Travel Data from the U.S. Census: A New Foundation for Transportation Planning

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The 1980 U.S. Census of Population and Housing will include the largest source of urban transportation data ever available for a single point in time. To properly use these data requires that planners understand the difference between census definitions and those commonly used in transportation. This paper describes those differences as well as the data that will not be included in the census. It recommends methods of local data collection that can supplement the census data to complete the measurement of total travel. Finally, it proposes a method of keeping the census commuting data up to date without extensive inventory data for 1980. The method is suitable for small urban areas as well as large metropolitan regions.

Plans for the 20th decennial census of the United States are virtually complete. Since the 1970 census, there have been drastic changes in the nature of transportation planning. At the same time, almost no new data on areawide travel patterns have been collected through regional transportation studies. This makes it essential for those interested in obtaining current travel information to learn about possible applications of census data as well as supplemental data needed to fill in the picture of total travel. Now is the time to plan for the supplementary data that must be collected by state, county, and municipal transportation agencies to get the maximum value from the 1980 census.

This paper identifies additional data needed to measure commuting in terms that are useful to transportation planners as well as appropriate measures of non-work travel. Perhaps even more importantly, it proposes a means of keeping the commuting data up to date so that the 1990 census could be used to verify such information rather than being used as the sole source.

SUPPLEMENTAL DATA ON COMMUTING

As described elsewhere (1), the journey-to-work data included in the 1980 U.S. Census of Housing and Population will include work destination, "usual" means of travel, and average travel time. Although this information, if properly collected and coded, will provide an excellent means of estimating overall commuting patterns within an urbanized area, it leaves some significant gaps in comparison with data that are commonly available through travel surveys. Trip frequency and work schedules are believed to be essential items for all urban areas if census commuting data are to be used properly. The other items described should probably be considered only for large urban areas.

1. Trip frequency—The 1980 census plans to ask about the usual means of travel used in the preceding week. Transportation planners generally use an average-day definition. Although work-trip generation rates have been relatively stable in the past, it would be very valuable to verify these rates for 1980, especially with increasing opportunities for four-day weeks and part-time employment.

2. Work schedules—An understanding of work schedules is critical to factoring average daily work trips to estimates of peak-hour utilization. Although the per-
Figure 1. Trips by U.S. households in 1970.

<table>
<thead>
<tr>
<th>ANNUAL TRIPS PER HOUSEHOLD</th>
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<tbody>
<tr>
<td>1500</td>
</tr>
<tr>
<td>1000</td>
</tr>
<tr>
<td>500</td>
</tr>
<tr>
<td>NON WORK</td>
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<tr>
<td>WORK</td>
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<tr>
<td>DAILY PEAK PERIODS</td>
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Obtaining these missing data items requires some special data collection. A survey of commuters gives the opportunity to collect additional data that, although not essential for all urban areas, will be extremely useful in analyzing current commuting patterns and projecting them into the future.

The principal characteristics that would probably be of interest to most transportation planners are described below. Since these supplemental surveys are likely to be conducted locally, other items of interest could easily be added.

1. Alternate mode—In investigating why commuters choose certain travel modes, it has been found that many commuters have no choice, or at least no reasonable one. The most common example of such limitation is the person who is a transit captive because the household does not own an automobile. This information will be included in the 1980 census. Many commuters from automobile-owning households, however, are relegated to the status of transit captive by other family members who preempt the family automobile for commuting or other purposes. In contrast to transit captives are automobile captives—those whose neighborhood has no bus service. Finally, a factor that can almost force a downtown commuter into an automobile regardless of transit service is the availability of free parking. Free parking for commuters is surprisingly common even in some large cities. To better define these options, a survey of commuters should inquire about automobile availability (as opposed to automobile ownership), transit availability, and the availability of free parking.

2. Land use at destination—To relate nonresidential travel demands to the composition of a commercial or industrial district, it is necessary to obtain information about type of land use at the destination or attraction end of the work trip. When these data are merged with local government files, it will be possible to calculate trip-attraction rates per job, per unit of land area, or per area unit of floor space.

3. Transit access—A major concern in large- and even moderate-sized regions is the mode of access used to get to transit. For rail rapid transit systems, the means of access is important. However, the census will not identify such mixed-mode trips but will collect data on the predominant mode.

