

SUPPLEMENTAL DATA NEEDS

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The range of data required for continuing transportation planning is, on the high end, the total requirements for transportation planning and, on the low end, nothing. One can find cases all along this spectrum. This range quite properly indicates that no single statement or recommendation can be made regarding supplemental data needs. Supplemental data needs are here defined as those that are required for continuing transportation planning that are not normally supplied by the Bureau of the Census.

This paper attempts to provide some ideas on what we believe are the types of data required. To generalize about the entire package of data needs, we have defined what is required for continuing transportation planning and have further stratified these into the following 3 categories: (a) what the Bureau of the Census provides in normally collected data and other services; (b) what is generally out of the realm of the bureau's services; and (c) what the bureau can provide in the way of special surveys made for specific transportation study areas.

TRANSPORTATION PLANNING DATA REQUIREMENTS

The transportation planning process relies very heavily on measurable characteristics within an urban or planning area. Inventories are made to obtain information on land use, population, economic activity, transportation facilities and related performance characteristics, and travel patterns and characteristics. In addition, less quantitative types of information are obtained, such as pertinent legislation and financial resources.

The base data collected are expanded, summarized, and processed for analytical purposes to develop trends and relationships for forecasting future conditions. These data form the basis for developing models for land use distribution, trip generation, trip distribution, modal choice, and traffic assignment. Forecasts are made of the items collected for the base year by using various analysis methods and projection techniques. The data required for continuing transportation planning are some subset or modification of the total requirements for transportation planning.

The Federal Highway Administration (FHWA) has defined the following 5 elements as essential to a continuing planning process: surveillance; reappraisal to maintain the planning process as a valid and effective program; service to those responsible for plan implementation; procedural development of new techniques; and annual report of continuing study activities. The element of major concern here is that of surveillance, which has been defined as "the maintenance of land use, socio-economic data, and transportation system characteristics on a current basis...to properly compare and evaluate the existing conditions in relation to the forecasts made in developing the recommended plans and programs and to determine if the assumptions made previously are holding over time."

The FHWA has prepared some expansion to the concepts describing the reappraisal function of the continuing planning process. This is shown in Figures 1, 2, and 3 for routine review (level 1), major review (level 2), and plan reevaluation (level 3). Varying data requirements are inherent in these concepts. For routine review, the basic data

required are dwelling unit, automobile ownership, employment, and vehicle-miles of travel (VMT) information by small area. This is for an annual process to determine if the changes in urban development are in accordance with forecasts. For major reviews, which may result from the routine review or should occur in any event every 5 years, more extensive data are required. Here, special generator studies of areas with intensive development are indicated along with screenline and other traffic counting surveys. A small-sample, home interview survey of trip origins and destinations might be taken to monitor changes in trip-making characteristics. This may be supplemented by a postcard transit survey.

Plan reevaluation is recommended at least every 10 years or when significant changes indicate a full reexamination of the plans previously made. Here a restudy of goals, objectives, analytical techniques, and procedures is recommended. A complete data collection effort similar to that for the base study may be indicated.

CONTINUING TRANSPORTATION PLANNING DATA REQUIREMENTS

As a basis for discussion of supplemental data needs, it may be advantageous to discuss what some transportation studies are considering or are doing with regard to data for continuing planning purposes. Guidelines prepared by the FHWA recommend annual estimates of growth considering factors such as population, employment, and automobile ownership. Direct measures of traffic growth through traffic counting programs are recommended as well as transportation system characteristics such as travel time, accident rates, capacity, level of service, additional miles of roadway, and parking supply.

Washington, D. C.

Wickstrom and Pisarski presented plans for updating transportation planning data in the Washington metropolitan area in 1969 at a meeting of URISA in Los Angeles. The surveillance activities described were for travel demand, transportation facilities, and land use and activity. For travel demand, a small-scale, continuing home interview survey is considered to detect changes in makeup, location, and characteristics of population and its associated travel demands and changes in the rate of trip-making within the same socioeconomic group. The survey will also provide data for study of migration, family size, and housing needs. For transportation facility surveillance, a counting program to provide yearly counts is envisioned to develop an annual flow map. Also speed and delay runs will be made of a sample of streets to determine travel time changes. Physical changes that affect travel will be obtained from the District of Columbia Department of Highways and Traffic and incorporated into the street inventory file. Surveillance for the transit system operating characteristics will be undertaken yearly. Special surveys will also be made annually of parking supply, passenger terminals and public transit use. The land use and activity surveillance will keep current

