VALUING DRINKING WATER RISK REDUCTIONS USING THE CONTINGENT VALUATION METHOD: A METHODOLOGICAL STUDY OF RISKS FROM THM AND GIARDIA

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ABSTRACT

This study develops contingent valuation methods for measuring the benefits of mortality and morbidity drinking water risk reductions. The major effort was devoted to developing and testing an survey instrument to measure the value of low-level risk reductions in community water systems from trihalomethanes (THMs). The study's first phase involved a program of qualitative work, including in-depth interviews and focus groups, conducted in southern Illinois, an area which suffers from excess THMs in drinking water supplies. The report provides in its appendices full documentation of the outcomes of this phase of the study.

On the basis of this effort a draft instrument was prepared which featured a risk ladder designed especially for this study in addition to other devices aimed at communicating THM risks in an in-person interview. This instrument was administered to a sample of 230 people in Herrin, Illinois. An experimental design was employed to test for question order and metric bias. The questionnaire worked well, on the whole, as judged by the experimental results, the interviewers' comments, and the empiricial findings. Chapters 4 and 5 present the findings which include various estimates of the value of a statistical life which are implied by these data.

The final chapter presents the results of a preliminary effort to develop a contingent valuation instrument suitable for measuring the benefits of a Giardia prevention program in San Francisco. The approach described there features a phone survey which simulates a referendum vote on whether San Francisco should install the equipment necessary to guarantee protection against the chance of an outbreak of giardiasis. In contrast to the Herrin study, where the amounts were obtained in an open ended question format, the San Francisco study has respondents respond to a take-it-or-leave it format which obtains several points on the respondent's demand curve by means of a followup question. The instrument has not yet been used in the field.

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Notice

This document is a preliminary draft. It has not been formally released by the U.S. Environmental Protection Agency and should not at this stage be construed to represent Agency policy. It is being circulated for comments on its technical merit and policy implications.

CHAPTER 1

INTRODUCTION

Part I of this report consists of five chapters which present the findings of our study on valuing drinking water mortality risk reductions. The research effort involved conducting research to develop and test a contingent valuation instrument to measure the benefits of reducing risks from trihalomethane (THM) contamination. We conducted the research in southern Illinois including a CV survey administered to 230 people in Herrin, Illinois in June-July, 1985. In this chapter we discuss the purpose of the study, the methodological issues involved in using the contingent valuation method to measure low-level mortality risk benefits, and describe the study site. The next chapter describes the approaches we used to develop and test the CV instrument which included the use of focus groups and in-depth interviews with representative respondents. A key component of the instrument which emerged from this process was a new type of risk ladder used as a visual aid to convey comparative risk levels. Chapter 3 describes the survey instrument which resulted from these efforts. Chapter 4 presents the initial empirical findings from the Herrin study. Chapter 5 uses the data presented in chapter 4 to estimate the value(s) of a statistical life which is the typical summary measure presented in studies of the economic value of low-level risk reductions.

THE RESEARCH PROBLEM

The problem posed to society by reducable low-level mortality risks is a difficult one. Although lowering mortality risks is a desirable goal, it is less certain that society should spend the money to reduce every type of low-

level risk to a negligible level. In the first place, the levels of contamination are so low that it is often difficult to measure them with reasonable certainty. Second, the risks posed by given levels of contamination are even more uncertain as they typically are based on extrapolations from animal models and faint tracings measured in human epidimeological studies. Third, the large number of mortality risks and the finite funds available to reduce these risks raises questions of allocative efficiency. Although human lives are involved, considerations of benefits vs. cost seem particularly applicable to policy decisions about these kinds of risks.

Measuring the benefits of low-level risk reductions poses a number of difficult methodological issues. In this study we explore the possibility of using the contingent valuation method to value one type of low-level risk, contamination of drinking water supplies by trihalomethanes or THMs. The contingent valuation (CV) method, uses survey research techniques to pose a scenario involving an environmental amenity on the basis of which respondents express their willingness to pay for specified levels of the amenity. Its name comes from the expectation that the respondents' WTP amounts are contingent upon the information presented in the scenario. For example, the values given in a CV study of air visibility benefits which uses a utility bill payment vehicle are contingent upon that particular vehicle and may differ if another payment vehicle in used.

In a report prepared for the U.S. Environmental Protection Agency's Office of Drinking Water, Temple, Barker, and Sloane (1982) assess the relative merit of five benefit measurement methodologies: community willingness to pay, human capital, medical and indirect costs avoided, implicit value, and individual willingness to pay which includes CV surveys or market studies. When it is not possible to directly purchase risk reductions in the market place, the available measures for measuring willingness-to-pay for risk reductions are known as hedonic pricing (Adelman and Grilliches 1961); Thaler and Rosen 1974), the household production function approach (Becker 1965; Hori 1975), and the CV method.

Use of the hedonic pricing technique in this context assumes that one of the characteristics of a good is a risk level. For example, hedonic price studies of work-related risk assume that one of the reasons jobs pay different wage rates is that they have different risks associated with them and studies

of air pollution health risks assume that one of the reasons that housing prices differ within an area is due to variations in air pollution health risk. The hedonic pricing technique is not suitable for valuing drinking water risk reductions, where there is little or no within-city variance in the risk levels.

The household production function approach assumes that households combine purchase goods and household labor to produce services such as risk reductions from which the household receives direct utility.[1] With respect to THMs, the household could reduce its current level of risk by the installation of a household filtration system or by switching to bottled water. Use of the household production technique to determine willingness-to-pay to reduce THM concentrations would require awareness by every household head of the level of risk posed by different levels of the contaminant. This is an assumption which will rarely be met when dealing with a low-level infrequently publicized environmental contaminant. Indeed, our research found that despite having been the recipient of government-mandated notices and newspaper publicity about excess THM levels (above the EPA standard) in their town's drinking water, civic-minded citizens in two southern Illinois towns could hardly recall the notices, much less describe the risks posed by the THMs.

As noted by Temple, Barker, and Sloane, the advantages of the CV method lies in its flexibility, its consistency with standard welfare economic theory (Freeman, 1979; Just, Hueth, and Schmitz, 1982), and its ability to measure a wide range important types of benefits. The major drawback to the use of the CV method to measure drinking water benefits, according to their report (Temple, Barker, and Sloane, 1982: 5), is the lack of sufficient evidence that the possible biases introduced by the use of a hypothetical decision context can be overcome. Since publication of this report, however, considerable research on the CV method has been reported[2] which addresses this issue although it has not been directly applied to drinking water issues. The

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1. Applications of the household production approach (e.g., travel cost analysis) typically rely primarily on purchased goods. Blomquist (1979), however, has used this technique to value risk reduction based on the use of seat belts.

2. See Cummings et al. (1986) and Mitchell and Carson (forthcoming) for reviews of this research.

present study is intended to address this drawback by exploring the degree to which the CV technique can be used to value drinking water benefits.

In order to be credible, a CV study must overcome a variety of threats to the study's validity and reliability (Mitchell and Carson, forthcoming). In order to produce information about benefits which meets the requirements of economic theory, CV surveys require respondents to assimilate a body of information -- the scenario -- about the valuation situation and to base their willingness to pay on this hypothetical situation. Such an unfamiliar and demanding situation creates an incentive for the respondents to minimize the effort involved in determining their value for the good. One effort minimizing strategy is to base their valuations on extraneous factors such as features of the scenario which are intended to be value-neutral. Another is to give token willingness-to-pay (WTP) amounts in order to avoid anticipated censure by the interviewer.[3] Low level risk reductions, as we shall see, pose special problems in this regard but the techniques developed for this study suggest that ways can be devised to address these issues which show considerable promise.

The literature on the contingent valuation method recently has been reviewed by Cummings et al. (1986) and by us (Mitchell and Carson, forthcoming). Likewise, Smith, Desvousges, and Freeman (1985) have reviewed the literature on economic behavior and risk changes. We will not, therefore, review these literatures here. The standard theoretical propositions about the relationship between willingness-to-pay and risk-reduction are based on expected utility theory (Jones-Lee, 1974; 1976; Cook and Graham, 1977; Weinstein, Shepard, and Pliskin, 1980).[4] More recently Machina (1983a) has developed a nonexpected utility framework for understanding individual behavior toward risk. Standard expected utility theory and the broader nonexpected utility theory are likely to provide similar accounts some of the simple risk-WTP relationships. We anticipate that nonexpected utility theory,

3. A considerable body of literature in the social psychological dimensions of decision making and in survey research techniques affirms these propensities (Tversky and Kahneman, 1981; Rossi, Wright, and Anderson, 1983; Gregory 1985).

4. This extends to more general approaches based on state-dependent utility functions (Karni, Schmeidler, and Vind, 1983).

as it becomes more developed, will supplant the current expected utility theory results for the more complex relationships between willingness-to-pay, risk-reduction, and the value of statistical life. Consequently, the experimental design for this study was developed along the line of a general response-surface estimation. The design also incorporates features which allow us to test for the presence or absence of several survey research response biases which have the potential to distort our findings.

CV SURVEYS AND THE BENEFITS OF IMPROVED DRINKING WATER QUALITY

The Temple, Barker, and Sloane (1982) report identifies three recipients of the benefits of reduced mortality: individuals, family, and society and two types of benefits: psychological and monetary. The monetary benefit is measured in part by the amount of consumption an individual would enjoy as a result of a prolonged life whereas the psychological component includes the well-being associated with a decrease in the risk of premature mortality. According to Temple, Barker, and Sloane, the CV method adequately measures individual and family benefits, but not those that accrue to society. This view assumes that individuals do not hold any value for others beyond their family when they value risk reduction measures which affect both their family and others. Except for the possibility that avoided medical costs covered by insurance do not enter into people's valuation in a CV survey, our view is that CV studies are well suited to measuring societal benefits. It is our experience that, even without being reminded, individuals' tend to include these benefits, at least when they value community reductions in THM risks. This was demonstrated in our preliminary research for this study when we explored whether a household water treatment device might be a more credible method of risk reduction than community treatment. Respondent reactions to this proposal clearly indicated that, for a given level of risk reduction, many people would pay more for a community-wide treatment program than they would reductions accomplished by the household device. When asked why, these people explicitly cited the protection accorded others by a community-wide program as an important reason for their different values. The values given in this study therefore include both individual, family, and community benefits.

TRIHALOMETHANE RISKS

Trihalomethanes or THMs are the most ubiquitous and, generally speaking, the synthetic organic chemical found in the highest concentrations in U.S. drinking water. THMs are formed when the chlorine used to disinfect raw drinking water supplies reacts with humic substances already present in the water (Culp, 1984). Surface water supplies, particularly those drawn from relatively shallow water bodies, pose the greatest problem, especially in the summer months.

In 1979, the U.S. Environmental Protection Agency determined that THMs pose a human health risk[5] and set a maximum contaminant level (MCL) of 0.10 mg/L total trihalomethanes (Culp, 1984: Appendix A)[6] for community water systems that add disinfectant to the treatment process (Cotruvo, 1981). In selecting the level for the MCL, EPA balanced public health benefits from the use of chlorine to produce biologically safe water against the cancer risks posed by low levels of THMs. Joseph Cotruvo (1981), the former director of EPA's criteria and standards division of the Office of Drinking Water, labeled the MCL as a "feasible" rather than "absolutely safe" level of protection. According to Crouch et al. (1983), under some conditions the risk posed by water just meeting the THM standard poses an annual risk more than 30 percent greater than the 1 in 1,000,000 level which is usually regarded as the "acceptable" level by EPA in setting standards.

The specific amenity we value in this study is reductions in the risk of getting cancer from THM contamination of their drinking water. The reductions occur by reducing THM levels in a local drinking water supply from various

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5. In the absence of definitive human epidemiological studies, THMs, on the basis of animal studies, are considered to pose "potential" carcinogenic risks to humans.

6. In setting this MCL, EPA concluded that it would be inappropriate at the time to distinguish between chloroform and other THMs. As a family of compounds, chlorinated and brominated THMs are similar in chemical composition and are formed concurrently during the chlorination of drinking water; the available treatment methods would simultaneously reduce them all (Cotruvo, 1981: 269; Culp, 1984).

levels above the MCL down to the level of risk associated with the current EPA THM standard. These risk reductions in the present lower the chance of dying from THM induced cancer death twenty years or so from now.

Measuring this amenity in a CV study poses difficult methodological challenges. Generally speaking, the more knowledgeable people are about the good to be valued in a CV study, the easier it is to accurately communicate the proposed improvements to the respondents. Our a priori assumptions were that people would not be very knowledgeable about THMs and the risks they pose. Indeed, there seemed to be good reasons to believe that some respondents would be misinformed on this subject. First, understanding the problem requires a basic grasp of the purification process used by the local water company. Otherwise, respondents might not understand the tradeoff between THM risks and the risks of drinking improperly purified water. Second, THMs themselves are likely to be unfamiliar to many respondents who might therefore confuse them with other contaminants which also possess long scientific names and short acronyms such as the PCBs. Third, the risks posed by the levels of THM contamination which typically occur are very low-level; down to .04 deaths per 100,000. Research has shown that people have difficulty understanding abstract risk levels and that they tend to exaggerate low level risks (Fischhoff, Slovic, and Lichtenstein, 1981, 1982; Slovic, Fischhoff, and Lichtenstein, 1982; Covello, 1983). Some CV researchers faced with this problem have chosen to sidestep it by valuing days of illness (Loehman, et al., 1979) or a risk reduction regulation (Burness, Cummings, Mehr, and Walbert, 1983) instead of specific levels of reduced risk. Efforts to develop ways to communicate risk reduction in surveys are still in their infancy (e.g. Smith, Desvousges, and Freeman, 1985) and largely unvalidated. Fourth, we anticipated difficulties associated with other aspects of the risk such as its latent nature -- death would occur several decades after exposure; and its emotional character -- the cause of death is cancer.

FIELD SITE

Although CV surveys are necessarily hypothetical, the degree to which they are viewed as realistic, plausible, and credible by respondents may be enhanced in various ways. This consideration influenced us to conduct this study in an area, southern Illinois, where local water companies had

experienced difficulty in meeting the EPA THM standards.[7] We worked in three communities. Herrin, Illinois, the community where we conducted the CV survey, is located in Williamson County, Illinois. Nearby are Marion and Carbondale, the two towns where we conducted our focus groups and preliminary interviews. Marion, population 15,000, is the site of a large federal penitentary and Carbondale, 14 miles to the west with a population of about 20,000 people, is the home of Southern Illinois University. Carbondale and Marion, like most of the communities in this area, obtain their water supplies from relatively shallow lakes whose humic content in the summer months interacts with the chlorine used in their treatment process to produce levels of THMs which, in recent years, have been shown to exceed the EPA Maximum Contaminant Level (MCL) of 0.1 mg/L. Between 1982 and 1985 Carbondale exceeded the standard six times with THM amounts above the MCL ranging from .007 mg/L to .165 mg/L. Marion, during the same period, exceeded the standard during each measurement period by .011 mg/L to .142 mg/L.

A provision of the Safe Drinking Water Act mandates public notification whenever a community exceeds drinking water MCL's for any contaminant. The regulations require community water system owners or operators to provide written notification about the violation to users via water bills or other direct mailing and to publish a notice in a newspaper serving the area for three consecutive days within fourteen days of learning of the violation. In addition, the system must also provide information about the violation to radio and television stations within seven days. Thanks to these procedures, consumers in Marion and Carbondale have received multiple individual notices about THM violations over the years and have been exposed to publicity about THM risks in the local newsmedia. The Southern Illinoisian, the major regional newspaper, published several informative articles about Carbondale and Marion's problems during this time period.[8] The news media also reached residents in nearby communities, such as Herrin, whose THM problems were much less severe.

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7. Because EPA regulations differ for medium and larger sized water systems, we needed towns with populations between 10,000 and 75,000.

8. These are contained in an appendix in Whitley (1985).

On the basis of this experience, it might be presumed that our respondents were knowledgeable about THMs in their drinking water. One interesting byproduct of our study is the finding that the public notification program was largely ignored by the residents of these three towns.[9] The level of information provided directly to the consumer differed greatly in Marion and Carbondale. Marion's customer notifications consisted of cryptic notices printed on customers' water bills. The notice on the September 1984 water bill read in its entirely as follows: "Annual ave. of THMS has been reduced to 0.045 ppm over EPA MAC on 7-11-84." Carbondale, as befitting a university town, provided its water customers, through clearly written articles in its newsletter, with a far more informative description of the problem and what the water system was planning to do about it. In addition to the individual notices disseminated by the water companies, the newsmedia were alerted to the situation and press coverage of these events was reasonably thorough (and accurate). Although the possibility of THMs causing cancer was noted in the press reports, they uniformly quoted state and local officials' to the effect emphasized that the risk from the extra THMs was not great enough to worry about. These assurances seem to have had an effect; there has been no expressions of citizen concern engendered by to these notices, as far as we can determine, and the water utility's remedial efforts have received little publicity. Nor has any community or regional group made an overt protest.

This is in sharp contrast to the turmoil caused by the discovery in 1983 that Crab Orchard Lake was contaminated by PCB's. This lake served as a source of drinking water for Marion. In this case officials and the press both defined the situation as one which threatened the health of Marion's water customers. Marion promptly ceased to use Crab Orchard Lake and substituted other sources of drinking water.

Herrin's 10,500 inhabitants receive their drinking water from the Rend Lake Water District. Rend Lake, the source of the district's water, is Illinois' second largest inland reservoir. The lake is located 40 miles north of Herrin. Water is treated at the District's treatment plant on the southeast end of the lake using precipitation with lime and alum, sedimentation, flocculation, filtration, and continuous chlorination. Owing

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9. See Whitley (1985) for a more detailed analysis.

presumably to the depth of Rend Lake which, at an average depth of 97 feet, is considerably deeper than the sources of Marion's and Carbondale's drinking water, Herrin's drinking water was found to exceed the MCL for THMs only once, in the summer of 1983. Because accounts obtained from the Rend Lake and Herrin authorities differ, it is difficult to determine what notification procedure, if any, was used to inform the Herrin consumers about the 1983 THM MCL violation. It appears that the utility may have utilized the radio instead of notifying Herrin consumers individually as required.

Herrin was chosen as the site for the survey because it is typical of the water systems in the area and, unlike Marion whose drinking water was found to be contaminated by PCBs several years ago, it had not experienced problems with any other kind of contaminant. Another desirable feature of town for the purposes of this study is the homogeneity of its population. Unlike Carbondale, whose university adds a number of highly educated and sophisticated residents to the local population, Herrin's residents, like those in other parts of southern Illinois, are predominantly working and middle class, virtually all white, and have lived in the area for most of their lives. This enabled us to achieve sufficient statistical power to test our instrument's effectiveness with a small sized sample.

CHAPTER 2

INSTRUMENT DEVELOPMENT RESEARCH

The instrument used in this study was gradually developed over the period of seven months from December, 1984 to June, 1985. In this chapter we discuss the findings of the qualitative research we conducted on how people think about drinking water and risk and how they responded to various ways of presenting the study's scenario material.[1] The next chapter presents the final instrument which embodied the insights described here.

INSTRUMENT DESIGN GOALS

The heart of a CV survey is the description of the hypothetical market for the good to be valued. In constructing the scenario for this study, we sought to maximize the following design goals.

1. The scenario should be understandable to all the respondents.
2. The scenario should avoid elements which contribute bias.
3. The scenario should meet the requirements of economic theory.
4. The scenario should be policy relevant.

The sequence given above is important. Unless the first two goals are met, the later ones are irrelevant since the data will be meaningless. If the scenario violates economic theory (goal 3), its policy relevance (goal 4) will be diminished or destroyed. Finally, even if the first three goals are met, the conditions set forth in the scenario may leave the policy maker with good quality theoretically valid results which are irrelevant to his or her needs. In this study, for example, the risk reductions we valued cover the range of risk reductions which might reasonably be expected to occur if THM control

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1. We benefitted from being able to follow the pathbreaking work of Smith and Desvousges (Smith, Desvousges, and Freeman, 1985) who, in 1984, conducted an experimental CV study of the value of risk reductions from toxic waste dumps which required them to struggle with many of the same methodological problems which confronted us.

programs were instituted by water systems which exceeded the Environmental Protection Agency's maximum contaminant level for THMs. We also included the MCL as an important element in the scenario.

DEVELOPMENT METHODOLOGY

Our development and pretesting efforts, which took place over a period of seven months from December, 1984 to June 1985, were directed at meeting the first two goals. We began by conducting four focus groups in December and January, 1985 to explore local residents' views about their drinking water, it's risks, and risks in general. We also obtained the participants' reactions to alternative versions of risk ladder we intended to use to communicate the risks posed by various levels of THMs. The focus group transcripts are included in appendix A.

The next step was to draft the questionnaire and pretest[2] it. The pretests occurred in several stages spread over a four month period beginning in March. The earliest stage was a series of interviews which Robert Mitchell and Karla Whitley[3] conducted with a diverse group of Carbondale residents. Each person was debriefed after their interview to learn why they gave the answers they did and what they thought about certain aspects of the schedule. We made continuous modifications to the instrument during this process as we learned what worked and what did not.

On May 9, a copy of the current draft questionnaire was sent for comment to Alan Carlin, George Parsons, Ann Fisher and David Schnare of the U.S.

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2. The literature on pretesting is surprisingly slight (e.g., Sheatsley, 1983), given its importance to survey research practitioners. In the strict sense, "pretest" usually refers to a small survey conducted to test a draft instrument. We will also use the term in the report to refer to the broader range of instrument development activities which precedes the testing of a survey instrument in the field.

3. Whitley, then a graduate student in geography at Southern Illinois University in Carbondale, played an important role in organizing the focus groups and assisting the pretesting work.

Environmental Protection Agency; Paul Slovic and Nancy Reiches of our advisory committee; Clifford Russell of RFF; and the following economist practitioners of the contingent valuation method: Kerry Smith, William Desvousges, Alan Randall, Bill Schulze. This group (see appendix B) made numerous suggestions, a number of which led to changes and improvements in the draft instrument.

The final pretesting occurred during the two-day interviewer training period and the first few days of field interviewing. This resulted in some minor wording changes, a revision of the interviewer evaluation questions, and various modifications in the interviewer's instruction manual.

Focus Groups

Focus groups (Smith, Desvousges, Freeman, 1985: chap. 8) are small groups of people chosen to represent a chosen point of view who are recruited to participate in a directed discussion. Commonly used by market researchers to gain a better understanding about how consumers respond to products and marketing approaches, focus groups are also used by survey researchers to obtain an in-depth understanding of certain difficult-to-ask-about topics which are to be included in a questionnaire. This format offers the opportunity to probe topics in depth, follow up new insights as they emerge in the discussion, and get peoples' reactions to prototype products or interview display cards. Focus group participants are not intended to be a random sample of the target population; instead they are selected from elements of the community who are reasonably representative of its membership and are likely to feel comfortable expressing their views in a group setting. Since the participants are not randomly recruited, the insights gained from focus groups must be tested through other means to ensure that they are generally true.

Smith, Desvousges, and Freeman (1985) were the first researchers to make formal use of focus groups to aid the design a CV instrument. They were faced, as we were in this study, with the need to communicate low level risks to respondents who, in their case, were asked to value the mortality risks posed by hazardous waste dumps. Smith et al. (1985) report that they gained substantial information "that was invaluable in the questionnaire development process" from their focus groups and our experience was very similar. We obtained helpful insights into how people think about risk, the words and

concepts they use to verbalize this understanding, their reaction to being asked risk reduction valuation questions, and their reactions to specific elements of our contingent valuation scenario, especially the prototype risk ladder. This information allowed us to identify the most likely sources of bias and how they could be minimized.

Two of our groups were conducted in Carbondale and two in Marion. Unlike Carbondale, Marion's population is more typical of the area in terms of educational and racial composition. Both towns have their own water plants whose water supply comes from surface sources. In addition to the excess levels of THMs described earlier, in 1983 PCBs were discovered in one of Marion's backup sources of raw water, Crab Orchard Lake (Whitley, 1985). This widely publicized occurrence forced the town to switch to alternative surface sources of drinking water. We were interested to see the extent to which this experience colored Marion residents' views about THMs.

We followed the practice, common to those who use focus groups, of recruiting our focus group participants from civic groups who were offered a $75 contribution for their help. Karla Whitley set up the groups with the cooperation of the League of Women Voters, the Junior Chamber of Commerce and several churches. This recruitment process yielded participants who readily understand the purpose of the group discussion and were articulate and candid in expressing their opinions. They are also better educated and more civic conscious than the average resident of these towns.

The groups ranged in size from 6 to 12 with an equal number of men and women. Each met for two hours in a room at the university (Carbondale) or in a community center (Marion). The discussion was led by Robert Mitchell. The Carbondale groups were held in a two day period in early December, 1984, and the Marion groups in a similar two day period at the end of January 1985.[4] The same general format was followed for each session. The researchers, Resources for the Future, and the purpose of the session were briefly introduced. The latter was described as an opportunity for us to get their views about their drinking water so we could better understand how to design a questionnaire on the topic. The sequence of the ensuing discussion proceeded from a general

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4. The month long interval between the Carbondale and Marion groups allowed us to assimilate the insights gained from the first groups before attempting the second round.

discussion about their drinking water to, at the end, our soliciting their reactions to specific features of a possible questionnaire such as alternative risk comparisons and risk ladder formats.

Although some participants spoke more frequently than others, in only one group did one member tend to dominate. The Carbondale sessions were recorded and transcribed. Owing to mechanical difficulties, the Marion transcript is based on notes taken by Whitley which were written up by her and Mitchell immediately following the group session. The transcripts are presented in appendix A.

In general, the participants were knowledgeable about where their drinking water comes from and how it is treated. They varied greatly in their evaluation of the quality of their town's drinking water. Although a small minority of participants were very sensitive to health considerations, most of the complaints concerned the taste, odor and color of the local drinking water.

It is noteworthy, considering the relatively high educational level of the group members (all had graduated from high school, most from college) and their participation in civic minded organizations, that they had very little awareness of THMs or of receiving a notice that their communities had exceeded the THM standard. This tends to confirm what we and others (Bruvold and Gaston, 1980; Stegman and Schneider, 1982a, 1982b; Bruvold, Wardlaw and Gaston, 1985) have found -- that the publication notification process is ineffective in informing the public about drinking water contamination.[5]

In-Depth Interviews

Mitchell drew upon the insights gained from the focus groups in writing the first draft of the questionnaire. The basic format for the RFF risk ladder, which will be described in the next chapter, was also developed during this period. The draft questionnaire was used in a series of trial interviews conducted in Carbondale in April, 1985. No college students were interviewed; only townspeople who were selected to represent as great a diversity of age,

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5. It may be that when the contamination is controversial the notification process has a different effect. We know of no studies which have examined the notification process under this condition.

sex and educational levels as possible. Each interviewee was paid $10 for his or her time. Mitchell and Whitley alternated taking the interviewer and observer role. At the conclusion of each interview the respondent was asked why he or she gave certain answers and what he or she thought about various aspects of the scenario such as the risk ladder or the cigarette equivalents. The interviews were scheduled to allow time to revise the questionnaire after each interview. Many changes were made in the interview schedule and display cards during this iterative process, although the basic format was retained because it worked well.

During the next six weeks the interview schedule was further revised to reflect the insights gained from the April interviews and from the experts to whom the draft schedule had been sent for comment. This revision was then pretested during another round of in-depth interviews conducted in late May in conjunction with the interviewer training.

FINDINGS

The following findings from the focus groups and in-depth interviews played an important role in the questionnaire design:

1. People assumed the researchers' goal is to get people to give as large amounts of money as possible to reduce the THM risk.

The most striking expression of this belief was a remark made in the second Marion focus group by a young man. Towards the end of the two hour discussion, after much discussion of THM risks and their low level, Mitchell introduced the cigarette comparison idea for the first time and applied it to the THM risks. This man immediately blurted out, "You won't get much money if you explain the risk like this." Others in the group nodded in agreement. Their assumption that we wanted high values was disturbing since Mitchell, being aware of this possibility, had made a concerted effort throughout the session to demonstrate that this was not his intention. He emphasized that the risk reductions they were discussing were very small and assured the participants that any valuation they had for the risk reductions, including zero, was acceptable.

We conjecture that two considerations helped create this misperception. The first is a salience effect wherein the subject of the study, in this case

THM risks, is assumed to be important by the participants because such an elaborate effort is being made to measure their views about it. This is a variant of the famous Hawthorne effect according to which the act of conducting a study conveys value in itself. The salience effect interacts with a social desirability effect. This second factor is produced by the widespread and strongly held norm that drinking water contaminants are "bad" and that reducing them is "good." This norm leads people to assume that a positive response is expected of them when an interviewer (or group leader) representing some nonprofit or public agency asks them how much they are willing to pay to reduce this type of risk. The motivation in this case is similar to that engendered by a door-to-door solicitation for a charitable cause. In both cases the person is put on the spot by being asked to express a monetary value for a socially desirable good in an in-person interview.

Subsequent interview development work confirmed this observation. In our in-depth interviews respondents, faced with the unfamiliar task of valuing drinking water risk reductions, would sometimes mutter, "Well, I guess I should pay something for this," in such a way that one got the strong impression that they really didn't think the risk was worth paying for but felt under moral pressure to offer an amount.

These findings showed that compliance bias was a potentially serious threat to the validity of this study. Compliance bias occurs when respondents give WTP amounts which differ from their true WTP amounts in an attempt to comply with the presumed expectations of the sponsor and/or the interviewer. These "white lies" are motivated by a desire to be helpful and cooperative with the interviewer's or sponsor's presumed intentions or by a desire to maintain the respondent's self esteem in the interview situation by giving socially acceptable responses. We redesigned the instrument[6] to legitimate $0 responses even more strongly than before and prefaced the valuation questions with an explicit statement that we were neutral about the referenda. The interviewers were carefully trained to maintain a neutral demeanor and to encourage the respondents to say what they really felt.

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6. The instrument is described in chapter 3 and the text is presented in appendix C.

2. Participants confirmed our expectations that risks levels are difficult for people to meaningfully understand and that numerical descriptions, such as 3 per 100,000 etc., are especially hard for people to grasp even when they are used to compare an array of common risks.

A primary purpose in conducting the focus groups was to learn how people react to descriptions of low level risks. As we expected, the focus group participants did not find numerical expressions of risk in terms of deaths per 100,000 etc. particularly meaningful in themselves. We experimented with variations of the Smith-Desvousges (Smith, Desvousges and Freeman, 1985: p. 8-35) risk ladder to see if this instrument, which compares risks by arraying them on a logarithmic scale of annual mortality risks per 100,000, helped respondents to low level risks.[7] We concluded that this instrument was not satisfactory for our purposes because it did not adequately convey the very low level of risks at the bottom of the ladder (those below 10 in 100,000). People appeared to find it difficult to understand the logarithmic scale. This led us to develop an alternative risk ladder which uses equal increments of annual mortality per 100,000 people and a three part format where, in addition to the basic ladder, two additional part-ladders expand the basic ladder's 0 - 25 and the 0 - 1 per 100,000 segments. We tested this type of ladder extensively in our in-depth interviews with successful results. Respondents often showed a considerable amount of interest in the ladder and their comments about it indicated that they found it credible and that they comprehended it in the manner we intended.

The focus groups also influenced our selection of the risks to be placed on the ladder. We added the risk of dying in an automobile accident, for example, because people asked about it, and dropped some of the recreational risks (such as the risk of death in hang gliding) because respondents tended

7. The lowest risk on their ladder and our versions is dying in a flood (.05 of 100,000). The highest risk on their ladder is the risk to stroke victims of dying from the stroke (11,765 in 100,000). Since everyone is vulnerable to a stroke, we felt respondents would not understand the nature of this risk without a special explanation. We used the second highest risk on their ladder as the highest on our versions. This is the risk of dying faced by Hollywood stuntmen (2,000 in 100,000).

to regard these kinds of voluntary recreational risks as very different from the risks imposed on drinking water users.

3. Cigarette equivalents seemed to be an effective way to convey low level risks.

We probed the focus group members' reactions to a number of other risk presentation techniques including bar graphs, pie charts and alternative numerical scales. Only a cigarette equivalent scale seemed uniformly promising; respondents had mixed reactions to the other techniques. For example, researchers have recommended describing risks to laypeople in terms of average loss of life expectancy (Cohen and Lee, 1979) or increased longevity (Schwing, 1979). As shown in the transcripts for the second Carbondale group and the second Marion group, many of our participants found this approach confusing. Several people in the Marion group commented that while the reduction in life expectancy made sense for cigarette smoking risks which have a long latent period, it was not a meaningful way to describe risks such as dying in a home fire since the latter risk involves an either/or situation which they found hard to reconcile with a risk described as an average loss of 23 days in a lifetime.

More recently, Urquhart and Heilman (1984) have proposed a safety-degree scale as a vehicle to communicate comparative risks. Their logarithmic scale is based on the size of the cohort for 1 death per year from the risk. On this scale the annual risk of dying from cigarette smoking at age 35 (1 in 600) has a score of 2.8 and the risk of dying from lightning in the U.S. (1 in 1,900,000) is 6.3. The key problem with using this scale for conveying low level risks in a survey is its logarithmic scale. The authors argue that the similarly logarithmic decibel and Richter scales have received widespread acceptance as a way of conveying noise and earthquakes levels. While it is the case, that these scales are commonly used by the newsmedia, there is no evidence that we are aware of that people grasp the notion that each whole number on the scale involves a doubling of the effect. Typically the Richter scale is used to compare earthquakes with other, well known, quakes. It is these other quakes, and their descriptions, which convey meaning not the scale number itself. Our anecdotal evidence and our experience with trying out a logarithmic scale in the focus groups suggests that many people find it difficult to grasp the logarithmic character of the scale. The potential bias

introduced by people mistaking a logarithmic scale for a linear scale is very large indeed, especially for low level risks. If people perceive being killed by lightning as 1/3 as likely as dying from cigarette smoking (linear), they are likely to view it as a much higher risk than if they grasp the fact that it is 1/3167 as likely.

Our experience in the focus groups suggested that a cigarette equivalent scale was a more successful technique for comparing risks. This scale, which we developed for this study, compares annual mortality risk per 100,000 to the number of cigarettes a person would have to smoke to experience an equivalent risk of dying from heart disease or cancer. In order to calculate the scale it was necessarily to make a number of simplifying assumptions, the most important of which was to posit a linear relationship between the number of cigarettes smoked and the subsequent risk of dying from cigarette-caused heart disease or cancer.[8] We also used cigarette risks for the population as a whole instead of for different age or sex subgroups.

The reaction of the man who exclaimed that people would not give much money for THM risk reductions after hearing them described as the equivalent of smoking a total of ten to thirty cigarettes indicated to us that this way of describing the risks could help people grasp just how low these risks are. Earlier in that discussion group Mitchell had attempted to explain the low level nature of the risks to the group, but the participants had obviously failed to grasp what we were trying to convey at that time. His reaction was commonplace; our focus group participants uniformly perceived reductions described in this manner as very small including those who were subsequently willing to pay money to obtain such an apparently trivial reduction. Participants also appeared to find the use of cigarette equivalents equally meaningful for immediate risks (e.g., home fires or auto accidents) and for delayed consequence risks (e.g., drinking water risks).

We were concerned that smokers and nonsmokers might respond in different ways to the cigarette equivalents, with the smokers reacting emotionally to

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8. The sources we consulted for a cigarette mortality rate varied somewhat in the mortality risk per 100,000 which we derived from their data for a single cigarette. Crouch and Wilson's (1982) data imply .02 deaths per 100,000, Urquhart and Heilmann's imply .04 per 100,000. We used .05 per 100,000 per cigarette as a conservative estimate.

the suggestion that their habit threatened their lives. This did not appear to be the case. Nonsmoker participants found them meaningful and smokers took them seriously and did not seem to regard them either as more serious or as more trivial than did the nonsmokers. There was an indication that people did not find the cigarette equivalents credible when applied to the full range of risks on the risk ladder. In the second Marion group, people found it hard to take the cigarette equivalents seriously when they were used for the higher level risks even though they regarded them as a credible and meaningful way to convey the lower level risks.

On the basis of these findings we used cigarette equivalents in our instrument as one of several devices to describe the low level risks. In the first part of the scenario we explicated the concept of cigarette equivalents. Later in the instrument we placed them on the risk ladder for annual mortality risks between 25 and .1 per 100,000. Finally, we used them to describe each of the THM risk reductions we asked the respondents to value.

In the actual administration of the questionnaire, however, the cigarette equivalent scale played a less important role in conveying the low level nature of the risks than we had expected based on these focus group findings. In the debriefing[9] the interviewers reported few instances of people concentrating solely on the cigarette equivalents when contemplating the THM risk reductions. Nor did any appreciable number of respondents react with the astonishment displayed by the focus group participant. According to the interviewers, most people treated cigarette equivalents as just one of the several pieces of information about the risks provided to them in the interview materials. Apparently the reaction we got from the focus group participants was influenced by the fact that we presented the cigarette equivalents to them as a separate scale and solicited their reaction to it in isolation. focus group participants' reaction was measured in isolation.

4. People's valuation of risk reductions are very sensitive to context.

When we probed the issue, we found people's value for THM risk reductions were sensitive to certain aspects of the scenario in ways consistent with other studies of risk perception. First, we found that personalizing the THM risks induced significantly higher values because people place very high value

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9. See appendix E.

on individual, identifiable lives. When we described the risk levels in terms of the number of people who would die each year in a city of 14,000 people (roughly Marion's size, although we did not explicitly link the hypothetical town to Marion), people reacted to the anonymous hypothetical victim rather than to the relative risk rate. Instead of viewing the risk level relevant to THM risks of .08 of a person dying each year as very low compared to other risks (such as experiencing childbirth or being a policeman) presented on the scale, participants tended to view it as high and worth a lot of money to reduce on the grounds that this rate yields one expected death each 12.5 years. However, when we expressed risks in terms of annual mortality rates per 100,000 people, the participants did not worry that they were causing some particular person's death if they accepted a higher risk rate. They accepted this type of description as conveying the risk they and others faced and valued it on these terms.

Second, risk values are sensitive to the scale used to describe the risk level. For index numbers above one, the higher the numbers the higher the value given to equivalent risk reductions. Several different indexes are used to describe THM risks. We initially described the EPA standard as 100 micrograms per liter (100 m/l). On this scale, the risk reductions we intended to value were 10, 80 and 230 m/l. One respondent in an in-depth interview alerted us to the possibility that these numbers conveyed an implied value when she commented that a reduction of 80 seemed sizable to her and of course a reduction of 230 must certainly be worth reducing. Thus sensitized to how the scale could convey meaning in itself -- the woman in question concentrated on the THM numbers and made little effort to comprehend the <u>risks</u> associated with them. We therefore experimented with the use of a parts per million scale which rendered the risk levels as .1, .11, .18 and .33 respectively. When the THM levels were expressed in this fashion, respondents did not appear to attach significant to the levels themselves as indicators of the degree of risk involved. This freed them to pay attention to the part of the scenario which translated the THM levels into risk levels.

That context influences risk perception is well documented in the experimental literature on risk perception (Kahneman, Slovic and Tversky, 1982). The inevitability of this phenomenon and the potential magnitude of these effects place a burden on the researcher to justify the context he or she chooses to use in a CV scenario. In our final instrument we avoided

contexts such as deaths per community because it distracted respondents' attention from the relative risks we wished them to evaluate. We decided not to describe THM concentrations in micrograms per liter because this implied risk levels which were inconsistent with the low-level nature of the THM risk levels we wanted the respondents to value. In both cases we chose alternative contexts which appeared to pose less chance of bias. Our findings are necessarily contingent on this choice.

5. Awareness of THM risks was low and people confused these risks with other drinking water risks.

Since the local citizens had been exposed to information about THMs as a result of the mandated notification process, we needed to know the extent to which people in Marion and Carbondale were aware of and concerned about THMs. Our focus groups offered us an excellent opportunity to investigate this topic because the type of people we recruited -- well educated, community-involved -- are precisely the type of people who would be most likely to have paid attention to the publicity about THMs. It was notable, therefore, that of the forty or so participants in our groups, only one person was reasonably well informed and only two or three others were partially informed about the THMs in their drinking water.[10] Those who had no memory of the THM notices and newspaper publicity included several participants who had evidenced a very strong concern about drinking water contamination earlier in the focus group discussion. No participant knew of anyone who was trying to pressure the authorities to take action to reduce the THM levels in their drinking water. This finding demonstrated that the topic of our study was not the subject of current controversy in these communities which made the job of designing the questionnaire easier since we did not have to contend with strong and possibly erroneous preconceptions. It also showed that we could not presume that people knew anything about THMs.

However, we did discover that many of our participants were aware of another drinking water contaminant, PCBs. As noted earlier, in contrast to their handling of the THM advisories, the press defined the PCB contamination as a serious problem. Not surprisingly, given the fact that both contaminants

10. Whitley's (1985) M.A. thesis in geography at Southern Illinois University explores this finding in depth.

have three letter acronyms and people's low level of knowledge about chemical contaminants in general, the focus group participants tended to talk about PCBs when we asked them if they had heard of THMs. This alerted us to another potentially serious source of bias in the form of amenity misspecification where people would unwittingly value PCB instead of THM risk reductions. In designing the instrument we: a) explicitly distinguished between THMs and PCBs at several points in the scenario, and b) emphasized that the only contaminant which would be affected by the referenda was THMs.

6. People valued collective drinking water improvements differently from individual improvements.

In contrast to many other goods which have been valued by the CV method, markets exist for drinking water in the form of bottled water or home treatment devices. This offered us a choice of provision methods. We could either ask people how much they are willing to pay for collective risk reduction through improvements in the town drinking water plant or we could ask them to value individual household reduction by offering them the opportunity to lease a hypothetical purification device which was guaranteed to provide a given quality of water. Although we preferred the collective provision method, since this represented the current policy option, we explored peoples' reactions to the household provision method in some of the in-depth interviews in order to see if the latter method was more meaningful to the respondents. Although the respondents could readily conceive of a household device, it proved to be no more realistic than the collective provision. From their spontaneous comments, however, we learned the respondents tended to place a higher value on equivalent risk reductions when they were provided collectively than when they were provided on a household basis because they valued knowing that their fellow townspeople would also be protected. In this case, at least, it appears that the household method of provision does not capture the full range of relevant benefits for policies which involve collective provision of risk improvements.

7. Respondents had ambivalent views about public authorities' protection of drinking water.

In order to value THM reductions, respondents have to evaluate the degree of risk posed by a given level of contamination. Is it "high" or "low," is it

"safe" or "unsafe?" In making such a determination, especially when it involves a formal decision with economic consequences such as the referendum vote we asked them to make, people draw on various sources of information which include the views of relevant authorities as well as those of their friends and relatives. Given the technical factors involved in THM contamination and the difficulty people have in judging risks it seemed to us people would be especially likely to be influenced by authorities' views in this case. If this was the case, our scenario, to be realistic, would have to include information about this topic. In order to do this, however, we needed to understand how people view different authorities so we could appropriately specify the authorities' views.

We therefore explored people's reactions to assurances made by city officials, local drinking water operators, and state environmental officials that various THM levels in excess of the MCL were not a serious threat to health. We found our focus group participants were of two minds about these assurances. On the one hand there was fairly widespread skepticism about assurances that the water is safe, especially from local authorities. As one participant in the second Carbondale group expressed it, "I've been inundated with too many movies where the people in authority are pulling one over on us." Participants in the first Marion group were skeptical of the competence of their drinking water plant operators because they are not paid very much. One person in the second group declared: "Politicians cover up the truth." Some participants in the first Carbondale group viewed the local authorities as having an interest in allaying people's concerns and used the term "public relations" to refer to their statements. When asked which authorities they would trust, participants tended to cite university scientists and the state EPA as sufficiently independent and expert to rely upon.

On the other hand, the participants believed strongly[11] that if there really was a serious problem with their drinking water, a "crisis," the authorities would inform them. There appear to be several reasons why they hold this belief. First, they believe their drinking water is constantly monitored by the plant operators for contaminants. Second they believe some of the important authorities, the state EPA in particular, are competent and

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11. See transcript of the first Carbondale group and the second Marion group in appendix A.

would not be motivated to cover up serious local drinking water problems. Third, they believe that authorities have acted when serious problems have occurred with drinking water in the past. For example, they are accustomed to receiving boil water advisories whenever work on their water system's pipes lowers the water pressure so that biological contaminants are temporarily introduced into the system. The PCB contamination in Orchard Lake was quickly labeled a problem by all the relevant authorities and received appropriate coverage in the local press. As a woman in one of the Marion groups expressed it: "I have enough confidence that I really believe if some agency, private or public, was convinced that there was a real danger, something would be done about it. I think most people feel this way. (Nods of agreement by the other participants.)"

These findings confirmed our assumption that people's valuation of drinking water risks will be strongly influenced by how they are defined by authorities. If the authorities regard these risks as trivial, people will be much less concerned than if some or all of the authorities express concern about the risks. This made it necessary to add to our scenario a description of the authorities' views about the seriousness of the THM risk reductions; without this specification we would not know what implicit assumptions our respondents would have had in mind about this factor. The reaction we specified was similar to the actual response to the THM notifications, the risks were so low that they were not worth worrying about. It is very probable that if our scenario had stated that the local and state authorities actively supported a referendum to raise water rates to cover the cost of reducing THMs, such a referendum would have received a higher proportion of yes votes, and respondents would have been willing to pay significantly more money for the same risk reductions.

8. Some people were afraid of giving a WTP amount higher than necessary to accomplish the drinking water quality improvement because of a fear that government would take the extra money and use it for other things.

This viewpoint emerged in the second Marion group. We noticed that when we asked them how much they would pay for a given improvement, people in several of the groups were anxious to know how much the improvements would actually cost. One person voiced what apparently lay behind the other participants' views on this matter when she said that she didn't want to give

the town more than it needed because it would use the money for other things.

This finding has important implications for the design of CV studies. The welfare measure which CV studies attempt to measure is consumer's surplus or the highest amount an individual is willing to pay for an amenity before doing without it. If people are averse to paying more than they think it will cost to provide an amenity, and if they believe the cost of providing it is lower than the maximum amount they would be willing to pay if necessary, they will understate their WTP amount. Plausible assurances have to be offered in the scenario to address this concern as which we attempted to do in this study.

CHAPTER 3

THE INSTRUMENT

In the previous chapter we described the research problem and our research efforts to learn about how people think about drinking water, mortality risks, and the CV interview experience. This chapter describes the research instrument which we developed for this study and the considerations which went into its design. We prepared the first draft of the questionnaire in February 1985 after the completion of the focus group phase of our research. During the next few months we tried the draft questionnaire out in various settings and on the basis of this experience we made numerous changes in it's wording, format, use of visual aids (or "exhibits" in survey jargon), and question order. These changes were intended to enhance the scenario's plausibility to make it easier for respondents to understand it.

From the survey designer's point of view, certain features of the scenario are intended to describe aspects of the amenity which the respondent should take into account when valuing the amenity and others are intended to be neutral in this respect. Whether the respondents react to the scenario as the researchers intend them to do is always an empirical question which must be explored in the design stage. It may turn out, for example, that respondents are sensitive to the particular payment vehicle used in a scenario. If this is the case, another vehicle may be preferable because respondents do not take it into account in valuing the amenity. It is not always possible to find a neutral alternative to a troublesome design feature. When this is the case, a choice has to be made between alternatives (if there are any), each of which has a particular effect on the valuation. To the extent that a scenario feature, such as the scale used to describe the concentration of THMs, appeared to influence the findings, we had to decide which version of that feature was most appropriate for our purposes. described in that chapter.

OVERVIEW OF THE INSTRUMENT

A copy of the instrument (which consists of the questionnaire and a set of display cards) is presented in appendix C. Before describing the instrument's most important features in detail, it may be helpful to briefly outline the scenario. It consisted of two parts, a lengthy introductory section and a valuation section. The introductory section began by describing the concept of mortality risks. It then introduced the concept of "extra" or "special" risks which some people are exposed to and others are not. Next, low level risks were described using several techniques. Drinking water risks from trihalomethanes were then described and compared with other risks using a risk ladder. The last portion of the introductory section introduced the maximum contaminant level for THMs and described the risks associated with various levels of THMs including the MCL level. When the interviewer had reached this point in the interview, the respondent was assumed to have acquired a basic understanding that the mortality risks posed by excess THM contamination: (1) occur as an unintended byproduct of the chlorination process, (2) pose a risk of causing cancer, (3) are regulated by EPA whose MCL for THMs carries a small amount of mortality risk, and (4) are are low compared to many other familiar extra risks and much lower than the basic risk of dying faced by people of various age groups.

The valuation portion of the scenario established a political market for controlling excess THM levels in which respondents were asked how they would vote on three different referenda. In each case they were told to assume that Herrin's drinking water exceeded the EPA THM standard by a given amount and a referendum would be held on whether or not the town should spend money to lower that THM level to the EPA standard and no lower. The respondents were told what the change in annual mortality risk per 100,000 people would be for each excess THM level if the relevant referendum passed. Those who said they would vote for a given referendum were asked to state the maximum amount they would pay in higher water bills for that risk reduction. At a later point in the survey every respondent was given the chance to revise his or her amount if he or she wished to do so for any reason.

KEY DESIGN CONSIDERATIONS

The Institutional Context

A key element which shaped our risk presentation format is the current institutional context for THM contamination.[1] There are two relevant features here, the regulatory framework for THMs and the water supply industry. Present government regulations mandate control of THMs in excess of the maximum contaminant level (MCL). The MCL in effect defines an officially sanctioned level of acceptable risk from THMs. In practice, programs to reduce THM risks in local drinking water systems are only undertaken when the MCL is exceeded. A plausible and relevant scenario, therefore, is one which values risk reductions from some level of THM contamination in excess of the MCL down to the MCL. Such a scenario requires a willingness to pay format where respondents are told that they face a given level of risk from excess THMs and are asked how much they are willing to pay to reduce this level down to the level of risk posed by the MCL. From a property rights standpoint this scenario, which we adopted, asked the respondents to value a gain from an assigned level of risk imposed on them by the nature of their water systems' raw water and its method of treatment. Unlike hazardous waste risks, which involve considerable uncertainty about the probability of exposure, exposure to the risks associated with the excess THM levels is certain unless respondents choose not to drink water from the tap.

In the United States, drinking water is supplied to communities by either public or private systems. As is the case with the majority of the 40,000 community water systems, Herrin's system is publicly owned. Altogether, public systems supply 88 percent of the total U.S. drinking water production (Clark and Stevie, 1978). Capital improvements to Herrin's system would require the issuance of bonds and the decision whether or not to assume the debt obligation may plausibly be the subject of a community vote. This suggests a referendum framework for the valuation of THM risk reductions, where the decision to reduce risks by installing and operating the appropriate

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1. This context accounts for much of the design difference between the present study and Smith, Desvousges, and Freeman's (1985) study of the benefits of changes in hazardous waste risks.

treatment equipment is decided by a majority vote.

Potential Biases

CV studies, for the reasons mentioned in the previous chapter, are vulnerable to bias from various sources. Table 3-1 lists the major potential sources of bias in CV studies. We have elsewhere (Mitchell and Carson, forthcoming) developed the rationale for this typology; here we will focus on the sources of bias which we believed would pose the greatest difficulty in this study. It is these biases which we made special efforts to avoid when we designed the THM drinking water instrument.

The possibility of amenity misspecification clearly posed the greatest design challenge. We had several reasons for fearing that the respondents might perceive risk reductions from controlling THM concentrations which pose a low level risk of cancer differently from the way we intended them to perceive them. The first is the possibility of metric bias. Low risk levels are widely regarded as prone to misperception by respondents who exaggerate them relative to zero risks which they overvalue Fischhoff, Slovic, and Lichtenstein, 1981, 1982). Our survey required the respondents to value a series of low level risks. This posed the possibility of metric bias, a form of misspecification where the respondent values the amenity on a different metric than the one intended by the researcher. In our case we were particularly concerned that respondents might regard the risk reductions we asked them to value as implying low, medium, and high improvements rather than the numerically based improvements we intended to convey.

The threat of metric bias can be illustrated by some of the findings of Smith, Desvousges, and Freeman's (1985) contingent valuation study of hazardous waste risk changes. These researchers used a very complex research design which employed a number of different methods and contingencies. Table 3-2 presents the option prices obtained by direct CV questions. These researchers communicated risk levels by means of pie charts. For each risk level respondents were given a card which showed a risk of exposure, a risk of death if exposed, and the combined risk (which was also labeled "personal risk"). For example, an exposure risk of 1/10 and a risk of death if exposed of 10/50 gave a combined risk of 1/50. Each of the eight subsamples valued

Table 3-1 TYPOLOGY OF THREATS TO VALIDITY IN CONTINGENT VALUATION

I. Incentives to Misrepresent Responses

This class of biases occur when a respondent intentionally or unintentionally misrepresents his or her true willingness-to-pay (WTP).

A. Strategic Bias. Where a respondent gives a WTP amount which differs from his or her true WTP amount (conditional on the perceived information) in an attempt to influence the provision of the good and/or the individual's payment for the good.

B. Compliance Bias

1. Sponsor Bias. Where a respondent gives a WTP amount which differs from his or her true WTP amount in an attempt to comply with the presumed expectations of the sponsor (or imputed sponsor).

2. Interviewer Bias. Where a respondent gives a WTP amount which differs from his or her true WTP amount in an attempt to either please or to gain status in the eyes of a particular interviewer.

II. Implied Value Cues

These biases occur when elements of the contingent market are treated by respondents as providing information about the "correct" value for the good.

A. Starting Point Bias. Where the elicitation method introduces a potential WTP amount which influences the WTP amount given by a respondent.

B. Range Bias. Where the elicitation method presents a range of p otential WTP amounts which influences a respondent's WTP amount.

C. Relational Bias. Where the description of the good presents information about it's relationship to other public or private commodities which influences a respondent's WTP amount.

D. Yea-Saying/Nay-Saying Bias. Where the elicitation procedure uses yes/no formats which influence a respondent's WTP amount.

III. Misspecification of Market Scenario

These errors occur when a respondent does not respond to the correct contingent market. Presuming that the researcher describes the correct market in the scenario, misspecifications are caused by the inability of a respondent to understand or perceive one or more elements of the researcher's intended market.

Table 3-1 (Continued)

A. Context Misspecification. Where the intended context or reference frame for the valuation exercise differs from that perceived by the respondent.

B. Payment Vehicle Misspecification. Where the perceived payment vehicle differs from the intended vehicle.

C. Multiple Valuation Misspecification. Where the respondent values more dimensions of the scenario than intended.

1. Payment Vehicle Valuation Bias. Where the payment vehicle itself is viewed as desirable or undesirable and hence is valued along with the amenity.

2. Method of Provision Valuation Bias. Where the method by which the good will be provided is valued in and of itself and affects the value given for the specified good.

D. Amenity Misspecification. Where the perceived good being valued differs from the intended good.

1. Part-Whole Bias. Where a respondent values a larger or smaller entity than the intended good.

a. Geographical Part-Whole Bias. Where a respondent values a good whose spatial attributes are larger or smaller than the spatial attributes of the intended good.

b. Benefit Part-Whole Bias. Where a respondent includes a broader or narrower range of benefits in valuing a good than intended by the researcher.

c. Policy-package Part-Whole Bias. Where a respondent values a broader or narrower policy package than the one intended by the researcher.

2. Property Right Misspecification. Where the intended property right of the good differs from the perceived property right.

E. Budget Constraint Misspecification. Where the perceived budget constraint differs from the intended budget constraint.

F. Probability of Provision Misspecification. Where the perceived probability of provision differs from the intended probability of provision.

Table 3-1 (Continued)

IV. Aggregation Bias

Where the aggregate value differs from the value which would be obtained from adding up measurements on every person or market in the population of interest.

A. Sampling Design Bias. Where the sample design imperfectly represents the population.

B. Response Rate Bias. Where those who complete the interview or questionnaire imperfectly represent the population.

C. Item Non-Response Bias. Where those who answer a WTP question imperfectly represent the population.

D. Sequence Aggregation Bias. Where the WTP amounts for amenities that are substitutes or complements are added together to value a policy package containing those amenities despite the fact that the amenities were valued independently of each other instead of in the appropriate sequence.

E. Benefit Component Aggregation Bias. Where independently derived estimates of two or more benefit components for a single amenity are aggregated to form an estimate of the combined benefits despite the fact that the benefit components are not additively separable.

SOURCE: Mitchell and Carson (forthcoming).

Table 3-2. OPTION PRICES FOR RISK REDUCTIONS FROM SMITH, DESVOUSGES AND FREEMAN STUDY

Subsample	Combined risk end point (1/10)[a]	(1/20)[a]	N	Risk improvement (δ) (annual deaths per 100,000)	Mean[b]	Std. deviation
1	1/100		36	1000	$16.56*	$20.57
	1/250		34	400	8.06	10.89
2		1/200	41	500	29.39**	43.87
		1/500	35	200	14.26	23.38
3	1/300		41	500	15.88**	21.28
	1/500		31	200	11.58	15.50
4		1/400	40	250	35.67**	50.26
		1/1,000	33	100	20.12	34.20
5	1/600		43	167	21,42*	26.51
	1/1500		36	83	11.72	14.64
6		1/1200	36	67	24.67**	46.84
		1/3000	29	33	18.48	46.03
	1/100[a]	1/200[a]				
7	1/60,000		48	1.6	18.13	26.72
	1/150,000		32	0.83	17.13	30.95
8		1/120,000	31	0.67	17.19	17.02
		1/300,000	28	0.33	10.11	14.05

Source: Smith, Desvousges, and Freeman (1985), table 11-7.

a. Conditional risk (risk of death, if exposed).
b. Protest bids excluded, outliers included.
*. Metric bias comparison 1.
**. Metric bias comparison 2.

two risk reductions -- first from the initial level to an intermediate (lower) level and, second, from the intermediate level to a final (lower) level.

The risk of death if exposed was set at 1/10 or 1/20 for six subsamples and at 1/100 or 1/200 for the remaining two subsamples. What is of interest to us here are the mean WTP amounts reported by Smith, Desvousges, and Freeman for the subsamples with the same conditional risk (risk of death, if exposed). Looking first at the subsamples with the 1/10 conditional risk (subsamples 1, 3, and 5), we see that the first risk improvement (in annual deaths per 100,000) which the respondents were asked to value varies greatly in size. At the extremes, subsample 1 first valued an improvement of 1000/100,000 whereas subsample 5 first valued 167/100,000, a risk reduction more than six times smaller. A similar pattern occurs for the subsampling with the 1/20 conditional risk. If the WTP amounts are not subject to metric bias, we would expect to find significant differences in the amounts offered with respondents offering more for the larger risk reductions. If, however, metric bias is present, we would expect the respondents to give roughly similar values. The two relevant comparisons are the sets of three means marked by single (comparison 1) and double (comparison 2) asterisks. Neither comparison shows the expected relationship between amount of reduction and the WTP amount. In each case the ranges for the three WTP amounts overlap despite the large disparity in risk reductions. These bias pattern is consistent with metric bias.

The risk reductions valued by subsamples 1-6 were much larger than those posed by realistic THM contamination levels. The last two subsamples, however, valued much lower risk reductions which are similar to those which concern us in this study. With the exception of the $10.11 mean WTP amount for the lowest risk reduction, the other three values reported for subsamples 7 and 8 are

virtually identical and very similar to those we considered in the first metric bias comparison. In other words, the subsample who valued a risk improvement of 1000/100,000 gave a WTP amount ($16.56) which is similar to the amount ($17.19) given by those in subsample 8 who valued the much lower risk reduction of 0.67/100,000. This is additional evidence of possible metric bias.

It is possible that these data patterns may be explained by factors other than metric bias. Given the complexity of the Smith, Desvousges, and Freeman study's design, further analysis may show that our interpretation is invalid. Our point in discussing these data here is to highlight the seriousness of the threat posed by metric bias and the desirability of a study design which makes it possible to test for metric bias.

The source of death, cancer, was another potentially complicating factor in communicating our risk reductions in this study. Cancer is thought to be especially dreaded and, as such, an outcome respondents might regard as unacceptable at any risk level. A final source of potential misperception was the respondents' unfamiliarity with the source of cancer, THM contamination. This created the possibility that the Herrin residents might confuse THMs with other acronymed contaminants, one of which, PCBs, had caused problems in a nearby water system. Alternatively, the unfamiliarity of THMs might tempt respondents to eschew the effort involved in valuing just THM-caused risks and value instead the offered risk reductions as if they were caused by cancer-causing contaminants in drinking water more generally.

In addition to amenity misspecification, another potential problem for the survey was bias from compliance behavior. Since improving the quality of drinking water is widely regarded as a desirable social goal, some respondents, if they believed the interviewers wanted them to pay for the risk reductions, might be motivated to give positive WTP amounts in order avoid appearing cheap

or antisocial in the eyes of the interviewer. We earlier described how we became alerted to the difficulty of avoiding this type of bias when a focus group member let it be known that he believed, despite our careful assertions to the contrary, that we wanted to obtain as high values as possible for the THM risk reductions.

Our third area of special concern was the possibility of importance bias. This type of bias occurs when the act of being interviewed suggests to the respondent that the amenity has value. When respondents are uncertain about whether or not a particular amount of risk reduction is large enough to worry about, they may be inclined to settle the doubt by reasoning that interviewers would not be going to the trouble of asking them about these risks if they were, in fact, inconsequential. As we will see in the next chapter, when we discuss what we call "position effect", the potential for importance bias is likely to be particularly strong when respondents who valued the first two of the three risk reductions at $0 are confronted with the third and highest risk reduction in the series. This is also the point where compliance factors may exert their greatest effect as well.

COMMUNICATING LOW LEVEL RISKS

Our strategy for communicating THM risks in an in-person survey was to begin by providing information about risks in general in such a way that respondents could compare the THM risk reductions with the risks involved with other, more familiar, situations. In order to ensure that respondents grasped the concepts necessary to valuing the risk reductions, we had to convey a considerable amount of information. Accepted survey practice rightly holds that respondents should be actively involved in the interview, otherwise they

are likely to become inattentive and bored. The standard technique for maintaining respondent attention is to avoid description and instructional material in favor of short and frequent questions. We decided that it was impossible to do this and still communicate the necessary information. Even after paring our descriptive material to a to a minimum and seizing every possible opportunity ask questions during this process, it was impossible to avoid a long stretch in which the respondents were required to listen to the interviewer describe important elements of the scenario. As we wrestled with the issue of how to maintain respondent involvement in this situation, we developed a format which relies heavily on visual aids.

Mortality Risks

The nature of our informational survey approach is illustrated in the first portion of the scenario which sought to convey the concept of mortality risks. The interviewer began by handing the respondent the card shown in figure 3-1. While the respondent examined the card, the interviewer said:

> This card shows the basic risk of dying we all face from such causes as accidents, long term illnesses, heart attacks and the like. On the average, census data show that out of every 100,000 people in the United States aged 25 to 34, 137 will die each year from one cause or another. Some will die in auto accidents, some from disease, some from accidents at their job, and some because they fall off a ladder at home. Thus the basic risk of dying for people in this age group is 137 of 100,000 (POINT).
>
> Another way[2] of expressing this risk level is to say that on the average one out of every 730 people (POINT) in this age group die in a given year. The two numbers -- 137 out of 100,000 and 1 of 730 -- are just different ways of expressing exactly the same level of risk.

2. Here and elsewhere, all emphases in the questionnaire materials are in the original.

Figure 3-1. CARD 4 FROM HERRIN SURVEY INSTRUMENT

BASIC RISKS OF DYING FROM ALL CAUSES

(Annual)

Age	No. of people who die each year per 100,000			Annual premium for $100,000 life insurance*
25-34	137 of 100,000	or	1 of 730	$137
35-44	229 of 100,000	or	1 of 437	$229
45-54	584 of 100,000	or	1 of 171	$584
55-64	1363 of 100,000	or	1 of 73	$1363

* This rate reflects the cost of paying the families of those who die under an "ideal" insurance plan in which everyone participates and there are no administrative costs.

What I want to do is to show you how different risks compare with each other. One way to compare risks is to use numbers like these. You can see on this card that as age increases, the number of people who die in a year also increases (RUN FINGER DOWN CARD).

Some people find it hard to make sense of numbers like these. Another way to compare these risks is to look at the size of the insurance premium that someone would have to pay for a life insurance policy with a death benefit of $100,000. For people age 25-34, it would only cost $137 a year to cover death from average risks. Because the risk of dying is higher for people in the 55-64 age group, the same $100,000 life insurance policy would cost $1363 a year.

IF[3] RESPONDENT QUESTIONS THE PREMIUM LEVELS AS BEING LOW, EXPLAIN THAT THIS IS AN "IDEAL INSURANCE SYSTEM" WITH NO ADMINISTRATIVE COSTS. THIS IS SIMPLY THE AMOUNT OF MONEY THAT, IF COLLECTED FROM EACH PERSON, WOULD BE ENOUGH TO PAY THE $100,000 PAYMENT FOR EACH ANNUAL DEATH.

Please look at the risk numbers for the other age groups on this card. Do you have any questions about these numbers or what they mean? (PAUSE)

Think of these risk levels as showing the basic "risk of dying." We all face these risks which increase as we get older. Of course some people face greater risks than others.

