ECONOMIC VALUATION OF MORTALITY RISK REDUCTION

Volume I
A STATED PREFERENCE APPROACH

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ABSTRACT

This study uses stated preference questions to evaluate preferences and values for risk reductions. Stated preference (SP) approaches use survey questions to have respondents explicitly or implicitly state their preferences and values (as opposed to a revealed preference approach based on interpreting observed behavior). The SP approach is used to provide comprehensive preference and valuation information on a wide range of situations (e.g., different fatal risk causes, different risk levels, different timing of risks) that are not available with observed behavior. Considerable variation is shown in the implied value of statistical life (VSL) depending on the risk level, type of risk (cancer, heart attack, or motor vehicle accident), and timing of risk.

1. Introduction

1.1 Background

The Clean Air Act (CAA) defines six air pollutants as criteria air pollutants for which the U.S. Environmental Protection Agency (EPA) has set national ambient air quality standards: particulate matter, ozone, lead, nitrogen dioxide, sulfur dioxide, and carbon monoxide. The CAA also identifies 188 pollutants as hazardous air pollutants (HAPs), which are also called air toxics. Human health effects from direct ambient exposures to these air pollutants can include premature mortality, respiratory and cardiovascular effects, cancer, poisoning, and immunological, neurological, reproductive, and developmental effects. Some air pollutants can also accumulate in the environment, affecting ecological systems and eventually human health.

EPA's Office of Air Quality Planning and Standards (OAQPS) faces a challenge in conducting required analyses of the benefits of air pollution control, including those analyses required in the process of developing standards under Section 112 of the Clean Air Act for regulating air toxics. As mandated by Executive Order 12886, OAQPS is required to perform benefit-cost analysis for all economically significant regulations. All of the national ambient air quality standards for criteria air pollutants qualify as economically significant regulations, and some of the maximum achievable control technology (MACT) standards required under Section 112 also involve significant economic impacts. Assessments of the health benefits expected to be achieved by alternative air pollution control regulations are a key part of the required benefit-cost analyses. Many other offices at EPA are also required to conduct benefit-cost analyses for proposed regulations for which the benefits are expected to include reductions in risk of human mortality and morbidity.

A quantitative assessment of expected health benefits requires quantification at several steps in the assessment: (1) emissions changes, (2) environmental concentration and disbursement changes, (3) human exposure changes, (4) human health risk response to exposure changes, and (5) monetary valuation of the human health risk changes. Monetary values for changes in expected risks of a wide range of human mortality and morbidity are needed for these benefit analyses. The current economics literature is limited in the types of human mortality and morbidity risks for which willingness-to-pay (WTP) estimates have been developed. Therefore, EPA needs new information to support benefit analysis when (1) the nature of the mortality and morbidity risks is different from that for which WTP monetary values are available from the current literature, and (2) the nature of mortality and morbidity risks differs by pollutant.

The remainder of Chapter 1 is an overview and discussion of the current literature on WTP to reduce mortality risks focusing on key concerns for environmental applications. Chapter 2 describes the design of this study. Chapter 3 presents the implementation of this study. Basic results are in Chapter 4, payment card results are in Chapter 5. Dollar choice question results are in Chapter 6, and nondollar choice question results are in Chapter 7.

1.2 Overview of Literature on WTP to Reduce Mortality Risks

Many studies, using either revealed preference or stated preference approaches, have estimated average WTP (or willingness to accept, WTA) in the United States (and a few studies in Canada, England, and New Zealand) for small changes in risks of accidental death. These studies are being used as the basis for monetary valuation of mortality risk in assessments of the potential benefits of regulatory and policy decisions in the United States. Reviews of this literature that discuss these types of applications of the results include Fisher et al. (1989), Miller (1989), Cropper and Freeman (1991), and Viscusi (1992, 1993).

The available WTP estimates for changes in health risks are typically applied on a per life saved (or lost) basis. In other words, the analysts first estimate the number of premature deaths expected to be prevented or reduced because of the program, and then apply a monetary value (either a single number, a range, or a distribution) to each premature death prevented. The estimates derived from the available WTP literature for this purpose are referred to as value of statistical life (VSL) estimates.

The estimates provided by the WTP (or WTA) studies are average dollar amounts that individuals are willing to pay (or willing to accept) for small reductions in (or increases in) risks of death. For example, one study might find an average annual WTP of $50 for an annual reduction in risk of death of 1 in 100,000. Summing this $50 value over 100,000 people gives the VSL, which in this example is $5 million. It is the total WTP per one life saved for the population at risk. Although the VSL estimate is applied in an assessment by estimating the number of lives saved and multiplying by the VSL, it is really an estimate of value for the change in risk to each exposed individual. Using this example, the WTP value is not correctly interpreted as a $5 million value for the single life saved, but rather a $50 value to each of the 100,000 individuals who experience a 10^{-5} (i.e., 1 in 100,000) reduction in annual mortality risk. Although empirical evidence concerning how VSL values may differ for substantially different risk change magnitudes is very limited, applying the available VSL estimates to changes in risk of 1 in 10, for example, would be questionable. Similarly, it is uncertain whether available VSL estimates are appropriate for valuing extremely small changes in risk, such as 10^{-7} or smaller.

1.2.1 Limitations of available literature

Although the VSL approach has many merits, there are also important limitations and uncertainties as it is currently applied to changes in mortality risks associated with changes in environmental quality. Most concerns about the VSL approach for valuing mortality risk changes associated with environmental programs come down to the basic assumption of how these values have been applied: the assumption that WTP to reduce or avoid a unit change in mortality risk is invariant with the type of risk and with the characteristics of the individuals at risk. This assumption is implicit whenever a VSL value is applied in any context that differs from the context in which it was originally estimated.

For the most part, available empirical WTP estimates are for risks of accidental death in circumstances where individuals are voluntarily exposed to risks (e.g., choosing a job or using a car). Some potentially important differences exist between the contexts of these available estimates and the contexts of most environmental health risk changes being evaluated in a cost-benefit analysis of an EPA program. Environmental health risks are primarily related to illness rather than accidents. Deaths as a result of environmental pollution exposures may be fairly quick, such as with heart attack or pneumonia, or may involve prolonged illness, such as with cancers or chronic respiratory disease. With environmental risks, there may also be a substantial lag between the time of a change in exposure and the time that a noticeable change in health is realized, such as with cancers that may occur many years after a harmful exposure. All of these factors represent differences in the nature of the risk that could potentially result in a different WTP for an equivalent magnitude reduction in that risk.

The available VSL estimates are also drawn largely from studies of working-age adults who are in good enough health to be employed. Risks associated with environmental pollution, however, may in some cases fall disproportionately on the young or the elderly, or on those with already compromised health. Differences in the characteristics of the individuals at risk, such as their ages and their health status, may result in differences in their WTP to reduce their risk relative to the WTP of a working-age adult in reasonably good health.

These concerns about the VSL approach stem from differences between the contexts in which most available VSL estimates have been derived and the contexts of risk reductions likely to be associated with changes in environmental quality. The use of available VSL estimates is, thus, likely to be more appropriate for risk changes in contexts that are similar to the contexts in which the estimates were derived, which may be the case for some kinds of pollution-related risks. For example, some pollution-related risks may affect exposed working age adults and may result in immediate changes in mortality risk. In these cases, available VSL estimates may be adequate. In other cases, however, there is considerable uncertainty about how appropriate available VSL estimates are for valuing changes in these risks.

One alternative to avoid the limitations of the VSL approach for valuing health risks associated with a proposed pollution control effort would be to perform a WTP valuation study for each proposed emission control standard for each air pollutant, carefully describing what is known and not known about the sources, exposures, and health risks that would be changed under the proposed control strategy. However, this is not a practical approach when dealing with so many different chemicals and compounds. Even if such studies were conducted for a selected list of the most significant air pollutants, the study results would become obsolete as soon as new scientific information on the health risks of the pollutant became available or new emissions control strategies were considered. This suggests that a more flexible approach of developing WTP values for a wide range of health risks might be of more lasting usefulness to the EPA. As new health risk information becomes available and as new control strategies are considered, different health risk assessment results will be obtained. If we know how monetary values should be adjusted for different types of health risks, then we can continue to determine monetary values for programs as the science and the technology change. This approach would obtain individuals' valuation for changes in health risks based on the characteristics of the risk and individuals' characteristics. This valuation information could then be applied to pollutant-specific health risk reductions expected for specific pollution control program evaluation.

1.2.2 Current evidence from the literature on these questions

Analysts have been exploring the dimensions of mortality risk that may be relevant to determining WTP in different contexts. Both theoretical and empirical work have been done, but neither is yet sufficient to provide a fully adequate basis for a new valuation approach that takes into account the specific nature of mortality risk that may be associated with environmental pollution. Theoretical analyses have primarily relied on the life-cycle consumption-saving model to examine questions about what may affect the WTP for mortality risk reduction. These analyses suggest factors that may be important, such as the age of the person facing a change in risk, and they may suggest the direction of an effect on WTP (i.e., either positive or negative), but they cannot provide quantitative estimates of how WTP changes in different contexts without empirical verification of parameter values. Empirical work on these questions has relied primarily on surveys and interviews to explore questions regarding WTP for mortality risk change in various contexts, perceptions about WTP, and preferences regarding public programs that affect mortality risk for a population.

People's reactions to and attitudes toward risks have been shown in a substantial risk perceptions literature to be affected by many attributes beyond simply the magnitude of the risk. Attributes that appear to be significant in how subjects rate different risks include dread or fear related to the risk, the source of the risk, its voluntariness, how controllable it is by the individual, and whether the mitigation measures are privately undertaken or are part of a broad government program (Slovic, 1987; Cropper and Subramanian, 1995). In addition, people seem to have a tendency to overestimate very small but unfamiliar risks (e.g., nuclear power accidents) and underestimate larger but more familiar risks (e.g., auto accidents). Reasons for these differences are not well understood but it may be because of numbness toward a familiar risk or because there are perceived differences in the extent to which a person controls his own level of risk exposure. Viscusi et al. (1997) present an alternative explanation: they found that people's orderings of what they think are the relative magnitudes of mortality risks from various causes more closely match actual population risk levels when the population risks are ordered according to life-years lost rather than simply numbers of deaths.

McDaniels et al. (1992) asked individuals to state how much they would be willing to pay to reduce annual fatalities due to various causes with different levels of controllability and dread. They report finding large differences in WTP, with the level of personal exposure being the most important factor influencing WTP to reduce "familiar" risks, and perceived dread and severity of consequences were the most important factors influencing WTP for less familiar risks. These findings are a little difficult to interpret because quantitative information was presented for familiar risks, but not for unfamiliar risks. Thus, it was not a direct test of differences in reactions to the same quantitative information for different types of risks.

Jones-Lee et al. (1985) found that the majority of respondents said that they would prefer a program that reduced deaths from cancer over a program that reduced the same number of deaths from automobile accidents or heart disease. This finding is not sufficient to conclude that WTP to reduce risks of fatal cancer necessarily exceeds WTP to reduce risks of fatal automobile accident or fatal heart disease, but it suggests that cancer deaths may be especially abhorred. Magat et al. (1996) explored respondents' preferences for risk reductions for fatal lymph cancer versus fatal auto accidents and found the median tradeoff between the two risks was 1.0, meaning they are viewed as approximately equal.

Cropper and Subramanian (1995) and Van Houtven (1997) report evidence suggesting that the perception and valuation of public programs to reduce risks from environmental pollution exposures are influenced by the size of the population affected. For instance, Van Houtven found that North Carolina residents presented with programs saving the same number of lives favored programs that affect smaller populations facing higher baseline risks (e.g., pesticide applicators, a smaller population facing higher individual risks than consumers of produce containing pesticide residue). The author interpreted this as evidence of altruistic motives, although other interpretations also seem plausible.

Cropper and Subramanian (1995) asked respondents in a national telephone survey to choose between pairs of programs that would save specified numbers of lives. The programs cost the same, but differed in the number of lives saved, in the nature of the program (e.g., an environmental program or a public health program), and in the attributes of the risk addressed by the program. They found that programs that saved more lives were definitely preferred. In addition, respondents favored programs that they deemed effective and funded through a mechanism perceived as fair, and opposed programs where they felt the government was invading individual choice. Respondents were more likely to favor a program if they thought they were among the beneficiaries of the risk reductions, and if they felt it was difficult to otherwise control the risk addressed by the program. The extent to which the beneficiaries of the programs are at blame for the risk (e.g., risk of cancer from smoking) did not prove to be a significant predictor of program choice.

Individual characteristics may also influence WTP for risk reductions. Shepard and Zeckhauser (1982) and Cropper and Sussman (1988) used a life-cycle consumption-saving model to examine how WTP for mortality risk changes might be expected to change through a person's lifetime. This model is based on the premise that a person makes consumption and saving decisions over time to maximize personal utility. Because this model is based on the premise that utility is a function of consumption, if there is additional utility derived from being alive that is independent of the utility derived from consumption, then the life-cycle model provides a lower bound estimate of WTP. These applications of the life-cycle consumption-saving model show that WTP for mortality risk reductions may increase with age, but beyond middle age, it may decline with the person's age (if the risk reduction takes place immediately).

The conclusions reached by these theoretical analyses of the effect of age on WTP for immediate mortality risk reduction using the life-cycle model show that it is important to consider nonlinear specifications. Jones-Lee et al. (1985) report findings that are consistent with the life-cycle models. Respondents to their stated preference survey gave WTP estimates for reductions in highway accident mortality risk, and the answers showed a fairly flat hump-shaped relationship between VSL and age, peaking at about age 40. The observed decline in WTP after age 40 was, however, not as rapid as that predicted by the life-cycle models. Krupnick et al. (2002) on the other hand, found little relationship between age and WTP for a personal health program to reduce risk of death for a sample of adults aged 40 to 74, except for a decline in WTP after age 70.

Another question that is relevant for pollution-related health risks is whether people "discount" future health risks. Latencies in risks, caused by a lag between when a change in exposure occurs and when a change in health materializes, may be a factor in WTP to reduce risks. Cropper et al. (1994) asked respondents to choose between programs that would save X lives now and programs that would save Y lives (Y>X) T years from now. The results indicate that people discount lives saved in the future at a positive discount rate. The implicit discount rate varies with T and with individual characteristics of the respondent such as age, race, and whether the respondent has dependent children. Another striking result is that people made a distinction as to the age of the people saved by the program, suggesting that life-years saved matter. For instance, respondents said that a program saving one 20-year-old was equivalent to a program saving eight 60-years-olds. However, this is not necessarily the result that would be obtained if 20-year-olds and 60-year-olds were each asked their WTP for their own safety. Questions framed as they were in this study are likely to lead respondents to be thinking about the health and safety of others as well as of themselves. Attitudes and values regarding other people's health and safety may not be the same as those for one's own safety, and it is the latter that VSL estimates are attempting to measure.

Cropper and Sussman (1990) used a life-cycle consumption-saving model to illustrate that if a person's utility is a function of consumption during only his own lifetime, the rate of discount for future risks to the individual would be expected to be the same as the market interest rate. When the model is extended to reflect concern for future generations (e.g., the person's utility is a function of others' future consumption as well as his own), a different (lower) discount rate for future risk is obtained.

This analysis by Cropper and Sussman underscores one of the difficulties that arises when it comes to questions of environmental pollutants that may have long-term or irreversible impacts on health risks for future generations. Although uncertainty remains about what discount rate should be used in an analysis of future expected costs and benefits, it is common sense that timing of costs and benefits does matter and that all other things being equal, a benefit obtained further into the future is worth less to people today than a benefit obtained now. However, any nonzero discount rate will render far future effects to virtually a zero present value, regardless of how catastrophic those effects might be when they are realized. Discount rates that apply to an individual's own future risk may not be the same as when they are considering risks to future generations.

There is very little empirical evidence about what a discount rate for future health risks might be. Smith and Desvousges (1987) obtained WTP for regulations expected to cause a change in the risk of dying 30 years from now. Similarly, Mitchell and Carson (1986) studied the risk of death from trihalomethanes in drinking water, which is incurred many years after exposure. However, these studies did not compare an individual's WTP today for a change in risk today with the same individual's WTP today for a change in the same kind of risk that isn't realized until some time from now, thereby providing direct evidence of the magnitude of the implicit discount rate. Alberini et al. (2002) asked the same individuals their WTP for mortality risk reductions over the next 10 years and over a 10 year period starting at age 70. Preliminary results from their analysis of the responses suggest a discount rate of about 12% after accounting for the respondents' chances of dying before reaching age 70.

A variation on the VSL approach is to count and value not lives saved (or lost) but life-years saved (or lost). Life-years saved captures the dimension of the age of the person at risk and accounts for the remaining life expectancy that would be lost in the event of a premature death. Life-years saved is estimated by subtracting the age at death, for the deaths prevented, from the life expectancy for the person whose premature death was prevented. Estimates of life-years saved provide a scaling of the mortality risk change relative to the remaining life expectancy of those affected, and they require information on the age distribution of those whose risk is changed by a program or intervention. At present there are no direct empirical estimates of WTP per life-year saved available in the literature. The estimates that are used are usually calculated from VSL estimates based on an assumed relationship between the value of a statistical life year (VSLY) and a VSL.

Moore and Viscusi (1988, 1990) used labor market data and a two-stage estimation approach to infer a discount rate and the VSLY from the estimated parameters of a wage-risk model in which risk is defined as expected life-years lost. They find discount rates vary with characteristics of the individual and that they are generally in the same range as market discount rates. Their estimation approach presumes a constant VSLY for the current year through a person's remaining lifetime. There is no reason to expect that this is necessarily the case. In fact, there is some limited evidence to the contrary. If VSLY were constant, then VSL would be a consistently declining function of age, with the rate of decline being a function of the discount rate. In a contingent valuation study of transportation safety, Jones-Lee et al. (1985) found VSL to increase with age to about age 40 and then decrease with age. This suggests that VSLY could be changing over time with changing patterns of income and other factors through a person's life. As life expectancy declines, limited remaining years might each be more highly valued. Rosen (1988) found this result in a theoretical analysis using the life-cycle consumption-saving model of how the value of a life-year might change with age. Conversely, changes in health that adversely affect a person's enjoyment of life could have the opposite effect.

Another approach for defining a change in mortality risk that is related to life-years saved is to define the change in risk in terms of a change in life expectancy. It may be possible in some cases to estimate the average change in life expectancy for a population whose exposure to a harmful pollutant is changed. A few recent stated preference studies (e.g., Johannesson and Johansson, 1996; Johnson et al., 1998) attempted to determine WTP values for changes in life expectancy, but these efforts remain exploratory and subject to difficulties in communicating life expectancy concepts to general population subjects. The way changes in life expectancy were presented in both of these studies tend to focus the respondent on additional time tacked on at the end of life, when many people expect that their quality of life may be poor. This may cause subjects to heavily discount the additional time gained. Changes in health risks as a result of pollution exposures are more likely to affect life expectancy through a shift in survival probabilities over many remaining years of life than as simply time added on or taken from the very end of life. This may be a complicated concept to communicate, but oversimplifying it may lead to very misleading results.

Johannesson and Johansson (1996) asked a random sample of Swedes to estimate their WTP now for a medical treatment that if given at 75 years of age would increase their remaining life expectancy from 10 years to 11 years, assuming that they survive to age 75 in the first place. This approach relies on a rather complex presentation of conditional probabilities. Many different "paths" of conditional probabilities of survival at different ages are consistent with an extension of life expectancy. The results were quite small WTP values for an additional year of life expectancy, compared to what we might expect to see based on results of wage-risk studies.

Johnson et al. (1998) asked subjects in a Canadian study their preferences for alternative pairs of future health scenarios, trading off health care expenditures with one or four additional years of life. They also included varying descriptions of symptoms and amount of associated restriction in activities during these additional years of life in each of the alternatives. The results indicate a very strong effect of quality of life on WTP to extend life. The mean WTP values to extend life fall essentially to zero when symptoms are severe enough to cause complete confinement at home or in a hospital.

1.2.3 Recent stated preference studies addressing key issues in mortality risk valuation

Table 1.1 summarizes features of four recent stated preference studies concerning mortality risk valuation that each address one or more key issues. In this section we discuss each of the issues and how they are addressed in these studies.

Risk reduction scenario definition and presentation

When a mortality risk reduction is presented to respondents, it needs to be defined in terms of its magnitude, cause, and timing. The magnitude of the risk reduction needs to be realistic in terms of what a policy relevant change might be, which for most policy decisions is quite small. On the other hand, respondents have shown difficulty with comprehension when the risk change presented is very small. These studies have all presented annual mortality risk changes on the order of 1 in 100,000 or 1 in 10,000. Three of the studies presented this as annual risk changes, but Krupnick et al. (2002) presented it as a 10-year risk, making the denominator 1,000 rather than 10,000. All of the studies held the denominator constant and changed only the numerator to show different magnitudes of risk change.

Two of the studies used visual aids to help communicate the magnitude of the risk change. Corso et al. (2001) used split samples to test for differences in visual aids. They used dots, logarithmic risk ladder, and linear risk ladder, and a control group with no visual aid. They found comparable median WTP values for reductions in risk of auto accident fatality, but greater sensitivity to risk reduction magnitude with the two groups that got dots or logarithmic risk ladder. The risk magnitude difference was a factor of 2, and the WTP ratios for these two groups were factors of 1.8 and 1.6, respectively. Krupnick et al. used dots and tabular presentation of comparable risk reduction actions such as cancer screen tests. Split sample comparisons of the WTP values showed a 1.6 factor, statistically significant, higher WTP for a 5 factor higher risk reduction.

Table 1.1 Recent mortality risk valuation studies using stated preference.

	Krupnick et al. (2002)[a]	**Corso et al. (2001)[b]**	**Magat et al. (1996)[c]**	**Viscusi et al. (1991)[d]**
Implementation year and location	1999 — Hamilton, Ontario	1999 — United States	1994 — Greensboro, North Carolina	1989 — Greensboro, North Carolina
Number of respondents	930	827	727	195
Survey method	Computer based, in person	Telephone with mailed visual aid materials	Computer based, in person	Computer based, in person
Mean age (range) of respondents	54 (40 to 74)	43 (18 to 70)	32	33
Payment vehicle	Preventative health/safety product	Auto safety device (side air bags)	Risk-risk tradeoff, varying by location	Location choice with varying cost of living
Elicitation method	Dichotomous choice with 2 follow-up questions	Double-bounded dichotomous choice	Iterative choice to point of indifference	Iterative choice to point of indifference
Risk presentation visual aid method	Dots	Dots, risk ladder	No visual aid	No visual aid
Cause of mortality risk	Unspecified, but primarily illness-related examples	Auto accident	Lymph cancer and auto accident	Auto accident
Annual risk change presented	1 in 10,000 5 in 10,000	0.5 in 10,000 1 in 10,000	X in 100,000 (varies)	X in 100,000 (varies)

VSL results in millions of US dollars (2000)	Mean values: $3.1 (1 in 10,000) $1.0 (5 in 10,000)	Median values: $4.5 (0.5 in 10,000) $3.4 (1 in 10,000)	Ratios of fatal cancer risk to fatal auto accident risk are: Median: 1.0	Mean: $11.4 Median: $3.2

a. WTP values for future risk reduction were not included in this publication. The authors report (Alberini et al., 2002) preliminary findings of a discount rate of about 12%. These will be reported in a future publication.
b. Both dots and risk ladders were found to improve WTP sensitivity to risk compared to no visual aid. Results here are averages for all 3 visual aids.
c. Dollar valuation was not done, only risk-risk comparisons.
d. Authors report mean VSL skewed by a few very high values that appear questionable.

Magat et al. (1996) is the only study in the group that compared different causes of death. They did not estimate WTP values, but rather evaluated risk-risk tradeoffs. They found that the median tradeoff between risk of fatal lymph cancer and risk of fatal auto accident was 1.0. Krupnick et al. (2002) did not specify a cause of death, but gave examples of risk reduction mechanisms that consisted primarily of illness-related preventions. Corso et al. (2001) specified reduced auto accident fatality risk due to side air bags.

Effects of individual characteristics on risk reduction valuation

Krupnick et al. conducted the most extensive examination of individual characteristics and their relationship with WTP of the four studies. They found a statistically significant positive effect on WTP associated with income, self-assessed quality of life, and if the respondent said they expected additional health benefits from the program. Most notable was that they found little effect of age or current health status on WTP, except for a decline in WTP to reduce mortality risk after age 70.

Valuation elicitation method

All of the studies used an elicitation approach based on a simulated private good. In other words, none of the studies asked respondents their WTP for programs that would benefit anyone other than themselves. Krupnick et al. (2002) used an unspecified preventative health/safety product, although their examples were primarily related to reducing risks of death from serious illness. Corso et al. (2001) used a very specific safety device: side air bags in automobiles. Viscusi et al. (1991) and Magat et al. (1996) used a change in residential location as a context for a change in risk of fatal auto accident (both studies) and in chronic respiratory disease (Viscusi et al.) or lymph cancer (Magat et al.). Exactly why risks would be different in different locations was not specified. Costs were introduced by specifying different increases in costs of living.

Other than the comparison of risk communication visual aids conducted by Corso et al. (2001), no direct comparison of valuation elicitation methods was conducted in these studies. The Krupnick et al. (2002) results show considerably lower VSL estimates than the other two studies, but the reasons for this are not clear. There are too many differences between the studies to attribute their different findings to any particular aspect of the study design. Note that Corso et al. reported only median WTP values, but these are comparable in magnitude to the median value reported by Viscusi et al. (1991) who report a mean value that is more than double the median value. This difference between mean and median results is typical in such studies, so the mean values obtained by Corso et al. can be assumed to be closer to the Viscusi et al. results than to the Krupnick et al. results. This is significant because in many ways the elicitation context used by Corso et al. has more in common with the approach used by Krupnick et al. than the approach used by Viscusi et al.

Krupnick et al. (2002) found that respondents who said that they were thinking about health benefits in addition to reducing fatal risks and that this influenced their answers revealed higher WTP values. Those who were concerned about potential negative side effects of the product revealed lower WTP. Krupnick et al. examined various indicators of comprehension problems, but for all respondents who passed the most basic comprehension screening there was little relationship between WTP values and higher comprehension assessment hurdles.

Krupnick et al. (2002) reported a fairly high share of respondents (20% to 30%, depending on the risk reduction level) who said they would not be willing to pay any amount for the risk reducing product. They did not report any assessment of whether these responses reflect no value for risk reduction or a rejection of the premises of the question for some reason.

2. Study Design

This study used stated preference questions to evaluate preferences and values for risk reductions. Stated preference (SP) approaches use survey questions to have respondents explicitly or implicitly state their preferences and values (as opposed to a revealed preference approach based on interpreting observed behavior).[1] SP approaches provide a cost-effective means to obtain comprehensive preference and valuation information on a wide range of situations (e.g., different fatal risk causes, different risk levels, different timing of risks) that often are not available with observed behavior. This is a strength of SP approaches.

There is a considerable economics literature on SP approaches. While SP approaches are sometimes controversial, when applied to use values (values tied to everyday uses and activities), as opposed to nonuse values (values related to motives like resource protection even if one never uses the resource), much of the literature supports that SP approaches can provide reliable preference and valuation information (see, for example, Carson et al. 1996).

We implemented two SP methods: stated choice and payment card WTP. Stated choice methods have respondents choose among two or more alternatives with different combinations or levels of characteristics and costs. Based on the responses to multiple stated choice questions, one can statistically compute the contribution of changes in the levels of individual characteristics on a respondent's utility and willingness to pay for improvements. The use of the stated choice in environmental economics evolved from conjoint analysis, which has been extensively used in marketing and transportation research.[2] The method has come into widespread use in environmental economics. For example, Viscusi et al. (1991) used SP choice surveys to estimate the value of reducing fatal risks, and Johnson et al. (2000*)* and Krupnick and Cropper (1992) used SP choice surveys to value reducing morbidity events. Stated choice surveys have been widely used in other environmental and resource economics applications ranging from cultural materials (Morey et al., 2002) and recreational fishing (Mathews et al., 1997; Ruby et al., 1998; Breffle et al., 1999, 2002) to resource management (Bishop et al., 2000), endangered species protection (Adamowicz et al., 1998), protecting forest loss (Layton and Brown, 1998), and facility siting and externalities (Opaluch et al., 1993; Kline and Wichelns, 1996; Johnson and Desvousges, 1997).

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[1]. For additional discussion, see Mitchell and Carson (1989), Kopp and Smith (1997), Adamowicz et al. (1998), and the U.S. DOI NRDA regulations at 43 CFR §11.83(c). Some authors use different terms to refer to these methods.

[2]. For survey articles and reviews related to use in marketing, see Louviere (1988, 1992, 1994), Green and Srinivansan (1990), Batsell and Louviere (1991); for use in transportation planning, see Hensher (1994).

The payment card approach has been used in stated preference studies for 20 years or more. In this approach, a respondent is presented a scenario, for example of reduced health risks accomplished through a particular program, and asked, "What is the most you would be willing to pay?" The respondent is provided a listing of alternative payment amounts to select from, including "other (please indicate how much)." See Mitchell and Carson (1989) and Rowe et al. (1996) for additional discussion of the payment card method.

Although empirical studies have found that SP methods can provide reliable results, valuation results are subject to the specific SP method. For example, Balistreri et al. (2001) report that stated choice methods resulted in higher values than did open-ended WTP questions, which were similar to actual dollar payments. SP surveys must also consider both general survey design considerations (Dillman 1978, 2000; Schuman and Presser 1996; and Tourangeau et al., 2000), and survey design considerations specific to valuation surveys (Mitchell and Carson, 1989; Kopp and Smith, 1997), such as the design of the program to obtain risk reductions, information presented to respondents, and elicitation effects such as starting value impacts, embedding, and scenario rejection. These features of SP studies are specifically addressed in this survey, as discussed below and in the analysis chapters.

The SP survey design went through several steps in this study. First, the study team explored issues related to valuation of health risk associated with air pollution exposures with fairly open-ended focus groups. Second, specific elements of a survey instrument were developed and presented in focus groups. Finally, a full instrument was developed, evaluated, and revised multiple times through focus groups and in several waves of one-on-one interviews.

2.1 Initial Exploration of Issues

After reviewing the available literature and assessing the needs for policy analysis, we identified several major issues for initial exploration. These issues included several aspects of communicating risk information to general population respondents and different ways of structuring stated preference valuation questions. This section gives highlights of the primary conclusions drawn from this process, which guided the subsequent development of the survey instrument.

2.1.1 Presentation of risk quantity

The primary challenge in presenting mortality risk information is making sure respondents understand the quantitative information. If the results of a study are to be used to assess the value of specific changes in the level of mortality risk for the affected population, it is critical that the results be meaningfully related to the size of the risk change presented to respondents. This is why there is an emphasis in the literature on testing for sensitivity to scope (i.e., the size of the risk change). Some economists have argued that the value for risk changes should be proportional to the size of the risk change (e.g., Hammitt and Graham, 1999), but even though many economists do not agree with the conclusion that WTP is necessarily proportional to the size of the risk change there is general agreement that WTP should vary in a meaningful way with the size of the risk change being evaluated. Crucial to obtaining this in stated preference studies is the effective communication of the quantitative information.

Previous studies used the convention of presenting risk information in terms such as 1 in 10,000 (rather than in decimals) because this is more easily understood. We continued with this convention and explored the ease with which respondents could work with different orders of magnitude. For many environmental policy decisions, risk changes as small as 1 in 100,000 or even 1 in 1,000,000 are relevant. We found that it would be difficult to work with risk numbers as small as 1 in 1,000,000 because many people expressed belief that "one in a million" is synonymous with "it would never happen to me," often likened to the chances of winning the lottery. Mortality risk changes on the order of 1 in 10,000 seemed meaningful to people relative to their actual current risks from the leading causes of death. It also seemed feasible for most people to work with risks on the order of 1 in 100,000. We stayed with risk changes on the order of 1 in 10,000 so that we could maintain the use of just one denominator throughout the presentation. Also, we found that the range of dollar amounts that would be relevant for examining risks on the order of 1 in 100,000 was relatively small and tended to be dismissed as unimportant compared to the dramatic implications of mortality risk (however small).

Several different types of visual aids to assist in communication of risk information were developed and tested with focus groups. Risk ladders and pie charts were interesting to people and helped communicate relative magnitudes. Pages of dots or squares with different colors for those who would be affected in a given time period seemed to be most effective at communicating absolute risk magnitudes and simultaneously showing both the numerator and the denominator in the risk numbers.

2.1.2 Health risk attributes: Combinations of mortality and morbidity

We spent a lot of time with focus groups exploring ways of incorporating both a morbidity and a mortality component of health risk. The idea was that with most illness-related mortality risks there is first a risk of getting the illness and then a second risk of dying from the illness. In addition there are variations in the length and severity of the morbidity before recovery or death occurs. These morbidity elements are potentially important in the valuation of environment-related health risk. We were attempting to define the health risk in terms of morbidity and mortality risk components without actually naming the type of illness or cause of death. If successful, the WTP results could be used for many different types of health risks. However, we eventually gave up this effort after concluding that we could not find a way to make this simple enough to be executed with a self-administered instrument. The primary problem was the quantitative presentation. We found that most people needed to be walked through the two-step risk numbers to understand their implications; this took a considerable amount of time and respondents tended to focus on the mortality component of the risk. When we said, for example, that the risk of getting ill is 1 in 1,000 and that 1 in 10 who get ill will die, most people were unable to tell us that the combined risk of getting ill and dying was therefore 1 in 10,000. After we walked respondents through this presentation and then told them the combined risk of getting ill and dying, they tended to focus on the risk of dying and did not pay much attention to the morbidity component.

We decided that the generic morbidity description based on simply length of time and degree of activity restriction was not sufficiently communicating the implications of the whole experience as we had intended. The presentation was therefore changed to use named causes of death and focus on the risk of death. Naming the cause of death has obvious implications regarding the process of injury or illness that precedes death. This diminished the generalizability of the results, but had a better chance of being effectively executed.

2.1.3 Presentation of risk timing/latency

A priority for this research effort was to consider incorporating a health risk latency into the survey design. Previous studies (e.g., Krupnick et al., 2002) incorporated this as a health risk that occurs at some specified future age, such as 70, which is the same for all respondents. This implies a short lag for some respondents and a long lag for others. Our goal was to define a 10-year or 20-year latency for all respondents. The general idea is that some actions cause immediate change in risk and some actions cause risk changes after some period of time, such as with exposure to carcinogens. Respondents understood the concept of a length of time between changes in exposures and changes in health outcomes, but communicating quantitative information with varying timing, risk levels, and costs was challenging.

In our first effort to introduce timing of risk changes we used a graphed timeline showing when over a person's remaining lifetime an exposure change, a morbidity risk change, and a mortality risk change would occur. The lifetime graph helped a small share of respondents (10% to 20%) understand the concepts of changes in risks at various points in time relative to remaining lifetime, but most were more confused by the graphs than helped.

The second effort used a table showing annual risk reductions in each of three time periods: 1 to 10 years, 11 to 20 years, and 21 years and onward. This was readily understood by most people, especially after the risk change was limited to mortality only. Eventually, this was further simplified to two time periods, with two versions for different respondents. One group got 1 to 10 years and 11 years and onward, and the other group got 1 to 20 years and 21 years and onward.

2.1.4 Payment vehicle

In early focus groups there was a lot of discussion of pollution-related health risks and potential programs for reductions in human exposures. Most mortality risk valuation studies have focused on reducing risk of fatal accidents or reducing risk of illness-related fatality through improvement in preventative health care. We wanted to find a way of presenting changes in risks related to environmental quality. The majority of respondents accepted the idea that health risk is related to environmental quality, but when describing a program to improve environmental quality, we found it difficult to get respondents to focus on risk changes for themselves. Describing environmental quality changes as a cause of risk reduction tended to focus people on benefits to others more than on themselves. When we asked them to say how much they would value the risk reduction to themselves they had trouble just thinking about themselves. When we asked them to value the change in environmental quality that would result in a change in risk for a population that included them, most respondents told us in response to follow-up questions that they were thinking more about the benefit to others, especially to children, than to themselves.

We concluded that getting respondents to focus on their own health risk change required a payment vehicle that simulated a private good. With a public good type of payment vehicle many people seemed to include value for others as well as for themselves, and it would be difficult to quantitatively separate these values. Although it may be of interest to know what people are willing to pay for reduced health risk for other people, it is not clear whether such values should be included in cost-benefit analysis (Jones-Lee, 1991). The current research priority is to obtain estimates of WTP for people's own health risk reduction. Either a health care or a relocation scenario was necessary to focus people on changes in risks to themselves alone.

