State Departments of Transportation

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Case studies from four states were reviewed with regard to the uses of census data by state transportation agencies: Kentucky, Wisconsin, Kansas, and New York.

Kentucky Statewide Traffic Model

The use of census data for traffic modeling is probably the single most common use of these data in transportation. Without demand models, transportation planners would be ill-equipped to determine what kind of transportation system will be needed under different population and economic growth scenarios.

The case study covered the second of two projects performed for the Kentucky Transportation Cabinet by Wilbur Smith Associates. In the current project, the area covered by the model was expanded to include surrounding states. The purpose was to make the model sensitive to facilities and traffic conditions beyond Kentucky's boundaries. Also, the traffic analysis zone (TAZ) system was redefined to make it compatible with census geography and to facilitate the modeling process and tie it more closely to the census data that traditionally have been available. Finally, the project is refining and recalibrating the trip generation and distribution components of the model utilizing census data.

Applications

The old Kentucky Statewide Transportation Model covered only the commonwealth of Kentucky and almost ignored conditions in other states that could affect Kentucky. To make the enhanced model more sensitive, the modeling area was expanded to include portions of Tennessee, West Virginia, Virginia, Ohio, Indiana, Illinois, Missouri, and Arkansas. The value of census data in accomplishing this expansion is obvious.

Census geography has become a common denominator in the collection and forecasting of demographic and other spatial data. Consequently, the TAZ system used in the old model was

replaced with a new TAZ system that is consistent with 1990 census geography. Census tracts were used as the building blocks for the new TAZ system. As a result of these enhancements, the model now includes almost 1,500 TAZs. TAZ connectors were created using an automated proximity-based procedure that employed the use of the census Topologically Integrated Geographic Encoding and Referencing (TIGER) files. The results of these efforts are shown in Figure 1.

The third enhancement undertaken in the current study involved refinement of the trip generation and distribution model components. The Kentucky model forecasts vehicle trips for automobiles and trucks. For automobile trips, the model develops separate forecasts by trip purpose. The 1990 census journey-to-work data were used to derive home-based-work trip production rates, attraction rates, and trip length frequency distributions. The 1990 Nationwide Personal Transportation Survey was used to derive trip rates and trip length frequency distributions for home-based and other non-home-based trips.

The census data also played an important role in developing procedures for estimating truck trips:

- The Transearch Commodity data base was used to estimate truck trips at the Bureau of Economic Analysis (BEA) level, and
- Census population employment data were used to disaggregate the BEA-level truck trips to the TAZ level.

Value of Census Data

Without census data it is unlikely that these three enhancements to Kentucky's statewide model would have been undertaken. It simply would have been too expensive and too lengthy a process to conduct the very large and extensive surveys that would have been required.

Wisconsin Statewide Transportation Plan

The Wisconsin application of census data in the statewide transportation plan, Translinks 21, involved the development and use of statewide traffic models in which all modes were analyzed simultaneously and interactions among the modes were specifically addressed.

Applications

For the passenger travel forecasting process, the demand model TRANPLAN was utilized. The model predicts intercity passenger trips, which were defined as only those trips that cross county lines. It is an integrated two-stage model system that forecasts both travel demand and mode share.

One component is a model forecast of natural growth stratified by two trip purposes. Natural growth is that growth resulting from changes in one or all of the following: population, employment, and income. The model also forecasts induced demand resulting from changes in the combined level of service provided by all modes. Because of its composition and focus, the zonal structure is considerably coarser than that used in Kentucky, consisting of only 157 zones. The structure of the model is shown in Figure 2.

The Census Bureau socioeconomic data were essential to the development of independent variables used in the travel demand component of the model. Census population and housing data were used to develop population forecasts. Census employment data were used to produce employment forecasts. Because of the county-level zone structure, journey-to-work data were not used directly.

Development of freight forecasts involved a somewhat different approach. The analysis used commodity flow data acquired from a commercial source. Trend forecasts were based on forecasts of economic activity. As with the passenger forecasts, the trend forecasts basically considered continuation of previous trends.

