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Health in the Family: Collective Rationality and Risk Perceptions

by

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Abstract

Heart disease is a large problem in the United States and Canada. The research conducted in this thesis will examine three things. First, what is the average American parent's WTP for a reduction in their own and child risk of developing heart disease by age 75, and how do these two estimates compare and is it an efficient allocation of family resources? Second, what are the contributing factors for the purchase of a heart disease risk reduction program? Third, how do individuals perceive heart disease risk, and do they understand the risk factors associated with the development of this disease? It was discovered that the MWTP for a parent and their child were equal, and that demographic and health factors contribute to the purchase of a heart disease risk reduction program. Overall individuals were found to understand the risks of heart disease and were able to identify common risk factors.

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Chapter 1 Introduction: Heart Disease in America and the Motivation for this Research

Heart disease is growing problem, and the leading cause of death in the United States where today more than 27% of Americans develop this serious disease. Given the dangers of this disease and its impact on society, this research examines parents' willingness to pay (WTP) for a reduction in their own and their child's risk of developing heart disease by age 75[1]. WTP is defined as the amount of money it takes to make an individual indifferent between the status quo choice and the new choice, in this case a reduction in heart disease risk (Adamowicz et al. 2012). These WTP values can be used by policy makers, like the United States Environmental Protection Agency (EPA), in evaluating the economic benefits and costs of programs that reduce the risk of heart disease caused by externalities such as air pollution. Since little is known about how parents perceive their children's risks, we will then compare the parent and child WTP calculations to determine if health care decisions in the family are efficient.

The data used in this research were collected using a U.S. nationwide representative panel and a stated preference survey. In addition to the valuation of risk reductions, we will look to understand how individuals perceive risk. Many risk factors are associated with the development of heart disease. Risk perception estimates will be collected before the introduction of risk factor

[1] 75 years of age was selected because of its proximity to the average life expectancey of a U.S. citizen, age 78 (United States Census 2010).

information, so that unbiased assessments of the individual's perceived risk will be measured.

Lastly we will examine demographic and health variables collected in the survey to better understand which factors affect the purchase of the risk reduction program, and if parent's can correctly identify variables that affect their own and child's risk.

In this chapter the basic outline of the thesis will be discussed. First, background information regarding heart disease followed by a brief description of the economic problem, and the reason for this research, will be examined. Next a brief overview of the methods employed and hypothesis tested in this research will be discussed. Lastly, a section on thesis organization will explain the structure of the thesis.

1.1 Introduction: Methods and Hypothesis testing

Before WTP valuations can be calculated, economic models must be estimated. Bivariate probit models are used to estimate parameters for the WTP estimates as there are two binary choice questions. The first is for the purchase of the parent's own risk reduction program and a second for their purchase of the child's risk reduction program. Bivariate probit models generate more efficient estimates of parameters by assuming that unobserved factors in the errors of both equations may be correlated (Greene 2006). Multiple sets of bivariate probit models will be estimated, starting with a simple model used for WTP estimation, followed by more complex models involving demographic and health variables.

The more complex models will be used to understand the factors that contribute to the purchase of a risk reduction program.

To measure how characteristics of individuals affect their perceptions of heart disease risk, seemingly unrelated regression (SUR) will be estimated for the parent and child risk perception models. SUR models are used in a similar fashion to the bivariate probit, where the error terms are assumed to be correlated across equations (Greene 2006). These models will also contain demographic and health variables which will be used to see if individuals correctly identify behaviors, choices, and demographics that alter heart disease risk.

1.2 Introduction: Thesis Organization

This thesis is organized as follows. Chapter 2 discusses the background literature regarding heart disease, parent and child risk reduction choices, and the underlying theory of this thesis. Chapter 3 covers the background literature discussing how individuals perceive risk, including research on how to accurately measure risk perceptions, and how individuals modify their risk perceptions based on new information and preferences. In Chapter 4 the methods used in creating the survey, building the econometric models, and an explanation of the various tests conducted with the econometric output are discussed. In chapter 5 the data collected in the survey will be summarized. Chapter 6 presents the results of the WTP calculations, bivariate probit, and SUR regressions. Chapter 7 covers the conclusions of the research and discusses the contributions to the economic literature. Following Chapter 7, there will be two sections. The first will list the references used in this research and the second will consist of an appendix where the extra statistical models and survey will be attached.

Chapter 2 Background and Theory: Heart Disease and WTP

In this chapter the background literature regarding heart disease, parent and child health care decisions, and the underlying theory of this research paper will be discussed. In the first section heart disease and its ill effects will be examined, with further discussion regarding the benefits of reducing the risk of developing heart disease for children and adults. In the second section, the parent and child health care and household model literature will be discussed, concluding with an in depth discussion of the economic theory to analyze the data collected in this research. In the last section, literature surrounding the use of stated preference and contingent valuation surveys will be scrutinized to gain knowledge of the techniques needed to create a proper survey to investigate the value of heart disease risk reductions.

2.1 Background and Theory: Heart Disease and Health Valuations

Heart disease is the leading cause of death in the United States; today more than 27% of Americans develop this serious disease before the age of 75 (American Heart Association 2010). Heart disease is a general term that represents many diseases, but the principal causes are: genetics, individual health choices, and the external environment (American Heart Association 2010, Sun et al. 2008). The most common forms of heart disease are coronary artery disease, cardiovascular disease, and hypertension (also known as high blood pressure). Given these various forms of heart disease, the term "heart disease" will refer only to coronary artery disease throughout this paper and the accompanying survey.

Heart disease is caused when fatty deposits of plaque, called atherosclerosis, block the insides of arteries that lead to the heart (American Heart Association 2010). The mortality and morbidity effects of heart disease can include shortness of breath, chest pains called “angina”, and the very serious condition of a heart attack and stroke which may lead to sudden death (American Heart Association 2010). Heart disease is of great concern to the health community and is a highly researched disease because of these life changing effects.

The American Heart Association[2] (2010) outlines six important risk factors that play a key role in the development of heart disease. These risk factors are: gender, smoking, current health status, family history, exercise, and diet. Gender plays a large role in one’s chances of developing heart disease. Men on average have a greater chance of developing heart disease (35%) than women (19%) due to hormonal differences in the body and general life choices (American Heart Association 2010).

Smoking is also a determining factor for the development of heart disease. Smokers on average have a 28% chance of developing heart disease where non-smokers have only a 21% chance on average (American Heart Association 2010).

[2] The American Heart Association, a non-profit organization operating in the United States, is dedicated to informing individuals of the dangers of Heart Disease and provides information about useful ways to lead heart healthy lives.

The quantity of cigarettes smoked per day is also very important, as heath complications increase with additional tobacco use.

One's current health status provides an indication of a person's chance of developing heart disease. Individuals who tend to live healthy lives and maintain a safe blood pressure (120/80 mmHg) and cholesterol levels (below 200 mg/dL) generally have lower chances of developing this debilitating disease (American Heart Association 2010). Diabetes and hypertension are generally signs of larger health problems in the body and individuals that suffer from these aliments have a higher risk of developing heart disease. In fact, individuals with diabetes are between two and four times more likely to develop heart disease in their life time, and over 65% of people with type two diabetes die from some form of heart disease (American Heart Association 2010). Maintaining a weight to height ratio, or Body Mass Index (or BMI), below 25 is an excellent way to prevent diabetes and hypertension and improve overall health.

Research indicates that individuals with a family history of heart disease are more susceptible to the disease. It is difficult to quantify the exact effect of an individual's family history on their chances of developing heart disease; although studies have shown that many other risk factors such as diabetes and hypertension can also be hereditary (American Heart Association 2010).

Diet and exercise are the last two key risk factors, and are integral to maintaining the correct BMI and to living a healthy lifestyle. The American Heart Association (2010) recommends that adults should exercise for at least 5 hours weekly, consisting of moderate activity such as brisk walking, and at least one hour weekly of vigorous activity, including jogging or swimming. It is suggested that children should play at least one hour a day, including vigorous activity three days a week (American Heart Association 2010). Healthy diets for adults should include four to five cups of fruit and vegetables a day, while children should eat two to three cups a day (American Heart Association 2010).

Now that heart disease and its risk factors have been discussed we focus our attention on the literature surrounding parent and child resource allocation in the household. The literature examined in the next section will describe the theoretical models that provide the basis for the valuation of health risk reductions, and for testing hypotheses regarding the efficient allocation of health care resources in the family.

2.2 Background and Theory: Parent and Child Resource Allocation, Economics Theory, and Applications

In this section, the economics literature discussing resource allocation between parents and their children will be examined. Parents who hold the role of head of a household make health care decisions that impact other members of the family. Throughout this section we will explore the literature starting with the early research in this field, and finishing with more current studies. Finally, the economic theory that will be used in this thesis will be discussed.

In the paper by Becker (1974) entitled "A Theory of Social Interactions" the interactions between the head of a household and their family were analyzed. While these topics had been discussed in sociology and anthropology, Becker sought to apply them to the field of economics to determine if the theory could explain household interactions. In this research Becker uses what he calls "social income" which is the sum of an individual's own income, and the monetary value of applicable characteristics of others in the individual's "social environment", to determine how members of a household, with one member acting as the head of the household, interact with one another. The head of a household, for this research, is defined as a family member who transfers purchasing power to all members of the family because he or she cares about their family's welfare.

In his research, Becker (1974) showed that the redistribution of income from the head of the household to its members does not affect the consumption habits or welfare of any particular member, because the head of the household offsets any individual's loss by supplementing the lost income with their own income, and the income of other members of the household. Given this finding, several implications were explained by Becker. First, the redistribution of income by the head of the household to the other family members means that each family member is partly insured against adversities or disasters that might befall them. The next implication is that since the head of the household cares for the other family members, the family in turn has an incentive to care for each other and works to maximize their own income, as well as the family's income as a whole. Becker showed that while every member of the household works for their own self interest, they "love" the other family members and distribute their income amongst one another. Given this altruistic behavior between family members the idea of a reckless or selfish family member was explored. Becker explained that when a family member acts in a recklessly and engages in activities that reduce another family member's income, the household head redistributes resources away from their own income, and the income of others in the family, to help the family member that was injured. Lastly, Becker demonstrated that the head of household's utility function acts as the family utility function. It was shown that the family acts as if they are maximizing this single family utility function subject to a budget constraint consisting of variables from the family.

This research conducted by Becker (1974) is important to the study at hand because it can help explain child and parent relationships in the family. Parents act altruistically towards their children, and other family members, because their utility functions consist of their own and family's preferences. This information on parent-child interactions will be important when investigating how parents value a reduction in their own risk, and the risk of their child, of developing heart disease by age 75.

The paper "Collective Labor Supply and Welfare" by Chiappori (1992) expanded upon the work in Becker (1974) by building a model to explain the collective labor supply of a household, when family members act on their own preferences while assuming Pareto efficient outcomes. A Pareto efficient outcome is one where everyone in the family is better off without making any one individual worse off (Chiappori 1992). Chiappori believed that by building and understanding a labor model for the family, one could also understand how families allocate other resources and consume market goods. Chiappori found that families share non-labor income with one another and choose hours of labor in a manner that best suits their personal interest and maximizes a single family utility function. Given this shared non-labor income and leisure time, Chiappori showed that family members behave altruistically towards one another in their labor decision making. It was concluded that further testing of the "collective model" was necessary to understand specific interactions between parents and children and how the addition of multiple sources of income and consumption of multiple market goods would affect the model.

Chiappori's (1992) research was further built upon in a study entitled "Collective Labor Supply with Children" by Blundell, Chiappori, and Meghir (2005). In this research, children, which the authors treat as a public good, were added to the collective labor supply model laid out in Chiappori (1992) to better understand the interactions between parents and their children. From a policy standpoint, benefits given to children such as schooling and nutrition are considered very important across the world. The authors of this paper discovered that children benefit more from a change in household income, from a subsidy or tax credit, when the head of household's marginal willingness to pay is sensitive to changes in their own private consumption. In essence this means that the child benefits most when the parent who is more sensitive to consumption changes includes the child's wellbeing as a component of their own utility function. The researchers furthered this discussion by examining both parents as competing heads of the household. They were not surprised to discover that children benefit the most when the decision making parent that is more sensitive to changes in their own utility, is given an additional increase to their income.

In the heart disease research examined in this thesis, every parent surveyed will be treated as the head of a household and a comparison between the father's and mother's WTP estimates will not be considered. Given the assumption that every parent is the head of household, the parent's utility function will include variables for the child's wellbeing, as described in the Becker (1974) and Blundell, Chiappori, and Meghir (2005) papers. These variables will be used in an attempt to provide more accurate WTP estimates, and examine the efficiency within the intra household allocation of resources.

In a paper entitled "Parental altruism and the value of avoiding acute illness: are kids worth more than parents?" a parent's preferences in mitigating their own and their children's risk of acute illness caused by ambient air pollution are examined. Parent altruism is the concept that parents are willing to provide at least some amount of care for their children, meaning that they would have a positive WTP for a risk reduction in their child's risk (Dickie and Messman 2003). A stated preference survey was conducted and the marginal rate of substitution (MRS), or the rate at which an individual is willing to give up one good for another while maintaining the same level of utility, was used as a guide to measure the parent's altruism towards their child (Dickie and Messman 2003). It was discovered that the MRS between the parent and their child was approximately two, meaning that the parent values the reduction of their child's illness twice as much as their own. It was also shown that the parent's WTP for a reduction in their own and their children's illness increases as household income increases. Further examination showed that increases with the duration of the illness and the number of symptoms increased WTP and that WTP decreased as the number of children in the household increased. Overall, these results demonstrate that on average, altruism plays a role in the health care of a family and parents favor their child's health over their own.

The research from Dickie and Messman (2003) was expanded upon in the paper by Dickie and Gerking (2007) entitled "Altruism and Environmental Risks to Health of Parents and their Children" where the MRS for a reduction in the risk of skin cancer was estimated for 488 parents and their children. In the survey a hypothetical skin lotion that blocks the sun's harmful rays was offered to the parents and their children, with the parent making the purchasing decision for their own and child's lotion. The authors found that the MRS between environmental health risks faced by the parent and child were equal to the marginal risk reduction cost for the hypothetical skin lotion. This result means that a parent, acting altruistically as the head of the household, redistributes family resources to decrease their children's environmental health risks.

In the paper "Altruism in the Family and Selfishness in the Market Place" by Becker (1981), the unitary household model is used to show the differences in intra household and market behaviors. Becker discovered that much like the Becker (1974) paper, a head of household acting altruistically towards his or her family works to maximize a single family utility function. Contrasting this Becker also showed that in the market place, individuals, including the head of household, work to maximize their own utility subject to their own constraints. Becker believes these differences occur because altruism is more "efficient" in families and less “efficient” in the market. It was concluded that the idea of altruism in the family should be further examined because family economic activity like consumption, education, health, and other variables make up roughly half of the economy.

This paper is important because it shows the relevance of the unitary household model as well as paternalistic altruism in the family. These ideas paired with the work in (Adamowicz et al. 2012) will be used to build the unitary household model used in this thesis.

Continuing the work of Dickie and Gerking (2007) in a working paper “Collective Rationality and Environmental Risks to Children’s Health” by Adamowicz et al. (2012) a stated preference survey was conducted to examine how parents allocate resources in the family to reduce the risk of members developing heart disease. The research sought to examine two hypotheses: if parents allocate resources in a Pareto efficient manner, and how the division of income between parents affects the allocation of resources. A total of 432 paired parents, 864 individual adults, were surveyed. Parents were asked if they would be willing to purchase a hypothetical drug that would reduce their own and child’s risk of developing heart disease by age 75. The data were analyzed using a parental resource allocation model that allowed parents to have different preferences between spouses, and utilized a household production function that incorporated perceived heart disease risks. The research found that a reallocation of household resources from the father to the mother would increase healthcare spending for their child.

The research conducted in Adamowicz et al. (2012) is the basis for this thesis, though there are some minor differences. First, more data will be used in this thesis because all parents, single, married, or living with a partner, will be included as individual observations. While the gender and marital status of the parent are still important, the parents will not be broken into groups of paired mothers and fathers. Instead, the gender and marital status of the parent will be used as a covariate in other models. Second, every parent will be treated as the head of household seeking to maximize a single family utility function as shown in Becker (1974, 1981). Using this theory, the research conducted in this thesis will examine the relationship between any parent and their child when faced with an option to reduce the risk of developing heart disease.

To understand the parent's own choice and the choice for their child regarding a heart disease risk reduction program, we first must understand the economic theory behind household decision making. Standard microeconomics employs utility theory, or the principle that individuals act to maximize their utility given various constrains such as income or time (Mankiw 2011). Given that the research conducted in the Adamowicz et al. (2012) paper is very similar to the research in this thesis, the same economic theory will be used. Next the economic theory of household decision making built from of the works of Becker (1974), Chiappori (1992), Blundell, Chiappori, and Meghir (2005), and Dickie and Gerking (2007), culminating with the theory from Adamowicz et al. (2012) will be explored.

In the literature examined in this section, it has been assumed that an individual acting as the head of the household maximizes a single family utility function subject to a set of given constraints. The parent's utility function consists of the consumption of market goods, public goods, and the perceived risk of developing heart disease by age 75 for the parent and the child. The parent's utility function can be written as

$$U = U(M^p, W, R^p, R^k) \quad (1)$$

$$Where\ M^p, W \geq 0$$

where the parent's utility, U, is a function of regular private market goods purchased by the parent for their own consumption, M^p, household public goods such as housing and the child's consumption of private goods, W, with parent and child perceived risk of developing heart disease by age 75, R^p and R^k, respectively. The parent makes choices for the family and purchases goods with household income, as the child is assumed to be too young to have income of their own and does not have personal health preferences. The household public good, W, includes items such as food for the family, mortgage or rental costs, water, and heating, as well as private goods such as gifts or recreational items for the child. Utility is assumed to be increasing and concave in consumption goods. Conversely, utility is decreasing and convex in relation to heart disease risks.

The parent's perception of risk is based on a risk production function for the parent and child,

$$R^p = R^p(X^p, I^p) \quad (2)$$

$$R^k = R^k(X^k, I^k) \qquad (3)$$

$$Where\ X^p, X^k \geq 0$$

where the perceived risk for the parent and child, R^p and R^k respectively, are a function of market goods, X^p and X^k, that may be purchased to reduce the risk of developing heart disease, and indexes of the parent's attitudes and information regarding their own and their child's risk of developing heart disease, I^p and I^k. The perceived risks for the parent and child are assumed to be diminishing with the consumption of goods $X^p$and X^kas $(\partial R^p)/(\partial X^p\ ), (\partial R^k)/(\partial X^k) < 0$ and $\partial^2 R^p/\partial X^{p2}$, $\partial^2 R^k/\partial X^{k2} \geq 0$. As in the equation (1), the purchase of market goods, $X^p$and X^k, for the parent and child are at the parent's discretion.

Parents use household income to provide the family with necessities such as food and shelter, non-essential goods, and healthcare. Given that scarcity exists, the parent must decide how to efficiently allocate resources within their household given a budget constraint,

$$Y = M^p + W + q(X^p + X^k) \qquad (4)$$

$$Where\ M^p, W, X^p, X^k \geq 0$$

where household income, Y, is spent on market goods for the parent, M^p, public goods for the household and market goods for the child, W , and risk reducing goods, $X^p$and X^k, with price q.

