Proceedings of the National Conference on Decennial Census Data for Transportation Planning

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Preface

For a combination of reasons, the decennial census is a valuable source of data on which to base transportation planning. First, since the 1960s, rising costs and diminishing local resources have forced most urban area planning agencies to forego large-scale data collection. Second, concurrent with the decline in local large-scale data gathering, planning agencies have faced increasing pressures from decision makers for up-to-date information on which to base their analyses and recommendations. Third, improvement in data-based modeling and in the transferability of parameters between areas has greatly reduced the need for locally conducted surveys, such as home-interview origin-destination studies. Finally, improvements both in the transportation-oriented information collected in the 1980 census questionnaire and in the detail and accuracy of geographic coding of the data obtained now afford transportation planners a data base that can fill part of the void left by the slowdown in local information gathering.

The 1980 census provided both sociodemographic and journey-to-work information, data that are essential to analysis of current conditions, trend evaluation, and accurate forecasting of such travel characteristics as vehicle availability. Residential population, housing statistics, and employment information can all be used to determine trip-generation patterns and their rates of growth or decline. In addition, census information also is available for journeys to work, travel time, major work-trip movements, modes of travel, carpool characteristics and use, and so forth. Such information can assist planners to develop insights into shifts during recent years. It is a valuable tool for understanding travel-generating characteristics of residential and employment zones and the patterns of travel between those zones. Other uses of 1980 census data include

- Analysis of accessibility to transportation by population segments;
- Development and/or review of basic relationships such as car availability to income and household size;
- Evaluation of transit service, for example, by use of the successive overlay technique or other analysis methods;
- Analysis and forecasts of land use trends;
- Evaluation of regional growth models against 1980 conditions;
- Evaluation of corridor service using reserved lanes for high-occupancy vehicles and of bus route studies in central business districts; and
- Improvement of multimodal travel services for work trips and selected link analysis for highway analysis.

For more than three decades the staff of the U.S. Department of Transportation, members of the Transportation Research Board (TRB) Committee on Transportation Information Systems and Data Requirements, and other transportation professionals have worked with the Bureau of the Census to improve the transportation-related information that it collects in the decennial census. The impacts of such activities have been increasingly apparent in the transportation-related information collected in 1960, 1970, and 1980.

In 1970 the Highway Research Board (HRB), forerunner of TRB, sponsored a conference on the use of census data in transportation planning. Three years
later an HRB conference in Albuquerque reviewed the process for preparing census data, heard reports on experiences in using these data, evaluated the adequacy of census data for transportation planning, and recommended improvements for the Census Bureau's consideration. The importance of the Albuquerque conference is apparent in the improvements that it prompted in the 1980 census.

The most recent effort to advise the Census Bureau occurred December 9-12, 1984, at the National Conference on Decennial Census Data for Transportation Planning in Orlando, Florida. Sponsors of this working conference included the Federal Highway Administration, the Urban Mass Transportation Administration, the Research and Special Programs Administration, and the Office of the Secretary of Transportation. The conference was structured to provide a review of past and current data-user experience with the 1980 census and featured workshop sessions focusing on various geographical levels of data use, for example, state, large metropolitan areas, small metropolitan areas, and small areas (traffic and transit zones).

The charge to the conference was to

- Identify continuing and anticipated data needs for transportation planning and related fields and determine which of the critical needs are best met by the decennial census;
- Evaluate the utility and comprehensiveness of regular and special products from the 1980 census from the user's perspective, with particular emphasis on the Urban Transportation Planning Package (UTPP);
- Hear census officials describe planning efforts that are scheduled and major decisions to be made for the 1990 census;
- Discuss possible changes in the questionnaire content, survey design, geographic coding, products (including the UTPP), and other aspects of the 1990 census that affect transportation planning and related fields; and
- Develop a list of recommendations on the questionnaire content, survey design, geographic coding, products, and other aspects of the 1990 census.

The report that follows contains the conclusions, recommendations, and reports presented at the conference.

It is essential to acknowledge the special efforts of the liaison representatives who worked closely with the steering committee in planning this conference and bringing it to a successful conclusion: Philip N. Fulton from the Census Bureau, Daniel B. Levine from the National Research Council's Committee on National Statistics, and James J. McDonnell, Rolf R. Schmitt, and Susan Liss from the Federal Highway Administration.
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Part I  Introduction
Introductory Remarks

Arthur B. Sossau

The National Conference on Decennial Census Data for Transportation Planning, jointly sponsored by the Transportation Research Board and the Federal Highway Administration, the Urban Mass Transportation Administration, the Research and Special Programs Administration, and the Office of the Secretary of the U.S. Department of Transportation, was organized to discuss and share experiences in the uses of the 1980 census data, which have been considerable, and to make recommendations that will help the 1990 census be even more responsive to the needs of transportation planners.

As those who have tried to gather information know, the quality of the information depends on the precision of the questions asked. From the standpoint of the transportation planner, the census is doing much better in this regard than it used to. One of the reasons for this conference was to help the Census Bureau ask questions that provide information that is useful to transportation professionals.

The U.S. Department of Transportation has developed training materials to encourage the use of census data. So far these include the Transportation Planners' Guide to Using the 1980 Census, Case Studies for Applying the Urban Transportation Planning Package in Transportation Modeling, and Technical Brief: Linking the UTPP with UTPS and Microcomputers. In addition, FHWA has conducted one- and three-day training sessions.

Metropolitan planning organizations (MPOs) are finding the data especially useful in three applications: to evaluate the transportation situation in 1980 and to help understand trends that extend from 1960 through 1980; to update, calibrate, and validate transportation prediction models; and to support constituent agencies with data that are necessary to guide their transportation policy decisions.

The first session in the conference explored the expectations for the transportation and place-of-work data provided by the 1980 census. The session, which is presented in Part II of this report, featured several papers, including two presentations by Bureau of the Census personnel about their 1980-related activities and services. This was followed by a session based on first-hand experiences in the use of the 1980 census data in which brief presentations indicated the range of applications for such data. These papers are given in Part III.

The basic work of the conference was conducted in six workshops:

1. Statewide Transportation Planning and Coordination, chaired by Richard S. Glaze, Florida Department of Transportation;
2. Transportation Planning in Large Metropolitan Areas, chaired by Gordon A. Shunk, North Central Texas Council of Governments;
3. Transportation Planning in Small Metropolitan Areas, chaired by Larry R. Goode, North Carolina Department of Transportation;
4. Transit and Traffic Analysis, chaired by Maurice Carter, San Diego, California;
5. Private-Sector Applications in Planning and Marketing, chaired by Rube Diamond, Southern California Association of Governments; and
6. Travel Research, chaired by Joseph L. Schofer, Northwestern University.

After the workshops had met once, the entire group was reconvened for a presentation by senior census officials on plans for the 1990 census, which forms Part IV, and a panel discussion of how current needs for transportation and workplace data will change or remain the same through the end of the 20th century and what those needs mean for the 1990 census, which is included in Part V. Then the workshops met again to discuss user needs and the 1990 census, including implications of census plans, alternatives to census data, implications of needs for census products, implications for the cost of the 1990 census, methods for meeting the costs, and roles of state and local agencies in acquiring and using the 1990 census data.

The workshops were asked to draft specific recommendations for the 1990 census in the following categories:

- Content of the questionnaire;
- Sample size and procedures;
- Geographic coding;
- Content and media of data products;
- Comparability among products of the decennial census, the economic census, and other census products; and
- Institutional and administrative concerns.

The workshop chairmen's reports and a summary of the findings and recommendations are included in Part V. It is intended that these proceedings provide the findings and recommendations of the conference and express the needs of the transportation community relative to the 1990 census.
Conference Findings and Recommendations

The products of the six workshops, representing the different perspectives of states, large and small metropolitan areas, transit, research, and nontransportation uses, display an amazing degree of uniformity in their findings and recommendations. This makes the task of bringing the disparate views of the six groups together into a common format far simpler.

The six workshops were asked to consider the topic in two phases, or levels. Level 1 concerned the broad problems and needs of the coming decade that should be met by census programs as foreseen by the workshop groups in their respective areas. Level 2 focused on detailed recommendations categorized into six areas: questionnaire content, survey procedures and sample size, geographic coding, data products, comparability, and institutional and administrative concerns.

Although the center of attention was the experience with the 1980 census and the UTPP and the prospective structure and content of the 1990 census and its products, the opportunity was taken to address other, related topics as the need was perceived, including local supplemental activities and alternatives, recommended actions and programs by the U.S. Department of Transportation (DOT), other census data sources, and needed participation by TRB. This perspective proved highly appropriate because, as the proceedings of the conference indicate, the concept evolved among conference participants that the decennial census had to be construed as part of a coordinated package of activities intended to provide comprehensive urban transportation data. This package includes other compatibly designed census surveys, coordinated local supplemental data collection, research activities, and federal, state, and local support efforts.

GENERAL FINDINGS AND RECOMMENDATIONS

A number of themes run through the discussions and findings of all of the workshops.

1. The Bureau of the Census has significantly improved the journey-to-work statistics program and the UTPP for 1980 compared with the materials available from 1970. They are to be commended for the substantial improvements made.

Although all of the workshops were able to make recommendations for further improvement, the general premise of their work was that the 1980 program had been a success. The report from the Workshop on Transportation Planning in Large Metropolitan Areas began with the statement: "All aspects of the 1980 census should be retained as they were except for changes recommended in the following. This recommendation is to endorse the 1980 census and to assure that no questions or procedures are deleted by virtue of their not being specifically requested." In the Workshop on Travel Research the brief but telling observation was made that "the investment has become cost-effective."
2. The data produced by the decennial census have become crucial elements in the transportation planning and policy processes at all levels of government.

A number of explanations arose from the different workshops on how and why the census data have acquired such prominence in the transportation sector. Among the reasons cited were the decline in funds to conduct local large-scale household surveys, increasing quality and utility of the census products, and improved methods for applying census data to traditional transportation issues. A broad array of examples was provided in each of the workshops of new and innovative uses of the census data.

3. The full utility of the journey-to-work data is still to be realized, particularly in nontraditional applications.

Although innovative applications are being developed continuously, many of these applications are anecdotal but theoretically applicable in similar situations elsewhere. Studies of employment in small areas by occupation and industry of workers have been conducted in a few places but are applicable across the nation. Similarly, the data have been used in hospital location studies, job opportunity studies, and selected marketing studies, such as bank and fast food site location. Their use in these special applications appears to be a product of the effective marketing efforts in some metropolitan areas. Such efforts have helped recover purchase costs of the data and, more importantly, have achieved a broader application of a valuable public resource.

4. The inherent limitations of the decennial census as a transportation data collection tool were recognized. The 1990 census cannot be a single source for meeting all local transportation data needs. Other Bureau of the Census surveys, particularly the Nationwide Personal Transportation Study and the Annual Housing Survey, supplemented by local data collection of complementary design must be melded to form a fully effective system of data development.

This was a key theme in the individual workshops. It can be considered an important sign of the maturity of the recommendation process. What evolved from the sessions was not a "wish list" approach to data needs to be met by the census process but rather a sophisticated appreciation of census capabilities and limits. It was helpful to ground the recommendations in practical judgments of what is achievable.

5. Important research questions exist and need to be answered early in order to fully and effectively design and use 1990 data.

More than many other previous discussions of census needs, this conference recognized the need for solid research answers on a number of topics before unequivocal answers and recommendations could be made. These research needs, another reflection of the sophistication of transportation professionals in matters pertaining to the census, are an important outcome of this conference. The research questions, detailed later, are applicable to both the Census Bureau and DOT research programs.

6. The geographic support system being developed for the 1990 census will be a valuable support tool for all census data and should be supported fully to assure its use in other areas of the Census Bureau and at the local and state levels.
The nature of transportation data systems places great dependence on the ability to manipulate and present data in a variety of geographic forms. Thus the 1990 Topologically Integrated Geographic Encoding and Referencing (TIGER) system, which will permit integration of map data and geographically detailed census data, is recognized as a powerful data development and data manipulation tool. Many of the geographic identification and aggregation problems of the past have resulted from the fact that the three main tools of census geographic support—maps, coding guides, and master reference files—were produced independent of each other. The new approach integrates these three separate systems and assures commonality and consistency. Strong support for the continued development of the TIGER system and for its use in all bureau products was expressed. There was also strong interest in the potential utility of the TIGER system at the local level for coding and presenting locally created data. If fully developed, the TIGER system would represent a very valuable asset to the urban planning process in itself, independent of associated census data.

7. **Flexibility in the application of data at varying geographical levels and areas, based on block coding, is central to the utility of census products.**

The numeric coding of home and work addresses to the most detailed units of geography, such as the block face and block, is essential to the fullest utility and effectiveness of census products. This concern goes hand in hand with the expressed need for greater flexibility in the manipulation and presentation of census data in general. Although the major use of block coding has been to assure the ability to reaggregate census data to locally defined traffic analysis zones, that is not the full need or potential for small-area coding. That potential comes about from coding at a common denominator level of geography like blocks or block faces so that data can be arrayed at geographic units appropriate to the analysis task. In transportation, the geographic units used may be zones, transit commuters defined along transit service corridors, or a host of other areas necessitated by special needs. Although in some of the largest cities many of the main regional planning uses of census data could employ units of geography at the tract level or larger, even in those cities, corridor studies and other special applications, which are likely to be more prevalent in the 1990s than full-scale regional analyses, will require data identified at small units of geography.