Although the respondent is not asked any questions during this extended description, the visual aid offers a focus for his attention. The interviewer directly relates the spoken material to the visual aid and encourages the respondent to to ask questions about it. Throughout the informational portion of the interview (as elsewhere), the wording and, especially, the sequence of the explanations were repeatedly tested and revised until they appeared to communicate the material smoothly and naturally. The interviewers were also trained to pace each presentation according to the interest and needs of the particular respondent.

The scenario's structure relied heavily on a type of repetition where the same concepts were used in different ways at various points in the interview. For example, the section of the instrument which followed the one quote above introduced the concept of "extra risks" such as dying while doing stunts as a Hollywood stuntman, in an airplane crash, being killed by lightning, and dying from smoking-induced cancer. The airplane and lightning risks later figured prominently on the risk ladder. The use of cigarette smoking risks served to introduce the concepts of death from cancer, which we later identified as a potential consequence of ingesting THMs, and incremental risk from smoking

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3. Here and elsewhere interviewer instructions are in caps.

individual cigarettes, which subsequently appeared on the risk ladder as a subsidiary risk scale.

Drinking Water Risks

The THM risks were introduced by asking the respondents to examine the two cards given in figure 3-2 while the following material was read to them:

> We all are exposed to many types of low level risks every day. These include being exposed to air pollution and eating food which has chemicals added to it to keep it from spoiling. Each of these activities poses some very small risk of dying from cancer. Sometimes if we pay more money we can reduce the risk somewhat, but we can never eliminate it. In each case we have to ask ourselves whether the size of the reduction in risk is large enough to be worth spending money for this purpose.
>
> The particular risk I want to ask you about involves drinking water.
>
> HAND RESPONDENT CARD 7 (See figure 3-2.)
>
> As you probably know, cities like this one who get their water from surface supplies add small amounts of chlorine to drinking water to purify it. The chlorine kills bacteria which would otherwise cause disease. Under certain special conditions, the chlorine can produce small amounts of chemicals called trihalomethanes or THM's in the drinking water people drink.
>
> Because they are created in the process of treating the water, THMs are very different from other types of chemical contaminants you may have heard about such as PCBs. (PAUSE)
>
> IF RESPONDENT ASKS ABOUT PCBs, SAY THEY WERE FOUND IN CRAB ORCHARD LAKE, THE SOURCE OF MARION'S WATER, A COUPLE OF YEARS AGO. IF THEY ASK ABOUT THE NEWS STORIES ABOUT PCBs IN REND LAKE SAY THAT PCBS WERE FOUND IN ONE OF THE RIVERS THAT GOES INTO REND LAKE, AND THAT SCIENTISTS ARE CURRENTLY STUDYING REND LAKE WATER TO SEE IF IT ALSO HAS PCBS. EMPHASIZE AGAIN THAT THIS STUDY IS ONLY ABOUT THMs WHICH ARE A DIFFERENT SOURCE OF CONTAMINATION IN DRINKING WATER.
>
> Because research has shown that THM's at high levels can cause cancer in animals, the Federal Environmental Protection Agency has established a maximum level for THM's in drinking water. This level is set at 0.10 parts per million, or about a few drops in a bathtub full of water. If a town's drinking water is tested and exceeds this level, the Environmental Protection Agency requires the town to notify its water customers of this fact.

Figure 3-2. CARDS 7 AND 8 FROM HERRIN SURVEY INSTRUMENT

WATER PURIFICATION
(CHLORINE)

↓

Trihalomethanes

THMs

(NOT PCBs)

.10 parts per million (ppm)

Card 8-A

HYPOTHETICAL DRINKING WATER MEASUREMENTS

(ppm = Parts per Million)

		LEVEL OF THMs IN WATER	EXCEEDS STANDARD BY	NOTIFICATION NECESSARY?
D	North Smithville	0.33 ppm	0.23 ppm	Yes
C	South Smithville	0.18 ppm	0.08 ppm	Yes
B	East Smithville	0.11 ppm	0.01 ppm	Yes
A	EPA Standard	0.10 ppm		No
	Smithville	0.09 ppm		No
	Centerville	0.07 ppm		No

It is important to know that the EPA standard for THMs still poses some risk. But the EPA feels this risk level is low enough to be acceptable.

HAND RESPONDENT CARD 8 (See figure 3-2.)

This card gives hypothetical THM levels for five cities. As you can see, three of the cities exceed the limit and have to send notices to their water customers. The other two have levels which are below the 0.10 ppm standard and would not have to send notices.

A little bit later I'm going to ask you to imagine that Herrin's drinking water is at the level of each of the three towns marked B, C and D, which exceed the EPA standard.

But first you will need to know how much risk is involved with these three different levels of THMs in drinking water. (PAUSE) The best way I can explain the risk is to compare it to other risks on this risk ladder.

We defined the risk level for the .10 ppm THM maximum contaminant level as a mortality risk of .57 per 100,000 per year. EPA defines total trihalomethanes as the sum of concentrations of the four halomethanes: chloroform, bromoform, dibromomethane, and bromodichloromethane. Crouch et al. (1983) point out that the cancer risk posed by these constituents varies considerably as bromoform, for example, poses a 600 times greater risk than chloroform. The Safe Drinking Water Committee (1981) of the National Academy of Science reviewed the evidence of the carcinogenicity of chloroform and calculated the 95 percent confidence estimate of lifetime cancer risk per mg/L concentration of chloroform at 1.7 per million. This represents an annual cancer risk of 0.002 per 100,000 for each mg/L of chloroform or a risk of 0.20 for the MCL if chloroform alone accounts for the contamination. According to Crouch et al., only rarely is one important contaminant present in drinking water so the "risk from drinking water in compliance with federal regulations may be substantially higher" (1983: 1371). Our risk level of .57 is a best estimate which allows for this possibility.[4]

---

4. It is derived from the $3.7\ 10^{7}$ upper 95 percent confidence estimate of the lifetime cancer risk for chloroform for daily ingestion of 1 liter of drinking water a day given in Rohlich (1978).

The Risk Ladder

Should someone worry about a risk of dying when it is described as a chance of 2/100,000 per year? Is this risk high or low, acceptable or unacceptable? What about a risk of .05/100,000 per year? The basic assumption underlying the use of a risk ladder is that people best understand unfamiliar risks when they can compare them with the risks posed by other, familiar, activities or situations. Our study strongly confirmed this assumption.

The risk ladder developed for this study was designed to provide a meaningful context for the risk levels posed by our hypothetical THM risk reductions. A basic problem with risk ladders is how to show a full range of risks and, at the same time, provide sufficient detail at the low level. A ladder which includes a reasonably wide range of mortality risks, say 0 to 100/100,000, would have to be several yards long to provide enough room at the bottom to differentiate between various risks at levels below 1/100,000. The most common solution to this problem is to use a logarithmic scale to compress the range. Smith, Desvousges and Freeman (1985) used a logarithmic risk ladder in their CV study of hazardous waste risk reduction benefits which emphasized the break between the different probability levels by showing spaces between the sections and by using a different color for each ladder segment.

If people fail to grasp the logarithmic concept, a scale of this type may convey an exaggerated image of the size of the lower level intervals relative to the higher probability risks. While people with reasonably high educational backgrounds can probably grasp the concept of a logarithmic scale, it is not, in our view, sufficiently intuitive a concept to use in a survey such as ours. Our limited trials of the Smith-Desvousges-Freeman scale reinforced our skepticism on this point. We therefore decided to adopt another approach. Our solution, which appeared to work well in the study, was to use a linear scale for a basic risk ladder and to enlarge or blow up the bottom portion of the ladder to show low level risks in more detail.

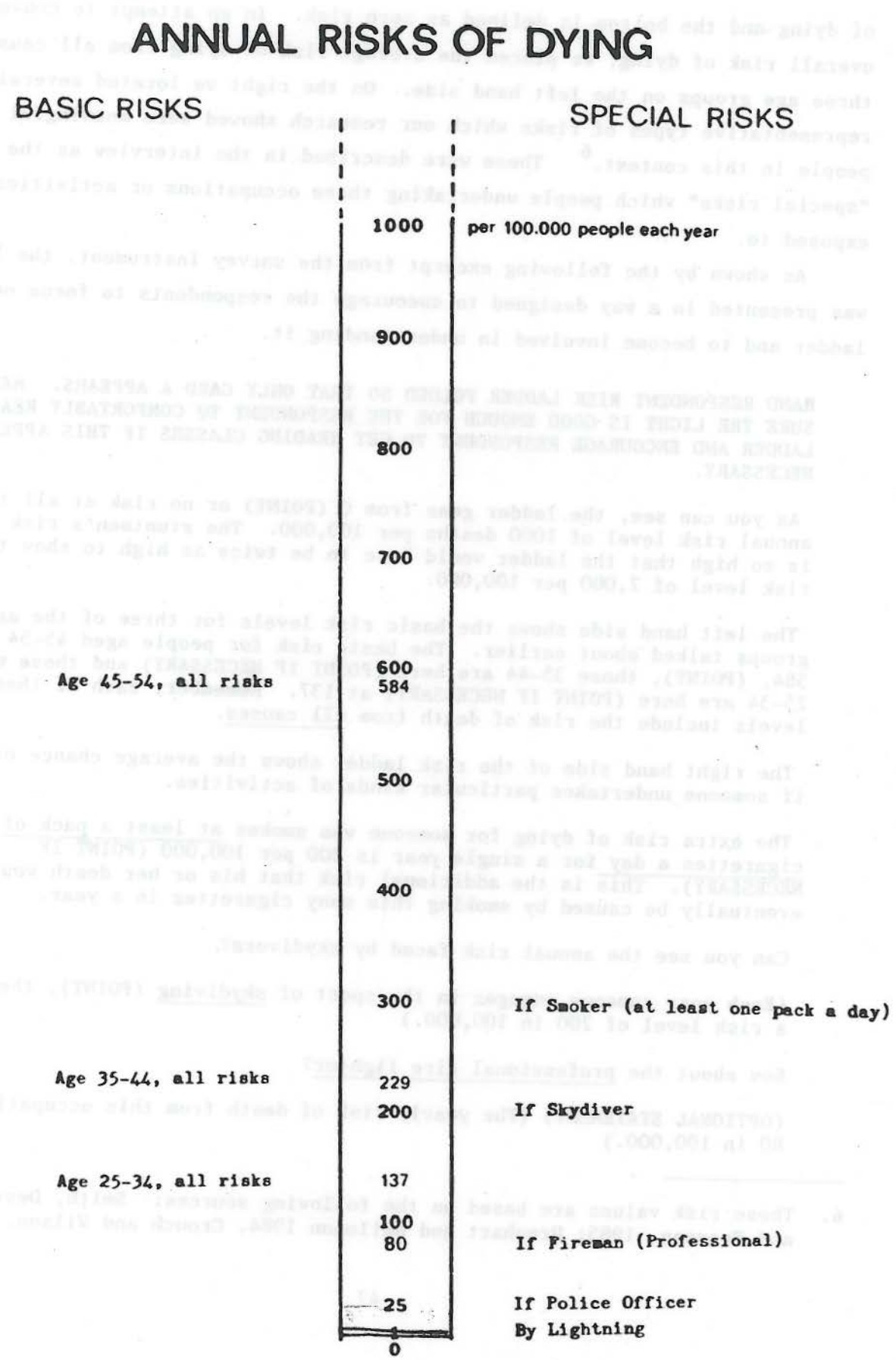
Figure 3-3 shows the basic risk ladder (A). At the top is an annual risk of 1000 per 100,000[5]

---

5. Smith, Desvousges, and Freeman's (1985) ladder was able to include a risk level of 2,000 per 100,000

Figure 3-3. RISK LADDER, PART A

A



of dying and the bottom is defined as zero risk. In an attempt to convey the overall risk of dying, we placed the average risk of dying from all causes for three age groups on the left hand side. On the right we located several representative types of risks which our research showed were meaningful to people in this context.[6] These were described in the interview as the "special risks" which people undertaking these occupations or activities are exposed to.

As shown by the following excerpt from the survey instrument, the ladder was presented in a way designed to encourage the respondents to focus on the ladder and to become involved in understanding it.

> HAND RESPONDENT RISK LADDER FOLDED SO THAT ONLY CARD A APPEARS. MAKE SURE THE LIGHT IS GOOD ENOUGH FOR THE RESPONDENT TO COMFORTABLY READ THE LADDER AND ENCOURAGE RESPONDENT TO GET READING GLASSES IF THIS APPEARS NECESSARY.
>
> As you can see, the ladder goes from 0 (POINT) or no risk at all to an annual risk level of 1000 deaths per 100,000. The stuntmen's risk level is so high that the ladder would have to be twice as high to show their risk level of 2,000 per 100,000.
>
> The left hand side shows the basic risk levels for three of the age groups talked about earlier. The basic risk for people aged 45-54 is at 584, (POINT), those 35-44 are here (POINT IF NECESSARY) and those aged 25-34 are here (POINT IF NECESSARY) at 137. Remember, each of these risk levels include the risk of death from <u>all causes</u>.
>
> The right hand side of the risk ladder shows the average chance of dying if someone undertakes particular kinds of activities.
>
> The extra risk of dying for someone who smokes <u>at least a pack of cigarettes a day</u> for a single year is 300 per 100,000 (POINT IF NECESSARY). This is the additional risk that his or her death would eventually be caused by smoking this many cigarettes in a year.
>
> Can you see the annual risk faced by skydivers?
>
> (Each year someone engages in the sport of <u>skydiving</u> (POINT), they have a risk level of 200 in 100,000.)
>
> How about the <u>professional fire fighter</u>?
>
> (OPTIONAL STATEMENT) (The yearly risk of death from this occupation is 80 in 100,000.)

---

6. These risk values are based on the following sources: Smith, Desvousges, and Freeman, 1985; Urquhart and Heilmann 1984, Crouch and Wilson, 1982)

Notice how firemen have a higher risk of dying because of their job than police officers (POINT IF NECESSARY).
Please look at the part of the ladder which is marked in blue (POINT). This is the risk level between 25 and 1 and is where the police officer's risk level is located.

Can you see the thin green line below the blue? This marks the range of the lowest risks. This is where the risk of being hit by lightning and dying in an air liner crash lies.

After presenting the basic risk ladder, the interviewer introduced the lower level risks by calling the respondents' attention to the bottom of the ladder where a green line marked the 1 in 100,000 risk level and a blue shaded area the 1 - 25 per 100,000 risk range. The respondent was then shown a companion ladder (B), shown in figure 3-4, which expanded these two risk ranges. The first expansion presented the 25 to 0 range and the second unfolded the 1 to 0 range. The two ladders (A and B) were attached to each other in such a way that whenever the B ladder was in front of the respondent, the A ladder was displayed to its left to underscore the relationship between the 0 - 25 risk levels and the full range of risk levels.

By expanding the bottom range of risks in this manner, we were able to provide a number of low level risk examples which the respondents could use in evaluating the THM risk reductions. One set of examples consisted of different situations such as the risk of dying during an appendectomy operation or of being killed by a drunk driver. The other set identified the risk associated with multiple occurrences of two types of risk -- dying during a scheduled airliner trip in the U.S. and smoking a single cigarette in a lifetime. This material was explained to the respondents in the following manner:

FOLD CARD B OUT FROM UNDER CARD A AND POINT TO WHAT IS NOW THE RIGHT HAND PAGE

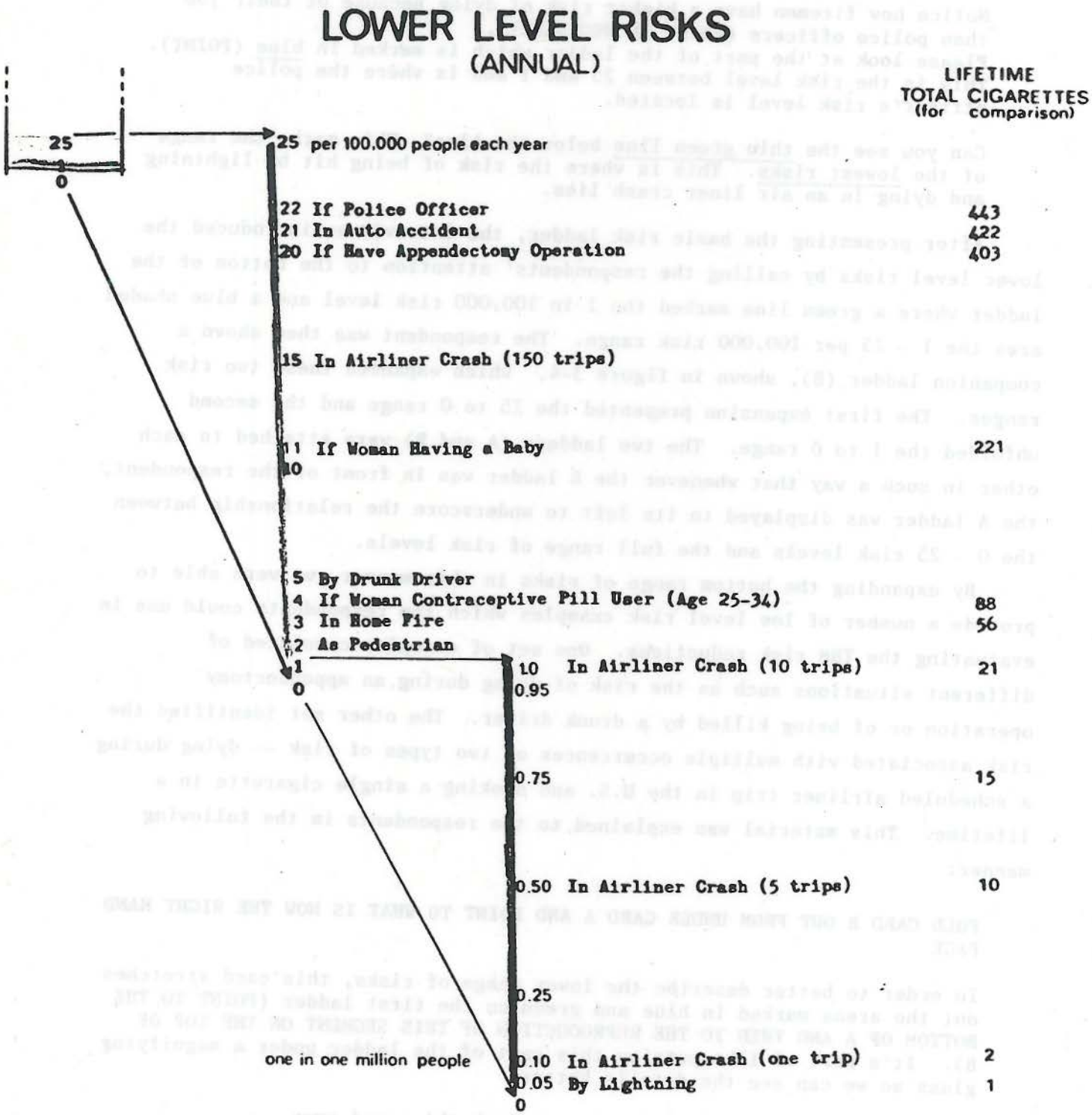
In order to better describe the lower range of risks, this card stretches out the areas marked in blue and green on the first ladder (POINT TO THE BOTTOM OF A AND THEN TO THE REPRODUCTION OF THIS SEGMENT ON THE TOP OF B). It's sort of like putting this part of the ladder under a magnifying glass so we can see the details better.

(PAUSE) Please take a minute or so to look this card over.

(PAUSE, GIVE RESPONDENT A CHANCE TO EXAMINE IT. ANSWER ANY QUESTIONS THEY ASK)

Figure 3-4. RISK LADDER, PART B

B



Remember that even though the scale is stretched out in this way, all these risk levels are at the bottom of the risk ladder and the part ingreen is at the very bottom.

Here you can see the police officer's annual risk at 22 per 100,000 (POINT IF NECESSARY). Just below it is the average annual risk everyone faces of dying in an automobile accident.

The next risk is not an annual risk like the others, but shows the chance that someone would die of complications while being operated on for an appendix.

IF RESPONDENT SAYS THIS RISK LEVEL SEEMS HIGH, EXPLAIN THAT THIS INCLUDES DEATHS WHICH OCCUR ALL OVER THE COUNTRY AND SOME PEOPLE GET OPERATED ON WHEN THEIR APPENDIX HAS BECOME VERY INFECTED.

IF NECESSARY, EXPLAIN THAT THIS RISK IS FOR A PARTICULAR OCCURRENCE WHEREAS THE OTHER LEVELS ARE FOR EXPERIENCING A SITUATION FOR A YEAR.

At 4 per 100,000 (POINT IF NECESSARY) is the extra annual risk of dying faced by a young woman who uses contraceptive pills. The interesting thing about this risk level is that doctors say that it is low enough to justify using contraceptive pills for younger women who want to practice birth control.

IF RESPONDENT MENTIONS HE OR SHE HAS HEARD OF A HIGH RISK FOR THE PILL, SAY THAT THE RISK INCREASES SIGNIFICANTLY FOR OLDER WOMEN AND DOCTORS NO LONGER RECOMMEND THAT THESE WOMEN USE THE PILL.

One of the reasons for this is that if the woman got pregnant, she would face the somewhat higher risk of dying in childbirth faced by a woman each time she has a baby. (POINT).

Each year we all face the risk of dying in an automobile accident caused by a car driven by another person who is drunk. This risk level is about 5 in 100,000 each year (POINT IF NECESSARY).

The bottom segment (POINT) stretches out the tiny area marked in green on the first ladder (POINT). All the risks in blue are quite low. These green risk levels are very low -- the chances of any of them occurring are all below 1 in 100,000. One tenth of one, .10, is where the risk of dying in a single airliner trip lies (POINT IF NECESSARY). (PAUSE) As I said before, this is at the one in a million level.

For each five airline trips you take in a given period of time you are exposed to this risk of dying (POINT TO .5).

Because some people find it hard to compare risks that are this small, we have put some cigarette smoking comparisons on the right hand side of this card. As you remember, the risk of dying from cancer or heart disease from smoking two cigarettes is roughly equivalent to the risk of dying in a crash when taking a single airplane trip. Note that this is

not two cigarettes a day, but the risk of dying if you only smoked two cigarettes in your entire lifetime.

As you can see, the risk of dying in an airline crash is extremely low. Let's compare it with another risk that people face, the yearly risk of dying in a home fire, (POINT). This risk is equivalent to smoking a total of 56 cigarettes in a lifetime. This means that it is 28 times higher than the risk you face of dying when you take a single airline trip. Although the home fire risk is higher, please note that both are low level risks compared to the overall risks of dying that we all face (POINT TO THE BASIC RISK SIDE OF CARD A) each year....Do you have any questions about these cards?

Immediately after the risk ladder was introduced, the respondents used the ladder to respond to a hypothetical situation. They were told to assume that they had to travel to Denver and could either take a three hour airplane trip or a 12 hour train trip. Both modes of travel presented the same risk of dying, .10 in 100,000, and cost the same. They were asked which mode they preferred (q. 6), and what was the highest risk on the ladder they would be willing to accept before they would switch their choice of transportation mode. The purpose of this exercise was to involve the respondents in using the risk ladder to think about risk choices. At the end of the survey, when they were formally debriefed, the interviewers were unanimously of the opinion that the travel exercise was not successful in achieving its purpose.

However, our experience with the risk ladder itself was quite favorable. Most respondents[7] seemed to find it plausible and interesting and found the other risks listed on the ladder useful points of comparison. As far as we can tell, based on our experience with the ladder in the pretest interviews, and on the accounts provided by the interviewers, no single feature of the ladder dominated the respondents' risk valuations. The respondents did not tend to rely on the cigarette equivalents or on one of the other risk comparisons to the exclusion of the others. In fact, contrary to our expectations, many respondents did not pay much attention to the cigarette equivalents when they assessed the THM risks. The interviewers indicated that without the context provided by the risk ladder the respondents would have had great difficulty in valuing the THM risk reductions.

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7. This evaluation is based on the interviewers' debriefing, the full transcript of which is contained in appendix E.

THE REFERENDUM ELICITATION FORMAT

We have argued (Mitchell and Carson, 1986) that referenda are preferable to consumer goods markets as a model for CV studies since citizens actually make binding decisions about the provision of public goods in this manner. The particular appropriateness of this model for drinking water amenities was noted at the beginning of this chapter. Our elicitation format asked respondents how they would vote in hypothetical THM reduction referenda. Our pretests, the interviewers' post-study evaluations, and the small percentage of item nonresponses for the WTP questions all suggested that the respondents found this framework meaningful. The fact that drinking water is provided and paid for at the community level no doubt contributed to the plausibility of this approach.

Prior to any WTP question, respondents were told that they would be asked to value three different amounts of risk reduction from THM contamination. Each WTP question asked the respondents to imagine that Herrin's THM levels exceeded the THM maximum contaminant level by a given amount and that they had the opportunity to vote whether or not to increase their household's water bill to cover the cost of reducing the level to, but not below, the EPA MCL. The amount of risk reduction which they would buy was described in various ways including a risk ladder on which the THM levels were superimposed. Respondents were told that the money they would pay in higher water bills would go for the cost of the new equipment needed to reduce the THM level and that this equipment would only affect the THM level; their drinking water would otherwise remain the same as it is now.

Contingencies

Respondents were informed, just prior to the elicitation questions, about three things they should keep in mind when valuing the risk reductions. The first two reinforced information previously provided to them; the third was new. While the respondent was shown a card summarizing each, the interviewer read the following material:

> First in deciding how to vote, you should assume that this is a situation where scientists are sure that THMs are the only source of chemical contamination in your drinking water. Therefore, only the THM

level will be affected if the referendum passes. This referendum has nothing to do with toxic waste dumps, nor with the PCBs which were found in Marion's water a few years back, or anything like this. (PAUSE) Moreover, the new equipment would not change your drinking water's taste, odor, and color in any way. (PAUSE)

Second, you should assume that if the new equipment is installed it will reduce the level of the THMs just to the point where the EPA standard will not be exceeded and no lower. Thus there will still be the risk of dying associated with the EPA standard (POINT). If the equipment is not installed the THM level will stay where it is and will not go any higher. (PAUSE)

Third, you should assume that various authorities agree that the risk posed by the extra THMs is not high enough to worry about. As you can see on this card, the local drinking water officials, the city health officials and the State of Illinois Environmental Protection Agency all agree that the risk is not high enough to be worth spending much money to change the drinking water plant. (PAUSE)

This last contingency, which specified that the issue was not controversial and that certain authorities felt the risks were not worth spending much money on, is of particular importance. Referenda normally occur in a context where issues are supported or opposed by various groups. In the case of controversial referenda, disagreement among groups about whether the referenda should be passed or not receive significant media coverage and people's votes are determined by some combination of their respect for or allegiance to the groups involved in the controversy and their own assessment of the referenda's merits. Contention is absent for noncontroversial referenda, but the voters' judgment about the issue will be affected by the nature of its support.

Our focus groups showed that people tend to give significant weight to the recommendations of relevant authorities when they evaluate risks. If we had not included a specification on this point, respondents would have made their own assumptions about the authorities' views anyway and we would not have known what these assumptions were. Why did we specify the view that the risks were not high enough to be worth spending much money on? Our first reason was realism. The view we ascribed to the authorities in our hypothetical referenda is the actual position taken by the authorities whenever the communities in this area exceeded the THM MCL between 1983 and 1985. For example, the local press quoted local government and state EPA officials as saying: "the risk is thought to be very slight," "no one should

be alarmed by this," "long run risk is minimal," "risk is extremely small," "long-term effect of drinking water containing THM is unknown and the risk to consumers...is considered very low," these are "very, very low levels...People shouldn't quit drinking their water by any means," these are very minute levels," "There's a lot of controversy in the scientific world whether that's too restrictive (the federal THM MCL standard)." None of the local newspaper articles carried any assessments of the THM risks which contradicted these views nor did we hear about contrary views being expressed in any other way.

A second reason for this contingency is that we wished to encourage the respondents to make their <u>own</u> judgment about the acceptability of the THM risk reductions. We knew from our focus groups that when we informed the respondents about the US EPA standard in the scenario, the respondents would be likely to interpret this as suggesting that THM levels in excess of this level should be cause for concern. By introducing the views of the state and local authorities in the way that we did, we sought to legitimate respondents' making their own decision about whether or not the risk levels were high enough to be worth paying money to reduce to the EPA standard. Our empiricial results and the interviewers' subjective evaluations suggest that we were successful in this regard. The interviewers reported that respondents approached the referenda questions seriously. Those who said the amount of risk reduction was too small to be worth increasing their water bill for, a view held by large percentages of the respondents for the lowest risk reductions, expressed this view firmly and rarely mentioned the local authorities' views as a justification for their position. Others did not hesitate to disagree with the local authorities' views, saying such things as "I know it is a small risk, but it is one we can do something about."

A final reason for describing the authorities' views in this way was to obtain a credible, conservative estimate for the benefits of THM risk reductions. Our estimates are based on a situation where drinking water contamination was not a current nor recent subject of controversy and where the citizens were offered the maximum amount of reassurrance that the risks are low. We learned from our focus groups that many people assume that if the risks posed by THM levels, such as the ones we proposed, were really serious, the local authorities would tell them that this was the case. It is important, therefore, to treat the benefits measured in this study as a lower bound of people's willingness to pay for drinking water risk reductions. If

we had portrayed the state EPA and, especially, the local drinking water authorities, as regarding these risks as "serious" and worth spending money for, it is very likely that the WTP amounts would have been bigger.

The Elicitation Questions

We used a two question sequence to obtain each of the three WTP amounts obtained from the individual respondents. They were first asked to say whether they would vote in a referendum to increase their annual water bill to get a specified risk reduction. Those who said they would vote no were counted as willing to pay $0 for the amenity after ascertaining, by a followup question, that they gave that response because the risk reduction was not worth anything to them. Those who said they would vote yes were then asked, "realistically, what is the highest amount per year" they would be willing to vote to increase their household's water bill for this risk reduction only. An open-ended format was used as we had determined that no elicitation aid such as a starting point or payment card was needed for this study.

At this point in the interview, about one out of four respondents asked how much the control program would cost. Because our pretesting had led us to anticipate this response, the interviewers were instructed to tell these respondents that they would be given the opportunity to say how much of an increase they would accept and that, if they were willing to pay any extra money for this purpose, they should vote yes; otherwise they should vote no. In order to separate protest zeros from genuine zero dollar WTP amounts, respondents who said they would vote no in the referendum were asked why they gave this response. Six percent of the 0$ bids were given in protest to some aspect of the survey, a relatively low rate of protest compared to many CV surveys. Half of these respondents said they did not have enough information to make a decision; the other half gave various reasons for their answer.

At the end of the interview, after they had answered a number of other questions, the respondents were reminded of the amounts (including $0) they originally gave for each of the three THM reductions and were asked:

> Now that you have had more of a chance to think about the question, would you like to change any of these amounts to make them lower or higher for any reason?

This was intended to give respondents the opportunity to reflect further on their responses after experiencing the entire interview. Although approximately 15 percent chose to revise their WTP amounts at this point, the interviewers reported (see appendix E) that the opportunity to revise could have been better presented to encourage more thought at the end of a long interview.

THE EXPERIMENTAL DESIGN

In order to test for the presence of metric and question-order bias, we assigned respondents randomly to one of four versions of the questionnaire based on a 2^2 factorial design (Box, Hunter, and Hunter, 1978). As shown in table 3-3, the A-B dimension consisted of lower and higher sets of risk reductions while the 1-2 dimension varied the order in which the first two reductions were valued.

The reductions valued by the respondents who received the A or low reduction treatment are .04, .4 and 1.3 (10^{-5}). Those assigned the B or high reduction treatment valued reductions of 2.4, 4.4, and 8.9 (10^{-5}). The A set of risk reductions covers the range most commonly encountered by local drinking water systems in practice. The scenario used in version B is identical to A except that each of the out-of-compliance risk levels is approximately five times higher than those used in version A. If the WTP amounts for A are statistically equivalent to those for B, the null hypothesis is accepted indicating the respondents value low, medium, and high risk reductions irrespective of the actual risk levels assigned to those changes in the scenario. If the WTP amounts given by the respondents in the B condition are higher for each of the paired risk reductions (e.g., lowest A vs. lowest B), an ordinal ranking, where the actual numbers on the risk ladder do not have meaning to the respondents, can be rejected. Given adequate power in the statistical design, rejection of the null hypothesis is a necessary but not sufficient basis on which to establish that respondents reacted to the risk stimuli in a cardinal manner.

The sequence of the risk valuation questions for those assigned to treatment 1 was lowest-middle-high whereas those in treatment 2 valued the middle reduction reduction first, then the lowest reduction followed by the highest reduction. If question order bias does not occur, the mean WTP

Table 3-3. EXPERIMENTAL DESIGN FOR JOINT TEST OF METRIC AND QUESTION ORDER BIAS

Valuation question order	Risk Reduction Levels	
	LOWER	HIGHER
1-2-3	Version A_1 .04/ .4/ 1.3/ 10^{-5}	Version B_1 2.4/ 4.4/ 8.9/ 10^{-5}
2-1-3	Version A_2 .4/ .04/ 1.3/ 10^{-5}	Version B_2 4.4/ 2.4/ 8.9/ 10^{-5}

amounts for both lowest risk reductions should be the same irrespective of treatment as should those for both middle risk reductions. If, however, people's responses are influenced by the sequence in which they are asked to value the risk reductions, the mean WTP amounts for the pairs will differ across treatments.

CHAPTER 4

INITIAL FINDINGS

The completed instrument was tested in a survey conducted in Herrin, Illinois. Conceived as pilot study for the instrument, a sample of 230 respondents were interviewed. In many respects the instrument worked well. The interviewers' reported positively about the respondents' reactions to the interview, the tests for question-order and metric biases were negative, as desired, and the WTP amounts for the combined treatments, after adjustment for a bias caused by the relative positions of the risk reductions the respondents were asked to value, are well explained by a simple logarithmic function.

The estimates of the benefits of THM reductions which we report in this chapter, while suggestive, must be interpreted with care. They are based on a moderate size sample which comes from a single small midwestern town chosen for its relatively homogeneous population. The question of whether our risk ladder does indeed result in valid valuations of low-level risks cannot be answered until the ladder is used in other settings and with other research designs.

The Sample

The sampling plan for the study was designed to provide a close approximation of a simple random sample. The housing unit sampling frame was selected in two stages. First, 250 households were chosen from the Herrin phone book using a random starting point and an interval which was large enough to provide this number of households and small enough to cover the entire Herrin listings. In order to compensate for any possible bias caused by a small number of households with unlisted telephones, each of the initially selected households was matched with a second household selected by a rule which specified the second house to the right of the household address selected from the telephone book sample. Interviewers were randomly assigned address pairs from the resulting pool of 500 addresses as needed until the desired number of interviews were completed.

In-person interviews were conducted in Herrin by four interviewers during June and July, 1985. The interviewers, who were noneconomist graduate

students at Southern Illinois University, received a two day training course directed by Robert Mitchell. Selection of the respondent at the household level required the interviewer to enumerate the members of the household. Because we wanted to interview people who could make financial commitments for their households, our sampling frame at this level consisted of "heads of household." In each household, the person to be interviewed was selected in a predetermined manner from the total number of residents 18 years and older who "have or share responsibility for deciding the household budget and for paying for housing, food, and other expenses" (interviewer instructions). The four versions of the questionnaire were randomly assigned to the respondents.

The level of nonresponse in obtaining interviews and, from those interviewed, in obtaining answers to the WTP questions (item nonresponse), was acceptably low. In all, interviews were attempted at 286 households and completed at 237 for an 83 percent completion rate.[1] Of those not completed, 22 occurred because the interviewer could not get the person who answered the door to provide enumeration information, 24 because the designated respondent refused to be interviewed, and 3 for other reasons including those not at home.[2] Despite the fact that we used an open-ended elicitation format, only seven respondents were unable to value the risk reductions. This low level of item nonresponse -- 3 percent -- appears to be due to the scenario's plausibility. Respondents were familiar with paying for their drinking water and they easily grasped and accepted the notion of voting in a town referendum to decide whether or not to fund treatment facilities. The interviewers reported that even respondents who exhibited a low level of interest in answering the early questions or who manifested impatience about the amount of information presented to them during the first portion of the interview, became attentive and thoughtful when the referendum was described to them.

It should be recalled that the respondents were allowed to revise their WTP amounts at a later point in the interview after they had had a chance to

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1. Completed interviews were distributed across the four experimental treatments as follows: A_1, 60; A_2, 59; B_1, 60; B_2, 58.

2. The not-at-home category was low because the interviewers made as many call-backs as needed during the six week period they were in the field.

fully comprehend the interview and, possibly, to rethink their initial amounts. Seventeen respondents (7 percent) revised their amounts at this point. Generally speaking, they used the opportunity to correct for nonmonotonic responses (giving higher amounts for lower risk levels) or to reduce or increase their WTP amounts for one or more risk reduction level.

Assessment of Conditions in Herrin

Respondents were asked to evaluate several aspects of Herrin's natural and social environment at the beginning of the interview. These questions were intended to communicate the fact that drinking water contaminant risks are only one of many environmental problems and to measure the degree to which the town's inhabitants were concerned about drinking water contamination. Table 4-1 summarizes their responses to these questions.

In general, the respondents did not express high levels of concern (Q. 1) when asked about the harm caused in Herrin by three kinds of pollutants. On a ten point scale, where 10 was the highest harm, only twelve percent rated the harm from motor vehicle pollution at 7 or above. The mean rating for this pollutant was 4.5. Pollution from manufacturing plants in Herrin received a mean rating of 4.6 on this scale. The pattern of responses for current harm in Herrin from "chemical contaminants in the town's drinking water" was different. The percent who rated this source of harm at 7 or above on the ten point scale was somewhat higher than it was for the other two sources of pollution, 19 percent, but the mean rating was lower, with a mean of 2.3. Most Herrin respondents appear to believe their drinking water is very safe from chemical contamination, but a small minority apparently believe chemical contaminants are very harmful. This survey finding is consistent with the views expressed by the focus group participants.

Using the same ten point scale, this time with 10 standing for the highest level of satisfaction, Herrin residents expressed an overall dissatisfaction (3.7) with street and highway maintenance in the town, strong satisfaction (6.9) with the public schools and moderate satisfaction (5.5) with the "competence of the local city officials." The latter item was asked because we anticipated that the respondents' views about the THM risk reductions might be influenced by their assessment of the local officials' competence. Our analysis showed that this was not the case.

Table 4-1. PERCEIVED HARM FROM POLLUTANTS IN HERRIN

Pollution from...	Lowest 1	2	3	4	5	6	7	8	9	Highest 10	Total	N	$\bar{m}$
Cars, trucks, busses	2%	10	18	21	23	14	7	4	.4	1	100%	233	4.5
Manufacturing plants	5	9	17	21	14	13	8	7	3	3	100	236	4.6
Chemical contaminants in town's drinking water(CHEMWAT)	6	18	21	19	9	8	6	6	3	4	100	201	2.3

SATISFACTION WITH SERVICES IN THIS TOWN

	Lowest 1	2	3	4	5	6	7	8	9	Highest 10	Total	N	$\bar{m}$
Street or highway maintenance	15	20	18	18	11	4	5	7	1	2	101	240	3.7
Public schools	3	.5	1	2	12	19	21	29	9	5	101	218	6.9
Competence of the local city officials	3	5	10	15	17	19	13	8	5	6	101	232	5.5

SATISFACTION WITH ASPECTS OF LOCAL DRINKING WATER

	Lowest 1	2	3	4	5	6	7	8	9	Highest 10	Total	N	$\bar{m}$
Taste	2	3	3	5	15	17	23	20	8	3	99	238	6.4
Odor	1	3	4	4	10	17	18	22	15	6	100	237	6.8
Appearance	4	1	3	3	10	14	22	23	18	6	100	237	7.1
Absence of supply interruptions	1	1	4	2	3	4	7	24	38	20	100	238	8.3
Freedom from chemical contamination	1	1	4	9	15	19	18	22	7	5	101	238	6.4

The last series of questions (Q. 3) used the ten point scale to inquire about how satisfied the respondents were with five characteristics of the drinking water that "comes out of your tap." Again 10 represented highest satisfaction. Respondents rating of their drinking water's appearance and absence of supply interruptions was quite high -- 7.1 and 8.3. Mean satisfaction levels for taste and odor were moderately high -- 6.4 and 6.8 respectively -- as was their satisfaction with their water's "freedom from chemical contamination that presents a health risk" (6.4). Only six percent were strongly dissatisfied with this last characteristic and rated it at 3 or below.[3]

Willingness-to-Pay for THM Risk Reductions

Before discussing the summary statistics for the WTP amounts, a few comments about the character of the WTP amounts based on the distribution of the responses are in order. Appendix D gives the original and revised amounts offered by each respondent in the A and B treatments in addition to the respondent's household size, income, age and answer to a question which asked them how harmful they think chemical contaminants are in Herrin's drinking water (CHEMWAT). The first thing these distributions illustrate is that the amounts offered by the individual respondents represent approximations rather than precise values. This is shown by the respondents' overwhelming tendency to use round numbers, such as $10, 12, 20, 24, etc. to express their value for one or more of the risk reductions, instead of amounts like $7, 23, or 51. Since we asked for annual amounts, it might not be immediately apparent why $12 and $24 qualify as "round" numbers. In the process of determining their willingness to pay, however, most respondents mentally referred to their monthly water. They did this spontaneously; the instrument did not ask them to do this in order to avoid introducing an artificial reference level. A one or two dollar increase per month results in WTP amounts of $12 or 24 a year.

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3. It would appear, judging from the responses to a different set of questions about drinking water given a national sample interviewed for the american Water Works Association Research Foundation (Audits and Surveys, 1985), that Herrin residents are somewhat less concerned about chemical contamination in their drinking water than U.S. citizens more generally.

This type of response to the request to value the risk reductions in dollars is understandable, given the novelty of the exercise, and acceptable, provided the approximations are thoughtful and constrained by the factors such as income which constrain respondent judgments in everyday life. We believe this was the case for most of this study's respondents. An aspect of the responses of a small number of respondents, which is less acceptable from the data quality point of view, was to give the same WTP amount for two or more levels of risk reduction. For example, four respondents in the A version said they were willing to pay $24 a year for each of the three risk reduction levels they were asked to value. Amounts such as these, which are unrelated to the size of the risk reduction, raise the question of whether the respondent is genuinely valuing each level or is taking an easy way out by simply giving a set amount for drinking water risk reduction in general. It is possible, of course, that these respondents have a risk reduction threshhold, at any point above which they are willing to spend their entire risk reduction budget to achieve that reduction and any other higher reductions. We are inclined, however, to regard this type of response pattern as evidence of respondent unwillingness or inability to arrive at considered values for the amenities described in the survey. Consistent with this judgment is the fact that almost all the respondents who exhibited this pattern are either retired or have a low level of education or both. Although, 15 respondents exhibited this type of answer pattern -- 7 percent of the sample. This level compares favorably with the 42 percent of Jones-Lee et al.'s (1985) respondents who exhibited a similar response pattern in a value-of-transportation-safety survey.

Table 4-2 shows the WTP amounts obtained for each of the six risk reductions valued in the study. Because a small percentage of extreme answers are common in CV surveys -- a few people give improbably high WTP amounts, relative to their income -- we present medians, 5 percent trimmed means and adjusted means in addition to the mean values for each of the six risk reductions.

Looking at the mean values first, they range from $3.42 per year for the smallest to $44.70 for the biggest risk reduction. Except for the a_3-b_1 comparison, an anomaly which we will discuss shortly, these findings show the anticipated positive correlation between willingness to pay and the size of the risk reduction. This mean series contains a number "bad" data points

Table 4-2 HOUSEHOLD WILLINGNESS TO PAY AMOUNTS IN HIGHER WATER BILLS PER YEAR FOR THM RISK REDUCTIONS

	THM Reduction (ppm)			Risk Improvement (Annual deaths per 100,000)	Version A (N=121)				
	From	To	TOTAL		Percent zero	Median	Mean	5% trimmed	Adjusted Mean
a_1	.11	.10	.01	(.04)	87%	$0	$3.78 (±$2.76)	$1.13 (±$1.41)*	$2.86 (±$1.82)
a_2	.18	.10	.08	(.43)	66	0	11.37 (±4.33)	8.30 (±3.72)	9.19 (±3.37)
a_3	.33	.10	.23	(1.33)	42	17	23.73 (±7.37)	18.99 ±6.35)	20.49 (±5.20)
					Version B (N=117)				
b_1	.55	.10	.45	(2.43)	58%	0	15.23 (±4.64)	12.70 (±4.25)	11.79 (±3.38)
b_2	.90	.10	.80	(4.43)	39	20	26.25 (±8.99)	23.08 (±5.78)	23.51 (±5.39)
b_3	1.65	.10	1.55	(8.93)	20	36	44.27 ±7.22	42.32 (±7.98)	42.68 (±7.32)

* Ninety-five percent confidence interval = mean plus or minus this amount.

** N=117 for A, 110 for B.

which are compensated for in different ways by the other three series.

The effect of using medians to estimate willingness-to-pay is to reduce the value of the risk reductions up to 2.4 in 100,000 from positive amounts to $0. As shown in the percent zero column, majorities of the respondents said they would vote no in a referendum to spend money to obtain these levels of risk reduction. Considering the extremely small risk reductions offered in a_1 and a_2, this finding lends credibility to the study. Despite the dread associated with cancer and people's concern about the quality of their drinking water, large numbers of our respondents did not automatically consider any risk level, however small, to be worth money to reduce. Moreover, our pretests provided strong anecdotal evidence that those who were willing to pay for a_1 understood the very small nature of the risk improvement but valued it nonetheless on what amounted to symbolic grounds. As one woman put it when asked why she was willing to pay $10 for a_1, "There are so many risks that I can't do anything about; it is worth money for me to do something about this one."

Comparisons may be made on the percent of respondents who express $0 responses for risk reductions with the findings of the only other CV study available to us which attempted to measure people's willingness to pay for risk reductions. Smith, Desvousges, and Freeman (1985) used a different risk presentation format than ours when they interviewed 371 respondents in obtain values for (among other things) a decreases in risk of exposure to contaminants from hazardous waste dumps. In all, 27 percent of their respondents gave $0 bids (1985; p. 11-31). Somewhat more than half (15 percent of the total sample) of these bids were protest bids in that the respondents gave $0 for reasons other than that is what they felt the risk reduction was worth. None of the respondents who gave nonprotest $0 bids for any of the risk reductions explained their bid as representing what they thought the reduction was worth. Most said they "could not afford anything" (Smith, Desvousges, and Freeman, 1985: p. 11-31). In our study, which valued much lower risk reductions than those proposed to Smith, Desvousges, and Freeman's respondents, a total of 63 percent of the respondents in the two versions gave $0 for the smallest risk reduction. Our level of protest bids was somewhat lower; only 7 percent said they gave $0 because they did not have enough information or for reasons other than the risk reduction was not worth any money at all to them.

It is of some interest to compare our level of valid $0 bids with the findings of a national telephone survey of public attitudes toward drinking water conducted by Audits and Surveys (1985). This study was a conventional attitude survey which did not attempt to convey a detailed scenario nor, of course, could it use visual aids. It found 55 percent of the respondents would not pay when asked:

> Suppose some substance were discovered in your tap water whose chances of causing your death over your lifetime were thought to be about equal to your chances of being struck and killed by lightning.[4] Would you be willing to pay to have this substance removed from your water supply?

The level of risk reduction invoked by the Audits and Surveys survey is quite similar to the lowest risk reduction (A_1) in the present study.

The five percent trimmed mean is a useful way to identify the degree to which outliers affect the values (Huber, 1981). It is calculated by dropping the highest five percent and the lowest five percent[5] amounts before calculating the means. As expected, given the small number of positive values, the trimmed means are considerably lower than the means at the lowest risk levels. Trimming the mean for the lowest risk reduction -- .04 in 100,000 reduction -- lowers the WTP amount by two-thirds to a level whose confidence interval includes $0. The difference between the mean and the trimmed mean estimates is much less -- 25 percent -- for the .4 risk reduction and declines further until the two values are quite similar for the higher risk reductions. At the highest risk reduction, b_3, outliers have very little effect on the values as the WTP amounts are very similar -- $40 to $44.70.

Because these differences suggest the presence of outliers, we examined the WTP amounts and calculated an adjusted mean after dropping 11 cases on the basis of two criteria. The first is if the interviewer's comments on the evaluation sheet suggest that the person clearly did not understand the scenario. The second is if the person repeated the same sizable WTP amount for each of the three risk reduction levels. The dropped cases in this category consist of the following: four on the basis of interviewer comments, three respondents who gave $120 WTP amounts for each risk level, and four

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4. The respondents had previously been instructed about this level of risk.

5. In this case a portion of the zero values.

whose only positive WTP amounts were $60 for two or more of the risk levels. In all, the dropped cases amount to five percent of the sample. Almost all of these cases[6] were also excluded in the 5% trim, but the adjusted mean retains all but one of the respondents who gave 0$ amounts, some of whom were excluded from the 5% trim.

Test for Question Order and Metric Bias

Table 4-3 presents the results of the experiment to test for the presence of metric and question order bias in the WTP amounts using an analysis of variance of a 2^2 factorial design (Box, Hunter, and Hunter, 1978). The test was conducted on the revised WTP data.[7] The hypothesis that the WTP amounts for the first and second levels were influenced by the order in which they were asked is rejected at a high level of statistical significance. A test for an interaction effect between question order and the risk reduction levels was also negative. Irrespective of the order in which the first and second reductions were valued, the amounts for those reductions are statistically equivalent. This reflects the fact that only three respondents gave nonmonotonic[8] WTP amounts for the first two risk reductions and in each case they spontaneously reordered their WTP amounts when they were offered the chance to revise them at the end of the interview.

While the respondents were insensitive to question order effects when they answered the elicitation questions, they were sensitive, as we hoped they

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6. ID Numbers: 1011, 2017, 2025, 4018, 1009, 3004, 2008, 2036, 4017, 2062.

7. Parallel tests on the unrevised data and on the revised data after dropping the bad data cases noted above yielded similar results. We feel the test on the revised unadjusted data is the most appropriate because the revision to the data by the respondent was usually due to an obvious mistake which the respondent consciously corrected. The unadjusted data is probably to be preferred for this test because of the possibility that an order or metric effect was responsible for "bad" data.

8. Higher amounts for the lower of the two reductions.

Table 4-3 TESTS FOR METRIC AND QUESTION ORDER BIASES

Metric Test: Ho: Ordinal Ranking
Amount A_i = Amount B_i i = 1,2,3

H_1: Cardinal Ranking
Amount A_i < Amount B_i i = 1,2,3

Order Test: Ho: No Question Order Bias
Order 1,2,3 = Order 2,1,3

H_1: Question Order Bias
Order 1,2,3 ≠ Order 2,1,3

Interaction Test: Ho: No Interaction Effect
$A_i - B_i$ for Order 1,2,3 = $A_i - B_i$ for Order 2,1,3 i = 1,2,3

H_1: Interaction Effect
$A_i - B_i$ for Order 1,2,3 ≠ $A_i - B_i$ for Order 2,1,3 i = 1,2,3

Joint Analysis of Variance Tests

Amount 1	VERAB	F = 21.93	P > .0001
	ORDER	F = 0.09	P > .7641
	ORDER*VERAB	F = 2.29	P > .1319
Amount 2	VERAB	F = 19.90	P > .0001
	ORDER	F = 0.41	P > .5243
	ORDER*VERAB	F = 2.05	P > .1537
Amount 3	VERAB	F = 20.74	P > .0001
	ORDER	F = 0.04	P > .8478
	ORDER*VERAB	F = 0.48	P > .4886

VERAB = Treatments A and B
ORDER = Treatments 1 (1,2,3) and 2 (2,1,3)
ORDER*VERAB = Interaction between treatments A and B and 1 and 2

N = 230

would be, to the amounts of risk reduction they were asked to value. When the WTP amounts for each pair of risk reductions -- the lowest in A and the lowest in B etc. -- were compared, B version respondents were willing to pay significantly more money for the risk reductions they were asked to value than were the A respondents to their lower risk reductions.[9]

On the basis of these results, we will assume that there are no order effects. As for metric bias, our test rejects the notion that the respondents valued "small", "medium", and "large" risks irrespective of the actual cardinal levels of these risks on the risk scale. This test does not provide evidence whether or not the A and B respondents responded in the same manner to the two different cardinal sets of risk values. The fact that a_3 is larger than b_1 provides some evidence that this was not the case. We believe this anomaly can be accounted for by position bias to which we now turn.

Position Bias

The research design we used to test for possible metric and order biases allowed us to test for another source of bias in the data and to possibly correct for it. As previously noted, the WTP amount for the third level in version A (a_3) is inconsistent with the generalization that the higher the risk reduction, the greater the WTP amounts. The respondents valuing a_3 gave a trimmed mean value of \$18.99 for a risk reduction of $1.3\ 10^{-5}$, whereas those valuing b_1 gave a WTP amount of \$12.70 for a risk reduction almost twice as large ($2.4\ 10^{-5}$). This anomaly suggests that the respondents are overvaluing

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9. It is noteworthy that the respondents who elected to revise their WTP amounts tended to do so in a way that enhanced this finding. When given the chance to think further about what these risk reductions were worth to them, those who received the lowest risks judged them to be worth less than they had originally thought. All nine respondents in treatment A who revised their WTP amounts elected to reduce them, four to \$0. In contrast, four of the eight people who revised their WTP amounts in the higher risk reduction treatment (B) decided to increase their original WTP amounts. (Two of the others decreased their amounts and two reversed them.)

the last value in a sequence, a_3, or undervaluing the first in a sequence, b_1, or both.

There are several grounds for believing that the position of the risk reductions in a sequence influences the respondents' WTP amounts. First, while the respondents valued the risk reductions independently, they did so with full awareness that they would be valuing three levels and what those levels were. Second, survey and market researchers have found that when respondents are asked to choose one of a series of possible answers, the position of the answers in the sequence can effect the responses. Third, the position effect we posit -- that respondents undervalue the smallest reduction and overvalue the largest one in the sequence -- is consistent with our present understanding of the factors which promote bias in CV surveys,[10] and appears to be consistent with research on the cognitive factors in decision making and on the psychometric properties of attitude scales.[11]

Immediately prior to the elicitation questions, the respondents were provided with a preview of the entire elicitation sequence. Our intent in providing this information was to give the respondents the opportunity to grasp the nature of the valuation exercise and to think about the risk reductions as they compared to each other. They were told that they would be be asked "how you would vote in each of the three different referenda" (questionnaire, p. 12) and what the risk reductions would be for each referenda. Not only were the risk reductions described in words at this stage in the interview, but the respondents were shown risk ladder C which superimposed each of higher risk levels on the low-level risk ladder. As a result, we have an assurance that the respondents perceived the three risk reductions as part of a sequence of three possible risk reductions from lower to higher.

Position effects in scale items which provide respondents with possible

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10. See Mitchell and Carson, forthcoming, chapter 8 for a review of these factors.

11. We have informally consulted with several experts in these latter fields and they have supported our interpretation. Our "scale" is different from ordinary attitude scales, however, so research findings from these literatures which are directly applicable to our finding are not immediately available to us.

response categories are well known in survey research. Consider a person who is asked how much he spends, on the average, whenever he goes to a drug store, and is given response categories to choose from of: $1-3, 4-6, 5-7, 8-10 or 11+. In cases like this one, where the respondent is unsure of how much he or she actually spends in such a situation, market researchers have detected a strong tendency to choose one of the middle categories (Tull and Hawkins, 1984). In this kind of situation, it appears that the end points suggest extremes and many people regard their behavior as falling somewhere in between the extremes.

What type of position effect is likely with our data where respondents are presented with three levels of risk reduction and asked whether or not they would vote to spend money to reduce each one? It is helpful to view this question from the perspective of cognitive social psychology which holds that an important influence on judgments such as these are the internal cognitive structures which people use to receive and organize information. According to Markus and Zajonc's (1985) recent review of this literature, cognitive structures, or "schemas" as they are often called, help the perceiver achieve some coherence in the environment and in the most general sense provide for the construction of social reality.[12] Although our understanding of the conditions under which particular schemas are invoked is still in its infancy, the available literature suggests that they have their most compelling effects in more complex cognitive tasks such as ours, where respondents were faced with deciding how high a risk they would tolerate from THM's before they were willing to vote to spend the money necessary to reduce the risk to the EPA MCL.

Faced with a judgment of this kind, some respondents may well have unconsciously[13] employed a schema where the lowest in a series of risk reductions is regarded to be inconsequential and the largest as consequential.

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12. The invoking of inappropriate schemas is the basis for the types of bias discussed by Tversky, Kahneman, and Slovic such as availability bias (Tversky and Kahneman, 1973).

13. It appears that individuals are not typically conscious that they invoke schemas (Nisbett and Wilson, 1977).

Respondents invoking such a schema would overvalue the last value, (a_3,b_3) and undervalued the first value (a_1, b_1).

We would expect this effect to be strongest in the A treatment. A_3 is the point where 66 percent of the respondents were faced with the decision whether to value the third risk reduction at $0, as they had the first two, or to give it a positive value. Some respondents who were uncertain about whether the risk reduction posed in a_3 is sufficiently large to be worth buying could have decided that it was on the grounds that since it is the largest reduction in the survey it probably represents a significant risk. Moreover, they may have been motivated to override their feeling about the third risk reduction level by the realization that that it is the last opportunity they will have to express their values for less hazardous water quality in the survey. This would result in importance bias, which occurs where some aspect of the act of being interviewed suggests to the respondent that one or more levels of the amenity has value. Importance bias could work in a reverse fashion and cause some respondents to undervalue the a_1 and b_1 reductions on the basis that, since they are the lowest ones, they are likely to be the inconsequential.

Another factor leading to the the invocation of such a schema, where a_3 and b_3 are overvalued, is compliance bias which occurs when respondents give WTP amounts which are influenced by what the respondent believes is expected of him or her by, usually, the interviewer. In the focus groups, as noted in the previous chapter, we learned there was a tendency for respondents to assume that we wanted to obtain as high dollar values for the risk reductions as possible. Thus alerted, we designed the survey and trained the interviewers to administer it in such a way as to minimize compliance effects. However, if there was any compliance bias, it would be most likely to occur when people who previously gave $0 values were asked to value the highest risk reduction.

Note that bias caused by the position in a sequence is different than bias caused by the order in which the questions are asked. One of the reasons why we informed the respondents about the entire sequence of risk reductions they would be asked to value prior to the elicitation questions was minimize question order bias. Our test for question order bias showed that we were successful in this regard and allows us to reject this as an explanation of the a_3,b_1 anomaly.

Conclusion

The instrument worked well, overall, in the Herrin survey. Both the response rate and the WTP-item response rate were high, the interviewers reported that the respondents took the referendum format seriously, and the interviewers held generally favorable views about how well the questionnaire accomplished its intended purposes.

The empirical results were also encouraging. Only a few WTP amounts appeared to be outliers, given by respondents who had not grasped our intentions or who were unwilling to do so and therefore gave unrealistically high WTP amounts. These outliers were easily adjusted by an explicit process whose intention was oriented solely towards removing obviously extreme WTP amounts. According to the question order experiment, the WTP amounts were not influenced by whether the lowest or the middle risk reduction were valued first. The crucial metric bias test likewise showed the desired effect: respondents did appear to discriminate between risk levels which ranged from 9.5 to .61 deaths per 100,000. This is, of course, only one piece of evidence that the risk ladder and the instrument's other risk-communication features successfully conveyed the intended risk levels to the respondents. Further research is required before we can be sure that the pattern of risk reduction valuations was not biased by the ladder format or other extraneous features of the scenario.

As for the data patterns themselves, we observe the following: (1) The very lowest risk levels received many no votes in the referendum, a finding which suggests that respondents were willing to accept the assumptions of the study and to discriminate between levels of risk. (2) The findings predict successful referenda where the risk reduction is in the area of 2 deaths per 100,000, a level associated with concentrations of THMs which have only been infrequently measured in community drinking water systems. (3) The household WTP amounts at this level are approximately $15 to $25 per household (based on the adjusted mean) per year in Herrin.

(4) We have identified a position effect which we hypothesize accounts for the anomaly that the highest risk reduction in version A was valued at a higher level than the lowest risk reduction in version B despite the fact that the actual risk reduction for b_1 was almost twice as big as a_3. Presented with a series of judgments to make about the value of different risk

reductions, respondents tend to undervalue the smallest reduction and to overvalue the highest. That such a schema has an effect is conjectural, of course, and the position effect needs to be tested in other settings before accepting it as a general phenomenom in CV surveys. A test for position bias will require a specification of a functional form for the willingness-to-pay equation. We provide this in the next chapter where we address the question of what value of a statistical life is implied by the findings described in this chapter.

CHAPTER 5

ESTIMATING THE VALUE OF A STATISTICAL LIFE

In this chapter we estimate the value of a statistical life (VSL) or, perhaps more correctly, estimate a valuation function which depicts willingness to pay, WTP, as a function of the magnitude of the risk reduction, δ, posed to the respondents. There are three basic ways in which the value of a statistical life can be estimated from our data: (1) calculating the implied value of a statistical life from the willingness to pay entries in table 4-3, (2) fitting a regression function to this "aggregate data", (3) using the individual observations. This third approach allows the calculation of other quantities of interest, such as the income elasticity for risk reduction.

ESTIMATES BASED ON MEAN AND MEDIAN VALUES

The implied value of a statistical life can be directly calculated from the median, trimmed mean, mean, and adjusted mean willingness to pay series in table 4-3, by dividing each of the willingness to pay amounts by their respective risk reduction (as a fraction of one) and by 1.86, the size of the average household.[1] These calculations are given in table 5-1. The median column has a zero for the VSL for three of the six risk reductions. We will defer a discussion of the interesting policy implications of this finding

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1. The usual way of defining the value of a statistical life is to use a standard δ^*, solve for the N which satisfies the following condition,

$$\sum_{i=1}^{N} \delta_i^* = 1,$$

and find the average willingness to pay, $\bar{\omega}_{\delta}^*$, for this standard unit of risk reduction. The statistical value of life is equal to $N\bar{\omega}_{\delta}^*$. Philosophical and practical policy-related problems occur with the concept of a VSL if $\bar{\omega}_{\delta}/\delta$ is not a constant for all relevant values for δ. These problems are considered later in this chapter.

Table 5-1. IMPLIED VALUE OF A STATISTICAL LIFE*

δ**	Mean	Median	5% Trimmed Mean	Adjusted Mean
.04	$3,304	-0-	$987	2500
.43	924	-0-	675	747
1.33	625	447	499	539
2.43	219	-0-	183	170
4.43	219	158	182	170
8.93	173	141	166	167

* Amounts are in thousand dollars.

** Mortality risk per 100,000.

until later in this chapter. The VSL for the means, 5% the trimmed means, and the adjusted means series all tell a similar story. The VSL tends to decline with increases in the size of the risk reduction, δ, with those declines being particularly pronounced for the smaller reductions. There is an order of magnitude difference between the VSL calculated at the smallest δ valued and the VSL calculated at the largest δ valued.

ESTIMATES BASED ON GROUPED DATA

Our next step is to attempt to fit some type of regression function to one or more of the aggregate willingness to pay series. Having deferred discussion of the medians and noted the problems of "bad" data points in the mean series, the adjusted mean series and the trimmed mean series are the most suitable candidates for this type of analysis. On the grounds that are more familiar with working with mean and interpreting mean data as opposed to other order statistics, the analysis that follows is biased on the adjusted mean series.

We begin by fitting a linear risk reduction to the six adjusted mean WTP data points. On the assumption that a zero WTP amount for a zero risk reduction is a natural restriction on this model, we set the intercept term to have a zero coefficient. The estimated coefficient obtained from regressing WTP_{δ} on δ is 5.1073 which has an accompanying t-statistic of 7.40 and an $\bar{R}^2$ of .744. The implied VSL for this model is approximately $180,000. The linear nature of the model forces the estimated VSL to be constant for risk reductions of all sizes. Inclusion of a POS variable -- indicating whether the risk reduction was the smallest (-1), the middle risk reduction valued by the respondent (0), or the largest valued by the respondent (1) -- results in a decrease in $\bar{R}^2$. Inclusion of a constant term results in a large increase in predictive power, but implies a sizable willingness to pay for a zero risk reduction.

An examination of the residuals and the actual data points, however, suggests the superiority of a logarithmic relationship between risk and willingness to pay, particularly for small risk reductions. Here, a constant term is needed because risk reductions smaller than one in a hundred thousand

will take on negative values when expressed in logarithms.[2] This equation's estimated coefficients are:

$$\widehat{\log (WTP)} = \underset{(20.65)}{2.5570} + \underset{(6.62)}{.4630}*\log(\delta), \qquad (1)$$

where the t-statistics are given in parenthesis and the adjusted $\bar{R}^2$ is .895.[3] This model implies that the VSL is much larger when summing individual WTP amounts over very small risk reductions when the amounts are summed than over moderate size risk reductions.