Given these four equations the parent is assumed to maximize their utility (1), subject to the risk production function for family (2) and (3), the family's budget constraint (4), and the non-negativity constraints on the market and risk reducing goods M^p, M^k, X^p, and X^k. Next the first order conditions will be examined.

First order conditions for maximizing household utility are as follows,

$$\frac{\partial U/\partial R^p}{\partial U/\partial M^p}\left(\frac{\partial R^p}{\partial X^p}\right) = q \qquad (5)$$

$$\frac{\partial U/\partial R^k}{\partial U/\partial M^p}\left(\frac{\partial R^k}{\partial X^k}\right) = q \qquad (6)$$

At an interior solution the parent's marginal rate of substitution between their own private consumption and their own consumption of the heart disease risk reducing good is equal to the price q. Furthermore, at an interior solution, the parent's marginal rate of substitution between their own private consumption and the child's consumption of a risk reduction good is also equal to price q.

In the survey, the parent makes a choice whether to purchase a risk-reducing good that tenders proportionate reductions in risk $\Delta^p = (\partial R^p / \partial X^p)/R^p$ and $\Delta^k = (\partial R^k / \partial X^k)/R^k$. Given these risk reductions the first order conditions can be rewritten as

$$MWTP^p = \frac{(\partial U/\partial R^p)R^p}{\partial U/\partial M^p}\Delta^p = q \qquad (7)$$

$$MWTP^k = \frac{(\partial U/\partial R^k)R^k}{\partial U/\partial M^p}\Delta^k = q \qquad (8)$$

$MWTP^p$ and $MWTP^k$ in equations (7) and (8) represent the marginal willingness to pay (MWTP) for the proportionate risk reductions Δ^p and Δ^k. MWTP is defined as the WTP for a one percentage point decrease in risk per person each year (Adamowicz et al. 2012). If Δ^p and Δ^krepresent an equal proportionate reduction, equations (7) and (8) suggest that the parent is willing to pay an equivalent amount for an equal proportionate reduction in their own and child's risk if

$$\frac{(\partial U/\partial R^p)R^p}{\partial U/\partial M^p} = \frac{(\partial U/\partial R^k)R^k}{\partial U/\partial M^p} \qquad (9)$$

Econometric tests will be used to examine if equation (9) holds, and determine if $MWTP^p$ and $MWTP^k$ are equal. As shown in the research of Adamowicz et al. (2012) the most efficient allocation of resources within the family is reached when equation (9) holds. The hypothesis outlined in equation (9) will be tested in the results chapter.

2.3 Background and Theory: Risk Valuation Methods

In this section contingent valuation (CV) and stated preference risk valuation surveys will be explored to better understand the techniques needed to construct a survey and interpret the collected data. The following section will focus on risk valuation methods that will assist in the construction of a survey to be used in this thesis research. The exploration of papers will begin with older literature and progress towards more recent research.

In a paper by V. K. Smith and W. H. Desvousges (1987) entitled "An Empirical Analysis of the Economic Value of Risk Changes" the authors conducted a survey to examine the value of risk due to hazardous materials in suburban Boston. A Contingent Valuation survey was used to measure how an individual's perceived risk changes as the actual baseline risk of a hazard increases or decreases. The results were contradictory, as it was found that the value of the perceived marginal risk decreased as the baseline risk levels increased. The counter intuitive nature of these results shows that the individuals surveyed did not fully understand the risks associated with the dumping of hazardous waste. Similar tests were conducted where road accidents were used in place of hazardous waste and conventional wisdom prevailed, as the value of perceived risk increased as the baseline risk increased.

From this paper the importance of informing the survey group is shown. In the Smith and Desvousges (1987) survey, the respondents were not thoroughly informed about the causes, side effects, and probabilities associated with urban hazardous waste. It is expected that as the risk reduction levels increase, the individual's WTP will also increase. Accurate communication of risk information is essential when creating a survey so that individuals can fully evaluate and internalize the perceived risk.

M. W. Jones-Lee (1991) published a paper entitled "Altruism and the Value of Other People's Health" where it was determined that in order to estimate an accurate measure of WTP, altruism must be incorporated. In his research it was discovered that when trying to determine the value of statistical life with regards to safety in the work place, one must consider that individuals may include helping others as part of their utility maximization. This finding is relevant to our research because parents might also consider the risk of their children and other family members in the home when considering their own willingness to pay. Though the safety of others was a significant factor in the individual's perceived risk value, Jones-Lee showed that when using the standard utility maximization framework where an individual seeks to maximize their utility given constraints, no new changes to the current value for statistical life are necessary.

In a paper by Krupnick and Cropper (1992) entitled "The Effect of Information on Health Risk Valuations" an interesting strategy was used to examine and individual's WTP for a reduction in their risk of developing a chronic lung disease. In their research the authors gave individuals a trade-off between either paying for a risk reducing good that decreased one's chance of developing chronic bronchitis, or the possibility that they could incur an increased risk of dying in an auto accident, or offset their chronic bronchitis risk. This set-up was used to first examine whether people understand the risks of chronic lung diseases and second to discover if people are willing to use tradeoffs when the risks involve one's health.

The research showed that individuals with a family history of chronic lung disease have a higher WTP for a reduction in their risk of developing the disease than people with no first-hand knowledge of the aliment (Krupnick and Cropper 1992). It was also shown that regardless of prior knowledge of the disease, participants were reluctant to trade-off the disease for a higher risk of mortality in an auto accident, and opted to pay for a reduction instead. These results show two things: first, individuals view mortally risks as being more significant than morbidity risks; and second, the format of using risk to risk trade-offs against risk to income trade-offs is an effective method of eliciting an individual's WTP.

The Krupnick and Cropper (1992) study also collected information on family history and prior personal knowledge of diseases and showed that this information affected the WTP for health risk reductions. Therefore, knowledge of heart disease and family history of heart disease information was collected in this study and employed in the econometric analysis.

In a paper by P.O. Johansson (1994) entitled “Altruism and the Value of Statistical Life: Empirical Implications”, explores how altruism is used to analyze projects involving health changes for the public. In his research Johansson found it difficult to calculate an exact WTP estimate for individuals when they were asked to choose a risk reduction program that would maximize their utility. Johansson believes this occurs because when individuals maximize their utility they not only choose the best result for themselves, but the best option for the public. Much like the paper by Jones-Lee (1991), it was determined that altruism must be taken into consideration when valuing the WTP of a public good because individuals gain utility when they believe their efforts are helping other individuals. While the Johansson study explores altruism involving the public, the research conducted in this thesis will examine parental altruism in the family, where a child’s wellbeing is perceived as a public good within a household. In other words, parental altruism can be explained as the maximization of a parent’s utility by providing a risk reduction program for their child. This is an important concept in this thesis as it is assumed that a parent is acting as the head of household with a single family utility function.

In a paper written by Hammitt and Graham (1999) entitled “Willingness to Pay for Health Protection: Inadequate Sensitivity to Probability?” a CV survey was implemented to examine how an individual’s WTP changes when the level of a risk reduction changes. In their survey they inquired about several different hazards ranging from car accidents to food-borne risks such as food poisoning. Their research showed that as a risk reduction level increases or decrease so does an individual's WTP, showing that individuals derived more utility from a high level of risk reduction, which is consistent with other WTP literature examined in this section. What is appealing about Hammitt and Graham's research is that they were able to measure sensitivity in the changes of an individual's WTP for different types of risk reductions, meaning that a reduction in the risk of being in a car accident is not equivalent to the reduction in the risk of food poisoning. Not all risks are valued equally. They concluded that the probability of being affected by a given risk was a large factor in the individual's WTP estimate.

This is an important result because the risk reduction levels in the survey used for this thesis will vary from person to person, and between parent and child as well. This survey technique is essential for rendering unbiased estimations of WTP.

In a paper by Krupnick et al. (2002) entitled "Age, Health and the Willingness to Pay for Mortality Risk Reductions: A Contingent Valuation Survey of Ontario Residents", a contingent valuation survey was conducted in Hamilton, Ontario, Canada to gather information on the WTP for a mortality risk reduction. The main objective of the research was to determine if age has an effect on an individual's WTP for a risk reduction, and to calculate the value of a statistical life in Canada. The author explains that the value of a statistical life is an individuals' WTP for a risk reduction in mortality, and is used as the economic value to a society of reducing one premature death in a given country's population. A computer based survey was delivered to 930 individuals. Individuals classified as "older", age 70 and above, were found to have a one-third reduction in their WTP for a mortality risk.

Krupnick et al. (2002) find that age plays a significant factor in one's WTP. In this thesis research, age will be included as a covariate in several estimations to determine if it is a statistically significant variable affecting the WTP of the parent and child, and affecting the parent's decision to purchase a heart disease risk reducing good. As shown in the research by Krupnick et al. (2002), values of health risk reductions may be affected by the age of the individual because as an individual age increases, their risk of developing heart disease also increases (American Heart Association 2012).

Ordering effects in WTP studies were tested in a research paper by Stewart et al. (2002). In their research three health programs were presented to a group of individuals with the goal of determining whether the ordering in which risk reduction programs were presented played a part in the individuals WTP for the program. The research showed that a "fading glow" effect was present in the ordering process, meaning that on average the first program captured most of the individual's WTP, while the following two programs were perceived as offering less overall utility.

In the survey implemented for this thesis, a random ordering process is used to alternate whether the child's or parent's program is shown first. This randomization process should equally distribute the two programs and prevent a “fading glow” from occurring throughout the data. In general, randomizing specific elements of the survey is viewed as a beneficial practice throughout the literature in this section as it helps prevent ordering bias.

In a paper by Hammitt and Liu (2004) entitled “Effects of Disease Type and Latency on the Value of Mortality Risk” a CV survey was used to examine an individual’s WTP for a reduction in environmental risks. Prolonged exposure to environmental risks like air or water pollution has been shown to increase the risks of developing cancer and other chronic disease. Due to the time lag between contact with the pollutant and the first sign of its effects, known as latency, a survey was developed to examine how an individual’s WTP varies over time (Hammitt and Liu 2004). The researchers discovered that an individual’s WTP for a risk reduction increased by approximately one and a half percent per year, from the time the individual first informed about the pollutant’s risks. After a period of twenty years WTP was found to have reached its highest point. Through the process of running multiple regressions the authors also discovered that cancer elicited a higher WTP than the other chronic diseases discussed in the survey, and WTP for a risk reduction increases if the affected areas involve prominent organs such as the lungs or liver.

The paper by Hammitt and Liu (2004) is important in the research for this thesis because WTP for a risk reduction in a chronic disease will also be examined. While the Hammitt and Liu paper focused mainly on measuring the effects of latency, this thesis will not look to directly measure latency’s effects, though they will be considered. Interactive charts in the survey will be used to show that risk of heart disease compounds, and as time passes an individual's risk increases from prolonged risk factors such as an unhealthy diet or lack of exercise.

A paper by Alberini et al. (2006) entitled "Willingness to Pay for Mortality Risk Reductions: Does Latency Matter?" showed that latency plays a large part in the WTP for a risk reduction. In their research conducted in the United States and Canada it was discovered that delaying the time period that a risk reduction occurs by ten to thirty years resulted in more than a 60% decrease for the WTP for the risk reduction program. This is believed to occur because of two reasons. First, individuals take into account that they might die before receiving a benefit for the program, and second, if the respondent is willing to replace their consumption for risk, the discount rate for risk reduction should be discounted at the same rate as consumption. Latency can be an issue in valuation, but should not be a problem in this thesis because of the format used in the survey. In the survey, individuals are asked about their chances of developing heart disease before age 75, then shown the cumulative probability of developing heart disease as a function of age in several interactive charts. This method should help avoid many of the latency issues that arise in other studies if it accurately represents the impact of the risk reduction on the risk of heart disease over time.

Alberini et al. (2006) also showed that respondents over the age of 70 had a WTP that was 33% less than younger individuals. This shows that age may be a significant factor in determining WTP because older individuals recognize that the benefit they will receive from the risk reduction program is diminishing as age increases. It was also discovered that low income individuals had WTP levels that were 48% lower than the average. This shows that as an individual's income decreases they are less likely to purchase a program that would reduce their risk. These results demonstrate the importance of demographic information on decision making as age and income both have significant effects on WTP. In this thesis, demographic information will be included in the models to determine the contributing factors for an individual's purchase of the risk reduction program.

In a paper by Jacobsson, Johannesson, and Borgquist (2007) entitled "Is Altruism Paternalistic?" a study was conducted to determine if altruism is paternalistic with respect to the health of others. In this research several experiments were conducted where individuals were given the opportunity to donate money, nicotine patches, or both, to hospital patients who were diabetic and smokers. The patients were noted as having a positive WTP for nicotine patches, though their WTP values were below the market value of the good. It was discovered that on average the value of individual donations were 40% greater for nicotine patches than for money when given a choice between a nicotine patch or a monetary donation. When the individuals were given the choice to donate both money and nicotine patches over 90% of the value of donations were for nicotine patches instead of money. Other control tests were conducted where other goods such as food stamps or payments for exercising were used instead of money, and similar results were calculated.

These results show that altruism can affect one's WTP for a good. It is believed that the donation of nicotine patches was greater than the donation of money because the survey participants viewed smoking as an inappropriate personal choice. Many of the surveyed individuals explained in the comments section of the survey that they believed individuals sometimes do not make fully rational choices for their best interests. The concepts of altruism affecting WTP shown in the Jacobsson, Johannesson, and Borgquist (2007) paper will be explored in this thesis paper as parental altruism and the WTP for a heart disease risk reduction will be examined.

In a paper by Aadland, Caplan, and Phillips (2007) entitled “A Bayesian Examination of Information and Uncertainty in Contingent Valuation” the authors researched the theoretical process of Bayesian updating when individuals are confronted with choices in non-market goods. Bayesian updating is the idea that an individual will change or “update” their level of perceived risk when given new information about the true value of the risk. WTP estimates for public goods are difficult to measure because of hypothetical bias. In order to mitigate these biases a combination of goods which currently exist in the market as well as hypothetical goods were used in the survey, and a cheap talk script was read to the respondents to reduce hypothetical bias. The research consisted of a stated preference survey used to elicit an individual’s WTP.

The research found that when individuals were given new information on the benefits and functionality of newly created public parks and roads, the survey respondents updated their WTP to a higher quantity on average (Aadland, Caplan, and Phillips 2007). They discovered that cheap talk can cause an upward bias and an overstatement of an individual’s WTP when the value of a good is very high.

Conversely they discovered a downward bias and an underestimation of WTP when the value of a given good is low.

This work is important because it shows that as additional value is presented to the individual, in this case new public parks, the WTP for these benefits rose. In the heart disease survey used in this thesis, individuals will be presented with two risk reduction levels, one that is high and one that is low. The Aaland, Caplan, and Phillips (2007) paper, showed that increased information can reduce uncertainty about a good and elicit more accurate WTP estimates. A small cheap talk scrip will be used in the heart disease research to insure that the parents thoroughly understand the variables and risk factors that cause an increase in the risk of developing heart disease.

In a paper by Cameron et al. (2010) entitled "The Effects of Children on Adult Demands for Health-Risk Reductions" the parent's WTP for a reduction in the risk of becoming ill is examined in a household setting. From this research five factors were found to have influenced the parent's WTP: whether or not the parent is married, the age of the children in the household, the age of the parent, the time period before the illness takes effect, and whether children will still be living in the house when the illness takes effect. Cameron concluded that single parents have a higher WTP because they are the lone primary care giver in the family, and as an individual's age increases their WTP decreases. Also, it was shown that latency has an effect on WTP because the later the risk reduction occurs the greater the decrease in the parent's WTP for the risk reduction. These finding are consistent with the literature as shown in Krupnick and Cropper

(1992). Age, marital status, and other demographics will be included in the analysis of heart disease risk reduction for this thesis.

In a paper by Cameron et al. (2010) entitled "Demand for health risk reductions: A cross-national comparison between the U.S. and Canada" a stated preference survey was used to calculate the WTP for a health risk reduction for individuals in the United States and Canada. The researchers designed a survey that would collect an individual's demographics, their personal health history, and their perception on how medication and the care of a doctor could help mitigate the risks of disease. The survey also included a risk tutorial that educated the survey respondent on how to interpret the various hypothetical risk reduction programs that the survey would offer. After respondents were informed about the risk communication tools in the survey they were presented with different scenarios where two risk reduction programs were presented against the status quo. They were then asked to choose from the various risk reduction programs along with an associated monthly price. After five risk reduction scenarios were completed the survey respondents were given various debriefing questions regarding whether they would actually purchase their selected risk reduction programs in a non-hypothetical world, and whether they believed that a doctor's diagnoses for their risk reductions were accurate.

The researchers found that both age and gender play a large role in an individual's WTP for a risk reduction in their health (Cameron et al. 2010). Americans of both genders had a higher WTP than their Canadian counterparts until approximately age 55 for males and 65 for females when the Canadian WTP rose above the American's value. It was also discovered that the educational level, marital status, as well as the individual's perception of their own health were significant factors affecting the WTP for risk reductions.

The survey design, in particular the methods used to inform people about risk, from Cameron et al. (2010), are similar to those used in the survey design for this thesis. Knowledge Networks will be used to gather data, just as in the Cameron et al. (2010) research, and the same methods of gathering demographic information will be implemented. The survey used in this thesis will also have several practice rounds to educate the survey taker on how to read the charts, use the interactive tools, and understand the risk reduction questions used in the survey. The major difference between this thesis and the 2010 paper by Cameron et al. will occur in the collection of the individual's perceived risk. In the Cameron et al. (2010) paper the surveyed individuals were given two choices differing from the status quo. In this thesis a parent will only be given one choice other than the status quo, and will have to decide whether to purchase the risk reduction program to decrease their own and child's risk of developing heart disease by age 75. One other difference is that the survey for this thesis examines heart disease, while Cameron et al. (2010) examined mortality and morbidity from various diseases.

The papers in this section have shown that contingent valuation (CV) and stated preference risk valuation surveys are frequently used tools for data collection data. Overall it was determined that presenting information to the respondent, and using practice rounds, leads to more accurate WTP estimates. In the survey used in this thesis, information on the risk factors associated with developing heart disease will be given, and practice questions will be formulated so that the most accurate WTP estimates can be calculated.

Chapter 3 Background and Theory: Risk Perceptions

One component of this thesis is the examination of factors affecting heart disease risk perceptions. In this section, the literature discussing how individuals perceive risk will be examined. First, research on how to accurately measure risk perceptions, and how individuals modify their risk perceptions based on new information and preferences will be examined. The literature will progress from older works to more current research findings and will encompass a wide range of mortality and morbidity risks. The chapter will be concluded with a brief overview of how perceived risks from the heart disease survey compare to real risks estimates from the American Heart Association will be presented.

3.1 Background and Theory: Accurately Measuring Risk Perceptions

In a paper by W. K. Viscusi (1985) entitled "Are Individuals Bayesian Decision Makers?" it was shown that an individual's perception of risk is more accurate for moderate risk levels, but commonly inaccurate for small and large levels of risk. In Viscusi's (1985) research, chemical factory employees were asked to examine the perceived risk of working with various chemicals. He surveyed two random samples. The first sample was questioned about the health hazards of handling dangerous chemicals, asbestos and the explosive chemical TNT, while the second sample was asked only about working with sodium bicarbonate, commonly known as baking soda. He discovered that the employees underestimated the small risk associated with baking soda and overestimated the large risks of working with dangerous chemicals, as was discussed earlier in

Aadland, Caplan, and Phillips (2007). When the employees were later informed of the actual risk of working with these chemicals they updated their original response to more closely match the average risk level.

