Household Travel Surveys: New Concepts and Research Needs

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At the Conference on Household Travel Surveys: New Concepts and Research Needs, held in Irvine, Calif., March 12–15, 1995, researchers and representatives of federal, state, and local government and private industry gathered to determine research needs and new concepts in household travel surveys. Concurrent workshops were held, in which resource papers and charges were presented. Resource papers were initially presented to the entire conference by appointed discussants, who summarized the papers' contents and commented on the ideas expressed in them. Authors were permitted to reply, to emphasize particular issues and to offer alternative interpretations to those of the discussants.

Resource paper authors and discussants were assigned to the workshops for which they had prepared material. Workshop topics were

- Nonresponse issues,
- Interactive stated-response methods,
- Survey methodologies,
- Data collection issues, and
- New technologies.

Although every attempt was made to keep each workshop focused on a specific area, there were a number of overlapping issues and issues that cut across most areas addressed at the conference.

Background

Household travel surveys have provided data for transportation planning for the past 30 to 40 years. The keynote paper, by Peter Stopher, provides an overview of the history of household travel surveys. There has been a resurgence of interest in household travel surveys within the past few years, fueled in part by requirements of the Clean Air Act Amendments of 1990, rules and regulations stemming from these amendments, and the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). Coupled with this resurgence of interest has been rapid change in survey designs, which began in the late 1980s The formation of the Bureau of Transportation Statistics within the U S. Department of Transportation as a result of

ISTEA has provided additional impetus to determine the direction of future activities in transportation data collection.

Throughout the brief history of household travel surveys, there has been continuous change in instruments, methods of surveying and sampling, and response rates achieved. In early household travel surveys, conducted through face-to-face interviews in respondents' homes, response rates in the range of 85 to 95 percent were commonly claimed. Response rates for recent telephone contact, mail-out, and telephone retrieval surveys have averaged approximately 40 percent The decline in response rates, as well as an increasing demand for information, has led to many changes in household travel surveys

To review existing travel surveys and examine new concepts and research needs, the Federal Highway Administration, Federal Transit Administration, and Bureau of Transportation Statistics asked the Transportation Research Board to develop the Conference on New Concepts in Household Travel Surveys. To organize and conduct this conference, TRB assembled a steering committee, appointed by the National Research Council, composed of individuals actively involved in designing and executing household travel surveys The committee's focus was the household travel survey, specifically the element of data collection that deals with the travel patterns of people living in households, from the perspective of how that travel satisfies various household and personal needs. Although it was recognized that there are issues in other areas of data collection allied with the household travel survey, it was believed that sufficient issues exist in this area of household travel surveys to convene a conference on the topic. Steering committee members expressed hope that in the near future, other conferences would be organized to deal with other areas of transportation data collection so that issues in related areas could be examined in depth.

The steering committee identified major issues in household travel surveys for which research should be conducted. The committee also performed a postconference function of developing a research agenda, by combining and sorting the research recommendations from the individual workshops Based on the work of the committee, recommended research topics were identified. These formed the research agenda, which is discussed later in this conference summary.

Conference Objectives

Conference objectives were to bring together nationally and internationally known experts in household travel surveys, with the aim of

- Reviewing existing household travel surveys with respect to recent developments and trends;
- Evaluating the ability of household travel survey data to meet transportation planning and analysis requirements, including the degree of accuracy;
- Analyzing various solutions to problems in household travel surveys, including new and emerging innovative approaches to conducting such surveys;
- Reviewing the implications of new concepts in household travel surveys on the development of national and state transportation systems; and
- Recommending a research program that is responsive to the issues, problems, and needs identified at the conference, which will assist in the further development and implementation of household travel surveys.

Workshops

Nonresponse Issues

Many issues arise in the area of nonresponse, ranging from entire households that do not respond to a survey to nonresponse on specific questions and items within a survey.

In general, surveys are encountering increasingly high levels of nonresponse, perhaps as a result of the number of surveys and marketing contacts made these days. Many recent transportation surveys, therefore, have used incentives to encourage response. There are several issues in the use of incentives, including the efficacy of monetary incentives versus gifts, lotteries, or sweepstakes. There is also an issue of whether incentives generate biases in the completed sample, resulting from a particular type of person or household being influenced by incentives. Other areas to consider are that designs, such as the use of pictographs and color, may affect nonresponse levels and that biases may arise from nonresponse to an entire survey.