Inclusion of the POS variable in Eq. (1) results in close to a perfect fit. The estimated coefficients for this new equation are:

$$\widehat{\log (WTP)} = \underset{(142.25)}{2.5682} + \underset{(29.80)}{.3680}*\log (\delta) + \underset{(13.62)}{.3639}*POS \qquad (2)$$

where $\bar{R}^2$ equals .998.[4] We note a significant reduction in the magnitude of the coefficient on $\log(\delta)$ with the inclusion of the POS variable. Constraining the POS coefficient to equal zero allows us to perform an F-test for position bias as this coefficient should be zero under the null hypothesis of the absence of position bias. The $F_{(1,3)}$ statistic from this test is 188.55. We reject this null hypothesis at any reasonable significance level in favor of the alternative hypothesis that respondents were responsive to the rank position of the risk reduction levels.

It is possible to correct for the position bias using Eq. (2) by estimating a "corrected" $\widehat{\log (WTP_c)}$,

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2. Without a constant term this would imply that willingness to pay for any risk reduction smaller than one in a hundred thousand is always less than one dollar.

3. The log likelihood is -.343, the log likelihood with only a constant is -7.617. The estimate of σ is .3027.

4. The log of the likelihood has been increased to 11.717. The estimate of σ is .0441. The POS variable implies a restriction that $\beta_3 + \beta_4 = 0$, where β_3 is the coefficient for TOP which equals 1 if POS=1 and zero otherwise, and β_4 is the coefficient for BOTTOM which equals 1 if POS =.1 and zero otherwise. This restriction is testable using an F test of the implied constraint. The estimated $F_{(1,2)}$ is .001 indicating that the restriction can not be rejected.

$$\log(\hat{WTP}_c) = 2.5682 + .36804*\log(\delta). \quad (3)$$

The $\hat{WTP}_c$ estimate is obtained by,

$$\hat{WTP}_c = EXP(2.5682 + .3680*\log(\delta) + \frac{\hat{\sigma}^2}{2}, \quad (4)$$

where the $\hat{\sigma}^2/2$ term is needed if we make the usual assumption that the error terms in the untransformed (i.e., linear) representation are from a log-normal distribution (Goldberger, 1968; Mood, Graybill, and Boes, 1974). Table 5-2 gives WTP, $\hat{WTP}$, and $\hat{WTP}_c$ for each of the six risk reductions valued by respondents.

There are a number of results from economic theory which describe how willingness to pay for risk reductions should change with δ. Following Jones-Lee (1974, 1976), we define a function $V(\delta)=WTP_\delta$.[5] This $V(\delta)$ function may be thought of as a Hicksian compensating consumer surplus measure. The other arguments in this function have been suppressed as we have equivalent random samples at each of the six δ points so the other arguments are orthogonal to δ and, thus, not necessary for the estimation of $V(\delta)$. A major theoretical result in the literature (e.g. Jones-Less 1976) is that $V(\delta)$ is an increasing function of δ, so that

$$\frac{\partial V(\delta)}{\partial \delta} > 0. \quad (5)$$

Another result is that the rate of change of $V(\delta)$ with respect to changes in δ is negative,

$$\frac{\partial^2 V(\delta)}{\partial \delta^2} < 0, \quad (6)$$

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5. Jones-Lee's theoretical development used p, the actual risk level, instead of $\delta = \bar{p} - p$, where $\bar{p}$ was the initial risk level. Only simple algebra is necessary to rewrite his results in the form presented here. This is not true of a number of Jones-Lee's and Weinstein, Shepard, and Pliskin's (1980) results on trade-off's between risk and income which are highly dependent on $\bar{p}$ and the independence axiom of expected utility. These additional results do continue to hold under nonexpected utility theory (Machina, 1982; 1983a; 1983b) and appear to be often violated empirically. We do not pursue tests of them here.

Table 5-2. PREDICTED WTP, WTP_c AND IMPLIED VALUE OF A STATISTICAL LIFE (VSL)*

δ**	WTP	$\hat{WTP}$	$\hat{WTP}_c$	VSL(WTP)	VSL(WTP_c)
.04	$2.86	$2.77	$3.99	$2,500	$3,492
.43	9.19	9.57	9.56	747	778
1.33	20.49	20.84	14.50	539	381
2.43	11.79	12.17	17.54	185	275
4.43	23.51	22.55	22.55	186	178
8.93	42.68	42.00	27.22	167	114

* VSL amounts are in thousand dollars.

** Mortality risk per 100,000.

implying that WTP_δ should be an increasing function of δ, but that these increases with changes in δ occur at a decreasing rate.

The condition in Eq. (5) is met if the coefficient on $\log(\delta)$ in Eq. (2) is positive, which it is. The condition in Eq. (6) is met for the functional form used in Eq. (2) if the coefficient on $\log(\delta)$ is less than one, which it is.[6]

Thus both of these theoretical results relating WTP_δ and δ have been found to hold for these data.

We can use Eq. (4) to graph willingness-to-pay as a function of δ and the value of a statistical life as a function of δ. These graphs are given in figures 5-1 and 5-2 for δ in the range of 10^{-7} to 10^{-4}, roughly the range of δ spanned by our experimental design.

It is sometimes argued (MITRE 1981; Temple, Barker & Sloane, 1982) that the value of a statistical life should increase with δ rather than decrease as shown in figure 5-1. This belief stems from another one of Jones-Lee's theoretical results which says that $V(\delta)$ should increase with increases in R_o,

$$\frac{\partial\left(\frac{\partial V(\delta)}{\partial \delta}\right)}{\partial R_o} > 0, \tag{7}$$

where R_o is the respondent's initial risk level. In the case of our individual level data, we cannot estimate this relationship because we have a fixed R_o. There were several reasons why we did not attempt to introduce different levels of R_o in the scenario for this study. First, the relationship shown in Eq. (7) is questionable as it relies very strongly on expected utility's independence axiom and is the theoretical result most at odds with the empirical evidence of actual behavior (Machina, 1983a). Second, the relationship is not policy-relevant. The δ we are dealing with are tiny compared to the R_o in our population. Government risk reduction programs, particularly those involving drinking water, do not involve risk reductions

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6. Eq. (2) is of the form $y = EXP(a + b*\log(\delta) + c*x)$. The second derivative of this expression with respect to δ is,

$$\frac{b^2*EXP(a + b*\log(\delta) + c*x)}{\delta^2} - \frac{b*EXP(a + b*\log(\delta) + c*x)}{\delta^2},$$

so that a sufficient condition for this derivative to be negative is that $1 > b > 0$.

Figure 5-1. IMPLIED VALUE OF STATISTICAL LIFE AS A FUNCTION OF DELTA

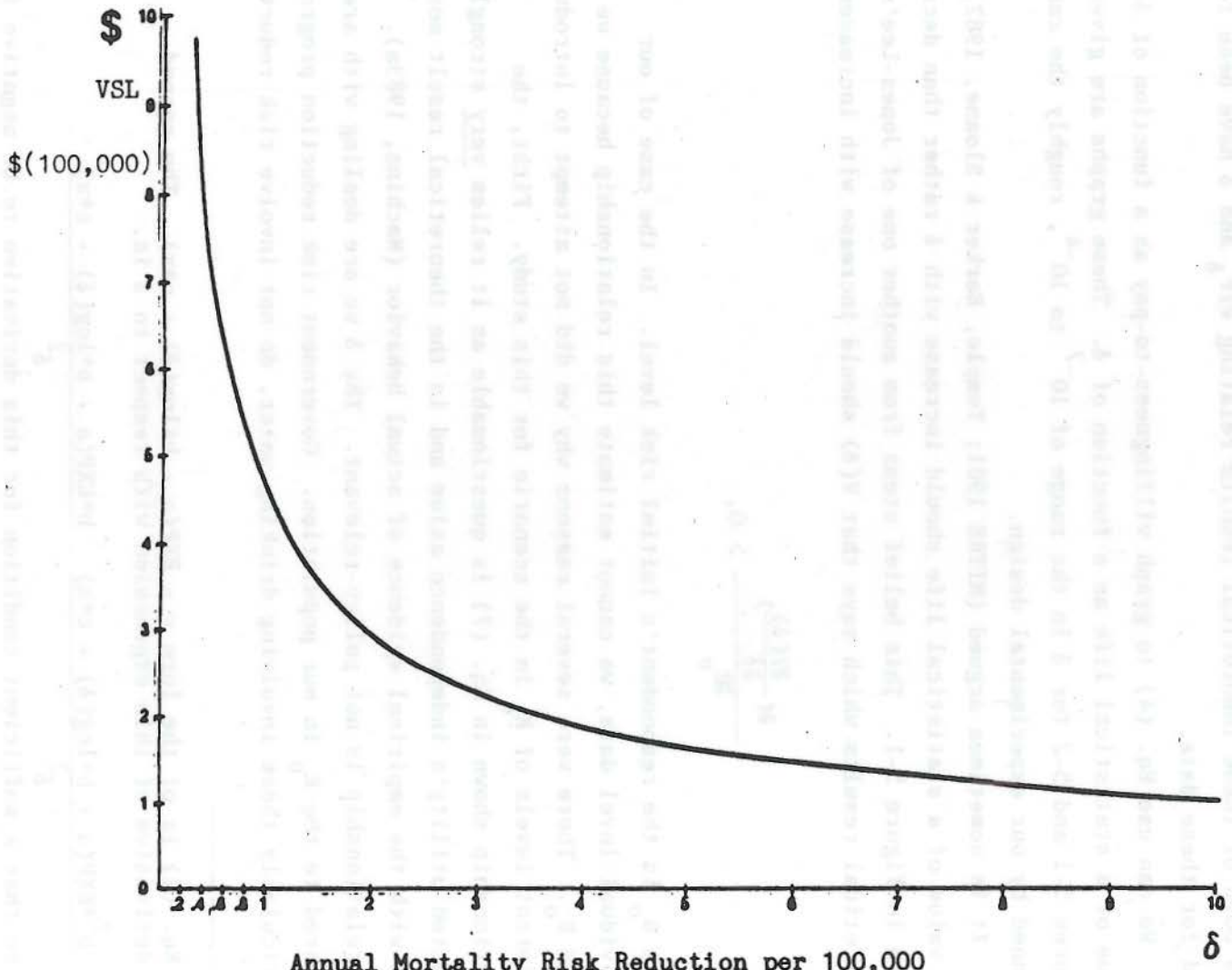
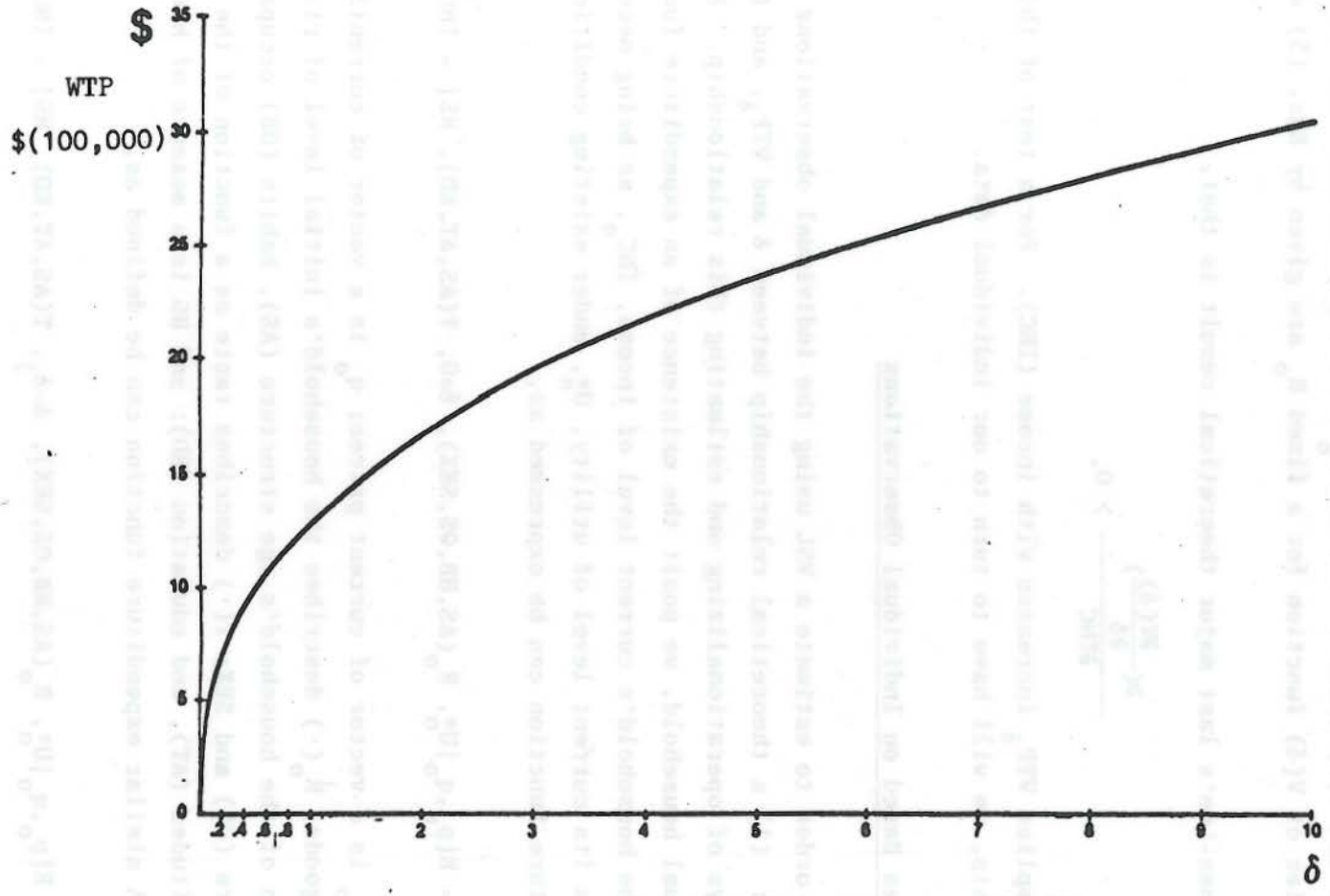


Figure 5-2. WILLINGNESS TO PAY AS A FUNCTION OF DELTA



that will appreciably change R_o. Third, estimating the change in $V(\delta)$ as a function of R_o using the individual micro data would have required very detailed and, probably, unobtainable information about the actual perceived level of risk to each member of the household for a risk of death twenty years in the future. Successfully communicating an awareness of such an initial risk level in a survey such as ours is, at best, a formidable task. Figure 5-2 graphs the $V(\delta)$ function for the $\bar{R}_o$ in our population. The theoretical properties of $V(\delta)$ function for a fixed R_o are given by Eqs. (5) and (6).

Jones-Lee's last major theoretical result is that,

$$\frac{\partial(\frac{\partial V(\delta)}{\partial \delta})}{\partial INC} > 0, \tag{8}$$

which implies WTP_δ increases with income (INC). For a test of this hypothesis, we will have to turn to our individual data.

Estimates Based on Individual Observations

In order to estimate a VSL using the individual observations we need to specify: (1) a theoretical relationship between δ and WTP_δ, and (2) one or more ways of operationalizing and estimating this relationship. For an individual household, we posit the existence of an expenditure function which gives the household's current level of income, INC_o, as being necessary to maintain its current level of utility, U_o^*, under existing conditions. This expenditure function can be expressed as,

$$E_o = E[p_o, q_o | U_o^*, R_o(AS,HB,OS,SEX), \delta=0, T(AS,AT,ED), HS] = INC_o, \tag{9}$$

where p_o is a vector of current prices; q_o is a vector of currently provided public goods; $R_o(\cdot)$ describes the household's initial level of risk as a function of the household's age structure (AS), habits (HB) occupational structure (OS) and SEX; $T(\cdot)$ describes taste as a function of the household's AS, attitudes (AT), and education (ED); and HS is a measure of household size. A similar expenditure function can be defined as,

$$E_j = E[p_o, q_o | U_o^*, R_o(AS,HB,OS,SEX), \delta=\delta_j, T(AS,AT,ED), HS] = INC_j, \tag{10}$$

where the only argument whose value has changed is δ. A form of the Hicksian compensating consumer surplus measure can be defined as,

$$V_j = E_o - E_j = INC - E[p_o, q_o | U_o^*, R_o(AS,HB,OS,SEX), \delta=\delta_j, T(AS,AT,ED), HS] \quad (11)$$

which we can rewrite as,

$$V_j = f(INC_o, R_o(AS,HB,OS,SEX), \delta_j, T(AS,AT,ED), HS] \quad (12)$$

where the arguments, p_o and q_o have been suppressed as they are the same for all residents of Herrin. The observed realization of V_{ij} in a contingent valuation survey is simply WTP_{ij}, the i_{th} respondent's willingness to pay for the risk reduction δ_j.

To estimate $V(\cdot)$ as a function of its arguments, the first step is to stack the n individual observations so that WTP_{ij} is a 3n x 1 vector. It is useful, at this point, to define a new index variable, k=1 ,..., N, where each k represents a unique ij pair and N=3n. Some of the right hand side arguments, such as δ_j, INC, and HS, are readily identifiable and available. The functions $R(\cdot)$ and $T(\cdot)$ must be specified as well as a functional form for $f(\cdot)$. We can operationalize AS in a number of ways. These include the age of the respondent, the number of children, and the age of any children. We have no real measure of OS, but Herrin is a light manufacturing town without a lot of high risk occupations. The primary measure of habits likely to be relevant to estimating Eq. (12) is smoking behavior. The most relevant attitudes for explaining the WTP_k are likely to be those directly concerned perceived drinking water safety. Our measure of ED is the number of years of schooling of the respondent. SEX is easily operationalized as the sex of the respondent. We will estimate

$$g(WTP_k) = h(X_k\beta) + \mu_k, \quad (13)$$

where X is a N x 1 matrix of the explanatory variables described above, β is a k x 1 vector of unknown coefficients to be estimated, μ is a N x 1 vector of error terms, and $g(\cdot)$ and $h(\cdot)$ are as yet undefined functional forms.

One way to estimate the parameters of Eq. (12) is to run a simple linear regression of the WTP amounts on the set of possible independent variables. This is inadvisable on two grounds. First, a large number of the WTP amounts are equal to zero, which leads us to consider limited dependent variable econometric models (Maddala, 1983; Amemiya, 1985). Second there is a large degree of multicollinearity among the possible independent variables. We address the latter problem first, since engaging in specification searches over large numbers of possible variable sets using limited dependent variable estimators is prohibitive in terms of computer time.

There are numerous ways to specify the household's age structure. Inclusion of age and number and age of children often results in a confusing pattern of signs on insignificant coefficients. A simple and initially appealing specification is to specify a dummy variable, AGED, which equals one if the respondent was 55 or older and zero otherwise. This specification generally separates households with children at home from those who do not and respondents 55 or older are less likely to be affected by a risk with a 20-year latency period. Our analysis includes an attitude question which asks respondents to rate how harmful they regard chemical contamination in Herrin's drinking water on an 10 point scale. We made a dummy variable, CHEMD, out of this question with 1 equal to ratings of 8 to 10, where 10 represents the highest possible subjectively perceived harm and 1 the lowest possible harm.

In designing the study, we were sensitive to the possibility that smoking behavior might influence people's evaluation of drinking water risks. Our initial concern was whether smokers would react defensively to our use of the cigarette equivalents in a way that would bias their responses. We were unable to detect such a reaction in the focus groups and the preliminary interviews. Smokers appeared to take the cigarette equivalents in their stride and did not express resentment or hostility to them when they were specifically asked to comment on the equivalents. We included a series of questions about the respondents' smoking behavior in the last part of the questionnaire. One third of the respondents currently smoke, and another 12 percent previously smoked but had stopped.

The variables which we use in the empirical estimation to be presented below are defined and their sample statistics given in table 5-3.

Surprisingly, we found little relationship between smoking habits and WTP_k in our preliminary regressions. Neither current nor previous smoking behavior was related to the WTP amounts. Nor did we find any relationship between SEX or ED and WTP_k. For this reason these variables are not included among the explanatory variables in table 5-3. It should be remembered that all of the demographic variables are basically orthogonal to δ, thus specification error in terms of inclusion or exclusion of demographic variables will affect only the precision of the δ coefficient.

We used nonnest hypothesis tests and Box-Cox regressions to explore whether or not a linear specification for WTP_k, δ, and INC_o was indicated. As with the grouped data, this analysis suggested a logarithmic rather than linear form.

The limited dependent variable which first comes to mind for estimating the $V(\delta)$ function using the individual data is the Tobit model (Tobin, 1958). The basic Tobit model assumes, in our case, that

$$WTP_{ij} = WTP_{ij} \text{ if } U_\delta > c$$

and (14)

$$WTP_{ij} = 0 \quad \text{if } U_\delta \leq c,$$

where U_δ is an underlying latent variable representing the utility which the respondent gets from δ_j and c is a specified constant term. The problem with this interpretation is that we are really interested in WTP_{ij} and not U_δ. We need a model where,

$$WTP_{ij} = WTP_{ij} \text{ if } WTP^*_{ij} > c$$

and (15)

$$WTP_{ij} = 0 \quad \text{if } WTP^*_{ij} \leq c,$$

where WTP^*_{ij} is the true willingness to pay for δ_j and c is a specified constant greater than or equal to zero. This specification is still troubling because it is possible for WTP^*_{ij} to be negative and because we have not demonstrated a divergence between WTP^*_k and WTP_k and provided a rationale for such a divergence, if it exists.

Table 5-3 VARIABLE DEFINITIONS AND DESCRIPTIVE STATISTICS

Variable Name	Description
WTP	Adjusted annual amount willing to pay in higher water bills for specified trihalomethane risk reductions.
LWTP	Equals log(WTP) if WTP $\geq$ 1 and equals 0 otherwise.
VOTE	Equals 1 if WTP > 0 and equals 0 if WTP=0.
δ	Risk reduction in terms of fewer annual deaths per 100,000 associated with reductions in level of trihalomethane contamination.
INC	Annual household income (thousand dollars).
LINC	Equals log (INC).
AGED	Equals 1 if respondent is age 55 or older, and equals 0 if respondent's age is less than 55.
CHEMD	Equals 1 if respondent rates the harm posed by "chemical contaminants in Herrin's drinking water" at 8-10 on a ten point scale where 10 is described as "highest harm" and 1 as "lowest harm."
HSIZE	Number of people in the respondent's household.
POS	Equals 1 if largest δ valued by respondent, -1 if the smallest δ valued by respondent, and zero otherwise.

Variable	Mean	Std. Dev.	Minimum	Maximum
WTP	18.210	27.200	0.000	150.000
VOTE	.459	.499	0.000	1.000
δ	2.850	3.026	.040	8.930
log (δ)	.0826	1.782	-3.219	2.189
INC	27.500	11.689	2.500	75.000
LINC	3.198	.549	.916	4.317
AGE	43.782	15.560	18.00	80.00
AGED	.298	.458	.000	1.000
CHEMD	.087	.283	.000	1.000
HSIZE	2.860	1.257	1.000	6.000
POS	0.000	.817	-1.000	1.000

The primary evidence for a divergence between WTP_c and WTP_k is the large number of zero WTP_c responses and the absence of any WTP_k responses in the $.01 to $4.99 range despite the fact that WTP amounts in this range were acceptable. If the distribution consisted of a spike at zero and then a smooth function after that, we would suspect a simple Kuhn-Tucker Corner Solution.[7]

The gap between zero and five dollars implies that the likelihood of the observed data being generated by any standard distribution is small unless there is censoring occurring over at least part of that gap. We believe that the "apparent" observed censoring is due to respondents with low WTP_k giving zero answers rather than giving WTP_c. There are a number of not necessarily contradictory reasons for this type of behavior.

First, even though respondents were free to give answers in other than even dollar amounts -- such as $.45 or $7.60 -- no respondent did so. As previously noted, people tend to give round/common/favorite numbers to CV valuation questions.[8] As long as the bids are spread out over a large enough range this tendency causes minor, and generally, ignored/ignorable econometric problems. This is not the case if a large number of WTP_c^* observations are concentrated in a small range with downward rounding. This argument implies many of the zeros observed are really small positive WTP_k^* which have been rounded downward. Second, the zero WTP_k amounts are the result of no votes to the basic question -- would you be willing to vote for the referendum if it cost you any positive amount. Thus treating a no vote as a zero depends upon the interpretation that any positive amount means any amount over $.01. It is likely that respondents took this statement to mean "not $.01" (for which it seems difficult to see how any effective policy could be implemented) but $1, $2 or $5. The implication of this argument is that our discrete choice question, VOTE, was not interpreted by the

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7. A gap is observed between zero and the lowest observed positive expenditure in studies of consumer durables such as new automobiles (Tobin, 1958) due to the existence of a minimum price for the commodity. Our situation does not have that characteristic since a respondent may name any non-negative amount.

8. By this we mean that people tend to give responses of 5, 10, 25 instead of 6, 9, or 27 dollars.

respondents as meaning "no" means 0, "yes" means greater than zero. Instead the interpretation was likely to have been, more like "no" means less than \$1 or even \$5, while "yes" means greater than or equal to \$1 or \$5. The third is that one survey in treatment went to some lengths to legitimate no votes while a WTP_k response in terms and hence to violate some social desirability norms. Reasons 1 and 2 suggest censoring at \$1 while reason 2 suggest censoring at \$1 or perhaps a somewhat higher amount.

Censoring at \$1 instead of \$0, the log-log form which we found fit the aggregate data well in Eqs. (1) and (2), suggests that assuming a log-normal distribution for WTP^*_{ij}, and working with the log of WTP^*_{ij} may be desirable. This implies that WTP^*_{ij} cannot be negative which is a desirable restriction. If we assume that the censoring occurs at $WTP^*_{ij} \geq 1$, then, censoring point for log (WTP^*_{ij}) is zero. Amemiya and Boskin (1974) have considered such a Tobit-like model (although with right hand instead of left hand censoring). The model they proposed is a regular Tobit specification where the dependent variable is considered to be the log of WTP^*_k instead of WTP^*_k. Cragg (1971) has proposed a more general model which includes the Amemiya and Boskin model as a special case.

The Cragg model can be seen as a two-part or stage model where one equation specifies the probability of a positive value of $\log(WTP^*_k)$ and the second equation predicts the value of $\log(WTP^*_k)$ conditional on the fact that it is positive. Thus for the Cragg model,

$$E[\log(WTP^*_k)] = PROB[\log(WTP^*_k) > 0]*E[\log(WTP_k) \mid \log(WTP^*_k) > 0]. \quad (16)$$

To simplify the notation, let $Z^*_k = \log (WTP^*_k)$. Assuming a normal distribution for Z^*_k; the probability that a limit observation, $WTP_k = 0$, or, equivalently $Z^*_k < 0$, is observed, is given by the probit model,

$$P(Z^*_k < 0) = \Phi(-X\beta_1), \quad (17)$$

where Φ is the normal cumulative distribution function, and β_1 is a vector of unknown parameters.[9] The density of the positive Z^*_k is assumed to be

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9. We have no observations where WTP_{ij} = \$1, so the placement of the strict inequality is of no consequence.

vector β_1 and variance σ^2, so that their conditional density is given by,

$$f(Z_k^* | Z_k^* > 0) = \frac{1}{\Phi(X\beta_2/\sigma)} \frac{1}{\sqrt{2\pi\sigma}} EXP[\frac{-1}{2\sigma^2}(Z_k^* - X\beta_2)^2]. \quad (19)$$

If we define I_k as an indicator which equals one if $Z_k^* > 0$ and equals zero if $Z_k^* \leq 0$, the log likelihood function for Z_k^* can be written as,

$$L = \sum_{k=1}^{N} [(1 - I_k)\log\Phi(-X\beta_1) +$$

$$I_k[\log\Phi(X\beta_1) - \log\Phi(X\beta_2/\sigma) - \frac{1}{2}\log(2\pi\sigma^2) - \frac{1}{2\sigma^2}(Z_k^* - X\beta_2)^2]] \quad (19)$$

The Tobit model represents the special case of the more general Cragg model where,

$$\beta_1 = \beta_2/\sigma, \quad (20)$$

in Eq. (19).

The estimated probit model along with a logistic and linear probability model are given as Eqs. (21), (22), and (23) respectively in table 5-4. Each shows almost an identical pattern of coefficient significance and each predicts that 50% of the population will be willing to vote for a referendum where δ is approximately 2.[10] For the probit equation, the exact 50% approval point is $\delta = 1.87$. The relationship between δ and the percent willing to approve the referendum at some positive amount is graphed in Figure 5-3. The most significant predictor of vote is log(δ). HSIZE and POS are also quite important in the prediction of vote.[11] We note that the

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10. These equations are evaluated at the mean levels of the other independent variables.

11. A likelihood ratio test of the more general form of position bias (i.e., inclusion of separate bottom and top dummies) has a value of .44 which is asymptotically distributed as a $\chi^2_{(1)}$ variable under the null hypothesis of position bias of the POS form. This value of the test statistic has a p-value of .493 so we accept the null hypothesis. Now defining the null hypothesis as the absence of any position bias (i.e. restricting the POS coefficient to be zero) results in a test statistic of 16.90 which is also distributed asymptotically $\chi^2_{(1)}$ under the null hypothesis. This test statistic has a p-value of .001 so we reject the null hypothesis of no position bias.

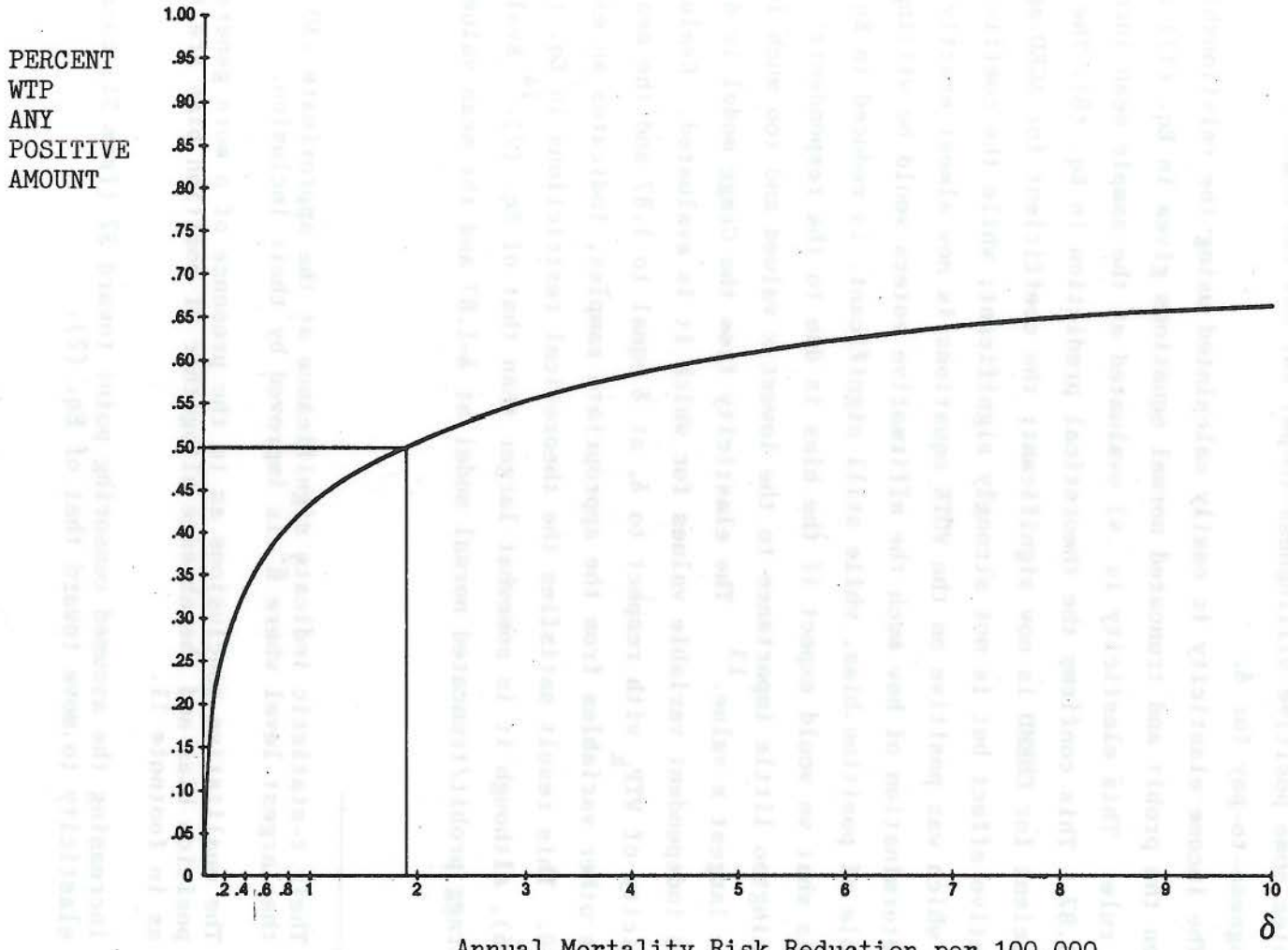
Table 5-4

	Eq. (21) Probit(VOTE)	Eq. (22) Logit(VOTE)	Eq. (23) OLS (VOTE)	Eq. (24) Truncated Normal [log (WTP ≥ 1)]
CONSTANT [1;1]*	-.8179 (-2.47)**	-1.4459 (-2.58)	.2206 (2.00)	2.3449 (9.01)
log (δ) [.0825;.8404]	.2623 (7.06)	.4470 (6.89)	.0831 (7.13)	.1398 (4.73)
LINC [3.1979;3.2513]	.1054 (1.06)	.1965 (1.16)	.0401 (1.20)	.3012 (4.21)
AGED [.2982;.1548]	-.1304 (-1.02)	-.2130 (-1.00)	-.0427 (-1.01)	-.1596 (-1.35)
CHEMD [.0877;.0987]	.1953 (1.064)	.3177 (1.02)	.0622 (1.00)	.3418 (2.07)
HSIZE [2.8596;3.0287]	.1183 (2.47)	.1963 (2.44)	.0387 (2.43)	-.0053 (-.160)
POS [0;.3026]	.2980 (4.09)	.4921 (4.14)	.1069 (4.24)	.1244 (2.41)
SIGMA	1.0000	-	.4489	.5935
N	684	684	684	314
Log-likelihood (constant only)	-471.82	-471.82	-494.14	-320.20
Log-likelihood	-396.66	-396.25	-419.15	-281.79
$\bar{R}^2$	-	-	.190	.202

* First number in bracket is variable mean for full sample. Second number is the variable mean for sample restricted to positive WTP observations.

** Asymptotic t-statistics in parentheses.

Figure 5-3. YES VOTE IN DRINKING WATER REFERENDA AS A FUNCTION OF DELTA



coefficients on LINC, AGED, and CHEMD are all insignificant at the standard .05 or .10 level.[12] The success of the probit model in predicting VOTE is presented in table 5-5.

The truncated normal model which completes the Cragg model is given in Eq. (24) of table 5-4. Here we note the much stronger role played by LINC, an encouraging sign for the model since an affirmative answer on VOTE merely indicates some positive willingness-to-pay but not the magnitude of the willingness-to-pay for δ.

The income elasticity is easily calculated using the relationship between the probit and truncated normal equations given in Eq. (17) and the chain rule. This elasticity is .43 evaluated at the sample mean income and a x of 1.87. This confirms the theoretical prediction in Eq. (8). The coefficient for CHEMD is now significant; the coefficient for AGED again has a negative effect but is not strongly significant; while the coefficient on HSIZE which was positive on the VOTE equations is now almost exactly zero in the determination of how much the affirmative voters would be willing to pay. The role of position bias, while still significant, is reduced in Eq. (24). This is what we would expect if the bias is due to the respondents' assigningtoo little importance to the lowest x valued and too much importance to the largest x value.[13] The elasticity from the Cragg model is dependent on the independent variable values for which it is evaluated. Evaluating the elasticity of WTP_k with respect to δ, at δ equal to 1.87 and the mean values of the other variables from the appropriate samples, indicates an elasticity of .78. This result satisfies the theoretical restrictions in Eq. (5) and Eq. (6), although it is somewhat larger than that of Eq. (2).[14] Evaluating the Cragg probit/truncated normal model at δ=1.87 and the mean values of the

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12. Their t-statistic indicate significance at the approximate .30 level--the largest level where $\bar{R}^2$ is improved by their inclusion.

13. The qualitative conclusions as to the presence of a more general form of position bias and the absence altogether of position bias are the same as in footnote 11.

14. Increasing the assumed censoring point toward $2 (from $1) causes this elasticity to move toward that of Eq. (2).

Table 5-5. ACTUAL AND PREDICTED VOTE FROM PROBIT EQUATION

		PREDICTED		
		0	1	
ACTUAL		684	368	616
	0	370	262	108
	1	314	106	208

other variables, indicates a VSL of $336,000 compared to $307,000 from Eq. (2) evaluated at the same δ.[15] The Tobit estimate is given in Eq. (26) in table 5-6 along with the ordinary least squares estimate of the same specification is given in Eq. (25). The Tobit specification indicates elasticities which are fairly similar to those of the Cragg model. The two equations give quite similar predictions for WTP_δ over the range of our experiment although they diverge significantly outside that range. The Tobit specification can be tested against the Cragg model[16] by means of a likelihood ratio test. This test is essentially a test of the restriction that the vector of parameters, β_1, in the probit model is equal to β_2/σ from the Tobit model. The value of this test statistic is 425.56 which is distributed as $\chi^2_{(7)}$, asymptotically, indicating that the Tobit specification should be rejected.[17] Due to this finding, we do not consider the Tobit model further.

Overall, the results for the estimation of the $V(\delta)$ function using the individual data provides strong support for the validity and reliability of our results. We have found our empirical results are consistent with the major theoretical predictions about the relationship between $V(\delta)$ and δ. These equations also have significant explanatory power suggesting that our respondents did not given random unconsidered responses.

Concluding Remarks

Our results show sizable differences in the VSL depending upon the x at which the $V(\delta)$ function is evaluated. This implies that there is no unique

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15. The variance correction when making the transformation from the log form to the linear form, noted earlier, must be taken into account when using the estimated parameters in Eq. (24).

16. For the least squares equation, this specification amounts to treating all of the $WTP_k=0$ observations (.e., the censored observations) as $1 bids.

17. Other test criteria such as the Lagrange multiplier test (Schmidt and Lin, 1984), Wald test (Mullahy, 1984), and a White Specification Test (White, 1986) had similar $\chi^2_{(7)}$ statistics.

VSL for policy makers to use in making decisions about the quality of safety increases/risk reductions to provide. We find the larger the δ the smaller the VSL. This would appear to be a perverse result, but it is the one predicted by economic theory. Risk reductions, in a sense, are just like any other normal good; consumers have declining marginal utility, and hence, declining marginal willingness-to-pay for them.

Our study is one of the first to value a fairly wide range of δ's. It is noteworthy that our findings are consistent with the pattern shown by VSL estimates for particular δ's. Bloomquist (1982), on the basis of a review of this literature, notes a strong tendency for those studies evaluating the VSL at small δ's to have much larger VSL's that those studies evaluating VSL's at large δ's. This is generally true whether the VSL's are from contingent valuation studies, hedonic wage studies, or household production function studies of observed safety behavior and purchases.

If one believes in majority rule, then our study suggests that a lower bound should be placed on the δ which the government attempts to implement, and an upper bound should be placed on the VSL to be used for policy purposes. While we don't believe a single study such as ours which is contingent on a particular scenario and on the responses of people in asingle town should be used set this minimum δ and maximum VSL, we believe that this concept is sufficiently important to warrant much additional study. While we have provided one possible explanation for the differences in the VSL found by various researchers, there are undoubtably others. We believe, for instance, that there are different VSL's for different types of risks for the same given δ, although it is likely that these different types of risk could be placed into several large classes where the within class VSL--δ relationship was fairly constant. Other researchers [xxx] have provided convincing evidence that risk is not a unidimensional concept to most people and that most people have strong preferences over different risk dimensions. Other possible explanations for the observed differences in the VSL's from different studies include the study of different populations and self-selection, and there is the always convenient, and probably often true, explanation that people did not correctly perceive the true risk (if the analysis is based on actual behavior) or that they did not correctly

Table 5-6 TOBIT ESTIMATES FOR CENSORED LOG-NORMAL WTP MODEL

	Eq. (25)	Eq. (26)
Variable	OLS	Tobit
CONSTANT	-.4091	-1.9994
	(-1.07)*	(-2.26)
Log (δ)	.318	.7700
	(7.84)	(5.30)
LINC	.2570	.4064
	(2.20)	(1.63)
AGED	-.2191	-.4817
	(-1.48)	(-1.29)
CHEMD	.3414	.6894
	(1.58)	(1.59)
HSIZE	.1275	.2853
	(2.30)	(2.28)
POS	.4244	.8101
	(4.81)	(3.69)
Log-Likelihood = -1272.3		Log-Likelihood = -1004.8
Log-Likelihood (constant only)= -1365.4		Log-Likelihood (constant only)= -1148.2
$\bar{R}^2$ = .232		
N = 684		N = 684

* Asymptotic t Statistic in Parentheses.

understand the risk level presented to them in a contingent valuation survey.

Another possible but deeper reason which has strong policy implications is that the risks valued are resolved at different points in time. Most risk studies have evaluated risk in the form of immediate/near-term accidents. This is true of almost all the indirect studies of wages premiums and safety behavior, and of the contingent valuation studies of risk changes conducted to date. The types of risks of interest to the U.S. Environmental Protection Agency, however, often have long latency periods of twenty or thirty years. The correct VSL's are those which have been discounted for this latency period. The advantage of the contingent valuation approach in this situation is that the respondents have already engaged in the appropriate discounting in giving their willingness-to-pay in the current period. Based on some sketchy empirical evidence and some preliminary work on nonexpected utility theory, it would appear that respondents do not engage in discounting behavior which is consistent with expected utility theory, although this observed behavior may be consistent with rational economic behavior. In the very simplest sense there may be two factors at work, the traditional trade-off between present and future consumption and the dread over the latency period of possibly getting a disease such as cancer if preventative steps are not taken in the current period. This implies standard discounting of the VSL derived from near-term risks many not be an appropriate measure. The entire theoretical underpinnings of the value of life literature is almost completely based on the maintained assumption that expected-utility is the appropriate behavioral model for explaining mortality related risk behavior. This assumption is quickly unraveling. The available results from work on nonexpected utility theory suggests that this theoretical framework will be a much more appropriate basis for building models of mortality-related risk behavior. This is another area which is currently fruitful for additional theoretical, experimental, and applied research.

CHAPTER 6

DEVELOPING A CONTINGENT VALUATION INSTRUMENT TO VALUE MORBIDITY RISK REDUCTIONS

In this chapter we discuss a second study which we conducted as part of our research program on developing CV methods for use in valuing drinking water benefits. The object of this study, is to develop an instrument suitable for valuing drinking water morbidity risk reductions from infection by Giardia lamblia. Owing to the primacy accorded the THM study, and its complexity, the Giardia study was limited to instrument development.[1] This chapter reviews that work and introduces the draft questionnaire which is contained in appendix G.

Outbreaks of giardiasis, the rather nasty, but usually transient, gastro-enteric disorder caused by the Giardia lamblia protozoan, have occurred periodically over the years in communities whose surface water supplies are not chemically pretreated and filtered. The site we chose for this research is one of the largest cities potentially at risk from giardiasis, San Francisco. We conducted focus groups in the San Francisco area to obtain information about people's perception of drinking water problems and the prospects of a giardiasis outbreak. We used this information to design a draft survey instrument whose scenario simulates a referendum on whether or not San Francisco should sell a bond issue to install equipment which would reduce the risk of giardiasis from a low but uncertain level to essentially zero. A unique feature of this instrument, from the CV point of view, is that it is designed for use as a telephone survey. Heretofore, because of their need to describe a relatively complex scenario, and their need for visual aids, very few CV surveys have attempted to use the telephone technology, despite its much lower cost than in-person surveys of comparable length.

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1. The instrument is being field tested and these results will be reported at a later time.

GIARDIA LAMBLIA

Giardia lamblia is a pathogenic protozoan which lives as an intestinal parasite in man and a number of other mammals. The disease caused by giardia is known as giardiasis and is the most common one caused by intestinal parasites in the United States. It is the leading cause of morbidity in overseas U.S. travelers. Transmission of giardiasis is through person-to-person contact, food, and water. The first well documented waterborne U.S. outbreak was in Aspen, Colorado in 1965-1966. Since that time there have been fifty-four confirmed outbreaks in the United States through 1982.[2] Both the number of outbreaks and the estimate of 20,000 illnesses reported by the Center for Disease Control are believed to be large underestimates.

Of the 41 outbreaks in the United States between 1965 and 1980, all but one (from a contaminated cistern on a Tennessee farm) occurred in the Rocky Mountain area, the Pacific Northwest or New England. Almost half of the reported outbreaks occurred in one state, Colorado. The outbreaks have generally occurred in areas served by small public or semipublic water systems which use raw surface water (from mountain streams) or surface water treated with low levels of chlorine and no filtration (Lippy, 1982). Several more sizable systems have reported outbreaks including Rome, N.Y. (4,800), Vail, CO (1978) Bradford, PA (1979), and, more recently, Reno, NV and Luzerne County, PA. Each of the later outbreaks involved more than 5,000 cases.

According to Gunther F. Craun of EPA's Cincinnati Health Effects Research Laboratory, "Waterborne outbreak data, engineering experience, and filtration theory indicate well operated and properly functioning, conventional treatment plants employing coagulation/flocculation, settling, and filtration should be successful in preventing waterborne outbreaks of giardiasis." Chlorination without filtration is not completely effective in removing or killing Giardia cysts. Thus the irony that raw water taken from very clear mountain water sources which does not need filtration for other purposes poses the threat of introducing Giardia into drinking water systems. This is the situation with San Francisco which receives its water from sources in the Sierra Nevada.

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2. Unless otherwise indicated, our source for information about giardiasis and giardia outbreaks is the report by our RFF colleagues, The Benefits of Preventing an Outbreak of Giardiasis Due to Drinking Water Contamination (Harrington, Krupnick, and Spofford, 1985).

Water systems with more advanced treatment processes may also be at risk if monitoring and maintenace are inadequate.[3] Once an outbreak is confirmed, boil water advisories are usually issued as boiling water for one minute is believed to kill the cysts.

The cysts are believed to be caused by contamination from human and animal populations. The Giardia lamblia protozoan multiplies in the upper portion of the small intestine of mammals and then enters a cyst stage when it is shed through the mammals feces into the environment (such as a reservoir). Giardiasis is sometimes known colloquially as "beaver fever" owing to the suspected role played by beavers in contaminating reservoirs and other water bodies, such as streams used by backpackers for drinking water. The cysts can remain viable for several months even if exposed to extreme cold or heat. Once ingested by a mammal, the cysts can cause giardiasis. The concern about a possible outbreak of giardiasis in San Francisco stems from the recent discovery that Giardia cysts are present in the city's Sierra Nevada reservoirs.

Harrington, Krupnick, and Spofford (1985) describe the disease's symptoms in vivid terms:

> Although seldom fatal, giardiasis can be an unpleasant and nasty disease. The acute symptoms...mimic those of amoebic dysentery, bacillary dysentery, bacterial food poisoning, and "travellers' diarrhea" caused by Escherichia coli: explosive diarrhea, marked abdominal cramps, fatigue, weight loss, flatulence, belching, anorexia, nausea, and vomiting. In a few rare cases, hospitalization for dehydration may be necessary.

These symptoms occur on average nine days after exposure. The acute phase of the disease generally lasts three to four days although it may develop into a chronic infection and reappear, in its acute stage, in an intermittent fashion over a period of many months.

Testing is usually only done for giardiasis after a person has suffered a prolonged period of diarrhea (which rules out most of the more common causes). Detection of Giardia involves taking several stool samples and is highly uncertain as the organism is only shed at irregular intervals. Susceptibility to giardiasis is quite variable. Studies have found from 1 to 15 percent of

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3. Two systems with filtered water -- Camas, Washington and Berlin, New Hampshire -- have experienced giardiasis outbreaks but in both cases the water systems were found to be not operating correctly (Craun, 1979).

the U.S. population harbor the parasite, although most of these people had no overt symptoms. It appears that resistance to acute symptoms can be acquired through repeated exposure.

Treatment by several antibiotic drugs is readily available with a high cure rate. Quinacrine, a commonly prescribed drug, requires a week's course at a cost of about $5.50. Currently there is no available drug for the prevention of the disease. The costs incurred by those who suffer from the disease include much more than the cost of the medicine, of course. Harrington, Krupnick, and Spofford (1985) estimate the average losses for confirmed cases of giardiasis in Luzerne County from medical costs, time costs for medical care, and loss of productivity and leisure time at $1,245 to $1,878 per case. Costs are also incurred by those in an affected community who do not get sick, but who purchase substitute sources of water and engage in other activities to avoid giardia. According to Harrington, Krupnick, and Spofford's calculations, the average cost of averting behavior in the Luzerne case lie between $480 and $1540 per household.

VALUING MORBIDITY RISKS

As with mortality risks, economists have several methodologies available to measure the consumers surplus for morbidity improvements. Chestnut and Violette (1984) provide a useful review of the studies which measure the benefits of pollution-induced changes in morbidity. Their review, which includes health production function, cost of illness and health index and utility function approaches in addition to contingent valuation studies, concludes that "we know very little about dollar values for changes in morbidity" (Chestnut and Violette, 1984: 6-13).

Only two CV studies of pollution-related morbidity risk reductions have been conducted.[4] Loehman et al. (1979) conducted a study which attempted to put dollar values on the changes in symptoms expected to be associated with changes in asthma attack and chronic bronchitis in Florida. This study used a mail methodology (20 percent response rate) and a variant of the payment card

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4. Other CV studies have focused to some extent on the health effects of air quality improvements (e.g. Brookshire et al., 1979) without valuing changes in morbidity as such.

format to elicit the WTP amounts. Respondents were asked how much they were wiling to pay to prevent 1 day of suffering various symptoms.

The second study was conducted by Rowe and Chestnut (1984) to value changes in conditions that affect asthma symptoms and to compare components of WTP with estimates of the individual's cost of illness. The sample consisted of 90 asthmatics in Glendora, California, a high pollution area east of Los Angeles. They were asked WTP and WTA questions about changes in the number of "bad asthma days" in personal interviews.

Harrington, Krupnick, and Spofford's (1985) recent study is the only available economic study of giardia reduction benefits. They used a cost of illness or damages approach which measured the losses that result from an outbreak of giardiasis on individuals, businesses, and communities. In contrast to the present study, their approach is necessarily limited to tangible losses; it does not include pain, suffering, aggravation, and anxiety. It is also ex post whereas our instrument is ex ante. Whereas they value the effects of a particular outbreak, the instrument which we will introduce in this chapter is intended to value the respondents' willingness-to-pay for a reduction of the risk of experiencing a giardia outbreak from some uncertain but presumably nonnegligible probability to an almost certain zero level.

FOCUS GROUPS

Two focus groups were conducted to explore local residents' perceptions of drinking water quality, knowledge of the Giardia threat, and views about various aspects of the draft scenario. Selma Monsky, of the Survey Research Center at the University of California-Berkeley, led the groups. Her staff used random telephone dialing in Berkeley and Oakland to recruit the participants who received an honorarium for their trouble. The groups were held at the Survey Research Center's building adjacent to the University campus. As is common with focus groups, the participants were somewhat more educated than the general public. Unlike the focus groups used in the THM study, the phone technique recruited people who did not know each other nor were they more civic-conscious than the general public.

The use of East Bay residents as participants offered an affordable alternative to conducting the focus groups in San Francisco as East Bay residents receive their water from the same type of source as San Francisco. Monsky structured the groups so that the first consisted of women and the

second of men. Robert Mitchell attended both and Richard Carson attended the first session and provided information about the scenario as appropriate. Transcripts of portions of the focus groups sessions are contained in appendix F.

The participants' views about their drinking water were generally positive. Similar to the views about THMs in southern Illinois, the northern Californians did not perceive a health threat of any kind, including Giardia, although, when their knowledge of Giardia was probed, many had some awareness of the disease. They associated it with the warnings to hikers in the Sierra not to drink water from streams because of the risk of getting Giardia.

It is important, in designing a survey, to know which aspects of the situation are most likely to influence people's decision about the subject of the survey. This knowledge makes it possible to address people's central concerns in such a way that their vote would be accurately predicted if they were confronted with an actual referendum on a policy-relevant giardia control program. The purpose of the focus groups was to identify these factors. The following observations are based on these groups.[5]

1. People perceived the risk as not life- threatening. People in both focus groups remarked that giardia "was not as bad as cancer," and that "chemicals are a bigger problem." They clearly discriminated between giardia-induced morbidity risks and mortality risks. The information that concerned them in this regard was to know that it was not life-threatening and did not cause permanent injury.

2. They wanted to know whether the cure involved trade-offs. Perhaps because the respondents live in the ecology-conscious Berkeley area several raised the question of what risks or consequences might be imposed by the changes to the water plant which were needed to eliminate the risk of a giardia outbreak. The interviewers should be prepared to offer assurances on this score.

3. They wanted to know whether people could become immune to the disease. The analogy with other intestinal diseases led several group members to declare that the disease would be more tolerable if people became immune to it. In other words, it might be something that people could live with.

4. Some people needed assurances that they would not be paying too much for the program. This concern, similar to one experienced in the THM survey, has important implications for CV surveys. Several group members said they were

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5. See appendix F for the transcipt of the two focus groups.

willing to pay for the giardia reduction program, but didn't want to pay more than they had to. This quite understandable sentiment makes it difficult to credibly communicate the notion of expressing their maximum willingness-to-pay.

5. People expressed a value for not having to worry. One value of a giardia reduction program is that it would essentially eliminate the possibility of an outbreak. The idea that they would not have to worry about a giardia outbreak and that this was worth money to them was expressed by some respondents.

6. The societal impact of the program also had value to participants. A number of people spontaneously expressed concern that a giardia outbreak would differentially affect: (1) low income and poorly nourished people, (2) old people, (3) and children. They were concerned about these impacts and while some of them specifically mentioned relatives who fit these categories, they also expressed concern for these kinds of people in general. Two respondents mentioned that it was a "matter of pride" to them that their community had good water. This value confirms the similar expression of societal values we noted for the southern Illinois case study and strongly supports the ability of CV surveys on drinking water risks to measure nonfamily impacts. Consistent with this observation is the fact that no participant expressed an interest in the possibility household averting behavior such as boiling water or installing a filter on their sink. Their natural tendency was to regard the problem as a community program and to accept the proposed scenario which involved community level solutions.

7. People did not express concern about or much interest in the cost of the disease to them. The type of impact charted by the Harrington, Krupnick, and Spofford (1985) study was not something which the focus group members commented on or asked about. In this respect, it may be well be that health care insurance programs do lead people to undervalue this aspect of the disease's impact because somebody else will bear most of the cost. It was interesting that when they thought about how much controlling the risk of giardia was worth to them, they used their water bills as a baseline rather than the cost of a visit to the doctor or a course of medicine or the cost of losing five days from work.

8. People felt comfortable with thinking about their WTP amount in terms of percent increases in their water bill. This was expressed spontaneously by them when they were asked in the course of the group discussion what they would be willing to pay, if anything, for a giardia program. Many of them seemed to be well aware of what they are presently paying for their water bill, another

similarity with Herrin.

9. They said the referendum format would make the valuation effort more plausible. It would make them take it "more seriously." One person made an interesting distinction between being "willing to pay" for the program and voting for it.

> Leader: Patricia, you're not willing to pay for it?
>
> Patricia: I'm not saying I'm not willing to pay for it. You asked if I'd vote for it and I said no, I wouldn't. I think that that amount of money, and you know it would be very expensive, could be used elsewhere. Air pollution, if you want to talk health, in my opinion is worse. When you want water to drink, you want air to breathe.

This observation makes a distinction between private accounts and public accounts and suggests that when CV studies use a referendum format at least some people search their preferences for public programs. We have elsewhere observed the tendency for people to want to take money that they are spending on other programs -- defense is the program most often mentioned in this regard -- and transfer it to pay for more of an environmental amenity. This tendency has to be discouraged in any referendum format because voters are never offered that opportunity. However, a reluctance to vote for a program because of a belief that there are more pressing needs elsewhere no doubt does enter into some voters' calculus, just as it does for the person contemplating a direct mail appeal for a donation to a cause.

10. Participants tended to trust health officials more than engineers. We probed to see which type of expertise people would be more likely to trust if health officials warned that a giardia prevention program was needed while water engineers said it was not needed. Overwhelmingly, people sided with the health officials on the grounds that while the engineers are experts, they nevertheless have a vested interest in perceiving their handiwork as adequate for the task.

TELEPHONE SURVEY

Although personal interviews have been the most common type of survey used by CV researchers, it is also possible to use telephone and mail surveys for this purpose. Each technique has its advantages and disadvantages.[6] The

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6. A good comparison of the methods is Frey (1983), chapter 2.

personal interview is the method of choice because it offers the most control over the interview situation. For example, while it is possible to use charts and other illustrative material in a mail survey, it is not possible to have the respondent look at the material in a particular sequence whereas in a personal interview this can be done and the interviewer can call attention to those aspects of the illustrative material which the researcher most desires the respondent to pay attention to.

Mail surveys are the least expensive survey method. But they suffer from two serious drawbacks. First, it is very difficult to get a high response rate.[7] And even if a high (e.g. 70 to 75 percent) rate is achieved, those who do not respond are likely to be less interested in the amenity being valued than those who do go to the effort of returning the questionnaire. This poses a bias problem. Second, the general level of literacy in the United States is sufficiently low that a sizable proportion of respondents may have difficulty understanding some of the questionnaire in the way the researcher intends it.

Telephone surveys are considerably cheaper to conduct than in-person interviews, although from a CV point of view they suffer from the problem that the interviewer cannot use visual aids and it is more difficult to conduct a long (over 20 minutes) interview by phone.[8] We decided to experiment with a telephone interview for the giardia study because the scenario which appeared to be most realistic in terms of the actual policy possibility, and most plausible in terms of respondent understanding, involved having the respondents value a single referendum which would reduce the possibility of a giardia outbreak from an uncertain, but definite, possibility to a virtual impossibility. This type of scenario does not require the use of a risk ladder or the presentation of a series of risk reductions. Other features of our scenario, to be discussed below, also fit a telephone interview format.

THE INSTRUMENT

The Survey Research Center at the University of California-Berkeley

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7. Dillman (1978, 1983) offers proven techniques for maximizing the response rate from mail surveys.

8. Frey (1983) gives examples of researchers who have successfully conducted telephone surveys lasting 40 minutes or more.

developed a survey instrument suitable for use in a telephone interview. The Center drew on its considerable experience with telephone interviewing in adapting a draft CV instrument to this format. Among the design considerations they considered to be of critical importance was to reduce the amount of explanatory material to a minimum. We are currently testing this instrument to see if it works as a telephone survey and if the responses it obtains are consistent with a valid CV study. In what follows we discuss its two most salient features.

Referenda Format

Telephone surveys are routinely used to assess voter intentions prior to elections. In California, which typically has ten propositions or more on the ballot during general elections, they have been successfully used to predict the outcome of referenda as well. The giardia survey instrument[9] is patterned after election surveys. As such, it includes standard questions about previous voting behavior (Q. 2) which can be used to identify the probable voters. And the elicitation question asks whether "If an election were being held today, would you personally vote for or against[10] a bond issue to protect the City's water supply against this kind of disease?"

In the Herrin study we followed this question up by asking those who would vote yes how much they would be willing to pay for the specified risk reduction. In this instrument we adapt a single price offer technique (Bishop and Heberlein, 1979) and ask different follow-up questions of those who say they would or they would not vote for the program. Each follow-up question poses a price and seeks the respondent's response to the program at that price. Moreover, each follow-up question has its own followr-up thus making it possible to get two points on the demand curve for each respondent. The sequence appears as follows:

A. Suppose it would increase your (household's) (water bill/rent) by $4 per month (for 20 years). Would you (still) vote for it?

Yes 1
No, probably not. . . (SKIP TO C) . .2

9. See appendix G for the complete text.

B. Suppose it cost another $10 per month (for 20 years). Would you vote for it then?

Yes . . . (SKIP TO NEXT PAGE) . . .1
No . . . (SKIP TO NEXT PAGE) . . .2

C. Would you vote for it if it cost only another dollar per month (for 20 years)?

Yes 1
No . . . (SKIP TO NEXT PAGE) 2

D. And suppose it cost you an extra $2 per month (for 20 years)? Would you vote for or against it?

For 1
Against 2

In order to simulate a referendum where people typically must vote on more than one issue, we included a question which asked the respondents how they would vote on a series of bond issues. This question, which precedes the giardia valuation question, reminds the respondent that there are many worthy public goods which government might provide. It is intended to add a dimension of realism to the exercise. These referenda include the following:

Here are some other issues that people have suggested as possible propositions for the next San Francisco City election. As I read each one, please tell me how you would vote if the election were being held today.

How about (EACH)? (Would you vote <u>for</u> for <u>against</u> it?)

	Vote for proposition	Vote against proposition	Would not vote on it	DK, Can't decide
A. A bond issue to pay for renovating San Francisco's city parks--including repairing buildings and landscaping as needed--assuming that it would cost each household another $4 per year in taxes	1	2	3	4
B. A fund to clean up hazardous material spills that could cost (you/your household) $8 a year . . .	1	2	3	4
C. A bond issue to build a new pier, including new unloading and warehouse facilities--assuming that it would cost (each household) $3 per year	1	2	3	4

10. Emphasis here and elsewhere in the original.

D. Bonds to renovate the city hospitals and to purchase new equipment--assuming this would cost your household $6 per year 1 2 3 4

E. bonds to repair old jail facilities and build new facilities to reduce overcrowding--assuming that this cost your household $5 a year 1 2 3 4

F. A bond issue to pay for new buildings at the community college--assuming that this would cost (you/your household) $10 a year 1 2 3 4

G. A bond issue to renovate the opera house and museums and which would also provide for expanding the art collections--at a cost of $3 per year per household. 1 2 3 4

Amenity Description

A crucial problem with the telephone survey format for CV studies is the limited amount of information that can be read to the respondent during the course of the interview. The Herrin instrument is very wordy indeed, too wordy in fact, but the presence of the interviewer and the use of visual aids made it tolerable for most respondents. Even if they were bored by the pace of the interview and its didactic quality, they endured it until the elicitation question section when the referendum format engaged their interest and attention.

With giardia, however, we knew from the focus groups that many people had questions they wished to have answered, but the telephone format would not allow us to convey this information in the usual manner. The solution we developed was to write a series of answers to questions we believed were the most likely ones to be asked by the respondents and to encourage the respondents to ask questions. Question X-1 contains the information about giardia which was either offered directly to the respondent or was provided in response to a question from the respondent.

[As you (may/probably) know], Giardiasis is a disease people get from impure water. It won't kill you, but it can cause severe diarrhea (runny bowels), cramps, belching, weight loss and other symptoms similar to a bad case

of intestinal or stomach flu. The worst stage only lasts three or four days, but if it's not treated, it can lead to more serious problems.

Some health and engineering experts say that it's possible for San Francisco's drinking water system to become infected with giardia in the new future. They want the City to take special steps to protect the water supply. Others think that the City's water is already adequately protected, and that the risk is too small to justify building the large and expensive filtration system or plant that all experts agree is the only way to guarantee that giardia cannot get into the system.

Before I ask how you would vote on this issue, is there anything more you'd need to know in order to decide how to vote?

IF YES: What else do you need to know? (CHECK APPROPRIATE BOXES, INDICATING R'S QUESTIONS. THEN GIVE ANSWERS INDICATED, RECORDING ANY COMMENTS FROM R.

Yes, need information. 1
No, ready to vote (SKIP TO A). 2

[ ] IF R ASKS ABOUT THE CHANGES OF AN EPIDEMIC IN SAN FRANCISCO, EXPLAIN: That's the big uncertainty. Outbreaks of giardiasis are rare, but they have occasionally occurred in cities like Wilkes-Barre, Pa.; Vail, Colorado; Reno, Nevada and other cities which do not filter their water. Most experts agree that there's not much chance of this happening in San Francisco, but it could happen. San Francisco could go for 100 years without an outbreak -- or there could be one next year or the year after.

[ ] IF R ASKS HOW MANY PEOPLE WOULD BE AFFECTED IN SAN FRANCISCO GIARDIASIS OUTBREAK, EXPLAIN: Most people who are exposed to giardiasis -- even during an epidemic -- do not get the disease. If there were an outbreak in San Francisco, the experts think that only a few thousand people might get it, but that it might be as many as 100,000 who get it. In other words, if there were an outbreak in San Francisco, it might be that only one person in every thousand San Franciscans would get the disease -- or it might be that as many as one person in every ten people would get it.

[ ] IF THEY DON'T BUILD FILTRATION PLANTS, IS THERE ANYTHING THAT COULD BE DONE AFTER THE CITY FOUND OUT THAT THERE WAS AN OUTBREAK? As soon as the health authorities learn that there's been an outbreak, they will tell people to boil their drinking water. Boiling water for one minute (after it comes to a boil) makes it safe to drink.

[ ] IF R WANTS TO KNOW HOW SERIOUS THE DISEASE IS FOR A PERSON WHO GETS IT:

It's a very unpleasant disease, but it wouldn't kill anyone. I described the symptoms earlier. Would you like me to go over them again briefly?