The idea of overestimating large risks and underestimating small risks discussed in Viscusi's (1985) paper is an interesting concept when applied to the heart disease research. To examine how individuals perceive risk, a regression equation will be estimated with the individual's perceived risk as the dependent variable and various risk factors as the independent variables. This estimation will be used to determine if parents systematically assess their child's and their own risk in a manner that is consistent with findings by the American Heart Association (2010).

In a paper by Viscusi (1990) entitled "Do Smokers Underestimate Risks?" 3,119 individuals were surveyed to examine their perceptions of the lung cancer risk associated with smoking. The survey group represented both cigarette smokers and non-smokers with about half identifying themselves as non-smokers, 25% as past smokers, and 25% as current smokers. The individuals were asked "Among 100 cigarette smokers, how many of them do you think will get lung cancer because they smoke?" and the results were tallied. The Surgeon General of the United States estimates the actual percentage of individuals that developed lung cancer from smoking cigarettes in 1990 to be between 5% and 10%. The mean value calculated in the survey was approximately 43%, and a vast overestimation of the actual value.

Viscusi (1990) identifies this large overestimation as a product of both anti-smoking media campaigns and the current social pressures opposed to smoking. Viscusi (1990) also believes that excise taxes on cigarettes function in the same way to increase lung cancer risk perceptions, and help discourage individuals from taking up the habit. In the survey for this thesis, information on whether the parent smokes cigarettes will be collected. It will be important to examine whether the survey respondents overestimate or underestimate the link between smoking and heart disease risk.

In the paper by Rogers (1997) entitled "The Dynamics of Risk Perception: How Does Perceived Risk Respond to Risk Events?" the link between perceived risk and experience are examined. A total of 570 individuals from two counties participated in a two part study in Texas where they were questioned about their perceived risk from nuclear power over a two year period. Of the two counties chosen, one was located adjacent to the nuclear power facility and one was miles away. Individuals were asked about their perceived risk in year one, and were given information about the real risk associated with these facilities. The researchers then conducted a follow up survey one year later to determine whether individuals changed their initial risk estimates. It was discovered that individuals living adjacent to the nuclear power facility perceived a lower risk of radiation contamination from the facilities than those who lived in a county miles away. The lower perceived risk from the individuals living in the adjacent city was found to be caused by favorable media released by the facility. This concept of more information leading to more accurate risk perceptions was reflected in the data collected from the second survey where approximately 70% of both samples updated their risk estimates to more accurately echo the real risk. It was believed that information given in the first survey, after the risk estimates were collected, caused the update to result in a more accurate prediction.

This research has shown that information regarding the real risk of a particular hazard assists individuals to perceive their personal risk more accurately. In the heart disease research the risk factors that positively and negatively affect one's chances of developing heart disease will be examined. Given the results from Rogers' (1997) study, it is expected that individuals with more information regarding the risk factors involved with heart disease should estimate their perceived risk more accurately reflecting their own average risk.

In a paper by Hahn and Renner (1998) entitled "Perception of Health Risks: How Smoker Status Affects Defensive Optimism" individuals were questioned about their perceived risk of developing lung cancer, heart disease, and other smoking related ailments. Research has shown that understanding how individuals perceive risk can be a difficult and confusing process. Generally individuals tend to underestimate their risk of developing life-threatening diseases when they are asked to compare their risk with that of an average person. In this study 154 individuals were surveyed of which 48% were current smokers, 25% were ex-smokers, and 27% were nonsmokers. The surveyed individuals were asked to estimate their perceived risk for a number of diseases compared to an average individual from their city; Berlin, Germany. Researchers discovered that smokers, both present and past, perceived a higher risk of developing lung cancer or having a heart attack than non-smokers, though they still believed their risk was below the average for the disease. This idea of underestimating one's risk compared to an average individual is called "defensive optimism."

Hahn and Renner (1998) believe the smokers estimated their perceived risk by comparing themselves to a "risk stereotype." A "risk stereotype" involves the creation of an abstract individual, as perceived in the mind of the smoker, which they compare to themselves by estimating the risk associated with years of smoking, cigarettes consumed per day, and nicotine content they believe is necessary to increase risk. The "risk stereotype" is used to assist the smoker to conceptualize the components of risk. These concepts can be applied to heart disease research to help explain how individuals perceive the risks associated with this disease. The variables perceived by the respondents as "risky" will be compared to information for the American Heart Association to measure whether individuals correctly identify their positive and negative effects on health.

In a paper by Sjöberg (2000) entitled "Factors of Risk Perception," research was conducted to better understand how individuals perceive risk. Six approaches including: technical estimates of risk, heuristics and biases, risk targets, the psychometric model, cultural theory of risk perception, and risk sensitivity analysis were used to examine perceived risk. Of these six approaches, three were found to have significant results. The first method is called the "technical estimates of risk." In this method the real risk faced from a particular disease is explained to an individual who is later questioned about their perceived risk of mortality from the given hazard. Much like the research of Viscusi (1985), individuals tend to underestimate small risks and overestimate large risks. The method of "technical estimates of risk" was shown to elicit more accurate risk perceptions when individuals either directly or indirectly experienced the given hazard.

The second significant method used the "psychometric model". In this method individuals were presented with various hazards and asked to rate their perceived risked on a given scale (Sjöberg 2000). Using this method researchers were able to measure which hazards were perceived as having the higher risk than the alternatives. Follow-up questions were used to better understand why the individual feared some hazards more than others. It was discovered that hazards which were not well understood but prominent in media discussions, such as radiation from nuclear energy, were perceived to have higher risks.

The final method used a technique called "risk sensitivity" (Sjöberg 2000). This method involves a more complex approach based on three factors. First the attitude of the individual is examined to determine if the individual has a positive or negative feeling towards a given hazard. In the case of nuclear energy individuals could have a negative attitude towards the risk of contamination from radiation, or a positive attitude towards the clean energy it provides. The second approach examines an individual's sensitivity towards a particular hazard. In sensitivity examination an individual is asked if they feel an emotional response to a given hazard. If the hazard makes the individual feel upset or anxious they are rated as having a high sensitivity, but if they feel indifferent or tranquil they are rated as having a low sensitivity. The last factor examined in risk sensitivity is called “specific fear.” In this analysis an individual is asked if their perceived risk of a hazard is affected by a personal fear. Individuals that fear a particular hazard tend to have a higher perceived risk than those who are indifferent.

After investigating these three approaches, and six different approaches in total, Sjöberg (2000) concluded that understanding how individuals perceive risk is a difficult process. There are many variables that contribute to an individual’s risk perceptions, and every individual thinks differently, has different experiences, and lives different lifestyles. Given all of these factors, differences in the way individuals perceive risk is expected. This research is important to this thesis research because it will help explain why an individual’s risk perceptions might vary. In heart disease research the factors that lead to an increase in the risk of developing heart disease by age 75 will be examined.

In a paper by Cameron (2005) entitled “Updating Subjective Risks in the Presence of Conflicting Information: An Application to Climate Change” the way an individual’s perceptions change with information is tested. In her research she examines whether individuals rethink their hypothesis given three different tests: Bayesian updating, alarmist learning, and ambiguity aversion, when given various sources of information on climate change. Bayesian updating, which has been discussed in the prior literature, is the idea that an individual will change or “update” their level of perceived risk when given information about the true value of the risk. Alarmist learning is the idea that individuals may overreact to new information they receive. Lastly, “ambiguity aversion” is the idea that individuals view known risks as lower than unknown risks. Using an individual’s prior information and own hypothesis regarding climate change, the context of the newly introduced information, and the individual's demographics, she was able to model the average individual's behavior.

After implementing a survey and collecting information from 602 respondents Cameron (2005) concluded that the assumption of people behaving in a Bayesian fashion was inconclusive. From analyzing the data she discovered that approximately 50% of the surveyed individuals Bayesian updated, while the other half changed their prior estimate to more reflect the average with the introduction of new information. She discovered that there was no evidence of alarmist learning over the sample average, but it could play a role in an individual's updating process on a case by case basis. It was also found that there are significant ambiguity effects when there is disagreement among sources of information, as people tend to ignore new information if the underlying elements are conflicting. She concluded that further research should be done to determine how individuals make judgments when given conflicting information.

The research in Cameron (2005) is important to the heart disease study because it helps reveal how individuals perceive risk, and how they modify their risk perceptions. Risk perception is important in decision making, especially when the risk to the individual involves their own health, as well as the health of their child. In the research conducted in this thesis, models will be estimated to determine if parents can correctly identify the factors associated with developing heart disease.

In the paper by Slovic and Peters (2006) entitled "Risk Perception and Affect" risk perception is discussed as being comprised of two fundamental categories, risk as feelings and risk as analysis. When individuals perceive risk as feelings, they rely on their instinctive and intuitive responses to a hazard; while risk as analysis uses logic, reason, and scientific deliberation when perceiving a risk. Throughout the Slovic and Peters (2006) paper, risk as feelings was investigated. When examining risk as feelings a model called "the affect heuristic" is used. "The affect heuristic" is divided into four sections with two sections representing "positive affect" and two sections representing "negative affect." When a particular hazard such as nuclear power is shown to have a positive affect, information proclaiming a *high benefit* of this technology leads the individual to perceive that nuclear power is associated with a *low risk*. This also works in reverse as a hazard with *low risk* is perceived to have a *high benefit*. On the opposite side of the spectrum when nuclear power is shown to have a negative affect, information describing a *low benefit* results in a perceived *high risk*, and vice versa. "The affect heuristic" is the basis for examining risk as feelings.

This article is important for the heart disease research because it will help shed light on how individuals perceive heart disease risk and the treatment they will receive from the risk reduction program. If individuals perceive that certain heart disease risk factors such as smoking lead to higher risks, then they should also perceive this activity to have a low benefit to their health.

After examining the risk perception literature it has become apparent that while a large number of papers have been written discussing how individuals perceive risk, it appears that there has not been much research comparing perceived risks to real risks. Through the use of a survey, demographic and risk perception information can be collected and regressions estimated to determine if individuals with certain risk factors, such as smoking or having diabetes, perceive the increased risk of developing heart disease. In some cases, these risk perceptions can be compared to real estimates from the American Heart Association to measure how accurately individuals predict these risk factors have on the development of heart disease by age 75. This analysis will be furthered discussed in the methods chapter, and fully examined in the third section of the results chapter.

Chapter 4 Methods: Overview

In this chapter the methods used in creating the survey, building the econometric models, and an explanation of the various tests conducted with the econometric output are discussed. The survey is one of the most important components of this research project because the entire data collection relies on the proper survey design. Once the survey is complete various econometric tools may be used to estimate regression equations to explain the variations in the collected data. Following the estimation of regression equations, various calculations are used to test the research hypotheses.

4.1 Methods: The Survey Design

To gather the necessary data for this project, a survey was implemented by Knowledge Networks[3] in the United States in three sections. First, a survey pretest using focus groups was administered in early November 2010 which collected 25 observations and was used to determine if the survey was functioning properly and to obtain feedback from the survey's participants. Next a "soft launch" of the survey was administered in December 2010 to 505 parents and was used to make final adjustments in the prices and risk reduction parameters used to elicit the WTP values. Lastly, from January through March 2011 the final survey was implemented. Given that there were some restrictions that had to be met before taking the survey such as: the parent or child has not been diagnosed with

[3] Knowledge Networks is recognized in the research community for their ability to construct and implement surveys with large sample sizes, and have a list of clients that range from Fortune 500 companies to various government entities.

heart disease, being a parent between the ages of 18-55, and having at least one biological child between the ages of 6-16, only 58% of the surveyed individuals passed the screener questions. Among the 58%, 71% completed the final survey. When the survey ended in March 2011, a total of 2650 parents participated in the final survey. Given that the survey went through several changes in its many iterations, only the last sample of 2650 observations will be used in this thesis.

The survey utilized for this thesis begins by informing the respondent about the objectives of the survey and that they will receive incentive points[4] to participate in a half hour survey involving heart disease and its risks. First, the survey asks several qualification questions inquiring if the participant is a parent of at least one child between the ages of six and sixteen, as this is a primary requirement to participate in the study. In some instances only one parent was surveyed, although on most occasions both parents were invited to take the survey independently.

Once the parents were chosen, the survey selected one of their appropriately aged children at random, and began asking questions about the family structure and demographics of the child and parent. Data were collected regarding the marital status and education level of the parent, number of children in the household, total household income, age, and other demographic variables for the parent and child. Some of the demographic questions were categorical, meaning that the values needed to be selected from a preset multiple-choice set,

[4] Knowledge Networks uses what they called incentive points, where registered survey respondents gain a certain number of points for taking surveys. These points can later be exchanged for money.

while others were finite such as age or education level. These demographic variables collected in this section of the survey are used to better understand the traits of the individuals involved in the research study.

Next, the parent is asked to answer questions regarding their own health, and the health of their child. These questions are needed to understand the individual's perceived base level of risk before the introduction of information on heart disease. After these data are collected, information regarding the risk factors involved with the development of heart disease described in the background section: gender, smoking, current health status, family history, exercise, are presented to the respondent. The parent is asked about the risk of developing heart disease for a second time to see if they changed their response given the new information.

After gathering the health data for the parent and child the survey then calculates an estimate of the probability of developing heart disease for the parent and child. The respondent is then given the choice to purchase a hypothetical drug program for themselves and their child that would reduce the risk of developing heart disease, and facing the symptoms of this disease by age 75. To prevent ordering bias, this question was randomized between the parent and child. In some cases the parent is asked about themselves first, while in other cases the questions start by focusing upon the child. The survey process randomly selects from two levels of risk reduction, 20% or 80% for the child and 10% or 70% for the parent, and randomly generates a price of $10, $20, $40, $80, or $160 which are the same for the child and parent. If the respondent chooses the hypothetical risk reduction program, the survey describes that they would visit a doctor of their choosing each year to arrange for a blood test. The blood test will indicate to the doctor how much blockage of arteries is present in the patient. Each year a reoccurring blood test would be performed and the doctor will give the individual a vaccine to decrease the build-up of fatty deposits in the arteries based on the outcomes of the blood tests. The individual was informed that the vaccine has been tested in clinical trials to ensure that it is safe. The vaccine is used to provide extra protection from heart disease over the benefits of consuming healthy foods and achieving the recommended exercise. The earlier the individual starts the program, the greater the benefits.

The response of the individual to the presentation of the risk reduction at a specified price generates the stated preference values regarding the purchase of a heart disease program and measures the willingness to pay for a percentage point decrease reduction in the risk of developing heart disease for the parent and child.

4.1.1 Methods: The Survey – Interactive Tools

An important component of the survey process is the presentation of risk information and the impact of the risk reduction program on the parent and child risk of heart disease. This risk information is presented using interactive methods within the survey process. It is important that the individual completing the survey is trained to use the interactive tools included in the survey. Below is an example of a question used in the survey, presented to demonstrate how the interactive tools operate.

Figure 1 - 4.1.1: Interactive Chart Example

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?

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

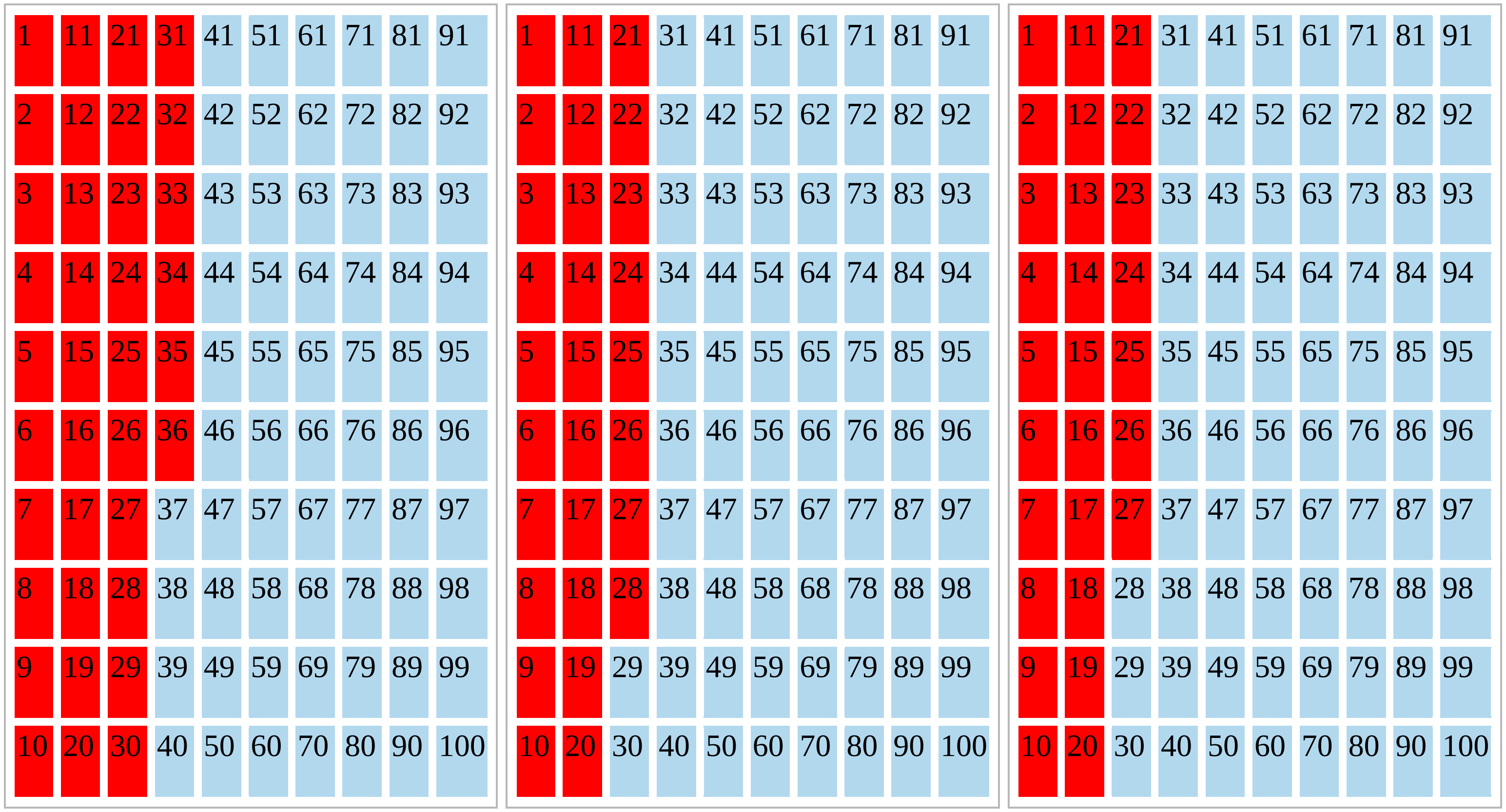
36 smokers out of 100 would get lung cancer.

In this question the respondent is asked to click upon a number that they believe is the best estimate of the percentage of long time cigarette smokers who will develop cancer in their lifetimes. The table consists of 100 blue boxes, but when a number is clicked, it and all of its previous boxes are highlighted in red so that the individual may visualize the percentage they are selecting. These types of questions are used to guide the respondent to begin thinking about the health risks and are used as practice questions for interactive charts which will be used throughout the survey.