Most people seemed willing to entertain the idea of moving by themselves to a different location for the purposes of answering the choice questions, even though they said they would not do that. There was general acceptance of the idea that location could affect risk levels, but occasional issues about how the motor vehicle risks would be varied, e.g., concerns about being forced to use public transportation.

2.2 Final Instrument: Focusing on Selected Issues

The final instrument is included in Appendix A.[3] The instrument was customized to each respondent's gender and age. The instrument was ultimately narrowed down to focus on four aspects of WTP values for mortality risk reduction, in addition to the basic goal of obtaining WTP values for a range of mortality risk reduction levels. Some aspects were included in every version of the instrument, and others vary across respondents.

The first aspect addressed was the cause of the fatal risk: cancer, heart attack, motor vehicle accident, and pneumonia. These were selected to get a range of mortality contexts and to overlap with previous studies. Every version of the instrument included variation in cause of fatal risk and at a minimum includes cancer and heart attack. Motor vehicle accident was included only with the relocation payment vehicle.

The second aspect addressed was the timing of the risk reduction. Risk reductions are presented in three types of timing profiles. One is constant annual reduction through the remaining life expectancy, another is delayed annual risk reduction that starts in 11 or 21 years from now and continues through the remaining life expectancy, and the third is near-term annual risk reduction

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[3]. Note that the question numbers skip some values, and some have letter suffixes, because as questions were added or deleted toward the end of instrument development, questions were not renumbered.

that starts now and lasts for 10 or 20 years. Each respondent received either the 10-year timing variations or the 20-year timing variations.

The third key aspect of the instrument was to obtain information on individual characteristics that might influence WTP responses. Many demographic variables, including age, household income, gender, education, race, and smoking status, were provided by Knowledge Networks and therefore did not need to be included in the instrument. Included were questions on health status, enjoyment of life now and expectations of enjoyment in the future, attitudes regarding common risk reduction behaviors, and personal expectations about mortality risk and chances of future survival.

Finally, the instrument was designed to test the effect of two different payment vehicles on WTP values via a split sample design. Some respondents got a health care payment vehicle and some got a relocation payment vehicle. The questions were structured as similarly as possible for the two payment vehicles, but some wording was necessarily different. Questions that differ in the instrument depending on the payment vehicle are labeled HC for health care and RL for relocation.

2.2.1 Final instrument overview

The first two questions (Q3 and Q4) asked for self assessed physical health and overall enjoyment of life, both on a 5 point scale from poor to excellent. Q5 asked if the respondent has any activity restriction due to long-term illness or medical condition. This was intended to briefly assess the severity of any chronic health problem.

Table 1 in the instrument (see Appendix A) showed respondents the current annual average mortality rates for four selected causes of death and for all causes of death by 10-year age group starting at age 35 to 44. There were different tables for men and women — respondents were shown the one for their gender. The data show that for all causes except motor vehicle accidents, the risks increase significantly with age. Q6, Q7, and Q8 asked respondents to enter information from the table for their age group. The question was repeated if the respondent made an error or skipped the question the first time. This was intended to be a simple comprehension assessment and to get everyone to take a look at the data in the table. Q9 asked respondents how they think their own chances of death from each of these causes compare to the average for their age group.

Table 2 in the instrument (see Appendix A) presented chances of living 10 more years, 20 more years (for everyone currently under age 75), and 30 more years (for everyone currently under age 65). The table was year of age and gender specific for each respondent. The data used to construct the individual tables are shown at the end of Appendix A. This is another way of presenting future mortality rate information and introduces 10-year and 20-year time blocks that were used later in the instrument. In Q11 respondents were asked to say what they think their own chances of survival to each of the time periods is. Then respondents were asked in Q12a (for everyone) and Q12b (if under age 75) what they think their enjoyment of life will be in 10 (Q12a) or 20 (Q12b) years.

Table 3 in the instrument (see Appendix A) presented examples of risk reduction actions that may be familiar to respondents and listed estimates of annual mortality risk reductions obtained with each action. The table was gender specific and each respondent sees just one table. The only difference is prostate cancer screening was included for men and breast cancer screening was included for women. Respondents were asked whether they take these action now or would consider taking them in the future. This was intended to get an idea of how eager respondents are to take risk reduction actions and to give examples of actions that result in a range of risk reductions similar to those asked about in subsequent valuation questions. Respondents were then asked how important it is to them to reduce their risk of death by 1 in 10,000 each year.

The next three screens showed 1,000 squares, with an explanation that each square represents 10 men or women the same age as the respondent. A number of squares shown in red matches the number of people their age and gender who would be expected to die in the next 10 years. The second screen showed one of the squares changed from red to green to illustrate a risk reduction of 1 in 10,000 over a 10-year period. The third screen showed five of the squares

changed from red to green to illustrate a risk reduction of 5 in 10,000 over a 10-year period. These screens were intended to illustrate the magnitude of the risk reductions presented for valuation in subsequent questions, and to put these in context relative to the baseline mortality rate for the respondent.

Respondents were then asked about how important a 5 in 10,000 risk reduction is compared to a 1 in 10,000 risk reduction. This was intended to provide an assessment of relative importance, and responsiveness to the scope of the risk change, with a measure other than dollars.

The next several screens introduced the choice questions and the payment card valuation questions. The design of these questions is discussed in detail in the next section.

2.2.2 Preference and valuation questions

Two types of choice questions were included in the instrument: nondollar and dollar. Nondollar stated choice questions were used to evaluate preferences across fatal risk causes and time profiles of risk reductions. Dollar stated choice questions were used to value constant annual risk reductions for different fatal risk causes. Finally, a payment card question was used to value constant annual risk reductions for one fatal risk cause, varied across respondents

Nondollar choice questions

Each instrument included five nondollar choice questions. These did not vary by the payment vehicle because the cost aspect was not yet introduced. These are questions Q16 through Q20 in the instrument.

The objectives of the nondollar choice questions were to introduce the choice presentation framework and to familiarize respondents with the concepts of fatal risk causes, risk levels, and timing before proceeding to the dollar choice questions. Thus, concepts of choices were initially addressed without the added difficulty of dollar valuation. The nondollar choice questions focus on alternative time profiles for risk reductions, which received limited attention in the dollar choice questions.

Because no costs were involved in this section, the nondollar choice section abstracted from a scenario for obtaining, and paying for, the risk reductions so as to reduce scenario rejection about who is ultimately going to pay. Respondents were introduced to the concept of risk timing by indicating that some actions may reduce fatal risks immediately and ongoing (such as improving transportation safety), and others may reduce the changes of death in the future (such as using sunscreens or reducing pollution exposure to reduce risks of future cancer). Respondents were specifically advised:

When answering these questions:

- Do not be concerned about what the actions are to reduce risk — we just want you to consider the risk reductions.
- Assume these actions would not cost you anything.

Respondents were also provided hyperlinks to bring up prior information tables for review in answering the questions, and they were led through the first question with voiceovers. Five nondollar choice questions were presented, followed by a question about the respondent's confidence in answering these questions (Q20a), ranging from "not at all confident" to "extremely confident."

Each alternative in each choice was a combination of several characteristics, as identified in Table 2.1. The alternatives were titled according to the time profile of risk reduction presented to aid respondents in identifying the differences across the alternatives. The risk reduction levels through time were constrained to not exceed the baseline risks for the time period for females by age group (male risks generally are slightly higher, but for simplicity we developed only age, and not gender, specific versions).

Table 2.1 Nondollar choice questions characteristics.

Characteristic	Values
Risk profiles	Constant annual risk reductions Near term annual risk reductions Delayed annual risk reductions
Fatal risk cause	Cancer Heart attack Pneumonia (only for age $\geq$ 45) Motor vehicle accidents
Risk reduction (RR) levels	0/10,000; 1/10,000; 2/10,000; 5/10,000

Notes:
For motor vehicle and pneumonia, RR in each time period = 1 only.
RR in each time period ≤ baseline female risk for each time period for each age group.

The timing of risks was presented for two time periods (near and distant), which varied by time version, as follows:

- Time version 1:
  - for the next 10 years
  - 11 years from now and onward.
- Time version 2:
  - for the next 20 years
  - 21 years from now and onward.

A version assignment plan randomly assigned respondents to one of the two time versions, depending on age (see Chapter 3). Once selected, each respondent saw the same time version for all nondollar choice question, dollar choice questions, and payment card questions. Note that all individuals age 65 and older were assigned to time version 1 because the life expectancy is less than 20 years. The two time period specifications can be mapped to three time periods: 0 to 10 years, 11 to 20 years, and 21+ years, as illustrated in Table 2.2, and used for detailed evaluations of how timing variations affected the responses to the choice questions.

Each nondollar choice question presented two alternatives, both of which had a reduction in near-term or future risks, or both. Thus, each alternative was an improvement over current conditions. As a result, we did not include a status-quo alternative. Thirteen versions of the five nondollar choice questions were selected. These are shown in Table 2.3.

The possible combinations of cause and risk reduction levels by time period are many. Several software packages are available to select choice pairs to meet statistical design objectives, and in many packages constraints may be imposed to eliminate certain types of inappropriate pairs (e.g., SAS Proc Factex and Proc Optex). However, we often find that, even with multiple constraints, the software package results are not entirely satisfactory and often require substantial revisions in the alternatives selected and paired in the question sequence and to reflect respondent age and other relevant considerations. Therefore, in this application, we used a manual procedure to design and combine choice pairs to obtain variation in the attributes and to meet other criteria, including minimum sample size (targets of 13 minimum per question per age group), variation in the cause of fatal risks presented, elimination of dominant pair alternatives (where one alternative had the same or higher risk reduction in both time periods) and many near dominant pair alternatives (e.g., cancer 5,0 versus heart 1,0 or motor 1,0 or pneumonia 1,0), and eliminating combinations with risk reductions that were less than the baseline risk levels for the individual's age group for the current and/or future time period.

Table 2.2 Examples of mapping time versions to risk reductions in three time periods.

	Maps to		
Version values	**Years 1-10**	**Years 11-20**	**Years 21+**
Example 1: Constant risk reduction			
V10/10+ 5/10,000 in next 10 years 5/10,000 for 11 years and onward	5/10,000	5/10,000	5/10,000
V20/20+ 2/10,000 in next 20 years 2/10,000 for 21 years and onward	2/10,000	2/10,000	2/10,000
Example 2: Near-term risk reduction			
V10/10+ 2/10,000 in next 10 years 0/10,000 for 11 years and onward	2/10,000	0/10,000	0/10,000
V20/20+ 5/10,000 in next 20 years 0/10,000 for 20 years and onward	5/10,000	5/10,000	0/10,000
Example 3: Delayed risk reduction			
V10/10+ 0/10,000 in next 10 years 2/10,000 for 11 years and onward	0/10,000	2/10,000	2/10,000
V20/20+ 0/10,000 in next 20 years 5/10,000 for 20 years and onward	0/10,000	0/10,000	5/10,000

Table 2.3 Nondollar choice question (Q16-Q20) versions.

Variable		Version 1 A	Version 1 B	Version 2 A	Version 2 B	Version 3 A	Version 3 B	Version 4 A	Version 4 B	Version 5 A	Version 5 B	Version 6 A	Version 6 B	Version 7 A	Version 7 B
Q16	Fatality	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Heart	Heart	Cancer	Cancer	Heart	Heart
	Timing words	Constant	Delayed	Constant	Delayed	Constant	Delayed	Constant	Delayed	Constant	Delayed	Constant	Delayed	Constant	Delayed
	Next 10/20 yrs	1	0	1	0	2	0	1	0	1	0	1	0	1	0
	Next 11+/21+ yrs	1	2	1	5	2	5	1	5	1	2	1	2	1	5
Q17	Fatality	Heart	Motor	Motor	Heart	Cancer	Motor	Motor	Heart	Motor	Heart	Heart	Cancer	Motor	Pneum.
	Timing words	Delayed	Delayed	Constant	Constant	Near	Near	Constant	Constant	Near	Near	Constant	Constant	Delayed	Delayed
	Next 10/20 yrs	0	0	1	1	1	1	1	1	1	1	1	1	0	0
	Next 11+/21+ yrs	1	1	1	1	0	0	1	1	0	0	1	1	1	1
Q18	Fatality	Heart	Cancer	Heart	Cancer	Cancer	Heart	Cancer	Heart	Heart	Cancer	Motor	Pneum.	Cancer	Cancer
	Timing words	Near	Near	Constant	Delayed	Delayed	Delayed	Delayed	Delayed	Constant	Near	Near	Constant	Constant	Near
	Next 10/20 yrs	1	1	2	0	0	0	1	1	1	2	1	1	1	5
	Next 11+/21+ yrs	0	0	2	5	1	1	2	2	1	0	0	1	1	0
Q19	Fatality	Cancer	Cancer	Cancer	Cancer	Heart	Heart	Cancer	Cancer	Cancer	Heart	Motor	Motor	Cancer	Heart
	Timing words	Near	Delayed	Delayed	Near	Near	Delayed	Constant	Near	Constant	Delayed	Near	Delayed	Delayed	Delayed
	Next 10/20 yrs	1	0	0	2	1	0	1	2	1	0	1	0	2	2
	Next 11+/21+ yrs	0	2	2	0	0	2	1	0	1	1	0	1	5	5
Q20	Fatality	Cancer	Heart	Heart	Heart	Heart	Cancer	Cancer	Cancer	Motor	Cancer	Cancer	Heart	Cancer	Cancer
	Timing words	Constant	Delayed	Constant	Delayed	Near	Constant	Constant	Delayed	Constant	Near	Constant	Constant	Constant	Near
	Next 10/20 yrs	1	0	2	1	1	1	2	1	1	2	2	1	2	5
	Next 11+/21+ yrs	1	1	2	5	0	1	2	5	1	0	2	1	2	1

Table 2.3 Nondollar choice question (Q16-Q20) versions (cont.).

Variable		Version 8 A	Version 8 B	Version 9 A	Version 9 B	Version 10 A	Version 10 B	Version 11 A	Version 11 B	Version 12 A	Version 12 B	Version 13 A	Version 13 B
Q16	Fatality	Heart	Heart	Heart	Heart	Heart	Heart	Cancer	Cancer	Cancer	Cancer	Heart	Heart
	timing words	Constant	Delayed	Constant	Delayed	Constant	Delayed	Constant	Delayed	Constant	Delayed	Constant	Delayed
	Next 10/20 yrs	2	0	2	0	1	0	1	0	1	0	1	0
	Next 11+/21+ yrs	2	5	2	5	1	5	1	5	1	5	1	2
Q17	Fatality	Pneum.	Heart	Cancer	Heart	Heart	Cancer	Motor	Pneum.	Pneum.	Cancer	Cancer	Heart
	timing words	Delayed	Delayed	Constant	Constant	Near term	Near	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	0	0	2	2	2	2	1	1	1	1	5	5
	Next 11+/21+ yrs	1	1	2	2	1	1	1	1	1	1	5	5
Q18	Fatality	Cancer	Cancer	Cancer	Cancer	Cancer	Heart	Pneum.	Heart	Motor	Pneum.	Pneum.	Cancer
	timing words	Constant	Near	Near	Delayed	Constant	Near	Near	Near	Near	Near	Near	Near
	Next 10/20 yrs	2	5	5	0	1	5	1	1	1	1	1	1
	Next 11+/21+ yrs	2	0	0	5	1	0	0	0	0	0	0	0
Q19	Fatality	Cancer	Heart	Heart	Cancer	Cancer	Cancer	Heart	Heart	Heart	Heart	Heart	Heart
	timing words	Constant	Delayed	Constant	Near	Delayed	Near	Constant	Near	Delayed	Near	Constant	Near
	Next 10/20 yrs	1	0	2	5	1	5	2	5	2	5	2	5
	Next 11+/21+ yrs	1	5	2	0	2	1	2	0	5	0	2	1
Q20	Fatality	Heart	Heart	Heart	Heart	Heart	Cancer	Heart	Pneum.	Pneum.	Heart	Pneum.	Pneum.
	timing words	Constant	Near	Near	Delayed	Constant	Near	Constant	Constant	Constant	Delayed	Near	Delayed
	Next 10/20 yrs	1	2	2	1	2	5	1	1	1	0	1	0
	Next 11+/21+ yrs	1	0	0	2	2	1	1	1	1	2	0	1

Based on the above, the eligible combinations for pairs of alternatives were enumerated, but this still led to a large number of combinations. To simplify the comparisons for respondents, we focused 80% of the comparisons on four types of comparisons where only a subset of the characteristics changed. These were selected to focus on tradeoffs between causes and tradeoffs between different risk timing profiles.

Same cause, constant risk reduction versus delayed risk reduction. This amounts to a simple timing question for the same cause. For consistency, and to allow the voice explanations of the first question to be the same, this type of comparison was always presented as the first question in each survey version and was in other questions in two versions (15 times total).

Different cause, same time profile of risk reductions. The time profile of the risk reduction could be constant, near term, or delayed, but was the same for both alternatives. For consistency, this type of comparison was always presented as the second question of the nondollar questions in each version and was in other questions 8 times (21 times in total).

Same cause, near-term risk reduction versus delayed risk reduction (9 times).

Same cause, constant risk reduction versus near term risk reduction (7 times).

The remainder of 13 question versions were randomly selected to reflect a mix of different causes for different time profiles of risk reduction — respondents would have to make choices with both the cause and time profile varying.

Within the pairs selected, there is more emphasis on cancer and heart attack so that there are enough pairs to allow many variations in risk timing for these two causes. Motor vehicle accident and pneumonia have equal attention, but at a lower level than for cancer and heart attack and with the emphasis on comparing the same risk reduction and timing for different causes. The observations on risk levels presented are relatively balanced, subject to age and cause constraints and subject to appropriate risk timing comparisons, and are not correlated with heart attack or cancer (risk levels for motor vehicle accident and pneumonia are constrained to 0 or 1 by the baseline risks for these causes).

The selected comparisons were assigned to versions to reflect variation in cause and relevant risk reduction levels by age group. Respondents were randomly assigned to one of between 6 and 10 age relevant versions. Not all possible versions (with age relevant questions) were included for each age group so that minimum samples per age group per included version would be obtained, and to allow repetition of at least a subset of versions across different age groups (see Chapter 3 for version assignment tables).

Dollar choice question design

The objective of the dollar choice questions was to determine WTP for constant risk reductions through time for the different fatal risk causes, and to determine the effect of age and of the payment vehicle on the WTP values. The decision to focus the dollar choice questions on constant risk reductions through time was made to ease respondent burden and to focus on measuring values comparable to those in the literature for the value of a statistical life (VSL), which are based on annual risk changes and cost per year.[4]

The health care program. The health care program introduction asked respondents to consider health care alternatives that may become available to reduce risks, such as annual screening procedures, preventative medicines and treatments, and nutritional supplements and other health enhancing products. Respondent were asked to assume the following:

- The health care option will have no side effects and will cause little or no inconvenience (to avoid reduced values due to negative attributes).

- The health care option will need to be started now and continued and paid for every year throughout your life to give you the stated risk reduction (to avoid respondents considering they might start paying later or paying intermittently, in which case the agreed-to costs interpreted as an every year payment would overstate value).

- The costs are out-of-pocket costs to you not covered by any insurance (to obtain individual value uncomplicated by insurance or government programs).

The relocation program. The relocation program introduction presented the premise that fatal risks and accidents vary within metropolitan areas and across the country because of differences in pollution levels, differences in transportation safety, and other factors. To obtain individual specific values, and based on pretests, the scenario explicitly asked the respondent “to assume that you *alone* will be moving . . .” and expresses:

> We understand you may find it difficult to think about moving alone. However, we want to understand how, *if you had to*, you would trade off reducing risks of fatal illnesses and fatal accidents just for yourself versus increased costs of living just for yourself. Because only you would be moving, consider only the risks of fatal illnesses and fatal accidents for yourself.

To make the relocation scenario more palatable, the alternative locations would have the same or lower risks compared to where the individual now lives. Respondents were further asked to assume that:

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[4]. A few questions with risk timing variations are included for age group 35-44 in the health care program to begin to investigate values for varying risk profiles by comparing delayed risk reductions to constant risk reductions. Ultimately, valuation of risk timing questions may help map dollar values for the nondollar choice questions in one combined model.

- The two locations are identical in terms of the quality of life, your work, or any factors that may influence where you want to live. The only real differences are the risks of fatal illnesses and of fatal motor vehicle accidents, and the cost of living (thus, the respondent should not embed values for other positive or negative attributes that may be associated with different locations — all locations are the same except for the stated risk reductions).

- Your income will remain the same as it is now.

Some respondents still found the health care, or the relocation, scenario or some of the assumptions to be difficult, while others felt comfortable with them. The follow-up questions (discussed below) and written comments were used to help evaluate scenario rejection and related issues.

Income/hardship question. A concern often raised in stated preference designs is that respondents need to consider their WTP responses within the context of their budget constraints, and it is often recommended to have a budget reminder statement or a question about budgets (Loomis et al. 1994; McConnell, 1995). Before asking the dollar choice and payment card valuation questions, in both the health care and relocation versions, we asked a "hardship" question:

> HC2. New health care options will cost money. Some of the costs may be paid by government or private insurance, but some costs may have to be paid by you. If you were interested in a new health care option, how much hardship would it cause you if the cost to you was each of the amounts shown:
>
> RL1 Moving to another location with lower risks of fatal illnesses and accidents may increase your "cost of living." By cost of living we mean your costs for housing, transportation, and other expenses. How much hardship would it cause you if, compared to now, your individual cost of living increased by each of the amounts shown?

These questions were followed by a list of $50/year, $500/year, $1,000/year, and $5,000/year and for each a 5 point scale of "no hardship," "a small hardship," "some hardship," "a moderate hardship," and "a great hardship."

These questions serve to introduce payment vehicle concepts in the scenario, and to have respondents think about the implications on their budgets for the range of cost levels they could encounter in the subsequent valuation questions. In the results section we report that the hardship responses are highly correlated with both the respondent's household income and with the valuation responses.

Dollar choice question versions

The format of the dollar choice questions is the same as for the nondollar choice questions, with the addition of the costs per year for each alternative. Four dollar choice questions were asked of each respondent. All of the dollar choice questions use a “forced choice” approach where the respondents is to pick either A or B, and incur the identified costs, even if they would prefer not to do anything and spend no more.

Because of the forced choice nature of the dollar choice questions, each choice question is followed by a “status quo” question (Ruby et al. 1998; DeShazo et al. 2001). For health care, the status quo question asks:

> Would you prefer the Alternative [A/B] you just selected, or to do nothing more to reduce your risks of dying, and having no additional health care costs?

For the relocation version, the status quo question asks:

> If you were moving, would you prefer to move to Location [A/B] you just selected, or to move to Location C where there would be no reduction in your risks of dying and where the costs of living would be the same as you now have?

For the relocation program it was important to make the status quo choice be another location rather than to not move at all because many respondents in pretesting expressed preference to not move for reasons not related to risk reductions, but showed willingness to consider the location options under the hypothetical “what if” assumptions. Offering an explicit option to not move might cloud the interpretation of the responses.

Respondents keep the same time period presentation (next 10/11+ years or next 20/21+ years), although for most respondents this would not matter since all risk reductions considered are constant over time. Respondents were assigned to the risk reduction or health care programs according to the assignment plan (see Chapter 3), and to one of 56 versions of the dollar choice questions based on their age and health care or relocation program assignment.

The characteristics and levels used in the dollar choice questions are summarized in Table 2.4. Note that motor vehicle is included only in the relocation versions because health care options seldom, if ever, would affect motor vehicle accident risk. Note also that certain levels of risk reduction for some fatal risk causes are relevant only to certain age groups because of low current period baseline risks.

Table 2.4 Dollar choice questions characteristics.

Characteristic	Values
Risk profiles	Constant annual risk reductions (most cases) Near-term risk reductions (11 questions for age group 35-44)
Fatal risk cause	Cancer Heart attack Pneumonia (only for age $\geq$ 45) Motor vehicle accidents (Relocation program only)
Risk reduction (RR) levels	0/10,000; 1/10,000; 2/10,000, 5/10,000 Notes: - For motor vehicle, RR = 0,1 only - If age < 45, RR for heart attack $\leq$ 1, RR for cancer $\leq$ 2 - For pneumonia, RR = 0,1 only and is not included for age < 45
Dollar values (by RR level)	0/10,000 ongoing: $0 1/10,000 ongoing: $50, $100, $150, $200, $250, $500, $1,000 2/10,000 ongoing: $100, $150, $200, $500, $750, $1,000, $1,500, $2,000 5/10,000 ongoing: $250, $300, $500, $1,000, $1,200, $2,000, $2,500, $3,000, $4,000, $5,000 1/10,000 delayed: $25, $50, $100, $200, $250, $500

The dollar values selected vary by risk reduction level, and for constant annual risk reductions cover implicit VSL ranges of $0.5 million to $10 million, as illustrated in Table 2.5, although VSLs lower than $0.5 million and higher than $10 million can still be revealed. Key values are used most often ($50, $100, $250, $500, $1,000, etc.), but other intermediate values ($300, $750, $1,200, $3,000, $4,000) are used occasionally to vary the ratios of values and the differences of values when comparing different risk reduction levels.

The possible combinations and comparisons of cause, risk reduction level, and dollar cost for use in the choice questions are many. For the reasons discussed earlier in this section, and further illustrated below, we used a manual procedure to design and combine choice pairs to obtain sufficient independent variation in the attributes to statistically identify the separate influences of each attribute on the choice of Alternative A or Alternative B, and to meet other criteria. The objectives included having:

- Minimum numbers of observations for key cause/risk level/dollar value combinations considered in the analysis to improve the evaluation of responsiveness to dollar costs – each key combination would enter into several choice questions, and thus in several follow-up status quo questions.

- Repetition of cause/risk level/dollar value combinations across age groups and programs to improve the evaluation of age and program effects.

- Sufficient observations for many dollar choice questions to allow pairwise comparison of the results across individual, or groups of, questions. We targeted a minimum of

15 responses for each dollar choice question, with most having sample sizes of 20-25 and several with sample sizes of 35 or more. Ideally, 35 or more would be desired for all questions, but covering a sufficient range of alternatives with the available sample precluded this.

- To support the evaluation of the relationship between values and risk reduction levels, all versions included three risk reduction levels (1/10,000; 2/10,000; and 5/10,000) for at least one fatal risk cause (cancer), except for the youngest age group for which the 5/10,000 reduction was not feasible.
- Comparisons of cancer, heart attack, and motor vehicle accidents for at least one risk reduction level.
- Elimination of dominant pair alternatives. These include pairs where for the same fatal risk cause, one alternative provides more risk reduction for less cost. Preferences in such pairs are nearly always trivial, and presenting such pairs can lead to respondent confusion or annoyance.

Table 2.5 Relationship between annual WTP for constant annual risk reductions and implicit VSL.

Constant annual risk reduction	Value of statistical life			
	$500,000	$1,000,000	$5,000,000	$10,000,000
1/10,0000	$50	$100	$500	$1,000
2/10,000	$100	$200	$1,000	$2,000
5/10,000	$250	$500	$2,500	$5,000

Reflecting these considerations, the selected cause and risk reduction combinations, by program type, are listed in Table 2.6. Each cause is listed with the risk reduction level in time period 1 and time period 2 as (Cause x,y). As a result of this plan, the number of dollar choice questions with pneumonia as a cause is very limited, and most likely sufficient to evaluate only relative values (larger than, smaller than) for pneumonia risk reduction compared to other causes.

Table 2.6 Cause/risk reduction combinations in the dollar choice questions.

Age group	Risk reduction program		
	Both health and relocation	Health only	Relocation only
35-44	Cancer 1,1 Cancer 2,2 Heart 1,1	Cancer 0,1	Motor 1,1
45-54	Cancer 1,1 Cancer 2,2 Heart 1,1	Cancer 5,5	Motor 1,1 Pneumonia 1,1 (light coverage)
55-64	Cancer 1,1 Cancer 5,5	Cancer 2,2	Motor 1,1

	Heart 1,1 Pneumonia 1,1 (light coverage)		
65-84	Cancer 1,1 Cancer 5,5 Heart 2,2	Cancer 2,2 Pneumonia 1,1 (light coverage)	Motor 1,1

Based on the above criteria, the eligible fatal risk causes, risk reduction levels, and dollar values combinations for each of two alternatives in each question were initially enumerated and then a subset randomly selected. The selected pairs were then reviewed, adjusted, and assigned to a survey version to reflect the following additional considerations.

Consistent structure. Questions were assigned to versions to have a generally consistent pattern of questions across version for each program and age group, and across age groups. For example, each version starts with the same type of comparison (same cause, different levels of constant risk reduction at different prices) and has generally the same/similar sequence of questions. Assignment of cause/risk combinations to the A or B alternative was also varied.

Diversity. Questions were assigned to versions so that respondents encountered diversity such that, for example, not all questions were about Cancer 1,1 and Cancer 2,2 at different costs.

Value ranges. Questions were assigned to versions to limit conflicts that reduce realism, such as having Cancer 1,1 costing $50 in one option and $1,000 in another option for the same respondent. Generally, questions were assigned so that, for example, Cancer 1,1 costs range from $50 to $200 for one respondent, and from $200 to $1,000 for another respondent.

Value ratios. The ratios of dollars in the choice question comparisons were constrained to reflect a priori expectations and pretest results as to the relative value of different cause/risk reduction combinations. This increases the accuracy of the estimation of relative values. Reflecting these considerations, we included of additional dollar values (such as $250, $300, $750, $1,200, $3,000, $4,000). The dollar ratio ranges are generally as listed below for cause/risk reduction combination comparisons.

Cause/risk level comparison	Dollar ratios (first cause/second cause)
Cancer 11/Heart 11	0.5 to 2, mostly around 1
Cancer 22/Cancer 11	1.5 to 4, mostly 2 to 3
Cancer 11/Cancer 01	2 to 5
Cancer 22/Cancer 01	4 to 5
Cancer 55/Cancer 11	2 to 10, mostly 3-5
Cancer 55/Cancer 22	2 to 5
Cancer 55/Heart 11	2.5 to 5
Cancer 11/Pneu 11	0.5 to 2
Motor 11/Pneu 11	0.5 to 2
Cancer 11/Motor 1,1	1 to 4
Heart 11/Motor 11	1 to 2.5, mostly 1 to 1.5
Heart 11/Cancer 01	2 to 5

This design purposefully does not have a level balance in terms of the number of occurrences of fatal causes or the risk reduction levels in the choice questions. More emphasis is placed on cancer, and then heart attack, to facilitate comparisons across risk levels, age groups, and health and relocation programs. Motor vehicle accident is relevant only in the relocation program, but is there on a comparable basis to cancer and heart attack. To meet other objectives, the number of dollar choice questions with pneumonia purposefully is limited, and most likely only sufficient to evaluate relative values for pneumonia compared to other cases (e.g., larger than, smaller than). The occurrence of risk reduction levels reflects a level balance of the risk levels relevant to the cause and age groups.

Ultimately, 56 dollar choice versions were defined, based on age and program, and are listed in Appendix B. A review of the final design finds low correlations between the key design variables, except for the risk reduction and costs, which are positively correlated by design and consistent with realistic presentations. This correlation is partially controlled by varying the cost ranges across different respondent versions (see value range discussion and starting value evaluations in the results chapter).

Payment card question

Following the dollar choice question section is a payment card valuation question. Including the payment card approach allows direct comparison of values obtained from dollar choice and payment card approaches when presented to the same individual in the same survey, and expands the valuation information.

The payment card approach is a conventional stated preference response format (Mitchell and Carson 1989) that has desirable properties relative to other formats, including overcoming potential problems with implied value clues (Rowe et al., 1996), high response rates, low rates of protest, and values consistent with open-ended WTP formats that are consistent with actual payments (Reaves et al., 1999; Balistreri et al., 2001). Each respondent retains the same health care or relocation program approach. The payment card valuation scenario is presented in the same format as the dollar choice questions. The respondent is presented a specified constant annual mortality risk reduction (1 in 10,000, 2 in 10,000, or 5 in 10,000) for a selected cause (cancer, heart attack, or motor vehicle accident. For the relocation program this is contrasted with a status quo option with no risk reduction and no additional cost of living that is labeled Locations C, so that the respondent is not given an option to say they don’t want to move.

Respondents with the health care program were asked:

> What is the most you would be willing to pay each year out of your own pocket for this health care option? (*Select a dollar amount, or fill in any specific amount)*

Respondents with the relocation program were asked:

> What is the most you would be willing to pay in higher annual costs of living per person to live in Location A rather than Location C? (*Select a dollar amount, or fill in any specific amount).*

The question is followed by a "payment card" listing amounts ranging from $0 to $6,200 using an approximately exponential scale (Rowe et al., 1996).

The selection of cause/risk reduction level combinations for the payment card approach parallels that for the dollar choice approach, with the omission of pneumonia risk reductions. The specific assignment of payment card scenarios is shown in the bottom rows of the tables in Appendix B and are assigned according to the dollar choice version the respondent gets. These are labeled questions HC10 and RL10 in the tables.

2.2.3 Follow-up questions and supporting data

The valuation section concludes with questions used to help detect and evaluate the significance of potential valuation elicitation influences that can bias results. The survey lists statements for respondents to express a range of agreement to disagreement with, and asks for "any additional comments to help us understand your answers." The statements listed are consistent for the health care and relocation programs, although the exact wording varies to be program specific. This statements, and the follow-up comments are designed to evaluate the following:

Scenario rejection, wherein respondents do not accept the scenario, may lead to lower reported values or refusal to answer. For instance, respondents may not believe the proposed risk reductions can happen through health care options or moving, they think insurance should pay, or they simply don't want to consider moving.

Uncertainty and inaccuracy can be tied to scenario rejection and may lead to lower reported values. Respondents may indicate they have a hard time answering accurately because the questions are difficult or because they can't accept the scenario.

Embedding usually results in higher values because respondents include, with the values for reduced mortality risks for the fatal risk cause of interest, values for other factors such as reduced morbidity risk, or reduced risks for other causes (e.g., reducing pollution may reduce multiple risks).

The Knowledge Networks data base includes a wide range of socioeconomic, attitudinal, behavioral, and demographic variables from which the researcher may select a subset for inclusion with the survey data. Table 2.7 lists the variables obtained for our sample population.

Table 2.7 Knowledge networks supplemental variables.

Name	*Descriptions*
PP Gender	Gender: male, female
PPAGECAT	Age in categories of: 35-44, 45-54, 55-64, 65-75, 75+
PPRACE	Race: 4 categories
PPHISPAN	Spanish, Hispanic or Latino descent (by original region)
PPETH	Respondent race/ethnicity: 4 categories
PPETHHH	Head of household race/ethnicity
PPMARIIT	Marital status: 5 categories
PPEDUC	Education: 9 levels from less than high school to doctorate degree
PPEDUCAT	Education: 4 levels from less than high school to bachelor or higher
PPWORK	Current employment status in 9 groups
PPOCC1	Occupation in 11 groups
PPOCM0160	Occupation in 58 groups
PPHHHEAD	Is respondent the head of the household
PPRENT	Own or rent living quarters
PPHOUSE	Housing type in 7 categories
PPINNCIMP	Household income in 17 categories
PPCMINCI	Is income based on census block group data (0,1)
PPTX_Y	Number in household in age group X to Y (6 groups) – also by gender
PPHHSIZE	Total household size
PPWEBUSE	Did respondent use internet before WebTV (0,1)
PPCOMP	Number of computers in household (not including WebTV)
PPWEB	Number of computers connected to internet
PPSTATE	State of residence
PPREG9	Region of residence (9 regions)
PPHEHPRB	Respondent ever had heart problems or disease (doctor diagnosed)
PPHE0149	What kinds of medicine are you taking – heart problems (list of 4)
PPHECANC	Respondent ever had cancer (doctor diagnosed)
PPHE0145	What kinds of medicines for cancer (4 categories)
PPHE0003	How would you say your health is (6 categories from excellent to poor)
PPHE0007	How often do you exercise (5 categories)
HEAL1700	Current cigarette smoker (0,1)
HEAL1710	Ever smoked cigarettes (regular, intermittent, no)
HEAL1720	When quit smoking (4 time period categories)
HEAL1730	How many cigarettes/day (9 categories)
HEAL1749	Does R plan to quit smoking in next 6 months (yes, no)

3. Implementation

3.1 WebTV Application Using Knowledge Networks Panel

The survey was implemented using the Knowledge Networks (KN) WebTV panel. This panel provides a cost-effective and timely approach to obtaining a representative nationwide sample and to achieving targeted minimum numbers of responses by age group and for survey versions. The WebTV survey methodology also allows extensive survey customization to present each respondent with age and gender specific risk data, graphics, and text, and with age specific stated choice and payment card questions. Finally, Knowledge Networks maintains a database of selected variables on its panel members, which can be used to supplement the survey data collection, or shorten the survey by not collecting data on respondents that are already available.