Yes...(REREAD THE FIRST PARAGRAPH OF Q X-1). 1

No 2

IN EITHER CASE, ADD: Some cases are worse than others and put people in bed for several days or even a week. But only rarely is it necessary to hospitalize someone for giardiasis.

[ ] IF R WANTS TO KNOW WHAT A PERSON WHO ACTUALLY GETS GIARDIASIS CAN DO, EXPLAIN: There are several drugs that can cure the disease and keep a person from getting it again. It's important to go to a doctor who can check that a person really has giardiasis. The doctor will prescribe one of these drugs, and it will cost between $10 and $25 in most drug stores -- depending on which drug the doctor prescribes.

[ ] IF R ASKS WHAT IT WILL COSTS: The engineers are trying to figure out the costs now. While they're doing that, we're trying to find out how much the average person is willing to pay per month. In no case, would people be asked to pay more than the actual cost of building the filtration plant (spread out over a 20 year period).

This scenario attempts to communicate the following information. First, giardiasis is described as a threat to morbidity. The respondent is told that it won't kill you.[11] The symptoms are described in terms that respondents can understand. The severity of the disease is noted by telling the respondent that the worst stage lasts three or four days and that it can lead to more serious problems if not treated.

Second, the possibility of an epidemic is described in terms of a disagreement among experts. That some experts think it is of concern, which they do, gives the referendum credibility. That other experts think the risk is too small to justify the expense suggests that the likelihood of an epidemic is probably low.

Third, the treatment method is described as involving a large and expensive filtration system or plant. This specification is intended to

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11. This statement may be a slight oversimplification, but it is necessary to make sure that respondents value giardiasis in terms of morbidity rather than mortality.

convey, in an economical manner, the notion that the solution involves equipment rather than chemicals.

This is the total description of the giardia risk reduction program which all the respondents will receive. As noted above, this is far less information than we attempted to convey in the THM survey. It addresses the most crucial issues, but begs many questions which the respondents may have. In so far as we are replicating a referendum, this amount of information is more than many voters have when they vote on a referendum (Magelby, 1984). And the interviewers were prepared to answer the follow-up questions listed above.

One problem with providing information on demand is that respondents, depending on how many questions they ask, receive different amounts of information. The instrument is so constructed that the interviewers will identify the questions which they answered for each respondent. This will make it possible to compare those who asked certain questions and received the preprogrammed answer with those who did not.

CONCLUSION

The approach to valuing giardia presented in this chapter represents a further development of the referendum format for valuing public goods. It is somewhat unconventional in the small amount of information provided about the good, but the good is one which lends itself to a referendum of this type and our developmental work suggests that the approach is likely to be feasible. These assumptions are currently being tested in a small scale survey.

The efficiency and economy to be gained by simulating referenda in telephone interviews is considerable. However, the validity of a survey of this type depends upon the information available to the survey designer about how people think about the issue. Without this knowledge, the brief scenario may be implausible or meaningless to many respondents because key aspects of the situation from their point of view are missing. In such a situation they may give random answers or impute meanings which the researcher does not intend them to impute. The degree to which respondents request additional information about the scenario constitutes an important test for the instrument described in this chapter. If respondents tend to ask questions about the referendum before giving their opinion, and if we have anticipated the questions which they ask so that the interviewers have suitable answers available to provide to

the respondents, it would appear that the respondents are receiving the information that is pertinent to their voting decision.

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APPENDIX A

TRANSCRIPT OF CARBONDALE AND MARION FOCUS GROUPS

INTRODUCTION

Four focus groups were conducted in southern Illinois as part of the instrument development stage of the THM risk study; two in Carbondale and two in Marion. All the groups, which consisted of from 7 to 12 participants each, were conducted by Robert Mitchell. In each case the participants were recruited from the League of Women Voters and the Junior Chamber of Commerce. These organizations were given an honorarium for their help in arranging their members' participation.

The two hour sessions began with a discussion of drinking water in general which led to a discussion of drinking water contamination and THMs. The last portion of the discussion was devoted to obtaining the participants' reactions to various versions of the risk ladder and the cigarette equivalent scale. Examples of the handouts which were used for this purpose are included in this appendix.

At the beginning of each session, the participants were told that Mitchell was designing a questionnaire about drinking water. In order to do this he needed to understand how people in the area feel about their drinking water. He emphasized that there were no right or wrong answers to the questions he would ask, and that their frank and honest opinions were desired. The Carbondale groups were tape recorded and the complete transcript is presented here. As the tape machine did not work for the Marion groups, the transcript consists of notes written by Mitchell and Karla Whitley immediately after each session. (Whitley organized the groups and acted as rapporteur).

TRANSCRIPT OF FOCUS GROUP #1
CARBONDALE, IL 12/3/84

RM HOW DID YOU RATE YOUR WATER?

I rated my water, I checked several things and I said it varies. Don't you think it varies, Lillian? I drink a lot of water and some days it's quite good and some days I really don't like it. It's never terrible and it's never marvelous.

The water, I've got a business in town, at least I do until the end of this week. I pay two water bills. The water in town that I pay for isn't as good as what I got when I lived in the water district.

You mean in terms of taste?

Yes.

I used to be on the Kinkaid Water District and they switched me to the Carbondale about a year ago. I can't tell a difference. It could be because we were on the extremity of the Kinkaid Lake Water District and we are on the extremity of the Carbondale Water District, but I can't tell the difference. Maybe because I'm not sensitive enough to water taste.

I rate this water against the best water I ever had and it's what kind of coffee it makes and how it washes clothes and dishes. But mostly on taste. Good water to me is tasteless.

The thing of it is you gotta realize is that some of the plumbing it runs through before it gets to you. Where I'm at with my business, it runs through a copper line before it gets into the building. There is a lot of corrosion in it, the pipe has been there a long time.

RM WHAT ABOUT THE COLOR?

I never see anything wrong with it.

Until you fill the swimming pool up with it and then it's green. You can see about 2 feet down into it. Beyond that you can't see a thing. That was a couple of years ago. If you fill it up from the hydrant.

South highway water line is moderately new because that area expanded about 15 years ago and the source of the water was changed and Cedar Lake as the primary source so that ours goes into Carbondale and then comes out again. It is very different water except when the lake turns over, it's very good.

RM HOW OFTEN DOES THE LAKE TURN OVER?

Twice a year--well, really only once a year--in the summer.

RM ON THE CHEMICAL SIDE, WHAT ABOUT THE FREEDOM FROM CHEMICALS THAT MIGHT HARM YOU HUMANS, HOW DO YOU RATE THE WATER?

I think ours has quite a lot of chemicals in it.

I think it does too but there is no real way of knowing because facts are not published. They probably should be.

RM We're talking about, not chlorine they put in to treat it, but basically other kinds of chemicals.

Mercury, pollutants, you can't always tell from the taste.

Actually, isn't it one in the same. The chemicals they put in react with the chemicals in the water to create chemicals and so it's a number of things. And when you drink the water who's going to separate out the chemicals in it. I am more concerned about the chemicals that come from the chemicals they put in to treat it than the reactions afterwards. We do have an awful lot of chlorine put into our water. And in the output you get the carcinogenic byproducts out of that and I'm not happy about that.

RM HAS THERE BEEN ANY PUBLICITY ABOUT THE BYPRODUCTS IN CARBONDALE?

No. Not very much. Occasionally.

Wasn't there an article in there about one of the effects of one of the chemicals we added created a carcinogen?

Yes. Very recently there was an article like that.

RM WAS IT THM?

I can't remember now.

A while ago there was a scare about eating fish out of the lake that mercury in it because apparently we were in an orchard area and they sprayed the fruit trees over 100 years or more and these contaminated the water. And there was an article in the paper that said there was it didn't affect the water and I haven't seen anything else on that. A couple of years ago.

They switched the water to a new reservoir which we mentioned earlier--Cedar Lake--and it's a relatively new lake, about 10 years old, it was in a heavy orchard area. All that area down there is fruit orchards.

The one bad thing that I have objection to about the water all these years is when during the building season of the year, it's necessary for them to attach plumbing and they flush out all of the mains. When they do that the water comes out a horrible color and if you happen to wash your clothing in it, at that time, the only way you can get the yellow out of white clothes is lemon juice and it takes a heck of a lot of lemon juice to get a sheet back white again. It certainly is unappetizing to drink but I don't know that it's dangerous. I never heard anybody say it was dangerous to drink but you can so innocently get a washer load of clothes in there.

They don't tell you, there is no warning.

Yes, there's radio warnings.

Well, they do warn you but this happened for a good many years without any warnings. Now they do put it in the paper on such and such a day there will be this construction and water main flushing.

Well, that must be one advantage of living in the inner city because I don't recall that.

This happens in the inner city.

They flush all over the city once a year.

Of course, the building is going on the periphery more but the flushing is going right through the inner city because when we lived on Elizabeth Street was when it was the worst and they didn't give us any advance warning. Now they do.

RM HOW DID YOU RATE NUMBER C? HOW MANY OF YOU GAVE IT A 10 RATING?

Nobody.

RM THOSE OF YOU WHO ARE MOST CONCERNED, WHICH ARE THE PARTICULAR CHEMICALS THAT YOU THINK ABOUT?

I'm thinking in general rather than specific.

We really don't know what is out there. After all, in the Crab Orchard area, of course, you are probably familiar with the Dioxin problem already.

Years ago, Crab Orchard Refuge Area the industrial area around the lake and when it closed down they had a plant there that they made electric motors, transformers, and they buried the by-products and since then it has kinda seeped right into the lake.

Who's going to clean it up.

RM WHO DO YOU THINK SHOULD CLEAN IT UP?

It falls under the federal jurisdiction. Because the company has been out of business for a number of years. It's on federal ground.

It's federal property.

Wasn't it Ordell? Well, that isn't on Crab Orchard Lake, is it?

Yes, it is.

I was corrected, Carbondale never did draw their water off Crab Orchard Lake.

Oh, yes they did (agreement).

The federal government said we will not sell you any more water. You've got to get your own and that is why Cedar Lake was built.

One of the concerns was how long had that been festering there before somebody ever discovered it. They only found it this last year.

The company went out of business in '76. Sangamo Electric. They sold out to another company and went out of business.

That shows how carefully we read the newspapers.

RM HOW SAFE IS YOUR DRINKING WATER?

You have to assume that it is safe and that we aren't all being poisoned or you go on a crusade to change it. And we don't know that it isn't safe so you have to make the assumption that as of right now it's safe.

As far as we know.

It's relatively safe. Not as safe as the water that we drank when we were young.

That's a good qualifying word, relatively.

RM What you are saying is that it is safe enough to drink and use it, but it could be safe, it could be cleaner.

I would feel better if we didn't put so much additives in it. In fact, some people claim that Cedar Lake water of and by itself is safer to drink than the water we drink after it's been purified. I would feel safer if I knew we were putting less things into it. In other words, if the source was primary enough that you could do that, but obviously you can't because it's gotta put things in it for the bacteria and what not.

RM A byproduct of chlorine is thought to be a possible carcinogen (THMS).

But they can take it out, can't they? They said they can add a chemical and it takes out because it is one of the more dangerous chemicals as I remember or carcinogen.

RM There are treatment processes that can be used.

Or were we just told that in the article to pacify our fears?

RM You have some confidence in your water because of assurances such as the one you mentioned. If there were problems, that things would be done to it.

There is another factor.

I am skeptical of it. I generally go to the store and buy drinking water. I don't drink much from the tap. Maybe it's just that I am skeptical. I really don't know what's in it. I would like to, but I have, it has tasted bad before. It has been cloudy before so I'm more or less playing it safe, trying to. I've thought about putting a water filter on too--on the faucet.

RM DOES ANYBODY ELSE BUY BOTTLED WATER?

No, but I do have a purifier.

But what does that take out?

It is supposed to take out the chemicals, but I really don't know what it takes out anyway. It has a charcoal filter on it and it is supposed to take out a lot of things. My husband bought it, I don't know what it takes out.

I want to ask her a question. How often....

RM One person buys bottled water and is thinking about installing a device and Gayle has a device, and no one else as of now....

What do they do about their ice?

Don't you think that we may feel a little more confident about our water than people in an industrial area? Because at least we don't have industrial waste being dumped in. We know we've got agricultural wastes that may be polluting us. I think we're not as fearful about it as we might be if we lived in some other place. But we still are kind of skeptical. None of us think it's perfect.

RM WHAT COULD HAPPEN THAT COULD LEAD YOU TO NOT THINK IT'S SAFE?

Some news report or the mercury that they told us about five years ago is really there in the water.

Confirmation of information or a new scare or something. They come up about once every five years.

RM IS IT FAIR TO SAY THAT THE ABSENCE OF SUCH A SCARE GIVES YOU SOME ASSURANCE THAT THE WATER IS SAFE?

No. There's things going on in all fields right now as far as you look into beef now they're adding steroids and all sorts of hormones to the food. I mean you're getting in the water, herbicides, insecticides, dioxin possibly, sulfur, sulfuric acid possibly. The possibilities are endless. One thing is that you can try drinking water and it has less contaminants than your other drinks have in them. Wherever your coca-cola's made--in St. Louis or Chicago--you're in bad shape there. It seems to me that you have to be satisfied with your water because the alternates are more detrimental. Milk in its fat content, DTD's and hormones and that sort of thing.

RM BASICALLY, YOU FEEL THAT WATER COMPARED TO OTHER THINGS IS OK? THERE ARE A LOT OF OTHER THINGS AROUND, BUT WATER IS NO WORSE THAN A LOT OF OTHER THINGS AROUND, PERHAPS BETTER?

If we could do something about it we would make it more pure but our capacity to do that is limited because of the bureaucracy involved and because of the focus of our interests in general, in society, is not on quality but on quantity. The cost would also...

We don't have a crisis here. We don't have water that tastes like sulfur and we don't have water that looks yellow and we don't have water that we know had dioxin in it, we don't have a crisis. We are not satisfied with our water, but we are not unsatisfied.

Water here is 100 percent better than what you would get in Chester.

It's relative.

One thing that I think is not clear is what testing procedures and how often tests are conducted. Usually we don't find out about anything until after somebody has discovered it is already there.

Last summer they had an article in the paper that we had too high a count of something in the water, therefore, don't complain if you find more chlorine, you may. When they quit putting it in they put a notice in the paper the problem had been met and we are going back to the normal. I think that kind of public relations give us a sense at least that things aren't too bad. That they are watching. It isn't something we have on our mind to worry about.

RM HOW MANY OF YOU AGREE WITH MARY JANE THAT THEY REALLY ARE WATCHING PRETTY MUCH? THAT IF SOMETHING REALLY BAD HAPPENS YOU'LL HEAR ABOUT IT?

The State Department of Health requires, I think it's a continuous monitoring, at least once a day.

But what does it monitor for?

Probably bacteria.

But not for some of these chemicals I wager.

I'm not saying they do it, I'm saying that the public relations they carried on allay the average person's average interests. Through that, but whether they should be, I have no idea.

I also think because of the University we have very well trained people in the water plant. I think that we are better off than many places in that we have a well run water plant.

I remember when we visited with the children at school they told how often they checked it and it was constant. But I think somebody raised an interesting question, if they change what they check for now that there are more contaminants in the air. We hope they are.

Maybe the part per million level is raised or lowered according to whatever they're looking for.

RM DOES THE WATER COMPANY--IS IT A MUNICIPAL COMPANY (YES)--HAVE A PRETTY GOOD REPUTATION IN TOWN?

It is evidently monitored or watched pretty closely by the federal government because we were forced to put in a new treatment plant, weren't we?

Yes, it's not bad.

RM IT'S WELL RUN?

It's a money maker.

Yes, but that doesn't take care of chemicals.

That was a waste treatment plant. That's a different kind of thing. But what you say is true.

There are all sorts of checks going on from different governmental agencies. Now whether they're functioning efficiently and freely, who knows?

RM WHO DO YOU TRUST MOST? LET'S SAY YOU GET INFORMATION OR PEOPLE SAY SOMETHING ABOUT WATER, WHO WOULD YOU TRUST MOST FOR THAT INFORMATION?

The federal--furthest away from the local manipulation.

RM WOULD THE REST OF YOU AGREE WITH THAT?

The University if they did an independent test. (agreement)

You would want somebody outside of the department, the city structure.

At one time, I would have trusted the EPA.

Actually, the state EPA is pretty good. They are underfunded.

The state EPA functions pretty well.

The State Health Department and the EPA require constant monitoring and they approve and so on.

RM THEN YOU HAVE A REASONABLE AMOUNT OF TRUST IN THE STATE EPA?

I think so, a number of years ago we did a study on Carbondale's water supply and we knew all these answers because we were to some extent for getting for Cedar Lake because it was a very miserable situation and since then we have assumed that everything is doing well. Haven't done anything about it.

RM IF THE CITY MANAGER SAID THE WATER IS SAFE, YOU WOULD NOT TRUST HIM OR HER AS MUCH AS YOU WOULD THE OTHER AGENCIES YOU HAVE MENTIONED SO FAR?

We would have to know where he got his information. (agreement)

He's probably just rereading information that was handed to him.

From the Water Department.

RM WHAT ABOUT THE LOCAL PHYSICIANS? WOULD THEY BE A SOURCE?

No.

Maybe the Public Health Department. They might know something about what's going on. County Health Department.

They are the ones who approve private water systems.

There are quite a lot of private water systems in this area too. Other than municipal.

Well, cisterns, etc.

RM THAT WOULD SERVE A SMALL CLUSTER OF HOUSES?

Usually individual houses.

I used to live on one three years ago. It had a deep well on it and it served six houses.

RM DID YOU GET THE WATER TESTED REGULARLY?

No. About once a month one of the people who lived out there, a professor at the university, would bring it in and get it checked. And there was nothing wrong with it so we just kept using it. It didn't have any chemicals in it. It was a deep well and we didn't add anything to it. The only thing is you had to watch your wash cause their was a lost of rust. Lot of iron in it. Hard water. Played devil with pipes, washing machines, water heaters.

Tasted good.

How do you compare its taste to what you drink now.

I liked it better. I like deep well water better.

RM THM is a side product of chlorine. There is a certain amount of uncertainty about what its effects would be because it is at a very low level. They have been found to be carcinogens in rats. The guideline for levels above which it is dangerous have been established. These are very small amounts. The amount of THM varies according to the organic matter in the water. Carbondale, I believe, has exceeded this level a couple of times. Not by a lot but by a little. Could we talk about your reactions to this? It is uncertain

whether THM's cause cancer, but there is an indication that it is probably something to worry about. This is a low level. It's exceeded occasionally by not very much. To not exceed the standard would require the installation of some equipment that would cost money. DOES THIS KIND OF THING CAUSE YOU ANY CONCERN AND IF SO WHAT CAN BE DONE ABOUT IT?

I would be interested in knowing if there were any studies on water systems that are naturally chlorinated and what the results there were in regard to THM.

I don't believe there are any that are naturally chlorinated but there are some that don't need chlorine because they are from mountain streams, etc.

I used to live in Galesburg and I heard that they did not need to chlorinate their water.

RM Or was it fluoride possible?

That's probably what it was.

I didn't realize that we had exceeded the limit. That does concern me especially because there are chemicals that the EPA set maximum levels for safety and then a few years later they said that's too much and they said that the safe level is a lot lower than that. So that if we exceed the current what is thought of as a safe level it may be that we are even unsafer than we think. I didn't know anything about it. And I really think that if it is known how to remove this stuff it's worth paying a little more taxes.

I do too. I would pay a little more here and would hope that the federal government would cut the defense budget. Considering I was looking at what I think I spend for water a year and next to air it is the most important thing I've got I'd spend a little more for better water.

I'd go along with that.

RM HOW MUCH DO YOU FOLKS SPEND?

It really depends on how much you use. Now that my son is not home washing his hair I spend about $80 a year. Water bill is your water and sewer.

For us it's about $100 a year unless it is a dry year and we water our garden. Our sewage is not included.

Depends on the size of your house, etc.

Has the question ever been raised, is there a chance that the chlorine is used more freely than necessary because it is not particularly harmful and it will kill all these things and we don't measure carefully enough to get just the right amount, which would apparently make quite a difference in these fractional amounts.

RM I think we can assume that the water treatment folks for the last decade have been pretty aware of this problem.

If nothing else probably for economy because the more chemicals they use the more it costs them.

RM They are professionals and they pride themselves on doing the optimal jiggling around with the chemicals so that the best quality water is obtained.

RM WHAT IF THE LOCAL WATER TREATMENT PEOPLE SAID IN THEIR PROFESSIONAL JUDGEMENT THAT IT IS NOT WORTH IT TO INSTALL THIS EQUIPMENT, BUT THAT THE WATER IS SAFE. THE LEVEL RISK OF INVOLVED IN OCCASIONALLY GOING OVER THE STANDARD IS SO LOW THAT IT WOULD BE A WASTE OF MONEY TO INSTALL THAT EQUIPMENT, WOULD YOU STILL WANT TO DO IT?

When the level goes up does that mean they are putting more chlorine into the water at that period say when the lake is turning over and is full of rotting vegetation?

It's only when more chlorine is in the water.

So it's only periodic particularly in the summer?

Right.

There is a period of perhaps a week when the water quality isn't that true in every summer. Some summers are worse than others.

RM Would it make a difference if it were just 5 or 10 days a year that you were subjected to? That would be of less concern than if it were something on a regular basis?

Yes. (agreement) Unless we found that there was a huge incidence of cancer that could be traced to the THM and that's pretty hard to prove.

RM We are talking about a really low level.

If it's just a low grade and I imagine that it doesn't occur very often, I think we would tolerate it. We have tolerated it. It is not a question would we, we have. We've probably tolerated it for the last 5 to 6 years and no one has caused any uproar about it. I guess it isn't enough to bother us. I haven't felt like going out and striking against it. If it only occurs every once in a while you feel you won't drink water that day or I won't drink in this period or I'll go do something else. But if it occurs every day you might think twice about it.

RM Let's say it occurs so that you wouldn't know in advance when it occurs.

You never do.

RM But it is only a few days a year. Under those conditions, you wouldn't spend a lot of money.

It has happened, but I don't think any of us has gone out for a referendum to change it.

I don't think I would go on a crusade about that. I'm on too many crusades already.

RM Of course, that's a lot of work. Let's say something is on the ballot, like a referendum on a school board issue or something like that. WHAT'S THE MOST YOU WOULD BE WILLING TO VOTE FOR AS AN INCREASE IN YOUR WATER BILL TO HANDLE THIS KIND OF SITUATION?

No one has said from any level that we should be concerned because a lot of what you fear comes from outside. Nobody was terribly concerned about dioxin until a lot of other people said you should be concerned, this is what it will do. Then suddenly, we all got concerned. How much are we going to play in the scenario with outside people.

RM Let's say some environmentalists think it would be a really good thing but it didn't have the support of local officials. WHAT IF THEY WERE THE ONES THAT PUSHED THIS? The water treatment people in particular think it is a waste of time and money. The state health people and the national EPA people think it would be a good thing to reduce this, but they don't have a strong position on it.

What kind of money are you talking about putting in equipment?

RM I'M ASKING WHAT WOULD IT BE WORTH TO YOU? WHAT IS THE MOST THAT YOU WOULD BE WILLING TO PAY TO INSTALL THAT EQUIPMENT? PER YEAR ON AN ANNUAL BASIS?

It wouldn't be much per person.

I'd feel $1.00 a month added to the bill perhaps wouldn't be inordinately high, for me, but it might be for other people.

It wouldn't for you, but I can think of some people that I know that it would be way too much for.

I spend $5.00 a month on buying water--plus what I get from the tap.

There are so many things in our environment that we are learning that are carcinogens and we don't fish Crab Orchard because of the dioxin and are uneasy about other places but if you were going to pay for machinery to take everything out or to eat beef that was only slaughtered and didn't have steroids, where would it end?

If we are only talking about combatting THM, machinery for that, then we might say whatever we say about adding to our bill but then 5 years from now we might have to add $5 a month more for complex machinery that would take out another possible carcinogen. So where do you go.

RM SO THERE IS AN UPPER LIMIT TO YOUR CARCINOGEN REDUCTION PROGRAMS?

If we had our choice, I would personally eliminate all the carcinogens from our environment at a cost that would benefit all of society and build us all up as better people. But that is impossible. People obviously don't care, people smoke right now and it is well proven that they are not going to stop smoking and the facts are out. People are going to go ahead and do it to themselves. People I talk to say you eat the beef with the steroids, you drink the water with the chlorine and chloride and THMs, they don't care, they say everything gives you cancer. Ultimately go back to war, it's all over. Live today.

I wondered if it was just for THM. I think it would be interested in anything that affects the water, toxic waste, spring crops, and other things that to me probably are more immediate to me than this.

I would pay for THM right now because that is what we know about now. And the next thing that came along I would make a decision on that.

RM You would be concerned that maybe THM's isn't the worst thing in the water.

Because at one time we didn't know where dyptheria came from.

This has reminded me of something. I come from New Orleans. Everybody drank the city water and it wasn't until I left that it became apparent that that was apparently the worse water in the country as far as carcinogens and all of the other problems. The taste isn't too bad but everything else is terrible. Anyway, everybody drank the water. Very few people drank distilled water. Very few people got filters for the water. Now almost everybody I know has distilled water or has filters on their water. The reason we got our filter was because we got one for each of our parents and we bought a third for ourselves. In this area I don't sense there is a crisis, there is no one hanging over our heads telling us that this is really terrible water so there isn't the rush by everyone. There were always some people who got distilled water and I think that a lot of people in this area get distilled water. I'm talking about all levels of New Orleans are now buying distilled water and putting the filters on. So it's a different sense of the safety of your water. At some point along the line when enough people say enough things about your water you reach that point and you go out and do something about it. We are no where near it here. At this point, I think most of us feel our water is fairly safe, fairly ok, but not perfect. We would like it better. I'm not sure we'd pay an awful lot more to improve it. Some on the whole scale of sensitivity would take an awful lot more before they would want to put anything on. I don't think as a society we are ready to pass a tax to do that.

RM WHAT WILL YOU PAY FOR HELP, GIVEN YOUR OBLIGATIONS, INCOME, PRIORITIES?

If you were designing a proposition?

You have to threaten the people to tell them that in 15 years they are going to die from drinking the THM's. You must have a sensational death rate that can be related to.

RM In other words, unless it is a really dramatic threat...

People wouldn't pay very much.

Unless you say something that is dramatic, sensational.

I would pay for the device. The general public will never do it. This group is quite a bit different group than the general public.

We keep ourselves pretty well informed.

In relation to what Gail was saying though, a little thing entered my mind and I just thought what an opportunity it was for the water purifiers to sell a product and I might just be a little suspicious of what was behind all of this.

That's very true. It would enter a lot of people's minds.

People might be skeptical.

As a matter of fact, we had a salesman come to our house a year or two ago selling a thing you put on your faucet which was supposed to remove the impurities and we didn't bite. Some people I know did. I never buy from people who come to the door.

I asked the salesman what kind of impurities will it take out and he didn't know. I also don't buy from door-to-door salesmen, but that was too silly.

RM IF I USED THIS APPROACH [HAVING PEOPLE VALUE THE IMPROVEMENT BY SAYING HOW MUCH THEY WOULD BE WILLING TO PAY FOR THE EQUIPMENT] IT APPEARS THAT I NEED TO CONVINCE PEOPLE THAT IT WOULD DO WHAT I SAY IT WILL DO?

Right.

RM Otherwise they are evaluating not what I think they are evaluating. They are evaluating the uncertainty of this thing working which isn't giving me what I need.

I think we are going to have more apprehensions about the THM's. It is practically unknown in the general public at this point so the questionnaire would deal with something that was so remote or strange, misunderstood, not understood that they would probably would say "Gee, I don't know what that is all about" and you probably wouldn't get the answers you want.

I think she is right. You have to specify what it is you are trying to take out of the water before you can say that this product will take it out of the water. You have to understand what it is doing.

I read that same article or saw that same item in the Southern Illinoisan that you are referring to and I skimmed through it and I said "Oh heck" and I didn't bother to read it through and really understand it.

RM When was this again?

This was last summer. (agreement)

RM You think people would understand things that are simpler. There are things in the water that run a small risk of causing cancer. This device would reduce the risk.

What's the standard mean?

RM The standard is this arbitrary number.

RM YOU WOULD WANT MORE INFORMATION?

We don't know how dangerous THM is.

RM WHAT INFORMATION WOULD YOU LIKE TO HAVE?

How many deaths per millions occur from cancer caused by THM? And how many less would occur if you decreased the level?

In a study if you do so and so for so many years, drinking say 2 quarts of water a day for 20 years or whatever you drink, then this would happen then you'll cut your life span down by so much years and that usually has an impact. It seems like a way that is measurable to many people's eyes including mine.

RM IF I SAID YOU WOULD CUT YOUR LIFE EXPECTANCY BY THREE DAYS WOULD THAT MAKE A DIFFERENCE?

No. (agreement) It would make sense to people but wouldn't make any difference.

It wouldn't make sense for a big expenditure. It would be understandable.

RM WHAT IF I SAID THAT THE RISK REDUCTION WOULD BE THE EQUIVALENT OF 24 CIGARETTES A YEAR?

That is negligible. In fact most of us get it by referred smoking.

RM DO YOU THINK SMOKERS WOULD OBJECT TO USING THIS KIND OF THING?

I think the general public is used to that by now.

They understand.

It might bug some people, but I don't know. It's a good example.

RM Another example would be Diet Coke and saccharin. We need to communicate the risk simply.

You are afraid that smokers would not answer your questionnaire? What difference would it make?

My risks are far higher in the business I deal in than 12 cigarettes a year. I deal in waste motor oil, solvent, exhaust fumes, and stuff like this everyday.

I agree.

You have to modify that questionnaire because in our area it is equivalent to 5 packs a year and in 4.4 area it would be equivalent to 4 times that so. That's what I mean you say there are some city levels that have reached that point whenever they made the survey several years ago. Those people would definitely have a much greater interest in putting in some kind of purification system.

RM WHAT IS THE LEVEL OF CIGARETTES A YEAR THAT WOULD BEGIN TO WORRY YOU?

100 packs. (confusion)

What is the danger of cancer when you smoke that little.

RM Risk of THMs... It's sort of the risk of dying in an airplane crash.

What is the cost that we will have to put out to save three days of our lives compared to passing a law stopping people from smoking amongst other people or reducing or eliminating lead from gasoline or stopping steroids from being placed in cows to get the same results would be a comparison how much are you willing to give to pay a cost that proportionate number.

RM IT WOULD MAKE IT EASIER FOR YOU TO THINK ABOUT IT BY COMPARING IT TO SOME OTHER RISK REDUCTION PROGRAMS...?

Maybe like the lead--people really know about that.

How much extra am I going to pay to get the lead out of gasoline? Versus how much am I going to pay to take the THM out of my water and then it seems more rational to the individual to spend the money.

At the place where you can get the best reduction.

One out of 100,000 doesn't seem like a lot of people. Statistically it doesn't...

TRANSCRIPT OF FOCUS GROUP #2
CARBONDALE, IL 12/4/84

RM DO YOU KNOW WHERE YOU GET YOUR WATER? WHICH WATER SYSTEM YOU ARE A PART OF?

Kinkaid.

RM IS EVERYBODY PART OF CARBONDALE?

No.

RM HOW MANY ARE CARBONDALE:

I'm South Highway.

That's Carbondale water.

We used to be Murdale but they just took over our lines so we are Carbondale.

RM YOU HAVE A PRIVATE WELL?

I have a cistern.

I use a lot of Carbondale water.

RM Those who have Carbondale water, how did you rate the overall quality of Carbondale water? How many thought it was a 9 or 10, 8, 7, 6, 5. We had a discussion group like this last night and there was quite a diversity of opinion. As far as taste goes, how did you rate it? How about the Kinkaid water?

A low rating as far as I'm concerned.

I buy distilled water to drink, just to keep in the refrigerator.

RM ARE YOU SATISFIED WITH CISTERN AND WELL WATER?

Yes, quite satisfied.

RM WHAT ABOUT THE FREEDOM FROM CHEMICALS SIDE OF THINGS? HOW DID YOU RATE THE CARBONDALE WATER?

I gave it a four that was the lowest rating I gave.

I put I'm not sure, I don't know.

RM YOU THINK IT IS PASSABLE OR YOU WOULDN'T DRINK IT?

Right.

RM AND THE KINKAID WATER ON CHEMICALS?

I rate it 6.

RM Not terrific but it seems ok.

RM HAS THERE BEEN ANYTHING IN THE NEWSPAPERS ABOUT PROBLEMS WITH THE WATER AROUND HERE?

Marion has had trouble with water.

Not in Carbondale recently. There was a scare years ago at Cedar Lake.

RM WHAT KIND OF SCARE WAS IT?

That it had some chemicals in it.

It was a new lake and there is vegetable material and organic material in new lakes which is inundated when the lake is first filled and that frankly has to disintegrate and the disintegration product puts tannic acid in the water and various flavors and colors that are not very well appreciated by the public. I think it was basically safe but it was unpallatable. It has improved with the age of the lake. And that is true with almost all new lakes--there is a period of time when the water is very unpallatable until the lake adjusts itself.

RM IF YOU HAD TO TALK ABOUT THE SAFETY OF YOUR DRINKING WATER, HOW WOULD YOU RATE IT?

I think Carbondale water is pretty safe. I'm biased, my father worked in the water department. There are minerals and things in it that they cannot take out; it is not a distillery.

Before I heard that I probably have a more negative view of it than now because I'm somewhat of a skeptic in terms of chemicals in the environment and especially when there is any governmental control or anything and I'm more of a skeptic and I had occasion to call the water district trying to find out what the sodium content was and I still don't know. That made me a little suspicious if someone can't give simple kinds of information like what's the sodium content of the water that we are drinking. But I have been reassured now.

The only chemical they are putting in is chlorine. They put some lime in there, too.

Flouride too.

My husband is a dentist and he checks some of the water here in town periodically for his patients and when he called Carbondale, he was reassured because he asked about certain chemicals too and they assured him that fluoride is added to an appropriate amount. When I say I'm not sure because I wouldn't know what was harmful for a human or not. I'm not a chemist and I don't know what good levels are. I have to rely on people to make sure it is safe for us.

RM IT IS VERY IMPORTANT THAT YOU GIVE YOUR OWN OPINION. WHEN YOU THINK ABOUT SAFETY WITH DRINKING WATER, WHAT KINDS OF THINGS WOULD BE UNSAFE AS FAR AS YOUR DRINKING WATER?

If it smells bad, I won't drink it.

There are a couple of things that I would think of as not being safe and one I've been to Mexico a couple of times and you don't drink their water. I rated Carbondale water high for color, appearance, and taste because I happen to like the way it tastes, but when you stop and think about it, you think there must be a lot of stuff in here to make it pure and I don't know what all chemicals. What they're putting in it to make it safe so that we don't get sick immediately. And what are the long term problems because of that. That would be my concern.

RM EVEN THOUGH IT SMELLS OK?

It looks ok, smells ok, tastes ok, and I'm not getting sick but I'm thinking maybe I'm really going to be sick down the road.

I would certainly think the process would be a shorter one with Cedar Lake water than like it is with Mississippi River water.

RM THERE IS SOME REASSURANCE THAT THE SOURCE IS A GOOD SOURCE?

It's somewhat more pure than what many communities have to rely on and the isolation of the lake surrounded by forest is certainly much better than industry and so on.

RM WATER THAT IS UNSAFE WOULD HAVE WHAT KIND OF CHARACTERISTICS?

Just look at it.

If the source looks bad and smells bad then you know there's a physical plant somewhere around there dumping into it.

Or a lagoon.

I lived here most of my life and I just now heard over the last year or so little things about different chemical spills in the area that I didn't know existed. You never know what's happened at some point in time in an area and then they create a lake 25 years later in that area.

RM WHAT WOULD BE UNSAFE?

Toxic chemicals.

That is what worries me is man-made chemicals. Man-made pollutants. I don't think we know enough about it to know what's going to happen.

I've drank water from the Mississippi and water from Lake Michigan and it doesn't taste that much different and it doesn't look that much different than the water that we drink from Carbondale. I lived in Chicago for quite a while and I lived in St. Louis and it worries you to wonder

what type of stuff I drank water from a cistern and sometimes it tasted awful and smell you knew sometimes after a rain all that stuff from a dirty roof was pouring down into it. Sometimes we would have to haul water and dump into, but you don't worry about those kinds of things (lizards and frogs) so much because they are natural. But when you talk about toxins that has only been around for 5 to 10 years you have no idea that's what scares me.

The Mississippi River which has such a large watershed naturally there is going to be some industries and cites and so forth which discharge into the stream and therefore you have a coalition of pollutants whereas Carbondale is fortunate to have Cedar Lake which is isolated. It has surface water that is rain water that has accumulated there, but there are controlled man-made sources of man-made pollutants that should leave a very high quality of water there.

RM SO YOU SEE IT IS PRETTY FREE FROM THESE KINDS OF POSSIBLE CONTAMINANTS THAT THE OTHER PEOPLE ARE TALKING ABOUT?

I think that the possibility of contamination there is greatly reduced over a river or whatever.

We used to live south of town in the country and our washer and dryer used to drain into a creek and the farmer next to us his cows used to urinate in that same creek and that would come past our house and enter into Drury Creek and I think Drury Creek went into the water system supply eventually.

No. It empties into Crab Orchard Creek below Crab Orchard Lake. And as far as I know there is no water demand for human use from that point on.

I was down in New Orleans just last year and I was really amazed at how well the water tastes down there and I was bragging about it, I finally found somebody that knew where the water came from and I found it came from the Mississippi River. It was the best I had ever tasted and it looked nice and they must purify it. That's right at the end of the Mississippi River and they were doing a good job. I don't know what all I was drinking but it tasted good.

RM WHO WOULD YOU BELIEVE IF SOMEBODY SAID THE WATER WASN'T SAFE?

The superintendent of the water department would know what was going on.

Department of Public Health - State.

I listen to the newspaper, not as a final authority but I certainly give it consideration.

If there was a big investigation going on and the newspaper was bringing it to our attention I think I would be concerned.

Radio.

That always concerns me too, though it seems like I am always the last one in our neighborhood to know that the water should be boiled. If you are not listening to the radio at that particular time or didn't talk to your neighbor you are out of luck. Lasts a day or two or a week, depending on the break that causes it.

The point is they suggest boiling the water until samples are analyzed so the water is not necessarily polluted however it is a precaution.

According to certain sources that say the water is really ok to drink, it looks bad. They put enough chlorine in there to kill anything that possibly could be in there. We haven't had too many people come down with Tijuana disease.

When your water is shut off for any reason now, if you have got your water disconnected it drives you crazy because you realize how often you go to that tap and turn it on. You really do become very dependent on our clean water source. I've been to Mexico and you are scared to death to drink the water and we just got back from Europe, they give water to you in a bottle if you ask for it. I don't know if that indicates we are tourists or if they all drink it out of bottles too. I don't know if they have a really big problem with their water source. Paris and Geneva. You automatically get bottled water if you ask for water. I don't know if they have a problem over there or not. You come back here and run it all you want fairly cheaply when you consider.

RM WHO WOULD YOU BELIEVE IF PEOPLE SAID THE WATER WAS SAFE? IF YOU MOVED TO A NEW TOWN, WHAT KINDS OF PEOPLE WOULD YOU BELIEVE?

Health Department and check it out with them. They are a reliable source to me.

I've been inundated with too many movies where the people in authority are pulling one over on us. Maybe it's too much Hollywood or whatever. I think I would want to hear it more from university people that were chemists. I don't know just some people that maybe were skeptical themselves and had gone out to prove it and had proven to their own satisfaction that everything was okay.

Maybe several independent sources coming to the same conclusion.

The newspaper investigation or a special committee of people or the university but I would not go with the voice of authority.

If I'm moving to a new area, I'd go with asking my employer or friends that I worked with or next door neighbors because these other people you ask them questions well I don't believe their answers. They will say something else that what it really is.

I think I would start out assuming it as okay. I have never moved into a house and assumed that you couldn't drink the water. Once in a while you will be in a park or something and they are using lake water to run the showers and toilets and they say don't drink the water. There aren't any signs like that around the problems.

For water to be safe, it has to be checked both chemically and biologically and, of course, about the only one that really can do that is some institution which has biologists and chemists involved and, of course, the Public Health Department is about the only one conveniently available.

I'd check facilities and look at that and if there are a couple of coffee filters where the water is going through we are in trouble. You can look at that and see what kind of equipment they've got. If it's pretty modern stuff you pretty well get the idea they at least know what they are doing.

I buy water to drink, I don't like the color, the taste, the odor. He drinks it right out of the tap. I feel that they know when it is unsafe. It's just my preference.

As far as we are concerned, it's a basic difference between our physical make-ups. She has a particularly sensitive nose that she can smell anything. As a result it affects her taste. I don't. I don't smell things she smells.

RM DO OTHERS OF YOU HAVE THE SAME SENSITIVENESS TO TASTE?

Whenever I go out of town for travelling, I can immediately taste and smell the difference in the water. Some places are very metallic tasting and a strange color even. And I don't enjoy drinking restaurant water when we're travelling.

Dorothy is on a different water system.

We lived away from here for 25 years and whenever we would come back to Carbondale, water always tasted great to me.

You can appreciate the smell of the water here if you go to Lake County, Illinois in northern Illinois. It's high in sulfur and you can't make coffee strong enough to kill that odor and taste.

We just came back from Florida and the sulfur water is so terrible. I've never seen vending machines for water, you can get a gallon distilled water.

RM Have you ever heard of something called THM? When chlorine reacts with certain aspects of the water, a by-product is created which in turn takes various forms. One of the forms is chloroform. These constitute a class of things called THM's which some animal studies suggest are cancer-causing. It is very difficult to make a judgement about this with humans. They haven't found definitely that it causes cancer in humans. HAVE YOU RUN ACROSS ANYTHING ABOUT THESE IN YOUR READING?

No, a little bit about the natural breakdown of drinking water as it reacts with biological material. The by-product is probably several different items. That is the reason why the state is no longer insisting on chlorinating waste water unless it goes into a source of human contact water. If it goes into a stream which has no known human use they find

that the water natural contaminants may be less hazardous than the chlorine to the environment of that stream.

RM Chlorine is an absolutely necessary thing for humans because it has made our drinking water safe. These THM's are just one of the many kinds of things that could potentially get into your water. I would like to talk about THM's, and then try to talk about some ways I might use to describe these risks to people. I'd like your own views about whether some things I will pass out will help you think about this. Let me pass out a risk ladder. Take a look at it and see if it makes any sense to you.

Where's cancer?

RM That's not on here. ARE THERE ANY QUESTIONS THAT COME TO YOUR MIND WHEN YOU LOOK AT IT? IS IT CONFUSING? DOES IT MAKE SENSE? IS IT INTERESTING?

I don't think it's real clear without verbal explanation.

RM If it were used in a mail questionnaire, there would have to be an explanatory paragraph. So when you first looked at it what was confusing or unclear to you?

What are the numbers anchored to? Are you taking a 1,000 at random?

I think the relationship like 2,000 out of 100,000 stuntmen you did explain that the ones in the italics mean out of the whole population and the ones that is confusing to me until I heard that.

If you change your numbers from like 100,000 your constants over 100,000 if you'd write that in as say a million rather than numbers.

Even percentages. I think people are used to saying 10 percent of the people in the U.S. die of this.

RM HAVING ALL THESE ZEROS REALLY MAKES IT CONFUSING?

Yes. (agreement)

A number per million might be easier.

If you could come up with something like just write in a 100,000 or something some constant it wouldn't have to be a million but just come up with something without all these zeros.

Does it make a difference that there might be more smokers than there are police officers. How do those interact?

RM Right, the more smokers there are in the population the greater the risk of everybody dying.

The police officer is confusing to me because I have no idea how many police officers there are so what does 22 mean, or how many stunt men.

Would it help if there were two charts?

RM (Explanation) It is a constant ratio.

I don't think that is clear here.

RM You can compare the risks. All on the same base.

I've always heard that home accidents are one of the leading causes of death and looking at this I would say that it is much riskier to be a stunt man.

But I've always heard that home accidents are one of the leading causes of death and they are way down here in the middle.

It's like comparing apples and oranges. I don't think you can. It reminds me of first year statistics when my professor says we can prove anything with numbers, we have to present it the right way. See, it isn't so bad to be a homemaker. I don't trust data like this until you really look at it and see what they're trying to say.

RM IS THERE SOMETHING ABOUT THESE DATA THAT MAKE YOU PARTICULARLY SKEPTICAL?

I think it is the range.

Two things make me very skeptical. I've never seen the relationship shown out of a 100,000, I've always seen percentages, any time I have looked at data on this type of thing. And the other thing is it just doesn't go with some other things that I have heard before. Like home accidents is really high and throwing this way down in the middle I'm wondering where are they getting their figures and where's cancer and heart attack and why aren't these mentioned. And some of these are a little strange like truck driver and the stunt man.

I think the misleading thing is that there probably are a lot more home accidents, people killed, than there are stunt men. You are using high numbers, 100,000 when there are not even 100,000 stunt men available. If you did use percentages, that's a little easier to compare.

I'd like to chop up your bar graph a little bit here. For somebody that is mathematical if you'd just gotten out of college you can relate to this. For the normal person, they could relate to a curve a lot easier than they can with this kind of a graph where it jumps.

RM WHAT WOULD THE CURVE LOOK LIKE?

It's gonna - you want to plot an x - y axis and .

RM WHAT WOULD WE HAVE?

It doesn't make any difference to me. The variable goes up.

Bar graph is easier to read.

If you did it on scale, you couldn't even see flood with a bar graph. Start with flood going up, poisoning, airplane, house fire. The other way would be risk factor.

I still question the 100,000 thing.

How many people die a year from bad water?

RM These numbers are chosen to represent a range from very low to very high and to give you a sense of the whole range. The point of this is to give you a sense of the high risk and the low risk. It is meant to be representative rather than exhaustive. But it is also meant to be clear.

I think I would still try to do it with the bar graphs. While these particular things might not be easy to put on a bar graph, if you have a whole list of these you can get things so that a flood would show up and then other natural disasters would be more proportionate.

I think they are more familiar with seeing that in newspapers and type. Everybody is exposed to those data.

RM Would the rest of you agree? Feel free to disagree.

With the pie, you can't identify the segments of pies when they get small. That is what I dislike. This is all right. There is no problem there.

You could even make little asterisks and say less than one-tenth of a percent or something.

RM How many people out of a 100,000 die each year?

Something we could relate to.

RM It gives you an anchor against which you could get a sense of...

RM This is adapted from the work of other researchers. I'm just seeing if it is possible to use it or not. I would think it would be somewhere in the middle wouldn't it? OTHER REACTIONS TO BARS?

They are fine for me. They suit me the same way the bar graphs. I like both of them much better than the ladder. I think the ladder is...

One problem. I would add the numeric right in the bars.

The problem if you do that to these figures part of these involve general population and then you have the specialized risk factors of people. On the bar graph you are not going to be able to tell which is which.

What if we had different colors?

It would have to be colored or something.

You're only rating so many people of that particular occupation whereas the others, diabetes, you are considering the general population.

I don't think they should be on the same graph.

They are really not comparable if you go to analyzing it.

You should show two different graphs.

I think if you have a bar graph you can put them on the same graph. You just use different lines for each type, solid, crosshatched. Make a good differentiation.

Why would you want to compare them on the same graph?

RM To get to convey a whole range or risks and to get a high risk you need a special population like stuntmen. To give variety.

I think you should include car accidents and maybe take truck driver out. My husband is always telling me there is no problem going on an airplane because x number of people die every year in car accidents and so much smaller percentage die an I'm always saying where is it written. I want to see it! That is a comparison that a lot of people make with airplanes vs. car travel.

RM SO THAT WOULD BE OF INTEREST TO YOU TO COMPARE THOSE KINDS OF THINGS?

Now we are adding a new dimension to the risk line.

RM Look at the next risk ladder.

I have been thinking about who would I believe if I moved into a town. I think you could get in a real dilemma because I wouldn't necessarily believe the water department or the health department or the EPA at this point mainly because what went on this summer at Crab Orchard. They were all saying something different and we're all supposed to believe. Who are we supposed to believe and trust? Supposedly dioxin was dumped into Crab Orchard Lake at this certain point and the EPA was saying we should really not use this water for swimming, eating the fish, drinking or anything until we have a lot of tests. I suppose on the other hand with the companies say "oh, we ran tests" and the water department didn't close it down and I know we've always water skied out there a lot and we've always fished a lot. We did not fish this summer, we did ski and the whole time I was wondering why am I doing this? I know I would not drink that water.

Basically this is the land filled or dumped. We are very fortunate here in having some of the worst soil in the country which is clay and the movement of this type of material in the clay is very minimal. If we had sand we would have a real problem. I think Carbondale was fortunate that this clay soil is more or less retained until something can be done about it. It wasn't dumped in the water, it was around the buildings.

RM Did others of you feel confused about what the situation was?

I didn't feel confused, I felt scared. I wouldn't read the paper. I thought nobody is going to tell the truth. All the conflicting stories it was like - forget it. I felt the same way I would feel about the possibility of a nuclear war. What are you going to do?

We quit fishing and most people didn't camp and I didn't even go swimming out there.

The lake was not closed by the health department. EPA would have, I think, closed it if the tone of the paper was correct. That's what I mean when you say you move into a new town and if EPA says I don't think this water is safe and the Health Department and water officials are saying look at my magnificent water treatment plant, I don't know who I would believe.

RM OTHER COMMENTS ABOUT WHO YOU BELIEVE OR SOURCES OF AUTHORITY?

You use the word sources of authority and this one thought keeps running through my mind. My mother is the most skeptical person in the world and she always hears about all this stuff ahead of time, you can't drink this or you can't. I would go with my mother. There are some people that research things very thoroughly and if they have come to the conclusion that it's okay then I'll go with their decision.

I do that a lot. I don't comparison shop as much as I should. I have friends who do a lot and when my washing machine broke down I said what brand did you buy last time. I bought the same brand they did because I know they really researched it.

RM Let's take a look at this ladder. On the right hand side is some new information. It's purpose is to convey more information using a different way of describing the level of risk involved. Everything is on the same scale. The right hand side has numbers that tell you for the population as a whole the average days of life expectancy that are diminished by being in that occupation for the population as a whole. CONFUSING?

Yes. (agreement)

We are talking about floods for example. In 3/10 of a day for a general population that could be like stuntmen you could say if you live in a flood plain area that would be an entirely different thing.

RM BEING FOR THE WHOLE COUNTRY MAKES IT HARD TO RELATE TO?

Actually this part is a little more reasonable to me. It gives it another figure that I can use in making comparisons.

RM SO YOU FIND IT HELPFUL?

Yes. I'm not saying I still like this thing. I think it would still work on a bar graph but I think this does.

RM Rest assured that if the bar graph was better we could put this on a bar graph.

This gives the other side more substance, a little more clarity.

RM DOES THIS HELP OR HINDER?

I think it does because it gives you a real quantity to think about. Another dimension.

RM WHEN YOU LOOK AT IT, WHICH NUMBER MAKES SENSE TO YOU?

Particularly when you get to 5/100ths and 3/10ths. The high and low.

RM For a smoker the 2,250 is a high risk and a 1/3 of a day is not so many days.

I thought if people would stop riding airplanes, stop smoking, etc. we would all each of us would gain this many days to our lives. Except when I got to the stunt man.

Some of them don't have numbers.

RM We ran out of time.

I think that is very confusing.

RM IF THE HEADING WAS NOT CONFUSING WOULD IT HELP?

Yes.

In other words, if this person didn't die in an airplane crash he would live 6 days longer?

RM On the average if we didn't have airplane crashes, everybody would live six days longer.

I don't know where we are going. I'm confused.

RM DOES HAVING THE DAYS ON THE RIGHT HAND SIDE HELP YOU OR NOT TO UNDERSTAND?

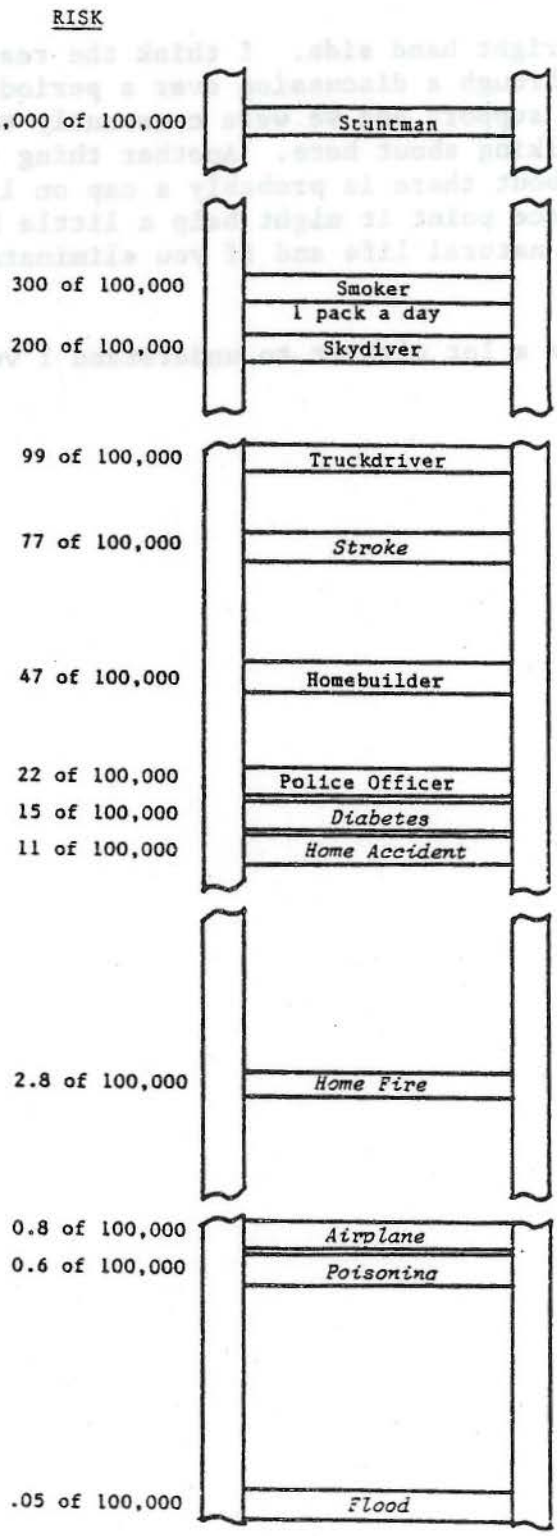
No, I don't think it helps because it's just like apples and oranges. I think if you are going to have a chart you need to make just one point. This looks like you are trying to make 3 or 4 different points here. You should make one point with each graph and you need to say occupation risk,

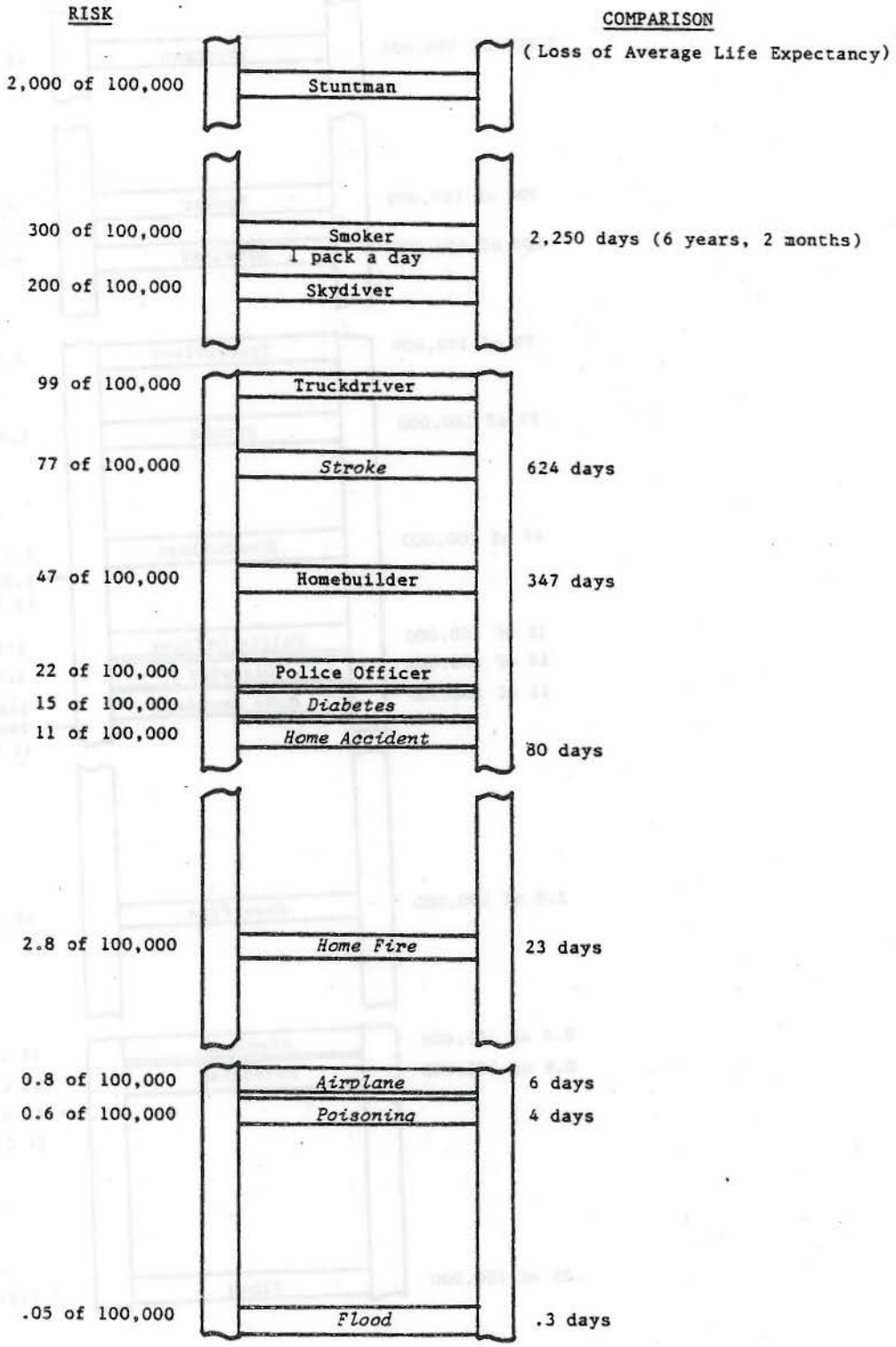
this many people die. Accidents and natural causes of death this kind of risk for death per 100,000. You have too much stuff on here.

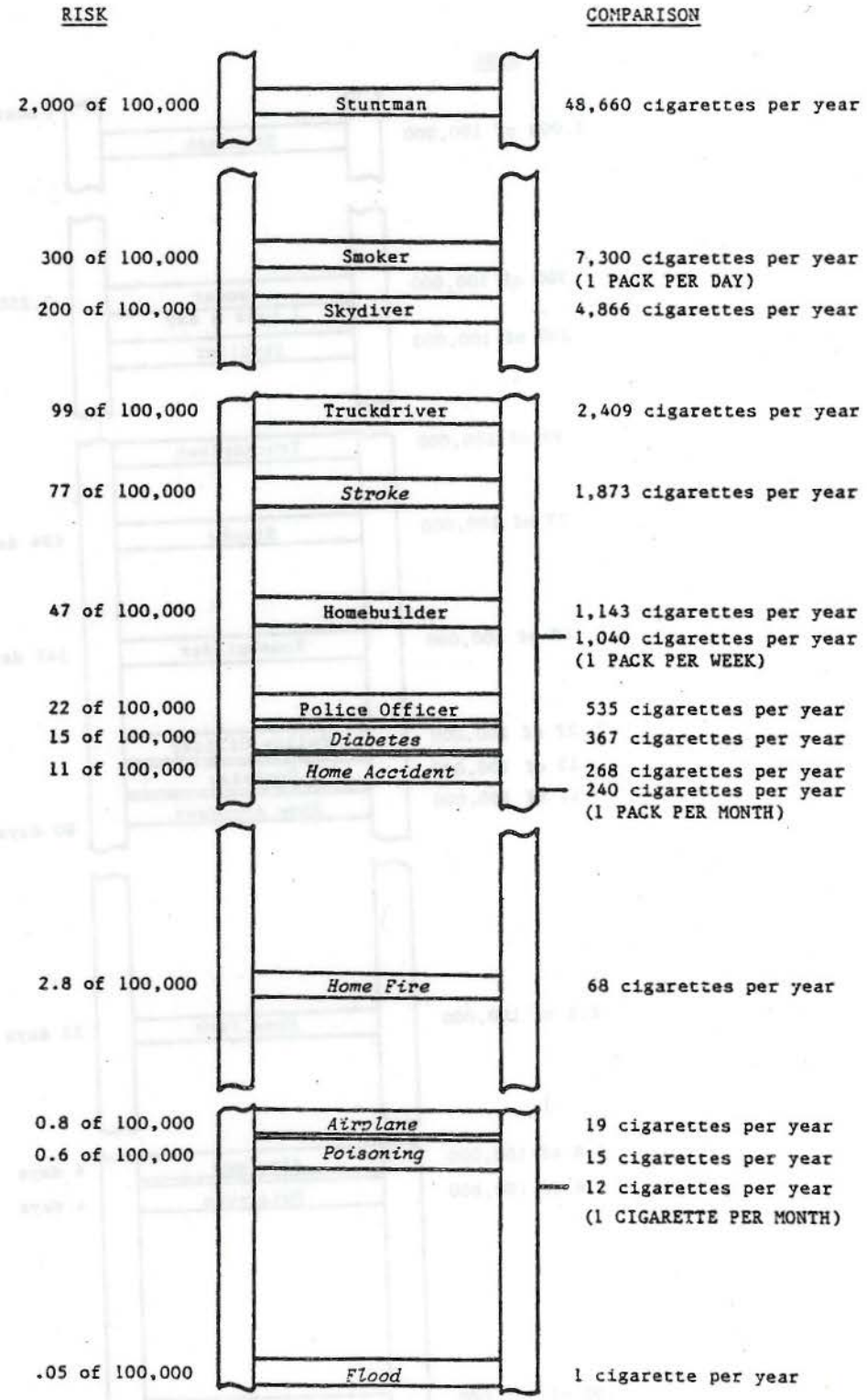
RM WOULD OTHERS AGREE?

I like the right hand side. I think the reason I like it is that I finished going through a discussion over a period of 3 weeks of heroic measures of life support and we were constantly talking about the various things we are talking about here. Another thing that might be helpful if we are talking about there is probably a cap on life somewhere too again if you had a reference point it might help a little bit. You are talking about a cap on a natural life and if you eliminated cancer entirely so these days.

To me, it is a lot clearer to understand I've got another three hundred.....


RISK
2,000 of 100,000
Stuntman
300 of 100,000
Smoker
1 pack a day
200 of 100,000
Skydiver
99 of 100,000
Truckdriver
77 of 100,000
Stroke
47 of 100,000
Homebuilder
22 of 100,000
Police Officer
15 of 100,000
Diabetes
11 of 100,000
Home Accident
2.8 of 100,000
Home Fire
0.8 of 100,000
Airplane
0.6 of 100,000
Poisoning
.05 of 100,000
Flood


RISK
COMPARISON
(Loss of Average Life Expectancy)
2,000 of 100,000
Stuntman
300 of 100,000
Smoker
1 pack a day
2,250 days (6 years, 2 months)
200 of 100,000
Skydiver
99 of 100,000
Truckdriver
77 of 100,000
Stroke
624 days
47 of 100,000
Homebuilder
347 days
22 of 100,000
Police Officer
15 of 100,000
Diabetes
11 of 100,000
Home Accident
80 days
2.8 of 100,000
Home Fire
23 days
0.8 of 100,000
Airplane
6 days
0.6 of 100,000
Poisoning
4 days
.05 of 100,000
Flood
.3 days


RISK
COMPARISON
2,000 of 100,000
Stuntman
48,660 cigarettes per year
300 of 100,000
Smoker
7,300 cigarettes per year
(1 PACK PER DAY)
200 of 100,000
Skydiver
4,866 cigarettes per year
99 of 100,000
Truckdriver
2,409 cigarettes per year
77 of 100,000
Stroke
1,873 cigarettes per year
47 of 100,000
Homebuilder
1,143 cigarettes per year
1,040 cigarettes per year
(1 PACK PER WEEK)
22 of 100,000
Police Officer
535 cigarettes per year
15 of 100,000
Diabetes
367 cigarettes per year
11 of 100,000
Home Accident
268 cigarettes per year
240 cigarettes per year
(1 PACK PER MONTH)
2.8 of 100,000
Home Fire
68 cigarettes per year
0.8 of 100,000
Airplane
19 cigarettes per year
0.6 of 100,000
Poisoning
15 cigarettes per year
12 cigarettes per year
(1 CIGARETTE PER MONTH)
.05 of 100,000
Flood
1 cigarette per year

TRANSCRIPT OF FOCUS GROUP #3
MARION, IL 1/30/85

This group took place on a very cold and icy night in the Senior Citizens Center in Marion. The 9 participants were all members of an adult sunday school class in one of the local churches. Half were men, half were women; all were married. As they pointed out, they are more educated than the average Marion resident -- five are college grads and three have more than a college education. Their median income was in the $35 to $50,000 range. One had less than a $10,000 income; three greater than $50,000. The participants knew each other well. They discussed the topic easily and were willing to disagree with each other.

