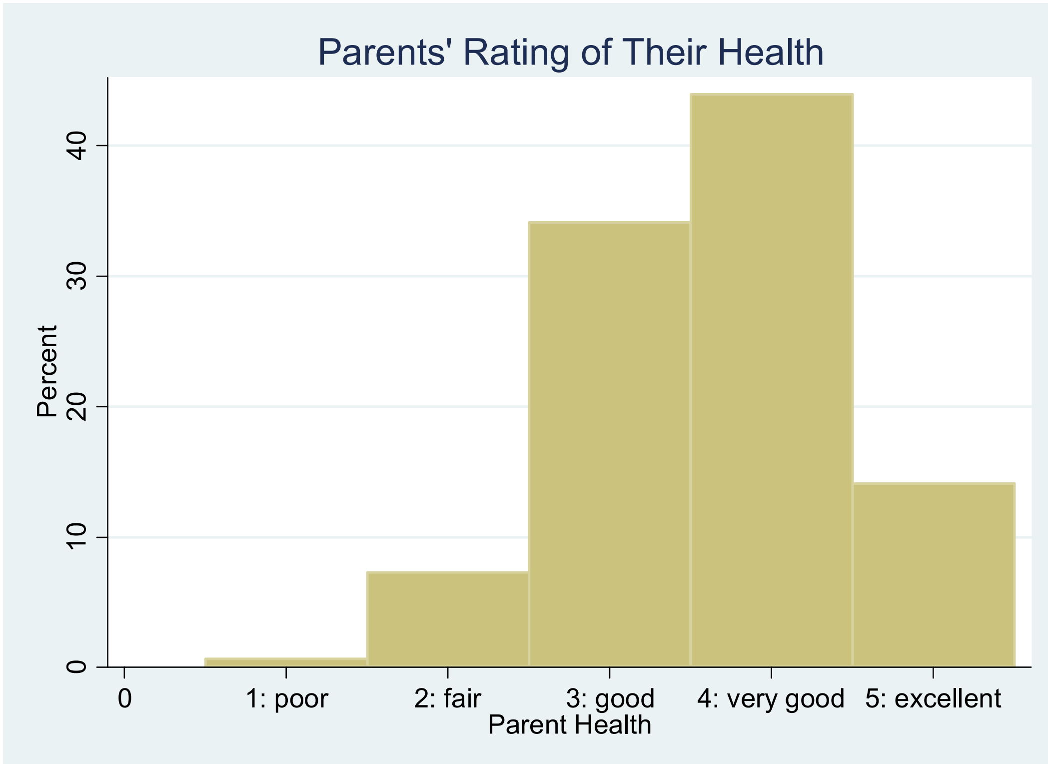


Figure 4.8b. Parents' Subjective Evaluation of Health: Relative Frequency.



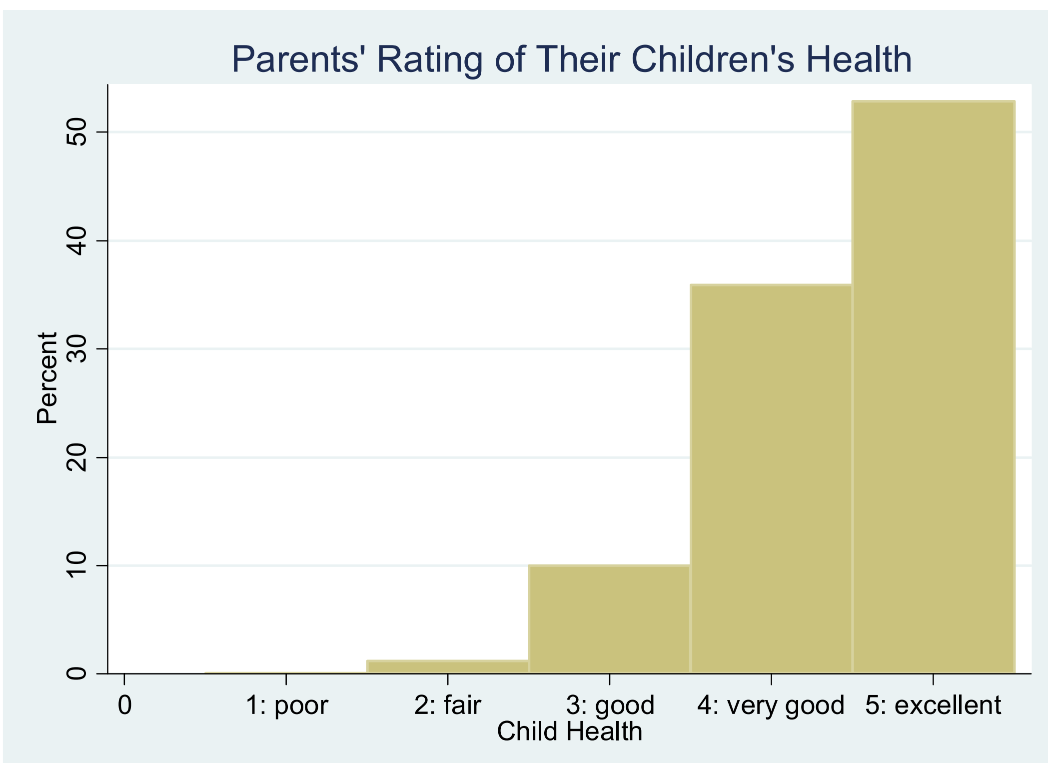


Figure 4.9a. Display of Risk Information by Blood Pressure.

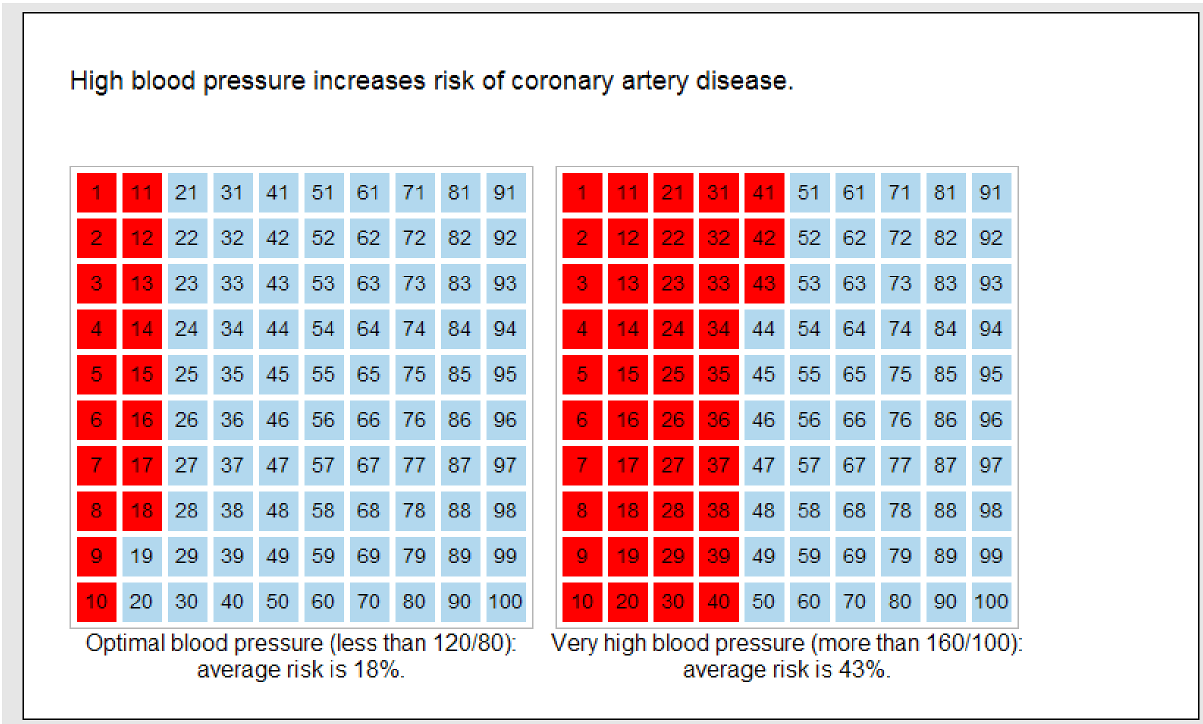
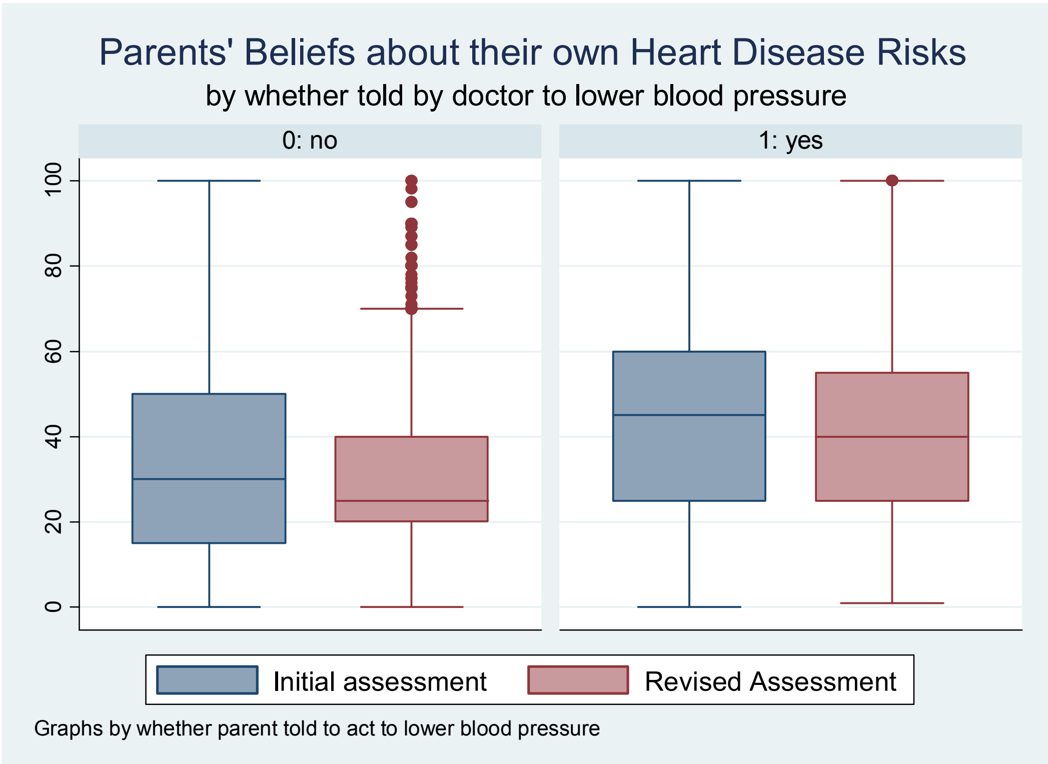


Figure 4.9b. Parents' Risk Beliefs by Blood Pressure.



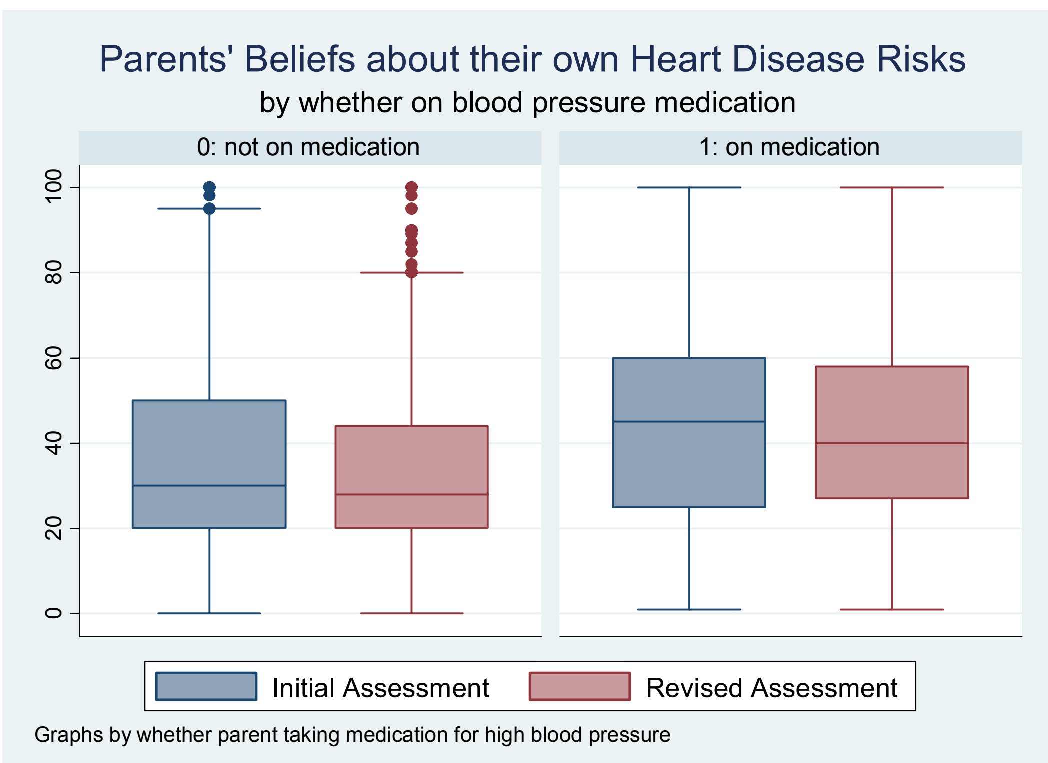


Figure 4.10a. Display of Risk Information by Cholesterol.

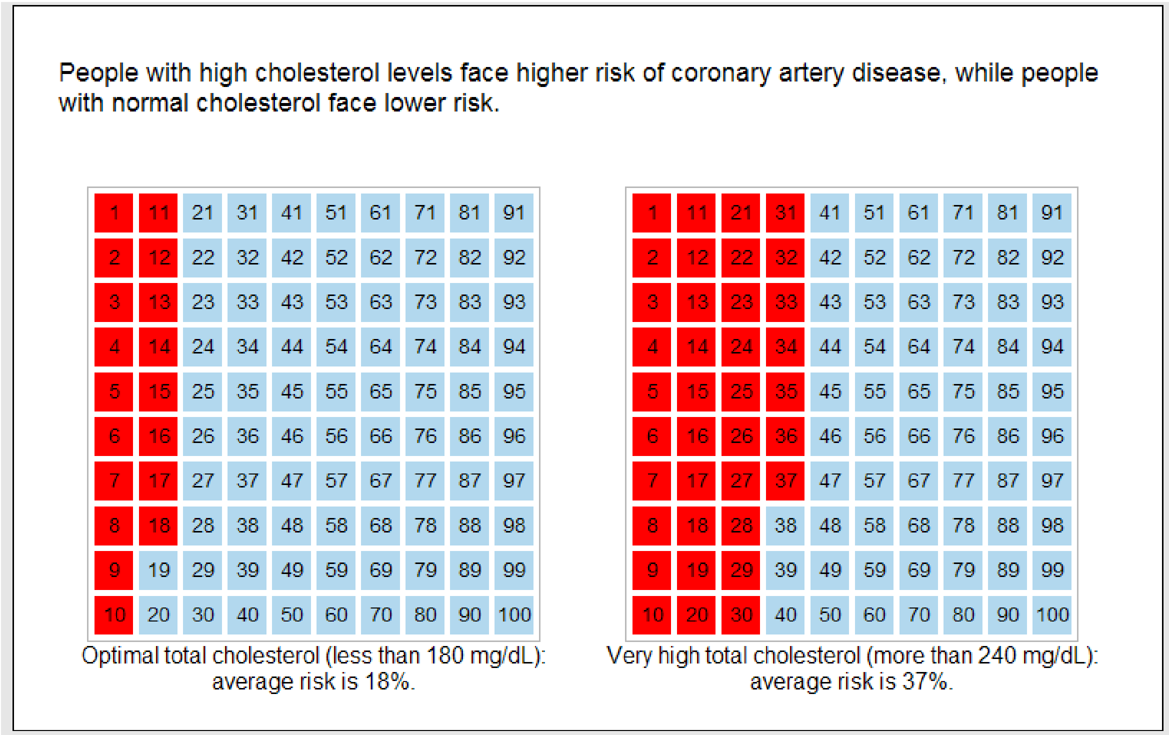
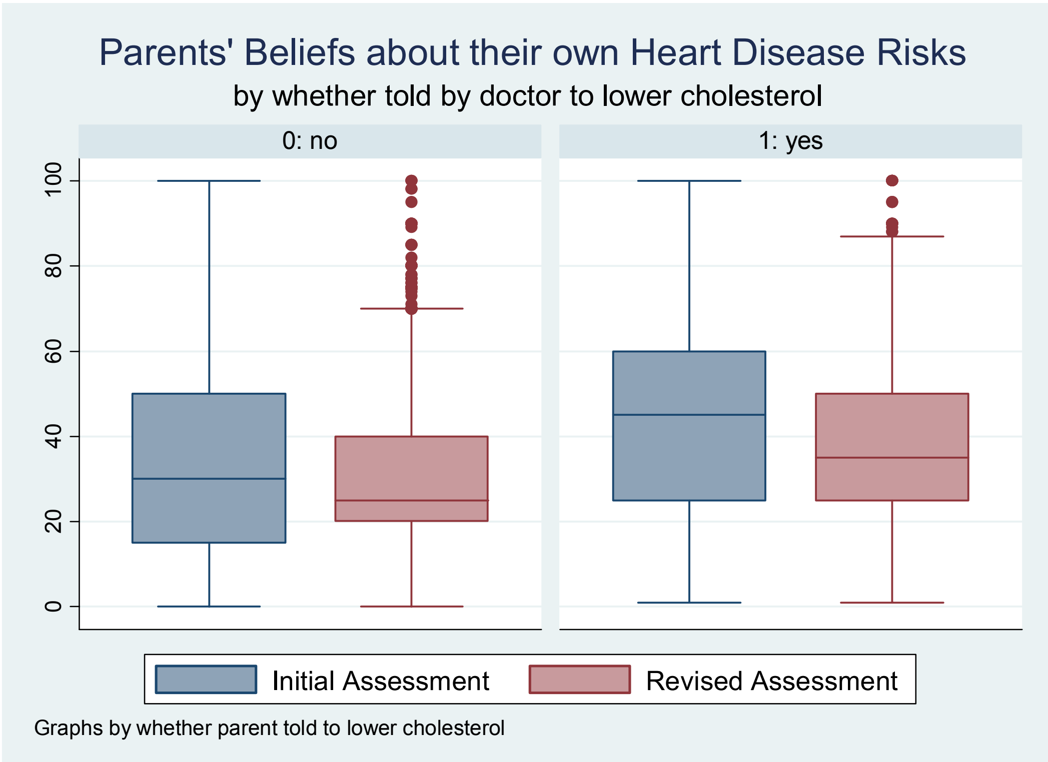


Figure 4.10b. Parents' Risk Beliefs by Cholesterol.



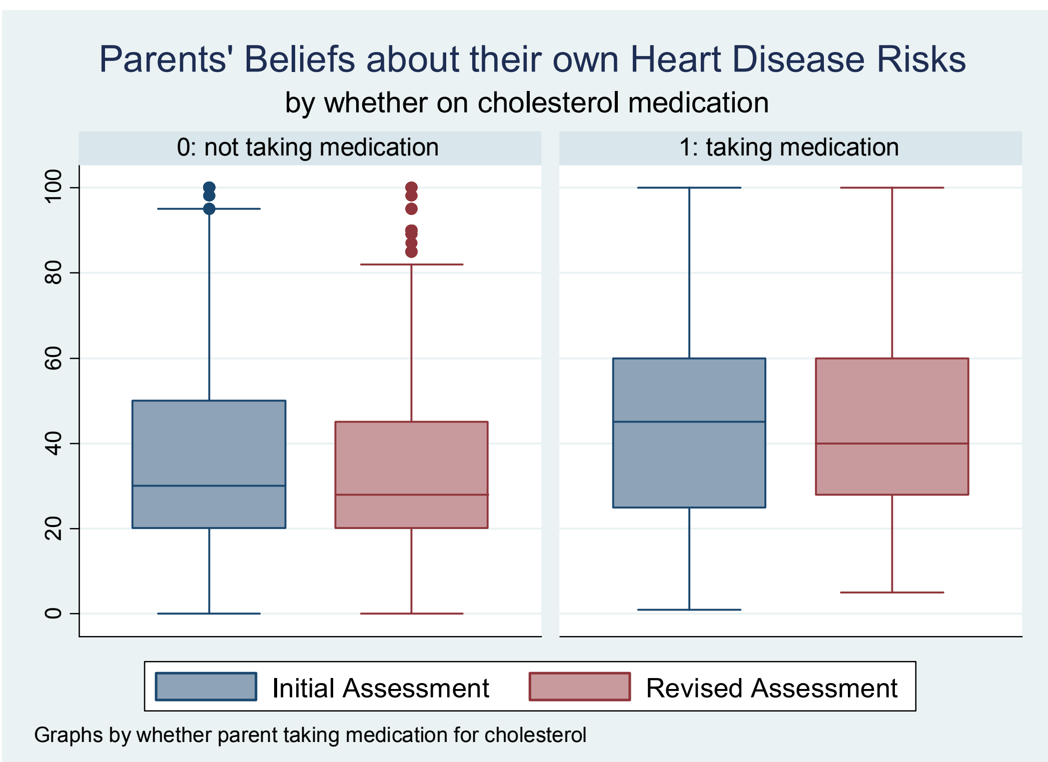


Figure 4.11a. Display of Risk Information by Diabetes.

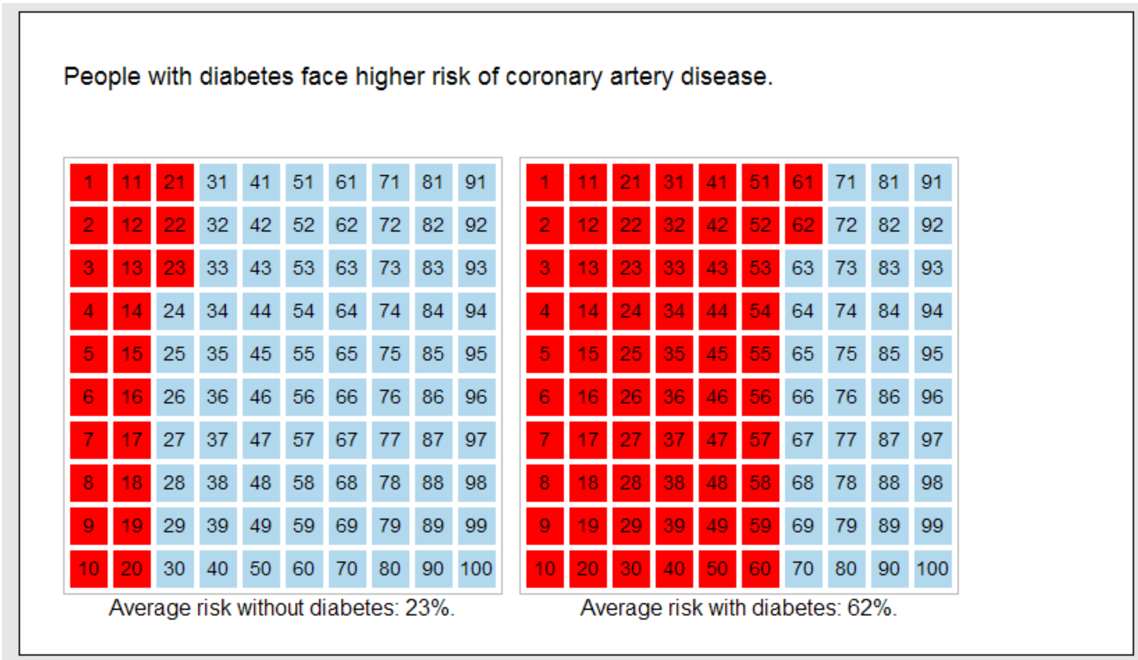
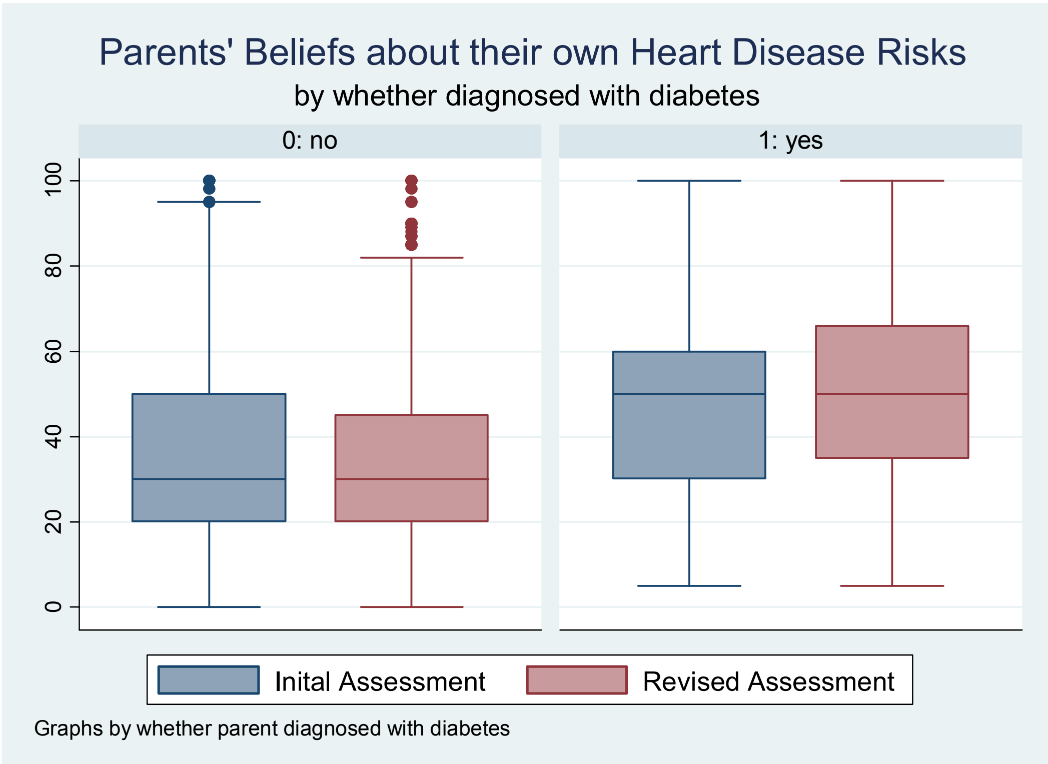


Figure 4.11b. Parents’ Risk Beliefs by Diabetes.



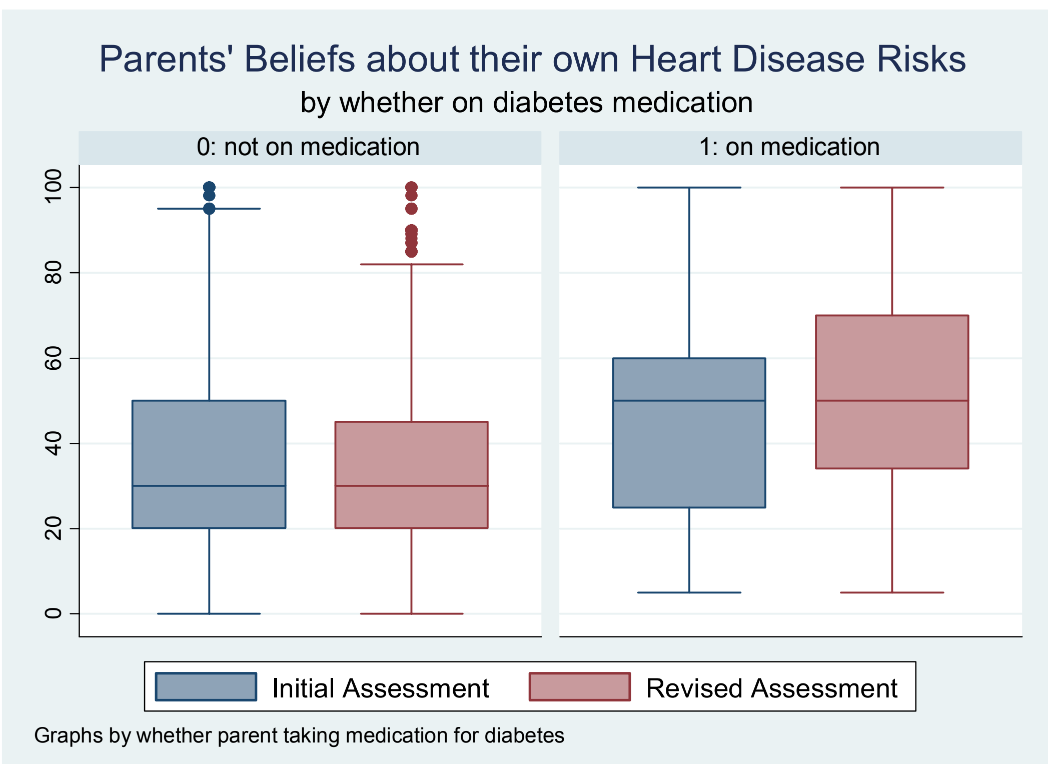
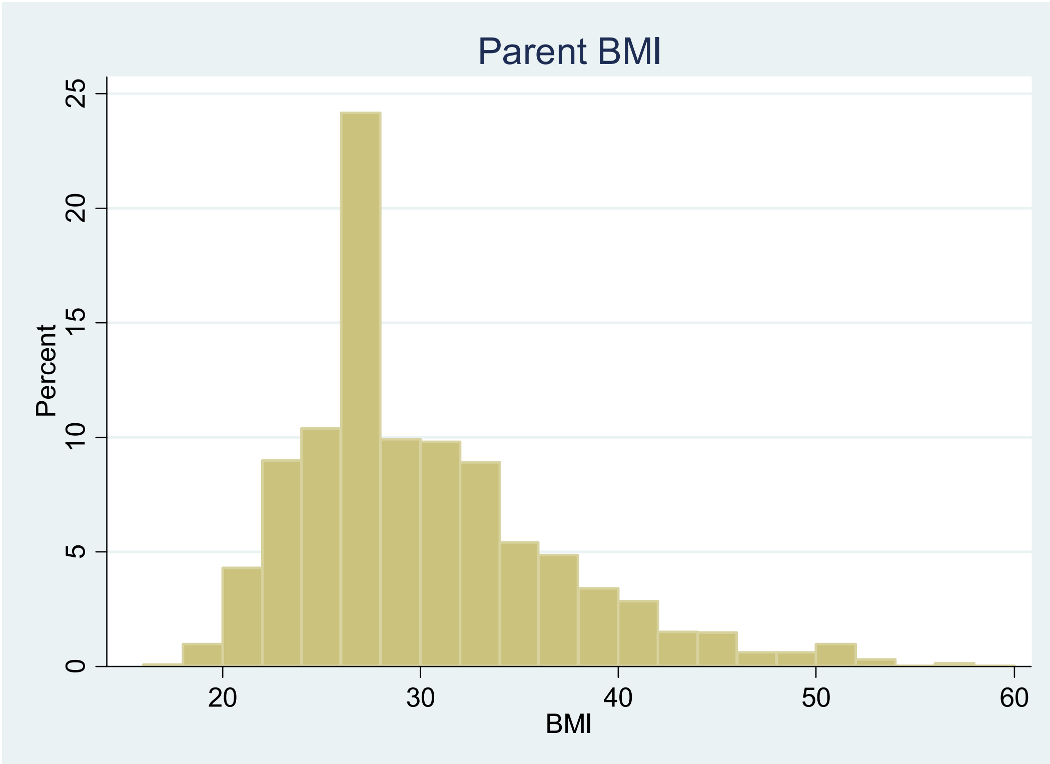


Figure 4.12. Body Mass Index of Parents and Children.



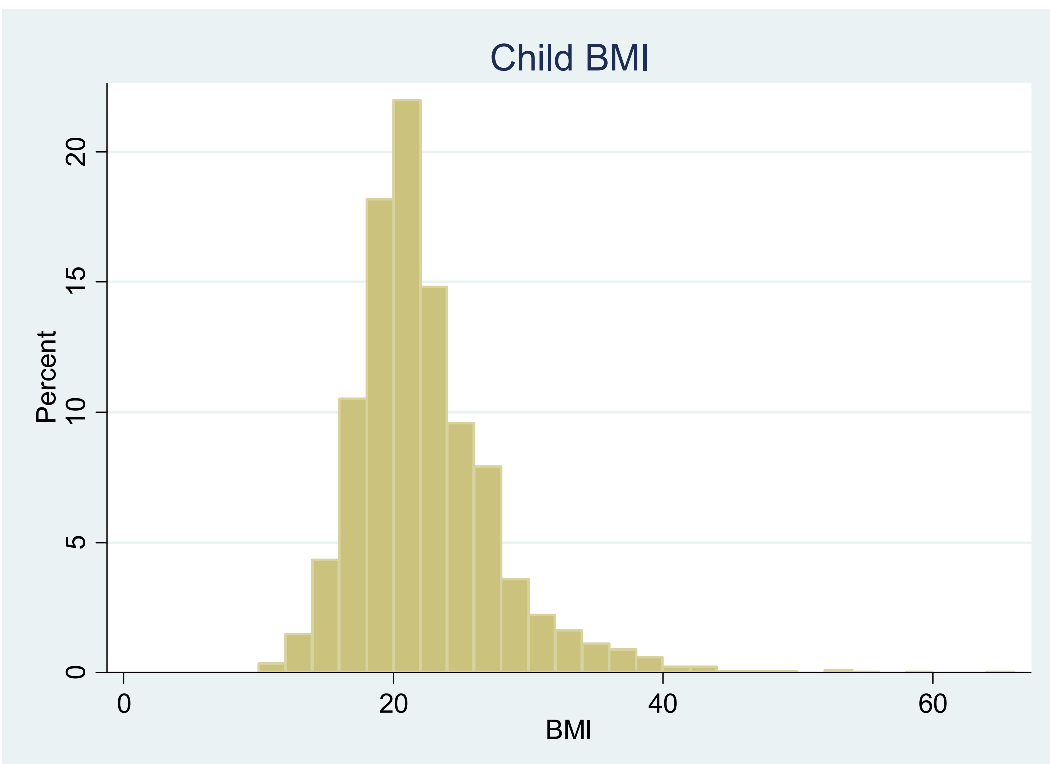
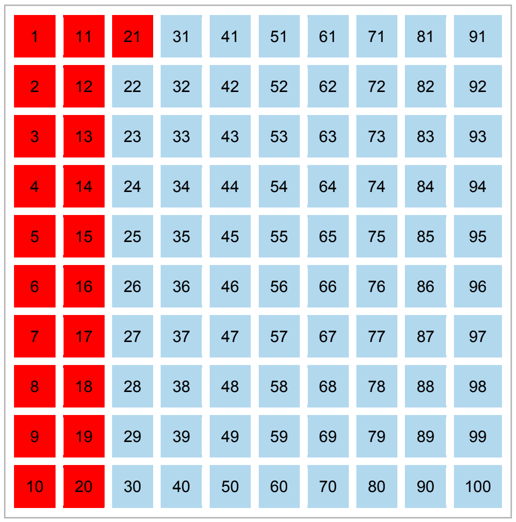
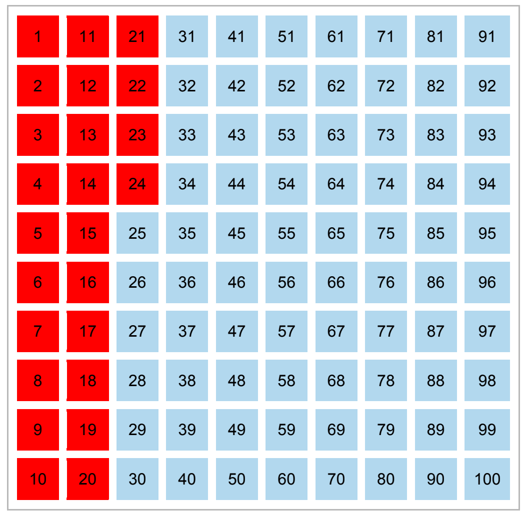


Figure 4.13a. Display of Risk Information by Body Mass Index.

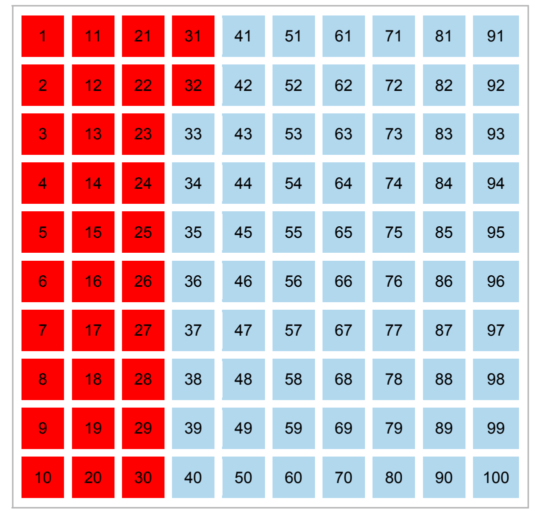
Based on your height and weight your Body Mass Index or BMI is approximately 23. Although BMI is not a perfect indicator, heart disease risks are higher for adults with BMI of 25 or above, and highest for adults with BMI 30 or above.



BMI less than 25:
average risk is 21%.



BMI between 25 and 30:
average risk is 24%.



BMI over 30:
average risk is 32%.

Figure 4.13b. Parents' Risk Beliefs by Body Mass Index.

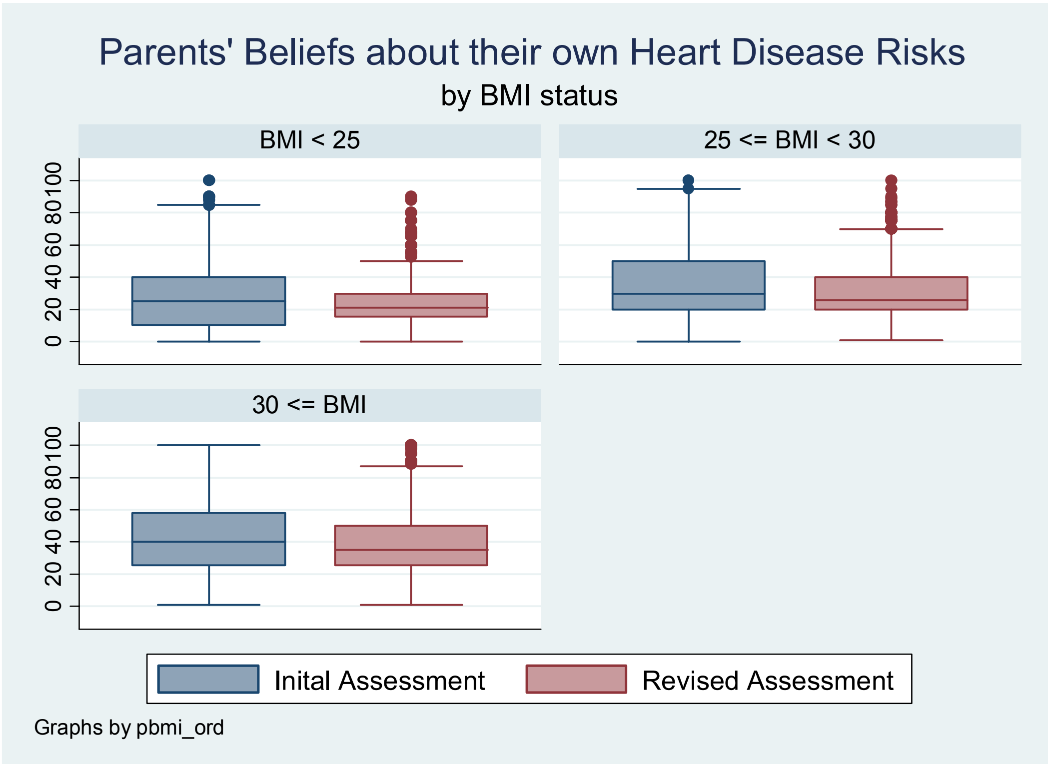


Figure 4.14a. Introductory Screen to Family History Section.

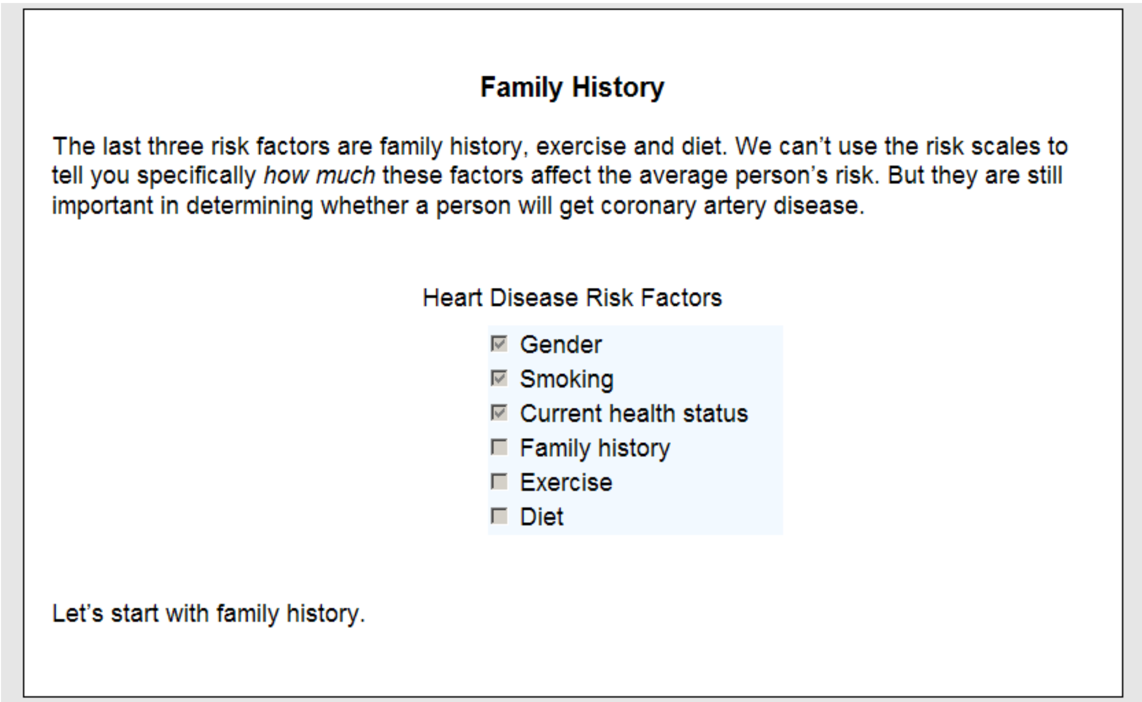
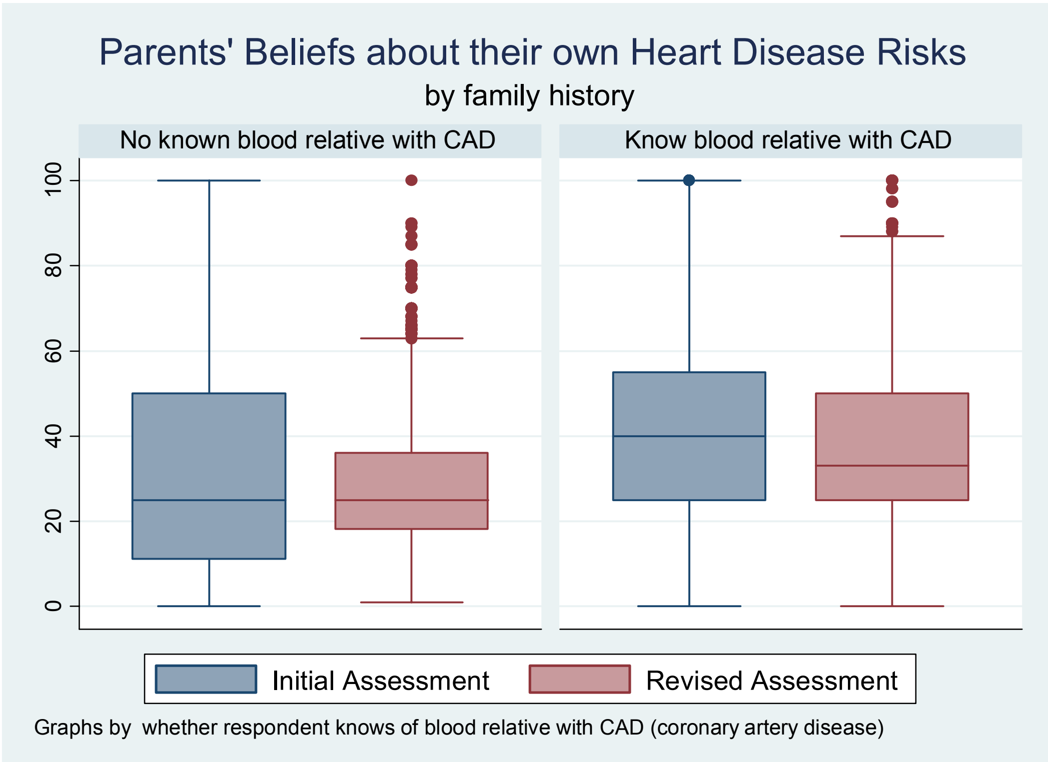


Figure 4.14. Parents' Risk Beliefs by Family History.



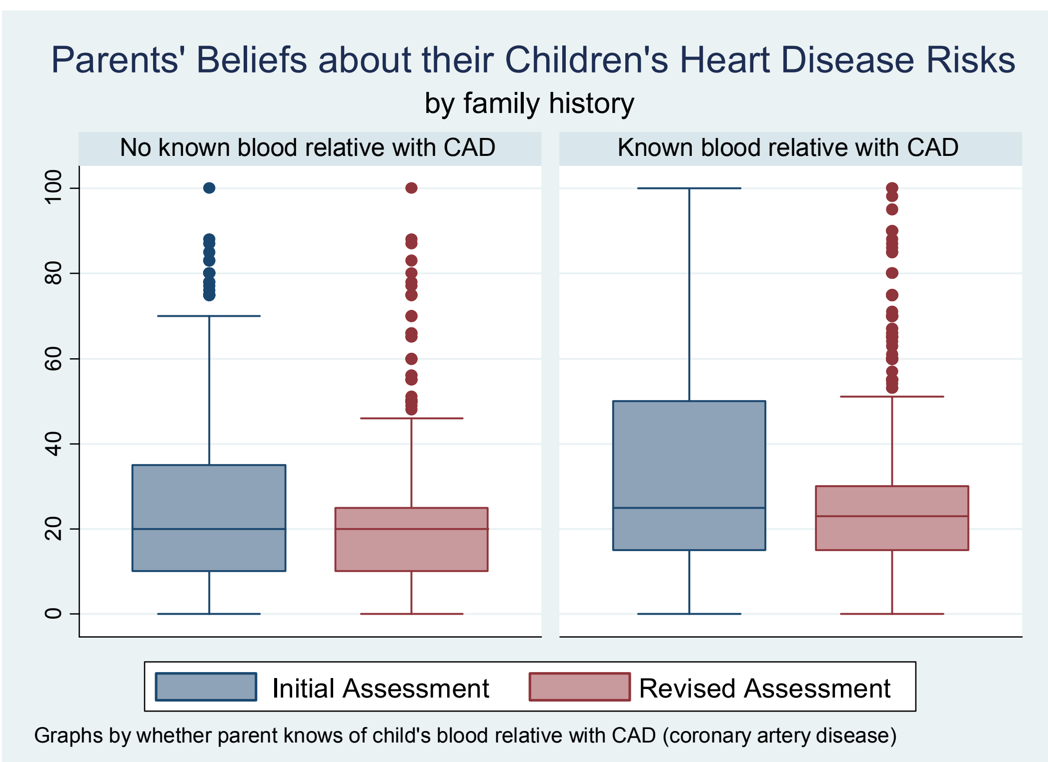


Figure 4.15. Reported Exercise Relative to Recommendations.

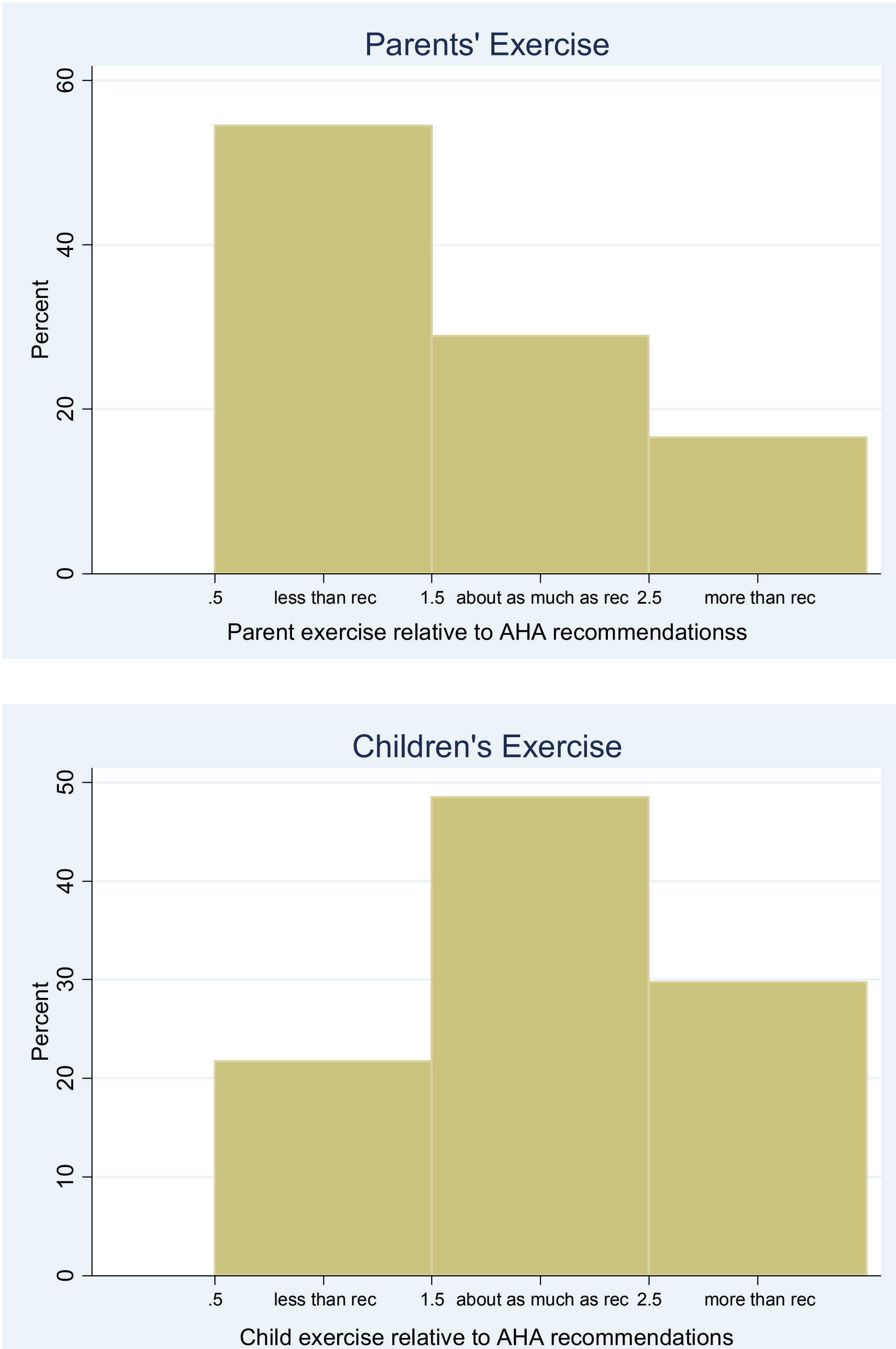
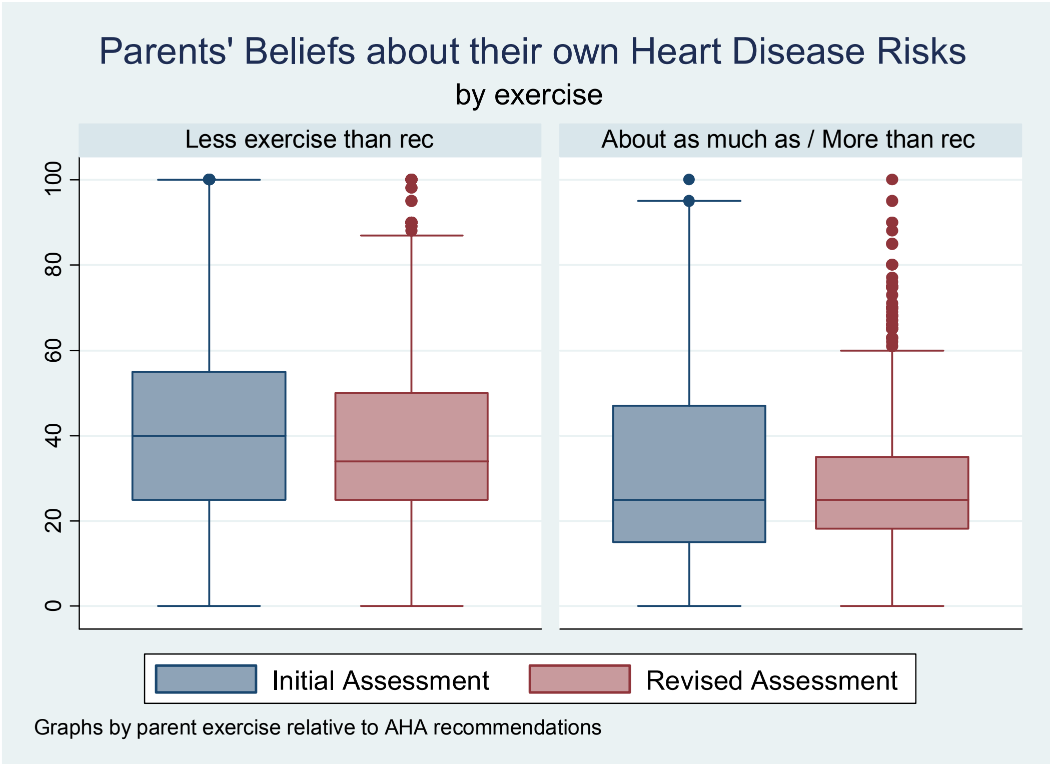


Figure 4.16. Parents' Risk Beliefs by Exercise.