8. **Despite significant improvements, full flexibility in the acquisition and tabulation of census data has not been achieved. The fixed-format approach represented by the UTPP should be overtaken in the 1990s by new technological capabilities. The Bureau of the Census and DOT should plan now to assure that the full potential of new technologies is employed to improve access to census products in the form users require.**

The presentation of census products in the 1980s has not changed significantly from decennial censuses in the recent past. Large books with extensive tables and public-use tapes are the major media. The UTPP was designed as a standardized special tape product to overcome the long waiting times and high costs for specially tailored products. As such it represents a great benefit to users, with high benefits relative to costs, but it is not ideal nor does it use the full potential of current information processing technologies. The UTPP represents a compromise in that all users must accept the same set of tabulations to assure the lowest cost and most rapid access to census data possible. The trade-off is cost-effective given current technological capabilities, but it may be unnecessary in the future. The growth in the power and availability of small computers suggests that future census
products could be user designed, acquired by line transmission, and usable on small computers. The small metropolitan areas particularly expressed this need, but it was supported by all other groups.

9. **Local resources, particularly geographic coding materials, represent an important source of support to be used at the earliest stages of decennial census system development.** These resources, particularly specialized knowledge and compilations of local addresses, should be fully utilised in system development and review. FHWA and UMTA should establish formal relationships that will promote and support these efforts.

Conference participants expressed support for the positive character of relationships among the Census Bureau, DOT, and local areas and proposed stronger use of local resources. In the preparation for the 1980 census, census personnel acquired and used guides developed locally for coding special addresses with considerable benefit to coding speed and quality. It was the consensus at the conference that these same procedures should be formalized into cooperative agreements between the Census Bureau and local authorities, supported and assisted by DOT, and employed comprehensively for 1990. In addition it was believed that local and state transportation organizations could play other support roles in regard to coding materials and should play a review role in the examination of precensus preparations. It was noted that local officials now participate in a review program before and after the census regarding population counts. It was believed that transportation officials should participate in those reviews with regard to their appropriate areas of cognizance.

10. **In the 1990s currently emerging trends in the character of employment will be major factors of concern to transportation planners and others. Among the changes of interest are multiple-job holders, working at home, decentralized workplaces, and flexitime work schedules. These must be recognized and accounted for in decennial census design to meet transportation and other needs.**

Many of the concerns about existing weaknesses in the utility of census data related to the treatment of atypical work situations. Given the wording and structure of current questions, workers commuting at odd hours, workers with more than one job, and workers who work at home some of the time cannot be identified. This is seen as a growing problem of importance to those concerned with employment, economic development, and labor issues, as well as transportation. It is expected that these atypical patterns will be increasingly typical in the 1990s. The lack of ability to identify these cases now impedes transportation planning and employment analyses. It was the conference consensus that the problem will increase with time.

11. **Any financial support for the census from transportation agencies at all levels of government should focus solely on the preparatory and review stages of decennial census operations. It is inadvisable to consider the use of outside-census funds for internal census activities such as the collection and processing stages. Funding for special tabulation packages such as the UTPP should continue.**

The impact on the 1990 census of current federal financial constraints was of major concern to the conference participants. It was observed that budget program cutbacks now in a cyclical program such as the decennial census could not be overcome by increased funding later. The suggestion of support from the transportation sector in the processing of data to assure fine-level geographic
coding was viewed as impractical and intrusive on census control and oversight of its mandated functions. Also, it was not clear whether, despite strong interest and support within the transportation community, funds would be any less constrained in the transportation sector than in the Bureau of the Census. It was concluded that to the extent that any transportation funds could be usefully employed in the census-related program, it would be in support of research, the development of preparatory materials, and special tabulations such as the UTPP.

12. Cooperative action between the Bureau of the Census and transportation agencies at all levels of government has been effective in improving the quality and cost-effectiveness of government products. This cooperation should be extended and expanded in the future to create better census data for transportation applications.

Most working groups noted the effectiveness of the cooperative efforts between the Census Bureau and DOT and the Census Bureau and localities. It was stressed that these efforts must continue and be given more formal structure where necessary to assure the continued high utility to the transportation sector of census products. The valuable role as an intermediary and professional review source played by TRB and its Committee on Transportation Information Systems and Data Requirements was also noted. These concerns for closer cooperation were highlighted by the extensive program of precensus preparation and research proposed by the conference participants.

DETAILED RECOMMENDATIONS

The detailed recommendations of the conference are synthesized here according to the six main subject areas that the workshops used to develop their findings:

- Questionnaire content
- Procedures and sample size
- Geographic coding
- Data products
- Comparability
- Institutional and administrative concerns

Within each subject area recommendations appear approximately in the order of their priority. In some cases a particular topic and its associated recommendations may appear in more than one subject area. These areas do not differ substantially from those used in the 1973 Albuquerque conference. Thus certain historical parallels are possible between the 1973 conference products and these recommendations.

Questionnaire Content

The discussions and recommendations produced on this topic were primarily concerned with restructuring of the 1980 questions to obtain the maximum benefit from them rather than identifying new questions to obtain new data.

Mode of Travel

A considerable amount of discussion occurred regarding the wording of the question on means of transportation to work (question 24b). The issue concerned
whether the question should be worded to obtain information on the character of the work trip based on the actual events of a specific day or based on a "usual" or "typical" pattern. It was decided that a definitive recommendation should not be made at this time pending the results of future research and the further definition of census procedures for 1990. Fundamentally, there are positive and negative aspects of either approach. These were thoroughly examined in the workshop discussions, and the criteria for a final decision were established. Some of the factors identified are presented here to establish the elements involved in a final decision:

1. Asking travel questions for a specific day is the standard approach in transportation surveys. It is the preferred approach for statistical reasons and for the maintenance of consistency with past data development. However, such surveys typically spread the interviewing over weeks and months, thus obtaining a distribution of daily, weekly, and seasonal patterns. The major negative aspect of keying question response to a single day for a survey conducted for only one day every 10 years is that there is no clear way, at least at this time, to be sure that the given day selected in the spring of 1990 will not turn out to represent an atypical situation. If the question is asked for "yesterday," that day could be a Saturday or a holiday. Even a Friday represents an atypical situation for some mode choices. If the specification of a given day could be done in such a way that the day selected would not be aberrant, a specific day would be preferred and recommended. However, even assuring that the day was a normal day for national patterns would not assure that data for specific cities would not be severely perturbed by local events such as a snowstorm, a transit strike, and so forth.

2. Conversely, current analytical capabilities present severe difficulty in dealing with responses to questions obtaining typical, or usual, behavior, which has caused problems in the use of the 1980 data. There is no definitive understanding of the relationship of such responses to actual activity levels observable in the transportation system. Further, there is a difference of unknown character between the meaning of the question as asked in 1980, that is, what was the usual travel last week, versus usual travel unrelated to the previous or any particular week.

Recognizing that a final decision cannot be made until later in the design process the 1990 census, the following preliminary findings and recommendations were outlined to act as criteria for the final decision:

1. If it were possible to assure that the single day selected would not be atypical, the question should be structured to ask for information about a specific day.

2. A multistaged census, if adopted as standard procedure, would seriously impede use of a specific-day format for the question. In that case a format using usual work trip would be preferred.

3. If research conducted in time to assist this decision establishes stable and known relationships between usual work travel and actual travel, a format using usual work trip is recommended.

4. Pending decisions on recommended restructuring of the labor-force questions, discussed in the following, the reference to "last week" in the question could be omitted.

5. Continuing coordination between the conference Steering Committee and the Census Bureau is required to respond to future decision requirements.

Changes were also recommended in the list of transportation modes available for respondents to select from in question 24b. Specifically, it was recommended that
1. Bus and streetcar (light rail), a joint category in 1980, should be separate categories in 1990.

2. Greater use of the "other, please specify" category should be made. For instance, individual cities could use it to meet special local needs, such as ferries in New York or in San Francisco.

3. The possibility of using local names instead of--or in conjunction with--standard national terminology should be considered. Cities where "the Metro," or "BART," or "the Muni" are common terms might not obtain necessary responses to a question that used the terms "light rail" or even "subway."

4. In the event that space for modal categories became critical, the consolidation of the now-separate categories for cars, vans, and trucks could be considered.

5. If a specific day is feasible as proposed in recommendation 1 in the preceding paragraph, automobile driver and automobile passenger could be reestablished as categories in the mode-choice question, as in 1970, and question 24c could be modified accordingly.

A major recommendation was that the structure for handling responses in the mode-choice question be modified to permit recording of all modes used on the trip from home to work. It would be highly desirable if this information could be recorded to permit identification of the order in which the modes were used. No significant restructuring of the question or the space it occupies on the questionnaire would be required to accomplish this. This approach would be most feasible with a specific-day format to the question.

Travel Time to Work

The first part of question 24 on work trips requests information on travel time to work. This part of the question also needs modification. It was recommended that question 24a be modified to obtain travel time to work by obtaining actual work-trip departure and arrival times. The additional difficulty of acquisition of information in this way is compensated for by the acquisition of peak travel-time distribution data and potential improvements in accuracy of the travel-time response.

Employment

Question 22, the two parts of which now obtain information on whether a person worked the previous week and if so how many hours, was identified as needing revision for both transportation and nontransportation purposes. The major concern is that the question does not recognize the rapidly changing structure of employment and work travel in the United States. Among the new characteristics of work behavior that must be captured are multiple-job holders, flextime schedules, and most importantly patterns of working at home on a scheduled basis, even though the employee has a regular work address. It was the view of the group that these work patterns would be increasingly typical in the 1990s and their economic and social characteristics must be captured via census questions. This need is tied to the structure of the travel-time question (24a) and the mode-choice question (24b). The importance of these trends for transportation is evident. They will shift the location, volume, and timing of work travel. The utility for other applications outside transportation is also seen as great. No specific wording was recommended, nor indeed was it suggested that question 22 had to be the one place where the information was captured. Primarily, the recommendation focused on the need for the following specific information, however structured within the questionnaire:
- Number of jobs held by an individual,
- Number of days per week trip made to work site,
- Number of days per week worked at home, and
- Hours of work per week per job.

Carpool Arrangements

It was recommended that questions 24c and 24d, which are concerned with carpool arrangements and vehicle occupancy, be modified. Specifically, the carpool question (24c) could be omitted and 24d retained with slightly revised wording to identify workers who drive alone or drive or ride in two-person vehicles, three-person vehicles, and so on.

Handicapped Status

It was recommended that question 19, which obtains information on handicapped status and the ability to use public transit, receive substantial revision. The current question appears to have satisfied none of the potential users of the information. Particularly, it failed to differentiate between regular public transit service and that developed specifically to respond to the needs of the handicapped. Further, it failed to recognize that some persons who cannot use transit have the ability to use their own private vehicles. Specific revisions require (a) that the question determine whether a handicap precludes driving or use of public transit or both and (b) that transit be clearly explained as being that not primarily used as service for the handicapped.

Workplace Identification

The format for recording addresses in the place-of-work question (question 23) was considerably improved in the 1980 census. A recommended addition would be to include the ability to record the nearest intersection to the workplace as a last resort in obtaining small-area work location identification.

Vehicle Availability

It was recommended that the categories used in the vehicle ownership questions (H28 and H29) be expanded in response to household vehicle ownership trends. The current ceiling of three or more vehicles is already inadequate in certain parts of the country and will certainly be totally inadequate nationwide in the 1990s. This might require extension to four or more or even five or more as the final category as determined by available research on vehicle ownership patterns. The questions on vehicle ownership contained in the household portion of the survey could be reduced to one question by merging automobiles, vans, and trucks if the recommended expansion of categories is accomplished to assure a detailed vehicle count. The current wording for vans and trucks should be modified to delete the 1-ton limit on vehicles.

Procedures and Sample Size

Sample Size

It was recommended that the original sample sizes programmed for the 1980 census
be applied to the journey-to-work statistics program in 1990 and that research be carried out jointly by the Bureau of the Census and DOT regarding sample sizes and error rates for the program. In 1980 the collected sample of 1 in 6 was cut in half; that is, only every other response collected was coded in an attempt to reduce costs in a tight budget situation. This is an inefficient way to save funds. That which is collected should be coded and used. Working groups at the conference pointed out the weaknesses in the sample regarding the ability to deeply stratify and tabulate the existing samples, particularly in small cities and in regard to mass transit strata. They agreed further that statistical research was required on the implications of varying sample sizes for the census and for transportation uses of the data. A test opportunity exists to code the remaining uncoded records for a selected set of locations as a benchmark comparison for statistical analysis.

