Surveillance and Socioeconomic Forecasting

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Data collection in smaller urban areas can be minimized through the use of secondary sources. Quite a bit of work can often be accomplished with minimal data acquisition. To establish a surveillance or monitoring program, one must first establish an inventory of basic information that includes such data as travel counts, routes and schedules of the public transportation system, maps, numbers of employees, and characteristics of the population. The monitoring effort should, in turn, be based on sound procedures and methodologies that are inexpensive and provide quick turn-around information. Census data can often be very useful. Data items to be forecast should be limited to those actually required for systems analysis. In many instances, the issues that emerge in smaller urban areas are not very different from those in larger areas. The difference is that, in smaller areas, there is often more reliance on secondary data sources. If more work is needed in any area, it may be in educating local officials not to be afraid of the kinds of borrowed information that can save them money and be quite valuable for their planning efforts.

Because the available resources of both money and staff are usually limited in smaller urban areas, it is important that surveillance and forecasting activities be scaled to the level required for planning and analysis. In the past, much effort has been expended in data collection, quite often using the majority of available resources. Another large expenditure of effort has revolved around the development and testing of numerous alternatives—both transportation and land-use related. These factors have resulted in high costs for socioeconomic forecasting.

The orientation of this paper is that data collection can be minimized through the use of secondary sources, relationships transferred from other areas or situations, and collection or surveillance activities designed for specific needs (such as regionwide analysis, site analysis, and corridor analysis). On the analysis side, it must be emphasized that regional analysis should be done only to determine problems likely to occur and not to test alternative land-use and transportation ideas. After the problems are uncovered, they should be studied on a problem-by-problem basis. Relative to forecasting, this leads to the possible conclusion that the only areawide transportation alternative that should be tested consists of the present system and any facilities committed to construction improvement. Similarly, there should generally be only one land-use forecast, or projection, used for system analysis. Land-use or socioeconomic alternatives should not generally be tested by using transportation models on a regional scale. A single future land-use forecast, or projection, should be developed by using levels of analysis similar to those used in the consideration of land availability; physical services such as sewer, water, and transportation; and socioeconomic factors. Generally, a forecast of travel demand based on the existing plus the committed system and the one land-use forecast can be used to determine potential problems—but not to test land-use or transportation alternatives.

Most transportation analysts agree that quite a bit of work can be accomplished by using only minimal data acquisition. However, the public and elected officials often distrust work accomplished by using secondary-source data or data borrowed from elsewhere. They see a need for current information collected in the local area.

INVENTORY

To establish a surveillance or monitoring program one must first establish an inventory of basic information. The monitoring program then functions by keeping the basic inventory information current, providing information to determine whether the system is adequate at future times, and indicating whether or not the transportation program and development trends are evolving as expected. In many cases, analysis of surveillance data will be the key to the identification of problem situations and the development of remedial actions.

A basic inventory of existing conditions should include the following:

1. An inventory of the roadway system, including distances and roadway use in terms of counts and possibly of the mix of travel (such as through travel versus local travel);
2. An inventory of the public transportation system, including routes, service periods and schedules, and equipment—both vehicles and fixed facilities such as maintenance facilities; and
3. An inventory of land activity, including maps (of residential, commercial, industrial, and open-space activities), data on population and numbers of dwelling units by some geographic unit, numbers of employees, and characteristics of the population in terms of income and automobile ownership.

SURVEILLANCE

The monitoring or surveillance program can be a continuing activity or one carried out at set time intervals. The monitoring should probably cover several areas such as changes in population, changes in employment, changes in travel, changes in transit patronage, and changes in the system. The appropriate data and levels of effort are summarized in Table 1.

The issues surrounding this monitoring effort include questions regarding

1. The geography to be used for data recording,
2. The frequency of activity and level of effort in terms of available resources,
3. The basic set of data required to allow problem identification and quantification,
4. Whether or not the monitoring effort should be an areawide activity or limited to particular subareas and the evaluation of the effectiveness of transportation system management actions,
5. The determination of whether or not vehicle-travel estimates are required on an areawide basis and the cost-effectiveness of traffic counts for such estimates, and
6. The requirement for periodic home-interview surveys and their frequencies and sampling rates (for example, whether a small sample survey should be collected on a continuing basis).

PROCEDURES FOR MONITORING

Because financial resources are limited and should most appropriately be used for planning and analysis, procedures and methodology for monitoring should be in-

expensive and provide quick turn-around information. Several issues should be considered—e.g., the types of data and the relationships that can be transferred from other areas or times and the use of secondary sources such as census data, assessors' records, vehicle registration records, and commercial sources such as Polk's Directories.