This analysis has identified two additional data items that are felt to be critical to maintaining consistency between the 1980 census journey-to-work data and regional travel data. Both work schedules and trip frequency can probably be obtained from a sample of employers without direct surveys of commuters. Alternate mode, land use at destination, and mode of access to transit, where necessary, must be obtained from a direct commuter survey. Trip routing for transit trips could be largely determined through some minor adjustments to the coding of the census questionnaire in such a way that all modes used, rather than simply the predominant mode, would be identified. The other two additional data items must be obtained through a supplemental survey at the local level. However, since they are of principal concern for downtown workers, it is felt that such needs could be met by a carefully designed, small-scale survey of downtown workers distributed through the cooperation of private businesses and major downtown government agencies.

NONWORK TRAVEL DATA

It can be seen in Figure 1 that in 1970 commuting represented a minority of daily household travel in the United States even though it did account for a majority of peak-hour trips. Moreover, although there is a broad range of research on commuting as well as a generally acceptable theory and operational models, there are many unknowns about nonwork trips. For this reason, we are not attempting in this paper to design a detailed methodology for measuring nonwork trips to supplement the census. Establishment of a monitoring system to keep the commuting data current is felt to be much more critical. However, in areas that have the resources to do both, it is felt that a small survey to measure total nonwork travel would be desirable. Because of the underreporting of nonwork trips in most travel surveys, it is felt that measuring the total vehicle kilometers of travel for nonwork trips would be more protective than a non-work-trip survey. Nonwork transit trips could be reported separately (it was found in the 1968 home-interview survey of the Washington, D.C., area that, although there was more than 50 percent underreporting of some categories of nonwork trips, there was virtually complete reporting of transit trips). In fact, the controlling factor would probably be total vehicle kilometers of travel for an average day and week. If the automobile were driven to work, the number of kilometers traveled...
on that trip could be subtracted to estimate nonwork vehicle kilometers traveled.

Monitoring vehicle travel (and perhaps person travel) in this fashion would produce some new data that could satisfy two emerging issues in transportation. The first of these is the possible trade-off between weekday work trips and weekend recreational trips that might occur if commuters were confronted with gas rationing or major gasoline price increases. Most older travel surveys measure an average weekday and ignore weekend travel completely. The second concern is the need to relate vehicle kilometers of travel to the vehicle fleet mix, which is generally impossible with any of the older surveys. Such estimates are necessary to meet air quality planning needs.

Finally, relating vehicle kilometers of travel directly to automobiles would make it possible to estimate future changes in travel indirectly by monitoring changes in vehicle registrations. Since vehicle registrations have been found to correlate closely with vehicle kilometers of travel, this is a simple method of simulating aggregate travel on a current basis. When this measure of total travel demand is compared with commuting travel as determined by the methods described above, it should give a good estimate of changes in nonwork automobile travel at a fraction of the cost of a continuing home-interview survey.

SUPPLEMENTAL DATA ON USE OF FACILITIES

Since the approach recommended here will generally not allow the estimation of volumes of travel on individual routes, it does not justify an extensive traffic-counting program to support it. In fact, it is felt that a count program designed to measure changes after the census, especially in growing areas, would be much more valuable than a complete coverage count at a single point in time—i.e., 1980. It is recommended that the measurement of the use of transportation facilities in 1980 concentrate on the following areas:

1. Regional vehicle travel—There are recommended procedures that can be used to estimate regional vehicle travel through a carefully designed sample (3). This regional estimate can then be used as a control, and individual travel components can be expressed as shares of regional vehicle kilometers of travel. A recommended refinement of the regional estimate would be an estimate of peak-hour or peak-period vehicle kilometers of travel since commuting accounts for such a large share of travel in that time period. Different regions may also wish to estimate vehicle travel separately for different jurisdictions, such as central city versus suburbs, or different development areas, such as CBD, high-density residential, and low-density residential.

2. Central-area cordon count—Because of the traditional importance and heavy travel demands of the central area, a special one-day cordon count would appear to be very useful, especially if it could be related to longer-term traffic counts on each of the routes of entry. This cordon count could estimate not only the mix of vehicles entering the central area but also automobile occupancy and transit ridership, which are highest in central areas. These data could then be related to the journey-to-work estimates for commuters employed in the central area.

3. On-board transit survey—In areas that exhibit significant transit ridership, an on-board transit survey would be a valuable complement to the journey-to-work data of the 1980 census. The work-trip data obtained in such a survey could be compared with the commuting data obtained in the census. Valuable supplemental data, such as mode of access, transit route, and walking distance at each end of the trip, could be obtained. Such a survey is probably the only feasible method of obtaining data on nonwork transit trips, especially for transit-dependent groups.