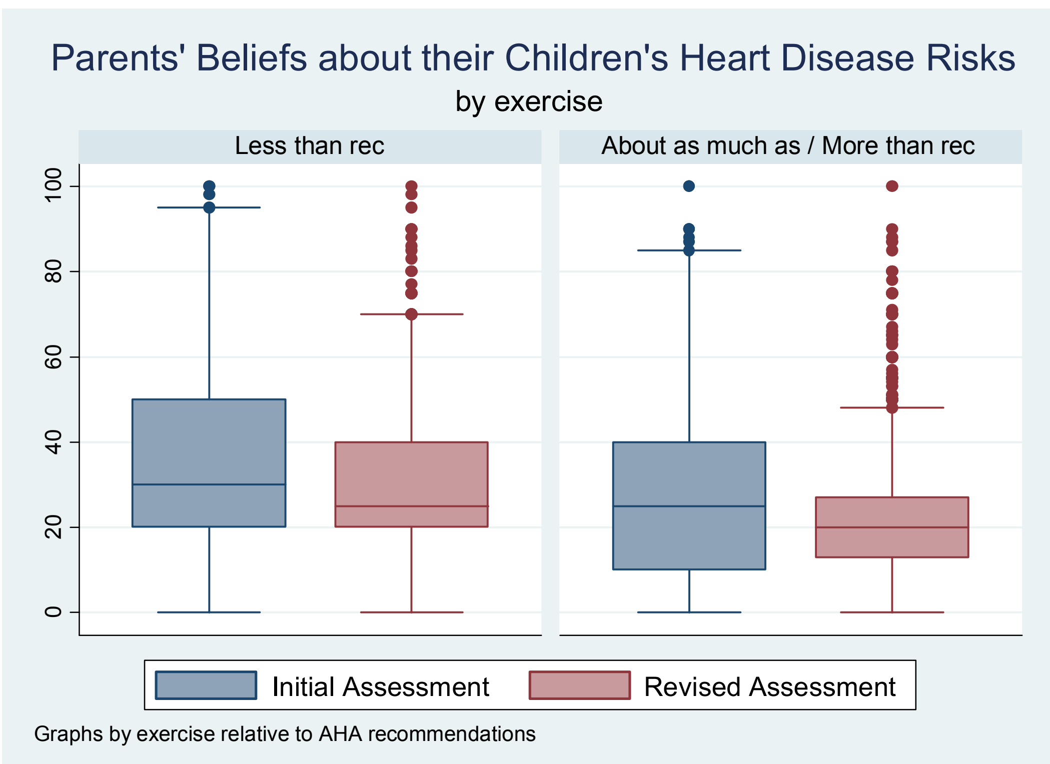


Figure 4.17. Parents' Subjective Evaluation of Healthiness of Diet.

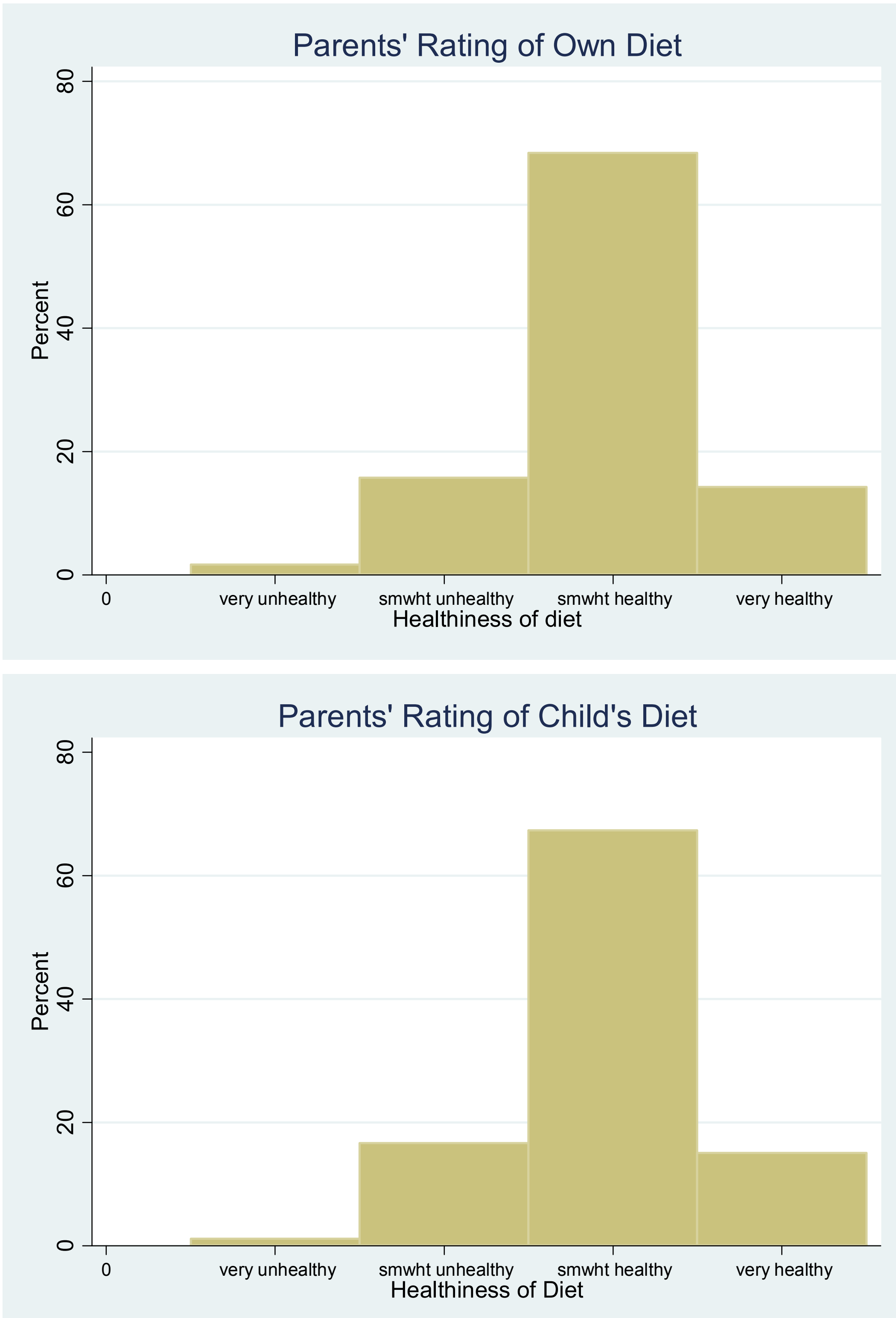
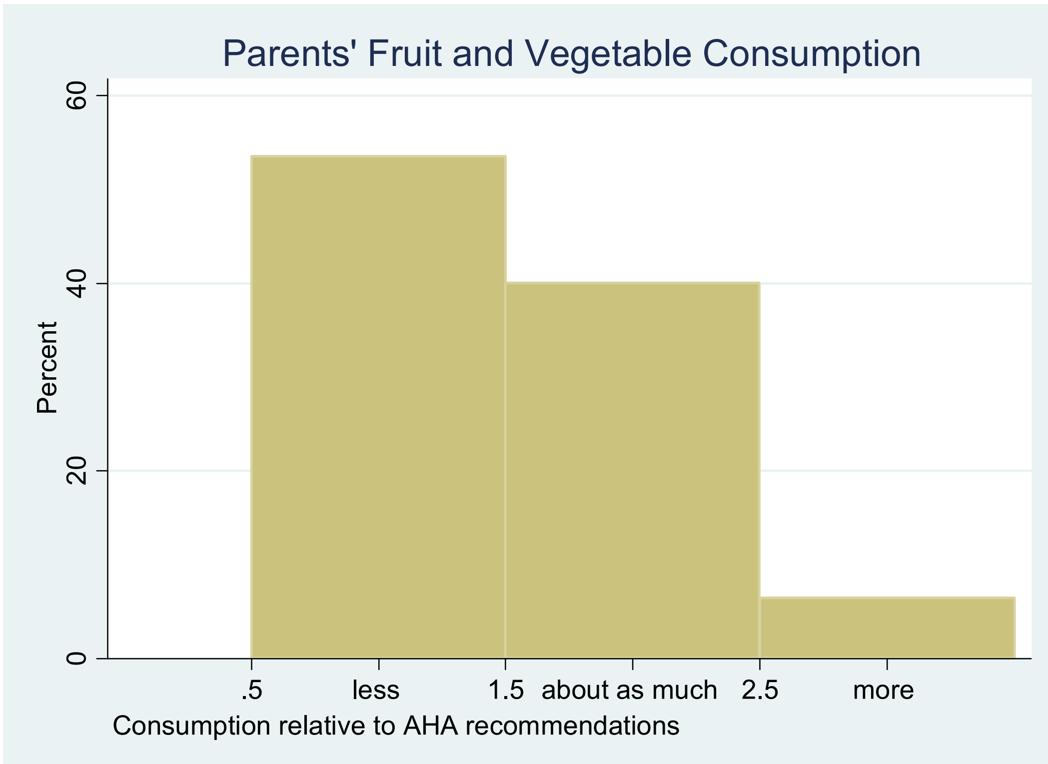


Figure 4.18. Reported Consumption of Fruits and Vegetables Relative to Recommended Amounts.



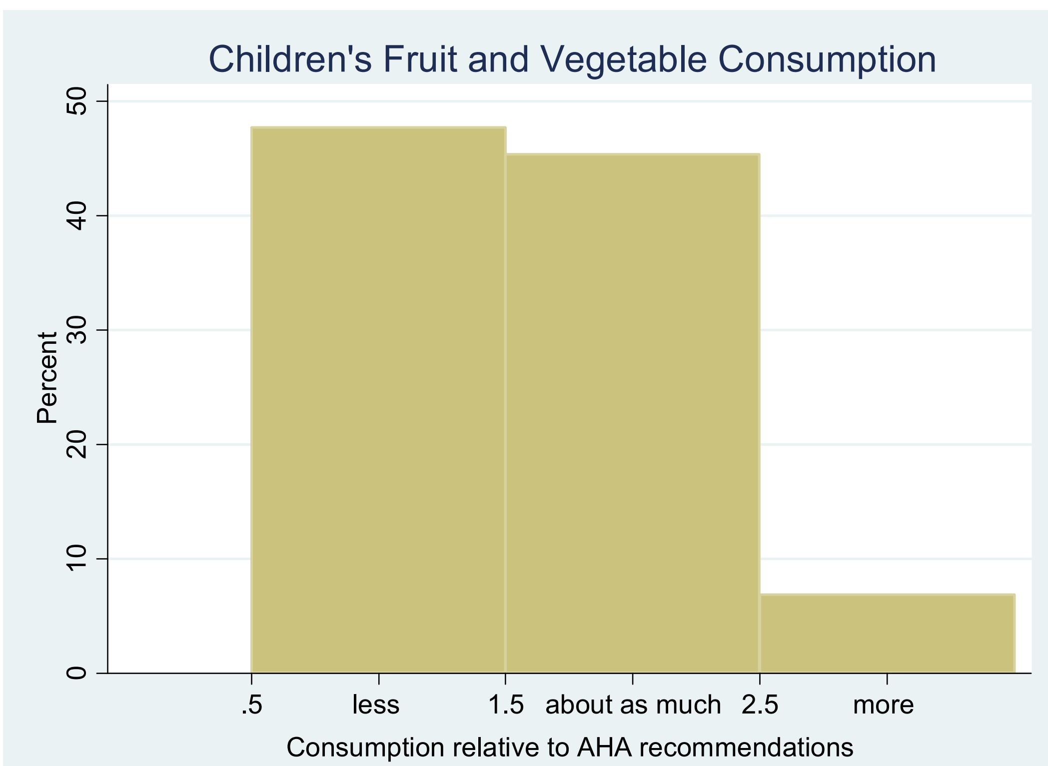
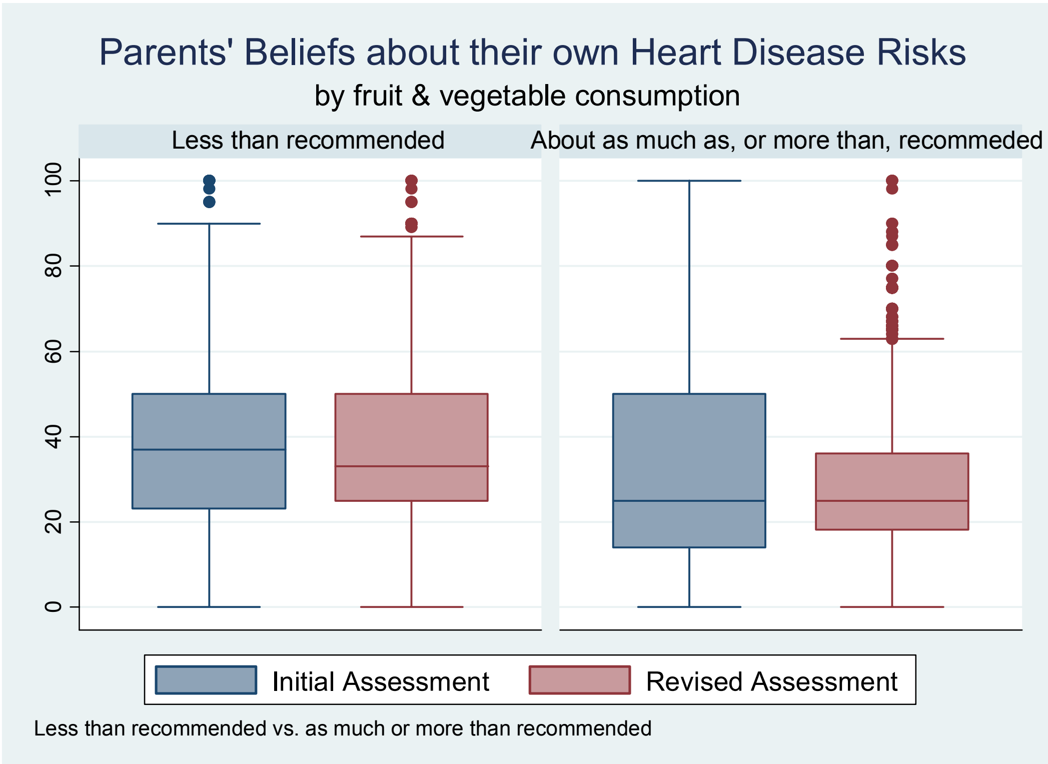


Figure 4.19. Parents Risk Beliefs by Fruit and Vegetable Consumption.



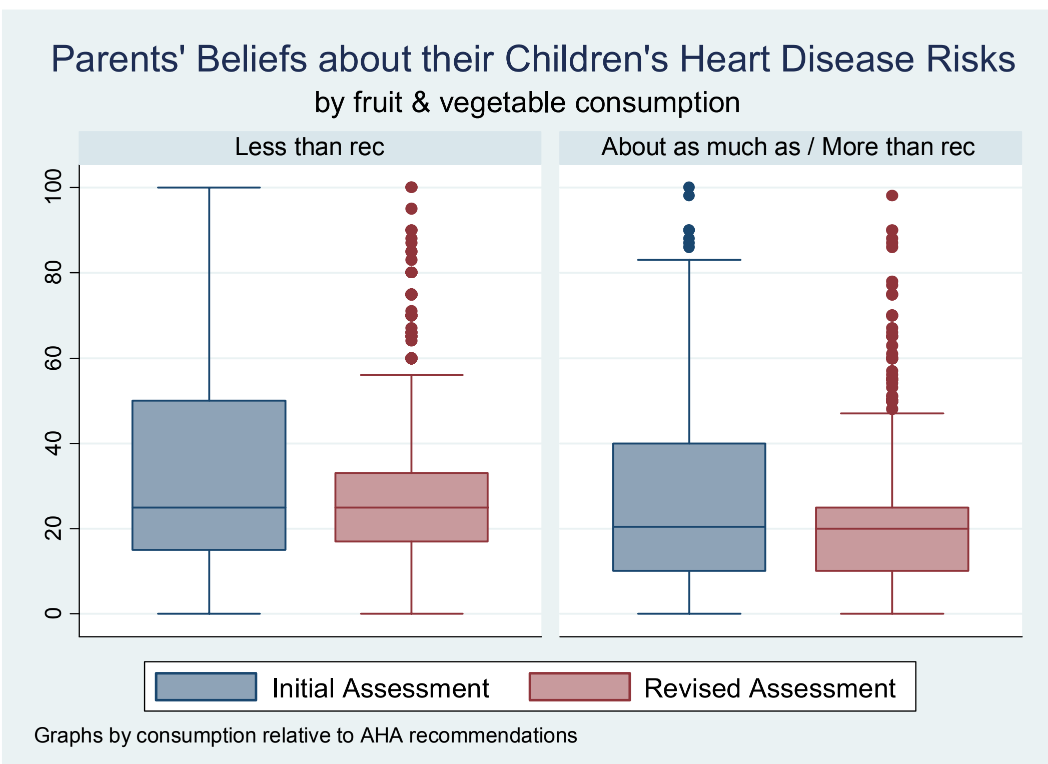


Figure 4.20a. Risk Scale to Elicit Parents' Beliefs about their Conditional Risk of Death from Heart Disease, Showing Response of 32 Chances in 100.

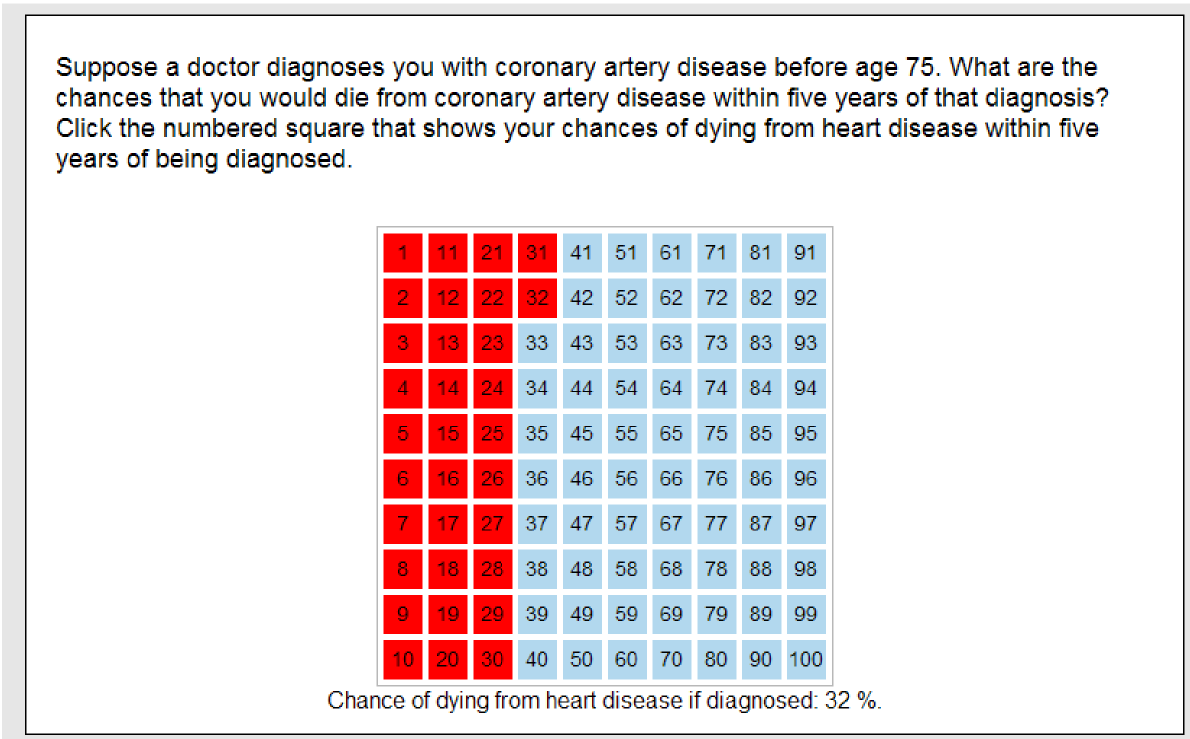


Figure 4.20b. Parents' Beliefs about the Conditional Risk of Death Given Diagnosis of Coronary Artery Disease.

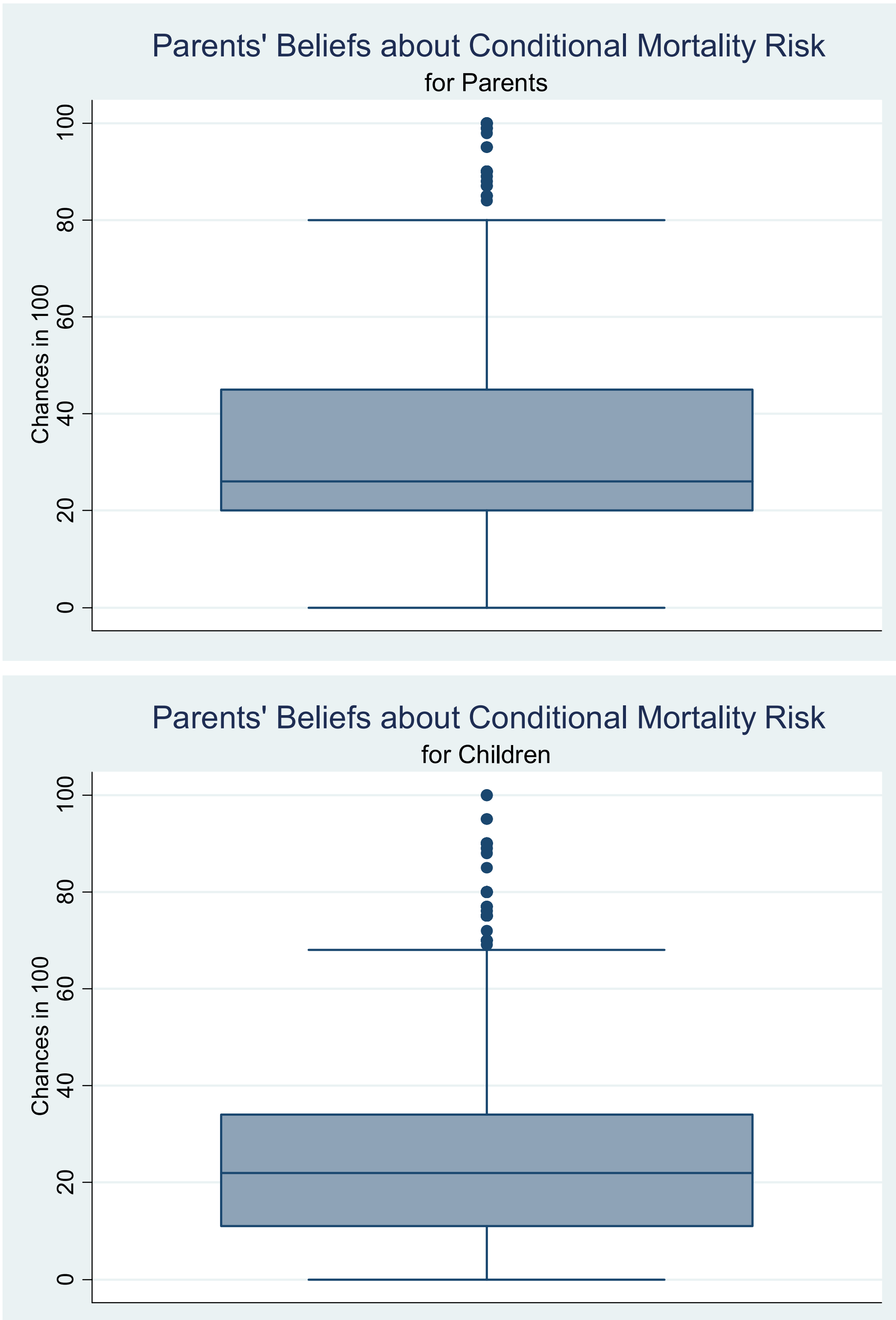


Figure 4.21a (i). Display of Hazard Function for 42 Year-Old Parent's Revised Risk Assessment of 34%.

Note: The figure shows the display as it would appear initially to the respondent.

Your heart disease risk profile is shown in the chart below. The height of the red curve shows your heart disease risk between now and any of the ages up to 75. To see how the chart works:

- Point to the red mark on the curve above the age of 75 to see your total risk of 34% between now and age 75.
- Point to any red mark on the curve above any other age to see your risk between now and that age.

Figure 4.21a (ii). Display of Hazard Function for 42 Year-Old Parent's Revised Risk Assessment of 34%, Showing Cumulative Risk of 34% by Age 75.

Note: The figure shows the display as it would appear to a respondent who followed the instruction to point the cursor to the hazard function at age 75 years.

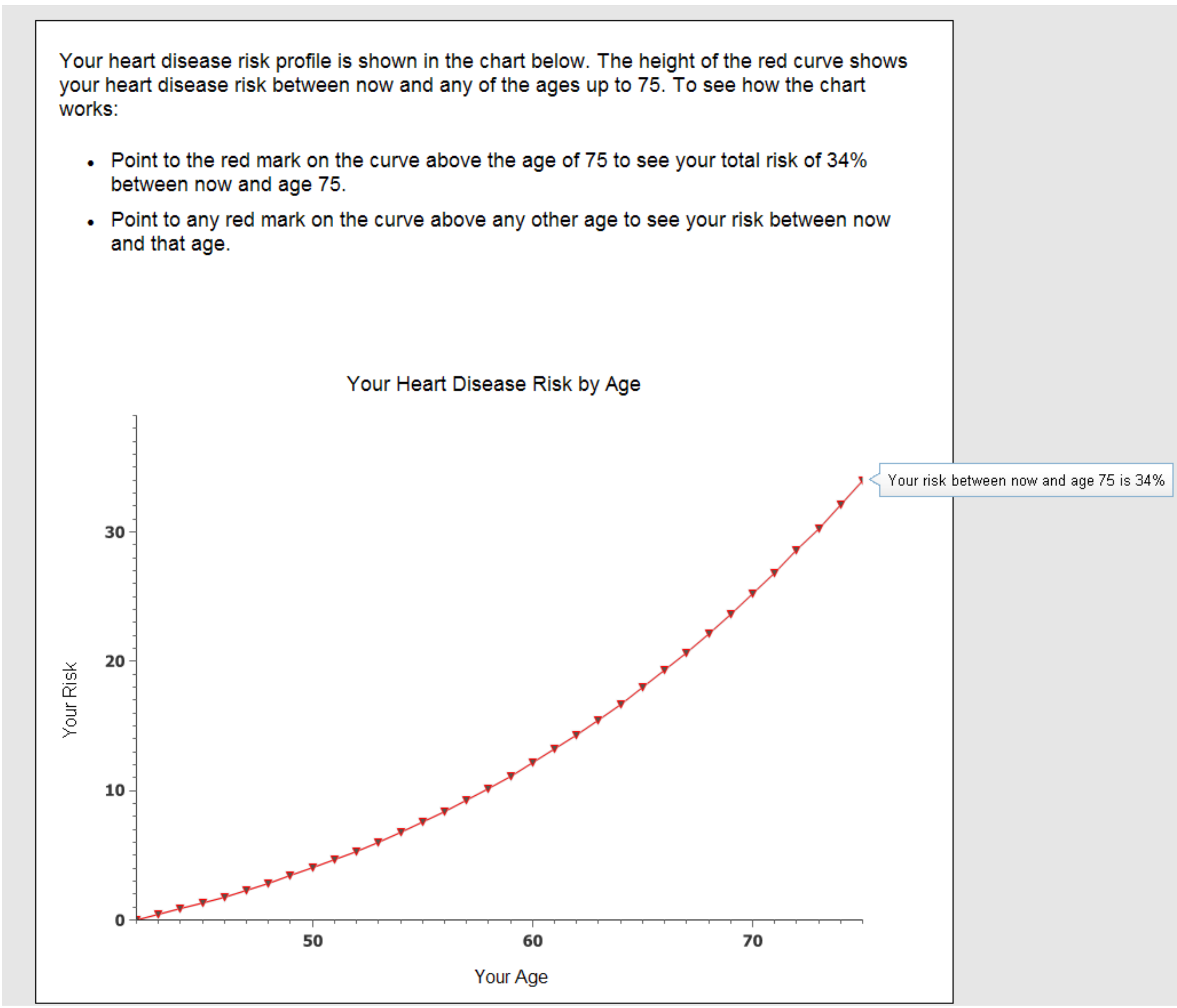


Figure 4.21a(iii). Display of Hazard Function for 42 Year-Old Parent's Revised Risk Assessment of 34%, Showing Cumulative Risk of 12% by Age 60.

Note: The figure shows the display as it would appear to a respondent using the cursor to determine the cumulative risk at age 60 years.

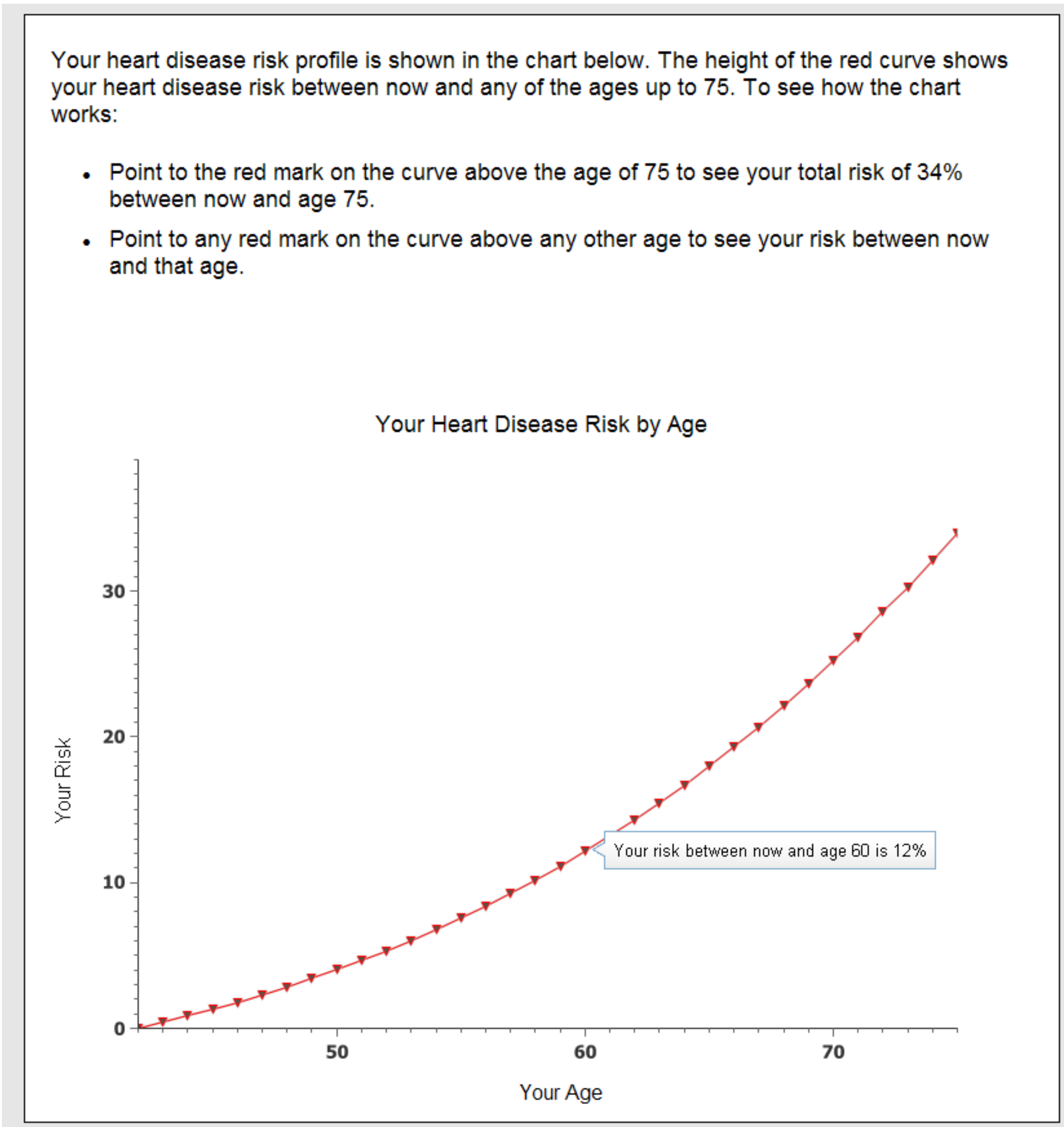


Figure 4.21b(i). Display of Hazard Function for Revised Risk Assessment for 11 Year Old Child of 24%.

Note: The figure shows the display as it would appear initially to the respondent.

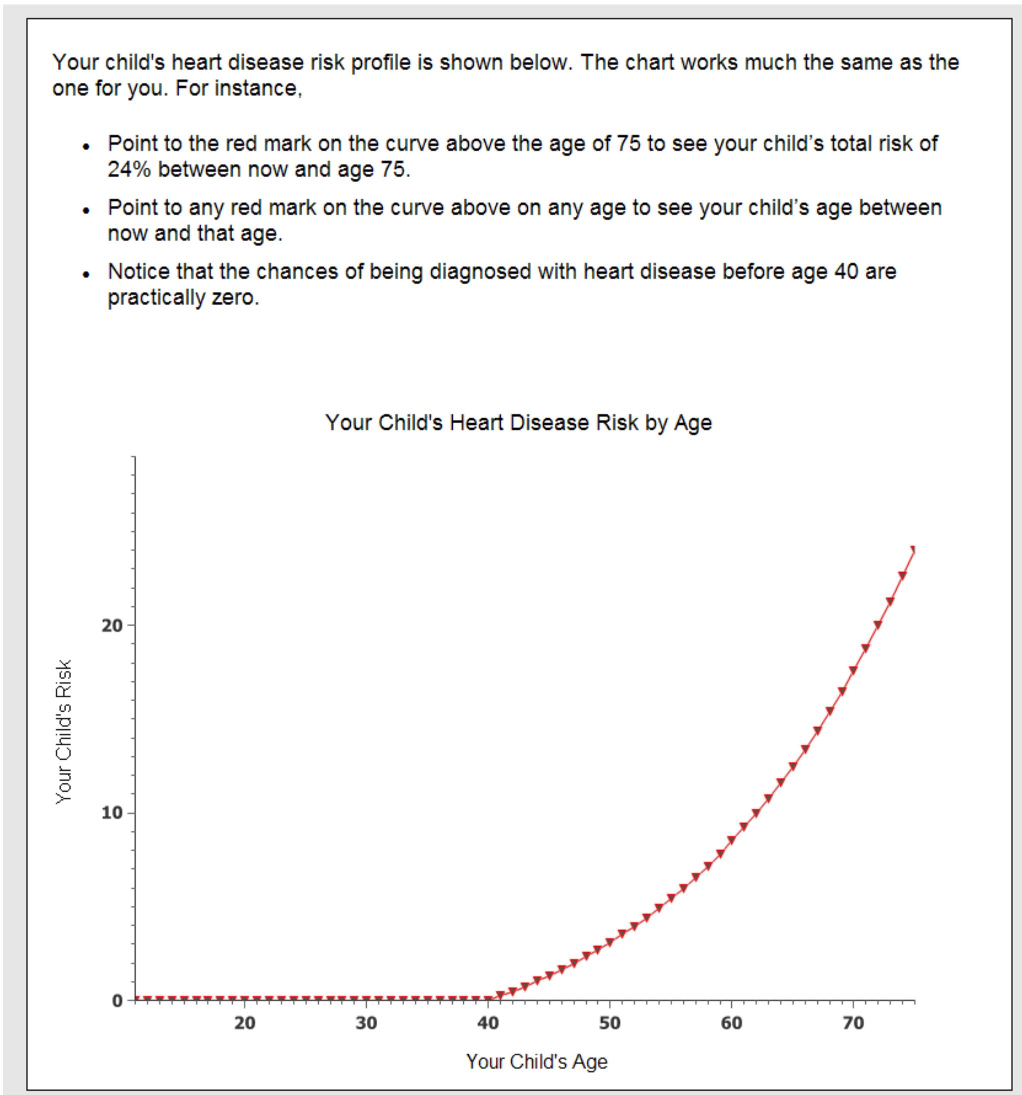


Figure 4.21b(ii). Display of Hazard Function for Revised Risk Assessment for 11 Year Old Child of 24%, Showing Cumulative Risk of 24% at age 75 Years.

Note: The figure shows the display as it would appear to a respondent who followed the instruction to point the cursor to the hazard function at age 75 years.

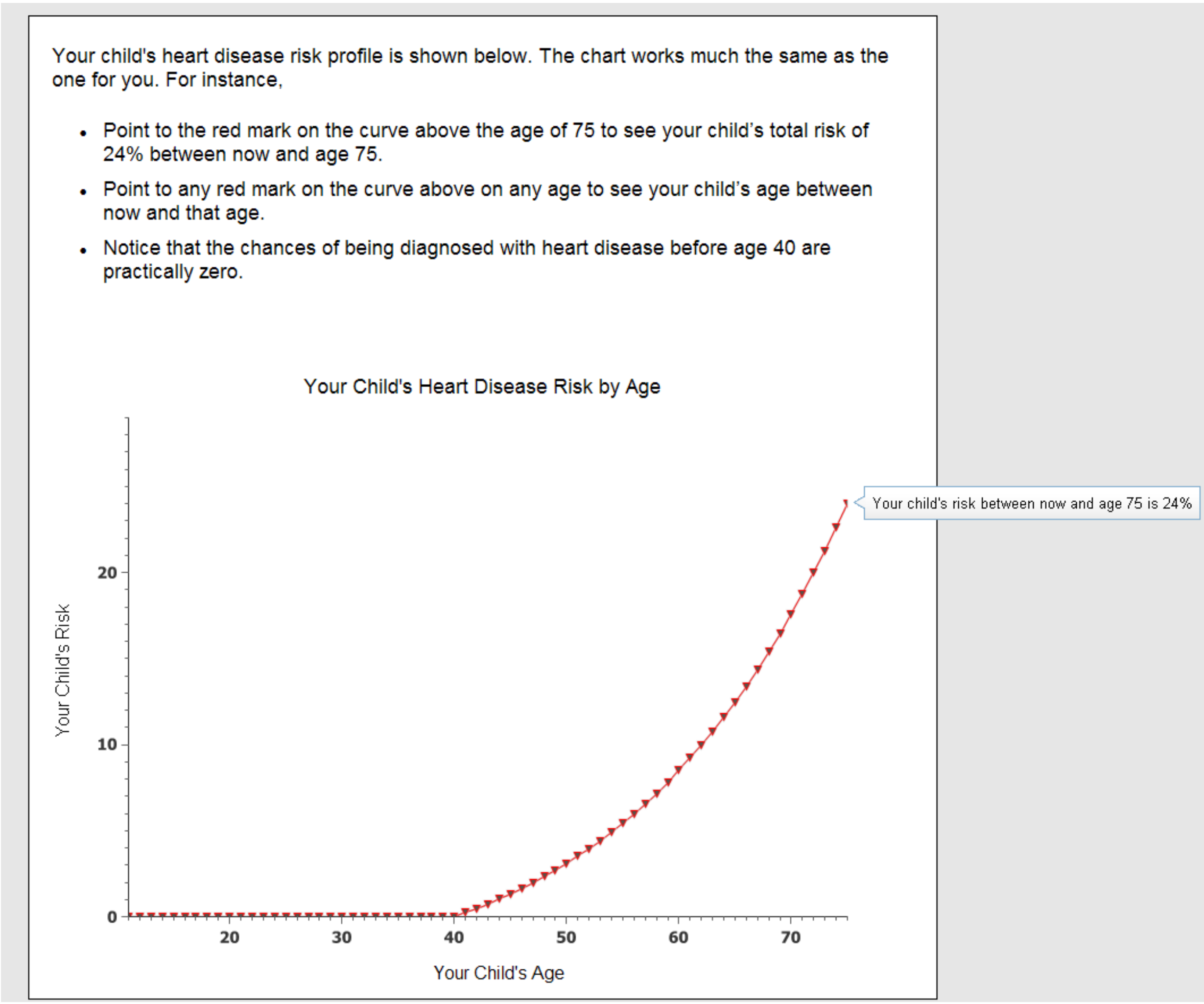


Figure 4.21b(iii). Display of Hazard Function for Revised Risk Assessment for 11 Year Old Child of 24%, Showing Cumulative Risk of 8.5% at age 60 Years.

Note: The figure shows the display as it would appear to a respondent using the cursor to determine the cumulative risk at age 60 years.

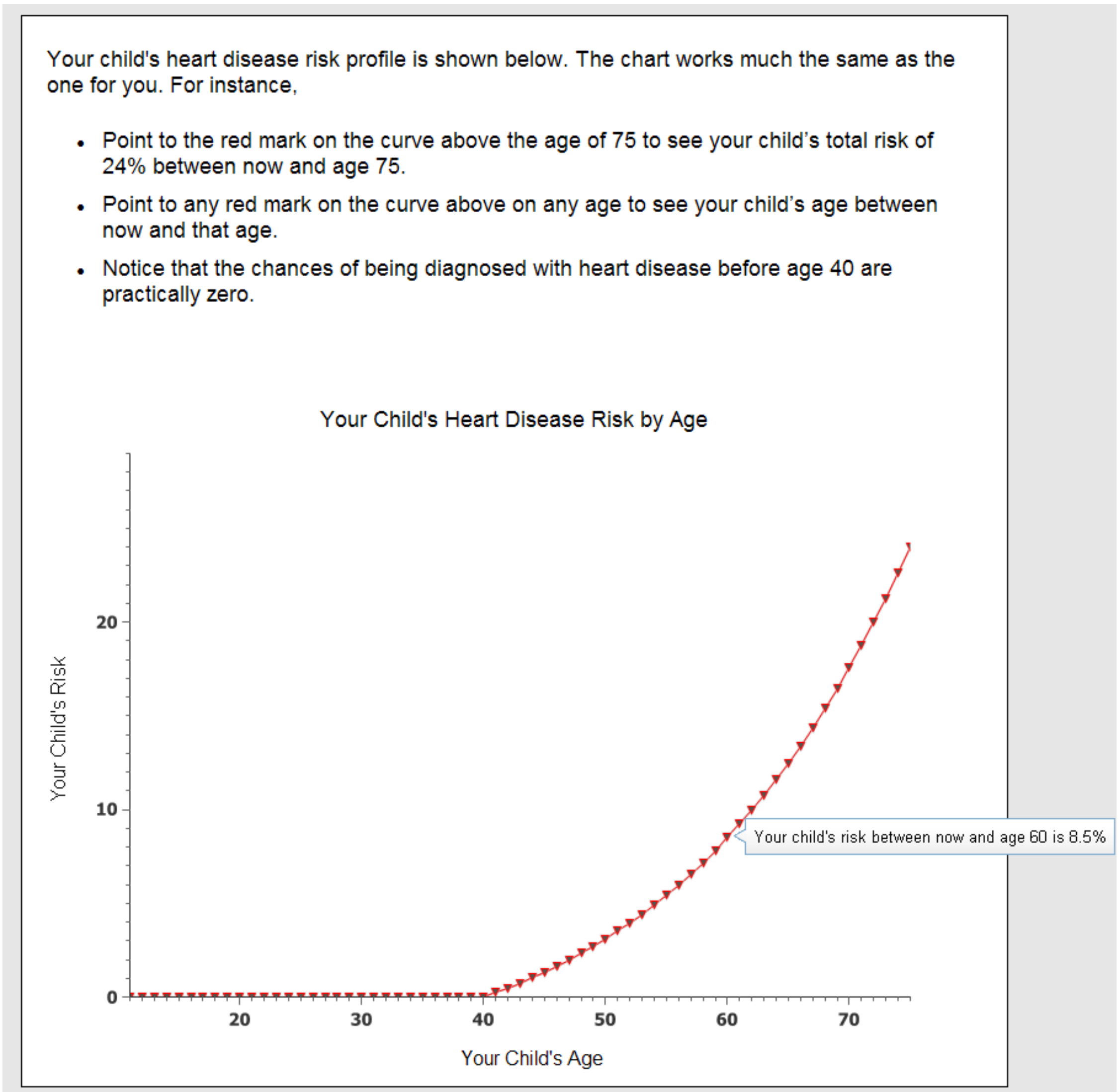


Figure 4.22a. Risk Scale Display for Child Risk Reduction of 20% from Revised Risk Assessment of 25%.

Your child's risk reduction from the prevention program is shown in green. The risk your child would still face, if any, is shown in red.

1	11	21	31	41	51	61	71	81	91
2	12	22	32	42	52	62	72	82	92
3	13	23	33	43	53	63	73	83	93
4	14	24	34	44	54	64	74	84	94
5	15	25	35	45	55	65	75	85	95
6	16	26	36	46	56	66	76	86	96
7	17	27	37	47	57	67	77	87	97
8	18	28	38	48	58	68	78	88	98
9	19	29	39	49	59	69	79	89	99
10	20	30	40	50	60	70	80	90	100

Figure 4.22b. Risk Scale Display for Parent Risk Reduction of 10% from Revised Risk Assessment of 30%.

Your risk reduction from the prevention program is shown in green. The risk you would still face, if any, is shown in red.

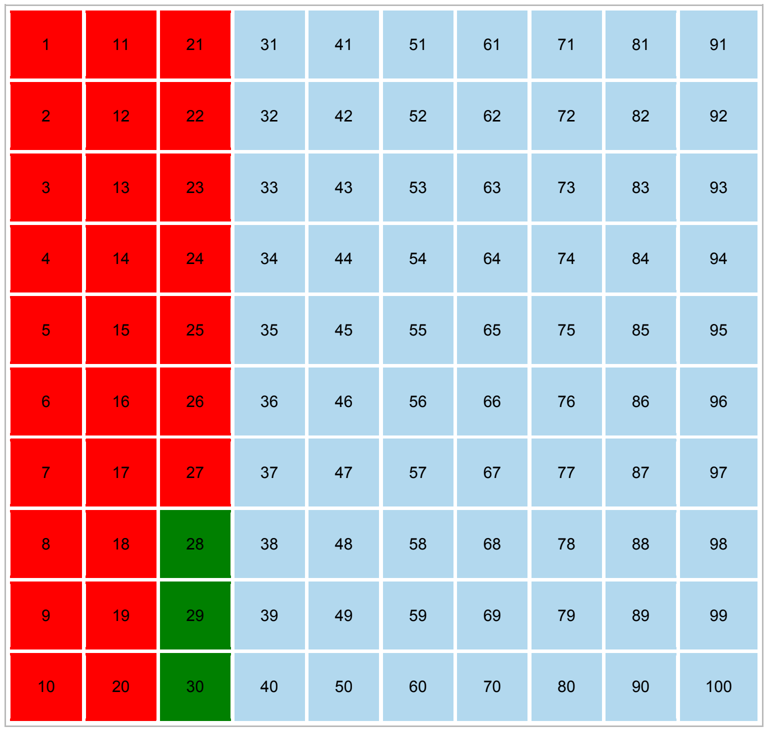


Figure 4.23a(i). Display of Hazard Functions for Child Risk Reduction of 20% from Revised Risk Assessment of 25% (Child Age 11 Years).

Note: The figure shows the display as it would appear initially to the respondent.

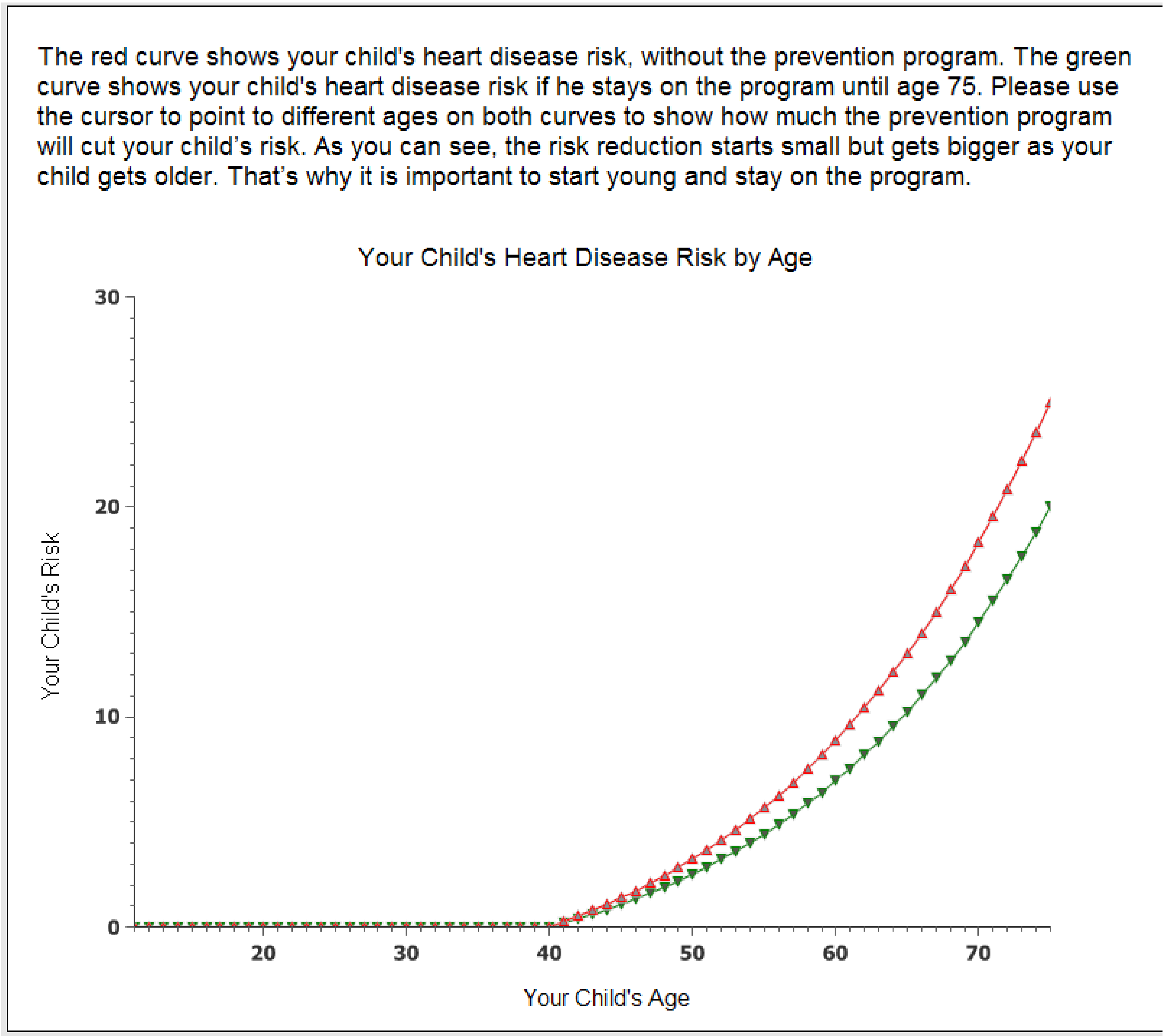


Figure 4.23a(ii). Display of Hazard Functions for Child Risk Reduction of 80% from Revised Risk Assessment of 24% (Child Age 11 Years).