Figure 2 - 4.1.1 demonstrates how the interactive tools can be used to present information to the individual taking the survey. In this figure the parent's, child's, and the average individual's chances of developing heart disease by age 75 are shown together in the same image. This helps the respondent visualize their own, and child's risks, so that they will understand the risk value presented to them when given the choice to participate in a risk reduction program.

Figure 2 – 4.1.1: Heart Disease Risk Comparison

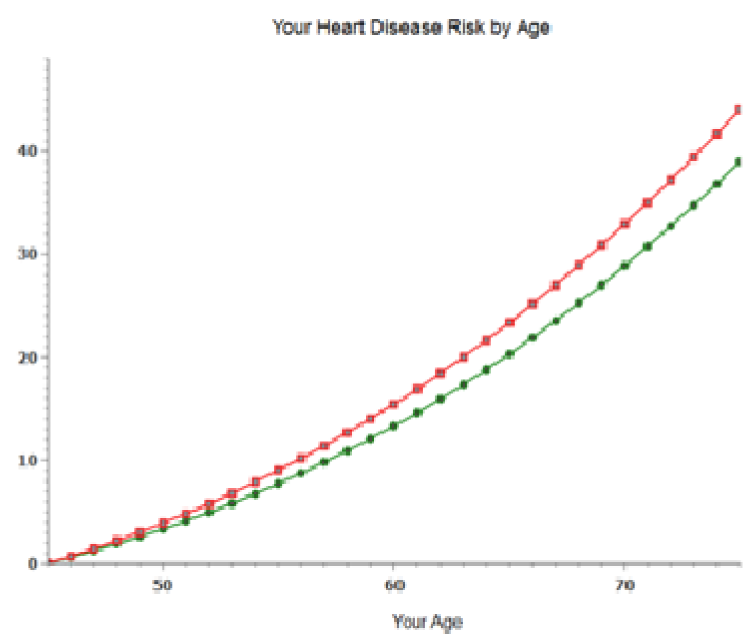
Your chances | Your child's chances | An average person's chances



Risk level 36%. | Risk level 28%. | Risk level 27%.

In Figure 3 - 4.1.1 the survey's interactive tools are presented to show effectiveness of a risk reduction program. The y-axis represents the risk level and the x-axis represents the age of the individual. Once the individual has entered all of their demographic and health variables the heart disease risk associated with their current state (age, lifestyle, etc.) is presented in a graph. In this figure the red line (top line) is the heart disease risk of the individual in their status quo situation, and the green line (bottom line) shows the reduction in the individual's risk if they accept the risk reduction program. This same presentation method is used to display the child's risk in the status quo and with the adoption of the risk reduction choice. These graphics help illustrate the effect of the risk reduction program to the respondent and clarify what the respondent is "buying" if they choose to participate in the risk reduction program.

Figure 3 – 4.1.1: Displaying Risk and Risk Reduction Effects



Overall there are two important pieces of information elicited from the respondents. First, whether the parent purchases their own or child's risk reduction program, which provides information used for the valuation of the programs and the comparison of parent verses child WTP. Second, the parents provide information on their own and child's perceived risks of developing heart disease, which will be used in the analysis of the factors affecting risk perceptions.

4.2 Methods: Econometrics

In this section, the econometric methods used in this research will be examined. First the probit and bivariate probit regression will be discussed as they will be used to examine the factors that contribute to the purchase of a heart disease risk reduction program, as well as the willingness to pay for the program. Next, the ordinary least squares and seemingly unrelated regressions will be explained as they will be used to analyze the risk perceptions of the surveyed individuals.

4.2.1 Methods: Econometrics - Probit Model

A probit model is used to examine factors that affect the probability of action or outcome, where the action or outcome is binary (1, 0) in nature (Greene 2006). From the survey, the yes or no responses to the purchase of the heart disease risk reduction program can be used in a probit model to examine the factors the affect the binary choice. A probit model is represented below, where β is an m-dimensional vector of parameters, x is an m-dimensional vector of variables related to person j, and ε is a component of preferences known to the individual but not observed by the researcher.

$$\lim_{x'\beta \to +\infty} Prob(Y = 1|x) = 1$$

$$\lim_{x'\beta \to -\infty} Prob(Y = 1|x) = 0$$

$$Prob\ (Y = 1|x) = \int_{-\infty}^{x'\beta} \phi(t)dt = \phi(x'\beta)$$

Where $\phi(.)$ denotes a normal distribution

With the "yes" choice of the program represented as

$$Prob\ (Y = 1|x) = Prob\ (\beta x_j + \varepsilon_j > 0)$$

4.2.2 Methods: Econometrics - Bivariate Probit Model

Bivariate probit models are used when two equations are known to have correlated error terms (Greene 2006). In this thesis there are two binary choice questions, one for the purchase of the parent's own risk reduction program and one for their purchase of the child's risk reduction program, where the errors may be correlated due to unobserved factors that appear in the errors of both responses. Given the potential of correlation between the error terms, the bivariate probit model is used to bring about more accurate estimates because efficiency is gained when the two regression equations are estimated simultaneously. Bivariate probit models use a cumulative distribution function (CDF) of a bivariate normal distribution given their multivariate nature.

$$y_1^* = x_1'\beta_1 + \varepsilon_1, \quad y_1 = 1\ if\ \ y_1^* > 0, 0\ otherwise,$$
$$y_2^* = x_2'\beta_2 + \varepsilon_2, \quad y_2 = 1\ if\ \ y_2^* > 0, 0\ otherwise,$$
$$E[\varepsilon_1|x_1, x_2] = E[\varepsilon_2|x_1, x_2] = 0,$$
$$Var[\varepsilon_1|x_1, x_2] = Var[\varepsilon_2|x_1, x_2] = 1,$$

$$Cov[\varepsilon_1, \varepsilon_2 | x_1, x_2] = \rho$$

With a bivariate normal CDF

$$Prob(X_1 < x_1, X_2 < x_2) = \int_{-\infty}^{x_2} \int_{-\infty}^{x_1} \phi_2 \, (z_1, z_2, \rho) dz_1 dz_2$$

Where $\phi_2(.)$ Denotes a CDF of a bivariate normal distribution

The same interpretation of the "yes" from the standard probit model applies in this model.

The bivariate probit model will be used in the calculation of marginal willingness to pay (MWTP) for the parent and the child as shown in equations (7) and (8) from the theory section. The bivariate probit method of regression is used to estimate the parameters that are used to calculate the marginal WTP. A "yes" response to the purchase of the risk reduction program is represented as the probability that an individual's WTP, for themselves or their child, is greater than price q (Adamowicz et al. 2012). Following these calculations, the hypothesis that parent and child MWTP are equal will be tested as shown in equation (9), as the theory presented earlier demonstrates that this is the most efficient outcome for the household. The bivariate probit model will also be used to examine the variables that contribute to the parent purchasing the heart disease risk reduction program to reduce their own risk and the risk of their child. These models will include price and risk reduction as well as various other demographic and health related factors. As discussed earlier in the Background and Theory Chapter 2.1, health and demographic variables should influence the parent's decision to purchase their own or child's risk reduction program.

4.2.3 Methods: Econometrics - OLS and SUR Models

The analysis of the factors affecting the perceived risk of heart disease is conducted using ordinary least squares regressions (OLS) and seemingly unrelated regressions (SUR). In an OLS regression, the regression line is estimated by minimizing the squared value of the error terms for the variables (Greene 2006).

$$y = f(x_1, x_2, \dots, x_n) + \varepsilon$$
$$y = \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n + \varepsilon$$
$$y_i = b_i x_i + \varepsilon_i$$
$$Minimize \sum_{i=1}^{n} \hat{\varepsilon}_i^2$$

In this research a SUR model will also be used to examine how individuals perceive certain risks. SUR models are used in a similar fashion to the bivariate probit, where the error terms are assumed to be correlated across M equations (Greene 2006).

$$y_v = \beta_v x_v + \varepsilon_v, \quad v = 1, \dots, M$$
$$\varepsilon = [\varepsilon_1', \varepsilon_2', \dots, \varepsilon_M']$$
$$E[\varepsilon] = 0$$
$$E[\varepsilon\varepsilon'] = V$$

The SUR method of regression will be used to examine the parent's own and child's first risk estimate. There first risk estimates gathered from the data refer to estimates given before additional information regarding health and risks were presented to the respondent. As discussed in the Background and Theory Chapter 3.1, health and demographic variables should influence and individual's heart disease risk assessment.

4.2.4 Methods: Econometrics - Willingness to Pay and the Likelihood Ratio Test

Willingness to pay (WTP) is the amount of money it takes to make an individual indifferent between the status quo choice and the new choice, in this case the heart disease risk reduction program (Adamowicz et al. 2012). Using equations (7) and (8), MWTP for a one percentage point decrease in the risk of developing heart disease can be calculated using the marginal utility of risk and the marginal utility of money for the child and parent as shown in Adamowicz et al. (2012). These values are represented by the coefficients on the risk reduction level and price from the regression results estimated in Model 1.

The equation for the calculation of MWTP is:

$$MWTP = -\frac{\left(\frac{\hat{\gamma}}{\sigma}\right)}{\left(\frac{\hat{1}}{\sigma}\right)}$$

Where the values of $\left(\frac{\hat{\gamma}}{\sigma}\right)$ and $-\left(\frac{\hat{1}}{\sigma}\right)$ are based on the estimated coefficients of risk and price from the probit model respectively. Using this formula will render MWTP, or the WTP for a one percentage point decrease in risk per person each year.

Lastly, a likelihood ratio test is used to test the difference between a restricted and an unrestricted model. Two models will be estimated using the equations outlined in Model 1. The first model will be evaluated without restrictions, while the second model will have the coefficients of price and risk reduction held constant across the equations. Imposing restrictions will allow one to test if coefficients across models are statistically different from one another to examine whether the parent and child risk reduction programs are valued equally as shown in equation (9) (Greene 2006).

The equation for the likelihood ratio test is shown below,

Likelihood ratio test = -2(LLV Restricted Model – LLV Unrestricted Model)

where LLV Restricted Model and LLV Unrestricted Model are the log likelihood values for the respective models (Greene 2006). Using the hypothesis test,

H0: Unrestricted Model = Restricted Model

HA: Unrestricted Model ≠ Restricted Model

If Test Value > Critical Value, Reject Null Hypothesis

it can be determined if there is a statistical difference between the two models.

The most important part of this research project was the building of an effective questionnaire. Once the proper questions were chosen a survey was constructed so that the necessary data were collected. With these data, models can be estimated and hypotheses can be tested. In the next chapter, the data collected using the survey will be examined.

Chapter 5 Data: Overview

In this chapter, the results of the survey process and the data collected using the survey will be summarized. First the variable names and descriptions will be presented. Next the price, risk reduction, and risk assessment variables will be discussed followed by the data collected regarding demographic variables and health variables, for the parent and child, will be examined. Lastly, the models that will be estimated using the data discussed in this section will be presented.

The following table lists and defines all of the variables discussed in the data sections and used in the empirical analysis. Some variables will have abbreviated titles to conserve space in other tables and throughout the discussion in this thesis. These variables are separated into three sections. The first section will examine the price, risk reduction, and risk assessment variables, the second will explore the Demographic variables, and the third will discuss the General Health variables. These variables will be utilized in the later regressions and presented in the Results Chapter.

Table 1 – 5.0: Variable Names and Descriptions

Variable Name	Description
Child	Binary, 1=Yes, Purchase the Program for the Child
Parent	Binary, 1=Yes, Purchase the Program for the Parent
Risk Child	First Heart Disease Risk Estimate for the Child, in Percent Units of Risk
Risk Parent	First Heard Disease Risk Estimate for the Parent, in Percent Units of Risk
Price	Price of the Program
Risk Reduction Child	Heart Disease Risk Reduction Level for the Child

	(In Percent Units of Risk Reduction)
Risk Reduction Parent	Heart Disease Risk Reduction Level for the Parent (In Percent Units of Risk Reduction)
Age Child	Age of the Child in Years
Age Parent	Age of the Parent in Years
Gender Child	Binary, 1=Male, Gender of Child
Gender Parent	Binary, 1=Male, Gender of Parent
Married	Binary, 1=Married, Marital Status of Parent
Number of Children in the Household	Number of Children in the Household
Education	Binary, 1=Four Year Degree or Higher, Education Level of Parent
Employed	Binary, 1=Employed, Parent is Employed in a Full or Part Time Job
Income	Annual Household Income from all Sources before Taxes
Smoker	Binary, 1=Yes, Parent Smoked More than 100 Cigarettes in Lifetime
Diabetic Child	Binary, 1=Yes, Child is Diabetic
Diabetic Parent	Binary, 1=Yes, Parent is Diabetic
BMI High Risk	Binary, 1=BMI Between 25-29 for Parent
BMI Highest Risk	Binary, 1=BMI 30 or Greater for Parent
Need Med. BP Child	Binary, 1=Yes, Child Needs Blood Pressure Medication
Need Med. BP Parent	Binary, 1=Yes, Parent Needs Blood Pressure Medication
Need Med. Chol. Child	Binary, 1=Yes, Child Needs Cholesterol Medication
Need Med. Chol. Parent	Binary, 1=Yes, Parent Needs Cholesterol Medication
Overall Health Child	Binary, 1=Child Overall Health is Good or Better
Overall Health Parent	Binary, 1=Parent Overall Health is Good or Better
Family History Child	Binary, 1=Child has a Family History of Heart Disease
Family History Parent	Binary, 1=Parent has Family History of Heart Disease
Exercise Child	Binary, 1=Child Gets Recommended or Greater Amount of Exercise
Exercise Parent	Binary, 1=Parent Gets Recommended or Greater Amount of Exercise
Diet Child	Binary, 1=Child Eats a Healthy Diet
Diet Parent	Binary, 1=Parent Eats a Healthy Diet

Diet Child	Binary, 1=Child Eats a Healthy Diet
Diet Parent	Binary, 1=Parent Eats a Healthy Diet

5.1 Data: Price, Risk Reduction Levels, and Risk Assessment

This section examines the price (or bid), risk reduction, and risk assessment variables used in the survey. The coefficients on the price and risk reduction variables will later be used to calculate the WTP for a reduction in the risk of developing heart disease by age 75 for the child and parent, while the risk assessment variables will be used to examine whether individuals correctly identify the factors that increase one's risk of developing heart disease.

Table 2 - 5.1: Purchase Statistics for the Parent and Child with the Risk Reduction Level and Price

Child				
20% Risk Reduction				
Price	Yes	No	Total	% Yes
10	128	136	264	48.4848%
20	116	164	280	41.4286%
40	96	162	258	37.2093%
80	87	213	300	29.0000%
160	63	197	260	24.2308%
80% Risk Reduction				
Price	Yes	No	Total	% Yes
10	180	113	293	61.4334%
20	151	93	244	61.8852%
40	130	137	267	48.6891%
80	130	122	252	51.5873%
160	82	147	229	35.8079%
Parent				
10% Risk Reduction				

Price	Yes	No	Total	% Yes
10	207	224	431	48.0278%
20	175	222	397	44.0806%
40	137	255	392	34.9490%
80	134	300	434	30.8756%
160	80	295	375	21.3333%
70% Risk Reduction				
Price	Yes	No	Total	% Yes
10	82	44	126	65.0794%
20	76	52	128	59.3750%
40	77	56	133	57.8947%
80	72	46	118	61.0169%
160	44	72	116	37.9310%

Table 2 - 5.1 displays the yes and no responses to purchase the risk reduction program for the child and parent with the price and risk reduction levels. In the first section, the data examined represents the parent's decisions for their child at the 20% and 80% risk levels. It is important to note that as the price increased from \$10 to \$160 the number of parents purchasing the risk reduction program for their child decreased for almost every price level. Similar results were calculated for the parent in the second section, as the purchase of their own program decreased with the increase in price at both the 10% and 70% risk reduction levels.

Table 3 - 5.1: Descriptive Statistics for the Parent's Perceptions of their Own and Child's Risk of Developing Heart Disease by Age 75 – First Assessment (Before Information Provision)

First Risk Assessment - Child	
Observations	2646
Mean	28.38 %
Standard Deviation	19.58

First Risk Assessment - Parent	
Observations	2646
Mean	35.75%
Standard Deviation	22.11

The variables listed in Table 3 - 5.1 represent the first heart disease risk assessment given by the parent for their own and child's risk of developing heart disease before age 75. This was conducted before the introduction of information regarding heart disease. The average individual's risk of developing heart disease by age 75 is approximately 27%. (American Heart Association 2010) Surveyed parents believed their risk of developing heart disease was approximately 36% while they believed their child's risk was approximately 28%. These variables will be used in seemingly unrelated regressions to determine if individuals systematically respond to heart disease risk factors.

5.2 Data: Demographics

This section describes the age, gender, marital status, the parent's education level, the number of children in the household, employment status, and household income of the surveyed individuals. These variables will be important in the explanation of an individual's choice to purchase a heart disease risk reduction program.

Table 4 - 5.2: Demographic Variables for the Parent and Child

Demographics			
Variable	Obs.	Mean	Stand. Dev.
Age Child (years)	2650	10.95	3.32
Age Parent (years)	2650	42.24	6.44
Number of Children in the	2216	2.30	1.10

Household			
Income (Annual, from all Sources before Taxes)	2650	$87,157.55	$48,694.82
Variable	Female	Male	% Male
Gender Child	1,281	1,369	51.66%
Gender Parent	1,698	952	35.92%
Variable	No	Yes	% Yes
Married	121	2,529	95.43%
Education (4 Year degree or Greater)	1,188	1,462	55.17%
Employed (Full or Part Time)	680	1,970	74.34%

As mentioned in the methods chapter the child selected for the survey must be between the ages of 6 and 16; as a result, the child's average age was 11 years. The parent's age was also bounded, between 18 and 55, which resulted in an average age of approximately 42 years. The average number of children per household in the survey was 2.3. This number is higher than the national average of 1.86 children per American household as calculated by the 2010 census (United States Census 2010). This result is likely attributed to the survey design, as data were only collected from families with children; the national census is collected from all households, including those without children. Thus the number of children per household was expected to be higher than the national average. The average annual household income, before taxes, was $87,157.55. This number was also larger than the national average of $50,054 (United States Census 2010) and is likely correlated with the education level and employment status of the surveyed parent. In this research household income includes employment income as well as unemployment compensation, child support, alimony, dividends, interest, social security, welfare, and gifts.

The gender of the children was represented as approximately the same frequency for males and females, but in the case of the parent, nearly twice as many females participated in the survey than males.

An overwhelming majority of the surveyed parents are married. Approximately 95% of the surveyed parents answered that they are currently married. The education variable measures whether the parent has attended a University and earned at least a four-year degree. Approximately 55% of the surveyed parents indicated they had obtained a four-year degree or higher which is higher than the national average of approximately 28% (United States Census 2010). Lastly, it is shown that approximately 74% of parents were employed at the time of the survey.

5.3 Data: General Health

In this section general health indicators as described by the surveyed parent are examined. These variables include whether the parent was ever a smoker, if the child or parent requires medication for blood pressure or cholesterol issues, whether the child or parent are diabetic, whether the parent has a Body Mass Index (BMI) between 25-29 or greater than 30, as well as the overall health, family history, exercise regime, and diets of the child and parent.

