

# Census Data Use for Statewide Transportation Planning and Transportation Planning in Smaller Metropolitan Areas

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As noted in a May 1992 conference on transportation data needs, there is an increasing need for effective transportation planning to produce the information required by recent legislative mandates (1). With the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) requirement for the development of state transportation plans and management systems, and with increased attention given to analyzing the effectiveness of Clean Air Act transportation control measures, the transportation profession is being asked to provide better analysis and evaluation of proposed transportation policies and strategies. In addition to theoretically sound and robust analytical tools, a quality data base is critical for the transportation profession to provide the desired information.

The purpose of this paper is to examine the use of census data in statewide transportation planning and in transportation planning that occurs in small metropolitan areas. The focus is on the future use of census data given that, in the absence of a requirement for statewide transportation planning, few state departments of transportation (SDOTs) had aggressively used census data in their planning activities. However, the importance of statewide transportation planning has increased dramatically with passage of ISTEA. The following section briefly describes the characteristics of this new planning environment. The next section presents the results of a telephone survey of selected SDOTs that was conducted to assess past and future use of census data in statewide planning and in small urban areas. The final section provides an overview of the data needs of the future and the important role that census data can play in satisfying some of these data needs.

At least for statewide planning purposes, there is a paucity of information on, and in many cases experience with, the use of census data. Most of the SDOTs contacted in the survey are still awaiting the results of the 1990 census and have not yet had the chance to use the census data in real planning applications. In addition, the ISTEA requirements for a statewide transportation plan and the development of six management systems are creating great demands in many SDOT planning offices. These factors are making it difficult for many planning offices to focus on the use of census data in transportation planning. The following material is thus a combination of past practices, current thinking on the part of SDOTs (where such thought has occurred), and likely future requirements for quality data.

## CHANGING ENVIRONMENT FOR TRANSPORTATION PLANNING

A workshop report from the last national conference on census data for transportation planning purposes stated that "statewide planning is predominantly a policy-level activity and therefore is not a heavy user of detailed census data" (2). This may have been true before the passage of ISTEA, but post-ISTEA statewide planning must now satisfy specific requirements, many of which can be usefully addressed with census data. Most important, a statewide transportation plan is now required. The ISTEA-mandated statewide transportation planning process includes several elements: data collection and analysis, consideration of 23 factors, coordination with other agencies relevant to the planning process, development of a state transportation plan, and development of a state transportation improvement program.

The 23 factors that must now be considered as part of the statewide transportation planning process are summarized in the accompanying text box. Many factors that would presumably benefit from analysis based on census data are indicated in italics in the text box. For example, one could envision census data being used to show the social effects of transportation decisions, the effectiveness of traffic congestion reduction methods (especially in areas where congestion does not yet occur), or the effectiveness of expanded and enhanced transit services.

In states where serious statewide planning activities occurred before ISTEA, one sees a higher propensity to use census data in the analysis and evaluation process. Therefore, it seems reasonable to assume that the state planning activities now under way in each state could find great use for census data in better understanding the demographic and trip-making behavior of the state's population. In many cases, the SDOTs will be just beginning to use these data. The true effect of these data on statewide planning might not be found until after the next decennial

### FACTORS TO BE CONSIDERED IN STATEWIDE PLANNING

*(Factors in italics indicate high potential for use of census data in analysis and evaluation)*

- Transportation needs identified through management systems
- Energy use goals, objectives, programs, or requirements
- *Bicycle and pedestrian considerations in projects*
- International border crossings, access to ports, airports, and so forth.
- *Transportation needs of nonmetropolitan areas*
- Metropolitan area plans
- *Connectivity between metropolitan planning areas*
- Recreational travel and tourism
- Plans for water quality and coastal zone protection
- *Transportation system management strategies*
- *Social, economic, energy, and environmental effects*
- *Methods to reduce traffic congestion and to prevent it where it does not yet occur*
- *Transit services*
- *Land use and development*
- Transportation enhancements
- Innovative financing mechanisms
- Preservation of rights-of-way
- *Long-range needs for person/goods movement*
- Efficient movement of commercial motor vehicles
- Life cycle costs
- Coordination of metropolitan transportation plans and programs
- Investment strategies for adjoining state and local roads that support rural economic growth and tourism
- Concerns of Indian tribal governments

census, when the states will have at least two reference points for comparing trends. ISTEA has thus created a potentially large new customer base for the use of census data.

In addition to the statewide plan, SDOTs are responsible for developing six management systems. The key characteristic of these systems is that they are to be integrally tied to the systems planning process. Although these systems have many characteristics that help define their role in the overall process, perhaps the most important is the use of performance measures as the basis for the identification of system deficiencies or opportunities. In essence, these six systems are adding a performance-based system monitoring element to the state transportation planning process. This is a potentially important issue for this conference because it raises the question of how system performance should be measured. The development of the congestion management system (CMS) is a good example of how this simple question could become complex and relate to the use of census data.