Note: The figure shows the display as it would appear initially to the respondent.

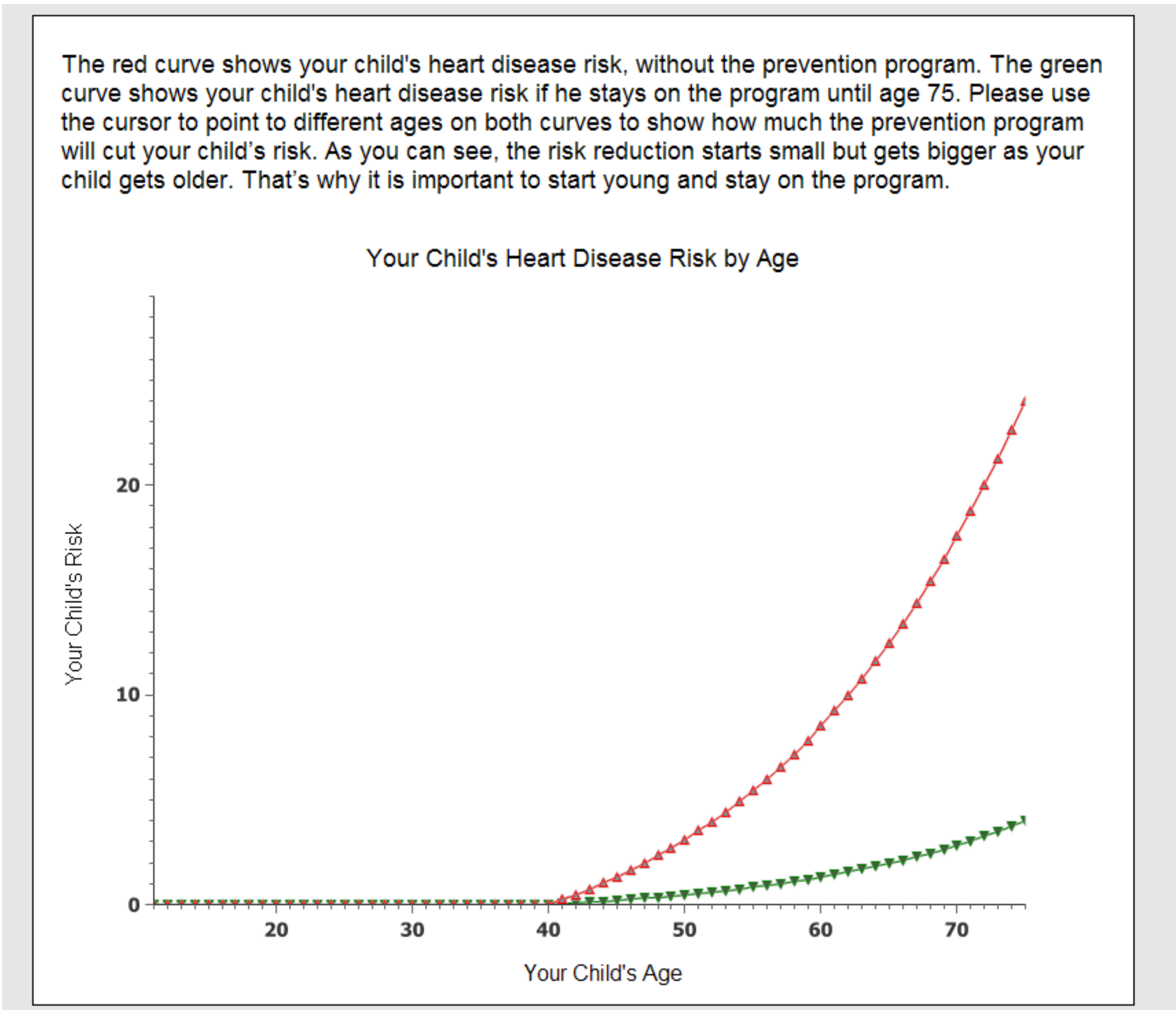


Figure 4.23a(iii). Display of Hazard Functions for Child Risk Reduction of 80% from Revised Risk Assessment of 24% (Child Age 11 Years).

Note: The figure shows the display as it would if the respondent used the cursor to determine the cumulative risk by age 60 without the vaccine..

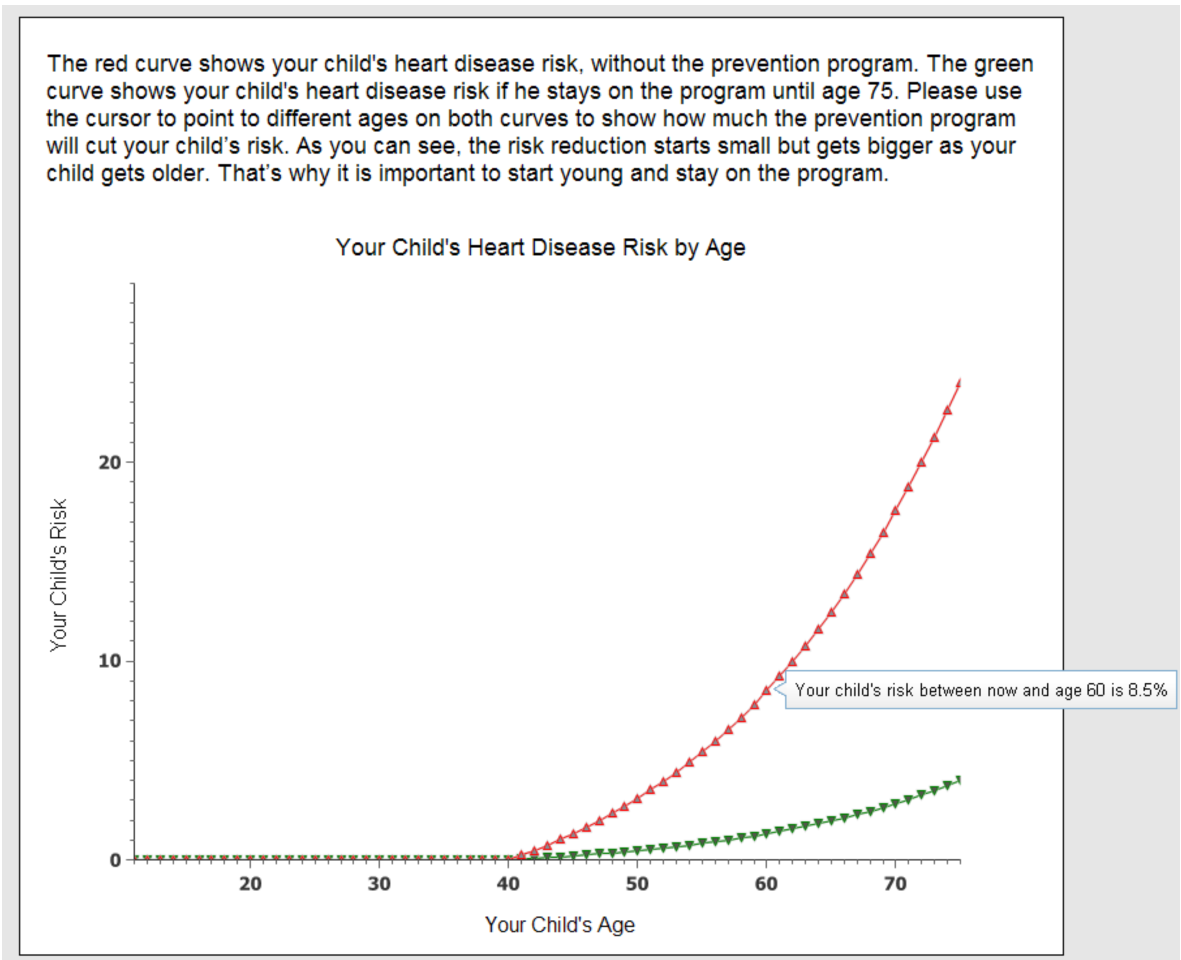


Figure 4.23a(iv). Display of Hazard Functions for Child Risk Reduction of 80% from Revised Risk Assessment of 24% (Child Age 11 Years).

Note: The figure shows the display as it would if the respondent used the cursor to determine the cumulative risk by age 60 with the vaccine.

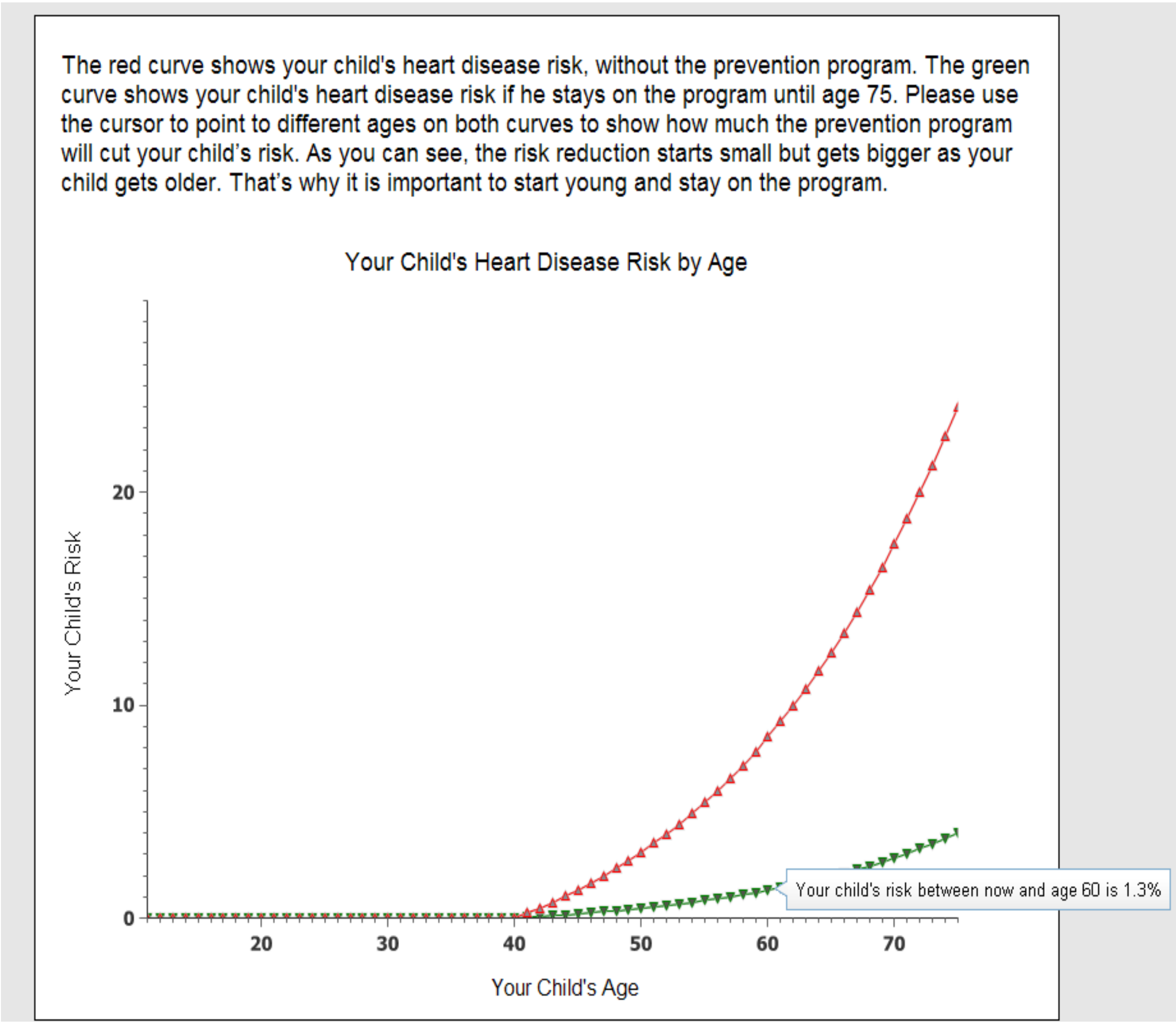


Figure 4.23b(i). Display of Hazard Functions for Child Parent Reduction of 10% from Revised Risk Assessment of 32% (Parent Age 42 Years).

Note: The figure shows the display as it would appear initially to the respondent.

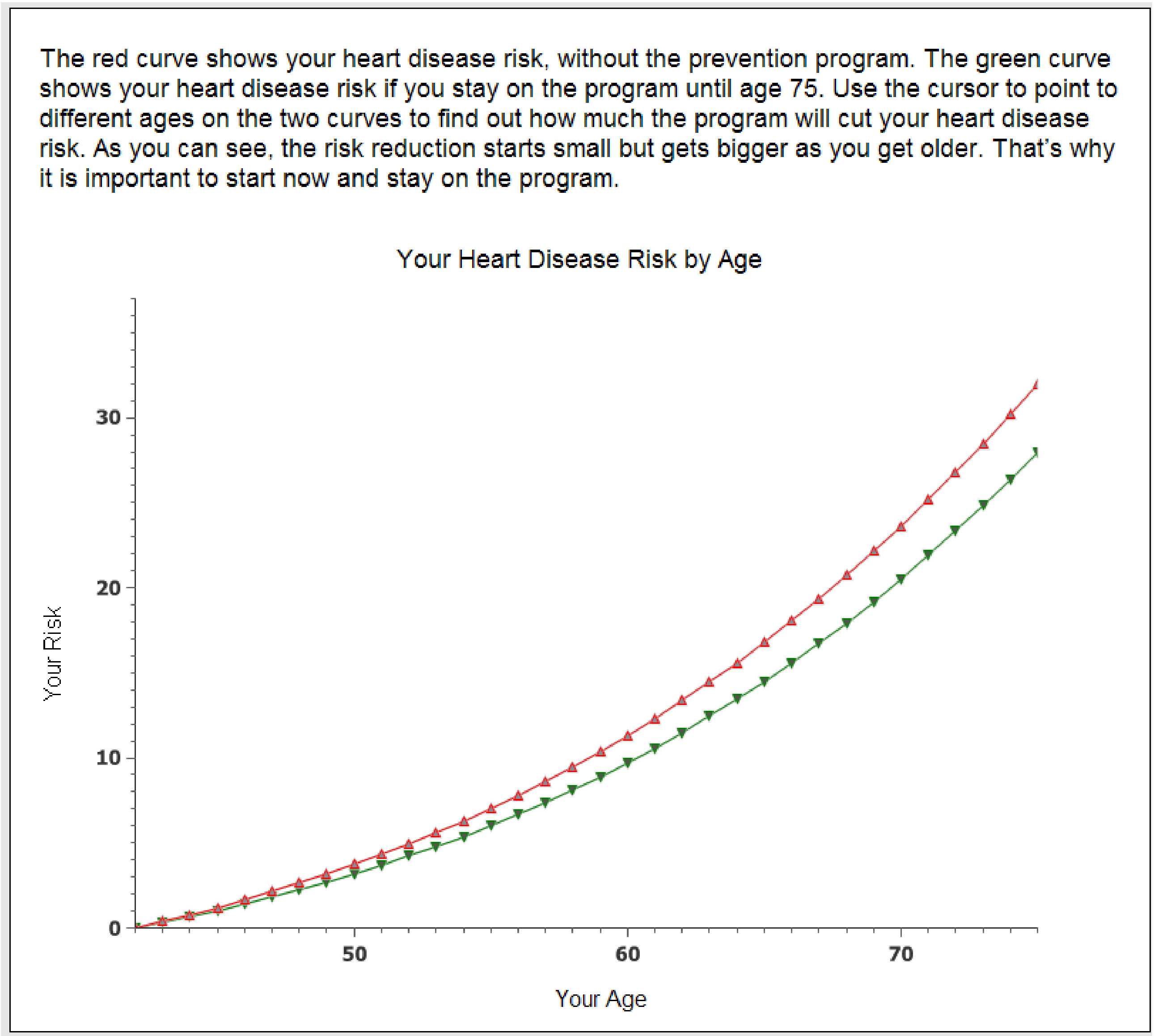


Figure 4.23b(ii). Display of Hazard Functions for Child Parent Reduction of 10% from Revised Risk Assessment of 32% (Parent Age 42 Years).

Note: The figure shows the display as it would if the respondent used the cursor to determine the cumulative risk by age 60 without the vaccine.

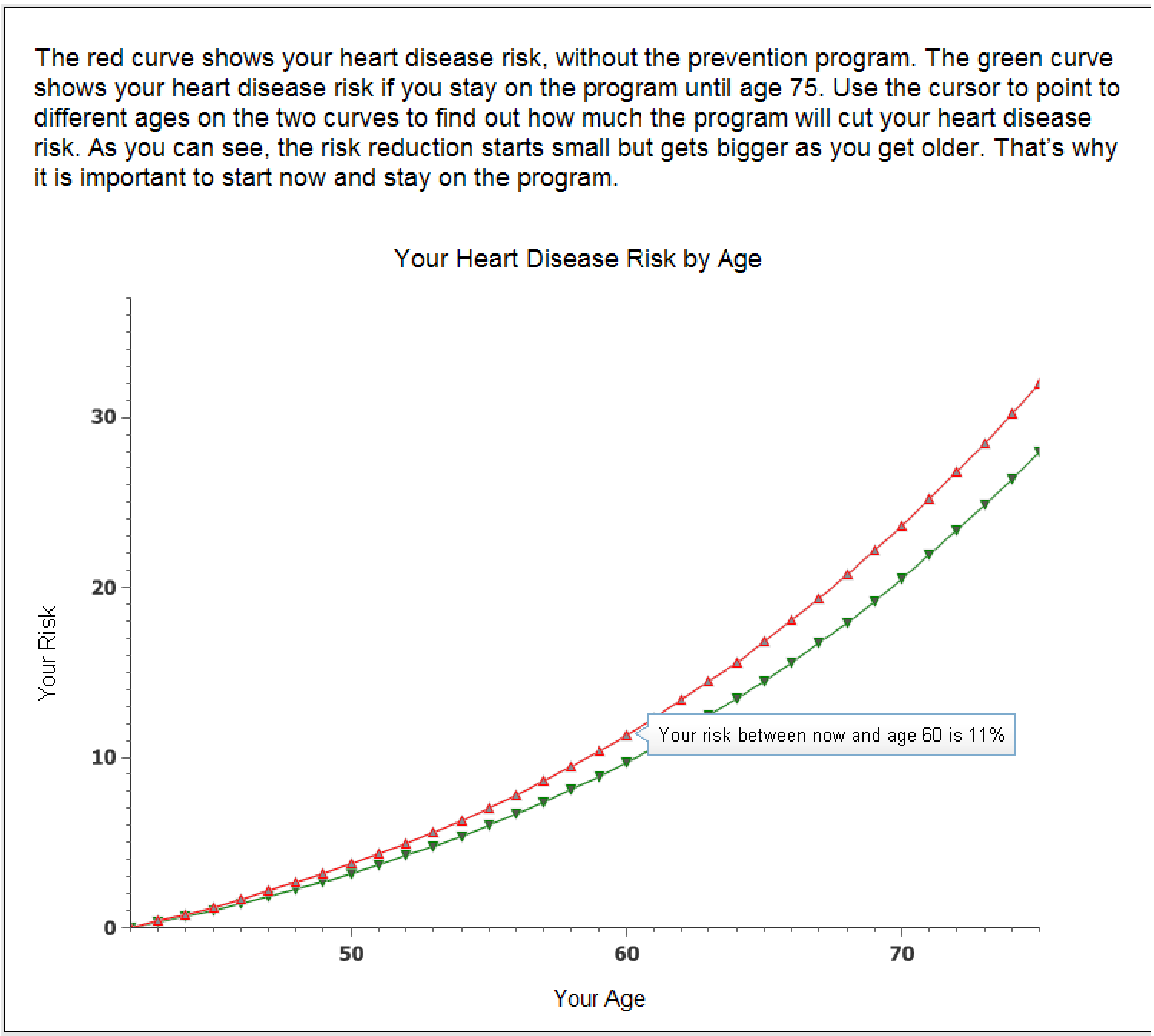


Figure 4.23b(iii). Display of Hazard Functions for Child Parent Reduction of 10% from Revised Risk Assessment of 32% (Parent Age 42 Years).

Note: The figure shows the display as it would if the respondent used the cursor to determine the cumulative risk by age 60 with the vaccine.

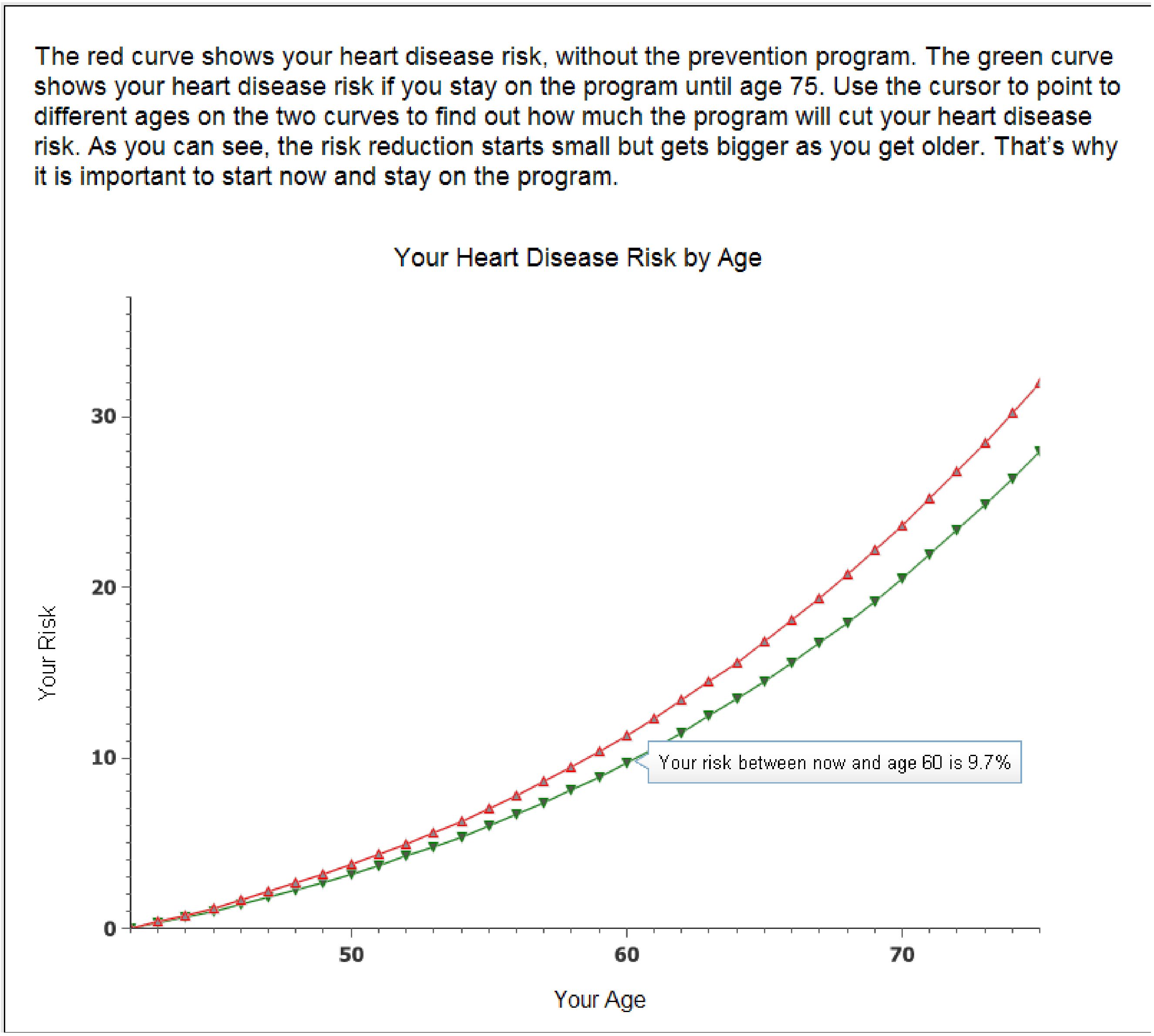
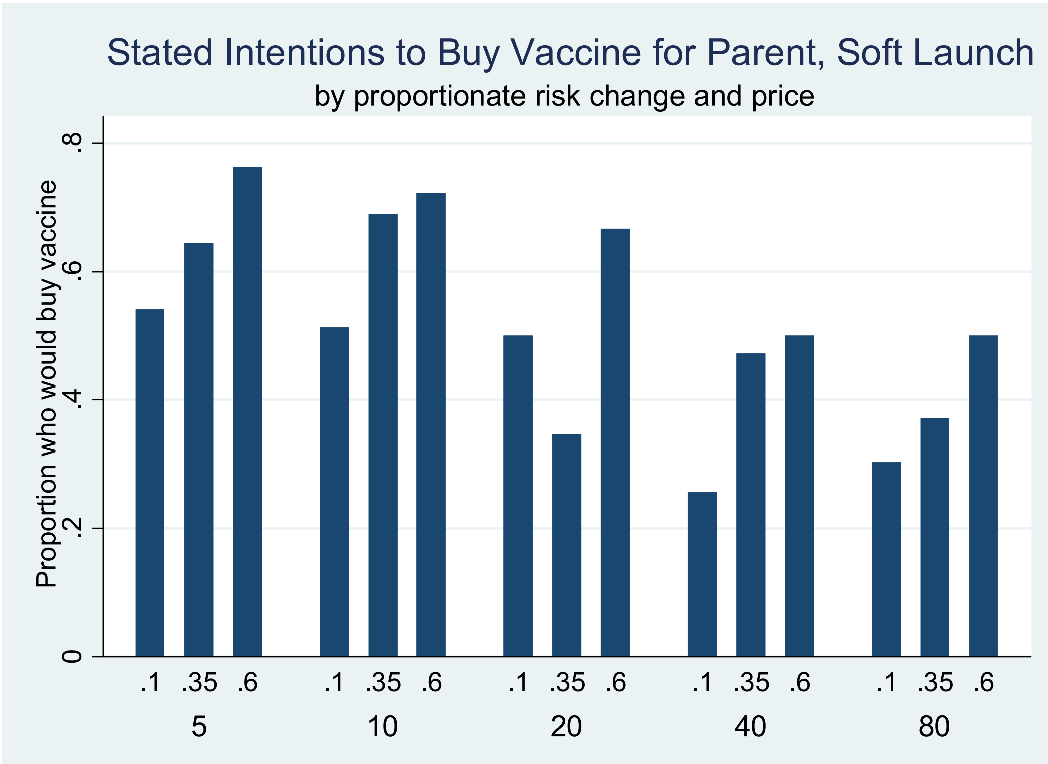


Figure 4.24a. Parents' Purchase Intentions: Soft Launch.



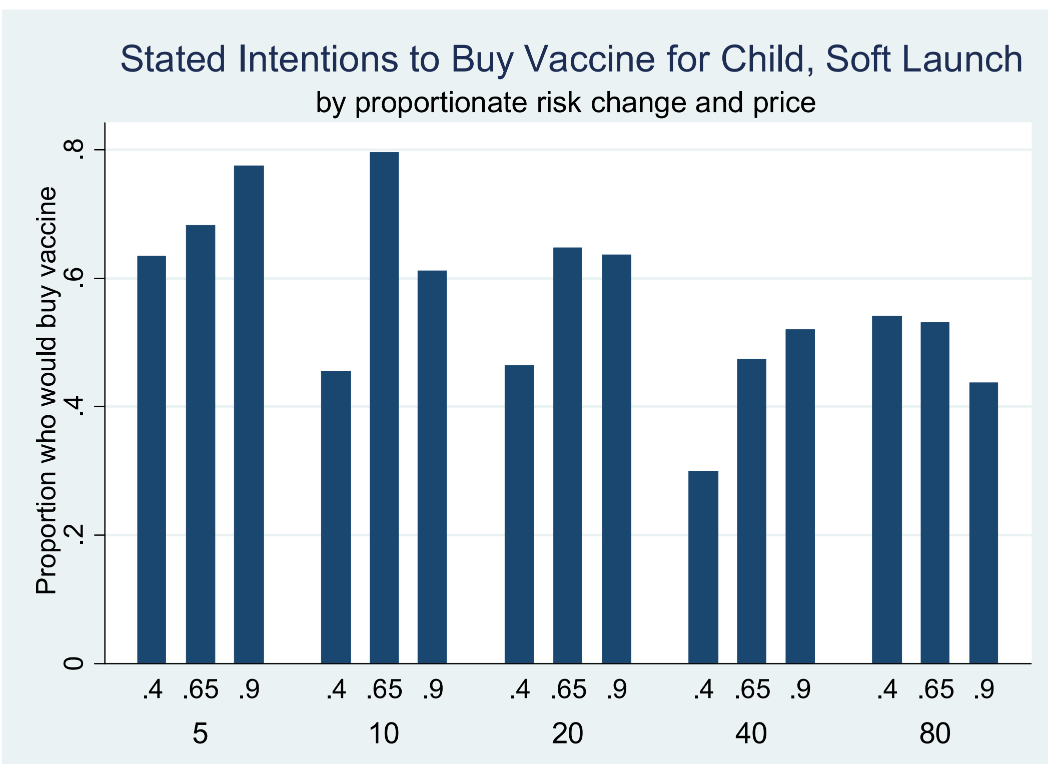
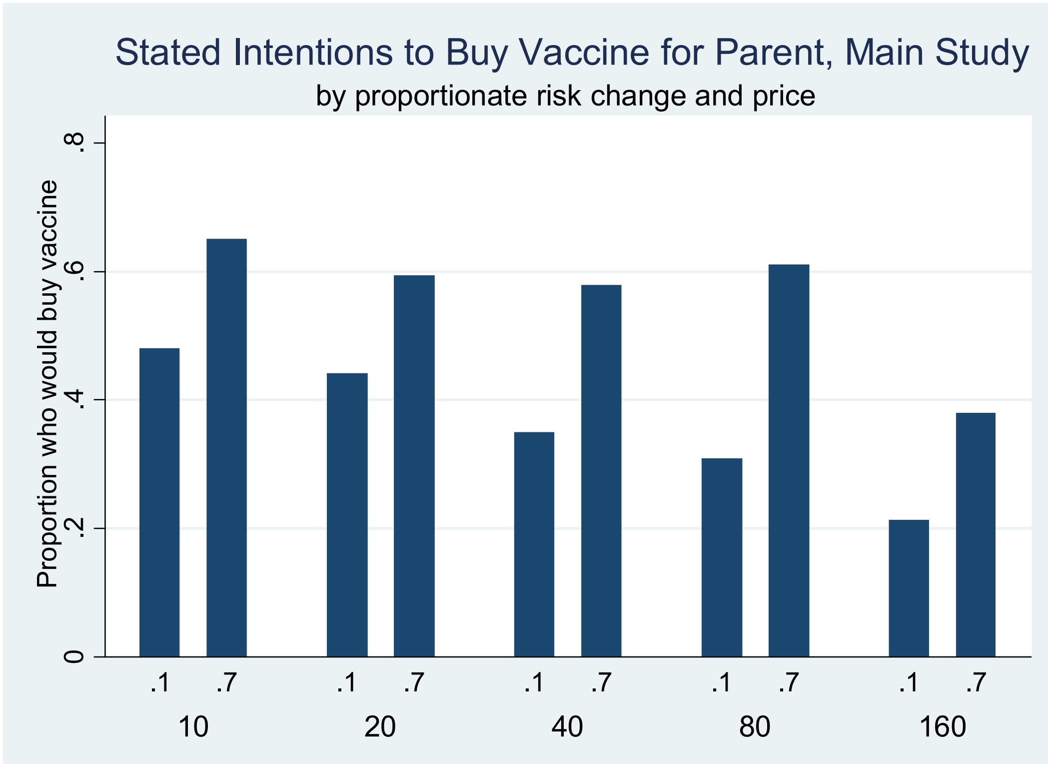


Figure 4.24b. Parents' Purchase Intentions: Main Study.



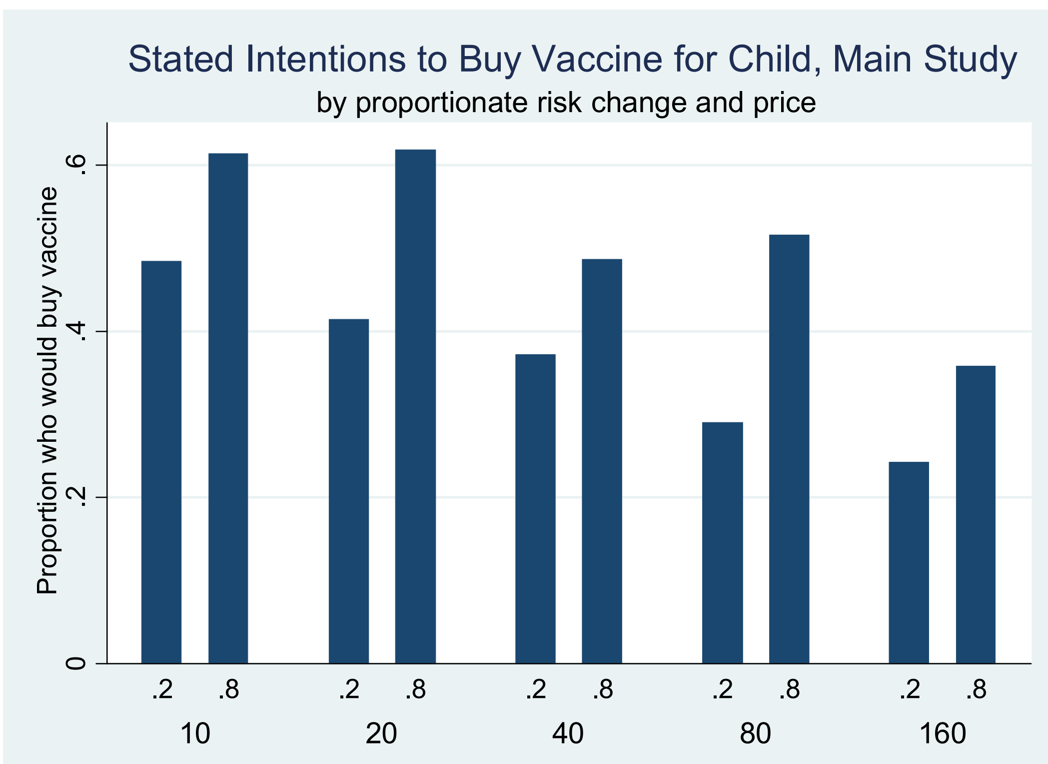


Figure 4.25. Certainty of Parents' Purchase Intentions.

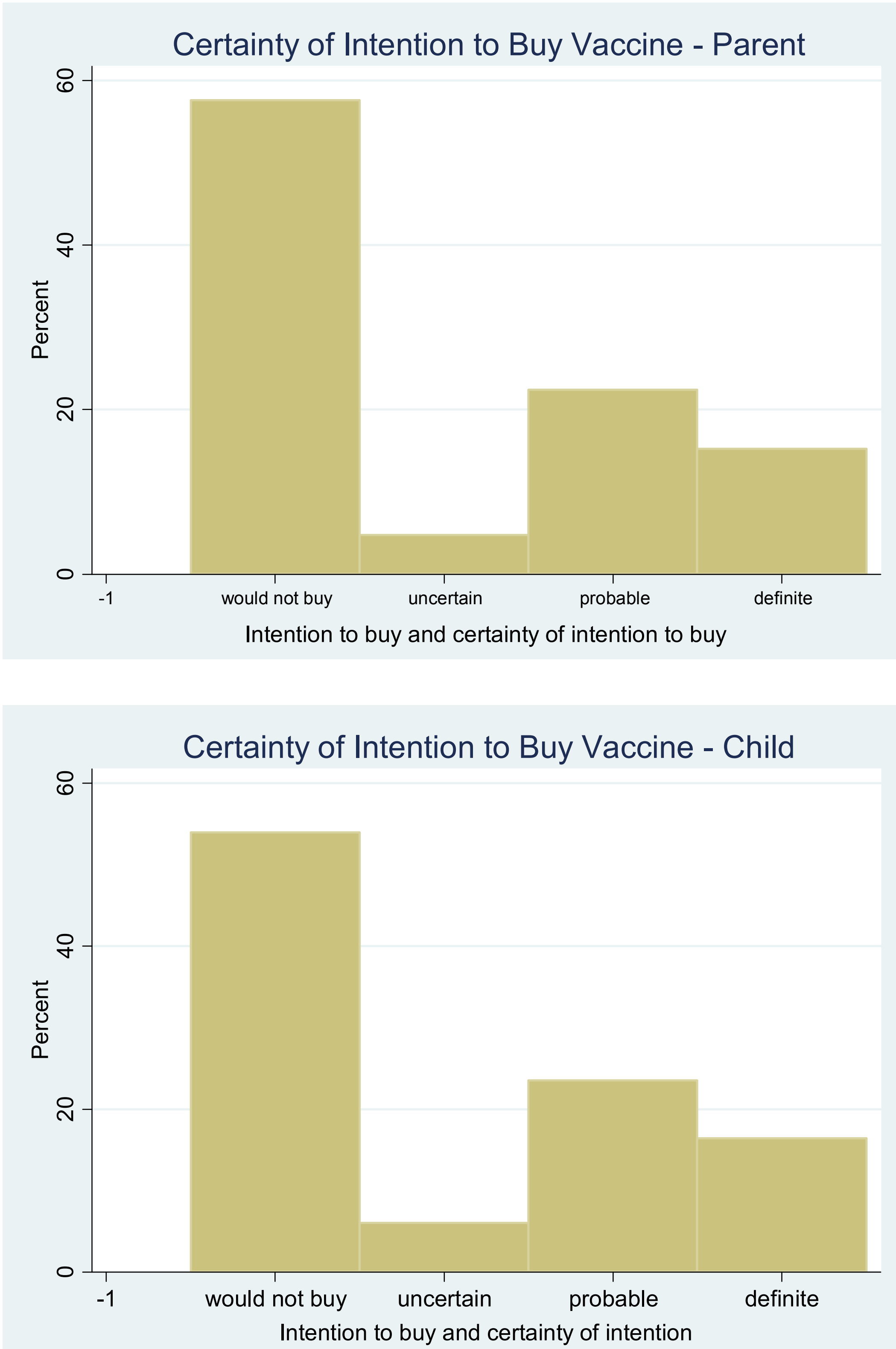


Table 4.1. Sampling Strata.

Stratum	Soft Launch	Main Study	Total in stratum
Single parents	388	113	501
Unmatched married parents	19	1669	1688
Matched married parents	98	868	966
Total number of parents	505	2650	3155

Table 4.2. Sample Parents' Characteristics Compared to US Population.

Characteristic	Sample	US
Pct. White, not Hispanic	79	64[a]
Pct. Black, not Hispanic	7	12 [a]
Pct. Hispanic	8	16 [a]
Average family size	4	3 [a]
Median age	42	37 [a]
Pct. Bachelor's degree or higher	53	31 [b]
Median family income ($ thousands)	75	62 [c]
Pct Employed		
Mothers	66	65 [d]
Fathers	90	88 [d]
Median earnings among employed ($ thousands)		
Women	35	28 [e]
Men	65	40 [e]

[a] Pertains to total population (not parents only). Source: US Decennial Census, 2010. Table DP-1. United States: Profile of General Population and 2010 Demographic Data Profile.
[b] Percent of family householders, age 25 years and older. Source: Current Population Survey. US Bureau of Labor Statistics, "Educational Attainment of the Population 25 Years and Over, by Selected Characteristics: 2010."
[c] Median income of family households in 2009 dollars. Source: American Community Survey, 2005-2009. US Bureau of the Census. Table S1901, Income in Past 12 Months.
[d] Percent employed among married parent families with own children under 18 years of age. For comparison, mothers' employment among families maintained by women is 67%. Source: Current Population Survey. US Bureau of Labor Statistics, "Employment Characteristics of Families – 2010," news release March 24, 2011.
[e] Median earnings in total population (not parents only), 2009 dollars. Source: American Community Survey, 2005-2009. US Bureau of the Census, Table S2001, Earnings in Past 12 Months.

Table 4.3. Health Risk Factors: Sample Proportions or Means.

Risk Factor	Parent	Child
Told by doctor to reduce blood pressure	0.256	0.026
On blood pressure medication	0.119	---
Told by doctor to reduce cholesterol	0.262	0.020
On cholesterol medication	0.087	---
Told by doctor have diabetes	0.050	0.004
On diabetes medication	0.036	0.003
BMI	29.609	21.772

Table 4.4. Reasons for Decision Whether to Participate in Vaccination Program.

A. **Reasons for choosing to participate: Among parents who said that they would purchase vaccine, proportion giving various reasons.**

Reason for choosing to participate in vaccination program	Parent	Child
The risk reduction is worth the expense	0.752	0.693
It is important to start young to reduce heart disease risk	0.349	0.502
I would spend whatever it takes to reduce heart disease risk	0.126	0.331
The program is better than other ways of reducing heart disease risk	0.087	0.075
Good habits developed now will likely continue in the future	0.217	---[a]
Some other reason	0.007	0.057

B. **Reasons for choosing not to participate: Among parents who said that they would purchase vaccine, proportion giving various reasons.**

Reason for choosing not to participate in vaccination program	Parent	Child
The risk reduction is too far in the future to justify the expense	0.163	0.256
My child might not stay on the program as an adult, so there is no sense paying for it now	---[a]	0.205
There are other ways to spend money, including on health, that are better than this program	0.179	0.167
I / my child can reduce heart disease risks without the program	0.507	0.491
I don't believe that the program would really work as described	0.217	0.195
The program is too expensive	0.092	0.088
I'm not that worried about heart disease risk	0.243	0.256
I already do enough to protect against heart disease risk	0.157	0.135
I cannot afford the program	0.157	0.139
Some other reason	0.296	0.304

[a] Reason not offered as an answer option.

Chapter 5: What do Parents Believe about Heart Disease Risks?

1. Introduction

This chapter presents some simple analysis of parents' beliefs about the heart disease risks that they and their children face. Three questions are addressed. (1) How do parents' subjective risk beliefs compare to objective estimates of risk from medical science? (2) How do parents' beliefs respond to information about risk? (3) How do parents' risk beliefs vary with known risk factors?

These questions are of interest for at least four reasons. First, parents make behavioral choices that influence the risks that they and their children face. It is important to determine whether parents' choices are based on adequate information about risk. Second, efforts to improve children's health often must operate through parents, and therefore an investigation of parents' beliefs about their children's risks is warranted. Third, analysis of responses to information may help improve programs designed to provide information about heart disease risks and risk factors. Fourth, willingness-to-pay estimates computed in this research are based on parents' subjective risk beliefs. The interpretation of the valuation estimates depends partly on whether parents' risk beliefs are sensible.

2. Initial and Revised Risk Beliefs

As discussed in Chapter 4, parents assessed risks of contracting coronary artery disease before age 75 using the risk scale. Parents made initial assessments of risk before receiving any information about the disease during the survey. Figure 5.1 presents relative frequency distributions of parents' initial assessments of their own and their children's risks. Three features of the distributions of parents' subjective risk assessments are worth noting. First, there is considerable variation in parents' subjective risk assessments both for themselves and for their children, with perceived risks ranging from 0 to 100 chances in 100. Second, relative frequency distributions of perceived risks to parents and to children are bimodal, with about one quarter of perceived risks lying between 20 and 30 chances in 100 and about 15% equal to 50 chances in 100.

Third, parents believe that their own risk of heart disease exceeds the risk faced by their children. Overall <u>median</u> perceived risks are 32 chances in 100 for parents and 25 in 100 for children. The null hypothesis that population median risk assessment is equal for parents and children was tested against a two-sided alternative using a Wilcoxon matched-pairs signed ranks test. This test was applied separately by gender of parents and children because, as discussed in Chapter 4, risks differ by gender. Specifically, the test was used to compare risk assessments for (1) mothers and daughters, (2) mothers and sons, (3) fathers and daughters, and (4) fathers and sons. The null hypothesis of <u>median</u> equality was rejected at the 1% in each of the four comparisons. Similarly, overall <u>mean</u> perceived risks are 36/100 for parents and 28/100 for children, and the null hypothesis that mean risk assessments are equal for parents and their children was tested using a matched-pairs difference between means tests for the same four classifications by parent and child gender. The hypothesis that mean risks are equal is rejected at the 1% level in all four comparisons.

As described in Chapter 4, parents had the opportunity to revise their initial estimates of the risk of getting heart disease after reviewing information about the disease. Parents' revised risk assessments are summarized in Figure 5.2. After receiving information about heart disease, parents continued to believe that their own risk of heart disease exceeds the risk faced by their children. Overall median revised risks are 29 chances in 100 for parents and 20 in 100 for children, and the null hypothesis that the population median is equal for parents and children is rejected at the 1% level in a Wilcoxon matched-pairs signed ranks test, for all four groups defined by parent and child gender. Similarly, overall mean revised risks are 34/100 for parents and 24/100 for children, and the null hypothesis that mean risk assessments are equal for parents and their children is rejected at the 1% level in a matched samples test for all four groups defined by parent and child gender.

The information provided about heart disease risks affected parents' risk perceptions, as evidenced by three facts. (The information provided was described fully in Chapter 4.) First, revised risk beliefs differ significantly from initial risk beliefs. Roughly 45% of parents revised their own risk assessment, with just over half of revisions being downward. Risk assessments for children were revised by 47% of parents, with 63% of revisions being downward. For both parents and children, downward revisions averaged -18 to -19 chances in 100 and upward revisions averaged 10 to 11 chances in 100. Median revised risk differs from median initial risk at the 1% level in Wilcoxon matched-pairs signed ranks tests for both parents and children. Means of revised and initial risk assessments also differ at 1% in matched-pairs tests for both parents and children.

Second, the dispersion in subjective risk assessments falls after information is received about risk. The reduction in dispersion is evident by inspection of the relative frequency distributions in Figures 5.1 and 5.2 and is confirmed by F-tests for equality of variances. The sample standard deviation of perceived risks for parents is 22 chances in 100 initially and 19 chances in 100 after revision. For children, the standard deviation is 28 chances in 100 initially and 24 chances in 100 after revision. For both parents and children, the null hypothesis that variances are equal before and after receipt of information is rejected at the 1% level. To the extent that a reduction in variance measures an increase in information, parents appear to be more informed about heart disease risks after reviewing the information presented in the survey. Third, some researchers have suggested that stated risk assessments of 50/100 should be interpreted as "don't know" responses (Fischhoff, and Bruine de Bruin, 1999), and substantially fewer parents report a risk belief of 50 chances in 100 after receiving information.

3. Subjective Risk Beliefs, Objective Risk Estimates, and Risk Factors

Relationships between heart disease risk factors and parents' risk assessments are summarized in Tables 5.1 and 5.2. Table 5.1 presents means of parents' initial and revised assessments of their own risks by gender and several other risk factors. Risk assessments that parents made for their children are not included in Table 5.1 because as documented in Chapter 4 relatively few sample children were reported to have high blood pressure, high cholesterol, or diabetes, and the survey did not inquire whether children smoked cigarettes. (Recall that half of sample children are 11 years of age or younger.) Also, a standard classification of adults as overweight or obese depends on BMI only. A comparable classification of children depends on percentiles of growth charts that differ by age and gender and thus does not lend itself to simple two-way comparisons like those used here for adults.

Table 5.1 also presents objective estimates of heart disease risks obtained from Framingham Heart Study data by Lloyd-Jones et al. (2006). That study estimated risk of atherosclerotic cardiovascular disease before age 75 years based on risk factors present at age 50 years. Risks were calculated using Kaplan-Meier survival analysis, adjusted for competing causes of death. Effects of individual risk factors were calculated separately without controlling for presence of other risk factors. Risk factors considered in the study were smoking, high blood pressure, high cholesterol, diabetes, and high BMI. Risk factors were assessed by clinical measurement of blood pressure, cholesterol, height and weight, by diagnosis of diabetes, and by patients' self-reported smoking status.

Table 5.2 presents means of parents' initial and revised assessments of their own risks and of their children's risks, by gender and additional risk factors not considered in Table 5.1: family history, exercise and diet. Information in Table 5.2 includes children because a reasonably large number of children fall into each sub-group considered there. However, no quantitative medical estimates of risk are presented for the risk factors considered in Table 5.2.

This section presents tests for whether parents' subjective assessments of risk vary predictably with presence of risk factors. The null hypothesis that the typical parent would see the same level of risk in the presence of a given risk factor as in its absence is tested against the alternative that parents see a higher level of risk in the presence of the risk factor. In other words, tests are conducted against one-sided alternatives because risk factors increase risk. When interpreting the tests, bear in mind that parents made initial assessments of risk before reporting their risk factors and before reviewing information about relationships between risk factors and risk.

Gender. Four features of risk assessments by gender are of interest. First, the average mother appears to have overestimated her risk, whereas the average father's assessment of his risk is relatively close to scientific estimates. Mean subjective risk assessments are 35 chances in 100 among mothers and 37 chances in 100 among fathers, compared to medical risk estimates of 19% for women and 35% for men. Second, parents tended to overestimate risk faced by daughters and to underestimate risk faced by sons. Mean initial risk estimates are 27 chances in 100 for girls, compared to 29 chances in 100 for boys.

Third, prior to receiving information, parents appear to have had at least some understanding that risks are higher for males than for females, but to underestimate the size of the gender difference. For parents' own risks, the null hypothesis that mean initial risk assessments are equal for mothers and fathers was tested against the one-sided alternative that risks are higher for fathers. The hypothesis is rejected at the 5% level based on a one-tail, matched-pairs test using the paired sample of married parents. However, the null hypothesis of equality is not rejected in an independent samples test applied to the unmatched parents ($p = 0.12$).[1] For parents' assessments of their children's risks, both mothers and fathers see their sons as facing higher risk than their daughters. Specifically, the hypothesis that parents make equal mean risk assessments for sons and daughters was tested separately for mothers and for fathers. Parents' initial risk estimates for sons are higher than for daughters, among both mothers and fathers, at the 5% level in one-tail independent samples tests.

Fourth, parents' revised risk assessments reflect the information that risks are higher for males than for females. In the sample of matched pairs of parents, the null hypothesis that mean initial risk assessments are equal for mothers and fathers is rejected at the 5% level in favor of the alternative that mean perceived risks are higher for fathers, in a matched pairs test. A parallel result is obtained among unmatched parents using an independent samples test. For children, both mothers and fathers have mean revised risk assessments for sons that are larger than those for daughters at the 1% level in independent samples tests.

Smoking. As shown in Table 5.1, both smokers and non-smokers appear to over-estimate risks of coronary artery disease relative to scientific risk estimates. Parents who smoke cigarettes see their risks of heart disease as higher than do non-smoking parents. Mean risk assessments of current smokers exceed those of non-smokers at the 1% level, for both mothers and fathers and for both initial and revised risk assessments. Thus, smokers appear to understand that they face higher risks of coronary artery disease than do non-smokers. If anything, smokers may slightly over-estimate the incremental risk posed by smoking. Scientific estimates indicate that risk to smokers is 6-7 percentage points higher than risk to non-smokers, whereas subjective estimates indicate that the initial risk assessment was 9-11 percentage points higher for the average smoker than for the average non-smoker.

Blood pressure. Mean risk assessments are higher at the 1% level for parents who have been told by a doctor to do something to reduce their blood pressure, and for parents who are taking medication to control blood pressure, than for other parents. This outcome is obtained for both mothers and fathers for both initial and revised risk assessments. Thus, parents appear to understand that elevated blood pressure increases risk of coronary artery disease. As shown in Table 5.1, women appear to over-estimate the risk they face regardless of blood pressure, whereas men may not fully appreciate the extent to which risk rises with blood pressure.

Cholesterol. Mean risk assessments are higher at the 1% level for parents who have been told by a doctor to do something to reduce their cholesterol, and for parents who are taking cholesterol medication, than for other parents. This outcome is obtained for both mothers and fathers for both initial and revised risk assessments. Thus, parents

[1] The hypothesis was tested separately in the sample of matched pairs of married spouses and in the sample of unmatched parents, because the observations on mothers and fathers in the matched sample are not independent.

appear to understand that high cholesterol is a risk factor for coronary artery disease. As in the case of blood pressure, women over-estimate risk regardless of their cholesterol information.

