

LIMITATIONS OF CENSUS DATA FOR TRANSPORTATION PLANNING AND NEEDED PROGRAMS

Robert E. Barraclough
 PADCO, Inc., Washington, D. C.

At a meeting of the HRB Committee on Transportation Information Systems and Data Requirements, we discussed the limitations of the census data for transportation planning purposes. We also discussed problem areas and needed programs and research. I will summarize the major points that were presented at this meeting.

There are 3 important gaps in the fitting of census data to transportation planning requirements: a data gap, a communications gap, and a tools and methods gap.

DATA GAP

The data requirements for the transportation planning process can be viewed as a matrix consisting of 3 dimensions: geographic, data category, and mode. This matrix is shown in Figure 1 (1). The geographic dimension broadly relates to trip length and distinguishes urban, statewide, and national transportation planning. The mode dimension covers the various transportation modes such as highway, rail, air, water, pipeline, and intermodal. The data category dimension covers the 3 basic aspects of the transportation process: the activities sited on the land, the flows of goods and people among the activities, and the channels on transportation networks through which the flows occur.

Census data fill some of the information needs for transportation planning purposes, and the 1970 census data fill more needs than the 1960 census data did; but there are still many very important data gaps. The gaps may be considered in terms of types of data, geographic coverage, level of detail, and updating the data.

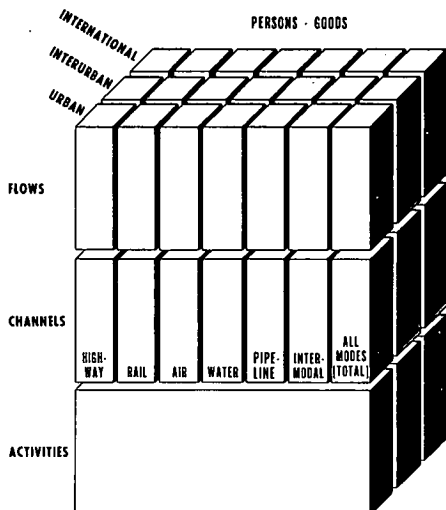


Figure 1. Transportation data structure.

Types of Data

Information on comprehensive land use activities is not available from census data. Population and employment data furnish part of the picture, but information must be added from other sources at great cost for a comprehensive portrayal of activities on the land with intensity measures. It is not practical to use data on nonresidential activities from censuses of business or manufactures for transportation planning purposes because the geocoding is too coarse and these data are available at points in time different from those of data from the population and housing census.

The Bureau of the Census has a logistical problem in taking censuses of population, housing, business, manufactures, transportation, and government, and the program for

taking these censuses at different points in time is the best solution from the point of view of logistics. Unfortunately, this solution does not take proper account of the needs of data users such as transportation planners who wish to have all the data on the various facets of metropolitan activity for the same point in time. Enormous costs and disbenefits are incurred just because the census metropolitan data are fragmented into a number of censuses taken at different points in time with different geocoding procedures. I am sure that a cost-benefit study that considered costs and benefits of both data producers and data users would show that the highest cost-benefit ratio would result if all of the various censuses were conducted concurrently, say, at 5-year intervals.

This would probably make it easier to provide for some of the flows of data that are not adequately provided for now in the census data, notably data on nonwork trips (such as school and shopping trips) and goods movement. The data that are now obtained on goods movement are collected at a very low cost but cannot be used for transportation planning purposes even at statewide or national levels. A wholesale revision of this program is necessary to meet the needs of transportation planners.

The DIME or geographic-base files with coordinates that will be available with the 1970 census data represent the first entry of the Bureau of the Census into the network data field. Actually these files only provide a framework for network data. Data on link volumes, speeds, and numbers of lanes will have to be added. Also, some means must be found for providing vehicle-miles of travel data.

Geographic Coverage

Perhaps the biggest problem of geographic coverage is with these network data. The DIME files will only cover metropolitan areas. They should be extended to cover metropolitan fringes, metropolitan interstices (such as between Washington, D. C., and Baltimore, Maryland), urban areas under 50,000 in population, and rural areas. Only then will we have a comprehensive framework for network data and a uniform national geocoding system suited to transportation requirements at national, statewide, and urban levels.

Level of Detail

The level of detail covered by census data is improving; for example, the 1960 journey-to-work data indicated only the city or county area in which persons worked, whereas the 1970 data will be coded to the block and block-face level. This level of detail in geographic coding is essential for many transportation planning purposes but may be difficult to apply to data on journey-to-work and employment. Many data from other censuses, such as manufacturing, business, and transportation, are not available at levels of geographic detail required for transportation planning. The trend in transportation planning appears to be toward greater rather than less detail, for example, the recent efforts in microassignment.

Updating the Data

The many important changes in the 10-year intervals between decennial censuses of population and housing necessitate costly special surveys. Mid-decade censuses are essential for transportation planning purposes, and transportation planning agencies should support the legislation recently reintroduced into Congress for taking these censuses. There should be consideration of providing for conduct of all of the censuses together at decennial and mid-decade intervals.

Continuing urban transportation planning is an established policy of the U. S. Department of Transportation, but at present there is no method to ensure that continuing data are provided. It seems clear there will be need for some data at intervals more frequent than 5 years. Probably these can be most efficiently provided at the local level, but the Bureau of the Census should have responsibility for annual updating of the geographic base files because these will be used at national and state as well as local levels.