Knowledge Networks panel members are recruited using probability sampling techniques, and are not limited to current WebTV users or computer owners. Knowledge Networks selects households using random digit dialing on a sample frame consisting of the entire U.S. telephone population. The sample frame is updated quarterly. Telephones with valid postal addresses are sent an advance mailing followed by a telephone recruitment. Approximately 56% of contacted households agree to be in the panel. Panel members agree to complete a short survey each week and are provided free hardware and WebTV access. See Appendix C for additional detail on Knowledge Networks methods, panels, and weights.

Berrens et al. (2001) present the results of parallel telephone and internet surveys to investigate their comparability. The telephone survey was administered to a national probability sample based on random digit dialing (RDD). The contemporaneous internet survey was administered to a random sample of the data base assembled by Harris Interactive. The survey was replicated by Harris Interactive six months later, and by Knowledge Networks nine months later. KN employs a randomly recruited panel, based on the same principles as a national probability sample. The KN sample characteristics are highly similar to those of the RDD telephone sample, but the KN sample had lower voter registration and lower rate of membership in environmental organizations. Knowledge and opinion questions generally show statistically significant but substantively modest differences across modes. Specifically, the KN sample had a higher percentage of “don’t know” responses. This perhaps reflects conditioning, fatigue, or changing norms of response — i.e., greater willingness to admit a lack of knowledge associated with greater exposure to surveys. Removing don’t knows, the results were the same. With inclusion of standard demographic controls, typical relational models produce similar estimates of parameters across modes. For a referendum CV question, they found the same basic relationships, but did find the internet samples were less likely to say yes. They conclude that the use of commercial internet samples may be reasonable for many types of social science research.

The socioeconomic characteristics of the KN panel closely match those of the U.S. population as a whole, and their procedure of supplying the WebTV equipment and training in its use ensures that their panel is not made up of only those who are already using computers or the internet.

However, questions remain about how a panel that agrees to answer surveys on a regular basis may be different from a randomly selected group of people. Also, it is unknown how doing many surveys over time might affect respondents and alter their responses. The Berrens et al. study suggested that differences are minimal, but more comparisons are needed before these questions can be answered with confidence. The cost-effectiveness and the flexibility of the WebTV survey tool with a pre-selected panel make it a very appealing approach.

Once we selected the Knowledge Network WebTV approach, we revised our surveys for the format, conducted two pretests (Section 3.2), and implemented the final survey (Section 3.3).

3.2 Pretesting

Knowledge Networks conducted two WebTV pretests of the survey. Pretest 1 was fielded between March 29, 2002, and April 1, 2002, and completed by 65 of 120 selected panel members. The purposes of the pretests were to identify issues with the respondents' comprehension of the survey wording, tables, and graphics, and to evaluate the functioning of the survey elements. For simplicity at this stage, the Pretest 1 survey instrument included only a few choice question versions and no audio files.

Based on the results of Pretest 1, the survey was modified, and Pretest 2 was fielded between April 19, 2002, and April 22, 2002. It was completed by 76 of the 140 selected panel members. Pretest 2 fully tested all elements of the final study design. It indicated that the elements of the survey worked well and comprehension was high, but the survey completion time was longer than desired: averaging 45 minutes for most respondents, and over 1 hour for some older respondents.

Two revisions after Pretest 2 reduced respondent burden. First, for some respondents the audio files downloaded slowly and added considerable time, while other respondents simply objected to both reading and hearing the same materials. Therefore, the audio text was streamlined, and respondents were given flexibility to skip many of the audio files. The final survey continued to require listening to the audio files for the stated preference introductions to ensure emphasis of the scenarios and assumptions. Second, respondents over about age 70 took much longer to complete the relocation version of the survey, and their comments indicated that the relocation scenario sometimes created consternation. As a result, we decided to assign only the health care version to respondents age 74 and older.

3.3 Final Implementation

The final implementation plan employed a stratified sampling plan to obtain target minimums for the number of responses by age group, by time version (10/10+ years and 20/20+ years), by nondollar choice question version, and by dollar choice/payment card versions. Using post-stratification weights, the sample results can be scaled to properly reflect the underlying population (see Appendix C). The sampling and assignment to survey versions followed the following steps and guidelines, which are summarized below and in Table 3.1.

Sampling by age group. To reach the target minimum number of responses by age group (Table 3.1, column 1), and reflecting expected responses rates by age group, Knowledge Networks identified a target number of panel members by age group with whom to field the survey (the final number fielded by age group is in Table 3.2). Note that, compared to the actual age group percentages of the total population age 35 and over, the older age groups were over-sampled to achieve a minimum number of age specific responses. Roughly comparable numbers of respondents were obtained in each age group, except that the sample size was increased for age group 35-44 to allow additional comparisons of timing variables (see next bullet), and the sample size for the 75-84 group was smaller because they received only the health care payment vehicle.

Assignment to time versions. Respondents were randomly assigned to the 10/10+ years or 20/20+ years time versions based on the selection percentage, by age group, identified in column 2 of Table 3.1. For age group 35-44, a higher percentage were assigned the 10/10+ time to increase the sample size for one age group to aid the comparison of time versions (for health care) and for the age group as a whole to increase the sample size for the comparison of programs (for the 10/10+ time version). For the two age groups 65 and older, only the 10/10+ time version was selected given the baseline expected years remaining is less than 20 years for this group.

Assignment to nondollar choice version. Respondents were assigned one of between 6 to 10 versions (out of 13 total) of nondollar choice questions based on their age and time version, as identified in Table 3.3. Each nondollar choice version has 5 choice questions. For ages 35-44 and time version 10/10+ years, nondollar choice versions 7-13 contain questions with risk changes that are not relevant (i.e., only versions 1-6 are candidates). For age 35-44 and time version 20/20+, years, nondollar choice versions 9-13 contain questions that are not relevant (i.e., only versions 1-8 are candidates). For ages 45-54, versions 1-10 were candidates, and for ages 55+ all 13 versions were candidates; however, to obtain minimum responses per questions, some versions were eliminated from the selection. A subset of versions were selected to be used across age groups to support age group comparisons. The specific assignment of and minimum response targets by nondollar choice versions are summarized in Table 3.3.

Table 3.1 Sampling and version assignment plan and minimum completion targets.

Steps =>	1. Solicit	2. Select time version of survey for each respondent			3. Select nondollar choice version for each respondent based on age and time version		4. Select health or relocate version for dollar choice questions for each respondent based on age/time version			5. Select dollar version based on age, time, and health or relocation selection	
	Target respondents % of sample	Time version	Select % of total	=> target # responses	# versions relevant to each group	Expected responses per version	Version	% of all in age/time group	Target #	# versions	Expected responses per version
Total number	**1075**										
Age 35-44											
Target %	**27.1%**										
Target #	291	V10/10+	62%	181	6	30	Health	50%	90	6	15
							Relocate	50%	90	6	15
		V20/20+	38%	111	8	14	Health	100%	111	6	18
							Relocate	0%	0	NA	NA
Ages 45-54											
Target %	**22.4%**										
Target #	241	V10/10+	50%	120	8	15	Health	50%	60	8	8
							Relocate	50%	60	8	8
		V20/20+	50%	120	8	15	Health	50%	60	8	8
							Relocate	50%	60	8	8
Ages 55-64											
Target %	**22.4%**										
Target #	241	V10/10+	50%	120	9	13	Health	50%	60	8	8
							Relocate	50%	60	8	8
		V20/20+	50%	120	9	13	Health	50%	60	8	8
							Relocate	50%	60	8	8
Ages 65-74											
Target %	**16.9%**										
Target #	182	V10/10+ only	100%	182	10	18	Health	50%	91	6	15
							Relocate	50%	91	6	15
Ages 75-84											
Target %	**11.2%**	V10/10+									
Target #	120	only	100%	120	10	12	Health	100%	120	6	20

Table 3.2 Surveys fielded and completed by age group.

Age group	National shares of 35-84 year olds	Number fielded	Number completed	Shares of respondents by age group	Completion rate
35-44	33%	483	341	24%	70.6%
45-54	27%	396	303	21%	76.5%
55-64	18%	395	336	23%	85.1%
65-74	13%	306	272	20%	88.9%
75-84	9%	216	185	13%	85.6%
Total		1,796	1,437		80.0%

Assignment to program and dollar choice/payment card version. Respondents were randomly assigned to either the health care program or the relocation program, except that (a) respondents aged 75 and older received only the health care program and (b) respondents aged 35-44 with time version 20/20+ years were assigned only the health care version to increase sample sizes for program and timing comparisons. After the program assignments, respondents were randomly assigned to one of 6-8 age and program relevant dollar choice/payment card versions (of 56 total versions — see Appendix B). The specific assignment of and minimum response targets by dollar choice/payment card versions are summarized in Table 3.4.

After the panel members were selected to receive this survey (Step 1), they were notified by e-mail. When the panel member started the survey, the survey program randomly selected the time version, nondollar choice version, health care or relocation program, and the associated dollar choice/payment card version according to the above steps.

As the fielding of the survey progressed, and by random assignment according to the above guidelines, some versions exceeded their target number of responses sooner than others. To obtain balance across survey versions (and thus balance across programs, risk causes, and risk levels), during the last week of the study, versions, by age, that had sufficient responses were closed and the remaining respondents were assigned to the remaining versions relevant for their age group.

The final survey was fielded between May 3, 2002, and May 22, 2002, to 1,796 panel members between ages 35 and 84 to meet or exceed the minimum sample targets by study cell. Three days after fielding the survey, a standard e-mail reminder was sent to the nonrespondents. On May 13, 2002, and May 19, 2002, two customized e-mail reminders were sent to the nonrespondents to encourage response. Because of the length of the survey, each respondent was given $10 for completing the survey.

Table 3.3 Completion targets and actual responses for nondollar versions.

Age groups	Assignment of age/time version population to question versions																									
	Time version 10/10+													Time version 20/20+												
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Age 35-44																										
Applicable versions	X	X	X	X	X	X								X	X	X	X	X	X	X	X					
Actual #	31	39	41	35	40	32								15	15	15	16	18	15	16	18					
Target #	30	30	30	30	30	30								14	14	14	14	14	14	14	14					
Age 45-54																										
Applicable versions	X		X	X	X		X	X	X	X				X	X	X		X	X		X	X	X			
Actual #	21		16	22	16		25	15	19	18				20	19	21		22	19		18	20	15			
Target #	15		15	15	15		15	15	15	15				15	15	15		15	15		15	15	15			
Age 55-64																										
Applicable versions	X		X	X	X			X	X		X	X	X	X	X	X		X	X				X	X	X	X
Actual #	18		22	17	18			16	17		14	18	18	22	22	25		21	21				17	20	15	19
Target #	13		13	13	13			13	13		13	13	13	13	13	13		13	13				13	13	13	13
Age 65-74																										
Applicable versions	X		X	X	X	X		X	X		X	X	X													
Actual #	26		26	28	29	25		24	35		29	33	19													
Target #	18		18	18	18	18		18	18		18	18	18													
Age 75-84																										
Applicable versions	X		X	X	X	X		X	X		X	X	X													
Actual #	16		17	15	13	14		20	24		20	24	25													
Target #	12		12	12	12	12		12	12		12	12	12													

Table 3.4 Completion targets and actual responses for dollar choice/payment card versions.

Assignment of age/time version population to question versions

Time version 10/10+

Age groups																
Age 35-44																
Version	1	2	3	4	5	6	**7**	**8**	**9**	**10**	**11**	**12**				
Actual #	21	18	16	18	15	16	19	17	18	21	19	20				
Target #	15	15	15	15	15	15	15	15	15	15	15	15				
Age 45-54																
Version	13	14	15	16	17	18	19	20	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**
Actual #	8	9	11	11	8	8	9	10	9	11	10	8	10	8	11	11
Target #	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Age 55-64																
Version	29	30	31	32	33	34	35	36	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**
Actual #	11	12	12	13	12	11	8	9	10	8	8	10	8	9	9	8
Target #	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Age 65-74																
Version	45	46	47	48	49	50	**51**	**52**	**53**	**54**	**55**	**56**				
Actual #	18	23	18	26	30	27	25	19	22	27	20	19				
Target #	15	15	15	15	15	15	15	15	15	15	15	15				
Age 75-84																
Version	45	46	47	48	49	50										
Actual #	24	33	40	33	35	23										
Target #	20	20	20	20	20	20										

Time version 20/20+

Age groups																
Age 35-44																
Version	1	2	3	4	5	6	**7**	**8**	**9**	**10**	**11**	**12**				
Actual #	20	21	22	17	23	25										
Target #	18	18	18	18	18	18										
Age 45-54																
Version	13	14	15	16	17	18	19	20	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**
Actual #	8	12	12	9	8	10	9	10	8	12	9	9	9	9	10	10
Target #	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Age 55-64																
Version	29	30	31	32	33	34	35	36	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**
Actual #	13	15	10	8	15	12	10	11	9	10	18	8	12	11	11	9
Target #	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Age 65-74																
Age 75-84																

Note: Shading indicates relocation/cost of living payment version.

Of the 1,796 fielded panel members, 1,469 returned the survey partially or fully completed, 1,437 responses, or 80%, were retained as sufficiently complete for use in the analysis. If respondents skipped 12 or more survey questions (25% of the 48 total questions), they were dropped. Twenty-five people (1.7% of respondents) were dropped because of this criterion. Further, if a respondent skipped more than 10% of the questions (seven questions or more) and three or more of these were choice questions, they were dropped. Seven more respondents were dropped because of this criterion. In total 32 subjects (2.2%) were dropped because of substantially incomplete responses.

The completion rate of usable responses by age group is summarized in Table 3.2. The completion rate exceeds 85% for respondents age 55 and older, but is 70% to 76% for respondents are 35 to 54, most likely reflecting work and family time conflicts during the survey implementation period.

Omitting respondents who appear to have taken a break during the survey (identified by unusually long time intervals to complete an individual survey section), the average time to complete the survey was about 34 minutes (median 33 minutes) for both the health care and relocation program versions. Time to complete the survey does not appear to vary much with the age of the respondent. The final survey time to complete is about 10-12 minutes less than in Pretest 2, reflecting the streamlining of the audio files and no longer assigning the relocation version to respondents over age 74.

The number of responses versus the minimum targets for the nondollar choice question versions is presented in Table 3.3, and for the dollar choice question and payment card versions are presented in Table 3.4. In Table 3.4, the shaded version numbers are relocation versions and the unshaded version numbers are health care versions. For all the nondollar choice and dollar choice/payment card versions, the number of responses by version meet or exceed the target minimums.

4. Basic Survey Results

4.1 Respondent Characteristics

The sample was selected from Knowledge Networks' national sample. The sample was stratified by age to ensure sufficient numbers of respondents across all age groups and for each of the choice question versions, as described in Chapter 3. Table 4.1 shows selected characteristics of the respondents.

Table 4.1 Respondent characteristics.

Characteristic		Respondent group (N = 1,437)
Average household income (2001)		$50,000
Average age		57 years
% female		53%
% married		69%
Education:	% completed high school or more	85%
	% completed 4-year college or more	25%
Race:	% white	85%
	% black	9%
	% other	6%
Region:	Northeast	19%
	Midwest	24%
	South	35%
	West	22%

4.2 Risk and Quality of Life Attitudes and Self Assessments

The first two questions in the survey asked respondents to assess their current physical health and enjoyment of life. After viewing information on mortality rates by age group in total and for selected causes of death, respondents were asked what they thought their enjoyment of life would be 10 years from now (all ages) and 20 years from now (ages 35 to 74 only). Table 4.2 shows the responses to these questions by age group.

Table 4.2 Evaluations of physical health and enjoyment of life by age group.

Question/ answer	Age group 35 to 44 #	%	45 to 54 #	%	55 to 64 #	%	65 to 74 #	%	75 to 84 #	%
How would you describe your physical health? (Q3)										
Poor	4	1%	12	4%	15	4%	8	3%	7	4%
Fair	39	12%	53	17%	60	18%	52	19%	41	22%
Good	156	46%	112	37%	126	38%	122	45%	91	50%
Very good	117	35%	92	30%	113	34%	71	26%	39	21%
Excellent	23	7%	34	11%	21	6%	18	7%	5	3%
How would you describe your overall enjoyment of life? (Q4)										
Poor	3	1%	7	2%	4	1%	2	1%	4	2%
Fair	41	12%	45	15%	32	10%	30	11%	19	10%
Good	122	36%	105	35%	119	36%	83	31%	78	42%
Very good	139	41%	107	35%	135	40%	111	41%	69	38%
Excellent	35	10%	38	13%	44	13%	46	17%	14	8%
If you live 10 more years, what do you think your overall enjoyment of life will be at that time? (Q12a)										
Poor	6	2%	6	2%	17	5%	14	5%	24	13%
Fair	27	8%	34	11%	46	14%	64	24%	60	33%
Good	127	37%	121	40%	138	41%	125	46%	77	42%
Very good	143	42%	109	36%	106	32%	50	19%	21	11%
Excellent	38	11%	32	11%	26	8%	17	6%	1	1%
If you live 20 more years, what do you think your overall enjoyment of life will be at that time? (Q12b)										
Poor	10	3%	15	5%	43	13%	49	18%	na	na
Fair	40	12%	62	20%	86	26%	117	43%	na	na
Good	125	37%	113	37%	132	40%	66	24%	na	na
Very good	131	39%	91	30%	58	17%	32	12%	na	na
Excellent	34	10%	22	7%	14	4%	8	3%	na	Na

Athough self-assessments of physical health show some modest decline with increasing age, self-assessed enjoyment of life remains fairly constant over the age groups.[5] This appears to be in contrast to expectations of declining enjoyment of life in the future. For example, Table 4-3 shows that 13% of those age 35 to 44 said that they currently have poor or fair enjoyment of life. About 25% of this age group said that they expected to have poor or fair enjoyment of life in 20 years. However, only about 12% of those currently age 55 to 64 said they have poor or fair enjoyment of life. The gap widens with age. For example 12% of those currently age 75 to 84 report poor or fair enjoyment of life, but 39% of those who are currently age 55 to 64 expect that they will have poor or fair enjoyment of life when they are 75 to 84. Overall, there seems to be a consistent pattern that many people expect enjoyment to decline more than it does with age. In fact, these responses show that there is very little, if any, decline in enjoyment of life with age for this group of respondents, even after age 74. However, these respondents show consistent expectations that enjoyment of life will decline in the future, especially after age 74.

Table 4.3 Comparison of perceived and actual quality of life by age.

Current age		Expected quality of life 10 years from now (Q12a)	Actual reported by those 10 years older (Q4)	Expected quality of life 20 years from now (Q12b)	Actual reported by those 20 years older (Q4)
35-44	Age group in 10/20 years		Age 45-54		Age 55-64
	% poor or fair	10%	17%	15%	11%
	% very good or excellent	53%	48%	49%	53%
45-54	Age group in 10/20 years		Age 55-64		Age 65-74
	% poor or fair	13%	11%	25%	12%
	% very good or excellent	47%	53%	37%	58%
55-64	Age group in 10/20 years		Age 65-74		Age 75-84
	% poor or fair	19%	12%	39%	12%
	% very good or excellent	40%	58%	21%	46%
65-74	Age group in 10/20 years		Age 75-84		Age 85-94
	% poor or fair	29%	12%	61%	NA
	% very good or excellent	25%	46%	15%	NA
75-84	Age group in 10/20 years		Age 85-94		
	% poor or fair	46%	NA		
	% very good or excellent	12%	NA		

[5]. Although the KN panel is similar to the U.S. population in factors such as income and race, it is possible that people willing to be on a panel and answer WebTV surveys regularly may differ from the norm. Older panel members, especially, may be more likely to be healthy and active than is typical for their age group.

Table 4.4 shows the average self-assessed (Q11) and the actual average chances of surviving 10 and 20 more years for each age group. The self assessments were obtained after respondents were shown data on average survival changes for people their age and gender. On average, respondents seem to think their own chances of survival are about the same as others their same age and gender, but there are some differences across the age groups. In general, the younger groups are a little pessimistic and the older groups are somewhat optimistic.

Table 4.4 Self-assessed and actual chances of surviving 10 and 20 more years.

	Chances of surviving 10 more years			Chances of surviving 20 more years		
Age group	**Average self-assessed probability**	**Average actual probability**	**n**	**Average self-assessed probability**	**Average actual probability**	**n**
35-44	92%	97%	334	86%	90%	336
45-54	87%	93%	293	75%	79%	295
55-64	83%	85%	322	63%	58%	328
65-74	73%	69%	268	42%	27%	266
75-84	54%	38%	184	na	na	0
Total	80%	80%	1,401	68%	65%	1,225

Question 13 listed several actions people might take to reduce their risk of death. These were shown as examples of risk reduction actions that many respondents might have some familiarity with. The respondents were also asked whether they do take, or would consider taking, these actions to reduce their own risk. This was to get a sense of their attitudes toward risk reduction actions. The results are shown in Table 4.5. The percentages of respondents who said they do take, or would consider taking, each action range from 50% for living in a cleanest air location to 94% for using a smoke detector in the home. As a check on accuracy, about 74% said they would never smoke cigarettes, which is consistent with other information that indicates that about 22% of the respondents are currently smokers.

Responses to Question 14, on the importance of reducing their annual risk of death by 1 in 10,000, are shown in Table 4.6. Only 3.5% said that it was not at all important to them. About 63% said that it was very or extremely important. In Question 15, respondents were asked to compare a 5 in 10,000 risk reduction to a 1 in 10,000 risk reduction. This question was intended to help them focus on the quantitative information and to address the question of proportionality of value for different levels of risk reduction. As shown in Table 4.7, the most often selected answer (42% of respondents) was that a risk reduction of 5 in 10,000 is about 5 times more important than a risk reduction of 1 in 10,000. About equal numbers of respondents said it was somewhat less important or somewhat more important (23% for each).

Table 4.5 Do you personally take, or would you consider taking, these actions to reduce your risks of death? (Q13)

Action	Yes	No	Don't know
Never smoke cigarettes	1,068 (74%)	246 (17%)	119 (8%)
Live in cleanest air location	724 (50%)	314 (22%)	397 (28%)
Annual colon cancer screening	1,020 (71%)	173 (12%)	238 (17%)
Annual prostate/breast cancer screening	1,172 (82%)	124 (9%)	135 (9%)
Regularly wear automobile seat belt	1,324 (92%)	74 (5%)	37 (3%)
Use a smoke detector in your home	1,346 (94%)	44 (3%)	34 (2%)

Table 4.6 How important to you, if at all, is it to reduce your risk of death each year by 1 in 10,000 for the rest of your life? (Q14)

Answer	Number	Percentage
Not at all important	50	3.5%
Only a little important	106	7.4%
Somewhat important	377	26.3%
Very important	520	36.3%
Extremely important	378	26.4%

Table 4.7 Which answer best completes this sentence: Compared to reducing risks by 1 in 10,000 each year, reducing risks by 5 in 10,000 each year is? (Q15)

Answer	Number	Percentage
Less important	35	2.4%
About as important	151	10.5%
Somewhat more important, but not 5 times more important	323	22.5%
About 5 times more important	599	41.7%
More than 5 times more important	324	22.6%

4.3 Comprehension and Response to the Scenarios

For the group of 1,437 respondents whose surveys were retained for analysis, individual question responses rates were quite high. The nonresponse rate for each question was 1% or less, with only a few exceptions. Nonresponse rates for the dollar choice questions were 1% to 2%, and the nonresponse rate for the payment card WTP question was 1.5%. Nonresponse rates for self-assessment of chances of living 10 and 20 more years (Q11a and Q11b) were 2.5% and 1.9%, respectively.

Questions 6, 7, and 8 asked respondents to read information presented in tables on mortality rates for their age groups. This was intended to get them to look more closely at the information in the tables and as an assessment of basic comprehension. If they didn't answer the question or answered it wrong, the question was repeated. About 1% of respondents skipped each of these questions the first time they were asked, and each of the questions was answered incorrectly by about 5% of respondents. Almost everyone answered correctly the second time it was asked.

Table 4.8 provides a summary of all the open-ended comments provided by respondents at the end of the survey. The comments are paraphrased to reflect comparable meaning and grouped according to general categories of comments. About 43% of the respondents offered comments.

Table 4.8 also shows the number of respondents who gave each of the comments and the percentage of total respondents that this reflects.

Respondents are also split in Table 4.8 between whether they got the health care or the relocation payment vehicle to see if reaction to the payment vehicles differed. Percentages of respondents who expressed negative comments about the survey or potential rejecting comments about the payment vehicle were comparable for the two groups. About half of the respondents who were dropped for the analysis because of incomplete surveys also provided comments. Most of these were that the survey was too confusing or complicated or that they objected to some basic premises in the survey.

As is discussed in more detail in subsequent chapters on the analysis of valuation responses, the two payment vehicles elicited significantly different responses, with the relocation payment vehicle eliciting significantly higher WTP values. Potential explanations for the differences in response were therefore explored. As shown above, open-ended comments showed little difference between the two payment vehicles. This suggests that the differences are not due to significantly more rejection of the payment scenario for one vehicle versus the other.

Table 4.8 Summary of open-ended comments.

Comment	Retained		Dropped	Health care		Relocation	
	#	%	#	#	%	#	%
Positive about the survey							
11 Survey fun/interesting/supportive comments/thought provoking.	25	1.7%		16	1.8%	9	1.6%
12 Can answer as if I would move, even though I wouldn't	8	0.6%				8	1.5%
13 I tried my best	21	1.5%		12	1.4%	9	1.6%
14 Answers based on the assumptions given/data from the tables	6	0.4%		2	0.2%	4	0.7%
Subtotal	**60**	**4.2%**		**30**	**3.4%**	**30**	**5.4%**
Negative about the survey							
21 Survey too long, too hard, too confusing, too general	105	7.3%	7	62	7.0%	43	7.8%
22 Questions too personal, invasive, depressing	4	0.3%	1	2	0.2%	2	0.4%
24 Can't answer; didn't understand; results won't be accurate	10	0.7%	1	7	0.8%	3	0.5%
25 problems with the survey/web/equipment	3	0.2%		2	0.2%	1	0.2%
Subtotal	**122**	**8.5%**		**73**	**8.3%**	**49**	**8.9%**
Relocation: possible rejections							
31 Can't imagine moving, would not be willing to move	34	2.4%				34	6.2%
32 Don't believe risks would change by moving	10	0.7%				10	1.8%
33 I already live in a clean/low pollution place	3	0.2%				3	0.5%
34 Complaint about government, health care, insurance	1	0.1%				1	0.2%
35 Other factors are more important in determining where to live	2	0.1%				2	0.4%
36 Too vague, why would costs differ?, what places are you talking about?	3	0.2%				3	0.5%
Subtotal	**53**	**3.7%**				**53**	**9.6%**
Health care: possible rejections							
41 Insurance/Medicare/government should pay	17	1.2%		17	1.9%		
42 Don't believe there are new treatments that can reduce risk	5	0.4%		5	0.6%		
43 Concern about negative side effects of treatment to reduce risk	4	0.3%		4	0.5%		
44 Don't trust or other complaints about doctors, insurance, government	33	2.3%		33	3.7%		
45 I'm on Medicare, I have insurance	12	0.8%		12	1.4%		
46 Need more information on what the treatment/test is; too vague	5	0.4%		5	0.6%		
Subtotal	**76**	**5.3%**		**76**	**8.6%**		

Table 4.8 Summary of open-ended comments (cont.).

Comment	Retained		Dropped	Health care		Relocation	
	#	%	#	#	%	#	%
Positive embedding — perceived benefits in addition to fatal risk reduction							
51 There would be other benefits of moving	3	0.2%				3	0.5%
53 There would be other health benefits	1	0.1%		1	0.1%		
54 There are benefits to the whole population. Answered in terms of society.	2	0.1%		2	0.2%		
55 Included other risks when answering.	1	0.1%		1	0.1%		
Subtotal	**7**	**0.5%**		**4**	**0.5%**	**3**	**0.5%**
General clarifications — negative							
61 My health is poor, nothing can be done	5	0.4%		4	0.5%	1	0.2%
62 Can't afford to pay, fixed income, etc.	48	3.3%	1	36	4.1%	12	2.2%
63 Not interested in prolonging life/ not happy	4	0.3%		3	0.3%	1	0.2%
64 Risk reductions are too small to be worth the costs	20	1.4%		15	1.7%	5	0.9%
65 Not sure about answers — could not really afford to pay that much	6	0.4%		3	0.3%	3	0.5%
66 Can't control risk; it's in God's hands	27	1.9%	2	16	1.8%	11	2.0%
67 Diet and lifestyle are more important	27	1.9%		15	1.7%	12	2.2%
68 Already doing everything I can to reduce risk	8	0.6%		5	0.6%	3	0.5%
69 I'm old, doesn't matter what I do now	5	0.4%	1	2	0.2%	3	0.5%
70 Can't make decisions so far into future	6	0.4%		4	0.5%	2	0.4%
71 Can't put a value on risk/life	4	0.3%	1	3	0.3%	1	0.2%
72 Would not want to change lifestyle	2	0.1%		2	0.2%		
73 Heredity and family history are more important.	21	1.5%		14	1.6%	7	1.3%
74 Won't/ Can't quit smoking	2	0.1%		1	0.1%	1	0.2%
Subtotal	**185**	**12.9%**		**123**	**13.9%**	**62**	**11.2%**

Table 4.8 Summary of open-ended comments (cont.).

Comment	Retained #	Retained %	Dropped #	Health care #	Health care %	Relocation #	Relocation %
General clarifications — positive							
81 Risk reduction/longer life is important	26	1.8%	1	23	2.6%	3	0.5%
82 Would pay a lot/all I could afford for risk reduction	6	0.4%		5	0.6%	1	0.2%
83 Value of risk reduction depends on quality of life	18	1.2%		14	1.6%	4	0.7%
84 Most concerned about cancer	13	0.9%		7	0.8%	6	1.1%
85 Value clean environment	2	0.1%				2	0.4%
86 I'm healthy	12	0.8%		9	1.0%	3	0.5%
87 I have good insurance/medical care; good insurance/health care is important.	9	0.6%		8	0.9%	1	0.2%
88 I believe location matters to health	11	0.8%				11	2.0%
89 Made choices based on cost/benefit ratio.	1	0.1%		1	0.1%		
90 I'd rather go quickly	1	0.1%		1	0.1%		
91 More concerned about heart	1	0.1%		1	0.1%		
92 More concerned about motor vehicle accidents	1	0.1%				1	0.2%
Subtotal	**101**	**7.0%**		**69**	**7.8%**	**32**	**5.8%**
Comments on own health							
95 I've had cancer; family history of cancer	3	0.2%		3	0.3%		
96 I've had heart attack/disease; family history of heart disease	3	0.2%		2	0.2%	1	0.2%
97 More concerned about next 10 years	3	0.2%		1	0.1%	2	0.4%
98 Other risks are more important	3	0.2%		2	0.2%	1	0.2%
Subtotal	**12**	**0.8%**		**8**	**0.9%**	**4**	**0.7%**
Total open-ended comments	616	42.9%	15	383	43.9%	233	42.2%

Table 4.9 shows answers to the payment hardship questions asked for each payment vehicle. This was the first set of questions asked after each payment vehicle was introduced. Respondents were asked how much hardship it would cause them if they had to pay more for health care (if they got the health care payment vehicle) or for cost of living (if they got the relocation payment vehicle). For a $50 annual increase, the two groups responded similarly. However, for the higher dollar amounts, significant differences appear. For $5,000, for example, 73% of the health care group said that this would be a great hardship, while only 46% of the relocation group said that this would be a great hardship.

Table 4.9 How much hardship would it cause you if you had to pay more each year?

	Health care				**Cost of living (relocation)**			
	$50	$500	$1,000	$5,000	$50	$500	$1,000	$5,000
No hardship	74%	20%	9%	1%	73%	37%	21%	6%
Small hardship	11%	24%	12%	4%	8%	26%	22%	10%
Some hardship	9%	25%	21%	8%	11%	17%	22%	17%
Moderate hardship	4%	14%	23%	13%	3%	10%	14%	20%
Great hardship	2%	16%	34%	73%	3%	9%	19%	46%
Refused to answer	1%	1%	1%	1%	2%	1%	3%	1%

Table 4.10 compares the two payment vehicles. For the most part, the two groups who received each of the payment vehicles are similar. Although the group receiving the relocation scenario is slightly younger and has slightly higher income, these differences are not sufficient to explain the significantly higher WTP for risk reduction. The primary differences are in the hardship responses and in the estimated elasticity of WTP with respect to household income. Based on analysis of the payment card responses, this elasticity is twice as high for the relocation group as for the health care group. Zero WTP responses and rejections of the scenarios are similar across the two groups. This suggests that the budget constraint is perhaps viewed differently for the two payment vehicles, or that the health care vehicle is causing respondents to anchor on costs of typical preventative health care procedures, which may be lower than actual maximum WTP for mortality risk reduction.

Table 4.11 shows the mean responses to the valuation follow up questions that asked respondents how much they agreed or disagreed with various statements regarding the valuation questions. The strongest agreement was with the statement that insurance should pay for any new health care options. For both payment programs, the majority agreed that they could answer the questions. For the other statements the mean is about in the middle between agree and disagree, and the means are very similar for the two payment programs.

Table 4.10 Differences between payment vehicles for mortality risk reduction.

	Health care	Relocation
Elasticity of payment card WTP wrt income	0.4	0.8
$1,000 would be a great hardship	34%	19%
$5,000 would be a great hardship	73%	46%
Accepted payment card zeros	6%	7%
Protest zeros, highs, refusals for payment card	4%	4%
Could answer the questions (HC11b, RL11a)[a]	61%	68%
Expect additional health benefits (HC11e, RL11d)[a]	35%	41%
Don't really believe could get risk reduction (HC11c, RL11b)[a]	34%	39%
Average age	58	55
Percent female	53%	50%
Average 2001 household income	$49,000	$53,000
1 in 10,000 risk reduction very or extremely important	65%	59%

a. These are the percentages of respondents who somewhat or strongly agreed with the statements.

4.4 Roadmap to Analysis Sections

Chapter 5 presents results of the analysis of the payment card responses. We started with the analysis of the payment card responses because the analysis is more straightforward than that for the choice questions and we expected the results to help us in formulating the choice model specifications.

Chapter 6 presents results for the dollar choice responses without variations in timing of the risk reductions. We expect that the timing variations will be more complex to model and we first wanted to have results to compare with payment card, which had no timing dimension.

Chapter 7 provides a preliminary presentation of the choice responses when the timing of the risk reduction varies. These include the nondollar choice questions and a few of the dollar choice questions.

Table 4.11 Means of responses to valuation follow-up questions.

Health care version	Mean[a] (standard deviation) (no. of respondents)	Relocation version	Mean[a] (standard deviation) (no. of respondents)
I think my insurance should pay for any new health care options to reduce risk of fatal illness. (HC11a)	1.6 (0.9) (881)		
I could answer these questions reflecting what I would prefer if I did have to pay for the new health care options. (HC11b)	2.2 (1.0) (864)	Although I may not want to move by myself, I could answer these questions reflecting what I would prefer if I did have to move alone. (RL11a)	2.0 (0.9) (546)
I don't believe there are any new health care options that would reduce my risks of death. (HC11c)	3.0 (1.3) (874)	I don't believe my risk of death could be lower in different locations. (RL11b)	2.9 (1.2) (548)
I had concerns that the health care options would have negative side effects or would be inconvenient to me, and this affected my answers. (HC11d)	3.1 (1.2) (878)	Moving alone would be very difficult for me, and this affected my answers. (RL11c)	2.8 (1.4) (550)
I was thinking that the health care options would reduce risks of nonfatal illness as well as reduce risks of death, and this affected my answers. (HC11e)	2.9 (1.1) (879)	I was thinking that in different locations I would have reduced risks of nonfatal illness and accidents as well as reduced risks of death, and this affected my answers. (RL11d)	2.8 (1.1) (550)

a. Scale is 1 = strongly agree, 2 = somewhat agree, 3 = neither agree nor disagree, 4 = somewhat disagree, 5 = strongly disagree.