Stages

It was recognized that the Census Bureau is investigating field procedures for conducting the 1990 census in stages; the first stage would be only an enumeration with absolutely minimal descriptors. It would be followed by additional collections and surveys to obtain detailed characteristics. In the discussion of this possibility, the point was made that as long as such procedures did not jeopardize either the quality or timeliness of reporting, users were indifferent to the collection procedure. It was also noted that selection of this field procedure could severely affect a decision to ask for travel on a specific day in question 24b. Therefore, given the potential risks and apparent minimal benefits of such a procedure, it was recommended that the 1980 procedure continue and that all information be collected in a single process.

Mode of Travel

It was recommended that procedures be developed to obtain greater use of the "other, please specify" responses to the question on means of transportation to work (question 24b). It was pointed out that this category should be treated in a more systematic fashion as a regular part of census processing and tabulation. Included in the proposed areas of consideration were the following:

1. Select and evaluate a small sample of these responses to determine their characteristics for use in adjustments to existing data,
2. Evaluate these responses for their insights into definitional problems needing clarification in the existing categories or possible new categories,
3. Look at the frequency of the use of this category in various cities and other areas to determine local coding problems where the use of the category is high, and
4. Consider making this an optional category to be used by local designation to meet particular needs in individual locations with special cases, for instance, tramways, ferries, and so on.

Temporary Residence

A continuing cause of difficulty in the use of census data results from cases in which a respondent is away from home on the census date and responds to the work travel questions for the city in which he is temporarily residing. These cases cause problems disproportionate to their numbers. It was recommended that
question H2 and its related questions regarding status away from home be used in conjunction with questionnaire processing to resolve these problems. If the question is restated, this problem possibly could be made into a benefit by providing information on those working away from home at the time of the survey.

Geographic Coding

Block Coding

A major finding of the conference was the necessity of coding journey-to-work data to the block level, which is crucial to the utility of the information. Although major discussion focused on the use of block coding as a means of reaggregation to the travel analysis zones used by transportation agencies, it was pointed out that this was only one of the benefits of block identification. The conference view was that the flexibility to present journey-to-work statistics in a variety of geographic formats was essential to their continuing value and that any attempts to lock the data into a single geographic areal unit would severely diminish their worth for transportation and other uses. It was recommended that block coding of work addresses be continued as a regular part of the census procedure and that information coded to block and block face be kept in survey records as a building block for statistical summaries.

Geographic Support System (TIGER)

The proposed geographic location and identification system known as the Topologically Integrated Geographic Encoding and Referencing (TIGER) system was identified as having broad national benefit in assuring the most effective use of census data. In particular, the transportation need for the capabilities represented by the TIGER system were identified. It was recommended that the new system be fully implemented as programmed. It was further recommended that the TIGER system, already finding application in the economic statistics and demographic programs of the Bureau of the Census, be made a standard geographic system for all census products. This would greatly enhance the integration and utility of census products. Finally, the value of the TIGER system in local applications was recognized, and it was recommended that programs be established to assist in the greater application of the system at the local level.

Local Assistance

It was a finding of the conference that the census programs to utilize local information sources to prepare geographic coding materials for the 1980 census on a cooperative basis had materially improved the geographic coding quality of the 1980 data. It was recommended that these programs be formalized in preparation for the 1990 census. Specifically, it was recommended that the cooperative process include more formal procedures for local agencies to provide coding source materials, formal procedures for local review of proposed coding materials before the census, and greater local input to the coding process. It was recommended that this program of input and review be funded as a regular part of the system development process.

Interregional Commuting

It was recommended that the census procedures to permit identification and
tabulation of journey-to-work data for large interregional areas be strengthened and expanded for 1990. The significant improvements in capability in this area in 1980 were noted. The use of commutershed boundaries for summarizing and reporting was deemed a substantial enhancement of past practice. Comments by Census Bureau personnel on the delays sometimes caused by special aggregations of metropolitan groupings and the expected substantial growth in interregional commuting patterns by the 1990s gave rise to the recommendation that special consideration be given to assuring the standardized ability to flexibly aggregate and tabulate large areal groupings for analysis.

In parallel to the preceding recommendation, it was recommended that the census design process for tabular presentation review the use of existing geographic clustering and presentation devices for their relevance in the 1990s. Particularly identified were the units of geography specified as central business districts (CBDs), urbanized areas (UAs), and the various regional and commutershed designations. It was the view of the conference that it would be timely to review these designations for their currency and relevance in the evolving form of urban development. Many of these designations and their application to specific urban places have not been seriously reviewed and revised for many years. Wholly new concepts for urban description may be appropriate.

Research

A family of research activities was recommended in the geographic subject area, in part to place existing decisions on a firmer footing and in part to expand existing capabilities. In addition to the research-related content in the preceding recommendations on geographic coding, the following activities were recommended:

1. Important research is needed in the relationship of geographic coding costs and accuracy to the geographic level chosen for coding. It is often alleged that coding costs could be reduced by coding at coarser levels of geography. Transportation experience, which has been extensive in this area, suggests that such an apparent trade-off is not necessarily valid. The research should examine the specific incremental costs of increasingly finer levels of geography and the consequent trade-offs in accuracy, quality, and utility. The block versus tract coding-level trade-off is another area that should be specifically examined.

2. Transportation research is required into the trade-offs between utility and accuracy of the use of traffic analysis zones by metropolitan planning organizations. The use of such zones has a long history, and consistency with past data, analyses, and practice has a value, but the trade-offs between cost and quality have not been examined for many years. They should be evaluated in the light of current technical capabilities and needs.

Data Products

Timeliness

Without question, the highest priority among conference participants regarding data products was the timely availability of those products. This strongly outweighed any proposed revisions in product design or media. It was noted that the late arrival of 1980 decennial census products had appreciably impaired
their utility, although it was recognized that the census record in this area is not different from that of other large surveys. It was recommended that every effort be made and every new technological avenue to improve speed of reporting be employed to assure more rapid delivery of products. Specifically, it was recommended that two years after the completion of census data collection be adopted as the goal for delivery of transportation data products.

A mechanism recommended to improve the timeliness of delivery of information is the delivery of single counts of the number of workers for all levels of geography (i.e., county, place, tract, and block groups) in advance of more detailed census products to assist in review and the establishment of control totals. One approach suggested, which has been used extensively in transportation surveys and is used to some extent in the census process now, would be to split the processing of detailed geographic information and all other information into two parallel processing tracks. This approach could make possible the earlier availability of summary statistics at broad levels of geography, such as the county, until fine-grained tabulations can be produced. This would appreciably enhance the value of the data. Experience with the 1980 data has shown that products such as the Summary Tape Files, which were available almost a year before the UTPF, were actively and effectively used by local agencies.

Flexibility

Flexibility, and the fullest use of new technological opportunities to achieve it, was again a theme in the area of data products. The rapid pace of computer development and information processing technology must be utilized to assure a more useful census data set. The discussions around this theme generated a number of proposals:

1. It was recommended that new technologies such as on-line access to data be employed, permitting menu-driven data development with highly flexible output tabular formats. This would require, in addition to adoption of new technologies available now, automated suppression and disclosure analyses. It is these institutional restraints, rather than technological capability, that are currently the biggest obstacles to rapid access to census products in flexible format.

2. It was recommended that census products be made available on storage devices such as floppy disks, which will be the likely main medium of information storage and exchange in the late 1980s and early 1990s. This would be of particular value to smaller units of government and individual researchers.

3. It was recommended that census technological and institutional difficulties that apply be overcome to permit the bringing together in a single product of data relevant to transportation needs. Specifically, the vehicle ownership data collected in the household portion of the decennial survey are not now tabulated and presented together with data contained in the individual portion of the survey, such as mode choice.

4. The pace of technological change in these areas is so great that these recommended new ideas may be superseded by the early 1990s when census data become available. It was recommended that every effort to stay abreast of and utilize new technological media be made.

Media

Written reports and magnetic tapes will most likely remain major media of information storage and retrieval in the 1990s. Major summary reports now exist
covering almost all travel-related data from the decennial census. It was recommended that new products be considered by the Census Bureau for inclusion in the 1990 reporting series. These included tabulations of worker characteristics at place of work, tabulations of daytime worker population as an available public-use tape product, and the generation of the UTPP as a regular census product in tape and written form.

Marketing

It was the view of the conference that the level of marketing of census data in the Bureau of the Census and outside it has been inadequate in the 1980s. The utilization of census data has far from reached its potential, and valuable assets are wasted thereby. It was recommended that the Bureau of the Census and DOT evaluate their procedures in this area. Particularly, more extensive support should be provided to local marketing efforts. This will assist the recovery of local collection costs and, more importantly, expand the use by the public and private sectors of a valuable public asset. It was recommended that existing internal procedures and external arrangements, such as those with data centers, be reviewed with the goal of substantially increasing use of census resources.

Comparability

Census Bureau Surveys

Comparability has a number of dimensions. The conference addressed many of them in the form of recommendations. The main one was that the Bureau of the Census and survey sponsors work for greater compatibility between their transportation-related products and those of other agencies. Specifically identified were the Nationwide Personal Transportation Study (NPTS), the journey-to-work component of the Annual Housing Survey (AHS), the National Travel Survey (NTS), and the surveys of the Economic Surveys Division, particularly the Service Surveys work in passenger travel-related activities.

Local Supplementary Surveys

Another dimension of comparability is the design and development of surveys complementary to the decennial census materials at the local and state levels. Inadequate attention has been given in the transportation community to well-planned supportive data collection aimed at matching, checking, and expanding the utility of the census data. It was recommended that FHWA and UMTA begin now to design for comprehensive data collection procedures and programs for 1990 to support the census investment.

Trend Analyses

A third dimension relates to the ability to perform trend analyses with the census data over the decades. A body of data has been developed that permits valuable studies to be performed on urban commuting trends. It was believed by the conference participants that inadequate attention has been paid in the past to doing such analyses and to organizing the data with the recognition that such trend studies will be performed in the future. It was recommended that the Census Bureau take the necessary actions to assure present and future
comparability of the data series to enhance the capability to perform such trend analyses.

Data Products

The final dimension of comparability about which recommendations were produced was the necessity for comparability between the special census product known as the UTPP and the regular census transportation products. The use of these two types of products as joint tools by local agencies is impeded by the fact that one contains a separate count of workers not assigned to detailed geographic units and the other source allocates these workers among the reported geographic units according to a standardized procedure. This results in differences in the control totals and creates problems in comparability of the two statistical systems. It was recommended that where addresses are allocated to detailed codes in one source, other sources use those same allocations to assure comparability of control totals.

Institutional and Administrative Concerns

Advisory Committee

It was recommended that a transportation advisory committee be formed to advise the Bureau of the Census on the entire range of areas identified here that will need continuing input and assessment between now and the census. It was noted that the TRB Committee on Transportation Information Systems and Data Requirements had in fact played that role in recent years on an informal basis, but a more formal relationship was now desirable. It was also recommended that TRB convene a meeting in the time frame of 1988, in advance of the census, to review the state of readiness of the census, review the progress of these recommendations, and promote responsiveness of MPOs to the upcoming census.

Disclosure

It was recommended that census disclosure rules be reevaluated in the light of 1990 data processing realities. In particular, rapid on-line disclosure review as previously identified was mentioned; and the need to review past decisions about the disclosure characteristics of unrelated addresses was again cited as an unnecessary barrier to better address coding.

Research

It was suggested that the ideal structure by which to meet some of the research needs identified here would be the American Statistical Association/Census Bureau Research Fellowship and Associateship Program. The transportation sector should continuously have someone in the capacity of a transportation research fellow at the bureau.

It was strongly recommended that the federal agencies participating in the census planning process recognize the strong research component in these recommendations and that an active program of research be mounted to respond to the many research questions identified that need resolution before final decisions regarding the 1990 census. Funds should be sought from census and transportation sources to undertake these initiatives, including TRB and NCHRP/NCTRIP sources.
Support for Census Products

It was recommended that the institutional and administrative framework for the marketing of transportation-related census data be reviewed and structured for 1990 so as to assure that the maximum benefit be derived from the 1990 census products. In particular, local agencies seeking to promote the use of journey-to-work data in the public and private sectors should receive greater assistance from the Census Bureau and DOT.

It was recommended that the states play a more expansive role in the planning for and utilization of the 1990 census products. The states could play a role as joint purchasing agent for local entities within the state in the acquisition of the UTPP special tabulations. A number of states purchased the UTPP for their entire state in 1980 with considerable benefit. Greater use of this approach in 1990 would reduce the overall costs of the program and ensure greater comparability of the data.

Cooperation

The strong cooperative relationship that has grown over the years as a tripartite relationship of the Bureau of the Census, DOT, and local governments has substantially assisted the development of more effective public programs in transportation data. These cooperative relationships must be supported, sustained, and expanded. It was recommended that these relationships be formalized into mechanisms of local assistance and review in transportation-related census programs. DOT should establish the means to support these cooperative efforts directly with the Census Bureau and through support of the states and local governments.

ACTION ITEMS

In the previous two sections, general and detailed recommendations are presented for consideration by the many participants in the decennial census development process. In this section those recommendations are summarized and restructured as an action program for each of the major organizations engaged in the process.