Robert Mitchell led the group discussion. He introduced himself as a researcher with a nonprofit Washington D.C. research organization and Karla Whitley as a graduate student at Southern Illinois University. He said the purpose of the discussion was to get their help in learning how best to ask people about their drinking water. When he writes a questionnaire he needs to know how people think about things and what words they use. There are no right or wrong answers.

It was not possible to record the conversation, so the following is based on Karla Whitley's extensive notes which were used to reconstruct the discussion a day after the session.

RM WHAT IS THE DRINKING WATER LIKE IN MARION?

The group had very strong feelings on this subject. Virtually every comment focused on the appearance of the water rather than on the risks it poses: "Taste is terrible." "Can drink it, but don't want to wash clothes in it."

Participants were quite knowledgeable about where their water comes from and the problems faced by the drinking water plant.

RM HOW GOOD IS THE QUALITY?

Every person seemed to know that the drinking water had PCBs in it because of the newspaper coverage about the PCB contamination. The general publicity about toxic contamination (e.g. Times Beach) appears to have stimulated their concern about this type of contamination.

RM WHAT ABOUT THE NOTICES ON YOUR WATER BILL?

(These concern the excess of THM's.) People were aware that there was such a notice, but were vague about it. Bob almost knew what it was called, but couldn't quite come up with the initials. He was, however, quite knowledgeable about the cause of THM's once RM mentioned them.

RM WHAT IS THE PROBLEM WITH THESE CONTAMINANTS?

"EPA's limit. Has something to do with PCBs. EPA and our mayor are always at each other's throats." (Very aware of the fact that the Mayor is pushing the federal government to allow Marion to use allegedly pure Devil's Kitchen Lake, which is in a federal wildlife refuge and therefore unavailable, for its water supply.)

One person talked about the treatment plant being overloaded. Another about PCB's being a product of a natural breakdown (obviously referring to THM's.) They said the PCB problem occurred before the THM problem was identified.

Mike said there were conflicting stories on levels and dangerousness. He knew that the THM problem only occurred when Crab Orchard Lake was used; he works out at the lake.

RM HAS THERE BEEN A LOT OF PRESS COVERAGE ON THMS?

"No, lot on water supply and on PCBs, but not on THMs." (General agreement)

RM HOW DO PEOPLE TALK ABOUT THE SAFETY OF THE DRINKING WATER AROUND HERE WHAT WORDS DO THEY USE? DO THEY MAKE JOKES?

They agreed that people did joke about it, but that the jokes concerned the water's appearance. "[illegible]an't see my feet in the bathtub." etc.

RM SAFETY? (probe)

Christy talked about hauling water home for several months from another town where she worked because of her concern about PCBs. She said her neighbors couldn't have cared less about the risk. People didn't believe it; hadn't read the Times Beach and all.

Bob: "So many scares; people just think it is another thing. It's an attitude we can't do much about."

Mike: "Christy's reaction is unusual."

RM ANY OF THE REST OF YOU DO ANYTHING ABOUT THE CONTAMINATION?

One couple talked about getting a water distiller. Someone else had a demonstration and said it was "incredible" because it showed how much stuff (dirt not toxics) was in the water. Another participant was called by [illegible]indsay Water who offered to do an analysis of their water. One of the group asked the person who was getting the distiller whether it would take out dioxins and THMs. He said yes.

RM DO PEOPLE USE THE WORD "SAFE"?

"They use the word unsafe."

"People are more concerned about appearance and taste than safety."

RM HOW MUCH TRUST DO YOU HAVE IN THE FOLKS WHO ARE IN CHARGE OF YOUR DRINKING WATER?

"None, nope, not anymore."

"Not saying that they deliberately do things wrong. But the operators are not paid a lot."

(In other words, they believed the situation [old plant, low paid operators] produces incompetence.)

Woman: "I have enough confidence that I really believe if some agency, private or public, was convinced that there was a real danger, something would be done about it. I think most people feel this way." (General agreement)

"I'm concerned that it has to get to that point before something is done." (General agreement)

Someone else mentioned that the PCB problem took the heat off people's concerns about THMs.

RM CAN ANYONE REMEMBER WHAT THE THM LEVEL IS OR HOW IT IS EXPRESSED ON YOUR WATER BILL?

Bob: "Parts per million. .0075 or something like that." Someone else added, "it's not a big number."

RM HOW MUCH OVER THE LIMIT ARE YOU?

People did not answer.

RM WHAT SENSE DO YOU HAVE OF HOW MUCH OVER YOU ARE?

"I don't know. All I know is that when I see it on my water bill, I am over. I am assuming that anything over the limit is dangerous. We are moving, and one of our criteria is to get off the Marion water system." (It was not clear, however, that the objection to the Marion water was purely on safety grounds.)

"More than just a slight risk and is continuous."

"As I recall seeing it, it's a slight amount, hard to measure. Also, I question how those levels are set. They seem to be pretty arbitrary anyway. I don't think anyone knows what 3 ppm would to to you compared with 5 ppm."

RM DO OTHERS OF YOU AGREE THAT IT IS ARBITRARY?

Rich: "I feel there is something, but they may not tell us everything about it. But I think they know what is there."

"I agree with Rich. How can they say this level will harm you and this level will not?"

Bob: "I have a calculating mind. But with numbers such as .0075 or whatever, I have trouble relating to that. We are saturated with information like that because we are an information society, with lots of people getting lots of government grants to study different things."

"Things are getting better now. Originally we had pure water, than industrialization harmed it, now we are making progress."

RM LET'S TALK ABOUT PARTS PER MILLION (SHOWED TWO LEVELS, 100 PPM AND 200 PPM). WHAT LEVELS OF RISK ARE WORTH SPENDING MONEY FOR?

"What does safe level mean?" (Reference to RM's explanation of how the MCL is defined by EPA.) "What does no health effects mean?"

RM WHAT EFFECTS WOULD YOU BE WILLING TO SPEND MONEY TO STOP?

One man mentioned a small town which had several leukemia deaths in a few months. They were of a mind to do something about this problem, no matter what the cost.

A woman mentioned that the cancer society showed a friend of hers figures about Marion's cancer rate and how it is going up.

(No one picked up on the ppm levels here. The implication is that immediately apparent and drastic effects such as the ones mentioned would definitely be worth spending a lot of money to cure.)

RM ARE THERE OTHER WAYS TO EXPRESS RISK THAT YOU WOULD REACT TO?

"I'm concerned if they are above normal limits."

"It's very difficult to pull up stakes, leave everything, if you have nothing concrete."

"And if you move, you may be moving into the same situation." (General agreement, people nodding their heads.)

(Again, nobody picked up on relative risks nor on the notion of where you draw the line between acceptable and unacceptable risks.)

RM SHOWED RISK LEVELS ON LADDER HE DREW ON THE BLACKBOARD. THEY INCLUDED 1 IN 100,000 AND 1 IN 1,000,000 RISK OF DYING IN A LIFETIME FROM THMS. ETC. HE ALSO TRANSLATED THESE INTO THE NUMBER OF PEOPLE IN A TOWN OF 14,000 PEOPLE WHO WOULD DIE EACH YEAR. (.11 AND .01 PERSON PER YEAR)

Immediate reaction. 10x increase is significant. RM reminded them that these are low levels, and people picked up on this.

RM WHICH DO YOU FIND EASIER TO UNDERSTAND, RISK LEVELS OR CONCENTRATIONS (e.g. 100 ppm)?

Firm opinion by the group that risk levels are more meaningful.

RM WOULD IT BE MEANINGFUL ENOUGH TO ENABLE YOU TO MAKE A JUDGMENT ABOUT HOW MUCH YOU WOULD BE WILLING TO PAY?

"That would be a fraction of a person in 75 years."

"It all depends on how expensive it would be to bring the level down."

They wanted to know how much it would cost, then they could make a judgment. Someone suggested using a scale of dollar amounts from which people would choose an amount.

RM WHAT IF YOU DON'T KNOW IF IT WILL COVER THE COST OR NOT?

Woman: "I couldn't do it if I didn't know if it would correct the problem. Are we talking about $50,000 or $5,000 a year? It may be worth $50,000 if I could be sure the problem is taken care of." Others made comments along this line.

"Would have to put a monetary value on it, but if it takes more than you can afford, you would have to uproot your family." WHY? "Because you are talking about your life style, your children, and you want them to be safe."

Another person said that respondent to a question such as "is it worth so much a year" would be easier than reaction to not having any limits. Another said he would like to have a line with suggested monetary amounts, then you would have some sort of idea what you would be willing to pay.

"Need bottom line cost, then take into account your own situation. Then tell them about the effects."

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"We're thinking in our minds that the 200 ppm level is much more dangerous than it is."

"When you say it is equivalent to 5 cigarettes a year, I wouldn't spend $500 a year."

"Nope, not even $100."

At least one person said that we (the researchers) wouldn't get a large WTP amount if we expressed it this way. The implication was that we wanted to get large amounts and we would not be smart to express it this way.

One person said he had done a calculation in his head that was helpful to him. He saw the equipment costing the town $1m and worked out a rough estimate of what this would cost each family.

"Give numbers so I can know how many people I would save in Marion."

"Three rather than 1/10 of a person means a lot more."

RM WHAT WOULD BE SOME USEFUL EXAMPLES OF COMPARATIVE RISKS?

They liked the cigarette example. Also being hit by lightening. Other risks mentioned were: auto accident, being hit by airplane, household accident, winning the lottery. Someone pointed out, with reference to the lottery, that the low probability of something positive happening is more understandable (they mean, more likely) than the low probability of something negative. Mentioned a friend who said of the state lottery, "I am going to win this thing." People tend not to believe that something negative will happen to them.

They commented that people's understanding of risks will vary according to their area of the country.

RM WOULD THE USE OF A REFERENDA FORMAT BE HELPFUL?

One person commented that people vote in referenda in terms of their gut level feelings at the time they vote.

TRANSCRIPT OF FOCUS GROUP #4
MARION, IL 1/31/85

This group took place on a very cold night in the Lions Club in Marion, Illinois. Originally five Methodists and five Jaycees were scheduled to attend, but the weather caused the Methodists to cancel. The Jaycees were all young men, 23-30; 3 were college and 2 were high school graduates. Only two were long time residents of the town. They were very cooperative and loquacious. Karla Whitley arranged the session and Robert Mitchell led the group discussion.

In general, the members of this group were aware of where their drinking water comes from, although they were not sure about the relationship between the City Lake and Crab Orchard Lake (the latter, which has been contaminated with PCB's, is used only when the water in City Lake is low). They were not impressed with the quality of the water works personnel, and knew the plant, which is located in the town, was very old. One of the five brings mineral water home from Nutrition Headquarters, a Carbondale health foods business, where he works. The others drink the local water.

Owing to a tape recorder failure, it was not possible to transcribe the transcript of this discussion. The following is based on extensive notes taken by Karla Whitley which she and Robert Mitchell wrote up immediately following the discussion group.

RM EXPLAINED THE TASK OF DESIGNING A STUDY TO MEASURE PEOPLE'S VIEWS ABOUT DRINKING WATER. HE SAID HE NEEDED THEIR HELP. IT IS HARD FOR HIM SITTING IN WASHINGTON TO KNOW HOW PEOPLE THINK ABOUT DRINKING WATER AND WHAT WORDS THEY USE. HE BEGAN BY READING THE DRAFT OF THE QUESTIONNAIRE TO THE POINT WHERE THE RESPONDENT IS ASKED: HOW SAFE DO YOU THINK THE LOCAL WATER IS?

The group expressed uncertainty for the most part. There was some mention of PCBs and one person mentioned dioxin.

RM HOW HIGH ARE THE LEVELS?

Not sure.

RM IS IT SAFE?

Reasonable doubt in everyone's minds. "If the press hadn't covered it, we'd never know."

"They have it roped off (waste site) so it must be reasonably dangerous."

"They just did that to take the heat off themselves."

RM AT THE PRESENT TIME DO YOU BELIEVE THE OFFICIALS?

General feeling they expressed was one of skepticism.

"Politicians cover up the truth."

RM ARE YOU AWARE OF A NOTICE ON YOUR WATER BILL ABOUT THMs?

No one was aware of the notice. Nor about THMs.

RM (EXPLANATION ABOUT THMS, THE STANDARD, AND THE LEVEL, 100 PPB ETC. NOTHING WAS SAID ABOUT THE LEVEL OF RISK.) IF I WERE TO ASK YOU HOW MUCH YOU WOULD BE WILLING PAY IN HIGHER TAXES FOR EQUIPMENT THAT WOULD PREVENT THIS PROBLEM, WHAT WOULD YOU WANT TO KNOW ABOUT THIS SITUATION?

"How would the money be spent?"

"What are the options. Can you boil the water and be rid of it?"

"What can be done to correct it?"

"How harmful is the problem? Would it cause diarrhea or whatever?"

"Would the solution work? Would kids be protected?"

"What are the long range effects?"

"How long has the problem been going on?" (Meaning, if it has been going on for a long time, and no apparent effects have ensued, perhaps it is not that serious a problem.)

"I would want to know the basic, who, what, when and why?"

*****

Since much of the group covered in this focus group replicated that of the previous Marion group, the remainder of this transcript consists of a summary of the major points which emerged rather than an attempt to recreate the discussion as it occurred.

GIVING WILLINGNESS TO PAY AMOUNTS

They had difficulty giving WTP amounts. Later in the session it came out that they were reluctant to reveal their total consumers surplus if it was not all needed to remedy the problem. They felt government would take as much as they revealed regardless of the actual cost. This accounted for their concern about the actual cost.

PRESENTATION OF RISK EVALUATION

RM PASSED OUT A SERIES OF RISK LADDERS AND ASKED THEM TO GIVE THEIR OPINIONS ABOUT HOW HELPFUL THEY FOUND THE INFORMATION ON EACH LADDER.

(Each ladder had only eight examples of risks of which only smoker was a self imposed risk. Ladder 1 had no comparative material in the right hand margin. The others had loss of average life expectancy in days, number of people dying in a city of 14,000, and cigarette equivalents. These were given to the respondents in turn.)

The conclusions which emerged from the discussion are as follows:

1. For some risks, certain types of comparisons seemed inappropriate to them and either confused them or made them doubt the credibility of the ladder. For example, loss of average life expectancy made sense for cigarette smoking, but not for death from home fires. In the latter case, it was hard to reconcile an average loss of 23 days from the fact that someone who dies in a home fire dies.

2. Some comparisons seemed inaccurate to them such as the average deaths for household and car accidents. In this case, they thought more than 3 people would die a year in Marion and more than .4 in home fires. Here the availability effect seemed to operate; they could remember reading about house fires that killed several people at one time.

3. Overall, they were not enthusiastic about the cigarette smoking comparison. When it was applied to low level risks, on the other hand, it was very effective. Risk of smoking 12 cigarettes a year is perceived to be low. A risk reduction amounting to reducing the number of cigarettes from 12 to 6 was widely viewed as inconsequential.

4. It took some discussion before they realized that the risk would not be totally removed and this knowledge was important to them. One of the group used the anology of bringing blood pressure down, e.g., where someone's blood pressure is reduced from a "too high" level to a level closer to but not at normal.

5. RM attempted to see if they found a series of risk reductions meaningful. For example, going from 400 ppm to 200 ppm and then going from 200 ppm to 100 ppm, etc. They did not find this easy to answer. Having the comparisons on the risk ladders did help them somewhat. But they were not sure 400 to 200 was a big improvement. This raises the issue of whether or not respondents can discriminate between various levels of low level reductions, or whether they only have a value for a generalized reduction from being above the standard to meeting the standard.

PERCEPTION OF RISK

1. One person said, if one person dies it is one too many. It appears that although this is a view that people easily assent to, they do not necessarily bring it to bear on every situation.

2. There were several spontaneous expressions of the view that everything causes cancer. Again, the pessimism and passivity implied by this stereotypical view seems to be contextual; people can be made to think about the relative risks of getting cancer.

3. In both Marion focus groups, it became clear that every person assumed that we wanted to learn how to present the risks so we would measure large values. It also seemed to be the case that they assumed the risks were high simply because we were going to such great lengths and expense to bring them together to discuss these risks. As a result in Group 4, RM had to go to some lengths to communicate the low level nature of the risks (the cigarette example finally did the trick). When the participants finally realized how low level they were and, further, the slight risk reduction implied by bringing the THM levels into compliance, they warned him that his explanations would not get the high WTP amounts they thought he wanted. He had to keep assuring them that he did not care how much they were willing to pay as long as they really understood the nature of the risk improvement.

4. Nevertheless, even after group 4 understood the low risk levels, and the fact that there was no pressure on them to give any amount, they expressed the strong opinion that some payment (e.g. $10 - $12 per year) was worth it to make the water a bit safer. They were not dissuaded from this view even when RM probed their views on this issue. They regarded this amount as a relatively nominal amount for a tax increase to lower the low level risk.

5. In estimating their WTP, they spontaneously used their current water payments as a base. They believe this amount is around $125 a year. On this basis, another $10 is acceptable whereas doubling the water payments to $250 would be clearly unacceptable.

6. In the discussion of risk, they commented how people take risks all the time. E.g., kerosine heater fumes are probably harmful, but people use them all the time. They also cited smoking (and three of the five were smoking away during the discussion).

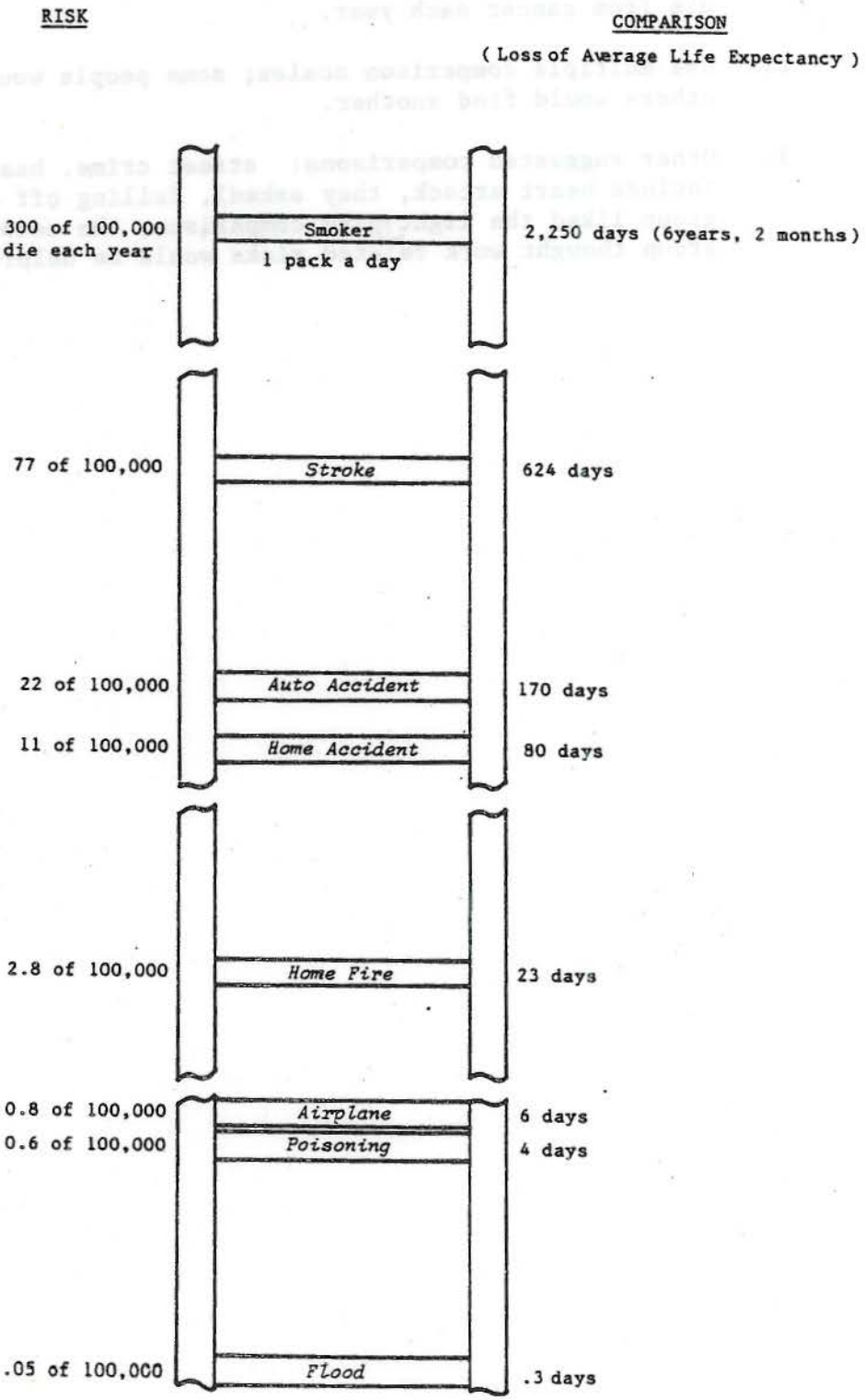
7. They agreed that the mention of cancer makes people react.

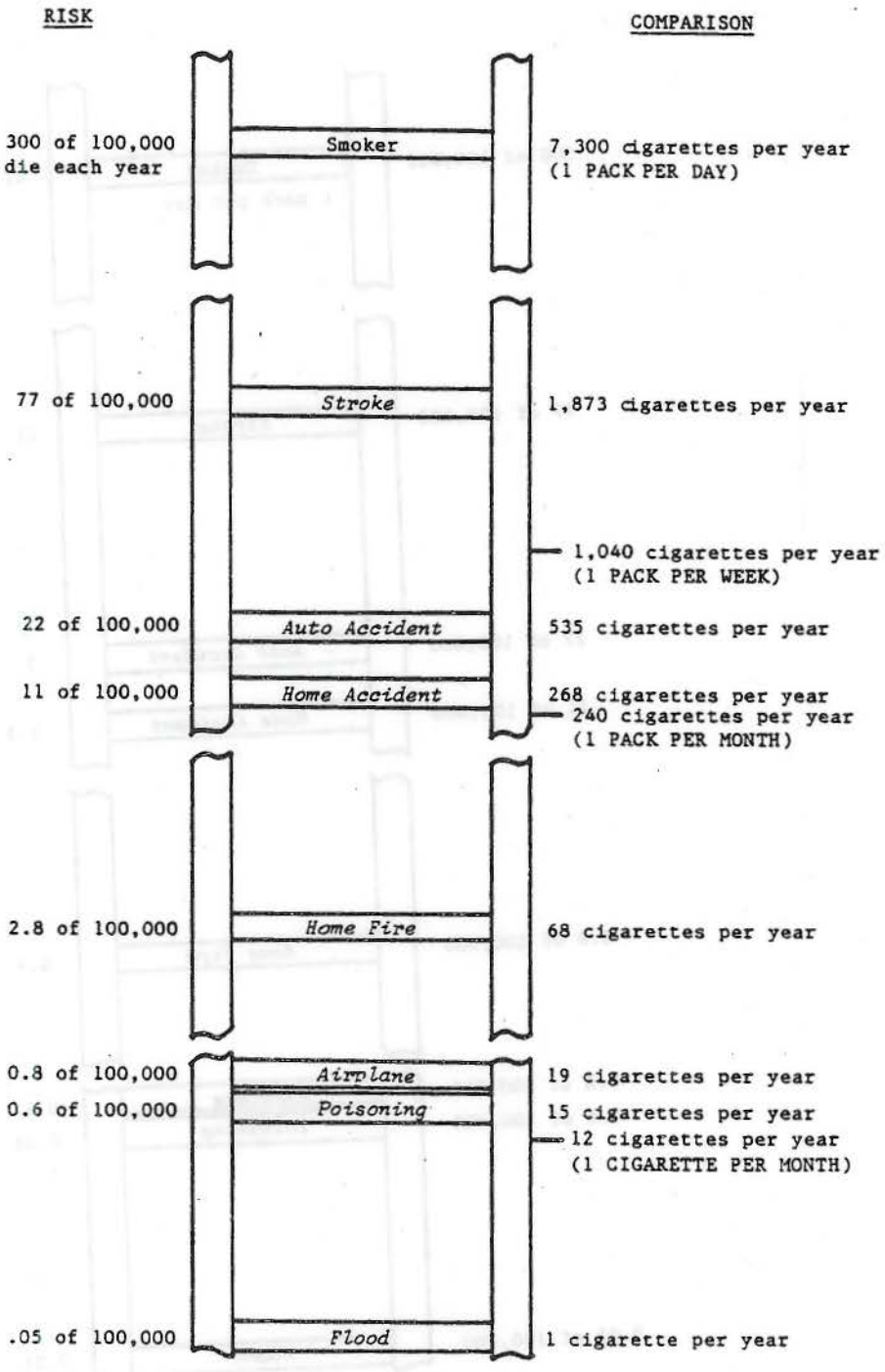
SUGGESTIONS WHICH EMERGE FROM THE MARION FOCUS GROUPS

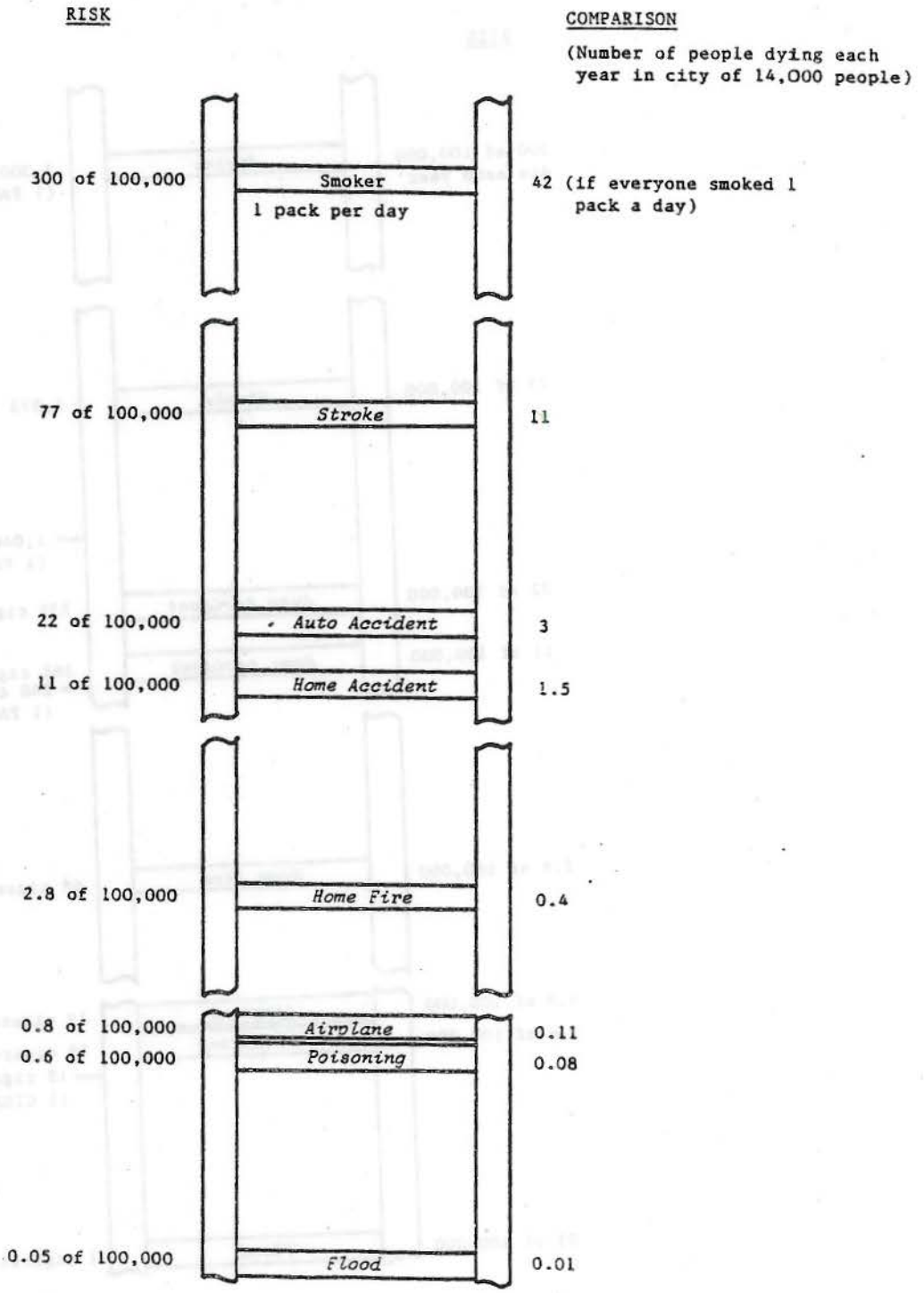
1. The fourth group said it would help them if they knew how many people die from cancer each year.

2. Use multiple comparison scales; some people would find one meaningful, others would find another.

3. Other suggested comparisons: street crime, heart attack (does stroke include heart attack, they asked), falling off a bar stool. The first group liked the lightning comparison; the second did not. The second group thought work related risks would be helpful.


RISK
COMPARISON
(Loss of Average Life Expectancy)
300 of 100,000 die each year
Smoker
1 pack a day
2,250 days (6years, 2 months)
77 of 100,000
Stroke
624 days
22 of 100,000
Auto Accident
170 days
11 of 100,000
Home Accident
80 days
2.8 of 100,000
Home Fire
23 days
0.8 of 100,000
Airplane
6 days
0.6 of 100,000
Poisoning
4 days
.05 of 100,000
Flood
.3 days


RISK
COMPARISON
300 of 100,000 die each year
Smoker
7,300 cigarettes per year (1 PACK PER DAY)
77 of 100,000
Stroke
1,873 cigarettes per year
1,040 cigarettes per year (1 PACK PER WEEK)
22 of 100,000
Auto Accident
535 cigarettes per year
11 of 100,000
Home Accident
268 cigarettes per year
240 cigarettes per year (1 PACK PER MONTH)
2.8 of 100,000
Home Fire
68 cigarettes per year
0.8 of 100,000
Airplane
19 cigarettes per year
0.6 of 100,000
Poisoning
15 cigarettes per year
12 cigarettes per year (1 CIGARETTE PER MONTH)
.05 of 100,000
Flood
1 cigarette per year


RISK
COMPARISON
(Number of people dying each year in city of 14,000 people)
300 of 100,000
Smoker
1 pack per day
42 (if everyone smoked 1 pack a day)
77 of 100,000
Stroke
11
22 of 100,000
Auto Accident
3
11 of 100,000
Home Accident
1.5
2.8 of 100,000
Home Fire
0.4
0.8 of 100,000
Airplane
0.11
0.6 of 100,000
Poisoning
0.08
0.05 of 100,000
Flood
0.01

DRINKING WATER RISK FOCUS GROUP NO. 1
MARION, ILLINOIS. JANUARY 30, 1985

This group took place on a very cold and icy night in the Senior Citizens Center in Marion. The 9 participants were all members of an adult sunday school class in one of the local churches. Half were men, half were women; all were married. As they pointed out, they are more educated than the average Marion resident -- five are college grads and three have more than a college education. Their median income was in the $35 to $50,000 range. One had less than a $10,000 income; three greater than $50,000. The participants knew each other well. They discussed the topic easily and were willing to disagree with each other.

Robert Mitchell led the group discussion. He introduced himself as a researcher with a nonprofit Washington D.C. research organization and Karla Whitney as a graduate student at Southern Illinois University. He said the purpose of the discussion was to get their help in learning how best to ask people about their drinking water. When he writes a questionnaire he needs to know how people think about things and what words they use. There are no right or wrong answers.

It was not possible to record the conversation, so the following is based on Karla Whitley's extensive notes which were used to reconstruct the discussion a day after the session.

RM WHAT IS THE DRINKING WATER LIKE IN MARION?

The group had very strong feelings on this subject. Virtually every comment focused on the appearance of the water rather than on the risks it poses: "Taste is terrible." "Can drink it, but don't want to wash clothes in it."

Participants were quite knowledgeable about where their water comes from and the problems faced by the drinking water plant.

RM HOW GOOD IS THE QUALITY?

Every person seemed to know that the dw had PCBs in it because of the newspaper coverage about the PCB contamination. The general publicity about toxic contamination (e.g. Times Beach) appears to have stimulated their concern about this type of contamination.

RM WHAT ABOUT THE NOTICES ON YOUR WATER BILL? (These concern the excess of THM's.) People were aware that there was such a notice, but were vague about it. Bob almost knew what it was called, but couldn't quite come up with the initials. He was, however, quite knowledgeable about the cause of THM's once RM mentioned them.

RM WHAT IS THE PROBLEM WITH THESE CONTAMINANTS?

"EPA's limit. Has something to do with PCBs. EPA and our mayor are always at each other's throats." (Very aware of the fact that the Mayor is pushing the federal government to allow Marion to use allegedly pure Devil's Kitchen Lake, which is in a federal wildlife refuge and therefore unavailable, for its water supply.)

One person talked about the treatment plant being overloaded. Anotehr about PCB's being a product of a natural breakdown (obviously referring to THM's.) They said the PCB problem occurred before the THM problem was identified.

Mike said there were conflicting stories on levels and dangerousness. He knew that the THM problem only occurred when Crab Orchard Lake was used; he works out at the lake.

RM HAS THERE BEEN A LOT OF PRESS COVERAGE ON THMS?

"No, lot on water supply and on PCBs, but not on THMs." (General agreement)

RM HOW DO PEOPLE TALK ABOUT THE SAFETY OF THE DRINKING WATER AROUND HERE? WHAT WORDS DO THEY USE? DO THEY MAKE JOKES?

They agreed that people did joke about it, but that the jokes concerned the water's appearance. "Can't see my feet in the bathtub." etc.

SAFETY? (probe) Christy talked about hauling water home for several months from another town where she worked because of her concern about PCBs. She said her neighbors couldn't have cared less aboutthe risk. People didn't believe it; hadn't read about Times Beach and all.

Bob: "So many scares; people just think it is another thing. It's an attitude we can't do much about."

Mike: "Christy's reaction is unusual."

RM ANY OF THE REST OF YOU DO ANYTHING ABOUT THE CONTAMINATION?

One couple talked about getting a water distiller. Someone else had a demonstration and said it was "incredible" because it showed how much stuff (dirt not toxics) was in the water. Another participant was called by Lindsay Water who offered to do an analysis of their water. One of the group asked the person who was getting the distiller whether it would take out dioxins and THMs. He said yes.

RM DO PEOPLE USE THE WORD "SAFE"?

"They use the word unsafe."

"People are more concerned about appearance and taste than safety."

RM HOW MUCH TRUST DO YOU HAVE IN THE FOLKS WHO ARE IN CHARGE OF YOUR DRINKING WATER?

"None, nope, not anymore."

"Not saying that they deliberately do things wrong. But the operators are not paid a lot.

(In other words, they believed the situation (old plant, low paid operators) produces incompetence.)

Woman: "I have enough confidence that I really believe if some agency, private or public, was convinced that there was a real danger, something would be done about it. I think most people feel this way." (General agreement)

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They commented that people's understanding of risks will vary according to their area of the country.

RM WOULD THE USE OF A REFERENDA FORMAT BE HELPFUL?

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DRINKING WATER RISK FOCUS GROUP NO. 2
MARION, ILLINOIS. JANUARY 31, 1985

This group took place on a very cold night in the Lions Club in Marion, Illinois. Originally five Methodists and five JC's were scheduled to attend, but the weather caused the Methodists to cancel. The JCs were all young men, 23 - 30; 3 were college and 2 were high school graduates. Only two were long time residents of the town. They were very cooperative and loquacious. Karla Whitley arranged the session and Robert Mitchell led the group discussion.

In general the members of this group were aware of where their drinking water comes from, although they were not sure about the relationship between the City Lake and Crab Orchard Lake (the latter, which has been contaminated with PCB's, is used only when the water in City Lake is low. They were not impressed with the quality of the water works personnel, and knew the plant, which is located in the town, was very old. One of the five brings mineral water home from Nutrition HQ, a Carbondale health foods business, where he works. The others drink the local water.

Owing to a tape recorder failure, it was not possible to transcribe the transcript of this discussion. The following is based on extensive notes taken by Karla Whitley which she and Robert Mitchell wrote up immediately following the discussion group.

RM EXPLAINED THE TASK OF DESIGNING A STUDY TO MEASURE PEOPLE'S VIEWS ABOUT DRINKING WATER. HE SAID HE NEEDED THEIR HELP. IT IS HEARD FOR HIM SITTING IN WASHINGTON TO KNOW HOW PEOPLE THINK ABOUT DRINKING WATER AND WHAT WORDS THEY USE. HE BEGAN BY READING THE DRAFT OF THE QUESTIONNAIRE TO THE POINT WHERE THE RESPONDENT IS ASKED: HOW SAFE SO YOU THINK THE LOCAL WATER IS?

The group expressed uncertainty for the most prt. There was some mention of PCBs and one person mentioned dioxin.

RM HOW HIGH ARE THE LEVELS?

Not sure.

RM IS IT SAFE?

Reasonable doubt in everyone's minds. "If the press hadn't covered it, we'd never know."

"They have it roped off (waste site) so it must be reasonably dangerous."

"They just did that to take the heat off themselves.

RM AT THE PRESENT TIME DO YOU BELIEVE THE OFFICIALS?

General feeling they expressed was one of skepticism.

"Politicians cover up the truth."

RM ARE YOU AWARE OF A NOTICE ON YOUR WATER BILL ABOUT THMs?

No one was aware of the notice. Nor about THMs.

RM (EXPLANATION ABOUT THMS, THE STANDARD, AND THE LEVEL, 100 PPB ETC. NOTHING WAS SAID ABOUT THE LEVEL OF RISK) IF I WERE TO ASK YOU HOW MUCH YOU WOULD BE WILLING TO PAY IN HIGHER TAXES FOR EQUIPMENT THAT WOULD PREVENT THIS PROBLEM, WHAT WOULD YOU WANT TO KNOW ABOUT THIS SITUATION?

"How would the money be spent?"

"What are the options. Can you boil the water and be rid of it?"

"What could be done to correct it?"

"How harmful is the problem? Would it cause diarrhea or whatever?"

"Would the solution work? Would kids be protected?"

"What are the long range effects?"

"How long has the problem been going on?" (Meaning, if it has been going on for a long time, and no apparent effects have ensued, perhaps it is not that serious a problem.)

"I would want to know the basic, who, what, when and why?"

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Since much of the ground covered in this focus group replicated that of the previous Marion group, the remainder of this transcript consists of a summary of the major points which emerged rather than an attempt to recreate the discussion as it occurred.

GIVING WILLINGINGNESS TO PAY AMOUNTS

They had difficulty giving WTP amounts. Later in the session it came out that they were reluctant to reveal their total consumers surplus if it was not all needed to remedy the problem. They felt government would take as much as they revealed regardless of the actual cost. This accounted for their concern about the actual cost.

PRESENTATION OF RISK EVALUATION

RM PASSED OUT A SERIES OF RISK LADDERS AND ASKED THEM TO GIVE THEIR OPINIONS ABOUT HOW HELPFUL THEY FOUND THE INFORMATION ON EACH LADDER. (Each ladder had only eight examples of risks of which only smoker was a self imposed risk. Ladder 1 had no comparative material in the right hand margin. The others had loss of average life expectancy in days, number of people dying in a city of 14,000, and cigarette equivalents. These were given to the respondents in turn.)

The conclusions which emerged from the discussion are as follows:

1. For some risks, certain types of comparisons seemed inappropriate to them and either confused them or made them doubt the credibility of the ladder. For example, loss of average life expectancy made sense for cigarette smoking, but not for death from home fires. In the latter case, it was hard to reconcile an average loss of 23 days from the fact that someone who dies in a home fire dies.

2. Some comparisons seemed inaccurate to them such as the average deaths for household and car accidents. In this case, they thought more than 3 people would die a year in Marion and more than .4 in home fires. Here the availability effect seemed to operate; they could remember reading about house fires that killed several people at one time.

3. Overall, they were not enthusiastic about the cigarette smoking comparison. When it was applied to low level risks, on the other hand, it was very effective. Risk of smoking 12 cigarettes a year is perceived to be low. A risk reduction amounting to reducing the number of cigarettes from 12 to 6 was widely viewed as inconsequential.

4. It took some discussion before they realized that the risk would not be totally removed and this knowledge was important to them. One of the group used the analogy of bringing blood pressure down, e.g., where someone's blood pressure is reduced from a "too high" level to a level closer to but not at normal.

5. RM attempted to see if they found a series of risk reductions meaningful. For example, going from 400 ppm to 200 ppm and then going from 200 ppm to 100 ppm etc. They did not find this easy to answer. Having the comparisons on the risk ladders did help them somewhat. But they were not sure 400 to 200 was a big improvement. This raises the issue of whether or not respondents can discriminate between various levels of low level reductions, or whether they only have a value for a generalized reduction from being above the standard to meeting the standard.

PERCEPTION OF RISK

1. One person said, if one person dies it is one too many. It appears that this although this is a view that people easily assent to, they do not necessarily bring to bear on every situation.

2. There were several spontaneous expressions of the view that everything causes cancer. Again, the pessimism and passivity implied by this stereotypical view seems to be contextual; people can be made to think about the relative risks of getting cancer.

3. In both Marion focus groups, it became clear that every person assumed that we wanted to learn how to present the risks so we would measure large values. It also seemed to be the case that they assumed the risks were high simply because we were going to such great lengths and expense to bring them together to discuss these risks. As a result in Group 2, RM had to go to

some lengths to communicate the low level nature of the risks (the cigarette example finally did the trick). When the participants finally realized how low level they were and, further, the slight risk reduction implied by bring the THM levels into compliance, they warned him that his explanations would not get the high WTP amounts they thought he wanted. He had to keep assuring them that he did not care how much they were willing to pay as long as they really understood the nature of the risk improvement.

4. Nevertheless, even after group 2 understood the low risk levels, and the fact that there was no pressure on them to give any amount, they expressed the strong opinion that some payment (e.g. $10 - $12 per year) was worth it to make the water a bit safer. They were not dissuaded from this view even when RM probed their views on this issue. They regarded this amount as a relatively nominal amount for a tax increase to lower the low level risk.

5. In estimating their WTP, they spontaneously used their current water payments as a base. They believe this amount is around $125 a year. On this basis, another $10 is acceptable whereas doubling the water payments to $250 would be clearly unacceptable.

6. In the discussion of risk, they commented how people take risks all the time. E.g., kerosine heater fumes are probably harmful, but people use them all the time. They also cited smoking (and three of the five were smoking away during the discussion.)

7. They agreed that the mention of cancer makes people react.

APPENDIX B

HERRIN INSTRUMENT REVIEW

On May 9, 1985 a copy of the draft questionnaire was sent for comment to Alan Carlin, George Parsons, Ann Fisher and David Schnare of the US Environmental Protection Agency, Paul Slovic and Nancy Reiches of our advisory committe, Clifford Russell of RFF, and the following economist practitioners of the contingent valuation method: Kerry Smith, William Desvousges, Alan Randall, William Schulze. A memo accompanied the questionnaire which described the rationale for the questionnaire's wording and the design of an experiment to assess the validity of the risk communication procedures. Two potential biases in particular were identified as potentially troublesome: amenity misspecification and compliance bias.

The risk levels described in the memo were somewhat different than the final risk levels used in the study. Version A contained our best estimates for the levels of risk involved for the EPA THM standard and three realistic levels of THMs which exceeded the EPA standard. Version B was identical except that each of the out-of-compliance levels was three times higher than those used in version A. (Thus a .11 ppm level of THMs in version A became .33 ppm in the B version and so on.)

By May 29 comments had been received from a number of those to whom we sent the draft instrument. A summary of these comments and the changes made in response to them are as follows.

Clifford Russell suggested that, given the unreliability of risk estimates in general, a greater difference between the versions A and B would provide a more reasonable test. This suggestion was adopted and a five fold difference between the two versions was implement. Thus the .33 level proposed for version B was increased to .55 etc.

Ann Fisher, in a May 20 communication, pointed out several inconsistencies on the cards and some minor word changes, all of which were corrected or changed. She also raised several other points:

1. The diversity of the risk comparisons on the ladder might confuse respondents because some are annual and some (e.g. dying in an airplane crash) are per event. (Kerry Smith and William Desvousges also raised this point.) Although our pretests indicated that respondents did not find this type of diversity confusing, we introduced wording changes to further clarify the different types of risks for the respondents. We also alerted the interviewers to watch for confusion or problems caused by this diversity and asked them to report any problems along this line to us immediately.

2. The description of the risks of cigarette smoking and being a policeman as voluntary don't reflect the reality of the long term commitment involved with being a policeman. While we understand the point, we did not change this part of the questionnaire for two reasons. First, it was too difficult to address this point in the questionnaire without adding to its already considerable cognitive complexity for the respondents. Second, our distinction is one which, from everything we could determine, made sense to the

respondents who viewed being a policeman or a smoker as very different from drinking contaminated drinking water.

3. Respondents are likely to want to know the costs of any program before they vote for it in a referendum as we ask them to do in the first part of the willingness-to-pay questions. This is indeed a question respondents raise and needed to be addressed. We revised the appropriate section accordingly.

4. If all respondents are not on city water, a question should be added to ascertain their water source. I double checked the situation in Herrin and determined that our entire sample was served by city water.

Kerry Smith provided extensive and very helpful written comments in his letter of May 15. Among the changes we made which address his comments are: the provison of a more detailed explanation of the assumptions behind the insurance examples, varying the order of valuation, previewing the entire series of risk improvements before valuing any one of them, gathering information on whether people are home owners, changing the description of the length of time the interview will take in the introduction, and varying the text with more interrogatories.

We did not adopt others of Smith's suggestions for various reasons. He recommended more design points to test how individuals' responses vary with the information they are provided. According to our calculations of the minimum sample size necessary to test differences with sufficient power, our sample size of 200 would not permit more sample points than the four we already had.

Smith (and Alan Randall) also raised the question of whether respondents would react differently to risks with long latency periods than to those with shorter term outcomes. This is one of the many complexities of working with risk. To produce a risk ladder with meaningful benchmarks on it, we had to combine different types of risk. But the risk ladder is only one of the devices we use to help respondents put drinking water risks in perspective. We feel the use of cigarette equivalents, which also involve long latency periods, helped to ensure that respondents grasped the nature of the drinking water risks. Again, our focus group and in-depth interview experience suggested that this would not be a problem.

Another of Smith's comments involves our assumption that the risks are strictly additive. He provided a citation to a debate on whether or not there are independent sources of risk and suggested that this debate was relevant to how we interpret our results in an expected utility framework.

Finally, Smith raised the question of whether our respondents should assume that they have other adjustment mechanisms available. We do assume that respondents will be free to engage in averting activities such as the purchase of bottled drinking water whether or not the referendum passes. We did not specifically describe this possibility, because we thought it would be self-evident to the respondents and because the scenario description was already over-long. People in southern Illinois seemed to be very aware of averting opportunities. The local drinking water in this area comes from relatively shallow surface sources with the result that its taste and odor characteristics are objectionable to more than a few people many of whom resort to home treatment or purchase bottled water. People are presumably aware of these options through local product advertising. In order to further address this

issue in the questionnaire, we added questions which probed whether respondents engage in averting behavior of any sort following which we offered the respondents the opportunity to revise their WTP amounts if they wished to do so for any reason. In all, 18 respondents (9 percent) said they usually do not drink the water as it comes out of the tap. One third of these respondents buy bottled water and half have a purification device attached to a faucet. There was no evidence that these respondents changed their WTP amounts because they became aware of the implications of their averting behavior.

In addition to the point mentioned earlier, Alan Randall, in a phone conversation, said he had some difficulty with the cigarette scale and wondered why we needed to mention "lifetime" when describing the number of cigarettes. We use cigarettes smoked in a lifetime for the cigarette low level risk equivalents to ensure that respondents do not misinterpret (as did some in the pretests) 10 cigarettes total as meaning 10 cigarettes a day or year.

William Desvousges sent us a copy of the questionnaire on which he had written comments. His primary concern was the instrument's wordiness in the section (pages 3 to 10) which explains risk and the risk ladder. In addition to various places where he questioned the way we worded various elements of the scenario, and his concern, noted above, about the diverse nature of the risks used as examples in the instrument, he also expressed his dislike of the cigarette equivalents which seem awkward to him. We addressed some of these concerns in our revision; others, including our use of cigarette equivalents, we retained because all the evidence available to us suggested that they worked well. Finally, Desvousges questioned whether the use of the respondent's water bill as a payment vehicle might introduce an implicit starting point. We believe the use of the bill as a starting point, which did in fact occur with great frequency, is inevitable given the fact that the water bill is the actual payment vehicle which would be used for any drinking water quality improvements. The use of any other payment vehicle would make the scenario unnecessarily hypothetical.

APPENDIX C
HERRIN INSTRUMENT

A1 May 1985

Card 1/ 1

Date: _____ Interviewer No. __/ 2

InterviewID No. __/__/__/ 3-5

Version 1/ 6

Resources for the Future Washington, D.C.

DRINKING WATER QUESTIONNAIRE

Hello, my name is _____ and I'm with Resources for the Future, a nonprofit research organization based in Washington, D.C.

We're conducting a study of people's views about certain kinds of environmental issues and risk in Southern Illinois. This letter describes (HAND LETTER TO PERSON) the study and Resources for the Future. The study is intended to give people like you the chance to have a say about government policies. (It has no connection with commercial products or services).

We have scientifically selected a sample of households to represent this area and your household is part of that sample. Because we have chosen relatively few households, your participation is extremely important. We hope you will help us. (PAUSE)

C-1 CONDUCT ENUMERATION INTERVIEW TO DETERMINE DESIGNATED RESPONDENT.

The interview will take about forty minutes.

There are no right or wrong answers. (PAUSE) Please let me know at any time if a question is unclear or you would like to have more information about it.

TO BE CODED BY INTERVIEWER

Respondent is 1 Male 2 Female 7

Respondent is: 1 Person first contacted or 2 Other person 8

Time ended: _____ Time begun: _____

Interview length: _____ minutes. 9-10

Pollution, which affects the quality of our air, water, and food, can come from many different sources.

HAND RESPONDENT CARD 1

In a moment I will name several types of pollution. Use this scale card to tell me how harmful you feel each one is to people's health and to the environment in this city. For example, if you feel **acid rain** is very harmful here you might rate it at 9 or 10 while if you feel it is not so harmful here you might rate it somewhere between 2 and 4.

1. Now, based on present conditions in Herrin, tell me the place on the scale that shows how harmful you think pollution from cars, trucks and buses is in Herrin. If you are unsure or have no opinion please let me know.

a. Pollution from cars, trucks, and buses ___ DK = 98 11-12

How about...

b. Pollution from manufacturing plants ___ 13-14

c. Chemical contaminants in the town's drinking water ___ 15-16

HAND RESPONDENT CARD 2

2. Here's another scale. This time 10 stands for the highest possible satisfaction. In general, how satisfied are you with the **Street and Highway Maintenance** provided by Herrin? Please tell me the place on the scale that shows how satisfied you are with the service.

a. Street and highway maintenance ___ DK = 98 17-18

How about...

b. The public schools ___ 19-20

c. Competence of the local city officials ___ 21-22

The third category of risks on the card are low level risks. These are rare occurrences such as being hit by lightning which has a risk level of less than one person per 100,000.

(Very few people are killed by lightning each year. Out of the two million people who die each year from all causes, only 116 are killed by lightning.)

This risk is so small that you would only have to pay five cents for a $100,000 life insurance policy against being killed by lightning in any given year.

On the card we show (POINT) another type of low level risk -- being killed in an airplane crash when taking a scheduled airliner in the United States. You may consider the risk of dying in an airliner crash pretty high because every crash gets a lot of televison and newspaper publicity. In fact, even though tens of thousands of flights occur each year involving millions of passengers, the average number of people killed in scheduled airliner crashes each year in the United States is only 121 people.

The data show that the risk level for each trip anyone takes on an airliner is .10 per 100,000 (POINT). This means that only one tenth of a person dies for every 100,000 people who take a single airline trip. (PAUSE) Obviously it is impossible for less than one person to die. Another way of expressing this risk level is to say that the risk level of dying in an airplane crash is one in a million.

This risk is so low that the cost of the $100,000 life insurance policy for a single trip on a scheduled airliner would be ten cents. (PAUSE)

Do you have any questions about these examples? (PAUSE)

Another kind of extra risk that some people accept is to smoke **cigarettes.** Of course, like being a policeman or taking an airline flight, this risk is voluntary. The risk comes from the fact that medical doctors have determined that some smokers will eventually die from lung cancer or heart disease caused by smoking even though other smokers will not.

The more cigarettes someone smokes in a lifetime, the higher the risk. What this means is that every cigarette a person smokes carries with it a very tiny risk of eventually dying from lung cancer or heart disease -- just as every mile you drive in your car poses a tiny risk of being killed in an automobile accident. (PAUSE) Using the best available data, we have calculated the number of cigarettes you would have to smoke to experience the same level of risk of dying as a stuntman, police officer and airline passenger.

HAND RESPONDENT CARD 6

This card shows these same three risks. Please look at the airline example (POINT). As a way of helping you to compare risks, the card shows how many cigarettes you would have to smoke in a lifetime to be exposed to the same level of risk as being killed when taking a single airliner trip.

As you can see, this risk is equivalent to the risk of dying from smoking two cigarettes in a lifetime. Obviously both risks are extremely low. (PAUSE)

Can you tell me the cigarette equivalent for the annual risk of being a police officer?

(In this case the annual risk of 22 in 100,000 is roughly comparable to the risk of smoking 438 cigarettes in a lifetime. This is the same as smoking a little more than 1 cigarettes a day for a single year.)

We can even make the same comparison for a stuntman. This risk is so high that someone would have to smoke 33,060 cigarettes in a lifetime to be exposed to the same level of risk that a stuntman faces in a year. This would be the equivalent of smoking 4.5 packs a day for a year! (PAUSE)

IF RESPONDENT SEEMS CONFUSED ABOUT THE CIGARETTE COMPARISONS, REPEAT PARTS OF THE ABOVE MATERIAL AS NECESSARY.

We all are exposed to many types of low level risks every day. These include being exposed to air pollution and eating food which has chemicals added to it to keep it from spoiling. Each of these activities poses some very small risk of dying from cancer. Sometimes if we pay more money we can reduce the risk somewhat, but we can never eliminate it. In each case we have to ask ourselves whether the size of the reduction in risk is large enough to be worth spending money for this purpose.

The particular risk I want to ask you about involves drinking water.

HAND RESPONDENT CARD 7

As you probably know, cities like this one who get their water from surface supplies add small amounts of chlorine to drinking water to purify it. The chlorine kills bacteria which would otherwise cause disease. Under certain special conditions, the chlorine can produce small amounts of chemicals called trihalomethanes or THM's in the drinking water people drink. Because they are created in the process of treating the water, THMs are very different from other types of chemical contaminants you may have heard about such as PCBs. (PAUSE)

IF RESPONDENT SAYS THIS RISK LEVEL SEEMS HIGH, EXPLAIN THAT THIS INCLUDES DEATHS WHICH OCCUR ALL OVER THE COUNTRY AND SOME PEOPLE GET OPERATED ON WHEN THEIR APPENDIX HAS BECOME VERY INFECTED.

IF NECESSARY, EXPLAIN THAT THIS RISK IS FOR A PARTICULAR OCCURRENCE WHEREAS THE OTHER LEVELS ARE FOR EXPERIENCING A SITUATION FOR A YEAR.

At 4 per 100,000 (POINT IF NECESSARY) is the extra annual risk of dying faced by a young woman who uses contraceptive pills. The interesting thing about this risk level is that doctors say that it is low enough to justify using contraceptive pills for younger women who want to practice birth control.

IF RESPONDENT MENTIONS HE OR SHE HAS HEARD OF A HIGH RISK FOR THE PILL, SAY THAT THE RISK INCREASES SIGNIFICANTLY FOR OLDER WOMEN AND DOCTORS NO LONGER RECOMMEND THAT THESE WOMEN USE THE PILL.

One of the reasons for this is that if the woman got pregnant, she would face the somewhat higher risk of dying in childbirth faced by a woman <u>each time</u> she has a baby. (POINT).

Each year we all face the risk of dying in an automobile accident caused by a car driven by another person who is drunk. This risk level is about 5 in 100,000 each year (POINT IF NECESSARY).

The bottom segment (POINT) stretches out the tiny area marked in <u>green</u> on the first ladder (POINT). <u>All</u> the risks in blue are quite low. These green risk levels are <u>very</u> low -- the chances of any of them occurring are all below 1 in 100,000. One tenth of one, .10, is where the risk of dying in a single airliner trip lies (POINT IF NECESSARY). (PAUSE) As I said before, this is at the <u>one in a million</u> level.

For each <u>five</u> airline trips you take in a given period of time you are exposed to this risk of dying (POINT TO .5).

Because some people find it hard to compare risks that are this small, we have put some <u>cigarette smoking comparisons</u> on the right hand side of this card. As you remember, the risk of dying from cancer or heart disease from smoking two cigarettes is roughly equivalent to the risk of dying in a crash when taking a <u>single</u> airplane trip. Note that this is <u>not</u> two cigarettes a day, but the risk of dying if you only smoked two cigarettes in your entire lifetime.

As you can see, the risk of dying in an airline crash is <u>extremely low</u>. Let's compare it with another risk that people face, the yearly risk of dying in a <u>home fire</u>, (POINT). This risk is equivalent to smoking a total of 56 cigarettes in a lifetime. This means that it is <u>28 times</u> higher than the risk you face of dying when you take a single airline trip. Although the home fire risk is higher, please note that <u>both</u> are <u>low</u> level risks compared to the overall risks of dying that we all face (POINT TO THE BASIC RISK SIDE OF CARD A) each year.

Do you have any questions about these cards?

5. Did any of these risk levels surprise you? (PAUSE) Which ones?

1 Yes 2 No 34

6. Now I'd like your opinion about the following hypothetical situation. Let's say that you want to visit some relatives in Denver during your vacation. You have the choice of taking a three hour airplane trip or taking a 12 hour train trip. If tickets for the train and the plane both cost <u>the same</u> and the risk of dying in a train crash was <u>exactly the same</u> as dying in an airplane crash (POINT TO .10 ON THE RISK LADDER), <u>which</u> would you normally prefer to take -- the plane or the train?

1 Plane (GO TO QUESTION 7A)

2 Train (GO TO QUESTION 7B)

3 Other (describe) REMIND RESPONDENT THESE ARE THE ONLY TWO OPTIONS 35

IF RESPONDENT CHOSES PLANE

7a. What if the train risk remained at 0.10 (POINT), but the risk of death from a plane crash was at some <u>higher</u> level on the risk ladder? What is the <u>highest risk per 100,000</u> you would be willing to accept and <u>still</u> take the plane rather than the train?

__/__/.__/ Highest risk level before taking train

99.0 Other, describe 36-39

IF RESPONDENT CHOSES TRAIN

7b. What if the plane risk remained at 0.10 (POINT), but the risk of death from a train crash was at some <u>higher</u> level on the risk ladder? What is the <u>highest risk per 100,000</u> you would be willing to accept and <u>still</u> take the train rather than the plane?

__/__/.__/ Highest risk level before taking train

99.0 Other, describe 36-39

Now that you are familiar with the risk ladder I'd like to show you the <u>actual</u> risk levels for the <u>three cities</u> whose drinking water did <u>not</u> meet the EPA standard. These risk levels were carefully computed by scientists using the best available information. They represent the <u>highest likely risk</u> posed by the different THM levels for people that drink the water every day for a <u>year</u>.

PLACE CARD C ON THE <u>LEFT</u> HAND SIDE OF THE RISK LADDER

9. These describe the situation I want to ask you about. Is there anything about these assumptions you find difficult to accept?

1 Yes 2 No 41

IF YES, ASK WHAT IT IS, AND EXPLAIN THAT WE WANT EVERYONE WHO ANSWERS THE QUESTIONS TO ASSUME THE SAME THINGS. EVEN IF THEY THINK ONE OR MORE OF THE ASSUMPTIONS IS IMPROBABLE, THEY SHOULD ASSUME IT IS TRUE FOR THE PURPOSES OF ANSWERING OUR QUESTIONS. SAY THAT YOU WILL MAKE A NOTE OF THEIR RESERVATION IF THEY WISH. (WRITE IT HERE)

OK, now I'm going to ask you about each of the three different levels of THMs, one at a time. We have found that some people vote yes and some people vote no to each of these referenda. Please don't think that we favor any position on these referenda. We do not. We simply want to understand how people really feel about the issue. So in answering the questions please try to think how you would actually vote if there really was such a referendum and the facts were as I have described them.

C-7

HAND RESPONDENT CARD 11, RESPONDENT SHOULD ALSO HAVE RISK LADDER AND CARD C IN FRONT OF HIM OR HER.

The first referendum is on whether or not Herrin should spend money to reduce the THM level in the city's drinking water from .11 parts per million to the EPA standard of .10. (PAUSE)

This card shows the amount of reduction in THMs that would occur if the referendum passes, the reduction in the annual risk of death and the cigarette equivalent for this risk reduction which is about the same as smoking 2 cigarettes in a lifetime (POINT TO THE BEFORE AND AFTER RISK LEVELS AND THE DIFFERENCE BETWEEN THE TWO).

If the referendum passes your annual water bill would be increased by some amount and you would get this level of annual risk reduction and no more. The amount of the increase will depend entirely on how much you are willing to pay for this purpose. If it loses, you will continue to be exposed to this higher level of risk (POINT) and no more.

(Remember: the only source of risk in the drinking water comes from THMs and many authorities do not think this risk is high enough to be worth spending much money to reduce.)

10. If there were an election on this issue, which way would you vote? Would you vote to increase your water bill by some amount to get this much yearly risk reduction, or, all things considered, would you vote not to increase your water bill for this purpose?

IF RESPONDENT ASKS HOW MUCH HIGHER THE WATER BILL WILL BE, SAY "You will be given the opportunity to say how much of an increase you will accept for this purpose. Therefore if you are willing to pay any extra money at all for this purpose, you should vote yes. If you are not, you should vote no."

1 VOTE FOR HIGHER WATER BILL AFTER ASKING HOW MUCH

2 VOTE FOR HIGHER WATER BILL WITHOUT ASKING

3 VOTE TO KEEP WATER BILL THE SAME AFTER ASKING HOW MUCH

4 VOTE TO KEEP WATER BILL THE SAME WITHOUT ASKING

5 OTHER (DESCRIBE) 42

Here's the last referendum.

HAND RESPONDENT CARD 13

This time the vote is whether or not to reduce the THMs from a level of .33 parts per million to the EPA standard of .10. (PAUSE) The same assumptions hold for this referendum as well.

The cigarette equivalent for this change in annual risk is about the same as smoking 28 cigarettes in a lifetime (POINT IF NECESSARY).

16. If there were an election on this issue, which way would you vote? Would you vote to increase your water bill by some amount to get this much yearly risk reduction, or, all things considered, would you vote not to increase your water bill for this purpose?

1 VOTE FOR HIGHER WATER BILL
2 VOTE TO KEEP WATER BILL THE SAME
3 OTHER (DESCRIBE) 52

IF VOTE FOR HIGHER WATER BILL:

17. Taking into account your income and expenses, realistically what is the highest amount per year you would be willing to vote to increase your household's water bill for this risk reduction only?

IF RESPONDENT GIVES A MONTHLY AMOUNT, CONVERT IT INTO A YEARLY AMOUNT AND ASCERTAIN WHETHER THIS IS THE AMOUNT THE RESPONDENT WISHES TO PAY

$ __/__/__/ per year (ROUND TO NEAREST DOLLAR) 53-55
998 DON'T KNOW, NOT SURE
999 REFUSED

IF VOTE TO KEEP THE WATER BILL THE SAME:

18. Did you vote to keep the bill the same because you think the risk reduction is not worth any money or because of some other reason?

1 RISK REDUCTION NOT WORTH ANY MONEY
2 NOT ENOUGH INFORMATION TO MAKE A DECISION

PROBE TO SEE WHAT INFORMATION THEY WISH TO HAVE AND ENCOURAGE RESPONDENT TO GIVE AN AMOUNT ANYWAY

3 WORTH SOME MONEY, BUT ASSUMED THE INCREASE WOULD BE LARGE AND MORE THAN I WANTED TO PAY

4 OTHER (PLEASE DESCRIBE): 56

IF WORTH SOME MONEY (3) ASK QUESTION 17 ABOVE.

C-9

IF RESPONDENT VOTED NO ON ALL THREE REFERENDA ONLY:

19. The referenda I asked you about offered you three different risk reductions. Since you voted no on all three, I'd like to ask what level of risk from THMs in your drinking water you would be willing to pay something higher on your water bill to bring down to the EPA standard. (PAUSE) Is there any level of risk from THMs in your drinking water that you would be willing to vote in a referendum to reduce?

1 Yes GO TO QUESTION 20
2 No -- Why not? (WRITE ANSWER HERE) SKIP TO QUESTION 21 57

3 Not sure, don't know SKIP TO QUESTION 21

IF YES:

20. What is the lowest level of risk from THMs that you would be willing to spend money to reduce to the EPA standard? Just tell me the number per 100,000 on the risk ladder.