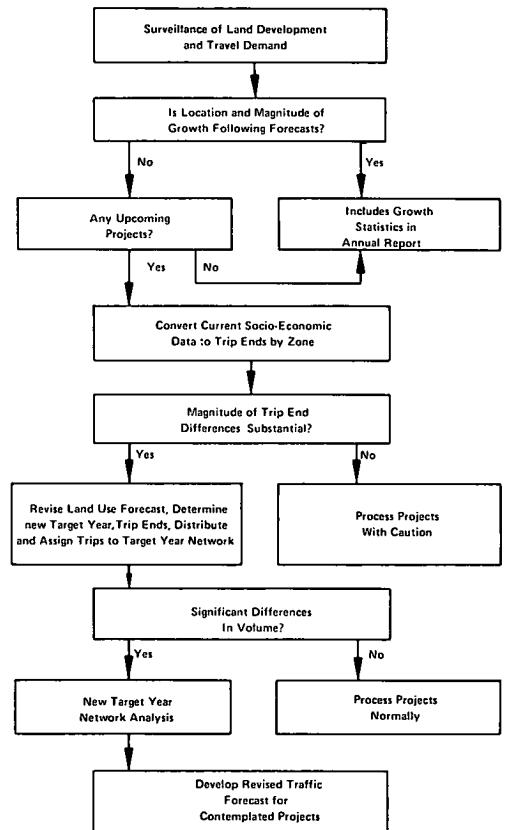


Figure 1. Level 1: routine review.

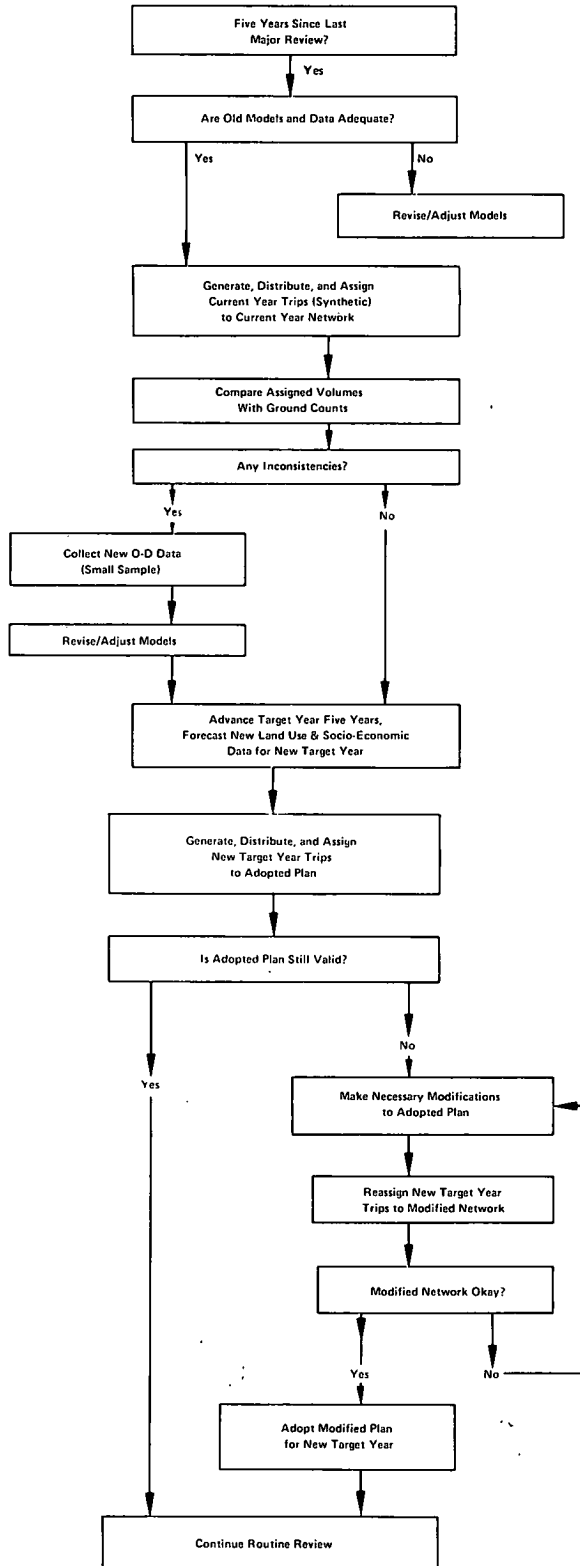


Figure 2. Level 2: major review.

data on the number of dwelling units and relevant household characteristics, employment by type, and land use by type.