Bureau of the Census should

1. Review recommendations and identify
   - Problems needing discussion or clarification,
   - Field test needs,
   - Hard-to-implement recommendations;

2. Develop plan for implementation;
3. Inform U.S. Department of Transportation of needed support at Department of Commerce, Office of Management and Budget (OMB), Congress, etc.;
4. Identify resources for research recommendations;
5. Initiate research fellowship program in transportation;
6. Establish transportation advisory committee;
7. Extend outreach program to MPOS;
8. Expand marketing of data;
9. Establish program for utilization of local resources in geographic coding; and
10. Maintain the dialogue.
U.S. Department of Transportation should

1. Transmit TRB recommendations to Census Bureau with strong support;
2. Support Census Bureau needs at Department of Commerce, OMB, and Congress;
3. Encourage and support MPO assistance to Census Bureau in coding materials, etc.;
4. Encourage and support state and MPO supplemental data programs designed and timed to complement census investment;
5. Refine research recommendations and identify resources (NCHRP, NCTRIP, other);
6. Expand existing training to include Urban Transportation Planning Package and Nationwide Personal Transportation Study for updating and applying urban model systems;
7. Sponsor research fellowship program; and
8. Maintain the dialogue.

TRB should

1. Disseminate recommendations;
2. Seek broad response from users, associations, etc.;
3. Continue to serve as coordination source; and
4. Continue to serve as sounding board.

MPOs and states should

1. Support census coding material needs,
2. Support decennial census program review process,
3. Incorporate new methods and data,
4. Develop programs for complementary data,
5. Coordinate needs, and
6. Support census program requirements.
Introduction to Keynote Address

Arthur B. Sosslau

The transportation planning community's interest in the decennial census began in the late 1950s with the advent of comprehensive transportation studies in Detroit and Chicago and efforts related to the planning of the Interstate system. The then Highway Research Board launched a committee to persuade the Census Bureau to include questions on place of work and car ownership in the 1960 census. The federal agency involved was the Bureau of Public Roads, the forerunner of the Federal Highway Administration (FHWA).

In the 1960s the Census Bureau established a Small Area Data Advisory Committee on which a number of transportation professionals, among them Bill Garrison, Bob Barraclough, and Kevin Heanue, were most active. FHWA was again involved and funded part of the pretest for the 1970 census in New Haven in which a place-of-work address was requested. FHWA developed the specifications for the 1970 Urban Transportation Planning Package (UTPP) and also initiated several projects to test the usefulness of census data in transportation planning.

In 1970 the Highway Research Board sponsored a conference on the use of census data in transportation planning and 3 years later the Albuquerque conference, which reviewed the situation and recommended improvements for the Bureau of Census to consider relative to the 1980 census.

An ad hoc group of the TRB Committee on Transportation Information Systems and Data Requirements worked to develop the specifications for the 1980 UTPP. FHWA spearheaded the effort to have the development of the package funded by the U.S. Department of Transportation (DOT).

FHWA personnel, specifically Jim McDonnell and Rolf Schmitt, have also played an important role in developing this conference. The agency participated in funding and was instrumental in obtaining funds from other agencies within DOT.

Because of FHWA's continued interest and support of the use of census data for transportation planning, we are most pleased that our keynote speaker is Richard B. Robertson, FHWA's Associate Administrator for Planning and Policy Development.

Robertson has a master's in regional planning from the University of North Carolina, a certificate in traffic engineering from Yale University, and a B.S. in civil engineering from the Virginia Military Institute. Before joining FHWA in 1981, he was director of transportation for the Appalachian Regional Commission, director of state transportation planning in the office of the governor of Virginia, executive director of the Richmond Regional Planning District Commission, and an urban transportation planner with the Virginia Department of Highways.

Dick is a member of the American Society of Civil Engineers, the Institute of Traffic Engineers, and the American Planning Association. He has received two administrator achievement awards since joining FHWA. Most important, Dick has been a user of census data and is a strong supporter of the association between DOT and the Census Bureau and of the need for the census to continue its efforts in collecting information for transportation.
Keynote Address

Richard B. Robertson

It is a real pleasure for me to join you at this TRB mid-decade conference. In reviewing the roster of those in attendance, one can quickly note that TRB has assembled a very distinguished group of transportation planners and researchers with a wide variety of backgrounds and diverse experiences. You are a cross section of professionals knowledgeable about census products and their application in transportation planning. Coming together at this conference, you are in a position to offer expert guidance to the Bureau of the Census in the design of the 1990 census. The main question to be addressed at this conference is, "What are your needs for data from the 1990 census?" Your focus is 8 to 10 years in the future, which should not be that difficult for most of you because of your expertise.

In 1973, a similar conference was held in Albuquerque. The recommendations from that conference helped structure the 1980 census. I note in reading the Special Report from that conference that the products from the 1960 and 1970 censuses were very valuable for use in the urban transportation planning process.

My experience goes back to the data available after the 1960 census. At that time, I was an urban transportation planner for the Virginia Department of Highways and following that, executive director of the Richmond Regional Planning District Commission. I found the data generally accurate, always late, but extremely comprehensive. It is the comprehensive quality of the data that I found to be very satisfying for state and local governmental needs. We at FHWA and UMTA have supported work leading up to the 1980 census and the work required for the packaging of the data for state and local users. I had many meetings with the Bureau of the Census staff and found them to be receptive and willing to listen to our real needs. The structure of the 1970 and 1980 censuses indicates that the Bureau of the Census does listen. However, I might add that the Bureau of the Census has always been very reluctant to collect data that could not be tabulated by the place of interview.

John Keane, director of the Bureau of the Census, stated at the recent Geographic Areas Conference that the recommendations made at conferences such as these are vital to the Bureau of the Census planning process and that they will be given "serious and grateful consideration." I believe that Dr. Keane is sincere about searching out the needs of the transportation constituency and in trying to fulfill their needs. I also believe that we must work together to ensure that "consideration" is translated into "implementation."

FHWA and the Bureau of the Census have worked together over the last 30 years to provide information for a federally aided surface transportation program that incorporates a balanced role among the federal, state, and local governments. This cooperative effort has matured over the years, beginning in 1960 when the Bureau of the Census started collecting journey-to-work statistics. This partnership is still young in census terms, considering that the 1990 census will mark the 200th anniversary of the first census.

It is hoped that the results of the decennial census have produced substantial cost savings to state and local governments. The goals of the Department of Transportation (DOT), FHWA, and the Bureau of the Census should logically continue to be guided by the needs of state and local governments.
Excellent working relationships have been established between metropolitan planning organizations (MPOs), states, and the Bureau of the Census. These relationships will continue to improve as the planning for the 1990 census continues. As long-time participants in the census process, we must all recognize both the fiscal and time constraints that the Bureau of the Census is under in developing and producing the census. We offer them our support within FHWA to assure a comprehensive, accurate, and useful census with data provided in a timely manner.

As we did for the 1980 census, FHWA will coordinate the acquisition of materials from the state and local governments and continue working with the MPOs as we did informally in 1970 and 1980. Coding of the place of work is a most important item; it is FHWA's intention to see that this data element is part of the 1990 census.

As evidence of our direct interest in ensuring an effective working relationship between our agency and the Bureau of the Census, I recently reorganized my office to centralize census coordination activities in one division. This reorganization will assure a central focus within FHWA. We intend to invest considerable staff effort to help the Bureau of the Census define the needs of the transportation community for the 1990 decennial census.

Why are the transportation data needs so critical? The federal government distributes more than $19 billion each year to the states for transportation purposes. The highway construction and safety program of $15 billion is concentrated on the federal-aid systems, which include 22 percent of the nation's mileage and carry 80 percent of all highway travel. The condition and performance of these highways have a direct impact on the economy of the country. To ensure that adequate funding is provided, it is necessary that Congress and the Administration have accurate estimates of future needs. Census data play a valuable role in determining these needs estimates. Census data give insight into changes in social and demographic characteristics that directly affect travel habits, population shifts, and population growth and change. These forecasts then become the basis for estimating future highway needs and for developing funding recommendations.

At the federal level we develop studies of a policy nature for use by the Congress. These studies have substantial input from state transportation agencies that evaluate transportation programs for their state legislatures. Local governments, often through an MPO, develop transportation plans according to their needs and forecast future growth and change in their areas.

The demographic changes in metropolitan areas may have a tremendous impact on the transportation systems in local areas. Accurate and timely information on these changes is of utmost importance to national, state, and local planners and policy makers. We all know that the development pattern of metropolitan areas has changed from the traditional single economic, employment, and social center (the central business district) to multiple centers located around the metropolitan area. Such significant demographic changes have major effects on political decision making, federal domestic assistance programs, and the economic vitality of these areas—and of course to transportation. To maximize the effectiveness of our response to these changes, it is critical that demographic and journey-to-work trends be monitored through a comprehensive program. Small-area data on places of work and commuting patterns are critical if we are to meet our responsibilities.

In our report to Congress in July 1983 on the status of the nation's highways, we estimated that during the next 17 years it would cost more than $300 billion to maintain the current performance of the major highway systems. To remove some of the serious deterioration problems and provide for better traffic flow with less congestion, it would cost more than $400 billion. These needs were determined assuming a conservative annual traffic growth of 2.5 percent. To show you how conservative we are in this Administration, traffic
Grew at the rate of 3 percent per year during the decade of the 1970s—a time of oil embargoes and escalating travel costs. For the last 3 years, traffic has been increasing at the rate of about 3.5 percent per year. During 1984, highway travel increased at the rate of 4.5 percent over the comparable period in 1983.

The economic base of this country is rooted in its ability to continually absorb more people into the workforce. An expanding economy is a national goal. As a society, our goal is to have as many people working as possible and to minimize the unemployment rate. However, jobs that cannot be made accessible to the labor force are jobs that cannot be filled, and therefore resources are wasted and costs are increased.

We in the transportation community are charged to develop a system that provides for the safe and efficient movement of people and goods—with particular emphasis on the journey-to-work trip. In order to invest our scarce highway revenues in the most effective manner, we must be able to evaluate the impact of both short-term (3 to 5 years) and long-term (10 to 20 years) investments.

Before we can plan for the future, we must know the characteristics of existing traffic. To adequately compare the desirability of improving one facility over another, we must know how and why traffic moves between small geographic areas, such as traffic analysis zones. The reason that we advocate traffic analysis zones is because they are the locally developed analysis areas that have been in existence in most metropolitan areas for more than 20 years. They are reasonable in size, contain homogeneous land uses, and are designed to be bounded by arterial streets and highways.

Between 1960 and 1980, the labor force increased by 37 million people—a 54 percent increase. In those 20 years, federal, state, and local governments spent $450 billion on highway improvements to try to keep up with this increasing demand for travel. Between 1980 and 2000, we expect an additional 32 million people to enter the workforce. Most of these workers will be added to the existing peak-hour traffic, which will cause even more serious problems on our congested metropolitan highways. Therefore, in order to properly plan for transportation improvements, we must know where these workers live and where they work. The information must be available at a geographic level that permits accurate impact analysis within traffic zones, and it must be delivered in a timely and usable manner.

State and local governments are currently spending more than $100 million of FHWA and UMTA funds each year for urban transportation planning activities and such expenditures are expected to continue. Using these funds and census demographic and journey-to-work data, transportation improvements will be planned and programmed. Some of the projects will be built, but many will not be constructed due to lack of funds. The availability of timely and accurate data will help ensure that the most effective projects will be funded.

Federal-aid transit programs are another user of census data for policy development and program evaluation purposes. The UMTA programs have grown from less than $1 billion per year in 1973 to more than $4 billion per year in 1984. In order for UMTA to conduct an objective analysis of discretionary projects, it must have a data base that only the decennial census can provide. With this common information base, objective interregional evaluations can be undertaken by UMTA and the most cost-effective projects identified for funding.

In local planning, transit analysis requires small-area travel data such as that available from the 1970 and 1980 censuses. For example, access walking distance is a very important factor in determining whether people will use transit. As a consequence, specific bus-route line markets tend to be long and thin. Only the census can provide the detailed data necessary to properly analyze the transit potential for these unique pieces of geography. My associates in UMTA join FHWA in supporting the journey-to-work program of the Bureau of the Census.
The role of the decennial census data, along with transportation surveys conducted between censuses, is becoming more important over time. The current need for transportation statistics by federal, state, and local governments has never been greater. At the same time, resources for data collection are diminishing.

Although the decennial census may be the centerpiece of national data sources for transportation planning, it does not stand alone. It is joined by the Nationwide Personal Transportation Study (NPTS), which is funded entirely by DOT and provides data on all travel, both work and nonwork. In addition, we also have the American Housing Survey (AHS), funded by the Department of Housing and Urban Development. Both the NPTS and the AHS are valuable resources to the transportation community. DOT intends to continue to fund the NPTS as part of the national transportation surveys. We expect the decision makers of the Bureau of the Census to continue to include transportation-related data in the decennial census at a geographical level that is required by local, state, and federal governments. A session on the NPTS will be held as part of this conference. We are interested in hearing your needs for structuring the reports for the recently completed 1983-1984 survey and receiving your input for the design of the next survey in 1987-1988.

