

Travel Surveys: Current Options

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The underlying factors that form the basis for travel survey design and their relationship to the most common options currently available for collecting travel data are described. A comparison of the advantages and disadvantages of each of the options is also included.

The term travel survey covers a multitude of data collection strategies and efforts. To consider all of the current options for collecting travel data in general is a task much too broad to undertake in this paper, although the development of a taxonomy of travel data and survey methods would be well worthwhile. The factors to be considered in selecting a travel survey methodology will be addressed, and the alternative options available for undertaking a survey of travel by household residents will be discussed.

TRAVEL SURVEYS

A review of such basic considerations as the following is necessary before a discussion of travel survey methods:

- Purpose of inquiry,
- Data element required,
- Collection location,
- Collection duration,
- Mechanics of collection, and
- Expansion and validation.

Purpose of the Survey

There are many purposes for undertaking a survey of travel.

1. How much of the travel on streets adjacent to an existing shopping center can be attributed to travel to or from the shopping center itself?
2. How many people ride a specific bus route on an average weekday, and from or to where are they coming or going? For what purpose are they traveling?
3. What is the total patronage of the public transit system for an average weekday, Saturday, or Sunday?
4. How much of the traffic on the streets of a metropolitan area can be attributed to travel by nonresidents of the metropolitan area? How much to residents?
5. How much of the traffic on the streets of a metropolitan area is truck travel and what are the geographic and temporal patterns of that truck travel?

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6. What are the geographic and temporal patterns of an amusement center? An urban university? A downtown medical center? An industrial park? A parking garage?

7. How much travel takes place between City A and City B?

Data Element

Another important factor is the choice of the data element. What is the basic unit of travel data to be collected? There is a widely held belief that travel is composed of discrete elements known as trips that have both a beginning and an ending, which overlooks the movement of goods. Many followers of this doctrine assert that trips are "produced" in the home and are "attracted" out of the home. Trip ends, neither of which are at home (about one-quarter to one-third of all person travel), are split 50/50 between productions and attractions. The trip is often considered the basic element; however, for trip-generation studies (a major focus of travel surveys), the trip end is the basic unit. But is the unit the vehicle trip or vehicle trip end, or is it the person trip or person trip end? For many site traffic trip-generation studies, the basic unit is the vehicle attraction.

Surveys often collect trip clusters by sampling trip makers and inventorying all trips by the trip maker or households and collecting all trips made by all members of that household.

Collection Location

If the person trip is the basic collection unit, the household may be a cost effective way to collect a cluster of trips. Alternatively, establishments can be sampled and the trips arriving at the establishment sampled (the establishment survey, workplace survey, or special generator survey). Another collection location may occur during the actual trip and is called an intercept survey that collects travel data from travelers actually in motion. The cordon survey, the on-board survey, and the intercity screen line survey are all examples of the intercept survey.

Collection Duration

The period over which the travel data is collected is also significant. Most home-interview surveys are for 24-hr periods with Saturdays and Sundays excluded. Traffic counts can range from periods of as short as 15 min to periods of 24 hr, or 3 days, weekday and continuous. The shorter the time, the lower the cost, but the higher the error. Duration is a function of purpose and level of precision.

Mechanics of Data Collection

The mechanics of data collection depend on the data element, the survey methodology, and the survey purpose. The various mechanisms are

1. Mechanical counts;
2. Manual counts;
3. Questionnaire (self-enumeration); and
4. Questionnaire (personal interview), which includes
 - a. Telephone at home,
 - b. At home,
 - c. Intercept, and
 - d. Establishment.

The self-enumeration questionnaire is potentially the least expensive technique of the simple counts; the personal interview at home is the most expensive. Self-enumeration runs the greatest risk of nonresponse bias and must be limited in both the duration and the complexity of questions.

Expansion and Validation of Travel Surveys

Most travel surveys are sample surveys and must be expanded to represent the population or universe from which the sample was drawn. Whenever possible, there should be a validation process to verify that the expanded sample survey estimate corresponds to an independent estimate for the universe. An example of such a procedure involves the expansion of the sample origin-and-destination surveys, assigning the expanded trips to the network, and comparing the areawide vehicle miles of travel (VMT) based on link estimates of highway volumes to areawide VMT based on highway link counts. In an establishment survey (attractions), the completed interviews and questionnaires are factored up to the count of people arriving at the establishment.

DATA FOR MODELING TRAVEL

Travel modeling is one of the most powerful tools available in the transportation planning battery and can be used at the local, regional, state, and national levels to provide the data necessary for the development, evaluation, and implementation of future transportation systems, and for the allocation of current and future resources for creating and maintaining those systems. The value of travel modeling lies in the ability to test the efficacy of possible alternative solutions without the expense of implementing each alternative in the real-world system.

Stopher and Meyburg (*1*) define the urban transportation planning process in three stages:

1. Inventory of existing land uses, socioeconomic characteristics, travel facilities, and travel characteristics for the area;
2. Forecasting of future land uses and travel demand; and
3. Detailing a set of alternatives for changes in transportation and land uses that will provide the basis for future policy and decision making.

The transportation planning process can be viewed as a seven-step sequence:

1. Inventory (land use, population, travel, and transportation facilities);
2. Land-use forecasts;
3. Trip generation;
4. Trip distribution;
5. Modal split;
6. Network assignment; and
7. Evaluation.

Travel modeling is used in Steps 3 through 6 and the specific models are calibrated to the local survey data. Current travel surveys—unlike their forerunners of the 1950s and 1960s that collected massive amounts of travel data including the zone-to-zone trip tables—are designed to provide calibration data for trip generation, trip distribution, and mode choice.