The purpose of the CMS is to identify and implement strategies that will reduce congestion and enhance the mobility of people and goods. The most traditional measure of system performance is some indication of network level of service or congestion. However, the second part of the definition of the CMS (that is, enhancing mobility) is not necessarily best monitored through level-of-service performance measures. In addition, some are arguing that the true measure of system performance is one that relates to the levels of accessibility provided by the transportation system (3). This might mean such things as the degree to which the transportation system provides access to job opportunities for low-income groups.

Figure 1 shows the evolution in thinking on measuring system performance from the traditional level of service concepts to the perspective of transportation accessibility. The different types of data needed to make the more complex performance measures operational are certainly related to the data that can be provided via the census. In taking a long-term perspective on how these management systems and systems planning are likely to evolve, we can see the importance that census data could have in determining how the performance of our transportation system is measured. Fundamentally, this means assessing how effective transportation officials are in accomplishing their goals and objectives. An example of this phenomenon is the questioning and assessment that followed the release of STF3A, which showed dramatic declines in carpooling and reduced market shares for transit and walking. After years of public policy incentives to encourage ridesharing, this very basic surrogate of transportation system performance, that is, average vehicle occupancy for the work trip, suggested that our best policy efforts were simply overwhelmed by market forces. Similar types of measures could be used in the CMS to gauge the level at which the transportation system is accomplishing its objectives.

This discussion has focused on the changing environment for statewide transportation planning. Another purpose of this paper is to examine the use of census data in small metropolitan areas. The environment for such planning, however, has not changed as dramatically as it has for statewide planning. Transportation planning remains an important activity simply because transportation investment has a relatively greater impact in smaller urban areas, where the transportation network might not be as ubiquitous as that found in larger metropolitan areas and the travel patterns are much more pronounced. In many cases, the most significant change in smaller urban area planning during the past several years has been in the relationship between transportation investment decisions and growth management policies that have provided policy and regulatory guidance on the types of urban form that are desired

System Capacity Operating Measures	Mobility	Accessibility
Delay	Mobility Index	% Employees Within
LOS	Service Hours per Capita	'X' Miles
Volume/Capacity	Speed Weighted Person Flow	% Low Income Within
Congestion Index	Travel Time per O/D	'X' Minutes

FIGURE 1 Various concepts of performance measures.

in a community. This guidance often relates to the decision-making process for investment in infrastructure. States such as Florida, Vermont, Oregon, and Georgia have pioneered some of the planning requirements that link community development and infrastructure expansion. In such cases, the use of census data can be critical for examining demographic and travel patterns that permit a community to assess appropriate development scenarios.

In summary, whereas past statewide transportation planning practice has not been widely based on state level analysis and plan development, this will soon change. In particular, a performance-based perspective on such planning, with a broad definition of performance, will rely even more on the type of data that is available through the census. Smaller urban areas will continue to rely on census data for very basic information that can be input into the planning process.

### USES OF CENSUS DATA FOR STATEWIDE PLANNING AND PLANNING FOR SMALL URBAN AREAS

There are many reports and articles in the literature that discuss the use of census data in transportation planning. The Transportation Research Board, for example, has held several conferences that have examined the past and desired use of such data in transportation planning applications (2,4,5). In addition, several reports are available that use census data in analyzing the trends in key socioeconomic data that will likely influence travel behavior. Good examples of these reports include those of Pisarski (6) and Rosetti and Eversole (7). At the state level, several organizations have prepared reports examining county-level journey-to-work statistics (8). For smaller urban areas, the extent of the technical literature is more limited and includes such reports as a Federal Highway Administration case study report on applications of the UTPP to transportation modeling (9) and an informational report from the Institute of Transportation Engineers (10).

To assess the current and expected status of census data use in statewide planning, a telephone survey of 22 SDOTs was conducted that focused on three questions: What are the current uses of census data? What are the limitations in the use of such data? What other types of data would be useful for your planning process? The SDOTs included those of both large and small states, those of heavily urban and primarily rural states, and SDOTs with a reputation for having strong state transportation planning activities. Of the 22 states contacted, 17 responded.

One of the most important roles that SDOTs play in a state's use of census data is as a clearinghouse or purchaser of the data files for use by metropolitan planning organizations. In some cases, the clearinghouse role includes being a technical resource in the use of the Census Transportation Planning Package (CTPP).

For statewide planning, the primary uses of census data fall into three major categories—trend analysis/socioeconomic forecasts, model development and calibration, and corridor analysis. Each of these uses will be described.