Diabetes. Results in Table 5.1 suggest that men and women who do not have diabetes over-estimate their risk of coronary artery disease. Persons with diabetes recognize that they are at higher risk, but may underestimate the extent of elevation in risk. At the 1% level, those who were diagnosed with diabetes at any age, those who were diagnosed as adults, and those who are taking diabetes medication on average see higher risks than persons without diabetes. This outcome is obtained for both men and women and for both initial and revised risk assessments. However, initial risk assessments by persons diagnosed with diabetes as adults and/or on medication for diabetes average between 44 and 48 chances in 100, whereas scientific estimates indicate that diabetics face risks of 57 to 67 chances in 100 depending on gender

BMI. Adults with a body mass index of less than 25 are classified as having normal body weight (or as underweight if BMI < 18). Adults with BMI values of 25 to less than 30 are considered overweight, and those with BMI over 30 are considered obese. As shown in Table 5.1, women in each category appear to over-estimate their risk of coronary artery disease before age 75 years, whereas initial risk beliefs of men in each category match scientific risk estimates relatively closely. Overweight women make higher initial risk assessments than women with BMI < 25 at the 1% level; overweight men perceive higher risks than men with BMI < 25 at the 5% level. Obese men and women see themselves at higher risk than their overweight counterparts at the 1% level. After reviewing information about BMI and heart disease risk, overweight parents perceive higher risk than those with BMI < 25 at the 1% level, and obese parents perceive higher risks than overweight parents at the 1% level, for both men and women.

Family history. Results in Table 5.2 indicate that parents see a substantial increase in risk when they know of a family member who had coronary artery disease. Initial risk assessments for parents who know of a blood relative who had heart disease are 11 percentage points higher on average than initial assessments for parents with no known family history of the disease. For men and women, mean initial and revised risk assessments are higher at the 1% level when there is a known family history of heart disease than when no family history of the disease is known. Parents also believe that children face higher risk, by 6-8 percentage points on average, when there is a family history of heart disease. Both mothers and fathers see higher average initial risks at the 1% level, for both sons and daughters, in the presence of a family history of heart disease.

Exercise. Parents believe that adults and children who get less exercise than recommended by authorities face higher risks of heart disease than do adults and children who get as much or more exercise than recommended. (See Table 5.2.) These differences are significant at the 1% level for both initial and revised risk assessments for men, for women, for fathers' assessments of risks faced by sons and by daughters, and for mothers' assessments of risks faced by sons and by daughters.

Diet. Parents believe that adults and children with less consumption of fruits and vegetables than recommended by authorities face higher risks of heart disease, as shown in Table 5.2. For men and women, mean initial and revised risks among those with less consumption than recommended are higher at the 1% level than mean risks among those with as much or more consumption than recommended. For boys and girls, mothers' mean initial risk assessments are higher at the 1% level when fruit and vegetable consumption is less than recommended than when consumption is as much or more than recommended; fathers' mean initial assessments are higher at the 1% level for daughters and at the 5% level for sons. Mothers' and fathers' revised assessments of risk for sons and daughters are higher at the 1% level when fruit and vegetable consumption is less than recommended.

4. Conclusions

Parents believe that they face higher risks of heart disease than do their children. Parents under-estimate the difference in heart disease risks by gender. Although perceived risks are somewhat higher for males than for females, medical evidence indicates that risks are almost twice as high for men as for women. A related point is that the average man's assessment of his own risk is fairly similar to scientific estimates, whereas women over-estimate their risk regardless of presence or absence of any risk factor, with the exception of diabetes. Both men and women may fail to appreciate fully the magnitude of the increase in risk associated with diabetes.

Parents understand at least qualitatively the association between risk factors and risks of coronary artery disease. For almost every risk factor, initial risk assessments are higher at the 1% level in the presence of the risk factor than in its absence, for men, women and children. Parents evidently believe that they could reduce their own and their children's risk of heart disease through diet and exercise, management of body weight, cholesterol and blood pressure, and avoidance of smoking. Consequently, the prevalence of unhealthy diets, inactivity, obesity, elevated cholesterol and blood pressure, and smoking would not appear to arise because of ignorance of the relationship between these risk factors and the chances of developing coronary artery disease.

Despite the relatively high awareness of factors contributing to heart disease risks, results indicate that an organized presentation of risk information can influence parents' subjective risk assessments. Almost half of parents revised their initial risk assessments after reviewing information about average risks and risk factors, and revisions were sizeable. The average downward revision was almost 20 percentage points and the average upward revision was about 10 percentage points. Also, revised risk assessments were less variable than initial assessments, suggesting a reduction in uncertainty about the level of risk faced.

References

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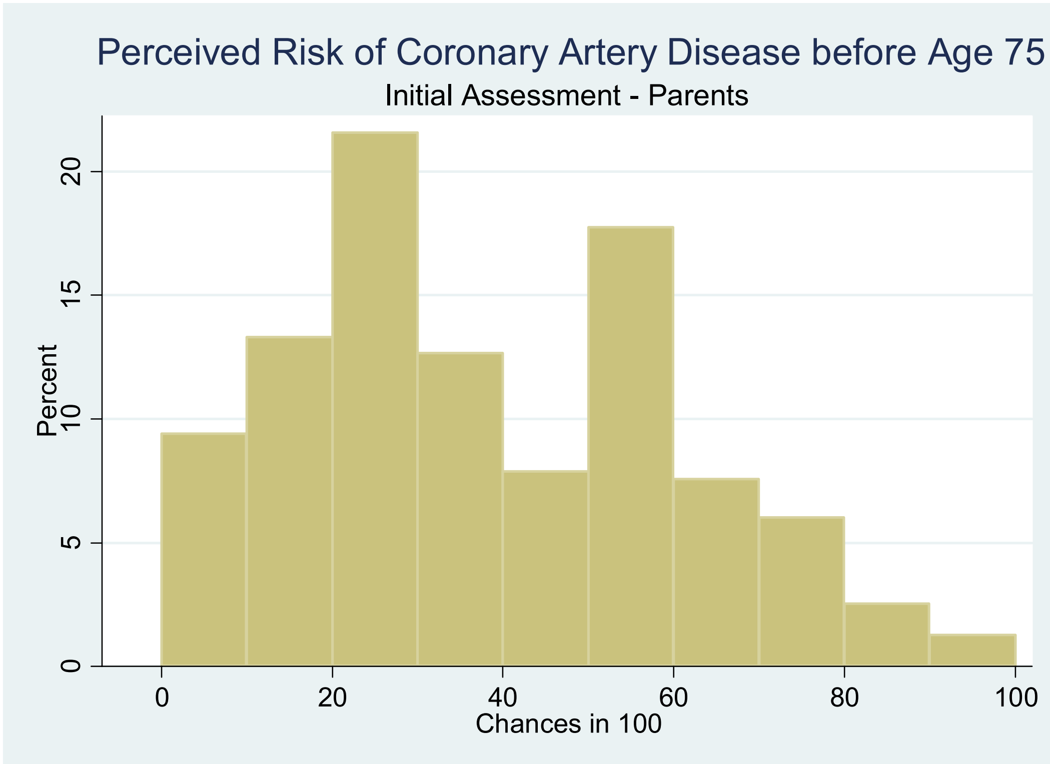
Lloyd-Jones, Donald M, Eric P Leip, Martin G Larson, Ralph B dD'Agostino, Alexa Beiser, Perter W F Wilson, Philip A Wolf and Daniel Levy. 2006. Prediction of lifetime risk for cardiovascular disease by risk factor burden at 50 years of age. *Circulation* 113: 791-98.

Figure 5.1. Parents' Initial Assessments Risks of Getting Heart Disease.



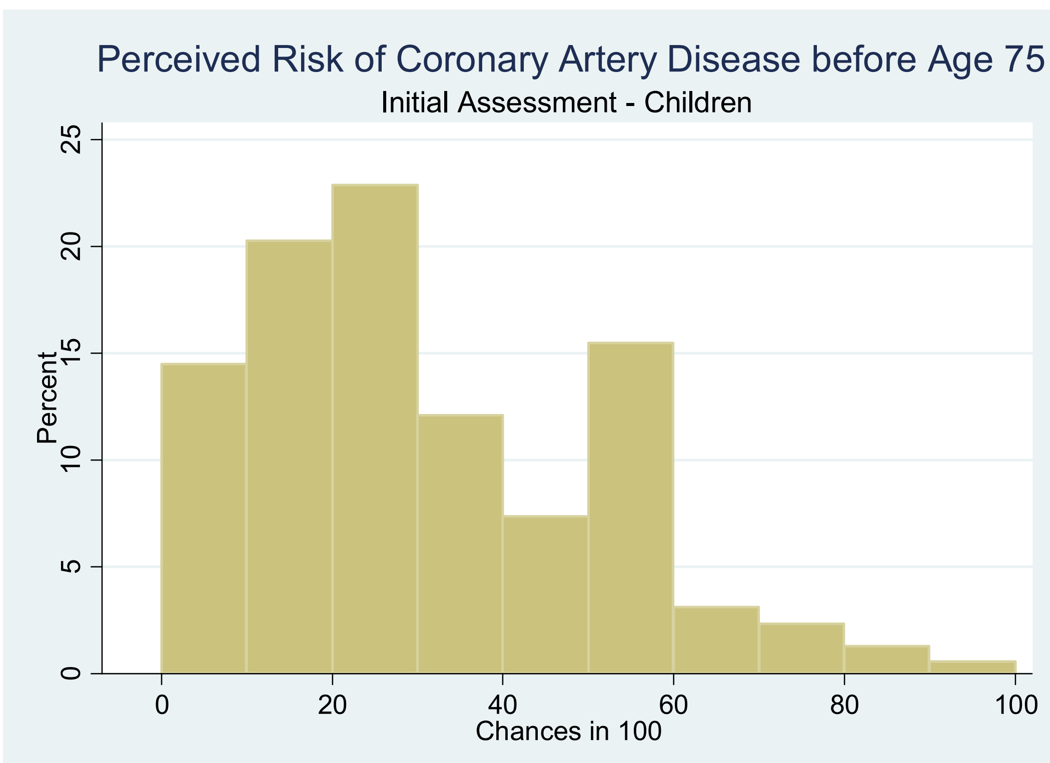
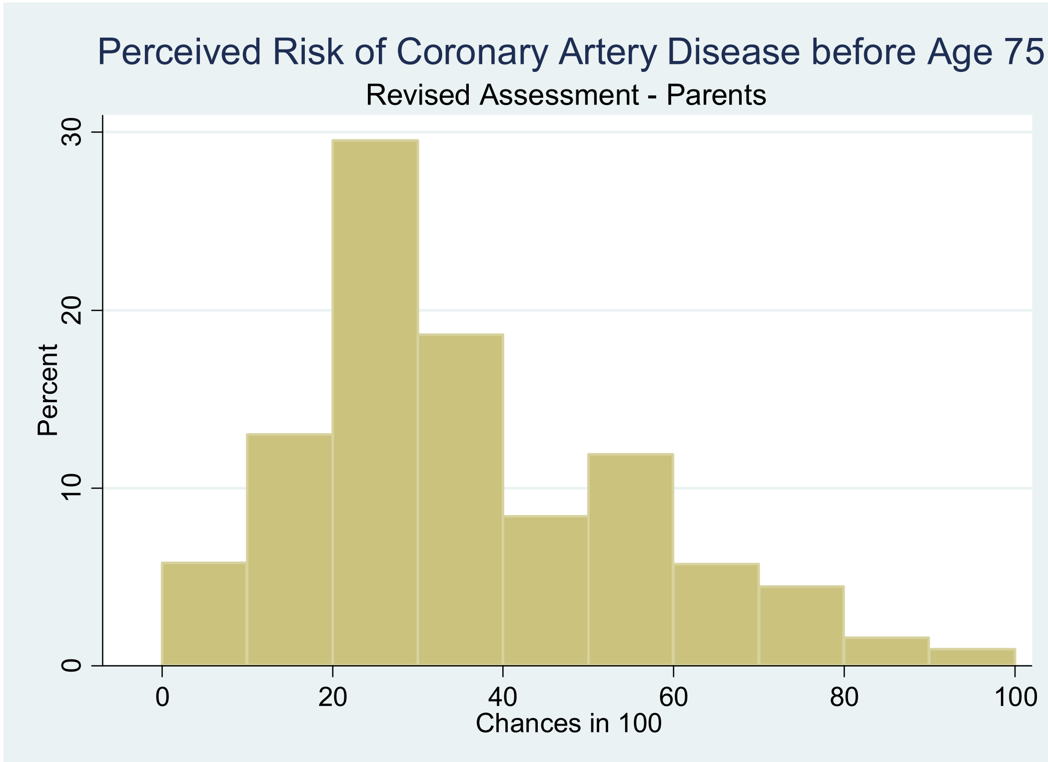


Figure 5.2. Parents' Revised Assessment Risks of Getting Heart Disease.



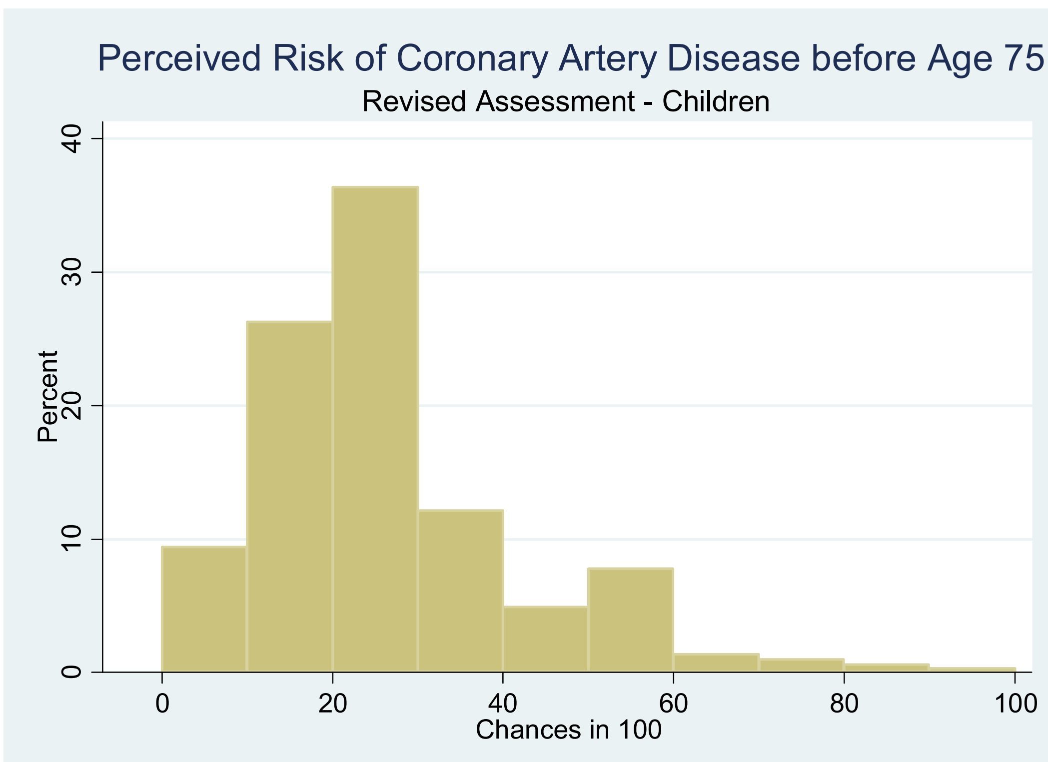


Table 5.1. Objective and Subjective Risk Estimates.

Scientific Estimates			
		Male	Female
Overall		35	19
Current Smoker?			
	No	28	14
	Yes	34	21
Blood pressure, mm Hg			
Diastolic	Systolic		
< 80	< 120	27	11
80 - 89	120 - 139	32	18
90 - 99	140 - 159	46	29
>= 100	>= 160 or treated	51	35
Total cholesterol, mg/dL			
	< 180	26	9
	180-199	29	11
	200-239	35	17
	>= 240	45	30
Diagnosed with diabetes?			
	No	30	16
	Yes	67	57
Body Mass Index			
	< 25	28	15
	25 - < 30	30	18
	>= 30	42	22

Parents' Perceptions: Means		Fathers		Mothers	
		Initial	Revised	Initial	Revised
Overall		37	35	35	34
Current Smoker?					
	No	36	34	34	31
	Yes	45	44	45	44
Told by physician to lower blood pressure?					
	No	34	32	33	30
	Yes	43	42	43	43
	Yes, on medication	41	41	45	45
Told by physician to lower cholesterol?					
	No	34	33	33	30
	Yes	41	39	45	42
	Yes, on medication	41	41	50	49
Diagnosed with diabetes?					
	No	36	34	35	32
	Yes	45	49	47	51
	Yes, as adult	45	49	46	51
	Yes, on medication	44	49	48	53
Body Mass Index					
	< 25	29	26	28	25
	25 - < 30	33	31	35	31
	>= 30	42	41	42	41

Table 5.2. Parents' Mean Risk Beliefs by Family History, Exercise and Diet.

	Fathers		Mothers		Sons		Daughters	
	Initial	Revised	Initial	Revised	Initial	Revised	Initial	Revised
Overall	37	35	35	34	29	26	27	23
Family history of heart disease?								
No	31	30	29	28	24	22	23	20
Yes	42	40	40	37	32	27	29	24
Exercise								
More than recommended	31	29	27	24	26	22	22	19
About as much as recommended	32	31	30	28	30	25	26	22
Less than recommended	42	40	40	37	35	32	34	31
Fruit & vegetable consumption								
More than recommended	34	30	25	23	22	20	22	18
About as much as recommended	32	31	32	29	28	23	24	21
Less than recommended	40	38	39	37	32	28	30	26

Chapter 6: Collective Rationality and Environmental Risks to Health in the Family

1. *Introduction*

Effects of environmental policy on individuals living in families depend on how resources are allocated within the family. Although protection of children from environmental health risks is a stated priority of many national governments (Scappecchi 2006), effectiveness and economic benefits of policies affecting children depend on parents' voluntary efforts to protect their children from risk. Two questions are particularly important in evaluating parents' risk-reduction efforts on behalf of children. First, are parents' actions consistent with a Pareto efficient allocation of resources within the family? If parents' actions are efficient and other persons do not display altruism toward children, then parents undertake the socially efficient level of investment in children's health protection. But if parents' risk protection efforts are not efficient within the family, then the extent of voluntary protection of children is likely to fall short of the socially efficient level. Second, how does the distribution of decision power between parents affect their investment in children's risk protection? This question bears on the effectiveness of targeted policies aiming to protect children, such as whether a transfer of resources from fathers to mothers would lead to increased protection of children.

Issues of efficiency and distribution within families also lie at the heart of distinctions between competing models of household resource allocation. Previous studies of parents' demands to reduce children's health risk have relied almost exclusively on the unitary model of household decision-making (Becker 1981), in which parents allocate resources as if maximizing a single utility function. The unitary model implies that family resource allocations are efficient and that a redistribution of family resources has no effect on behavior. Alternatives to unitary models can be distinguished depending on whether or not they assume cooperation and hence Pareto efficiency. The model of collective rationality (Chiappori 1988; Apps and Rees 1988) assumes that household members with different preferences cooperate to allocate resources efficiently. The collective model predicts that redistribution of resources within the family affects decision power and thus resource allocation, and implies a proportionality restriction on the effect of redistribution. Non-cooperative models do not predict efficiency and produce varying predictions about effects of redistribution on allocation (Browning, Chiappori and Lechene 2009).

What is known about efficiency, distribution, and parents' investments in children's health? Several studies provide evidence that resources allocated to children are influenced by the distribution of resources within the family and thus are inconsistent with the unitary model (Duflo 2000, Lundberg, Pollack and Wales 1997, Schultz 1990, Thomas 1990), but these studies do not test consistency with the Pareto efficiency restriction of collective rationality.

This chapter tests whether parents' choices of risk-reducing goods for family members are consistent with Pareto efficiency within the family, and examines how the distribution of resources between mothers and fathers affects these choices. The chapter extends the model of Blundell, Chiappori and Meghir (2005) to incorporate household production of perceived risk of contracting heart disease. Heart disease is the leading cause of death in the United States, has been linked to exposure to particulate matter (Brook et al. 2004), and is influenced by health choices made throughout life including during childhood. The model implies an equilibrium condition governing expenditures on protecting children from heart disease risk that is analogous to the Lindahl-Samuelson condition for efficient public goods provision.

Additional predictions of the model are that: (1) the value of morbidity risk reduction to adults is equal to the marginal cost of achieving it. (2) The value of morbidity risk reduction to children is determined as the sum of each parent's willingness to pay to reduce the child's risk and equals the marginal cost of reducing risk. These predictions in turn imply that (3) a family's marginal rate of substitution between morbidity risk to a parent and to a child is equal to the corresponding ratio of marginal risk reduction costs. Empirical support for these predictions provides a basis for transferring estimates of benefits of reduced morbidity for adults to estimate benefits for children. Thus, a compelling case can be made to investigate the validity of these predictions because: (1) it is not feasible to conduct separate morbidity valuation studies for each of the large number of illness risks that have been associated with exposure to environmental hazards and (2) studies of adult willingness to pay for reduced morbidity, while scarce, still outnumber those for children.

The model is tested using a stated preference survey on heart disease risks. Use of stated preference data is controversial partly because respondents are often thought to overstate their purchase intentions when they do not actually have to pay. Two methods are employed to mitigate this problem of hypothetical bias. First, hypothetical willingness to pay responses are divided based on a follow-up question about the degree of certainty in respondents' purchase intentions. Blumenschein et al. (2008) and others have shown that hypothetical bias can be eliminated by treating respondents who state that they would buy a good but are uncertain about their purchase intentions as non-purchasers. Second, econometric methods applied confine any systematic tendency to misstate willingness to pay in a regression constant term that plays no role in testing efficiency, and no role in one of two tests for effects of distribution. In consequence, estimates presented avoid perhaps the most damaging criticism of the stated preference valuation method.

Results are consistent with a Pareto efficient allocation of resources within the family. Results bearing on the link between the distribution of family resources and the resulting allocation are mixed, but it appears that a redistribution of resources from fathers to mothers may increase protection of children from health risk.

2. Theoretical Framework

2.1 Pareto Efficient Allocation

The theoretical approach extends the collective model of Blundell, Chiappori and Meghir (2005) to incorporate household production of perceived health risk. The model envisions a family consisting of two parents and one child in which parents allocate family resources for one period. The mother cares about her consumption of private goods and of within-family public goods, and about her perceptions of her own and her child's risk of contracting heart disease. The father likewise cares about his consumption of private and family public goods, and about his perceptions of his own and the child's heart disease risk. Private and public consumption goods are purchased at unit prices. Family public goods include expenditures on items like housing and heating/cooling of the home, as well as expenditures for the child's consumption.

A parent's utility function is given by

$$U^i = U^i(C^i, R^i, Q, R^{ki}), \qquad i = m, f. \tag{1}$$

In this equation, C^i represents expenditures on private market goods consumed by parent *i*, Q denotes expenditures on family public goods including consumption expenditures for the child, R^i represents the parent's perception of his or her risk of contracting heart disease, and R^{ki} denotes parent *i*'s perception of the child's risk of contracting heart disease. The index *i* distinguishes mother (*m*) from father *(f*). Utility is increasing and concave in consumption and decreasing and convex in heart disease risks. Although the child does not have well-defined preferences that are respected by either parent, the parents treat the child's consumption as a public good within the family. Each parent also cares about the child's heart disease risk, but the parents may perceive this risk differently. Parental preferences are egoistic in that neither parent cares about the other's welfare, consumption or risk.

Perceived risks are home-produced according to the health production functions

$$\begin{aligned} R^i &= R^i(G^i, \Omega_i), \\ R^{ki} &= R^{ki}(G^k, \Omega_{ki}) \quad i = m, f. \end{aligned} \tag{2}$$

In these equations, G^i and G^k represent the parent's and the child's use of a market good to reduce risk of heart disease, and Ω_i and Ω_{ki} represent indexes of parent *i*'s attitudes and information concerning his or her risk and the child's risk of heart disease. Each parent is assumed to know the amount of market goods G^k used by the child but the parents may differ in attitudes and information Ω_{ki} about the child's risk. Consequently the parents may differ in perceptions of the level of risk faced by the child. Perceived risks are diminishing and convex in the risk-reducing good, but use of G is not a direct source of utility for either parent.[2]

The family budget constraint is

$$y_m + y_f = Y = C^m + C^f + Q + p(G^m + G^f + G^k). \tag{3}$$

In the family budget constraint, pooled family income Y is determined as the sum of parental incomes y_m and y_f, private and public consumption goods are purchased at unit

2 The possibility that risk reducing goods directly affect parental utility is addressed in the econometric methods discussed later.

prices, and p denotes the common price of risk-reducing goods for each family member.

To achieve a Pareto-efficient outcome, parents allocate family resources as if to maximize a weighted sum of parental utilities given by

$$\mu U^m(C^m, R^m, Q, R^{km}) + (1-\mu)U^f(C^f, R^f, Q, R^{kf}) \tag{4}$$

subject to the budget constraint (3), the health production functions for heart disease risk (2), and non-negativity restrictions on all purchased goods. The Pareto weight μ in equation (4) represents the mother's decision power and $1-\mu$ represents the father's decision power (Browning and Chiappori 1998).

2.2 Decentralized Parental Decision-Making and Efficiency

A Pareto efficient allocation involving public goods can be sustained by decentralized decision-making given a suitable distribution of household income and efficient settings of Lindahl prices (Cornes and Sandler 1996, Donni 2009). Analyzing the allocation problem in terms of decentralized decision-making aligns the model with the field study, in which each parent made independent decisions without consulting the other parent.

The decentralized perspective treats family resource allocation as a two-stage process. In the first stage, parents agree on a sharing rule governing the distribution of family income, and on Lindahl prices specifying each parent's contribution to public expenditures. Parent *i* receives the income share s_i, where $s_m + s_f = Y.$ Parent *i* contributes q^i to public consumption and g^{ki} to the risk-reducing good for the child. Family consumption of public goods is $q^m + q^f = Q$ and the child receives $g^{km} + g^{kf} = G^k$ of the risk-reducing good. Parents agree on Lindahl shares $\tau_i = q^i / Q$ and $t_i = g^{ki} / G^k$, where $\tau_m + \tau_f = 1$ and $t_m + t_f = 1.$

In the second stage of the decentralized allocation problem, each parent chooses (C^i, G^i, q^i, g^{ki}) to maximize his or her utility

$$U^i\left[C^i, R^i(G^i, \Omega_i), q^m + q^f, R^{ki}(g^{km} + g^{kf}, \Omega_{ki})\right], \tag{5}$$

subject to the individual budget constraint $s_i = C^i + pG^i + \tau_i(q^m + q^f) + t_i p\left(g^{km} + g^{kf}\right)$ and non-negativity restrictions on C^i, G^i, q^i, g^{ki}. In all that follows, each parent is assumed to have positive private goods consumption.

Pareto efficiency implies that if each parent makes positive contributions to risk reduction for the child then parents' risk protection efforts satisfy a form of Lindahl-Samuelson condition. This result follows from first-order conditions

$$\frac{\partial U^i / \partial R^i}{\partial U^i / \partial C^i}\left(\frac{\partial R^i}{\partial G^i}\right) \leq p, \quad if <, \quad G^i = 0,$$

$$\frac{\partial U^i / \partial R^{ki}}{\partial U^i / \partial C^i}\left(\frac{\partial R^{ki}}{\partial G^k}\right) \leq t_i p, \quad if <, \quad g^{ki} = 0. \quad i = m, f.$$

As shown, at an interior solution each parent's marginal rate of substitution of consumption for the risk-reducing good equals the relative price faced by the individual parent.

In the field study, parents make choices about a risk-reducing good that produces given proportionate changes in risk $\Delta^i = (\partial R^i / \partial G^i) / R^i$ and $\Delta^{ki} = (\partial R^{ki} / \partial G^k) / R^{ki}$. Rewriting the first-order conditions to focus on proportionate changes in risk yields

$$W^i = \frac{(\partial U^i / \partial R^i) R^i}{\partial U^i / \partial C^i} \Delta^i \leq p, \quad if <, \quad G^i = 0,$$
$$W^{ki} = \frac{(\partial U^i / \partial R^{ki}) R^{ki}}{\partial U^i / \partial C^i} \Delta^{ki} \leq t_i p, \quad if <, \quad g^{ki} = 0. \quad i = m, f. \tag{6}$$

In equation (6), W^i and W^{ki} denote parent *i*'s willingness to pay for a change in the risk reducing goods that produce proportionate risk changes Δ^i and Δ^{ki}. In consequence,

$$\sum_i \frac{\partial U^i / \partial R^{ki}}{\partial U^i / \partial C^i} \Delta^{ki} = p = \frac{\partial U^j / \partial R^{kj}}{t_j (\partial U^j / \partial C^j)} \Delta^{kj}, \quad j = m, f. \tag{7}$$

According to equation (7), family willingness to pay for a unit of the risk reducing good for the child, computed as the sum of each parent's individual willingness to pay, equals the relative price. Also, family willingness to pay equates to each parent's individual willingness to pay relative to the parent's Lindahl share of child expenditures. Collecting results in equations (6) and (7) and considering an equal proportionate reduction in all perceived risks $(\Delta^m = \Delta^{km} = \Delta^f = \Delta^{kf})$ implies that the parents allocate resources so that at an interior solution, the family is willing to pay an equal amount for an equal proportionate reduction in risk for any member as shown in equation (8).

$$\frac{(\partial U^m / \partial R^m) R^m}{\partial U^m / \partial C^m} = \frac{(\partial U^m / \partial R^{km}) R^{km}}{t_m (\partial U^m / \partial C^m)} = \frac{(\partial U^f / \partial R^f) R^f}{\partial U^f / \partial C^f} = \frac{(\partial U^f / \partial R^{kf}) R^{kf}}{t_f (\partial U^f / \partial C^f)}. \tag{8}$$

Equation (8) provides the basis for the econometric tests for efficiency presented in Section 3. For comparison with prior research on health valuation in the family, equation (8) can be re-expressed in terms of marginal rates of substitution between child and parent risk:

$$\sum_i \frac{(\partial U^i / \partial R^{ki}) R^{ki}}{(\partial U^i / \partial R^i) R^i} = 1 = \frac{(\partial U^j / \partial R^{kj}) R^{kj}}{t_j (\partial U^j / \partial R^j) R^j}, \quad j = m, f. \tag{9}$$

In a Pareto efficient household operating at an interior solution, the sum of parents' marginal rates of substitution between equal proportionate risk reductions affecting the child and the parents equates to unity. If supported by empirical evidence, equations (8) and (9) provide a basis for transferring morbidity valuation estimates from parents to children.

2.3 Non-cooperation and inefficiency

The non-cooperative model of Browning, Chiappori and Lechene (2009) may be used to develop an alternative to the hypothesis of efficiency. Those authors demonstrate than in a non-cooperative equilibrium, all public goods (except possibly one) are exclusively provided by one parent only. If parent *i* is the exclusive provider of the risk-reducing good for the child, then

$$\begin{aligned} &\frac{\partial U^i / \partial R^{ki}}{(\partial U^i / \partial C^i)} \Delta^{ki} = p \\ &\frac{\partial U^j / \partial R^{kj}}{(\partial U^j / \partial C^j)} \Delta^{kj} < p, \quad j \neq i. \end{aligned} \tag{7'}$$

In contrast to parents in an efficient household, non-cooperative parents make choices about the risk-reducing good for the child according to their individual valuations rather than family valuations. Assuming that parent *j* has a positive marginal valuation of child risk reductions, then with diminishing marginal rates of substitution the family's risk protection efforts for the child fall short of the Pareto efficient amount. The efficiency restrictions given in equations (7), (8) and (9) do not apply to the non-cooperative household, implying that the inefficient equilibrium of the non-cooperative household can be distinguished from the efficient solution described above.

Efficient and inefficient outcomes are not as easily distinguished, however, if the parents jointly contribute to one public good, and if that good happens to be heart disease risk reduction for the child. In that case, both parents buy the risk-reducing good for the child until meeting the equilibrium condition $\frac{\partial U^i / \partial R^{ki}}{(\partial U^i / \partial C^i)} \Delta^{ki} = p$ for $i = m, f$. The sum of parents' marginal valuations of the child's use of the risk reducing good would equate to twice the price of the good. Although the resulting allocation is inefficient, it cannot be distinguished from the efficiency restriction in equation (7) without identification of the Lindahl shares.

2.4 Effects of distribution

The non-cooperative, unitary and collective models have different implications for the effect of the distribution of family resources on allocation. According to the non-cooperative model, a redistribution of family income between parents has no effect on household demands if both parents contribute to any family public good. If parents contribute to disjoint sets of public goods, then the intra-family distribution of income affects household demands.

In the unitary model, the Pareto weight μ is fixed so that household decisions arise from maximization of a unique, well-defined utility function. In contrast the collective model allows decision power to depend on the economic environment including prices and one or more "distribution factors." Distribution factors affect family decision-making but do not directly affect preferences or the budget. Estimating the influence of distribution factors on household demands provides a way to test between models because the unitary model predicts that distribution factors have no effect on household decisions, whereas the collective model predicts proportionality in the effects of distribution factors across goods (Bourguignon, Browning and Chiappori 2009).

Examples of distribution factors used in prior empirical tests of the unitary or collective models include the spouses' nonlabor incomes (Schultz 1990, Thomas 1990); the distribution of wealth by gender at marriage (Thomas, Contreras and Frankenberg 1999); receipt of social pension (Duflo 2000) or child benefit (Lundberg, Pollack and Wales 1997) by gender; and sex ratios and divorce laws (Chiappori, Fortin and Lacroix 2002). Spouses' total incomes or relative income are probably the most frequently used distribution factors (Bourguignon et al. 1993, Browning et al. 1994, Thomas and Chen 1994, Phipps and Burton 1998, Dosman and Adamowicz 2006). In the empirical work of Section 3, the parents' individual incomes, and exogenous changes in individual incomes, are treated as distribution factors, so that: $\mu = \mu(y_m, y_f, p, \Omega)$, where Ω denotes a vector composed of $(\Omega_m, \Omega_{km}, \Omega_f, \Omega_{kf})$.

To develop the proportionality restrictions implied by the collective approach, start with the optimal choices of risk-reducing goods from the decentralized maximization problem of parent *i*: $G^i(p, s_i, t_i, \tau_i, \Omega_i, \Omega_{ki})$ and $g^{ki}(p, s_i, t_i, \tau_i, \Omega_i, \Omega_{ki})$. Let $V^i(p, t_i, s_i, \tau_i, \Omega_i, \Omega_{ki})$ represent the indirect utility function from the decentralized maximization problem of parent *i.* The parents choose s_i, τ_i and t_i to maximize

$$\mu V^m(p, t_m, s_m, \tau_i, \Omega_m, \Omega_{km}) + (1-\mu) V^f(p, t_f, s_f, \tau_i, \Omega_f, \Omega_{kf}) \tag{10}$$

subject to $s_m + s_f = Y$ and $\tau_m + \tau_f = 1$ and $t_m + t_f = 1$. The solution to this problem together with the decentralized problems implies that the rate of tradeoff between mothers and fathers consumption of market goods is equates to the parents' relative decision power, as shown in equation (11).

$$\frac{(\partial U^m / \partial R^m) R^m / (\partial U^m / \partial C^m)}{(\partial U^f / \partial R^f) R^f / (\partial U^f / \partial C^f)} \frac{\Delta^m}{\Delta^f} = \frac{1-\mu}{\mu} = \frac{\partial U^m / \partial C^m}{\partial U^f / \partial C^f}. \tag{11}$$

Parents determine their income and Lindahl shares from maximizing the weighted sum of indirect utilities in equation (10) so that $s_i = s_i(\mu, p, \Omega)$ and $t_i = t_i(\mu, p, \Omega)$, where $\sum s_i = Y$ and $\sum t_i = 1$, and $\mu = \mu(y_m, y_f, p, \Omega)$. Substitution and differentiation indicates that the ratio of effects of any pair of distribution factors on demand is equal across goods. For example,

$$\frac{\partial g^{ki} / \partial y_m}{\partial g^{ki} / \partial y_f} = \frac{\partial \mu / \partial y_m}{\partial \mu / \partial y_f}, \qquad i = m, f. \tag{12}$$

Although the right hand side of equation (12) is not observable, it is the same for each parent. Consequently the restriction can be assessed for testing for equality across risk-reducing goods.

3. Econometric Methods and Results

3.1 Data and Initial Nonparametric Test for Pareto Efficiency

This section describes use of the data from the field study, documented in Chapters 4 and 5, to test predictions of the model just described. Married parents' assessments of risks of contracting coronary artery disease before age 75 are summarized in Table 6.1. As discussed in more fully in Chapter 5, parents believe that they face higher risks of heart disease than do their children. Parents under-estimate the difference in heart disease risks by gender. Although perceived risks are somewhat higher for males than for females, medical evidence indicates that risks are almost twice as high for men as for women (Lloyd-Jones et al. 1999, 2006). A related point is that the average man's assessment of his own risk is fairly similar to scientific estimates, whereas women over-estimate their risk. Nonetheless, evidence presented in Chapter 5 establishes that parents understand at least qualitatively the association between important risk factors and risks of coronary artery disease.

Parents' purchase intentions for vaccines to reduce heart disease risks are summarized in Table 6.2. Panel A pertains to the sample of matched pairs and Panel B to the sample of unmatched parents. As shown, a majority of parents indicated that they would not purchase the vaccine. Among those who said they would purchase the vaccine, about six percent indicated on follow-up that they were uncertain about their purchase intentions. Blumenschein et al. (2008) and others have shown that hypothetical bias can be eliminated by treating respondents who indicate uncertainty about purchase intentions as non-purchasers. Consequently, only parents who said that they were willing to pay for a vaccine and who said that they "probably" or "definitely" would pay for it are treated as stating positive purchase intentions. Table 6.3 presents the proportion of parents who "probably" or "definitely" would purchase a vaccine by price and by size of proportionate risk change. The table is constructed from data on mothers and fathers in both samples. As shown, parents were more likely to say that they would purchase vaccines that offered larger risk reductions or that had lower prices.

In an efficient household, each parent would choose to provide the risk reducing good for the child if and only if this decision is Pareto efficient for the family (see equation (7)). As described in Section 2, in the field study each parent in a matched pair was assigned the same price and same percentage risk change for the child. In short, each parent in a matched pair faced an identical choice regarding the vaccine for the child, and the choice either is Pareto efficient or it is not. Pareto efficiency implies that each parent would make the same decision about purchasing the vaccine for the child. In a non-cooperative household, however, parents make decisions based on individual rather than on family valuations of risk reductions for the child (see equation (7')), and one parent may be the sole provider of the vaccine for the child. These observations motivate a simple non-parametric test for consistency of parents' decisions with Pareto efficiency.

Table 6.4 presents a cross-tabulation of matched parents' stated purchase intentions for the vaccine that reduces risk for their child. In 74% of pairs, spouses state the same purchase intention.[3] A high degree of agreement is consistent with the efficiency hypothesis, because purchasing the vaccine is either efficient for the family or not, independently of whether the mother or the father evaluates the vaccine. Subject to sampling variation, each parent, whether mother or father, should make the same decision about the vaccine. To test this idea more formally, a McNemar test (see Agresti 2002) is used to assess the hypothesis that, conditional on a pair of spouses, the stated intention to buy the child's vaccine is independent of an individual parent's identity as mother or father. This hypothesis is not rejected at conventional levels (p = 0.77), an outcome that is consistent with efficiency.

3.2 Econometric Methods and Parametric Tests for Pareto Efficiency

Econometric methods focus on estimating first order conditions in equation (6), re-expressed in more compact notation and allowing for variation between parents as

$$\begin{aligned} W^i &= \gamma^i \Delta^i + controls + \omega_i \leq p, \qquad if <, G^i = 0, \\ W^{ki} &= \gamma^{ki} \Delta^{ki} + controls + \omega_{ki} \leq t_i p, \quad if <, g^{ki} = 0, \quad i = m, f. \end{aligned} \tag{13}$$

Expression (13) pertains to the *h*th mother or father although the observation index has been suppressed. The $controls$ reflect the influence of observed characteristics of the *h*th mother or father on valuation of vaccines to reduce heart disease risk, and the random disturbances ω_i and ω_{ki} capture effects of unobserved characteristics on willingness to pay. The Δ^i and Δ^{ki} variables representing the randomly assigned proportionate reductions in risk for the parent and child are coded 0.1 and 0.7 for the parent and 0.2 and 0.8 for the child. Also, γ^i and γ^{ki} denote parameters that are interpreted as the parent's willingness to pay to eliminate risk. Thus, equation (13) treats willingness to pay as proportionate to the size of risk reduction.[4]

The equations in (13) are estimated by allowing stated willingness to pay ($\tilde{W}^i$ and $\tilde{W}^{ki}$) to differ from true willingness to pay (W^i and W^{ki}). A discrepancy between stated and true willingness to pay may remain even though respondents with uncertain purchase intentions are treated as non-purchasers. As shown in equation (14), the differences between stated and true willingness to pay is modeled as sum of systematic ($\gamma^{i0}, \gamma^{ki0}$) and random ($\nu_i, \nu_{ki}$) factors with zero mean

3 Parents appear to have expected an even higher extent of agreement. After stating their purchase intentions for the child's vaccine, parents were asked whether they thought that their spouse (partner) would agree with their decision. About 95% of parents expected their spouses to agree.

4 Hammitt and Graham (1999) review the theoretical expectation that willingness-to-pay should be proportional to the change in risk, at least for small risk changes, and discuss how stated willingness-to-pay is, in general, less than proportional. Equation (13) imposes proportionality for risk changes of any magnitude.

$$\tilde{W}^i - W^i = \gamma^{i0} + \nu_i$$
$$\tilde{W}^{ki} - W^{ki} = \gamma^{ki0} + \nu_{ki}, \quad i = m, f. \tag{14}$$

Insert equation (13) into equation (14) to obtain

$$\tilde{W}^i = \gamma^{i0} + \gamma^i \Delta^i + controls + \varepsilon_i$$
$$\tilde{W}^{ki} = \gamma^{ki0} + \gamma^{ki} \Delta^{ki} + conrols + \varepsilon_{ki}, \quad i = m, f, \tag{15}$$

where ε_i and ε_{ki} are assumed to be jointly normally distributed with zero means, variances σ_i^2 and σ_{ki}^2, and covariance $\sigma_{i,ki}$.

The dependent variables in equation (15), stated willingness to pay for vaccines, are latent: parents were asked whether they would be willing to pay a randomly assigned price. Parents are assumed to answer in the affirmative if $\tilde{W}^i \geq p$ for the parent, or if $\tilde{W}^{ki} \geq t_i p$ for the child. Suppressing the $controls$ for notational simplicity, the parent indicates willingness to purchase a vaccine if

$$\varepsilon_i / \sigma_i \leq (\gamma^{i0} / \sigma_i) + (\gamma^i / \sigma_i)\Delta^i - (1/\sigma_i)p$$
$$\varepsilon_{ki} / \sigma_{ki} \leq (\gamma^{ki0} / \sigma_{ki}) + (\gamma^{ki} / \sigma_{ki})\Delta^{ki} - (t_i / \sigma_{ki})p, \quad i = m, f. \tag{16}$$

Thus, equations are estimated for whether vaccines are purchased with covariates for the randomly assigned percentage risk changes and prices of vaccines. Vaccine prices are measured in hundreds of dollars. A supplementary covariate also was included to indicate the order in which the vaccines were presented (parent or child first). In the sample of unmatched parents, parameters of two of the equations in (16) can be estimated, for either the mother ($i = m$) or the father ($i = f$). Equations are estimated separately for mothers and for fathers using bivariate probit in view of distributional assumptions made earlier and to allow for the possibility that $\sigma_{i,ki} \neq 0$. In the sample of matched parents, parameters of all four equations in (16) are estimated by multivariate probit to allow for nonzero correlation between the decisions of married parents.

There are two key advantages to this design. First, the coefficient of the price of the vaccine to the parent in equation (16) equals $-1/\sigma_i$. This value can be used to recover the parent's willingness to pay to eliminate his or her risk (γ^i) from the standardized coefficient γ^i / σ_i (see Cameron and James 1987).[5] In the equation for the

5 If the risk reducing goods are direct sources of utility, a possibility suggested earlier, the correct price to use in equation (16) would be the randomly assigned price of the risk reducing goods net of monetized utility/disutility. Suppressing subscripts and superscripts, suppose that this price of G is $P^* = P + u$, where P denotes the value of price used in the survey and u denotes monetized utility/disutility. Then substitute $P + u$ into the equation (16) to replace the true value P^*. The term $-(1/\sigma\ )u$ then can be treated as an additional component of the error already present in the equation. This term will affect the estimate of the constant term if it has a non-zero mean, but will not affect the point estimates of the coefficients of price and parent/child risk reduction because these variables were randomly assigned.

child, the coefficient of price equals $-t_i/\sigma_i$ and can be used to recover γ^{ki}/t_i. In other words, the parent's willingness to pay to eliminate the child's risk, relative to the parent's share of child expenditures, is identifiable. Based on equation (7), this ratio is interpreted as family willingness to pay to eliminate the child's risk.

Second, the randomly assigned risk reductions and costs are orthogonal to each other as well as to observed and unobserved parent characteristics. This means that if the functional form of equation (15) is correct: (1) endogeneity problems in estimating the γ^i and γ^{ki}/t_i are avoided; (2) estimates of the γ^i and γ^{ki}/t_i are unaffected by whether observed characteristics are included as $controls$, and (3) any systematic tendency for respondents to misstate their purchase intentions affects only the constant term which plays no role in testing Pareto efficiency.

Table 6.5 presents estimates for whether matched parents said that they would buy vaccines to reduce heart disease risks. A stated intention to purchase a vaccine indicates that (1) the parent reported that he or she would purchase the vaccine, and (2) the parent responded to the follow-up question by stating that he or she would "probably" or "definitely" purchase the vaccine if it were actually available. Vaccine prices are expressed in hundreds of dollars. Because the mothers and fathers in each sample pair are married and living together, all four equations in (16) are estimated jointly by multivariate probit. Starting values were generated from unreported binomial probit estimates.[6] Estimated disturbance correlations (not reported in the table) range from 0.56 to 0.93 and each is significant at the 1% level, indicating an efficiency gain relative to separate binomial probit estimation of each equation.

Estimates of standardized coefficients (e.g., γ^i/σ_i) are reported first. Estimates of un-standardized coefficients measuring willingness to pay are discussed momentarily. For both mothers and fathers, estimated coefficients of parent and child risk change variables are positive and significant at the 1% level. Coefficients of the price of the vaccine are negative and significant at the 1% level. These estimates are consistent with results in Table 6.3 and imply that parents were more likely to indicate that they would buy vaccines that offered larger risk reductions or were less costly. Order of presentation of vaccines does not matter. In summary, results pass the basic tests for sensitivity to size of risk change ("scope" test) and price of vaccine, and for insensitivity to order.

The coefficient estimates of the risk change variables presented in Table 6.5 are more easily interpreted by obtaining estimates of un-standardized coefficients (γ^i and γ^{ki}/t_i). Based on the discussion of equations (13) and (16), estimates of γ^i are interpreted as the willingness to pay of parent i to eliminate his or her heart disease risk, and estimates of γ^{ki}/t_i are interpreted as the willingness to pay of parent i to eliminate the child's risk, relative to the parent's Lindahl share of child expenditures. As discussed in Section 1, an individual parent's willingness to pay relative to his or her share of child expenditures equates to family willingness to pay. Point estimates of the

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6 Multivariate normal probabilities are simulated using the Geweke-Hajivassilou-Keane smooth recursive simulator (see Greene 2011).

un-standardized coefficients are computed by multiplying the standardized coefficients by estimates of σ_i for parents and σ_{ki} for children and re-scaling by 100 because vaccine prices are measured in hundreds of dollars. Estimates in the sample of matched parents indicate that mothers are willing to pay $219 annually to eliminate their own risks, and fathers are willing to pay $107 annually to eliminate their risk. Family willingness to pay to eliminate risk to a child lies between $142 and $203 annually. Standard errors for these estimates are presented in Table 6.5.

Table 6.5 also outcomes of tests for whether parents' decisions about risk-reducing goods are consistent with the Pareto efficiency condition in equation (8). Pareto efficiency implies that

$$\gamma^m = \gamma^{km} / t_m = \gamma^f = \gamma^{kf} / t_f . \quad (17)$$

A Wald test is applied to the joint hypotheses $\gamma^{km}/t_m - \gamma^m = 0, \gamma^{kf}/t_f - \gamma^f = 0, \gamma^{km}/t_m - \gamma^{kf}/t_f = 0$, by constructing a quadratic form involving the vector of the three differences and their covariance matrix, resulting in a chi-square test statistic with three degrees of freedom. As shown in Table 6.5, the hypothesis of efficiency is not rejected at conventional levels (p = 0.5). Thus, parents' choices of risk-reducing goods within the family appear to be consistent with Pareto efficiency.

Corresponding estimates for unmatched parents are shown in Table 6.6, which presents full information maximum likelihood bivariate probit estimates. The two-equation system for a parent's choices about the vaccine to reduce his or her risk and the vaccine to reduce the child's risk is estimated separately for mothers and for fathers. Binomial probit coefficients (not presented) were used as starting values in computing the bivariate probit estimates. Estimated disturbance correlations are about 0.9 and are significant at the 1% level for both mothers and fathers, indicating that bivariate probit offers an efficiency gain over binomial probit applied separately to the parent and child equations. As in the matched pairs, estimates of standardized coefficients of all risk change variables are positive and significant at the 1% level, and coefficients of the vaccine price are negative and significant at 1%. Thus, these results also pass the basic tests for sensitivity to scope and economic validity. Order of presentation of vaccines is unrelated to fathers' choices, but mothers were more likely at the 5% level to purchase the vaccine for the child when it was presented first.

Estimates of un-standardized coefficients in the unmatched sample suggest that mothers are willing to pay $233 annually to eliminate their own heart disease risk, that fathers are willing to pay $320 annually to eliminate their risk, and that families are willing to pay between $201 and $265 per year to eliminate heart disease risk to one of their children. (Standard errors are reported in the table.) Table 6.6 also reports results of partial tests for Pareto efficiency in allocations of risk reducing goods. In the unmatched sample, equation (17) is assessed by testing $H_0 : \gamma^i = \gamma^{ki} / t_i$ separately for mothers ($i = m$) and fathers ($i = f$). This hypothesis is tested by expressing the difference $\gamma^{ki}/t_i - \gamma^i$ relative to its standard error, resulting in a test statistic asymptotically distributed as standard normal under the null hypothesis that the population difference is zero. As shown in Table 6.6, the null hypothesis is not rejected at conventional significance levels for either fathers or mothers.

3.3 Testing Effects of Distribution

Possible links between parents' individual contributions to family income and intra-family resource allocations are examined in two ways. First, the association between parents' individual incomes and their willingness to purchase vaccines is estimated. Second, the causal effect of parents' individual contributions to family income is estimated based on experimentally assigned changes in income and expenses.

To examine the association between parents' individual contributions to family income and willingness to pay for vaccines, expand the *controls* in equation (15) so that

$$\begin{aligned} \tilde{W}^{i} &= \gamma^{i0} + \gamma^{i}\Delta^{i} + \alpha^{i} y_{i} + \beta^{i} Y + \varepsilon_{i} \\ \tilde{W}^{ki} &= \gamma^{ki0} + \gamma^{ki}\Delta^{ki} + \alpha^{ki} y_{i} + \beta^{ki} Y + \varepsilon_{ki}, \quad i = m, f, \end{aligned} \tag{18}$$

where y_i denotes a measure of the contribution of parent i to family income and $Y = y_m + y_f$ denotes a measure of family income. According to the unitary model, individual contributions to income have no effect on resource allocation as long as family income is held constant, implying that $\alpha^i = 0 = \alpha^{ki}, i = m, f$. The collective model allows individual income contributions to influence resource allocation by shifting decision power within the family and imposes the proportionality restriction $(\partial W^i / \partial y_m) / (\partial W^i / \partial y_f) = (\partial W^{ki} / \partial y_m) / (\partial W^{ki} / \partial y_f), i = m, f$.

Multivariate probit estimates focusing on the association between incomes and purchase intentions for vaccines are presented in the right-hand columns of Table 6.5 for matched pairs. The measure of Y, family income, used to estimate the model is an indicator for whether family income exceeds $80,000, the approximate sample median. The measure of individual earnings for the father is an indicator for whether the father's labor earnings exceed $60,000, the approximate sample median earnings for men. The measure of individual earnings for the mother is an indicator for whether the mother's labor earnings exceed $20,000, the approximate median for all mothers in the sample (including those not employed). An additional dummy variable for whether parent *i* reported any source of nonlabor income was included, as well as a covariate to control for the number of children in the family.

