

Travel Surveys

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Travel surveys will continue to be one of the most important ways of obtaining the critical information needed for transportation planning and decision making in the new millennium. Not only will these surveys be used to gather current information about the demographic, socioeconomic, and trip-making characteristics of individuals and households, but they will also be used to further our understanding of travel in relation to the choice, location, and scheduling of daily activities. This will enable us to enhance our travel forecasting methods and improve our ability to predict changes in daily travel patterns in response to current social and economic trends and new investments in transportation systems and services. These travel surveys will also play a role in evaluating changes in transportation supply and regulation as they occur.

In the last half century, travel survey methods have undergone tremendous change. Originally, travel surveys were conducted primarily through face-to-face interviews, typically conducted in respondents' homes or at intercept points along major roadways and transit routes or at major transportation nodes. The surveys produced high-quality data that provided a sound basis for the development of the first generation of travel forecasting models. Significant changes in modern urban lifestyles, however, made the large-scale use of traditional face-to-face survey methods extremely costly. In response to these societal changes, travel survey methods have adapted to better fit contemporary lifestyles and have become much more economical to conduct. Thus, travel surveys are now an integral part of the continuing transportation planning process and are frequently used in many different types of transportation studies.

CURRENT STATE OF METHODOLOGY

Current state-of-the-art household travel surveys rely extensively on the use of mail and telephone to obtain information on the daily travel and other activities of a representative sample of the population. Typically, eligible persons in randomly selected households are mailed survey diaries in which they are asked to record all travel or activities conducted during a randomly assigned 1- to 2-day period. Retrieval of this information is conducted over the telephone or by the mailing back of the survey diaries. Households participating in these surveys are generally given postcard or telephone call reminders about their upcoming travel survey day and the need to promptly provide their survey diary information to the survey interviewers. To ensure the accuracy of the data collected, the retrieved information is checked for missing, invalid, or inconsistent data. Persons providing incomplete or

inconsistent diary information are prompted, or are recontacted, by survey interviewers to obtain the missing the data.

After the information collected in state-of-the-art travel surveys has been reviewed and edited, it is keyed into computer data files, geocoded, weighted, tabulated, and analyzed. If a computer-assisted telephone interviewing (CATI) system is used, the survey information is directly entered into computer files and processed as it is collected. Also, if the CATI system is linked to a geographic information system (GIS), real-time geocoding of trip ends occurs. Next, technical reports summarizing the major findings and documenting the survey results are prepared. The documentation includes data dictionaries for all survey files produced, a complete description of all survey procedures, and full disclosure of survey response rates at each stage of the survey interviewing process.

Although household-based travel surveys are one of the most comprehensive means of obtaining data for transportation planning and decision making, they are by no means the only way to obtain such information. Workplace surveys, license-plate surveys, licensed driver surveys, transit on-board surveys, and other types of travel intercept surveys are used to supplement and enrich the data collected in household travel surveys. In addition, analysts are beginning to use travel survey data within increasingly integrated data systems containing information such as detailed land use attributes, economic activity, or the patterns of air pollution, road accidents, and noise.

Regardless of the method of data collection being used, state-of-the-art travel surveys place an important emphasis on a total design survey process that follows a series of logical, interconnected steps. The steps include preliminary planning; selection of a survey design; selection of a survey sample; development and pretest of the survey instrument and all administration procedures; administration of the survey interviewing; coding, editing, validation, and processing of the data collected; the analysis and weighting of survey data; presentation of survey results; and the documentation and archiving of the cleaned data.

Throughout the total design survey process, quality control procedures are implemented to ensure the accuracy of the survey results. The quality control procedures include a complete pretest of all survey procedures, the review and editing of survey data for missing and invalid data, the recontacting of some travel survey households and imputation of some data items from other survey responses, comparison of survey results with the latest census or other secondary source data, and adjustment of survey weights to account for identifiable response biases. Also, in the very best travel surveys, quality control subsamples or follow-up interviews with survey nonrespondents are conducted to determine and correct for biases associated with unit nonresponse (from nonparticipation) or item nonresponse (from items that a participant refused or left incomplete). Only by a full consideration of all sources of error and deliberate design decisions to minimize or correct for these errors can high-quality data collection result.