Table 5 - 5.3: Health Variables for the Parent and Child

Health Variables			
Variable	No	Yes	%Yes
Smoker (Parent Smoked more than 100 Cigarettes in their Lifetime)	1,825	825	31.13%
Need Med. BP Child	2,590	60	2.26%
Need Med. BP Parent	2,010	640	24.15%
Need Med. Chol. Child	2,602	48	1.81%
Need Med. Chol. Parent	1,957	693	26.15%
Diabetic Child	2,640	10	0.38%
Diabetic Parent	2,522	128	4.83%
BMI High Risk (Between 25 and 29)	1,701	949	35.81%
BMI Highest Risk (Greater than 30)	1,595	1,055	39.81%
Family History Child	1,563	1,087	41.02%
Family History Parent	1,210	1,440	54.34%
Variable	Less than Good	Good or Better	% Good or Better
Overall Health Child	22	2,628	99.17%
Overall Health Parent	180	2,470	93.21%
Variable	Less than Recommended	Recommended or Greater	%Rec. or Greater
Exercise Child	571	2,079	78.45%
Exercise Parent	1,407	1,243	46.91%
Variable	Not Healthy	Healthy	% Healthy
Diet Child	441	2,209	83.36%
Diet Parent	430	2,220	83.77%

The smoker variable, which reflects the frequency and percentage of parents who have smoked over 100 cigarettes in their lifetime, is used to determine whether the parent currently is, or has ever been a smoker. While this way to categorize "smokers" is not ideal, it was the best choice given the data that were collected. Out of the 2,650 parents surveyed, 825 have smoked at least 100 cigarettes in their lifetime. Next, the number of individuals who have been prescribed by a physician the necessity to use medication to lower their blood pressure is examined. Only 2% of children were advised they needed this medication, while approximately 24% of parents were directed to take this medication. The necessity to take cholesterol medication is another metric for examining an individual's health. In this table the need for cholesterol medication for the child was only 2%, while 26% of parents were asked to take this medication. Diabetes can also play a role in the development of heart disease. Out of the 2,650 surveyed individuals, less than 1% of the children have been diagnosed with this disease, while nearly 5% of parents said they have this disease.

A BMI or body mass index is a term used to represent the ratio of an individual's height and weight, and is a good indicator as to whether a person is at the recommended weight for their size (American Heart Association 2010). This table presents the number of parents with a BMI between 25 and 29, and those of 30 and above. These categorical variables were chosen instead of a continuous variable so that these specific risk categories could be examined. Research has shown that individuals with a BMI between 25 and 29 have a higher risk of developing heart disease than those with an established healthy BMI range, while an individual with a BMI of 30 or more faces an even higher risk (American Heart Association 2010). Nearly 36% of the surveyed parents had a BMI between 25 and 29, which was calculated using the given weight and height of the survey respondent, while 40% were in the highest risk category indicated a BMI of 30 or more. Only 24% of the surveyed parents presented a BMI in the average or healthy category.

Though BMI values were calculated for the child, these values are difficult to interpret as a child's constant growth indicates their BMI is based upon the average weight of children their age. The American Heart Association (2010) measures a child's BMI by age, height in quarter inches, and weight in lbs. In the survey we approximated height in categories of two inch increment and weight in 10 pound increments. To properly measure a child's BMI, more accurate data are needed. Given these sampling problems the child's BMI will not be included in this analysis.

Next, variables used to examine whether the parent or child has a family history of heart disease are examined. It is shown that 41% of children and 54% of parents responded that they knew of biological relatives that have been diagnosed with heart disease. This response is curious, as the child's family history should be at least as high as the parent's. A possible explanation for this is the parent believed their family member with heart disease was too far removed to affect their child, yet still affected their personal health.

The overall health of an individual represents how one feels about their lifestyle in general. The respondent was given five choices: Excellent, Very Good, Good, Fair, and Poor, which were split into the two following categories: "Less than Good" and "Good or Better." As shown, 99% of children were thought to have at least good health while 93% of parents thought similarly.

The above table also displays the exercise regimes for the child and parent. The American Heart Association (2010) recommends that children participate in at least one hour of exercise per day, including vigorous exercise at least three times a week. For parents, at least five hours of moderate exercise along with one hour of vigorous activity per week is suggested. From the survey results we can see that 78% of children and 47% of parents reported to have met these exercise requirements.

Lastly, we examine the diets and eating habits of the parent and their child. The American Heart Association (2010) recommends children eat two to three cups of fruit and vegetables per day, while parents should eat between four to five cups of fruit and vegetables per day. The respondents were asked if their diets were: Very Healthy, Somewhat Healthy, Somewhat Unhealthy, or Very Unhealthy. These four responses were separated into two groups: "Not Healthy" and "Healthy". The surveyed parents indicated that overall 83% of children eat healthy diets while 84% of parents followed the American Heart Association's recommendations.

5.4 Data: Model Specifications

In this section the specifications for the equations which will be estimated in the Results section will be presented. First, the bivariate probit models discussed in Chapter 4.2.2 are shown below. The first model, Model 1, is a function of the randomly generated price and risk reduction variables only. This Model will be used to generate the estimates to calculated MWTP as shown in equations (7) and (8). These MWTP estimates will be used to test the hypothesis shown in equation (9) that child and parent MWTP are equal, and that the theory is correct in assuming that this is the most efficient outcome for a household. Model 6[5] will be used to examine the contributing factors for the purchase of a heart disease risk reduction program. As discussed in Chapter 2.1, health and demographic variables should affect the purchase of the heart disease risk reduction program.

Model 1

$$Child\ Purchase = \alpha + \beta_1 Price + \beta_2 Risk\ Reduction\ Child$$
$$Parent\ Purchase = \alpha + \beta_1 Price + \beta_2 Risk\ Reduction\ Parent$$

Model 6

$$\begin{aligned} Child\ Purchase \\ &= \alpha + \beta_1 Price + \beta_2 Risk\ Reduction\ Child + \beta_3 Age\ Child \\ &+ \beta_4 Gender\ Child + \beta_5 Age\ Parent + \beta_6 Gender\ Parent \\ &+ \beta_7 Married\ Parent + \beta_8\ Numb. Children\ in\ Household \\ &+ \beta_9 Education\ Level\ of\ Parent \\ &+ \beta_{10} Employment\ status\ of\ Parent + \beta_{11} Household\ Income \\ &+ \beta_{12} Smoking\ Parent + \beta_{13} Diabetic\ Child \\ &+ \beta_{14} Diabetic\ Parent + \beta_{15} BMI\ High\ Risk \\ &+ \beta_{16} BMI\ Highest\ Risk + \beta_{17} Need\ Med. BP\ Child \\ &+ \beta_{18} Need\ Med. BP\ Parent + \beta_{19} Need\ Med. Chol\ Child \\ &+ \beta_{20}\ Need\ Med\ Chol\ Parent \end{aligned}$$

$$\begin{aligned} Parent\ Purchase \\ &= \alpha + \beta_1 Price + \beta_2 Risk\ Reduction\ Parent + \beta_3 Age\ Parent \\ &+ \beta_4 Gender\ Parent + \beta_5 Married\ Parent \\ &+ \beta_6\ Numb. Children\ in\ Household \\ &+ \beta_7 Education\ Level\ of\ Parent \\ &+ \beta_8 Employment\ status\ of\ Parent + \beta_9 Household\ Income \\ &+ \beta_{10} Smoking\ Parent + \beta_{11} Diabetic\ Parent \\ &+ \beta_{12} BMI\ High\ Risk + \beta_{13} BMI\ Highest\ Risk \\ &+ \beta_{14} Need\ Med. BP\ Parent + \beta_{15}\ Need\ Med\ Chol\ Parent \end{aligned}$$

[5]Models 2-5, 7, and 8 are included in the appendix

Next the model using the SUR method of regression discussed in Chapter 4.2.3 will be examined. Model 11[6] will be used to examine the risk perceptions for the parent's own and child's risk of developing heart disease by age 75. As discussed in Chapter 3.1, health and demographic variables should effect individual risk perceptions.

Model 11

$$
\begin{aligned}
Child\ First\ Risk\ Estimate
&= \alpha + \beta_3 Age\ Child + \beta_4 Gender\ Child + \beta_5 Age\ Parent \\
&+ \beta_6 Gender\ Parent + \beta_7 Smoking\ Parent + \beta_8 Diabetic\ Child \\
&+ \beta_9 Diabetic\ Parent + \beta_{10} BMI\ High\ Risk \\
&+ \beta_{11} BMI\ Highest\ Risk + \beta_{12} Need\ Med. BP\ Child \\
&+ \beta_{13} Need\ Med. BP\ Parent + \beta_{14} Need\ Med. Chol\ Child \\
&+ \beta_{15}\ Need\ Med\ Chol\ Parent + \beta_{16} Overall\ Health\ Child \\
&+ \beta_{17} Overall\ Health\ Parent + \beta_{18} Family\ History\ Child \\
&+ \beta_{19} Family\ History\ Parent + \beta_{20} Exercise\ Child \\
&+ \beta_{21} Exercise\ Parent + \beta_{22} Diet\ Child + \beta_{23} Diet\ Parent
\end{aligned}
$$

$$
\begin{aligned}
Parent\ First\ Risk\ Estimate
&= \alpha + \beta_1 Age\ Parent + \beta_2 Gender\ Parent \\
&+ \beta_3 Smoking\ Parent + \beta_4 Diabetic\ Parent \\
&+ \beta_5 BMI\ High\ Risk + \beta_6 BMI\ Highest\ Risk \\
&+ \beta_7 Need\ Med. BP\ Parent + \beta_8\ Need\ Med\ Chol\ Parent \\
&+ \beta_9 Overall\ Health\ Parent + \beta_{10} Family\ History\ Parent \\
&+ \beta_{11} Exercise\ Parent + \beta_{12} Diet\ Parent
\end{aligned}
$$

The next Chapter, Results, the models discussed in this chapter will be estimated. The coefficients of the variables will be used in the calculation of MWTP, exploration of the contributing factors of the purchase of the risk reduction program, and understanding of how individuals perceive risk.

[6] Models 9, 10, and 12 can be seen in the appendix sections

Chapter 6 Results: Overview

In the following sections two different regression methods, bivariate probit and SUR, are used to estimate models to examine the willingness to pay for heart disease risk reductions and the factors affecting perceptions of heart disease risk respectively. In sections 6.1 and 6.2 a bivariate probit regression will be used to estimate the Parent and Child risk valuation models while taking into account the correlation of the error terms between the Child and Parent's models. Given that the parent is making decisions for both their own risk reduction decisions and their child's, the parent's explanatory variables will be included in the child's model (Jones-Lee 1991, P.O. Johansson 1994). Eight models are estimated using the bivariate probit method of estimating with child and parent equations simultaneously.

In section 6.3 seemingly unrelated regressions (SUR) are used to estimate the coefficients of variables that affect an individual's perceived risk. Two models are estimated, the first for the parent's perception of risk for themselves, and another for the parent's perception of their child's risk, using data on risk perceptions collected before the introduction of heart disease risk information.

6.1 Results: Willingness to Pay and Family Health Care

This section will examine the WTP for a reduction in the risks associated with developing heart disease by the age of 75, and determine whether parent and child WTP is the same, or differs in any statistically significant way. A bivariate probit model must be used to estimate the coefficients of price and risk reduction for the parent and child. This particular model was chosen because it includes the key variables, price and risk reduction level, that are needed to calculate WTP. Other variables regarding the demographics and health of the individual were not considered in this model because the price and risk reduction variables are exogenous variables as they were chosen for the respondent at random.

Table 6 - 6.1: Parameter Estimates from a Bivariate Probit Model of Program Purchase as a Function of Price and Risk Reduction for Parent and Child risk reductions

Model 1		
90*,95**,99***	Child	Parent
Price	-.0042*** (.0005)	-.0046*** (.0005)
Risk Reduction Child	.008*** (.0007)	-
Risk Reduction Parent	-	.0101*** (.0008)
Constant	-.3077*** (.0491)	-.2071*** (.0415)
Number of Obs.	2647	
Log Likelihood	-2773.7993	
Wald Chi Squared (# of Vars)	314 (4)	

All of the variables are statistically significant at the 99% level. Further explanation of the coefficients will be discussed in Results section 6.2 where they can be compared with the estimates in Model 6. Now that the coefficients are estimated MWTP can be calculated as shown in equations (7) and (8) from Chapter 2.2.

Table 7 - 6.1: Calculation of MWTP

$$MWTP = -\frac{\left(\frac{\hat{\gamma}}{\sigma}\right)}{\left(\frac{\hat{1}}{\sigma}\right)}$$

MWTP Child = - (.00804507/-.00415711)
MWTP Child = 1.9353 dollars per percentage point of risk reduction
with Standard Error (.2689)
95% Confidence Interval [1.4081 to 2.4624]
99% Confidence Interval [1.2425 to 2.6280]

MWTP Parent = -(.0101151/-.00456010)
MWTP Parent = 2.2174 dollars per percentage point of risk reduction
with Standard Error (.2819)
95% Confidence Interval [1.6649 to 2.7699]
99% Confidence Interval [1.4912 to 2.9435]

Using the formula listed in the Methods chapter, MWTP was calculated to be approximately $1.94 per one percentage point of risk reduction per year for the child, and approximately $2.22 per one percentage point of risk reduction per year for the parent. At first glance, it appears that the parent's MWTP is slightly larger than the child's, so to assess whether this is an efficient allocation of resources in the household, it is necessary to test whether these two numbers are statistically different. As was discussed in Background and Theory sections, the parent maximizes the family utility function by providing for the family. Given the result of equation (9), the parent should have an equal MWTP for their own and child's health. The principle can be further examined by testing the following hypothesis:

HO: MWTP Parent = MWTP Child

HA: MWTP Parent ≠ MWTP Child

After examining the overlap of both the 95% and 99% confidence intervals, it can be determined that the parent and child MWTP are not statistically different. This means we fail to reject the null hypothesis and the theory shown in equation (9) which shows that that the most efficient allocation of family resource occurs when parental MWTP is the same for the parent and child.

To further explain the results of MWTP calculations, a likelihood ratio test can be conducted to examine whether the parent and child models are statistically different. (Greene 2006) Two models were estimated, a Restricted and an Unrestricted model, using NLogit. The Unrestricted model mimics the simple model used above as it only three variables: price, risk reduction level, and a constant. The Restricted model uses the same variables, but fixes the coefficients for price and risk reduction level to be equal across the child and parent equations.

Table 8 - 6.1: Likelihood Ratio Test Using Model 1

Model 1				
90*, 95**, 99***	Unrestricted		Restricted	
	Child	Parent	Child	Parent
Price	-.0042*** (.0005)	-.0046*** (.0005)	-.0043*** (.0004)	-.0043*** (.0004)
Risk Reduction Child	.0080*** (.0007)	-	.0088*** (.0006)	-

Risk Reduction Parent	-	.0101*** (.0008)	-	.0088*** (.0006)
Constant	-.3077*** (.0489)	-.2071*** (.0413)	-.3346*** (.0458)	-.1884*** (.0383)
Rho	.9030*** (.0097)		.9013*** (.0098)	
Number of Obs.	2647		2647	
Log Likelihood	-2773.799		-2777.829	
Hypothesis Testing				
H0: Unrestricted Model = Restricted Model HA: Unrestricted Model ≠ Restricted Model If Test Value > Critical Value, Reject Null Hypothesis -2(Restricted Model - Unrestricted Model) -2[(-2777.829) - (-2773.799)] Test Value = 8.06 Chi-Squared Critical Value (P = .05) = 5.99 Chi-Squared Critical Value (P = .01) = 9.21 8.06 > 5.99, Reject the Null Hypothesis 8.06 < 9.21, Fail to Reject the Null Hypothesis				

The results reveal that the unrestricted and restricted models are statistically different with 95% level of confidence, though they are not statistically different at the 99% level of confidence. This reveals that the coefficients from the parent and child models are very similar, which helps explain why their MWTP estimates are not statistically different.

6.2 Results: Contributing Factors for the Purchase of a Heart Disease Risk Reduction Program

In this section the contributing factors for the purchase of the heart disease risk reduction program are discussed. Eight models are estimated to test various specifications using a wide variety of variables. Model 1 is a replica of the simple model used for the WTP calculations while Model 6 was chosen because it was the most robust and consistent with the expectations of this research.[7]

Table 9 - 6.2: Contributing Factors for the Purchase of a Heart Disease Risk Reduction Program

90*,95**,99***	Model 1		Model 6	
	Child	Parent	Child	Parent
Price	-.0042*** (.0005)	-.0046*** (.0005)	-.0042*** (.0005)	-.0049*** (.0005)
Risk Reduction Child	.008*** (.0007)	-	.0082*** (.0008)	-
Risk Reduction Parent	-	.0101*** (.0008)	-	.0114*** (.0009)
Age Child	-	-	.0093 (.0072)	-
Gender Child	-	-	.0441 (.0414)	-
Age Parent	-	-	-.0064 (.0050)	.0039 (.0047)
Gender Parent	-	-	.0989 (.0635)	.2014*** (.0637)
Married	-	-	-.3121** (.1240)	-.2482** (.1251)
# Children in HH	-	-	-.0920*** (.0270)	-.0777*** (.0277)
Education	-	-	.0840 (.0631)	.1770*** (.0638)
Employed	-	-	.1571** (.0688)	.2230*** (.0704)
Income ($10,000's)	-	-	.0312*** (.0064)	.0290*** (.0065)
Smoking	-	-	.1626*** (.0617)	.2353*** (.0628)

[7] Additional models, Models 2-5, were formed using health and demographic variables. These models were estimated with different specifications than Models 1 and 6. Models 2 through 5 may be found in the appendix.

Diabetic Child	-	-	.2559 (.3003)	-
Diabetic Parent	-	-	.2914** (.1342)	.2836** (.1356)
BMI High Risk	-	-	.0683 (.0752)	.1210 (.0769)
BMI Highest Risk	-	-	.2339*** (.0782)	.2528*** (.0799)
Need Med. BP Child	-	-	.1667 (.1508)	-
Need Med. BP Parent	-	-	.2263*** (.0704)	.2567*** (.0710)
Need Med. Chol Child	-	-	.0951 (.1688)	-
Need Med. Chol Parent	-	-	.0514 (.0673)	.1876*** (.0676)
Constant	-.3077*** (.0491)	-.2071*** (.0415)	-.4448* (.2470)	-.9638*** (.2485)
Number of Obs.	2647		2213	
Log Likelihood	-2773.7993		-2219.6794	
Wald Chi Squared (# of Vars)	314 (4)		443.03 (35)	

Model 1

Child

In the first model for the child: the price, the child's risk reduction level, and the constant are all statistically significant at the 99% level. Price is negative so an increase in the price will decrease the probability of purchasing the program, which is consistent with the Law of Demand. The risk reduction level is positive, meaning that a decrease in the child's risk will increase the probability of the purchasing the program.

Parent

In the first Model for the parent: the price, parent's risk reduction level, and the constant are also all statistically significant at the 99% level. Price is negative like in the child's model, so an increase in the price will lead to a decrease in the probability of the parent purchasing the program. The risk reduction level variable is positive meaning that an increase in the risk reduction level will increase the probability of the parent purchasing the program. It is important to note that the parameters for price and risk reduction are almost identical between Model 1 and 6, indicating robustness of the coefficients.

Model 6

Child

In this model new variables were added describing: the age and gender of the child and parent, marital status of the parent, number of children in the household, education level of the parent, employment status of the parent, household income, whether the parent is or was a smoker, whether the parent and child have been diagnosed with diabetes, two variables describing BMI levels, and whether the parent and child need medication for blood pressure and cholesterol. The price, risk reduction level, marital status of the parent, number of children in the household, employment, household income, smoking, diabetic parent, highest BMI range for the parent, and the need for blood pressure medicine for the parent are all statistically significant at the 95% level or greater.