CURRENT OPTIONS

In the selection of travel survey methodology for travel characteristics to be used to calibrate travel models, there are several methods currently in practice:

1. Mail-out/mail-back survey [Houston–Galveston Area Council of Governments (H–GAC)];
2. Mail-out/telephone-back survey [Denver Regional Council of Governments (DRCOG)];
3. Telephone interview (Minneapolis–St. Paul area);
4. Intercept interview [North Central Texas Council of Governments (NCTCOG) special use];
5. Telephone/home interview (Charlotte, North Carolina); and
6. Home interview (NCTCOG).

Each of these surveys embodies certain advantages and disadvantages that make them suited to certain applications. In general terms, the primary differences are in collection cost and accuracy. It has been assumed over the years that there is a direct correlation between collection cost and data accuracy, but very little has been done to establish the precise form or the validity of this correlation beyond the obvious relationship of accuracy and sample size.

The six types of travel survey methodology listed represent four basic methods of data collection and transmission:

1. By mail, self-enumeration;
2. By telephone;
3. By home interview; and
4. By intercept interview, self-enumeration.

Although these four methods are listed separately, the distinctions between them are not rigid and allow for numerous combinations.

Mail Interview

The mail-out/mail-back survey is considered to be the least expensive and, by some, the least reliable form of travel survey

data collection. In its most primitive form no verbal contact is made between the surveyor and householder surveyed. This method can be refined by a prequalification telephone interview to ensure willingness and to obtain socioeconomic data about the household. Further variations include a follow-up call to thank the households and to check questionable information. The advantage of this form is its alleged inexpensiveness. Its major disadvantages are the lack of personal contact between surveyor and the household members being surveyed, and the ease with which a household can either not respond or respond incorrectly or incompletely.

Telephone Interview

This method is more labor intensive than the mail-out/mail-back survey and requires greater use and coordination of staff resources. The primary advantage of the telephone interview survey is that it does allow personal contact between the surveyor and the householder, which allows for greater staff interaction and control of the quality of the data collected. Some of the disadvantages of the telephone interview are its relatively greater expense, the potential bias of excluding households without telephones, and loss of personal verification of data which is possible with the face-to-face home interview.

Home Interview

The home interview method is the most labor-intensive method. Its advantage is the greater quality control that is possible when trained interviewers interact personally with the householder at home. The disadvantages are the cost of training and maintaining a staff of proficient interviewers, the security risk to those interviewers involved in entering the homes of strangers, the security risk to the householder of allowing a stranger to enter the home, and the consequent bias that can result from householder refusal—particularly in the case of single members, female heads of household, or elderly households. One means of minimizing this latter bias is to allow for telephone interviews in the case of one-person households, or two-person households in which the head is female, elderly, or both.

Intercept Survey

The intercept survey is conducted by interviewing the trip maker en route. This may involve having the traveler recall all of the travel for a particular day, or concentrating solely on the intercepted trip. If the interception takes place at the entrance to a sampled establishment, the trip maker can be requested to relate data for all travel going to, while at, and leaving the establishment. If all persons entering the building are counted, the sampled trips can be expanded to include total arrivals. This is similar to the cordon-type trip-generation studies done for specific sites.

The advantage of this approach is to obtain better attraction trip-generation rates than are typically obtained from the household survey. Trip attraction rates derived from household surveys are subject to a variety of omissions and larger sample errors. The disadvantage of the establishment survey is the

difficulty of factoring the travel to obtain a picture of total travel produced in the region. It is probably best used as an adjunct to the household survey to obtain special-use data rather than as a substitute for the household survey.

Computer Survey Technology

A survey method that has only begun to be explored is the use of computers in collecting travel survey data. In recent surveys in Denver, Colorado, and Charlotte, North Carolina, a management information system designed at Barton-Aschman Associates was used to manage, coordinate, write letters, maintain quotas, prepare progress reports, evaluate interviewing productivity, check trip rates by stratum, and maintain the initial household and survey data before, during and after the survey. In Seattle, the computer was used more directly to record the data during the interview process. As computers and their interface with other communication systems, such as telephone and television, became more common, new methods of data collection will become available to the transportation professional. As these methods become available, it is important for the transportation professional to integrate these new techniques with the experience gained from conducting surveys over the past 33 years.

CONCLUSION

One of the lessons learned in the massive travel surveys of the 1950s and 1960s was that valid statistical assumptions could be made from a smaller sample than had previously been considered acceptable. As interviewing techniques, and computer technology were refined, travel surveys were further streamlined to meet the more stringent economic conditions prevailing in the 1970s and 1980s.

One of the studies that should be made as a result of recent and ongoing travel survey efforts is the clarification of the relationship among the travel survey methods and the quality of the data produced. Comparative studies of cost per interview, household trip characteristics by travel survey method, sample household characteristics by travel survey method, and other such comparisons among the variables for each travel survey might reveal valuable methodological insights. However, this kind of cross-method comparison could prove to be difficult. A cross index of recent travel survey results would be a worthwhile endeavor especially where longitudinal data are available from studies conducted at different times in the same place with and without a change in method. The local, regional, state, and national environments in which people work are likely to become more complex and more costly; decisions will become more critical. An effort should be made to unify and develop the best aspects of the methods discussed here for a survey methodology that takes full advantage of the power of mini-computers and management software.

REFERENCE

1. P. R. Stopher and A. H. Meyburg. *Urban Transportation Modeling and Planning*. Lexington Books, Lexington, Mass., 1975, 345 pp.