Baton Rouge, Louisiana

The change in dwelling units and land use are considered to be the key to the continuing phase. These changes are monitored by processing occupancy permits (required of every new homeowner or business establishment) and building permits. Trip generation in the base transportation study was based on population, passenger cars, blue-collar labor force, white-collar labor force, school enrollment, school attendance, commercial acres, dwelling units, total sales, retail sales, transit index, floor space, and commercial acres. Except for school attendance, these variables are determined from the land use information or from rates. The change in dwelling units by zone and the base population per dwelling unit are used to calculate new populations. Estimates of other population-based variables are obtained by calculating the 1965 relationship between population and the other planning variables and by applying this to the new population estimates.

Yearly traffic counts are taken at all external stations to monitor changes in traffic entering or leaving the study area. Control stations are also monitored within the study area. From these, VMT estimates are made for small areas (zones).

The Louisiana Department of Highways has developed an excellent surveillance procedure. The program is based on a recording of building permits, occupancy permits, site plans, and subdivision plats. These documents are transmitted on a continuing basis by the local jurisdictions to the highway department. The highway department has detailed parcel maps on which information regarding construction and occupancy is recorded. New development is added to these maps as the information is received.

The results of this process are used in 2 forms, one graphic and one quantitative. Four maps are used to display the updated land use pattern, the future land use plan, the updated base year transportation system, and the recommended transportation system. The maps, in combination, provide a direct picture of the relationship of current development to the future land use plan and of the extent to which the recommended transportation system is being realized. The magnitude of growth is quantified by maintaining current data on 2 key surveillance elements, dwelling units and employment. This is accomplished by adding employment data from the state employment agency to the development information received from the local areas.

Macon, Georgia

Monitoring in Macon, Georgia, will include traffic growth, changes in land use, basic trip-producing and trip-attracting socioeconomic variables, transit, parking, and street system. Land use information is monitored by using property maps, aerial photos, city directory (cross check for new construction and street addresses), and building permits. A continuous updating of the street inventory is made from information received weekly

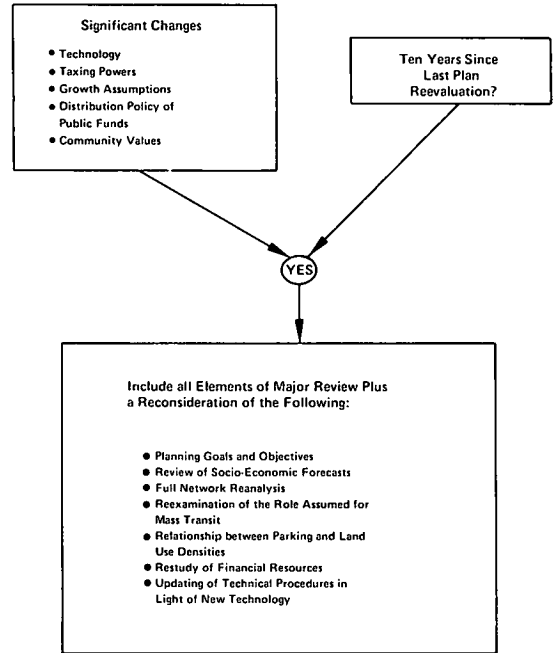


Figure 3. Level 3: plan reevaluation.

from county and city engineers, the Macon City Directory, and field work. A parking inventory will be produced annually, and transit patronage will be monitored by a cordon count around the CBD.

Other Cities

In several studies, land use data are kept current at the parcel level by monitoring building and occupancy permits and integrating these with assessor's records. Many studies plan to use secondary sources, such as state employment agencies, to update and maintain current files on population, employment, automobile ownership, retail sales, and land use. The plans being submitted to the FHWA regarding continuing study make little mention of the use of the 1970 census. This information was contained in a lecture given in the FHWA's urban transportation planning short course by M. L. Marks. Marks suggests the use of data on the primary work trip and on employment by place of work from the journey-to-work survey by the Bureau of the Census. A comprehensive traffic counting program oriented around VMT estimates should be initiated. The primary purpose of the counting program is to monitor changes in travel by functional classification of facilities and by subarea as a means for determining whether the trends forecast by the base study remain valid.