The coefficient of price is negative, as in the first model meaning that an increase in the price will result in a decrease in the probability of purchasing the program on average. The child risk reduction mimics the first model as well with a positive coefficient. This indicates that an increase in the risk reduction level will result in an increase in the probability of purchasing the program on average. The marital status of the parent has a negative coefficient in this model which means that unwed parents are more likely to purchase the program than those that are married. The number of children in the household is also negative. This means that as additional children are brought into the household the probability of purchasing the program for the child is decreased. This is likely due to the increased cost to the household medical care associated with larger families.

The employed variable is positive, meaning that parents who are currently employed are more likely to purchase the program for their child than those who are not. Income is also a positive variable in this model. This indicates that as income increases the probability of purchasing the program also increases. The employment and income variables are slightly correlated, as can be seen in the correlation matrix in the appendix. Smoking is positive as expected, which means that smokers are more likely to purchase the program than non-smokers. This shows that smokers are likely willing to pay more for the heart disease risk reduction. The diabetic parent variable is positive in this model. This indicates that parents' who have been diagnosed with diabetes are more likely to purchase the program for their child than those without the condition. This illustrates that parents understand diabetes to be hereditary, and can be passed through genetics, as seen in the literature (Lloyd-Jones et al. 1999, 2006).

The highest level of risk associated with a BMI of 30 or higher is positive in this model. This indicates that parents who belong within this BMI range are more likely to purchase the program for their child than those without a BMI in this range. Lastly, the need for blood pressure medicine by the parent is positive. This suggests that parents who have been told by a medical professional that they need medications to regulate their blood pressure are more likely to purchase the program for their child than those who do not require medication. This is consistent with the literature as high blood pressure can be hereditary.

The age and gender variables for the child and parent were not statistically significant in this model. This reveals that age and gender do not affect the probability of purchasing the program. The education level was also not statistically significant in this model indicating that parents with a four-year college education were not more likely to purchase the program for their child than those without a college degree. Whether the child has been diagnosed with diabetes was also not statistically significant. This is likely due to the small number of children with the disease, only 10 respondents or .38% of the data. The BMI level between 25 and 29 was also not statistically significant in this model which is likely due to parents underestimating the risk of being only marginally overweight.

The child's need for blood pressure medication was also not statistically significant. Much like in the child diabetes variable, this variable also suffered from a lesser number of respondents with 60 cases or 2.26% of children requiring this medication. Lastly, the need for cholesterol medication for the parent and child were also not statistically significant in this model. In the case of the child, only 48 respondents, or 1.81% of the data, needed this medication inferring the lack of data is likely the reason for the lack of statistical significance. For the parent, this means they do not believe that their need for the medicine will affect their child; which is contrary to the literature, as this type of disease has been shown to be hereditary (Lloyd-Jones et al. 1999, 2006).

Parent

In the parent's model the explanatory variables include: the age and gender of the parent, marital status of the parent, number of children in the household, education level of the parent, employment status of the parent, household income, if the parent is or was a smoker, whether the parent has been diagnosed with diabetes, two variables describing BMI levels, and whether the parent needs medication for blood pressure and cholesterol. The child variables were omitted from this model as it is hypothesized that they will not directly affect the parent's WTP. This concept will be tested in a later model, Model 8, included in the appendix. The price, risk reduction level, gender of the parent, marital status, number of children in the household, the parent's education level, employment status, household income, whether the parent is or ever was a smoker, being diagnosed with diabetes, the highest BMI level representing a BMI of 30 or higher, the need for blood pressure and cholesterol medication, and the constant, are all significant at the 95% level or higher.

Price is negative as in the first model, meaning that an increase in the price will result in a decrease in the probability of purchasing the program, on average. The risk reduction level is positive revealing that an increase in the reduction of risk offered by the program will result in an increase in the probability of purchasing the program. The gender of the parent is positive which means the men are more likely to purchase the program than women. The marital status variable has a negative coefficient. This means that unmarried parents are more likely to purchase the program than those that are married. The number of children in the household is also negative. This is likely the case because as additional children enter the household, the overall household costs increase, economically deterring parents who then become more reluctant to purchase the program for themselves. Education is positive, showing that parents with at least a four-year degree are more likely to purchase the program than those who do not have a degree. The employment status is also a positive variable meaning that parents who are currently working are more likely to purchase the program than those who are not. Household income is also positive meaning as household income increases, so does the probability of purchasing the program for the parent.

The coefficient of the smoking variable is positive showing that parents who smoke are more likely to purchase the risk reduction program. The variable for diabetes has a positive coefficient; this indicates that parents with diabetes are more likely to purchase the program than those that do not. This is consistent with the literature as diabetes has shown to increase the risk of developing heart disease. The highest BMI level representing individuals with BMI's of 30 or more is positive meaning that parents that fall into this range are more likely to purchase the program than those who do not. This is consistent with the literature as indicated overweight individuals are shown to have increased chances of developing heart disease. Lastly, the need for blood pressure and cholesterol medication were shown to positively influence the choice of the risk reduction program. This means that parents who are currently taking these medications are more likely to purchase the program than those who are not taking the medication. The literature has shown that having elevated blood pressure and cholesterol levels increases the risks of developing heart disease (Lloyd-Jones et al. 1999, 2006).

Only two variables, age and the BMI range between 25 and 29, were not statistically significant at the 95% level or greater. This means that as the parent's age increases the probability of purchasing the program does not increase. This could show that the parent's age is interacting with other variables in the model, resulting in a loss of significance in the variable. The BMI range between 25 and 29 was also not statistically significant. This could arise if parents with a BMI between 25 and 29 view themselves as only being slightly overweight, and do not consider their weight as a factor for an increased risk in heart disease.[8]

6.3 Results: Contributing Factors of Risk before the Introduction of Information

In this section factors that contribute to an individual's perception of risk are discussed. The dependent variable in these models is the parent and child's first estimate of their risk of developing heart disease by age 75. These regressions will be used to examine if individuals understand the factors that affect their current risk level before information is given on the risk factors.

[8] Two additional models, Models 7 and 8, were created to test eight new variables and test symmetry between the models. These models can be found in the appendix.

Four models were estimated in this section. Models 9 and 10 used the OLS method of regression while Models 11 and 12 used the seemingly unrelated regression (SUR) method. Model 11 is the preferred model because it had a comparable R-squared value to the OLS method models of 9 and 10, and has improved efficiency because the error terms of the two equations are assumed to be correlated. Models 9, 10, and 12 are included in the appendix.

Table 10 - 6.3: Examining Individual's Risk Assessment before the Introduction of Information

90*, 95**, 99***	Model 11	
	Child	Parent
Age Child	-.0080 (.0851)	-
Gender Child	2.5409*** (.4849)	-
Age Parent	-.2924*** (.0608)	-.2325*** (.0613)
Gender Parent	-2.1317*** (.7781)	.7103 (.8381)
Smoking	.7082 (.7735)	4.2782*** (.8357)
Diabetic Child	3.4639 (3.9700)	-
Diabetic Parent	1.0090 (1.7208)	2.0705 (1.8564)
BMI High Risk	3.5703*** (.9502)	4.4390*** (1.0269)
BMI Highest Risk	3.1582*** (1.0085)	6.3594*** (1.0895)
Need Med. BP Child	.7135 (1.8021)	-
Need Med. BP Parent	.9667 (.9170)	3.6018*** (.9887)
Need Med. Chol. Child	1.8210 (1.9893)	-

Need Med. Chol. Parent	3.3303*** (.8709)	5.1556*** (.9389)
Overall Health Child	-20.0931*** (2.7798)	-
Overall Health Parent	-3.6829** (1.5026)	-9.6423*** (1.6183)
Family History Child	1.6733*** (.5046)	-
Family History Parent	5.9624*** (.7255)	9.2813*** (.7775)
Exercise Child	-3.8313*** (.6212)	-
Exercise Parent	-2.9941*** (.7569)	-5.1271*** (.8120)
Diet Child	-5.3091*** (.7647)	-
Diet parent	-1.9437* (1.0775)	-7.8368*** (1.0955)
Constant	66.2113*** (3.9786)	50.4678*** (3.1469)
Number of Obs.	2644	
R-Squared	0.1347	0.2074

Model 11

Child

Model 11 was estimated using the SUR method of regression. The same approach was used in these models as in the previous probit regression where the parent variables are included in the child models. The gender of the child, age and gender of the parent, both BMI levels, the need for cholesterol medicine for the parent, overall health of the child and parent, family history of the child and parent, diet of the child, and exercise for the child and parent, and the constant are statistically significant at the 95% level or greater.

The gender of the child is positive; this indicates that parents understand that the risk of heart disease for male children is greater than female children. The age of the parent is negative which suggests that an increase in the age of the parent will result in a decrease in the perceived risk. Much like the gender of the child, the gender of the parent is also positive pointing out male parents on average feel that their children have a higher risk than do female parents. Both BMI risk levels are positive suggesting that parents with a BMI of 25 or greater perceive an increase in risk for their child. The need for cholesterol medication for the parent is positive; this signifies that individuals taking medicine to control their cholesterol perceive a higher risk of developing heart disease. The overall health of the child and parent was negative; this means that individuals who are in good health understand that they have a decreased risk of developing heart disease.

Family history for both child and parent was positive, which suggests that if an individual has a family history of heart disease perceive their self as having a higher risk. Lastly exercise for the child and parent as well as the diet for the child was negative. These negative coefficients show that individuals who subscribe to the suggested daily exercise regime and eat healthy diets perceive a decreased risk of developing heart disease. All of these outcomes are consistent with the information given by the American Heart Association (2010).

The age of the child, smoking parents, diabetic child and parent, the need for blood pressure medication for the child and parent, the need for cholesterol medication for the child, and the diet of the parent were not statistically significant in this model. The lack of significance in the age of the child signifies that as age varies the level of perceived risk does not change. The child's age is likely not significant because of the small range, between 6 and 16, used in the survey. The smoking parent variable was also not significant, indicating the child's risk assessment does not vary with the smoking habits of the parent. This means that a smoking parent does not think that their smoking affects their child's risk.

The non-significance of the diabetic child and parent variables show that the parent does not believe that diabetes plays a role in the development of heart disease. This is contrary to the American Heart Association (2010) where it is stated that diabetes will lead to an increase in the risk of developing heart disease. Much like the diabetes variables, the need for blood pressure medicine variables for the parent and child as well as the need for cholesterol medication for the child were not statistically significant. As discussed earlier, the number of surveyed individuals who have diabetes or are taking regular medication for blood pressure or cholesterol was very small compared to the sample size, which likely changes the result. Lastly the Diet of the Parent was not a statistically significant variable. This means that the parent does not feel that their diet increases the risk of heart disease for their child.

Parent

In this model the SUR method of regression was used to determine the variables that affected the parent's perceived risk. The parent's first risk assessment is the dependent variable and various demographic and health variables are used as the independent variables. The parent's model only contains variables that describe the parent; child variables are left out of this model. The age of the parent, smoking, both BMI levels, the need for blood pressure and cholesterol medicine, overall health, family history, exercise, and diet are all statistically significant at the 95% level or greater.

The age of the parent is negative; this means that as age increases the risk of developing heart disease is perceived to decrease. This is an unusual result, and as seen in Model 6, is contrary to the information given by the American Heart Association (2010). Smoking is positive meaning that parents who smoke perceive a higher risk. The two BMI levels are also positive. This implies that if a parent has a BMI higher than 25 they perceive themselves as having a greater risk. The needs for blood pressure and cholesterol medication also have positive signs on their coefficients. This means that parents who have been told by a doctor that they need to take these medications have a higher perceived risk. The overall health variable is negative indicating parents who are in good health perceive a lesser chance of developing heart disease.

Family history was shown to have a positive coefficient. This illustrates that parents with a family history of heart disease believe they have a greater perceived risk than those without a family history of this disease. Lastly, exercise and diet variables have negative coefficients. This means that parents who subscribe to daily recommended exercise, and eat healthy diets, have a lower perceived risk of developing heart disease.

Mirroring the results from Model 6, these outcomes are consistent with the information stated by the American Heart Association (2010) with the exception of the parent's age. The American Heart Association explains that as age increases so too does the risk of developing heart disease. This result is curious and could be attributed to correlation with other variables.

One notable result of this model was the Smoker variable. With a coefficient of 4.2782, this means that the parent believes that smoking increases their risk of developing heart disease by approximately four percent. This finding is consistent with the American Heart Association (2010) which states that Smoking increases an individual's risk of developing heart disease between five and ten percent. This means that parents accurately assess the risk of smoking and that information on this issue appears to have been effective in terms of affecting the perception of heart disease risks.

The parent's gender and whether they have diabetes were not statistically significant variables in this model. This means that there is no difference between men and women when it comes to evaluating their perceived risk, even though the American Heart Association (2010) states that women have a 19% chance of developing heart disease, while men have approximately a 35% chance. A possible explanation for this is that females overestimate their actual risk while males underestimate their risk, resulting in the same risk perception. The non-significance of the diabetes variable suggests that parents with diabetes do not perceive a higher risk of developing heart disease from having this condition.

Much like in Model 1, this is likely best explained by the lack of observations regarding diabetic parents.

Model 12

In the last model, Model 12, a similar approach to Model 8 from results section 6.2 was employed where symmetry was applied and the child variables were regressed in the parent's model. The child's model saw only one difference as the variable describing the need for cholesterol medication was now statistically significant much like the first model. In the parents model there is no change in the original variables but one newly introduced child variable, the child's need for cholesterol medicine, is now statistically significant at the 95% level or greater. This means that parents who have children with a need for cholesterol medication have a greater perceived risk for themselves. Due to the lack of consistency with the literature, this model will not be included in the principal section of this research, and can be viewed in the appendix.

In conclusion this chapter shows that the MWTP for a risk reduction in heart disease for a parent and their child was not statistically different leading to a failed rejection of the null hypothesis that the two MWTP measures are the same. This means that parental altruism plays a factor in the parent's decisions for their child's health with regards to heart disease, and is consistent with the theory that suggests equal percentage risk reduction values as shown in equation (9). It was also shown that many demographic and health variables affect the parent's decision to purchase their own risk reduction program, as well as purchase the program for their child. These finding were consistent with the theory discussed in the Background and Theory Chapter 2.1. Lastly it was discovered that overall parents appear to understand the risk factors associated with an increased risk of developing heart disease, and is also consistent with the theory in the Background and Theory Chapter 3.1.

While the MWTP estimates calculated in this chapter are very similar to the ones found in Adamowicz et al. (2012) the overall approach was different. In the paper by Adamowicz et al. (2012) only paired parents, either married or partnered, were used. This differs from the work in this thesis as all of the observations, including cases were only one parent was asked to participate were used. Given this change in the observations, a unitary model like the ones discussed in Becker (1974, 1981) was chosen instead of the collective model used in Adamowicz et al. (2012).

Chapter 7 Conclusions: Overview

In this chapter the conclusions of the research will be discussed. First the research topics, models, and hypotheses will be examined. Next the contributions to the literature and economic community will be discussed. Lastly the limitations of the research and ideas for future research will be discussed.

7.1 Conclusion: Research Summary and Contributions to the Literature

Heart disease is a large problem in the United States and Canada. Organizations like the American Heart Association and the United States Environmental Protection Agency are doing their best to educate the public on the risks of heart disease, and studying the impact of environmental factors on health risks respectively. This research set out to examine three things. First, what is the average American parent's WTP for a reduction in their own and child risk of developing heart disease by age 75, and how do these two estimates compare and is it an efficient allocation of family resources? Second, what are the contributing factors for the purchase of a heart disease risk reduction program? Third, how do individuals perceive heart disease risk, and do they understand the risk factors associated with the development of this disease?

For the first research question it was shown that parent's MWTP for their own and child's risk reduction were $2.22 and $1.94 dollars per percentage of risk reduction respectively. Given that the child's MWTP was positive, it was shown that parental altruism effects the heart disease risk reduction decisions of parents when making decisions about their child. While the parent's MWTP is higher in absolute terms, it was concluded that the two MWTP estimates were not statistically different at the 95% and 99% levels, which resulted in a failure to reject the null hypothesis:

$$HO: MWTP\ Parent = MWTP\ Child$$

$$HA: MWTP\ Parent \neq MWTP\ Child$$

This failed rejection confirms the household model theory used in this paper which originated from Adamowicz et al. (2012). The acceptance of equation (9) which stated that the equal MWTP for the parent and child, showed that equal estimates for WTP result in an efficient allocation of household resources.

The next research question sought to examine the contributing factors for a purchase of the heart disease risk reduction program. It was discovered that in the case of the child: price, risk reduction level, marital status of their parents, number of children in the household, employment status of the parents, household income, parents the smoke or have smoked in the past, diabetic parents, a BMI of 30 or more, the need for blood pressure medication for the parent were all statistically significant variables at the 95% level or greater. These variables affected the probability of the parent purchasing the program for the child.

In the case of the parent: price, risk reduction level, gender, marital status, number of children in the household, education level, employment status, household income, whether the parent is currently or ever was a smoker, being diagnosed with diabetes, a BMI of 30 or higher, and the need for blood pressure and cholesterol medication were statistically significant variables at the 95% level or greater. These variables also affected the probability of purchasing the program by the parent for themselves.

Lastly in regards to third research question, it was shown that on average individuals do understand the risk factors involved with developing heart disease. In the case of the child: gender of the child, age and gender of the parent, both BMI levels, the need for cholesterol medicine, overall health, family history, exercise for the child and parent, diet for the child, and the constant are statistically significant at the 95% level or greater. Overall the parent perceived their child as having approximately 28% risk of developing heart disease by age 75 across the sample.

In the case of the parent: the age of the parent, smoking, both BMI levels, the need for blood pressure and cholesterol medicine, overall health, family history, exercise, and diet are all statistically significant at the 95% level or greater. Overall the parent's estimated their own risk of developing heart disease by age 75 to be approximately 36% across the sample.

The results calculated in these three research questions will make contributions to the economic literature surrounding household models, calculations of WTP, and risk perceptions. The WTP information in particular could be used by United States EPA as regulation input calculations for future policy actions.

7.2 Conclusion: Limitations, and Future Research

There were several limitations to the research conducted in this thesis. The first major limitation in this research was that many of the questions in the survey had bounded responses, where individuals were made to choose a bracketed answer instead of inputting their own response. This bracketed, multiple choice style was used to streamline the survey's duration and cut down on wild responses. Given these bracketed answers, less accurate measurements in variables such as household income and child weight and height. An example of the child's weight and height, the bracketed responses meant that BMI calculations for children could not be used since the American Heart Association requires measurements to a quarter of an inch and within one pound. In the future more accurate data could be collect to prevent the loss of variables.

The use of a stated preference format was also a limitation in this research. There is still a debate in the economics community as to whether stated or revealed preference is the best at measuring WTP. Stated preference surveys often suffer from several ailments such as hypothetical and response biases, where the respondent answers the questions the way they believe the questionnaire wanted them to answer. This can lead individuals away from their true feelings, and more accurate responses. While a "cheap talk" script was used in this research to reduce hypothetical bias, further accuracy could be gained by using "certainty questions" like those in Adamowicz et al. (2012). Certainty questions are used to measure a respondent's confidence in their stated answer. The reliability of some responses is also questionable. Diet, exercise, and other health questions were skewed toward the "healthy" side in many cases even though other data collected on BMI shows that this data might not be accurate.