Data requirements for transportation planning change as the process evolves. There is a considerable time lag between the establishment of a data need and the provision for this need through a national program. This fact makes it essential that there be a constant review of data needs and programs for satisfying these needs so that programs are properly responsive to current needs.

COMMUNICATIONS GAP

There seems to be insufficient communication between the transportation planning groups and the Bureau of the Census, chiefly in the areas of required data items, acceptable sampling variability, confidentiality, and the data processing procedures. The bureau knows what data it collects and which of these can be made available, and the transportation planner knows what data items are useful for his purpose and which are not available. It would be better if there were some reversal of these roles. The bureau as a data producer should have a close knowledge of the requirements of data users, and the transportation planner as a data user should know thoroughly what data are being collected and what problems are associated with making these data available.

The standards of sampling variability that are maintained by the Bureau of the Census appear to be high compared with those that the transportation planner is satisfied with. It appears that the bureau is concluding unilaterally that certain data at certain geographic levels should not be made available on the grounds that the sampling variability is too high. The transportation planner, however, is often forced to collect and use data of higher sampling variability. There is need for better communication between the bureau and the transportation planner on this point.

The confidentiality issue also calls for greater communication. It appears that some data cannot be furnished at the required level of detail because this would violate confidentiality restrictions as viewed by the bureau. Many of the data required for public transportation planning may not be available for this reason. It is most important that transportation planners and employees of the bureau define and solve these problems, particularly for those areas that may require special surveys to obtain data similar to those that apparently cannot be made available by the bureau because of confidentiality restrictions.

Finally, there is need to communicate regarding data processing procedures. It is possible that census data could be made more useful for transportation planning purposes at no additional cost if it were processed differently, for example, in the geocoding of work-trip data.

This conference provided a good start toward better communications between the bureau and transportation planning groups, but clearly there is a need for a more frequent interchange of information and this need should be formalized. The HRB Committee on Transportation Information Systems and Data Requirements working alone or with the Committee on Transportation Forecasting could contribute to an improved interchange of information between the Bureau of the Census and the transportation planning groups.

TOOLS AND METHODS GAP

So far we have been talking about improving census data for transportation planning. Some committee members expressed the view that if the 1970 census data were ready tomorrow most transportation planners would be "hip high" in data and would not be able to use it not because of the shortcomings of the data but because the tools and methods have not been developed for most of the transportation planning applications of the data. Others pointed to the need for developing standard methods for adding to the census data to build an integrated body of data suited to transportation planning purposes. They felt that the census data provided a strong foundation on which to build a superstructure of additional data based on standard methods. They saw the need for a methodology that would result in saving of local energies in additional data collection tasks.

The Census Use Study has developed methods of machine geocoding of a file containing street addresses, given a DIME geographic base file (the ADMATCH package). The

geocodes that are assigned in this way include coordinates so that the file can then be used for computer mapping that the Census Use Study has under development (GRIDS).

Also, under Census Use Study auspices, a method has been developed for the Office of Civil Defense in which population is allocated to shelters by using census population data and network data similar to those that will be available from the 1970 census. The same method can be used for other allocation problems, such as allocating population to shopping centers or children to school.

The proposed package of standard tabulations of census work-trip and related data, which is being developed under the leadership of the Federal Highway Administration, provides for rendering census data into a form that is more useful to transportation planners. The Federal Highway Administration has also sponsored research on the relationship between peak-hour traffic and the work-trip data that will be available from the 1970 census.

These are some of the tools and methods that have been developed to date for use of the 1970 census data, and there are probably others. These represent only a start on the total necessary for a full use of the census data by transportation planning organizations. For public transportation planning, a standard package could be developed that accepts as input the work-trip data in the standard form available from the Bureau of the Census and provides as output answers as to where there is or is not potential for public transportation services and the level of service that would probably be sufficient. The potential range of other applications extends from microassignment and detailed impact studies to statewide transportation planning.

What appears necessary and urgent is a program to provide for the development of transportation planning applications involving use of the 1970 census data. This program should include a list of these applications, cost estimates, and suggested agencies that should undertake the development of the tools and methods for these applications. The program should also include consideration of methods of supplementing the census data to obtain the full complement of required data.

CONCLUSION

The 1970 census data, compared with the 1960 census data, are much more useful for the transportation planner. There is need, however, for considerable additional data in order to meet the needs for transportation planning at national, statewide, and urban levels. Some of these additional data needs could be provided for by bringing together the separate censuses of business, manufacturing, government, transportation, and population and housing. If these were conducted concurrently, composite and comprehensive metropolitan data would be easier to obtain and ad hoc data collection efforts could be largely avoided. Also, some of the additional data needs could be met by extension of the 1970 census network and geocoding data to additional areas to provide for a comprehensive national system of network and geocoding data.

There is an urgent need to develop a full range of tools and methods for transportation planning applications involving use of the 1970 census data. A first step would be the development of a comprehensive program for this purpose.

There is a need for stronger communication between the Bureau of the Census and transportation planning groups on required data, acceptable sampling variability, confidentiality, and data processing procedures. The HRB Committee on Transportation Information Systems and Data Requirements could be useful in this regard. It could arrange for a series of meetings with the bureau on transportation planning data requirements. The committee could at the same time arrange for a constant review of transportation planning data requirements to keep abreast of changing needs. This is particularly necessary in view of the long lead time usually required to effect the inclusion of new data in national and state programs.

REFERENCE

1. Transportation Information. U. S. Department of Transportation. 1969.