__/__/./__/ per 100,000 58-61
98.0 DON'T KNOW, NOT SURE
99.0 REFUSED

ALL RESPONDENTS

21. Now I'd like to ask you your opinion about the risks associated with the EPA THM standard. Here at A is the annual risk posed by the present standard. EPA chose this level as posing an acceptable level of risk from THMs, but it could have chosen other levels, either higher or lower. Some people think the risk level EPA choose is too high and should be lowered even if it means that more cities will have to spend money to meet the standard. Others think EPA chose an unnecessarily low risk level and should raise it somewhat so fewer cities will have to spend money to meet the standard. How do you feel about the risk associated with the current EPA standard? As far as you are concerned, do you think EPA should require communities to meet this risk level from THMs or a lower or higher one?

1 Too low 2 Too high 3 About the right level 4 DK 62

IF TOO LOW OR TOO HIGH:

22. Where on the risk ladder would you prefer the EPA THM standard to be? Just tell me the number per 100,000 on the risk ladder which is an acceptable level of risk from THMs.

__/__/./__/ 63-66
98.0 DON'T KNOW, NOT SURE
99.0 REFUSED

36. What do you smoke?

1 Cigarettes About how many each day? __/__ 13, 14-15
2 Pipe
3 Cigars

37. Do you own or rent your house (trailer, apartment)?

1 Own 2 Rent 3 Other (DESCRIBE:) 16

38. Do you or does someone else in your household pay a water bill?

1 Person pays (USUALLY OR SOMETIMES)

2 Someone else in the household pays 17

3 Do not pay a water bill (BECAUSE RENT ETC.)

IF PERSON OR SOMEONE IN HOUSEHOLD PAYS:

39. How many times during the year do you get billed for city water?

1 EVERY MONTH 2 EVERY OTHER MONTH 3 EVERY THREE MONTHS
18
4 EVERY SIX MONTHS 5 ONCE A YEAR 6 NOT SURE, DON'T KNOW

40. About how much do you pay for your water?

$__/__/__/ per year (CALCULATE THE YEARLY AMOUNT IF RESPONDENT GIVES
998 Don't Know IT BY A SUBYEARLY AMOUNT AND REPEAT THE YEARLY
999 Refused TO THE RESPONDENT)
19-21

41. Had you ever heard of THMs before this interview?

1 Yes

2 Unsure, but maybe yes 22

3 No

IF YES OR UNSURE, BUT MAYBE YES:

42. Please tell me where you heard about them? (RECORD)

43. About how long ago was this? (RECORD)

C-11

44. Please tell me what you remember about them?

(PROBE TO SEE: a) IF WHAT THEY RECALL WAS REALLY THMs

b) IF THEY HAD PCBs CONFUSED WITH THMs -- IF SO, EXPLAIN THE DIFFERENCE AND THAT THIS SURVEY IS ONLY ABOUT THMs

RECORD ANSWERS HERE

c) WHETHER THEY HAD HEARD OF THE EPA STANDARD

d) AND WHETHER THEY RECALL ANY NOTIFICATION ABOUT HERRIN BEING OVER THE STANDARD

23

45. Here's the last question. Thinking back to the earlier part of the interview, you said you were willing to pay (READ ANNUAL AMOUNT) extra on your water bill for (RISK REDUCTION). REPEAT FOR EACH AMOUNT GIVEN AND RECORD IN THE ORIGINAL AMOUNT COLUMN.

	Original Amount	Revised Amount	
B to A	$__/__/__/ per year	$__/__/__/ per year	24-26
C to A	$__/__/__/ per year	$__/__/__/ per year	27-29
D to A	$__/__/__/ per year	$__/__/__/ per year	30-32

Now that you have had more of a chance to think about the question, would you like to change any of these amounts to make them lower or higher for any reason?

1 Yes

2 No 33

3 Other (RECORD):

IF YES: What changes would you like to make? RECORD NEW AMOUNT ABOVE IN THE REVISED AMOUNT COLUMN. IF NO CHANGE, COPY ORIGINAL AMOUNT INTO REVISED AMOUNT COLUMN.

Why did you decide to make this change? (PROBE; RECORD ANSWER HERE)

34

Thank you very much for answering these questions. In case you may wonder what Herrin's current THM level is. It has been below the EPA standard for several years.

Card 1

----------HARM TO ENVIRONMENT IN THIS TOWN---------

Lowest Harm									Highest Harm	Don't Know, Not Sure
1	2	3	4	5	6	7	8	9	10	

Card 2

--------SATISFACTION WITH SERVICES IN THIS TOWN---------

Lowest Satisfaction									Highest Satisfaction	Don't Know, Not Sure
1	2	3	4	5	6	7	8	9	10	

Card 3

ASPECTS OF YOUR DRINKING WATER

Taste

Odor

Appearance

Supply Interruption

Contamination by Chemicals That May Harm Health

Card 4

BASIC RISKS OF DYING FROM ALL CAUSES

(Annual)

Age	No. of people who die each year per 100,000			Annual premium for $100,000 life insurance *
25-34	137 of 100,000	or	1 of 730	$137
35-44	229 of 100,000	or	1 of 437	$229
45-54	584 of 100,000	or	1 of 171	$584
55-64	1363 of 100,000	or	1 of 73	$1363

* This rate reflects the cost of paying the families of those who die under an "ideal" insurance plan in which everyone participates and there are no administrative costs.

Card 5

EXAMPLES OF EXTRA RISK

	BASIC RISK	+	EXTRA RISK	=	NEW RISK
	Basic Risk of Dying Ages 25-34		Annual extra risk of dying from being a STUNTMAN		
	137 OF 100,000	+	2,000 OF 100,000	=	2,137 OF 100,000
Insurance premium	$137	+	$2,000	=	$2,137

	AGE 25-34		Annual extra risk of dying from being a POLICE OFFICER		
	137 OF 100,000	+	22 OF 100,000	=	159 OF 100,000
Insurance premium	$137	+	$22	=	$159

	AGE 25-34		Extra risk of dying in an airplane crash during ONE AIRLINE FLIGHT		
	137 of 100,000	+	0.10 of 100,000 or (1 of 1,000,000)	=	137.10 of 100,000
Insurance premium	$137	+	$.10	+	$137.10

Card 6

CIGARETTE SMOKING COMPARISON

	Basic Risk of Dying Ages 25-34		Annual extra risk of dying from being a STUNTMAN		
	137 of 100,000	+	2,000 of 100,000	=	2,137 of 100,000
Insurance Premium	$137	+	$2,000	=	$2,137
Cigarette Equivalent	33,060 in lifetime				

(4.5 packs a day for one year only)

	Age 25-34		Annual extra risk of dying from being a POLICE OFFICER		
	137 of 100,000	+	22 of 100,000	=	159 of 100,000
Insurance Premium	$137	+	$22	=	$159
Cigarette Equivalent	438 in lifetime				

(1.2 cigarettes a day for one year only)

	Age 25-34		Extra risk of dying in an airplane crash during ONE AIRLINE FLIGHT		
	137 of 100,000	+	0.10 of 100,000 or (1 of 1,000,000)	=	137.10 of 100,000
Insurance Premium	$137	+	$.10	+	$137.10
Cigarette Equivalent	2 cigarettes total in a lifetime				

Card 7

WATER PURIFICATION
(CHLORINE)

Trihalomethanes

THMs

(NOT PCBs)

.10 parts per million (ppm)

Card 8-A

HYPOTHETICAL DRINKING WATER MEASUREMENTS

(ppm = Parts per Million)

	LEVEL OF THMs IN WATER	EXCEEDS STANDARD BY	NOTIFICATION NECESSARY?
D North Smithville	0.33 ppm	0.23 ppm	Yes
C South Smithville	0.18 ppm	0.08 ppm	Yes
B East Smithville	0.11 ppm	0.01 ppm	Yes
A EPA Standard	0.10 ppm		No
Smithville	0.09 ppm		No
Centerville	0.07 ppm		No

C-17

Card 8-B

HYPOTHETICAL DRINKING WATER MEASUREMENTS

(Parts per Million)

	LEVEL OF THMs IN WATER	EXCEEDS STANDARD BY	NOTIFICATION NECESSARY?
D North Smithville	1.65 ppm	1.55 ppm	Yes
C South Smithville	0.90 ppm	0.80 ppm	Yes
B East Smithville	0.55 ppm	0.45 ppm	Yes
A EPA Standard	0.10 ppm		No
Smithville	0.09 ppm		No
Centerville	0.07 ppm		No

Card 9-A

HYPOTHETICAL DRINKING WATER MEASUREMENTS

ANNUAL RISK LEVELS*

		LEVEL OF THMS IN WATER		RISK		TOTAL CIGARETTES IN LIFETIME
D	North Smithville	0.33 ppm	=	1.9 of 100,000	or	39 cigarettes
C	South Smithville	0.18 ppm	=	1.0 of 100,000	or	21 cigarettes
B	East Smithville	0.11 ppm	=	0.61 of 100,000	or	13 cigarettes
A	EPA Standard	0.10	=	0.57 of 100,000	or	11 cigarettes
	Smithville	0.09 ppm	=	0.51 of 100,000	or	10 cigarettes
	Centerville	0.07 ppm	=	0.34 of 100,000	or	7 cigarettes

* For someone who drinks the water with this level of THMs every day for a year.

Card 9-B

HYPOTHETICAL DRINKING WATER MEASUREMENTS

ANNUAL RISK LEVELS*

		LEVEL OF THMS IN WATER		RISK		TOTAL CIGARETTES IN LIFETIME
D	North Smithville	1.65 ppm	=	9.5 of 100,000	or	195 cigarettes
C	South Smithville	0.90 ppm	=	5.0 of 100,000	or	105 cigarettes
B	East Smithville	0.55 ppm	=	3.0 of 100,000	or	65 cigarettes
A	EPA Standard	0.10	=	0.57 of 100,000	or	11 cigarettes
	Smithville	0.09 ppm	=	0.51 of 100,000	or	10 cigarettes
	Centerville	0.07 ppm	=	0.34 of 100,000	or	7 cigarettes

* For someone who drinks the water with this level of THMs every day for a year.

Card 10

1. THM's ARE THE ONLY SOURCE OF CHEMICAL CONTAMINATION

2. THM's WILL BE REDUCED ONLY TO THE STANDARD, NO LOWER

   TASTE, ODOR ETC. WILL REMAIN THE SAME AS BEFORE

3. Each of the following say the risk level posed by the extra THM's is not high enough to worry about.

   Local Drinking Water Utility Officials

   City Health Officials

   State EPA Officials

Card A-11

B to A

	From	To	CHANGE IF REFERENDUM PASSES
LEVEL OF THMs ppm	.11	.10	.01 parts per million
General Risk of Dying per 100,000	.61	.57	.04 per 100,000
General Risk Equivalent in Total Cigarettes	13	11	2 cigarettes in lifetime

Conditions:

1. THMs only source of contamination.
2. Reduced only to EPA standard.
3. Authorities say risk level not high enough to worry about.

Card A-12

C to A

	From	To	CHANGE IF REFERENDUM PASSES
LEVEL OF THMs ppm	.18	.10	.08 parts per million
General Risk of Dying per 100,000	1.0	.57	.43 per 100,000
General Risk Equivalent in Total Cigarettes	21	11	10 cigarettes in lifetime

Conditions:

1. THMs only source of contamination.
2. Reduced only to EPA standard.
3. Authorities say risk level not high enough to worry about.

Card A-13

D to A

	From	To	CHANGE IF REFERENDUM PASSES
LEVEL OF THMs ppm	.33	.10	.23 parts per million
General Risk of Dying per 100,000	1.9	.57	1.33 per 100,000
General Risk Equivalent in Total Cigarettes	39	11	28 cigarettes in lifetime

C-21

Conditions:

1. THMs only source of contamination.
2. Reduced only to EPA standard.
3. Authorities say risk level not high enough to worry about.

Card B-11

B to A

	From	To	CHANGE IF REFERENDUM PASSES
LEVEL OF THMs ppm	.55	.10	.45 parts per million
General Risk of Dying per 100,000	3.0	.57	2.43 per 100,000
General Risk Equivalent in Total Cigarettes	65	11	54 cigarettes in lifetime

Conditions:

1. THMs only source of contamination.
2. Reduced only to EPA standard.
3. Authorities say risk level not high enough to worry about.

Card B-12

C to A

	From	To	CHANGE IF REFERENDUM PASSES
LEVEL OF THMs ppm	.90	.10	.80 parts per million
General Risk of Dying per 100,000	5.0	.57	4.43 per 100,000
General Risk Equivalent in Total Cigarettes	105	11	94 cigarettes in lifetime

Conditions:

1. THMs only source of contamination.
2. Reduced only to EPA standard.
3. Authorities say risk level not high enough to worry about.

Card B-13

D to A

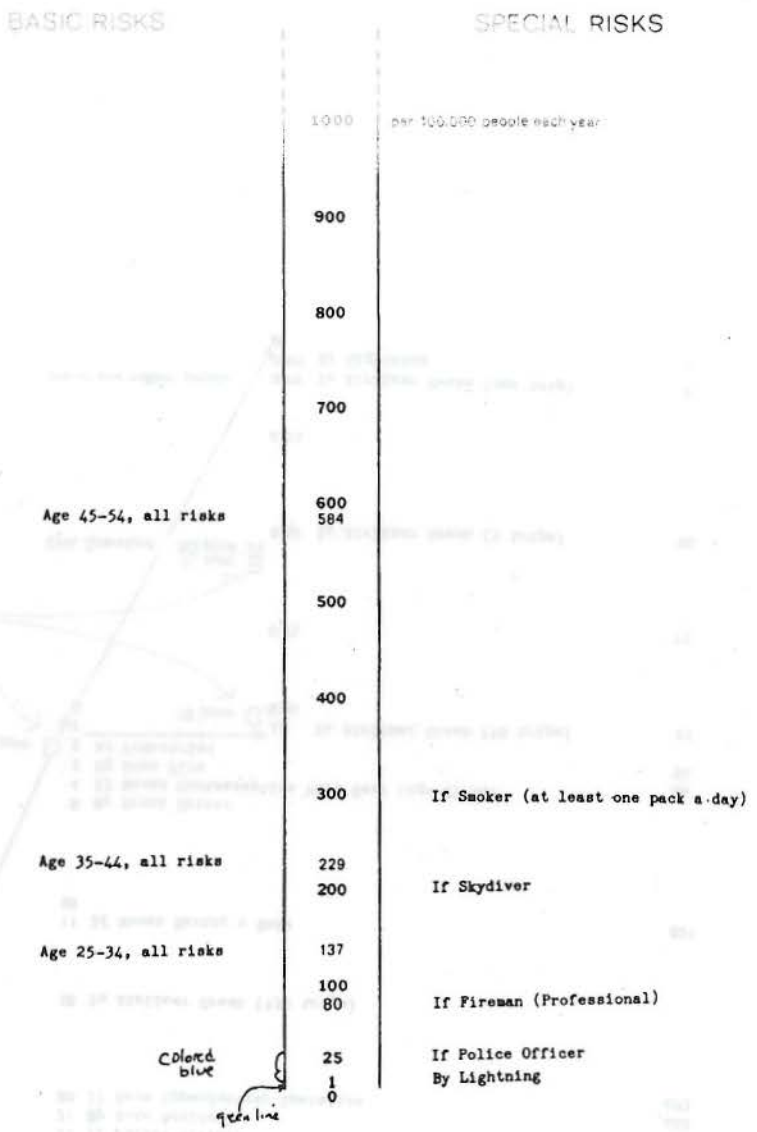
	From	To	CHANGE IF REFERENDUM PASSES
LEVEL OF THMs ppm	1.65	.10	1.55 parts per million
General Risk of Dying per 100,000	9.5	.57	8.93 per 100,000
General Risk Equivalent in Total Cigarettes	195	11	184 cigarettes in lifetime

Conditions:

1. THMs only source of contamination.
2. Reduced only to EPA standard.
3. Authorities say risk level not high enough to worry about.

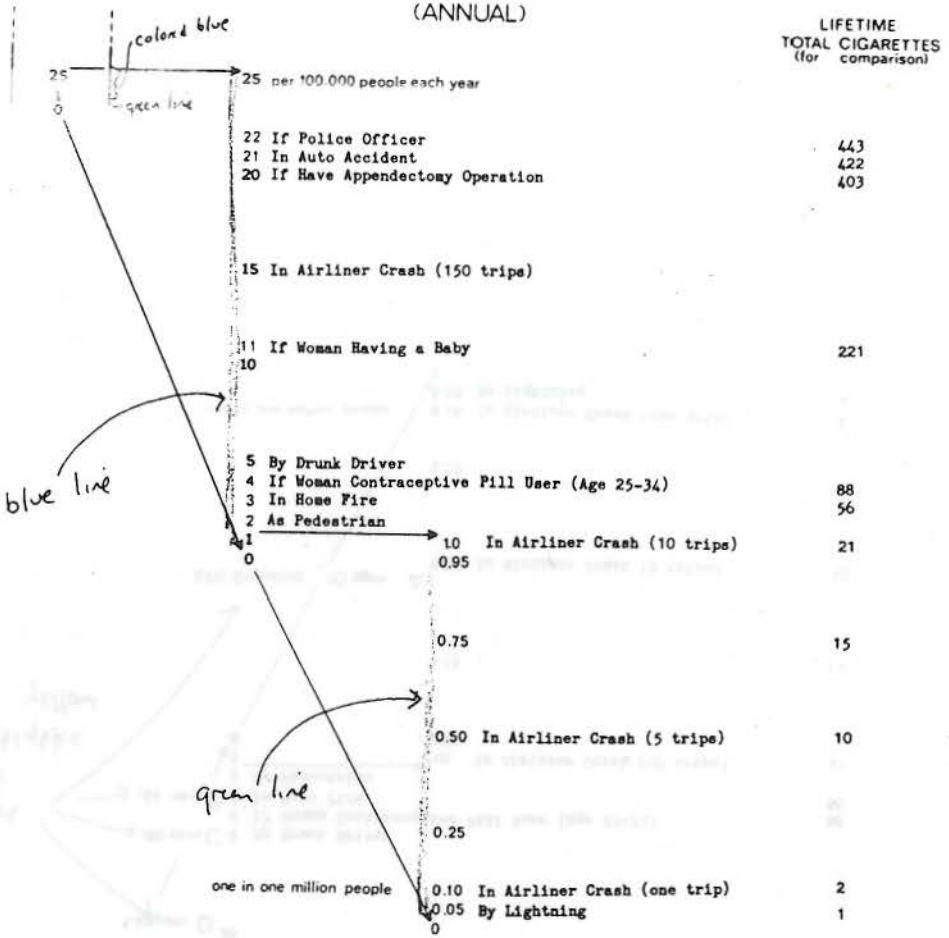
A

ANNUAL RISKS OF DYING



B

LOWER LEVEL RISKS
(ANNUAL)



Note: Cards A & B are attached to each other so they open out with A on the left and B on the right.

C

Version A

Blue/green colors here as on A and B

LOWER LEVEL RISKS
(ANNUAL)

LIFETIME TOTAL CIGARETTES (for comparison)

25 per 100,000 people each year

22 If Police Officer — 443
21 By Auto Accident — 422
20 If Have Appendectomy Operation — 403

15 In Airliner Crash (150 trips)

11 If Woman Having a Baby — 221

.33 ppm D

5 By Drunk Driver
4 If Woman Contraceptive Pill User (Age 25-34) — 88
3 By Home Fire — 56
2 As Pedestrian

1.0 In Airliner Crash (10 trips) — 21

.18 ppm C

0.95

0.75 — 15

EPA Standard .11 ppm B / .10 ppm A

0.50 In Airliner Crash (5 trips) — 10

0.25

one in one million people

0.10 In Airliner Crash (one trip) — 2
0.05 By Lightning — 1

0

each is highlighted in yellow

C-25

D

Version B

Blue/green colors here as on A and B

LOWER LEVEL RISKS
(ANNUAL)

LIFETIME TOTAL CIGARETTES (for comparison)

25 per 100,000 people each year

22 If Police Officer — 443
21 In Auto Accident — 422
20 If Have Appendectomy Operation — 403

15 In Airliner Crash (150 trips)

11 If Woman Having a Baby — 221

1.65 ppm D

.90 ppm C

.55 ppm B

5 By Drunk Driver
4 If Woman Contraceptive Pill User (Age 25-34) — 88
3 In Home Fire — 56
2 As Pedestrian

1.0 In Airliner Crash (10 trips) — 21

0.95

0.75 — 15

highlighted yellow

EPA Standard .10 ppm A

0.50 In Airliner Crash (5 trips) — 10

0.25

one in one million people

0.10 In Airliner Crash (one trip) — 2
0.05 By Lightning — 1

0

Card Y

TOTAL FAMILY INCOME FOR 1984

A Under $5,000

B $5,000 to less than $10,000

C $10,000 to less than $15,000

D $15,000 to less than $20,000

E $20,000 to less than $25,000

F $25,000 to less than $30,000

G $30,000 to less than $35,000

H $35,000 to less than $40,000

I $40,000 to less than $45,000

J $45,000 to less than $50,000

K $50,000 to less than $100,000

L $100,000 and over

Appendix D DISTRIBUTION OF WTP RESPONSES FOR HERRIN STUDY

VERSION A

ID	AMOUNT1	AMOUNT2	AMOUNT3	RAMOUNT1	RAMOUNT2	RAMOUNT3	HSIZE	INCOME	AGE	CHEMWAT
2063	0	.	0	0	0	0	4	22.50	35	6
2075	0	0	.	0	0	0	1	17.50	27	3
2009	0	0	A	0	0	0	1	2.50	70	2
1010	0	0	0	0	0	0	2	27.50	56	A
2029	0	0	0	0	0	0	3	22.50	26	3
2037	0	0	0	0	0	0	4	27.50	29	4
2041	0	0	0	0	0	0	4	17.50	29	6
2049	0	0	0	0	0	0	1	7.50	63	9
2061	0	0	0	0	0	0	2	12.50	54	A
2069	0	0	0	0	0	0	4	12.50	15	2
2077	0	0	0	0	0	0	3	17.50	59	A
3001	0	0	0	0	0	0	3	22.50	66	8
3005	0	0	0	0	0	0	1	22.50	45	5
3009	0	0	0	0	0	0	6	17.50	48	4
3013	0	0	0	0	0	0	2	27.50	53	6
3029	0	0	0	0	0	0	1	27.50	25	4
3033	0	0	0	0	0	0	2	27.50	38	2
3049	0	0	0	0	0	0	4	37.50	28	6
3081	0	0	0	0	0	0	4	37.50	42	4
4005	0	0	0	0	0	0	6	12.50	31	8
4029	0	0	0	0	0	0	4	22.50	57	4
1003	0	0	0	0	0	0	3	27.50	49	2
1006	0	0	0	0	0	0	2	47.50	45	A
2003	0	0	0	0	0	0	3	32.50	25	3
2007	0	0	0	0	0	0	2	7.50	54	1
2011	0	0	0	0	0	0	1	12.50	80	5
2039	0	0	0	0	0	0	3	17.50	36	A
2055	0	0	0	0	0	0	4	25.00	40	9
2071	0	0	0	0	0	0	2	32.50	57	A
2079	0	0	0	0	0	0	3	27.50	18	4
3003	0	0	0	0	0	0	2	22.50	66	3
3019	0	0	0	0	0	0	3	22.50	24	3
3023	0	0	0	0	0	0	2	17.50	45	7
3035	0	0	0	0	0	0	1	27.50	62	2
3043	0	0	0	0	0	0	3	27.50	20	4
3051	0	0	0	0	0	0	2	32.50	30	5
3055	0	0	0	0	0	0	1	17.50	62	3
3063	0	0	0	0	0	0	2	22.50	64	3
3067	0	0	0	0	0	0	3	32.50	35	2
3071	0	0	0	0	0	0	2	22.50	70	4
3091	0	0	0	0	0	0	4	47.50	35	4
3107	0	0	0	0	0	0	4	22.50	43	4
3111	0	0	0	0	0	0	3	32.50	43	2
4007	0	0	0	0	0	0	3	12.50	58	2
4015	0	0	0	0	0	0	2	32.50	55	10
4016	0	0	0	0	0	0	5	47.50	33	8
4035	0	0	0	0	0	0	3	42.50	24	2
3101	0	0	10	0	0	10	1	32.50	50	3
4011	0	0	10	0	0	10	2	2.50	28	3
1006	0	0	12	0	0	0	3	27.50	55	1
2053	0	0	12	0	0	12	3	12.50	33	A
3075	0	0	12	0	0	12	4	37.50	25	3
4003	0	0	14	0	14	14	4	32.50	29	3
3069	0	0	20	0	0	20	4	47.50	40	3

ID	AMOUNT1	AMOUNT2	AMOUNT3	RAMOUNT1	RAMOUNT2	RAMOUNT3	HSIZE	INCOMF	AGE	CHEMWAT
3027	0	0	20	0	0	20	2	22.50	72	2
3039	0	0	20	0	0	20	2	27.50	72	3
3095	0	0	20	0	0	20	2	22.50	64	3
1001	0	0	24	0	0	24	2	37.50	73	A
2021	0	0	24	0	0	24	2	22.50	65	1
3073	0	0	24	0	0	24	3	42.50	10	3
2047	0	0	24	0	0	24	3	22.50	37	A
3103	0	0	24	0	0	24	4	47.50	42	3
3021	0	0	25	0	0	25	3	37.50	27	4
3037	0	0	25	0	0	0	2	22.50	68	3
3093	0	0	25	0	0	25	1	27.50	24	4
2035	0	0	25	0	0	25	4	47.50	36	2
3063	0	0	25	0	0	25	3	32.50	23	2
2015	0	0	30	0	0	30	3	27.50	22	A
3015	0	0	30	0	0	30	5	37.50	58	5
3087	0	0	30	0	0	30	3	32.50	35	3
3007	0	0	35	0	0	35	4	17.50	38	2
2065	0	0	36	0	0	36	5	47.50	38	8
2059	0	0	36	0	0	36	1	12.50	64	1
3079	0	0	36	0	0	36	1	17.50	67	3
3017	0	0	40	0	0	0	2	37.50	39	3
4021	0	0	60	0	0	24	5	22.50	26	A
2023	0	0	60	0	0	60	2	17.50	23	A
1012	0	0	120	0	0	120	2	37.50	26	A
2027	0	0	120	0	0	120	4	42.50	45	7
3105	0	10	20	0	10	20	2	17.50	20	3
3097	0	10	30	0	10	30	4	32.50	42	7
2033	0	12	12	0	12	12	2	47.50	59	A
4031	0	12	12	0	12	12	5	22.50	42	2
3045	0	12	20	0	12	20	2	25.00	67	4
2043	0	12	24	0	12	24	4	42.50	49	A
3099	0	12	24	0	12	24	4	37.50	20	4
3011	0	12	36	0	12	36	2	22.50	24	4
3077	0	15	30	0	15	30	2	27.50	65	4
3109	0	15	30	0	15	30	1	17.50	23	6
3065	0	20	30	0	20	30	2	32.50	32	4
3047	0	20	30	0	20	30	3	32.50	30	4
3025	0	20	40	0	20	40	3	32.50	40	4
3053	0	25	30	0	20	30	3	32.50	20	3
3089	0	25	40	0	25	40	5	75.00	55	4
2031	0	36	36	0	36	36	1	25.00	60	A
2051	0	36	36	0	36	36	2	12.50	58	A
3057	0	36	50	12	36	50	6	32.50	28	2
3031	0	40	50	0	30	50	2	47.50	40	5
2013	0	50	50	0	50	50	2	27.50	49	8
2045	0	50	65	0	50	65	4	37.50	30	2
2019	0	60	60	0	60	60	4	22.50	30	2
4023	0	60	60	0	60	60	5	17.50	29	A
4001	5	5	5	5	5	5	4	2.50	41	7
2067	10	25	35	10	25	35	6	22.50	22	4
3041	10	25	45	10	25	40	4	27.50	28	2
4025	12	12	12	12	12	12	2	22.50	44	2
2057	12	12	24	12	12	24	1	12.50	70	A
2081	12	12	36	12	12	36	1	12.50	63	A

ID	AMOUNT1	AMOUNT2	AMOUNT3	RAMOUNT1	RAMOUNT2	RAMOUNT3	HSIZE	INCOME	AGE	CHEMWAT
3085	20	30	40	20	30	40	4	32.50	30	4
3059	20	50	70	20	50	70	4	27.50	25	6
1005	24	24	24	0	0	0	2	17.50	73	6
2073	24	36	36	24	36	36	2	17.50	67	8
4009	30	50	30	30	50	30	1	27.50	41	A
4033	36	40	40	24	24	24	5	37.50	38	10
4094	36	60	120	36	60	120	5	22.50	41	8
3061	50	60	75	50	60	75	3	32.50	15	4
2001	60	84	120	60	84	120	4	32.50	40	A

VERSION B

ID	AMOUNT1	AMOUNT2	AMOUNT3	RAMOUNT1	RAMOUNT2	RAMOUNT3	HSIZE	INCOME	AGE	CHEMWAT
4030	A	0	A	0	0	0	3	25.00	68	6
2006	0	0	0	0	0	0	4	27.50	46	A
2056	0	0	0	0	0	0	3	27.50	43	5
3010	0	0	0	0	0	0	4	32.50	64	3
3046	0	0	0	0	0	0	1	22.50	67	5
3054	0	0	0	0	0	0	2	47.50	30	4
3078	0	0	0	0	0	0	1	37.50	54	3
3090	0	0	0	0	0	0	2	22.50	72	4
4002	0	0	0	0	0	0	3	7.50	71	5
4014	0	0	0	0	0	0	3	75.00	72	6
4026	0	0	0	0	0	0	3	2.50	37	1
2004	0	0	0	0	0	0	3	12.50	40	A
2012	0	0	0	0	0	0	2	22.50	39	8
2032	0	0	0	0	0	0	1	7.50	66	A
2040	0	0	0	0	0	0	1	7.50	58	A
2044	0	0	0	0	0	0	1	12.50	58	3
2052	0	0	0	0	0	0	1	2.50	27	A
2056	0	0	0	0	0	0	2	22.50	62	5
3016	0	0	0	0	0	0	3	27.50	53	5
3040	0	0	0	0	0	0	3	27.50	40	5
3096	0	0	0	0	0	0	3	37.50	27	2
4006	0	0	0	0	0	0	4	75.00	40	6
4024	0	0	0	0	0	0	3	25.00	52	1
3026	0	0	12	0	0	12	3	22.50	22	3
3050	0	0	12	0	0	12	3	32.50	35	3
3052	0	0	12	0	0	12	2	37.50	30	2
3098	0	0	20	0	0	20	3	27.50	27	3
2066	0	0	24	0	0	24	2	22.50	68	5
3042	0	0	24	0	0	24	2	22.50	57	5
3110	0	0	24	0	0	24	3	27.50	32	3
2028	0	0	24	0	0	24	1	12.50	50	6
2080	0	0	24	0	0	24	2	32.50	33	3
3024	0	0	24	0	0	24	4	42.50	51	7
3030	0	0	25	0	0	25	5	32.50	41	4
3058	0	0	25	0	0	25	1	42.50	57	3
4010	0	0	25	0	0	25	4	37.50	35	6
3060	0	0	25	0	0	25	4	27.50	25	3
2072	0	0	36	0	0	36	3	22.50	34	4
3068	0	0	36	0	0	36	1	22.50	30	4

ID	AMOUNT1	AMOUNT2	AMOUNT3	RAMOUNT1	RAMOUNT2	RAMOUNT3	HSIZE	INCOME	AGE	CHEMWAT
2002	0	0	48	0	0	48	2	37.50	65	10
2020	0	0	48	0	0	48	2	7.50	67	A
2078	0	0	50	0	0	50	1	22.50	54	A
2022	0	0	60	0	0	60	4	37.50	55	10
2042	0	0	60	0	12	60	3	17.50	40	7
3008	0	0	60	0	0	60	1	27.50	59	2
3056	0	10	30	0	10	30	2	27.50	73	4
4026	0	12	12	0	12	12	3	27.50	37	7
2046	0	12	24	0	12	24	3	32.50	32	4
2070	0	12	36	0	12	36	3	27.50	31	5
3020	0	12	40	0	0	40	5	22.50	34	5
3062	0	12	50	0	12	50	3	37.50	13	7
2060	0	15	30	0	15	30	4	32.50	34	1
3080	0	20	40	0	20	40	4	42.50	40	5
2076	0	20	48	0	20	48	2	12.50	41	7
4020	0	24	24	0	24	60	3	27.50	25	3
3086	0	24	48	0	25	50	2	27.50	47	3
3032	0	25	40	0	25	40	3	32.50	40	5
2074	0	25	50	0	25	100	2	22.50	67	A
3092	0	25	50	0	25	50	2	37.50	10	3
3100	0	25	50	0	25	50	2	32.50	58	2
2082	0	30	50	0	30	50	4	32.50	42	7
3104	0	30	50	0	30	50	4	27.50	37	2
3108	0	36	60	0	36	60	2	27.50	28	3
2038	0	50	50	0	50	50	2	17.50	23	4
4012	0	50	75	0	50	75	4	25.00	31	8
4006	0	60	60	0	60	60	3	25.00	39	7
2064	0	120	150	0	120	150	4	27.50	28	7
3002	5	12	12	5	12	12	3	32.50	34	6
3014	10	20	30	10	20	30	4	32.50	43	3
3066	10	35	60	10	35	60	4	27.50	40	4
3034	12	12	24	12	12	24	1	17.50	68	4
3006	12	24	30	12	24	30	5	32.50	58	3
3084	12	24	48	12	24	48	5	47.50	34	3
2010	15	15	15	15	15	15	5	17.50	37	4
4034	15	20	25	15	20	25	2	12.50	67	10
3076	15	25	40	15	25	40	4	32.50	28	2
3106	20	40	75	20	40	75	2	32.50	30	4
3102	20	50	80	20	50	80	3	47.50	45	1
2050	24	24	24	24	24	24	1	7.50	67	2
2024	24	24	24	24	24	24	2	27.50	38	7
4028	24	24	24	24	24	24	2	12.50	68	10
4032	24	24	24	24	24	24	3	12.50	67	A
3044	24	24	48	24	24	48	4	32.50	10	2
2014	24	30	36	24	30	36	2	12.50	62	A
4019	24	36	48	24	36	48	3	17.50	49	10
2016	25	25	50	25	25	50	2	27.50	33	5
3112	30	15	50	15	30	50	1	27.50	60	2
3072	30	30	40	30	30	40	4	37.50	31	2
4022	30	50	75	30	50	75	5	32.50	39	9
2048	30	60	100	30	60	100	1	22.50	31	A
3028	30	60	120	30	60	120	4	32.50	54	4
3094	30	80	100	30	80	100	4	32.50	32	2
3036	35	50	100	35	50	100	3	37.50	52	3

ID	AMOUNT1	AMOUNT2	AMOUNT3	RAMOUNT1	RAMOUNT2	RAMOUNT3	HSIZE	INCOME	AGE	CHEMWAT
2034	36	0	75	36	60	75	2	17.50	67	8
1007	36	36	36	36	36	36	1	17.50	69	1
2030	36	36	36	36	36	36	1	7.50	59	A
1004	36	36	36	36	36	36	4	47.50	40	1
3048	40	50	75	40	50	75	2	37.50	45	2
3074	40	80	120	40	80	120	2	32.50	25	6
2068	48	84	108	48	84	108	4	32.50	27	A
3064	50	50	100	50	50	100	4	32.50	20	2
3038	50	75	100	50	75	100	3	37.50	25	2
3012	50	75	100	50	75	100	4	22.50	25	3
3018	50	80	150	50	80	150	6	42.50	32	3
3070	50	100	120	50	100	120	4	32.50	30	2
3082	50	100	150	50	100	150	4	32.50	32	6
3088	60	30	90	30	60	90	4	47.50	40	2
2062	60	60	60	60	60	60	4	17.50	70	5
2008	60	60	60	60	60	60	4	12.50	36	1
2036	60	60	60	60	60	60	5	12.50	36	2
4017	60	60	60	60	60	60	4	12.50	66	A
2018	60	60	72	36	36	48	2	22.50	69	4
2054	60	60	96	60	60	96	1	25.00	45	1
3022	60	70	100	60	70	100	4	27.50	25	4
3004	120	360	120	120	120	120	6	22.50	34	9
1009	125	125	125	125	125	125	3	22.50	53	9

APPENDIX E

HERRIN INTERVIEWER DEBRIEFING

At the conclusion of the field work in Herrin, the interviewers were formally debriefed. The session, conducted by Robert Mitchell, probed their views about how the respondents interpreted the questions, how well or how poorly the various elements of the interview worked, how meaningful were the WTP responses, and what changes could be made to improve the interview. The three interviewers who conducted most of the interviews participated in the two hour session. This appendix contains a complete transcript of the debriefing. What follows is a summary of the major conclusions.

MAJOR CONCLUSIONS

The interviewers reported that many aspects of the instrument worked as intended. They discerned no tendency on the part of the respondents to act strategically or to give WTP amounts designed to gain the interviewers' or the survey's sponsors' approval. They believed the respondents valued THM risks and did not confuse them with PCBs or other types of drinking water contamination. The risk ladder was "a powerful tool" which contributed greatly to the survey's success. The comparative risks caught the respondents' interest and most respondents accepted them as plausible. Very few respondents were judged not to have grasped the nature of low level risks. And the mode of death, cancer, did not appear to have created problems in the interview.

The WTP amounts given by the respondents were based on serious consideration, for the most part, and most respondents' took their income constraint into account. While some respondents found it difficult to give a dollar figure, the referendum format helped the valuation process, and the interviewers' felt that most respondents' WTP amounts were reliable. According to the interviewers, if the respondents were asked to value the same risk reductions in a later interview, their responses would very likely be about the same. They felt particularly confident that the $0 amounts were given by respondents who grasped the scenario. Regarding the outcome of an actual election if one were to be held in Herrin, the respondents felt that those who voted no in the hypothetical referendum might be less likely to take the trouble to vote and that a relatively nominal amounts, such as $12 per year, stood an excellent chance of passage under the contingent conditions posed in the survey instrument. Fifty dollars a year, however, would, they thought, be more difficult to get the Herrin voters' approval.

The interviewers identified several potential problems with the presentation of the risk levels at the point where the WTP values were elicited. One problem was a feeling on the interviewers' part that how the risks were presented may have led some respondents to relate more to the levels of THMs than to the risks associated with these levels. Another problem was the possible bias introduced by the structure of the ladder itself. Figures E-1 and E-2 present the low level risk portion of the ladder with the THM levels for version A (E-1) and B (E-2) superimposed as they were in the materials presented to the respondent when the WTP amounts were elicited. For version A, the highest risk level, .33, is on the upper of the two portions of the ladder

and all three levels are on this portion for version B. Some respondents apparently saw the transition in scales as a "big jump." Finally, the absence of examples between 0.50 and 1.0 on the risk scale made it more difficult for respondents to evaluate the two lower level risks for .11 and .18 ppm. Neither the airline crash nor the cigarette equivalent subscales appeared to assist respondents with this task.

These problems could be addressed by not identifying the various THM levels (A,B,C etc.) with the ppm level when they are shown on the ladder, by identifying some meaningful comparative risks to include on the ladder at the 0.50 to 1.0 risk levels and by rewording the instrument to better communicate the relationship of the two low-level risk ladder portions at the elicitation point. Whether bias was actually introduced by the ladder configuration used in the Herrin study is uncertain and more applications of versions of the ladder would be very helpful in improving our understanding of this issue.

The questionnaire's length was judged to be too long although the interviewers did not give the impression that this affected the quality of the WTP amounts. According to their remarks, candidates for deletion would be some of the material on cigarette equivalents, as respondents did not pay much attention to them when it came time to value the THM risks, the material on insurance, and the questions (p. 10, questions 6 and 7) comparing plane and train risks. The latter simply did not work as intended.

Figure E-1 RISK LADDER, PART C

C

LOWER LEVEL RISKS
(ANNUAL)

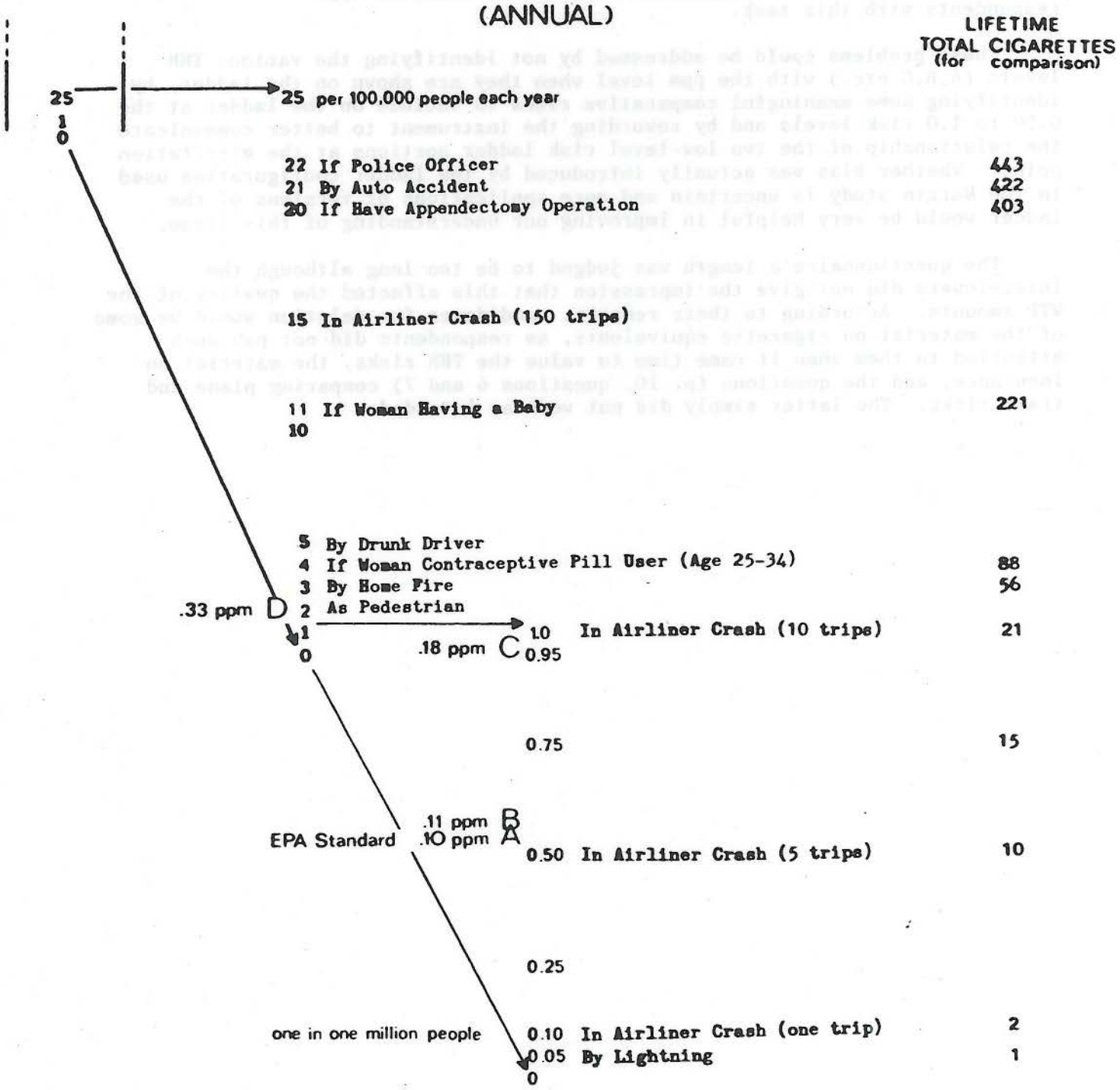
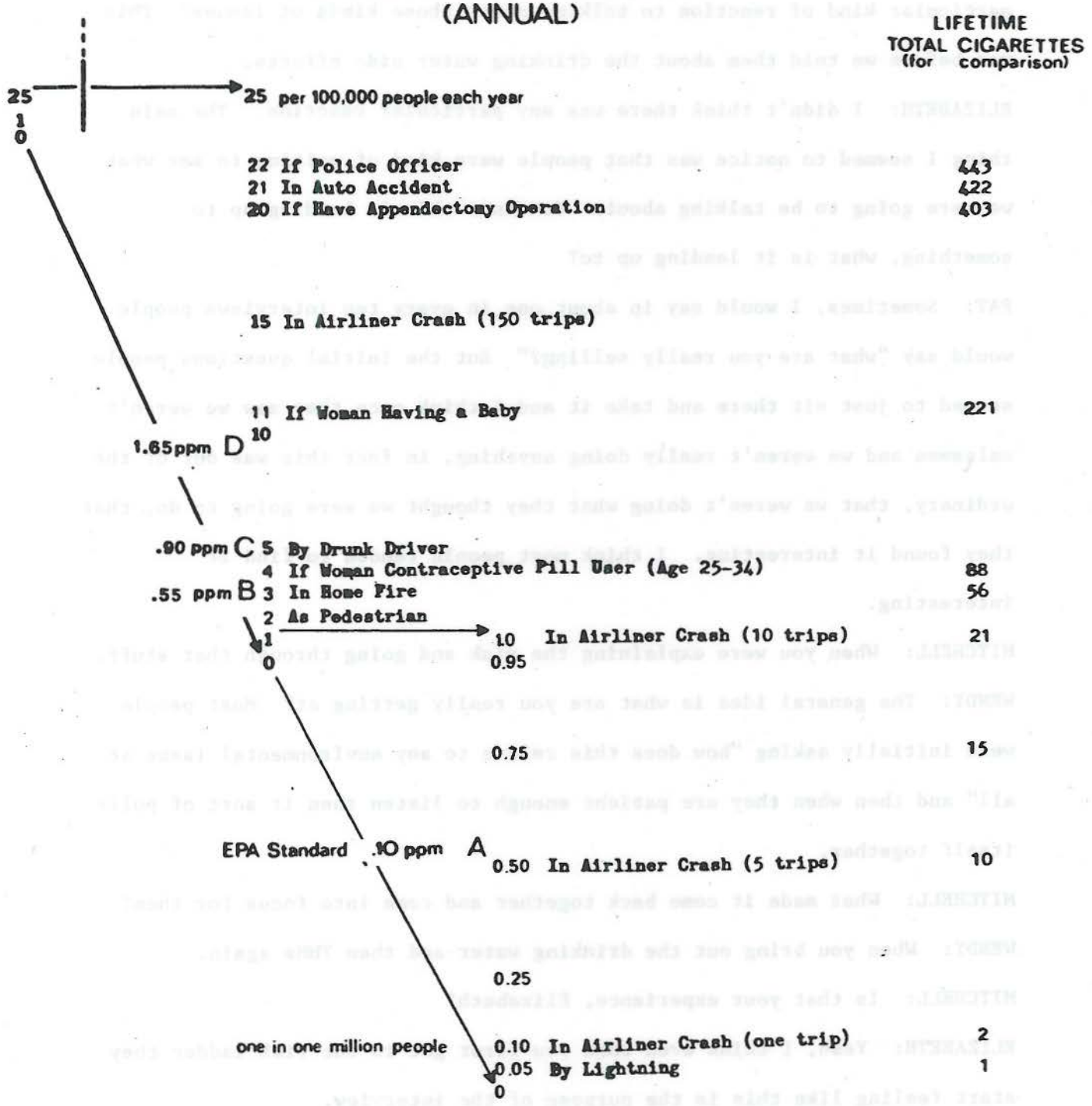


Figure E-2 RISK LADDER, PART D

D

LOWER LEVEL RISKS
(ANNUAL)



TRANSCRIPT OF HERRIN INTERVIEWER DEBRIEFING

MITCHELL: General -- The first one is "How did people react to the topic of risk?" When you began that part of the questionnaire. Was there any particular kind of reaction to talking about those kinds of issues? This was before we told them about the drinking water side effects.

ELIZABETH: I didn't think there was any particular reaction. The main thing I seemed to notice was that people were kind of waiting to see what we were going to be talking about. You know this is leading up to something, what is it leading up to?

PAT: Sometimes, I would say in about one in every ten interviews people would say "what are you really selling?" But the initial questions people seemed to just sit there and take it and I think once they saw we weren't salesmen and we weren't really doing anything, in fact this was out of the ordinary, that we weren't doing what they thought we were going to do, that they found it interesting. I think most people tended to find it interesting.

MITCHELL: When you were explaining the risk and going through that stuff.

WENDY: The general idea is what are you really getting at? Most people were initially asking "how does this relate to any environmental issue at all" and then when they are patient enough to listen then it sort of pulls itself together.

MITCHELL: What made it come back together and come into focus for them?

WENDY: When you bring out the drinking water and then THMs again.

MITCHELL: Is that your experience, Elizabeth?

ELIZABETH: Yeah, I think even when you first got to the risk ladder they start feeling like this is the purpose of the interview.

MITCHELL: Pat?

PAT: Yeah, I think Wendy has hit the nail on the head. There was a real (I wouldn't call it anxiety) but people were waiting, and in fact, they would ask, "What are we getting at?" I think that that sometimes worked against the interview, because people would get impatient and it was like you know what's there is just too much. It was like "what are you really going to ask me?" It seemed to me like things really didn't come together until you really got to the referenda question, or perhaps when you introduced the actual levels of the THM's for any hypothetical cities. Up to that point I think people were still very much questioning what the purpose of the subject was or where you were headed.

MITCHELL: Now, could we have taken out some of that earlier stuff, do you think? You can see what the information tries to provide.

ELIZABETH: I think that we could have had a lot of the examples that could be replaced by a question like "Do you understand what we are talking about?" and you know probing something specific to make sure they were getting it, and if they weren't then going into more examples especially when you go through each item on the risk ladder individually. It got kinda long.

MITCHELL: But before we get to the risk ladder. The materials between the first questions and what we were asking them about drinking water. That range of materials which introduces the concept of risk and relative risks, extra risk, etc. Could that material have been cut down?

PAT: I took the liberty of actually going through and editing the questionnaire so I have kinda (I don't know I may have the jump on Wendy and Elizabeth in that respect) but there were several places where I felt things could have been chopped out, but they may relate to other questions you are going to ask. Perhaps having to do with the cigarette equivalence.

I think that a lot of that descriptive material, for instance, didn't contribute because I saw so few people using those cigarette equivalence when they were going through and probing themselves and making decisions about how they perceived those risks. So it seemed like a lot of that was, even though it didn't take up a lot of the interview, there was at least one big jump, you know when you used card 5 on page 4 where we were talking about nothing but the cigarette equivalence. And perhaps on page 6 but on the flip side of that I probably got more responses either concerning cigarette equivalence when they were initially introduced. After that in particular and looking at the risk ladder very few people ever seemed to really use those for any comparisons. They found it interesting, you know, in what people commonly got, but ordinarily they would doubt you "I don't know if I really believe that." "It seems like you might have made this up." But past this point very few people really focused on that or used it or mentioned it. Maybe they were thinking it but they never verbalized and never seemed to use it in comparisons. So I begin to wonder sometimes in reading that or in mentioning that in the interview whether it was adding to it or not. The other big thing -- the risk ladder was a very powerful tool, I think that when you got it out graphically it was very good because people tended to look at it and I think they looked at it very critically so it seemed like a lot of description. Sometimes it seemed like people were shaking their heads because they had already looked. They could actually read the information before you could explain it. So they seemed to already have that in hand in reading it kinda seemed like "come on, let's hurry" especially people who were really keen and were probably the exception anyway. They tended to be ahead of me in terms of looking at that.

MITCHELL: Pat, you mentioned two things. One is the cigarette equivalence material was introduced early and something the people really didn't use and the second is that the risk ladder itself seemed to be quite powerful and self-explanatory. Let me check with Wendy and ask her about the cigarette equivalence. Would you agree with Pat that very few people used it and it is something that is redundant or is too much explanation about it?

WENDY: In general, unless I really made it a point to show them on the risk ladder that look here again you have the cigarette equivalence and these are associated with these different events on the left hand side of the column--unless I really made that effort to point that out again--very few people did use the cigarette equivalence.

MITCHELL: Elizabeth, what was your experience with this?

ELIZABETH: I agree with that very much. That nobody tried to give their answers in cigarette equivalence instead of risk per hundred thousand or I would say only about two or three people really appeared to go back and forth between the rest of the risk ladder and the cigarette equivalence.

MITCHELL: The purpose of the risk equivalence was to convey the low level nature of the THM risk. That is to say, for example, in a discussion group I was having trouble conveying the notion that the THM risk was very low and then when I mentioned the equivalence of smoking 10 cigarettes in a lifetime or something, they all of a sudden seemed to understand just how low the risks were and the larger scheme of things. Did they play this role at all? Or are you telling me the facts were irrelevant to people thinking about THM levels as being low?

WENDY: I think that people were more comfortable in understanding the low level risk if they had something to compare it with. For example, a woman

had had a baby and was on the pill, or something generally found out some other things on the ladder that were easier for her to understand than to go back and forth to the cigarette equivalence. It was sort of an extra, but not something that was very familiar to them.

MITCHELL: Then you can say that people did not really connect the use of cigarettes?

ELIZABETH: I thought they were useful when they were on Card 6 when you were going through the first examples. You know they got the idea that the low level risk was two cigarettes in a lifetime and that kind of thing, but once when you actually got to the risk ladder I don't think they paid any attention to it.

MITCHELL: Pat?

PAT: Yeah, I think the only exception I might feel to generalize on were people were--I hate to say they were cynical--but their were people who perhaps were always smokers, that did occasionally seem to focus on that. You know, they would say "that is crazy, I smoke two packs of cigarettes a day." They were very few and far between, but there were a couple of people who did use it and usually they were very obvious because they just laughed at the risk levels because of the smoking equivalence. But other than that, I would say that by far the majority of the people it just never seemed to come up. And like Elizabeth said, they tend to look at examples on the risk ladder like the risk of dying in a home fire or having a baby, being killed by a drunk driver, and whatever. They just, in particular when we do the actual referendums and when you definitely mention the cigarette equivalence people just didn't go "Oh, 40 cigarettes, that's not many, I could go for that." That just never happened. Intuitively you would think it would happen, but it didn't and so that is what I would

really judge on it--that in the referendum questions people just really did not verbalize that they were using that as a scale at all.

MITCHELL: OK. It seems like the rest of you are agreeing with that. Which is sort of what you have been saying. But just to make sure. The fact that the referendum questions people but you can tell does not focus on the cigarette on those cards.

ELIZABETH: Yes, that was what was my experience. Nobody mentioned them.

WENDY: I don't want to jump too far ahead, but speaking about the referendum question, are you going to talk about that later?

MITCHELL: Oh yes.

WENDY: Well, I will just wait and hold my comments until then.

ELIZABETH: I had one more comment on the earlier pages before you go into the risk ladder. The explanation when you start talking about low level risk--about being hit by lightening--people seemed to find this a little bit confusing because they were looking at the card and they couldn't find it on the card. It was like "Am I looking in the wrong place?" and then when you get down to the one on the card, the airplane crash, they realize, oh.

MITCHELL: Otherwise, when you shifted to the airplane thing then they connected to the low level?

ELIZABETH: Right.

MITCHELL: But the fact that the lightening wasn't there was confusing at that point on this problem of low level risk? Did people grasp the notion of low level risks, do you think? Overall?

WENDY: In general?

MITCHELL: Yes.

WENDY: I would say the people I spoke with did not.

MITCHELL: In what way?

WENDY: This gets back to my comments that I have on the actual decisions they made at the referendum. It is just that they said a thing about concentrations and numbers and concentrations in THMs and numbers as they were you know surface value and didn't really translate it to the risk of dying from that. They were just comparing the numbers without figuring the risks associated with it. So just the question of risk, I think, most people didn't quite grasp.

MITCHELL: OK. In other words, Wendy, when they were comparing .11 to .10 the difference between .11 and .10 wasn't very big. It just looks big. So in other words, focusing on that and the difference between .10 and .18 did not connect with different risk levels?

WENDY: Right. They were just looking at the numbers and they were not looking at the difference between them. And seeing that change was one of the things I had a hard time getting across to them. You know the actual difference in the cigarette equivalence or the number of persons per 100 thousand.

MITCHELL: OK, Pat?

PAT: It is kind of a tough question. Earlier I think when Wendy started interviewing we kicked this around a little bit and I think I even told you we talked and I thought maybe she was introducing a bias because she felt it was crazy and before even the last few interviews, I have been doing, I have kinda thought about it a little harder and I think that most people get it but I think there were other things that interfered with them valuing or not valuing and recognizing the risk levels. I think there were things like people just having a natural bias against the thought of something like water being contaminated. I think for some people it didn't

matter if there was any risk. I mean, if there was any risk, it was too much. And so I would say they might not have looked critically at it. I don't see how someone could have sat through that entire interview and not have had, you know, a good feeling for the way we were describing risk and in the end they could not have come away with an idea of how they could compare risk. Other than, of course, there were people who were either for or didn't care enough or just wanted to get through it so they might have made comments that they made just not giving it their best judgment. But all in all, I feel that most people understood the risk but whether they translated that into a personal decision of whether I want to assume that risk or not that's a different question because I think people didn't always do that. They would value it because of grandchildren and because it is just a bad thing to have contamination. They would value it because of a sense of social responsibility and intergenerational equity.

MITCHELL: There were not valuing levels but just risk generalizing?

PAT: Right, because I think in certain cases (and I would not say that is not necessarily always true) because if people didn't value it frequently they looked at it and they said "this is crazy, the risk level is so low I couldn't worry about this if I had to. This is ridiculous." And those people you tended to think really understood it. And other people you kind of questioned it. We have to question why did they value this given especially like on the A1 version between the two lowest levels of contamination. There you sometimes wonder how people discriminated, but some people did.

MITCHELL: Then what you are saying is those that took the zero dollars for it, did sometimes understand the low level nature of the risk?

PAT: Well, I sometimes got that feeling. But you know there were

occasionally people who looked at the cigarette equivalence and they saw that it was 40 and that was it. Their decision was made. Their were also sometimes older people who sometimes looked at it and saw their basic risk was off the scale and they realized that it was like they felt it doesn't matter to me. But on the other hand, the next interview might be an elderly woman who has grandchildren who might say "I know this might not make a lot of difference to me, but I would be worried about my grandchildren having to drink this water so I would pay more money for this."

MITCHELL: OK, the issue is whether people who gave zero dollars really understood how the low level risk really were or didn't they?

ELIZABETH: Well, in the first place, I kinda disagree with Pat and Wendy that the people who were willing to give money didn't understand. I thought that on the whole they did tend to understand and their value for it was based on other reasons but they understood the risk was not real high. Certainly the people who weren't going to give any money did seem to be doing it because of the level of the risk not because they didn't care whether the water was clean or whatever. Just that the risk was very low and that was the reason for their decision.

MITCHELL: Well, Wendy what is your reaction to that?

WENDY: I would agree that the people who did vote no either said that they were on a fixed income, and absolutely could not afford it, or that they did understand the lower level of risk.

MITCHELL: Elizabeth felt that those who did value it did so for various reasons. Would you agree with that? That they did understand that there is a low risk and went ahead and valued for whatever reasons?

WENDY: I am not sure that they really grasped that it was that low a level. It seemed to come on more when you go to the center of the referendum and it was like increasing you know the difference was increasing, they just upped the money without really discriminating and trying to decide on a real value for that money use.

MITCHELL: Pat, how do you react to the idea that people gave money did understand the low level of the risk, but for whatever reasons gave money for it?

PAT: I would say that there are definitely people who understood it because I would say that some of the more intelligent people who certainly were a little more critical of the entire interview and the information we were giving them valued it. But I would say that this might be something you might be looking for. I think that looking at the B interviews shows that it was better than the A interview perhaps except that I say that because people with discriminate had the highest level and with B interviews in particular people who, I think, really understood it and valued it were really looking critically at trying to find that point where they would draw the line. They were certainly looking at the risk critically enough that they were looking to draw a line somewhere and now that I think about it, A interviews, it happened a lot at the C and D level where the risk doubled. I sometimes wondered if we weren't introducing that by saying "Well, if this D level was on a ladder it would be twice as high on a zero to one scale." But on the other hand, I think that it helped people see it. But I think there was a line and that brings up a point--those lines between one and two where we separated the scale and where we separated is something we will talk about a little later--between 25 and 26 those places where people tended to pull numbers. Maybe that is

something you may want to kick around either that or the data that people drew lines at those points because the scale shifted on the bottom.

MITCHELL: OK, that's the most useful thing. Let's make a note of that.

ELIZABETH: I have some other point I want to make about the valuing of these two questions. I thought that they had some problem particularly when they get to the point when we are saying "where should we put the standard." We seem to concentrate when we were talking about the change when we are telling them about the number of parts per million rather than the deaths per hundred thousand and then when you ask them to put it on the scale of 100 thousand a lot of times they confused the parts per million numbers with the actual deaths per thousand numbers and thought the parts per million numbers were deaths. So that you know the lowest level was .1 death per hundred thousand whereas it was actually .1 parts per million.

MITCHELL: Of course on the scales it shows the two are side by side.

ELIZABETH: Right.

MITCHELL: Did the rest of you find that?

WENDY: Yeah, I did. What Elizabeth said.

PAT: I would say that something that I was kind of careful with because and I think that was a problem with the questionnaire and something maybe we should have talked about changing. Something I actually started doing in the last interview because I think Elizabeth is right that the way it was written people tend to see those numbers, but when the referendum questions were up I frequently also mentioned the risk per 100 thousand as well as the cigarette equivalence and I think it might have made a difference as well as the mention of the PPM and the cigarette equivalence in the text. But I frequently would say "you know the risk equivalence in terms of 100 thousand is this" and I think it did make a difference because

I agree that the parts per million were not what they were really focusing on other than that gave them the scale of contamination but I think that might have drawn them away from concentrating on the risk perhaps.

ELIZABETH: Yes, because the number of deaths per 100 thousand for those levels didn't show on the risk ladder. The only number that was associated with them on the risk ladder was parts per million and a lot of times they unconsciously started to answer "where would you put the above?" Say for A2 when you ask them about 90 parts per million down to the point .1 you know the 1.65 and then you ask them where would you put the level, they tend to say "Maybe at 1" whereas actually they would have meant at 3.

MITCHELL: I see, so when you ask them where they would put the risk level their answer sort of revealed what they were really thinking instead of recording PPM and risk level.

ELIZABETH: Yes.

WENDY: That is what I feel, they do concentrate on the parts per million and not on the actual data.

MITCHELL: Elizabeth? Comment.

ELIZABETH: I felt that it might have been clearer for them if we had the numbers of the deaths on the card with different levels rather than the parts per million. Because they have been thinking all along on how many deaths per hundred thousand and then when we introduce the parts per million we tell them but I don't think they caught it. You know that you were switching scales.

MITCHELL: For example, on card 9, if we just had eliminated the THM's? On the cards on the risk levels?

ELIZABETH: No, that was fine. When you had both of them on it, it was o.k. It was when you got to part C or D and you only had the parts per

million although it was on the scale. They didn't really pick up the actual numbers that equated with the deaths. They kind of uncritically took the numbers from the first parts per million as the number on the scale.

MITCHELL: So one way to get around that might to have been to highlight the risk levels and not the PPM levels?

ELIZABETH: Right.

PAT: I think also A, B, C, and D were pretty effective. I think that without the levels of THMs that just A, B, C and D would have worked pretty well also. Exclusive of the PPM.

MITCHELL: OK. One thing about the low level risks. They concentrated, or a number of people concentrated, on the PPM levels, etc. And yet Pat you said that they on Version B search around more and that those levels seemed to be higher or people perceived them as higher.

PAT: It seemed like the intervals on the scale, you know, just looking at the risk ladder and the position of the different levels of contamination, I think people just tended to see gaps there. It was obvious, I think with a lot of people, that A and B were so close they were overlapped where the difference was tiny. And even up to C, I think people did a good job, but between C and D we changed scales and people perceived that as a difference. You know, a big jump. And in fact, it is kind of a big jump. But I think on the B scale people tended to be a little more discriminating. You know, they tended to look at it and kinda -- it was a little more difficult to say, you know that going from C to D is too much or that from B to C.

ELIZABETH: I thought too that possibly it was because when you got to the B scale on card D you had other numbers to compare to, like the risk of

dying in the home. But when you are on the C card the A level for the first three you don't have anything else in there for them to say "Well, you know this is like the risk of being hit by a drunk driver."

MITCHELL: Right, and we do have, of course, the airplane crash business. Any comments on that?

ELIZABETH: Well, but see that is above C. That is not between B and C. So they don't have anything. It was like there was 5 the airplane crash below A and then you have A, B, C and then the next one and then you come to the next example the pretend airplane crash. But there are no examples in between.

MITCHELL: Right, they have to extrapolate.

ELIZABETH: Yes.

MITCHELL: And of course the cigarettes were inserted there but as you say many people didn't tend to focus on that.

ELIZABETH: Yes.

MITCHELL: When people got to varying the levels, would you say they focus, because it is important, they focus on PPM's but they didn't search at least on the lowest level. But they didn't search around on the scale to fix themselves on cigarettes or airplane crashes, or whatever.