As shown in Table 6.5, inclusion of control variables for income, earnings and family size has little impact on estimated coefficients risk change variables or the vaccine price, reflecting the exogenous assignment of experimental design points. Willingness-to-pay estimates are similar to those obtained without inclusion of the control variables, and the hypothesis of efficiency is not rejected (*p*=0.62). Family income is positively associated with purchase intentions for vaccines but is significant at the 5% level only for mothers. Fathers with one or more sources of non-labor income appear to be more willing to purchase vaccines, but only at the 10% level. Mothers' earnings are positively associated at 5% with mothers' intentions to purchase vaccines to reduce the child's risk.

Corresponding bivariate probit estimates controlling for the intra-family distribution of income for unmatched parents are presented in the right hand columns of Table 6.6. As was the case for the matched pairs, inclusion of control variables has little bearing on estimated coefficients of experimental design point variables, willingness to pay, or the test for efficiency. Increases in family income are positively associated at the 5% level or less with mothers' willingness to purchase vaccines, and with fathers' willingness to purchase a vaccine to reduce their own risks. Individual sources of nonlabor income have no discernible impact. Individual earnings are positively and significantly associated with willingness to pay for vaccines by mothers but not by fathers.

The finding in both samples that mothers' earnings are positively associated with willingness to pay for a vaccine to reduce children's risk, whereas fathers' earnings are unrelated to willingness to pay, suggests that an increase in mothers' relative incomes would increase family expenditures on children's risk protection. This outcome is inconsistent with the unitary model.

Tests of the unitary and collective models often rest on an examination of the association between spouses' individual incomes and demands (Bourguignon, Browning and Chiappori 2009). An obvious shortcoming of this approach, however, is that parents' individual incomes may be correlated with the disturbance terms in equation (18), resulting in inconsistent estimation of income coefficients. This problem may be ameliorated to some extent by considering the subsample of employed parents (Browning and Meghir 1990). A separate analysis for employed spouses may be warranted in any case, to the extent that decision power may differ between households depending on whether the mother is employed. However, results in subsamples of employed parents largely mirror those presented in Tables 6.5 and 6.6.

Alternatively, the potential endogeneity of income can be avoided by making use of the exogenous variation in parents' contributions to household income incorporated in the field study. Recall that parents made an additional decision regarding the risk-reducing vaccine for the child, contingent on a hypothetical, experimentally assigned redistribution of contributions to family income. Parents' post-redistribution stated willingness to pay for the child's vaccine is modeled as

$$\tilde{W}^{ki\prime} = \gamma^{ki0\prime} + \gamma^{ki\prime}\Delta^{ki} + \eta^{ki}dy_m + \theta^{ki}dY + \varepsilon_{ki}{}', \quad i = m, f, \tag{19}$$

where the prime notation ($\tilde{W}^{ki\prime}$, etc.) indicates the post-redistribution choice, dy_i represents the change in expense ($dy_i < 0$) or income ($dy_i > 0$) assigned to parent *i,* and $dY = dy_m + dy_f$ represents the resulting change in family resources available to purchase consumption goods and risk-reducing goods. Increases in exogenous expenditure are treated as reductions in a parent's contribution to the family income available for consumption and for purchase of risk-reducing goods.

According to the unitary model, the change in individual contributions to family income has no effect as long as overall family income is held constant, implying

$\eta^{ki} = 0, i = m, f$. This hypothesis is tested jointly for both parents in the matched sample, and separately for mothers and fathers in the unmatched sample. The collective model allows the change in individual contributions to income to affect decisions through an impact on decision power and imposes a proportionality restriction that can be tested only in the matched pairs.

One additional issue to consider before estimation is that although the absolute value of dy_i is randomly assigned, the algebraic sign of dy_i is determined by the parent's stated decision regarding the child's vaccine prior to the redistribution.7 Let $\bar{W}^{ki} = 1$ if the parent would buy the vaccine for the child given the pre-existing distribution of family income, and $\bar{W}^{ki} = 0$ otherwise. Then $dy_i = (1 - 2\bar{W}^{ki})|dy_i|$, were $|dy_i|$ is randomly assigned but dy_i is endogenous. The model is recursive because the outcome of the $\tilde{W}^{ki}$ equation (16) appears on as a determinant of $\tilde{W}^{ki\prime}$ in equation (19). The fact that the model is recursive in the observed indicator $\bar{W}^{ki}$ implies that maximizing the joint likelihood of equations describing parents' purchase intentions for children's vaccines before and after the redistribtuion produces consistent estimators despite the endogeneity (Greene 2011, p. 746). To simplify the estimation, equations for purchase intentions for vaccines for the mother and father are excluded from this procedure.

Multivariate probit estimates of effects of exogenous changes in the intra-family distribution of income are presented in Table 6.7 based on the sample of matched pairs. The two equations for each parent in the pair pertain to the initial purchase decision for the child's vaccine and the subsequent decision after the experimental redistribution of family income. As shown, the hypothetical redistribution had no significant effect on resource allocation.

Corresponding bivariate probit estimates computed in the sample of unmatched parents are presented in Table 6.8. As shown, a redistribution of income from fathers to mothers increases mothers' willingness to contribute to risk reduction for the child. This results is consistent with the associational evidence presented previously and suggests that a redistribution of family resources from fathers to mothers would improve children's health.

4. Conclusions

This chapter presented tests for whether parents' choices of risk-reducing goods for family members are consistent with Pareto efficiency within the family based on estimates of willingness to pay to eliminate risk of coronary artery disease for parents and children. The chapter also examined how the distribution of resources between mothers and fathers affects choices about risk-reducing goods. Analysis was based on

7 As described in Section 3, a parent who indicated probable or definite intention to buy the vaccine for the child was assigned an increase in exogenous expenditure, and the spouse or partner was assigned an increase in income. Conversely, a parent who said that he or she would not purchase the vaccine for the child, or who on follow-up indicated that the intention to purchase was uncertain, was assigned an increase in income, and the spouse or partner was assigned an increase in exogenous expenditure.

an extension of the model of Blundell, Chiappori and Meghir (2005) to incorporate household production of perceived risk of contracting heart disease. Heart disease is the leading cause of death in the United States, has been linked to exposure to particulate matter (Brook et al. 2004), and is influenced by health choices made throughout life including during childhood. The model implies an equilibrium condition governing expenditures on protecting children from heart disease risk that is analogous to the Lindahl-Samuelson condition for efficient public goods provision.

The model was tested using a stated preference survey on heart disease risks. Use of stated preference data is controversial partly because respondents are often thought to overstate their purchase intentions when they do not actually have to pay. Two methods are employed to mitigate this problem of hypothetical bias. First, hypothetical willingness to pay responses are divided based on a follow-up question about the degree of certainty in respondents' purchase intentions. Second, econometric methods applied confine any systematic tendency to misstate willingness to pay in a regression constant term that plays no role in testing efficiency, and no role in one of two tests for effects of distribution.

Empirical results presented are consistent with a Pareto efficient allocation of resources within the family. In other words, results are consistent with the hypotheses that (1) the value of morbidity risk reduction to parents is equal to the marginal cost of reducing parent risk; (2) the value of morbidity risk reduction to children is determined as the sum of each parent's willingness to pay to reduce the child's risk and equals the marginal cost of reducing the child's risk; and (3) parents' marginal rate of substitution between morbidity risk to a parent and to a child is equal to the corresponding ratio of marginal risk reduction costs. Initial findings bearing on the link between the distribution of family resources and the resulting allocation of resources are mixed, but it appears that a reallocation of resources from fathers to mothers may increase protection of children from health risk.

Estimates of mothers' willingness to pay to eliminate their own heart disease risk range from $215 to $240 annually, depending on subsample examined and specification of willingness to pay equation. Estimated annual willingness to pay of fathers to eliminate risk ranges from $110 to $320. Parents' willingness to pay to eliminate risk to one of their children is estimated as $140-$265 annually. (Standard errors of these values are presented in Tables 6.5 and 6.6.) Estimates of annual willingness to pay to reduce heart disease risks are somewhat lower than might be expected based on the degree of mortality risk associated with heart disease and estimates of the value of avoided mortality derived from the labor market. A possible explanation for this outcome is that the risk changes considered are much larger than those typically contemplated in studies from the labor market and that the marginal value of risk reduction declines as successive units of risk are removed.

Results presented in this chapter suggest five policy implications. First, public programs to reduce morbidity risks faced by children may prove less effective than expected as parents respond to policy changes by reallocating family resources away from reducing children's risk. Second, family willingness to pay to reduce children's morbidity risk reflects the preferences of both parents as well as their relative decision power. Third, public programs may be more effective in reducing children's risk if the programs induce a shift of family resources and decision power from fathers to mothers. Fourth, as long as persons outside the family do not display paternalistic altruism toward children and children's preferences are not counted, efficiency of parents' efforts to protect reduce children's morbidity risk is consistent with social efficiency. Fifth, existing estimates of reduced morbidity for adults can be more accurately transferred to children if policy makers consider the relative marginal costs of risk reduction for each.

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Table 6.1. Relative Frequency Distribution of Parents' Assessments of Risk of Coronary Artery Disease Diagnosis before Age 75.
A. Matched Pairs (N=432).

		Mothers' Risk Estimates for					Fathers' Risk Estimates for			
Chances in 100		Self		Child			Self		Child	
From	Through	Initial	Revised	Initial	Revised		Initial	Revised	Initial	Revised
0	10	0.171	0.104	0.263	0.196		0.148	0.092	0.254	0.201
11	20	0.166	0.207	0.189	0.297		0.118	0.138	0.224	0.353
21	30	0.171	0.281	0.180	0.283		0.214	0.286	0.224	0.283
31	40	0.127	0.138	0.118	0.111		0.120	0.182	0.069	0.060
41	50	0.205	0.157	0.171	0.085		0.191	0.136	0.159	0.069
51	60	0.053	0.030	0.028	0.014		0.065	0.058	0.021	0.014
61	70	0.039	0.037	0.021	0.002		0.046	0.042	0.018	0.009
71	80	0.058	0.042	0.025	0.007		0.081	0.053	0.023	0.007
81	90	0.012	0.005	0.005	0.002		0.014	0.009	0.009	0.005
91	100	0.000	0.000	0.002	0.002		0.005	0.005	0.000	0.000
	Mean	35	32	28	24		37	35	27	23
Standard Deviation		21	18	20	14		22	19	19	14

B. Unmatched Parents.

		Mothers' Risk Estimates for					Fathers' Risk Estimates for			
Chances in 100		Self		Child			Self		Child	
From	Through	Initial	Revised	Initial	Revised		Initial	Revised	Initial	Revised
0	10	0.196	0.112	0.261	0.194		0.164	0.101	0.293	0.222
11	20	0.121	0.203	0.155	0.286		0.139	0.154	0.158	0.338
21	30	0.202	0.285	0.195	0.295		0.188	0.274	0.226	0.255
31	40	0.115	0.153	0.110	0.098		0.101	0.165	0.093	0.070
41	50	0.179	0.122	0.181	0.091		0.186	0.139	0.165	0.088
51	60	0.061	0.041	0.043	0.015		0.070	0.055	0.023	0.011
61	70	0.056	0.038	0.022	0.007		0.076	0.053	0.025	0.004
71	80	0.053	0.038	0.021	0.006		0.051	0.036	0.010	0.008
81	90	0.010	0.005	0.009	0.004		0.015	0.015	0.006	0.004
91	100	0.008	0.004	0.004	0.003		0.010	0.008	0.002	0.000
	Mean	35	32	29	25		37	35	27	23
Standard Deviation		22	19	20	15		23	20	19	14
	N	1156					526			

Table 6.2. Proportion of parents who said that they would purchase vaccines to reduce risks of coronary artery disease.

A. Matched Pairs	Mother Decision for:			Father Decision for:	
	Self	Child		Self	Child
Would not buy vaccine	0.57	0.50		0.49	0.63
Would buy vaccine	0.43	0.50		0.51	0.37
Certainty of decision:					
Uncertain	0.06	0.06		0.04	0.06
Probably	0.22	0.26		0.28	0.20
Definitely	0.15	0.17		0.19	0.11
Number of Observations	432			432	

B. Unmatched Parents	Mother Decision for:			Father Decision for:	
	Self	Child		Self	Child
Would not buy vaccine	0.67	0.63		0.53	0.53
Would buy vaccine	0.33	0.37		0.47	0.47
Certainty of decision:					
Uncertain	0.04	0.06		0.06	0.07
Probably	0.20	0.20		0.23	0.24
Definitely	0.09	0.11		0.18	0.17
Number of Observations	1118			516	

Table 6.3. Overall proportion of parents who would buy vaccine by price and risk change.

		Proportion who would "probably" or "definitely" buy vaccine					
	Risk Reduction (%)	$10	$20	$40	$80	$160	All
Parent	10	0.413	0.385	0.317	0.267	0.183	0.315
	70	0.585	0.488	0.508	0.552	0.304	0.490
	All	0.453	0.410	0.367	0.328	0.211	0.356
Child	20	0.414	0.337	0.322	0.242	0.183	0.299
	80	0.531	0.524	0.416	0.457	0.315	0.453
	All	0.477	0.422	0.371	0.341	0.245	0.374

Table 6.4. Matched Parents' Purchase Intentions for the Child's Vaccine (Number of Observations).

Would parent "probably" or "definitely" buy vaccine for child?				
		Mother		
		No	Yes	Total
Father	No	188	54	242
	Yes	58	132	90
	Total	246	186	432

Table 6.5. Heart Disease Vaccine Purchase Intentions: Matched Pairs. Multivariate Probit Estimates (Standard Errors in Parentheses).

	Mothers		Fathers		Mothers		Fathers	
Covariate	Mother	Child	Father	Child	Mother	Child	Father	Child
Proportionate Risk Change	1.048**	0.725**	0.580**	0.605**	1.068**	0.758**	0.604**	0.624**
	(0.186)	(0.155)	(0.194)	(0.153)	(0.211)	(0.178)	(0.203)	(0.171)
Price of Vaccine/100	-0.479**	-0.356**	0.540**	-0.426**	-0.492**	-0.371**	-0.529**	-0.415**
	(0.132)	(0.126)	(0.125)	(0.129)	(0.140)	(0.129)	(0.128)	(0.136)
Order	0.182	-0.026	0.177	-0.133	0.171	-0.040	0.159	-0.102
	(0.126)	(0.125)	(0.127)	(0.124)	(0.129)	(0.129)	(0.131)	(0.127)
Constant	-0.422**	-0.338*	-0.027	-0.163	-0.533*	-0.485*	-0.021	-0.165
	(0.123)	(0.137)	(0.119)	(0.135)	(0.202)	(0.221)	(0.209)	(0.214)
Number of Children					-0.073	-0.079	-0.096	-0.117
					(0.061)	(0.062)	(0.067)	(0.069)
Income					0.310*	0.291*	0.278	0.093
					(0.142)	(0.137)	(0.168)	(0.167)
Earnings					0.176	0.258*	-0.094	0.179
					(0.130)	(0.135)	(0.160)	(0.158)
Nonlabor Income					-0.084	-0.058	0.205	0.224
					(0.141)	(0.132)	(0.123)	(0.124)
Log-likelihood	-833.021				-822.489			
N	432				432			
γ^{i}	218.88**		107.24*		216.32**		116.46*	
	(69.56)		(42.89)		(70.48)		(45.47)	
γ^{ki} / t_i		203.32*		141.81*		197.10*		150.02*
		(83.44)		(55.75)		(85.74)		(61.80)
Efficiency (Chi-Square)	2.312				1.777			
p-value	0.509				0.620			

* Significant at the .05 level.
** Significant at the .01 level.

Table 6.6. Heart Disease Vaccine Purchase Intentions: Unmatched Parents. Bivariate Probit Estimates (Standard Errors in Parentheses).

	Mothers		Fathers		Mothers		Fathers	
Covariate	Mother	Child	Father	Child	Mother	Child	Father	Child
Proportionate Risk Change	0.963**	0.804**	1.099**	0.726**	1.014**	0.847**	1.119**	0.769**
	(0.119)	(0.105)	(0.178)	(0.148)	(0.125)	(0.110)	(0.182)	(0.151)
Price of Vaccine/100	-0.413**	-0.399**	-0.340**	-0.274**	-0.433**	-0.418**	-0.350**	-0.290**
	(0.077)	(0.076)	(0.105)	(0.103)	(0.079)	(0.078)	(0.107)	(0.105)
Order	-0.126	0.168*	0.078	0.075	-0.119	0.159*	0.094	0.086
	(0.079)	(0.078)	(0.112)	(0.112)	(0.081)	(0.080)	(0.114)	(0.114)
Constant	-0.500**	-0.741**	-0.333**	-0.469**	-0.669**	-0.955**	-0.477**	-0.382
	(0.078)	(0.086)	(0.110)	(0.126)	(0.148)	(0.149)	(0.210)	(0.207)
Income					0.245**	0.246**	0.349*	0.167
					(0.084)	(0.082)	(0.157)	(0.156)
Earnings					0.252**	0.332**	-0.009	0.144
					(0.084)	(0.085)	(0.146)	(0.146)
Nonlabor Income					0.102	0.063	0.008	-0.032
					(0.085)	(0.084)	(0.117)	(0.115)
ρ	0.902**		0.898**		0.899**		0.902**	
	(0.016)		(0.023)		(0.017)		(0.024)	
Log-likelihood	- [illegible]		-559.655		- [illegible]		-551.277	
N	1156		526		1156		526	
γ^{i}	233.471**		320.229**		239.718**		317.86**	
	(52.27)		(110.72)		(52.99)		(108.97)	
γ^{ki} / t_i		201.27**		265.03*		206.83**		260.68**
		(44.50)		(112.72)		(45.45)		(108.56)
Efficiency (z)	-0.753		-0.660		0.747		0.695	
p-value	0.452		0.509		0.455		0.487	

* Significant at the .05 level.
** Significant at the .01 level.

Table 6.7. Heart Disease Vaccine Purchase Intentions for the Child, Before and After Redistribution of Family Income : Matched Pairs.
Multivariate Probit Estimates, Standardized Coefficients (Standard Errors in Parentheses).

	Mothers		Fathers	
Covariate	Before	After	Before	After
Proportionate Risk Change	0.950**	0.730**	0.764**	0.548**
	(0.213)	(0.215)	(0.212)	(0.213)
Price of Vaccine/100	-0.353**	-0.235	-0.455**	-0.312**
	(0.128)	(0.126)	(0.128)	(0.129)
Order	0.023		-0.041	
	(0.106)		(0.087)	
Constant	-0.469**		-0.260	-0.119
	(0.149)		(0.146)	(0.143)
Proportionate Family Income Change		2.398		1.603
		(1.655)		(1.254)
Proportionate Mother Income Change		-0.888		-0.008
		(1.236)		(1.094)
Log-likelihood	-857.29			
N	426			

* Significant at the .05 level.
** Significant at the .01 level.

Table 6.8. Heart Disease Vaccine Purchase Intentions for the Child, Before and After Redistribution of Family Income: Unmatched Parents.
Bivariate Probit Estimates, Standardized Coefficients (Standard Errors in Parentheses).

	Mothers		Fathers	
Covariate	Before	After	Before	After
Proportionate Risk Change	0.639**	0.491**	0.472**	0.636**
	(0.133)	(0.127)	(0.188)	(0.186)
Price of Vaccine/100	-0.379**	-0.327**	-0.287**	-0.275**
	(0.076)	(0.072)	(0.105)	(0.102)
Order	0.159**		0.034	
	(0.051)		(0.081)	
Constant	-0.647**	-0.398**	-0.322*	-0.245*
	(0.092)	(0.086)	(0.133)	(0.124)
Proportionate Family Income Change		0.472		3.354**
		(0.732)		(1.081)
Proportionate Mother Income Change		0.957*		-0.450
		(0.481)		(0.916)
ρ	0.950**		0.916**	
	(0.015)		(0.033)	
Log-likelihood	-1082.3		-549.28	
N	1118		516	

* Significant at the .05 level.
** Significant at the .01 level.

Chapter 7: Single Parents' Demands to Reduce their Own and their Children's Heart Disease Risks

1. Introduction

As discussed in the previous chapter, the effects of environmental policy on individuals living in families depend on how resources are allocated within the family. In particular, effectiveness and economic benefits of policies affecting children depend on parents' voluntary efforts to protect their children from risk. Chapter 6 of this report presented an analysis of how married or cohabitating parents allocate resources to reduce their own and their children's risks of contracting heart disease. The chapter focused on married parents to test for efficiency and for effects of distribution on resource allocation in two-parent families. This chapter presents a companion analysis of single-parent families.

The empirical analysis presented rests on a unitary model of family behavior that supports valuation of morbidity risk reductions. The unitary model is justified because there is only one parent present in the household. The model envisions an altruistic, utility-maximizing parent, a selfish child, and household production of morbidity risks. The model predicts that the value of morbidity risk reduction to parents and to children is equal to the marginal cost of achieving it and that the single parent's marginal rate of substitution between a morbidity risk to herself and to her child is equal to the corresponding ratio of marginal risk reduction costs. Empirical support for these predictions would provide a basis for transferring morbidity valuation figures computed for adults to estimate values of morbidity risk reduction to children.

A compelling case can be made to investigate the validity of these predictions because: (1) it is not feasible to conduct separate morbidity valuation studies for each of the large number of illness risks that have been associated with exposure to environmental hazards and (2) studies of adult willingness to pay for reduced morbidity, while scarce, still outnumber those for children. Additionally, testing how single parents allocate resources to reduce their own and their children's risk furthers understanding of family behavior as well as the effects of environmental policy aimed at protecting human health.

The chapter also presents estimates of single parents' willingness to pay to reduce heart disease risks for themselves and for their children. Tests of the model and estimates of willingness to pay to reduce heart disease risk are based on data on risk perceptions and stated preferences collected in the survey described in Chapter 4. Owing to the common source of survey data and the similarity between the theoretical framework and econometric specification used in Chapters 6 and 7, the willingness-to-pay results in the two chapters are directly comparable.

Use of stated preference data is controversial partly because respondents are often thought to overstate their purchase intentions when they do not actually have to pay. Two methods are employed to mitigate this problem of hypothetical bias. First, hypothetical willingness-to-pay responses are divided based on a follow-up question about the degree of certainty in respondents' purchase intentions. Blumenschein et al. (2008) and others have shown that hypothetical bias can be eliminated by treating respondents who state that they would buy a good but are uncertain about their purchase intentions as non-purchasers. Second, econometric methods applied confine any systematic tendency to misstate willingness to pay in a regression constant term that plays no role in testing the model or in estimating willingness to pay to eliminate heart disease risk.

Empirical results presented are consistent with key predictions of the model. In other words, results are consistent with the hypotheses that (1) the value of morbidity risk reduction to parents is equal to the marginal cost of reducing parent risk; (2) the value of morbidity risk reduction to children is equal the marginal cost of reducing children's risk; and (3) parents' marginal rate of substitution between morbidity risk to a parent and to a child is equal to the corresponding ratio of marginal risk reduction costs.

Estimates of single parents' willingness to pay to eliminate their own heart disease risk range from about $130 to $200 annually, depending on subsample and model specification. Estimated annual willingness to pay to eliminate children's risk ranges from $100 to $130. (Standard errors of these values are presented in Table 7.1 below.) Estimates of annual willingness to pay to reduce heart disease risks are somewhat lower among single parents than among married parents (see Chapter 6), and are lower than might be expected based on the degree of mortality risk associated with heart disease and estimates of the value of avoided mortality derived from the labor market. A possible explanation for this outcome is that the risk changes considered are much larger than those typically contemplated in studies from the labor market and that the marginal value of risk reduction declines as successive units of risk are removed.

2. Theoretical Framework

The conceptual framework adopted in this paper is an extension of a traditional unitary model of family behavior (see Becker 1974, 1981; Smith and Desvousges 1987). This framework assumes that the family behaves as if maximizing a single utility function subject to a single budget constraint and household choices can be described as if made by a single individual (a parent). The unitary perspective is adopted because the analysis in this chapter focuses on health risk tradeoffs facing a single parent and her child, rather than on the issue of how a couple of parents would allocate resources among themselves and their children as in Chapter 6.

The model focuses on choices made by the parent about goods that reduce heart disease risks for herself or her child. To align the theoretical model with the field data (described in Chapter 4), it is useful to think of a "family" composed of one parent (p) and one minor child (k), with the parent making decisions for one time period. Because the child is young, the parent is modeled as a paternalistic altruist, choosing the quantities of market goods that she and her child consume and the levels of morbidity risk that she and her child face. The child does not have well-defined preferences that are respected by the parent and has neither labor earnings nor asset income. Because the model considers only one child, allocation of resources among children in a family is not considered.

The model is familiar (Dickie and Gerking 2009) and consequently discussion is restricted to elements needed to support the empirical analysis presented in the next section. The parent's utility function is given by

$$U = U(C^p, R^p, C^k, R^k). \tag{1}$$

In this equation, C^p represents expenditures on consumption goods for the parent, C^k denotes consumption expenditures for the child, R^p represents the parent's perception of her risk of contracting heart disease, and R^k denotes the parent's perception of the child's risk of contracting heart disease. Utility is increasing and concave in consumption and decreasing and convex in heart disease risks.

Perceived risks are home-produced according to the health production functions

$$\begin{aligned} R^p &= R^p(G^p, \Omega_p), \\ R^k &= R^k(G^k, \Omega_k). \end{aligned} \tag{2}$$

In these equations, G^p and G^k represent the parent's and the child's use of a market good to reduce risk of heart disease, and Ω_p and Ω_k represent indexes of the parent's attitudes and information concerning her risk and the child's risk of heart disease. Perceived risks are diminishing and convex in the risk-reducing good, but use of G is not a direct source of utility for the parent.

The budget constraint is

$$Y = C^p + C^k + q(G^p + G^k). \tag{3}$$

In the budget constraint, income Y denotes parental income, consumption goods are purchased at unit prices, and q denotes the common price of risk-reducing goods for each family member.

The parent allocates family resources as if to maximize utility subject to the budget constraint (3), the health production functions for heart disease risk (2), and non-negativity restrictions on purchased goods. In all that follows, the parent is assumed to have positive consumption $C^p > 0$.

First-order conditions include

$$\frac{\partial U / \partial R^p}{\partial U / \partial C^p}\left(\frac{\partial R^p}{\partial G^p}\right) \le q, \quad if <, \quad G^p = 0,$$

$$\frac{\partial U / \partial R^k}{\partial U / \partial C^p}\left(\frac{\partial R^k}{\partial G^k}\right) \le q, \quad if <, \quad G^k = 0.$$

As shown, at an interior solution the parent's marginal rate of substitution of consumption for the risk-reducing good equals the relative price. These equations imply that at an interior solution, the parent's valuation of heart disease risk reduction to a family member equates to the marginal cost of risk reduction:

$$\frac{\partial U / \partial R^p}{\partial U / \partial C^p} = \frac{q}{\partial R^p / \partial G^p},$$
$$\frac{\partial U / \partial R^k}{\partial U / \partial C^p} = \frac{q}{\partial R^k / \partial G^k}. \tag{4}$$

In the field study, parents make choices about risk-reducing goods that produce given proportionate changes in risk $\Delta^p = (\partial R^p / \partial G^p) / R^p$ and $\Delta^k = (\partial R^k / \partial G^k) / R^k$. Rewriting the first-order conditions to focus on proportionate changes in risk yields

$$W^p = \frac{(\partial U / \partial R^p) R^p}{\partial U / \partial C^p} \Delta^p \le q, \quad if <, \quad G^p = 0,$$
$$W^k = \frac{(\partial U / \partial R^k) R^k}{\partial U / \partial C^p} \Delta^k \le q, \quad if <, \quad G^k = 0. \tag{5}$$

In equation (5), W^p and W^k denote the parent's willingness to pay for a change in the risk reducing goods that produce proportionate risk changes Δ^p and Δ^k. Considering an equal proportionate reduction in both perceived risks $(\Delta^p = \Delta^k)$ implies that the parent allocates resources so that at an interior solution, she is willing to pay an equal amount for an equal proportionate reduction in risk for herself and her child as shown in equation (6).

$$\frac{(\partial U / \partial R^p) R^p}{\partial U / \partial C^p} = \frac{(\partial U / \partial R^k) R^k}{\partial U / \partial C^p}. \tag{6}$$

Equation (6) provides the basis for the econometric tests of the model presented in Section 3. The equation is an example of the hypothesis of a model of parental altruism that applies when considering choices of risk-reducing goods (1) that have the same price for the parent and child, and (2) that produce equal proportionate risk reductions. For comparison with prior research on health valuation in the family, equation (6) can be re-expressed in terms of marginal rates of substitution between child and parent risk:

$$\frac{(\partial U / \partial R^k) R^k}{(\partial U / \partial R^p) R^p} = 1. \tag{7}$$

At an interior solution, the parent's marginal rate of substitution between equal proportionate risk reductions affecting the child and the parent equates to unity. Prior empirical support for the predictions of this general modeling framework is provided by Dickie and Gerking (2007, 2009).

3. *Econometric Framework and Results*

3.1 Data and Econometric Methods

This section describes use of the data from the field study, documented in Chapters 4 and 5, to test predictions of the model just described. As discussed in more fully in Chapter 5, parents believe that they face higher risks of heart disease than do their children. Parents under-estimate the difference in heart disease risks by gender. Nonetheless, evidence presented in Chapter 5 establishes that parents understand at least qualitatively the association between important risk factors and risks of coronary artery disease.

Econometric methods are nearly identical to those used in Chapter 6 and focus on estimating first order conditions in equation (5), re-expressed in more compact notation and allowing for variation between parents as

$$\begin{aligned} W^p &= \gamma^p \Delta^p + controls + \omega_p \le q, \qquad if <, G^p = 0, \\ W^k &= \gamma^k \Delta^k + controls + \omega_k \le q, \qquad if <, G^k = 0. \end{aligned} \tag{8}$$

Expression (8) pertains to the *h*th single parent although the observation index has been suppressed. The $controls$ reflect the influence of observed characteristics of the *h*th parent on valuation of vaccines to reduce heart disease risk, and the random disturbances ω_p and ω_k capture effects of unobserved characteristics on willingness to pay. The Δ^p and Δ^k variables represent the randomly assigned proportionate reductions in risk for the parent and child. Also, γ^p and γ^k denote parameters that are interpreted as the parent's willingness to pay to eliminate risk. Thus, equation (8) treats willingness to pay as proportionate to the size of risk reduction.

The equations in (8) are estimated by allowing stated willingness to pay ($\tilde{W}^p$ and $\tilde{W}^k$) to differ from true willingness to pay (W^p and W^k). As shown in equation (9), the differences between stated and true willingness to pay is modeled as sum of systematic (γ^{p0}, γ^{k0}) and random (ν_p, ν_k) factors with zero mean

$$\begin{aligned} \tilde{W}^p - W^p &= \gamma^{p0} + \nu_p \\ \tilde{W}^k - W^k &= \gamma^{ki0} + \nu_k. \end{aligned} \tag{9}$$

Insert equation (8) into equation (9) to obtain

$$\begin{aligned} \tilde{W}^p &= \gamma^{p0} + \gamma^p \Delta^p + controls + \varepsilon_p \\ \tilde{W}^{ki} &= \gamma^{k0} + \gamma^k \Delta^k + conrols + \varepsilon_k, \end{aligned} \tag{10}$$

where ε_p and ε_k are assumed to be jointly normally distributed with zero means, variances σ_p^2 and σ_k^2, and covariance σ_{pk}.

The dependent variables in equation (10), stated willingness to pay for vaccines, are latent: parents were asked whether they would be willing to pay a randomly assigned price. Parents are assumed to answer in the affirmative if $\tilde{W}^p \ge q$ for the parent, or if $\tilde{W}^k \geq q$ for the child. Suppressing the $controls$ for notational simplicity, the parent indicates willingness to purchase a vaccine if

$$\begin{aligned} \varepsilon_p / \sigma_p &\leq (\gamma^{p0} / \sigma_p) + (\gamma^p / \sigma_p)\Delta^p - (1/\sigma_p)q \\ \varepsilon_k / \sigma_k &\leq (\gamma^{k0} / \sigma_k) + (\gamma^k / \sigma_k)\Delta^k - (1/\sigma_k)q. \end{aligned} \tag{11}$$

On the basis of expression (11), equations are estimated for whether vaccines are purchased with covariates for the randomly assigned percentage risk changes and prices of vaccines. As in Chapter 6, a positive purchase intention is recorded if the parent indicated that she would buy the vaccine *and* indicated on follow-up that she would "probably" or "definitely" really make the purchase if the vaccine were available. Vaccine prices are measured in hundreds of dollars. A supplementary covariate was included to indicate the order in which the vaccines were presented (parent or child first). In the sample of single parents, parameters of the two equations in (11) are estimated using bivariate probit in view of distributional assumptions made earlier and to allow for the possibility that $\sigma_{pk} \neq 0$.

There are two key advantages to this design. First, the coefficient of the price of the vaccine to the parent in equation (11) equals $-1/\sigma_p$. This value can be used to recover the parent's willingness to pay to eliminate her risk (γ^p) from the standardized coefficient γ^p / σ_p (see Cameron and James 1987). Similarly, the coefficient of vaccine price in the equation for the child equals $-1/\sigma_k$ and can be used to recover γ^k. In other words, the parent's willingness to pay to eliminate her own risk and her willingness to pay to eliminate her child's risk are identifiable.

Second, the randomly assigned risk reductions and costs are orthogonal to each other as well as to observed and unobserved parent characteristics. This means that if the functional form of equation (10) is correct, then: (1) endogeneity problems in estimating the γ^p and γ^k are avoided; (2) estimates of the γ^p and γ^k are unaffected by whether observed characteristics are included as $controls$, and (3) any systematic tendency for respondents to misstate their purchase intentions affects only the constant term which plays no role in testing equation (6).

3.2 Results

Table 7.1 presents estimates for whether "single" parents said that they would buy vaccines to reduce heart disease risks. Results in the columns labeled "Single Stratum" are based on the sample of parents who were classified into the "Single Parent" sampling stratum by Knowledge Networks. (There were a total of 501 observations obtained from this stratum but three parents did not report vaccine purchase intentions.) However, approximately three dozen of these parents reported in the survey that they were married and living with their spouses. A possible explanation for this discrepancy is that these parents have married since the time that their marital status was last updated in the KN profile data. The columns of Table 7.1 labeled

“Unmarried” provide results for the 462 parents who reported in the survey that they were not married and living with their spouses. Among these 462 unmarried parents, 90 are living with a partner. The columns in Table 7.1 labeled “No spouse/partner” report results for the 372 who are living with neither a spouse nor a partner.

Table 7.1 reports maximum likelihood bivariate probit estimates for parents' purchase intentions. As in Chapter 6, a stated intention to purchase a vaccine indicates that (1) the parent reported that she would purchase the vaccine, and (2) the parent responded to the follow-up question by stating that he or she would “probably” or “definitely” purchase the vaccine if it were actually available. Starting values were generated from unreported binomial probit estimates. Estimated disturbance correlations exceed 0.92 and each is significant at the 1% level, indicating an efficiency gain relative to separate binomial probit estimation of each equation.

Covariates include design point variables reflecting proportionate risk reductions (Δ^p and Δ^k), vaccine price (*q*) expressed in hundreds of dollars, and a dummy variable indicating the order in which the vaccines were presented (parent or child first). Additional covariates included in one specification for the unmarried parents include the number of children living in the household, a dummy variable for whether family income exceeds the single stratum median income, and a dummy variable taking the value unity if the observation comes from a father as opposed to a mother (61 observations are for fathers).

Estimates of standardized coefficients (e.g., γ^p / σ_p) are reported first. Estimates of un-standardized coefficients measuring willingness to pay are discussed momentarily. For all subsamples and specifications, estimated coefficients of parent and child risk change variables are positive and significant at the 1% level. Coefficients of the price of the vaccine are negative and significant at the 1% level, with the exception of the price of the child's vaccine in the smallest sample of unmarried/unpartnered parents, where the coefficient is significant at 5%. These estimates are consistent with results for married parents in Chapter 6 and imply that single parents were more likely to indicate that they would buy vaccines that offered larger risk reductions or were less costly. Order of presentation of vaccines does not matter. In summary, results pass the basic tests for sensitivity to size of risk change (“scope” test) and price of vaccine, and for insensitivity to order.

As shown in the second set pair of columns labeled “Unmarried,” none of the additional covariates reflecting family size, income, or parent gender are significant at the 5% level, although income is significant at the 10% level for vaccine purchases for parents. Also, inclusion of the additional covariates has little impact on the size or significance of coefficients of design point variables, in consequence of the previously discussed research design.

The coefficient estimates of the risk change variables presented in Table 7.1 are more easily interpreted by obtaining estimates of un-standardized coefficients (γ^p and γ^k). Based on the discussion of equation (8), estimates of γ^p are interpreted as the willingness to pay to eliminate heart disease risk to the parent, and estimates of γ^k are interpreted as the willingness to pay to eliminate heart disease risk to the child. Point estimates of the un-standardized coefficients are computed by multiplying the standardized coefficients by estimates of σ_p for parents and σ_k for children and re-scaling by 100 because vaccine prices are measured in hundreds of dollars. Estimates for the single stratum of parents indicate that parents are willing to pay $133 annually to eliminate their own risks, $105 annually to eliminate risk to the child; both are significant at 1%. Willingness to pay estimates for parents in remaining columns of the table also are significant at 1%, but remaining willingness to pay estimates for children are significant only at 10%. For parents who report their marital status as unmarried, willingness to pay to eliminate risk is estimated to range from $150 to $160 for the parent and from about $110 to $120 for the child. Finally, in the sample of parents who report neither a spouse nor a partner present, valuation estimates for elimination of risk are about $200 for the parent and about $130 for the child. In comparison with results presented in Chapter 6, estimates in Table 7.1 suggest that single parents are willing to pay somewhat less than are married parents to eliminate heart disease risks to themselves and to their children.

Table 7.1 also reports outcomes of tests for whether parents' decisions about risk-reducing goods are consistent with the model prediction in equation (6). This condition implies the null hypothesis $H_0 : \gamma^k - \gamma^p = 0$. The *z*-statistic pertaining to this hypothesis is reported at the bottom of the table along with its *p*-value. As shown, the hypothesis is not rejected at conventional levels. Thus, single parents' choices of risk-reducing goods within the family appear to be consistent with the unitary model of parental altruism.

5. Conclusions

This chapter presented tests for whether single parents' choices of risk-reducing goods for themselves and their children are consistent with a unitary model of parental altruism, based on estimates of willingness to pay to eliminate risk of coronary artery disease for parents and children. The model was tested using a stated preference survey on heart disease risks. Use of stated preference data is controversial partly because respondents are often thought to overstate their purchase intentions when they do not actually have to pay. Two methods are employed to mitigate this problem of hypothetical bias. First, hypothetical willingness to pay responses are divided based on a follow-up question about the degree of certainty in respondents' purchase intentions. Second, econometric methods applied confine any systematic tendency to misstate willingness to pay in a regression constant term that plays no role in testing efficiency, and no role in one of two tests for effects of distribution.

Empirical results presented are consistent with key predictions of the model. In other words, results are consistent with the hypotheses that (1) the value of morbidity risk reduction to parents is equal to the marginal cost of reducing parent risk; (2) the value of morbidity risk reduction to children is equal the marginal cost of reducing the child's risk; and (3) parents' marginal rate of substitution between morbidity risk to a parent and to a child is equal to the corresponding ratio of marginal risk reduction costs.

Estimates of single parents' willingness to pay to eliminate their own heart disease risk range from about $130 to $200 annually, depending on subsample examined and specification of willingness to pay equation. Estimated annual willingness to pay to eliminate children's risk ranges from $100 to $130. (Standard errors of these values are presented in Table 7.1.) Estimates of annual willingness to pay to reduce heart disease risks are somewhat lower among single parents than among married parents, and are lower than might be expected based on the degree of mortality risk associated with heart disease and estimates of the value of avoided mortality derived from the labor market. A possible explanation for this outcome is that the risk changes considered are much larger than those typically contemplated in studies from the labor market and that the marginal value of risk reduction declines as successive units of risk are removed.

Results presented in this chapter suggest two policy implications. First, public programs to reduce morbidity risks faced by children may prove less effective than expected as parents respond to policy changes by reallocating family resources away from reducing children's risk. Second, existing estimates of reduced morbidity for adults can be more accurately transferred to children if policy makers consider the relative marginal costs of risk reduction for each.

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Table 7.1 Heart Disease Vaccine Purchase Intentions: Single Parents. Bivariate Probit Estimates (s.e.)

	Single Stratum		Unmarried		Unmarried		No spouse/partner	
Covariate	Parent	Child	Parent	Child	Parent	Child	Parent	Child
Proportionate Risk Change	0.952**	0.512**	1.088**	0.514**	1.098**	0.497**	1.321**	0.560**
	(0.216)	(0.176)	(0.228)	(0.184)	(0.230)	(0.189)	(0.257)	(0.212)
Price of Vaccine/100	-0.716**	-0.487**	-0.693**	-0.426**	-0.723**	-0.441**	-0.656**	-0.437*
	(0.149)	(0.150)	(0.160)	(0.160)	(0.167)	(0.165)	(0.187)	(0.186)
Order	0.063	0.101	0.016	0.126	0.005	0.126	-0.116	0.251
	(0.115)	(0.114)	(0.119)	(0.118)	(0.121)	(0.119)	(0.133)	(0.132)
Constant	-0.144	-0.165	-0.175	-0.205	-0.013	-0.017	-0.171	-0.291
	(0.115)	(0.152)	(0.119)	(0.157)	(0.295)	(0.316)	(0.131)	(0.179)
Number of Children					-0.071	-0.064		
					(0.066)	(0.065)		
Income					0.234	0.124		
					(0.124)	(0.122)		
Father					0.051	0.100		
					(0.176)	(0.175)		
ρ	0.924**		0.922**		0.922**		0.925**	
	(0.020)		(0.021)		(0.022)		(0.024)	
Log-likelihood	-522.05		-487.07		-483.71		-389.01	
N	498		462		462		372	
γ^p	133.10**		156.94**		151.78**		201.35**	
	(39.21)		(46.14)		(44.20)		(65.43)	
γ^k		105.22**		120.78		112.83		128.23
		(50.61)		(64.49)		(62.16)		(75.60)
Altruism (z)	-0.696		-0.750		-0.843		-1.236	
p-value	0.486		0.453		0.399		0.217	

* Significant at the .05 level.
** Significant at the .01 level.

Appendix A: Institutional Review Board Approval of Exempt Research and EPA Confirmation

University of Central Florida

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Exempt Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Mark T. Dickie**

Date: **April 30, 2010**

Dear Researcher:

On 4/30/2010, the IRB approved the following activity as human participant research that is exempt from regulation:

Type of Review:	Exempt Determination
Project Title:	Morbidity valuation, benefit transfer and family behavior
Investigator:	Mark T Dickie
IRB Number:	SBE-10-06892
Funding Agency:	Environmental Protection Agency(EPA)
Grant Title:	Morbidity valuation, benefit transfer and family behavior (RD83326301-0)
Research ID:	1044140

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Joseph Bielitzki, DVM, UCF IRB Chair, this letter is signed by:

Signature applied by Joanne Muratori on 04/30/2010 09:24:19 AM EDT

IRB Coordinator

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MEMORANDUM

OFFICE OF THE
SCIENCE ADVISOR

FROM: Warren Lux
EPA Human Subjects Research Review Official

TO: Kelly Maguire
National Center for Environmental Economics

SUBJECT: Confirmation of Exemption Determination for Research Involving Human Subjects

DATE: May 4, 2010

I have reviewed the study cited below according to the requirements of EPA Order 1000.17 Change A1 **(Policy and Procedures on Protection of Human Research Subjects)** and have confirmed the determination of the University of Central Florida Institutional Review Board that it qualifies as research with human subjects that is exempt from EPA Regulation 40 CFR 26 **(Protection of Human Subjects)** by virtue of belonging to category (2) under 40 CFR 26.101(b). Accordingly, approval is granted for the research to proceed.

Study Title:	*Morbidity Valuation, Benefit Transfer, and Family Behavior*
EPA Grant Number:	RD83326301-0
Primary Awardee:	University of Central Florida
Federalwide Assurance #:	FWA00000351
UCF IRB Protocol #:	SBE-10-06892
Principal Investigator:	Mark Dickie
EPA Project Officer:	Kelly Maguire
HSRRO Project #:	E10-022CS

Appendix B: Knowledge Networks Field Report

Field Report

Heart Disease

Conducted for
University of Central Florida

Submitted to Dr. Mark Dickie

1350 Willow Road, Suite 102
Menlo Park, CA 94025
P: 650-289-2160
F: 650-289-2001
www.knowledgenetworks.com

Knowledge Networks Deliverable Authorization			
Printed Name	Signature	Date	Title
J. Michael Dennis	Mike Dennis	04.18.2011	SVP, Government and Academic Research

Heart Disease

Introduction

Knowledge Networks conducted a study of parents of children between ages 6 and 17 about the issues of children's health. In addition to having a child in the age range, the parents were screened for the absence of history of heart problems.

The sample consisted of the combination of married and single parents. Where possible, parents married to each other where interviewed about the same child

Sample Composition

Single Parents	501
Married Matched Parents	966
Married Unmatched Parents	1,688

The data collection took place from 11/11/10 to 3/16/2011.

Cooperation and Incidence Rates

	Invited	Completed Screener	Cooperation Rate	Qualified Completes	Incidence Rate
Parent1 (single or married)	6469	3767	58.2%	2672	70.9%
Parent2 (married only)	666	542	81.3%	483	89.1%

Key Personnel

Key personnel on this study include:

Mike Dennis – Senior Vice President, Government & Academic Research. M. Dennis is based in the Menlo Park office of Knowledge Networks.
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Bill McCready – Vice President, Business Development. B. McCready is based in the Chicago office of Knowledge Networks.
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Knowledge Networks Methodology

Introduction

Knowledge Networks (KN) has recruited the first online research panel that is representative of the entire U.S. population. Panel members are randomly recruited through probability-based sampling, and households are provided with access to the Internet and hardware if needed.

Knowledge Networks selects households by using address-based sampling methods; formerly, KN relied on random-digit dialing (RDD) Once households are recruited for the panel, they are contacted by e-mail for survey taking or panelists visit their online member page for survey taking (instead of being contacted by phone or postal mail). This allows surveys to be fielded very quickly and economically. In addition, this approach reduces the burden placed on respondents, since e-mail notification is less intrusive than telephone calls, and most respondents find answering Web questionnaires more interesting and engaging than being questioned by a telephone interviewer. Furthermore, respondents have the freedom to choose what time of day to participate in research.

Documentation regarding KnowledgePanel sampling, data collection procedures, weighting, and IRB-bearing issues are available at the below online resources.

- http://www.knowledgenetworks.com/ganp/reviewer-info.html
- http://www.knowledgenetworks.com/knpanel/index.html
- http://www.knowledgenetworks.com/ganp/irbsupport/

Panel Recruitment Methodology

When Knowledge Networks began recruiting in 1999, the company established the first online research panel (now called KnowledgePanel®) based on probability sampling covering both the online and offline populations in the U.S. Panel members are recruited through national random samples, originally by telephone and now almost entirely by postal mail. Households are provided with access to the Internet and hardware if needed. Unlike Internet convenience panels, also known as "opt-in" panels, that includes only individuals with Internet access who volunteer themselves for research, KnowledgePanel recruitment uses dual sampling frames that includes both listed and unlisted telephone numbers, telephone and non-telephone households, and cell-phone-only households, as well as households with and without Internet access. Only persons sampled through these probability-based techniques are eligible to participate on KnowledgePanel. Unless invited to do so as part of these national samples, no one on their own can volunteer to be on the panel.

RDD and ABS Sample Frames

KnowledgePanel members today could have been recruited by either the former random digit dialing (RDD) sampling or the current address-based sampling (ABS) methodologies In this section, we will describe the RDD-based methodology; the ABS methodology is described in a separate section below. To offset attrition, multiple recruitment samples are fielded evenly throughout the calendar year.

KnowledgePanel recruitment methodology has used the quality standards established by selected RDD surveys conducted for the Federal government (such as the CDC-sponsored National Immunization Survey).

KN employed list-assisted RDD sampling techniques based on a sample frame of the U.S. residential landline telephone universe. For purposes of efficiency, KN excludes only those banks of telephone numbers (a bank consists of 100 numbers) that had fewer than two directory listings. Additionally, an oversampling was conducted within a stratum of telephone exchanges that had high concentrations of African American and Hispanic households based on Census data. Note that recruitment sampling is done without replacement, thus numbers already fielded do not get fielded again.

A telephone number for which a valid postal address can be matched occurred in about 67-70% of each sample. These address-matched cases were all mailed an advance letter informing them that they had been selected to participate in KnowledgePanel. For purposes of efficiency, the unmatched numbers were most recently under-sampled at a rate of 0.75 relative to the matched numbers. Both the minority oversampling mentioned above and this under-sampling of non-address households are adjusted appropriately in the panel's weighting procedures.

Following the mailings, telephone recruitment by trained interviewers/recruiters begins for all sampled telephone numbers. Telephone numbers for cases sent to recruiters were dialed for up to 90 days, with at least 14 dial attempts for cases in which no one answers the phone, and for numbers known to be associated with households. Extensive refusal conversion was also performed. The recruitment interview, about 10 minutes in length, begins with informing the household member that the household had been selected to join KnowledgePanel. If the household does not have a computer and access to the Internet, the household member is told that in return for completing a short survey weekly, the household will be provided with free monthly Internet access and a laptop computer (in the past, the household was provided with a WebTV device). All members of the household are enumerated, and some initial demographic and background information on prior computer and Internet use was collected.

Households that informed recruiters that they had a home computer and Internet access were asked to take KN surveys using their own equipment and Internet connection. Incentive points per survey, redeemable for cash, are given to these "PC" (personal computer) respondents for completing their surveys. Panel members provided with a laptop computer and free Internet access do not participate in this per-survey points-incentive program. However, all panel members do receive special incentive points for select surveys to improve response rates and/or for all longer surveys as a modest compensation for the extra burden of their time and participation.

For those panel members receiving a laptop computer, each unit is custom-configured prior to shipment with individual email accounts so that it is ready for immediate use by the household. Most households are able to install the hardware without additional assistance, although KN maintains a toll-free telephone line for technical support. The KN Call Center contacts household members who do not respond to e-mail and attempts to restore both contact and participation. PC panel members provide their own e-mail addresses, and we send their weekly survey invitations to that e-mail account.

All new panel members receive an initial survey for the dual purpose of welcoming them as new panel members and introducing them to how online survey questionnaires work. New panel members also complete a separate profile survey that collects essential demographic information such as gender, age, race, income, and education to create a personal member profile. This information can be used to determine eligibility for specific studies and is factored in for weighting purposes. Operationally, once the profile information is stored, it does not need to be re-collected as a part of each and every survey. This information is also updated annually for all panel members. Once new members have completed their profile surveys, they are designated as "active," and considered ready to be sampled for client studies. [Note: Parental or legal guardian consent is also collected for the purpose of conducting surveys with teenage panel members, aged 13 to17.]

Once a household is recruited and each household member's e-mail address is either obtained or provided, panel members are sent survey invitations linked through a personalized e-mail message (instead of by phone or postal mail). This contact method permits surveys to be fielded quickly and economically, and also facilitates longitudinal research. In addition, this approach reduces the burden placed on respondents, since e-mail notification is less intrusive than telephone calls and allows research subjects to participate in research when it is convenient for them.

Address-Based Sampling (ABS) Methodology

When KN first started panel recruitment in 1999, the conventional opinion among survey experts was that probability-based sampling could be carried out cost effectively through the use of a national RDD samples. The RDD landline frame at the time allowed access to 96% of U.S. households. This is no longer the case. In 2009, Knowledge Networks introduced use of the ABS sample frame to panel recruitment to reflect the real changes in society and telephony over recent years. Those changes that have reduced the long-term scientific viability of landline RDD sampling methodology are as follows: declining respondent cooperation in telephone surveys as reflected in "do not call" lists, call screening, caller-ID devices, and answering machines; dilution of the RDD sample frame as measured by the working telephone number rate; and finally, the emergence of cell phone-only households (CPOHH) because such households are excluded from the RDD frame because they have no landline telephone.