Can new types of collection methodologies be developed to minimize costs? For example, to determine origin-destination (O-D) information, an on-board automobile survey could be designed that would obtain odometer readings, time of day of trip, and trip purpose. Such a survey could be carried out through the use of a diary carried in a sample of automobiles. The cost would be considerably less than that of the traditional O-D survey (partly because an O-D survey does not require geographic coding), but the results would provide trip rates by purpose, trip lengths by purpose, and automobile occupancy—just what is needed for model calibration.

Current collection methods should be modified to reduce costs. For example, external surveys are normally important in smaller urban areas. Their costs can be reduced by interviewing in one direction only, reducing the hours of interviewing, and reducing the percentage of traffic included in the interview stations (e.g., 75 percent rather than the recommended 85-90 percent). The use of new techniques, such as the partial matrix, where interviews on a small number of screen lines are expanded to represent an entire trip matrix, should be considered.

Are traffic counts a cost-effective basis for estimating the vehicle travel in an urban area? Are there alternative methods, e.g., based on fuel consumption? Are vehicle-travel estimates on a subarea basis required for monitoring purposes?

CENSUS DATA

The 1980 U.S. Census will provide data that can be used in planning studies to identify surveillance checkpoints, to validate demographic and travel models, and for other useful purposes. To make optimum use of these data, however, it will be necessary for transportation planning agencies to prepare themselves through the collection of supplementary data.

Even without the valuable journey-to-work information that will be collected, census data provide a wealth of socioeconomic information of significance to the transportation and comprehensive planner. These data are valuable for land-use modeling or forecasting and travel forecasts related to work travel and as a source of information about automobile ownership and occupancy, incomes, and so on. They can also be used for transportation-impact analyses (such as the characterization of the social and economic structures of the areas through which a new road or service may pass) and a surveillance of change based on the historical reporting of population shifts within a region, on changes in household size or automobile-ownership rates, or on changes in economic structure in terms of income and employment type.

The 1980 journey-to-work data will include destination, usual travel means, and travel time. To properly use these data, it may be necessary to collect additional data relative to the frequency of travel—i.e., to determine the difference between an average day (used in the census) and a usual day (on an average day, 10-20 percent of workers may not commute from home to work). Also, an understanding of work schedules is critical to factoring average daily work trips to estimates of peak-hour use.

There are also other issues involved in the use of census data for transportation planning purposes. Is it necessary to consider all travel or is the work data base and its relationship to all travel sufficient? How frequently should the socioeconomic information available in the census and used in the planning effort be revised (e.g., annually or every three years)? What is the appropriate level of geographic detail for use and monitoring (for example, by tract or zone, central business district or the central city)? What is the appropriate level of aggregation for factors such as age group and income level?

Table 1. Recommended monitoring activity.

Data Item	Monitoring Interval (years)	Level of Detail
Socioeconomic		
Population	2	Areawide
No. of dwelling units	2	Areawide
Total employment	2	Areawide
No. of automobile registrations	2	Areawide
Land use	2	Areawide by category
Transportation system		
Roadway distances	2	Functional classification
Vehicle travel (km)	2	Functional classification
Transit revenue vehicle travel (km)	2	Areawide
No. of transit revenue passengers	2	Areawide
Total no. of transit passengers	2	Areawide
Transit service area (0.4-km bandwidth)	4	Areawide
Transit-vehicle age distribution	2	Areawide

Note: 1 km = 0.62 mile.

FORECASTING OF GROWTH PARAMETERS

The primary purpose of forecasting transportation-related variables is to determine their probable effect on the transportation system. It may be most appropriate to limit the data items to be forecast to those actually required for systems analysis. On a zonal-type basis, the most important are population and number of dwelling units, income, automobile availability, and employment.

The issues that emerge for planning for smaller urban areas are probably not too different from those that are important for larger areas.

1. What geographic unit—zone, tract, or district—should be considered as the basic forecasting unit?
2. Should alternatives be forecast or should the most likely future be the sole forecast?
3. How far into the future should forecasts be made? Given the concentration on low-capital improvements, transportation system management measures, and such, is the 20-year horizon still valid or should we concentrate on some shorter period?
4. Should the emphasis be on forecasts of how we would like to have a region change or on forecasts of how the region is likely to change. Is there some validity to the idea that trends should be used rather than forecasts?
5. Are models useful and desirable in smaller-urban-area forecasting or should manual methods using a high degree of judgment be emphasized?
6. Finally, how precise must one be in the development of forecasts?