Some recent surveys have used various methods to "convert" respondents who refuse to complete a survey. The extent to which conversion of refusals may succeed, its potential to add a new bias, and concerns with the quality of data resulting from a reluctant respondent who has been "converted" are issues to be addressed At the other end of the spectrum, there are issues of item nonresponse, particularly to questions about income, but also to questions relating to personal characteristics and information on activities and travel. A part of this activity of cleaning data sets has always involved the imputation of missing values. The workshop considered the following issues:

- What is permissible for imputation and whether imputed values should always be flagged in data sets;
- Factors that create nonresponse, such as illiteracy and people whose primary language is not English; and
- The extent to which nonresponse problems can be reduced through design and administration procedures.

Another issue that relates closely to nonresponse is defining what constitutes a complete household. In some surveys, failure to retrieve data from any person in the household is considered sufficient to render the household incomplete, and the data are discarded. In other households, some residents may refuse to provide information, and the household is still counted as being complete Apart from the budgetary impact of such decisions on the agency executing a survey, there are potential nonresponse biases that may arise from different definitions of what constitutes a complete household. A related issue is collection of data by proxy (i.e., under what circumstances it may be possible to obtain data about one member of a household by questioning another member of the household). Routinely, this is the procedure used for acquiring data from children. The issue here is whether proxy completion for adults and older children will create response and reliability problems. This is an increasingly important issue, given the growing number of surveys using telephone retrieval to collect data from households.

Stated Response

Stated-response surveys attempt to reflect real-world consumer decision making. Respondents are presented with a range of options (e.g., transportation modes they might have for a specific trip) described by a limited set of characteristics. Certain characteristics are selected for variation, and respondents are asked to select their preferred option under each of a number of different scenarios of the values of the characteristics. To do this, respondents must weigh the pros and cons of option characteristics. These sets of trade-off questions typically are administered to specific survey population subgroups

In the past year, at least six metropolitan planning organizations (MPOs) added stated-response elements to their travel behavior surveys (Portland, Ore.; Vancouver, Wash.; Eugene and Salem, Ore.; Washington, D.C.; and Dallas, Tex.). The purpose of this workshop was to explore issues relating to the use of stated-response surveys. The workshop addressed the following concerns:

- Complexity of the topic;
- Types of issues best addressed through stated-response surveys;

- Process (determining attributes and levels);
- Timing of revealed-preference and stated-response surveys;
- Experimental design, including degree of individualization;
- Sample size and population subgroups;
- Layout of forms (respondent burden); and
- Analysis of results.

Although it was recognized that some background on stated-response surveys had to be presented to provide the framework for discussion, the intent of this workshop was not tutorial. Instead, its goal was to address specific practical issues that MPOs must understand when considering a stated-response element for household travel behavior surveys.

Survey Methodologies

In the area of methodologies, a number of issues were covered. Several sampling and statistical issues have arisen as planners use data that have been collected from travel behavior surveys. Some of these issues involve the initial decisions regarding the sampling frame. For example, in many surveys, the sample had been stratified based on variables usually found in traditional forecasting models, which include number of persons in household, vehicle availability, housing type, and income. Recently, there has been interest in incorporating life-style and other sociodemographic variables as predictors of travel behavior. This approach has led to slightly different sampling schemes in which land use, population density, and access to various transit options are the key sampling strata. Other methodological issues that have arisen include the following:

- Targeting of subgroups of the population, particularly those that use specific (rare) modes or that represent rare or unusual segments,
- Cross-sectional or panel surveys; and
- Use of mail-out forms to collect household and personal data.

Another area of concern of this workshop was data expansion, particularly with respect to determining the universe from which a sample has been drawn and changes that may occur if the decennial census changes to continuous measurement of the variables currently contained in the "long form."

Within the area of methodologies, retrieval methods were discussed. Such methods currently focus on mail-back or telephone retrieval, the latter using computer-assisted telephone interviewing (CATI); however, the possibility of returning to the use of face-to-face in-home interviews should be considered.