The biggest problem faced in conducting high-quality travel surveys today is nonparticipation. Although most travel surveys start with a random sample of households or individuals selected for participation, many of the selected individuals simply do not respond. Such nonparticipation negatively affects the quality of data collected. Much research in recent years has focused on techniques for improving participation in travel surveys. In state-of-the-art travel surveys, presurvey letters, toll-free survey hot lines, cash incentives, and refusal conversion techniques are used to encourage participation.

SURVEY ENVIRONMENT

The environment within which travel surveys will be conducted will be characterized by policy makers' demands for more frequent and reliable information to respond to:

- A continued concern with greenhouse gases, air quality, and urban congestion, and the need to address these issues with more policy-sensitive travel forecasting models, including activity modeling and microsimulation;
- A resulting emphasis on sustainable transport systems, requiring greater use of nonmotorized transport, new public transport options, and nontransport solutions to transport problems;
- A need to give greater consideration to urban freight and commercial vehicle movements in addressing traffic and environmental problems;
- The desire to use and enhance the effectiveness of intelligent transportation system (ITS) technologies;
- A greater concern with various forms of user-pays solutions such as toll roads and other road pricing schemes; and
- Increased trends toward privatization of road and public transport systems, creating a greater commercial need for timely and accurate market data on travel patterns.

At the same time that policy makers are demanding more information, survey practitioners will be faced with some of the following challenges in the new millennium:

- Higher levels of multiculturalism, and multiple languages, within urban areas;
- Greater pressures on the free time available to individuals, reducing their willingness to use this time to participate in surveys and other "public service" activities;
- Advances in personal communications technology that will make it much easier for people to have greater control over whom they choose to communicate with and how, when, and where these communications take place;
- Introduction of more restrictive "privacy legislation" in many countries, reducing what data can reasonably be collected and how it can be used; and
- Continued restrictions on the public funds available for the collection and analysis of travel survey data.

FUTURE DIRECTIONS

The basic conflict between the need for increasingly detailed and frequent data on daily travel patterns and the growing difficulty in contacting and interviewing persons about their travel will require continued improvements in travel survey methods. Some of the likely improvements are discussed in the following subsections.

Conversion of State-of-the-Art Travel Surveys into State of Practice

The most urgent need for travel surveys in the new millennium is to convert today's state of the art into tomorrow's state of practice. Pressing on with improvements in the former in a small number of surveys is somewhat pointless if the lessons learned are not transferred to the latter in a large number of surveys. Another important component of raising the quality standards of travel surveys is a full and honest documentation of the survey processes.

Mixed-Mode Survey Designs

State-of-the-art travel surveys use some combination of telephone and mail methods to recruit, interview, and follow up on persons asked to participate in the surveys. In most of these designs, however, almost all of the interviewing of survey respondents is conducted exclusively by the mailback of the survey diaries or the retrieval of the diary information over the telephone. We know from experience that some respondents respond better to mail methods, others to telephone methods. Further, we know that some potential respondents will respond neither to mail nor to telephone interviewing techniques, but that they will respond if properly approached and asked questions in a face-to-face interview. To obtain acceptable response rates for travel surveys in the new millennium, practitioners will need to resort to the use of mixed-mode survey designs, rather than relying on a single method of interviewing. This will entail giving potential survey respondents greater choices over how, where, and when to be interviewed. Certainly, this will require some negotiation between the survey interviewer and respondent, but the essential point is that survey practitioners are going to need to view survey respondents as their customers and adapt the interviewing method used to the personal preferences of each potential customer.

Other types of mixed-mode survey designs will address a familiar problem: the trade-off between the level of detail and the size of the sample. Is it better to ask many people a few questions or a few people many questions? We expect that layered strategies will become more commonplace: within a large representative sample, a subgroup is targeted for more in-depth data collection, and in some cases more than two levels may be involved.