Are there reasonable alternatives to the decennial census, the AHS, and the NPTS? I don't think so. One alternative that might be proposed would be for individual states and metropolitan areas to conduct their own surveys. This would involve much work and would result in locally based data. However, it is likely that the statistics would not be comparable between areas nor published in a standard format for use by others outside the area. Such surveys would be extremely costly and I believe the overall accuracy would be far less than that achieved by the Bureau of the Census.

It is very important that this conference develop detailed recommendations for the Bureau of the Census. The conference at Albuquerque in 1973 resulted in a series of recommendations. Some of these were addressed in designing the 1980 census; some were not. The recommendations included statements on (a) the role of TRB in annual meetings of the UTPP user group, (b) the usefulness of the UTPP in local planning activities, (c) the geographic coding detail for workplaces, (d) the content of the questionnaire with regard to items such as departure time and travel time to work, (e) the development of a worker file, and (f) the need for a liaison person who is knowledgeable in all census transportation-related matters. At this conference there will be more discussion of these recommendations and how they were satisfied. We in FHWA and the Bureau of the Census need your insight again if we are to meet the challenges facing us in transportation.

The recommendations of this conference are vitally important to us at FHWA. We, along with UMTA, wonder if the $260,000 we invested in developing the computer program that allows the Bureau of the Census to develop the UTPP tapes was a good investment. We must make that judgment again, but before we do, we must evaluate the uses of the products developed. The first positive piece of evidence to indicate that we invested wisely was that more than 150 packages were delivered to entire states, large and small metropolitan areas, new urbanized areas, and rural counties with small urban places as compared with 121 packages for the 1970 census. This is not to indicate, however, that some technical problems have not arisen.

During the conference we will be extremely interested in learning of both the successes and failures of the 1980 census and its products from your perspective. Was your local investment in purchasing the package worthwhile? Did all that work in accumulating census blocks into traffic analysis zones pay off? Was the accuracy of the workplace coding adequate for your needs? Was the UTPP design too complex to easily decode? Was the 10 percent sample of workplaces a large enough sample for your needs? Was the 1984 delivery period
too far removed from the actual census? Were the other products of the Bureau of the Census sufficiently detailed to allow for the elimination of parts of the UTPP? Again, was your local investment in staff time and scarce funds worthwhile for the product that you have now received and are using?

Tomorrow you will concentrate on discussing the uses of the 1980 census data, which will be followed by discussions of needs for the 1990 census. The Bureau of the Census has identified four issues that are of substantial interest:

1. Level of geographic coding for the place-of-work question,
2. Subject matter to be included in the questionnaire,
3. Overall sample size, and
4. Cost and who should pay for block or traffic-analysis-zone coding.

On the last point, I believe that the best way for traffic-analysis-zone coding to the accomplished is as a funded component of the decennial census. The Bureau of the Census, supported by FHWA, must convince the Office of Management and Budget and the Congress as to the merits of this investment. Although I will not exclude the possibility of some fiscal support from FHWA, we prefer other funding solutions. The bottom line is that we must work together to acquire these data and do whatever is necessary to achieve this objective.

The purpose of this conference is to identify data needs and to develop recommendations. The product must be a report that can be used in designing the 1990 census. The members of this conference should reach a consensus on the recommendations. If this is done, most of the proposals are likely to be implemented. This conference has been timed so that the recommendations can be utilized by the Bureau of the Census in developing concepts for the pretests, which are scheduled to begin in 1985.

You should leave this conference with a better understanding of the Bureau of the Census plans and programs on the one hand and the transportation planning community's needs on the other. But in order to come up with conference recommendations, we want to identify the limitations of the 1980 census. How can the 1990 census be improved to provide the necessary data for your needs? The results of your efforts will be a report, with recommendations, from each of the six working groups. I am confident that the next few days will prove to be highly productive ones for the data-user community, as well as the Bureau of the Census and the Department of Transportation.

I wish I could participate in your deliberations, but since that is not possible I look forward to working with you to implement your recommendations.
Part II  Transportation Data from the 1980 Census
Transportation Planning and Census Data: An Evolving Relationship

Alan E. Pisarski

The urban transportation planning process and census data have a relationship that now spans almost 30 years. During that period both the planning process and the census data products have changed considerably. The nature of the changes in each area has served to bring the planning process and the data into a closer relationship, and today the planning process has a greater dependence on census data than ever before.

In the following material the evolution of the urban transportation planning process and the parallel evolution of related census data will be traced. Identification of the strengths and weaknesses of the current relationship will be sought in order to help point the way toward a more productive relationship in the future.

**EVOLUTION OF THE TRANSPORTATION PLANNING PROCESS**

The evolution of the transportation planning process is briefly summarized in Table 1, which shows the shifts in emphasis in data collection activities responsive to the changing character of the process. Also shown, in brief terms, are the census data available to support the changing urban data needs and how those data have been applied.

The late 1950s and early 1960s saw the development of the large-scale urban transportation studies. The dominant characteristics of these studies were their long-term view and their comprehensive scope. The new attributes of these studies included a geographic area of concern determined by the scale of the transportation problems to be faced rather than by jurisdictional boundaries and an emphasis on the transport system as an interrelated set of facilities and services rather than individual facilities. The nature of the process and the newly emerging tools to support it—models and computers—made massive demands for data. The data activities of these studies were of unprecedented scale. Starting from zero, inventories of existing facilities, services, and land use were conducted. Large-scale sample surveys were conducted to obtain passenger and vehicle flows related to demographic characteristics. It was not unusual in the early years for more than half of an urban-study budget to be allocated to data collection.

The role of census data in this period was small. The Bureau of the Census had played an important role early in the start-up stages of the urban studies, acting as advisor to the Bureau of Public Roads in the development of survey methods—sampling plans, survey design, and so forth. But census data were of limited application.

The 1960 census was primarily used as a check source on local data collection. In particular, the detailed socioeconomic data, more extensive than those collected in the local surveys, were of value. In 1960 for the first time work-trip data were collected in the decennial census. The coarseness of the geography to which work addresses were coded made these data useful primarily as a check on existing local data.
In the 1970s the urban planning process had matured. The large-scale data collection efforts had been completed and with few exceptions had become basically one-time efforts. Plans for continuous local surveying, monitoring, and updating had declined because of unavailable funds and shifts in priorities. The costs of redoing the large-scale surveys had become unacceptably large. The focus of most studies had shifted from system-based to corridor- or facility-based studies in highways. Mass transit received new emphasis and to the extent that systemwide programs were undertaken, they were transit oriented. Environmental and, after 1974, energy concerns grew in importance. It was a period of restraint and constraint. Data collection shifted to smaller surveys for the updating of aging data bases or for ad hoc projects. Carpooling, transit operations planning, and transportation systems management became major activities of the metropolitan planning organizations (MPOs).

In this environment the 1970 decennial census work-trip data looked better and better. Although limited in scope, definitional compatibility, and geocoding quality, the census data still represented a powerful resource. This was the joint product of the decline of locally developed sources and real improvements in the census data. The first Urban Transportation Planning Package (UTPP) was developed. Its genesis and its utility derived from new capabilities in census geographic coding. The breakthrough that changed the role of the decennial census data was the block coding of home and work addresses made possible by the advent of machine-readable geographic base files. This permitted aggregation of the data to user-specified geography. For transportation planners that meant traffic zones and data capability with the entire data network modeling chain employed by the MPOs. It also opened up new uses for the workplace data in other professions. Daytime population data became useful to both public and private entities.

At the Albuquerque conference in 1973, forerunner of this meeting, the promise of the new data was punctuated. The problems of the new data resource were aired and the way to further enhance the potential of the new capabilities was indicated.

A process of mutual accommodation has taken over. Census data have changed--improved--to meet user needs, and the urban transportation planning process has changed to better respond to and utilize the capabilities of the census resource.

Importantly, the match between census supply and urban transportation data demand is not a perfect one. Definitional incompatibilities persist. Pressures in the planning process--both theoretical and practical--urge more detailed, more disaggregate statistics, whereas census disclosure rules and practice permit only the generation of aggregate information. Perhaps as important transport problems and issues are increasingly oriented to nonpeak, nonwork travel, this will diminish the utility of the census resource or necessitate its adapting to the new needs. The census data set has grown in utility with the expansion of the vehicle-ownership and mode-to-work categories, the improvement of carpool data, and the addition of travel time information.

Transportation Uses of Data

The Transportation Planners' Guide to Using the 1980 Census (1) has an extensive section on transportation and nontransportation applications of the census data, particularly oriented to use of the UTPP transportation applications. About 20 different major applications of the census data are described. These cover the entire range of activities in the urban transportation planning process from fundamental data base building to model building, special analyses, and program impact assessment. In Table 2 some of these major categories of applications
TABLE 1  The Evolving Transportation Planning Process

<table>
<thead>
<tr>
<th>Urban transportation planning emphasis</th>
<th>1960</th>
<th>1970</th>
<th>1980</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start-up studies, regionwide systems studies, capital-intensive long-range view</td>
<td>Modal alternatives, transportation system management, corridor analysis, environment, energy, plan updates, disaggregate models</td>
<td>Maintenance, operations, vanpooling, near-term view, plan updates</td>
<td></td>
</tr>
<tr>
<td>Data collection emphasis</td>
<td>Large-scale household origin-destination surveys, truck-taxi surveys, external surveys, land use surveys, facility inventories</td>
<td>On-board surveys, phone quota, samples, corridor surveys</td>
<td>Census supplementals</td>
</tr>
<tr>
<td>Census data available</td>
<td>Socioeconomic detail, coarse geographic origin-destination surveys, special requests</td>
<td>Socioeconomic detail, fine geographic origin-destination surveys, UTPP, worker files</td>
<td>Socioeconomic detail, fine geographic origin-destination surveys, UTPP, carpooling, travel times</td>
</tr>
<tr>
<td>Transportation application</td>
<td>Socioeconomic check source</td>
<td>Socioeconomic update, recalibration of models, network loading</td>
<td>Socioeconomic update; recalibration of models; monitoring carpools, vanpools, and transit; operations planning</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>Daytime population</td>
<td>Traffic-sensitive branches, chains or franchises</td>
</tr>
</tbody>
</table>

TABLE 2  Transportation Applications of Census Data

<table>
<thead>
<tr>
<th>Application</th>
<th>Workshop Scope</th>
<th></th>
<th></th>
<th></th>
<th>Travel Research</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Statewide</td>
<td>Large</td>
<td>Small</td>
<td>Transit and Traffic</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Metropolitan</td>
<td>Metropolitan</td>
<td></td>
</tr>
<tr>
<td>Socioeconomic data base</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Resident end</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work end</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Trend analysis</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Accessibility analysis</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Park-and-ride locations</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Bus routing and circulation analysis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOV-lane analysis</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Land use and arterial spacing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selected-link analysis</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Trip generation</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Trip distribution</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Mode choice</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Automobile occupancy</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Automobile ownership</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Activity mapping</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
are identified and related to the areas covered by the workshops at this conference.

Generally, the applications cited are those traditionally covered by household origin-destination surveys. Census data provide a more reliable and extensive source of socioeconomic data than that provided by household surveys. Conversely, census data are more limited in actual trip data. One of the issues with respect to data and the urban transportation planning process is to determine the best mix of census supplied and locally supplemented data. The patterns of data development have been shifting over time as census capability expands and local needs change. What should they be in the future? Should the census provide a bigger share of the data set required and supplementary local surveys a smaller share?

Some of the criteria that will guide these decisions are as follows:

- **Census resource limits:** There is only so much space available for questions in the decennial census. There are competing demands and pressures to reduce the overall scope of the census. Staff and funds are as limited as question space.
- **Census technical limits:** Sets of questions that require extensive explanation, recalls to clarify responses, or extensive local knowledge would not be technically feasible. Sample sizes of the census subsections are a limitation particularly with regard to transit.
- **Data variability with geography:** The strength of the census resource is its complete coverage, under consistent definition, of the U.S. population. If a given characteristic (e.g., shopping-trip rates) shows extensive stability with respect to geography while behaving in ways explainable by socioeconomic variation, a small, nationally based sample survey such as the Nationwide Personal Transportation Study (NPTS) might be a more efficient data collection tool.
- **Data variability with time:** As with geographic variation, if data characteristics show kinds of temporal variability that limit the value of an observation taken in April every 10 years, other survey means should be considered. Other temporal considerations relate to the long-term planning-development horizon of the census. This suggests that changing public issues are inappropriate. Will carpooling and vanpooling issues still be important in the 1990s? Will the travel patterns of women be more or less a topic of concern? Should mode coding include electric vehicles?

All these questions cannot be resolved in preparing for 1990, but the criteria and the questions can be kept in mind so that the recommendations are thoughtful and implementable.