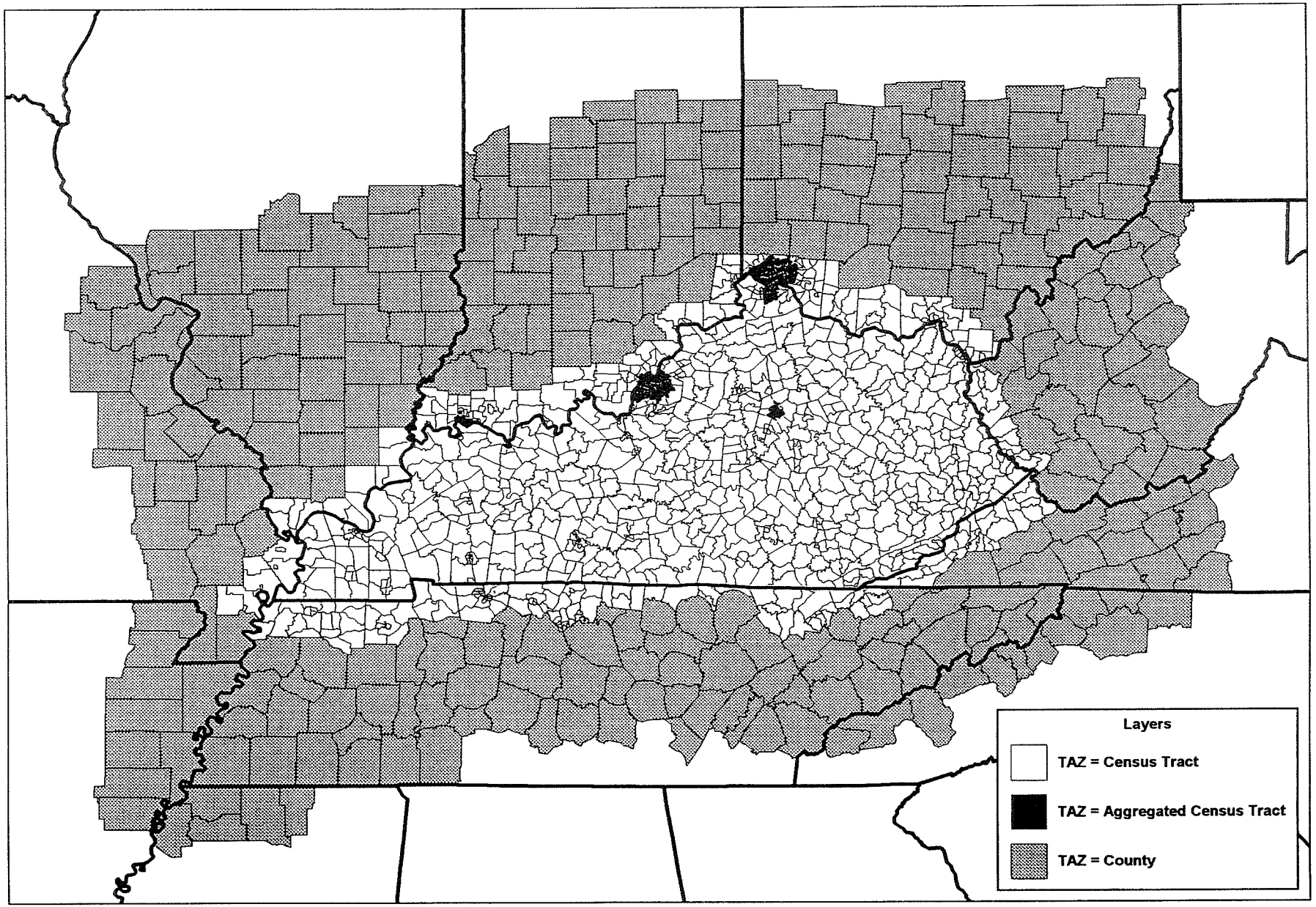

FIGURE 1 Kentucky statewide model traffic zone system.