Use of the Internet and Multimedia Methods

Increased use of the Internet and multimedia computer technology can improve state-of-the-art travel survey methods to better serve potential customers. Use of the Internet and the e-mailing of survey materials between survey interviewer and respondent provide a means of giving some survey respondents greater choice of when and where to be interviewed. Increased use of multimedia methods and computer technology, whether provided via the Internet, CD-ROM discs, or videotapes, could also greatly simplify the asking of complicated survey questions and make it much easier and faster for some survey respondents to respond to these questions. Whereas the Internet and multimedia methods will be immediately useful in some circumstances, such as the conduct of surveys with businesses, the widespread use of the Internet for the conduct of general travel surveys must await the more widespread penetration of the Internet into households.

Use of Monitoring and Remote-Sensing Technologies

Further advances in automatic monitoring and remote-sensing technologies, such as vehicle instrumentation and global positioning systems (GPS), when linked to well-developed GIS databases, will offer substantial opportunities to improve the amount, detail, and accuracy of the data collected in 21st century travel surveys. Some new automobiles already include GPS-based in-vehicle navigation systems. With some slight modifications, these in-vehicle navigation systems could be used to record information on vehicle trip origins and destinations and the exact routing of these vehicle trips through the transportation network by time of day. Vehicle speeds and travel times by network link would also be available. Because many of the new vehicles instrumented with in-vehicle navigation systems also are

equipped with wireless phones, obtaining real-time survey data about the other characteristics of this travel would be possible.

The use of GPS technology to record daily travel patterns may not be limited to in-vehicle travel in the longer-term future. If GPS equipment can be sufficiently miniaturized, it may be possible to integrate its use with wireless phone technology and further reduce respondent burden. All that may be asked of the potential survey respondents is that they wear or carry around with them a small remote-sensing device for a few days and answer a few simple questions. Whereas this could almost completely eliminate respondent burden, there would still be the questions of whether a significant number of individuals would agree to have their daily activities and movements tracked so precisely and whether such a situation would cause them to change their travel and activity behavior.

Another source of monitoring data that holds great promise is the use of data from automatic ticketing machines on public transport systems. Such machines can provide information on every trip made on these vehicles in terms of origin, destination, time of boarding, and ticket type. Once smart cards become the standard “ticket” used by all passengers, there is the promise of sociodemographic data encoded on the smart card also being recorded for every trip. By analogy, individualized data may be collected automatically from ITS, including electronic toll collection and traffic monitoring systems.

Increased Attention to Urban Freight and Commercial Vehicle Surveys

The increasing role of commercial vehicles in urban congestion and environmental problems means that more attention must be focused on measuring travel patterns for such vehicles. Such surveys have been difficult in the past because of the quantity of data that must be collected and the lack of cooperation that has been obtained from drivers and vehicle owners. However, the advances in GPS technology described above promise major improvements in the ease of data collection and the quality of trip data that can be collected. Substantial improvements in urban commercial vehicle surveys can be expected in the future.

Continuous Travel Surveys (Including Panel Surveys)

Another likely direction will be greater use of continuing travel surveys, including long-term panel surveys. The advantages of continuing surveys are that they give more timely data, rather than sporadic data every 10 years or so, which is much more useful for monitoring the effects of projects and policies. In an era of continuing public finance austerity, it is also politically easier to obtain a relatively small continuing budget allocation than a massive allocation at various points in time. Managerially, continuing surveys have the advantage of keeping the survey team together, so that continuous improvement is possible and the skills developed are not dissipated.

Whereas longitudinal panel surveys have been used in some transportation studies, few panels yet span more than a few years. Longitudinal panel designs provide the opportunity to ask questions of the same individuals on repeated occasions about how and why their daily travel has evolved over time. They can provide transportation modelers and others with unique insights into how personal and household lifestyle and life-cycle factors influence daily travel behavior and into the turnover of membership in particular population segments, such as transit users. Panels raise complex sampling and analysis issues, especially

concerning strategies used to deal with attrition, but wider use of panels can be expected to the extent that methodological improvements address these issues.