ELIZABETH: Well, I wouldn't say they focused on the parts per million, but they focused on the number that was the parts per million, but they didn't focus on it as parts per million.

MITCHELL: But they didn't connect that with risks and such. Unless they singularly saw it as deaths per 100 thousand.

ELIZABETH: Yes, I don't think they managed to pull those numbers in with the numbers that are on the deaths per 100 thousand in any kind of comparison.

MITCHELL: Other comments on that question?

PAT: I would say, in general, I did not have people articulate that they were not seeing that number. I mean, they weren't saying "like o.k., so the risk is 1.65." I didn't have people say that. I don't know, and if it did happen, it probably happened very rarely. I don't think people were making decisions because they were looking at those risk levels for the most part in terms of the interviews I did. Although I think Elizabeth is right that it cluttered the card that there were people who initially, I mean by the time they got to the referendum question, I think they were discriminating well enough and weren't making that mistake. But certainly initially I think that card 9 was pretty busy. It was just too much with the THM and the risk levels and cigarette equivalence. It was helpful because there was so much information, but for a lot of people they were having a hard time seeing what might have been, the most critical information on it.

ELIZABETH: Where I thought that their confusion showed up was not in evaluating the levels when we were doing the referendums, but when we got past the referendums and asked them about the moving the standard. That is where these numbers confused them.

MITCHELL: OK. Let's look, hold that one if we might. It is a much less important question in the interview and .

Where the value that the people give and what they mean is actually crucial to how I interpret the results or deal with the numbers that you got.

On the risk ladder question the problem of looking at the bottom of A and meaningfully differentiating what are low level risks. So we draw B which draws down 25 to 1 and 1 to zero. How well did that work in the way of setting up the basis for talking about low level risks in the context

of larger risks? What problems did we have with that?

ELIZABETH: I thought that it helped them see that those were low level risks. But I also think that the risk ladder itself guided their answers a lot. That people tended towards any numbers that you asked them from ones that were actually on there. Like they would say (when you were asking them about the plane and train) 22 or 25. Nobody said 23, because 23 didn't show up on the ladder. You know, it wasn't actually printed on there.

MITCHELL: So if we had had risks for each of those points on the lower level it would have helped people.

ELIZABETH: Even if we had had numbers for each of the points it would just help some of them. The risks might have made a difference.

MITCHELL: I see. It occurs that it could have been a little more precise.

ELIZABETH: Yes.

MITCHELL: Typically, a little hard to deal with. Do others of you think that would help to have the numbers up and down?

WENDY: I think so too. Because they were just seeing the one example and taking that number.

MITCHELL: What about on the very lowest level? Where we simply don't have any examples? There aren't any examples really that are reasonably neutral that we could use. But if we had the numbers up and down would that have helped there?

PAT: I don't know. One thing I would like to say also is I agree with Elizabeth that I think people who would say (and this came up on the plane, train question). It was like 25, 80, 200, it was like there was actually an interval there where no one would pick numbers. So I think that is definitely something that people focused on the examples that were there.

But one of the comments, and this is kind of the same thing you were saying, there weren't examples. Perhaps you could use between 0 and 1 and I think something that might have complimented all the discussions on the risk level would be to have a risk similar to drinking water risk. You know, such as drinking six cups of coffee a day.

ELIZABETH: Or possibly some other cancer causing agent.

PAT: Right. Something that is more like drinking water. Sometimes people were treating water as different than driving a car or being a policeman or having a baby, because very day you drink water. And even though every day you might get in your car, it still seems different because you feel like you have control in a car. You know people say "I have been driving all of my life and I never had an accident" or whatever, but water is different because there they have no choice. It is like when you turn that tap on its right there.

MITCHELL: That was the purpose of the cigarette equivalence, to provide precisely such a scale.

PAT: Right, unfortunately they didn't see it that way. They just didn't perceive it that way.

ELIZABETH: It may just have been somewhat the physical set up of the card that the cigarette equivalence was off to the other side and they weren't actually on the scale.

MITCHELL: But the issue is they paralelled it someway.

ELIZABETH: Right, it might of

MITCHELL: It might of biased the answers. At least for some people it might make the risk unacceptable just because some cigarettes are equivalent even if it is only 10 in a lifetime.

WENDY: You know it was more the exception definitely the exception to the rule.

MITCHELL: That physical change might have really helped. Other reactions to this comment?

WENDY: I was thinking that maybe right next to the example how many sugars would this be? You did lose them. They didn't follow. I didn't follow the cigarette equivalence.

PAT: I think that that may be true. But I think one other thing about the cigarette equivalence was some people didn't smoke but were adamantly against smoking. Any cigarettes were too many. They saw a cigarette scale that said 2 and that was helping to make their decision right away. They would say "I am definitely against cigarettes smoking" etc. So for some people, I think they made the decision on that bias. I can think of a couple of interviews here I am pretty sure I noted that comment.

MITCHELL: You mean any kind of

PAT: Yeah, smoking worked against, I mean it was like as far as I'm concerned any smoking was bad and wrong and I don't

ELIZABETH: Smoking is evil, and anything that is equivalent to smoking.

MITCHELL: Elizabeth, you said that you met some people like that?

ELIZABETH: A few. Generally middle-aged people tended to feel like that. The retired people didn't seem to be so adamant anti smoking. But there were some younger ones who were very much against the idea of even having tried a cigarette in their lifetime.

MITCHELL: That would have made the risk and tended to bias the findings if they would have found the risk unacceptable.

ELIZABETH: It is possible. I think from my examples, it wasn't so much that (again they weren't really following through with the cigarette equivalence) I thought. So a few people kinda tended to react to it but I don't know that they actually remembered that when they got to making a decision.

MITCHELL: I see.

PAT: I agree with Wendy that I can remember that there were only two people specifically who just, I think with those two people, I think it might have influenced their answers somewhat.

MITCHELL: OK. So it is a small number of people, but if they could be identified then you know one could rule their anwers out on those grounds. But generally speaking it wouldn't. Your impression is that it wouldn't bias the answer, for the most part.

WENDY: For the most part, no.

ELIZABETH: I think that Pat's suggestion that people don't see smoking cigarettes on the same level as drinking water. It is not like something that you can easily avoid--drinking water. So that example might have been some kind of preserative in food or maybe saccarin. You know something that you could not easily avoid.

MITCHELL: In regard to the sheer physical form of the risk ladder (parts A and B) getting the numbers. Are there other changes you recommend, or, to put the question another way "Is the basic form promising?" As a way of describing the low level risks.

WENDY: I think that some people had trouble seeing once you broke the 25 to zero down seeing it as a continuing scale that continued. They looked at this as something separate than the left hand side of the card (Card A) and I think that they lost perspective of where the basic risk of dying was and where the smoking one pack of cigarettes a day was. Even though the card was open and they could see both sides at the same time, I think that they lost the perspective that that was so many times greater than you know being hit by a drunk driver.

ELIZABETH: Although putting them on the scale probably would have confused the numbers much more.

MITCHELL: Could you make a guess as to what percent of the people had that problem, Wendy?

WENDY: What percentage?

MITCHELL: Yes, was it everybody or a few or any number.

WENDY: I would say a few. I would say at first when you showed the other side of the card that everybody sort of lost perspective. Some people were able to put it back together and see the card as a continuum but others could not. But a few who really couldn't had trouble grasping the main ideas anyway.

MITCHELL: Elizabeth, what was your experience with that?

ELIZABETH: I thought the basic form was good. Possibly an addition of some kind of line from the left hand 25 to the 25 on the right hand side. So it looks like its bottoming out and it is physically attached to the other side.

WENDY: Or maybe above and below it kinda folded out longer rather than being side by side.

MITCHELL: I see. You could fold it out and look down and then attach with an arrow.

ELIZABETH: Yes.

MITCHELL: Pat?

PAT: You know it seemed when you brought it out people like it. People tended to really study it. They really studied it. Graphically I think it worked very well and I don't see how we could have done this without an aid like this. I think that what they are saying is very true also. That because graphically (next time maybe you should consult a graphic analyst of some kind) because they maybe could have clued us in on that. That when you separate that scale you know people practically ignored the initial

risk ladder and I think that some place that really reared its head was, once again, on the train and plane question. Because unless you really almost told people "Please consider the entire ladder" they were just looking at that 25 to 0 scale. And they would initially just start looking there for something they could use for comparison. And it is like you know "Please, consider this." I think there is a lot of truth to that, people didn't always look at it as a whole.

ELIZABETH: I think another addition that might have helped to draw them back to the left hand side might have been a few more examples on that you know like once you get to 300 there is no more special risks listed. So if there was a little bit more going on there for us to look at they might have tended to go back a little bit. Go back and forth between the two. It is like on the plane and train question, it is pulling out a number as an example. They are not going to give an example higher than 300.

MITCHELL: Right, How about the examples that were on the risk ladder? Did anyone have any problems of bias or reactions to that in any way that might have contributed to different levels of risk?

PAT: I don't know, you know in terms of people commenting, I think they tended to take this at face value, Robert. I think that a lot of people not knowing what the numbers are when they looked at these things said "Oh, that is interesting, I thought that was higher or lower." There were very few people who tended to question, the numbers that were on the

Side 2:

ROBERT: As you were saying Pat, I gather you didn't find any. What was on the card people took at face value? They didn't seem to react in the way

that was harmful to the interview situation.

PAT: Nothing other than interest. You know people just "Yeah, that is kinda interesting."

MITCHELL: Wendy?

WENDY: Yes, I agree with Pat that people did like the look of the card and didn't have any trouble with the examples on it. Everybody did seem to find it very interesting.

MITCHELL: Elizabeth?

ELIZABETH: The only bias that I think existed would be that a few people I ran into who were officers or firemen who tended to say "Well, you are right, police and firemen face risk all the time. I believe these other ones are less consequential to me." Other than that, I thought even people didn't really identify (even with the airline crash) the number of trips and saying "Gee, I fly, you know, a hundred times a year." They didn't do that just specifically the police officer mainly and the fireman were the, I thought that any one I interviewed reacted because of that one.

MITCHELL: Generally, speaking, on the levels of B, did people see that as sort of an acceptable risk level, you know not extraordinary? How well did the people understand the notion that we all face risk and these are levels that different people face and this is not extraordinary?

ELIZABETH: I thought that they accepted it pretty well. The only thing was they were surprised at how they were in comparison to each other. Like the home fire was so much lower than having a baby. People tended to say, "I don't know anybody who ever died having a baby."

MITCHELL: So what you are saying, the ladder seemed to work well and people were interested in it but when they mapped the accept standards onto the ladder they just went away from the ladder. Getting back to what you

were saying before.

ELIZABETH: I think they were still tied very much to the ladder and the problem was that for the A series, they didn't have the comparisons on the ladder to pull comparisons from. From the A, B, C on the A. There wasn't anything there and they tended to identify with the examples that were on there.

MITCHELL: Is it possible with the A one that people were just valuing, as I think someone suggested earlier, some risk (low levels), extra risks and find it very difficult to meaningfully discriminate between the acceptance because one was higher than the other, etc.? Is that possible? Do you think that is what was happening on the A?

WENDY: I think that is what happened, because between C, B-C, what kind of risk would fall in there? What would happen to me, what would I have to do to have something familiar to me? So they noticed that the levels were increasing, but they couldn't tie it to anything that could possibly happen to them. So they just noticed that the increase in concentration and not really the risk itself.

MITCHELL: Other comments to that?

PAT: I don't know. I agree, I think that examples help because based on people kind of articulating that and in that section of the ladder between one and zero with so few examples it is hard to say. I think that it might have influenced a little bit, but I just don't remember them ever asking, I don't know, I just don't think, I don't know if it would have helped. It probably would have.

ELIZABETH: Like just one example in between B and C.

MITCHELL: What if I had done airline trips on the right hand side there, not just having 9 and 10, 6, 7 or 8 or 9?

PAT: Yeah, I don't think that would work.

MITCHELL: Elizabeth, do you think it would have worked?

ELIZABETH: No, I think it was just like Pat said, an example. People do not tend to say "Well, here I'll use this example at the 10 trip level." They would pick something that wasn't similar to when they were picking out an example to refer to.

MITCHELL: This was an attempt to introduce just another metric here. The number of airline trips, cigarettes, etc. The problem is when you introduce the risks that people may react to the particular event or risk itself. If they have a concept that finds that their to another scale is meaningful like an up and down scale. What about the connection of the EPA level? Did they understand that it did involve some very low level risk or did they tend to put a zero here?

PAT: I think people saw that as having a risk, and it was as if many people--one of the things that did inhibit decisions with many people was the installation of equipment that wouldn't have lowered beyond that level--to zero perhaps. Or people who looked at that in kind of, comes back to the question about standards and how people interpreted it. Undeniably people just said that risk level is ok and will say "They must know what they are doing when they set those levels of risk." But I think people accepted it and I certainly think they understood that there was risk involved with all of those levels of contamination.

MITCHELL: Wendy, what was your experience? Did any of your people confuse that with their risk?

WENDY: Nobody came out and said that but I get this feeling that people did reach values that way because, especially those people who say "I will pay anything, just give me clean water." But they may assume that it will

be perfectly clean and I think people did say, in fact, there would still be some risk associated with that.

MITCHELL: They would pay for a slight increase, I would ask. They were focusing on a point there was a slight increase in risk. There were already taking a risk and that was a slight improvement.

WENDY: Right, I think that they assumed that they would pay as much as they possibly could and the risk is definitely zero.

MITCHELL: Elizabeth, what is your experience with these levels of risk?

ELIZABETH: I think generally they thought they realized that there was risk there but again going to the change in the EPA standard question just like one or two people wanted to lower the standards. They would go down the risk ladder. Either it was all right there although they were willing to pay to go back to .11 or .10. They would still say they think the standard is all right. I think it was just them not looking at it quite critically enough when you get to the very end of the interview.

MITCHELL: And also the legitimacy of the EPA?

ELIZABETH: Yes.

WENDY: Yes, these are experts and they must know what they are doing even though they voted to increase their water bill previously. They just didn't want to touch it if someone said this is how it should be.

PAT: That was perplexing because you would have thought that many people would have changed the standards, up to that point they were giving every indication that they thought it was too low or too high and then when asked the question, it was like "They know what they are doing. I don't know anything about how they do that. So how could I..." and even people I really pushed sometimes would say "Well, when they make a decision they used data just like this, they have risk levels and that is how they make decisions."

See, people would say even then frequently like "Well, you know they must be doing other things " so it didn't really make, no matter how hard you seemed to push it was really hard to get people to value that change. Even those we thought would do it.

MITCHELL: OK. Let me summarize what we have been saying in this area that people meaningfully used the EPA standard as base and worked from that. Is that what you are saying?

PAT: Yes.

MITCHELL: Fooling around with the standards was beyond their ability and comprehension to set it at different levels stretching their ability too much.

ELIZABETH: I think that is particularly true for someone that you thought would lower the standard. I think they tended to be kinda like "Yeah, there is risk, but there are others, the risk of being hit by lightening. Things on the level that you really can't do anything about and its not really gonna happen to you", that kinda thing.

MITCHELL: Ok. The third thing would be most people did see the EPA standard as involving some risk somewhat unavoidable--as involving some unavoidable risk. We have been going on for a little over an hour how about a five minute break and then we will pick it up. I will leave the phone line open. Turn off the tape recorder Pat and I'll start talking again in about five minutes.

MITCHELL: Let me just get back to another question. These are overall questions about the questionnaire. What is, apart from the necessary wording basis, comes the logical progression of the questionnaire work? In other words, going from, you know, from risks, in general, to drinking water and the step by step thing? Did it progress logically in a way that made sense to people? Was it workable?

ELIZABETH: I thought, on a whole, it was logical. It might have been beneficial to add somewhere if you asked about the first three questions about the different scales. To give them some kind of more specific statement where they are headed because I felt sometimes people weren't paying as much attention as they might have if they knew where we were going because they were trying to figure out where we were going.

MITCHELL: OK. Where would this be on the questionnaire more specifically?

ELIZABETH: Page three before you give them card 4.

MITCHELL: What do the rest of you think of that idea?

WENDY: Yeah, I would agree with Elizabeth there is a sentence that we will be coming more to drinking water risks. To go further on that and explain why we are setting them up to understand risks at all and then give them the next card.

MITCHELL: Pat?

PAT: I absolutely agree. It was four pages before you reintroduced the idea that we are really to be speaking about, or asking questions, about risks and drinking water and it was--there were people, I think, who were kind of temuous there for a couple of pages. They were just kind of going "What are we really doing? What are we really doing?" And you say "pretty soon you will know because we will be asking you some question and just filling in general information you have to have." But I very much

agree that it is something that definitely defines the purpose of the interview early on and probably would have contributed greatly to capturing the respondents attention and also be something that would have helped to give them some sense of direction for all this information. Because we talk a lot about risks and then it seems after the fact here is drinking water. I don't know--it makes logically sense--but somehow here I think it would have helped to clue people in that this is very important information and that understanding this will allow them to answer questions later on in the interview.

MITCHELL: OK.

ELIZABETH: The struggle is to find some kind of framework that you can use.

MITCHELL: If they had more framework they might have paid more attention to the material

WENDY: Plus, we say that we are going to interview them and ask question and then the next 20 minutes we just talk to them aside from a few questions, like "Do you have any questions?" and "Do you need explanation on the risks for the few examples," but they needed more of a chance to respond and to keep their attention.

MITCHELL: OK. Next now is the wording itself, in general. Could most people understand the wording in the questionnaire, or did it go over their heads in some places?

PAT: I felt that it read very well. I never had people (maybe a couple of places where it was awkward wording, like the stuntman-police risk, there is a place where you say "the risk of dying while doing stunts like the Hollywood stuntman" (a pause of course), the pause was really important to make it work and then as the policeman, officer, etc. There were places

like that where perhaps it gets where you were reading perhaps too quickly, too fast where you really had it down well. Overall, I never had people stop me "Well, what's that, I don't understand what you are getting at." Other than the fact that they might have been wanting, like Elizabeth said, to somehow frame all this information so they knew what was really going on. In general, I felt that it read very well. Other than, like Wendy said, it was too long. There were places where you lost people because you were reading and reading and there were no questions, no interaction. Which is kind of a preliminary problem we had months ago when we were just beginning to field test it. You felt like there was too much reading. It might be that it wasn't too long, but too much descriptive material with too little interaction.

MITCHELL: That is another issue.

PAT: Yes.

MITCHELL: What you are saying, Pat, is that as far as the wording went it did seem to be understandable and it flowed along reasonably well. Apart from the other problem? Is that correct?

PAT: Yes, I thought it read very well.

MITCHELL: What is your reaction to the reading part of it, Elizabeth? On how people comprehended it?

ELIZABETH: I thought on the whole it was fine. There are a couple of spots that were bad. Question 4, I thought, tended to be a problem where you asked, you don't ask them, but you are saying "Do they have problems identifying extra risks?" I felt like it was about a 50-50. Either they felt like they got it the first time or they needed further explanation and I think that is just because of the way the question was worded. They were not quite sure what you wanted them to answer when you asked them "What is

the extra risk per 100 thousand," and people, I would say, of the 50 percent who needed further explanation, it was just that they didn't tell you the number, they told you the dollar amount. It was just a little unclear.

PAT: This is something that I--I really think all the insurance premiums should have been dropped myself. I really think that it just added nothing. People never focused on it, they never asked questions about it. It was something that was there. I just never had people comment on it and it really was a pretty good jump of reading in this initial part and because it was after this point, it was never really used again. It just seemed kind of superfluous. I think it could have been used to streamline it or perhaps something else could have been included. I just don't think that it made any difference.

MITCHELL: Wendy, would you agree about the insurance premium?

WENDY: Definitely.

MITCHELL: What about the wording in general? Did it seem to be fairly clear to people aside from these other problems?

WENDY: Yes, the comprehension everybody seemed to have, you know, understanding well. In fact, just a few spots where there were minor words. But overall, people understood.

MITCHELL: OK. Let me illustrate a comment. Kind of on the other parts, but let me move on to some other things. Thinking about the values that people gave, would you say that most people were giving meaningful answers to the valuation question or were they guessing about something they really didn't feel like they knew very much about?

PAT: I think a little bit of both. I think some people... I think that the fact that some people scaled it against...almost all these people scaled it against their monthly bill. Like "I would pay one more dollar on

my bill, or $2 or $5, $10," or whatever and so I think at that point they were thinking without us really initiating that. They were definitely thinking in terms of a monthly bill and almost no one would just, off the top of their head, give a yearly number. They would say, "Oh, my bill is $9, I could give a dollar a month more," or something like that.

MITCHELL: OK. Let me look at that one, Pat. Did the rest of you have that experience? Where people were aware, particularly about the amount of the implications for them?

ELIZABETH: I agree with them, particularly about the amount. I did have a lot of people who gave an annual number, but that may have been related to the monthly figure in their head and instead of saying $2 a month, they said $25. But not as much as Pat had the monthly figure.

MITCHELL: Did people seem to take their income and other monetary constraints into account in giving their amount as far as you could tell?

ELIZABETH: I think the only element of guessing on it was that people were concerned with how much it was going to cost and if they get an idea that it was going to be extremely expensive to reduce their level, they might have given a slightly inflated set of values. Not that they weren't willing to pay that, but they wouldn't really expect, once they found what it really cost, they wouldn't expect to pay that much.

MITCHELL: Let me see, what we are aiming for is for people to give the most that you know, whatever the difference was worth to them? Are you saying they were giving less or more?

ELIZABETH: No, I think that they were doing the amount that it was worth, but that had they had the information about how much it would cost that they might have decided it wasn't worth that much. You know their portion of it.

MITCHELL: I see.

ELIZABETH: There was a little bit of an element of guessing there that they guessed that it would be expensive and this would be in proportion.

MITCHELL: Was it that people tended to give amounts that was geared to what their income, etc. was?

ELIZABETH: On the whole, yes. There were a few people who were, throughout the interview, saying "They think that it is important to reduce these levels." They feel that you are exposed to so many of the risks that if you can reduce them you should, and would give more than their income would lead you to suspect. But on the whole, it was pretty much scaled to income.

MITCHELL: Did the people tend to give you monthly amounts instead of relating directly to their water bill or not?

ELIZABETH: I would say about half and half.

MITCHELL: OK, more like Wendy's then Pat's in that respect.

ELIZABETH: Well, it sounded like Pat's were more toward the monthly.

MITCHELL: With Wendy it was fixed. I gather.

WENDY: I haven't said anything yet.

MITCHELL: Have we said it all, Elizabeth?

ELIZABETH: Yes.

MITCHELL: I thought Wendy has spoken before. Let me shift to Wendy. Is that your experience with people giving an estimate?

WENDY: Definitely the majority of my respondents equated to the monthly bill and then tried to compute it to a dollar a year figure. That was definitely the case.

MITCHELL: And they were giving an amount that was meaningful to them not just...

WENDY: Yes, but that is what takes me back to the risk thing and makes me wonder if we were just really evaluating their income. Did they really tie it again back to the risk instead of studying the amount based on their monthly bill and their income as it was independent of the risk. I keep bringing that up, but I think that is what I saw most often.

MITCHELL: Yes, that has been registered and these are really two different issues. One is what exactly is there to evaluate. Some improvement in risk level vaguely defined where you know a precise improvement as was intended in the questionnaire. You can see what I mean. Did they really understand the risk levels that are involved? Apart from that in valuing whether it was the precise risk level or a vague improvement there is the issue whether they were considering giving meaningful amounts, you know random amount that came to their heads.

WENDY: No, I think people did give meaningful amounts. They did look at what people were realistically paying and I think people thought about that and considered that.

MITCHELL: If we interviewed everybody next month, which we are not going to do. How many people do you think would give us quite different answers? Or do you think they would tend to give pretty much the same answers?

PAT: That is a tough question. I have some confidence that most of the people who were giving money were giving all they thought they wanted to give or would give.

MITCHELL: Would they give the same amount or would there be a lot of variability there and uncertainty and they might come out with a different amount the next time around.

PAT: It makes me think about a guy I interviewed near the end of my interviews I have done. He says, "This is a hypothetical study, right? I'm

going to give you a hypothetical number." It was human nature and he was hitting at the core of the problem with asking questions like that anyway. I don't know what would the variance be on something like that, the standard deviation. It think its pretty hard to say. I don't know. I think it is just guessing about it if you say anything other than I felt like most people who gave money were being pretty honest. Although there were also people who just kind of $25, $50, $100 and didn't really give it a lot of careful thought.

MITCHELL: What proportion of the people were sort of like that?

PAT: One tenth, I would say at the most. I found fewer people who seemed to be that way than those who gave it some thought and really "Oh, my water bill is this...I will give a couple more dollars." There were also people who said, "Well, there is a hundred fifty thousand people on the Rend Lake Water District. If we all give a dollar a month that would be over a million dollars a year." There were people who did that too. They looked at it that way, you know very logically. And said, "You know, a dollar a month is a lot of money for everybody." So it depended a lot on the individual perspective in their thinking. It would be tough to say.

MITCHELL: Elizabeth, do you think people would tend to give the same amounts if they were reinterviewed, or would it vary a lot?

ELIZABETH: I don't think it would vary a lot. I think most of them would stick pretty much to..I think they based their amounts on their income and that while they scaled between the different referendums, they based it on the risk and changes in the risk levels. The number they started out with was based, you know, like say the first one you asked them they said "Well, I will give $2 a month more, $24," and for the next one as it went up they said "Well, maybe I'll give $40 or $50." So I think they would tie it to

their income unless their income had changed, they would stick pretty much to what they said.

WENDY: I think people would not change their answers very much. Especially the people who came to their decision logically and really thought about it. There might be a little variance but if they went through the same thought process then I feel that most people would give about the same answers.

MITCHELL: Just for an estimate, what percentage gave a quick, casual answer, like Pat mentioned?

WENDY: I would say about the same, 10 percent.

MITCHELL: OK. How much of a problem do you think we have with people who gave amounts for these risk improvements because they felt that was what we wanted them to say? That we wanted to get people to do that, they were sort of pleasing us? Do you think this was very much of a problem?

WENDY: No. I don't think so. In the interviews that I did, I didn't find that was a problem at all.

MITCHELL: People, if they didn't feel it was worth it, they were free enough to say that?

WENDY: Right.

MITCHELL: Elizabeth?

ELIZABETH: I agree I didn't think it was much of a problem. Maybe one or two people.

MITCHELL: Pat?

PAT: I also feel that people..I had a couple of people that asked me what it was worth. They would say "Well, what do you think it is worth?" Just like, "Well, tell me what it is really worth so I can give you the right answer." But they were few and rare so I don't think that we were not

introducing that kind of a bias although I still think there was that group of people who did it because it was the right thing to do -- to vote yes for environmental qualities. But that is kind of different than, I think, us getting that out of them. On the other hand, because you were asking the question, you kind of, I think some people kind of interpreted it as "If I don't say yes then I am doing something that is not right for humanity."

MITCHELL: How much of a problem do you think we have with people who exaggerated how much they would really pay because they thought their answers might encourage the city to do something about the THM risk?

ELIZABETH: I don't think that entered into it too much. People didn't seem to really expect us to be feeding information back to water districts at all I don't think.

PAT: I agree. I don't think people played with the answers because of that at all. At least there were no clues that I would tend to make or believe that they played with the answers because they thought that it might coerce some agency into changing policy or whatever.

MITCHELL: Wendy?

WENDY: I agree. Nobody did have that intention at all.

MITCHELL: In the interview we gave a lot of information about things that included specialized payments on their water bill, risk levels, information about risk, information about THM, THM risk levels. We described the referendum and certain things that we wanted them to take into account in the referendum to be used by the authorities, etc. What if any of these elements were changed or new information was added? Is there any kind of information that if it was changed you think the people's answers would have been very sensitive to? Does that question make sense? With the

exception of some particular elements that require these things in scenario, in other words, describing a scenario for people, giving them information about risk, the ladder, etc. If you fooled around with certain things, certain elements, do you think people might have reacted to and that it would change people's answers or would be likely to change, to give more money or less money. If the circumstances that we described to them were altered.

ELIZABETH: I think that the assumption about the authorities agreeing that it is not a high enough level to worry about, if you changed that it was a concern. You know something like that that people would have tended to give more money. But not everybody.

MITCHELL: OK. Pat, do you have anything to add to that?

PAT: Looking at the assumptions, I would agree in part with Elizabeth there and I also think that in the first assumption if you were changing the taste, odor and color of the water, for some people that might have been important because I know I had people who would say, "If all you are going to do is eliminate the THM forget it, because it is just not enough." Even as they were looking for, if they were going to invest money in equipment they want equipment that would really do a lot.

ELIZABETH: To do something identifiable.

MITCHELL: Wendy?

WENDY: I think that maybe if there was an example close to home. Sometimes people saw it too much as a hypothetical situation and had trouble putting it in the perspective that this was actually for their water. Maybe if there was an example that said, "Yes, your town has had a THM problem but it hasn't happened for a long time and you don't have one now" or something like that. That they may have valued it more.

MITCHELL: What is your reaction to Wendy's last statement?

PAT: Yes, I think that is very appropriate because people would ask, "What Herrin?" They would ask at this point, or earlier, "What's Herrin's THM level?" Before they would even want that information and then you would say, "Well we will talk about that later." I think that is right that in some way that definitely might have brought it home.

ELIZABETH: Or as an example, the levels, you know another specific town in the area. Like Carbondale or Murphysboro. Their level is this rather than just, whatever.

MITCHELL: What you are saying is that making it more realistic in that sense. Even though the THM's are high, they were not aware of it and people were pretty hypothetical. What effect would that have? Let's say if the levels were given, let's say for Carbondale a year ago, Marion at the present time, etc. What effect do you think that would have had on the amounts that people gave, whether they were willing to give or not?

WENDY: I think more people would have voted yes and more people would have spent money on it because, as we pointed out earlier, everybody tends to think "Well, it won't happen to me." If we demonstrate "Yes, it has happened around here and it is still possible," then they might have valued it more.

MITCHELL: Elizabeth, do you agree?

ELIZABETH: I think some people would have changed their minds but I think the people, particularly those who didn't give money, might not have been affected at all. But there were not many people who thought their levels were low and that it didn't matter if it was here or Timbucktoo, they would not give money.

MITCHELL: Pat?

PAT: I think that is true. There is that group that would not give money, but I think those were being very critical, which is why I think, as Wendy was saying, people who might have given $12 might give $20. I think that might have happened simply because I had a lot of people at this point who were very intrigued as to what the THM level is, etc. You know, "Does Herrin have this problem?" I think we would have seen larger amounts and we probably would have seen a slightly higher response in terms of people giving money at different levels.

MITCHELL: Could that feature of it, would if anything in your judgment lead to underestimation, hard to know how much, but it probably biases the answers down. It is hard to know how much, but it probably might have brought the answers down a little but that might have otherwise have had that feature in it, in the scenario.

ELIZABETH: I think we would have had specific groups that would have been more affected, like the older people who were doing it for their grandchildren. If it was brought more to home they would give more money. People who were basing it just on the risk levels, I don't think, it would have affected them until we found some kind of logical progression that didn't have some previous bias in one direction or another.

MITCHELL: How much of a problem did the PCB business introduce and the fact that Marion has them and the potential confusion for that as a problem?

PAT: A lot of people mentioned it. I very rarely had the feeling that they were valuing that although I agree I think that there was a group of people that were very aware of the fact that there had been a lot of water contamination problems because the media has focused so heavily on it here. But I think the description--by the time we got to the referendum

questions, I felt really comfortable with the information we had given them about THM's and trying to screen out all the PCB's static, so it is hard to say. I think there was a group of people that contamination to them is bad and perhaps they didn't look at the risk level as critically as you would have wanted them to and I think that that as a whole the issue of contamination and PCB's entered because that is where most of these people had exposure.

MITCHELL: They were more sensitive possibly to the whole issue of contamination?

PAT: Yes, I would say they were more sensitive.

MITCHELL: Are there any more comments on the PCB thing? Would you agree with Pat that our attempts to disentangle those two were successful?

ELIZABETH: Yes, I think the people who may have had the PCB and THM's were confused somewhat where the people who didn't have much information about the PCB to start out with and just had some general idea that it was something in water. I don't think they based their information and answers on that but more on information we gave them. I don't think that introduced a lot of changes in it.

MITCHELL: Wendy?

WENDY: Yes, I feel the same way. I didn't have a problem with that too much but generally the set of people I spoke to were pretty much unaware about any sort of water problems and I was really surprised about that. So being unaware didn't confuse them, so it didn't seem to be much of a problem.

MITCHELL: Despite what is in the papers and so forth.

WENDY: Right.

MITCHELL: Elizabeth, were your people, roughly speaking, what proportion of your people were aware of some water problems?

ELIZABETH: I think the main influence on their awareness of the water problem was that front page article in the paper in June on the THMs. If they were aware of any kind of water problem they were generally aware that something had come up. It wasn't something they worried about or anything like that, just that they had heard something connected to water.

MITCHELL: That was the end of June?

ELIZABETH: Yes.

MITCHELL: And after the article, it changed things a little bit?

ELIZABETH: Well, after the article, particularly about a week or two after, people were a little bit more specifically aware of some kind of issue about it and given like the last couple weeks now, they have been less specific about "what did you hear?"

MITCHELL: A little publicity there that died out.

ELIZABETH: Yes, and I don't think that particularly influenced their answers either, just that they were aware and if it influenced anything it was just is there anything about these THM levels that is surprising to you and after that point tended to say they were surprised that it was as low as it was.

MITCHELL: What proportion of the people you interviewed would you say had some idea there were water quality problems in the Herrin Area?

ELIZABETH: I don't know, maybe some 30 or 40 percent were aware, in general, of something. They were aware, but they were not concerned.

MITCHELL: Pat?

PAT: Yes, I would say about half of the people would have mentioned something about knowing--and a lot of people--the Big Muddy River is the

water supply for Herrin for all intents and purposes. This is something I am sure Elizabeth and Wendy will back me on. Herrin used to have their own water supply. They had two reservoirs that had exceptionally good water quality and apparently within the last decade joined the Rend Lake system. Many citizens, I would say about half of the people I talked to, at least commented that they thought that was the biggest mistake the city ever made and they say "Now we get our water from the Big Muddy which is Rend Lake and so that is...

ELIZABETH: It sounds bad.

PAT: Yes, and I think that was something else that entered into some peoples--I think that was early on in the interview--you know, I think by the time you were doing risk valuations and all that it wasn't really important. But a lot of people looked at Rend Lake because it is the Big Muddy River and as being contaminated and that's that. to some extent. But I agree with Elizabeth that in general those articles in the Southern Illinoisan. I felt like they were aware of water quality problems. I would say about half of the people, many mentioned or say I know about Crab Orchard Lake or something like that. But they were specifically unaware of the standard and no one knew that Herrin had exceeded the standards. Very few people knew any specific information other than they might have had a feeling that there is stuff in the water I know but I just don't know what it is. People were vaguely aware but specifically no.

MITCHELL: I guess I know your people were sort of aware.

PAT: I feel like as many as half of them might have mentioned it some time or other. In fact, I noted that here that I think really about in the place I noticed that a lot was the first set of questions where you asked about water contamination. People frequently would say "I read a lot about

Crab Orchard Lake and those problems, but I just don't know about Rend Lake." So they might have mentioned it that way but certainly nothing that they focused on and asked questions about.

MITCHELL: Did you have anybody who was aware of Herrin having a higher THM level than they should have had?

WENDY: They were notified right?

PAT: Well, that's a good question, Robert, because when Carl and I were trying to run that information down we got mixed stories from all the parties involved where the city was saying the Rend Lake Water District was responsible, the Rend Lake Water District says "Well, we notified via the radio just like we do with a boil water order" and so it would have been easily missed or dismissed by people.

MITCHELL: So, in fact, they did not get a little deal with their bill?

PAT: Apparently in talking with the EPA people and the representatives from the utilities, they were probably never given a written notification which is what the law says they should be getting.

ELIZABETH: I know when I was up in Chicago and my sister where they live they've been out of compliance several times and she says they never receive any kind of written information in their bill. They have only seen it in the newspaper.

MITCHELL: So much for the law.

PAT: I would also the EPA, the guy from the EPA that I talked to, they said that even though that may be what the regulation says, they know that that frequently is maybe not ignored but it just doesn't happen.

MITCHELL: Turn to page 23 of the questionnaire. I recognize this page. Wendy, tell me which, if any, of these items your answers to them you think would be particularly useful for me in evaluating whether I should take the

numbers associated with them seriously or not?

WENDY: Item D, Really seemed to grasp the low level nature of THM risks.

MITCHELL: If you said no, definitely no, what would that mean?

WENDY: Then I would be hesitant to say they really understood the whole purpose of the interview and they were really valuing the risks and not just the concentrations or just giving me answers.

MITCHELL: Now, what if said not sure, same thing?

WENDY: Just not sure.

MITCHELL: What about any of the other items convey that kind of information or

WENDY: Well, across the board, if I said they did not understand the risk ladder, then I was lead to believe that they really didn't understand the referendum question specifically at all.

MITCHELL: So in other words, when you said no in that you meant that at the end of the interview they still didn't understand it?

WENDY: Uh-huh.

MITCHELL: Okay. On "I" when you first started interviewing you tended to have a lot of "no's" on "I", is that correct?

WENDY: Uh-huh.

MITCHELL: How should I interpret those "no's"? Should I show those answers as being meaningless?

WENDY: No, because I think as I got more familiar and more comfortable doing this, then I presented the information more fresher or whatever, but no I'd keep the answers.

MITCHELL: But, I should look particularly at the "b" and "c" as sort of indicators as where the real problems lie?

WENDY: Yes, even on question "d" where if I said then I would

consider the answers. I'm not sure that they really considered the risks in this problem as it was but they still showed that yes it was important enough to them.

MITCHELL: I should look at those with caution?

WENDY: Yes.

MITCHELL: But then on "c", a no would be a more serious kind of flag. Don't you think?

WENDY: Uh-hum.

MITCHELL: Elizabeth, can you give me your reading on the meaning of your answers as potential flags to me, as to whose answers I should throw out or consider with caution?

ELIZABETH: Okay, I particularly don't specifically remember saying no or definitely not to "i". But I don't think I had any R's who were not taking the answers seriously.

MITCHELL: So not understanding it enough so the answers were meaningless?

ELIZABETH: No, possibly "h". There were a few people that had enough knowledge about the PCB's and had them confused with THM's that they might have influenced their answers but I don't think a lot because I think they also knew that PCB's were a problem in Marion, not Herrin, so that any of the answers p. 23 that I said.....definitely not, for you should look at but I don't know that you would want to necessarily throw them out.

MITCHELL: Okay. Now on the "c" for you, what does a no mean there? Would it indicate?

ELIZABETH: It wouldn't indicate that they didn't understand it. It would indicate more that there was a lot more paraphrasing of the stuff, that I went over it more, that they had trouble getting to understanding but not that they didn't reach the understanding.

MITCHELL: So it tells me that you had to really work with them to get them to understand it?

ELIZABETH: Right.

MITCHELL: Then "d"?

ELIZABETH: I don't think that should influence answers at all. Some of them didn't seem to really feel it was a low level risk but were still sincerely evaluating the risk. It might have been people who were adamantly against smoking although it was a low level risk it was something you couldn't include like Pat's people who feel that water quality is a sacred thing that you should have anything in it but water kind of thing but they would still sincerely meant their answers even more so. Don't throw them away.

MITCHELL: Pat?

PAT: I think with "c", unless people, with "c" I responded that I didn't find people having trouble with the risk ladder as long as I had two criteria I used. One was that they didn't ask questions. If they said I don't really understand what's going on then I went on the assumption that they do. And the other thing was where they seemed to have inappropriate answers for that or they would value one thing and value a lower level of risk and not a higher of risk and so I used that as a criteria. But I, in general, and I think that almost everyone understood it pretty well so I think there other than you might remember those first few interviews where I was misinterpreting. But I don't "c" is where I was misinterpreting the question. For the first few interviews remember I absolutely marked those wrong. Remember that, we talked about that because you noticed it on that first bunch of interviews. I think it was only about a dozen.

MITCHELL: So you don't think you have many yesses on "c"?

PAT: I think that most people seemed to understand it very well.

MITCHELL: If you did have a yes, how should I interpret that?

PAT: I would say that those people really showed that they had a lot of trouble. Anyone that said yes they absolutely were missing the boat.

MITCHELL: Now, Wendy, we were talking about "c", I was assuming a yes.

WENDY: Yes.

MITCHELL: Then how about "d"?

PAT: I used that, I used kind of the same criteria there. I looked for inappropriate responses. If I found that I really had to go back and say "are you sure that this is what you want to say?" Look at the position of this on the risk ladder or for people that were saying outrageous things like "yea, the risk that I would accept would be 1 out of 10, a level of 10,000 per 100,000 or something. I used again a pretty strict criteria only where people really seemed to miss the boat, really seemed to be out in left field, did I say that they were not grasping the low level risks?

MITCHELL: Since you said that, I should be dubious about their answers?

PAT: Yes. Those people were just absolutely doing something that seemed wrong so I was having to go over the material several times and it just was penetrating.

MITCHELL: What about "I'm not sure?"

PAT: Those would be people that maybe had what seemed like appropriate answers but at the same time I was perhaps giving them a lot of extra explanation so that it seemed like they knew what they were doing but I certainly wasn't 100 percent sure that they were answering based on the information that we gave them and their understanding of it.

MITCHELL: Anything else any of you want to say on this because this is very helpful to me. Otherwise, I'm crunching numbers, but if I know your reactions that is a very helpful thing.

ELIZABETH: On "f", it is difficult to find anyone who appeared to focus on the cigarette equivalents., which may not have, was partly even people who focused on the cigarette equivalents didn't tend to focus on it exclusively.

MITCHELL: That's why I was asking. In fact, that just didn't happen but this is not . Many people work for and that's one of the big surprises from conversation this afternoon. Let me ask you a question about--did people react to the notion of cancer in a way that was noticeable. Was cancer a big scarry think that got them all excited or upset and they would do anything to avoid any risk of cancer? Or did they take it in their stride?

ELIZABETH: I thought they tended not to be upset about it but they have heard so many things about cancer causing unless they said this is causing 50 deaths a year...cancer because of it they weren't concerned about it.

MITCHELL: Other reactions?

PAT: Since we interviewed a rather old population, I would say a lot of older people, I thought the thing would pop up, but it very rarely did. In fact, it was just the opposite sometimes. People would say everything causes cancer. This is just one of many causes which we would bring up in the interview and talk about that too. I think that people interpret it that way too. You mentioned something had anyone talked about Reagan's condition. No one even skirted that or mentioned it at all.

MITCHELL: Do you have a reaction to Reagan?

ELIZABETH: Yes. I haven't heard anything on it.

MITCHELL: This would lead people to pay more attention to the cancer thing or be more concerned.

MITCHELL: Were there any others, news events that we have mentioned, were there any other news events that affected people's answers?

PAT: The airline crash off the British coast but it was only like for a couple of days of interviewing after that people seemed to mention it and then we were pretty much saying "well, that wasn't a flight in the U.S." It didn't in general seem to be a problem.

MITCHELL: Wendy?

WENDY: No, I agree with him.

MITCHELL: Elizabeth?

ELIZABETH: I don't think I even had anyone mention it.

MITCHELL: That's a relief, because you hate to do a study and all of a sudden have something in the middle of it.

PAT: Had another airline crash yesterday in Texas.

MITCHELL: Right. How well did that referendum format work? That is, having them make their decisions in terms of by thinking about how they would vote in a referendum?

PAT: I thought it was pretty effective. I think it was a good idea and I think that the problem was with the assumptions. I think that it was a good technique to try to get people to think as we talked about earlier when we were discussing the assumptions. I guess that helped to standardize responses but they also some people thought they were a little unrealistic when in fact speaking of question 23 that's the other thing I would comment on is that on page 23 was the understanding or accepting the assumptions because I had several that I am not sure there because they

seemed to have pretty strong feelings about a couple of or one of the assumptions perhaps and.

MITCHELL: What's wrong with the assumptions? Just the idea of the referendum?

PAT: I thought it was very good.

MITCHELL: Wendy?

WENDY: I think it was a good format.

MITCHELL: Elizabeth?

ELIZABETH: The only thing I found as I was doing more of them I tended to focus their attention more on the figures for the deaths per 100,000 which isn't actually included in the text. But I found pointing them out specifically helped.

MITCHELL: In other words, in countering what you interated they weren't really focusing on that side of it?

ELIZABETH: Right. And as I went on, I found myself doing more of that.

MITCHELL: Pointing to that? The rest of you--did you find yourselves doing that or not?

WENDY: I sure did because they weren't really focusing on the change and that I wanted them to look at. One thing I noticed too was that two reactions that people tended to think that my vote is not going to make a difference anyway, that came up a little bit and the other was then they voted to increase their bill without asking how much money. They were sort of intimidated and uncomfortable at having to say "well how much should it be?" They felt uncomfortable trying to come to a dollar figure.

MITCHELL: Follow-up on that, Wendy. By asking first how they would vote, was that a way of easing people who would have found it difficult anyway to give a dollar amount?

WENDY: Did that make it easier for them?

MITCHELL: Is there another way we could have done it that would have made it easier for those people to give a dollar amount?

WENDY: Maybe by asking them initially now if you had the choice how much, asking them if you were on the City Council or something how much would you charge people if you had to establish a dollar figure, how much would you say is a reasonable amount. If they had to made a decision to charge.

MITCHELL: There has got to be a very different thing that we are trying to get at. We are not trying to get a reasonable amount nor would they think everybody should pay.

WENDY: People seemed uncomfortable having to say a dollar and the one-two punch like you said I don't know a more effective way there would have been.

MITCHELL: Pat, did the one-two punch work? Would there be a better way of helping people to deal with the difficult question of how much?

PAT: There was a wide variation. There were some people that was really tough for them to come up with a number. You felt like we just stalled out there sometimes because they would tend to hem-haw around, but I thought it was pretty effective overall. I felt that most people, because it was realistic enough. The only thing once again going back to maybe varying the assumptions or something might make it different but I thought it was good. If anything it might have worked against an individual valuation just because of that whole question of thinking of the community parent as voting whether or not so in some ways it's taking something away from the individual and like Elizabeth said earlier, "well, my vote is not really, it won't make any difference" which was a classic argument for

people that refused too. In my opinion, you don't want my opinion, get somebody else's you know my opinion isn't worth anything.

MITCHELL: Except for that?

PAT: I thought it was effective though. I thought it worked.

MITCHELL: Elizabeth?

ELIZABETH: I thought it was effective too that the people who did have trouble coming up with an amount once they said they would be willing to vote to raise their bills felt it was probably easier for them to come up with an amount.

MITCHELL: Some people wanted to know how much it would cost, right? Telling them that they would find out later. Did that generally handle that situation?

PAT: Yes. I wouldn't call it a misunderstanding, but that's exactly what several people you had to say then you are going to make a decision on how much you would pledge. That tended very rarely would those people change their minds but it would be hard to say when you told them that it would be an individual decision whether they went one way or the other because I would say most of them didn't change their minds. If they were saying "well, I probably would buy it, what's it going to cost?" It seemed like most of those people still would say yea, what seemed to be their inclination before.

MITCHELL: The assumptions we mentioned before. We described three assumptions. Did you have problems with those assumptions? And if so, what? Or were people pretty much able to accept them?

PAT: Most people did, but a lot of people don't like to believe that the local drinking water officials are unresponsive to the federal regulations. That was the thing I found the most often was that people were saying "I

can't help but think that these people really would care about the public health which is their job and that they would say that they don't want install equipment that would help to make our water better."

MITCHELL: For those people, did they say that they didn't see the improvements were so slight that they wouldn't be worth much money. Did this seem credible to them?

PAT: No, there were more people who probably tended to be concerned about drinking water quality in general. They wanted to think they are yielding to these so-called experts or professionals who have the responsibility of making sure that they have good clean water. So they were going, I think that they care and that they do a good job. Of course, the flip side of that were those people who said you can't trust them anyway. There were just about as many people who had that attitude.

MITCHELL: Elizabeth, what were your experiences with the assumptions?

ELIZABETH: There was some skepticism for the first one that the only source of the chemical contamination would be the THM's. They didn't seem to have trouble accepting that for the purposes of the referendum. I think they tended more to assume that no matter what was in there, that only the THM's would be affected by the referendum rather that what the referendum...

WENDY: I think I only had one response that had a question where they did not like the assumptions. That was on the third one and this was a woman who then didn't vote to increase her water bill. Her questions were if we went ahead and set a standard why would they not think now that they should support that standard and that was her only...

MITCHELL: Which is a reasonable question. Most people were accepting as credible that the local authorities did not feel it was worth spending money.

PAT: I'd say 80 percent of the people just said yes or no there are no problems with the assumptions.

ELIZABETH: I have one comment on the questionnaire about the assumptions that possibly if you queried them after each assumption, you might have got a little more objection. I don't think I have anybody who objected two assumptions. They objected to one of the assumptions and that was it. I don't know if there might have been some who if asked each time might have brought up a couple more objections. I don't think that it had any affect on their accepting the assumptions for the purposes of the referendum. But I think you might have heard a few more comments.

MITCHELL: If there was in fact a referendum in Herrin and let's say the issue was to increase their water bills by $10.00 a year, let's say $12.00 a year, a $1.00 a month, based on your experience with these interviews let's something say the local officials are sort of dubious about it but they are not saying this has to be done but they are saying well it wouldn't hurt kind of thing, do you think it would pass?

ELIZABETH: I think that question that was missing from the interview if there was a referendum would you go out and vote? A lot of these people wouldn't have bothered. I think it would pass if people were concerned enough about it to go out and vote for it.

MITCHELL: Which people? The ones said it wasn't worth anything to them?

ELIZABETH: No. I think the people who were concerned about their water quality would be more likely to go out and vote.

MITCHELL: The others would be more likely to be indifferent?

ELIZABETH: Particularly at a $12.00 a year increase. Some of them would vote against it but would not make a point of it.

MITCHELL: You would guess that it would pass?

ELIZABETH: Yes.

MITCHELL: Wendy?

WENDY: I vote yes.

MITCHELL: Pat?

PAT: I think it would pass too.

MITCHELL: What if it was $50 a year? Pat?

PAT: No. I would say it would be, there would have to be a darn good PR campaign by whoever wants the changes. I don't think it would pass on its own initiative.

MITCHELL: Elizabeth?

ELIZABETH: Yea, I agree. I think the people who were marginally against it would be more likely then to go out and vote against it. Unless they get some kind of real evidence of damage to people in the town.

MITCHELL: Wendy?

WENDY: I don't think it would pass.

MITCHELL: What if the water authorities said its a good thing and the doctors in town say we are going to need all this equipment. And it costs $50, what's your guess?

PAT: I think that it would be close with that kind of campaign with local community leaders behind it and one reason I say that is because Herrin seems to be a very tight community. Very close knit, people have been there, lifelong residents, that they would like to see their kids growing up there and they would like it to be everything that it could be. But I still would say that at $50 a year it would probably be very close even with a lot of support?

MITCHELL: Wendy?

WENDY: I think $50 is too high for the people in the area.

MITCHELL: Even if...

WENDY: Even if it was supported by health officials.

MITCHELL: Elizabeth?

ELIZABETH: I think a lot would depend on how they go about making the information available to people. It seemed like a lot of these people weren't up on local news. It took quite a while for it to filter into their awareness. A lot of people seemed not to read the local newspaper.

PAT: I would also say, Robert, that I have a bias here knowing that the usually the it would depend a lot on the level of contamination I think too. I think at marginal levels people would be discriminating at the $50 level for just knowing the THM level for this area they tend to be very marginal. That is something else that colored my opinion of that. It would depend a lot on what the level was. If it was at a high level, I would think that the people who responded yes in the interview would probably take that to the polls, but personally knowing that there usually are very marginal levels here that I don't think people could be persuaded unless there was a lot of support from local agencies, and the medical community.

ELIZABETH: Again, I think that support wouldn't be there unless there were high levels.

MITCHELL: Get the opportunity to revise your answers toward the end, did people tend to do that at all?

ELIZABETH: Very few.

PAT: I think I had maybe one out of all the interviews I did. One, maybe two.

MITCHELL: Wendy?

WENDY: I just had one person. I think reasons by the end of the interview they were relieved, I don't have to think any more and the questions are over.

MITCHELL: In fact, if they had been fresher more people might have changed? Are there other reasons why so few people did it besides that or do you think that is the main reason? Pat?

PAT: I would agree with Wendy there. It was like an after-the-fact question. At that point, you do get the feeling that the interview is over and in fact we cue them by saying here is the last question. I think people, it's very easy to say no. Instead of yes and then revising those numbers.

MITCHELL: That's very helpful. I've gone through my agenda pretty much. I'm sure there are some things I didn't touch on that you would like to comment on.

ELIZABETH: I had one more comment on the last question. I think perhaps you might have gotten a little more response if you would have had another card and listed each of the risk reductions so they could look at it and say "oh, yea, and well you voted for this first one." But I don't think that would have made a lot of difference. I think very few people would have changed their minds.

MITCHELL: If it had been up front more and not a tag-on it might have offered people more of an opportunity to change. One notion about the change was there was concern on my part that people would be valuing both PCB and THM's so it comes right after further knowledge of PCB. But what you have been saying is that in truth we were successful in disentangling the two so that you wouldn't expect anything. Such as confusion over what had been valued, how can I lower it? That wasn't a problem? Other aspects

of the interview that you'd like to tell me about that we haven't touched on?

PAT: There is one question that there is definitely consensus, the train/plane question. I think and that is I know you had ulterior motives but I just don't know that it added anything. It would have seemed that by design it should have gotten people to look at the risk ladder critically in making some decisions but there was an awful lot of static, plus I think it came at a kind of a critical point where you were very close to referendum questions. People have a pretty good grasp of the risk ladder and it almost seemed to break the flow of the interview, frequently. Plus there was so much static in terms of I would never get on an airplane, or people looking at the risk levels and just truly arbitrary answers because people would just I don't know what to think of this then you probe them to try to get them to say something and pretty soon I know it seemed like I would say three out of every ten would just seem to throw out a number. Some people I just don't know that it was an effective question in that it added much to the interview.

MITCHELL: In other words, they would have grasped the ladder as well without it as with it?

PAT: Yes, I just don't think it helped.

ELIZABETH: I think there was a lot of arbitrary bias in your answers to start out with.

WENDY: But it was a chance for them to respond and to let us know the person is out in left field or that was the two advantages I got.

ELIZABETH: Maybe something more closely tied to some kind of cancer causing risk or...because a big enough portion of the people I think were

completely predisposed to taking the train or plane and not care how much risk they are exposed to.

PAT: One thing Wendy said is very true and I think that that was the best thing to question was people would say that risk would have to be pretty high "how about two", but then this is troubling because you would think that's not high but maybe it is high for them. Although it seems totally absurd. But it was a good clue as to sometimes as how people were looking at that ladder.

MITCHELL: We could have had another way of accomplishing that mission, it would have been better?

PAT: Yes, maybe. I would say that it did have some utility but it just seemed like it was such an important part where it broke the flow. People are kind of "well, we are talking about drinking water risks," we are just getting ready to look at these cities' levels of risk and then all of a sudden here's this out of the blue question. That's the way I think a lot of people looked at it, like what?

ELIZABETH: Use a risk that is similar to one of the ones that is on the scale. For instance where would you expect to find the risk for taking a train, that kind of thing. Maybe it was somewhere around 15 plane trips or maybe it was somewhere around getting hit by a car.

MITCHELL: That a good idea. It gets them working to say something and if they are thinking about applying what they understand about the ladder. Other?

PAT: Yes, I have one on page 11 where you ask "is there anything about the THM risk levels that surprises you?" This is something I just kind of started playing around with and a lot of people would say "no". It seems like right away they would say no. I wondered if they said no defensively

because they are perhaps not understanding or don't, these are the people that before gave hints that they thought certain risk levels would be low or high and I found that probing there sometimes saying "do they seem high or low" and they would say "no" and then perhaps something like "well, none of them look lower or higher than you might have expected them to be" and if so, just adding something like that seemed to make a difference.

MITCHELL? It made the question less intimidating?

PAT: Yes, then I found that people would say "well, you know they do look kind of low."

ELIZABETH: I think maybe the use of word surprise was a problem here because if they didn't have any knowledge of THM's. They had no expectations about what the levels were going to be so they were really surprised, not like it was contrary to what they would have expected to see. They didn't have any expectations.

MITCHELL: That's a good suggestion. Other aspects where it might be improved?

MITCHELL: Referendum questions--when you would ask "did you vote to keep the bill the same, did you think the risk reduction is not worth <u>any money at all</u> or because of some other reason." From there on you start to corner people and some people I feel like we almost even trying to be a neutral as possible you almost corner them into giving money. Because some people catch that any money at all and go well you know it might be worth something or someone who didn't have enough information the same kind of thing they would start to say "are you certain no money at all" and you would volunteer whatever information you could give them and I really felt very rarely that there were people who might have given money because they felt like they were being cornered there. Not very often, it might have

been only a couple times, but these would be people that I felt like were pretty firm with their "no" answers but they kind of stuck on that any one at all and say well everything is worth something maybe.

MITCHELL: It sort of bullies them into giving an amount?

PAT: Yes, I think if that question was pushed much then you were kind of right, it was trying to draw a yes out of them.

MITCHELL: How many people do you think may have given answers they wouldn't have because they were pushed?

PAT: Very few because I was pretty careful and in general I think people would settle on that it really wasn't worth, that's what they were trying to say you know it's not worth it to me. In fact, that is the way they tended to answer the question.

MITCHELL: Wendy, do you think that you had many people that may have given answers, amounts who didn't really value the THM reductions, but who we pushed it on them?

WENDY: Not when people voted no, it would seem like they were because the risk wasn't anything or they were on fixed income and couldn't pay anything anyway but no, I didn't feel like any answers were off.

MITCHELL: Elizabeth?

ELIZABETH: No, I didn't feel that they felt trapped by it at all. I did think that the wording of the question disposed people to say yes, it wasn't worth anything at all to me rather than coming up with their own reasons.

MITCHELL: Other aspects of the questionnaire where you would like to make comments?

ELIZABETH: Page 18, I still have a little bit of a problem with the wording of question 21. By the time I finally got it so that I wasn't confusing myself either then I could recognize if they seemed confused. I

was resorting to using my own wording.

MITCHELL: Did the others of you have problems there?

WENDY: Yes, I had to reword and reexplain it. Looking at the risk, how do you think you would set standards too high or whatever. That was a problem for me.

PAT: Yes, even I know for sure Wendy didn't see the previous wording and I don't know that Elizabeth did either, but before it was too blunt. This seemed like an improvement, but I agree with what they are saying but still I don't know but if the wording of the question made any difference we kind of hoped that it would have but it just didn't. I think it was hard for people to think like they were EPA administrators that were and the question is were you asking them that perhaps but that's the way they perceived it and so that's I think the answers there. There is another where it was real easy to say I think it's about the right level. That's where people say "Well, I wouldn't mess with that."

ELIZABETH: My problem with it wasn't really that it was more are you asking is the risk level too high or too low or is the standard too high or too low and whichever one they are answering they are going the opposite direction from the other. Once you got that straightened out you were all right.

PAT: Yes, you are right because I found myself doing the same thing. You would paraphrase and say please looking at the risk level because you are right it's another one of those problems where the risk level and the level of contamination were both in there.

ELIZABETH: If they wanted the risk level to go down, they wanted the standards to go up.

MITCHELL: Right. It does get confusing.

ELIZABETH: One page 20, question 30, I am curious about why there wasn't a space for how many people over 18 because I know the information was on the enumeration but I wasn't sure how closely those were going to be showing with the questionnaires.

MITCHELL: Which question was this?

ELIZABETH: Number 30 on page 20.

MITCHELL: We get the number of people over 10 going to 18, right?

ELIZABETH: Yes. But you don't have the people who are over 18.

MITCHELL: I see. What I am after there is whether there are kids around but this would allow me since some people may be especially sensitive if they have kids around, especially younger kids.

ELIZABETH: Then on question 31 I thought it worked well with the card, I didn't have any problem with people telling their income level at all.

MITCHELL: Good, how about the rest of you?

WENDY: Just a couple said they refused to give it but for the most part it worked real well.

PAT: Yes, I think I had a couple people refuse, but I think everyone else seemed to be pretty honest given the way their dwelling looked and there were a couple where I might have wondered but there were a couple I think that they probably told me lower numbers. I am sure they did given the kind of cars that were in the driveway and the way their homes looked.

MITCHELL: It sounds like you had a better experience. Normally speaking that is a tough question.

ELIZABETH: That's what I was expecting to find and it wasn't at all.

MITCHELL: It sounds like you did real well on that.

PAT: People were, in general, very open which was comforting after initially being told by a lot of people that this was going to be, although

I wouldn't say it was great. But once you were especially in someone's home, they tend to be very friendly. That was good. I was never invited to leave or anything like that.

MITCHELL: What proportion of the people, do you think, enjoyed the interview? If anybody.

PAT: I would say the majority by far. Maybe not enjoy it so much as that was a good experience. I really felt like I learned something.

MITCHELL: Even though there was that bad time in that long stretch of exposition, but once they got to the referendum and the rest of it it sort of came together for them?

ELIZABETH: Since they got to answer questions, they ended with a good impression about it.

MITCHELL: It is really in the design it is obviously desirable to have questions sprinkled through but it is really hard to come up with. We did have those lines we could have given people a chance to say if they understood. But to come up with meaningful questions or even interesting questions which I would like to do.

ELIZABETH: I think another advantage of maybe cutting out some of that long part would have been, I think, it would have gone over a little better if it had been more like 30 minutes instead of 40.

MITCHELL: Sure. Could each of you sort of go through the questionnaire and just do lines through what you think in your experience could be dropped out without harming the basic information that people get? I'd really appreciate that if you could send those to me. I would like to redraft it and try to fool around with the risk ladder and other things based on your comments to see what I can come up with.

ELIZABETH: I have one more question that I had a comment on, on page 21, where you asked them if they heard of THM's before this interview. I thought it might have helped a little bit to segregate their feelings about THM's and PCB's if there was a more general question before that "had you heard anything about water contamination problems?" And then asking them specifically did you hear anything about THM's or was it something else?

MITCHELL: What if I in that deal where we explain so much to them, if they heard of THM's there at some place where we are talking about THM's?

PAT: I think that would have been good right after that initial introduction and description of what the source of THM's.

MITCHELL: In that general thing abut water contamination then THM's.

PAT: It was interesting, I had a couple of people who were pretty, in fact, this was shortly after that front page article and it was interesting that they never brought it up during the interview. They always waited until afterwards and then they said something. These were both people that I had appointments with and they said "I just read about this in the paper and I just wanted to see what you were going to say about this and it was kind of interesting." They didn't volunteer it whereas it might have been good to have drawn it out earlier and known that they had, in fact, read those articles.

MITCHELL: Other comments?

PAT: I don't know what else to say.

MITCHELL: Why don't we wrap it up. If you would go through the questionnaire and mark those things then why don't we set the fee for debriefing at $25, would that be okay?

PAT: Sure.

MITCHELL: Then I'll talk with Sunday and Monday?

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APPENDIX F

TRANSCRIPT OF BERKELEY FOCUS GROUPS

INTRODUCTION

Two focus groups were conducted in Berkeley, California to explore people's understanding of giardia and their reaction to a referendum to install equipment to prevent a possible giardia outbreak. Although the participants live in the East Bay area, their water supply is similar to San Francisco's. Each group was recruited by telephone from a random sample of Berkeley residents in order to ensure a wide representation of viewpoints. Participants were given a small honorarium to motivate their participation. The evening sessions were led by Selma Monsky, of the University of California Survey Research Center, and took place at the Center which is located next to the Berkeley campus. The following transcripts consist of the portions of each two hour session which were most relevant to the purposes of this study. They are presented in the order in which they occurred; skips from one section to another are identified by *****. Participants are identified by W (woman), M (man) or S (Selma Monsky). Succeeding comments are made by different people.

GROUP 1

This group, consisting of women only, was conducted on February 3, 1986 by Selma Monsky. Richard T. Carson and Robert C. Mitchell sat in on this group and occasionally asked or answered questions.

S If we can get started. This is Richard Carson and this is Robert Mitchell. We are here to get your ideas tonight on several aspects of drinking water and before we get started I just wanted to say that we would like to be as informal as possible, you don't have to wait to be called on, you don't have to raise your hand. If you have something to say please feel free to say it and give us your honest opinion. You're not going to hurt anybody's feelings if you do disagree with something somebody else says. The only rule that I would ask you watch is that we don't have two people talking at the same time because it safest in the long run if we can tape these sessions and as you know tape recorders are stupid and can't decipher two voices. To start with I'd like to know how satisfied you people are generally with the quality of the drinking water that you get from the East Bay System.

*****

Selma Why do you believe the risk is worse than the media let us believe, I'm not disagreeing, I'm just interested.

W Basic nature is of paranoria. I have that same reaction too. You're suspicious of ... they tell you its safe and then you discover they tested for ...

W Well that, and then they tell you that no river water is safe today and you shouldn't drink it in the high Sierra either.

S Why is that?