DATA NORMALLY PROVIDED BY THE BUREAU OF THE CENSUS

An examination of the inventories usually required for transportation planning immediately indicate that census data have been used in the past and will be very valuable to continuing study work. Of the 4 major inventory items—economic activity and population, land use, travel characteristics, and transportation facilities—census data are most applicable in the area of economic activity and population. Some uses have been made of census housing data in the land use phases. Generally, data and services provided by the Bureau of the Census have not been applied in inventories of travel characteristics and transportation facilities. This does not, however, preclude use of the bureau's data or its expertise in these areas.

Basically, the census now provides the following 3 products applicable to transportation planning: population and housing data, work-trip and employment data from the journey-to-work survey, and geographic base files. These products are extremely valuable to continuing transportation planning and should find wide use when available for 1970. In the population and housing area, data useful in continuing transportation planning and available from the bureau on a block level that can be aggregated to study specifications include existing dwelling units by type and character, number of units in group quarters, family size, economic status of family (automobiles owned and income), number of workers by occupation and industry, and number of students by age and school level.

The journey-to-work survey provides information that should find use in several applications. The information can be summed by work place to provide an estimate of employment. Because the work place is expected to be coded by block, employment estimates by small areas (zones) can be developed. Information will be available on income of workers, mode of travel to work, industry, and occupation. The journey-to-work data may possibly be correlated to total peak-hour trips and total daily trips and may act as a surrogate for more complete travel surveys. In any case, the survey will serve as a bench mark for work trips in checking of forecasts made and the travel models developed.

In the area of geographic base files, the Bureau of the Census has developed a set of address coding guides covering SMSA's. These guides consist of an ordered list of block faces giving the street name, address, and census block and tract number for each block face. In some areas these guides will be supplemented by the addition of grid coordinates of the ends of each street segment (ACG/DIME). This source will be valuable in geographically coding address-based surveys and secondary source information, such as automobile registrations, as a base for highway inventory information, as a source for developing traffic assignment networks, and as a base for data aggrega-

tion and display. The Census Use Study program begun in New Haven and its extension to SCRIS (Southern California Regional Information System) are using the ACG/DIME concepts in practical transportation applications, and these should provide much useful insight to other urban areas.

DATA GENERALLY NOT PROVIDED BY THE BUREAU OF THE CENSUS

The Bureau of the Census does not provide data obtained in transportation facility inventories. Data obtained in these inventories are used to monitor changes in the system and include traffic counts, travel time by the various modes, capacity added to the transportation system, parking supply and characteristics, and changes in accident rates.

Facility Information

Some items of data that must be collected annually to determine if changes in urban development have affected the transportation system loadings or its performance are as follows:

1. Traffic growth indicated by traffic counts for the entire area by functional classification, for subareas (such as ring and corridor) by functional classification, and for traffic generators;
2. System performance or travel time among subareas by mode;
3. Capacity added by functional class and by subareas as a result of traffic operations improvements and as a result of construction;
4. Speed, volume, and capacity relationships with regard to traffic on arterials by subarea, extent of overcapacity mileage, delay caused by congestion, and peak-hour length by subarea;
5. Parking in the CBD including supply on streets and in garages or lots, cost and its effect on transit usage, and building ordinances regarding parking;
6. Accident rates by subarea, by functional class, and by highway design type;
7. Transit route changes area-wide passengers, equipment, revenues and expenses, route miles, and bus miles;
8. Taxi vehicles and riders;
9. Automobile occupancy at screenlines and on principal arterials;
10. Vehicle classification by functional class and by subarea; and
11. Forecast relationships such as VMT per person, VMT per vehicle, and automobiles per dwelling unit.

The VMT measure in a metropolitan area is a most direct way of determining the demand for facilities. Other indicators such as new dwelling units and new employment are very good surrogate indicators of changing travel demand patterns, but the measurement of area-wide or subarea VMT is the most direct measure. Travel estimates by subarea are required to effectively test whether the various models used in the planning process are reproducing actual travel as measured during a census year. The socioeconomic surveys taken by the census need to be supplemented by a comprehensive traffic counting program that is designed to yield VMT estimates by small area by functional classification.

Traffic counts carefully programmed to yield not only volume data on specific road segments but also aggregate travel demand for portions of a metropolitan area by functional class of facility are some of the most important supplemental data to be collected by an urban transportation study group during a census year. During other years, when the degree of reappraisal may not be so intensive as in a census year, the estimates can be less accurate and less extensive but should still yield sufficient data to make a meaningful annual reappraisal.