According to the Centers for Disease Control and Prevention (January-June 2010), approximately 28.6% of all U.S. households cannot be contacted through RDD sampling—26.6% as a result of CPOHH status and 2% because they have no telephone service whatsoever. Among some age segments, the RDD non-coverage would be substantial: 40% of young adults, ages 18–24, reside in CPOHHs, 51% of those ages 25–29, and 40% of those ages 30–34.[8]

After conducting an extensive pilot project in 2008, KN made the decision to move toward address-based sample (ABS) frame in response to the growing number of cell-phone- only households that are outside the RDD frame. Before conducting the ABS pilot, we also experimented with supplementing its RDD samples with cell-phone samples. However, this approach would was not cost effective—and raised a number of other operational, data quality, and liability issues (for example, calling cell phones while respondents were driving).

The key advantage of the ABS sample frame is that it allows sampling of almost all U.S. households. An estimated 97% of households is "covered" in sampling nomenclature. Regardless of household telephone status, those households can be reached and contacted through postal mail. Second, the KNABS pilot project revealed several additional advantages beyond expected improvement in recruiting adults from CPOHHs:

- Improved sample representativeness for minority racial and ethnic groups
- Improved inclusion of lower educated and low income households
- Exclusive inclusion of the fraction of CPOHHs that have neither a landline telephone nor Internet access (approximately four to six percent of US households).

ABS involves probability-based sampling of addresses from the U.S. Postal Service's Delivery Sequence File. Randomly sampled addresses are invited to join KnowledgePanel through a series of mailings and, in some cases, telephone follow-up calls to non-responders when a telephone number can be matched to the sampled address. Operationally, invited households have the option to join the panel by one of several ways:

- Completing and returning a paper form in a postage-paid envelope,
- Calling a toll-free hotline maintained by Knowledge Networks, or
- Going to a dedicated KN web site and completing an online recruitment form.

After initially accepting the invitation to join the panel, respondents are then "profiled" online by answering key demographic questions about themselves. This profile is maintained through the same procedures that were previously established for RDD-recruited panel members.

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8 Blumberg SJ, Luke JV. Wireless substitution: Early release of estimates from the National Health Interview Survey, January–June 2010. National Center for Health Statistics. December 2010. Available from: http://www.cdc.gov/nchs/nhis.htm.

Respondents not having an Internet connection are provided a laptop computer and free Internet service. Respondents sampled from the ABS frame, like those sampled from the RDD frame, are offered the same privacy terms and confidentiality protections that we have developed over the years and that have been reviewed by dozens of Institutional Review Boards.

Large-scale ABS sampling for KnowledgePanel recruitment began in April 2009. As a result, sample coverage on KnowledgePanel of CPOHHs, young adults, and non-whites has been increasing steadily since that time.

Because KnowledgePanel members have been recruited from two different sample frames, RDD and ABS, KN implemented several technical processes to merge samples sourced from these frames. KN's approach preserves the representative structure of the overall panel for the selection of individual client study samples. An advantage of mixing ABS frame panel members in any KnowledgePanel sample is a reduction in the variance of the weights. ABS-sourced samples tend to align more closely to the overall demographic distributions in the population, and thus the associated adjustment weights are somewhat more uniform and less varied. This variance reduction efficaciously attenuates the sample's design effect and confirms a real advantage for study samples drawn from KnowledgePanel with its dual frame construction.

Survey Administration

For client surveys, samples are drawn at random from among active panel members. Depending on the study, eligibility criteria will be applied or in-field screening of the sample will be carried out. Sample sizes can range widely depending on the objectives and design of the study.

Once assigned to a survey, members receive a notification e-mail letting them know there is a new survey available for them to take. This email notification contains a link that sends them to the survey questionnaire. No login name or password is required. The field period depends on the client's needs and can range anywhere from a few hours to several weeks.

After three days, automatic email reminders are sent to all non-responding panel members in the sample. If email reminders do not generate a sufficient response, an automated telephone reminder call can be initiated. The usual protocol is to wait at least three to four days after the e-mail reminder before calling. To assist panel members with their survey taking, each individual has a personalized "home page" that lists all the surveys that were assigned to that member and have yet to be completed.

Knowledge Networks also operates an ongoing modest incentive program to encourage participation and create member loyalty. Members can enter special raffles or can be entered into special sweepstakes with both cash rewards and other prizes to be won.

The typical survey commitment for panel members is one survey per week or four per month with duration of 10 to 15 minutes per survey. Some client surveys exceed this time, and in the case of longer surveys, an additional incentive can be provided.

Survey Sampling from KnowledgePanel

Once Panel Members are recruited and profiled, they become eligible for selection for specific client surveys. In most cases, the specific survey sample represents a simple random sample from the panel, for example, a general population survey. Customized stratified random sampling based on profile data can also be conducted as required by the study design.

The general sampling rule is to assign no more than one survey per week to members. Allowing for rare exceptions during some weeks, this limits a member's total assignments per month to four or six surveys. In certain cases, a survey sample calls for pre-screening, that is, members are drawn from a subsample of the panel (such as females, Republicans, grocery shoppers, etc.). In such cases, care is taken to ensure that all subsequent survey samples drawn that week are selected in such a way as to result in a sample that remains representative of the panel distributions.

For this survey, a nationally representative sample of U.S. parents of kids 6-16 years old was selected.

Sample Weighting

The design for KnowledgePanel® recruitment begins as an equal probability sample with several enhancements incorporated to improve efficiency. Since any alteration in the selection process is a deviation from a pure equal probability sample design, statistical weighting adjustments are made to the data to offset known selection deviations. These adjustments are incorporated in the sample's **base weight**.

There are also several sources of survey error that are an inherent part of any survey process, such as non-coverage and non-response due to panel recruitment methods and to inevitable panel attrition. We address these sources of sampling and non-sampling error by using a **panel demographic post-stratification weight** as an additional adjustment.

All the above weighting is done before the study sample is drawn. Once a study sample is finalized (all data collected and a final data set made), a set of **study-specific post-stratification weights** are constructed so that the study data can be adjusted for the study's sample design and for survey non-response.

A description of these types of weights follows.

The Base Weight

In a KnowledgePanel sample there are seven known sources of deviation from an equal probability of selection design. These are corrected in the Base Weight and are described below.

1. Under-sampling of telephone numbers unmatched to a valid mailing address

An address match is attempted on all the Random Digit Dial (RDD)-generated telephone numbers in the sample after the sample has been purged of business and institutional numbers and screened for non-working numbers. The success rate for address matching is in the 60 to 70% range. Households having telephone numbers with valid addresses are sent an advance letter, notifying them that they will be contacted by phone to join KnowledgePanel. The remaining, unmatched numbers are under-sampled as a recruitment efficiency strategy. Advance letters improve recruitment success rates. Under-sampling was suspended between July 2005 and April 2007. It was resumed in May 2007, using a sampling rate of 0.75. RDD recruitment ended in July 2009.

2. RDD selection proportional to the number of telephone landlines reaching the household

As part of the field data collection operation, information is collected on the number of separate telephone landlines in each selected household. The probability of selecting a multiple-line household is down-weighted by the inverse of the number of landlines. RDD recruitment ended in July 2009.

3. Some minor oversampling of Chicago and Los Angeles in early pilot surveys

Two pilot surveys carried out in Chicago and Los Angeles when the panel was initially being built increased the relative size of the sample from these two cities. With natural attrition and growth in size, that impact is disappearing over time. It remains part of our base adjustment weighting because of a small number of extant panel members from that initial panel cohort.

4. Early oversampling the four largest states and central region states

At the time when the panel was first being built, survey demand in the four largest states (California, New York, Florida, and Texas) necessitated oversampling during January–October 2000. Similarly, the central region states were oversampled for a brief period of time. These now diminishing effects still remain in the panel membership and thus weighting adjustments are required for these geographic areas.

5. Under-sampling of households not covered by the MSN® TV service network

Certain small areas of the U.S. are not serviced by MSN®, thus the MSN®TV units distributed to non-Internet households prior to January 2009 could not be used for those recruited non-Internet households. Overall, the result is a small residual under-sample in those geographic areas which requires a minor weighting adjustment for those locations. Since January 2010, laptop computers with dial-up access are being distributed to non-Internet households thus eliminating this under-coverage component.

6. RDD oversampling of African American and Hispanic telephone exchanges

As of October 2001, oversampling of telephone exchanges with a higher density of minority households (specifically, African American and Hispanic) was implemented to increase panel membership for those groups. These exchanges were oversampled at approximately twice the rate of other exchanges. This oversampling is corrected in the base weight. RDD recruitment ended in July 2009.

7. Address-based sample phone match adjustment

Toward the end of 2008, Knowledge Networks began recruiting panel members by using an address-based sample (ABS) frame in addition to RDD recruitment. Once recruitment through the mail, including follow-up mailings to ABS non-respondents was completed, telephone recruitment was added. Non-responding ABS households where a landline telephone number could be matched to an address were subsequently called and telephone recruitment was initiated. This effort resulted in a slight overall disproportionate number of landline households being recruited in a given ABS sample. A base weight adjustment is applied to return the ABS recruitment panel members to the sample's correct national proportion of phone-match and no phone-match households.

8. ABS oversample stratification adjustment

In late 2009 the ABS sample began incorporating a geographic stratification design. Census blocks with high density minority communities were oversampled (Stratum 1) and the balance of the census blocks (Stratum 2) were relatively under-sampled. The definition of high density and minority community and the relative proportion between strata differed among specific ABS samples. An appropriate base weight adjustment is applied to each sample to correct for this stratified design.

The Panel Demographic Post-stratification Weight

To reduce the effects of any non-response and non-coverage bias in the overall panel membership (before the study sample is drawn), a post-stratification adjustment is applied based on demographic distributions from the most recent data from the Current Population Survey (CPS). The benchmark distributions for Internet access among the U.S. population of adults are obtained from the most recent special CPS supplemental survey measuring Internet access (October 2009).

The overall panel post-stratification variables include:

- Gender (Male/Female)
- Age (18–29, 30–44, 45–59, and 60+)

- Race/Hispanic ethnicity (White/Non-Hispanic, Black/Non-Hispanic, Other/Non-Hispanic, 2+ Races/Non-Hispanic, Hispanic)
- Education (Less than High School, High School, Some College, Bachelor and beyond)
- Census Region (Northeast, Midwest, South, West)
- Metropolitan Area (Yes, No)
- Internet Access (Yes, No)

The Panel Demographic Post-stratification weight is applied prior to a probability proportional to size (PPS) selection of a study sample from KnowledgePanel. These weights generally constitute the starting weight for most client samples selected from the panel.

Study-Specific Post-Stratification Weights

Once all the study data are collected and made final, a post-stratification process is used to adjust for any survey non-response as well as any non-coverage or under- and over-sampling resulting from the study-specific sample design. Demographic and geographic distributions for the non-institutionalized, civilian population ages 18+ from the most recent CPS are used as benchmarks in this adjustment.

The following benchmark distributions are utilized for this post-stratification adjustment:

- Gender (Male/Female)
- Age (18–29, 30–44, 45–59, and 60+)
- Race/Hispanic ethnicity (White/Non-Hispanic, Black/Non-Hispanic, Other/Non-Hispanic, 2+ Races/Non-Hispanic, Hispanic)
- Education (Less than High School, High School, Some College, Bachelors and higher)
- Census Region (Northeast, Midwest, South, West)
- Metropolitan Area (Yes, No)
- Internet Access (Yes, No)

Comparable distributions are calculated by using all completed cases from the field data (n = 3155). Since study sample sizes are typically too small to accommodate a complete cross-tabulation of all the survey variables with the benchmark variables, a raking procedure is used for the post-stratification weighting adjustment. This procedure adjusts the sample data back to the selected benchmark proportions. Through an iterative convergence process, the weighted sample data are optimally fitted to the marginal distributions.

After this final post-stratification adjustment, the distribution of the calculated weights are examined to identify and, if necessary, trim outliers at the extreme upper and lower tails of the weight distribution. The post-stratified and trimmed weights are then scaled to the sum of the total sample size of all eligible respondents.

Parent 1 (Single + Married)

1. Parent 1 respondents (Single + married) were weighted to look like the ages 18-55 single and married parents/legal guardians with kids 6-17 from KN members by controlling the demographics within 4 groups (see below) on the standard weighting variables (drop Internet access).

1=Single Males, 2=Single Females, 3=Married Males and 4=Married females.

* Single are defined as 18-55 parents/legal guardians, "not married" with kids 6-17 and that they are the only parents in the households

* Married are defined as 18-55 parents/legal guardians, married (ppmarit=1), with kids 6-17 in the households.

2. Trim the weights separately within the four groups and scale the weights to sum to the sample size of total respondents (weight1, not delivered) and by Single and married separately (weight2, delivered).

Based on the sample sizes, weighting variables are collapsed as follows within the four groups:

Within Single males: Age (18-44, 45-55), Race/Ethnicity (White, Non-White), Education (LHS/HS, Some College, Bachelor or Higher)

Within Single females: Age (18-34, 35-39, 40-44, 45-55), Race/Ethnicity (White, African American, Other/2+ Races, Hispanic), Education (LHS/HS, Some College, Bachelor or Higher)

Within Single (males + females): Region (NE, MW, South, West), Metro (Y/N)

Within married males: Age (18-34, 35-39, 40-44, 45-55), Race/Ethnicity (White, African American, Other, Hispanic, 2+ Races), Region (NE, MW, South, West), Metro (Y/N), Education (LHS/HS, Some College, Bachelor or Higher)

Within married females: Age (18-34, 35-39, 40-44, 45-55), Race/Ethnicity (White, African American, Other, Hispanic, 2+ Races), Region (NE, MW, South, West), Metro (Y/N), Education (LHS/HS, Some College, Bachelor or Higher)

B. Parent 1 (Matched Married)

1. Parent 1 matched married respondents were weighted to look like the ages 18-55 married parents/legal guardians with kids 6-17 from KN members by controlling the demographics within gender on the standard weighting variables (drop Internet access).
2. Trim the weights separately within gender and scale the weights to sum to the sample size of Parent 1 matched married respondents (weight3, delivered).

C. Parent 2 (Matched Married)

1. Parent 2 matched married respondents were weighted to look like the ages 18-55 married parents/legal guardians with kids 6-17 from KN members by controlling the demographics within gender on the standard weighting variables (drop Internet access).
2. Trim the weights separately within gender and scale the weights to sum to the sample size of Parent 2 matched married respondents (weight3, delivered).

Based on the sample sizes, weighting variables are collapsed as follows within gender:

Within males: Age (18-34, 35-39, 40-44, 45-55), Race/Ethnicity (White, African American/Hispanic, Other/2+ Races), Region (NE, MW, South, West), Metro (Y/N), Education (LHS/HS, Some College, Bachelor or Higher)
Within females: Age (18-34, 35-39, 40-44, 45-55), Race/Ethnicity (White, African American/Hispanic, Other/2+ Races), Region (NE, MW, South, West), Metro (Y/N), Education (LHS/HS, Some College, Bachelor or Higher)

Weights are trimmed more aggressively in order to minimize the size of weights. The deviations between the sample and benchmarks are control within +/- 3.5%.

Weights Definition:
weight1: Parent 1 respondents
weight2: Parent 1 respondents (weights are scaled to sum to the sample size of Single and Married respondents separately)
weight3: Parent 1 and Parent 2 matched married respondents

Trimming:
weight1:
Single Males: (4.55%, 95.45%)
Single Females: (1.84%, 98.16%)
Married Males: (1.96%, 98.04%)
Married Females: (0.36%, 99.64%)
weight2: None – scaled weights based on weight1
weight3:
Parent 1:
Males: (0.83%, 99.17%)

Females: (0.83%, 99.17%)
Parent 2:
Males: (0.85%, 99.15%)
Females: (1.61%, 98.39%)

Design Effect:
weight1: 2.3355
weight2:
Single Males: 1.9558
Single Females: 2.7131
Married Males: 2.2051
Married Females: 1.9358
weight3:
Parent 1:
Overall: 1.8268
Males: 2.0002
Females: 1.6625
Parent 2:
Overall: 1.7636
Males: 1.6255
Females: 1.8981

Range on Weights:

Analysis Variable : weight1

Minimum	Maximum	N	Sum	1st Pctl	99th Pctl
0.1289155	7.4409076	2672	2672.00	0.1495996	6.8470231

Analysis Variable : weight2

single	N Obs	Minimum	Maximum	Sum	1st Pctl	99th Pctl
Married Parent	2171	0.1348819	7.7130718	2171.00	0.1614012	6.8498375
Single Parent	501	0.1118178	5.9389235	501.0000000	0.1118178	5.9389235

Analysis Variable : weight2

single	Gender	N Obs	Minimum	Maximum	Sum	1st Pctl	99th Pctl
Married Parent	Male	766	0.2755864	7.7130718	1029.38	0.2755864	7.7130718
	Female	1405	0.1348819	6.4851094	1141.62	0.1567606	4.2805955
Single Parent	Male	66	0.1750320	5.6196143	102.5828836	0.1750320	5.6196143
	Female	435	0.1118178	5.9389235	398.4171164	0.1118178	5.9389235

Analysis Variable : weight3

N

in_parent2	Obs	Minimum	Maximum	Sum	1st Pctl	99th Pctl
Parent 1	483	0.1494920	5.1088220	483.0000000	0.1646701	4.6548725
Parent 2	483	0.1566871	4.9350595	483.0000000	0.1582817	4.9350595

Analysis Variable : weight3

in_parent2	Gender	N Obs	Minimum	Maximum	Sum	1st Pctl	99th Pctl
Parent 1	Male	241	0.1523116	5.1088220	237.7148775	0.1646701	5.1088220
	Female	242	0.1494920	4.1099107	245.2851225	0.1669454	4.1099107
Parent 2	Male	235	0.1873291	4.4462345	236.7022291	0.1890860	4.4462345
	Female	248	0.1566871	4.9350595	246.2977709	0.1566871	4.9350595

Age 18-55 Married/Single Parents Benchmarks - Within Married/Single
Source: KnowledgePanel (Active Members)

Table of PPGENDER by group4

PPGENDER(Gender)	Statistic	group4: Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
Male	Frequency	2043824	0	1.636E7	0	1.841E7
	Percent	4.73	0.00	37.86	0.00	42.59
	Col Pct	100.00	0.00	100.00	0.00	
Female	Frequency	0	7480816	0	1.733E7	2.481E7
	Percent	0.00	17.31	0.00	40.10	57.41
	Col Pct	0.00	100.00	0.00	100.00	
Total	Frequency	2043824	7480816	1.636E7	1.733E7	4.322E7
	Percent	4.73	17.31	37.86	40.10	100.00

Table of age4 by group4

age4	Statistic	group4: Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
Age 18-34	Frequency	466989	3164149	3425085	4530396	1.159E7
	Percent	1.08	7.32	7.93	10.48	26.81
	Col Pct	22.85	42.30	20.93	26.14	

Age 35-39	465718	1383881	3219983	3926925	8996507
	1.08	3.20	7.45	9.09	20.82
	22.79	18.50	19.68	22.66	
Age 40-44	544034	1455212	4625063	4194484	1.082E7
	1.26	3.37	10.70	9.71	25.03
	26.62	19.45	28.26	24.20	
Age 45-55	567082	1477574	5094315	4677779	1.182E7
	1.31	3.42	11.79	10.82	27.34
	27.75	19.75	31.13	26.99	
Total	2043824	7480816	1.636E7	1.733E7	4.322E7
	4.73	17.31	37.86	40.10	100.00

Table of PPETHM by group4

PPETHM(Race/Ethnicity, Census categories) group4

Frequency / Percent / Col Pct	Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
White, Non-Hispanic	1146867	2996827	1.124E7	1.224E7	2.762E7
	2.65	6.93	26.00	28.33	63.91
	56.11	40.06	68.66	70.64	
Black, Non-Hispanic	282535	2138365	1153051	1062391	4636343
	0.65	4.95	2.67	2.46	10.73
	13.82	28.58	7.05	6.13	
Other, Non-Hispanic	65856	158751	770579	722995	1718180
	0.15	0.37	1.78	1.67	3.98
	3.22	2.12	4.71	4.17	
Hispanic	498180	1844627	2829207	2660224	7832238
	1.15	4.27	6.55	6.16	18.12
	24.37	24.66	17.29	15.35	
2+ Race, Non-Hispanic	50385	342246	375598	642088	1410317
	0.12	0.79	0.87	1.49	3.26
	2.47	4.57	2.30	3.71	
Total	2043824	7480816	1.636E7	1.733E7	4.322E7
	4.73	17.31	37.86	40.10	100.00

Table of PPREG4 by group4

PPREG4(Region 4 - based on State of residence) group4

Frequency / Percent / Col Pct	Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
Northeast	510277	1313369	2821840	2869482	7514967
	1.18	3.04	6.53	6.64	17.39
	24.97	17.56	17.24	16.56	
Midwest	306683	1174388	3830882	3830764	9142717
	0.71	2.72	8.86	8.86	21.15
	15.01	15.70	23.41	22.11	
South	736543	3470377	5886255	6425076	1.652E7
	1.70	8.03	13.62	14.87	38.22
	36.04	46.39	35.97	37.08	
West	490321	1522683	3825468	4204262	1.004E7
	1.13	3.52	8.85	9.73	23.24
	23.99	20.35	23.38	24.26	
Total	2043824	7480816	1.636E7	1.733E7	4.322E7
	4.73	17.31	37.86	40.10	100.00

Table of PPMSACAT by group4

PPMSACAT (Frequency / Percent / Col Pct)	Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
Non-Metro	347394 0.80 17.00	1197032 2.77 16.00	3111795 7.20 19.02	3090007 7.15 17.83	7746228 17.92
Metro	1696429 3.93 83.00	6283785 14.54 84.00	1.325E7 30.66 80.98	1.424E7 32.95 82.17	3.547E7 82.08
Total	2043824 4.73	7480816 17.31	1.636E7 37.86	1.733E7 40.10	4.322E7 100.00

Table of ppeducat3 by group4

ppeducat3 (Frequency / Percent / Col Pct)	Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
LHS/HS	1118141 2.59 54.71	3698831 8.56 49.44	6691591 15.48 40.89	5939648 13.74 34.27	1.745E7 40.37
Some College	519594 1.20 25.42	2643696 6.12 35.34	4157189 9.62 25.40	5258497 12.17 30.34	1.258E7 29.11
Bachelor or Higher	406088 0.94 19.87	1138289 2.63 15.22	5515665 12.76 33.71	6131439 14.19 35.38	1.319E7 30.52
Total	2043824 4.73	7480816 17.31	1.636E7 37.86	1.733E7 40.10	4.322E7 100.00

Table of PPNET by group4

PPNET (Frequency / Percent / Col Pct)	Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
No	800215 1.85 39.15	3365148 7.79 44.98	1745905 4.04 10.67	2635249 6.10 15.21	8546517 19.78
Yes	1243609 2.88 60.85	4115668 9.52 55.02	1.462E7 33.82 89.33	1.469E7 34.00 84.79	3.467E7 80.22
Total	2043824 4.73	7480816 17.31	1.636E7 37.86	1.733E7 40.10	4.322E7 100.00

Table of PPMARIT by group4

PPMARIT(Are you now married, widowed, divorced,) by group4

PPMARIT	Frequency / Percent / Col Pct	Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
1	Frequency	0	0	1.636E7	1.733E7	3.369E7
	Percent	0.00	0.00	37.86	40.10	77.96
	Col Pct	0.00	0.00	100.00	100.00	
2	Frequency	18411	227916	0	0	246326
	Percent	0.04	0.53	0.00	0.00	0.57
	Col Pct	0.90	3.05	0.00	0.00	
3	Frequency	902072	2022975	0	0	2925047
	Percent	2.09	4.68	0.00	0.00	6.77
	Col Pct	44.14	27.04	0.00	0.00	
4	Frequency	142942	1109815	0	0	1252757
	Percent	0.33	2.57	0.00	0.00	2.90
	Col Pct	6.99	14.84	0.00	0.00	
5	Frequency	418091	2474658	0	0	2892749
	Percent	0.97	5.73	0.00	0.00	6.69
	Col Pct	20.46	33.08	0.00	0.00	
6	Frequency	562308	1645453	0	0	2207761
	Percent	1.30	3.81	0.00	0.00	5.11
	Col Pct	27.51	22.00	0.00	0.00	
Total	Frequency	2043824	7480816	1.636E7	1.733E7	4.322E7
	Percent	4.73	17.31	37.86	40.10	100.00

Table of parent_hh by group4

parent_hh	Frequency / Percent / Col Pct	Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
1	Frequency	2043824	7480816	5090465	9235719	2.385E7
	Percent	4.73	17.31	11.78	21.37	55.19
	Col Pct	100.00	100.00	31.11	53.29	
2	Frequency	0	0	1.094E7	7951276	1.889E7
	Percent	0.00	0.00	25.31	18.40	43.71
	Col Pct	0.00	0.00	66.84	45.88	
3	Frequency	0	0	320847	137730	458577
	Percent	0.00	0.00	0.74	0.32	1.06
	Col Pct	0.00	0.00	1.96	0.79	
4	Frequency	0	0	15050	4858.8	19909
	Percent	0.00	0.00	0.03	0.01	0.05
	Col Pct	0.00	0.00	0.09	0.03	
Total	Frequency	2043824	7480816	1.636E7	1.733E7	4.322E7
	Percent	4.73	17.31	37.86	40.10	100.00

Age 18-55 Married/Single Parents Benchmarks - Within Married/Single

Source: KnowledgePanel (Active Members)

Table of PPGENDER by single

PPGENDER(Gender) / Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
Male	1.636E7 37.86 48.57	2043824 4.73 21.46	1.841E7 42.59
Female	1.733E7 40.10 51.43	7480816 17.31 78.54	2.481E7 57.41
Total	3.369E7 77.96	9524640 22.04	4.322E7 100.00

Table of age4 by single

age4 / Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
Age 18-34	7955480 18.41 23.61	3631138 8.40 38.12	1.159E7 26.81
Age 35-39	7146908 16.54 21.21	1849599 4.28 19.42	8996507 20.82
Age 40-44	8819548 20.41 26.18	1999246 4.63 20.99	1.082E7 25.03
Age 45-55	9772094 22.61 29.00	2044656 4.73 21.47	1.182E7 27.34
Total	3.369E7 77.96	9524640 22.04	4.322E7 100.00

Table of PPETHM by single

PPETHM(Race/Ethnicity, Census categories) by single

Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
White, Non-Hispanic	2.348E7 54.32 69.68	4143694 9.59 43.50	2.762E7 63.91
Black, Non-Hispanic	2215443 5.13 6.58	2420900 5.60 25.42	4636343 10.73
Other, Non-Hispanic	1493573 3.46 4.43	224607 0.52 2.36	1718180 3.98
Hispanic	5489431 12.70 16.29	2342807 5.42 24.60	7832238 18.12
2+ Race, Non-Hispanic	1017686 2.35 3.02	392631 0.91 4.12	1410317 3.26
Total	3.369E7 77.96	9524640 22.04	4.322E7 100.00

Table of PPREG4 by single

PPREG4(Region 4 - based on State of residence) by single

Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
Northeast	5691322 13.17 16.89	1823645 4.22 19.15	7514967 17.39
Midwest	7661647 17.73 22.74	1481070 3.43 15.55	9142717 21.15
South	1.231E7 28.49 36.54	4206920 9.73 44.17	1.652E7 38.22
West	8029730 18.58 23.83	2013005 4.66 21.13	1.004E7 23.24
Total	3.369E7 77.96	9524640 22.04	4.322E7 100.00

Table of PPMSACAT by single

PPMSACAT single

Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
Non-Metro	6201802	1544426	7746228
	14.35	3.57	17.92
	18.41	16.22	
Metro	2.749E7	7980214	3.547E7
	63.61	18.46	82.08
	81.59	83.78	
Total	3.369E7	9524640	4.322E7
	77.96	22.04	100.00

Table of ppeducat3 by single

ppeducat3 single

Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
LHS/HS	1.263E7	4816972	1.745E7
	29.23	11.15	40.37
	37.49	50.57	
Some College	9415686	3163291	1.258E7
	21.79	7.32	29.11
	27.94	33.21	
Bachelor or Higher	1.165E7	1544377	1.319E7
	26.95	3.57	30.52
	34.57	16.21	
Total	3.369E7	9524640	4.322E7
	77.96	22.04	100.00

Table of PPNET by single

PPNET single

Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
No	4381154	4165363	8546517
	10.14	9.64	19.78
	13.00	43.73	
Yes	2.931E7	5359277	3.467E7
	67.82	12.40	80.22
	87.00	56.27	
Total	3.369E7	9524640	4.322E7
	77.96	22.04	100.00

Table of PPMARIT by single

PPMARIT(Are you now married, widowed, divorced,)

single

PPMARIT	Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
1	Frequency	3.369E7	0	3.369E7
	Percent	77.96	0.00	77.96
	Col Pct	100.00	0.00	
2	Frequency	0	246326	246326
	Percent	0.00	0.57	0.57
	Col Pct	0.00	2.59	
3	Frequency	0	2925047	2925047
	Percent	0.00	6.77	6.77
	Col Pct	0.00	30.71	
4	Frequency	0	1252757	1252757
	Percent	0.00	2.90	2.90
	Col Pct	0.00	13.15	
5	Frequency	0	2892749	2892749
	Percent	0.00	6.69	6.69
	Col Pct	0.00	30.37	
6	Frequency	0	2207761	2207761
	Percent	0.00	5.11	5.11
	Col Pct	0.00	23.18	
Total		3.369E7	9524640	4.322E7
		77.96	22.04	100.00

Table of parent_hh by single

parent_hh single

parent_hh	Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
1	Frequency	1.433E7	9524640	2.385E7
	Percent	33.15	22.04	55.19
	Col Pct	42.52	100.00	
2	Frequency	1.889E7	0	1.889E7
	Percent	43.71	0.00	43.71
	Col Pct	56.06	0.00	
3	Frequency	458577	0	458577
	Percent	1.06	0.00	1.06
	Col Pct	1.36	0.00	
4	Frequency	19909	0	19909
	Percent	0.05	0.00	0.05
	Col Pct	0.06	0.00	
Total		3.369E7	9524640	4.322E7
		77.96	22.04	100.00

Is R a parent or legal guardian?

PARENT	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	43218670	100.00	43218670	100.00

)

kids6to17	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	20913284	48.39	20913284	48.39
2	15361389	35.54	36274673	83.93
3	4980840	11.52	41255513	95.46
4	1545987	3.58	42801500	99.03
5	280659.2	0.65	43082159	99.68
6	114963.5	0.27	43197122	99.95
7	13286.51	0.03	43210409	99.98
8	8260.592	0.02	43218670	100.00

Heart Disease - Parent 1 Respondents - Within Married/Single By Gender
Trimmed and Scaled: Weighted by weight1

The FREQ Procedure

Table of PPGENDER by group4

PPGENDER(Gender) group4

Frequency / Percent / Col Pct	Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
Male	118.27	0	993.06	0	1111.3
	4.43	0.00	37.17	0.00	41.59
	100.00	0.00	100.00	0.00	
Female	0	459.34	0	1101.3	1560.7
	0.00	17.19	0.00	41.22	58.41
	0.00	100.00	0.00	100.00	
Total	118.268	459.338	993.058	1101.34	2672
	4.43	17.19	37.17	41.22	100.00

Table of age4 by group4

age4 group4

Frequency / Percent / Col Pct	Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
Age 18-34	17.803	183.23	187.42	282.3	670.75
	0.67	6.86	7.01	10.57	25.10
	15.05	39.89	18.87	25.63	
Age 35-39	34.925	88.245	196.56	250.84	570.57
	1.31	3.30	7.36	9.39	21.35
	29.53	19.21	19.79	22.78	
Age 40-44	29.005	93.333	286.87	268.22	677.43
	1.09	3.49	10.74	10.04	25.35
	24.52	20.32	28.89	24.35	
Age 45-55	36.536	94.533	322.21	299.98	753.26
	1.37	3.54	12.06	11.23	28.19
	30.89	20.58	32.45	27.24	
Total	118.268	459.338	993.058	1101.34	2672
	4.43	17.19	37.17	41.22	100.00

Table of PPETHM by group4

PPETHM(Race / Ethnicity) group4

Frequency / Percent / Col Pct

PPETHM(Race / Ethnicity)	Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
White, Non-Hispanic	70.285 2.63 59.43	191.94 7.18 41.79	708.62 26.52 71.36	785 29.38 71.28	1755.8 65.71
Black, Non-Hispanic	12.787 0.48 10.81	130.91 4.90 28.50	56.861 2.13 5.73	68.12 2.55 6.19	268.68 10.06
Other, Non-Hispanic	12.426 0.47 10.51	5.4168 0.20 1.18	49.409 1.85 4.98	45.288 1.69 4.11	112.54 4.21
Hispanic	13.896 0.52 11.75	104.37 3.91 22.72	154.08 5.77 15.52	161.75 6.05 14.69	434.1 16.25
2+ Race, Non-Hispanic	8.8747 0.33 7.50	26.707 1.00 5.81	24.083 0.90 2.43	41.17 1.54 3.74	100.83 3.77
Total	118.268 4.43	459.338 17.19	993.058 37.17	1101.34 41.22	2672 100.00

Table of PPREG4 by group4

PPREG4(Region 4 - Based on State of Residence) group4

Frequency / Percent / Col Pct

PPREG4	Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
Northeast	27.81 1.04 23.51	89.209 3.34 19.42	174.71 6.54 17.59	183.99 6.89 16.71	475.72 17.80
Midwest	29.544 1.11 24.98	65.727 2.46 14.31	245.83 9.20 24.75	245.67 9.19 22.31	586.77 21.96
South	35.09 1.31 29.67	210.93 7.89 45.92	343.69 12.86 34.61	402.08 15.05 36.51	991.79 37.12
West	25.824 0.97 21.84	93.469 3.50 20.35	228.83 8.56 23.04	269.6 10.09 24.48	617.72 23.12
Total	118.268 4.43	459.338 17.19	993.058 37.17	1101.34 41.22	2672 100.00

Table of PPMSACAT by group4

PPMSACAT(MSA Status) group4

Frequency / Percent / Col Pct	Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
Non-Metro	9.3201	74.766	171.32	197.19	452.6
	0.35	2.80	6.41	7.38	16.94
	7.88	16.28	17.25	17.90	
Metro	108.95	384.57	821.74	904.14	2219.4
	4.08	14.39	30.75	33.84	83.06
	92.12	83.72	82.75	82.10	
Total	118.268	459.338	993.058	1101.34	2672
	4.43	17.19	37.17	41.22	100.00

ppeducat3 group4

Frequency / Percent / Col Pct	Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
LHS/HS	33.43	216.59	372.24	370.96	993.22
	1.25	8.11	13.93	13.88	37.17
	28.27	47.15	37.48	33.68	
Some College	58.625	169.57	266.67	337.19	832.05
	2.19	6.35	9.98	12.62	31.14
	49.57	36.92	26.85	30.62	
Bachelor or Higher	26.213	73.175	354.15	393.19	846.73
	0.98	2.74	13.25	14.72	31.69
	22.16	15.93	35.66	35.70	
Total	118.268	459.338	993.058	1101.34	2672
	4.43	17.19	37.17	41.22	100.00

Table of PPNET by group4

PPNET(HH Internet Access) group4

Frequency / Percent / Col Pct	Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
No	8.9417	101.47	20.086	49.399	179.89
	0.33	3.80	0.75	1.85	6.73
	7.56	22.09	2.02	4.49	
Yes	109.33	357.87	972.97	1051.9	2492.1
	4.09	13.39	36.41	39.37	93.27
	92.44	77.91	97.98	95.51	
Total	118.268	459.338	993.058	1101.34	2672
	4.43	17.19	37.17	41.22	100.00

Table of PPMARIT by group4

PPMARIT(Marital Status) group4

Frequency / Percent / Col Pct	Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
1	0 0.00 0.00	0 0.00 0.00	993.06 37.17 100.00	1101.3 41.22 100.00	2094.4 78.38
2	2.1847 0.08 1.85	20.274 0.76 4.41	0 0.00 0.00	0 0.00 0.00	22.458 0.84
3	54.073 2.02 45.72	145.33 5.44 31.64	0 0.00 0.00	0 0.00 0.00	199.4 7.46
4	17.895 0.67 15.13	53.597 2.01 11.67	0 0.00 0.00	0 0.00 0.00	71.492 2.68
5	26.029 0.97 22.01	142.58 5.34 31.04	0 0.00 0.00	0 0.00 0.00	168.61 6.31
6	18.086 0.68 15.29	97.559 3.65 21.24	0 0.00 0.00	0 0.00 0.00	115.65 4.33
Total	118.268 4.43	459.338 17.19	993.058 37.17	1101.34 41.22	2672 100.00

Table of GROUP by group4

GROUP(Data source) group4

Frequency / Percent / Col Pct	Single Male Parent	Single Female Parent	Married Male Parent	Married Female Parent	Total
1	118.27 4.43 100.00	459.34 17.19 100.00	0 0.00 0.00	0 0.00 0.00	577.61 21.62
2	0 0.00 0.00	0 0.00 0.00	649.18 24.30 65.37	908.28 33.99 82.47	1557.5 58.29
3	0 0.00 0.00	0 0.00 0.00	343.88 12.87 34.63	193.05 7.23 17.53	536.93 20.09
Total	118.268 4.43	459.338 17.19	993.058 37.17	1101.34 41.22	2672 100.00

Heart Disease - Parent 1 Respondents - Within Married/Single
Trimmed and Scaled: Weighted by weight2

Table of PPGENDER by single

PPGENDER(Gender) single

Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
Male	1029.4 38.52 47.42	102.58 3.84 20.48	1132 42.36
Female	1141.6 42.73 52.58	398.42 14.91 79.52	1540 57.64
Total	2171 81.25	501 18.75	2672 100.00

Table of age4 by single

age4 single

Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
Age 18-34	486.9 18.22 22.43	174.37 6.53 34.80	661.27 24.75
Age 35-39	463.76 17.36 21.36	106.83 4.00 21.32	570.6 21.35
Age 40-44	575.39 21.53 26.50	106.11 3.97 21.18	681.51 25.51
Age 45-55	644.95 24.14 29.71	113.69 4.25 22.69	758.63 28.39
Total	2171 81.25	501 18.75	2672 100.00

Table of PPETHM by single

PPETHM(Race / Ethnicity) single

Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
White, Non-Hispanic	1548.3 57.94 71.32	227.44 8.51 45.40	1775.7 66.46
Black, Non-Hispanic	129.55 4.85 5.97	124.64 4.66 24.88	254.19 9.51
Other, Non-Hispanic	98.161 3.67 4.52	15.476 0.58 3.09	113.64 4.25
Hispanic	327.39 12.25 15.08	102.58 3.84 20.47	429.97 16.09
2+ Race, Non-Hispanic	67.64 2.53 3.12	30.862 1.16 6.16	98.502 3.69
Total	2171 81.25	501 18.75	2672 100.00

Table of PPREG4 by single

PPREG4(Region 4 - Based on State of Residence)
single

Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
Northeast	371.82 13.92 17.13	101.5 3.80 20.26	473.32 17.71
Midwest	509.47 19.07 23.47	82.636 3.09 16.49	592.11 22.16
South	773.05 28.93 35.61	213.39 7.99 42.59	986.44 36.92
West	516.66 19.34 23.80	103.47 3.87 20.65	620.13 23.21
Total	2171 81.25	501 18.75	2672 100.00

Table of PPMSACAT by single

PPMSACAT(MSA Status) by single

Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
Non-Metro	382	72.934	454.93
	14.30	2.73	17.03
	17.60	14.56	
Metro	1789	428.07	2217.1
	66.95	16.02	82.97
	82.40	85.44	
Total	2171	501	2672
	81.25	18.75	100.00

Table of ppeducat3 by single

ppeducat3 by single

Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
LHS/HS	770.38	216.86	987.24
	28.83	8.12	36.95
	35.48	43.29	
Some College	625.94	197.93	823.87
	23.43	7.41	30.83
	28.83	39.51	
Bachelor or Higher	774.68	86.207	860.89
	28.99	3.23	32.22
	35.68	17.21	
Total	2171	501	2672
	81.25	18.75	100.00

Table of PPNET by single

PPNET(HH Internet Access) by single

Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
No	72.027	95.764	167.79
	2.70	3.58	6.28
	3.32	19.11	
Yes	2099	405.24	2504.2
	78.55	15.17	93.72
	96.68	80.89	
Total	2171	501	2672
	81.25	18.75	100.00

Table of PPMARIT by single

PPMARIT(Marital Status) by single

Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
1	2171 81.25 100.00	0 0.00 0.00	2171 81.25
2	0 0.00 0.00	19.48 0.73 3.89	19.48 0.73
3	0 0.00 0.00	172.95 6.47 34.52	172.95 6.47
4	0 0.00 0.00	62.011 2.32 12.38	62.011 2.32
5	0 0.00 0.00	146.25 5.47 29.19	146.25 5.47
6	0 0.00 0.00	100.31 3.75 20.02	100.31 3.75
Total	2171 81.25	501 18.75	2672 100.00

Table of GROUP by single

GROUP(Data source) by single

Frequency / Percent / Col Pct	Married Parent	Single Parent	Total
1	0 0.00 0.00	501 18.75 100.00	501 18.75
2	1614.4 60.42 74.36	0 0.00 0.00	1614.4 60.42
3	556.57 20.83 25.64	0 0.00 0.00	556.57 20.83
Total	2171 81.25	501 18.75	2672 100.00

NOTE: Internet Access is not included in weighting

Age 18-55 Married Parents Benchmarks
Source: KnowledgePanel (Active Members)

Table of PPGENDER by PPGENDER

PPGENDER(Gender) / PPGENDER(Gender) — Frequency, Percent, Col Pct	Male	Female	Total
Male	1.636E7	0	1.636E7
	48.57	0.00	48.57
	100.00	0.00	
Female	0	1.733E7	1.733E7
	0.00	51.43	51.43
	0.00	100.00	
Total	1.636E7	1.733E7	3.369E7
	48.57	51.43	100.00

Table of age4 by PPGENDER

age4 / PPGENDER(Gender) — Frequency, Percent, Col Pct	Male	Female	Total
Age 18-34	3425085	4530396	7955480
	10.17	13.45	23.61
	20.93	26.14	
Age 35-39	3219983	3926925	7146908
	9.56	11.65	21.21
	19.68	22.66	
Age 40-44	4625063	4194484	8819548
	13.73	12.45	26.18
	28.26	24.20	
Age 45-55	5094315	4677779	9772094
	15.12	13.88	29.00
	31.13	26.99	
Total	1.636E7	1.733E7	3.369E7
	48.57	51.43	100.00

Table of ppethm3 by PPGENDER

ppethm3 (Frequency / Percent / Col Pct)	PPGENDER(Gender): Male	Female	Total
White, Non-Hispanic	1.124E7 33.35 68.66	1.224E7 36.33 70.64	2.348E7 69.68
Black or Hispanic	3982258 11.82 24.33	3722615 11.05 21.48	7704873 22.87
Other or 2+ Races, Non-Hispanic	1146177 3.40 7.00	1365082 4.05 7.88	2511259 7.45
Total	1.636E7 48.57	1.733E7 51.43	3.369E7 100.00

Table of PPREG4 by PPGENDER

PPREG4(Region 4 - based on State of residence)

PPREG4 (Frequency / Percent / Col Pct)	PPGENDER(Gender): Male	Female	Total
Northeast	2821840 8.37 17.24	2869482 8.52 16.56	5691322 16.89
Midwest	3830882 11.37 23.41	3830764 11.37 22.11	7661647 22.74
South	5886255 17.47 35.97	6425076 19.07 37.08	1.231E7 36.54
West	3825468 11.35 23.38	4204262 12.48 24.26	8029730 23.83
Total	1.636E7 48.57	1.733E7 51.43	3.369E7 100.00

Table of PPMSACAT by PPGENDER

PPMSACAT — PPGENDER(Gender)

Frequency / Percent / Col Pct	Male	Female	Total
Non-Metro	3111795 9.24 19.02	3090007 9.17 17.83	6201802 18.41
Metro	1.325E7 39.33 80.98	1.424E7 42.26 82.17	2.749E7 81.59
Total	1.636E7 48.57	1.733E7 51.43	3.369E7 100.00

Table of ppeducat3 by PPGENDER

ppeducat3 — PPGENDER(Gender)

Frequency / Percent / Col Pct	Male	Female	Total
LHS/HS	6691591 19.86 40.89	5939648 17.63 34.27	1.263E7 37.49
Some College	4157189 12.34 25.40	5258497 15.61 30.34	9415686 27.94
Bachelor or Higher	5515665 16.37 33.71	6131439 18.20 35.38	1.165E7 34.57
Total	1.636E7 48.57	1.733E7 51.43	3.369E7 100.00

Table of PPNET by PPGENDER

PPNET — PPGENDER(Gender)

Frequency / Percent / Col Pct	Male	Female	Total
No	1745905 5.18 10.67	2635249 7.82 15.21	4381154 13.00
Yes	1.462E7 43.39 89.33	1.469E7 43.61 84.79	2.931E7 87.00
Total	1.636E7 48.57	1.733E7 51.43	3.369E7 100.00

Table of PPMARIT by PPGENDER

PPMARIT(Are you now married, widowed, divorced,)

PPMARIT	PPGENDER(Gender)		
Frequency / Percent / Col Pct	Male	Female	Total
1	1.636E7 / 48.57 / 100.00	1.733E7 / 51.43 / 100.00	3.369E7 / 100.00
Total	1.636E7 / 48.57	1.733E7 / 51.43	3.369E7 / 100.00

Table of parent_hh by PPGENDER

parent_hh	PPGENDER(Gender)		
Frequency / Percent / Col Pct	Male	Female	Total
1	5090465 / 15.11 / 31.11	9235719 / 27.41 / 53.29	1.433E7 / 42.52
2	1.094E7 / 32.46 / 66.84	7951276 / 23.60 / 45.88	1.889E7 / 56.06
3	320847 / 0.95 / 1.96	137730 / 0.41 / 0.79	458577 / 1.36
4	15050 / 0.04 / 0.09	4858.8 / 0.01 / 0.03	19909 / 0.06
Total	1.636E7 / 48.57	1.733E7 / 51.43	3.369E7 / 100.00

Is R a parent or legal guardian?

PARENT	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	33694030	100.00	33694030	100.00

kids6to17	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	15647914	46.44	15647914	46.44
2	12654832	37.56	28302745	84.00
3	3832434	11.37	32135179	95.37
4	1250724	3.71	33385903	99.09
5	214783.4	0.64	33600687	99.72
6	71795.7	0.21	33672482	99.94
7	13286.51	0.04	33685769	99.98
8	8260.592	0.02	33694030	100.00

Heart Disease - Parent 1 Matched Married Respondents
Trimmed and Scaled: Weighted by weight3

Table of PPGENDER by PPGENDER

PPGENDER(Gender) by PPGENDER(Gender)

Frequency / Percent / Col Pct	Male	Female	Total
Male	237.71	0	237.71
	49.22	0.00	49.22
	100.00	0.00	
Female	0	245.29	245.29
	0.00	50.78	50.78
	0.00	100.00	
Total	237.715	245.285	483
	49.22	50.78	100.00

Table of age4 by PPGENDER

age4 by PPGENDER(Gender)

Frequency / Percent / Col Pct	Male	Female	Total
Age 18-34	46.521	62.072	108.59
	9.63	12.85	22.48
	19.57	25.31	
Age 35-39	47.583	58.023	105.61
	9.85	12.01	21.86
	20.02	23.66	
Age 40-44	68.339	56.072	124.41
	14.15	11.61	25.76
	28.75	22.86	
Age 45-55	75.273	69.118	144.39
	15.58	14.31	29.89
	31.67	28.18	
Total	237.715	245.285	483
	49.22	50.78	100.00

Table of ppethm3 by PPGENDER

ppethm3 PPGENDER(Gender)

Frequency / Percent / Col Pct	Male	Female	Total
White, Non-Hispanic	166.03 / 34.37 / 69.84	180.91 / 37.45 / 73.75	346.93 / 71.83
Black or Hispanic	54.753 / 11.34 / 23.03	44.21 / 9.15 / 18.02	98.963 / 20.49
Other or 2+ Races, Non-Hispanic	16.936 / 3.51 / 7.12	20.17 / 4.18 / 8.22	37.106 / 7.68
Total	237.715 / 49.22	245.285 / 50.78	483 / 100.00

Table of PPREG4 by PPGENDER

PPREG4(Region 4 - Based on State of Residence) PPGENDER(Gender)

Frequency / Percent / Col Pct	Male	Female	Total
Northeast	39.166 / 8.11 / 16.48	42.399 / 8.78 / 17.29	81.565 / 16.89
Midwest	56.604 / 11.72 / 23.81	56.624 / 11.72 / 23.08	113.23 / 23.44
South	85.42 / 17.69 / 35.93	84.141 / 17.42 / 34.30	169.56 / 35.11
West	56.524 / 11.70 / 23.78	62.121 / 12.86 / 25.33	118.65 / 24.56
Total	237.715 / 49.22	245.285 / 50.78	483 / 100.00

Table of PPMSACAT by PPGENDER

PPMSACAT(MSA Status) by PPGENDER(Gender)

Frequency / Percent / Col Pct	Male	Female	Total
Non-Metro	44.42 9.20 18.69	45.657 9.45 18.61	90.078 18.65
Metro	193.29 40.02 81.31	199.63 41.33 81.39	392.92 81.35
Total	237.715 49.22	245.285 50.78	483 100.00

Table of ppeducat3 by PPGENDER

ppeducat3 by PPGENDER(Gender)

Frequency / Percent / Col Pct	Male	Female	Total
LHS/HS	94.786 19.62 39.87	76.968 15.94 31.38	171.75 35.56
Some College	61.431 12.72 25.84	77.698 16.09 31.68	139.13 28.81
Bachelor or Higher	81.498 16.87 34.28	90.618 18.76 36.94	172.12 35.63
Total	237.715 49.22	245.285 50.78	483 100.00

Table of PPNET by PPGENDER

PPNET(HH Internet Access) by PPGENDER(Gender)

Frequency / Percent / Col Pct	Male	Female	Total
No	2.1991 0.46 0.93	0 0.00 0.00	2.1991 0.46
Yes	235.52 48.76 99.07	245.29 50.78 100.00	480.8 99.54
Total	237.715 49.22	245.285 50.78	483 100.00

Table of PPMARIT by PPGENDER

PPMARIT(Marital Status) by PPGENDER(Gender)

Frequency / Percent / Col Pct	Male	Female	Total
1	237.71 49.22 100.00	245.29 50.78 100.00	483 100.00
Total	237.715 49.22	245.285 50.78	483 100.00

Table of GROUP by PPGENDER

GROUP(Data source) by PPGENDER(Gender)

Frequency / Percent / Col Pct	Male	Female	Total
3	237.71 49.22 100.00	245.29 50.78 100.00	483 100.00
Total	237.715 49.22	245.285 50.78	483 100.00

Heart Disease - Parent 2 Matched Married Respondents
Trimmed and Scaled: Weighted by weight3

The FREQ Procedure

Table of PPGENDER by PPGENDER

PPGENDER(Gender) / PPGENDER(Gender) Frequency Percent Col Pct	Male	Female	Total
Male	236.7 49.01 100.00	0 0.00 0.00	236.7 49.01
Female	0 0.00 0.00	246.3 50.99 100.00	246.3 50.99
Total	236.702 49.01	246.298 50.99	483 100.00

Table of age4 by PPGENDER

age4 / PPGENDER(Gender) Frequency Percent Col Pct	Male	Female	Total
Age 18-34	44.435 9.20 18.77	60.725 12.57 24.66	105.16 21.77
Age 35-39	47.845 9.91 20.21	57.217 11.85 23.23	105.06 21.75
Age 40-44	68.723 14.23 29.03	60.706 12.57 24.65	129.43 26.80
Age 45-55	75.699 15.67 31.98	67.649 14.01 27.47	143.35 29.68
Total	236.702 49.01	246.298 50.99	483 100.00

Table of ppethm3 by PPGENDER

ppethm3 — PPGENDER(Gender)

Frequency / Percent / Col Pct	Male	Female	Total
White, Non-Hispanic	166.96 34.57 70.53	178.42 36.94 72.44	345.38 71.51
Black or Hispanic	52.714 10.91 22.27	47.59 9.85 19.32	100.3 20.77
Other or 2+ Races, Non-Hispanic	17.031 3.53 7.20	20.284 4.20 8.24	37.314 7.73
Total	236.702 49.01	246.298 50.99	483 100.00

Table of PPREG4 by PPGENDER

PPREG4(Region 4 - Based on State of Residence)
PPGENDER(Gender)

Frequency / Percent / Col Pct	Male	Female	Total
Northeast	41.929 8.68 17.71	34.364 7.11 13.95	76.293 15.80
Midwest	56.923 11.79 24.05	57.001 11.80 23.14	113.92 23.59
South	81.008 16.77 34.22	93.575 19.37 37.99	174.58 36.15
West	56.842 11.77 24.01	61.358 12.70 24.91	118.2 24.47
Total	236.702 49.01	246.298 50.99	483 100.00

Table of PPMSACAT by PPGENDER

PPMSACAT(MSA Status) by PPGENDER(Gender)

Frequency / Percent / Col Pct	Male	Female	Total
Non-Metro	43.511 9.01 18.38	39.402 8.16 16.00	82.913 17.17
Metro	193.19 40.00 81.62	206.9 42.84 84.00	400.09 82.83
Total	236.702 49.01	246.298 50.99	483 100.00

Table of ppeducat3 by PPGENDER

ppeducat3 by PPGENDER(Gender)

Frequency / Percent / Col Pct	Male	Female	Total
LHS/HS	92.971 19.25 39.28	76.956 15.93 31.25	169.93 35.18
Some College	61.774 12.79 26.10	78.135 16.18 31.72	139.91 28.97
Bachelor or Higher	81.956 16.97 34.62	91.206 18.88 37.03	173.16 35.85
Total	236.702 49.01	246.298 50.99	483 100.00

Table of PPNET by PPGENDER

PPNET(HH Internet Access) by PPGENDER(Gender)

PPNET	Statistic	Male	Female	Total
No	Frequency	0	2.5809	2.5809
	Percent	0.00	0.53	0.53
	Col Pct	0.00	1.05	
Yes	Frequency	236.7	243.72	480.42
	Percent	49.01	50.46	99.47
	Col Pct	100.00	98.95	
Total	Frequency	236.702	246.298	483
	Percent	49.01	50.99	100.00

Table of PPMARIT by PPGENDER

PPMARIT(Marital Status) by PPGENDER(Gender)

PPMARIT	Statistic	Male	Female	Total
1	Frequency	236.7	246.3	483
	Percent	49.01	50.99	100.00
	Col Pct	100.00	100.00	
Total	Frequency	236.702	246.298	483
	Percent	49.01	50.99	100.00

Table of GROUP by PPGENDER

GROUP(Data source) by PPGENDER(Gender)

GROUP	Statistic	Male	Female	Total
3	Frequency	236.7	246.3	483
	Percent	49.01	50.99	100.00
	Col Pct	100.00	100.00	
Total	Frequency	236.702	246.298	483
	Percent	49.01	50.99	100.00

Appendix C: Text Version of Questionnaire

CONSENT **[DISPLAY]**

EXPLANATION OF RESEARCH

Title of Project: Family Heart Disease Risk and Prevention Survey.
Principal Investigator: Mark Dickie
Other Investigators: Shelby Gerking

You are being invited to participate in a research study. Whether you take part is up to you.