5. Payment Card Analysis and Results

All of the respondents were asked a payment card WTP question after the dollar choice questions. Those who had the health care payment vehicle were asked their maximum ongoing annual willingness to pay for an ongoing annual risk reduction for fatal cancer of 1, 2, or 5 in 10,000, or for fatal heart attack of 1 in 10,000. Those who had the relocation and cost of living payment vehicle were asked their maximum ongoing annual willingness to pay for an ongoing annual risk reduction for fatal cancer of 1, 2, or 5 in 10,000, or for fatal motor vehicle accident of 1 in 10,000. The specific question was assigned to each respondent according to the dollar choice question version that they received, as was described in Chapter 2 and Appendix B.

Respondents were given an option to select from a list of dollar amounts, which ranged from $0 to $6,200, or to fill in any dollar amount they chose. Of the 1,437 respondents, 1,382 selected a dollar amount from those listed, 34 filled in other dollars amounts (all were less than $6,200), and 21 did not answer the payment card question.

5.1 Evaluation of Problem Responses

A first step in the analysis of the payment card responses was to assess credibility of $0 values, $6,200 values (the highest given), and values that were high relative to household income or relative to amounts that respondents said would cause them "great hardship." The intention of this assessment was to identify payment card responses that should be treated as missing values because respondents appear to be protesting or misunderstanding the question rather than answering it as it was intended. Elimination criteria were fairly stringent; the benefit of the doubt went to retention. We dropped 50 payment card responses, or 3.5%, from the analysis as a result of this assessment.

There were 125 $0 WTP responses (8.8% of 1,416 dollar responses). We first established criteria for keeping the $0 as valid, which overrode any indication of protest motivation. Those that did not pass the keep criteria were then evaluated for evidence of protest motivation. The $0 responses were kept as valid zero WTP if:

- open-ended comments indicated the respondent couldn't afford or did not care about reducing risk of death — coded as 62, 63, or 64 (Table 4.7)
- Q14 = 1 or 2 — reducing risk 1 in 10,000 "not at all important" or "only a little important"
- HC2a or RL1a = 5, a $50 cost would cause a "great hardship."

The first two criteria identified 39 $0 values as valid based on evidence of low value or low importance for the good. The hardship criterion added another 17 $0 values to the keep list.

For the remaining 69 $0 WTP values, if one of the following protest criteria were met, then they were dropped from the analysis as presumed protest responses rather than true zero values. There were 35 $0 values that were thus labeled as protest responses, leaving 90 zero values (34 + 39 + 17) as presumed valid in the data. The protest criteria were:

- open-ended comment = any value between 20 and 49 (see Table 4.7)
- HC11d = 1, strongly agree with concern for side effects
- HC11c = 1, strongly agree, don't believe there are health care options to reduce risk
- RL11b = 1, strongly agree, don't believe moving could reduce risk
- RL11c = 1, strongly agree, don't want to move and this affected my answers.

Suspect high WTP responses were identified and evaluated. During this process, concerns arose with the coded income values for several respondents. In particular, 12 cases reported incomes of $2,500 (the midpoint of the lowest response category of $0 to $5,000) or $6,250 (mid-point of $5,000 to $7,500), and the WTP/income ratio exceeded 5% (the WTP/income ratio for these 12 respondents ranged between 8% and 248%), even though the responses to the hardship questions suggested the respondent could pay a substantial amount without hardship. Education and other responses generally confirmed concerns with the coded income value for these respondents. This indicated the reported income value was most likely in error, or substantially understated ability to pay. This could be due to incorrectly reported income (perhaps to avoid providing the correct answer), not including all sources of income (e.g., social security, interest, or dividends), or even a wealth effect for older respondents whose income does not reflect ability to pay. Rather than delete the WTP responses for these 12 individuals as suspect, we estimated a replacement income value based on an income prediction model (Table 5.1). On average, estimated income increased by 10-fold for these 12 individuals and the WTP/income ratios dropped: 10 to less than 4% and 2 to between 5% and 10%.[6]

We used three criteria to identify payment card responses that appeared to be suspect on the high side: highest value given, high value relative to income, and high value relative to hardship responses. Many of the same respondents were identified with these three criteria, and we evaluated to assess whether there was justification to retain the response in the analysis.

Table 5.1 OLS linear model for predicting household income (N = 1425).

Variable	Coefficient	t-ratio
Intercept	62700	16.73
Married (= 1 if married)	12878	7.71

[6]. Similar, but less severe, concerns with reported income occurred for other respondents as well. However, we did not consider replacing the reported income for other respondents important (particularly the other 57 respondents with reported income of $2,500 or $6,250) because the WTP/income ratio generally was not unusually high, or other factors supported retaining the WTP values in spite of the WTP/income ratio. However, any lingering reporting measurement error would reduce the precision and magnitude of the income variable in the regression analyses.

Age > 64	-4152	-1.98
Hardship score (from HC2/RL1)		
Sum of hardship scores for $50, $500, $1000, $5000)*	-2133	-10.79
Sum of hardship scores * Program dummy (1 = relocation)	-153	-1.15
Education Dummies (less than High School in intercept)		
High school diploma or equivalent	3236	1.38
Some college	8487	3.37
Associate degree	11810	3.04
Bachelors degree	21021	7.55
Masters degree	30163	8.51
Doctorate or professional degree	25913	5.10
Work Dummies (Full-time paid employee in intercept)		
Self employed	-8173	-2.51
Owner/partner	15269	3.01
Work without pay in family business	-8835	-0.53
Unemployed/looking for work	-14564	-3.11
Retired, disabled, homemaker	-7353	-3.55
Other	-13319	-2.22
Adjusted R^2	.2679	
F Value	33.58	

* Hardship scores for each dollar level range from 1 = no hardship to 5 = a great hardship. Thus, a higher sum of hardship scores for all dollar levels indicates greater hardship paying additional money for health care or cost of living.

All 35 WTP responses of $6,200, the highest value selected by any respondent, were reviewed: 10 (1.1%) for the health care program and 25 (4.5%) for the relocation program. Although a few respondents wrote in values other than those listed on the payment card, none wrote in values higher than $6,200. Error in these high values can have a much larger impact on the analysis than error in lower WTP responses.

We also reviewed all responses where WTP/income ratio exceeded 10%: 29 responses (2.0% of the sample). For the respondents as a whole, 60% selected values less than 1% of income, 76% provided values less than 2% of income, and 93% provided values less than 5% of income.

Of particular note was that 11 of the 29 respondents with WTP in excess of 10% of income were over age 64 (and all but 2 over age 70). This may suggest a higher willingness to pay to reduce risks for some older individuals or errors in reported income as the proper measure of ability to pay. For most of these individuals, the WTP amount did not conflict with other responses.

Because of concerns with the accuracy of the reported income data, and as a measure of ability to pay, we used a lenient criterion to identify suspect high WTP responses: if the respondent was age 64 or less we use a criterion of 10%, and if the respondent was over age 64, we use a criterion of 20%.

The introduction to the health care and relocation programs asked respondents to consider how much hardship it would cause them if their health care costs or costs of living increased by $50, $500, $1,000, and $5,000. The response levels were 1 = no hardship, 2 = a small hardship, 3 = some hardship, 4 = a moderate hardship, and 5 = a great hardship. Responses were identified for evaluation based on the lowest dollar amount the respondent indicated would cause “a great hardship” compared to the WTP response, as shown in Table 5.2. We identified 24 cases for review (about 1.8% of respondents) based on the hardship criteria.

Table 5.2 Screening criteria for hardship evaluation.

Lowest dollar amount that would cause great hardship	Evaluate if payment card WTP exceeds
$50	$200
$500	$1,000
$1,000	$1,500
$5,000	$5,000

Respondents were dropped from the payment card analysis if they met: (1) both the hardship and income criteria, or (2) gave a WTP of $6,200 and met either the hardship or income criteria. In total, 15 WTP responses were deleted as “high” bids, 9 of which had values of $6,200. In all but 3 cases the WTP/income ratio exceeded 10% (often substantially), and in 12 cases the WTP response was in conflict with the hardship question responses. One case differed slightly: the WTP/income ratio was 3.3%, the WTP response of $550 greatly exceeded the $50 value for which the respondent indicated a great hardship, and the respondent indicated no confidence in their WTP response.

Table 5.3 summarizes the problem response assessment and exclusion decisions for the payment card analysis. The final analysis sample for the payment card was 1,366 respondents (1,437 - 71), including the 12 respondents whose household income was predicted based on Table 5.1. Missing values for all other variables in the payment card analysis were set equal to the sample means.

Table 5.3 Problem payment card response evaluation summary.

Category	Retained for analysis	Dropped from analysis
No response		21
$0 WTP	90	35
Suspect low income — recoded	12	
Highest WTP ($6,200)	26	9
Other income/hardship conflict		6
Total	128	71

5.2 Summary Statistics for Payment Card Responses

Table 5.4 shows annual average and median WTP values for the health care payment vehicle for the three risk reductions for fatal cancer. Each respondent received just one risk reduction, so these means are for different subsets of the sample. The mean WTP values increase with the increase in the size of the risk reduction, although not in a fully proportional manner. The implicit VSL estimates based on these means range from $1.4 million to $3.5 million.

Table 5.4 Annual WTP for fatal cancer risk reduction, payment card results for health care payment vehicle, final sample.

	Annual fatal cancer risk reduction		
	1 in 10,000	**2 in 10,000**	**5 in 10,000**
Mean WTP	$346	$486	$701
S.E. of mean	$38	$64	$81
Median	$130	$130	$340
Number of responses	244	159	192
VSL mean	$3.5 million	$2.4 million	$1.4 million

Notes: Results are from varying subsets of the sample and have not been weighted to sample-wide or population-wide values.

Table 5.5 shows mean and median WTP values for different causes of fatal risk and for the different payment vehicles. There are two notable aspects of the results. First, the relocation payment vehicle results in substantial higher WTP values (about double) for the same risk cause. Second, WTP values for heart attack are somewhat higher than for cancer, and WTP values for motor vehicle accidents are substantially lower than those for cancer, for the same payment vehicle.

Table 5.5 Annual WTP for different causes of fatal risk reduction, payment card results for 1 in 10,000, final sample.

	Health care payment vehicle		Relocation payment vehicle	
	Cancer	**Heart attack**	**Cancer**	**Motor vehicle accident**
Mean WTP	$346	$463	$934	$590
S.E. of mean	$38	$51	$116	$76
Median	$130	$175	$550	$220
Number of responses	244	250	150	141
VSL mean	$3.5 million	$4.6 million	$9.4 million	$5.9 million

Notes: Results are from varying subsets of the sample and have not been weighted to sample-wide or population-wide values.

The results in Tables 5.4 and 5.5 have not accounted for any differences across respondents. These factors are explored in the next section. As noted, these means are for subsets of the sample and have not been weighted to sample or population means, which will be addressed in future analysis. However, given the limited impact of differences in age, as discussed below, these means are likely to reasonably reflect population means.

5.3 Payment Card WTP Analysis

5.3.1 Payment card model concepts

The following modeling concepts were used to guide initial regression specifications to analyze the determinants of the payment card WTP responses (PCWTP), and with extensions to later model the choice question responses. This model is clearly simple. Alternative modeling assumptions may result in different and more complicated specifications to explain WTP. Based on the model concepts, we discuss the selection of variables and functional form specifications for the payment card regressions.

For simplicity we ignore error terms that arise because of uncertainty of preferences, reporting error, and deviations between modeled preferences and actual preference specifications, although the manner in which errors enter the specification can have importance impacts. We begin with the following notation:

i	= individual.
t	= time period (1,2,3).
j	= cause of death, j = 1 to 4 for the four causes of interest. The risks for other causes are held constant in each scenario.
P_{it}	= the probability individual i expects related to surviving into or through time period t, which equals 1 - $\Gamma_j R_{ijt}$ (1 minus the sum of current risks of death by cause j in time t for individual i).
RR_{ijt}	= risk reduction for cause j in time period t. Note, that RR = 0 for all causes but one for each payment card question, and for each dollar choice alternative.
Q_{it},	= quality of life variable (absolute or index relative to age group) for individual i in time t.
M_{it},Z_{it}	= vectors of individual specific characteristics and value elicitation characteristics that may be time dependent.

C(x) = cost of program to reduce risks in state x in time t. Note, the cost is constant for each year in the payment card questions. x = 0 for the current condition and A for the payment card alternative. For the dollar choice alternatives x = A or B. Because cost is constant in all time periods in the payment card questions, the t subscript can be suppressed.

In the payment card model, PCWTP = C(A).

$EU_{it}(x)$ = expected utility in time t under state x for individual i, x = 0,A,B.
α,β,δ,… a,b,c,… = model parameters that may be indexed to time, cause, or other factor.

For notation simplicity, we drop the i subscripts. We begin with a simple one time period model for one cause of death, and thus drop the t and j subscripts for this model. For payment card questions, the expected utility in the next period in the current state is a multiple of the probability of living to the next period, and the utility one derives in the next period given values for expected quality of life in the next period, Q_t; the cost of the program to reduce risk, C(x); and sociodemographic and illness/accident experience characteristics of the individual, and value elicitation influences, M_t,Z,:

$$EU_t = P_t * U[Q_t,M_t,Z_t,C(x)] . \qquad (1)$$

The difference in expected utility in the next period between the proposed risk reduction level (and higher costs) and the current state is:

$$EU_t(A)–EU_t(0) = [(P_t+RR_t)*U(Q_t,M_t,Z_{t,}C(A)_t)] – [P_t*U(Q_t,M_t,Z_{t,}C(0)_t)] . \qquad (2)$$

For simplicity we assume utility is separable as in Equation 3a, with U1 and U2 as multiplicative functions of the vector of M and Z individual characteristics and elicitation influences, and the program cost C, as in Equation 3b and Equation 3c:

$$U(Q_t,Mt, Z_t, C) = U1(Q_t,M_t) + U2(Z_t, C) \qquad (3a)$$

$$U1(Q_t,Mt) = Q_t^{a0} A_m M_{tm}^{am} \qquad (3b)$$

$$U_2(Z_t,C) = c_0A_kZ_{kt}^{bk} * C^{(}. \text{ Thus, } U2(Z_t,C(0)) = 0 . \qquad (3c)$$

Applying Equations 3a through 3c into Equation 2 and rearranging, C(A) is a multiplicative function of the various factors in the utility function as in Equation 4a. Equation 4b is a simple transformation of Equation 4a for which the parameters can estimated through standard log transformations, and where the bkτ, amτ parameters in Equation 4b are simple transformations of parameters in Equation 4a.

$$C(A) = [(RR * Q_t^{a0} * A_m M_{tm}^{am})] / ((P_t+RR) * b_0A_kZ_{kt}^{bk})]^{1/(} \qquad (4a)$$

$$C(A) = b_{0\tau} * (RR/(P_t+RR))^{1/(} * Q_t^{a0\tau} * A_m M_{tm}^{am\tau} * A_kZ_{kt}^{bk\tau} \qquad (4b)$$

Multiple time periods. Multiple time periods can be introduced by defining expected lifetime utility (LUT) as in Equation 5 where d equals a rate of time preference to discount future utility. Solving for C(A) becomes a bit messy. Therefore, we assume Q_t, M_t and Z_t are constant through time, which holds for many variables (e.g., elicitation influences, gender, etc.) and which reflects the typical assumptions used in many models (e.g., current income serves as a proxy for the stream of future wealth or ability to pay, and current age and self-perceived quality of life are highly correlated to future expected quality). Using the simplifications as above, C(A) is solved in Equation 6.

$$LTU = E_t\ (1/(1+d)^t * E(U)_t = E_t\ D_t * E(U)_t \tag{5}$$

$$C(A) = b_{0\tau} * ((RR * E_tD_t)/(E_tD_t * P_t + RR * E_tD_t))^{(} * Q^{a0\tau} * A_m\ M_m^{am\tau} * A_kZ_k^{bk\tau} \tag{6}$$

Fatal risk cause. If the specific cause of risk reduction is entered outside of the utility function (replacing RR with RR_j), there is no impact on the C(A) equations. In this case, fatal risk causes would affect only the valuation if individuals valued an $RR_j\tau$ that was different than the RR_j presented in the questions (e.g., scenario rejection by valuing a different commodity than the researcher intended). Alternatively, the cause of fatal risk reductions may be one of the M variables in the utility function. Expected future utility may be affected by the probability of dying of cause j and one's dread about the characteristics of death by each cause j, such as the nature of the illness, accident, and treatment costs before death. Next, if an individual perceives his likelihood of dying of cause j = 1 as much higher than his likelihood of dying of cause j = 2, (holding other characteristics of the illnesses constant), they may prefer the same level of risk reduction for cause 1 over cause 2. One may perceive their likelihood of dying of a cause j as high based on age and gender specific baseline risks through time (e.g., cancer and heart attack are much more likely as one ages than motor vehicle accidents), or because of family history with the illness. Variations in utility from reduced risk from different illnesses can simply be represented by one or more illness specific variables in the M variables.

Elicitation influences. Elicitation influences may be reflected in the above framework. For example:

- **Rejection of risk reduction.** Respondents who do not believe the risk reduction would occur may be responding to an $RR\tau = 8 * RR$, where $0 \leq 8 < 1$, reflecting a WTP for an expected RR less than the researcher intended.

- **Program.** For the health care scenarios, respondents appear to work within their current budget allocations and may be anchoring on current or expected health care costs. In the relocation scenarios, respondents appear to be making more substantive (or long-run) adjustments to their budget allocations, which alter how they view spending C dollars for risk reduction as compared to those in the health care scenarios. This is readily included as a Z variable in the above models, but may also be a factor multiplying how income enters into the U1 function (e.g., Incomeτ = Income * Program adjustment).

- **Embedding.** Respondents who expect other health benefits from the program (health care or relocation) in addition to the specified fatal risk reduction may be placing additional value on the program, which would be a factor in the M vector of utility variables.

- **Starting values.** Responsiveness to starting values often reflects uncertainty in values, unintentional conditioning of respondents as to expected responses, or other factors (see Section 5.3.3). These would be among the Z variables.

5.3.2 Payment card regression specifications

Based on the above modeling concepts, we estimated multiplicative models using log transformations. Because the above concepts are subject to many assumptions, simple linear models are also estimated to evaluate the robustness of the regression variables to functional form. To further evaluate the results, separate models are estimated for:

- Combined data for the health care and relocation programs and all causes and risk levels.
- Health care program data only for all causes and risk levels.
- Relocation program data only for all causes and risk levels.
- Cancer only for both programs and all risk levels. Given the large share of cancer questions, a cancer only model can be estimated, but the data are not sufficient to estimate robust models for other causes.

Table 5.6 lists the variables used in the PCWTP regressions. These variables in the final models differ from those in the above conceptual model, as discussed below.

- Baseline risks and the perceived probability of survival into future time periods are not included in the regression models, because of high correlations between baseline risks (and future survival) and age and perceived quality of life in the future. Age was a preferred variable because age may also reflect other influences on risk reduction values beyond just baseline risks and survival probabilities. For example, individuals may or may not prefer to spend a higher share of income or wealth to reduce risks as they age. Specifications with baseline risks or self-perceived survival probabilities performed similar to or worse than the selected specifications.

- Individual specific relative risks by cause (e.g., how do you rate your risks for heart attack/cancer/motor/pneumonia compared to others your age) may be expected to explain differences in value across causes across individuals. However, these variables were also highly correlated with perceived quality of life and risk behavior variables and added little to the analysis.

- Age is expected to be a significant factor reflecting changes in baseline risks and attitudes toward risks over a person’s lifetime. Some theoretical studies of the relationship between age and WTP for mortality risk reduction, which specify utility as a function of time available for consumption and enjoyment of life, predict a nonlinear relationship between annual WTP for risk reduction and age, with WTP increasing to age 40 or 50 and declining after that. We tried several nonlinear specifications for age and found that

WTP was for the most part slightly increasing with age until after age 74. Thus, we include a dummy for age greater than 74 (AGE75+) to allow for this shift.

- The expected quality of life in the future is indexed to age groups to reduce correlation with the age variable and to better characterize variability across individuals within age groups. While we collected expected quality variables for several time periods, we used the expected quality in the next 10 years because it is available for all respondents, and the indexed values across time periods are highly correlated.

- Individual variations in risk preferences are reflected in the Behavior variable, which serves as a measure of risk preference or avoidance. The larger the value, the fewer risk avoiding behaviors the individual currently takes (e.g., using smoke detectors, not smoking). Other similar variables, such as smoking variables, were evaluated and found not to be preferred to this index variable.

Table 5.6 Payment card model variables.

Name	Definition	Mean (range)
PC WTP	annual willingness to pay for risk reduction selected from payment card or entered as "other" amount, 2002 dollars	$632 ($0 – $6,200)
PC RISK	risk reduction (per 10,000) in payment card question	2.1 (1 – 5)
PC HEART	payment card asked WTP for reduction in risk of fatal heart attack	0.18 (0 – 1)
PC MOTOR	payment card asked WTP for reduction in risk of fatal motor vehicle accident	0.10 (0 – 1)
AGE	respondent age in years	57 (35 – 84)
AGE75+	respondent age 75 to 84 = 1	0.13 (0 – 1)
INCOME	household income before taxes in 2001	$50,400 ($2,500 to $150,000)
CHILDREN	one or more children under 18 in household = 1	0.26 (0 – 1)
QUALITY	index of expected enjoyment of life 10 years from now relative to predicted value based on age and gender (Q12a)	1.0 (0.3 – 2.1)
BEHAVIOR	Sum of responses to whether respondent does or would take 6 risk reduction actions (Q13), yes = 1; no or don't know = 2	7.4 (6 – 12)
RELOCATE	payment vehicle program is relocation = 1	0.38 (0 – 1)
START ALL	mean dollar per 1 in 10,000 risk reduction presented in all choice questions preceding the payment card question	$341 ($66 – $913)
DON'T BELIEVE	respondent agrees with statement that he/she doesn't believe a risk reduction could be achieved with the program given (0 = strongly disagree; 4 = strongly agree)	2.1 (0 – 4)
EMBED	respondent agrees with statement that he/she was thinking of other health benefits in addition to fatal risk reduction and that affected his/her answers (0 = strongly disagree; 4 = strongly agree)	2.1 (0 – 4)
COULD ANSWER	respondent agrees with statement that he/she could answer the valuation questions in the survey in spite of concerns with some of the question premises (0 = strongly disagree; 4 = strongly agree)	2.9 (0 – 4)

- Income is included, but we suspect wealth (which was not available) may be a more important variable for older individuals. Whether a respondent has children at home is included because, for the same income, the ability to pay for risk reductions would be reduced. Marital status was evaluated but generally was not significant.

- Elicitation features are evaluated with the Program, Start ALL, Embed, Don't Believe, and Could Answer variables.

5.3.3 Payment card regression results

Log-log and linear OLS models are reported in Tables 5.7 and 5.8. Ordered probit model results are presented for the combined log-log model in Table 5.9. The OLS models treat WTP as a point estimate at the dollar amount chosen from the payment card. The ordered probit model treats WTP as an interval variable, assuming that maximum WTP is equal to or greater than the amount chosen from the payment card and less than the next higher dollar amount on the payment card.

Model specification. We first consider the functional form of the regressions models. Overall, the linear and log-log OLS models are very similar in terms of the explanatory power, and the sign and significance of coefficients. The log models consistently have the BEHAVIOR variable as statistically significant, while the linear models have the QUALITY variable as statistically significant — these two variables have a high correlation and just fit slightly differently in the different functional forms. The log models demonstrate a more consistent coefficient magnitude and statistical significance for the risk reduction coefficients and for this reason may be slightly preferred. This form is consistent with declining marginal value for larger risk reductions, which is what we see in the simple means (Tables 5.4 and 5.5). The ordered probit combined log-log model is very similar to the OLS combined log-log model, except the coefficients on the scenario variables (risk reduction level, cause, and the relocate program variable) are somewhat smaller, suggesting slightly smaller WTP values. In the future, it may be useful to explore additional models with more interactive terms (e.g., between risk reduction levels and other variables).

Next, we consider the different models (combined, health only, relocate only, cancer only). Overall, the models are statistically significant but explain less than 20% of the variation in values across individuals, which suggests a high degree of heterogeneity across individuals and that more can be done to understand individual preferences. The combined models and the relocation only models are clearly superior to the health care models. However, the signs and magnitudes of the coefficients in the health care only model are similar to the other models. Overall, the combined models are preferred as they are based on more information.

Table 5.7 Payment card log-log OLS models.

Variable	Coefficients (s.e.) by model			
	Combined model (N = 1,366)	**Health Care model (N = 845)**	**Relocation model[a] (N = 521)**	**Cancer combined model (N = 975)**
LN PC RISK	0.458 (0.111)*	0.499 (0.139)*	0.399 (0.186)*	0.477 (0.111)*
PC HEART	0.326 (0.195)	0.354 (0.203)	—	—
PC MOTOR	-0.230 (0.244)	—	-0.311 (0.280)	—
LN AGE	0.942 (0.369)*	0.782 (0.462)	0.515 (0.827)	0.814 (0.451)
AGE75+	-0.610 (0.240)*	-0.565 (0.259)*	0.492 (0.349)	-0.400 (0.288)
LN INCOME	0.495 (0.104)*	0.507 (0.102)*	0.975 (0.140)*	0.474 (0.123)*
CHILDREN	-0.0844 (0.166)	0.0578 (0.209)	-0.323 (0.273)	-0.0527 (0.198)
LN QUALITY	0.387 (0.192)*	0.340 (0.234)	0.485 (0.336)	0.422 (0.224)
BEHAVIOR	-0.223 (0.050)*	-0.246 (0.061)*	-0.188 (0.084)*	-0.258 (0.059)*
RELOCATE	-4.78 (1.77)*	—	—	-4.66 (2.06)*
RELOCATE (LN INCOME	0.492 (0.166)*	—	—	0.486 (0.193)*
LN START ALL	0.046 (0.085)	0.040 (0.100)	0.077 (0.160)	-0.0209 (0.0961)
DON'T BELIEVE	-0.204 (0.053)*	-0.118 (0.066)	-0.359 (0.090)*	-0.218 (0.062)*
EMBED	0.215 (0.057)*	0.233 (0.070)*	0.164 (0.098)	0.164 (0.066)*
COULD ANSWER	0.236 (0.067)*	0.200 (0.081)*	0.254 (0.118)*	0.222 (0.079)*
Intercept	-3.68 (1.99)	-3.14 (2.32)	-6.67 (3.84)	-2.22 (2.41)
Adjusted R^2	0.14	0.09	0.19	0.14
F Value	15.65	7.75	10.99	13.38

Notes: * = $p < 0.05$
a. The AGE75+ variable is replace with AGE65+ for the relocation program sample, because the oldest age group was excluded from this program.

Table 5.8 Payment card linear OLS models.

Variable	Coefficients (s.e.) by model			
	Combined model (N = 1,366)	**Health care model (N = 845)**	**Relocation model[a] (N = 521)**	**Cancer combined model (N = 975)**
PC RISK	59.5 (18.5)*	72.5 (20.2)*	43.1 (36.1)	58.6 (19.7)*
PC HEART	31.6 (80.1)	48.4 (71.3)	—	—
PC MOTOR	-258 (101)*	—	-287.6 (130.4)*	—
AGE	6.63 (2.97)*	5.99 (3.27)	2.29 (8.15)	6.10 (3.84)
AGE75+	-98.7 (108)	-84.9 (103.7)	189.7 (185.6)	-86.1 (137.3)
INCOME	0.00251 (0.00103)*	0.00234 (0.00088)*	0.0125 (0.0016)*	0.00277 (0.00126)*
CHILDREN	-75.7 (69.9)	33.68 (76.69)	-244.7 (134.0)	-110.3 (88.2)
QUALITY	290 (95)*	430.7 (98.3)*	25.79 (197.29)	338.7 (117.3)*
BEHAVIOR	-19.6 (21.0)	-27.0 (22.6)	-12.8 (41.3)	-15.1 (26.4)
RELOCATE	-75.3 (108)	—	—	-155.3 (126.4)
RELOCATE (INCOME	0.00962 (0.00161)*	—	—	0.0110 (0.0020)*
START ALL	0.277 (0.104)*	0.286 (0.109)*	0.232 (0.216)	0.327 (0.130)*
DON'T BELIEVE	-51.0 (22.3)*	-14.26 (24.07)	-109.2 (44.2)*	-58.7 (27.6)*
EMBED	59.9 (24.0)*	70.04 (25.55)*	30.5 (48.5)	74.4 (29.5)*
COULD ANSWER	86.8 (28.3)*	58.18 (29.90)*	120.7 (58.0)*	108.1 (35.4)*
Intercept	-628 (296)*	-747 (309)*	-127 (667)	-774 (374)
Adjusted R^2	0.14	0.07	0.15	0.16
F Value	16.19	6.44	8.83	15.48

Notes: * = $p < 0.05$
a. The AGE75+ variable is replace with AGE65+ for the relocation program sample, because the oldest age group was excluded from this program.

Table 5.9 Payment card log-log ordered probit model.

Variable	Combined model coefficient (s.e.) (N = 1,366)
LN PC RISK	0.405 (0.096)*
PC HEART	0.269 (0.169)
PC MOTOR	-0.237 (0.211)
LN AGE	0.917 (0.319)*
AGE75+	-0.506 (0.208)*
LN INCOME	0.480 (0.089)*
CHILDREN	-0.078 (0.144)
LN QUALITY	0.367 (0.167)*
BEHAVIOR	-0.194 (0.430)*
RELOCATE	-3.214 (1.448)*
RELOCATE (LN INCOME	0.345 (0.136)*
LN START ALL	0.0709 (0.0739)
DON'T BELIEVE	-0.180 (0.046)*
EMBED	0.189 (0.049)*
COULD ANSWER	0.219 (0.058)*
Constant	-3.394 (1.705)*
Mean log-likelihood	-2.88
Number of iterations	78

Notes: * = $p < 0.05$.

Scenario variables. Turning to the regression variables, we first consider the scenario variables of risk reduction, cause and program. Risk reduction level (PC RISK) is consistently statistically significant in all but one linear model. The log models show a consistent risk reduction elasticity between 0.4 (for the relocation only model) and 0.5 (for the health care only model). This value is well less than one, indicating that for these size risk reductions and payments, WTP is not linearly proportional with the risk level, even though simple ratings of the importance of risk levels (from Q15, see Chapter 4) suggest that without consideration to money, preferences may be close to linear proportional. Thus, we conclude there is an income effect associated with annual payments that influences reported WTP for increasing risk levels.

The values for heart attack are slightly larger, but not statistically significantly larger than for cancer. Further, because of a positive correlation between heart attack and START ALL (discussed below), it is likely that heart attack values are not actually larger than those for cancer. Values for motor vehicle accidents are lower than those for cancer and heart attack, and statistically significantly so in the linear model specifications. The lack of significance in the log-log models may simply reflect the limited number of observations for the motor vehicle accident risk reduction case in the payment card questions (about 10% of the sample and 20% of the relocation sample). A much lower value for motor vehicle also is found in the simple payment card means and medians (Table 5.5) and in the dollar choice question results (Chapter 6).

The WTP program (health care or relocate) influences are also reflected in the regressions. First, one or both of the RELOCATE or RELOCATE(INCOME variables are statistically significant in both the linear and log-log models, reflecting the higher values in the relocate program approach. As noted above, the risk reduction variable (PC RISK) has a smaller coefficient in the relocation program, reflecting less responsiveness to risk levels.

Individual characteristics. Income is a statistically significant variable in every model. However, the income coefficient in the relocation model is nearly twice as large (log-log models) to 5 times as large (linear models) as in the health care program. This appears to reflect a significant difference in how income influences responses to the two payment approaches. Respondents seemed to see an equivalent dollar payment for increased health care as a greater financial burden than an increase in cost of living. After exploring several possibilities to explain this difference in response to the program, the most striking thing we found was that the responses to the hardship questions were also quite different for the two programs. Other reactions to the programs seemed quite similar, such as responses to the follow up question. With the health care program, respondents appear to be considering minor, or short-run, adjustments in their income allocation across budget categories. They are anchoring on current expenditure patterns and what might be adjusted within those patterns. They may also be anchoring on what they expect additional health care options to cost. With the relocation program, respondents appear to be considering more significant, or long-run, adjustments in their income allocation across budget categories. Rather than fixing on current spending constraints, the relocation program allows a long-term reallocation of spending to reflect long-term priorities.

Age is an important variable in theoretical models and policy discussions regarding WTP to reduce fatal risks. Here we find a weak age effect for individuals between ages 35 and 74, where WTP appears to increase slightly with age. Then, WTP decreases for individuals over age 75. We evaluated several alternative age specifications (squared terms, splines) and consistently found the same results. Based on other survey data and pretests, it appeared that even though life years remaining decrease with age (possibly decreasing WTP), increases in baseline risks may make reducing risks more valuable as one ages until the very latter years, and shifting budget constraints may allow more funds to be applied to risk reduction.

Risk behavior (BEHAVIOR) and perceived quality of life variables were routinely consistent, but often not in the same model because of their correlation – individuals who avoid fatal risks are also more likely to indicate they had a higher expected perceived quality of life in the next 10 years relative to others in their age/gender group. Thus, as expected, individuals with higher quality of life and who take risk reduction behaviors have a higher value for additional risk reduction. These variables were also highly correlated with self reported probabilities of survival into the future, and self reported risks of fatal cancer, heart attack, motor vehicle accident, and pneumonia compared to others in the same age group (e.g., including different sets of these variables often gave similar results).

Other variables such as having any children at home, marital status, and education seldom added to the assessment, and often were correlated with included variables.

Elicitation variables. Each of the elicitation variables (DON'T BELIEVE, EMBED, COULD ANSWER, and START ALL) is statistically significant in some or all models. DON'T BELIEVE reflects rejection of the scenario as valid, usually resulting in reduced, downward biased WTP values. Here, the coefficient on DON'T BELIEVE is substantially larger in the relocation models. EMBED reflects respondents valuing a larger good than just the fatal risk reduction for a specific cause — they may be valuing morbidity impacts or including perceived risk reductions for other causes. As a result, embedding biases upward the reported values relative to the true values. Here, the effect of EMBED is larger for the health care program than for the relocation program. Combined, the DON'T BELIEVE and EMBED variables nearly net out in the combined models (another reason to prefer these models), and lead to an upward effect in the health care only model and downward effect in the relocation only model.

COULD ANSWER reflects respondents' self reported confidence in their answers. Many previous studies (starting with Chestnut and Rowe, 1990) found that respondents who were uncertain in their answers tended to provide lower values (except for some $0 respondents, who stated that they were very certain in their answers). This finding is repeated here and is consistently statistically significant in all models. Based on the linear program only models, if every respondent were very confident in their responses, values for a cancer risk reduction of 1 in 10,000 would be predicted to increase about 15%.

The potential for starting value influences in WTP question sequences has long been reported in the stated preference literature and may be the result of starting values unintentionally communicating information about expected responses, providing unintended valuation anchors and conditioning, and reflecting issues of incentive compatibility (for examples, see Rowe et al., 1980; Mitchell and Carson, 1989; DeShazo, 2002; and Whitehead, 2002). The payment card design is intended to mitigate this potential effect (Rowe et al., 1996), but in our application the responses to the payment card WTP question may still be influenced by the dollar values presented to a respondent in the preceding dollar choice questions. To evaluate this potential, we defined an indicator variable, START ALL, which equaled the average of the dollar value divided by risk reduction level (1, 2, or 5) the respondent saw in the dollar choice questions (4 questions times 2 values — one for each alternative). Thus, START ALL is an indicator of the average price per unit risk reduction the respondent encountered. By design, the average price per unit risk reduction varied across survey versions (Chapter 2).

The evidence of a starting value influence in the payment card WTP responses is mixed, but suggests this effect exists to some degree. The START ALL variable is statistically significant in the linear models for the combined data (both programs and all causes), health care program data, and cancer data (both programs combined). It is not significant in the relocation only model (but has a similar coefficient and a t-ratio of 1.1), suggesting the effect is strongest for the health care program results. These results suggest a constant starting value effect independent of the risk reduction level being valued. The natural log of START ALL (or START ALL unlogged) is never significant in the various log models, although the coefficients are consistently positive. These results suggest the starting value effect is not proportional to the risk reduction level valued. Which specification (log, linear, or other) properly reflects the influence of START ALL is unclear, and functional form and starting value variable specification warrant additional attention. Given very similar results for a starting value variable in the analysis of the dollar choice questions (Chapter 6), we conclude that some starting value influences are apparently present.

The starting value impact appears to be reducing WTP and implicit VSL values from the health care program payment card results. This is because most respondents encountered starting values less than their reported WTP. START ALL ranged from $66 to $913, with a median of $216 and a mean of $340 (which is about the 66th percentile of the distribution).[7] The START ALL mean is less than or equal to the PCWTP mean for all causes and risk reduction levels in the health care program, and thus is most likely pulling down the reported values.