Another limitation of this research is the survey design. The survey used in this research was very ambitious and had multiple sections. Due the length of this survey, time became a factor for the survey respondents. Other problems occurred because the survey was not quite representative of the US population. Variables such as household income, the number of children in the household, and education level of the parent were found to be greater than the national average. Further problems include the complexity of the issues being discussed and questions being asked about heart disease and health, as well as the functions of the tools used in the survey. The large amount of information that was given, and the tools, graphs, and tables, used in the survey can become overwhelming to some.

Lastly the good itself, a percent risk reduction in heart disease, could be a limitation. The concept could be difficult to understand for some and other respondents could have dismissed the good because they do not believe it is possible to decrease one's risk with this good.

One future research idea that could be done using this data would be to examine the perceived heart disease risk estimates gathered before and after the introduction of information, and examine how individual's update their responses. There are many papers regarding whether individuals are Bayesian updaters, and this data could be used to test those hypotheses.

Another possible future research idea would be to examine the differences in the perceived risks reported by individuals, with the objective measures of risk. In this research the perceived increase in the risk of developing heart disease from smoking was shown to be very close to the real risk estimates presented by the American Heart Association (2010). Other variables such as diabetes, elevated BMI, and the individual's diet could be examined to see if the perceived risks given by the survey respondents accurately reflect the objective measures of risk.

Further research could include the use of a revealed preference survey using real risk reduction programs including doctors, medical studies, and real market drugs. While this research would be difficult to administer given that presently no drugs exist, the revealed preference results could be compared to the stated preference results calculated in this thesis. Lastly, the stated or reveal preference surveys could be repeated in given intervals to measure if WTP estimates or risk perceptions change over time.

Literature Cited

Aadland, David, Arthur Caplan, and Owen Phillips. 2007. "A Bayesian examination of information and uncertainty in contingent valuation." *Journal of Risk & Uncertainty*. 35(2): 149-178.

Adamowicz, W., Dupont, D.P., Krupnick, A., and Zhang, J. 2011. "Valuation of Cancer and Microbial Disease Risk Reductions in Municipal Drinking Water: An Analysis of Risk Context Using Multiple Valuation Methods" *Journal of Environmental Economics and Management*. 61(2):213-226.

Adamowicz, Wiktor, Mark Dickie, Shelby Gerking, Marcella Veronesi, and David Zinner. 2012. "Collective Rationality and Environmental Risks of C hildren's Health." Working Paper #2012, Department of Resource Economics and Environmental Sociology, University of Alberta, Edmonton, AB.

Afschin Gandjour, Amiram Gafni. 2010. "The Additive Utility Assumption of the QALY Model Revisited." *Journal of Health Economics.* 29(2): 325-328

Alberini, A., M. Cropper, A. Krupnick, and N. Simon. 2006. "Willingness to pay for mortality risk reductions: does latency matter?" *Journal of Risk and Uncertainty*. 32 (3): 231-245.

American Heart Association. 2010. http://www.heart.org/HEARTORG/ (Accessed May 2010).

Anderson, Lisa R. and Jennifer M. Mellor. 2008. “Predicting Health Behaviors with an Experimental Measure of Risk Preference.” *Journal of Health Economics.* 27(5): 1260-1274.

Becker, Gary S. 1974. “A Theory of Social Interactions.” *Journal of Political Economy*. 82: 1063-1093.

Becker, Gary S. 1981. “Altruism in the Family and Selfishness in the Market Place.” *Economica*. 48(189): 1-15.

Blundell, Richard, P.A. Chiappori, and C. Meghir. 2005. “Collective labor supply with children.” *Journal of Political Economy* 113: 1277-1306.

Cameron, Trudy Ann. 2005. “Updating Subjective Risks in the Presence of Conflicting Information: An Application to Climate Change.” *Journal of Risk and Uncertainty*. 30(1): 63-97.

Cameron, Trudy Ann, J.R. DeShazo, and E.H. Johnson. 2010. “The Effect of Children on Adult Demands for Health-Risk Reductions.” *Journal of Health Economics*. 29(3): 364-376

Cameron, Trudy Ann, J.R. DeShazo, and Peter Stiffler. 2010. “Demand for Health Risk Reductions: A Cross-National Comparison between the U.S. and Canada.” *Journal of Risk and Uncertainty*. 41:245-273.

Carlsson, Fredrik, Olof Johansson-Stenman, and Peter Martinsson. 2004. “Is Transport Safety More Valuable in the Air?” *Journal of Risk and Uncertainty*. 28(2): 147-163.

Chiang, Alpha C. and Wainwright, Kevin. 2005. *Fundamental Methods of Mathematical Economics, 4th Edition*. New York, NY: McGraw-Hill Irwin.

Chiappori, Pierre-André. 1992. “Collective Labor Supply and Welfare.” *Journal of Political Economy*. 100(3): 437-467.

Dickie, Mark and Shelby Gerking. 2007. “Altruism and Environmental Risks to Health of Parents and their Children” *Journal of Environmental Economics and Management*. 53(3): 323-34.

Dickie, Mark and Victoria L. Messman. 2004. “Parental Altruism and the Value of Avoiding Acute Illness: are Kids worth more than Parents?” *Journal of Environmental Economics and Management.* 48: 1146-1174.

Greene, William H. 2006. *Econometric Analysis, 5th Edition*. Upper Saddle River, New Jersey: Prentice Hall.

Haab, Timothy C. and Kenneth E. McConnell. 2002. *Valuing Environmental and Natural Resources.* Northampton, Massachusetts: Edward Elgar Publishing, Inc.

Hahn, André and Britta Renner. 1998. “Perception of Health Risks: How Smoker Status Affects Defensive Optimism.” *Anxiety, Stress and Coping: An International Journal*. 11:93-112.

Hammitt, James K. 2004. “Effects of Disease Type and Latency on the Value of Mortality Risk.” *Journal of Risk and Uncertainty*. 28(1): 73-95.

Hammitt, James K. and John D. Graham. 1999. "Willingness to Pay for Health Protection: Inadequate Sensitivity to Probability?" *Journal of Risk and Uncertainty*. 8:33–62.

Hoehn, J.P. and A. Randall. 2002. "The Effect of Resource Quality Information on Resource Injury Perceptions and Contingent Values." *Resource and Energy Economics.* 24: 13-31.

Jacobsson, Fredric, Magnus Johannesson, and Lars Borgquist. 2007. "Is Altruism Paternalistic?" *The Economic Journal.* 117: 761-781.

Johannesson, Magnus and Per-Olov Johansson. 1997. "Is the Valuation of a QUAL Gained Independent of Age? Some Empirical Evidence." *Journal of Health Economics.*16(5): 589-599.

Johansson, Per-Olov. 1994. "Altruism and the Value of Statistical Life: Empirical Implications." *Journal of Health Economics.* 13: 111–118.

Johansson, Per-Olov. 2002. "Defining the value of Statistical Life: Reply." *Journal of Health Economics*. 21(1): 177-178

Jones-Lee, Michael W. 1991. "Altruism and the Value of Other People's Safety." *Journal of Risk and Uncertainty.* 4: 213–219.

Jones-Lee, Michael W. 1974. "The Value of Changes in the Probability of Death or Injury." *Journal of Public Economy*. 82: 835-849.

Jones-Lee, Michael W., M. Hammerton, and P.R. Philips. 1985. "The Value of Safety: Results of a National Sample Survey." *The Economic Journal.* 95: 49-72.

Kenkel, Don. 1997. "On Valuing Morbidity, Cost-effectiveness Analysis, and Being Rude." *Journal of Health Economics*. 16(6): 749-757.

Krupnick, Alan J. and Maureen L. Cropper. 1992. "The Effect of Information on Health Risk Valuations." *Journal of Risk & Uncertainty*. 5(1): 29-48.

Krupnick, Alan, Anna Alberini, Maureen L. Cropper, Martin Daniel Heintzelman. 2002. "Age, Health and the Willingness to Pay for Mortality Risk Reductions: A Contingent Valuation Survey of Ontario Residents." *Journal of Risk and Uncertainty*. 24(2): 161-186.

Lloyd-Jones, Donald M., Martin G. Larson, Alexa Beiser, and Daniel Levy. 1999. "Lifetime Risk of Developing Coronary Heart Disease." *The Lancet.* 353: 89-92.

Lloyd-Jones, Donald M., Eric P. Leip, Martin G. Larson, Ralph B. D'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.

Mankiw, NG. 2011. *Principles of Economics, 5th edition*. Mason, OH: South-western Cengage Learning.

Rogers, George O. 1997. "The Dynamics of Risk Perception: How Does Perceived Risk Respond to Risk Events?" *Risk Analysis*. 17(6): 745-757.

Sjöberg, Lennart. 2000. "Factors in Risk Perception." *Risk Analysis.* 20(1): 1-12.

Slovic, Paul and Ellen Peters. 2006. "Risk Perception and Affect." *Current Directions in Psychological Science.* 15(6): 322-325.

Smith, V. Kerry and William H. Desvousges. 1987. "An Empirical Analysis of the Economic Value of Risk Changes." *Journal of Political Economy.* 95: 89–113.

Stewart, Jennifer M., Eamon O'Shea, Cam Donaldson, and Phil Shackley. 2002. "Do Ordering Effects Matter in Willingness-to-pay Studies of Health Care?" *Journal of Health Economics*. 21(4): 585-599.

Sun, Qinghua, Peibin Yue, Zhekang Ying, Arturo J. Cardounel, Robert D. Brook, Robert Devlin, Jing-Shian Hwang, Jay L. Zweier, Lung Chi Chen, and Sanjay Rajogopalan. 2008. "Air Pollution Exposure Potentiates Hypertension through Reactive Oxygen Species-Mediated Activation of Rho/ROCK." *Arteriosclerosis, Thrombosis, and Vascular Biology*. 28:1760-1766.

Tversky, A. and D. Kahneman. 1974. "Judgment under Uncertainty: Heuristics and Biases." *Science*. 185: 1124-1131.

United States Department of Commerce. 2010. 2010 United States Census. http://www.census.gov/2010census/ (accessed October 2012)

Viscusi, W.K. 1985. "Are Individuals Bayesian Decision Makers?" *American Economic Review.* 75(2): 381-385.

Viscusi, W.K. 1990. "Do Smokers Underestimate Risks?" *Journal of Political Economy*. 98(6): 1253-1269.

Viscusi, W.K. 1997. "Alarmist Decisions with Divergent Risk Information." *The Economic Journal.* 107(445): 1657-1670.

Viscusi, W.K. and W.N. Evans. 1998. "Estimation of Revealed Probabilities and Utility Functions for Product Safety Decisions." *Reviews of Economics and Statistics.* 80:28-33.

Viscusi, W.K and W.A. Magat. 1992. "Bayesian Decisions with Ambiguous Belief Aversion." *Journal of Risk and Uncertainty.* 5:371-387.

Appendices: Correlation Matrix

Table 11 – A1: Correlation Matrix for Child – Age Parent

	Child	Parent	Risk Child	Risk Parent	Price	Risk Reduction Child	Risk Reduction Parent	Age Child	Age Parent
Child	1	-	-	-	-	-	-	-	-
Parent	0.662	1	-	-	-	-	-	-	-
Risk Child	0.1305	0.072	1	-	-	-	-	-	-
Risk Parent	0.1367	0.1606	0.7499	1	-	-	-	-	-
Price	-0.1586	-0.1736	-0.0478	-0.0397	1	-	-	-	-
Risk Reduction Child	0.1469	0.0678	0.0368	0.0339	-0.0192	1	-	-	-
Risk Reduction Parent	0.0648	0.1845	-0.0093	0.0115	0.0011	0.5718	1	-	-
Age Child	0.038	0.0427	0.0094	0.0081	0.0136	-0.0387	-0.0015	1	-
Age Parent	0.0367	0.0898	-0.0604	-0.0323	0.0179	-0.0382	-0.0006	0.4881	1
Gender Child	0.0328	0.0228	0.065	-0.0054	0.0182	-0.0062	0.0114	0.0014	0.0047
Gender Parent	0.0719	0.1317	-0.0592	0.0412	-0.0088	-0.0118	0.0146	-0.0191	0.1243
Married	-0.042	-0.0226	-0.002	-0.0076	0.0242	0.0258	0.0204	-0.042	0.0384
# Children in HH	-0.0796	-0.0763	-0.0283	-0.0513	-0.0304	0.0483	0.0274	-0.1035	-0.1819
Education	0.0459	0.0739	-0.0109	-0.0662	-0.0053	0.0175	0.0172	-0.0595	0.1454
Employed	0.0924	0.1256	-0.0188	-0.0022	0.0244	-0.0157	-0.005	0.0955	0.1206
Income	0.1009	0.1147	-0.0135	-0.0409	0.0212	-0.0022	0.0049	0.0821	0.2261
Smoking	0.0702	0.0884	0.0398	0.1274	-0.0262	0.0167	0.0437	0.0534	0.0074
Diabetic Child	0.01	-0.0021	0.0224	0.0056	0.0155	-0.0281	-0.0155	0.0008	0.0497
Diabetic Parent	0.0716	0.0797	0.0496	0.0996	-0.026	0.0032	0.0184	0.0125	0.0328
BMI High Risk	-0.0288	-0.0161	-0.0001	-0.0571	-0.0513	-0.0048	-0.0095	-0.0468	0.0055
BMI Highest Risk	0.0967	0.1066	0.1019	0.2228	0.041	0.0152	0.0419	0.0739	0.0192
Need Med. BP Child	0.0319	0.0159	0.0648	0.0406	-0.0123	-0.0127	0.0199	0.0038	-0.0182
Need Med. BP Parent	0.1225	0.1448	0.1101	0.2098	0.0004	0.0093	-0.0033	0.0933	0.1373

Need Med. Chol. Child	0.0226	0.0091	0.0896	0.0795	0.016	-0.009	-0.0029	0.0385	0.0027
Need Med. Chol. Parent	0.0725	0.1257	0.1382	0.2119	0.0109	-0.0328	-0.0259	0.0824	0.1765
Overall Health Child	-0.0353	-0.0211	-0.1333	-0.0321	0.0208	0.0064	-0.0036	-0.0329	-0.0193
Overall Health Parent	-0.0815	-0.0637	-0.1304	-0.2203	0.0137	-0.0378	-0.0186	-0.0487	0.0016
Family History Child	0.0387	0.0525	0.1177	0.0816	0.0138	0.0193	0.0216	0.0684	0.0576
Family History Parent	0.0176	0.0333	0.1848	0.2385	-0.0073	0.0152	-0.0006	0.0283	0.045
Exercise Child	-0.0638	-0.0539	-0.1705	-0.093	-0.0009	0.0253	0.02	-0.1414	-0.0615
Exercise Parent	-0.0481	-0.068	-0.1654	-0.2247	0.0171	-0.0041	-0.0213	-0.0253	0.0104
Diet Child	-0.0652	-0.0338	-0.172	-0.1209	-0.0133	-0.0213	-0.0066	-0.1365	-0.0468
Diet Parent	-0.0469	-0.066	-0.1575	-0.238	0.0264	-0.0076	-0.0037	-0.012	0.0573

Table 12 – A2: Correlation Matrix for Gender Child – Diabetic Parent

	Gender Child	Gender Parent	Married	# Children in HH	Education	Employed	Income	Smoked	Diabetic Child	Diabetic Parent
Gender Child	1	-	-	-	-	-	-	-	-	-
Gender Parent	0.0054	1	-	-	-	-	-	-	-	-
Married	0.0056	0.1282	1	-	-	-	-	-	-	-
# Children in HH	-0.0338	0.0141	0.0813	1	-	-	-	-	-	-
Education	-0.0228	0.0395	0.0817	-0.0223	1	-	-	-	-	-
Employed	-0.0019	0.2892	-0.0061	-0.1291	0.122	1	-	-	-	-
Income	0.0268	0.08	0.197	-0.041	0.3804	0.1648	1	-	-	-
Smoking	0.0334	0.0256	-0.1001	-0.0798	-0.223	-0.0062	-0.1206	1	-	-
Diabetic Child	-0.017	-0.0267	0.0145	0.0319	0.0538	0.0012	0.0313	-0.008	1	-
Diabetic Parent	0.0272	0.0421	-0.0122	0.0083	-0.103	-0.0344	-0.078	0.0858	0.0578	1
BMI High Risk	0.0099	0.0392	0.0044	0.0534	0.059	0.0092	0.0432	-0.0092	-0.03	-0.0883
BMI Highest Risk	-0.0064	0.1424	-0.0034	-0.032	-0.1521	0.0796	-0.0974	0.0641	0.0434	0.1642
Need Med. BP Child	0.019	0.0167	-0.0938	-0.0038	-0.0239	0.0168	-0.0348	0.0051	0.0403	0.036
Need Med. BP Parent	-0.0147	0.1276	-0.0414	-0.1054	-0.0742	0.0546	-0.0255	0.0882	0.019	0.16
Need Med. Chol. Child	0.0025	-0.0169	-0.027	-0.0274	-0.0498	0.0106	-0.0142	0.0186	-0.0082	0.0499
Need Med. Chol. Parent	0.0091	0.149	0.0114	-0.0678	0.0284	0.0753	0.0689	0.0308	0.0501	0.1506
Overall Health Child	-0.0065	0.0271	0.082	0.0171	-0.0275	-0.0129	0.0076	0.0024	-0.0738	-0.0013
Overall Health Parent	0.0086	0.018	0.076	0.0244	0.1393	0.076	0.1132	-0.1067	-0.0134	-0.2013
Family History Child	0.0265	-0.096	0.0403	-0.0077	0.0289	-0.0225	0.0288	-0.0164	-0.0036	0.0084
Family History Parent	-0.0041	-0.0564	0.0301	-0.0083	0.0783	-0.001	0.0314	-0.0163	0.0243	0.0336
Exercise Child	0.0464	0.0308	0.0042	0.0342	0.0193	-0.019	0.0143	-0.0104	-0.0416	-0.0599
Exercise Parent	0.024	0.0703	0.0414	-0.0226	0.0983	0.0115	0.1162	-0.0894	0.0041	-0.0834
Diet Child	-0.0226	-0.041	0.0316	0.068	0.049	-0.0552	0.0204	-0.0534	0.0077	-0.0054
Diet Parent	0.0239	-0.0512	0.0586	0.0192	0.1076	-0.0495	0.0766	-0.0498	0.0269	-0.0274

Table 13 – A3: Correlation Matrix for BMI High Risk – Need Med. Chol. Parent

	BMI high Risk	BMI Highest Risk	Need Med. BP Child	Need Med. BP Parent	Need Med. Chol. Child	Need Med. Chol. Parent
BMI High Risk	1	-	-	-	-	-
BMI Highest Risk	-0.6154	1	-	-	-	-
Need Med. BP Child	-0.0368	0.0872	1	-	-	-
Need Med. BP Parent	-0.0999	0.2871	0.1292	1	-	-
Need Med. Chol. Child	-0.0393	0.056	0.4044	0.0825	1	-
Need Med. Chol. Parent	-0.0694	0.1942	0.0712	0.2843	0.1206	1
Overall Health Child	0.0028	-0.0199	-0.1428	-0.0357	-0.0587	-0.0195
Overall Health Parent	0.1165	-0.1991	-0.0521	-0.186	-0.0301	-0.1077
Family History Child	-0.0118	0.0066	0.0242	0.0156	0.0195	0.0304
Family History Parent	-0.0512	0.0571	0.0025	0.0959	0	0.091
Exercise Child	0.0176	-0.0564	-0.0636	-0.0471	-0.0855	-0.0772
Exercise Parent	0.0685	-0.2349	-0.0553	-0.1242	-0.0588	-0.1116
Diet Child	-0.0237	-0.0795	-0.1024	-0.1144	-0.0454	-0.0825
Diet Parent	0.0741	-0.2048	-0.1155	-0.1453	-0.049	-0.0879