Sosslau's paper draws attention to the data needed to determine the various types of problems in an area and the magnitude of the problems. The workshop participants considered a set of basic information about the street system essential. They noted that the planning process must identify the locations of deteriorated and structurally insufficient streets and bridges. Similarly, streets that have comparatively large traffic volumes and slow travel times must be identified and categorized, as well as the costs to operate and maintain the current system. Other necessary information includes the location, type, and severity of accidents.

After the basic information has been identified, an analysis must be performed to determine where to make capital investments and how to relate this information to decision makers in a manner that can inspire confidence. Elected officials respond to information on the street-system condition, levels and types of congestion, and accidents, as well as to analytical studies based on this information. A problem, however, is the differentiation between the concepts of requirements and of needs. A possible solution to this problem is to downgrade the old needs study to consider tolerable levels of service rather than desirable.

The question of secondary versus primary data was discussed. In most areas, complete sets of data are available, albeit 10-15 years old. But because it is unlikely that significant changes will have altered prior trends in many communities, it may be more efficient to update older data than to allocate additional resources to the development of a new data base.

The types of data that have been collected in most areas and of additional information currently needed include the following:

Collected in the Past	Currently Needed
Home-interview origin and destination surveys	Air quality
Truck surveys	Employment
System inventories	Transit-user origin and destination surveys
Traffic counts (screen lines, cordons, vehicle travel)	Major-generator information
Accident studies	Aerial photographs
Land-use inventories	Income
Transit inventories	Automobile ownership
	Energy use

Some of the workshop participants indicated that, in their areas, all of the above types of information have been collected and most of it has been used extensively. However, it would be very costly to duplicate and, in many areas, has not been kept current. However, relationships have not changed that much—new growth can be readily ascertained by aerial photography and that may be all that is needed.

It was observed that the extensiveness of individual, home-based origin and destination (O-D) surveys precludes repeating them frequently. In many areas, only very limited surveys will be made; the number of questions will be limited and the sampling framework will be highly structured. Modeling relationships will be further simplified, and borrowing of relationships from other areas will be more extensive. However, the workshop participants considered modeling of future travel demand unnecessary in smaller areas because the projects to be evaluated are not sufficiently complex. The roadside survey remains a very valuable technique and should be considered as a basic data item for corridor and project planning purposes.

Attitude surveys are useful for identifying problem areas (real and perceived) in smaller urbanized areas. The inherent characteristics of these surveys can categorize the various subpopulations and aid in determining different perceptions of transportation problems by different population subsets (elected officials can be one of the population subsets).

The types of data most needed are those that are pertinent to short-range planning. However, such short-range work should not restrict future options; the process should have a long-range perspective and analytical emphasis restricted to short-range forecasts. Most smaller areas implement major transportation projects at long intervals, and the process should reflect their limited resources. More resources should be put into contingency planning through problem identification and the development of solutions. Accuracy is not as important as experience in dealing with short-range problems.

One continuing theme of the discussion was the need to provide quick responses to specific problems and the data required to facilitate the answers.

The ability to evaluate the effects of land-use changes is perhaps more critical in smaller areas. Overall, data are needed for four different types of mutually exclusive types of planning efforts:

1. Long-range system planning,
2. Short-range system planning,
3. Long-range project or corridor planning and evaluation, and
4. Short-range project or corridor planning and evaluation.

The types and the detail of data needed for the four types of planning, although similar, are not identical. As there is a middle of the road in the planning process, there is also a middle of the road in data-collection detail and frequency.

SOME SPECIFIC COMMENTS FROM INDIVIDUAL WORKSHOP PARTICIPANTS

1. The data needed for evaluating specific projects should be current and presented in graphical form.
2. The type of planning that is going on in an area will dictate the type of data that should be collected. Do not spend time on items that are not readily and immediately usable. Use all available shortcuts and pertinent secondary data.
3. Manuals on sampling techniques should be developed.
4. The comprehensive list of survey items was interesting, but not relevant to future data-collection efforts.
5. There is a lack of effective current planning activities.
6. Data that can be used in manually or computer-oriented techniques are needed specifically designed for short-range planning activities.
7. The current planning process should be more than just activity to satisfy federal-aid requirements. It should be integrated so as to allow policy planning as well as project planning.
8. Fewer parameters should be collected for systems planning, and the geographic extent of corridor planning should be minimal. Is updating studies for only one project every 5 years valid?
9. Because each locality is unique, it is difficult to specify definitive data requirements in a general manner.
10. Each urban area, regardless of size, should define its goals and objectives in regard to growth and preservation of current values before initiation of a new work program.
11. Classical data revisions take too much time (3-5 years), cost too much, and are often not relevant to current needs. Generally, there is only one active project in a study area, and planning data should be processed quickly.
12. It is incumbent on planners to advise policymakers about problem areas. Confidence and communication between staff and elected officials remain an essential, if not critical, necessity.
13. Planning to serve the needs of current elected officials is by definition short-range planning. It is difficult to design and develop a data-collection program that satisfies this requirement. A general framework that is inherently flexible and responds to specific needs, addressing problems as they develop, is of major importance.
14. One important product of a current data set and its analysis is the identification of current or anticipated (1-3 year) failures in the system.