**Nontransportation Uses of Data**

Many of the transportation applications identified in the foregoing have nontransportation uses as well. Analyses that look at access to hospitals have utility for health planners as well as transportation planners. The worker location files are useful in real estate, marketing, and other public and private uses. Those retail operations that key branch locations to traffic flows and demographics are provided a major information resource. These capabilities have not come close to being fully utilized. Some of these nontransportation applications are as follows (2):

1. Development planning
   a. Developing community profile for overall economic development programs
b. Analysis of labor force composition and trends  
c. Analysis of population and employment distribution patterns  
d. Studies of retail location and marketing  

2. Educational planning  
a. Analysis of future school enrollments by grade  
b. Redistricting of schools  
c. Analysis of special educational needs by small areas  
d. Assessment of bilingual education needs  

3. Housing  
a. Assessment of housing improvement needs  
b. Analysis of real estate trends and tax revenue forecasting  
c. Targeting of building code inspections  
d. Analysis of displacement and other problems occasioned by condominium conversion  

4. Health care  
a. Planning of general health care  
b. Analysis of special health program needs as related to socioeconomic factors  
c. Analysis of public health factors  
d. Identification of areas not adequately served by physicians  
e. Identification of areas most in need of improved ambulance service  

5. Energy conservation planning  
a. Identification of target areas for energy conservation assistance in the building sector  
b. Analysis of local problems and opportunities for energy conservation in space heating, water heating, and cooking  
c. Identification of key corridors for bicycle facility development  

6. Land use planning—analysis of socioeconomic, demographic, housing, employment, and transportation trends  

7. Fire protection and disaster planning  
a. Analysis of fire and disaster risks by subareas  
b. Insurance-cost analysis for residences by small areas  

8. Public works  
a. Evaluation of projects requiring displacement or relocation of residents  
b. Improved record keeping of street inventory data using census GBF/DIME file capabilities  
c. Assessment of utility needs  
d. Estimation of right-of-way acquisition costs  
e. Preparation of environmental impact statements  

9. Social service programs  
a. Analysis of service area boundaries and facility locations  
b. Analysis of client group needs and resources  
c. Assessment of day care center requirements  
d. Assessment of playground requirements  
e. Preparation of funding applications for programs  
f. Forecasts of future tax revenues  

10. Local government administration  
a. Forecasts of future demand for services  
b. Identification of target areas and groups to increase voter registration  

11. Other—assessment of labor market conditions and workers by type of activity  

The tools provided by the 1980 census represent a better resource than ever before, both in quality and in content, and it is a resource that planners are
TABLE 3  Evolving Decennial Census Data for Transportation

<table>
<thead>
<tr>
<th>Data Element</th>
<th>1960</th>
<th>1970</th>
<th>1980</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicles owned</td>
<td>Automobiles (0, 1, 2, 3+)</td>
<td>Automobiles (0, 1, 2, 3+)</td>
<td>Automobiles (0, 1, 2, 3+)</td>
</tr>
<tr>
<td>Mode choice</td>
<td>Eight basic categories</td>
<td>Nine categories</td>
<td>Vans, trucks (0, 1, 2, 3+)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Twelve categories</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Car</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Truck</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Motorcycle</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bicycle</td>
</tr>
<tr>
<td>Travel mode</td>
<td>Principal means last week</td>
<td>Chief means last day worked last</td>
<td>Carpool question</td>
</tr>
<tr>
<td>Workplace</td>
<td>Cities, counties</td>
<td>week Block (otherwise same as</td>
<td>Automobile occupancy question</td>
</tr>
<tr>
<td>identification</td>
<td></td>
<td>in 1960)</td>
<td>Mode usually used in usual work</td>
</tr>
<tr>
<td>Travel times</td>
<td></td>
<td></td>
<td>trip Block (or place level)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Travel time to work in minutes</td>
</tr>
</tbody>
</table>

better prepared to use. As a result, planning activities in the 1980s will be more efficient and effective.

EVOLUTION OF TRANSPORTATION DATA FROM THE DECENNIAL CENSUS

In Table 3 the changes in the decennial census transportation data set over the years are summarized; this confirms the discussion in the previous section of evolving transportation planning activity. A dynamic process is shown in which each succeeding census has seen improvement, new content, and expanding relevance to planning needs.

From a look at the additions made over time it is clear that they reflect the concerns and issues current at the time of census planning. It must constantly be recognized that the planning phase for the decennial census precedes output by almost 10 years, which suggests that the recommendations and decisions of this conference should be in the time frame of the early and mid-1990s. This argues for continued focus on the most basic and enduring of data needs.

The transportation content and coverage in the decennial census have grown as many other transportation-related census activities have suffered. The former Transportation Division of the Census Bureau is gone. The Census of Transportation has become a minor effort. The National Travel Survey and the Commodity Transportation Survey have either diminished in scale or been dropped. However, there are indications at the Bureau of the Census that transportation, along with other service industries, will receive new emphasis in the future. NPTS has become a major national data resource. The truck surveys are increasingly valuable. The Services Industries Division of the bureau is researching an expanded transportation effort.

Looking at Table 3, one should envision what a new column labeled 1990 could and should say. Beyond that, the focus should be on the Bureau of the Census and its extensive family of data collection activities as an integrated resource in support of an improved urban transportation planning process.

REFERENCES

Products and Services from the 1980 Census
Larry W. Carbaugh

The results of the 1980 Census of Population and Housing were released through three major media, namely, printed reports, computer tapes, and microfiche. These 1980 products reflected some changes over their 1970 counterparts. For example, in 1980 more data were tabulated by race and data were presented for more areas, such as Indian reservations, Alaska Native villages, and census blocks. However, the new look in the 1980 data program was the emphasis on data for local areas and the involvement of users in defining tabulation areas and disseminating the data products. The contents of the 1980 census are shown in Table 1. The resulting data products and services are listed in the Census Bureau publication 1980 Census Basics (1). A review of some of these products and services follows.

PRINTED REPORTS

The 1980 census reports are organized into three major groups according to subject: population census (PC80), housing census (HC80), and joint population and housing census (PHC80). They are further classified geographically into a series of area reports, one for each state and another for each metropolitan area. In addition, special population and housing subject reports are prepared that present detailed characteristics data (e.g., workers by place of work, employed persons by occupation and industry, or mobile homes) for the nation as a whole.

The population data are issued in four parts, or chapters, with Chapters A and B presenting basic demographic data (e.g., sex, age, race, and ethnicity, which are collected on a complete-count or 100-percent basis) for counties, townships, places, and Standard Metropolitan Statistical Areas (SMSAs) and Chapters C and D containing estimates of social and economic characteristics (e.g., income, education, and occupation) for similar areas within each state.

Similarly, the housing data are issued in two chapters; Chapter A contains complete-count data and Chapter B contains sample estimates for the same areas as the population reports. An additional housing report series presents detailed sample housing data for each metropolitan area.

The joint population and housing reports contain similar complete-count and sample data but are issued by metropolitan area. PHC80-1 presents complete-count data for blocks (including those in nonmetropolitan areas) and PHC80-2 contains a combination of complete-count and sample data for census tracts. A new joint population and housing report was introduced for the 1980 Census: PHC80-3, Summary Characteristics for Governmental Units and Standard Metropolitan Statistical Areas. This report contains data for each of approximately 39,000 general-purpose local governments (counties, incorporated places, and, in 20 states, most minor civil divisions) in the nation.
### TABLE 1 Subject Items Included in the 1980 Census

<table>
<thead>
<tr>
<th>Population</th>
<th>Housing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>100-Percent Items</strong></td>
<td></td>
</tr>
<tr>
<td>Household relationship</td>
<td>Number of living quarters at address</td>
</tr>
<tr>
<td>Sex</td>
<td>Access to unit</td>
</tr>
<tr>
<td>Race</td>
<td>Complete plumbing facilities</td>
</tr>
<tr>
<td>Age</td>
<td>Number of rooms</td>
</tr>
<tr>
<td>Marital status</td>
<td>Tenure (whether unit is owned or rented)</td>
</tr>
<tr>
<td>Spanish/Hispanic origin or descent</td>
<td>Condominium identification</td>
</tr>
<tr>
<td></td>
<td>Acreage and presence of commercial establishment or medical office</td>
</tr>
<tr>
<td></td>
<td>Value of home (owner-occupied units and condominiums)</td>
</tr>
<tr>
<td></td>
<td>Contract rent (renter-occupied units)</td>
</tr>
<tr>
<td></td>
<td>Vacant for rent, for sale, etc., and duration of vacancy</td>
</tr>
<tr>
<td><strong>Sample Items</strong></td>
<td></td>
</tr>
<tr>
<td>School enrollment</td>
<td>Type of unit and units in structure</td>
</tr>
<tr>
<td>Years of school completed</td>
<td>Stories in building and presence of elevator</td>
</tr>
<tr>
<td>State or foreign country of birth</td>
<td>Year structure built</td>
</tr>
<tr>
<td>Citizenship and year of immigration</td>
<td>Year household moved into unit</td>
</tr>
<tr>
<td>Language spoken at home and ability to speak English</td>
<td>Year householder moved into unit</td>
</tr>
<tr>
<td>Residence in 1975</td>
<td>Acreage and crop sales</td>
</tr>
<tr>
<td>Activity in 1975</td>
<td>Source of water</td>
</tr>
<tr>
<td>Veteran status and period of service</td>
<td>Sewage disposal</td>
</tr>
<tr>
<td>Work disability and public transportation disability</td>
<td>Heating equipment</td>
</tr>
<tr>
<td>Children ever born</td>
<td>Fuels used for house heating, water heating, and cooking</td>
</tr>
<tr>
<td>Marital history</td>
<td>Costs of utilities and fuels</td>
</tr>
<tr>
<td>Labor force status</td>
<td>Complete kitchen facilities</td>
</tr>
<tr>
<td>Hours worked previous week</td>
<td>Number of bedrooms</td>
</tr>
<tr>
<td>Place of work</td>
<td>Number of bathrooms</td>
</tr>
<tr>
<td>Travel time to work</td>
<td>Telephone</td>
</tr>
<tr>
<td>Means of transportation to work</td>
<td>Air conditioning</td>
</tr>
<tr>
<td>Private vehicle occupancy</td>
<td>Number of automobiles</td>
</tr>
<tr>
<td>Year last worked</td>
<td>Number of light trucks and vans</td>
</tr>
<tr>
<td>Industry</td>
<td>Homeowner shelter costs for mortgage, real estate taxes, and hazard insurance</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
</tr>
<tr>
<td>Class of worker</td>
<td></td>
</tr>
<tr>
<td>Number of weeks worked in 1979</td>
<td></td>
</tr>
<tr>
<td>Usual hours worked per week in 1979</td>
<td></td>
</tr>
<tr>
<td>Unemployment in 1979</td>
<td></td>
</tr>
<tr>
<td>Income in 1979 by source</td>
<td></td>
</tr>
<tr>
<td>Poverty status in 1979</td>
<td></td>
</tr>
</tbody>
</table>

*To meet the aim of greater statistical reliability for small areas, there was a 50-percent sample of the population in governmental jurisdictions with a population of less than 2,500. The sample was 1 in 6 (16.7) in areas with a population of 2,500 or more, yielding a national sample rate of 19.7 percent.*

### TABLE 2 Relationship of Summary Tape Files to Reports

<table>
<thead>
<tr>
<th>Report Series</th>
<th>Complete-Count Data</th>
<th>Sample-Estimate Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STF 1</td>
<td>STF 2</td>
</tr>
<tr>
<td>Population Housing</td>
<td>PC80-1-A</td>
<td>PC80-1-B</td>
</tr>
<tr>
<td>Population and housing</td>
<td>HC80-1-A</td>
<td>PHC80-2</td>
</tr>
<tr>
<td></td>
<td>PHC80-1 (blocks)</td>
<td>(census tracts)</td>
</tr>
<tr>
<td></td>
<td>PHC80-3 (governmental units)</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>PHC80-4 (congressional districts)</td>
<td>--</td>
</tr>
</tbody>
</table>
COMPUTER TAPES

A series of machine-readable summary data files parallels the release of the printed reports. These files contain the same data items as those presented in the reports but often in more detail and for smaller areas. In addition, data files are also released that contain, instead of summary data, disaggregated individual person and household records with identifying information removed. These files allow users to develop their own tabulations.

**Summary Data**

As noted previously, the summary tape files (STFs) are released in conjunction with the printed reports (see Table 2). However, two of these tape files, STFs 1 and 3, also present data for census areas (enumeration districts and block groups) that do not appear in print. Because STFs 1 and 3 also contain summaries for larger areas such as tracts, minor civil divisions, and counties, users are able to obtain data for these areas well in advance of comparable printed reports containing these data.

Users are also able to obtain more race tabulations on the summary files than is possible from the printed reports. The printed reports are limited to those census areas having 400 or more of a particular race or ethnic group, whereas the tape files present separate summaries for areas having as few as 15 in a particular group. In fact, summaries are provided for up to 24 different race and ethnic groups on STF 2 and up to 327 race and ethnic and ancestry groups on STF 4.