- The purpose of this research is to provide policy-makers with better information about what people believe about their own and their children's risks of getting heart disease later in life.
- You are invited to participate in a survey about heart disease prevention. If you agree to participate, you will be asked questions regarding your beliefs about risks of life-threatening illnesses, especially heart disease. If you participate you will also be asked about the value to you of heart disease prevention. The survey includes questions about you and about a child living with you.
- Your knowledge and opinions are important for this study. There is no right or wrong answer to the survey questions. If you participate, please just answer the questions as thoughtfully as you can.
- The survey takes about 25 minutes on average. Please take the survey only when you can give it your full attention and complete it in one sitting.

You must be 18 years of age or older to take part in this research.

Study Contact for questions about the study or to report a problem: If you have questions, concerns, or complaints: Dr. Mark Dickie, Department of Economics, University of Central Florida, Box 161400, Orlando, FL 32816-1400; 407-823-4730; mdickie@bus.ucf.edu. You may also contact Knowledge Networks at 800-782-6899.

IRB contact about your rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research and Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at 407-823-2901.

[DISPLAY]

The questions in the survey require more thoughtful consideration from you than some other surveys. Therefore, please complete the survey at a time when you can give it your full attention and when you can complete it in one sitting. We thank you in advance for your time and your careful attention to this survey.

[SP; TERMINATE IF SKIPPED]
I agree to give the survey my full attention and to complete it in one sitting.

[DISPLAY]
To get started we need to find out a little bit about you and the people living with you.

[RADIO]
[PROMPT IF SKIP]
Q0**.** Are you now married and living with your spouse?
Yes → Q0A
No → Q0bi
[RADIO]
[IF Q0=YES]
Q0a**.** How long have you been married to your current spouse?
Less than 1 year
1 to 5 years
6 to 10 years
11 to 15 years
16 to 20 years
More than 20 years

[RADIO]
[IF Q0=YES]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
Q0b. Have you ever been married to anyone other than your current spouse?
Yes → Q0d
No → Q1

[RADIO]
[IF Q0=NO]
[PROMPT IF SKIP]
Q0bi. Do you now live with a partner?
Yes → Q0bii
No → Q0c

[RADIO]
[IF Q0BI=YES]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]

Q0bii**.** How long have you been living with your current partner?
Less than 1 year
1 to 5 years
6 to 10 years

11 to 15 years
16 to 20 years
More than 20 years
[CONTINUE WITH Q0C]

[RADIO]
[IF Q0=NO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]

Q0c. Have you ever been married?
Yes → Q0d
No → Q1

[RADIO]
[IF Q0B=YES OR Q0C=YES]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]

Q0d. How many times have you been married, in all?
Once
Twice
Three times
Four or more times

[RADIO]
[IF Q0B=YES OR Q0C=YES]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]

[DISPLAY IF TERMINATE BASED ON ANY OF Q1 - Q5]
[DISABLE BACK BUTTON]
Unfortunately, you do not qualify for this survey. Thank you for your time.

[RADIO]
[PROMPT IF SKIP]
Q1. How many children now live with you in your household?
Answer options are 0,1,2,…10 or more
[IF Q1=0, GOTO TERMINATE SHOW]
[IF Q1=1 GOTO Q2]
[IF Q1>1, GOTO Q3]

[RADIO]
[IF Q1=1]
[PROMPT IF SKIP]

Q2. Is this child your biological child (your own "natural" child, NOT an adopted, step, or foster child)?
Yes
No
[IF Q2=NO, GOTO TERMINATE SHOW]
[IF Q2=YES, GOTO Q4]

[RADIO]
[IF Q1>1]
[PROMPT IF SKIP]
Q3. Of the [answer from Q1] children that live with you now, how many are your biological children (your own "natural" children, NOT counting adopted, step, or foster children)?
Answer options are 0,1,2,…10 or more
[IF Q3=0, GOTO TERMINATE SHOW]
[IF Q3=1, GOTO Q4]
[IF Q3>1, GOTO Q5]

[RADIO]
[PROMPT IF SKIP]
Q4. Is this child at least 6 years old, but younger than 17 years old?
Yes
No
[IF Q4=YES and (Q0=YES or Q0bi=YES), GO TO Q5A]
[IF Q4=YES and Q0=NO and Q0bi=NO, GO TO Q6]
[IF Q4=NO GoTo Terminate show]

[RADIO]
[IF Q3>1]
[PROMPT IF SKIP]
Q5. How many of these [answer from Q3] children are at least 6 years old, but younger than 17 years old?
Answer options are 0,1,2,…10 or more

[IF Q5=0, GOTO TERMINATE SHOW]
[IF Q5=1, AND (Q0=YES OR QOBI=YES), GOTO Q5A]
[IF Q5=1 AND Q0=NO AND Q0BI=NO, GO TO Q6]
[IF Q5>1, AND (Q0=YES OR Q0BI=YES), GOTO Q5B]
[IF Q5>1, AND Q0=NO AND Q0BI=NO, GOTO SELECTION OF SAMPLE CHILD BY BIRTHDAY ALT. 1]

[RADIO]
[IF (Q0=YES OR Q0BI=YES) AND EITHER Q4=1 OR Q5=1]
[PROMPT IF SKIP]
Q5A. Is this child also the biological child of the spouse(if q0=yes) / partner (if q0bi=yes) you currently live with?
Yes
No
[IF Q5A=YES, DOUBLE UP* AND GO TO DISPLAY BEFORE Q6]
[IF NO, GOTO Q6]

[*DOUBLE UP = IF THE SPOUSE OR PARTNER IS A PANELIST, HE/SHE GETS THE SAME SURVEY VERSION AS IS ASSIGNED TO THE RESPONDENT – SAME SETTINGS OF ATTRIBUTES IN CONJOINT.]

[DISPLAY IF Q5A=YES]
Your spouse **(IF Q0=YES) /** partner **(IF Q0BI=YES)** may also have the opportunity to take this survey. Although you might feel like discussing parts of the survey with your spouse **(IF Q0=YES) /** partner **(IF Q0BI=YES)** , please wait until after he or she has taken it before you talk about it. Thank you.

[RADIO]
[IF (Q0=YES OR Q0BI=YES) AND Q5>1]
[PROMPT IF SKIP]
[# OF OPTIONS = ANSWER TO Q5]
Q5B. Based on the answers you provided, you have [answer from Q5] biological children between the ages of 6 and 17 years who live with you. How many of these **[answer from Q5]** children are also the biological children of the spouse (if q0=yes) / partner (if q0bi=yes)you currently live with?
Answer options are 0,1,2,…10 or more
[IF Q5B=0, GOTO SELECTION OF SAMPLE CHILD BY BIRTHDAY ALT. 1]
[IF Q5B>0, DOUBLE UP]
[IF Q5B=1, GOTO Q6]
[IF Q5B>1, GOTO SELECTION OF SAMPLE CHILD BY BIRTHDAY ALT. 2]

[SELECTION OF SAMPLE CHILD BY BIRTHDAY ALT. 1]
[DISPLAY]
[IF Q5>1 AND (Q0=NO AND Q0BI=NO), OR IF Q5B=0]
Q5C. Based on the answers you provided, you have [answer from Q5] biological children between the ages of 6 and 17 years who live with you.

In the rest of this survey, we would like to ask questions about you and about <u>one</u> of these children – the child <u>whose birthday is coming up next</u>. When you are asked questions about your child, please only think of this child.

If two or more children happen to have the same birthday, please think of the [50%: youngest/ 50%: oldest] of them.
[GOTO Q6]
[SELECTION OF SAMPLE CHILD BY BIRTHDAY ALT. 2]
[DISPLAY]
[IF Q5B>1]
Q5D. Based on the answers you provided, you have [answer from Q5B] biological children between the ages of 6 and 17 years who live with you and who are also the biological children of the spouse (if q0=yes) / partner (if q0bi=yes)you currently live with.

In the rest of this survey, we would like to ask questions about you and about <u>one</u> of these children – the child <u>whose birthday is coming up next</u>. When you are asked questions about your child, please only think of this child.

If two or more children happen to have the same birthday, please think of the [50%: youngest/ 50%: oldest] of them.
[GOTO Q6]

[RADIO]
[PROMPT IF SKIP]

[Q6 ANSWER USED LATER IN SURVEY]
Q6. How old is this child?
6 years old
7 years old
8 years old
9 years old
10 years old
11 years old
12 years old
13 years old
14 years old
15 years old
16 years old

[DISPLAY]
In the remainder of this survey, we'll ask questions about you and about this child – your biological child aged **[answer from Q6]** years old who lives with you.

We ask you that you take your time in answering these survey questions and read carefully all the information given to you.

[GOTO Q7]

[PROMPT IF SKIP]
[RADIO]
[USE ANSWER TO Q7 FOR HE/SHE, HIS/HER DURING REST OF SURVEY.]
Q7. Is this child a boy or a girl?
Boy
Girl

[DISPLAY]
And now for a few questions about you….

[RADIO]
[PROMPT IF SKIP]
[ANSWER TO Q8B USED LATER IN SURVEY]
Q8b. What is your age?
Answer options are by individual year, from 18-55 inclusive.
[PROMPT IF SKIP]
[RADIO]
Q9. Are you a man or a woman?
Man
Woman

[Two additional questions to verify screener.]
[MP.]
[PROMPT IF SKIP]
[IF ANY ANSWER EXCEPT NONE, GO TO TERMINATE SHOW]

Q10. Has a doctor or other health care professional ever told you that you had any of the following conditions? Please check all that apply.

Coronary artery disease (this is sometimes called coronary heart disease)
Chest pain because of coronary artery disease (sometimes called angina)
Heart attack (a doctor might call this a myocardial infarction)
None of these conditions **[SP]**

[radio]
[PROMPT IF SKIP]
[IF q11 = YES, TERMINATE SHOW]
Q11. Have you ever had surgery to correct any condition caused by coronary artery disease? For instance, have you ever had a stent inserted in an artery, or have you had coronary bypass surgery?

1. Yes
2. No

[SAME RESPONSE FORMAT AS Q10, BUT Q12 NOT USED AS SCREENER.]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]

Q12. Now please think about your child's biological **<mother if Q9 = Man / father if Q9 = woman>. Has a doctor or health professional ever said that <he/she = opposite gender of respondent given in Q9>**
had any of the following conditions? Please check all that apply.

Coronary artery disease (this is sometimes called coronary heart disease)
Chest pain because of coronary artery disease (sometimes called angina)
Heart attack (a doctor might call this a myocardial infarction)
None of these conditions **[SP]**

[DISPLAY FOR "PROMPT IF SKIP"]:
You do not have to answer any question you do not wish to answer. But, we will not be able to proceed through the rest of the survey without your answer to this question.
[DISPLAY THE SKIPPED QUESTION BELOW THAT TEXT. IF RESPONDENT SKIPS AGAIN, THEN TERMINATE AND DISPLAY:]
Thank you for your time.

[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
SD1. What is the highest level of schooling that you have completed?
Less than high school
High school graduate
GED or equivalent
Some college (including 2-year degree)
Graduate of 4-year college or university

Graduate or professional degree

[IF SKIP, PROMPT WITH “YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN.”]
SD2. Are you currently
Employed → SD2a
Not employed → SD4

[IF SD2=EMPLOYED]
[IF SKIP, PROMPT WITH “YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN.”]
SD3. How much total income do you earn <u>from your employment</u> annually?
$0
More than $0 to less than $5,000
$5,000 to less than $10,000
$10,000 to less than $20,000
$20,000 to less than $30,000
$30,000 to less than $40,000
$40,000 to less than $50,000
$50,000 to less than $60,000
$60,000 to less than $70,000
$70,000 to less than $80,000
$80,000 to less than $90,000
$90,000 to less than $100,000
$100,000 to less than $125,000
$125,000 to less than $150,000
$150,000 to less than $175,000
$175,000 to less than $200,000
$200,000 or more

[Multiple response format except last answer option]
[IF SKIP, PROMPT WITH “YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN.”]
SD4. Apart from earnings from employment, have you personally received any income from any other source during the past 12 months? Please check all other sources of income, such as

Unemployment compensation
Child support
Alimony
Dividends
Interest
Social Security
Welfare
Gifts

Any other income besides earnings from employment.

No other sources of income except earnings from employment

[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]

[validity check make sure "answer to SD6 >= answer to SD3"]
[If SD6<SD3, display "Your household's total income should be at least as large as your personal income." Then re-ask SD6.]

SD6. Please indicate the total annual income from all sources for all adults in your household. Please include all sources or income, including earnings from employment and any other income. Your household's total annual income is

$0
More than $0 to less than $5,000.
$5,000 to less than $10,000
$10,000 to less than $20,000
$20,000 to less than $30,000
$30,000 to less than $40,000
$40,000 to less than $50,000
$50,000 to less than $60,000
$60,000 to less than $70,000
$70,000 to less than $80,000
$80,000 to less than $90,000
$90,000 to less than $100,000
$100,000 to less than $125,000
$125,000 to less than $150,000
$150,000 to less than $175,000
$175,000 to less than $200,000
$200,000 or more

[radio]
[PROMPT IF SKIP]

W11. We would like to know how you feel about getting money now compared to getting money later. Please imagine that you have won a $100 prize. Suppose you were given the following options: You could either receive the $100 prize one month from now, or receive $LATER thirteen months from now. Which option would you choose? *Please select one response only.*

$100 one month from now
$LATER thirteen months from now

COMPUTE $LATER = K * $100, WHERE K IS RANDOMIZED OVER 1.05, 1.10, 1.20, 1.40, 1.80.

[DISPLAY]

Let's now move to the main part of the survey which asks about risks to your health and to the health of your child. To help you pin down your answers, we want you to use a scale like the one you'll see after you click "Next".

[Display the following text above grid.. Below grid, text reads: Risk level __ %.] [Please delete the "Grid is 10x10" that occurs above all the scales.)

Here's the scale. In a moment you will have the chance to use it, but first, notice that it has numbered squares beginning with 1 at the top left through 100 at the bottom right. When you are ready to move on, click the "Next" button below the scale.

> **{NOTES TO KN RE THE GRIDS: THE 100 SQUARES IN THE GRID SHOULD BE NUMBERED, BEGINNING WITH 1 IN THE UPPER LEFT HAND CORNER, TO 10 IN THE BOTTOM LEFT CORNER, 11 IN THE TOP OF THE SECOND COLUMN, AND SO ON DOWN AND ACROSS UNTIL 100 APPEARS IN THE SQUARE AT THE BOTTOM RIGHT HAND CORNER.**
>
> **THE INITIALLY DISPLAYED GRID SHOULD HAVE ALL 100 SQUARES COLORED BLUE. LATER, RED SQUARES ARE USED TO SHOW LEVELS OF RISK. THE TEXT BELOW THE GRID SHOULD INDICATE THE RISK LEVEL IN %. SO IF 10 OF 100 SQUARES ARE COLORED RED, THE RISK LEVEL IS 10%, ETC. ANY RED SQUARES SHOULD BE GROUPED IN CONSECUTIVELY NUMBERED SQUARES BEGINNING AT 1. SO IF 15 SQUARES ARE RED, THE RED ONES ARE SQUARES 1-15, AND THE TEXT BELOW THE GIRD READS 15% RISK.**
>
> **IN SOME CASES THE GRIDS ARE USED ONLY FOR DISPLAY AND SHOULD NOT ALLOW THE RESPONDENT TO CHANGE THE RISK LEVEL REPRESENTED BY THE NUMBER OF RED SQUARES. IN OTHER CASES, THE GRID SHOULD BE INTERACTIVE, SO THAT THE RESPONDENT CAN INDICATE A RISK LEVEL BY CLICKING A SQUARE IN THE GRID. FOR EXAMPLE, IF THE RESPONDENT SELECTS THE 56TH SQUARE, THEN ALL SQUARES FROM 1-56 SHOULD CHANGE FROM BLUE TO RED, AND THE RISK LEVEL SHOULD READ 56%. IF THE RESPONDENT THEN CLICKS ON SQUARE NUMBER 67, THEN SQUARES 57-67 ALSO BECOME RED, AND THE RISK LEVEL SHOULD READ 67%. IF THE RESPONDENT THEN CLICKS SQUARE 35, SQUARES 36-67 CHANGE BACK TO BLUE, AND ONLY SQUARES 1-35 ARE RED, WITH 35% DISPLAYED BELOW THE GRID. THE RESPONDENT RECORDS HIS/HER FINAL ANSWER BY CLICKING THE "NEXT" BUTTON.**
>
> **FINALLY, FOR SOME OF THE GRIDS, A THIRD COLOR BESIDES RED AND BLUE WILL BE NEEDED.}**
>
> **PLEASE LIGHTEN SLIGHTLY THE SHADE OF BLUE USED IN THE GRIDS SO THAT THE BLACK NUMBERS SHOW UP A LITTLE MORE CLEARLY. THANK YOU.**

[New screen display:]

Red squares in the scale show the chance that something will happen to make your health worse. For example, to show a 50% chance of worse health, half of the squares would be colored red. Remember that there are 100 squares in the scale, so a 50% chance is shown with 50 red squares:

[Static grid with 50 red, risk level of 50% indicated below grid.]

[New screen:] More red squares means a greater chance that your health will become worse. This scale shows a 75% chance, with 75 of the 100 squares colored red. The 75% chance of worse health also is shown numerically below the scale.
[Static grid with 75 red, risk level of 75% indicated.]

[New screen:] If something was 100% certain to make your health worse, all 100 squares would be red, as shown on the scale below. For a 0% chance, none of the squares would be red (they would all be blue).
[Static grid with 100 red squares, risk level of 100% indicated below grid.]

[NEW SCREEN:] This scale shows a 25% chance that your health will become worse. You can see that 25 squares are colored red. Chances of worse health also are shown numerically below the scale. **[Static grid with 25 red, 25% risk level.]**

[Display]
Now it's time for you to practice using the scale for a made-up example for Mr. A (he's not a real person), and his risk of having a car accident. Let's suppose that Mr. A's chances of being in a serious car accident are 33% or 33 in 100. You can use the scale to show this amount of risk by clicking on the number 33.
A1. Please click on number 33 in the scale now.

[DISPLAY Interactive grid with all 100 squares blue, and 0% risk level indicated below. Respondent should be able to click squares in the grid to show a risk level.]

[IF A1 answer = 33 (respondent clicks "Next" with risk level equal to 33, GoTo A3.]
[If respondent selects "Next" with the risk level <u>not</u> equal to 33:]
A2. *Oops! You must have clicked the wrong square in the scale. Please select the square numbered 33 in the scale below.*
[Interactive grid]
[IF A2 answer = 33, GoTo A3.]
[IF A2 answer NE 33, that is, if respondent selects "Next" with the risk level <u>not</u> equal to 33 for a second time, terminate.]

A3. Ms. B's chances of getting in a serious car accident are 1% or 1 in 100. Please show her risk by marking the scale below.
[Interactive grid with all blue squares initially and 0% risk level]

[IF A3 answer = 1, GOTO A5.]
[IF A3 answer NE 1, GOTO A4.]
[If respondent selects "Next" with the risk level **<u>not</u>** equal to 1:]
A4. *Oops! You must have clicked the wrong square in the scale. Please select the square numbered 1 in the scale below.*
[Interactive grid]
[IF A4 answer = 1, GoTo A5.]
[IF A4 answer NE 1, that is, if respondent selects "Next" with the risk level <u>not</u> equal to 1 for a second time, terminate.]

[RADIO]
A5. Which of these two people has the greater chance of being in an accident?
1. Mr. A
2. Ms. B

[If A5 answer=1, Display:] That's terrific. You might have thought that was too easy, but you would be surprised how many people get this wrong because they don't pay attention.
[THEN GOTO DISPLAY AFTER A6]

[If A5 answer NE 1:]
Are you sure? Remember, Mr. A's chances of getting in a wreck are 33 in 100, and Ms. B's chances are 1 in 100.

Let's have another look at the scales for these two people.

Mr. A's risk.
<DISPLAY Static grid with 33 red>

Ms. B's risk.
<DISPLAY Static grid with 1 red>

[Next screen] Remember Mr. A? He had a 33% chance of getting in a wreck. Ms B's chance was 1%.

[RADIO]
[IF A5 NE 1]
A6. Which of these two people has the greater chance of being in an accident?
1. Mr. A
2. Ms. B
[IF A6 ANSWER = 1, CONTINUE WITH DISPLAY BELOW]
[If A6 answer=2 OR SKIP, terminate.]

[Display]
In the rest of the survey, you'll have the chance to use the risk scale to estimate risks for yourself and for your child. Let's use the scale for two diseases that you or your child might get in the future. Let's do lung cancer first. Later on we'll ask about heart disease.

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
S1. First, please think about a typical adult cigarette smoker. If you had to make an estimate, about how many packs of cigarettes do you think the average smoker smokes in a day?

1. Less than half a pack
2. About half a pack
3. About one pack
4. About one and half packs per day
5. About two packs per day
6. About two and half packs per day
7. About three packs per day
8. More than three packs per day
9. Don't know

S2. Think about a group of 100 average or typical smokers, who smoke cigarettes for all of their adult lives. How many smokers out of 100 do you think would get lung cancer?

Please mark your answer on the scale below. Remember, you can change your answer as often as you like until you click "Next."
[Interactive grid]
[Text below grid reads: [answer to S2] smokers out of 100 would get lung cancer.]

[display if the respondent does not select a square on S2:]
You did not indicate how many smokers out of 100 would get lung cancer.

S2a. Do you think that any smokers out of 100 would get lung cancer?
Yes → Send them back to S2.
No → Skip to S4

S3. Now please consider a group of 100 smokers who are diagnosed with lung cancer. Some smokers who get lung cancer live longer than five years, and others die within five years.

Out of 100 smokers who are diagnosed with lung cancer, how many do you think would die of lung cancer within five years of being diagnosed? Click the square that shows how many would die of lung cancer within five years of getting it.

[INTERACTIVE GRID WITH 100 BLUE SQUARES. WHEN RESPONDENT SELECTS A SQUARE, ALL THE SQUARES FROM 1 – THAT SQUARE RE-COLOR TO RED .
EXAMPLE: RESPONDENT ANSWERS S3 BY CLICKING SQUARE NUMBER 40. SQUARES 1-40 CHANGE TO RED. TEXT BELOW GRID HAS ONE LINE:

[ANSWER] SMOKERS OF 100 WITH LUNG CANCER WOULD DIE]

[display if the respondent does not select a square on S3:]

You did not indicate how many smokers would die lung cancer.

S3a. Do you think that any smokers out of 100 would die of lung cancer?
Yes → Send them back to S3.
No → Skip to S4

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
S4. Have you ever smoked cigarettes?
1. Yes → S5
2. No → SKIP TO Display for heart disease after S10.

[RADIO]
[IF S4=YES]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
S5. Have you smoked more than 100 cigarettes during your lifetime?
1. Yes →S6
2. No → display for heart disease after S10.

[RADIO]
[IF S5=YES]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
S6. Have you smoked at least one cigarette per day during the past month?
1. Yes → S7
2. No → S8

[RADIO]
[IF S6=YES]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
S7. About how many packs of cigarettes do you usually smoke in a day?

1. Less than half a pack
2. About half a pack
3. About one pack
4. About one and half packs per day
5. About two packs per day
6. About two and half packs per day
7. About three packs per day
8. More than three packs per day

GO TO S10.

[RADIO]
[IF S6=NO]

[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
S8. Have you stopped smoking altogether?
1. Yes →S9
2. No → S10

[RADIO]
[IF S8=YES]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
S9. How long ago did you stop smoking for the last time?
1. Less than 1 year ago
2. 1 to 5 years ago
3. 6 to 10 years ago
4. 11 to 15 years ago
5. 16 to 20 years ago
6. More than 20 years ago
CONTINUE WITH S10.

[ALL RESPONDENTS]
[DISPLAY]
Heart disease is the last disease that we'll ask you about. We'll focus on the most common form of heart disease, called *coronary artery disease*.

Coronary artery disease occurs when fatty deposits build up in the arteries that carry blood to the heart. The buildup of fatty deposits – called atherosclerosis – narrows the arteries and limits the flow of blood.

The buildup of fatty deposits starts in childhood, as explained in a recent article you may have seen in the *Wall Street Journal* (Nov 30, 2010, p D4).

[Display – new screen]
Coronary artery disease can cause chest pain and can lead to a heart attack. A heart attack occurs when one or more arteries are completely blocked with fatty deposits.

Heart disease is the leading cause of death in the United States.

In the rest of the survey, we'll use the terms "heart disease" and "coronary artery disease" to mean the same thing.

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
H1. Have you ever heard or read about coronary artery disease, heart disease, or a heart attack?
1. Yes
2. No

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
H2. Have you ever known anyone personally, like a friend or relative, who has been diagnosed with coronary artery disease or has had a heart attack?
1. Yes
2. No

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
H4. Have you ever thought about the possibility that <u>you</u> might get coronary artery disease or have a heart attack?
1. Yes
2. No

[RADIO]

[DISPLAY]
Now, we'll ask you a few questions to help you estimate your own chances of getting coronary artery disease before you reach age 75. There are no right or wrong answers to these questions, please just make the most accurate estimate that you can.

[PROMPT IF SKIP]
H10. How many chances in 100 do you think you have of getting coronary artery disease before you reach age 75? Please mark the scale to show your answer.

[[Please change the grid for this question so that it starts with blue squares from 1-100, and allow respondents to select any square. Selecting a square recolors all squares up through the one selected to red.]

[Text below grid reads:] Risk level [answer to H10]% chance of heart disease.

[ANSWER TO H10 USED LATER IN SURVEY.]

[display if the respondent does not select a square on H10:]
[SHOW DISPLAY AND H10A ON THE SAME SCREEN]
You did not indicate any risk of getting coronary artery disease.

[PROMPT IF SKIP]
H10a. Everybody probably faces at least a small risk of getting heart disease Do you think that you have any chance at all of getting heart disease before age 75?
Yes → Send them back to H10.
No → go to H11.

[terminate if H10a is skipped]

[DISPLAY]
Now let's talk about your child's chances of getting heart disease before age 75. The questions about your child are similar to those we asked about you.

[radio]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
H11. Have you ever thought about the possibility that your child might get coronary artery disease or have a heart attack sometime during **<his/her based on Q7>** life?
1. Yes

2. No

[Display]
Now please think about your child's chances of getting coronary artery disease before **[he/she based on Q7]** is age 75.

[PROMPT IF SKIP]
H15. How many chances in 100 do you think your child has of getting coronary artery disease before he reaches age 75? Please mark the scale below to show your answer.

[[Please change the grid for this question so that it starts with blue squares from 1-100, and allow respondents to select any square. Selecting a square re-colors all squares up through the one selected to red.]

[Text below grid reads:] Risk level: <answer to H15>%chance of heart disease.

[Answer to H15 used later in survey.]

[display if the respondent does not select a square on H15:]
[SHOW DISPLAY AND H15A ON THE SAME SCREEN]
You did not indicate any risk of getting a heart disease.

[PROMPT IF SKIP]

H15a. Everybody probably faces at least a small risk of getting heart disease Do you think that your child has any chance at all of getting coronary artery disease before age 75?
Yes → Send them back to H15.
No → continue.

[terminate if H15a is skipped]

[Display]

You may not be too sure about the risk estimates you just made. You'll be able to change these estimates later, after you've had a chance to review some information about heart disease.

Let's start with the average person's risk. According to medical research, the average person has about 27 chances in 100, or 27%, of getting coronary artery disease before reaching the age of 75. Click "Next" to see how the average person's risk of heart disease compares to the estimates that you made for yourself and for your child.

[Fit three grid squares: parent risk scale (H10, show only the H10 answer as red, and remaining squares as blue), kid risk scale (H15 answer squares red, remaining blue, and 27% risk scale (27 red, 73 blue), all static.]

[Next screen display]
Of course, you and your child will probably not have the same risk as the average person, because chances of getting heart disease depend on six risk factors that are different for everyone.

[Next screen display]
Here are six important risk factors for heart disease.

[Display a checklist]
Heart Disease Risk Factors
- Gender
- Smoking
- Current health status
- Family history
- Exercise
- Diet

Let's briefly review each of these risk factors for you and your child.

[display centered] Gender

Heart disease risks are different for men and women. You can see how big the difference is by clicking "Next." [Splits the old gender slide into two slides to provide a better transition]

[DISPLAY]
NEXT SCREEN:

On average, heart disease risk is higher for males than for females.

[THEN SHOW TWO RISK SCALES SIDE-BY-SIDE, DISPLAY ONLY (RESPONDENTS CANNOT SELECT SQUARES IN GRID)].
[LEFT HAND SCALE SHOULD HAVE SQUARES 1- 19 COLORED RED, TEXT BELOW READS: AVERAGE WOMAN'S RISK: 19 %.]
[RIGHT HAND SCALE SHOULD HAVE SQUARES 1-35 COLORED RED, TEXT BELOW READS: AVERAGE MAN'S RISK: 35 %.]

[display centered] Smoking

Heart disease risks are different for smokers and nonsmokers. Click “Next” to see how big this difference is. Next screen:
[display]
Smokers face higher risks of coronary artery disease than non-smokers.

[Then display 2 risk scales side-by-side, display only.]
[Left hand scale should have squares 1-21 colored red. Text below reads: Average non-smoker’s risk: 21 %.]
[Right hand scale has squares 1-28 colored red. Text below reads: Average smoker’s risk: 28 %.]

Current Health Status

Now that we have considered gender and smoking status, let’s turn to your current health status and the current health status of your child.
[Display a checklist with Gender, Smoking checked off.]
If possible, please darken somewhat the checkmarks used in these checklists throughout the survey so that the checkmarks are more visible.
Heart Disease Risk Factors

- Gender
- Smoking
- Current health status
- Family history
- Exercise
- Diet

[RADIO]
[IF SKIP, PROMPT WITH “YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN.”]
C1. Overall, would you say that your health is
1. Excellent
2. Very Good
3. Good
4. Fair
5. Poor

[RADIO]
[IF SKIP, PROMPT WITH “YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN.”]
C2. How about your child’s health? Overall, would you say it is

1. Excellent
2. Very Good
3. Good
4. Fair

5. Poor

[IF Q9=1 (male) GO TO C3, IF Q9=2 (female) GO TO C3A]

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C3. Have you ever been told by a doctor or health professional that you need to do something (like take medication, stop smoking, change your diet or exercise more) to lower your blood pressure?
Yes
No
[Yes: GO TO C3B]
[No: Go to c4]

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C3A. Except during pregnancy, have you ever been told by a doctor or health professional that you need to do something (like take medication, stop smoking, change your diet or exercise more) to lower your blood pressure?
Yes
No
[Yes: GO TO C3B]
[No: Goto c4]

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C3B. [If Yes to C3 or C3A]: Are you currently taking medication for high blood pressure?
Yes
No
[continue with c4]

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C4. Has a doctor or health professional ever said that your child needs to do something (like take medication, change his/her Q7 diet, or exercise more) to lower his/her Q7 blood pressure?
Yes
No

[DISPLAY]
High blood pressure increases risk of coronary artery disease.

[THEN DISPLAY 2 RISK SCALES SIDE-BY-SIDE, DISPLAY ONLY.]

LEFT HAND SCALE SHOULD HAVE SQUARES 1-18 COLORED RED. TEXT BELOW READS: OPTIMAL BLOOD PRESSURE (LESS THAN 120/80): AVERAGE RISK IS 18%.
RIGHT HAND SCALE HAS SQUARES 1-43 COLORED RED. TEXT BELOW READS: VERY HIGH BLOOD PRESSURE (MORE THAN 160/100): AVERAGE RISK IS 43%.

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C5. Has a doctor or health professional ever told you that you need to do something (like take medication, change your diet, or exercise more) to lower your cholesterol?
Yes
No
[yes: goto c6 / no: go to c7]

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C6. [If C5=yes]: Are you currently taking any medication for high cholesterol?
Yes
No
[continue with c7]

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C7. Has a doctor or health professional ever said that your child needs to do something (like take medication, change his/her Q7 diet, or exercise more) to lower his/her Q7 cholesterol?
Yes
No

[Display] People with high cholesterol levels face higher risk of coronary artery disease, while people with normal cholesterol face lower risk.

[BELOW THE CURRENT TEXT, DISPLAY 2 RISK SCALES SIDE-BY-SIDE, DISPLAY ONLY.]
LEFT HAND SCALE SHOULD HAVE SQUARES 1-18 COLORED RED. TEXT BELOW READS: OPTIMAL TOTAL CHOLESTEROL (LESS THAN 180 MG/DL): AVERAGE RISK IS 18%.
RIGHT HAND SCALE HAS SQUARES 1-37 COLORED RED. TEXT BELOW READS: VERY HIGH TOTAL CHOLESTEROL (MORE THAN 240 MG/DL): AVERAGE RISK IS 37%.

[IF Q9=1 (male) GO TO C8, IF Q9=2 (female) GO TO C8A]

[RADIO]

[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C8. Has a doctor or health professional ever told you that you have diabetes?
Yes
No

[IF C8=YES GO TO C9, IF C8=NO GO TO C11]

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C8A. Except during pregnancy, has a doctor or health professional ever told you ever told you that you have diabetes?
Yes
No

[IF C8A=YES GO TO C9, IF C8A=NO GO TO C11]

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C9. How old were you when you were first told that you have diabetes?
10 years old or younger
11 to 20 years old
21 to 30 years old
31 to 40 years old
41 to 50 years old
51 to 55 years old

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C10. Are you currently taking medication for your diabetes?
Yes
No

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C11. Has a doctor or health professional ever said that your child has diabetes?
Yes
No

[IF C11=YES GO TO C12, IF C11=NO GO TO C13]

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C12. Is your child currently taking medication for **<his/her Q7>** diabetes?
Yes
No

[Display] People with diabetes are at much higher risk of coronary artery disease than people without this disease.

[DISPLAY]
People with diabetes face higher risk of coronary artery disease.
[THEN DISPLAY 2 RISK SCALES SIDE-BY-SIDE, DISPLAY ONLY.]
LEFT HAND SCALE SHOULD HAVE SQUARES 1-23 COLORED RED. TEXT BELOW READS: AVERAGE RISK WITHOUT DIABETES: 23%.
RIGHT HAND SCALE HAS SQUARES 1-62 COLORED RED. TEXT BELOW READS: AVERAGE RISK WITH DIABETES: 62 %.

[DISPLAY]
Weight in relation to height, called a "body mass index" or BMI, also is a risk factor for coronary artery disease. We'll calculate your body mass index and your child's body mass index in a moment. Please click "Next."

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C13. How tall are you? 1. Less than 4 feet 8 inches
2. 4 feet 8 inches to less than 4 feet 10 inches
3. 4 feet 10 inches to less than 5 feet 0 inches
4. 5 feet 0 inches to less than 5 feet 2 inches
5. 5 feet 2 inches to less than 5 feet 4 inches
6. 5 feet 4 inches to less than 5 feet 6 inches
7. 5 feet 6 inches to less than 5 feet 8 inches
8. 5 feet 8 inches to less than 5 feet 10 inches
9. 5 feet 10 inches to less than 6 feet 0 inches
10. 6 feet 0 inches to less than 6 feet 2 inches
11. 6 feet 2 inches to less than 6 feet 4 inches
12. 6 feet 4 inches to less than 6 feet 6 inches
13. 6 feet 6 inches to less than 6 feet 8 inches
14. 6 feet 8 inches or more

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C14. About how much do you weigh?

1. Less than 100 pounds

2. 100 to 109 pounds
3. 110 to 119 pounds
4. 120 to 129 pounds
5. 130 to 139 pounds
6. 140 to 149 pounds
7. 150 to 159 pounds
8. 160 to 169 pounds
9. 170 to 179 pounds
10. 180 to 189 pounds
11. 190 to 199 pounds
12. 200 to 209 pounds
13. 210 to 219 pounds
14. 220 to 229 pounds
15. 230 to 239 pounds
16. 240 to 249 pounds
17. 250 to 259 pounds
18. 260 to 269 pounds
19. 270 to 279 pounds
20. 280 to 289 pounds
21. 290 to 299 pounds
22. 300 or more pounds

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C15. How tall is your child?

1. Less than 2 feet 6 inches
2. 2 feet 6 inches to less than 2 feet 8 inches
3. 2 feet 8 inches to less than 2 feet 10 inches
4. 2 feet 10 inches to less than 3 feet 0 inches
5. 3 feet 0 inches to less than 3 feet 2 inches
6. 3 feet 2 inches to less than 3 feet 4 inches
7. 3 feet 4 inches to less than 3 feet 6 inches
8. 3 feet 6 inches to less than 3 feet 8 inches
9. 3 feet 8 inches to less than 3 feet 10 inches
10. 3 feet 10 inches to less than 4 feet 0 inches
11. 4 feet 0 inches to less than 4 feet 2 inches
12. 4 feet 2 inches to less than 4 feet 4 inches
13. 4 feet 4 inches to less than 4 feet 6 inches
14. 4 feet 6 inches to less than 4 feet 8 inches
15. 4 feet 8 inches to less than 4 feet 10 inches
16. 4 feet 10 inches to less than 5 feet 0 inches
17. 5 feet 0 inches to less than 5 feet 2 inches
18. 5 feet 2 inches to less than 5 feet 4 inches
19. 5 feet 4 inches to less than 5 feet 6 inches

20. 5 feet 6 inches to less than 5 feet 8 inches
21. 5 feet 8 inches to less than 5 feet 10 inches
22. 5 feet 10 inches to less than 6 feet 0 inches
23. 6 feet 0 inches to less than 6 feet 2 inches
24. 6 feet 2 inches to less than 6 feet 4 inches
25. 6 feet 4 inches to less than 6 feet 6 inches
26. 6 feet 6 inches to less than 6 feet 8 inches
27. 6 feet 8 inches or more

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
C16. About how much does your child weigh?

1. Less than 20 pounds
2. 20 to 29 pounds
3. 30 to 39 pounds
4. 40 to 49 pounds
5. 50 to 59 pounds
6. 60 to 69 pounds
7. 70 to 79 pounds
8. 80 to 89 pounds
9. 90 to 99 pounds
10. 100 to 109 pounds
11. 110 to 119 pounds
12. 120 to 129 pounds
13. 130 to 139 pounds
14. 140 to 149 pounds
15. 150 to 159 pounds
16. 160 to 169 pounds
17. 170 to 179 pounds
18. 180 to 189 pounds
19. 190 to 199 pounds
20. 200 to 209 pounds
21. 210 to 219 pounds
22. 220 to 229 pounds
23. 230 to 239 pounds
24. 240 to 249 pounds
25. 250 to 259 pounds
26. 260 to 269 pounds
27. 270 to 279 pounds
28. 280 to 289 pounds
29. 290 to 299 pounds
30. 300 or more pounds

[DISPLAY] Based on your height and weight your Body Mass Index or BMI is approximately "COMPUTE.[insert a formula for BMI]". Although BMI is not a perfect indicator, heart disease risks are higher for adults with BMI of 25 or above, and highest for adults with BMI 30 or above.

[PLEASE DISPLAY 3 GRIDS SIDE-BY-SIDE. LEFT HAND SCALE SHOWS 1-21 RED, TEXT BELOW SAYS BMI LESS THAN 25: AVERAGE RISK IS 21%.
MIDDLE SCALE SHOWS 1-24 RED, TEXT BELOW SAYS BMI BETWEEN 25 AND 30: AVERAGE RISK IS 24%.
RIGHT HAND SCALE SHOWS 1-32 RED, TEXT BELOW SAYS BMI OVER 30: AVERAGE RISK IS 32%.]

[DISPLAY] Based on your child's height and weight **<his/her Q7>** Body Mass Index or BMI is approximately "COMPUTE. [insert a formula for BMI]" For [boys/girls based on Q7] of age [answer to Q6] years old, heart disease risks are higher when BMI is [table lookup] or above, and highest when BMI is [table lookup] or above. But there is not enough data to tell *how* much higher the risk is for children.

[display centered] Family History

[DISPLAY]
The last three risk factors are family history, exercise and diet. We can't use the risk scales to tell you specifically *how much* these factors affect the average person's risk. But they are still important in determining whether a person will get coronary artery disease.

[Display a checklist with Gender, Smoking, and current health status checked off.]
Heart Disease Risk Factors
- Gender
- Smoking
- Current health status
- Family history
- Exercise
- Diet

Let's start with family history
[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
F1. Please think about your blood relatives on your side of your family. Have any of your blood relatives ever had a heart attack or been treated for coronary artery disease?
Yes
No
Don't Know

[RADIO]

[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]

F3. Now please think about your child's biological <mother's if Q9 = Man / father's if Q9 = woman> blood relatives. Have any of <her/his = opposite gender of respondent given in Q9> blood relatives ever had a heart attack or been treated for coronary artery disease?

Yes
No
Don't know

[Display] Next, we will ask about exercise.

Exercise

[Display a checklist with Gender, Smoking, Family History, and Current Health status checked off.]

Heart Disease Risk Factors

- Gender
- Smoking
- Current health status
- Family history
- Exercise
- Diet

[RADIO]

[Display:] The American Heart Association recommends that adults in normal good health should get at least 5 hours weekly of moderate physical activity (such as brisk walking), or at least 1 hour weekly of vigorous activity (such as jogging) or some equivalent combination of moderate and vigorous activity.

[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]

E1a. How much exercise do you get, compared to the American Heart Association recommendations?

Less exercise than recommended
About as much exercise as recommended
More exercise than recommended

[Display] The American Heart Association recommends that children in normal good health should participate in physical activity for 1 hour daily, including vigorous activity on at least 3 days per week.

[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]

E2a. How much exercise does your child get, compared to the American Heart Association recommendations?

Less exercise than recommended

About as much exercise as recommended
More exercise than recommended

Diet

[Display]
The last item to cover on the list of heart disease risk factors is diet.
[Display a checklist with all items except Diet checked off.]
Heart Disease Risk Factors
- Gender
- Smoking
- Current health status
- Family history
- Exercise
- Diet

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
D1. Would you say that you eat a healthy diet?
1. Very healthy
2. Somewhat healthy
3. Somewhat unhealthy
4. Very unhealthy

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
D2. Would you say that your child eats a healthy diet?
1. Very healthy
2. Somewhat healthy
3. Somewhat unhealthy
4. Very unhealthy

[Display] The American Heart Association recommends that adults eat 4-5 cups of fruits and and vegetables daily.

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
D2a. How much fruit and vegetables do you eat in a typical day?
Less than recommended
About as much as recommended
More than recommended

Next screen [please split the adult and child fruit/veg to two separate screens.]
[Display] The American Heart Association recommends that teenagers eat 4-5 cups of fruits and vegetables daily. Younger children should eat 2-4 cups of fruits/vegetables depending on their age and size.

[RADIO]
[IF SKIP, PROMPT WITH "YOUR ANSWER TO THIS QUESTION WAS NOT RECORDED. PLEASE ANSWER THE QUESTION IF YOU CAN."]
D3a. How much fruit and vegetables does your child eat in a typical day?
Less than recommended
About as much as recommended
More than recommended

[Display]
Now you have considered each of the main risk factors and you know how much they affect heart disease risk. If you have two or more risk factors, then your risk would be even higher.
People with several risk factors have the highest heart disease risk of all.

[New screen]
R1. Earlier, you said that your chances of getting heart disease before age 75 was <answer from H10>%. Now that you have thought about your risk factors, maybe you would like to change your answer. If so, use the risk scale below. If you do not wish to change your answer, just leave the scale marked as it is. When you are ready to move on click "Next."

[Interactive grid. When initially displayed, number of red squares = answer to H10, remaining squares are blue.]

R1a.
Suppose a doctor diagnoses you with coronary artery disease before age 75. What are the chances that you would die from coronary artery disease within five years of that diagnosis? Click the numbered red square that shows your chances of dying from heart disease within five years of being diagnosed.

[PLEASE MAKE THE GRID FOR THIS QUESTION HAVE 1-100 BLUE SQUARES AND ALLOW RESPONDENTS TO SELECT ANY SQUARE IN THE SCALE, CAUSING THE ALL SQUARES UP TO THE ONE SELECTED TO RE-COLOR AS RED.
TEXT BELOW SCALE SHOULD READ:]
Chance of dying from heart disease if diagnosed: <answer to R1a>%.

[display if the respondent does not select a square on R1a:]

[SHOW DISPLAY AND R1B ON THE SAME SCREEN]
You did not indicate any risk of dying from coronary artery disease.

[PROMPT IF SKIP]
R1b. Anyone diagnosed with heart disease probably faces at least a small risk of dying from the disease. Do you think that you have any chance at all of dying from heart disease before age 75?
Yes → Send them back to R1a.
No → go to R2.

[Display]
R2. Now let's continue with your child. Earlier, you said that your child's chance of getting heart disease before age 75 was **<answer from H15>%.**

If you would like to make a different estimate, please do so using the scale below. Then click "Next."

If you want to leave your estimate the same, just click "Next."

[Interactive grid. When initially displayed, number of red squares should equal answer to H15, remaining squares are blue]

R2a. Suppose a doctor has diagnosed your child with coronary artery disease before age 75. What do you think are the chances are that **<he/she Q7>** would die from coronary artery disease within five years of that diagnosis? Click the square that shows your child's chances of dying from heart disease within five years of being diagnosed.

[PLEASE MAKE THE GRID FOR THIS QUESTION HAVE 1-100 BLUE SQUARES AND ALLOW RESPONDENTS TO SELECT ANY SQUARE IN THE SCALE, CAUSING THE ALL SQUARES UP TO THE ONE SELECTED TO RE-COLOR AS RED.
TEXT BELOW SCALE SHOULD READ:]
Chance of dying from heart disease if diagnosed: <answer to R2a>%.

[display if the respondent does not select a square on R2a:]
[SHOW DISPLAY AND R2B ON THE SAME SCREEN]
You did not indicate any risk of dying from coronary artery disease.

[PROMPT IF SKIP]
R2b. Anyone diagnosed with heart disease probably faces at least a small risk of dying from the disease. Do you think that your child has any chance at all of dying from heart disease before age 75?

Yes → Send them back to R2a.
No → go to next section.

[Display]
Now that we've covered the information about risk factors, let's consider:

- How heart disease risks increase with age, and
- What the benefits are of reducing the risk of heart disease.

Heart disease risks over time

[Display]
[The following is just the copy of the previous client's word document titled "Displays following R2a --UCF Heart Disease Risk Survey"]

[DISPLAY THE NEXT TWO PARAGRAPHS ON THE SAME SCREEN]

You put your chances of getting coronary artery disease before you reach age 75 at [answer from R1] chances in 100. Your risk estimate means more than you might think at first. The next screen shows the risk you face between now and any age up through age 75.

(Please be patient as the next screen may take a moment to appear.)

[KN: The next screen displays a graph of cumulative risk by age. The instructions below explain the development of the graph for both the parent and the child.
The graph is built up from the function $G(a)$, where a is an index that runs from current age to 75:

$$G(a) = 100\left\{1 - \exp\left[\left(\frac{1-\exp\left(0.06\left(a-q\right)\right)}{1-\exp\left(0.06\left(75-q\right)\right)}\right)\ln(1-R)\right]\right\}.$$

In this equation, $q = \max(40,\ \text{Current Age})$, and $R = \begin{cases} R1/100 \text{ for parent} \\ R2/100 \text{ for child} \end{cases}$. Current age is Q8b for the parent, Q6 for the child.

The graph will show the positive quadrant of a standard (x, y) plane. The horizontal axis shows age in years from Current Age through 75. The vertical axis shows cumulative risk through each given age, in percent. So the range is (0,100), but most respondents will be far below 100% risk, so that the graph can be re-scaled accordingly.
The function to be graphed is as follows (please us a red curve to trace the function).
If Current Age ≥ 40, graph the function $F(a) = G(a)$, from above, over the domain (Current Age, 75).
If Current Age < 40, graph the function $F(a)$, defined by

$$F(a) = \begin{cases} 0 & \text{for Current Age } \leq a < 40 \\ G(a) & \text{for } 40 \leq a \leq 75 \end{cases}.$$

If the respondent points the mouse to the curve above an age a on the horizontal axis, please show a box should display “Your risk between now and age a is $F(a)\%.$” [Note the % sign added] for the parent, OR “Your child’s risk between now and age a is $F(a)\%.$” [Again note % sign] when this is done for the child. For example, the respondent points to the graph above age 60, the box displays “Your risk between now and age 60 is <insert the value of the function *F(60)*>%.” If the respondent subsequently points to the graph above a different age, the first pop-up disappears and a new one for the newly selected age is shown.

[Graph shows cumulative risk function for parent (respondent). The graph is labeled “Your Heart Disease Risk by Age”; the horizontal axis is labeled “Your Age”; the vertical axis is labeled “Your Risk”.]

[Display]
Your heart disease risk profile is shown in the chart below. The height of the red curve shows your heart disease risk between now and any of the ages up to 75. To see how the chart works:

- Point to the red mark on the curve above the age of 75 to see your total risk of [answer to R1]% between now and age 75.
- Point to any red mark on the curve above any other age to see your risk between now and that age.

[Display] [KN: Note that the current version of the online survey has the wrong last sentence of the next paragraph.
Now let’s continue with your child. You put your child’s chances of getting coronary artery disease before <he/she Q7> reaches age 75 at [answer from R2] chances in 100. The next screen shows the risk your child faces between now and any age up through age 75.

[Graph shows cumulative risk function for child. The graph is labeled “Your Child’s Heart Disease Risk by Age”; the horizontal axis is labeled “Your Child’s Age”; the vertical axis is labeled “Your Child’s Risk”.]
[Display]
Your child’s heart disease risk profile is shown below. The chart works much the same as the one for you. For instance,

- Point to the red mark on the curve above the age of 75 to see your child’s total risk of [answer to R2]% between now and age 75.
- Point to any red mark on the curve above any age to see your child’s age between now and that age.

- Notice that the chances of being diagnosed with heart disease before age 40 are practically zero.