As noted above, START ALL was not statistically significant in the models using only the relocation program data (but the coefficient of .232 in the linear model is similar to the coefficient in the health care model). In part this most likely reflects that all of the START ALL values (ranging from $66 to $913) are below the mean PCWTP values, and most are well below the PCWTP values (66% of respondents had START ALL less than $340). Thus, the low starting values are most likely reducing the reported values, but the differences in starting values across versions are less important in explaining differences in reported WTP values in the relocation version for which WTP responses are generally higher than in the health care version.

Another potential impact of the starting values may be to slightly elevate PCWTP values for heart attack relative to cancer. This is because, as an artifact of the random design, a positive correlation (.15) exists between asking PCWTP values for heart attack and START ALL values, and a negative correlation (-.20) exists between asking PCWTP for cancer and START ALL values. Based on the above assessment, this would increase heart attack mean values and depress cancer mean values.

5.3.4 Conclusions

The following list summarizes the key conclusions from the payment card mean value and regression analyses:

- Overall, the payment card results appear consistent with other literature values, and show a strong degree of internal consistency with respondent hardship scores, attitudes, and sociodemographic characteristics, as reflected in the regression models.

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7. The START ALL distribution, mean, and median are very similar for the health care and relocation survey versions.

- We prefer the combined models across both programs because they use more data, which allows the effects of individual characteristic variables to be more readily seen.

- We slightly prefer the log-log models because of greater consistency in the results across the log models and with our theoretical considerations of how risk factors would influence values.

- Exploring alternative specifications considering interactive variables (e.g., risk and other variables) would be useful. Currently, many variables are modeled to have the same influence on WTP regardless of the risk reduction levels, which may be too simple.

- Risk reduction values increase with risk reduction levels, but with an elasticity between 0.4 and 0.5, and thus are not linearly proportional. This appears to reflect income effects rather than simply utility effects where income is unconstrained.

- Values for fatal cancer and fatal heart attack appear similar, while values for fatal motor vehicle accidents are lower. This may reflect differences in the expected nature of death by these different causes, or differences in the risks perceived by the respondent.

- Values are much larger in the relocation program than in the health care program. This appears to reflect health care program respondents using short-run budget reallocations and possibly anchoring on expected health care costs, while relocation program respondents are using long-run budget reallocations. This is consistent with the substantially greater effect of income on the WTP responses for the relocation program than for the health care program, and with the responses to the hardship questions.

- Income is an important factor in explaining WTP, and has a much larger impact in the relocation program than in the health care program.

- Age has a small influence on WTP, with values slightly increasing with age until respondents exceed age 74, when values drop. This age 75 or older effect most likely reflects lesser expected life span, reduce quality of life, and other considerations.

- Respondents who expect higher quality of life in the future and are risk averse (as indicated by engaging in risk averting behaviors) have higher values for additional risk reductions.

- Elicitation influences are reflected in the reported WTP values. Respondents who do not believe the scenarios (scenario rejection) report lower WTP values. Respondents who report they included values for other benefits (reduced morbidity and/or reduced mortality for other causes) report higher WTP values. Respondents who strongly agree they could answer the questions reflecting their values report higher values. Dollar values used in prior dollar choice questions influence reported values in the WTP responses. Taken together, the impact of scenario rejection, embedding, and starting values is to reduce reported values. Further, the impact of respondents having uncertainty that leads them to not being confident in their responses appears to also reduce their reported WTP values.

For later comparisons, Table 5.10 reports weighted estimated mean WTP and VSLs for the payment card results. We compute the estimated mean WTP and VSLs for the entire sample. For comparison of results, these estimated means are preferred to the raw means, such as reported in Tables 5.4 and 5.5, because the raw means for each individual cause and risk level combination are obtained from subsamples of the respondents that sometimes have significantly different mixes of age groups and other sample characteristics.

Table 5.10 Payment card weighted mean estimates of WTP and VSL: Linear models ($2002)[a]

Scenario		**Mean WTP/year (SE of estimated mean)**		**Mean VSL ($millions)**	
Cause	Risk reduction per year	Health care only model	Relocation only model	Health care only model	Relocation only model
Age group		35-84	35-74		
Cancer	1 in 10,000	$385 (6.0)	$850 (15.9)	$3.85	$8.50
	2 in 10,000	$458 (6.2)	$893 (16.0)	$2.20	$4.46
	5 in 10,000	$675 (7.1)	$1093 (16.4)	$1.35	$2.19
Heart attack	1 in 10,000	$434 (6.1)	--	$4.34	--
	2 in 10,000	$506 (6.4)	--	$2.53	--
	5 in 10,000	$724 (7.3)	--	$1.45	--
Motor vehicle	1 in 10,000	--	$561 (15.3)	--	$5.61

a. Results are weighted from sample shares to population shares for 5 age groups. This weighting reduces values by 4% or less. The health care and relocation results are for different age groups. When the health care is restricted to individuals age 35-74, the values increase by 3% to 4%.

To compute weighted estimated means, we use the separate health care only and relocation linear models, even through the combined log models are preferred for purposes of interpreting the results across the respondents. Linear models are used because the predicted values from the log models vary significantly depending on the error assumptions used, and for the linear models the health care and relocation only models are preferred to a combined model given significant differences in the models. Using the models, values are predicted for each individual in the payment card sample. Then, the individual values are weighted to adjust the sample shares to the population shares based on the percentage of the sample and population in each of the five age categories.[8] From these predicted individual values, the sample weighted estimated mean (and standard of the mean) is computed.

As discussed in Chapter 3, the sample was over weighted in some age categories to support sufficient observations for methods tests. Here, the weighting decreases the raw sample means by 4% or less. Note, the health care results are for a wider age bracket, ages 35 to 84. When restricted to individuals 35 to 74, as in the relocation program, the weighted means increase by 3 to 4%.

6. Dollar Choice Question Analysis and Results

6.1 Description of Dollar Choice Responses

The dollar choice questions are HC3 through HC10 in the health care program version and RL2 through RL9 in the relocation program version (Appendix A). Each dollar version contains four choice questions, with a follow-up status quo option for each choice question. There are 56 versions of the choice questions, 28 for each program (Appendix B). The numbers of respondents who received each version and the percentages of respondents who chose each alternative are shown in Appendix B. The percentages of respondents who preferred to stay with their original choice rather than take a no cost, status quo option in each of the four follow-up questions are also shown in Appendix B.

There were 885 respondents to the health care program version, and 552 respondents to the relocation program version. Some of the choices for the youngest age group (ages 35 to 44) included a delayed risk reduction in one or two of the choice questions for the health care program. These were excluded from the analysis presented in this chapter. For all of these dollar choice question versions, with the exception of Version 5, there were two choices with delayed risk in one of the alternatives. The number of these respondents is shown in Table 6.1. We begin with the choice model estimation without any variation in the timing of the risk reduction. The responses to the dollar choice questions that included a delayed risk reduction will be incorporated in future data analysis.

Table 6.1 Number of respondents who were asked choice question with delayed risk reduction.

	Number of respondents by version					
Choice question version	1	2	3	4	5	6
Question HC5	41	39	37	34	38	41
Question HC9	41	39	37	34	—	41

In addition to excluding the choices with a delayed risk, we excluded two choices in dollar choice versions 35 and 36, because of an error. In these cases, motor vehicle accident risk reduction was accidentally included in the health care program version, which is not a realistic combination. A total of 37 respondents answered these versions, so a total of 74 choices were dropped from the analysis.

Table 6.2 lists the total number of choice questions for all respondents, the numbers excluded for this analysis, and the numbers of choice questions retained for this analysis, by age group. All of the choices dropped were for the health care program, so the final number of choices available for this analysis was 5,252, with 3,044 of these based on the health care program and 2,208 based on the relocation program. Of this total number of choices available for this analysis, 42 were not answered (about 0.8%).

Table 6.2 Total numbers of choice questions by age group.

Age group	Total choices	Choices dropped	Choices used in this analysis
35 to 44	1,364	422 (delayed risk)	942
45 to 54	1,212	0	1,212
55 to 64	1,344	74 (production error)	1,270
65 to 74	1,088	0	1,088
75 to 84	740 (health care only)	0	740
Total	5,748	496	5,252

The simple percentage results for the dollar choice questions indicate respondents paid close attention to the causes, relative costs, and risk reduction levels as reflected by considerable consistency of results and responsiveness to scope in the first question in the sequence.

Consistency and rank ordering of causes

In 26 choice questions, respondents considered the same fatal risk reduction at the same price, but for different causes of death. The results show a consistent ranking of causes even though the sample sizes are relatively small for these comparisons — ranging from 17 to 38 observations per question (A > B used to indicate reducing risks for cause A is preferred to reducing risks for cause B).

- fatal cancer ≥ fatal heart attack (6 of 7 comparisons)
- fatal cancer > fatal motor vehicle accident (7 of 7 comparisons)
- fatal cancer > fatal pneumonia (3 of 3 comparisons)
- fatal heart attack > fatal motor vehicle accident (5 of 6 comparisons)
- fatal heart attack > fatal pneumonia (3 of 3 comparisons).

Motor vehicle accidents and pneumonia were not compared for the same cost, but were compared for different costs in four relocation questions. Because pneumonia shows up in few questions and because few respondents chose pneumonia, the model was not able to estimate a value for pneumonia reductions (see Section 6.3). The results below suggest WTP to reduce risks of fatal pneumonia would be about 50% of the value to reduce risks of fatal motor vehicle accidents (the percentage selecting motor vehicle was consistent in each question for each comparison).

Comparison	% selecting the option
1. A Pneumonia 1,1 at $50	48% of 40 observations in 2 questions
B Motor vehicle 1,1 at $100	52%
2. A Pneumonia 1,1 at $100	37% of 38 observation in 2 questions
B Motor vehicle 1,1 at $50	63%

A similar comparison of the over 40 relocation questions of motor vehicle accident versus cancer or heart attack for the same size risk reductions but at different prices consistently indicates that motor vehicle risk reduction values are 25% to 50% of the cancer and heart attack values.

Just from the simple percentage results, there is a consistent ordering of the valuation of the same level of risk reduction by cause, which is consistent across age groups:

Cancer ≥ heart attack > (2 to 4) × motor vehicle accident ≥ 2 × pneumonia

Thus, WTP values to reduce risks of fatal pneumonia appear to be less than 12% to 25% of WTP values to reduce risks of fatal cancer or fatal heart attack.

Sensitivity to scope

Respondents show responsiveness to the scope of risk reduction changes and costs, although small sample sizes and significant heterogeneity in preferences within the sample limit testing for scope using simple comparisons. Scope is perhaps best evaluated based on the results of the first questions, where question sequencing effects and costs of risk reductions in prior questions would not have an effect, and where comparisons are made between different sample groups (as opposed to comparing results across questions within the same sample group).

There are 13 cases where, for individuals of the same age group, in the first choice question different sets of respondents are given the same choice, but where only one dollar amount changes. For example,

- Group A's first choice is cancer 1,1 at $50 versus cancer 2,2 at $100, and
- Group B's first choice is cancer 1,1 at $50 versus cancer 2,2 at $200 – in each case the only difference is the price of one alternative.

In this example, we would expect cancer 2,2 to be selected more often for Group A than for Group B because the cost of cancer 1,1 is the same but the cost of cancer 2,2 has increased for Group B. For the 13 comparisons of this type, 10 show differences in the percent selecting each alternative in the expected direction and 9 of these differences are statistically significant. There are three comparisons with differences in the other direction, but two of these differences are not statistically significant. All three comparisons that do not follow expectations are comparisons with small sample sizes (19 individuals or less).

Response to survey production errors

During the final edits to the survey, errors occurred in three of the 224 dollar choice questions. These were unintentional, but the responses to these questions again demonstrate that respondents were paying attention to the questions.

- Two health care questions inappropriately included reduced risks for fatal motor vehicle accidents compared to risks of fatal pneumonia (HC7, Versions 35 and 36). Reducing motor vehicle accident risks would be difficult or impossible to accomplish through health care programs. The exact same questions also were asked of individuals of the same age group for the relocation program. The percent selecting the motor vehicle accident risk reduction alternatives in the health care program was significantly less (29% in the health care version versus 62% in the relocation version). These questions were deleted from the dollar choice model analysis.

- One unintended dominant alternative pair was included (HC5 in Version 49) where one of the alternatives offered more risk reduction at less cost. As expected, an overwhelming percent (89%) selected the dominant alternative. Some who selected the other alternative may have done so thinking there was a typo and the dollars were reversed (as intended but not produced), or due to other reasons or confusions. This question was retained in the dollar choice models.

Evaluation of problem respondents

As with the payment card data, the dollar choice data were evaluated in terms of suspect low and high bids, as reported below. Review of the responses to the follow-up choices suggested a high percentage of respondents were sticking with some fairly high payment values, and a substantial share of respondents always picked the largest risk reduction and stayed with it at all the dollars presented. Choice response patterns were therefore evaluated to check for consistency with answers to other questions in the survey.

Low values. About 14% (201) of the respondents always chose the status quo option over options A or B. All respondents chose among options with dollar values of $50 or more with the exception of a few respondents in the 35-44 age group (who received delayed risk choices with $25 values). By comparison, in the payment card data, about 15% of respondents reported WTP less than $50. Thus, the percent of respondents reporting low values is generally consistent for the payment card and dollar choice methods, although the low value respondents in the two approaches are not always the same individuals.

High values/suspect values. About 56% of respondents picked the selected A or B alternative over the status quo option in all four follow-up questions. About 17.5% of respondents always picked the largest risk reduction and highest cost alternative offered in each dollar choice question and then stayed with it over the status quo option. Many of these respondents are likely to be providing valid valuation information because the dollars in the choice questions in some survey versions were comparable to or lower than the costs they expressed would cause “a great hardship" (less than or equal to $200, $500, or $1,000), and 63% of respondents rated reducing fatal risks by 1 in 10,000 as very or extremely important (and thus more than 63% would rate 2 in 10,000 and 5 in 10,000 risk reductions as extremely important).

However, about one-fourth of respondents selected A or B options over the status quo with costs that significantly exceeded their selected payment card values (adjusted for the risk reduction levels considered in the payment card and dollar choice questions). Many also selected options over the status quo with costs exceeding the amounts they indicated would cause "a great hardship" (HC2/RL1). This suggests that in the dollar choice questions some respondents may be focusing on the cause and risk reduction levels with less consideration to the dollar values, or perhaps simply wanting to reduce risks and thus providing responses that reflect a kind of "yea saying" that results in overstated values.

For the present analysis, we addressed the potential "yea saying" effect in the dollar choice questions by (1) conservatively identifying a subset of individuals who always picked the A or B option over the status quo and who agreed to dollar amounts that were inconsistent with other responses they provided, and (2) a price parameter was not estimated for these individuals in the choice model estimation.

The criteria in Table 6.3 were used to identify respondents suspected of overstating their true WTP in the choice responses. The criteria are roughly based on the findings from the payment card analyses. Approximately 15% of all respondents met these criteria, whereas less than 2% would meet similar criteria with their payment card responses. Of the respondents who always selected the A/B option over the status quo, 21% of them met this selection criteria. This is about 11.7% of the whole sample, and is the group for which a price parameter was not estimated. They are kept in the analysis because their answers may still provide accurate information about

Table 6.3 Selection criteria to identify respondents suspected of overstating their WTP values in their choice question answers.

If hardship score equals 5 for:	And risk reduction equals:	And maximum dollar selected is greater than:	And maximum dollar selected as a percentage of income is greater than:
$50	1/10,000 or 2/10,000	$250	2% for age < 70 3% for age ≥ 70
$50	5/10,000	$500	2% for age < 70 3% for age ≥ 70
$500	1/10,000 or 2/10,000 or 5/10,000	$500	2% for age < 70 3% for age ≥ 70
$1,000	1/10,000 or 2/10,000 or 5/10,000	$1,200	2% for age < 70 3% for age ≥ 70
$5,000, or no hardship = 5	1/10,000		5%
$5,000, or no hardship = 5	2/10,000 or 5/10,000		5% for age < 70 10% for age > 70

their preferences regarding the risk causes. However, their responses regarding the dollar amounts are suspect.

6.2 Dollar Choice Model

This section presents in detail the econometric model developed for the dollar choice data. In the dollar choice model, individual *i*'s utility from alternative *j*, U_{ij} is assumed to have two components, a deterministic component, V_{ij}, and a random component, ε_{ij}:

$$U_{ij} = V_{ij} + \varepsilon_{ij}. \tag{6.1}$$

The deterministic component is assumed to be a function of two variables, risk reduction (which varies across alternatives by level and cause) and a composite of all other goods with a price of $1 (i.e., the numeraire). When the alternative has a positive level of risk reduction at a positive cost, as in all of the A and B alternatives, this component is:

$$\begin{aligned} V_{ij} &= \alpha_c CQ\ CANCER_{ij} + \alpha_h CQ\ HEART_{ij} + \alpha_p CQ\ PNEU_{ij} + \alpha_m CQ\ MOTOR_{ij} \\ &+ \left\{\beta_i [\gamma_h (1 - RELOCATE_i) + \gamma_r (RELOCATE_i)]\sqrt{CQ\ RR_{ij}}\right\} \\ &\times (1 - CQ\ PNEU_{ij})(1 - CQ\ MOTOR_{ij}) \\ &+ \beta_0 (1 - HARDSHIP_i)(INCOME_i - COST_{ij}), \end{aligned} \tag{6.2}$$

where CQ denotes "choice question" (as opposed to "payment card"). The first four variables are dummy variables that take on a value of 1 if the alternative contains risk reduction for each respective cause and 0 otherwise (each alternative has risk reduction for only one cause) in alternative *j*. RR is the risk reduction level for cancer and heart attack scenarios (the risk reduction is always 1 in 10,000 for motor vehicle accidents and for pneumonia). HARDSHIP equals 1 if the individual's responses violated hardship and income criteria (see Table 6.3), and COST is the annual additional cost to obtain the risk reduction presented in alternative *j*. RELOCATE equals 1 if the payment vehicle is relocation, allowing utility to vary by health care versus relocation payment vehicle program. Several other socioeconomic and survey variables (defined in Table 5.6) are also used in the model estimation.

Utility increases at a decreasing rate with increases in the risk reduction level for cancer and heart attack by using a square-root function. This specification is consistent not only with results from the payment card analysis but also with preliminary choice question modeling using a full quadratic with both linear and squared terms.[9]

The variable CQ RR enters utility only for cancer and heart attack alternatives for two reasons. First, motor vehicle accident and pneumonia risk reductions appear in a relatively small proportion of choice alternatives, resulting in a very small sample size on which to base cause-specific parameters for these categories. Motor vehicle accident risk reduction appears only in relocation alternatives (in about 25% of the questions) and pneumonia shows in about 10% of all health and relocation questions. Second, the risk reduction level is always 1 in 10,000 for these two causes, because the baseline risks are low for most age groups. Therefore, RRs for these categories are perfectly correlated with the simple dummy variables identifying them. Consequently, only dummy parameters are estimated for motor vehicle accident and pneumonia risk reductions; these are interpreted to be the marginal utilities for a 1 in 10,000 change in risk.

Dummy parameters are also estimated for cancer and heart attack. However, these are included primarily to test for whether there is a significant difference in how fatal risk reductions are valued. If these parameters are not statistically different from each other (they are not different in any model, as we shall see), we cannot conclude there is a significant difference in values for their risk reductions. The absolute levels of these parameters are of much less interest, although they do add additional model flexibility with respect to the status quo alternative (discussed below).

A substantial degree of heterogeneity across individuals is built into the marginal utility of cancer and heart attack risk reductions through the individual-specific parameter β_i. This term allows utility from risk reductions to vary as a function of socioeconomic variables and as a function of perceptions of and attitudes about the survey risk reduction scenarios. Most of these are the same variables as those used in the payment card analysis (Chapter 5). One difference is that START is the dollar value per 1 in 10,000 risk reduction shown in the first choice question only, averaged over the two alternatives in the first question. All but one variable used in the payment card analysis also appear in this term, and these variables are incorporated similarly to how they were included in the payment card analysis[10]:

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[9]. This quadratic was subsequently replaced with the square root function to aid in estimation (linear and squared terms are highly correlated, and the square root function reduces the number of parameters to estimate by one) and to avoid an atheoretic inflection point in the functional form for higher levels of risk reduction. A logarithmic form was also considered, but was abandoned because ln(1) = 0.

[10]. The variable AGE had to be omitted because of correlation with AGE75+ and other variables; AGE was creating serious estimation impediments and was therefore dropped early in the analysis. The relationship between age and choice preferences needs to be further explored in future analysis.

$$\beta_i = 1 + \beta_1(INCOME_i) + \beta_2(QUALITY_i) + \beta_3(AGE75+_i) + \beta_4(CHILDREN_i) + \beta_5(BEHAVIOR_i) + \beta_6(START_i) + \beta_7(DON'T\ BELIEVE_i) + \beta_8(EMBED_i) + \beta_9(COULD\ ANSWER_i). \tag{6.3}$$

All of the heterogeneity in the model is from β_i; because there are only two variables that contribute to utility (risk reduction and the numeraire), it is not possible to incorporate the same types of heterogeneity into the marginal utilities for both. Therefore, the parameter on the numeraire, β_0, is the marginal utility of money, which is homogeneous for everyone.[11] While the marginal utility of money does not vary with income, the marginal utility of (and ultimately the WTP for) risk reduction does vary with income, because income enters into β_i.

Note that all of the other β parameters in Equation 6.3, when added to 1, scale the base RR parameters (denoted γ_h and γ_r for the health care and relocation programs, respectively) up or down in proportional terms. For example, if the parameter on CHILDREN is -0.12, it means those with children, all else constant, will have a 12% lower marginal utility from this component of the utility function for any given cancer or heart attack risk reduction.

In the follow-up question to each choice pair, the respondent is asked whether the chosen alternative is preferred over the status quo, with no changes in risk reduction at no cost. Status quo utility assumes a zero contribution from risk reduction.[12] Therefore, status quo utility is a function only of the numeraire:

$$V_{i0} = \beta_0(1 - HARDSHIP_i)(INCOME_i) + \varepsilon_i. \tag{6.4}$$

As a side note, the addition of the status quo comparison allows all of the cause dummies to be identified. In an A-B-Only model, where only data from the A-B choice pairs are used, one of those constants must be fixed for identification.

The random component, ε_{ij}, is assumed to be Type I extreme-value distributed. This assumption generates a discrete-choice logit model. The random terms are assumed to be independently distributed across respondents and their A-B alternatives. Accounting for any correlation across choice questions for a given individual would improve efficiency and may decrease the standard errors of the parameter and WTP estimates (although the consistency property is maintained

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[11]. For those violating hardship and income criteria (HARDSHIP = 1; see Equation 6.2), we assumed choice question responses add no additional information on which to base an estimate of the marginal utility of money.

[12]. While it is not possible to take the square root of zero, as RR approaches zero, the utility from risk reduction also approaches zero asymptotically.

without addressing correlation); this more complex error structure is not explored here but would be an area of future exploration. The cumulative distribution function for ε_{ij} is:

$$F(\varepsilon) = \exp\left\{-e^{-[1+s(1-SQ_j)]\varepsilon}\right\}. \tag{6.5}$$

The random component is not identically distributed across alternatives. If the comparison includes the status quo (i.e., the respondent is comparing the status quo to the alternative preferred in the A-B choice question in the follow-up), the dummy variable SQ has a value of 1, and the logit scale varies by the parameter *s*, which is another proportional scale factor that increases or decreases all of the demand parameters by the same proportion. The logit scale is inversely proportional to the error variance. That is, a negative value for *s* indicates there is more noise in the responses to the follow-up status quo questions; respondents have less coherence and more difficulty in making the comparison.

Given the logit formulation, the likelihood function is the standard joint probability computed as the product of probabilities associated with the observed choices. For example, in an A-B choice question, the probability A is chosen over B, P(A) is:

$$P(U_{A_{ij}} > U_{B_{ij}}) = \frac{e^{V_{Aij}}}{e^{V_{Aij}} + e^{V_{Bij}}}, \tag{6.6}$$

and the probability B is chosen is 1 - P(A).

The follow-up question adds another slightly more complicated component to the likelihood. The choice of the status quo versus the preferred A-B alternative must be conditioned on the initial choice. Given that A is initially chosen, the probability that A is again preferred over the status quo is (see Amemiya, 1994, p. 10):

$$P(U_{A_{ij}} > U_0 \mid U_{A_{ij}} > U_{B_{ij}}) = P(U_{A_{ij}} > U_0 \cap U_{A_{ij}} > U_{B_{ij}}) \div P(U_{A_{ij}} > U_{B_{ij}})$$

$$= \frac{\left[\dfrac{e^{V_{Aij}}}{e^{V_0} + e^{V_{Aij}} + e^{V_{Bij}}}\right]}{\left[\dfrac{e^{V_{Aij}}}{e^{V_{Aij}} + e^{V_{Bij}}}\right]} = \frac{e^{V_{Aij}} + e^{V_{Bij}}}{e^{V_0} + e^{V_{Aij}} + e^{V_{Bij}}}. \tag{6.7}$$

Other probabilities are computed in parallel fashion. Note that the probability of choosing alternative A or B is a decreasing function of the utility from the status quo, V_0. Also of interest is that because of the nature of the logit formulation, $P\left(U_{A_{ij}} > U_0 \middle| U_{A_{ij}} > U_{B_{ij}}\right)$ and $P\left(U_{B_{ij}} > U_0 \middle| U_{B_{ij}} > U_{A_{ij}}\right)$ are identical and not a function of the A-B choice.

6.3 Estimation Results for the Dollar Choice Models

6.3.1 The estimated combined dollar choice model

Using the maximum likelihood algorithm in Gauss, the combined model, which is a combination of the relocation and health care program choice data and the follow-up choice data, was estimated with parameter convergence and inversion of the matrix of second-order partial derivatives. The parameter estimates are reported in Table 6.4. All parameters have the expected sign (with the exception of the pneumonia constant, which appeared in only 22 choices and was seldom selected). We conclude that the data are insufficient to provide a valuation basis for fatal pneumonia. Most of the parameter estimates are also statistically significant (except for the

Table 6.4 Dollar choice question model parameter estimates.[a]

Parameter	Combined choice model estimates	A-B choice model estimates	Health care program model estimates	Relocation program model estimates
α_c (cancer constant)[b]	0.443e-1 (0.543)	0.277e-1 (0.553)	0.404 (3.728)	-0.377 (-2.345)
α_h (heart attack constant)[b]	0.185e-1 (0.247)	Fixed at 0	0.313 (3.145)	-0.345 (-2.344)
α_p (pneumonia constant)	-0.160 (-1.706)	-0.164 (-1.447)	-0.355e-1 (-0.305)	NA
α_m (motor vehicle constant)	0.136 (1.637)	0.435 (3.777)	NA	0.216 (1.732)
γ_h (HC risk reduction – square root)	0.815 (4.313)	0.419 (2.053)	1.120 (4.653)	NA
γ_h (RL risk reduction – square root)	1.003 (4.375)	0.800 (2.085)	NA	0.659 (1.625)
β_0 (marginal utility of money)	0.770e-3 (13.354)	0.752e-3 (12.640)	0.778e-3 (10.178)	0.697e-3 (7.222)
β_1 (income heterogeneity)	0.561e-5 (3.459)	0.708e-5 (1.753)	0.344e-5 (2.955)	0.104e-4 (1.480)
β_2 (quality)	0.276 (2.109)	0.674 (1.521)	0.286 (2.364)	0.295 (0.813)
β_3 (age75+)	-0.190 (-2.206)	-0.467e-1 (-1.540)	-0.107e-1 (-1.804)	Not estimated
β_4 (children)	-0.119 (-1.632)	-0.225 (-1.281)	-0.107 (-1.487)	-0.186 (-0.926)
β_5 (behavior)	-0.152 (-6.413)	-0.125 (-3.121)	-0.178 (-6.785)	-0.695e-1 (-2.008)
β_6 (start value)	0.537e-4 (3.265)	0.587e-4 (1.661)	0.293e-4 (2.283)	0.671e-4 (1.355)
β_7 (don't believe)	-0.200 (-4.256)	-0.273 (-2.112)	-0.136 (-4.102)	-0.351 (-1.675)
β_8 (embed)	0.543e-1 (1.854)	0.164e-1 (0.312)	0.339e-1 (1.362)	0.112 (1.047)
β_9 (could answer)	0.189 (3.207)	0.258 (1.646)	0.138 (3.075)	0.313 (1.350)
s (status quo follow-up scale)	-0.1656 (-2.100)	NA	-0.427e-1 (-0.373)	-0.479 (-4.893)

a. Asymptotic t-statistics in parentheses.
b. Absolute parameter magnitude of little relevance; of most importance is whether the cancer and heart attack dummies are statistically different from each other.

cancer and heart attack dummies, which for reasons described above are not important; also, CHILDREN is only significant at the 10% level).

Of significance is the similarity between the payment card parameters and the choice question parameters in terms of sign and relative magnitude. All of the socioeconomic variables, which include income, self-reported quality of life, a dummy for those age 75 and over, an index for how much the individual pursues risk-reducing behavior, and a dummy for whether the individual has children, affect marginal utility from risk reduction (and subsequently WTP) in the combined model in a comparable fashion to the payment card results.

The cancer and heart attack dummies are not significantly different from each other, indicating no significant variation in risk reduction utility as a function of these two causes (although the cancer dummy is slightly higher). This is roughly consistent with the payment card results: in the log payment card model, heart attack WTP was slightly higher than that for cancer, but with only marginal significance; in the linear model there was no significant difference. The motor vehicle dummy parameter estimate is positive and significant and, as mentioned above, the pneumonia dummy parameter estimate has the wrong sign but is only marginally significant.

Additionally, γ_h is less than γ_r : marginal utility (and WTP) under the relocation program is higher than under the health care program, all else constant, which may reflect a perception of greater income flexibility under the relocation program, which would require moving, an entire change of lifestyle, and consequently a potentially greater ability to pay after budget reallocations whereas the health care approach appears to result in less budget reallocations (although, as noted before, income heterogeneity enters the model through the marginal utility of risk reduction, not income).

Starting values, discussed in Chapter 5, were also included in the models of the dollar choice responses. In this case, START VALUE is defined as the average of the two dollar values, adjusted for the size of the risk reduction, presented in the first dollar choice question. The purpose is to see if the values presented in the first choice question influence the responses to the first and subsequent dollar choice questions. Just as in the linear payment card models, this variable is positive and statistically significant in the combined choice model. START VALUE is also significantly correlated (0.33) with whether a respondent always selected the A or B option over the status quo and also violated hardship and income criteria (see data cleaning discussion above).

Other elicitation variables (embedding, scenario rejection, and the self-assessed ability to answer the questions) also show the same signs and similar statistical significance as in the payment card results. It is important to recall the dollar choice questions were asked before the payment card questions and thus the dollar choice responses were not influenced by the payment card question (although the reverse could have occurred). This indicates that stated choice questions may be subject to many of the same elicitation influences as in other stated preference formats.

The negative sign on the scale *s* indicates less coherence in the responses to the follow-up questions, which means respondents found them to be more difficult, on average, than the A-B choices. The parameter value of -0.17 means that all of the demand parameters in the utility function are scaled down by 17% for the follow-up component in the likelihood function (or, equivalently, that the error variance is scaled up). A number of factors could be contributing to the added noise. First, the status quo may be further away from most A-B alternatives in "variable space." That is, if the status quo is more dissimilar to most A-B alternatives (or is perceived as such) than the A-B alternatives are to each other, then it may be more difficult for respondents to make comparisons to the status quo. Second, there may be more of an opportunity to express scenario rejection when a ranking includes the status quo, with no cost, than when both alternatives include a cost, which can confound the results and add noise. Third, in the relocation program questions, even though the respondent is told to assume a move is required even in the status quo alternative, some respondents may not believe they would actually have to move if they chose the status quo. Different respondent interpretations or assumptions could add noise to the results.

6.3.2 Models based on data subsets

We estimated three other models using various subsets of the choice question data. The first submodel is an A-B choice model that does not include the follow-up status quo questions. This model is useful in examining how including the status quo option affects results. The other two submodels use just the health care program data and just the relocation program data, including the status quo questions in both cases. These two submodels allow for complete independence in the parameters across the two programs.

Two generic conclusions can be drawn from the results of all three submodels. First, combining all the data has important efficiency implications. The parameter estimates in the submodels have much larger standard errors than in the combined model, indicating that the submodels do a significantly poorer job of explaining the variation in the data. However, the efficiency gains of combining the data come at the expense of model flexibility. Second, the parameter estimates from the submodels are qualitatively comparable to each other and to the combined model. There are no sign reversals, for example.

A-B choice model

For identification, the heart attack dummy in the A-B choice model was fixed at zero (and the estimated cancer dummy is again not significantly significant), and the status quo scale parameter is also unidentified. The most important finding in omitting the follow-up data is that the estimated risk reduction parameters, γ_h and γ_r, are lower, which translates into lower WTP values for the same risk reduction (Section 6.4). We had no prior expectation about how including status quo alternatives would affect estimation. Where A/B options were chosen over status quo options in the majority of instances, including the status quo leads to an increase in estimated risk reduction values.

Many variables that were significant in the combined model are no longer significant in this model, including QUALITY, EMBED, AGE75+, and CHILDREN. The starting value variable is still marginally significant and positive, showing that there may be an anchoring effect.

Health care program choice model

In this model, the motor vehicle accident dummy is not relevant and only γ_h was activated. Most of the parameters that were significant in the combined model are again significant, except for EMBED and CHILDREN. The health care program risk reduction parameter is slightly higher here than in the combined model, which translates into slightly higher WTP (for the health care program) than when the health care and relocation data are combined. START VALUE is again positive and significant, suggesting anchoring. Survey issues such as scenario rejection and comprehension are highly significant. A final important result is the magnitude of the status quo scale parameter, *s*, while still negative, is very small and not statistically different from zero.

Relocation program only

The estimated status quo scale parameter in this model is negative and highly significant, which indicates that virtually all of the follow-up question noise in the combined model is stemming from the relocation data. This may result from the difficulty respondents may experience when considering an alternative that requires them to move (even when they choose the status quo). This finding is important in that it suggests including the status quo as an alternative under a relocation program adds relatively little information on top of the forced-choice A-B questions, and may even result in scenario rejection.

As compared to the health care only model, fewer variables are statistically significant, perhaps in part because of the smaller sample sizes. The ones that still have significance at the 10% level or better include the cause dummies (pneumonia was not estimated), risk reduction, DON'T BELIEVE, and BEHAVIOR.

6.4 Willingness-to-Pay Estimates

Mean WTP was computed as the compensating variation (CV) using the choice question parameter estimates from all of the models. These estimates are reported in Table 6.5. For a model with only one alternative in each state of the world (i.e., one risk reduction level in each alternative), estimated CV is simply the marginal utility for the risk reduction divided by the marginal utility of money (for detail, see Hanemann, 1999):

$$CV_i = \frac{1}{\beta_0}\left\langle \begin{array}{l} \alpha_c CQ\ CANCER + \alpha_h CQ\ HEART + \alpha_p CQ\ PNEU + \alpha_m CQ\ MOTOR \\ + \left\{\beta_i [\gamma_h (1 - RELOCATE) + \gamma_r (RELOCATE)]\sqrt{CQ\ RR}\right\} \\ \times (1 - CQ\ PNEU)(1 - CQ\ MOTOR) \end{array} \right\rangle . \quad (6.8)$$

The variation in WTP in Table 6.5 reflects many of the issues that have already been discussed. In the combined model, the cancer and heart attack values associated with the health care program are lower than those for the relocation program, but diminishing marginal utility of risk reduction is the same in percentage terms (i.e., marginal values fall off at the same rate) because of the properties of the square root function. For example, using the combined model, the mean WTP for a 1 in 10,000 cancer risk reduction under the health care program is $912, and increases 116% when the risk reduction level increases to 5 in 10,000. For the relocation program, that value starts at $1,108 but also increases by the same percentage. This feature translates into a larger absolute increase in WTP with higher risk reduction levels for the relocation model.

Motor vehicle accident risk reduction is valued for a 1 in 10,000 decrease for three of the models, but the results are not consistent and the mean WTP is not statistically different from zero. As explained earlier, the estimated pneumonia parameter did not have the right sign, was not significant, and is not used to estimate a pneumonia risk WTP.

Mean WTP estimates for the submodels are also reported in Table 6.5. As compared to the health care and relocation program estimates from the combined model, the submodels show more variation across the programs, which is a result of the added flexibility of estimating two independent models.