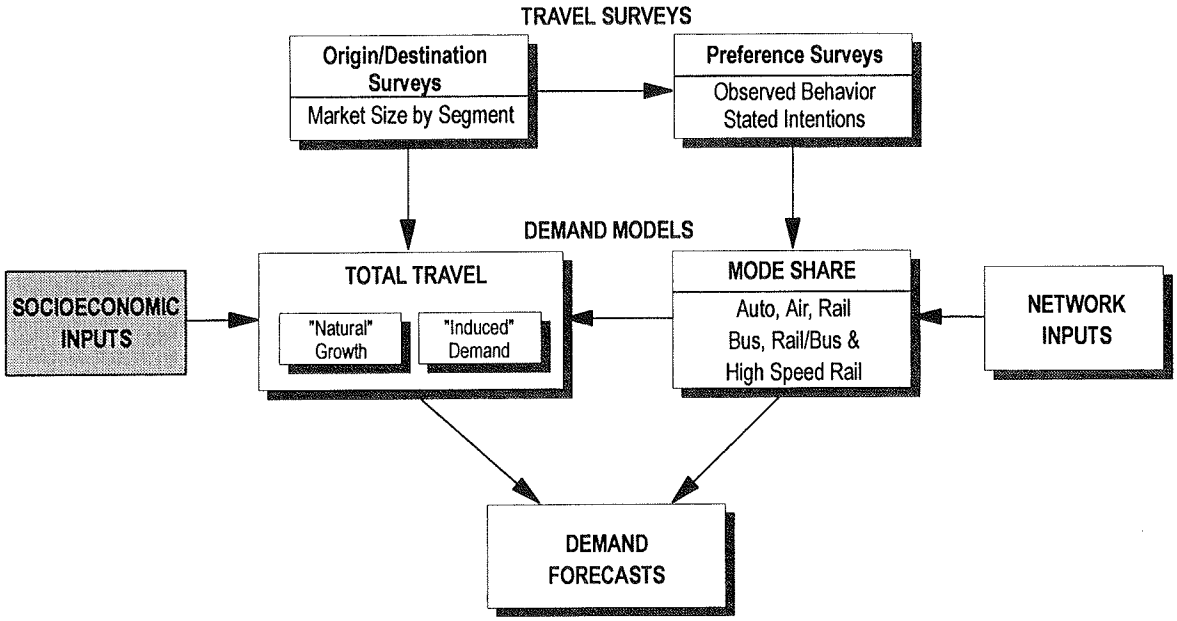

FIGURE 2 Translinks 21 intercity passenger analysis.

The plan forecast was largely based on a truck and rail intermodal scenario. An expert panel defined the extent to which different commodity types could be diverted from one mode to another on the basis of emerging truck-rail intermodal partnerships. This diversion would involve utilization of intermodal container, trailer-on-flat-car, and new RoadRailer technologies. The extent to which different commodity types could be diverted took into account haul distance as well as service frequencies necessary to achieve different levels of diversion. The diversion rates were applied to the freight forecasts and assigned to the network using a TRANPLAN methodology.

Value of Census Data

To accomplish the foregoing tasks, a wide variety of census data was required to produce a state-level multimodal plan that captures the interactions between and among the modes, including the census of population and housing; county business patterns; the census of transportation, communications, and utilities (in particular the Commodity Flow Survey); selected current industrial reports; the annual survey of manufacturers; and other important data.

The Wisconsin example clearly demonstrates that census data are extremely critical to statewide transportation planning activities.

Kansas Department of Transportation

The Kansas Department of Transportation case study involved three different types of applications.

Applications

The first type of application involves 12 months of experience by the Kansas Bureau of Transportation Planning in which census data were fundamental, and even essential, to their operations, such as the following:

- Voting district redefinition,
- Services for the mobility disadvantaged,
- Indian reservation transportation planning,
- Statewide trip exchange matrix,
- Regional trip exchange matrix,
- Airports relative to population centers,
- County population trends, and
- Wichita travel time analysis.

The foregoing list includes only those examples in which the census data were the primary source of information. It also reflects the Bureau's reputation in Kansas as experts regarding census data. Bureau staff are often called upon to support other organizations because of this expertise.

The Wichita travel time analysis highlights the critical nature of census data relative to the activities to the Kansas Bureau of Transportation Planning. As a part of the Wichita analysis, a map was produced that shows the travel times from various TAZs to the Wichita downtown area. The Bureau incurred certain trials and tribulations in generating these kinds of data. One of these involves the difficulties of combining the census data base with mapping procedures. Certainly, these capabilities should be enhanced in the future to facilitate meaningful displays of census data in relation to surrounding geographical attributes.

Value of Census Data

These examples demonstrate that the census data are the easiest data sources to access. They also highlight the importance of journey-to-work information from the census. If census data were not available, the timeliness, speed, and accuracy of transportation-related analyses would be greatly reduced. In fact, many of these activities simply would not be undertaken because of the unavailability of a good source of data.

The Kansas case study effectively communicates the essential nature of census data to transportation planning. It also made some recommendations for improvements. For example, the desirability of census output in a machine-readable compressed format was cited. In particular, a relational data-base format distributed on CD-ROM was suggested. Indicative of the importance of trend analysis in transportation planning, it was also suggested that the data from previously censuses be redistributed on CD-ROM and that there be consistency between successive census activities. The Kansas Bureau of Transportation Planning believes that the Census Transportation Planning Package (CTPP) urban and statewide data are the most critical of the data bases. These data concerning trip ends are not available from any other current source.