One important link in many current data-collection programs is the lack of information about the local street system.

CONCLUSIONS

1. Most of the data collected in the past have been useful and continue to be useful.
2. Data-collection efforts today should be structured to obtain information to assist in problem identification and short-range planning. A more general set is necessary for long-range planning.
3. Most of the data-collection procedures used in the past (e.g., the roadside-interview survey) to collect information for long-range system planning are also useful for corridor planning.
4. It may be necessary to collect some data for local elected officials that the staff analysts believe is unnecessary for technical purposes.
5. Models must be simplified so that the data needed for their use are easy to collect, code, and summarize. The data required to run them should be of types that do not become dated quickly.
6. The staff should be knowledgeable and experienced. It is difficult to collect accurate and appropriate data in urban areas without both knowledgeable and adequate staff.
7. It is of prime importance that key issues and problems in an area be defined and agreed on before study revisions are undertaken. Typical studies such as site impact analysis, corridor planning, and project planning should be clearly defined and limited in terms of scope and geography.

Session Summary

The conclusions of this portion of the workshop include the following:

1. The data collected in the past have been useful and will continue to be used. The past designs were correct and useful and continue to influence current planning. The transferable types of data, relationships, and synthesis methods evolving as effective today are a function of past efforts.
2. This previous work allows the analyst to minimize extensive collection of new data and direct current activities to specific problem solving with a high degree of confidence.
3. It is, however, necessary that some current data be collected to instill political and public confidence in planning work but this should be coordinated with and integrated into the overall activity.
4. For a variety of reasons, it has become obvious that some type of outside support will be necessary to assist most small and medium-sized urban areas in their surveillance and forecasting activities.
5. Every data-collection effort should be carefully planned and evaluated before approval. For example, home-interview surveys, once considered a necessity, are now rarely taken.
6. It is necessary to define and agree on problem areas before study updates are undertaken. Studies should be limited to pertinent corridors, intersections, specific services, and other identified needs. The planner should tailor the study to the problems at hand and design the data collection and analysis accordingly.

Techniques

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The objectives and issues discussed in this workshop could be grouped into four categories—data needs (discussed by Stockwell), monitoring critical data elements (discussed by Stuart and by Studer), census data (discussed by Silver and by Fulton), and forecasting (discussed by Roberts).

DATA NEEDS

Objectives

The following objectives were defined:

1. Identification of the types of data that need to be monitored,
2. Identification of the frequency of data collection necessary to ensure a timely data base within limited resources, and
3. Identification of substitute data elements that can satisfy selected or site-specific needs.

Issues

1. Should we continue to collect the extensive set of classical data elements?
2. Should data be kept continuously updated or should new efforts be undertaken at predetermined frequencies?
3. How can secondary-source data be used when it is not geographically compatible with planning areas?
4. Can sampling of critical data elements be substituted for cross-sectional data-collection efforts? Do planning staffs and elected officials have an adequate understanding of the theory of sampling?
5. Can telephone, mail-back, and on-board surveys substitute for face-to-face home-interview surveys?

MONITORING CRITICAL DATA ELEMENTS

Objectives

The following objectives were defined:

1. Identification of methods and sources for monitoring critical data elements,
2. Identification of the benefits and limitations of using commercial sources of data, and
3. Identification of the many uses of traffic counts in urbanized areas.

Issues

1. Should socioeconomic data be collected in an independent manner by metropolitan planning organizations (MPOs) and states?
2. Considering the accuracy problems, should an MPO rely on secondary or commercial data sources?
3. Should the problem of collecting adequate income data eliminate it as a data analysis element?
4. Should the increasing cost of collecting traffic-count data restrict it as a feasible data element?
5. Should a limited monitoring program be established in each urbanized area?

CENSUS DATA

Objectives

The following objectives were defined:

1. Identification of the types of data that are available from the U.S. Bureau of the Census and
2. Identification of the ways in which census data can be used in an urban planning program.