Data Collection Instruments and Related Issues

A significant amount of variety exists in the structure and form of instruments to collect household travel data. The past 4 years have seen considerable increases in this variety. Among alternative instruments are travel or activity diaries, 1-day or multiday diaries, and separate or included memory joggers. Older forms of household travel surveys, patterned largely after the interview forms used in the 1950s and 1960s, continue to be used by many agencies. More detailed issues in instrument design include such items as whether to include personal data in diaries; the extent to which a diary is used as a more-detailed memory jogger, with most information requested for the first time in the retrieval interview; use of booklet diaries or single-sheet diaries; and embedding answer categories within questions or using separate lists of categories. In addition to being addressed from the point of view of nonresponse, the issue of literacy was addressed in this workshop, particularly concerning the complexity of concepts, language, and instructions in a data collection instrument

Finally, this workshop considered issues of content in survey instruments, including collection of personal and household income, vehicle odometer readings, and detailed in-home activities The workshop resource paper addressed as many of these instrument design issues as possible, providing brief descriptions of each and discussing some of the pros and cons of each type of instrument.

New Technologies

Use of new technologies in the collection and analysis of travel survey data may offer many benefits, such as improved data quality and reduced survey costs. For example, CATI systems permit interviewers to enter data directly into a computer file as the interview proceeds, instead of through a separate step when the interview is complete. Logic and consistency checks built into CATI software minimize data errors and enable survey interviewers to recycle quickly through questions in which initial responses may have been incorrect or ambiguous Similarly, use of geographic information system (GIS) technology greatly improves the accuracy of coding location data and substantially reduces the time required for postprocessing and expanding survey data. Other new technologies such as vehicle instrumentation, cellular telephones, bar coding, laptop computers, video, aerial photography, and the Global Positioning System (GPS) also are being applied in innovative ways to the collection of travel survey data.

The workshop addressed the following questions·

- How are new computer and other technological innovations being applied to the collection, processing, and analysis of travel survey data?
- What are the advantages of these new technologies, and what new biases or other errors might they introduce?
- What are the costs involved in using these new technologies, and where do they offer the greatest return on investment of time and survey resources?
- What obstacles prevent more widespread use of these new technologies, and how can these obstacles be overcome?

Overarching Themes

Although workshops were focused on specific issues, five primary themes common to two or more of the workshops emerged:

- Concerns about standards and best practice;
- Concerns that quantity of sample and budget are too often the drivers of surveys, because clients do not know what a "good" survey is;
- Nonresponse,
- Expectations of random digit dialing becoming increasingly difficult; and
- Need for research to determine how to perform surveys better.

Standards and Best Practices

There appears to be considerable concern among most transportation survey professionals that no established standards are applied to surveys This results in much variability in survey quality and harms the credibility of survey data. Among issues that the workshops raised in this area are the wide divergence in methods of calculating response rates, lack of comparability between surveys because of lack of standards on how to assess survey success, and lack of minimum standards that agencies can apply and expect from survey consultants. Although these issues were raised in the context of household travel surveys, they extend to most forms of transportation data collection.

Strategies that could help improve household travel surveys include

- Establishing a consistent method for calculating the response rate and adopting it for all household travel surveys;
- Determining minimum acceptable response rates and best-practice response rates to be used to solicit survey contractors and to assess whether a survey is acceptable; and
- Determining other measures that can be used to assess data quality, including such concepts as minimum acceptable levels of missing and imputed data and required verification processes.

Criteria for "Good" Surveys

A related issue raised at several workshops was concern over what many agencies are currently using as the yardstick by which surveys are judged. Conference participants perceived that the primary measures used by most agencies are the quantity of data (as measured by final sample size) and adherence to budget. In other words, a survey is considered "good" if the desired sample size was met or exceeded, regardless of the response rate, which could vary from 10 or 15 percent to 75 percent or more, and if the survey was completed within budget. This appears to be the case at least in part because the profession has provided no basis to assess the quality of data collected.

Quality of data collected is of primary importance; therefore, the profession needs to

- Develop a means to assess what represents a good survey, in terms of quality and performance measures;
- Educate clients needing transportation surveys about survey quality and the significance of quality measures,
- Make clients aware of the potential dangers of using poor quality data; and
- Adopt quality measures to assess the quality of survey data.

Nonresponse

Although one workshop was devoted entirely to nonresponse issues, concerns about nonresponse arose in all workshops. The declining response rates in recent household travel surveys in the United States have been dealt with either by acceptance of these rates or by diversion of resources to countermeasures such as offering recruited households incentives to respond. There was a marked contrast on this issue between participants whose experience is primarily in the United States and participants from overseas (particularly Europe and Australia), where much higher response rates are still being achieved. It was observed in a number of cases that the decline in response rates is not limited to household travel surveys Declining response rates even affected the decennial census, in which much greater effort was expended to reach a satisfactory level of response.