Parking inventories—Areas of high commuter parking demand will be readily identifiable through the 1980 census. A study of parking price and occupancy conducted during the same period will identify total parking demand, of which commuter parking is only a part. Comparing these data with the number of drivers commuting to the CBD, as identified in the census, could make it possible to identify imbalances between parking demand and supply at a fraction of the cost of a conventional parking survey.

CONTINUING DATA BASE ON COMMUTING

By the time the 1980 census results on the journey to work are available, it will have been 15 years or more since the previous regional travel surveys were conducted in most urban regions. In view of the extensive changes in urban growth patterns, costs of transportation, and attitudes toward the regulation of travel in metropolitan areas that have occurred during this period, it is amazing to consider that public policies have generally been formulated without hard data on current travel.

It appears that, although the Federal Highway Administration intended the studies of the 1960s to make the transition into continuing planning processes in the 1970s, the need for continuing travel data was not resolved. Several agencies saw the need to refresh their travel data base of the early 1960s with a small-scale, continuing effort that would not become outdated (4). However, the federal procedures did not specifically call for new travel data. Instead, they recommended monitoring the inputs to the travel demand process, running the models calibrated on the original survey, and attempting to simulate ground counts (5). Unfortunately, there are so many factors that can be adjusted to bring about such a simulation that important discrepancies can be masked.

It has become increasingly difficult to obtain approval for efforts to collect new travel data, especially with more priorities on planning funds including satisfying new federal requirements. At the same time that metropolitan planning organizations were struggling to keep their regions certified to do transportation planning without new data, there were increasing calls from the federal government for new data on components of the traveler market, such as the elderly, the handicapped, minorities, and low-income trip makers.

In my opinion, some of the plans for continuing home-interview surveys were overly optimistic. However, maintaining a continuing planning process without anticipating any new data is similarly unrealistic. The compromise recommended is a program of monitoring commuting patterns to new job locations. In fact, such an effort to detect change may prove to be more valuable than any supplemental data collection effort tied in with the census. It should be designed in such a way as to analyze the location of new jobs, identify the location of workers' residences and work schedules, and measure the relative use of at least the automobile, the carpool or vanpool, and transit modes.

New Job Locations

The recommended program provides extremely valuable
data on two major travel determinants: job location and home location. These can be obtained directly from the employer without resorting to a personal survey. Measuring changing job locations will provide a direct comparison with the accuracy of small-area employment forecasts, probably the most important single factor influencing future travel demand. Tracking the residences of workers in new businesses will provide a check on the accuracy of local housing forecasts and also yield a valuable measure of the extent of in-commuting from ex-urban areas, a trend that seems to have been a major factor in declining growth rates within the statistical boundaries of many urban areas.

When the relations between new jobs and residences are established, it will be possible to add this matrix to data produced from the 1980 census to produce a quick estimate of current commuting patterns. It could be assumed that the distribution of trips by modes for trip interchanges that existed in 1980 would not change.

The next improvement in this process is a survey of commuting modes, perhaps stratified to concentrate on central business districts. Having already established the distribution of trips, such a survey could be scientifically designed to produce accurate data, at relatively low cost, on actual travel modes as well as on alternatives, characteristics of the destination, and details on the routing of the trip. Such data would provide information on changes in the extent of carpooling and transit use in major commuting corridors. This would be an extremely valuable means of measuring the success of major transportation system improvements. This special survey could also be used to establish modal splits for patterns that were rare or nonexistent in 1980.

The data on commuting to new job sites would provide a means of establishing changes in commuting patterns at a very early stage. Rather than measuring changes by monitoring aggregate commuting patterns, the homes and travel modes of employees at new work places could be monitored. Such changes could also be simulated through the use of existing models to see whether they can be predicted accurately. In this way, major changes in commuting behavior can be identified soon after they happen rather than after they have become significant enough to affect aggregate commuting streams—a slow, evolutionary process.

Finally, the political value of such current data should not be underestimated. Although technicians may be convinced that models calibrated on 1960s data can simulate current travel in the 1980s, this strains the credibility of the planning process with nontechnicians. It is not necessary to have a great deal of data. A small survey will usually satisfy politicians and citizens who are supportive participants in the transportation planning process (especially if there is no other information). An antagonists will not be satisfied with any amount of data if they disagree with the results. However, friends of the transportation planning process will be a lot happier if they can be shown that this process is not completely detached from the world of hard data.