For the combined model, 95% confidence intervals on mean WTP were simulated using the Krinsky-Robb method based on 500 draws (Krinsky and Robb, 1986). Because of the nonlinearities in the utility function, the distribution of mean WTP is not symmetric, and the maximum likelihood estimates of WTP do not lie at the midpoint. These confidence intervals were simulated for only the combined model. The large standard errors on many of the parameter estimates in the submodels indicate that the confidence intervals for those models would be very large.

Table 6.5 Mean sample compensating variations by model (annual WTP per person in 2002$).[a]

Risk reduction	Combined choice model[b]	VSL (in 2002$ millions) based on combined model	A-B choice model[c]	Health care choice model[c]	Relocation choice model[c]
Health care program					
Cancer					
1 in 10,000	$912 (655-1,042)	$9.1	$812	$1,083	
2 in 10,000	$1,266 (942-1,406)	$6.3	$1,133	$1,317	
5 in 10,000	$1,968 (1484-2,142)	$3.9	$1,770	$1,780	
Heart attack					
1 in 10,000	$879 (637-1,012)	$8.8	$775	$965	
2 in 10,000	$1,232 (908-1,382)	$6.2	$1,096	$1,199	
5 in 10,000	$1,934 (1,432-2,147)	$3.9	$1,733	$1,662	
Relocation program					
Cancer					
1 in 10,000	$1,108 (836-1,253)	$11.1	$1,513		$1,245
2 in 10,000	$1,543 (1,160-1,734)	$7.7	$2,125		$1,984
5 in 10,000	$2,407 (1,813-2,652)	$4.8	$3,338		$3,451
Heart attack	$1,074 (787-1,232)	$10.7	$1,476		$1,290
1 in 10,000	$1,510 (1,157-1,698)	$7.6	$2,088		$2,029
2 in 10,000	$2,373 (1,794-2,654)	$4.7	$3,302		$3,496
5 in 10,000					
Motor vehicle					
1 in 10,000	$177 (-40-379)	$1.8	$578		$309

a. These are mean values for the respondent samples and have not been weighted to the general population.
b. Simulated 95% confidence intervals in parentheses; simulated using Krinsky-Robb (1986) procedure (500 draws).
c. Because of the relatively low explanatory power in these models (i.e., large standard errors on the parameter estimates) as compared to the combined model, confidence intervals were not simulated.

7. Risk Timing and Nondollar Choice Questions

7.1 Introduction

This chapter presents preliminary findings concerning preferences for the timing of risk reductions and other preliminary findings from the nondollar choice questions (Q16 to Q20). These results are preliminary because they are based on simple comparisons of the percentages of respondents selecting various responses. Initial modeling of these results was completed but was judged to be insufficient. Additional modeling is necessary to more thoroughly evaluate the nondollar choice results accounting for the significant respondent heterogeneity, for the potential that time preferences for risk reductions may vary by age and in a different manner for different fatal risk causes, and for potential elicitation effects.

7.2 Risk Timing

Each respondent was assigned to one of two time period versions for the nondollar choice questions, presenting risk reductions for a near-term period and a delayed period. The two versions are (1) for risk reductions over the next 10 years and then for 11 years and onward (10/11+ version) and (2) for risk reductions over the next 20 years and then for 21 years and onward (20/21+ version). Respondents ages 35 to 64 were assigned either the 10/11+ version or the 20/21+ version according to the sampling plan presented in Chapter 2. Respondents age 65 and over all received the 10/11+ version. Three types of risk reduction timing profiles were included in the questions: (1) the constant risk profile showed the same annual risk reduction in both the near-term and delayed time periods, (2) the delayed risk profile showed no (or smaller) risk reduction in the near-term time period with the annual risk reduction starting in 11 or 21 years from now and continued every year from then on, and (3) the near-term risk profile showed an annual risk reduction in the next 10 or 20 years and no, or smaller, annual risk reduction thereafter.

Table 7.1 presents an aggregate comparison of results, by age group, for nondollar choice questions where the cause of the fatal risk was the same in both alternatives of a question, but the risk timing profile was different in the two alternatives. We aggregate the results of all similar types of questions because the heterogeneity across respondents and small sample sizes reduces the reliability of results from individual questions. In Table 7.1, Group A shows the results of the 15 questions comparing a constant risk reduction through time to a delayed risk reduction for the same cause (however, the cause and levels of constant and delayed risk reductions vary across questions).

The sum of annual risk reductions for the constant risk reduction cases is 20 in 10,000 in all the time periods.[13] The sum of the annual risk reductions for the delayed risk reduction cases is 2 in 10,000 in the near-term period and 63 in the 10,000 in the delayed period.[14] In this case, the level of annual risk reductions in the delayed cases averages about three times the level of constant annual risk reductions. Group B shows the results of all seven questions comparing constant risk reduction to near-term risk reductions. Group C shows the results for nine questions comparing delayed risk reductions to near-term risk reductions.

Table 7.1 Risk timing preferences by age.[a]

Comparison group	Timing profile	Sum of near-term 10^{-4} risk reductions[b]	Sum of delayed 10^{-4} risk reductions[b]	Percent selecting option, by age group (number of observations in parentheses)					
				35-44	45-54	55-64	65-74[c]	75-84[c]	Total
A (15 questions)	Constant vs.	20	20	57%	63%	61%	69%	69%	63%
	delayed	2	63	43% (476)	37% (476)	39% (375)	31% (307)	31% (209)	37% (1,825)
B (7 questions)	Constant vs.	11	11	52%	55%	53%	56%	54%	54%
	near-term	29	2	48% (131)	45% (133)	47% (190)	44% (154)	46% (94)	46% (702)
C (9 questions)	Near-term vs.	23	1	62%	47%	48%	51%	53%	52%
	delayed	4	22	38% (219)	53% (163)	52% (291)	49% (212)	47% (148)	48% (1033)

a. Comparisons holding fatal cause constant (e.g., cancer vs. cancer, heart vs. heart).
b. Ages 35 to 64 received one of two time versions (0-10/11+ and 0-20/21+). Ages 65+ received only the 10/11+ time version, which, compared to other age groups, will reduce the revealed aversion to delayed risks and reduce preferences for near-term risks.
c. The sum is the addition of the annual risk reduction presented in each question, without regard to the number of years for which the risk reduction occurs — see footnotes 1 and 2 of this chapter.

A few caveats are in order before turning to the results:

- The results in Table 7.1 are aggregated across all four fatal risk causes, although the data suggest that timing preferences may vary with the cause of the risk.

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13. The constant risk reductions considered are 1/10,000 and 2/10,000. The sum of these across the 15 questions totals 20/10,000 in both the near-term and delayed time periods.

14. Two of the delayed risk profile questions include a 1/10,000 risk reduction in the near-term period, combined with larger risk reductions in the delayed time period. The delayed time period risk reductions are 2/10,000 and 5/10,000, and thus the total across the 15 questions equals 63/10,000.

- The results are combined for both time period versions (10/11+ and 20/21+). Some comparisons may have more of one of the time period versions. Note also that individuals age 65 and older received only time period version 10/11+. Thus, one would presume if they had a random mix of both time period versions, as did the younger age groups, their preferences for delayed risks would be lower than reported and their preferences for near-term risks would be higher than reported — amplifying the differences across age groups.

- Different age groups received different versions of the questionnaire (Chapter 2). Although many of the same questions were repeated in different versions, each age group answered a different combination of questions. Further, different individuals answered different questions. These factors may blur the simple comparisons in Table 7.1.

Overall, the results in Table 7.1 suggest that respondents prefer constant risk reduction scenarios over delayed risk reduction scenarios, and that this preference increases with age. Other things being equal, we expect that a risk reduction starting 11 years from now would be preferred to a risk reduction starting 20 years from now, so the fact that the age groups age 65 and over received only the 10/11+ year version most likely mitigates the aversion to the delayed risks for the older groups compared to the younger groups. The finding that constant risk reduction is preferred to a larger delayed reduction is consistent with theoretical expectations given expected discounting of future benefits. It is also consistent with expectations that older age groups would be more averse to delayed risk reductions because they have lower probabilities of surviving until the risk reduction would begin.

Table 7.1 also shows that respondents prefer constant risk reduction scenarios to near-term risk reduction scenarios, and prefer near-term to delayed risk reductions. For these cases, the preferences of one risk timing profile versus the other are not as strong as in the case of constant versus delayed, and there is not as much difference in preferences across the age groups. For constant versus delayed, preferences are very similar across all age groups. For near-term versus delayed, ages 35 to 44 have a strong preference for the near-term risk reduction, ages 45 to 64 somewhat prefer the delayed risk reduction, and ages 65 to 84 somewhat prefer the near-term reduction. This result for the 65 to 84 year olds would most likely be stronger if they were also offered the 20/21+ year version.

The dollar choice questions include 11 risk timing questions, which were asked only of respondents age 35 to 44 who received the health care program version. Nine of these questions compare a constant annual risk reduction of 1 in 10,000 to a delayed annual risk reduction of 1 in 10,000 (with zero near-term risk reduction) at different prices, as summarized in Table 7.2. The

Table 7.2 Dollar valuation of risk timing for respondents age 35-44.

Version/question, number of observations	Dollars for constant RR	Dollars for delayed RR	Dollar difference	Dollar ratio	% selecting constant RR
Cancer (1,1) vs. Cancer (0,1)					
V1/HC5, 41	$100	$25	$75	4.0	44%
V2/HC5, 39	$200	$100	$100	2.0	51%

V3/HC5, 37	$50	$25	$25	2.0	65%
V4/HC5, 34	$500	$200	$300	2.5	50%
V6/HC5, 41	$1,000	$250	$750	4.0	29%
Heart (1,1) vs. Cancer (0,1)					
V2/HC9, 39	$500	$200	$300	2.5	18%
V3/HC9, 37	$200	$100	$100	2.0	49%
V4/HC9, 34	$500	$100	$400	5.0	41%
V6/HC9, 41	$1000	$500	$500	2.0	34%

difference in these alternatives is the addition of a 1 in 10,000 annual risk reduction in the near-term (next 10 or 20 years) period. These results should be viewed cautiously because they are based on small samples, and the percentage of individuals given the 10/11+ and 20/21+ time versions differs slightly across questions. The first block of Table 7.2 presents the results for constant risk reduction versus delayed risk reductions for fatal cancer. The results suggest adding a 1 in 10,000 risk reduction for the near term (10 or 20 years) adds $75 to $300 in annual value, and the constant risk reduction is valued 2.0 to 2.5 times as much as the delayed risk reduction only. The second block of Table 7.2 presents the results for the same timing comparison, but for constant heart attack risk reduction versus delayed cancer risk reduction. In this case, the value of a constant heart attack risk reduction of 1 in 10,000 is less than $100 greater than (and less than double in value) a 1 in 10,000 delayed cancer risk reduction. This implies near-term cancer risk reductions are valued more than near-term heart attack risk reductions for this age group.

7.3 Other Nondollar Choice Results

The nondollar choice data can be used to compare preferences across fatal risk causes. Initial modeling of the nondollar choice questions, where the models begin to account for age and other individual characteristics, and the timing of risks suggest that preferences for risk reductions by cause are (with “>” implying preferred): cancer > motor vehicle accident > heart attack ≥ pneumonia. These results differ somewhat from those previously reported. This may reflect preliminary modeling to date, the few occurrences of motor vehicle accident and pneumonia in the dollar choice questions resulting in difficulty in measuring their values compared to cancer and heart attack (as discussed in Chapter 6), differences in scenarios, and differences in the difficulty of the dollar and nondollar choice questions.

The valuation questions use health care scenarios (for illnesses) and relocation scenarios (for illnesses and motor vehicle accidents). The results may be influenced by these scenarios. For instance, some respondents suggested that they doubted that relocation would affect their risk of fatal motor vehicle accident, which might have suppressed the preferences to reduce motor vehicle accident risks. The nondollar questions are asked without a specific scenario about how the risk reductions will be achieved, but it is likely that respondents assumed scenarios similar to those in the valuation questions: health care options to reduce illnesses, and improved traffic safety (e.g., improved roads, traffic management, and enforcement, or changes in driver age) or improved motor vehicle safety features to reduce motor vehicle accidents.

- The nondollar choice questions are difficult for some respondents. These questions required respondents to compare fatal risk causes, risk levels, and risk timing profiles. The timing profiles seemed especially difficult. This difficulty is reflected in the follow-up question (Q20a) asking ". . . how confident are you that your answers accurately reflect your preferences about reducing fatal risks?" to which 19% responded "not at all confident" or "slightly confident" and 32% responded "very confident" or "extremely confident." The answers to the follow-up questions to the dollar choice and payment card questions (while differently worded and with different response options) suggest somewhat more comfort with the responses to these questions. We suspect that the dollar choice questions were easier because they focused on constant risk reductions over time. When respondents have more difficulty in answering choice questions, elicitation effects may increase and confound results, which has not been addressed in our initial modeling.

We believe the nondollar choice questions are valuable for respondents to begin to work with the risk concepts (fatal risk causes, risk reduction levels and presentation format). However, in future applications of the survey we recommend simplifying this section by including comparisons that generate more clear preferences and reducing the number of nondollar choice questions. We place more reliance on the dollar choice and payment card results than on the above preliminary nondollar choice question results presented here.

8. References

Adamowicz, W., P. Boxall, M. Williams, and J. Louviere. 1998. "Stated Preference Approaches for Measuring Passive Use Values: Choice Experiments and Contingent Valuation." *American Journal of Agricultural Economics* 80:64-75.

Alberini, A., M.L. Cropper, A. Krupnick, and N.B. Simon. 2002. "Willingness to Pay for Future Risk: How Much Does Latency Matter?" Presented at the Second World Congress of Environmental and Resource Economists, June 24-27, Monterey, CA.

Amemiya, T. 1994. *Introduction to Statistics and Econometrics.* Harvard University Press, Cambridge, MA.

Balistreri, E., G. McClelland, G. Poe, and W. Schulze. 2001. "Can Hypothetical Questions Reveal True Values? A Laboratory Comparison of Dichotomous Choice and Open-Ended Contingent Values with Auction Values." *Environmental and Resource Economics* 18:275-292.

Batsell, R.R. and J.J. Louviere. 1991. "Experimental Analysis of Choice." *Marketing Letters* 2:199-214.

Berrens, R.P., A.K. Bohara, H. Jenkins-Smith, C. Silva, and D.L. Weimer. 2001. "The Advent of Internet Surveys for Political Research: A Comparison of Telephone and Internet Samples." NSF Grant Number 9818108. Working paper, University of Wisconsin-Madison. October.

Bishop, R.C., W.S. Breffle, J.K. Lazo, R.D. Rowe, and S.M. Wytinck. 2000. Restoration Scaling Based on Total Value Equivalency: Green Bay Natural Resource Damage Assessment. Report prepared for U.S. Fish and Wildlife Service, U.S. Department of Interior, and U.S. Department of Justice.

Breffle, W.S., E.R. Morey, R.D. Rowe, D.M. Waldman, and S.M. Wytinck. 1999. Recreational Fishing Damages from Fish Consumption Advisories in the Waters of Green Bay. Report prepared by Stratus Consulting Inc., Boulder, CO, for the U.S. Fish and Wildlife Service, U.S. Department of Interior, and U.S. Department of Justice.

Breffle, W.S. and R.D. Rowe. 2002. "Comparing Choice Question Formats for Evaluating Natural Resource Tradeoffs." *Land Economics* 78(2): 298-314.

Carson, R.T., N.E. Flores, K.M. Martin, and J.L Wright. 1996. "Contingent Valuation and Revealed Preference Methodologies: Comparing the Estimates for Quasi-Public Goods." *Land Economics* 72(1): 80-99.

Chestnut, L.G. and R.D. Rowe. 1990. Preservation Values for Visibility Protection at the National Parks. Prepared by Stratus Consulting, Boulder, CO, for the U.S. Environmental Protection Agency, Research Triangle, NC.

Corso, P.S., J.K. Hammitt, and J.D. Graham. 2001. "Valuing Mortality-Risk Reductions: Using Visual Aids to Improve the Validity of Contingent Valuation." *Journal of Risk and Uncertainty* 23(2):165-184.

Cropper, M.L. and A.M. Freeman III. 1991. "Environmental Health Effects." In *Measuring the Demand for Environmental Quality,* J.B. Braden and C.D. Kolstad (eds.). North-Holland, New York.

Cropper, M.L. and U. Subramanian. 1995. "Public Choices between Lifesaving Programs: How Important Are Lives Saved?" Policy Research Working Paper 1497. The World Bank, Washington, DC.

Cropper, M.L. and F.G. Sussman. 1988. "Families and the Economics of the Risks to Life." *American Economic Review* 78:255-260.

Cropper, M.L. and F.G. Sussman. 1990. "Valuing Future Risks to Life." *Journal of Environmental Economics and Management* 19:160-174.

Cropper, M.L., S.K. Aydede, and P.R. Portney. 1994. "Preferences for Life Saving Programs: How the Public Discounts Time and Age." *Journal of Risk and Uncertainty* 8:243-265.

DeShazo, J.R. 2002. "Designing Transactions without Framing Effects in Iterative Question Formats." *Journal of Environmental Management and Economics*. 43(3):360-385.

DeShazo, J.R., T.A. Cameron, and M. Saenz. 2001. "A Test of Choice Set Misspecification for Discrete Models of Consumer Choice." Working paper, available from UCLA School of Public Policy, 3250 Public Policy Building, Los Angeles, CA 90049.

Dillman, D.A. 1978. *Mail and Telephone Surveys: The Total Design Method.* John Wiley & Sons, New York.

Dillman, D.A. 2000. *Mail and Internet Surveys: The Tailored Design Method*. John Wiley and Sons, New York.

Fisher, A., L.G. Chestnut, and D.M. Violette. 1989. "The Value of Reducing Risks of Death: A Note On New Evidence." *Journal of Policy Analysis and Management* 8(1):88-100.

Green, P.E. and V. Srinivasan. 1990. "Conjoint Analysis in Marketing: New Developments with Implications for Research and Practice." *Journal of Marketing* (October):3-19.

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

Hanemann, W.M. 1999. "Welfare Analysis with Discrete Choice Models." In *Valuing Recreation and the Environment: Revealed Preference Methods in Theory and Practices,* C. Kling and J. Herriges (eds.). Edward Elgar, Cheltenham, UK.

Hensher, D.A. 1994. "Stated Preference Analysis of Travel Choices: The State of Practice." *Transportation* 21:107-133.

Hensher, D.A. and M. Bradley. 1993. "Using Stated Choice Data to Enrich Revealed Preference Discrete Choice Models." *Marketing Letters* 4:139-152.

Johannesson, M. and P. Johansson. 1996. "To Be, or Not to Be, That Is the Question: An Empirical Study of the WTP for an Increased Life Expectancy at an Advanced Age." *Journal of Risk and Uncertainty* 13:163-174.

Johnson, F.R., M.R. Banzhaf, and W.H. Desvousges. 2000. "Willingness to Pay for Improved Respiratory and Cardiovascular Health: A Multiple-Format Stated-Preference Approach." *Health Economics* 9:295–317.

Johnson, F.R., W.H. Desvousges, M.C. Ruby, D. Stieb, and P. De Civita. 1998. "Eliciting Stated Health Preferences: An Application to Willingness to Pay for Longevity." *Medical Decision Making* 18(2):S57–S67.

Johnson, F.R., and W.H. Desvousges. 1997. "Estimating Stated Preferences with Rated-Pair Data: Environmental, Health, and Employment Effects of Energy Programs." *Journal of Environmental Economics and Management* 34(1):79-99.

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

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

Kline, J. and D. Wichelns. 1996. "Measuring Public Preferences for the Environmental Amenities Provided by Farmland." *European Review of Agricultural Economics* 23:421-436.

Kopp, R. and V.K. Smith. 1997. "Constructing Measures of Economic Value." In *Determining the Value of Non-Market Goods: Economic, Psychological, and Policy Relevant Aspects of Contingent Valuation Methods,* R. Kopp, W. Pommerehne, and N. Schwarz (eds.). Kluwer, Boston, pp. 101-126.

Krinsky, I. and A.L. Robb. 1986. "Estimating the Statistical Properties of Elasticities." *Review of Economics and Statistics* 68:715-19.

Krupnick A. and M.L. Cropper. 1992. "The Effects of Information on Health Risks Valuations." *Journal of Risk and Uncertainty* 5:29-48.

Krupnick, A., A. Alberini, M. Cropper, N. Simon, B. O'Brien, R. Goeree, and M. 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.

Layton, D. and G. Brown. 1998. Heterogeneous Preferences Regarding Global Climate Change. Presented at NOAA Applications of Stated Preference Methods to Resource Compensation Workshop, Washington, DC.

Loomis, J., A. Gonzalez-Caban, and R. Gregory. 1994. “Do Reminders of Substitutes and Budget Constraints Influence Contingent Valuation Estimates?” *Land Economic*s 499-506.

Louviere, J.J. 1988. “Conjoint Analysis Modeling of Stated Preferences.” *Journal of Transport Economics and Policy* 10:93-119.

Louviere, J.J. 1992. “Experimental Choice Analysis: Introduction and Overview.” *Journal of Business Research* 24:89-95.

Louviere, J.J. 1994. “Conjoint Analysis.” In *Advances in Marketing Research,* R. Bagozzi (ed.), Blackwell Publishers, Cambridge MA, pp. 223-259.

Magat, W.A., W.K. Viscusi, and J. Huber. 1996. “A Reference Lottery Metric for Valuing Health.” *Management Science* 42(8):1118-1130.

Mathews, K.E., W.H. Desvousges, F.R. Johnson, and M.C. Ruby. 1997. Using Economic Models to Inform Restoration Decisions: The Lavaca Bay, Texas Experience. TER technical report prepared for presentation at the Conference on Restoration of Lost Human Uses of the Environment, Washington, DC, May 7-8.

McConnell, K.E. 1995. “Consumer Surplus from Discrete Choice Models.” *Journal of Environmental Economics and Management*, 29(3):263-270.

McDaniels, T.L., M.S. Kamlet, and G.W. Fischer. 1992. “Risk Perception and the Value of Safety.” *Risk Analysis* 12:495-503.

Miller, T.R. 1989. “Willingness to Pay Comes of Age: Will the System Survive?” *Northwestern University Law Review* 83:876-907.

Mitchell, R.C. and R.T. Carson. 1986. *Valuing Drinking Water Risk Reductions Using the Contingent Valuation Method: A Methodological Study of Risks from THM and Giardia.* Report prepared for the U.S. Environmental Protection Agency (CR810466-01-6), Washington, DC, prepared by Resources for the Future, Washington, DC.

Mitchell, R.C. and R.T. Carson. 1989. *Using Surveys to Value Public Goods: The Contingent Valuation Method*. John Hopkins Press for Resources for the Future, Washington, DC.

Moore, M.J. and W.K. Viscusi. 1988. “The Quantity-Adjusted Value of Life.” *Economic Inquiry* 26:369-388.

Moore, M.J., and W.K. Viscusi. 1990. “Models for Estimating Discount Rates for Long-Term Health Risks Using Labor Market Data.” *Journal of Risk and Uncertainty* 3:381-401.

Morey, E.R., K.G. Rossmann, L. Chestnut, and S. Ragland. 2002. "Estimating E[WTP] for Reducing Acid Deposition Injuries to Cultural Resources: Using Choice Experiments in a Group Setting to Estimate Passive-Use Values." In *Valuing Cultural Heritage: Applying Environmental Valuation Techniques to Historic Buildings, Monuments and Artifacts,* S. Narvud and R.C. Ready (eds.). Edward Elgar Publishing, Cheltenham, UK.

Opaluch, J.J., S.K. Swallow, T. Weaver, C.W. Wessells, and D. Wichelns. 1993. "Evaluating Impacts from Noxious Facilities: Including Public Preferences in Current Siting Mechanisms." *Journal of Environmental Economics and Management* 24:41-59.

Reaves, D.W., R.A. Kramer, and T.P. Holmes. 1999. "Does Question Format Matter? Valuing and Endangered Species." *Environmental and Resource Economics* 14:365-383.

Rosen, S. 1988. "The Value of Changes in Life Expectancy." *Journal of Risk and Uncertainty* 1:285-304.

Rowe, R.D., R. D'Arge, and D. Brookshire. 1980. "An Experiment on the Economic Value of Visibility." *Journal of Environmental Economics and Management* 7:1-19.

Rowe, R.D., W. Schulze, and W. Breffle. 1996. "A Test for Payment Card Biases." *Journal of Environmental Economics and Management* 31:178-185.

Ruby, M.C., F.R. Johnson, and K.E. Mathews. 1998. Just Say 'No': Assessing Opt-Out Options in a Discrete-Choice Stated-Preferences Survey of Anglers. TER working paper T-9801.

Schuman, H. and S. Presser. 1996. *Questions and Answers in Attitude Surveys: Experiments on Question Form, Wording, and Context.* Sage Publications, Thousand Oaks, CA.

Shepard, D.S. and R.J. Zeckhauser. 1982. "Life-Cycle Consumption and Willingness to Pay for Increased Survival." In *The Value of Life and Safety,* M.W. Jones-Lee (ed.). North Holland, New York.

Slovic, P. 1987. "Perception of Risk." *Science* 236:280-285.

Smith, V.K. and W.H. Desvousges. 1987. "An Empirical Analysis of the Economic Value of Risk Changes." *Journal of Political Economy* 95:89-111.

Tourangeau, R. L.J. Rips, K. Rasinski. 2000. *The Psychology of Survey Response.* Cambridge University Press, New York.

Tsevat, J., N.V. Dawson, A.W. Wu, J. Lynn, J.R. Soukup, E.F. Cook, H. Vidaillet, and R.S. Phillips. 1998. "Health Values of Hospitalized Patients 80 Years or Older." *Journal of the American Medical Association* 279(5):371-375.

Van Houtven, G.L. 1997. "Altruistic Preferences for Life-Saving Public Programs: Do Baseline Risks Matter?" *Risk Analysis* 17:85-92.

Viscusi, W.K. 1992. *Fatal Tradeoffs: Public and Private Responsibilities for Risk*. Oxford University Press, New York.

Viscusi, W.K. 1993. “The Value of Risks to Life and Health.” *Journal of Economic Literature* 31:1912-1946.

Viscusi, W.K., and M.J. Moore. 1989. “Rates of Time Preference and Valuations of the Duration of Life.” *Journal of Public Economics* 38(3):297-317.

Viscusi, W.K., J.K. Hakes, and A. Carlin. 1997. “Measures of Mortality Risk.” *Journal of Risk and Uncertainty* 14:213-233.

Viscusi, W.K., W.A. Magat, and J. Huber. 1991. “Pricing Environmental Health Risks: Survey Assessment of Risk-Risk and Risk-Dollar Trade-Offs for Chronic Bronchitis.” *Journal of Environmental Economics and Management* 21(2):32-51.

Whitehead, J.C. 2002. “Incentive Incompatibility and Anchoring in Iterative Valuation Questions.” *Land Economics* 79(2):285-297.

A. Instrument Script and Programming Instructions

Email Subject Line: A Survey about Reducing Your Fatal Risks

Email Body: This week we'd like you to participate in a survey about options to reduce your fatal risks. Your opinions will be used as input to public decisions concerning environmental protection and transportation safety. The survey will take approximately 30 minutes. You will hear audio explanations and instructions of some questions. Given the complexity of the questions, the audios are designed to aid you in your comprehension of those questions. Therefore, it is <u>extremely important</u> for you to listen to the audios before you answer the questions or continue to the next screen. Please also remember to turn up the volume on your WebTV before beginning the survey. Because of the length of the survey, you will receive $10 by mail for completing the survey. Thank you for participating in this important research.

Programming notes.

1. Notes regarding programming in italics.
2. Text that is variable by respondent (age/gender, or version variables) is in brackets. To be filled in with appropriate gender, age, data.
3. *Section titles (Introduction, Risk of Death…) and question numbers are not shown to respondents. Question numbers are not be in sequence due to previous revisions.*
4. *ppgender: 1=male 2=female*
5. *Program will generate 3 identifying variables: next: 1=10/11+ years; 2=20/21+ years; version1: 1-13 (non-dollar versions); version2: 1-56 (dollar versions)*
6. *All audio screens have one prompt. If respondents skips before the audios starts or finishes, they receive this prompt message once: "Please finish listening to the audio before continuing."*

Introduction

[Screen 1]

This survey includes written and audio explanations to help you understand the questions. Please read all the information carefully and listen to all the audio explanations that are provided.

[Screen 2]

In this survey we are focusing on your health and reducing risks of death.

Q3 In general, how would you describe your physical health?
Select one answer only

Poor	Fair	Good	Very Good	Excellent
☐	☐	☐	☐	☐

[Screen 3]

Q4 In general, how would you describe your overall enjoyment of life?
Select one answer only

Poor	Fair	Good	Very Good	Excellent
☐	☐	☐	☐	☐

[Screen 4]

Q5 Are your activities, such as work, household chores, or leisure activities, currently restricted because of any long term illness or medical condition?
Select one answer only

☐ Not at all restricted
☐ Slightly restricted

- ☐ Somewhat restricted
- ☐ Very restricted
- ☐ Extremely restricted

Risks of Death

[Screen 5]

Table 1 shows how many U.S. [women *(if ppgender=2)***/men** *(if ppgender=1)***] die <u>each</u> <u>year.</u> Deaths are shown for the 4 major causes of death that are the focus of this survey, and deaths from all causes are also shown. Reading across the row, the table shows how many [women** *(if ppgender=2)***/men** *(if ppgender=1)***] die each year for every 10,000 who are in each age group. Please review this table then continue with the survey.**

[if ppgender=2]

Table 1. Deaths each year out of 10,000 women in each age group in the U.S.

Age group	*Heart attack*	**Cancer**	**Pneumonia**	**Motor Vehicle Accident**	**All causes**
35 to 44	1	4	0.1	2	14
45 to 54	3	13	0.3	2	30
55 to 64	12	35	1	2	80
65 to 74	35	70	3	2	200
75 to 84	115	110	13	3	490
85 and over	415	145	70	4	1,485

[if ppgender=1]

Table 1. Deaths each year out of 10,000 men in each age group in the U.S.

Age group	Heart attack	Cancer	Pneumonia	Motor Vehicle Accident	All causes
35 to 44	3	3	0.2	2	25
45 to 54	11	13	0.6	2	55
55 to 64	30	45	1	2	130
65 to 74	75	105	5	2	310
75 to 84	180	175	19	4	700
85 and over	465	260	85	6	1,695

[Screen 6]

[Show Table 1 here again with the row highlighted based on their ppage]

The row for your current age group is highlighted. According to Table 1, how many [women ***(if ppgender=2)***/men ***(if ppgender=1)***] out of 10,000 in your age group die each year from:

Q6 **motor vehicle accidents** (enter number) ________________

Q7 **cancer** (enter number) ________________

[if (ppgender=1 and ((35<=ppage<=74 and Q6=2) or (75<=ppage<=84 and Q6=4) and (ppage>=85 and Q6=6))) or (ppgender=2 and ((35<=ppage<74 and Q7=2) or (75<=ppage<=84 and Q6=3) or (ppage>=85 and Q6=4))) then Skip to Q8. All else show Q6A]

[if (ppgender=1 and ((35<=ppage<=44 and Q7=3) or (45<=ppage<=54 and Q7=13) or (55<=ppage<=64 and Q7=45) or (65<=ppage<=74 and Q7=105) or (75<=ppage<=84 and Q7=175) or (ppage>=85 and Q7=260))) or (ppgender=2 and ((35<=ppage<=44 and Q7=4) or (45<=ppage<=54 and Q7=13) or (55<=ppage<=64 and Q7=35) or (65<=ppage<=74 and Q7=70) or (75<=ppage<=84 and Q7=110) or (ppage>=85 and Q7=145))) then Skip to Q8. All else show Q7A]

[Screen 6a]
[Show Table 1 here again with the row highlighted based on their ppage]

Please review Table 1 again. The row for your current age group is highlighted. According to Table 1, how many [women ***(if ppgender=2)***/men ***(if ppgender=1)***] out of 10,000 in your age group die each year from:

[Show Q6a and Q7a on the same screen]

Q6a **motor vehicle accidents** (enter number) ________________

Q7a **cancer** (enter number) ________________

[Screen 7]
[Show table 1 again here with the "10 years from their ppage" row highlighted]

Q8 The age group you will be in 10 years from now is now highlighted in Table 1. According to the table , how many [women ***(if ppgender=2)***/men ***(if ppgender=1)***] out of 10,000 die each year from heart attack in the age group you will be in 10 years from now?

____

[if (ppgender=1 and ((35<=ppage<=44 and Q8=11) or (45<=ppage<=54 and Q8=30) or (55<=ppage<=64 and Q8=75) or (65<=ppage<=74 and Q8=180) or (75<=ppage<=84 and Q8=465) or (ppage>=85 and Q8=465))) or (ppgender=2 and ((35<=ppage<=44 and Q8=3) or (45<=ppage<=54 and Q8=12) or (55<=ppage<=64 and Q8=35) or (65<=ppage<=74 and Q8=115) or (75<=ppage<=84 and Q8=415) or (ppage>=85 and Q8=415))) then Skip to Q9. All else show Q8A]

[Screen 7a]
[Show table 1 again here with the "10 years from now" row highlighted]

Q8A Please review Table 1 again. The age group you will be in 10 years from now is highlighted. According to the table , how many [women ***(if ppgender=2)***/men ***(if ppgender=1)***] out of 10,000 die each year from heart attack in the age group you will be in 10 years from now?

____

[Screen 8]

Q9 Considering your health, your family history, and your lifestyle, do you think your own risk of death from each of these causes is less than, about the same, or more than for others your age?

Select one answer from each row in the grid

	Less than others your age	About the same as others your age	More than others your age
Heart attack	☐	☐	☐
Cancer	☐	☐	☐
Pneumonia	☐	☐	☐
Motor vehicle accident	☐	☐	☐

How long will you live?

[Screen 9]

[ppage=<74]

Table 2 shows estimates of the percentage of [women ***(if ppgender=2)***/men ***(ppgender=1)***] currently age ***[subject's age based on ppage]*** who will live to different ages. The last column shows the same information by showing the number out of 10,000 expected to be alive at various ages.

[ppage>74]

Table 2 shows estimates of the percentage of [women ***(if ppgender=2)***/men ***(ppgender=1)***] currently age ***[subject's age based on ppage]*** who will live 10 years or more. The last column shows the same information by showing the number out of 10,000 expected to be alive in 10 years.

[All]

The highlighted row shows the percentage of [women ***(if ppgender=2)***/men ***(if ppgender=1)***] your age who will live at least 10 more years.

[Show table 2 with "10 or more years" row highlighted]

[If ppage =< 64, show 10, 20 and 30 years

If 64 < ppage =< 74, show 10 and 20 years

If ppage > 74 show 10 years]

Table 2. How long [women *(if ppgender=2)*/**men** *(if ppgender=1)*] **age** *[subject's age based on ppage]* **live**		
Living at least	**Chances of living this long or longer**	**Number out of 10,000 who live this long**
10 more years (to age [ppage + 10])	% [Cell 1]	
20 more years (to age [ppage + 20])	%	
30 more years (to age [ppage + 30])	%	

[Table 2 actual data provided separately by gender and age. See Table 4 at the end of Appendix A.]

Q10 According to Table 2, what percentage of [women (ppgender=2)/men (ppgender=1)] your age will live at least 10 more years?

Enter an answer from 0 to 100

__________%

if Q10~= [Cell 1] or Q10=skip, then show Q10A, Screen 9a.

[Screen 9a]

[Show table 2 with "10 or more years" row highlighted]

Q10A Please review Table 2 again. The highlighted row shows the percentage of [women ***(ppgender=2)***/men ***(ppgender=1)***] your age who will live at least 10 more years. According to Table 2, what percentage of [women ***(ppgender=2)***/men ***(ppgender=1)***] your age will live at least 10 more years?

Enter an answer from 0 to 100

__________%

[Screen 10]

[Show Table 2 without highlighting]

[If ppage =< 64, show 10, 20 and 30 years

If 64 < ppage =< 74, show 10 and 20 years

If ppage > 74 show 10 years]

Q11 How long you will live depends on your age, gender, health and lifestyle, family history, where you live, and other factors.

Thinking about your own situation, how likely do you think it is you will live at least:

10 more years (to age *[ppage + 10]***)?...**

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	☐

20 more years (to age *[ppage + 20]***)?...**

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	☐

30 more years (to age *[ppage + 30]***)?...**

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	☐

[Prompt message if Q11 is skipped]
For the purpose of this study, it is important that you answer this question. Thank you for your cooperation.