Greater Emphasis on Collecting Information on Activities

Given the needs of emerging activity-modeling approaches, it is likely that future travel surveys will pay more attention to the measurement of the activities at the end of trips and to how and when the respondent chose to do them. Some attention is already paid to activities, but often it is only as a way of having respondents remember more about the trips they made to those activities. In the future, new types of coding frames will be needed for the characterization of activities and the activity-scheduling process.

Widening Range of Stated-Response Techniques

Greater use of stated-response (SR) data collection strategies and techniques in travel surveys is also likely in the new millennium. SR techniques refer to methodologies for obtaining information about user responses and decision processes in new situations. The most widely used SR survey technique is stated-preference (SP) choice experiments, but a wide variety of other techniques exists to allow respondents to explore and experiment with aspects of hypothetical situations. Policy makers will increasingly want information about potential transportation services and regulatory measures that have not been tried before. The evaluation of novel transportation solutions such as ITS, alternative-fuel vehicles, and congestion-pricing alternatives is problematic to the extent that individuals are asked about their likely responses to situations of which they have little or no experience. SR data collection might also be combined with the use of long-term panel surveys and new multimedia computer technology to obtain information on the effects of new transportation services and policy measures. SR survey methodologies, together with virtual reality simulation of various transportation alternatives, will certainly offer exciting insights into how various types of travelers might respond to innovative transportation solutions.

Two provisos are in order. First, SR survey questions must be subjected to full testing under cognitive laboratory conditions to ensure that respondents understand the SR task in the way that the survey designer intends them to, so that unrealistic SR questions are not used, as has often happened in the past. Second, the SR, and particularly SP, questions must be designed in such a way that models other than conventional compensatory choice models can be tested with the data, so that we are to extend our understanding of choice processes.

Use of Travel Surveys as a Specific Instrument of Transport Policy

In the past, travel surveys have been used almost exclusively to collect information about how people travel. However, it has long been known in the physical and social sciences that the mere act of measuring something will often change the very thing we are trying to measure. Such a phenomenon has now been recognized in transport, and a number of studies in Europe, Australia, and Canada are using the survey as a way for respondents to become aware of their travel and explore opportunities for change, notably ways to undertake their current activities in a more sustainable and less transport-intensive manner. In some cases, respondents go on to report on trial changes in their behavior. This use of both revealed and stated travel surveys as positive policy instruments is an area of great promise.

CONCLUSIONS

Travel surveys will be undertaken in an environment characterized by several conflicting features:

- There will be an increasing need for accurate, timely, and cost-effective data for public- and private-sector planning in passenger and freight transport.
- However, there will be increasing difficulty in obtaining such data from respondents who may speak many different languages, who will have less free time to participate in surveys, and who will be subjected to many other surveys and marketing approaches by various organizations.
- New technology will provide new options for obtaining data from respondents but will also give them greater opportunity to block those attempts.

In such an environment, we expect that the major advances in travel surveys will come about by:

- Application of the best survey practice of today in such a way that it is common practice tomorrow;
- The use of mixed-mode survey designs to meet the data needs of the surveyor in ways that create the least burden and the greatest respect for respondents;
- The judicious use of new technologies to augment existing survey techniques, especially in the automatic recording of time/space trajectories of vehicles and people;
- A move toward more continuous surveys to provide more timely data in an economical manner, which would also develop and preserve technical and managerial skills in the conduct of complex surveys;
- Increased use of longitudinal surveys, activity surveys, and SR surveys to provide a better understanding of decision-making processes by travelers; and
- The use of surveys as direct instruments of transport policy, as a means of bringing about behavioral change.

The biggest challenge for travel surveys will be to balance the need for increasingly detailed, accurate, and timely data on daily travel patterns with the need to minimize respondent burden and protect personal privacy. The continued success of travel surveys in obtaining information needed for decision making in the new millennium will require that travel survey methods be continuously adapted to the changing lifestyles and personal preferences of the individuals who will be asked to participate in them.