**Microdata**

Public-Use Microdata Sample (PUMS) files, as noted previously, provide users with the ability to prepare their own tabulations. For example, tabulations showing the characteristics of those who work at home or households with more than two workers can be prepared.

To protect the confidentiality of the respondents to the census, these individuals person and household record files do not identify any geographic area with fewer than 100,000 population. This limitation still allows for SMSAs, central cities, groups of counties, and even large counties and cities to be identified.

To make the PUMS geographic areas more meaningful, the Census Bureau asked users within each state, usually through the State Data Center, to identify the area groupings. Most commonly used areas are state planning areas, economic development districts, or similar regional areas.

Three mutually exclusive samples are available: the A sample includes 5 percent of all persons and housing units and the B and C samples each include 1 percent of all persons and housing units.

**Software**

To assist users in accessing and using the machine-readable data, the Census Bureau has developed a computer system called CENSPAC. This system, written in COBOL, makes use of other machine-readable files, known as data dictionaries, to display and label printouts or to create extract files. The CENSPAC system also allows users to specify the format of the data files they are processing so that it can be used for census files other than the summary files, such as those from the Urban Transportation Planning Package (UTPP).
MICROFICHE

In order to provide users with access to some of the more useful data for enumeration districts and block groups from STFs 1 and 3, special microfiche are available that contain these summaries.

SPECIAL DATA SERVICES

As noted in the introduction, the 1980 data program emphasized local involvement in specifying tabulation areas and in disseminating the 1980 data products. Two programs in particular highlight this new involvement—the Neighborhood Statistics Program and the State Data Center Program.

Neighborhood Statistics Program

In this program almost 1,300 cities, counties, townships, and other areas defined neighborhoods for which they wanted data prepared. The Census Bureau then prepared several products for each neighborhood defined. These include (a) tables that present data about the population, such as age, family income, and employment status as well as data about housing; (b) a nine-page narrative profile covering a variety of subjects such as marital status, educational attainment, income, and poverty status and the characteristics of the neighborhood's housing units; and (c) STF 1 and 3 summaries for each neighborhood.

State Data Center Program

This program is a cooperative effort between the Census Bureau and individual states to distribute census products and provide services. A network consisting of one or more state-level organizations and including many libraries, planning groups, and others that serve as local data center affiliates has been set up in all states (except Wyoming), the District of Columbia, Puerto Rico, and the Virgin Islands.

These networks receive all Census Bureau reports, computer tapes, maps, and microfiche from the 1980 census for their state as well as technical assistance and training. In return for these products and services from the Census Bureau, the state networks maintain libraries that are open to the public, provide assistance in using the data, and offer tape copies, computer printouts, map reproduction, and photocopy services, often on a cost-reimbursable basis.

This presentation has only highlighted the major 1990 census products available services. More details about these products can be obtained from the Census Bureau's main office or any of the 12 regional offices or from the nearest state data center.

REFERENCE

Transportation Data from the 1980 Census: A Retrospective Assessment
Philip N. Fulton

Transportation data are an integral part of the U.S. Census of Population and Housing. The bulk of these data are statistics pertaining to the journey to work of the labor force. During the planning phase of the 1980 census, four basic goals were identified for the journey-to-work statistics program: (a) include additional transportation questions in the census to meet program needs, (b) provide more journey-to-work data in standard census products, (c) improve the quality of small-area place-of-work coding, and (d) increase the utility of the Urban Transportation Planning Package (UTPP). This paper provides an assessment of how successful the Census Bureau was in achieving these goals.

TRANSPORTATION QUESTIONS IN THE CENSUS OF POPULATION AND HOUSING

The inclusion of transportation items is a fairly recent occurrence in the history of the decennial census. Although the first census was conducted in 1790, questions pertaining to transportation did not appear until 1960 when three such questions were asked on a 25-percent sample basis. The population items in 1960 included questions on each worker's place of work (city, county, and state) and means of transportation to work, whereas the housing items included a question on the number of automobiles available for use by the members of each household. The principal impetus for adding the question on place of work to the 1960 census was the need for data on commuting interchanges for use as an indicator of economic integration between large cities and their suburbs as part of the criteria for delineating metropolitan statistical areas. The commuting data from the census were certainly of interest to transportation planners, but urban transportation planning was still being done on the basis of origin-destination surveys.

By 1970, with the development of Address Coding Guides (ACGs) and Dual Independent Map Encoding (DIME) files, interest in the census as a source of transportation planning data had increased considerably. The ACGs and DIME files provided the capability of geographically coding addresses within the urbanized portion of metropolitan areas down to the level of the census block. The 1970 census again asked questions on place of work, means of transportation to work, and automobile availability, this time based on a 15-percent sample. However, the place-of-work question asked for the actual street address of the respondent's workplace, and these addresses were coded to census blocks within the areas covered by ACGs and DIME files.

Between 1970 and 1980, several developments resulted in a significant expansion in the number of transportation items included in the decennial census. The energy crisis of the early 1970s and the subsequent ongoing concern for the nation's supply of nonrenewable energy sources brought about a sharp increase in the need for statistics for transportation planning and policy formulation. From 1975 to 1977, under the sponsorship of the U.S. Department of Transportation, the Census Bureau conducted for the first time journey-to-work surveys in 60 metropolitan areas and a national survey in 1975, all as part of
the Annual Housing Survey. In recognition of the growing need for analysis of these data, a Journey-to-Work Statistics Branch was created within the bureau's Population Division to carry out the technical planning and developmental work pertaining to the collection, processing, tabulation, and analysis of journey-to-work data from the decennial census and periodic surveys. Also during the decade, the cost of conducting origin-destination surveys increased rapidly, and the U.S. Department of Transportation began to encourage local agencies to look to the decennial census as an alternative source for cost-effective transportation planning data.

Thus, due to the significant increase in the need for transportation data at all levels of government, the 1980 census included eight transportation items: six population questions and two housing questions. On the population side, in addition to questions on place of work and means of transportation to work, the 1980 census asked about carpooling arrangements, the number of riders in the carpool, travel time from home to work, and whether persons had a disability that limited or prevented their use of public transportation. On the housing side, the automobile availability question was supplemented with an additional question on the number of light trucks and vans available for use by members of each household.

JOURNEY-TO-WORK DATA IN STANDARD 1980 CENSUS PRODUCTS

Standard census data products include printed reports for states and Standard Metropolitan Statistical Areas (SMSAs) that contain information on all the various subjects collected in the census, special reports that focus on a particular subject, and data on computer tape. Important improvements were made in the journey-to-work data included in each of these products for 1980.

State and SMSA Reports

The series of state reports entitled General Social and Economic Characteristics (Series PC80-1-C) contains data for states, counties, places of 2,500 or more inhabitants, SMSAs, and towns or townships in selected states. For 1980 these reports include data on all the journey-to-work items (place of work, means of transportation, carpooling, persons per vehicle, travel time) for all geographic areas regardless of size. In 1970 not all the journey-to-work information collected was published for counties and small places. Furthermore, the place-of-work data in the 1980 reports show the number of persons who worked outside their area of residence instead of their county of residence as was the case in 1970. This means that if a particular table is for residents of the state, counties, places, or towns and townships, the 1980 data will show how many residents worked outside each specific state, county, place, or town and township rather than always referring to the county of residence.

The series of state reports entitled Detailed Population Characteristics (Series PC80-1-D) contains detailed cross-tabulations of characteristics for each state and each SMSA of 250,000 or more inhabitants. For 1980 an expanded table was added to this series that provides socioeconomic and demographic characteristics of interstate commuters. One of the most important characteristics shown is the earnings of workers who work in one state but live in another. Each commuter flow between contiguous states is identified uniquely.

The series of SMSA reports entitled Census Tracts (Series PHC80-2) provides data for each SMSA and its census tracts. Summaries for component counties and places of 10,000 or more inhabitants are also given. For 1980 these reports contain more detailed place-of-work destinations than in 1970. In addition to the central cities and counties that make up the SMSA, important suburbs and
destinations outside the SMSA are also included. For SMSAs in New England, the place-of-work destinations shown in the tract reports are individual towns or logical groupings of towns rather than county portions. This provides more useful town-to-town commuting data for areas where counties have little meaning.

**Subject Reports**

In contrast to 1970, when only one subject report on journey-to-work data was produced, three such reports were produced as part of the 1980 census.

The first, Journey to Work: Metropolitan Commuting Flows (PC80-2-6C), portrays the commuting patterns of workers in the 318 SMSAs recognized for the 1980 census (excluding Puerto Rico). Place of residence and place of work are also shown in summary tables for the United States and each of the four census regions and nine census divisions. Data are given on the workplaces of workers residing or working in each SMSA. They cover the component counties of each SMSA, their central cities, and other places with 25,000 or more residents. Commuter interchanges between SMSA components and areas outside the SMSA are shown when they amount to 100 or more workers.

The second subject report, Journey to Work: Characteristics of Workers in Metropolitan Areas (PC80-2-6D), provides comparative data on the characteristics of workers who reside in each geographic unit of each SMSA and who work in each unit, followed by information on the characteristics of workers commuting within and between each geographic unit. The geographic units recognized are each central city; each other place of 50,000 or more inhabitants; for workplace only, the central business district (CBD) of each central city and the remainder of the central city; the remainder of each county containing central cities or other qualifying places; and each additional county that does not contain either a central city or other qualifying place. Summary data on the workplace of workers classified by type of residence for the United States and regions are also provided.

The third subject report, Place of Work (PC80-2-6E), presents information on selected social and economic characteristics of workers by place of work. The total number of workers that worked in each area and the number of those workers living outside their area of work are given. Areas of work shown in the report include each state, county, and SMSA central city, each other place of 25,000 or more inhabitants, and each New England county subdivision.

**Computer Tapes**

The 1980 census computer files include Summary Tape Files (STFs), Public-Use Microdata Sample (PUMS) files, and other special-purpose files.

STF 3 provides characteristics summarized for geographic areas down to the level of block group or enumeration district. Because of this small-area geographic detail, the content detail of STF 3 had to be somewhat abbreviated. Instead of place-of-work data for specific workplace destinations, STF 3 contains four unique place-of-work records—state and county, minor civil division (MCD), place, and SMSA—that can be used to ascertain general commuting patterns. For example, on the Massachusetts STF 3, the place-of-work records on the data record for Chelsea city in the Suffolk County portion of the Boston SMSA could be used to find the number of Chelsea residents who worked in Chelsea, worked in Boston, worked elsewhere in Suffolk County, worked outside Suffolk County but within the Boston SMSA, worked outside the Boston SMSA but within Massachusetts, or worked outside Massachusetts.

STF 4 provides characteristics summarized for geographic areas down to the census-tract level. This file provides in complete detail the
transportation-item categories reported in the census as well as cross-tabulations of carpooling arrangements and sizes separately for workers using cars, trucks, and vans. STF 4 also includes the most detailed place-of-work tabulation contained in any standard 1980 census product, the so-called "20 places of work." This tabulation provides the number of workers commuting to 20 workplace destinations that are defined uniquely for each county (MCD in New England). The destinations may be cities, counties, towns or town groupings in New England, or other areas. For 1980 many more cities were included in these lists of workplace destinations to provide more subcounty detail.

PUMS are computerized files containing most population and housing characteristics as shown on a sample of individual census records. These files contain no names or addresses, and geographic identification is limited to counties or county groups with at least 100,000 or more inhabitants to protect confidentiality. Microdata files allow the user to prepare customized tabulations. Place-of-work information on the 1970 census microdata files was of limited utility because it was provided in terms of recodes (e.g., worked inside or outside county of residence or worked in central city or in the suburbs or outside the SMSA of residence). For 1980 the actual county or county group of work is included in the microdata files to allow users to develop their own customized county-to-county commuting tabulations.

Another important computer tape is the user file developed from the base file that was the source of the three journey-to-work subject reports described earlier. This file contains a record for the number and characteristics of workers in each commuter flow that occurred between specified geographic areas in the United States. The geographic areas include counties, cities of 25,000 or more inhabitants, and New England county subdivisions. Much of the data contained in this file for cities of 25,000 to 50,000 persons, nonmetropolitan counties, and New England subdivisions is not available elsewhere in other census data products.

PLACE-OF-WORK CODING

The development of the ACGs as part of the 1970 census provided the capability for the first time of geographically coding place-of-work addresses down to the level of the census block; the 1960 census had asked only city, county, and state of work. About 63 percent of the eligible workers (those living in SMSAs who worked in the ACG-covered portion of their SMSA) were coded to block of work in 1970.

For the 1980 census place-of-work ACGs were prepared from computerized geographic base files (GBF/DIME files) that allowed more extensive block coding, and workers were assigned to the census tract of work if a block code could not be obtained. In addition several other noteworthy improvements were made in the 1980 place-of-work coding operation that resulted in more accurate small-area data: (a) a better coder-training program was developed that combined videotaped training modules with step-by-step workbooks of place-of-work coding exercises, (b) the place-of-work coding procedures themselves were more comprehensive and easier for the coders to use than those in 1970, and (c) place-of-work coding specialists from the Census Bureau's Journey-to-Work Statistics Branch were detailed to each of the three census processing centers as technical advisors for the duration of census processing. But the single most significant improvement in place-of-work coding for 1980 was the creation of Major Employer Lists (MELS) covering each SMSA.