[Screen 11]
[Show Q12A and Q12B on the same screen]

12A If you live 10 more years, (to age *[ppage + 10]***), what do you think your overall enjoyment of life will be at that time?**
Select one answer only

Poor	Fair	Good	Very Good	Excellent
☐	☐	☐	☐	☐

[If ppage =< 74]
12B If you live 20 more years, (to age *[ppage + 20]***), what do you think your overall**

enjoyment of life will be at that time?
Select one answer only

Poor	Fair	Good	Very Good	Excellent
☐	☐	☐	☐	☐

Reducing Risks of Death

[Screen 12]

Your decisions about lifestyle, health care, and travel safety can reduce your risks of death. Society's decisions can also reduce your risks of death, such as through actions about pollution control and transportation safety.

Table 3 shows examples of actions some people take to reduce their risks of death, and the average risk reduction achieved each year.

Q13 Do you personally take, or would you consider taking, these actions to reduce your risks of death?

[if ppgender=1] Select Yes, No, or Don't Know for each action

Table 3. Examples of actions to reduce risks of death each year

Action	**Average reduction in individual risk of death each year**	**Do you, or would you, do this?** Yes	No	Don't know
Never smoking cigarettes	**26 in 10,000**	☐	☐	☐
Living in an area in the U.S. with the cleanest air (compared to living in an area with average air pollution)	**3 in 10,000**	☐	☐	☐
Annual colon cancer screening (50 years and older)	**3 in 10,000**	☐	☐	☐
Annual prostate screening (men 70 years and older) (men 50 years or older)	**2 in 10,000 1 in 10,000**	☐	☐	☐
Regularly wearing an automobile seat belt	**1 in 10,000**	☐	☐	☐
Using a smoke detector in your home	**1 in 100,000**	☐	☐	☐

[if ppgender=2] Select Yes, No, or Don't Know for each action

Table 3. Examples of actions to reduce risks of death each year				
Action	**Average reduction in individual risk of death each year**	**Do you, or would you, do this?** Yes	No	Don't know
Never smoking cigarettes	**26 in 10,000**	☐	☐	☐
Living in an area in the U.S. with the cleanest air (compared to living in an area with average air pollution)	**3 in 10,000**	☐	☐	☐
Annual colon cancer screening (50 years and older)	**2 in 10,000**	☐	☐	☐
Annual mammogram (40 years and older)	**2 in 10,000**	☐	☐	☐
Regularly wearing an automobile seat belt	**1 in 10,000**	☐	☐	☐
Using a smoke detector in your home	**1 in 100,000**	☐	☐	☐

[Screen 13]
[if ppgender=1]

Table 3. Examples of actions to reduce risks of death each year	
Action	**Average reduction in individual risk of death each year**
Never smoking cigarettes	**26 in 10,000**
Living in an area in the U.S. with the cleanest air (compared to living in an area with average air pollution)	**3 in 10,000**
Annual colon cancer screening (50 years and older)	**3 in 10,000**
Annual prostate screening (men 70 years and older) **(men 50 years or older)**	**2 in 10,000** **1 in 10,000**
Regularly wearing an automobile seat belt	**1 in 10,000**
Using a smoke detector in your home	**1 in 100,000**

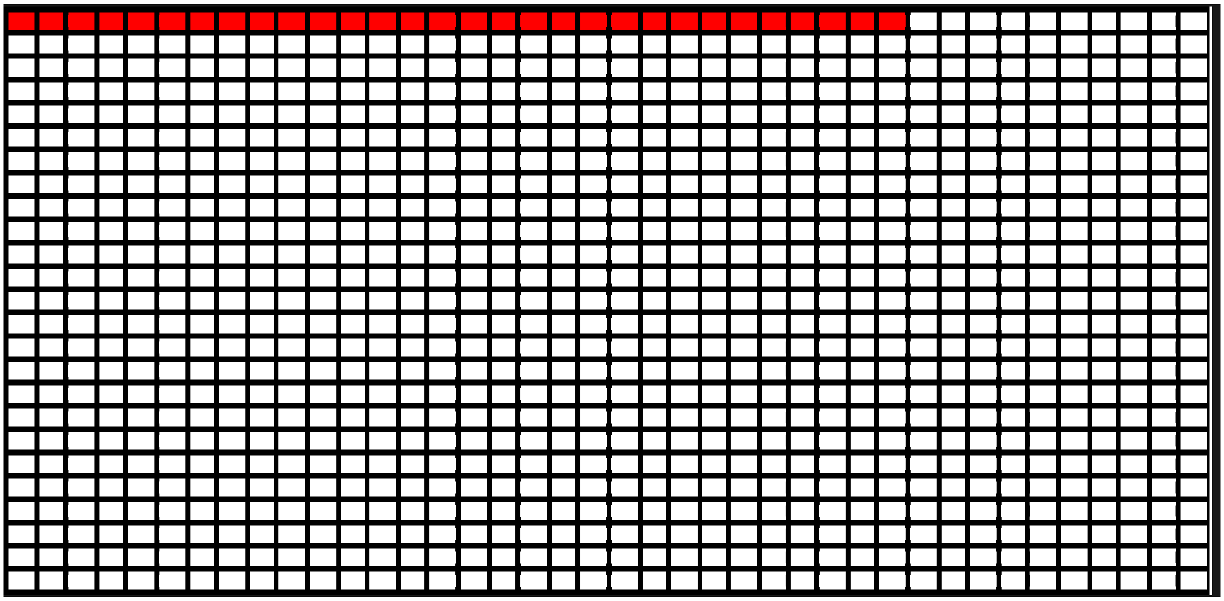
[If ppgender=2]

Table 3. Examples of actions to reduce risks of death each year	
Action	**Average reduction in individual risk of death each year**
Never smoking cigarettes	**26 in 10,000**
Living in an area in the U.S. with the cleanest air (compared to living in an area with average air pollution)	**3 in 10,000**
Annual colon cancer screening (50 years and older)	**2 in 10,000**
Annual mammogram (40 years and older)	**2 in 10,000**
Regularly wearing an automobile seat belt	**1 in 10,000**
Using a smoke detector in your home	**1 in 100,000**

Q14 How important to you, if at all, is it to reduce your risk of death each year by 1 in 10,000 for the rest of your life?
Select one answer only

Not at all important	Only a little important	Somewhat important	Very important	Extremely important
☐	☐	☐	☐	☐

[Screen 14]
[# who die in next 10 years (from Table 4) by gender and age—shown in red].



[if ppgender=2 Figure legend is:]
This figure shows the risk reductions another way. The figure shows 1,000 squares to represent 10,000 women. Each square represents 10 women your age. The red squares show the number of women expected to die in the next 10 years out of every 10,000 women your age. These are deaths from all causes.

[if ppgender=1 Figure legend is:]
This figure shows the risk reductions another way. The figure shows 1,000 squares to represent 10,000 men. Each square represents 10 men your age. The red squares show the number of men expected to die in the next 10 years out of every 10,000 men your age. These are deaths from all causes.

[Screen 15]
Repeat squares figure with # fewer who die with 1 in 10,000 risk reduction, shown in green.

A 1 in 10,000 risk reduction each year means that over 10 years there will be 10 fewer deaths. This is shown by 1 square changed from red to green in the figure.

[Screen 16]
Repeat squares figure with # fewer who die with 5 in 10,000 risk reduction, shown in green.

A 5 in 10,000 risk reduction each year means that over 10 years there will be 50 fewer deaths. This is shown by 5 squares changed from red to green in the figure.

[Screen 17]
[Last squares up while Q15 is asked]

Q15 Which answer best completes this sentence: "Compared to reducing risks by 1 in 10,000 each year for the rest of your life, reducing risks by 5 in 10,000 each year for the rest of your life is…"
Select one answer only

- ☐ **Less important**
- ☐ **About as important**
- ☐ **Somewhat more important, but not 5 times more important**
- ☐ **About 5 times more important**
- ☐ **More than 5 times more important**

WHAT RISK REDUCTIONS WOULD YOU PREFER?

[Screen 18]

Some actions may result in immediate and ongoing reductions in fatal risk, such as improving transportation safety. Other actions may reduce the chances of death in the future, such as using sunscreen or reducing pollution exposure to reduce the risk of future cancer.

[Screen 19]

Each of the next questions compare two alternatives to reduce your risk of death over time. We are interested in understanding which types of risk reductions you would prefer.

When answering these questions:

- **Do not be concerned about what the actions are to reduce risk—we just want you to consider the risk reductions.**
- **Assume these actions would not cost you anything.**

[Screen 20]

For the next questions, you can look back at the tables shown earlier in the survey by clicking the links:

"Click here to view Table 1" shows average risks of death.

"Click here to view Table 2" shows chances of living to various ages.

"Click here to view Table 3" shows examples of risk reduction actions.

[Link the hyperlink to Table 1, Table 2, and Table 3 based on ppgender and ppage]

Voice for Screen 21: require this voiceover before proceeding
[if (version1=1,2,3,4,6,11,12) and (next=1) embed= "vq16cancer1.mp3"]
[if (version1=1,2,3,4,6,11,12) and (next=2) embed= "vq16cancer2.mp3"]
[if (version1=5,7,8,9,10,13) and (next=1) embed= "vq16heart1.mp3"]
[if (version1=5,7,8,9,10,13) and (next=2) embed= "vq16heart2.mp3"]

Vq16cancer1.

We want to know which fatal risk reduction you would prefer. First, look at Alternative A, which reduces chances of fatal cancer. No other illness or accident risks are reduced.Alternative A reduces your risk by a constant amount every year for the rest of your life.

Now look at Alternative B, which also reduces chances of fatal cancer. No other illness or accident risks are reduced. There is no change in your risks over the next 10 years, but after 10 years your risk is reduced by a greater amount than in Alternative A every year from then on.

Vq16cancer2.

We want to know which fatal risk reduction you would prefer. First, look at Alternative A, which reduces chances of fatal cancer. No other illness or accident risks are reduced. Alternative A reduces your risk by a constant amount every year for the rest of your life.

Now look at Alternative B, which also reduces chances of fatal cancer. No other illness or accident risks are reduced. There is no change in your risks over the next 20 years, but after 20 years your risk is reduced by a greater amount than in Alternative A every year from then on.

Vq16heart1.

We want to know which fatal risk reduction you would prefer. First, look at Alternative A, which reduces chances of fatal heart attack. No other illness or accident risks are reduced. Alternative A reduces your risk by a constant amount every year for the rest of your life.

Now look at Alternative B, which also reduces chances of fatal heart attack. No other illness or accident risks are reduced. There is no change in your risks over the next 10 years, but after 10 years your risk is reduced by a greater amount than in Alternative A every year from then on.

Vq16heart2.

We want to know which fatal risk reduction you would prefer. First, look at Alternative A, which reduces chances of fatal heart attack. No other illness or accident risks are reduced.

Alternative A reduces your risk by a constant amount every year for the rest of your life.

Now look at Alternative B, which also reduces chances of fatal heart attack. No other illness or accident risks are reduce. There is no change in your risks over the next 20 years, but after 20 years your risk is reduced by a greater amount than in Alternative A every year from then on.

[Screen 21]

Q16 Would you prefer Alternative A or Alternative B to reduce your risk of death?

	Alternative A Constant annual risk reduction	**Alternative B** Delayed annual risk reduction
Reduced risk for fatal	[heart attack/cancer]	[heart attack/cancer]
Risk reduction each year:	reduced each year by:	Reduced each year by:
For the next [10] years	[1] in 10,000	no reduction
[11] years from now and onward	[1] in 10,000	[2] in 10,000
Your current risks	Click here to view Table 1	
	A	B
Which do you prefer?	☐	☐

Click here to view Table 2

Click here to view Table 3

[Screen 22]

The next questions are very similar. Please review the description of the alternatives and choose the risk reduction that you prefer.

Please notice that in some questions the risk reductions are for different causes of death, and the timing and amount of risk reduction vary.

[Screen 23]

Q17 Would you prefer Alternative A or Alternative B to reduce your risk of death?

	Alternative A **Constant annual risk reduction**	**Alternative B** **Constant annual risk reduction**
Reduced risk for fatal	[motor vehicle accident/cancer]	[cancer/motor vehicle accident]
Risk reduction each year:	reduced each year by:	reduced each year by:
For the next [10] years	[1] in 10,000	[1] in 10,000
[11] years from now and onward	[1] in 10,000	[1] in 10,000
Your current risks	Click here to view Table 1	

	A	B
Which do you prefer?	☐	☐

Click here to view Table 2

Click here to view Table 3

[Screen 24]

Q18 Would you prefer Alternative A or Alternative B to reduce your risk of death?

	Alternative A Constant annual risk reduction	**Alternative B** Near term annual risk reduction
Reduced risk for fatal	[cancer]	[cancer]
Risk reduction each year:	reduced each year by:	reduced each year by:
For the next [10] years	[1] in 10,000	[2] in 10,000
[11] years from now and onward	[1] in 10,000	no reduction
Your current risks	Click here to view Table 1	

Which do you prefer?	A ☐	B ☐

Click here to view Table 2

Click here to view Table 3

[Screen 25]

Q19 Would you prefer Alternative A or Alternative B to reduce your risk of death?

	<u>Alternative A</u> **[Near term] annual risk reduction**	**<u>Alternative B</u>** **[Delayed] annual risk reduction**
Reduced risk for fatal	[heart attack]	[heart attack]
Risk reduction <u>each year:</u>	reduced each year by:	reduced each year by:
For the next [10] years	[1 in 10,000]	[no reduction]
[11] years from now and onward	[no reduction]	[2 in 10,000]
Your current risks	Click here to view Table 1	
Which do you prefer?	A ☐	B ☐

Click here to view Table 2

Click here to view Table 3

[Screen 26]
Q20 Would you prefer Alternative A or Alternative B to reduce your risk of death?

	<u>Alternative A</u> **[Delayed] annual risk reduction**	**<u>Alternative B</u>** **[Delayed] annual risk reduction**
Reduced risk for fatal	[cancer]	[pneumonia]
Risk reduction each year:	reduced each year by:	reduced each year by:
For the next [10] years	[no reduction]	[no reduction]
[11] years from now and onward	[1 in 10,000]	[1 in 10,000]
Your current risks	Click here to view Table 1	

Which do you prefer? A ☐ B ☐

Click here to view Table 2

Click here to view Table 3

[Screen 27]

Q20a For the last 5 questions selecting Alternative A or B, how confident are you that your answers accurately reflect your preferences about reducing fatal risks?

Select one answer only

Not at all confident	Slightly confident	Somewhat confident	Very confident	Extremely confident
☐	☐	☐	☐	☐

HEALTH CARE OPTIONS

[Screen HC1]

The next questions consider new health care options that may become available to reduce your risks of having a fatal illness. The kinds of new health care options we want you to think about are things like:

- **annual screening procedures**
- **preventative medicines and treatments**
- **nutritional supplements and other health enhancing products**

[Screen HC2]

HC2 New health care options will cost money. Some of the costs may be paid by government or private insurance, but some costs may have to be paid by you. If you were interested in a new health care option, how much hardship would it cause you if the cost to you was each of the amounts shown:

Select one answer from each row in the grid

	No hardship	A small hardship	Some hardship	A moderate hardship	A great hardship
$50/year	☐	☐	☐	☐	☐
$500/year	☐	☐	☐	☐	☐
$1,000/year	☐	☐	☐	☐	☐
$5,000/year.	☐	☐	☐	☐	☐

[Screen HC3]
[Voice reads text as it appears on the screen]
[All, embed= "vhc3intro.mp3"]

The following questions ask you to choose between two alternative health care options to reduce your fatal risk. While answering these questions, please assume:

- **The health care options will have no side effects and will cause you little or no inconvenience.**

- **To be effective, the health care option will need to be started now for both current and delayed risk reductions**

- **The health care option will need to be continued, and paid for, every year throughout your life to continue giving you the stated risk reduction.**

- **The costs shown are out-of-pocket costs to you that are not covered by any insurance.**

[Show Screen HC4 while the voice over reads the following. Require this voiceover]
[All, embed= "vhc3.mp3"]
Alternatives A and B are two new health care options that would reduce fatal risk by the amounts shown every year and cost you the amounts shown every year, starting this year. Please tell us whether you would prefer Alternative A or Alternative B if these were your only choices. Later, you will be given the choice to have no change in health care.

[Screen HC4]
HC3 If you had to choose, would you prefer Alternative A or Alternative B?

	Alternative A [Constant] annual risk reduction	**Alternative B** [Delayed] annual risk reduction
Reduced risk for fatal	[cancer]	[cancer]
Risk reduction each year:	reduced each year by:	reduced each year by:
For the next [10] years	[1 in 10,000]	[no reduction]
[11] years from now and onward	[1 in 10,000]	[2 in 10,000]
Your current risks	Click here to view Table 1	
Additional costs you pay each year starting now	$[x]	$[y]
Which do you prefer?	A ☐	B ☐

Click here to view Table 2

Click here to view Table 3

[Screen HC5]
[show table from Question HC3 with the choice they selected highlighted]

HC4 These are the choices you saw in the previous question with the selection you made highlighted. Would you prefer Alternative [A/B] you just selected, or to do nothing more to reduce your risks of dying, and having no additional health care costs?
Select one answer only

- ☐ I prefer Alternative [A/B] I chose above.
- ☐ I prefer to do nothing more and have no reduction in risk and no more health care costs.

[Screen HC6]

The next questions are very similar. Please review the description of the alternatives and choose the alternative that you prefer.

Please notice that in some questions the health care options are for different causes of death, and the risk reductions (size and timing) and out-of-pocket costs to you vary.

[Screen HC7]

HC5 If you had to choose, would you prefer Alternative A or Alternative B?

	<u>Alternative A</u> **[Constant] annual risk reduction**	**<u>Alternative B</u>** **[Constant] annual risk reduction**
Reduced risks for fatal	[heart attack]	[cancer]
Risk reduction <u>each year:</u> For the next [10] years [11] years from now and onward	reduced each year by: [1 in 10,000] [1 in 10,000]	reduced each year by: [2 in 10,000] [2 in 10,000]
Your current risks	Click here to view Table 1	
Additional costs you pay each year starting now	$[x]	$[x]
Which do you prefer?	A ☐	B ☐

Click here to view Table 2

Click here to view Table 3

[Screen HC8]
[show table from Question HC5 with the choice they selected highlighted]

HC6 These are the choices you saw in the previous question with the selection you made highlighted. Would you prefer Alternative [A/B] you just selected, or to do nothing more to reduce your risks of dying, and having no additional health care costs?
Select one answer only

- ☐ I prefer Alternative [A/B] I chose above.
- ☐ I prefer to do nothing more and have no reduction in risk and no more health care costs.

[Screen HC9]

HC7 If you had to choose, would you prefer Alternative A or Alternative B?

	<u>Alternative A</u> **[Constant] annual risk reduction**	**<u>Alternative B</u>** **[Delayed] annual risk reduction**
Reduced risks for fatal	[cancer]	[cancer]
Risk reduction <u>each year:</u> For the next [10] years [11] years from now and onward	reduced each year by: [1 in 10,000] [1 in 10,000]	reduced each year by: [no reduction] [5 in 10,000]
Your current risks	Click here to view Table 1	
Additional costs you pay each year starting now	$[x]	$[x]

	A	B
Which do you prefer?	☐	☐

Click here to view Table 2

Click here to view Table 3

[Screen HC10]
[show table from Question HC7 with the choice they selected highlighted]

HC8 These are the choices you saw in the previous question with the selection you made highlighted. Would you prefer Alternative [A/B] you just selected, or to do nothing more to reduce your risks of dying, and having no additional health care costs?
Select one answer only

☐ I prefer Alternative [A/B] I chose above.
☐ I prefer to do nothing more and have no reduction in risk and no more health care costs

[Screen HC11]

HC9 If you had to choose, would you prefer Alternative A or Alternative B?

	Alternative A **[Delayed] annual risk reduction**	**Alternative B** **[Delayed] annual risk reduction**
Reduced risks for fatal	[pneumonia]	[cancer]
Risk reduction each year: For the next [10] years [11] years from now and onward	reduced each year by: [no reduction] [1 in 10,000]	reduced each year by: [no reduction] [5 in 10,000]
Your current risks	Click here to view Table 1	
Additional costs you pay each year starting now	$x	$x
Which do you prefer?	A ☐	B ☐

Click here to view Table 2

Click here to view Table 3

[Screen HC12]
[show table from Question HC9 with the choice they selected highlighted]

HC10 These are the choices you saw in the previous question with the selection you made highlighted. Would you prefer Alternative [A/B] you just selected, or to do nothing more to reduce your risks of dying, and having no additional health care costs?
Select one answer only

- ☐ I prefer Alternative [A/B] I chose above.
- ☐ I prefer to do nothing more and have no reduction in risk and no more health care costs

[Screen HC13]

HC10a **Now suppose that you were offered a new health care option that would reduce your annual risk of fatal [cancer] as shown below every year for the rest of your life if you continue it each year.**

	Constant annual risk reduction
Reduced risks for fatal	[cancer]
Risk reduction each year: For the next [10] years [11] years from now and onward	reduced each year by: [1] in 10,000 [1] in 10,000
Your current risks	click here to view Table 1

What is the most you would be willing to pay each year out of your own pocket for this health care option?

Select a dollar amount, or fill in any specific amount

$0	$1	$4	$7	$30
$50	$80	$130	$220	$340
$550	$720	$900	$1,100	$1,400
$1,600	$2,200	$2,600	$3,200	$6,200

Other (please indicate how much) $ _______________

Click here to view Table 2

Click here to view Table 3

[Screen HC14]

HC11 The following are statements some people tell us about their answers to the questions about choosing between alternatives to reduce fatal risks. From strongly agree to strongly disagree, how do you feel about these statements?
Select one answer from each row in the grid

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
I think my insurance should pay for any new health care options to reduce risk of fatal illness.	☐	☐	☐	☐	☐
I could answer these questions reflecting what I would prefer if I did have to pay for the new health care options.	☐	☐	☐	☐	☐
I don't believe there are any new health care options that would reduce my risks of death.	☐	☐	☐	☐	☐

[Screen HC15]

Again, the following are statements some people tell us about their answers to the questions about choosing between alternatives to reduce fatal risks. From strongly agree to strongly disagree, how do you feel about these statements?
Select one answer from each row in the grid

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
I had concerns that the health care options would have negative side effects or would be inconvenient to me, and this affected my answers.	☐	☐	☐	☐	☐
I was thinking that the health care options would reduce risks of nonfatal illness as well as reduce risks of death, and this affected my answers.	☐	☐	☐	☐	☐

[Screen HC16]

HC14 Please provide us with any additional comments to help us understand your answers.

Living in Different Locations

[Screen RL1]

The risks of fatal illnesses and accidents vary within a metropolitan area and across the country due to differences in pollution levels, differences in transportation safety, and other factors.

In the next questions we want you to assume that you alone will be moving. You must choose between two different locations other than where you now live. These new locations will have the same or reduced risks of fatal illnesses and fatal accidents compared to where you now live.

[Screen RL2]

RL1 Moving to another location with lower risks of fatal illnesses and accidents may increase your "cost of living." By cost of living we mean your costs for housing, transportation, and other expenses. How much hardship would it cause you if, compared to now, your individual cost of living increased by each of the amounts shown?

Select one answer from each row in the grid

	No hardship	A small hardship	Some hardship	A moderate hardship	A great hardship
$50/year	☐	☐	☐	☐	☐
$500/year	☐	☐	☐	☐	☐
$1,000/year	☐	☐	☐	☐	☐
$5,000/year.	☐	☐	☐	☐	☐

[Screen RL3]

We understand you may find it difficult to think about "moving alone." However, we want to understand how, if you had to, you would trade off reducing risks of fatal illnesses and fatal accidents just for yourself versus increased cost of living just for yourself.

Because only you would be moving, consider only the risks of fatal illnesses and fatal accidents for yourself.

[Screen RL4]
[Voice read text as it appears on the screen]
[All, embed= "vrl2intro2.mp3"]

In making your choices between the two locations, please assume:

- **The two locations are identical in terms of the quality of life, your work, or any factors that may influence where you want to live.**
- **The only real differences are the risks of fatal illnesses and of fatal motor vehicle accidents, and the cost of living. Your income will remain the same as it is now.**
- **The only risk changes are those shown for each location. All other risks would remain the same.**

[Screen RL5]
[Show screen RL5 while the voiceover reads: Require this voiceover
[All, embed= "vrl2.mp3"]
Locations A and B are two alternative locations where your fatal risk would be lower every year by the amounts shown and your personal cost of living would be higher by the amounts shown every year, starting this year. Please tell us whether you would prefer Location A or Location B if these were your only choices. Later, you will be given the choice of a new location with no change in risk or cost.

[Screen RL5]

RL2 If you had to choose, would you prefer Location A or Location B?

	Location A [Constant] annual risk reduction	**Location B** [Delayed] annual risk reduction
Reduced risks for fatal	[cancer]	[cancer]
Risk reduction each year:	reduced each year by:	reduced each year by:
For the next [10] years	[1 in 10,000]	[no reduction]
[11] years from now and onward	[1 in 10,000]	[5 in 10,000]
Your current risks	Click here to view Table 1	
Your increased cost of living each year starting now	$[x]	$[x]
Which do you prefer?	A ☐	B ☐

Click here to view Table 2

Click here to view Table 3

[Screen RL6]

[show table from Question RL2 with the choice they selected highlighted]

RL3 These are the choices you saw in the previous question with the selection you made highlighted. If you were moving, would you prefer to move to Location [A/B] you just selected, or to move to another Location C where there would be no reduction in your risks of dying and where the cost of living would be the same as you now have?

Select one answer only

☐ I prefer Location [A/B] that I chose above.

☐ I prefer Location C with no reduction in risks and the same cost of living as I now have.

[Screen RL7]

The next questions are very similar. Please review the description of the alternatives and choose the alternative that you prefer.

Please notice that risk reductions in some questions are for different causes of death, and the risk reductions (size and timing) and cost of living changes vary.

[Screen RL8]

RL4 If you had to choose, would you prefer Location A or Location B?

	<u>Location A</u> **[Constant] annual risk reduction**	**<u>Location B</u>** **[Constant] annual risk reduction**
Reduced risks for fatal	[heart attack]	[cancer]
Risk reduction <u>each year:</u> For the next [10] years [11] years from now and onward	reduced each year by: [1 in 10,000] [1 in 10,000]	reduced each year by: [2 in 10,000] [2 in 10,000]
Your current risks	Click here to view Table 1	
Your increased cost of living each year starting now	$[x]	$[x]

	A	B
Which do you prefer?	☐	☐

Click here to view Table 2

Click here to view Table 3

[Screen RL9]
[show table from Question RL4 with the choice they selected highlighted]

RL5 These are the choices you saw in the previous question with the selection you made highlighted. If you were moving, would you prefer to move to Location [A/B] you just selected, or to move to another Location C where there would be no reduction in your risks of dying and where the cost of living would be the same as you now have?

Select one answer only

☐ I prefer Location [A/B] that I chose above.
☐ I prefer Location C with no reduction in risks and the same cost of living as I now have.

[Screen RL10]

RL6 If you had to choose, would you prefer Location A or Location B?

	<u>Location A</u> **[Constant] annual risk reduction**	**<u>Location B</u>** **[Constant] annual risk reduction**
Reduced risks for fatal	[heart attack]	[cancer]
Risk reduction <u>each year:</u> For the next [10] years [11] years from now and onward	reduced each year by: [1 in 10,000] [1 in 10,000]	reduced each year by: [2 in 10,000] [2 in 10,000]
Your current risks	Click here to view Table 1	
Your increased cost of living each year starting now	$[x]	$[x]
Which do you prefer?	A ☐	B ☐

Click here to view Table 2

Click here to view Table 3

[Screen RL11]
[show table from Question RL6 with the choice they selected highlighted]

RL7 These are the choices you saw in the previous question with the selection you made highlighted. If you were moving, would you prefer to move to Location [A/B] you just selected, or to move to another Location C where there would be no reduction in your risks of dying and where the cost of living would be the same as you now have?

Select one answer only

☐ I prefer Location [A/B] that I chose above.
☐ I prefer Location C with no reduction in risks and the same cost of living as I now have.

[Screen RL12]

RL8 If you had to choose, would you prefer Location A or Location B?

	<u>Location A</u> **[Delayed] annual risk reduction**	**<u>Location B</u>** **[Delayed] annual risk reduction**

Reduced risks for fatal	[heart attack]	[pneumonia]
Risk reduction <u>each year:</u> For the next [10] years [11] years from now and onward	reduced each year by: [no reduction] [5 in 10,000]	reduced each year by: [no reduction] [1 in 10,000]
Your current risks	Click here to view Table 1	
Your increased cost of living each year starting now	$[x]	$[x]

Which do you prefer? A ☐ B ☐

Click here to view Table 2

Click here to view Table 3

[Screen RL13]
[show table from Question RL8 with the choice they selected highlighted]

RL9 These are the choices you saw in the previous question with the selection you made highlighted. If you were moving, would you prefer to move to Location [A/B] you just selected, or to move to another Location C where there would be no reduction in your risks of dying and where the cost of living would be the same as you now have?
Select one answer only

☐ I prefer Location [A/B] that I chose above.
☐ I prefer Location C with no reduction in risks and the same cost of living as I now have.

[Screen RL14]

RL10 Now suppose that you were moving alone to either A or C. In Location A your annual fatal risk from [motor vehicle accident] would be less than in C as shown below. Please assume that all other risks are the same.

	<u>Location A</u> **Constant annual risk reduction**	**<u>Location C</u>** **No risk reduction**

Reduced risks for fatal	[motor vehicle accidents]	no reduction
Risk reduction each year: For the next [10] years [11] years from now and onward	reduced each year by: [1] in 10,000 [1] in 10,000	reduced each year by: no reduction no reduction
Your current risks	Click here to view Table 1	

What is the most you would be willing to pay in higher annual cost of living per person to live in Location A rather than Location C?
Select a dollar amount, or fill in any specific amount

$0	$1	$4	$7	$30
$50	$80	$130	$220	$340
$550	$720	$900	$1,100	$1,400
$1,600	$2,200	$2,600	$3,200	$6,200

Other (please indicate how much) $ _______________

Click here to view Table 2

Click here to view Table 3

[Screen RL15]

RL11 The following are statements some people tell us about their answers to the questions about choosing between alternatives to reduce fatal risks. From strongly agree to strongly disagree, how do you feel about these statements?
Select one answer from each row in the grid

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
Although I may not want to move by myself, I could answer these questions reflecting what I would prefer if I did have to move alone.	☐	☐	☐	☐	☐
I don't believe my risk of death could be lower in different locations.	☐	☐	☐	☐	☐

[Screen RL16]

Again, the following are statements some people tell us about their answers to the questions about choosing between alternatives to reduce fatal risks. From strongly agree to strongly disagree, how do you feel about these statements?
Select one answer from each row in the grid

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
Moving alone would be very difficult for me, and this affected my answers.	☐	☐	☐	☐	☐
I was thinking that in different locations I would have reduced risks of nonfatal illness and accidents as well as reduced risks of death, and this affected my answers.	☐	☐	☐	☐	☐

[Screen RL17]

RL14 Please provide us with any additional comments to help us understand your answers.

Table 4. Life expectancy data (data for survey Table 2).

Age	Stationary population in	Percentage who will live X years	Number out of 10,000 who will live X years	Number who die in 10 years

	the age interval	10 years	20 years	30 years	10 years	20 years	30 years	(for dots)
For U.S. men								
35	96,093	97%	92%	80%	9,700	9,200	8,000	300
36	95,907	97%	91%	78%	9,700	9,100	7,800	300
37	95,711	97%	91%	77%	9,700	9,100	7,700	300
38	95,502	97%	90%	75%	9,700	9,000	7,500	300
39	95,279	96%	89%	73%	9,600	8,900	7,300	400
40	95,039	96%	88%	71%	9,600	8,800	7,100	400
41	94,780	96%	87%	69%	9,600	8,700	6,900	400
42	94,503	96%	86%	66%	9,600	8,600	6,600	400
43	94,205	95%	85%	64%	9,500	8,500	6,400	500
44	93,883	95%	83%	61%	9,500	8,300	6,100	500
45	93,536	94%	82%	59%	9,400	8,200	5,900	600
46	93,161	94%	81%	56%	9,400	8,100	5,600	600
47	92,756	93%	79%	53%	9,300	7,900	5,300	700
48	92,321	93%	77%	50%	9,300	7,700	5,000	700
49	91,856	92%	76%	47%	9,200	7,600	4,700	800
50	91,360	92%	74%	44%	9,200	7,400	4,400	800
51	90,830	91%	72%	41%	9,100	7,200	4,100	900
52	90,262	90%	69%	38%	9,000	6,900	3,800	1,000
53	89,651	89%	67%	35%	8,900	6,700	3,500	1,100
54	88,990	88%	65%	31%	8,800	6,500	3,100	1,200
55	88,273	87%	62%	28%	8,700	6,200	2,800	1,300
56	87,492	86%	60%	25%	8,600	6,000	2,500	1,400
57	86,640	85%	57%	22%	8,500	5,700	2,200	1,500
58	85,715	83%	54%	19%	8,300	5,400	1,900	1,700
59	84,710	82%	51%	16%	8,200	5,100	1,600	1,800
60	83,622	80%	49%	13%	8,000	4,900	1,300	2,000
61	82,442	79%	45%	11%	7,900	4,500		2,100
62	81,166	77%	42%	9%	7,700	4,200		2,300
63	79,788	75%	39%	7%	7,500	3,900		2,500
64	78,311	74%	35%	6%	7,400	3,500		2,600
65	76,736	72%	32%		7,200	3,200		2,800
66	75,069	70%	29%		7,000	2,900		3,000
67	73,302	67%	26%		6,700	2,600		3,300
68	71,421	65%	22%		6,500	2,200		3,500
69	69,412	63%	19%		6,300	1,900		3,700
70	67,272	60%	17%		6,000	1,700		4,000
71	65,010	58%	14%		5,800	1,400		4,200
72	62,636	55%	12%		5,500	1,200		4,500
73	60,161	52%	10%		5,200	1,000		4,800
74	57,594	48%	8%		4,800			5,200

Table 4. Life expectancy data (data for survey Table 2) (cont.).

Age	Stationary population in the age interval	Percentage who will live X years			Number out of 10,000 who will live X years			Number who die in 10 years (for dots)
		10 years	20 years	30 years	10 years	20 years	30 years	
For U.S. men (cont.)								

75	54,944	45%			4,500			5,500
76	52,223	41%			4,100			5,900
77	49,435	38%			3,800			6,200
78	46,573	34%			3,400			6,600
79	43,624	31%			3,100			6,900
80	40,579	28%			2,800			7,200
81	37,439	24%			2,400			7,600
82	34,226	22%			2,200			7,800
83	30,992	19%			1,900			8,100
84	27,798	16%			1,600			8,400
85	24,677							
86	21,651							
87	18,759							
88	16,037							
89	13,517							
90	11,222							
91	9,169							
92	7,366							
93	5,814							
94	4,505							
For U.S. women								
35	97,915	99%	95%	88%	9,900	9,500	8,800	100
36	97,814	98%	95%	86%	9,800	9,500	8,600	200
37	97,705	98%	94%	85%	9,800	9,400	8,500	200
38	97,589	98%	94%	84%	9,800	9,400	8,400	200
39	97,463	98%	93%	83%	9,800	9,300	8,300	200
40	97,328	98%	93%	81%	9,800	9,300	8,100	200
41	97,182	98%	92%	80%	9,800	9,200	8,000	200
42	97,025	97%	91%	78%	9,700	9,100	7,800	300
43	96,857	97%	91%	76%	9,700	9,100	7,600	300
44	96,676	97%	90%	74%	9,700	9,000	7,400	300
45	96,482	97%	89%	72%	9,700	8,900	7,200	300
46	96,272	96%	88%	70%	9,600	8,800	7,000	400
47	96,046	96%	87%	68%	9,600	8,700	6,800	400
48	95,799	96%	86%	65%	9,600	8,600	6,500	400
49	95,531	95%	84%	63%	9,500	8,400	6,300	500
50	95,239	95%	83%	60%	9,500	8,300	6,000	500
51	94,920	94%	82%	57%	9,400	8,200	5,700	600
52	94,572	94%	80%	54%	9,400	8,000	5,400	600
53	94,192	93%	78%	50%	9,300	7,800	5,000	700

Table 4. Life expectancy data (data for survey Table 2) (cont.).