Life with heart disease

[Display] You've thought a lot now about the risk of getting heart disease. But if you did get heart disease, what would your life be like? What are the benefits of reducing heart disease risk?

[RADIO]

L1. If you had heart disease, could it happen that you would have periodic episodes of chest pain or discomfort?

Yes

No

[Display] It often does happen that heart disease leads to chest pain or discomfort. While not all heart disease patients experience chest pain, it is the most common symptom of this disease.

By reducing your risk of heart disease, you increase your chances of living free from symptoms like chest pain.

[RADIO]

L2. If you had heart disease, could it happen that you would experience shortness of breath?

Yes

No

[Display] It often does happen that heart disease leads to shortness of breath. Heart disease patients are often limited in what they can do for this reason. Walking, climbing stairs, and other activities may seem more difficult than earlier in life.

By reducing your risk of heart disease, you would be better able to carry on your normal activities.

L2a. Can heart disease limit your ability to do household chores or to work in a job or business?

Yes

No

[display] Some heart patients have to rely on other people to take over some of their responsibilities at home or at work. Having to depend on others can be frustrating, costly, or can cause you to be less productive at work.

By reducing your risk of heart disease, you increase your chances of maintaining your independence.

[RADIO]

L3. If you had heart disease, do you think you might need more medical treatment, like more doctor visits and medication?

Yes
No

[Display] Medication is often prescribed for heart patients, and some people experience problems with side effects of medication. If it's a severe case of heart disease, you might need hospitalization and surgery, like a bypass operation.

By reducing your risk of heart disease, you increase your chances of living without lots of medication, medical treatment, or surgery.

[RADIO]

Reducing heart disease risks

[Display]
You may be interested in ways to reduce heart disease risk for you and your child. This part of the survey is about a program to reduce the risk of heart disease, and whether you would choose to participate.

The program is not yet available. We need your help in evaluating the program before it goes on the market.

[Display]
How the program works

- Each year, you would visit a doctor of your choosing to arrange for a blood test. The blood test will tell you and your doctor how much blockage of arteries is present.

- After each of the yearly blood tests, your doctor would give you one of several vaccines that would slow the build-up of fatty deposits in the arteries. The vaccine you get would be based on the outcome of the blood tests. The vaccine would be given by a shot in the arm.

- The vaccine would become available only after extensive testing shows that that it meets the same strict approval process used for other medications.

[Display]
Benefits and side effects

The vaccine would provide extra protection from heart disease over and above the benefits you can currently get from eating right and getting enough exercise. The younger you are when you start the program, the greater the benefits. In a moment, we'll show you the benefits that you and your child would get.

But any medication can have side effects. In clinical trials, some people experienced side-effects like soreness in the arm, fatigue, or slight stomach upset. These side-effects generally disappeared within 1-2 days.

More serious side-effects very rarely occurred.
[Display]

What is the reduction in heart disease risk that you can expect from the vaccine?

First we will tell you about the risk reduction [version CA: insert "**YOUR CHILD" / VERSION AC: INSERT "YOU"**>], can expect from the vaccine, then we'll tell you about how much risk reduction [**VERSION CA**: insert "**YOU"/VERSION AC: INSERT "YOUR CHILD"]** can expect from the vaccine. We also will ask if you would be willing to pay your own money to get these benefits.

[RANDOMIZE QUESTION BLOCKS: VERSION CA: 50% WILL GET CHILD QUESTION BLOCK FOLLOWED BY ADULT QUESTION BLOCK; VERSION AC: 50% WILL GET CHILD QUESTION BLOCK FOLLOWED BY ADULT QUESTION BLOCK]

[START OF CHILD QUESTION BLOCK]
[Display]
Children who stay on the program from your child's age until age 75 would cut their risk by <H-KID>%.

RANDOMIZE H-KID = 20, 80.

To see what a **<H-KID>%** risk reduction would mean for your child, click "Next."
[DISPLAY]

Your child's risk reduction from the prevention program is shown in green. The risk your child would still face, if any, is shown in red.

[INSERT Risk Scale with boxes 1-HK colored red, and boxes (HK+1) through R2 colored green.]

[**COMPUTE DHK = (H-KID / 100) * (R2 ANSWER), AND if the result is not an integer, ROUND *UP*TO INTEGER. THEN COMPUTE HK = (R2 ANSWER) – DHK.]**

[DISPLAY]
To see how the prevention program would affect your child's risk by age, click "Next."
[DISPLAY]

The red curve shows your child's heart disease risk, without the prevention program. The green curve shows your child's heart disease risk if [he/she q7] stays on the program until age 75. Please use the cursor to point to different ages on both curves to show how much the prevention program will cut your child's risk. As you can see, the risk reduction starts small but gets bigger as your child gets older. That's why it is important to start young and stay on the program.

[Show the red and green curves as you already have them programmed.]

[Display]
We would like to know whether you would be willing to pay your own money to get these benefits for your child. If you have other children, you could put them in the program too. But for now please consider just the one child.

RANDOMIZE H_K OVER FIVE DOLLAR VALUES OF COST: 10, 20, 40, 80, 160.
[radio]
[PROMPT IF SKIP]

[New slide]. Would you be willing to pay $**< H_K > to put your child in the heart disease prevention program for the first year?**As you think over your answer, please consider two things:

•If your child was in the program, you would have less money available to pay for other family members to participate and to buy all the other things your family needs.

•If you put your child in the program for the first year, you may want to continue in future years to get the full heart disease prevention benefit. Of course, when your child becomes an adult it will be up to [him/her] to decide whether to participate.

So please take a moment to make sure your answer really reflects what you would do if this program were available.

To state your answer, please click "Next."

[sp; on the next screen]
W1. Would you be willing to pay **$< H_K > to put your child** in the heart disease vaccination program for the first year?
1. Yes
2. No

[If W1=1]
[sp]

W2a. You said that you would pay $**< H_K >** for your child to be in the heart disease prevention program for the first year. If the program was actually available, how certain are you that you would really do this?

1. Definitely
2. Probably
3.Uncertain

[MP; IF W1=1]

W3a. Which of the following reasons best describes why you would put your child in the program? (Please mark all that apply.)

1. The risk reduction is worth the expense.
2. It's important to start young to reduce heart disease risk.
4. I would spend whatever it takes to reduce my child's heart disease risk.
5. The program is better than other ways of reducing heart disease risk.
6. Some other reason.

[GO TO W4]

[IF W1=2]
[SP]
W4a. Which of the following reasons best describes why you would not put your child in the program? (Please mark all that apply.)

1. The risk reduction is too far in the future to justify the expense.
2. My child might not stay on the program as an adult, so there is no sense paying for it now.
3. There are other ways to spend money, including on health, that are better than this program.
4. My child can reduce heart disease risks without the program.
5. I don't believe that the prevention program would really work as described.
6. The program is too expensive.
7. I'm not that worried about my child's heart disease risk.
8. I already do enough to protect my child against heart disease.
9. I cannot afford the program
10. Some other reason.

[radio]
[if q0=yes or if q0bi=yes]
[PROMPT IF SKIP]

W4. Do you believe that your spouse (if q0=yes) / partner (if q0bi=yes)would agree with your decision about whether or not to enroll your child in the program?

Yes
No
[END OF CHILD QUESTION BLOCK]

[start of adult question block]
[Display]
Adults who stay on the program from your age until age 75 would cut their heart disease risk by **<H-PAR>**%.

RANDOMIZE H-PAR = 10, 70.

KEEP H-KID > H-PAR. Of the 4 possible combinations of (20,80) x (10,70), only 3 should actually be administered. The (H-KID=20, H-PAR=70) pair should not be used.

To see what a **<H-PAR>**% risk reduction would mean for you, click "Next."

COMPUTE DHP = (H-PAR / 100) * (R1 ANSWER), AND if result is not an integer, ROUND *UP*TO INTEGER. THEN COMPUTE HP = (R1 ANSWER) – DHP.

[DISPLAY]

Your risk reduction from the prevention program is shown in green. The risk you would still face, if any, is shown in red.

[INSERT Risk Scale with boxes 1-HP colored red, and boxes (HP+1) through R1 colored green.]

[DISPLAY]

To see how the program would affect your risk by age between any age and age 75, click "Next."

[DISPLAY]
The red curve shows your heart disease risk, without the prevention program. The green curve shows your heart disease risk if you stay on the program until age 75. Use the cursor to point to different ages on the two curves to find out how much the program will cut your heart disease risk. As you can see, the risk reduction starts small but gets bigger as you get older. That's why it is important to start now and stay on the program.

[Show the red and green curves as you already have them programmed.]

[Display]

We would like to know whether you would be willing to pay your own money to get these benefits.

Please use the same dollar price for H_P as was used for H_K in question W1 above.

[radio]
[PROMPT IF SKIP]

[DISPLAY]
WOULD YOU BE WILLING TO PAY $<H_P> TO PARTICIPATE IN THE HEART DISEASE VACCINATION PROGRAM FOR THE FIRST YEAR?

As you think over your answer, please consider two things:

- If you are in the program, you would have less money available to pay for other family members to participate and to buy all the other things your family needs.
- If you are in the heart disease vaccination program for the first year, you may want to continue in future years to get the full heart disease prevention benefit.

So please take a moment to make sure your answer really reflects what you would do if this program were available.

To state your answer, please click "Next."

W5a. Would you be willing to pay $**< H_P >** to participate in the heart disease vaccination program for the first year?
Yes
No

[If W5=Yes Go to W6. If W5=NO go to W8]

W6a. You said that you would pay $<H_P> to participate in the heart disease prevention program for the first year. If the program was actually available, how certain are you that you would really do this?

1. Definitely
2. Probably
3. Uncertain

[If W6=1,2,3 Go to W7]

W7. Which of the following reasons best describes why you would choose to participate in the heart disease prevention program? (Please mark all that apply.)

1. The risk reduction is worth the expense.
2. It's important to start young to reduce heart disease risk.
3. If I develop good health habits now, it's likely the habits will continue in the future.
4. I would spend whatever it takes to reduce my heart disease risk.
5. The program is better than other ways of reducing heart disease risk.
6. Some other reason.

[GO TO END OF ADULT QUESTION BLOCK]

W8. Which of the following reasons best describes why you would not participate in the heart disease prevention program? (Please mark all that apply.)

1. The risk reduction is too far in the future to justify the expense.
2. There are other ways to spend money, including on health, that are better than this program.
3. I can reduce heart disease risks without the program.
4. I don't believe that the prevention program would really work as described.
5. The program is too expensive.
6. I'm not that worried about my heart disease risk.
7. I already do enough to protect my child against heart disease.
8. I cannot afford the program.
9. Some other reason.

[END OF ADULT QUESTION BLOCK]

[radio]

[IF q0=no AND q0bi=no, survey ends here]

[IF q0=yes or q0bi=yes]

We have one more question about your child's possible participation in the heart disease prevention program.

To get the full risk reduction of the prevention program, your child would have to stay on the program for many years. During that time, your family's financial situation could change in unexpected ways.

We would like to find out whether your decision would be affected if your family's financial situation changed.

[SHOW THE FOLLOWING DISPLAYS AND W9 If W2a =1 or 2] but only [IF q0=yes or q0bi=yes]

Suppose that you personally had a new expense. For example, suppose that you felt obligated to give financial help to a relative on your side of the family, or that you had an expensive medical procedure, or that you lost money on an investment that you personally had made. Suppose that the total cost to you is $X per year, for the next year.

At the same time, suppose that your spouse (if q0=yes) / partner (if q0bi=yes) unexpectedly received an extra $Y of income per year for the next year, from some source.

[Please randomize $X so that 50% of respondents get X = 2% of lower limit of answer to SD6, and 50% get X = 10% of lower limit to answer to SD6, given that lower limit is at least $5000. If the lower limit is less than $5000, set $X =$500.] Please randomize $Y so that 50% get Y=0.5X and 50% get Y=1.5X.
[Display]
Now please consider whether these changes in your family's finances would affect whether you would enroll your child in the heart disease prevention program.

[Display]

[radio]
[PROMPT IF SKIP]

W9. If you had extra expenses of $X per year and your spouse (q0=yes) / partner (q0bi=yes) had extra income of $Y per year, for the next year, would you be willing to pay $**< H_K >** for your child to enroll in the prevention program for the first year?
Yes
No

[If Q0=yes or q0bi=yes]
[SHOW THE FOLLOWING DISPLAYS AND W10 If W1=NO or ifW2a =3]

Suppose that your spouse (if q0=yes) / partner (if q0bi=yes) personally had a new expense. For example, suppose that <**he/she**> felt obligated to give financial help to a relative on <**his/her**> side of the family, or that <**he/she>** had an expensive medical procedure, or that <**he/she**> lost money on an investment that <**he/she**> personally had made. Suppose that the total cost to your spouse (if q0=yes) / partner (if q0bi=yes) is $X per year, for the next year.

At the same time, suppose that you unexpectedly received an extra $Y of income per year for the next year, from some source.

[IF Q9=MAN, USE SHE/HER IN PREVIOUS PARAGRAPH. IF Q9=WOMAN, USE HE/HIS.]

[Please randomize $X so that 50% of respondents get X = 2% of lower limit of answer to SD6, and 50% get X = 10% of lower limit to answer to SD6, given that lower limit is at least $5000. If the lower limit is less than $5000, set $X = $500.] Please randomize $Y so that 50% get Y=0.5X and 50% get Y=1.5X.

[Display]
Now please consider whether these changes in your family’s finances would affect whether you would enroll your child in the heart disease prevention program.

[radio]
[PROMPT IF SKIP]

W10. If your spouse (q0=yes) / partner (q0bi=yes) had extra expenses of $X per year and you had extra income of $Y per year, for the next year, would you be willing to pay $< **H_K** > every year for your child to enroll in the prevention program?
Yes
No

Next screen

[IF Q0=NO AND Q0BI=NO, SURVEY IS FINISHED]
[if Q0=yes or Qobi=YES, show sd7a or B and sd9]

We have just two more questions.

[RADIO]
[IF Q0=YES]
SD7a. Who takes primary responsibility for making health care decisions for your child?
You
Your spouse
You and your spouse jointly
Someone else

[RADIO]
[IF Q0=NO AND Q0BI=YES]
SD7b. Who takes primary responsibility for making health care decisions for your child?
You
Your partner
You and your partner jointly
Someone else

[NUMBER BOX]
SD9. What is the largest amount of money that you would be willing to spend on yourself during one month, without consulting your spouse (if q0=yes) / partner (if q0bi=yes)?

Appendix D: Additional Description of Data

This appendix provides additional documentation about the survey data collected. First, three issues related to data quality are documented. Second, summary statistics for all variables are presented. Third, definitions of variables are presented.

The first data quality issue is that 27 respondents failed to report family income on the survey question SD6. For these 27 respondents, family income from the KN profile data was substituted. A dummy variable indicates the cases for which this occurred.

The second data quality issue is that 27 respondents reported a value for their own gender in survey question Q9 that does not match the KN information on their gender recorded in the KN profile variable PPGENDER. (Only 1 of these 27 also failed to report family income.) Among these cases, 14 occur in the sample of matched pairs of married parents, generating the contradiction that 14 same-sex couples produced a mutual biological child. In each of these 14 cases, the spouse or partner of the individual with inconsistent gender information has the same gender recorded in response to Q9 as in the KN profile. Also, in each of these cases, the KN profile information on gender would imply a couple of opposite-sex individuals. Therefore for these cases it would appear almost certain that the information in the KN profile must be correct, and the response to Q9 incorrect.

Moreover, since 14 of 14 cases in the matched pairs favor the accuracy of the KN profile variable over the Q9 response, it is assumed in constructing the data that the other 13 cases of discrepancies be resolved in favor of the KN profile data. In summary, for all 27 cases in which the response to Q9 does not match the KN profile gender variable, the Q9 response is replaced with the KN variable PPGENDER to generate the variable pp_pmale that denotes parent gender. These cases are marked by a dummy variable indicating the presence of a gender discrepancy.

One feature of the design of the computerized survey may have contributed to the apparently inaccurate gender response in 27 cases is that the “Back” button in the web browser was disabled in the survey. This feature enabled the investigators to control the order in which information was presented and questions answered. For example, it ensured that respondents did in fact report their initial risk assessments before receiving information about average risks and risk factors. But, respondents who mistakenly selected the wrong gender would be unable to go back and correct their answers if they wanted to do so.

The third data quality issue was discussed in Chapter 7. About three dozen parents who were sampled as part of the “single parent” stratum reported on the survey that they were married and living with their spouses.

Table C.1 below reports summary statistics. Definitions for the variables are presented in Table C.2.

Table C.1. Summary statistics for variables. (See Table C.2 for definitions.)

Variable	Obs	Mean	Std. Dev.	Min	Max
hhno	3155	295770.1	76466.12	180	393832
pp_pmale	3155	.3426307	.4746644	0	1
mno	3155	690311.6	204989.9	353	942861
group	3155	2.147385	.6658787	1	3
caseid	3155	1819.004	1323.451	2	4352
duration	3155	1782.573	7212.88	8	73370
main_study	3155	.8399366	.366723	0	1
single	3155	.1587956	.3655433	0	1
married0	3155	.8412044	.3655433	0	1
matched	3155	.3061807	.4609788	0	1
married	3155	.8472266	.3598259	0	1
partner	3155	.0288431	.1673919	0	1
weight2	2672	1.000041	1.140676	.11	7.71
weight3	966	1.000062	.8922113	.15	5.11
time_with	3155	3.823455	1.865539	0	6
marr_prev	3155	.2399366	.4271122	0	1
divorced	3155	.1030111	.3040216	0	1
n_marriages	3155	.4231379	.8144445	0	4
ppmarit	3155	1.477655	1.204669	1	6
hhsize	3155	4.263391	1.246189	2	14
nkids_0117	3155	2.109984	1.059252	1	11
nkids	2672	4.238024	1.109608	3	12
nkids_01	3155	.0700475	.2626142	0	2
nkids_25	3155	.3125198	.5785906	0	3
nkids_612	3155	1.058954	.8596932	0	5
nkids_1317	3155	.6684628	.7792514	0	4
nadults	3155	2.153407	.7099597	1	9
resp_decide	3155	.2136292	.4099329	0	1
sps_decide	3155	.0396197	.1950948	0	1
both_decide	3155	.6212361	.4851561	0	1
max_spend_~f	2703	1086.956	27398.54	0	1000000
hh_head	3155	.9122029	.2830445	0	1
eth_wht	3155	.7873217	.4092668	0	1
eth_blk	3155	.0662441	.2487477	0	1
eth_oth	3155	.0424723	.201696	0	1
eth_his	3155	.0751189	.2636248	0	1
eth_two	3155	.0288431	.1673919	0	1
sch_less	3155	.0098257	.098652	0	1
sch_hs	3155	.1242472	.3299157	0	1
sch_ged	3155	.0304279	.1717888	0	1
sch_some	3155	.3087163	.462037	0	1
sch_coll	3155	.3226624	.4675689	0	1
sch_grad	3155	.2041204	.4031213	0	1
ppeduc	3155	11.21046	1.560679	3	14

ppage	3155	41.98035	6.503177	22	55
page	3155	42.07956	6.505864	20	55
gender_dis~p	3155	.0088748	.0938021	0	1
kage	3155	11.08273	3.308748	6	16
kmale	3155	.5150555	.4998525	0	1
ownhome	3155	.8415214	.3652471	0	1
employed	3155	.7448494	.4360149	0	1
earn	3155	6.074802	4.259882	-1	17
inc	3155	9.981933	3.675053	1	17
earn_miss	3155	.0053883	.0732184	0	1
earn_0	3155	.2608558	.439171	0	1
earn_5	3155	.0152139	.1224224	0	1
earn_10	3155	.0383518	.1920746	0	1
earn_20	3155	.066878	.2498501	0	1
earn_30	3155	.0760697	.2651517	0	1
earn_40	3155	.0855784	.2797849	0	1
earn_50	3155	.0919176	.2889554	0	1
earn_60	3155	.081775	.274065	0	1
earn_70	3155	.066561	.2492997	0	1
earn_80	3155	.0453249	.2080487	0	1
earn_90	3155	.0396197	.1950948	0	1
earn_100	3155	.0272583	.162861	0	1
earn_125	3155	.0488114	.2155077	0	1
earn_150	3155	.0202853	.1409967	0	1
earn_175	3155	.0129952	.1132715	0	1
earn_200	3155	.0047544	.0687987	0	1
earn_top	3155	.0123613	.1105097	0	1
inc_miss	3155	.0085578	.0921265	0	1
inc_0	3155	.0082409	.0904188	0	1
inc_5	3155	.0085578	.0921265	0	1
inc_10	3155	.0104596	.101752	0	1
inc_20	3155	.0364501	.1874369	0	1
inc_30	3155	.0576862	.2331861	0	1
inc_40	3155	.0744849	.2626001	0	1
inc_50	3155	.0896989	.2857952	0	1
inc_60	3155	.0928685	.290294	0	1
inc_70	3155	.0792393	.2701547	0	1
inc_80	3155	.0776545	.2676696	0	1
inc_90	3155	.0849445	.2788433	0	1
inc_100	3155	.0795563	.2706479	0	1
inc_125	3155	.1201268	.3251613	0	1
inc_150	3155	.074168	.2620856	0	1
inc_175	3155	.0399366	.1958413	0	1
inc_200	3155	.0253566	.1572306	0	1
inc_top	3155	.0405705	.1973243	0	1
ue_comp	3155	.0497623	.2174879	0	1
child_suppt	3155	.0881141	.2835057	0	1

alimony	3155	.0044374	.0664764	0	1
dividends	3155	.1106181	.3137083	0	1
interest	3155	.1597464	.3664288	0	1
soc_sec	3155	.0431062	.2031283	0	1
welfare	3155	.0158479	.1249066	0	1
gifts	3155	.0925515	.2898488	0	1
anyother	3155	.0941363	.2920645	0	1
nonlabor_inc	3155	.4136292	.4925616	0	1
sources	3155	.6583201	.9265459	0	4
smk_nev	3155	.6732171	.4691115	0	1
smk_evr	3155	.3267829	.4691115	0	1
smk_dly	3155	.1103011	.3133144	0	1
smk_fmr	3155	.2031696	.4024215	0	1
smk_cur	3155	.1236133	.3291921	0	1
smk_status	3155	1.560697	.9669764	1	4
quit_1	3155	.01458	.1198833	0	1
quit_5	3155	.0456418	.2087402	0	1
quit_10	3155	.044374	.2059573	0	1
quit_15	3155	.037401	.1897723	0	1
quit_20	3155	.0244057	.1543296	0	1
quit_top	3155	.036767	.1882192	0	1
quit_when	641	3.599064	1.565227	1	6
smk_me_q	348	2.218391	1.006323	1	5
mra_wrng	3155	.1166403	.321042	0	1
mra_ref	3155	.0025357	.0502994	0	1
mra_not	3155	.1191759	.3240467	0	1
lc_get	3153	51.43229	23.06065	0	100
lc_die_c	3150	54.8927	23.73254	0	100
lc_die_u	3153	29.73565	20.36555	0	100
lc_get_50	3155	.1388273	.345821	0	1
lc_die_c_50	3155	.1977813	.3983895	0	1
heard_read	3155	.9207607	.2701547	0	1
know_pers	3155	.7635499	.424969	0	1
pthought	3155	.6865293	.4639774	0	1
kthought	3155	.3429477	.4747694	0	1
pcad_get0	3154	35.71465	22.23554	0	100
pcad_get1	3154	33.59226	19.41563	0	100
pcad_die_c	3142	31.67823	19.98485	0	100
pcad_die_u	3142	12.24928	13.36656	0	100
pcad_get0_50	3155	.1534073	.3604368	0	1
pcad_get1_50	3155	.0973059	.2964208	0	1
pcad_die_~50	3155	.1213946	.3266371	0	1
previse	3155	.4475436	.4973195	0	1
prevdown	3155	.2415214	.4280735	0	1
prevision	3154	-2.122384	12.46835	-75	60
kcad_get0	3155	28.14739	19.73491	0	100
kcad_get1	3155	24.22314	15.25614	0	100
kcad_die_c	3149	25.51318	17.5282	0	100

kcad_die_u	3149	7.308349	8.710467	0	89
kcad_get0_50	3155	.1413629	.3484508	0	1
kcad_get1_50	3155	.0706815	.2563326	0	1
kcad_die_~50	3155	.0941363	.2920645	0	1
krevise	3155	.4729002	.4993442	0	1
krevdown	3155	.2992076	.4579835	0	1
krevision	3155	-3.924247	13.09108	-90	50
know_pain	3155	.9137876	.2807219	0	1
know_sb	3155	.9606973	.194345	0	1
know_lmt	3155	.948336	.2213829	0	1
know_med	3155	.9787639	.1441934	0	1
pfam_hd	3155	.5391442	.4985444	0	1
othbiofam_hd	3155	.3901743	.4878665	0	1
kfam_hd	3155	.6706815	.4700403	0	1
othbio_cad	3155	.0117274	.1076734	0	1
othbio_ang	3155	.0069731	.0832264	0	1
othbio_mci	3155	.0126783	.1118996	0	1
phlth_e	3155	.140729	.3477969	0	1
phlth_v	3155	.4393027	.4963808	0	1
phlth_g	3155	.341046	.4741359	0	1
phlth_f	3155	.0725832	.2594922	0	1
phlth_p	3155	.0063391	.0793786	0	1
khlth_e	3155	.5283677	.4992738	0	1
khlth_v	3155	.3587956	.4797231	0	1
khlth_g	3155	.0998415	.2998361	0	1
khlth_f	3155	.0117274	.1076734	0	1
khlth_p	3155	.0009509	.0308264	0	1
phlth	3155	3.635499	.8345777	1	5
khlth	3154	4.402346	.7226178	1	5
phbp	3155	.2564184	.4367247	0	1
phbp_med	3155	.118542	.3233	0	1
pcholesterol	3155	.2618067	.4396876	0	1
pchol_med	3155	.0871632	.2821188	0	1
pdiabetes	3155	.0500792	.2181431	0	1
pdiab_med	3155	.0361331	.1866509	0	1
pdiab_age	158	3.987342	1.070671	1	6
khbp	3155	.0259905	.1591321	0	1
kcholesterol	3155	.0199683	.1399135	0	1
kdiabetes	3155	.0041204	.0640685	0	1
kdiab_med	3155	.0031696	.0562186	0	1
pheight	3153	68.04377	4.014171	56	82
pweight	3152	204.4734	45.16174	120	330
pbmi	3152	29.60945	6.541236	16	59
kheight	3148	61.37357	8.486268	32	80
kweight	3149	115.6653	43.81625	30	320
kbmi	3148	21.7716	5.267089	10	66
pexercise	3154	1.620482	.7527762	1	3

pfrtveg	3153	1.529337	.6148378	1	3
pdiet	3154	2.95149	.6032942	1	4
kexercise	3154	2.080533	.7131462	1	3
kfrtveg	3154	1.591947	.616363	1	3
kdiet	3154	2.962904	.5983007	1	4
late_amt	3155	128.4881	26.06525	102	180
prefer_100	3155	.7248811	.4466449	0	1
pcad_get2	3155	24.90396	17.49876	0	90
kcad_get2	3155	11.58796	11.19284	0	80
h_par_35	3155	.059588	.2367594	0	1
h_par_60	3155	.0354992	.1850672	0	1
h_par_70	3155	.1968304	.3976661	0	1
h_kid_40	3155	.0535658	.2251945	0	1
h_kid_65	3155	.0538827	.2258219	0	1
h_kid_80	3155	.40729	.4914076	0	1
h_kid_90	3155	.0526149	.2232988	0	1
d_par	3155	.2507448	.2464817	.1	.7
d_kid	3155	.5161648	.2924491	.2	.9
pfirst	3155	.503962	.5000636	0	1
kfirst	3155	.496038	.5000636	0	1
price	3155	55.60856	51.34288	5	160
pbuy	3153	.4243578	.4943235	0	1
pbuy_miss	3155	.0006339	.0251737	0	1
pbuy_cert	3152	.9530457	1.186383	0	3
pbuy_probdef	3155	.3762282	.4845152	0	1
pbuy_def	3155	.1521395	.359213	0	1
kbuy	3151	.4608061	.4985406	0	1
kbuy_miss	3155	.0012678	.0355896	0	1
kbuy_cert	3147	1.023832	1.196681	0	3
kbuy_probdef	3155	.3984152	.4896494	0	1
kbuy_def	3155	.1638669	.3702134	0	1
think_spsa~e	2763	.9268911	.2603624	0	1
dwifexp	2764	.4345152	.4957829	0	1
dwifdoll	2758	494.5794	7148.019	-20000	30000
dwifprop	2696	.0068249	.0768084	-.1	.15
dwifdown	2764	.2192475	.4138115	0	1
dwifup	2764	.2673661	.4426651	0	1
dhusdoll	2758	-586.3307	6945.799	-20000	30000
dhusprop	2696	-.0075297	.0753863	-.1	.15
dhusdown	2764	.2832851	.4506752	0	1
dhusup	2764	.213097	.4095697	0	1
d_hhinc_pos	2764	.4815485	.4997498	0	1
kbuydz	2761	.4313654	.4953566	0	1
dbuy_dz	2758	-.0130529	.3218159	-1	1
w3a_1	1452	.6928375	.4614763	0	1
w3a_2	1452	.5020661	.500168	0	1
w3a_3	1452	.3312672	.4708311	0	1
w3a_4	1452	.0750689	.2635932	0	1

w3a_5	1452	.0571625	.2322329	0	1
w3a_ref	1452	.0061983	.0785122	0	1
w4a_1	1699	.256033	.4365687	0	1
w4a_2	1699	.2054149	.4041235	0	1
w4a_3	1699	.1665686	.3726999	0	1
w4a_4	1699	.4914656	.5000743	0	1
w4a_5	1699	.1954091	.396632	0	1
w4a_6	1699	.0876986	.2829394	0	1
w4a_7	1699	.256033	.4365687	0	1
w4a_8	1699	.1353737	.3422231	0	1
w4a_9	1699	.1389052	.3459494	0	1
w4a_10	1699	.3042966	.4602444	0	1
w4a_ref	1699	.0029429	.0541846	0	1
w7_1	1338	.7518685	.4320901	0	1
w7_2	1338	.3490284	.4768412	0	1
w7_3	1338	.2174888	.412692	0	1
w7_4	1338	.1263079	.3323203	0	1
w7_5	1338	.0866966	.2814951	0	1
w7_6	1338	.0074738	.0861599	0	1
w8_1	1815	.1630854	.3695454	0	1
w8_2	1815	.1785124	.383049	0	1
w8_3	1815	.507438	.5000825	0	1
w8_4	1815	.2165289	.4119923	0	1
w8_5	1815	.092011	.2891212	0	1
w8_6	1815	.2429752	.4289984	0	1
w8_7	1815	.1570248	.3639244	0	1
w8_8	1815	.1570248	.3639244	0	1
w8_9	1815	.2958678	.4565576	0	1
w8_10	1815	.0016529	.0406334	0	1

Table C.2 Definitions of Variables.

variable name	storage type	display format	value label	variable label
hhno	long	%12.0g		household id
pp_pmale	byte	%8.0g		parent male based on ppgender
mno	long	%12.0g		member number
group	byte	%8.0g	GROUP	data source
caseid	int	%8.0g		case id
duration	long	%12.0g		interview duration in minutes
main_study	byte	%8.0g	MAIN_STU	not soft launch
single	byte	%8.0g	LABA	stratum = single parent
married0	byte	%8.0g	LABA	strata = married parent (both unmatched and matched)
matched	byte	%8.0g	LABA	stratum = matched married parent
married	byte	%8.0g	LABA	married & live with spouse q0
partner	byte	%8.0g	LABA	now live with partner q0bi
weight2	double	%10.0g		single/married parents scaled weights
weight3	double	%10.0g		matched married parents weights
time_with	byte	%8.0g	TIME_WIT	how long with current spouse or partner
marr_prev	byte	%8.0g	LABA	married previously q0b q0c
divorced	byte	%8.0g	LABA	married previously & not currently married
n_marriages	byte	%8.0g	N_MARRIA	number of times married q0d
ppmarit	byte	%8.0g	PPMARIT	marital status
hhsize	byte	%8.0g	LABB	household size
nkids_0117	byte	%8.0g		number kids in hh based on kn profile info
nkids	byte	%8.0g	NKIDS	q1 number of kids live with you in hh now
nkids_01	byte	%8.0g	LABB	presence of household members - children 0-1
nkids_25	byte	%8.0g	LABB	presence of household members - children 2-5
nkids_612	byte	%8.0g	LABB	presence of household members - children 6-12
nkids_1317	byte	%8.0g	LABB	presence of household members - children 13-17
nadults	byte	%8.0g	LABB	presence of household members - adults 18+
resp_decide	byte	%8.0g	LABC	sd7 respondent mainly decides child health care
sps_decide	byte	%8.0g	LABC	sd7 spouse or partner mainly decides child health care
both_decide	byte	%8.0g	LABC	sd7 respondent and spouse joinly decide child health care
max_spend_self	long	%12.0g		sd9 max dollars/month spend on self without consult spouse
hh_head	byte	%8.0g	HH_HEAD	household head
eth_wht	byte	%8.0g	LABA	white, not hispanic
eth_blk	byte	%8.0g	LABA	black, not hispanic
eth_oth	byte	%8.0g	LABA	other, not hispanic
eth_his	byte	%8.0g	LABA	hispanic
eth_two	byte	%8.0g	LABA	two or more races not hispanic
sch_less	byte	%8.0g	LABA	less than hs
sch_hs	byte	%8.0g	LABA	high school grad
sch_ged	byte	%8.0g	LABA	ged

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sch_some          byte   %8.0g        LABA       some college incl 2-yr degree
sch_coll          byte   %8.0g        LABA       college grad 4-yr
sch_grad          byte   %8.0g        LABA       graduate or professional degree
ppeduc            byte   %8.0g        PPEDUC     education (highest degree
                                                   received)
ppage             byte   %8.0g        LABB       age
page              byte   %8.0g                   parent age q8b
gender_discrep    byte   %8.0g        LABA       discrepancy between gender q9 and
                                                   ppgender
kage              byte   %8.0g                   child age q6
kmale             byte   %8.0g        LABA       child male q7
ownhome           byte   %8.0g        LABA       own or buying home
employed          byte   %8.0g        LABA       parent employed sd2
earn              byte   %8.0g        EARN       sd3 labor earnings
inc               byte   %8.0g                   sd6 or ppincimp household income
earn_miss         byte   %8.0g        LABD       refused sd3 labor earnings
earn_0            byte   %8.0g        LABD       labor earnings zero
earn_5            byte   %8.0g        LABD       labor earnings > 0 but < 5000
earn_10           byte   %8.0g        LABD       labor earnings 5 to < 10 k
earn_20           byte   %8.0g        LABD       labor earnings 10 to < 20 k
earn_30           byte   %8.0g        LABD       labor earnings 20 to < 30 k
earn_40           byte   %8.0g        LABD       labor earnings 30 to < 40 k
earn_50           byte   %8.0g        LABD       labor earnings 40 to < 50 k
earn_60           byte   %8.0g        LABD       labor earnings 50 to < 60 k
earn_70           byte   %8.0g        LABD       labor earnings 60 to < 70 k
earn_80           byte   %8.0g        LABD       labor earnings 70 to < 80 k
earn_90           byte   %8.0g        LABD       labor earnings 80 to < 90 k
earn_100          byte   %8.0g        LABD       labor earnings 90 to < 100 k
earn_125          byte   %8.0g        LABD       labor earnings 100 to < 125 k
earn_150          byte   %8.0g        LABD       labor earnings 125 to < 150 k
earn_175          byte   %8.0g        LABD       labor earnings 150 to < 175 k
earn_200          byte   %8.0g        LABD       labor earnings 175 to < 200 k
earn_top          byte   %8.0g        LABD       labor earnings > 200 k
inc_miss          byte   %8.0g        LABD       refused sd6 hh income
inc_0             byte   %8.0g        LABD       hh income zero
inc_5             byte   %8.0g        LABD       hh income > 0 but < 5000
inc_10            byte   %8.0g        LABD       hh income 5 to < 10 k
inc_20            byte   %8.0g        LABD       hh income 10 to < 20 k
inc_30            byte   %8.0g        LABD       hh income 20 to < 30 k
inc_40            byte   %8.0g        LABD       hh income 30 to < 40 k
inc_50            byte   %8.0g        LABD       hh income 40 to < 50 k
inc_60            byte   %8.0g        LABD       hh income 50 to < 60 k
inc_70            byte   %8.0g        LABD       hh income 60 to < 70 k
inc_80            byte   %8.0g        LABD       hh income 70 to < 80 k
inc_90            byte   %8.0g        LABD       hh income 80 to < 90 k
inc_100           byte   %8.0g        LABD       hh income 90 to < 100 k
inc_125           byte   %8.0g        LABD       hh income 100 to < 125 k
inc_150           byte   %8.0g        LABD       hh income 125 to < 150 k
inc_175           byte   %8.0g        LABD       hh income 150 to < 175 k
inc_200           byte   %8.0g        LABD       hh income 175 to < 200 k
inc_top           byte   %8.0g        LABD       hh income > 200 k
ue_comp           byte   %8.0g        LABD       received unempl compensation past
                                                   year sd4
child_suppt       byte   %8.0g        LABD       received child support past year
                                                   sd4
alimony           byte   %8.0g        LABD       received alimony past year sd4
dividends         byte   %8.0g        LABD       received divident income past
                                                   year sd4
interest          byte   %8.0g        LABD       received interest income past
                                                   year sd4
```

soc_sec	byte	%8.0g	LABD	received social security income past year sd4
welfare	byte	%8.0g	LABD	received income from welfare past year sd4
gifts	byte	%8.0g	LABD	received gift income past year sd4
anyother	byte	%8.0g	LABD	received any other nonlabor income past year sd4
nonlabor_inc	byte	%8.0g	LABD	have any source personal nonlabor income
sources	byte	%8.0g		sd4 number of itemized sources personal nonlabor income
smk_nev	byte	%8.0g	LABE	smoked 0 or no more than 100 cigs
smk_evr	byte	%8.0g	LABE	smoked more than 100 cigs
smk_dly	byte	%8.0g	LABE	smoked daily past month
smk_fmr	byte	%8.0g	LABE	have stopped smoking altogether
smk_cur	byte	%8.0g	LABE	ever smoker have not quit altogether
smk_status	byte	%8.0g	SMK_STAT	smoking status indicator
quit_1	byte	%8.0g	LABE	quit smoking within past year
quit_5	byte	%8.0g	LABE	quit smoking 1 to 5 yrs ago
quit_10	byte	%8.0g	LABE	quit smoking 6 to 10 yrs ago
quit_15	byte	%8.0g	LABE	quit smoking 11-15 yrs ago
quit_20	byte	%8.0g	LABE	quit smoking 16 to 20 yrs ago
quit_top	byte	%8.0g	LABE	quit smoking > 20 yrs ago
quit_when	byte	%8.0g	QUIT_WHE	how long ago quit ordinal s9
smk_me_q	byte	%8.0g	SMK_ME_Q	daily consumption of respondent ordinal s7
mra_wrng	byte	%8.0g	LABA	wrong answer, chose ms b
mra_ref	byte	%8.0g	LABA	no answer ,mr a vs ms b
mra_not	byte	%8.0g	LABA	not right on mr a - wrong or refused
lc_get	byte	%8.0g		how many smokers out of 100...would get lung cancer?
lc_die_c	byte	%8.0g		of 100 smokers...with lung cancer, how many would die....?
lc_die_u	double	%10.0g		(lc_get) * (lc_die_c) = implied unconditional death risk lung cancer
lc_get_50	byte	%8.0g	LABF	lung cancer morbidity risk estimate = 50
lc_die_c_50	byte	%8.0g	LABF	lung cancer conditional mortality risk estimate = 50
heard_read	byte	%8.0g	LABG	h1 ever heard or read re coronary artery disease etc
know_pers	byte	%8.0g	LABG	h2 know personally one with cad or heart attack
pthought	byte	%8.0g	LABG	h4 thought re possibility parent might get cad, heart attack
kthought	byte	%8.0g	LABG	h11 thought re possibility child might get cad, heart attack
pcad_get0	byte	%8.0g		h10 parent initial perceived risk of getting cad
pcad_get1	byte	%8.0g		r1 parent revised perceived risk of getting cad
pcad_die_c	byte	%8.0g		r1a parent perceived risk of dying conditional on cad
pcad_die_u	double	%10.0g		(kcad_get1)*(kcad_die_c) = implied unconditional death risk

pcad_get0_50	byte	%8.0g	LABG	parent initial risk estimate for self = 50%
pcad_get1_50	byte	%8.0g	LABG	parent revised risk estimate for self = 50%
pcad_die_c_50	byte	%8.0g	LABG	parent death risk estimate for self = 50%
previse	byte	%8.0g	LABG	parent revised initial risk estimate for self
prevdown	byte	%8.0g	LABG	parent revised risk of cad < initial risk
prevision	byte	%8.0g		parent revised minus initial risk cad
kcad_get0	byte	%8.0g		h15 child's risk of getting cad as initially perceived by parent
kcad_get1	byte	%8.0g		r2 child's risk of getting cad from parent's revised risk perception
kcad_die_c	byte	%8.0g		r2a child's risk of dying conditional on cad as perceived by parent
kcad_die_u	double	%10.0g		
kcad_get0_50	byte	%8.0g	LABG	iinitial risk estimate for child = 50%
kcad_get1_50	byte	%8.0g	LABG	revised risk estimate for child = 50%
kcad_die_c_50	byte	%8.0g	LABG	death risk estimate for child = 50%
krevise	byte	%8.0g	LABG	parent revised initial risk estimate for child
krevdown	byte	%8.0g	LABG	child revised risk of cad < initial risk
krevision	byte	%8.0g		child revised minus initial risk cad
know_pain	byte	%8.0g	LABG	l1 can cad cause chest pain
know_sb	byte	%8.0g	LABG	l2 can cad cause shortness of breath
know_lmt	byte	%8.0g	LABG	l2a can cad limit activities
know_med	byte	%8.0g	LABG	l3 can cad cause increase need for med
pfam_hd	byte	%8.0g	LABH	f1 respondent knows of blood relative with cad
othbiofam_hd	byte	%8.0g	LABH	f3 respondent knows of other bio parent blood relative with cad
kfam_hd	byte	%8.0g	LABH	respondent knows of kid blood relative with cad
othbio_cad	byte	%8.0g	LABA	other bio parent diagnosed cad q12
othbio_ang	byte	%8.0g	LABA	other bio parent angina q12
othbio_mci	byte	%8.0g	LABA	other bio parent heart attack (myocardial infarction) q12
phlth_e	byte	%8.0g	LABH	parent health excellent (evgfp)
phlth_v	byte	%8.0g	LABH	parent health very good (evgfp)
phlth_g	byte	%8.0g	LABH	parent health good (evgfp)
phlth_f	byte	%8.0g	LABH	parent health fair (evgfp)
phlth_p	byte	%8.0g	LABH	parent health poor (evgfp)
khlth_e	byte	%8.0g	LABH	child health excellent (evgfp)
khlth_v	byte	%8.0g	LABH	child health very good (evgfp)
khlth_g	byte	%8.0g	LABH	child health good (evgfp)
khlth_f	byte	%8.0g	LABH	child health fair (evgfp)

khlth_p	byte	%8.0g	LABH	child health poor (evgfp)
phlth	byte	%8.0g	LABI	c1 parent health (reverse coded) e-vg-g-f-p
khlth	byte	%8.0g	LABI	c2 child health (reverse coded) e-vg-g-f-p
phbp	byte	%8.0g	LABJ	c3-c3a parent told high blood pressure
phbp_med	byte	%8.0g	LABJ	c3b parent taking medication for high blood pressure
pcholesterol	byte	%8.0g	LABJ	c5 parent told high cholesterol
pchol_med	byte	%8.0g	LABJ	c6 parent taking medication for cholesterol
pdiabetes	byte	%8.0g	LABJ	c8-c8a parent told diabetes
pdiab_med	byte	%8.0g	LABJ	c10 parent taking medication for diabetes
pdiab_age	byte	%8.0g	PDIAB_AG	c9 age when parent diagnosed diabetes
khbp	byte	%8.0g	LABJ	c4 told child high blood pressure
kcholesterol	byte	%8.0g	LABJ	c7 told child cholesterol
kdiabetes	byte	%8.0g	LABJ	c11 told child has diabetes
kdiab_med	byte	%8.0g	LABJ	c12 child taking medication for diabetes
pheight	byte	%8.0g		parent height in inches as lower limit of c13
pweight	int	%8.0g		parent weight in pounds as upper limit of c14
pbmi	byte	%8.0g		parent bmi as reported to parent in survey
kheight	byte	%8.0g		child height in inches as lower limit of c15
kweight	int	%8.0g		child weight in pounds as upper limit of c16
kbmi	byte	%8.0g		child bmi as reported to parent in survey
pexercise	byte	%8.0g	LABK	e1a parent exercise relative to aha recs
pfrtveg	byte	%8.0g	LABK	d2a parent fruit & veg relative to aha recs
pdiet	byte	%8.0g	LABL	d1 reverse coded parent healthiness of diet
kexercise	byte	%8.0g	LABK	e2a child exercise relative to aha recs
kfrtveg	byte	%8.0g	LABK	d3a child fruit & veg relative to aha recs
kdiet	byte	%8.0g	LABL	d2 reverse coded child healthiness of diet
late_amt	int	%8.0g		larger later amount in 13 mos vs. $100 in 1 mo
prefer_100	byte	%8.0g	LABD	w11 prefer $100 in 1 mo to late_amt in 13 mos
pcad_get2	byte	%8.0g		parent cad risk if take vaccine
kcad_get2	byte	%8.0g		child cad risk if take vaccine
h_par_35	byte	%8.0g	LABM	parent risk reduction 35% (soft launch only)
h_par_60	byte	%8.0g	LABM	parent risk reduction 60% (soft launch only)
h_par_70	byte	%8.0g	LABM	parent risk reduction 70% (main study only)
h_kid_40	byte	%8.0g	LABM	child risk reduction 40% (soft launch only)

h_kid_65	byte	%8.0g	LABM	child risk reduction 65% (soft launch only)
h_kid_80	byte	%8.0g	LABM	child risk reduction 80% (main study only)
h_kid_90	byte	%8.0g	LABM	child risk reduction 90% (soft launch only)
d_par	double	%10.0g		parent proportional risk reduction
d_kid	double	%10.0g		child proportional risk reduction
pfirst	byte	%8.0g	LABM	order, parent wtp question before child
kfirst	byte	%8.0g	LABM	order, child wtp question before parent
price	int	%8.0g		annual cost of vaccine ($2010-2011)
pbuy	byte	%8.0g	LABM	would buy vaccine for self (w5a)
pbuy_miss	byte	%8.0g	LABM	refused wtp question for self
pbuy_cert	byte	%8.0g	LABN	ordinal how certain would buy vaccine for parent (w6a)
pbuy_probdef	byte	%8.0g	LABM	would probably or definitely buy vaccine for self
pbuy_def	byte	%8.0g	LABM	would definitely buy vaccine for self
kbuy	byte	%8.0g	LABM	would buy vaccine for child (w1)
kbuy_miss	byte	%8.0g	LABM	refused wtp question for kid
kbuy_cert	byte	%8.0g	LABN	ordinal how certain would buy vaccine for kid (w2a)
kbuy_probdef	byte	%8.0g	LABM	would probably or definitely buy vaccine for kid
kbuy_def	byte	%8.0g	LABM	would definitely buy vaccine for kid
think_spsagree	byte	%8.0g	LABM	think spouse/partner would agree with buy_kid
dwifexp	byte	%8.0g	DWIFEXP	identifies whether wife or husband had expense increase
dwifdoll	int	%8.0g		signed dollar change in wife income (+) or expense (-)
dwifprop	double	%10.0g	LABO	signed redistribution to (+)/from(-) wife as proprotion of hh income
dwifdown	byte	%8.0g	LABP	dummy wife expense increase 2% or >= 10% of hh income
dwifup	byte	%8.0g	LABQ	dummy wife income increase 0.5 or 1.5 times husband expense increase
dhusdoll	int	%8.0g		signed dollar change in husband income (+) or expense (-)
dhusprop	double	%10.0g	LABO	signed redistribution to (+)/from(-) husband as proprotion of hh income
dhusdown	byte	%8.0g	LABP	dummy husband income increase 0.5 or 1.5 times wife expense increase
dhusup	byte	%8.0g	LABQ	
d_hhinc_pos	byte	%8.0g	LABR	income increase exceeds expense increase
kbuydz	byte	%8.0g	LABR	would buy vaccine for child after redistribution
dbuy_dz	byte	%8.0g	DBUY_DZ	buy vaccine after vs. before redistribution

w3a_1	byte	%8.0g	W3A_1	* [the risk reduction is worth the expense.] which of the following reasons best d
w3a_2	byte	%8.0g	W3A_2	* [it's important to start young to reduce heart disease risk.] which of the foll
w3a_3	byte	%8.0g	W3A_3	* [i would spend whatever it takes to reduce my child] which of the following reas
w3a_4	byte	%8.0g	W3A_4	* [the program is better than other ways of reducing heart disease risk.] which of
w3a_5	byte	%8.0g	W3A_5	* [some other reason.] which of the following reasons best describes why you would
w3a_ref	byte	%8.0g	W3A_REF	* [refused] which of the following reasons best describes why you would put your c
w4a_1	byte	%8.0g	W4A_1	* [the risk reduction is too far in the future to justify the expense.] which of t
w4a_2	byte	%8.0g	W4A_2	* [my child might not stay on the program as an adult, so there is no sense paying
w4a_3	byte	%8.0g	W4A_3	* [there are other ways to spend money, including on health, that are better than
w4a_4	byte	%8.0g	W4A_4	* [my child can reduce heart disease risks without the program.] which of the foll
w4a_5	byte	%8.0g	W4A_5	* [i dont believe that the prevention program would really work as described.] whi
w4a_6	byte	%8.0g	W4A_6	* [the program is too expensive.] which of the following reasons best describes wh
w4a_7	byte	%8.0g	W4A_7	* [i'm not that worried about my child] which of the following reasons best descri
w4a_8	byte	%8.0g	W4A_8	* [i already do enough to protect my child against heart disease.] which of the fo
w4a_9	byte	%8.0g	W4A_9	* [i cannot afford the program] which of the following reasons best describes why
w4a_10	byte	%8.0g	W4A_10	* [some other reason.] which of the following reasons best describes why you would
w4a_ref	byte	%8.0g	W4A_REF	* [refused] which of the following reasons best describes why you would not put yo
w7_1	byte	%8.0g	W7_1	* [the risk reduction is worth the expense.] which of the following reasons best d
w7_2	byte	%8.0g	W7_2	* [it’s important to start young to reduce heart disease risk.] which of the foll
w7_3	byte	%8.0g	W7_3	* [i would spend whatever it takes to reduce my heart disease risk.] which of the

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w7_4            byte   %8.0g      W7_4     * [the program is better than other
                                             ways of reducing heart disease
                                             risk.] which of
w7_5            byte   %8.0g      W7_5     * [some other reason.] which of the
                                             following reasons best
                                             describes why you would
w7_6            byte   %8.0g      W7_6     * [refused] which of the following
                                             reasons best describes why you
                                             would choose to
w8_1            byte   %8.0g      W8_1     * [the risk reduction is too far in
                                             the future to justify the
                                             expense.] which of t
w8_2            byte   %8.0g      W8_2     * [there are other ways to spend
                                             money, including on health,
                                             that are better than
w8_3            byte   %8.0g      W8_3     * [i can reduce heart disease risks
                                             without the program.] which of
                                             the following r
w8_4            byte   %8.0g      W8_4     * [i don't believe that the
                                             prevention program would really
                                             work as described.] wh
w8_5            byte   %8.0g      W8_5     * [the program is too expensive.]
                                             which of the following reasons
                                             best describes wh
w8_6            byte   %8.0g      W8_6     * [i'm not that worried about my
                                             heart disease risk.] which of
                                             the following reaso
w8_7            byte   %8.0g      W8_7     * [i already do enough to protect
                                             myself against heart disease.]
                                             which of the foll
w8_8            byte   %8.0g      W8_8     * [i cannot afford the program]
                                             which of the following reasons
                                             best describes why
w8_9            byte   %8.0g      W8_9     * [some other reason.] which of the
                                             following reasons best
                                             describes why you would
w8_10           byte   %8.0g      W8_10    * [refused] which of the following
                                             reasons best describes why you
                                             would not partic
                                           * indicated variables have notes
```