Conference participants acknowledged that nonresponse is likely to increase unless steps are taken to reverse the trend. In addition, the levels of nonresponse typically experienced in household travel surveys lead many to believe that significant nonresponse biases are present in all household travel data sets Despite this, efforts to determine the nature of nonresponse bias are not routinely done. A variety of approaches were suggested to address the issue of nonresponse. Most important were the following·

- Undertake studies to determine the seriousness of nonresponse bias in household travel surveys;
- Conduct research to find methods to reverse the decline in response rates; and
- Make nonresponse surveys a routine part of any household travel survey in which the response rate is below a particular level (to be determined on the basis of the recommended studies).

Random Digit Dialing

Another pervasive theme that emerged in conference discussions was the expectation that, in the United States, it will become increasingly difficult to rely on random digit dialing to draw a sample for a household travel survey. First, it is expected that technology that screens telephone calls will become increasingly more sophisticated, allowing people to avoid sales calls, surveys, and other intrusions into their daily lives. Second, notions of a future in which people are assigned a telephone number, similar to how a social security number is assigned today, and in which that number will move with them wherever they live, suggested to conferees that random digit dialing will become infeasible as a method of sample selection. Although such technology is in the future, rapid technological developments and breakthroughs may make it arrive sooner than expected.

Strategies to overcome the problems of random digit dialing include

- Exploring alternatives to random digit dialing, particularly focusing on the possibility of sampling from GIS data bases of addresses;
- Considering issues of adequacy of sampling frames and providing guidance to the profession; and
- Conducting research on alternatives to initial cold contacts by telephone and testing alternative methods in practice.

Ways To Improve Survey Methods

Most workshops addressed methods for improving surveys. It was noted that most agencies performing surveys are unable to undertake research or experiment with relatively untested survey methods. In recent years, funding has not been available for research on improving household travel surveys. Comparing different ways of performing surveys has largely required comparing two metropolitan areas' procedures, however, problems are created by the variability of many factors, resulting in considerable uncertainty about whether one method is better than another. No series of controlled experiments has been conducted to compare alternative ways in which a wide range of elements of household travel surveys may be designed.

Survey methods could be improved by the following measures:

- Develop a research program that will allow comparative testing under controlled conditions of alternative methods for conducting many aspects of household travel surveys; and
- Allocate funding to undertake comparative tests of alternative methods under carefully controlled situations.

Conclusion

Summaries of each workshop are provided in this document, along with recommendations on research directions that conferees believed deserve priority in the next few years. In a number of cases, there was clear overlap among workshops; other recommendations are specific to the charge of a particular workshop

Finally, there are many areas in household travel surveys in which little has changed in the past 20 or more years. Perhaps one of the most important of these areas is how the transportation planner views the design of survey instruments. Instruments are generally designed with the needs of the planner, not the respondent, in mind The result is that there is a tendency for many survey instruments to try to force-fit respondents into the thinking patterns of the profession, and there is a tendency to use jargon that is not used or understood by respondents. It is clear that such problems contribute to nonresponse and are likely to arise in designing stated-response surveys. In addition, these problems are an issue in data collection instruments and probably affect survey design and new technologies.

It is time for the profession to take a hard look at the manner in which surveys are designed and at the quality of data obtained. The necessity of providing respondents with definitions of words or phrases should be taken as a danger signal indicating use of specialized or complex language. Ways other than offering definitions should be sought to solve the problem Transportation professionals who design household travel surveys must place themselves in the shoes of the respondent. This is likely to bring significant rewards, such as better quality of data, increased response rates, and reduced ambiguity of responses.

It was the hope of all conference participants that conference findings be addressed. Transportation planning depends on sufficient data that are accurate, timely, and of good quality. Planning models are sensitive to the quality of input data. The saying "garbage in, garbage out" is highly applicable to these models, for which the "in" is primarily data from household travel surveys Even if the primary use of data is to provide descriptive statistics instead of input to models, the saying still applies. The credibility of the transportation planning process rests on the "goodness" of input data, most of which come from household travel surveys. It is worth spending a modest amount of money on research to improve the quality of the data we collect.