Age	Stationary population in the age interval	Percentage who will live X years			Number out of 10,000 who will live X years			Number who die in 10 years (for dots)
		10 years	20 years	30 years	10 years	20 years	30 years	
For U.S. women (cont.)								
54	93,778	93%	77%	47%	9,300	7,700	4,700	700
55	93,326	92%	75%	43%	9,200	7,500	4,300	800
56	92,830	91%	73%	40%	9,100	7,300	4,000	900
57	92,285	90%	71%	36%	9,000	7,100	3,600	1,000

58	91,689	90%	68%	32%	9,000	6,800	3,200	1,000
59	91,039	89%	66%	29%	8,900	6,600	2,900	1,100
60	90,330	88%	63%	25%	8,800	6,300	2,500	1,200
61	89,554	86%	60%	22%	8,600	6,000	2,200	1,400
62	88,709	85%	57%	18%	8,500	5,700	1,800	1,500
63	87,791	84%	54%	15%	8,400	5,400	1,500	1,600
64	86,801	83%	51%	13%	8,300	5,100	1,300	1,700
65	85,741	81%	47%		8,100	4,700		1,900
66	84,609	80%	44%		8,000	4,400		2,000
67	83,397	78%	40%		7,800	4,000		2,200
68	82,088	76%	36%		7,600	3,600		2,400
69	80,667	74%	32%		7,400	3,200		2,600
70	79,125	72%	28%		7,200	2,800		2,800
71	77,464	70%	25%		7,000	2,500		3,000
72	75,688	67%	22%		6,700	2,200		3,300
73	73,797	64%	18%		6,400	1,800		3,600
74	71,793	61%	15%		6,100	1,500		3,900
75	69,675	58%			5,800			4,200
76	67,466	55%			5,500			4,500
77	65,096	51%			5,100			4,900
78	62,603	47%			4,700			5,300
79	59,946	43%			4,300			5,700
80	57,109	39%			3,900			6,100
81	54,097	36%			3,600			6,400
82	50,913	32%			3,200			6,800
83	47,566	28%			2,800			7,200
84	44,075	25%			2,500			7,500
85	40,477							
86	36,820							
87	33,149							
88	29,512							
89	25,961							
90	22,546							
91	19,312							
92	16,301							

Table 4. Life expectancy data (data for survey Table 2) (cont.).

Age	Stationary population in the age interval	Percentage who will live X years			Number out of 10,000 who will live X years			Number who die in 10 years (for dots)
		10 years	20 years	30 years	10 years	20 years	30 years	
For U.S. women (cont.)								
93	13,547							
94	11,074							

Source: United States Life Tables, 1998 by Robert N. Anderson in National Vital Statistics Reports Vol 48, Number 18, February 7, 2001.

B. Dollar Choice Question Versions and Results

Table B.1. Dollar choice questions versions and results ages 35-44, health care payment vehicle.

Number of respondents		41		39		37		34		38		41	
		Version 1		Version 2		Version 3		Version 4		Version 5		Version 6	
Question	Variable	A	B	A	B	A	B	A	B	A	B	A	B
HC3	Fatality	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	2	1	2	1	2	1	2	1	2	1	2
	Next 11+/21+ yrs	1	2	1	2	1	2	1	2	1	2	1	2
	Cost	$50	$100	$50	$200	$100	$150	$200	$500	$500	$1,500	$1,000	$1,500
HC4	% chose	41%	59%	56%	44%	35%	65%	62%	38%	71%	29%	39%	61%
	% stayed with RR	59%	92%	73%	94%	38%	88%	43%	77%	48%	73%	44%	72%
HC5	Fatality	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer
	Timing words	Constant	Delayed	Constant	Delayed	Constant	Delayed	Constant	Delayed	Constant	Delayed	Constant	Delayed
	Next 10/20 yrs	1	0	1	0	1	0	1	0	2	0	1	0
	Next 11+/21+ yrs	1	1	1	1	1	1	1	1	2	1	1	1
	Cost	$100	$25	$200	$100	$50	$25	$500	$200	$1,000	$200	$1,000	$250
HC6	% chose	44%	56%	51%	49%	65%	35%	50%	50%	42%	58%	29%	71%
	% stayed with RR	89%	52%	90%	68%	83%	46%	82%	35%	75%	59%	92%	66%
HC7	Fatality	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	2	1	2	1	1	1	2	1	2	1	1	1
	Next 11+/21+ yrs	2	1	2	1	1	1	2	1	2	1	1	1
	Cost	$200	$50	$100	$50	$100	$200	$500	$200	$2,000	$1,000	$200	$100
HC8	% chose	34%	66%	54%	44%	89%	11%	53%	47%	24%	76%	41%	59%
	% stayed with RR	86%	59%	86%	59%	73%	75%	72%	44%	100%	52%	100%	79%
HC9	Fatality	Cancer	Cancer	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart
	Timing words	Constant	Delayed	Delayed	Constant	Delayed	Constant	Delayed	Constant	Constant	Constant	Delayed	Constant
	Next 10/20 yrs	2	0	0	1	0	1	0	1	1	1	0	1
	Next 11+/21+ yrs	2	1	1	1	1	1	1	1	1	1	1	1
	Cost	$200	$50	$200	$500	$100	$200	$100	$500	$500	$500	$500	$1,000
HC10	% chose	46%	54%	79%	18%	51%	49%	59%	41%	58%	42%	63%	34%
	% stayed with RR	100%	50%	74%	71%	63%	78%	55%	93%	73%	69%	73%	86%
HC10a	Fatality	Cancer		Cancer		Heart		Cancer		Cancer		Heart	
	Next 10/20 yrs	1		2		1		1		2		1	
	Next 11+/21+ yrs	1		2		1		1		2		1	

Table B.2. Dollar choice questions versions and results ages 35-44, relocation payment vehicle.

Number of respondents		18		16		18		21		19		19	
		Version 7		**Version 8**		**Version 9**		**Version 10**		**Version 11**		**Version 12**	
Question	***Variable***	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
RL2	Fatality	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	2	1	2	1	2	1	2	1	2	1	2
	Next 11+/21+ yrs	1	2	1	2	1	2	1	2	1	2	1	2
	Cost	$50	$100	$50	$200	$100	$150	$200	$500	$500	$1,500	$1,000	$1,500
RL3	% chose	17%	83%	50%	50%	17%	83%	43%	57%	26%	74%	53%	47%
	% stayed with RR	33%	73%	50%	100%	67%	67%	44%	92%	60%	57%	60%	78%
RL4	Fatality	Cancer	Motor	Cancer	Motor	Cancer	Motor	Cancer	Motor	Cancer	Motor	Cancer	Motor
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	1	1	1	1	1	1	1	2	1	1	1
	Next 11+/21+ yrs	1	1	1	1	1	1	1	1	2	1	1	1
	Cost	$200	$50	$100	$50	$50	$50	$500	$200	$1,000	$500	$1,000	$250
RL5	% chose	44%	56%	56%	44%	50%	44%	62%	38%	58%	42%	47%	53%
	% stayed with RR	88%	70%	67%	57%	89%	63%	69%	25%	100%	38%	78%	90%
RL6	Fatality	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	2	1	2	1	1	1	2	1	2	1	1	1
	Next 11+/21+ yrs	2	1	2	1	1	1	2	1	2	1	1	1
	Cost	$200	$50	$100	$50	$100	$200	$500	$200	$2,000	$1,000	$200	$100
RL7	% chose	56%	39%	69%	31%	61%	33%	71%	29%	53%	47%	42%	58%
	% stayed with RR	90%	57%	82%	60%	73%	83%	80%	17%	100%	22%	88%	91%
RL8	Fatality	Motor	Heart	Motor	Heart	Motor	Heart	Motor	Heart	Cancer	Heart	Motor	Heart
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	1	1	1	1	1	1	1	1	1	1	1
	Next 11+/21+ yrs	1	1	1	1	1	1	1	1	1	1	1	1
	Cost	$200	$100	$500	$200	$500	$500	$100	$150	$500	$500	$1,000	$1,000
RL9	% chose	6%	94%	6%	94%	44%	50%	43%	57%	74%	26%	26%	74%
	% stayed with RR	100%	71%	100%	80%	63%	67%	56%	75%	79%	60%	60%	79%
RL10	Fatality	Cancer		Cancer		Motor		Cancer		Cancer		Motor	
	Next 10/20	1		2		1		1		2		1	
	Next 11+/21+	1		2		1		1		2		1	

Table B.3. Dollar choice questions versions and results ages 45-54, health care payment vehicle.

Number of respondents		16		21		23		20		15		18		18		19	
		Version 13		Version 14		Version 15		Version 16		Version 17		Version 18		Version 19		Version 20	
Question	Variable	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
HC3	Fatality	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Heart	Cancer	Heart
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	2	1	2	1	2	1	2	1	2	1	2	1	1	1	1
	Next 11+/21+ yrs	1	2	1	2	1	2	1	2	1	2	1	2	1	1	1	1
	Cost	$50	$100	$50	$200	$100	$150	$200	$500	$500	$1,500	$1,000	$1,500	$500	$200	$500	$500
HC4	% chose	38%	63%	48%	52%	52%	48%	65%	35%	60%	40%	44%	56%	0%	100%	79%	21%
	% stayed with RR	83%	100%	70%	91%	83%	82%	85%	86%	78%	67%	38%	60%	NA	67%	87%	25%
HC5	Fatality	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	5	1	5	1	5	1	5	2	5	1	5	2	5	2	5
	Next 11+/21+ yrs	1	5	1	5	1	5	1	5	2	5	1	5	2	5	2	5
	Cost	$100	$500	$200	$2,000	$50	$250	$500	$1,000	$1,000	$2,000	$1,000	$5,000	$200	$1,000	$500	$2,000
HC6	% chose	38%	63%	71%	29%	61%	39%	75%	25%	67%	33%	67%	33%	56%	44%	58%	42%
	% stayed with RR	83%	100%	73%	83%	79%	89%	87%	100%	60%	100%	50%	67%	50%	100%	73%	100%
HC7	Fatality	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	2	1	2	1	1	1	2	1	2	1	1	1	2	1	2	1
	Next 11+/21+ yrs	2	1	2	1	1	1	2	1	2	1	1	1	2	1	2	1
	Cost	$200	$50	$100	$50	$100	$200	$500	$200	$2,000	$1,000	$200	$100	$500	$100	$1,000	$500
HC8	% chose	44%	56%	86%	14%	70%	30%	55%	45%	53%	47%	44%	56%	33%	67%	74%	26%
	% stayed with RR	100%	78%	89%	33%	81%	86%	82%	89%	100%	43%	75%	80%	100%	67%	86%	80%
HC9	Fatality	Cancer	Cancer	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Heart	Cancer	Heart	Cancer
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	2	5	5	1	5	1	5	1	1	1	5	1	1	5	1	5
	Next 11+/21+ yrs	2	5	5	1	5	1	5	1	1	1	5	1	1	5	1	5
	Cost	$100	$250	$250	$50	$500	$200	$2,000	$500	$500	$500	$5,000	$1,000	200	$1,000	$1,000	$3,000
HC10	% chose	38%	63%	81%	19%	35%	65%	25%	75%	87%	13%	28%	72%	61%	39%	53%	47%
	% stayed with RR	83%	90%	94%	50%	88%	80%	80%	87%	85%	100%	40%	46%	64%	71%	60%	78%
HC10a	Fatality	Cancer		Cancer		Cancer		Heart		Cancer		Cancer		Cancer		Heart	
	Next 10/20	1		2		5		1		1		2		5		1	
	Next 11+/21+	1		2		5		1		1		2		5		1	

Table B.4. Dollar choice questions versions and results ages 45-54, relocation payment vehicle.

Number of respondents		17		23		19		16		19		17		21		21	
		Version 21		**Version 22**		**Version 23**		**Version 24**		**Version 25**		**Version 26**		**Version 27**		**Version 28**	
Question	***Variable***	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
RL2	Fatality	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Pneu	Cancer	Pneu	Cancer
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	2	1	2	1	2	1	2	1	2	1	2	1	1	1	1
	Next 11+/21+ yrs	1	2	1	2	1	2	1	2	1	2	1	2	1	1	1	1
	Cost	$50	$100	$50	$200	$100	$150	$200	$500	$500	$1,500	$1,000	$1,500	$50	$100	$200	$200
RL3	% chose	12%	88%	17%	83%	21%	79%	44%	56%	63%	37%	41%	59%	24%	71%	24%	76%
	% stayed with RR	100%	87%	50%	84%	100%	87%	86%	78%	33%	86%	43%	90%	60%	73%	40%	69%
RL4	Fatality	Cancer	Motor	Cancer	Motor	Cancer	Motor	Cancer	Motor	Cancer	Motor	Cancer	Motor	Cancer	Motor	Cancer	Motor
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1
	Next 11+/21+ yrs	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1
	Cost	$200	$50	$100	$50	$50	$50	$500	$50	$1,000	$500	$1,000	$1,000	$50	$100	$500	$200
RL5	% chose	53%	47%	74%	26%	79%	21%	56%	44%	68%	32%	65%	35%	67%	29%	67%	33%
	% stayed with RR	89%	50%	94%	33%	100%	75%	89%	57%	77%	33%	64%	33%	86%	83%	86%	14%
RL6	Fatality	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Pneu	Motor	Pneu	Motor
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	2	1	2	1	1	1	2	1	2	1	1	1	1	1	1	1
	Next 11+/21+ yrs	2	1	2	1	1	1	2	1	2	1	1	1	1	1	1	1
	Cost	$200	$50	$100	$50	$100	$200	$500	$200	$2,000	$500	$200	$100	$50	$100	$100	$50
RL7	% chose	82%	18%	83%	17%	68%	32%	75%	25%	16%	84%	41%	59%	48%	52%	43%	57%
	% stayed with RR	93%	100%	89%	100%	100%	67%	92%	50%	100%	63%	71%	60%	60%	73%	78%	67%
RL8	Fatality	Motor	Heart	Motor	Heart	Motor	Heart	Motor	Heart	Pneu	Heart	Motor	Heart	Cancer	Heart	Heart	Pneu
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Next 11+/21+ yrs	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Cost	$200	$100	$500	$200	$500	$500	$500	$1,000	$100	$200	$1,000	$1,000	$500	$500	$500	$500
RL9	% chose	18%	82%	13%	87%	42%	58%	69%	31%	42%	58%	29%	71%	57%	43%	100%	0%
	% stayed with RR	100%	86%	100%	85%	88%	55%	55%	100%	63%	73%	40%	67%	67%	78%	71%	N/A
RL10	Fatality	Cancer		Cancer		Cancer		Motor		Cancer		Cancer		Cancer		Motor	
	Next 10/20 yrs	1		2		5		1		1		2		5		1	
	Next 11+/21+ yrs	1		2		5		1		1		2		5		1	

Table B.5. Dollar choice questions versions ages 55-64, health care payment vehicle.

Number of respondents		24		27		22		20		26		23		18		19	
		Version 29		Version 30		Version 31		Version 32		Version 33		Version 34		Version 35		Version 36	
Question	*Variable*	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
HC3	Fatality	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Pneu	Cancer	Pneu	Cancer
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	5	1	5	1	5	1	5	1	5	1	5	1	1	1	1
	Next 11+/21+ yrs	1	5	1	5	1	5	1	5	1	5	1	5	1	1	1	1
	Cost	$50	$250	$50	$500	$100	$300	$200	$1,200	$500	$3,000	$1,000	$4,000	$50	$100	$200	$200
HC4	% chose	33%	67%	48%	48%	32%	68%	50%	50%	77%	23%	70%	30%	33%	67%	32%	68%
	% stayed with RR	88%	100%	92%	77%	57%	100%	60%	90%	70%	67%	44%	86%	83%	92%	83%	62%
HC5	Fatality	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Motor	Cancer	Motor
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	2	1	2	1	2	1	2	5	2	1	2	1	1	1	1
	Next 11+/21+ yrs	1	2	1	2	1	2	1	2	5	2	1	2	1	1	1	1
	Cost	$200	$500	$100	$200	$50	$100	$500	$750	$2,500	$1,000	$1,000	$1,500	$50	$100	$500	$200
HC6	% chose	50%	50%	52%	48%	27%	73%	30%	70%	31%	69%	61%	39%	94%	6%	63%	37%
	% stayed with RR	83%	100%	71%	69%	83%	94%	67%	71%	63%	61%	36%	89%	94%	0%	67%	71%
HC7	Fatality	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Pneu	Motor	Pneu	Motor
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	5	1	5	1	1	1	5	1	5	1	5	1	1	1	1	1
	Next 11+/21+ yrs	5	1	5	1	1	1	5	1	5	1	5	1	1	1	1	1
	Cost	$500	$50	$250	$50	$200	$150	$1,200	$200	$2,000	$500	$2,500	$1,000	$50	$100	$100	$50
HC8	% chose	50%	46%	70%	30%	50%	50%	55%	45%	35%	62%	22%	74%	83%	17%	53%	42%
	% stayed with RR	83%	91%	79%	63%	82%	91%	91%	44%	67%	69%	60%	65%	67%	100%	80%	75%
HC9	Fatality	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Pneu	Heart	Cancer	Heart	Cancer	Heart	Heart	Pneu
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	2	1	2	1	2	1	2	1	1	1	2	1	1	1	1	1
	Next 11+/21+ yrs	2	1	2	1	2	1	2	1	1	1	2	1	1	1	1	1
	Cost	$200	$100	$500	$200	$750	$500	$1,000	$1,000	$100	$200	$2,000	$1,000	$500	$500	$500	$500
HC10	% chose	50%	46%	44%	56%	55%	45%	75%	25%	38%	62%	22%	70%	61%	39%	79%	21%
	% stayed with RR	92%	64%	83%	60%	75%	90%	80%	60%	70%	81%	60%	75%	82%	57%	67%	75%
HC10a	Fatality	Cancer		Cancer		Cancer		Heart		Cancer		Cancer		Cancer		Heart	
	Next 10/20	1		2		5		1		1		2		5		1	
	Next 11+/21+	1		2		5		1		1		2		5		1	

Table B.6. Dollar choice questions versions ages 55-64, relocation payment vehicle

	Number of respondents	37		38		39		40		41		42		43		44	
	Variable	***Version 37***		**Version 38**		**Version 39**		**Version 40**		**Version 41**		**Version 42**		**Version 43**		**Version 44**	
Question		**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
RL2	Fatality	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Pneu	Cancer	Pneu	Cancer
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	5	1	5	1	5	1	5	1	5	1	5	1	1	1	1
	Next 11+/21+ yrs	1	5	1	5	1	5	1	5	1	5	1	5	1	1	1	1
	Cost	$50	$250	$50	$500	$100	$300	$200	$1,200	$500	$3,000	$1,000	$4,000	$50	$100	$200	$200
RL3	% chose	21%	74%	17%	83%	23%	77%	22%	78%	35%	65%	25%	75%	11%	89%	18%	82%
	% stayed with RR	25%	64%	33%	67%	67%	80%	75%	64%	86%	62%	60%	93%	50%	82%	67%	79%
RL4	Fatality	Cancer	Motor	Cancer	Motor	Cancer	Motor	Cancer	Motor	Cancer	Motor	Cancer	Motor	Cancer	Motor	Cancer	Motor
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	1	1	1	1	1	1	1	5	1	1	1	1	1	1	1
	Next 11+/21+ yrs	1	1	1	1	1	1	1	1	5	1	1	1	1	1	1	1
	Cost	$200	$50	$100	$50	$50	$50	$500	$50	$2,500	$500	$1,000	$1,000	$50	$100	$500	$200
RL5	% chose	42%	53%	61%	39%	85%	15%	61%	39%	75%	25%	60%	40%	89%	11%	59%	41%
	% stayed with RR	75%	40%	55%	86%	91%	50%	82%	57%	87%	80%	83%	88%	94%	100%	90%	86%
RL6	Fatality	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Pneu	Motor	Pneu	Motor
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	5	1	5	1	1	1	5	1	5	1	5	1	1	1	1	1
	Next 11+/21+ yrs	5	1	5	1	1	1	5	1	5	1	5	1	1	1	1	1
	Cost	$500	$50	$250	$50	$200	$150	$1,200	$200	$2,000	$500	$2,500	$1,000	$50	$100	$100	$50
RL7	% chose	42%	58%	78%	17%	50%	50%	72%	28%	65%	35%	65%	35%	47%	53%	29%	71%
	% stayed with RR	75%	45%	71%	100%	100%	54%	92%	60%	100%	57%	92%	86%	56%	80%	80%	83%
RL8	Fatality	Motor	Heart	Motor	Heart	Motor	Heart	Motor	Heart	Pneu	Heart	Motor	Heart	Cancer	Heart	Heart	Pneu
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Next 11+/21+ yrs	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Cost	$200	$100	$500	$200	$500	$500	$500	$1,000	$100	$200	$1,000	$1,000	$500	$500	$500	$500
RL9	% chose	5%	95%	17%	78%	27%	73%	39%	61%	35%	65%	55%	45%	37%	63%	71%	29%
	% stayed with RR	0%	67%	67%	64%	86%	68%	57%	91%	71%	85%	82%	89%	57%	67%	75%	80%
RL10	Fatality	Cancer		Cancer		Cancer		Motor		Cancer		Cancer		Cancer		Motor	
	Next 10/20 yrs	1		2		5		1		1		2		5		1	
	Next 11+/21+ yrs	1		2		5		1		1		2		5		1	

Table B.7. Dollar choice questions versions ages 65-84, health care payment vehicle.

Number of respondents		41		54		57		59		65		50	
		Version 45		**Version 46**		**Version 47**		**Version 48**		**Version 49**		**Version 50**	
Question	***Variable***	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
HC3	Fatality	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	5	1	5	1	5	1	5	1	5	1	5
	Next 11+/21+ yrs	1	5	1	5	1	5	1	5	1	5	1	5
	Cost	$50	$250	$50	$500	$100	$300	$200	$1,200	$500	$3,000	$1,000	$4,000
HC4	% chose	37%	63%	50%	48%	54%	44%	66%	32%	69%	31%	70%	30%
	% stayed with RR	73%	81%	78%	92%	68%	84%	46%	89%	73%	90%	54%	73%
HC5	Fatality	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	2	1	2	1	2	1	2	1	2	1	2
	Next 11+/21+ yrs	1	2	1	2	1	2	1	2	1	2	1	2
	Cost	$200	$500	$100	$200	$50	$100	$250	$750	$2,500	$1,000	$1,000	$1,500
HC6	% chose	59%	39%	48%	52%	46%	54%	68%	29%	11%	89%	54%	46%
	% stayed with RR	63%	88%	73%	89%	65%	87%	55%	82%	86%	74%	59%	83%
HC7	Fatality	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	5	2	5	2	1	2	5	2	5	2	5	2
	Next 11+/21+ yrs	5	2	5	2	1	2	5	2	5	2	5	2
	Cost	$500	$100	$250	$100	$200	$300	$1,200	$400	$2,000	$1,000	$2,500	$2,000
HC8	% chose	59%	41%	52%	46%	49%	51%	31%	68%	40%	58%	48%	52%
	% stayed with RR	79%	65%	89%	56%	71%	76%	94%	45%	85%	61%	67%	65%
HC9	Fatality	Cancer	Pneu	Cancer	Pneu	Cancer	Pneu	Cancer	Pneu	Cancer	Pneu	Cancer	Pneu
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	2	1	2	1	2	1	2	1	2	1	2	1
	Next 11+/21+ yrs	2	1	2	1	2	1	2	1	2	1	2	1
	Cost	$200	$100	$500	$200	$750	$500	$250	$100	$1,000	$500	$2,000	$1,000
HC10	% chose	71%	27%	48%	46%	68%	30%	64%	32%	69%	31%	66%	34%
	% stayed with RR	86%	36%	77%	52%	77%	41%	76%	68%	78%	65%	76%	35%
HC10a	Fatality	Cancer		Cancer		Heart		Cancer		Cancer		Heart	
	Next 10/20 yrs	1		5		1		1		5		1	
	Next 11+/21+ yrs	1		5		1		1		5		1	

Table B.8. Dollar choice questions versions ages 65-74, relocation payment vehicle.

Number of respondents		24		19		22		27		20		19	
		Version 51		Version 52		Version 53		Version 54		Version 55		Version 56	
Question	Variable	A	B	A	B	A	B	A	B	A	B	A	B
RL2	Fatality	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer	Cancer
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	5	1	5	1	5	1	5	1	5	1	5
	Next 11+/21+ yrs	1	5	1	5	1	5	1	5	1	5	1	5
	Cost	$50	$250	$50	$500	$100	$300	$200	$1,200	$500	$3,000	$1,000	$4,000
RL3	% chose	25%	75%	21%	79%	32%	68%	33%	67%	40%	60%	58%	42%
	% stayed with RR	17%	78%	0%	73%	71%	53%	33%	78%	75%	42%	36%	88%
RL4	Fatality	Cancer	Motor	Cancer	Motor	Cancer	Motor	Cancer	Motor	Cancer	Motor	Cancer	Motor
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	1	1	1	1	1	1	1	1	1	1	1
	Next 11+/21+ yrs	1	1	1	1	1	1	1	1	1	1	1	1
	Cost	$200	$50	$100	$50	$50	$50	$250	$50	$2,500	$500	$1,000	$1,000
RL5	% chose	46%	50%	58%	42%	68%	27%	56%	44%	35%	60%	79%	21%
	% stayed with RR	73%	33%	64%	63%	67%	83%	67%	50%	71%	33%	73%	75%
RL6	Fatality	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart	Cancer	Heart
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	5	2	5	2	1	2	5	2	5	2	5	2
	Next 11+/21+ yrs	5	2	5	2	1	2	5	2	5	2	5	2
	Cost	$500	$100	$250	$100	$200	$300	$1,200	$400	$2,000	$1,000	$2,500	$2,000
RL7	% chose	33%	67%	68%	32%	50%	50%	59%	41%	50%	45%	74%	26%
	% stayed with RR	100%	56%	85%	50%	73%	64%	81%	45%	90%	33%	86%	60%
RL8	Fatality	Motor	Heart	Motor	Heart	Motor	Heart	Motor	Heart	Motor	Heart	Motor	Heart
	Timing words	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant
	Next 10/20 yrs	1	2	1	2	1	2	1	2	1	2	1	2
	Next 11+/21+ yrs	1	2	1	2	1	2	1	2	1	2	1	2
	Cost	$200	$200	$500	$750	$500	$1,000	$500	$2,000	$200	$500	$1,000	$2,000
RL9	% chose	17%	83%	47%	47%	50%	50%	63%	37%	25%	75%	32%	68%
	% stayed with RR	25%	75%	44%	78%	64%	82%	47%	80%	60%	73%	83%	77%
RL10	Fatality	Cancer		Cancer		Motor		Cancer		Cancer		Motor	
	Next 10/20	1		5		1		1		5		1	
	Next 11+/21+	1		5		1		1		5		1	

C. Knowledge Networks Methodology

Introduction

Knowledge Networks has recruited the first online research panel that is designed to be representative of the entire U.S. population. The panel is representative because it is recruited using high quality probability sampling techniques, and is not limited to current Web users or computer owners. Knowledge Networks selects households using random digit dialing (RDD) and provides selected households with free hardware and internet access. This allows surveys to be administered using a Web browser and enables the inclusion of multimedia content. Once a person is recruited to the panel, they can be contacted by e-mail (instead of by phone or mail). This permits surveys to be fielded very quickly and economically. In addition, this approach reduces the burden placed on respondents, since e-mail notification is less obtrusive than telephone calls, and most respondents find answering Web questionnaires to be more interesting and engaging than being questioned by a telephone interviewer.

Panel Recruitment Methodology

Knowledge Networks' panel recruitment methodology uses the quality standards established by the best Random Digit Dialing (RDD) surveys conducted for the Federal Government.

Knowledge Networks utilizes list-assisted RDD sampling techniques on the sample frame consisting of the entire United States telephone population. The sample frame is updated quarterly. Knowledge Networks excludes only those banks of telephone numbers (consisting of 100 telephone numbers) that have zero directory-listed phone numbers. Knowledge Networks' telephone numbers are selected from the 1+ banks with equal probability of selection for each number. Note that the sampling is done without replacement to ensure that numbers already fielded by Knowledge Networks do not get fielded again.

Having generated the initial list of telephone numbers, the sample preparation system excludes confirmed disconnected and nonresidential telephone numbers. Next, the sample is screened to exclude numbers that are not in the WebTV internet service provider network. This process results in the exclusion of approximately 6% to 8% of the United States population. This percentage is diminishing steadily and as of July 2001, we will begin to include a small sample from the out of WebTV internet service provider network in the panel to represent these areas and reduce coverage error.

Telephone numbers for which Knowledge Networks is able to recover a valid postal address (about 50%) are sent an advance mailing informing them that they have been selected to participate in the Knowledge Networks Panel. In addition to information about the Knowledge Networks Panel, the advance mailing also contains a monetary incentive to encourage cooperation when the interviewer calls.

Following the mailing, the telephone recruitment process begins. The numbers called by interviewers consist of all numbers sent an advance mailing, as well as 50% of the numbers not sent an advance mailing. The resulting cost efficiency more than offsets the decrease in precision caused by the need for sample weights. Cases sent to telephone interviewers are dialed up to 90 days, with at least 15 dial attempts on cases where no one answers the phone, and 25 dial attempts on phone numbers known to be associated with households. Extensive refusal conversion is also performed. Approximately 56% of the contacted households agree to be in the Panel.

Experienced interviewers conduct all recruitment interviews. An interview, which typically requires about 10 minutes, begins with the interviewer informing the household member that they have been selected to join the Knowledge Networks Panel. They are told that in return for completing a short survey weekly, the household will be given a WebTV set-top box and free monthly internet access. All members in the household are then enumerated, and some initial demographic variables and background information of prior computer and internet usage are collected.

To ensure consistent delivery of survey content, each household is provided with identical hardware, even if they currently own a computer or have internet access. Microsoft's WebTV is the hardware platform currently used by the Knowledge Networks panel. The device consists of a set-top box that connects to a TV and the telephone. It also includes a remote keyboard and pointing device. WebTV has a built-in 56K modem that provides the household with a connection to the internet. The base unit also has a small hard drive to accommodate large file downloads, including video files. File downloads do not require any user intervention and usually occur during off hours.

Prior to shipment, each unit is custom configured with individual e-mail accounts, so that it is ready for immediate use by the household. Most households are able to install the hardware without additional assistance, though Knowledge Networks maintains a telephone technical support line and will, when needed, provide on-site installation. The Knowledge Networks Call Center also contacts household members who do not respond to e-mail and attempts to restore contact and cooperation.

All new panel members are sent an initial survey to confirm equipment installation and familiarize them with the WebTV unit. Demographics such as gender, age, race, income, and education are collected for each participant to create a member profile. This information can be used to determine eligibility for specific studies and need not be gathered with each survey.

Survey Administration

For client-based surveys, a sample is drawn at random from active panel members who meet the screening criteria (if any) for the client's study. The typical sample size is between 200 and 2000 persons, depending on the purpose of the study. Once selected, members can be sent an advance letter by mail several days prior to receiving the questionnaire through their WebTV appliance to notify them of an important, upcoming survey.

Once assigned to a survey, members receive a notification e-mail on their WebTV letting them know there is a new survey available for them to take. The e-mail notification contains a button to start the survey. No login name or password is required. The field period depends on the client's needs, and can range anywhere from a few minutes to two weeks.

E-mail reminders are sent to uncooperative panel members. If e-mail does not generate a response, a phone reminder is initiated. The usual protocol is to wait at least three days and to permit a weekend to pass before calling. Knowledge Networks also operates an ongoing incentive program to encourage participation and create member loyalty. To assist panel members with their survey taking, each individual has a personalized "home page" that lists all the surveys that were assigned to that member and have yet to be completed.

Survey Sampling from Panel

Once Panel Members are recruited and profiled, they become eligible for selection for specific surveys. In most cases, the specific survey sample represents a simple random sample from the panel. The sample is drawn from eligible members using an implicitly stratified systematic sample design. Customized stratified random sampling based on profile data is also conducted, as required by specific studies.

The primary sampling rule is not to assign more than one survey per week to members. In certain cases, a survey sample calls for pre-screening, that is, members are drawn from a subsample of the panel (e.g., females, Republicans). In such cases, care is taken to ensure that all subsequent survey sample drawn that week are selected in such a way as to result in a sample that is representative of the panel distributions. Furthermore, Panel Members are not assigned surveys on the same topic in a given three-month period.

For this study, 1,796 panel members were selected and fielded the survey, with an over-sample of the older age groups. Knowledge Networks maintained the representativeness of the sub-samples within each age group on gender, ethnicity, education, and region (as defined by the four geographic regions used by the U.S. Census Bureau).

Weighting and Estimation

Whereas in principle the sample design is an equal probability design that is self-weighting, in fact there are several known deviations from this guiding principle. Furthermore, despite our efforts to correct for known sources of deviation from equal-probability design, there are several other sources of survey error that are an inherent part the process. We address these sources of survey error globally through the poststratification weights, which we describe below.

Sample Design Weights

The six sources of deviation from epsem design are:

1. Half-sampling of telephone numbers for which we could not find an address

2. RDD sampling rates proportional to the number of phone lines in the household

3. Minor oversampling of Chicago and Los Angeles due to early pilot surveys in those two cities

4. Short-term double-sampling the four largest states (CA, NY, FL, and TX) and central region states

5. Under-sampling of households not covered by MSN TV

6. Oversampling of minority households (Black and Hispanic).

Selection of one adult per household.

A few words about each feature:

1. Once the telephone numbers have been purged and screened, we address match as many of these numbers as possible. The success rate so far has been in the 50-60% range. The telephone numbers with addresses are sent a letter. The remaining, unmatched numbers are half-sampled in order to reduce costs. Based on previous research we suspect that the reduced field costs resulting from this allocation strategy will more than offset increases in the design effect due to the increased variance among the weights. We are currently quantifying these balancing features.

2. As part of the field data collection operation, we collect information on the number of separate phone lines in the selected households. We correspondingly downweight households with multiple phone lines.

3. Two pilot surveys carried out in Chicago and Los Angeles increased the relative size of the sample from these two cities. The impact of this feature is disappearing as the panel grows.

4. Since we anticipated additional surveying in the four largest states, we double-sampled these states during January-October 2000. Similarly, the central region states were oversampled for a brief period.

5. Certain areas of the U.S. are not serviced by MSN®. We select a smaller sample of phone numbers in those areas and use other internet service providers for internet access of recruited households in those areas.

6. As of October 2001, we began oversampling minority households (Black and Hispanic) to increase panel capacity for those subgroups.

7. Finally, for most of our surveys, we select panel members across the board, regardless of household affiliation. For some surveys, however, we select members in two stages: households in the first stage and one adult per household in the second stage. We correct

for this feature by multiplying the probabilities of selection by 1/ai where ai represents the number of adults (18 and over) in the household.

Poststratification Weights

Since Stratus Consulting has specific hypotheses for each of the five age groups, Knowledge Networks computed five sets of post-stratification weights, one for each age group. The primary purpose of a post-stratification adjustment to survey weights is to reduce the sampling error for characteristics highly correlated with reliable demographic and geographic totals – called population benchmarks. To implement post-stratification, we used the following raking variables:

- Gender: male and female
- Race/ethnicity: white (nonhispanic), black (nonhispanic), other (nonhispanic), hispanic
- Region: northeast, midwest, south, and west
- Education — highest level achieved: less than high school, high school, some college, college degree or more.

Each age group received one set of weights that were derived using the above raking variables (wt_group).

In addition, Knowledge Networks computed a set of weights which weights all valid completes (where include = 1) back to the CPS benchmarks on age, gender, race/ethnicity, region, and education (wt_all). This set of weights addresses Stratus Consulting's need to test hypotheses among all respondents.

In order to calculate final weights, we derive weighted sample distributions along various combinations of the above variables. Similar distributions are calculated using the most recent U.S. Census Bureau's Current Population Survey data and the Knowledge Networks panel data. Cell-by-cell adjustments over the various univariate and bivariate distributions are calculated to make the weighted sample cells match those of the U.S. Census and the Knowledge Networks panel. This process, known as raking, is repeated iteratively until there is convergence between the weighted sample and benchmark distributions (CPS distributions).

No collapsing was needed between cells for the overall weighting variable (wt_all). To compute the weighting variable for each age group, ethnicity was collapsed into "White or Other" and "Black or Hispanic" for age groups 35-44, 45-54, 55-64, and 65-74, to reduce the variance caused by the small cell size. For age group 75-84, ethnicity was not used as a raking variable due to the small cell size of the nonwhite group (n = 13).

The final post-stratification weights that apply to each age group are scaled to the number of completes for a given age group. The overall post-stratification weights applied to all respondents are scaled to the completed sample size.