Speed-delay runs have been conducted along many transportation arteries over the years. Such work has resulted in profiles of speed and reasons for speed changes. This information has been used to improve operations of arterial streets through signalization and other traffic engineering features. This information has also been used to determine reasonable speeds to assign to street links in traffic assignment networks.

However, comparatively little work has been done in determining overall travel times among major focuses in a metropolitan area. During a census year when much socio-economic data are being collected by the Bureau of the Census, it is prudent to supplement such data with transportation system performance characteristics.

A specific measure used by the public in evaluating the goodness of the transportation system is the time it takes to travel from one place to another and how this changes over time. The investment of so much money in the improvement of facilities logically causes one to ask whether the travel service provided by the system is improving or worsening. Such questions can be answered by properly planned and scheduled travel time surveys to determine how long it takes to travel from one area to another by mode. Such data should be developed on an annual basis.

Areas that could be considered as a focus for travel time measures would be the CBD, airports, regional shopping centers, minor CBD's, large recreational sites, areas of high residential density, and outlying areas with growth potential. The number of focuses needed for any one urban area depends on size, age, density, and degree of residential and commercial mix.

In order to maintain consistency from one year to another as routes change and the best route mileage either increases or decreases, travel time between the focuses instead of speed should be used. Using this effective measurement makes it possible for improvements in the transportation system to be ascertained readily to determine if the investments in facilities are leading or lagging behind the growth in demand.

Overall travel time measures are very important in determining the overall trend between the base year study and the forecast. Many studies indicate that over the 20-year forecast period effective area-wide speed will change from 20 to 30 mph or more. Now that most studies have progressed 5 or more years toward their initial forecast, a measurement should be taken to determine if the assumptions used are currently valid. Only by testing and probing can plans be evaluated over time. Regional travel time information is one of the necessary ingredients in any continuing program of planning, but it is extremely important that adequate data be collected during census years to supplement the host of socioeconomic data collected at that time.

Origin-Destination Information

The home interview survey has developed much trip and socioeconomic information over the years and has served as a base of information from which to develop and test proposed transportation systems. A home interview survey should only be undertaken when previous surveys are out of date and models that were developed cannot replicate existing conditions.

Except for some special major generator studies, origin-destination travel information will generally not be a necessary part of the annual surveillance program. The 5-year program generally will not require new origin and destination information unless inconsistencies occur when synthesized trips assigned to networks are compared with ground traffic counts and transit rider counts. For these surveys, selected home interviews may be conducted for model calibration and may only be necessary in newly developed portions of the study area or for areas that have changed in character.

Other possibilities for specialized information include postcard surveys of transit riders and cordon line surveys in special areas or around traffic generators. The home interview might be a less detailed survey than that currently in vogue. Perhaps socioeconomic and trip information, such as number of trips by mode, purpose, and land use, without actual origins and destinations may be all that is required. This would update trip rates by land use types as well as residential generation.

For trip length information a very small O-D type of survey would suffice, if one is necessary. The alternatives for trip length are (a) interviews made on the street to obtain information on single trips from transit riders and automobile occupants, and (b) records of speed and travel time by using a speedometer and time clock mechanism. For every minute of the day, the recording speedometer indicates the speed of the vehicle as well as the time that the vehicle is in motion. The miles that the vehicle travels can also be recorded. One of these instruments on a number of vehicles, included in

a systematic sample and driven during a 7-day period, would provide the number of vehicle trips, the time of day of these trips, the trip length frequency of all the trips, and the miles driven for each trip. The driver would have to indicate when he was driving on a freeway or other type of road so that the average speed of travel by functional class of highway could be determined. Thus, valuable information needed for calibrating most travel forecasting procedures could be obtained without undertaking an arduous address geographic coding process that takes substantial time and slows the planning process in too many instances.

Trip rates for major attractors could be gathered by counting traffic entering and leaving major employment, shopping, and commercial areas. Taxi data could be collected as usual from taxi companies, and such information could be supplemented by installing the recording speedometer, odometer, and time clock.

Small-truck traffic volumes could be estimated from vehicle classification surveys on major arterials and stratified by type of subarea such as the CBD, intermediate areas, and suburban areas. The relationship between occurrences in the base year data and during a census year could be used to extrapolate forward to provide a 20- to 25-year forecast of travel for all vehicles.