#### Trend Analysis

The use for census data cited most often was in trend analysis. The purpose of trend analysis is to examine, over time, the changes of key socioeconomic data or travel characteristics that provide some sense of what has occurred in the state or its subareas. The states typically compare results of the 1990 census with results from past years to identify high-growth areas and work trip interchanges. One state mentioned that it supplements trend analysis from the decennial census with similar information collected on a biennial basis to provide a more timely and useful trend analysis. The Maryland Department of Transportation, for example, used census trend data on population, mode split, travel time, and interjurisdictional travel to develop broad policy concepts for its corridor-based Commuter Assistance Study. The New York State Department of Transportation examined similar trends at the urban and county

levels. Pennsylvania has likewise conducted trend analysis on key variables. North Carolina uses the demographic data for establishing statewide population/employment/travel trends. In addition, one other state specifically mentioned that trend analysis of travel data was a primary tool for projecting traffic volumes in rural areas.

The primary use of trend analysis is to better understand what is happening to variables of interest to planners, transportation officials, interest groups, and the media. An excellent example of the use of trend data in public discourse was the comparison of journey-to-work data on automobile occupancy. As noted earlier, the analysis of these data not only caused major debates among transportation professionals but also became the focus of media attention.

With the new requirements for statewide planning, the use of census data in trend analysis will likely increase. Not only will these trends provide useful contexts for transportation plan updates, but the trends will, over time, probably be examined on a trip pattern basis (e.g., county-to-county travel). Several states are already doing this. Given the emphasis on a continuous statewide planning process that will presumably continue for many years, such trend data could be very useful in gauging changing characteristics of travel between different areas of a state.

### Model Development and Validation

Unlike the use of journey-to-work data for developing "observed" work trip tables for aggregate trip distribution and mode choice models in metropolitan areas as reported elsewhere in these Proceedings (see the paper by C. Purvis), very few states have statewide travel demand models. Ohio used the census data for all demographic forecasts in its statewide model. California has used housing, income, and employment data in regression equations to establish trip generation rates for a statewide journey-to-work model. Colorado, Connecticut, and Wisconsin are developing statewide transportation models that will use census and other data. California will be using census data in a geographic information system (GIS) context to analyze accessibility and demographic issues in applications of the ISTEA CMS management system. Maryland is also expecting to develop a model that uses census data within the context of the ISTEA management systems. Michigan has used census data for helping evaluate corridor-level improvements of the state highway system and is developing a statewide GIS approach to the management systems that incorporates census data.

Although several states in the survey indicated that census data would be used in a statewide model, in many instances the model is not yet developed. It appears likely that many of these "models" will turn out to be nothing more than the county-to-county travel trends discussed in the preceding section. One of the more interesting applications of census data at a state level is the use of GIS and the TIGER files to develop a comprehensive data base for the state. In particular, states that are developing a CMS on a GIS platform will find use for census data.

As in the case of trend analysis and socioeconomic forecasts, the changing environment for statewide transportation planning could provide greater use of census data in statewide planning. States such as Wisconsin and Michigan are developing statewide models for both passenger and freight movement that will require quality data. Other states will probably follow in years to come. The great burst of creative energy in metropolitan level transportation model building did not occur until after Congress, in 1962, required that a transportation plan be developed for every urbanized area. Similarly, we can anticipate that more states will develop a statewide modeling capability in the future. Census data could be important inputs into such models.

### Corridor Analysis

A few states had novel approaches to the incorporation of census data in corridor and project analysis at the state level. Household-based information such as income level, ethnic background, and housing costs were found to be useful for impact analysis of right-of-way

purchases. One state is developing a GIS for use with management systems and in corridor analysis. The GIS will incorporate significant census data at the tract level and can thus be used to determine potential socioeconomic effects of alternative highway alignments in a corridor. This example points out the powerful tools that can be developed for statewide planning by joining a robust data set with a new generation of spatial analysis software.

### Small Urban Areas

Transportation planning in small metropolitan areas is often characterized by fairly straightforward analysis approaches that are not data intensive. Planning agencies for such areas do not have the resources to conduct large-scale data collection efforts, so the census data are an important source of information for at least a "snapshot in time" of the key variables. Unlike larger metropolitan areas, where extensive efforts are often made to estimate and validate numerous models, smaller urban areas usually use census data to determine three items of information: household income distribution, the distribution of households by number of workers, and the distribution of households by number of vehicles.

This information can be used in the development of market-segmented trip generation models or through sketch planning tools as input into small-area transportation evaluation. It is not likely, however, that we will see the census data being used extensively in small urban areas. They will continue to be a major source of sociodemographic data for the analysis zones in the study area.