W Giardia

W Giardia

W Fever

W Giardia is not as bad as chemicals that you sit around and give you cancer twenty years down the line. I wouldn't worry that much about giardia. You can get rid of that, you know what the symptoms are. The scarey thing about these chemicals is that it's not really clear what effect they are going to have. And it won't be clear for a long time like that whole asbestos thing

S She thinks that chemicals are a great aspect...

W I myself do

S You were nodding at one point, who was it that you were agreeing with?

W I would say that I would agree with right now that the chemicals are probably a bigger problem, although I don't think that always has to be.

S Someone else reacted to giardia before, who was that

W I called it eager beaver. I had heard the reason not to drink directly out of the streams is that they use it for range country. Ranchers have cattle up there and hence there's manure and the bacteria from it.

S Has anyone else ever heard of giardia?

W When I was in Canada a couple of years ago camping at Jasper they were telling people not to drink the water there. Not just river water, but tap water had giardia.

W When I was at the University of Washington, there was a fellow that had come up with some sort of filter device. I know a couple of years ago he was going to try to market for hikers.

W The way I learned about giardia was this labor day I was at my mother-in-law's. She lives in Mount Baker and she has well or spring water. It is in a drought year and so there were alot of cases. A little girl got sick. They'd called the doctor and he said there might be giardia, there had been a lot of cases of it. He said there were a lot of beaver around, a lot of other kinds of small wild life that can get into the water systems.

S Have the rest of you heard of giardia before?

W No, not the term I heard about the symptoms, not the word.

S Had you heard of "Eager Beaver"?

W Yes, I'd heard about beaver...

S You said you hadn't had a problem.

W I was wondering what's in the water? I know its about the same thing that causes problems in China and in Africa.

W In Africa, there's other things. I know we were told in Africa not to even walk in the water because it would go into our intestines.

W You'll have to ask one of these men, I don't know the answer

W Is that giardia?

W That sounds like flukes.

W Flukes, Yes

W I know there's alot of giardia in the Philipines because ...

S I'm so impressed you know, I never even heard of anything of these things until Richard came to see me a couple of months ago.

W Oh really?

S Because they have a particular interest in giardia and since some of you do and some don't, which of you wants to tell them about what its about?

RTC (Summary) Giardia is not too much different from traveller's diarrhea. Basically a parasite and spread by beavers. Although SF's water is not contaminated right now it's looking like at some point in the future it might happen. It is not fatal. It resembles a mild case of disentery. Never fatal in US. Lasts about three to four days usually although when it lasts longer, people have to go to the doctor and get treated.

W That happened to a women I worked with. She got it in Mexico and it took her a very long time to get over it.

W It reoccurs?

RTC Basically, yes, it gets somewhat better and then it gets worse

W That's what the health department calls you about, who you went with, who you live with? Do you work in the food industry?

RTC Right.

S The health department here?

RTC Right, pretty much it can be spread from person to person but it's a lot harder. What people sort of worry about is the possibility

of a large outbreak. If it comes in drinking water perhaps a hundred thousand people would get it at one time. Chances of it happening are really slim because most often the chlorine they actually put in the water usually kills it. The way you can prevent it with 100 percent certainty is to build fairly large, usually sand bank filter, systems.

W I was reading something about if you are out hiking, you can't boil it. I mean its like that won't kill it.

RTC The only basic 100 percent way to get rid of it is to force the water through a sufficiently fine filter where it can't pass through. Boiling will kill it most of the time just like chlorine will kill it most of the time.

W What would you recommend to backpackers?

RTC They make a filter devices, somebody actually I think is selling these now, and they make some chemicals that you can put in the water.

W Will Halozone take care of it?

R I think Halozone does take care of it.

W Do you acquire immunity from giardia?

RTC In Colorado where basically they are using close to pure mountain water without filtering it, most of the local people seem to develop and immunity to it.

S As far as I know its not a threat now. But assume for the moment that public health experts in the East Bay said that our water supply carried giardia and they got a proposition added to the ballot for the next election to require building a filtration plant or some other system to purify the water. If that proposition were on the ballot would you be likely to vote for or against it?

W Can I ask, how is water processed now?

RTC The water for both SF and the East Bay comes from the Sierras and is in contrast to the water in southern CA, some of the best water in the country. It comes down in the pipes and they basically test it here and lightly chorinate it.

W It's not filtered?

RTC In a couple of reservoirs it is filtered but they don't use the sort of filters that would pull out giardia. They do filter the water where ever it has problems, but use different type of filters to take out different things.

S We are assuming now that it took more elaborate, more expensive equipment or processes in order to protect against giardia. Would you vote for it or against it? Patrica?

P Against it.

S Why.

P Well because Mr. Carson just said that its not guaranteed that this filter system is going to filter out...

RTC If they put in filters, there is basically 100% probability it will eliminate the risk of giardia.

W How many people is this going to affect? Not 100% of course.

RTC Probably 100 thousand people would get it. Alot of those would just think they had a couple of day virus. Say ten to twenty people would probably have to get medical help.

W Of the 900,000 that don't get it, is it because they have a natural resistance to it?

RTC People have a natural resistance to it. It just depends on how concentrated they were in that particular water. In this case the chlorine the water stays in the system and the longer the chlorine is in contact with the water the higher the chances of killing it.

W With your background in economics how much is this going to cost?

RTC That's part of the problem with this thing, really good estimates of how likely it is to actually happen are unavailable.

S Let's turn it back to her, how much would it be worth to you?

W I would say that there are a whole lot of costs that I would want to look at, such as the number of days away of work, the medical costs, just some of the human costs. How many days of my life am I going to waste that...

W How much is each day worth?

W Right, so those are some of the things that I'd think about.

W I think that in America, the people who are likely to be most affected by something like this would be the poor and malnourished people in America, and we've got alot of them. I would say that those are the people who are going to be hardest hit. My family has a stronger chance of combating something like this, but it's the people who don't have a vote, and who aren't as aware of there political economical factor in such a ballot, that wouldn't vote for it although they are the people that might be affected the most by it. They might be a higher percentage. Well if its so much money that will come out of my pocket, I would have to think about that. I would be mostly concerned with, is this something that going to save a bunch of lives? Poor people aren't going to be able to get to a doctor and they aren't going to be able to take the time off work. Socially I would be conscious to something like that...

S You would vote for it?

W Yes, because we have to be able to drink water, there are alot of people who cannot afford bottled water.

W There was a scare on bottled water, that it had too much of something in it too. What is supposed to be good for you?

W Its also a matter of pride; this has been a country where you can drink the water.

W In that case I would want to have an alternative that had free bottled water.

S How much would it be worth to you? Assume that it raised your water bill, how much would you be willing to pay extra on your water bill each month before you started saying lets take our chances?

W There's no guarantee of good health in just filtering the water because there can be something else that comes up next month.

S This is protecting it against giardia.

W This is giardia, as I'm saying when your looking at this overall there can be some other chemical unknown and there probably will be alot in the future that...

W Well, I sort of think that we come to a level of civilization where we can offer drinkable water at the tap and...

S Patricia, you're not willing to pay for it?

W I'm not saying I'm not willing to pay for it. You asked if I'd vote for it and I said no, I wouldn't. I think that that amount of money, and you know it would be very expensive, could be used elsewhere. Air pollution, if you want to talk health, in my opinion is worse. When you want water to drink, you want air to breath.

W I would estimate the cost of a filter like this would cost less than a trident submarine.

W What sort of filter is involved?

RTC The typical construction, is like 4 feet of sand that they force the water through.

W So it's not going to be any sort of thing that the cure will be worse than the illness?

RTC No.

S I don't know how much a trident submarine costs on a per capita basis. How much would knowing that the water system was protected against giardia be worth to you and your family for a month? How much more would you be willing to pay for your water? You don't have to be afraid to say it, we're not going to tell anybody

W No more than twenty five percent I would figure, to be realistic.

S Twenty five percent?

W As top.

S Do you know about what your water bill is now?

W I checked it out for tonight. Every two months its between $35 and $45 depending on how much I...

S So your saying another twenty five percent a month. You might be willing to pay ten dollars a month more?

W Yes, but also the quality of drinking water is very high on our list of priorities so we might be unusual.

S Well, I'm not concerned about whether your'e unusual. How about you Kathy?

W I would tend to agree with Mavis. I think that I would go up at least 25% if I knew my water was safe against giardia. I also look at my water bill and I pay about $35 a month, I mean every two months.

S How about you?

W Well if it were a real threat of course ... I think clean air and clean water are two of the highest priorities things in the US and if it got to a threatening point, yes I would be willing to pay for it.

S How much?

W That would depend on how serious it was. If was really a serious thing, then you'd pay alot more than if it was just a chance here and there. If they could convince me that it was quite serious, I've lived in Mexico, we had to boil our water every day.

S When you say "quite serious." what do you mean by that?

W I mean that like in Mexico every gringo gets sick if they drink the water if they didn't grow up with it. I think you should be able to drink the water and not get sick. To me that's important. We don't know how lucky we are that we can do that right now

W I was trying to think of what dollar value I wanted to put on it and that's becomes a hardest question at this point and time. This idea of five dollars a family doesn't seem for us to be hard, but

today I was with some students who were worrying about not buying books this year and I wonder how that might affect that kind of a household. Would an extra five dollars ... ?

S So you're saying that it would be worth it to you personally but your concerned about other people's ability to pay?

W There would be costs in relation to the cost benefit ...

S Jan, what's it worth to you, if anything?

W It's not the money. I don't know if I would vote for it, something like this politically. But healthwise and medically I am real concerned. I would think giardia is not that terrible a thing to have to go through, it not like its something there's coleria.

W Something worse, it would have been a lot easier to value.

W Right.

W I guess I still have the conviction that we're just beginning to live with giardia. In a generation we will be pretty immune to it and ...

S You mean literally, physically immune?

W I mean the whole thing, immunity. Why can't they keep the cattle out of the streams? I don't know if I would actually vote for it. If everyone passed it, it would be depressing to me.

S Depressing?

W I wouldn't get bugged out if I had to pay two or three extra dollars a month on my water bill and it just seems like its treating a symptom and not the cause.

S Would the filter system be giardia specific?

W We could reintroduce beaver coats in the market.

RTC That's actually the first thing they usually when this happens in various places; they go out and trap the beavers.

W But only beavers?

R It usually tends to be mostly beavers.

W Really.

W If there more beavers, why are we having giardia now?

RTC Beavers have gotten infected with giardia, and not from people.

S How do you feel about this proposition?

W I think I be very much with ___. My only question would be, how does this affect giardia, affect the children, and older folks? Depending on that, I would surely vote for it.

S If you were what?

W Depending on if I know that its debilitating for children or for the older people.

W It's a hard situation, but I would vote for it for health safety, to help most of the children and people. If you don't have health you are ... If it's for health I'd vote for it.

S _____

W Well I voted for it, I just wouldn't put a price on it.

S How much would you price?

W My price? Well I would most likely say 25 percent.

S And your water bill runs around the same as hers.?

W Yes.

S I was interested in the number of people you really thought it was going to help, or if it depended on who it was going to help. Suppose you were in a situation where the health experts said one thing and the water department engineers disagreed. Which side would you come down on.?

W Well I think I'd have to find out the facts, find out why disagreed, what survey they had done.

S You've got a lot of nerve thinking for yourself.

W I would want to know what studies they did and why they disagree. Get all the facts possible, not only from them but maybe from other organizations that had information.

S How about the rest of you? Whose advice or opinion would you be most impressed by, the public health people or the water department engineers?

W The engineers who didn't take ...

RTC The public health people tend to worry about what would happen if giardia ever got into the water system and the engineers basically believe that the system as it's designed, eliminates almost all the chances of giardia getting in the system. This is why they disagree.

W I have one question. What kind of time delay are we talking about The health department says against that and the engineers say OK you want to build the thing its going to take five years ...

RTC Public health is saying you better build now or in five years. It might take three years to do it.

W I'm really confused about this. The beavers have been out there forever and giardia been out there forever to ...

RTC _____

W What are the percent of beavers who are infected?

RTC This varies according to time of year.

W Who takes the survey?

W I'm coming from a health care perspective because I'm a nursing student. I just did my rotation for public health and know how the client numbers would be if you suddenly had to increase that all of the other problems like infant nutrition.

S If you suddenly had to increase?

W If I had to now take on 20 extra clients because I'm going to be doing some sort of giardia followup, I couldn't be doing all of the other things, so that would become ...

W You mean it would stress the health care system?

W The health care system right now in the public sector is stressed because of the payment schedule, what's happening there.

S What do you mean by that?

W We're changing our, the way we're funding health care in this country. We're now going on a thing called diagnostic related groups so what we are trying to do is do some cost containment. And with the cost containment, always the first thing that seems to get hit are those things that are perceived by the public as being in excess for people who should be able to pay for their own health care. I think using the public health service to the maximum right now.

W I think right now when I look at my tax bill -- and we did our taxes yesterday -- I think I can remember when I used to think we could buy a Rolls Royce for what I paid out in taxes. If you start to look at that, and you feel you can't pay everything, so where am I going to cut?

S Patrica and Jan, you were much more skeptical than most of the others. I think, about the value of doing this. Can you picture anything that might happen that might make you change you mind and say yes I'd vote for it?

W I don't feel a few days, a hundred thousand people out of a million ... A few days of lost time and discomfort are with us now because we have it now, we have the flu were're not controlling, we have

the common cold, we have the sore throat, and then there are always new things. That's why I think that much money could maybe used elsewhere.

S It would have to be a more serious illness or more painful or ...

W Right.

W What happens to the economy of an area who have one hundred thousand for every thousand out of work, along with the flu and a cold. What's the cost of having that many people sick for a few days and then recovering medical costs. It seems to me that there is an effect on just deciding when the flu goes around. Somebody you work with isn't in, and every few weeks somebody else is out you don't have operators working the lines and that sort of cost is something to consider too. You can take the money for something else, but if you have the disease you're going to have to spend the money to go to the doctor, so you won't be saving anyway.

S Can we come up with some sort of idea of the cost of this plant?

RTC _____

W How much is it per person?

RTC Somewhere between 2 and 4 dollars.

W For a year.

R For ten years.

W Where would they build these filters? At what site, on the river and wreck the rivers?

RTC Put the filters in the pipes.

W Do you rotate the sand banks?

RTC Every so often.

W Well, the question really is, at what risk would you say its worth ...

RTC If they knew it was going to happen, it would be worth doing it. Anybody knows what the risk is, except it's small.

S Jean, let me ask you a question, what would have to happen before you would vote for as opposed to against this proposition?

W I could see that life threatening disease ...

S Life threatening as opposed to merely uncomfortable?

W Its not really that I'm not willing to spend the money. Its more philosophical for me, that you just let nature run its course and

we'll get used to giardia just like we've gotten use to measles, so ... Two to four dollars a year for ten years is no big deal.

S The point that you were both making before, I think, is that even if the costs are very small, you didn't think it would be worth it, is that correct?

W No, I'd rather spend five hundred million dollars on something else.

W Like what?

W I'd have to think about that, I think air pollution stuff or ...

W Like toxic waste?

W Like toxic waste, or acid rain, any number of things.

W Or the fact that we're not going to have as much water in the future as we've had in the past?

S Where do the rest of you put it in the systems priorities compared to air pollution and toxic waste?

W Clean water.

W But there's the risk of giardia.

S But, the risk of giardia ...

W Oh, much larger.

W It's a future risk. Where we know acid rain is right now a serious risk, and air pollution, right now ...

S Which of those would you give top priority?

W Living here, its like our water is ...

S Worse that air pollution?

W I think so, actually I think there's been a little headway in terms of air pollution and I know the Bay's a lot cleaner that when I was a child here, and acid rain is tied in with air pollution ...

S How about you, do you agree or disagree?

W I think one problem in the future is nuclear waste.

S Nuclear waste

W Nuclear waste and hazardous waste, but clean air is very important too. If they are going to cut down all the trees, they're not going to have the oxygen.

W That comes from the ocean.

W I start feeling crazy when I think about all these things that we have to worry about. How do you stack these things up? Where do you put them? I was reading an article the other day about Mexico City, how it's the most polluted city. The air pollution is worse there than any other city in the world and they advise people not to run and exercise because you breath in more. They say things like it is like smoking two packs of cigarettes a day. In CA we're pretty lucky. In SF, I don't know about LA. But I think one of the big problems in the future is going to be water. I don't know about giardia. I think giardia is a serious problem. I know somebody that got it and took months to get rid of it. She lost 20 pounds. If my grandmother had gotten that, maybe she wouldn't survive, so I think giardia is a serious issue. But I think the availability of clean water and just water, our water table it going down. Without water I don't know what we're going to do.

S You're more concerned about the water table than about the threat of giardia?

W Yes, I'm more concerned about clean water, and then the water table, and then giardia.

*****

S How would describe the kinds of people who would favor this proposition to protect the water against giardia. What kinds of people do you think would oppose it and what kinds of people do you think would be for it?

W Probably people with young children and older people.

W Medical people.

W Medical, although the medical people would be drinking bottled water.

S How about the rest of you, how would you decide it?

S What do you think?

W It would be the older ones or the children.

W It could also be people that drink a lot of water.

W Some people I know never drink a glass water. They drink coffee or beer, everything but a glass of water. They aren't thinking about it.

W I think it would be family, people with families, people who are thinking about the future too.

W I think conservationists would think about water. They hike a lot and they know what it is. They can't drink the water up in the ...

S Can we go back for a minute to the question we were raising before. If it were the public health people who are expressing the concern that there was a potential epidemic, and if the water department engineers said its not a big deal, who would you trust?

W I'd go with ...

S With who?

W When you saying who might vote against it, I was thinking there are a lot of people who are skeptical. I would go with the health authorities, that's what they are there for. I have to trust that they are doing their job.

S Becky?

W I think I'd go with health department.

S Is there anybody who would go with the engineers? OK, there's no one party line here. We really want to know what people think and why.

W I bet it would be a close vote. If you had a epidemic, even a little epidemic, it might sway more people than if you had none.

S Jan your feeling is that you would listen to the water engineers rather than the people health people, is that right?

W Yes, I think, I think part of it is that the engineers are the people building these things.

W On the other hand, the engineers that built _____ which like the plant. Oh we put it in straight, and it turned upside down, and put it in backwards.

W Engineers are not infallible.

W Are these the engineers that designed Diablo Canyon?

W Are they people who might have a vested interest. Let's say Selma was the engineer that had designed the system that is now being used. Then I might say she might have a vested interest, whereas if this is a different group of engineers, then I might want to look at.

S If there were such a proposition, who do you think would be busy trying to mobilize the people to vote either for it or against it?

W Contractors who would vote for it.

W I would think the PTA's, mothers in clubs, school teachers and things would, health care people would be inclined to vote for it.

W I don't know who would do it, to vote against.

W The beavers!

W Probably Christian Scientists would say that they would need to vote for it, maybe.

S Margaret, you've been awfully quiet back there. Do you want throw something in?

W I think what might be on the ballot at the same time affects peoples' votes. If you're casting a whole lot of votes, then if this is down at the end (of the ballot) and you voted for a lot of issues that cost money, you've got to vote against something. If it cost money, unless I've been sold on the idea, I'm going to vote against it.

W I would say maybe (position on the ballot) shouldn't affect my vote, sometimes I think we vote against things under other circumstances we might vote for.

S How about the other people?

W If I found out the beavers aren't moving really very fast I might not vote for it.

W If you're saying one person in a hundred, its one thing, if you're saying that there's one chance in a hundred that giardia are going to get through, it's very hard for me to take. We're talking about an unknown and we're having professionals take a look.

RTC What if there was a one in a thousand chance?

W So if you project, that means one out of a thousand people get it in the population. I would say that's too much, unexceptionally high.

W That's not a good ratio you would say?

W At that point I'd be willing to build the dam, I can't tell you what number I'm gonna accept. I would say probably if enough people were worried about it, and enough to put on the ballot, I'd want to vote for it.

W You just go around to get enough votes to get it on the ballot and you just go around to houses and knock on the doors and say please sign here.

W Because they get enough signatures to put it on the ballot is not going to influence me at all.

W I suppose if somebody leaked a rumor that there was graft and that people wanted to build it just because they wanted to build something, you couldn't believe either side then. You'd wonder whether you should vote for it, when it gets so political that you can't believe one statement or the other. You wonder who is telling the truth or is there any truth in it and you say a bunch

of doctors, what doctors, how does my doctor feel about it? It goes to that.

W I would rather err on the side of caution. At the expense of twenty to forty dollars over a long period of time, I would figure that it generally would be justified... unless I got the idea that the guy that was running it, that the people behind it, were kind of flaky for whatever reason. That would sort of take away the validity of their cause.

RCM It might not be legitimate?

W That's one of the only things I can think of. I would be very willing to throw out a little bit of money just to be on the safe side, but I don't want to be a fool about it either.

W I think I would vote against it if I found out it was all made up or something. Well they just made up this giardia because some guys want to make lots of money.

W Want to sell sand!

W Or, if they said, OK, we're going to build this plant or this filtering system and in 5 years from now when giardia starts showing up we'll take care of it. But also you know some other group says, well, in 5 years we can innoculate all the beavers where there's not going to be a problem like that. Maybe in a case like that I might say OK. If I knew there was a chance of it being taken care of in some other way...

RCM You would take a risk?

W If there was some valid way in the future, some other way it could be taken care of, then I might consider not voting for it.

W Or if you found out that it was, the forestry people or the lumber people that wanted to kill all the beavers anyway because they wanted to cut all the trees down and get them from the beavers. You don't know, anything's possible now a days.

W I think we've all been watching 20, 20 too much.

W Sixty minutes.

W It would depend on the credibility of the people involved.

S How do you determine credibility.

W I would probably rely a great deal on what the Sierra Club says, what the Audubon Society says, what broader says, what other people say about some of these issues, because I feel they have investigated.

S Are you an Audubon or Sierra member?

W I'm on the board of Audubon.

S How about you?

W What?

S Are you either Sierra club or Audubon?

W I work for an environmental law organization.

W I found that in CA there are so many issues on the ballot that I don't have the time to study all of them carefully. I belong to the League of Women Voters and I go along with them. If they said for some reason, no, I think I feel they have studied it and I would go along with them.

S Have the rest of you decided about the giardia referendum?

W I read the booklets, the arguments for and against, and certainly the endorsement of a group like that would be important.

S How about are you?

W I usually discuss things with my husband because politically we differ. I come from biology background, when it comes to areas like this and he comes from the forestry industry. We usually discuss it and we don't always vote together.

W I discuss it with my husband in general.

RCM If you had to ask people about giardia, what kind of information do you think they would want?

W Something that they can relate to.

RCM What aspect of the description do you think people could relate to?

W Diarrhea.

W Abdominal cramping.

W Cramping.

W I think if you wanted to get someone's attention over the phone, a description of something like dysentry stomach cramps and flu, you could probably get their attention. I think over the phone there are times when my best intentions are to give someone the time and answer their questions. But they tend to call at the dinner hour, the kids falling apart, dinner's burning, I'm tired then. After dinner I'm tired, kids in bed. Its hard to get people on the phone to give you five minutes or so and I would assume you really can't take much more than five minutes.

RCM What other kinds of information would be important?

W What causes it, how close they are, and what the probability is of it being a serious health hazard in the future.

W Yes, tell people the beavers are coming, the beavers are coming.

GROUP 2

This group, restricted to men only, was conducted on February 4, 1986 by Selma Monsky. Robert Mitchell sat in on this group and occasionally asked or answered questions. As before, this transcript consists of the portions of the two hour session which were most relevant to the purposes of this study.

(Discussion of giardia)

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Selma: There is a possibility of an outbreak of giardia in the next few years. However, health experts feel that the risk is too small to be worth that much expense. How do you feel about it? Suppose you lived in San Francisco.

M One of the ways that you treat water when your camping against giardia is to use chlorine. common practice of treating city water with chlorine so I would imagine that it may take care of it, at least it would lessen the chance.

M Did you have a taste of that? It must be good for you.

S Treating it with chlorine, what do the rest of you think?

M I wouldn't rely on it, someone saying the risk is to small to worry about, but if it's possible to prevent it I'd be in favor of doing so.

M I agree with that. In fact the American Water Works Association people who do water treatment, I'm sure they would be able to come up with some good answers.

S What else would you like to know if you had to vote yes or no on a referendum on this kind, what would you want to know to help you decide which way you would vote?

M Things I would want to know would be exactly what are the factors of the disease, the long term factors of the disease, what are the treatments for it, and what are the long term factors for the treatment so you can balance one against the other. Less the cost in terms of dollars and cents and more in terms of human life and quality of life.

S How are you using the term "factors" of the disease?

M Basically the symptoms of the disease in the long term.

S Who can answer that?

M I think its a temporary discomfort that passes in four days, I'd be a little more concerned about it if it had longer term effects.

M And how would it affect older people of given ages and pregnant women. You would have to really thoroughly examine the disease.

M I'd also be concerned about the estimate of the probability of the risk. Both some number but more important than that is some kind of estimate of the uncertainty in that. It's easy to say one in a thousand chance, that we'll have this outbreak in the next ten years, but the biggest risk might be the fact that scientists don't know and that if they were up front about the fact we might be wrong in that estimate by a factor of a 1000. The other things would be the risk of the treatment method for the water, if any. Trying to compare the risk of doing the treatment against the risk of the disease. Offhand, I wouldn't expect the cost to be that much. People aren't spending that much on water. If the cost of water went up a little bit to make it safer that wouldn't be my main concern.

S What do you mean by a little bit?

M Compared with other utilities, to me, having clean water to drink, to drink out of the tap and not worry about it, is one of the biggest advantages of having a well organized society.

S What's it worth to you?

M It's worth a lot. I don't know. Obviously I don't want to pay more than I have to, but I did use bottle water once when I was travelling aboard. The one thing that I miss most, actually, about advanced civilization, was basically being able to drink the water. To me having safe water is very important.

S So you want to know the long term effect based on particularly vulnerable people -- pregnant women and old people -- and the probability of people getting it and the relative risk of treatment versus the disease itself.?

M I think that's the sort of nearsighted way we tend to go about things, especially changing things, changing them very rapidly, without knowing what's going to happen.

M I would like to have better filtering and if that's what's going to be installed I think, rather than filter my own water, I'd vote for this and spend the cost. It seems like a lot of people are willing to pay a lot more for their water but those people would jump at the chance to vote for something like this.

S And what would you want to know to help you decide whether to vote for this?

M I think I'd look for what the method was, because if its installing filters its a better technology than say putting chloroform in waters.

S Anything else anybody would want to know to help them decide?

M I think before I get all excited about it, I'd like to know a lot more about the science of treating water, how do they do it what are the capabilities, what do they know about how they might be able to handle this.

M I know if you go down to RAI to get backpack supplies, they sell you a chlorine kit for treating water, you chlorinate the water, you over chlorinate it, and you put another chemical that releases the chlorine to restore the taste and supposedly it kills the giardia. So maybe since you already use chlorine to treat water with you could increase the dosage or something.

m That would bother me, the word expert always bother me because we still have doctors who are saying its OK to smoke and that type of thing can go in any field.

M My point is that perhaps the people that are in the field of treating water may know ways of taking care of giardia that the laymen may not know about and it may be that there is an additional cost and they haven't felt the need to do it yet but the technology is there.

S As I understand it if this isn't a matter of chlorination, but of filters and mechanical means of verification.

M That's not what I was saying, I was saying that it may not be filtering or mechanical or rather chemical means.

S Can we assume for the moment that maybe they do know what there talking about?

M Yea, I would hope so.

S Assuming they did, but it was going to cost something to build this filtration plant and they were thinking about putting this proposition on the ballot in the next election, how likely would you be to vote for the proposition, if you thought the water supply might be jeopardized?

M It would depend on how it was presented. If it's presented intelligently and comprehensively as in perhaps description of a proposition of valid measure, where you have hopefully an objective viewpoint of the pros and cons and there is specific information, and its a reasonable increase in price -- its not suddenly ten dollars a month more on your water bill and they can show that the expense is just to cover cost and not to increase profits, I would definitely consider voting for it.

S What else would you want to know besides the price?

M I can add from my experience. I was paying in CA five gallon bottles cost 4 dollars at least, my wife and I use about 2 bottles, maybe not quite 2 bottles a week, so its four to eight dollars a week for drinking and cooking.

M They also sell filters that you can put on your water faucet so you can filter you own drinking water directly.

M That may not take off all the bacteria.

M Is that charcoal?

M No its more than that.

M There's different kinds...

M Similar to the ones they used for backpacking, that kind of filter big canister?

M You can't be in a hurry to get water for that.

S Are you saying that you would prefer...?

M This is just an alternative. I think if this proposition came up, personally I feel sort of proud of living in an area where we have a real good water supply, good water district and I'd like to see it be a leader in the field. I'd be all for it.

S So, you'd be vote for it?

M If they say that's what they wanted installed. More rationally, I'd like to know why is it necessary, I'd like to have them demonstrate that there is a problem.

S How about the rest of you, would you be inclined to vote for or against it the proposition?

M I think I would vote for it. To build these plants takes years and the water seems to be getting somewhat worse. They find more places where pollution or something in the ground affects the water. We don't know years from now what the effect will be of all this combined.

M What are you talking about, local referendum just for our district or for the whole state?

S Local.

RCM In this case we should just assume that it would only affect giardia, it wouldn't affect salt or any other contaminant that might occur or taste or odor. It would simply filter out the giardia.

M Do you build up any sort of immunity for it, or is the second time as bad?

M Like a cold?

M I'd be very likely to vote for it unless it seemed like they didn't know what they were doing or they didn't present enough information. I certainly be inclined to vote for it.

S How about you?

M Inclined.

S Inclined to vote. Anybody included to vote against it, suppose the public health people said that you need it and the water department engineers said you don't need it, which way would you go, who do you believe?

M Public Health people.

S Any special reason?

M I'm not sure, somehow I place more faith in people whose job it is to be concerned about health, than people whose job it is simply to move water around.

M And cut costs.

M If the engineer said not that it wasn't needed, but that the systems available were inadequate to do the job, that would be a different thing because that's the area of expertise of engineers.

M I'd be real interested if the public health people said you needed it and they said you didn't, because as far as I can see its to their interest to be for it. Basically it increases prestige and their getting new projects to do which engineers like to do. Their going to get more money and more people than if they said it wasn't needed. I'd look twice at it, but I would still vote with the public health people.

M By the way, does this filtering system, it affect the entire system?

M Nobody's explained it to us yet.

M So there's no major difficulty with installing the filters?

*****

S So you said you didn't want to spend like 10 dollars a month for it, how much would it be worth to you?

M I'd swallow five dollars a month fairly easily.

S How about the rest of you, what's it worth to you?

M The figures I go by are that bottled water would cost me about 32 dollars a month. It would cost less to install the system and bottled water is not a convenience because it has to be stored?

S So you'd happily pay ten dollars a month, how about you?

M I would pay ten dollars a month without worrying about it too much. I'd say if it got up towards $20, 25 a month then I would start to wonder whether they really understand the risk well enough. Because that would be pretty expensive. But at five or ten a month I wouldn't read it too carefully and I would probably vote for it. If it were a lot more than that, I would start looking pretty

carefully at whether the risk of an outbreak is really that serious or whether its just something ... there's always some finite but very very small probability of something terrible happening and this isn't as terrible as a lot of things that could happen. If the risk was really small then I might have to look for it.

S How much do you think its worth?

M Ten is pretty easy, most likely they'd float a bond issue. Ten dollars a month is over a thousand dollars a year, I mean a hundred dollars a year. That's not bad these days.

S How about you?

M I was kind of amazed to think back when you had a drought. I don't know how many years ago it was, and I like everybody else, we bent over backwards conserving water, and when I got my water bill and found out even though I was using less than half what I used before I was paying more than twice as much as I paid before. So I don't think I'd kick about a little bit of money.

M It proves the utilities have a fairly good, water has a good reputation for the most part. Utilities have a very black reputation, second only perhaps only to Nazies. Especially the nuclear power, utilities in passing all that expense on to us.

M We don't hear that much written about water in this area, although you do in other areas. I've been here for over thirty-five years and I haven't remembered much being written about water in this area.

M Except during the drought.

S What kinds of people do you think generally would favor this proposition?

M Anybody who thought they were going to get sick.

S Well who do you think would think they were going to get sick?

M If they convinced the people they were going to get sick, everybody would believe it. On the basis of what we talked about tonight I'm not convinced at all but I'm sure if they came up with logical explanations, statistics, and projections I could understand that.

S I don't think they're ever going to say that everybody's going to get sick. What their going to say is that there's a high risk or there's a risk that people might get it and so what I'm really asking is how high the risk would have to be to make you feel that its worth it?

M People come down with the flu, some people get it once or twice a year, I just wondered if anybody would want to not get sick for a period of time.

S As I understand it, they're not saying that there is a long term effect unless its untreated, is that right? But if you get medical care you get rid of it, but it doesn't keep you from getting it again.

M Is there an accumulative effect as you go on in time? Is there a greater and greater likelihood of people getting the disease from the water? That would be one major concern.

R Is there a way of getting it back?

M It's got to come from someplace.

R We're talking about the effects, not the details.

M What I meant was as time progresses would water be transported through this system in five years there may be fifteen chance of infection, in twenty five years there could be a 35 percent chance.

M No medical evidence to support it. But I still come back to this theory. A lot of these people I worked with in Mexico that were mostly Americans, the longer they were down there the less they got anything. I don't know how you support that, but some of them have been there 20, 30 years. They did not suffer from what the casual tourist suffered from.

M That's usually because of bacteria which are different in different locations so you get sick the first time you encounter bacteria from a different location, and once you get those bacteria in your gut it gets used to it, and you don't get sick. But giardia is a parasite, it's different, so you don't build up any immunity to it.

M Attitude may have something to do with your immunity system.

S What does?

M Attitude and expectations.

M That would work in the favor of us because we don't expect to get sick from out water, we expect to get sick from other people's water.

M There's no chance of that.

M Is there a chance of that?

M It seems to me as though this issues rests on the probability of people getting exposed, how many people are going to get sick in a year, and is this going to increase in subsequent years and what would cause the increase?

RCM In this case you can assume you can't treat the source, you can't attack the source, the only way to be sure there wouldn't be an outbreak would be to install the filters.

S What would I have to say would happen to the risk before you decide it wasn't worth it? If I said that you had one in a 1000 chance of getting it would you vote for it or against it?

M You said the risk is what it presently is then I wouldn't be concerned.

M I think if you said it is 1 in a thousand at 50 cents a month I'd still vote for it but if it's 1 in a thousand at 10 dollars a month...

M Maybe you're going about it the wrong way if you're trying to sell it to the voters.

S I'm not trying to sell it, I'm trying to learn.

M Nobody is trying to sell it. What we're asking is what its worth is to people.

M I'm not sure people could make up their mind on that until it actually happened. There's a lot of people who tell you one thing, but when it actually happens they may change their minds.

M Who would gain from this aside from the public? Supposing the risk remains as it is and throughout the area things called filters or what ever it is, pipe systems, does somebody gain from that? Manufacturers of the filters, is there some movement behind it? People get suspicious.

M You'd be reluctant to vote for it because of certain kinds of suspicion, even if you don't know what they are.

M I think that my suspicion would be if there's no authentic threat, only inuendoes, I would start to wonder why does somebody want to spend my money for that, for something that doesn't exist?

S As I understand it, there's a concern that it might hit San Francisco's water, so what I'm really saying is if you were a San Franciscan ...

M So far you've concentrated on the negative effect of the disease. But more and more people are becomming aware of what they drink. I think I would buy it more on purity of the water as the first consideration and prevention of the disease the second consideration.

RCM It's a difficult decision to know whether to go forward or not and in a real sense it sort of depends on what its worth to people and not to sell it.

M One thing that's interesting is that Blue Cross always says you have a 1 in 7 chance of going to the hospital. If you buy medical insurance you save 90% of the costs of hospitalization for whatever that period might be. But I pay for that with my health insurance and go without it lots of times just to save the money. I think

people like to take risks and put off for tomorrow the risks that they could start paying for today. I doubt that psychology a lot of the time unless its really inexpensive. Wearing your seatbelt is free. Health insurance and water pollution aren't free.

M If you were to rank the things that could happen to you, injuries or sicknesses, automobile accident, a fall in the bathroom, getting sick from water is way down there. Look at things in perspective.

M You can be awfully miserable with something like that.

M You can sort of think about it as once in a lifetime thing. If there's any possibility of it happening again, you just buy bottled water.

M At home?

M I tend to be very risk adverse about things like this, in general.
S Risk adverse?

M Except in this particular case its not permanent injury. Its something, well, what I guess I would be interested in knowing whether it is possible that the disease could be fatal for sensitive populations ... babies and old people. I should assume that's not true?

M There have been some cases...

S You've been very quiet, how much would it be worth to you?

M Having listened now, and getting a better picture of what we're talking about if they said they could put in a system that would eliminate the chances down to a percent I'd pay ten dollars.

S Ten dollars a month?

M I'd pay $15 if it were 100% for sure?

M Would you pay that if the risk of an outbreak in SF were say 1 in a thousand?

M I would feel better if I would just not have to worry about it.

M How can we separate East Bay and SF? Assuming that SF will have an outbreak and do we pay for it or do they pay for it and if I live in Oakland and work in SF. How does this affect me?

S So you are willing to pay 10 dollars a month. And how about the rest of you?

S What percentage is it?

M I have no idea, I pay my landlord?

M If you paid ten dollars a month, 10,000 people paid it, that would be like two hundred million dollars. We should get for a twenty year bond or something like that.

M Make a calculation about how much money they should get.

M It seems like it would throw it in to a place where they had to do it.

S If we said the risk was one in a hundred as opposed to one in a thousand would that have any effect on your feeling.

M Oh yes.

M One hundred per year?

M I really think anybody, if they're really convinced, would pay anything they'd have to pay to get good water. Whether it was five dollars or ten, I don't think they'd mind that much.

*****

M If you have five hundred thousand people, one in a hundred, five thousand people a year, is an awful lot.

RCM Risking a outbreak.

M With the outbreak there could be five thousand people affected. That could just be a major disaster for health care. Can you imagine twenty thousand people with those symptoms.

M Imagine it would be worse.

M Much worse.

M Considering those terms I think its worth putting more money...

M It's much more impressive when you think of twenty thousand people sick at one time. When you think of yourself sick for four days.

RCM The odds of you being sick.

M You could cripple a city, having those many people sick at one time.

M Is boiling the water alleviating this problem?

RCM Yes.

M It has been done, I know that from being from Europe, at certain times we always boiled water, well water.

M Was this disease known to you in Europe?

M No. It was just a caution everybody boiled the water.

M I think I'd rather take the filters than everybody boiling their water.

S Everybody boiling their water what?

M Would be very wasteful.

M You would help allow extra energy for gas. If you're talking about a short term then maybe some people can justify the solution for a few weeks, or a few months, to do that instead of paying ten dollars forever.

M How many people is it estimated will be diseased in one outbreak?

RCM It could be 20,000 people.

M How many people are sick on the average now, does anybody know?

M Tremendous amount of sick leave taking.

M If it wasn't publicized it might go almost unnoticed, there would be a lot of people left home or sick.

M I don't think there's a voluntary interest to publicize it.

S This is a surprise, everybody here is so happily paying for this. The women last night were tougher they had several people who didn't want to. There's nobody here who is bothered by the idea of voting yes on this, nobody wants to vote against it?

M Were the same questions raised about the high risks and did they discuss the same things we discussed?

S Essentially.

M I think there's a lot of evidence that women tend to pay the bills.

S I'm just interested, don't let the majority scare you into agreeing. If anybody is against it, I'm really interested in knowing. Everybody's for it, that amazing.

M I'm not going to vote for it, but if it comes up the way you presented it there's no way of denying it.

S But you wouldn't discuss it, you'd really have to be convinced

M Oh yea, the documentation, what we were talking about earlier. I'd like to know the sources, what can or cannot be done about that, I'd like to know the medical health point of view, statistics, treatment aspect.

S You say you want to hear these things, who do you want to hear it from?

S What kinds of people would you expect to come out for it?

M Do you mean individuals or organizations?

S Anyone, whose going to be quoted on the ballot as being in favor?

M Anybody to make money out of it.

M Anybody would jump on that bandwagon.

S I'm not clear, the politicians would jump on the bandwagon?

M We need this, we want to take care of you, you don't want to get this disease, this is why i'm in support of it.

M You need a statement from the American Water Works Association.

M That wouldn't carry any weight with me, because I don't know that name.

M I have a vested interest too, if they supported it, they said it's needed, I think I'd believe it.

M I think health organizations would be behind it. I would assume they would be.

M Health insurance organizations will.

S Anybody else you expect to be against it?

M I think people who might represent pregnant women, disabled, aged people, children. Spokespeople for them would be for it.

S And who would you expect to oppose it?

M Taxpayers association that are against it for no particular reason

M I think a lot of people too who, if the proposition if not well presented, then they would tend to vote against it, figuring that if it is really needed, it will come up again, and it will come up in better form.

M I think my roommate would be against it too. People who eat regularly McDonalds would be against it. People who eat cheap and fast, they don't care what they put into their bodies.

S Would you mind explaining people about who eat at McDonalds

M If you are not really concerned with what goes into your body then you wouldn't be concerned with what you drink either. You pay your money and take your chances. The idea is you pay less and take more chances. So I think those people would decidedly be against any sort of investment capital in something that's only preventive, may never happen.

M How many people who are heavy drinkers or into drugs likewise may not support it.

M Some people never drink water.

S Who else do you think would be?

M Drug manufacturers who would lose their business of selling their certain drugs.

M Something like that wouldn't be so much of any company's business they would be willing to risk their reputation by coming out on a limb opposing it. So I don't think you have to be to concerned about them, but a lot of people have a vested interest in illness.

S In what?

M But as sporatic as this there's no way to make a decent income so I don't imagine there would be any vested interest in preserving it.

M I guess there might be some people who would be concerned about the filtering causing problems with the water, that some particles from the filters might get into the water and cause health effects. Some people might take a militant anti-interventionist attitude, because they don't want to do anything that directly adds the risk. I wouldn't expect this from too many people like that.

M I'd be kind of afraid if this ever came up in proposition form, they'd write it up the way they did this real estate one that came up years ago, where you voted yes to get no and no to get yes. It had people so confused the people voted no not knowing they were voting yes. I can see something like this coming up and some political, so many of them have come up that way you don't really know what your voting for.

S You think that's deliberate?

M I'm pretty sure in this case it was very deliberate from the real estate people. Sure that's the more reason they did that this, they could pull the wool over a lot of people's eyes.

M How do they usually decide when you vote on a referendum?

M Something like that takes a tremendous amount of studying and looking into, asking questions to really find out what's going on.

S Who do you ask?

M Lots of people, cigarette companies come in, you see them backing something with millions of dollars.

S Anybody else whose opinions you particularly respect or seek out when you make decisions?

M Often there's so many propositions that I haven't thought of at all, there a very extensive brief prior...

S What?

M A brief explaining both sides and objective interpretations of both sides and I depend very heavily on that for issues that are not critical to me.

M Don't you find sometimes that after you read that you come away with the distinct impression that somebody has to be lying. Both of these things can't be right. You come across that all the time. I keep saying to myself, they shouldn't be able to lie on this stuff, but I'm sure that they are, one side or the other.

M And if I can't decide one way or the other, if I don't feel that I know enough about it, then often times I won't vote on it a certain proposition.

M Don't you think that most people, when that happens, are not understanding what's happening. I wonder, do they vote a certain way? Do they vote no or do they vote yes. I guess what I was going to say earlier I tend to think something real short concise and simple would be good.

M I was just thinking about that, I kind of read things, if something real complicated sometimes I will...

M Don't you read the proposition sometimes and see how many people in the Senate voted for it?

M That's a good question.

M I guess what I was about to say earlier was that some times I tend to think when something is real short and concise and simple, and it looks harmless enough people, will vote yes.

M If they can have a price tag on it.

M I was just thinking about that, if there's something real complicated sometimes I will or because I don't know.

M Don't you read the proposition sometimes and you see how many people the Senate for or against, you figure if 77 people said yes it must be alright in spite of what anybody else says.

M Until you read the history of those 77 people, you're saying you can't tell who is lying and why they would lie. I raise an argument somebody say pro or against and it does sound like BS sometimes. This guy who says no, no we can't do this I realize his logic is completely off, and he is just BSing. I'm just thinking something like this, the presentation is very very important and the people who aren't going to take the extra few minutes to read I would think that they would want to do a little troubleshooting to try whichever way you'd want things to happen. I would play that game a little bit, playing politics.

M A lot of people don't really get that far down the ballot.

M Haven't there been studies made where you go down the ballot and you only look at it this costs money, OK I'll vote against that; if it doesn't cost money, I'll vote for it. And there are a lot of them that don't cost money, sometimes.

R If you got a telephone call and she posed a question to you about the giardia prevention...

M I think I'd be more inclined not to listen to anybody that talked to me on the telephone. I get sick and tired of people bothering me. If it's not in person, I don't want to talk to them on the telephone.

R What if the question was posed in terms of a hypothetical referendum?

M I don't think it would affect me, I don't know that it would affect about whether I thought it was a good idea particularly. It might make me more interested to know that its likely to become a referendum, rather than its some company calling up. But in this case if someone said something about giardia, I wouldn't expect it to be a commercial concern. Un. of Cal. is doing a survey I don't think it would make that much difference whether it was going to be a referendum or not.

M I don't think so. Unless, who was proposing the referendum. It might be a referendum proposed by an unknown group of people, there are a lot of really poor referenda proposed as well as some good ones.

M If somebody calls me up I would listen. I usually listen but I wouldn't make any commitment or decision at that time.

R Why not?

M Because then, if I didn't know anything about it, I would try to find out more, and then make decisions.

M At least would make me take it more seriously and I wouldn't make a decision at that time but especially if the referendum were backed by organizations that I respected that would certainly...

M It would give it a bit more weight than just somebody calling me up polling my opinion about it.

M It would give it some status at least. It would give it some, I don't know if its valid or not.

M At least I wouldn't hang up on the person.

M No, I don't think it would bias the person, agreeing or disagreeing, it would just focus my attention on it more than if it were otherwise.

M I think the fact the referendum would definitely influence, I'd put a lot of weight on that

S You'd say yes you'd vote for it?

M I'd vote for it. I'm not sure but I put more weight on it since it is a referendum.

M It would focus my attention on it more.

M I don't know, I like really off the cuff opinions, I think someone says referendums to me, immediately I'd start thinking about -- does this person want me to sign something, am I supposed to, if they want me to sign something am I supposed to go to a rally? It makes me more concerned about the opinion I express and I think much more seriously. I think it's a good idea abstractly, of course, its a wonderful idea, But if it is expressed as a referendum, I'd say I have to know more, have to think about it more. I would probably be less likely to make a commitment to them, but more likely to do backup work.

S On the one hand, when we conduct the survey we want people to take it seriously, but don't want to make one side more patable than the other. We're trying to get an unbiased question, it never occurred to me that that would have that effect

M It's hard, we want people to concentrate on it and think it though. Like I think everybody so far said the referendum way of doing it gets your attention, but we really don't want people to think it's on the ballot.

M Would this be a referendum to go to the state legislature?

M It's not a referendum, your just taking a public opinion.

S That's right.

M It confuses me.

S What if I said to you, if the presidential election were being held tomorrow who would you vote for? You would understand that it wasn't really being held tomorrow. This is the same sort of thing. If we called, and said we're doing a public opinion survey, I want to ask you some questions, and this is what giardia is like and so forth.

M If you didn't hear the word referendum.

M If you didn't hear the word referendum I'd understand you.

S Suppose that you had to vote either for or against a bond issue that would cost your household X dollars and it would be for this purpose?

M I'm a little surprised that most people would take the time out, they could take the time out to listen on the phone about anything. I mean I consider my home to be my castle and if I ask somebody to call me that's fine. If some of my friends call me,

But anybody calls me for any reason, and want's to ask my opinion on this or that, or they want to sell me a gold mine in Africa or something like, that I'd tell them I don't do this.

S We were able to persuade better than 70% of the people we called to talk to us. That's if we call cold, using random digit dialing. But if we know who we're calling, then we can call and say this is the Bugg residence. We can also write letters beforehand so that increases the chances because it establishes credibility. But what I'm so curious about is if the mere word referendum gives this more credibility, and makes you more likely to vote yes, then why don't you vote yes on all the propositions on every ballot. Somebody is voting no.

M I'm not influenced by referendums.

M I think if you simply say what if tomorrow there were going to be a vote, it have of course less influence than if you said there is going to be a vote, or that we're going to put this on the ballot. That makes a big difference, it would be less, I'm sure, if you simply said this is a hypothetical situation.

S Of course we're not allowed to lie to people.

M You could make a hypothetical that that sounded more realistic. You could say that San Francisco board of supervisors or the San Francisco water district, whatever it is the proper authority, is proposing this bond issue. Then it would sound like sort of real

M If in the beginning of the conversation you gave them a very descriptive scenario of what would happen if this disease broke out in East Bay or SF, basically this equals ... now we'd like your opinion about this, I certainly would have an opinion on that.

RCM Would you be as inclined to assume that a yes vote would probably be in order?

M My immediate reaction is that if there was a referendum, I wouldn't be as likely to say yes if it was a referendum.

RCM If it actually got on the ballot?

S Would everyone agree?

M Well, using the referendum format would make it a little more gripping to people.

SUGGESTED INTRODUCTION (IF R WAS NOT INFORMANT):

Hello, this is _____ from the Survey Research Center at the University of California. We're conducting a survey, interviewing a scientific sample of people who live in the Bay Area and your telephone number happened to fall into our sample. (The rules we have to follow in selecting one person in each sample household tell me to interview you.) Is this a convenient time for you?

IF R ASKS ABOUT NATURE OF SURVEY: We're trying to learn more about people's experiences and opinions about drinking water. *IF NECESSARY, ADD:* There are differences of opinion about the need for and the value of certain kinds of action to provide the right kind of water, and we're trying to find out what the average person thinks.

1. A. How long have you lived in San Francisco -- at least five years, or less than five years?

At least 5 years . . . *(SKIP TO Q 2)* . . . 1
Less than 5 years 2

B. Have you lived here at least one year, or less than 12 months?

At least a year (12 months or more) . . . 1
Less than 12 months 2

2. A. Have you ever voted (EACH)?

B. *IF YES:* Do you usually, sometimes, or only rarely vote (EACH)?

	A. EVER VOTE?		B. HOW OFTEN VOTE ON THIS:		
	Yes	No	Usually	Sometimes	Rarely
(1) In the presidential elections (held every four years)	1	0	1	2	3
(2) In the San Francisco city election for mayor	1	0	1	2	3
(3) For or against State propositions	1	0	1	2	3
(4) For or against City of San Francisco propositions	1	0	1	2	3

3. A. In order to know which questions apply to you, please tell me whether you own or rent your home or apartment.

Own . . . . . *(SKIP TO Q 4)* 1
Rent 2
Other *(SPECIFY:* _____ *)* 3

B. Do you have to pay your own water bill, or is that included (in your rent)?

Included in rent (or arrangement) *(SKIP TO Q 6)* 1
Pay own water bill 2

4. A. About how much does your water bill usually run -- for the average three-month period?

Names dollar amount *(SPECIFY:$____)* . . . 1

Not sure or don't know . . *(SKIP TO Q 5)* . 2

B. It's often hard to remember how much bills like these run. How confident are you about the (DOLLAR FIGURE) -- would you say that you're quite confident, somewhat confident, not too confident, or that it's a wild guess that could be way off?

Very confident 1

Somewhat confident 2

Not too confident 3

Wild guess that could be way off 4

NOW SKIP TO Q 6 BELOW

5. If you had to guess, would you say that it probably runs over $40 for the average three-month period, between $30 and $40, or less than $30?

Over $40 1

Between $30 and $40 2

Less than $30 3

Can't even guess, have no idea 4

6. A. How satisfied are you with the quality of the water provided by the Water Department -- very satisfied, somewhat satisfied, a little dissatisfied, or very dissatisfied?

Very satisfied . . *(SKIP TO Q 7)* 1

Somewhat satisfied *(SKIP TO Q 7)* 2

A little dissatisfied 3

Very dissatisfied 4

B. As you see it, what's wrong with the San Francisco water supply?

7. Have you ever used bottled water (since you've lived in San Francisco) -- that is, ordinary drinking water, not sparkling water?

Yes 1
No, never in San Francisco *(SKIP TO Q 9)*. 2

8. *IF EVER USED BOTTLED WATER:*

A. About how long ago did you use it, or are you using it now?

More than a year ago *(SPECIFY:* _____years ago) 1
Used during the last 12 months 2

B. What's the main reason you (use/used) it -- (is/was) it because of the way it (tastes/tasted), because you (think/thought) it was healthier than water from the tap, or what?

CODE ALL THAT APPLY, BUT DO NOT PROBE FOR OTHER REASONS.

Prefer the taste of bottled water 1
Think/Thought bottled water safer 2
Other *(SPECIFY:* _____
_____*)* 3

9. A. Have you ever heard of giardia or giardiasis?

Yes, have heard of it 1
Possibly, not certain 2
No, never heard of it . . *(SKIP TO NEXT PAGE)* 3

B. Where or how did you happen to hear about it? [*IF R MENTIONS SOURCE BUT NO MENTION OF CONTENT:* What did (it/they) say about it?] [*IF NEEDED:* What else did (it/they) say about it?]

10. Here are some other issues that people have suggested as possible propositions for the next San Francisco City election. As I read each one, please tell me how you would vote if the election were being held today.

How about (EACH)? (Would you vote <u>for</u> or <u>against</u> it?)

	Vote for proposition	Vote against proposition	Would not vote on it	DK, Can't decide
A. A bond issue to pay for renovating San Francisco's city parks -- including repairing buildings and landscaping as needed -- assuming that it would cost each household another $4 per year	1	2	3	4
B. A fund to clean up hazardous material spills that could cost (you/ your household) $8 a year	1	2	3	4
C. A bond issue to build a new pier, including new unloading and warehouse facilities -- assuming that it would cost (each household) $3 per year	1	2	3	4
D. Bonds to renovate the city hospitals and to purchase new equipment -- assuming this would cost your household $6 per year	1	2	3	4
E. Bonds to repair old jail facilities and build new facilities to reduce overcrowding -- assuming that this cost your household $5 a year . .	1	2	3	4
F. A bond issue to pay for new buildings at the community college -- assuming that this would cost (you/ your household) $10 a year	1	2	3	4
G. A bond issue to renovate the opera house and museums and which would also provide for expanding the art collections -- at a cost of $3 per year per household	1	2	3	4

X-1. [As you (may/probably) know], Giardiasis is a disease people get from impure water. It won't kill you, but it can cause severe diarrhea (runny bowels), cramps, belching, weight loss and other symptoms similar to a bad case of intestinal or stomach flu. The worst stage only lasts three or four days, but if it's not treated, it can lead to more serious problems.

Some health and engineering experts say that it's possible for San Francisco's drinking water system to become infected with giardia in the near future. They want the City to take special steps to protect the water supply. Others think that the City's water is already adequately protected, and that the risk is too small to justify building the large and expensive filtration system or plant that all experts agree is the only way to guarantee that giardia cannot get into the system.

Before I ask how you would vote on this issue, is there anything more you'd need to know in order to decide how to vote?

Yes, need information 1

No, ready to vote *(SKIP TO A)* 2

IF YES: What else do you need to know? *(CHECK APPROPRIATE BOXES, INDICATING R'S QUESTIONS. THEN GIVE ANSWERS INDICATED, RECORDING ANY COMMENTS FROM R.*

[ ] *IF R ASKS ABOUT THE CHANCES OF AN EPIDEMIC IN SAN FRANCISCO, EXPLAIN:* That's the big uncertainty. Outbreaks of giardiasis are rare, but they have occasionally occurred in cities like Wilkes-Barre, Pa.; Vail, Colorado; Reno, Nevada and other cities which do not filter their water. Most experts agree that there's not much chance of this happening in San Francisco, but it could happen. San Francisco could go for 100 years without an outbreak -- or there could be one next year or the year after.

[ ] *IF R ASKS HOW MANY PEOPLE WOULD BE AFFECTED IN A SAN FRANCISCO GIARDIASIS OUTBREAK, EXPLAIN:* Most people who are exposed to giardiasis -- even during an epidemic -- do not get the disease. If there were an outbreak in San Francisco, the experts think that only a few thousand people might get it, but that it might be as many as 100,000 who get it. In other words, if there were an outbreak in San Francisco, it might be that only one person in every thousand San Franciscans would get the disease -- or it might be that as many as one person in every ten people would get it.

[ ] *IF THEY DON'T BUILD FILTRATION PLANTS, IS THERE ANYTHING THAT COULD BE DONE AFTER THE CITY FOUND OUT THAT THERE WAS AN OUTBREAK?* As soon as the health authorities learn that there's been an outbreak, they will tell people to boil their drinking water. Boiling water for one minute (after it comes to a boil) makes it safe to drink.

[ ] *IF R WANTS TO KNOW HOW SERIOUS THE DISEASE IS FOR A PERSON WHO GETS IT:* It's a very unpleasant disease, but it wouldn't kill anyone. I described the symptoms earlier. Would you like me to go over them again briefly?

Yes . . .*(REREAD THE FIRST PARAGRAPH OF Q X-1)* 1

No 2

IN EITHER CASE, ADD: Some cases are worse than others and put people in bed for several days or even for a week. But only rarely is it necessary to hospitalize someone for giardiasis.

[ ] *IF R WANTS TO KNOW WHAT A PERSON WHO ACTUALLY GETS GIARDIASIS CAN DO, EXPLAIN:* There are several drugs that can cure the disease and keep a person from getting it again. It's important to go to a doctor who can check that a person really has giardiasis. The doctor will prescribe one of these drugs, and it will cost between $10 and $25 in most drug stores -- depending on which drug the doctor prescribes.

[ ] *IF R ASKS WHAT IT WILL COST:* The engineers are trying to figure out the costs now. While they're doing that, we're trying to find out how much the average person is willing to pay per month. In no case, would people be asked to pay more than the actual cost of building the filtration plant (spread out over a 20 year period).

A. If an election were being held today, would you personally vote for or against a bond issue to protect the City's water supply against this kind of disease?

Would vote for it 1

Would vote against it . .*(SKIP TO Q X-2-C)* 2

Depends on the cost 3

X-2. A. Suppose it would increase your (household's) (water bill/rent) by $4 per month (for 20 years). Would you (still) vote for it?

Yes 1

No, probably not. . . *(SKIP TO C)* 2

B. Suppose it cost another $10 per month (for 20 years). Would you vote for it then?

Yes . . . *(SKIP TO NEXT PAGE)* 1

No . . . *(SKIP TO NEXT PAGE)* 2

C. Would you vote for it if it cost only another dollar per month (for 20 years)?

Yes 1

No . . . *(SKIP TO NEXT PAGE)* 2

D. And suppose it cost you an extra $2 per month (for 20 years)? Would you vote for or against it?

For 1

Against 2

11. And now some background questions about you -- for statistical purposes only. How old were you on your last birthday?

_____years old

12. What was the highest grade you completed in school?

No formal schooling 1
Some grammar/elementary school 2
Completed 8th grade 3
Some high school 4
Completed high school 5
Some college or junior college graduate . 6
Completed 4 years college 7
Some postgraduate work or degree 8
Other *(SPECIFY:* _____) 9

13. Are you presently employed, unemployed and looking for work, retired, (a housewife), a student, or what?

Employed full-time (35+ hours) 1
Employed part-time 2
Unemployed or laid-off 3
On strike 4
Retired 5
Housewife 6
Student 7
Other *(SPECIFY:* _____) 8

14. What kind of work (do/did) you usually do (before you retired/became a housewife/student, etc.)?

A. What kind of business or industry (do/did) you work for? *(IF NECESSARY:* What (do/did) they do or make there?)

B. And exactly what (do/did) you do there? [*IF NECESSARY:* What (is/was) your job title? What (are/were) your main duties?

15. Now I'll read you a list of different ways people describe themselves. As I read each one, please tell me whether you think it's a very accurate (good) description of you, a fairly accurate one, or doesn't describe you at all.

How about (EACH)? (How well does that describe you?) (Would you say it's a very accurate, somewhat accurate description, or doesn't describe you at all?)

	Very accurate description	Somewhat accurate description	Does not describe me at all
A. I'm more concerned about what's happening to our air, water and other aspects of our environment than most people are	1	2	3
B. When it comes to politics, I'm more conservative than the average person	1	2	3
		SKIP TO D	*ASK C*
C. When it comes to politics, I'm more liberal than the average person	1	2	3
D. I rarely vote in national elections (for President of the U.S.)	1	2	3
E. I make a point of being informed about the issues in most local elections	1	2	3
F. I'm not really interested in politics	1	2	3

16. A. Does your household include any children who are less than 18 years old?

Yes 1
No . . . . . *(SKIP TO Q 17)* 2

B. How many, if any, are less than 6 years old?

C. How many are at least 6, but less than 18?

	B. Under 6	C. 6-17
None	0	0
One child	1	1
2 children	2	2
3 children	3	3
4 or more children *(SPECIFY:* _____ children)	4	4

17. And how many adults 18 or older live with you -- or are you the only one?

No other adults, only R 1
1 other adult 2
2 other adults 3
3 or more other adults *(SPECIFY:* _____ other adults 4

18. A. What race or ethnic group do you consider yourself? *(IF NECESSARY:* We mean White or Caucasian, Black, Asian, Mexican-American, Native American Indian, or what?)

White or Caucasian 1
Black, Afro-American or Negro 2
Latino, Mexican-American, Hispanic, Chicago or Mexican . . .*(SKIP TO Q 19)* . 3
Native American Indian, Alaskan native. . 4
Asian, Pacific Islander .*(SKIP TO Q 19)* . 5
Filipino. 6
Other *(SPECIFY:* _____) 7
Don't know 8
Refused 9

B. And are you of Spanish or Hispanic origin or descent?

Yes 1
No 2

19. *CODE, ASKING AS NEEDED:* Are you now married, widowed, divorced, separated, living with someone you're not married to, but in a marriage-type relationship, or have you never been married?

Married 1
Widowed 2
Divorced 3
Separated 4
Not married, but living together in a marriage-type relationship 5
Never married (including only marriage annulled) 6

20. We'd also like some idea of your total (family) income for last year -- 1985 -- from all sources.

A. Was it over or under $20,000?

Over $20,000 . . . . *(SKIP TO D)* 1
Exactly $20,000 . . *(SKIP TO Q 21)* . . . 2
Under $20,000 3

B. Was it under or over $10,000?

Over $10,000 . . . . *(SKIP TO Q 21)* . . . 1
Exactly $10,000 . . *(SKIP TO Q 21)* . . . 2
Under $10,000 3

C. And was it under or over $5,000?

Over $5,000 . . . . *(SKIP TO Q 21)* . . . 1
Exactly $5,000 . . . *(SKIP TO Q 21)* . . . 2
Under $5,000 . . . . *(SKIP TO Q 21)* . . . 3

D. And was it under or over $60,000?

Over $60,000 . . . . *(SKIP TO Q 21)* . . . 1
Exactly $60,000 . . *(SKIP TO Q 21)* . . . 2
Under $60,000 3

E. And was it under or over $40,000?

Over $40,000 1
Exactly $40,000 2
Under $40,000 3

21. A. From time to time, the office calls people we've interviewed to make sure that we're doing our jobs properly. Just in case they should want to phone you -- or in case we find that I forgot to ask something -- may we have your permission to call back?

Yes 1

No . . . . *(EXPLAIN AND TRY TO PERSUADE BEFORE CIRCLING CODE) (SKIP TO Q 22)* . . 2

B. And what's the best time to reach you?

SUGGESTED DAY(S) OF THE WEEK:_____

SUGGESTED TIME(S) OF THE DAY:_____

22. That's my last question. Is there anything you'd like to add, or anything else you think we should be asking?

THANK AND TERMINATE

23. TIME ENDED:_____ a.m. p.m.

24. INTERVIEW LENGTH:_____ minutes

DO NOT ASK -- INTERVIEWER OBSERVATIONS

R01. Sex of respondent:

Male 1
Female 2

R02. Did the respondent have any difficulty hearing the questions?

Yes, great difficulty 1
Yes, some difficulty 2
No, none at all 3

R03. Did the respondent have any difficulty understanding the questions?

Yes, great difficulty 1
Yes, some difficulty 2
No, none at all . . *(SKIP TO R05)* . . . 3

R04. *IF ANY DIFFICULTY:* Which ones were troublesome?

R05. What was the respondent's initial attitude about being interviewed?

Very interested or enthusiastic 1
Somewhat interested 2
Indifferent 3
Somewhat reluctant 4
Very reluctant 5

R06. What was the respondent's attitude during the interview?

Friendly and eager, volunteered information 1
Cooperative, but not particularly eager. 2
Indifferent or bored 3
Often irritated or hostile -- seemed anxious to get interview over with . . . 4

R07. A. How confident do you feel about the validity of R's answers?

Completely confident . . *(SKIP TO R08)* . . 1

Some doubts 2

No confidence 3

B. *IF ANY DOUBTS:* Please say which data you have doubts about and why you feel this way.

R08. Other comments about interview or respondent.

R09. Date Completed:_____, 1986

R10. Interviewer Signature:_____