Large-truck travel movements are not so uniformly distributed throughout a metropolitan area as small-truck movements. Very little study was made of the movement of goods during most initial studies, and it would seem appropriate to undertake a major survey of goods movement, during the census year especially, and probably to limit the study to goods moved by large trucks. Because such a large proportion of the transportation dollar is spent on moving goods, it would appear that much savings could be made in implementing recommendations developed from a system analysis of the movement of goods in a metropolitan area.

For the 10-year reevaluation, an examination is made of the procedures and models used as the basis for the forecast. In addition, a reconsideration of goals and objectives as well as the roles assumed for the various modes is made. Here, a complete O-D survey may be desirable. The need for such information is determined from the requirements of new techniques developed and changes monitored in trip rates and trip distribution. Again, special types of surveys, such as the modified home interview (without trip origin and destination data), transit postcard, or cordon count surveys, and special generator studies may be all that is needed.

Fiscal Data

Local governments spend substantial funds in road and street improvements every year. As the basis of the financial resources study, which is the major ingredient in developing a short-range priority improvement program, fiscal data need to be collected annually both in the years when the census is taken and in those years when no census is taken. The identification of how much money each jurisdiction is spending on different types of road improvements on the various functional classes of streets and highways is a necessary element in determining the possibility of implementing the plan over the forecast period. Such a study may show that additional funds are required or the level of travel service proposed for the future will not evolve in the time schedule expected.

Timing of Data Collection With Census

To make an annual reappraisal requires that some data be collected every year. It seems reasonable to expect that an extensive coverage of data will be needed in the years when a major reevaluation of the plan will be undertaken or when a reappraisal, testing, and updating of the models will be accomplished. The same types of data should be collected annually but not necessarily of the same scope or degree of detail. For instance, traffic counting on an annual basis should be undertaken so that VMT estimates for fairly large areas result. The 5-year reappraisal or the 10-year plan reevaluation requires data for much smaller areas. For travel time information, the number of focuses for which travel time runs are made on an annual basis may be few compared to the number needed during the reappraisal or reevaluation years.

In general, a continuing process needs information collected on a gross basis annually and collected in such a manner that the base can be expanded and more detailed information collected when the updates are needed. Although collecting comprehensive data every 5 years without collecting anything in the interim may seem prudent, it may cost more over a long period of time because the annual testing and probing of change may result in different decisions being made as to the duration and intensity of some of the data collection efforts on the fifth year.

Because urban planning efforts are being structured around the 5-year and 10-year updates, it would seem reasonable to schedule these to fall on the census years. In 1970, work could be undertaken to forecast information to 1975 and 1995. In 1975, the forecast made in 1970 of 1975 conditions could be tested against actual data collected in 1975. The travel models could be refined or adjusted based on data collected and then used in forecasting 1980 and 2000 conditions. In 1980, when census data are again collected, a major reevaluation of the plan could be undertaken by using the extensive trip and socioeconomic data available at that time.

SPECIAL SURVEYS BY THE BUREAU OF THE CENSUS

In addition to the usual censuses taken on a periodic basis, the Bureau of the Census undertakes special surveys on a contract basis. For example, the Federal Highway Administration contracted with the bureau for a quarterly, 3,000-sample nationwide personal transportation survey to obtain information on households, automobile ownership, travel to work, shopping and school trips, and specific travel on a single travel day. The Bureau of the Census designed the survey form, selected the sample, carried out the interviews, and processed the survey cards. There is the possibility that for special travel surveys the Bureau of the Census can provide similar services to urbanized areas. Interviewers trained for regular censuses may be able to provide services in the home interview area to transportation studies. This approach should be further considered and explored.

The matter of disclosure must be considered in the use of information collected by the Bureau of the Census. Census information cannot be made available if the aggregation of sample data allows recognition of any individual household or sample unit. Although this may appear to be no problem, there have been cases in which a greater aggregation of data has been deemed necessary by the Bureau of Census than was expected or desired by the user. Some discussion and clarification of disclosure policies would be desirable.

CONCLUSION

It should be obvious from the large number of data collection possibilities discussed in this paper that considerable thought must be given to determining the types and quantity of data required for a particular study area. No general recommendations can be made. Each case must be handled individually, and needs must be determined on the basis of the currently available information. The census years may be a good time for developing a new data base.