### EXISTING LIMITATIONS AND DESIRED DATA

The concern mentioned most often at the state level was the delay in release of census data, particularly the CTPP. Because of the looming deadlines for preparation of various elements of the ISTEA-mandated statewide plans and management systems, most states have moved ahead with planning efforts, relying on city- and county-level census data, older census data at more disaggregate levels, and other data sources.

Another major concern was the focus on journey-to-work trips in the census data. No information was provided on recreational trips, non-home-based trips, or freight movement. This concern reflects the significant growth trends that have been observed in all parts of the country in nonwork trips and in non-home-based work trips (or the trip-chaining phenomenon). These trips will become even more important in the analysis of trip making in metropolitan areas. Nonwork trips can be expected to be an important issue for statewide, intercity trip making. Indeed, as one SDOT official put it, "Our state is very rural, which makes journey-to-work data relatively useless." Some states have addressed this data gap by performing their own origin-destination studies and travel log surveys or by relying on data collected for local or private (freight) planning purposes.

Some states expressed concerns about the accuracy of census data. It was felt that wording on some questions on the census form was unclear, such as what constitutes a handicap or a trip. Other states have noticed major differences between census data and results from other local and statewide surveys. One state believed that the data are already "old" by the time they reach the states because of the previously mentioned delays; this could be a particular concern in rapidly growing corridors of any state.

The final category of limitations revolved around technical aspects of the census data. States relying heavily on GIS applications have mentioned that place of employment information is difficult to use in rural areas because the address ranges in the TIGER files are not very accurate in these areas. In addition, there are major discrepancies between census tract and jurisdictional boundaries, which can make GIS applications difficult. One state noticed differences between results obtained from STF-1 and those obtained from STF-3. Problems such as this have led another state to have doubts about any large-scale use of census data for its statewide planning.

Following up on the limitations mentioned previously, most states would like the census to continue collecting the information that is now being collected; however, it must be dissemi-

nated more quickly. One state suggested that summary information of major trip characteristics and demographic information be released at the county level shortly after completion of the census; the state believed that this would be most useful for statewide planning purposes. More detailed and disaggregated data could be released in ensuing years.

If census data collection were expanded, nearly all states would like to see travel data on nonwork trips, including recreational and shopping trips. However, concern was expressed that these data not be collected in a superficial manner, such as asking about "typical" trip-making patterns. Rather, a few states suggested that the census should ask long form recipients to track all travel activity on a particular day. If this level of information is not collected in the future, one state suggested that the census at least ask about trip chaining on work trips, especially considering the potential effects that it has on mode split and vehicle occupancy. The survey participants were also asked to identify additional census data that would be useful for transportation planning in the future.

## CONCLUSIONS

This paper began by stating that the environment of statewide transportation planning has changed dramatically with ISTEA and that the changing environment will likely create a need for better data in the future. Thus, it was suggested, the types of data desired in the next decennial census should not be based on an assessment of what has occurred in the past. Except in the case of small urban areas, the survey lends credence to this approach. Only a few states had reached a point where statewide transportation planning was based on a strong modeling framework. However, this is likely to change. Future state transportation planning will rely more heavily on data about travel from one area of the state to another. Therefore, this conference should consider carefully what additional data might be necessary to make the county-to-county data more useful for state planning purposes.

In addition, given the changing characteristics of travel, serious consideration should be given to obtaining information on nonwork trips. Such information would be especially important for larger metropolitan areas but would also help smaller urban areas and rural states.

The use of census data in small urban areas was also discussed. In each of the telephone interviews and through an extensive literature search, no strong evidence was found to suggest major additions to the census data that are already collected. Given the primary importance of census data for establishing the demographic base for small-area studies, a consensus can certainly be reached on the need to continue collecting such data.

Let me end with a statement similar to the one I made at the Transportation Research Board conference on data needs. That statement was as follows:

I worry that many of our public policies and subsequent policy requirements have gone far beyond the data base and technical modeling capabilities that exist in our profession. There is little doubt in my mind that we are about to play a catch-up game, due in part to many years of neglect and limited resources. However, I hope that our profession, and this conference, goes beyond simply looking at what is necessary to support the decisions of today. Because if we do, my fear is that once we finally have in place the data base and analysis methods that are needed for today, the decision-making environment will have changed again. In all of our discussions, we need to provide some strategic perspective on the importance of data and of the analytical capability it supports. Will they be useful 10 years from now? 20 years from now? 50 years from now? I know the answers to these questions are not easily forthcoming. However, by simply asking them, we might be able to put in place a data base that truly can support the decision-making process of the 21st century.

After having thought a great deal about statewide planning needs for census data for this conference, I believe that my statement is even more valid than when I made it 2 years ago.

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