Conceptual Framework for Identifying Commuting Patterns

There is a great deal of flexibility in the manner of identifying "new" employment locations. The most rigorous method would be to identify jobs at any new office or industrial site as new jobs. An initial assumption would then be that existing buildings would continue to draw workers from approximately the same labor-market area as in 1980 and with similar work-schedule and mode-split characteristics. A much simpler assumption would be to classify new jobs according to whether they occur within existing or new employment districts. Jobs in employment districts that were relatively well developed in 1980 would be assumed to generate work-trip patterns similar to those identified in 1980 census data on the journey to work. A simple factor could update them. Newly developing employment districts would include new employment centers on the fringe of the downtown area as well as those in new suburban areas. Only jobs in these developing areas would be surveyed.

Once the method of identifying new jobsites is determined, a sample can be drawn for all new jobsites. This can either be a simple random sample or a stratified sample in which the sample rate is proportional to the size of the employer. Although a detailed design should be done, it is expected that a sample of about 10 percent would be appropriate.

The first stage of the survey would be to identify only work schedules and the locations of workers' residences. It should be possible to obtain this information through the employer. If additional data, such as mode split, are required, they must be obtained through direct survey. But the information already obtained should make it possible to select a highly structured sample. For example, if data are desired on carpooling to a new suburban plant adjacent to a freeway that has a reserved carpool lane, the sample could be designed to focus only on employees who reside in that particular corridor.

A final improvement on this process would be to survey employees who work in areas that were developed in 1980. This would be done where there was reason to believe major changes had been made in commuting patterns. In combination with the data on commuting to new work locations, this would then constitute a complete update of the journey-to-work data of the 1980 census.

Potential Data Sources

The key data resource in this proposal is a means of identifying new work sites. The greatest advantage of the technique is that it requires only a mechanism for monitoring change, not one that will establish a complete base-year situation. The base-year file would come from 1980 census commuting data. Two common sources of such data on change are employer files and building-permit files.

Employer files have been developed from state employment-security records in several areas. Such files not only list employment for all private and government employers at a given point in time but can also be linked for different years (6). Once an employer record has been put into a fixed format and coded to a small area, changes in employment for all future years can be obtained by a computer match. Moreover, since the proposed method requires only changes in employment since 1980, it is not necessary to do all the processing for a base-year file. All that is needed is a copy of the raw files for 1980, which can be matched to future-year files to identify new employers. However, many new-employer records will probably represent businesses moving into locations that existed in 1980 to take the place of other businesses that have moved out. Since the initial effort will concentrate only on new buildings, the files can be compressed to premise address so that turnover at existing addresses will not be surveyed.

A much simplified method involves identifying new employment sites rather than new firms. Such a data file could range in sophistication from a complex property identification system that identifies changes in building space to a simple inventory of all new nonresidential developments in a community. The latter list could be compiled by someone familiar with the area.
Workplace Interviews as an Efficient Source of Travel Survey Data

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In recent years, personal surveys have become increasingly expensive. At the same time, doubt about their reliability has increased. In addition to cost increases, a problem shared by most other service industries, other problems in personal surveys include the increased difficulty of finding adults at home and higher nonresponse rates because of privacy and security problems. The results of two recent travel surveys conducted through employers in the Washington, D.C., area indicate that such a sampling frame may solve many of these problems. With the cooperation of slightly more than 400 employers, 10,000 questionnaires were distributed. The response rate compared quite favorably with that of personal surveys on similar subjects, and the costs were a mere fraction of the cost to conduct such a survey in person. The general applicability of this technique, as well as its potential application for private survey research firms rather than government agencies, is discussed.

The increased difficulties of obtaining survey data from individuals have become so widespread that they have now become a concern not only to survey researchers but also to the public at large. The two principal problems are a dramatic decrease in the probability of finding people at home during the day and a marked increase in the nonresponse rate. These two problems also contribute to excessive increases in the cost of surveys.

A possible solution in those surveys that collect information only on the employed labor force is to interview workers on the job rather than at home. This virtually ensures that a contact will be made with a respondent within a reasonable number of calls. It also makes it more likely that the survey will be completed by respondents, especially if the employer’s approval is given, since the questionnaire can then be

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REFERENCES


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