Table 14 – A4: Correlation Matrix for Overall Health Child – Diet Parent

	Overall Health Child	Overall Health Parent	Family History Child	Family History Parent	Exercise Child	Exercise Parent	Diet Child	Diet Parent
Overall Health Child	1	-	-	-	-	-	-	-
Overall Health Parent	0.1439	1	-	-	-	-	-	-
Family History Child	0.0009	-0.0274	1	-	-	-	-	-
Family History Parent	0.0096	-0.0447	0.1911	1	-	-	-	-
Exercise Child	0.0892	0.0485	-0.0585	-0.0392	1	-	-	-
Exercise Parent	0.0222	0.15	-0.0521	-0.0726	0.2014	1	-	-
Diet Child	0.0825	0.0975	-0.0051	-0.0323	0.2129	0.1067	1	-
Diet Parent	0.0474	0.2059	0.0125	-0.0508	0.0649	0.1943	0.4809	1

Appendices: All Models

Table 15 – A5: Models 1-4 with Extended Decimal Places

90*,95**,99***	Model 1		Model 2		Model 3		Model 4	
	Child	Parent	Child	Parent	Child	Parent	Child	Parent
Price	-0.0041571*** (0.0004747)	-0.0045601*** (0.0004817)	-.0041786*** (.0004763)	-.0046719*** (.000486)	-.0039802*** (.0005221)	-.004641*** (.0005353)	-.0040705*** (.0005249)	-.0047555*** (.0005388)
Risk Reduction Child	0.0080451*** (0.0006583)	-	.008092*** (.000663)	-	.0079804*** (.0007384)	-	.0081017*** (.000745)	-
Risk Reduction Parent	-	0.0101115*** (0.0007722)	-	.0103605*** (.000781)	-	.0110589*** (.0008762)	-	.0111826*** (.000885)
Age Child	-	-	.0126234** (.0061988)	-	.0111229 (.0069592)	-	.0097864 (.0071102)	-
Gender Child	-	-	.0301205 (.0358371)	-	.0468356 (.0403277)	-	.0437712 (.0407174)	-
Age Parent	-	-	.0052089 (.0042162)	.0184307*** (.0039619)	.0019671 (.004704)	.0145333*** (.004427)	-.0026244 (.0048533)	.0092069** (.0045663)
Gender Parent	-	-	.1913486*** (.052322)	.3048155*** (.0524908)	.2248448*** (.0587616)	.362743*** (.0591503)	.1731962*** (.0614542)	.3003269*** (.0617051)
Married	-	-	-	-	-.2620391** (.1198655)	-.2099066* (.1212612)	-.3641501*** (.1229582)	-.3138122** (.1245145)
# Children in HH	-	-	-	-	-.1101157*** (.0262318)	-.1016578*** (.0268598)	-.1023855*** (.0265343)	-.0925021*** (.0271831)
Education	-	-	-	-	-	-	-.0055292 (.0605247)	.0660095 (.0608607)
Employed	-	-	-	-	-	-	.1690974** (.0679374)	.2382672*** (.0693176)

Income	-	-	-	-	-	-	2.72e-06*** (6.29e-07)	2.51e-06*** (6.36e-07)
Constant	-0.307716*** (0.0491384)	-0.2071163*** (0.0414698)	-.7511449*** (.1728388)	-1.099523*** (.1713451)	-.1731 (.2317552)	-.5778783** (.2320544)	-.2297348 (.2377208)	-.6889951*** (.2386717)
Number of Obs.	2647.0000		2647.0000		2213		2213	
Log Likelihood	-2773.7993		-2738.0916		-2287.6308		-2265.0397	
Wald Chi Squared (# of Vars)	314 (4)		372.56 (10)		331.63 (14)		369.30 (20)	

Table 16 – A6: Models 5-8 with Extended Decimal Places

90*,95**,99***	Model 5		Model 6		Model 7		Model 8	
	Child	Parent	Child	Parent	Child	Parent	Child	Parent
Price	-.0041782***	-.0048729***	-.0041957***	-.0049453***	-.0042122***	-.0049156***	-.0042399***	-.0049823***
	(.0005306)	(.0005455)	(.0005318)	(.0005483)	(.0005328)	(.0005493)	(.0005338)	(.0005516)
Risk Reduction Child	.0080826***	-	.0081739***	-	.008165***	-	.0082094***	-
	(.0007524)		(.0007552)		(.0007566)		(.000758)	
Risk Reduction Parent	-	.0111246***	-	.0113725***	-	.0113485***	-	.0114287***
		(.0008968)		(.0009012)		(.0009023)		(.0009042)
Age Child	.0093895	-	.0093368	-	.0056851	-	.0046884	-.0018242
	(.0072123)		(.0072381)		(.0073454)		(.0099013)	(.0100405)
Gender Child	.0426459	-	.0441256	-	.041139	-	.0838874	.0646413
	(.0412763)		(.0413833)		(.0415991)		(.0559474)	(.0570204)
Age Parent	-.0043357	.0074975	-.0064252	.0039468	-.0058777	.0041951	-.0062251	.0036864
	(.0049045)	(.0046068)	(.0049661)	(.0046831)	(.0049859)	(.0047031)	(.0052751)	(.0053645)
Gender Parent	.1163572*	.2361235***	.0988841	.2014319***	.1096093*	.2206718***	.1218229*	.2408333***
	(.0628874)	(.0631078)	(.0634616)	(.0637313)	(.064386)	(.0645226)	(.0648044)	(.0655465)
Married	-.3365681***	-.2716452**	-.3121446**	-.2482418**	-.2921235**	-.2402208*	-.3124661**	-.2674261**
	(.1237111)	(.1253439)	(.1239576)	(.1250566)	(.1245442)	(.125563)	(.1251378)	(.1266476)
# Children in HH	-.1001124***	-.0883073***	-.0920298***	-.0776698***	-.089303***	-.0783686***	-.0882607***	-.076933***
	(.0269191)	(.027592)	(.0270468)	(.0277455)	(.0271301)	(.0277508)	(.0272267)	(.0279383)
Education	.0781216	.1741456***	.0840192	.1770006***	.0900803	.182935***	.0914161	.1860561***
	(.0629003)	(.0635075)	(.0630707)	(.0637969)	(.0635772)	(.0643173)	(.0640218)	(.0653587)
Employed	.1559372**	.2261556***	.1571032**	.2299914***	.1648345**	.2350127***	.1662402**	.2399294***
	(.0686592)	(.0702019)	(.0687616)	(.0704449)	(.0692583)	(.0708189)	(.0694328)	(.0711532)
Income	3.11e-06***	2.95e-06***	3.12e-06***	2.90e-06***	3.22e-06***	3.04e-06***	3.21e-06***	3.02e-06***
	(6.36e-07)	(6.44e-07)	(6.38e-07)	(6.48e-07)	(6.41e-07)	(6.51e-07)	(6.42e-07)	(6.54e-07)
Smoking	.1709854***	.2419076***	.162643***	.235348***	.1514728**	.2278328***	.1533279**	.2339377***

	(.0616101)	(.0625641)	(.0617424)	(.0628325)	(.0620329)	(.0631114)	(.0621159)	(.0633034)
Diabetic Child	.2977602 (.2988814)	-	.2559095 (.3002669)	-	.1958252 (.3007278)	-	.1406839 (.4427621)	-.0652517 (.4526054)
Diabetic Parent	.3548374*** (.1330789)	.3866433*** (.1344318)	.2914471** (.1341812)	.2835607** (.1356439)	.2469373* (.1364346)	.2598875* (.1374678)	.2375437* (.1370414)	.2418772* (.1387386)
BMI High Risk	.0942527 (.0747428)	.1543904** (.0763193)	.0682941 (.0751795)	.1209608 (.0768654)	.0534009 (.0757336)	.1030278 (.0773032)	.0556871 (.0759222)	.1067394 (.0776568)
BMI Highest Risk	.3099792*** (.0753903)	.3565186*** (.0769837)	.2338561*** (.0781707)	.2527865*** (.0799292)	.2024931** (.0808241)	.1944851** (.0826954)	.2052334** (.0810017)	.199409** (.0830171)
Need Med. BP Child	-	-	.1666857 (.1507629)	-	.1433873 (.1526902)	-	.0086066 (.2055295)	-.1959906 (.2056464)
Need Med. BP Parent	-	-	.2262951*** (.0704231)	.2567353*** (.070979)	.2012722*** (.0713429)	.2359648*** (.0718124)	.2100201*** (.0715795)	.2488567*** (.0723931)
Need Med. Chol Child	-	-	.0950564 (.1687632)	-	.087905 (.1708092)	-	.0970209 (.230683)	.0088285 (.2272882)
Need Med. Chol Parent	-	-	.0514329 (.0672746)	.1875636*** (.0675632)	.0344789 (.0678216)	.1675158** (.068065)	.0312479 (.0680698)	.1644985** (.0686097)
Overall Health Child	-	-	-	-	-.2350696 (.2405332)	-	-.2235069 (.3075903)	.0356714 (.291823)
Overall Health Parent	-	-	-	-	-.2341051** (.1169245)	-.1379864 (.1167651)	-.2318398** (.1174389)	-.1401184 (.1178421)
Family History Child	-	-	-	-	.0014635 (.0434489)	-	.1081439* (.0582247)	.1628386*** (.0592129)
Family History Parent	-	-	-	-	-.0106361 (.0572417)	.0371743 (.0577968)	-.0308726 (.0577047)	.0070788 (.05882)
Exercise Child	-	-	-	-	-.0510043 (.0527166)	-	-.1481588** (.0710388)	-.1461672** (.0717345)
Exercise Parent	-	-	-	-	-.0490785	-.1082204*	-.0310025	-.079503

					(.0599895)	(.0603242)	(.0605257)	(.0615829)
Diet Child	-	-	-	-	-.1527879** (.0624182)	-	-.0954528 (.0853206)	.0864694 (.0869843)
Diet parent	-	-	-	-	.053486 (.0825783)	-.0865963 (.0781399)	.0206314 (.0873519)	-.1350221 (.0888503)
Constant	-.4606809* (.2457606)	-1.024281*** (.2473136)	-.4448057* (.2469566)	-.9637918*** (.2485342)	.1631674 (.354494)	-.7338486*** (.2720897)	.1794894 (.398971)	-.728614* (.3899416)
Number of Obs.	2213		2213		2213		2213	
Log Likelihood	-2235.2079		-2219.6794		-2208.8348		-2201.5343	
Wald Chi Squared (# of Vars)	418.08 (29)		443.03 (35)		459.14 (47)		470.02 (56)	

Table 17 – A7: Models 9-12 with Extended Decimal Places

90*, 95**, 99***	Model 9	Model 10	Model 11		Model 12	
	Child	Parent	Child	Parent	Child	Parent
Age Child	-.0533956 (.1251569)	-	-.0080499 (.0850767)	-	-.047691 (.1247015)	-.0586266 (.1345197)
Gender Child	2.589521*** (.7134569)	-	2.540853*** (.4848709)	-	2.592314*** (.7107017)	.0761064 (.7666576)
Age Parent	-.2876319*** (.0653945)	-.2355607*** (.0614698)	-.2924168*** (.0607647)	-.2324504*** (.0612901)	-.28957*** (.0651379)	-.2282402*** (.0702664)
Gender Parent	-2.030029*** (.7841236)	.7553819 (.84044)	-2.131684*** (.7780788)	.7103264 (.8380536)	-2.021975*** (.7815402)	.8725791 (.8430735)
Smoking	.7602875 (.7772472)	4.236272*** (.8379555)	.708175 (.7734959)	4.278243*** (.8357406)	.7383168 (.7741646)	4.322821*** (.8351172)
Diabetic Child	6.527805 (5.842943)	-	3.463873 (3.970004)	-	6.448783 (5.819051)	4.414483 (6.277205)
Diabetic Parent	.7648135 (1.73256)	2.100772 (1.862233)	1.009087 (1.720807)	2.070514 (1.856396)	.7760852 (1.725352)	1.72592 (1.861194)
BMI High Risk	3.624273*** (.9539256)	4.423429*** (1.03012)	3.570257*** (.9501702)	4.438991*** (1.026899)	3.620431*** (.9507091)	4.513194*** (1.025562)
BMI Highest Risk	3.205548*** (1.013052)	6.258025*** (1.091935)	3.158241*** (1.008475)	6.35938*** (1.089469)	3.179185*** (1.009516)	6.390355*** (1.088999)
Need Med. BP Child	-2.137672 (2.651305)	-	.7134735 (1.802117)	-	-2.236599 (2.64146)	-4.362962 (2.849432)
Need Med. BP Parent	1.006412 (.9227307)	3.649324*** (.9916516)	.9666924 (.916958)	3.601779*** (.9887221)	1.056311 (.9198938)	3.73432*** (.9923201)
Need Med. Chol. Child	6.699137** (2.92801)	-	1.82103 (1.989281)	-	6.698064** (2.915798)	7.212809** (3.145368)
Need Med. Chol. Parent	3.164343***	5.193856***	3.330325***	5.155616***	3.14584***	4.882775***

	(.8774002)	(.9417638)	(.8709063)	(.9389269)	(.8738416)	(.9426421)
Overall Health Child	-19.62889*** (3.996707)	-	-20.09314*** (2.779765)	-	-20.71603*** (4.074453)	-.9212207 (4.395248)
Overall Health Parent	-3.65178** (1.514971)	-9.675102*** (1.623345)	-3.682918** (1.502553)	-9.64226*** (1.61828)	-3.594873** (1.509334)	-9.512047*** (1.628169)
Family History Child	2.438293*** (.742426)	-	1.673297*** (.5046344)	-	2.443996*** (.73967)	1.139813 (.7979067)
Family History Parent	5.85023*** (.7355232)	9.269755*** (.779633)	5.962365*** (.7254598)	9.281294*** (.7774658)	5.821635*** (.7327867)	9.073164*** (.7904815)
Exercise Child	-5.095865*** (.9139141)	-	-3.831342*** (.621239)	-	-5.053642*** (.9105838)	-1.807701* (.9822771)
Exercise Parent	-2.767276*** (.7664501)	-5.126215*** (.814248)	-2.994131*** (.7569304)	-5.127129*** (.8119826)	-2.773843*** (.7637508)	-4.801337*** (.8238835)
Diet Child	-4.525478*** (1.124501)	-	-5.309099*** (.7646513)	-	-4.581413*** (1.120791)	1.0762 (1.209035)
Diet parent	-2.397686** (1.15134)	-7.871913*** (1.098885)	-1.943701* (1.077486)	-7.836761*** (1.095514)	-2.357712** (1.14692)	-8.449056*** (1.237221)
Constant	66.257*** (4.874545)	50.66083*** (3.155864)	66.21129*** (3.978587)	50.46782*** (3.146937)	67.3205*** (4.927517)	52.10826*** (5.315477)
Number of Obs.	2646	2647	2644		2644	
R-Squared	0.1367	0.2072	0.1347	0.2074	0.1369	0.2112
Adj. R-Squared	0.1298	0.2036	-	-	-	-

Appendices: Survey

[HEART DISEASE SURVEY]
September, 2010
- Study Details -

SNO	**13866**
Survey Name	**HEART DISEASE SURVEY**
Client Name	**University of Central Florida**
Great Plains Project Number	**K2716**
Project Director Name	**Rodkin**
Team/Area Name	**Dennis**

Samvar (Include name, type and response values. "None" means none. Blank means standard demos. This must match SurveyMan.)	**Standard**
Specified Pre-coding Required	
Timing Template Required (y/n)	**Enabled by default**
Multi-Media	

HEART DISEASE SURVEY
September, 2010
- 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 XX minutes.
- You will receive [Insert KN incentive].

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.

[KN: Can we please disable the back button globally? Thank you.]

[DISPLAY]
[Progress bar]

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 one of these children – the child whose birthday is coming up next. 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 one of these children – the child whose birthday is coming up next. 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.
[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 <u>all sources</u> for all adults in your household. Please include all sources or income, including earnings from employment and any other income. Your <u>household's total annual income</u> 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 1.025, 1.05, 1.10, 1.20, 1.40.

[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 <u>die</u> 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.

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 silimar 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 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:

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

In this equation, $q = \max(40,\ \text{Current Age})$, and $R = \begin{Bmatrix} R1/100 \text{ for parent} \\ R2/100 \text{ for child} \end{Bmatrix}$. 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.

Currently the program has been extensively, but not yet fully, tested and is not available to anyone. We need your help in evaluating the program to make it as effective as possible.

[Display]
The program would take advantage of recent improvements in vaccines to reduce the risk of heart disease. .The vaccine would work by slowing the build-up of fatty deposits in the arteries.

If the vaccine becomes available, it would have first been approved by government authorities using the same strict approval process for all other medications. Thus, it would be approved only after extensive testing in people over many years.

If you or your child enrolled in the program, your participation would be fully supervised by your own doctor. Or if you prefer, the program would refer you to a physician to supervise your participation.

[Display]
The first step in the program is to visit the doctor for a few simple medical tests.

The outcome of the tests will tell the doctor which of several vaccines is best for you. You would get the vaccine by a shot in the arm.
.

Each year, you and your child would get new blood tests and a booster shot.

In previous trials with vaccines, 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]
To get the full benefit of the vaccine, a person would have to start now, and stay on the program. The younger you are when you start the program, the more it will reduce your risk.

Anyone who starts the program and later quits can expect to find that their heart disease risk would soon rise back up to where it would have been had they never participated at all.

And as long as either of you stay on the program, the annual cost is guaranteed not to increase.

[display]
First we will ask whether you would enroll [version CA: insert "**YOUR CHILD" / VERSION AC: INSERT "YOURSELF"**>] in the program, then we'll ask whether you would enroll [**VERSION CA**: insert "**YOURSELF"/VERSION AC: INSERT "YOUR CHILD".]**

The annual cost would be the same for each of you, but the risk reductions are larger for your child because [**IF Q7=1, INSERT "HE"/IF Q7=2, INSERT "SHE"/IF Q7 SKIPPED INSERT "HE/SHE"**] is younger.

[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 = 40, 65, and 90.

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 put your child in the heart disease prevention program. 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: 20, 40, 60, 80, 160, 320
[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]
W2. 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 your household would really do this?

1. Definitely
2. Probably
3. Uncertain

[IF W1=1]

W3. 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 END OF CHILD QUESTION BLOCK]

[IF W1=2]
[SP]
W4. 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, 35, 60.

KEEP H-KID > H-PAR. Of the 9 possible combinations of (40,65,90) x (10,35,60), only 8 should actually be administered. The (H-KID=40, H-PAR=60) 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 be in the heart disease prevention program.

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."

W5. 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]

W6. 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=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 W2=1 or 2]

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]
[SHOW THE FOLLOWING DISPLAYS AND W10 If W1=NO of ifW2 =3 or 4]

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)?