New York State Department of Transportation

Like Kansas, the New York State Department of Transportation (NYSDOT) makes a strong point that many of its planning activities simply would not be done in the absence of census data. The expense would be prohibitive to conduct special surveys that would be needed to undertake the analyses that are currently performed on a regular basis.

Applications

The Planning Data Analysis Group (PDAG) of the NYSDOT has undertaken a multifaceted proactive role with regard to census data. To fulfill the need for those who are experts in census data to assist others who have little working experience with census data files and to increase awareness of the values associated with the census data, PDAG has undertaken an

outreach effort. As a part of this effort they have conducted training courses and twice have sponsored the National Highway Institute (NHI) course regarding the CTPP.

One of the means by which PDAG has attempted to increase knowledge and awareness of census data and its usefulness involves the production of a newsletter-type publication called FACTS, which is distributed to regional offices and to MPOs to tell them about certain aspects of census data. This newsletter is a good means of maximizing the value of the census to the greatest number of potential users. It also is an excellent means of improving the performance of NYSDOT and the MPOs by helping them to take advantage of information that is available but which they may not be aware of.

One example of NYSDOT's use of census data involves the results of a study regarding access from suburban counties to the core of Manhattan in New York City. In this analysis, data showing the county of residence, employment, and trip characteristics were examined in a variety of ways. Pie charts were developed showing how the choice of transportation mode is influenced by location. The journey-to-work data also were used to show the influence of the unique mass transit system that exists in the New York area. This study demonstrates that census data that are consistent for various geographical areas have high value in revealing those factors that influence transportation activities and choices.

The second example application by PDAG is the development of regional data profiles for use in NYSDOT's regional comprehensive planning. To assist in this planning process, county data profiles have been developed to provide the demographic, economic, and transportation information that affects travel characteristics. Regional profiles contain a variety of information, for instance, the characteristics of transportation choices by workers in relationship to their household income.

When the effort was initiated, PDAG experienced difficulties in getting input from the regions about what data they needed. After drafts of the regional profiles were circulated, requests for more details resulted, which indicates how the value of census data can be increased by increasing awareness of its availability and utility.

A final example application from New York is the development of processes that link census data with the Department's geographic information system (GIS). The illustrative application involves a transit market research project. Using GIS, the Department's Public Transportation Division identified market opportunities as an input to bus route and service planning activities. Visual comparisons of the type that were prepared greatly facilitate the assessments that must be undertaken to better plan for bus routes and services.

Value of Census Data

Given the extensive use of census data by NYSDOT, it is informative to look at their concerns regarding the application of census data in transportation planning. Briefly, there is the issue of trip-chaining, a phenomenon that clearly is affecting transportation choices in a significant way. NYSDOT also has suggested that the mode of transportation might be refined somewhat because it is possible in large areas like New York and Chicago to confuse commuter, subway, and heavy-rail modes. Like a number of other states, New York State must deal with international crossings. Therefore, the Department has suggested that it would be useful to know the origin and destination details of cross-border travel.

Conclusions

Valuable lessons may be learned from these four case studies. First, it is clear that there are far more applications involving census data than it was possible to review. In fact, this review covered only selected examples of items in the four case studies. If other states were contacted, it is very likely that still more applications would be revealed.

Second, because census data are available, transportation planners know a lot more about those factors that influence trip-making characteristics and choices than they would know

otherwise. Transportation planners are able to relate socioeconomic and geographical features with trip-making characteristics. That knowledge is crucial if appropriate plans are to be prepared for transportation systems.

Third, because census data are available, a better job of transportation planning is accomplished. There can be no question that transportation systems are better planned in the United States simply because census data are available.

Fourth, consistent, universal coverage is one of the most valuable characteristics of the census data. The same information is available for all areas. The same definitions are applicable. The temporal relationships are the same within the data base.

Fifth, if the census data were not available, it would require extraordinary efforts to obtain information on a case-by-case basis. This situation has extensive implications regarding cost, time, geographical coverage, inconsistencies between the way different surveys would be undertaken, and the ability to undertake trend analysis.

Sixth, although it is clear that some changes are appropriate to improve transportation planning capabilities even more, if census data were not available or there were a decline in the quality and comprehensiveness of census transportation data, transportation planners most likely would not do much of the transportation planning that is undertaken today. There would be a tremendous waste of efficiency in developing transportation plans and providing transportation systems that properly respond to the nation's needs, and future generations would suffer.