Complete number-and-street place-of-work addresses are usually reported by about half of all respondents. The rest report the name of their employer, the name of the building or shopping center where their employer is located, or some
other description of where they work. In order to code these responses, the Census Bureau developed extensive precoded lists of major employers (companies, businesses, shopping centers, office buildings, colleges, military installations, etc.) for each SMSA. The bureau also contacted the local metropolitan planning organization (MPO) in each SMSA to request a list of its major traffic generators to check the coverage and accuracy of the Census Bureau's list. About half of the MPOs responded.

The estimated rates of small-area place-of-work coding in the 1980 census are as follows:

<table>
<thead>
<tr>
<th>Level of Coding</th>
<th>Percentage of Eligible Workers Coded by Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Census tract</td>
<td>1960</td>
</tr>
<tr>
<td>Block</td>
<td>NA</td>
</tr>
</tbody>
</table>

About 73 percent of all workers eligible for small-area coding were coded to the block level, a 10-percentage-point improvement over 1970. Further, about 81 percent of eligible workers were coded at least to the census tract of work.

URBAN TRANSPORTATION PLANNING PACKAGE

The availability of block-level data on commuting origins and destinations from the 1970 census made possible the development for the first time of the Urban Transportation Planning Package (UTPP). The 1970 UTPP was a special tabulation of census data for individual metropolitan areas tailored to the geographic areas that are used in transportation planning. Local transportation planning organizations prepared specifications for the blocks that made up their traffic analysis zones, and the Census Bureau then produced a standard set of tabulations for those zones on a cost-reimbursable basis. Specifications for the content of the UTPP were submitted to the bureau by FHWA. About 120 UTPPs were prepared after the 1970 census.

The Census Bureau again produced the UTPP after the 1980 census. This time specifications were developed and submitted to the bureau by an ad hoc committee of transportation planners under the auspices of the Transportation Research Board. Funding for development of the necessary computer programs and administration of the 1980 project was provided by the U.S. Department of Transportation.

1980 UTPP Highlights

Just as improvements in the quality of 1980 census place-of-work coding resulted from experience gained in coding to block for the first time in 1970, so too did improvements in the overall UTPP program derive from experience with the production and use of the 1970 version. The highlights of the 1980 UTPP program were in the general areas of product utility, user assistance, and governmental cooperation.

The 1980 UTPP was a much more useful and flexible product than the 1970 package. The 82 data tables included in the 1980 UTPP compared with 43 in the 1970 version gave users a more comprehensive transportation planning data base. Purchasers of the 1980 package had the option of having the small-area parts of their UTPP tabulated on the basis of traffic zones, census tracts, or block groups and the option of receiving the package on computer tape, printout, or microfiche; the 1970 UTPP was only produced on computer tape using traffic zones. The 1980 UTPP was not limited to SMSAs as the 1970 version had been,
because some transportation planning regions are not limited to one metropolitan area; in addition to single SMSAs, special 1980 UTPPs were produced that covered single SMSAs with commuters (significant commuter inflows from adjacent SMSAs), multiple SMSA planning regions, nonmetropolitan counties containing urbanized areas, and entire states. As part of the 1980 UTPP processing, place-of-work responses that were incomplete or not reported were allocated to the most detailed level of geography possible; no such allocation procedure was developed for the 1970 UTPP.

User assistance as part of the 1980 UTPP program was provided by the Census Bureau in a variety of ways. UTPPs produced on computer tape included in addition to the data files a machine-readable data dictionary containing the boxheads, stubs, and titles of all tables; a geographic name reference file for the geographic codes associated with the data; and a program to print out the tables. Extensive documentation was also provided with the tapes. From 1981 to 1984 staff of the Census Bureau and the U.S. Department of Transportation conducted more than 20 one-day user workshops on the UTPP throughout the United States. These workshops provided an orientation to the technical specifications of the UTPP and its application to transportation planning for more than 1,000 state and local planners. The Census Bureau also developed procedures for correcting place-of-work coding problems that occurred during census processing. UTPP purchasers who found such problems and notified the bureau within a reasonable time received corrected files without additional charge.

Another highlight of the 1980 UTPP program was the degree of intra- and intergovernmental cooperation achieved. Within the federal government, the already strong tradition of cooperation between the Census Bureau and the U.S. Department of Transportation was strengthened further in carrying out this successful project. Further, a solid working relationship was established between the Census Bureau and many local MPOs and states that will be the basis for mutual assistance in future censuses.

1980 UTPP Problems

Although the 1980 UTPP program was much improved over 1970, a few problems did occur. There were place-of-work coding errors in some areas that made the data less usable than they could have been. The computer program included on the UTPP tapes did not work for some areas because it could not accommodate all the geographic components in large metropolitan regions (the program has been corrected and will be sent to those UTPP purchasers that were affected). Despite the user workshops conducted as part of the UTPP program, some planners had trouble using the UTPP because of a lack of familiarity with census concepts, processing techniques, and the limitations of the data. Some planners also made mistakes in their census geography-to-traffic-zone equivalency files, which resulted in erroneous UTPP data. Such errors necessitated the correction of the equivalency files and reruns of the UTPPs.

Selected Results of the UTPP Program

Some overall results of the 1980 UTPP program as of December 1, 1984, are presented here. The information is not final because the program has not been closed and a few more UTPPs remain to be done. The various types of UTPPs that were produced in 1980 are summarized as follows:
The SMSA-with-commutershed packages (a single-SMSA package that includes special inflow data from an adjacent SMSA) covered the following areas: Ann Arbor, Michigan; Baltimore, Maryland; Chicago, Illinois; Detroit, Michigan; Ft. Lauderdale-Hollywood, Florida; Gary-Hammond-East Chicago, Indiana; Miami, Florida; Newport News-Hampton, Virginia; Norfolk-Virginia Beach-Portsmouth, Virginia-North Carolina; Washington, D.C.,--Maryland-Virginia. Multiple-SMSA UTPPs were produced for the following regions: San Francisco Bay area (four SMSAs); Southern California (four SMSAs); Puget Sound region (three SMSAs); Cleveland, Ohio (two SMSAs); Columbus, Ohio (two SMSAs); Cincinnati, Ohio (two SMSAs); Houston, Texas (two SMSAs); Philadelphia, Pennsylvania (two SMSAs); and Bradenton-Sarasota, Florida (two SMSAs). Special UTPPs were done for each regional planning area in Massachusetts, areas that are usually made up of one or more core SMSAs and surrounding nonmetropolitan towns with commuting linkages to the SMSAs. UTPPs covering the entire state were prepared for Connecticut and Rhode Island. A statewide UTPP was also produced for New Jersey that included inflow data for commuters from counties adjacent to New Jersey in New York, Pennsylvania, and Delaware. Finally, three UTPPs were produced that covered nonmetropolitan urbanized areas: Grand Junction, Colorado; Houma, Louisiana; and Jackson, Tennessee. In all, 152 packages were produced from the 1980 census compared with 120 from the 1970 census.

A greater proportion of large metropolitan areas took part in the UTPP program than did smaller areas (Table 1). All but three of the SMSAs of 1,000,000 or more (Milwaukee, Wisconsin; Pittsburgh, Pennsylvania; Sacramento, California) purchased UTPPs in 1980, whereas fewer than half of the SMSAs under 250,000 participated in the program. Among all SMSAs, 55 percent purchased the UTPP.

A larger proportion of SMSAs purchased the UTPP in the Northeast than in the other regions (Table 2). About 67 percent of the SMSAs in the Northeast purchased a package, 60 percent in the West, and 56 percent in the Midwest. Only 46 percent of the SMSAs in the South participated in the UTPP program. Within regions, the highest rate of purchase occurred in New England (Maine, Vermont, New Hampshire, Rhode Island, Massachusetts, and Connecticut) where nearly 80 percent of the SMSAs were covered by a UTPP. The lowest rate of purchase was in the West South Central states (Arkansas, Louisiana, Oklahoma, and Texas) where only 39 percent of the SMSAs were covered. The low rate in these states is primarily attributable to Texas, where only 5 of 26 SMSAs were covered by UTPPs.

Table 3 presents a comparison of UTPP cost data for 1970 and 1980. The data substantiate the cost-effectiveness of the 1980 census UTPP program. In constant 1983 dollars, the average cost of purchasing a UTPP was about the same in 1980 as it was in 1970, and the cost actually dropped significantly between 1970 and 1980 on a per-capita basis. The average cost was about $11,000 in both 1970 and 1980, and the cost per 1,000 population was $11.81 in 1980 compared with $16.14 in 1970.
### TABLE 1  1980 SMSAs Covered by UTPPs by Size of SMSA

<table>
<thead>
<tr>
<th>SMSA Population</th>
<th>No. of SMSAs Covered by UTPPs</th>
<th>Percentage of UTPP Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000,000+</td>
<td>38</td>
<td>92</td>
</tr>
<tr>
<td>500,000-999,999</td>
<td>41</td>
<td>78</td>
</tr>
<tr>
<td>250,000-499,999</td>
<td>71</td>
<td>56</td>
</tr>
<tr>
<td>100,000-249,999</td>
<td>140</td>
<td>40</td>
</tr>
<tr>
<td>&lt; 100,000</td>
<td>28</td>
<td>43</td>
</tr>
<tr>
<td>Total</td>
<td>318</td>
<td>55</td>
</tr>
</tbody>
</table>

### TABLE 2  1980 SMSAs Covered by UTPPs by Census Region and Division

<table>
<thead>
<tr>
<th>Region and Division</th>
<th>No. of SMSAs Covered by UTPPs</th>
<th>Percentage of UTPP Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New England</td>
<td>29</td>
<td>79</td>
</tr>
<tr>
<td>Middle Atlantic</td>
<td>34</td>
<td>56</td>
</tr>
<tr>
<td>Total</td>
<td>63</td>
<td>67</td>
</tr>
<tr>
<td>Midwest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>East North Central</td>
<td>58</td>
<td>57</td>
</tr>
<tr>
<td>West North Central</td>
<td>20</td>
<td>54</td>
</tr>
<tr>
<td>Total</td>
<td>84</td>
<td>56</td>
</tr>
<tr>
<td>South</td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Atlantic</td>
<td>58</td>
<td>52</td>
</tr>
<tr>
<td>East South Central</td>
<td>20</td>
<td>45</td>
</tr>
<tr>
<td>West South Central</td>
<td>41</td>
<td>39</td>
</tr>
<tr>
<td>Total</td>
<td>119</td>
<td>46</td>
</tr>
<tr>
<td>West</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mountain</td>
<td>17</td>
<td>53</td>
</tr>
<tr>
<td>Pacific</td>
<td>35</td>
<td>63</td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
<td>60</td>
</tr>
<tr>
<td>Total United States</td>
<td>318</td>
<td>55</td>
</tr>
</tbody>
</table>

### TABLE 3  Summary of UTPP Cost Data

<table>
<thead>
<tr>
<th>Item</th>
<th>1970</th>
<th>1980</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of UTPPs produced</td>
<td>121</td>
<td>152</td>
</tr>
<tr>
<td>Total population in areas covered</td>
<td>81,796,344</td>
<td>142,068,485</td>
</tr>
<tr>
<td>Percentage of U.S. total population</td>
<td>40</td>
<td>62</td>
</tr>
<tr>
<td>Total cost (unadjusted) ($)</td>
<td>534,200</td>
<td>1,678,348</td>
</tr>
<tr>
<td>Total cost ($1983)</td>
<td>1,320,100</td>
<td>1,678,348</td>
</tr>
<tr>
<td>Average cost (unadjusted) ($)</td>
<td>4,415</td>
<td>11,042</td>
</tr>
<tr>
<td>Average cost ($1983)</td>
<td>10,910</td>
<td>11,042</td>
</tr>
<tr>
<td>Cost per 1,000 population (unadjusted) ($)</td>
<td>6.53</td>
<td>11.81</td>
</tr>
<tr>
<td>Cost per 1,000 population ($1983)</td>
<td>16.14</td>
<td>11.81</td>
</tr>
</tbody>
</table>
SUMMARY

The four basic goals for the 1980 census journey-to-work statistics program were to include additional transportation questions in the census to meet program needs, provide more journey-to-work data in standard census products, improve the quality of small-area place-of-work coding, and increase the utility of the UTPP. An assessment of the results of the 1980 census shows that the Census Bureau was quite successful in meeting these goals.

The number of transportation-related items included in the decennial census increased from three questions in 1960 and 1970 to eight questions in 1980. More journey-to-work data were published in standard census reports for all geographic areas. Three special subject reports on the journey to work were published in 1980 compared with one in 1970. More journey-to-work data were made available on computer tape in 1980 than ever before. About 73 percent of eligible workers were coded to block of work in 1980 compared with 63 percent in 1970. About 81 percent of eligible workers were coded at least to their census tract of work in 1980.

The 1980 census UTPPs were improved significantly over 1970. The 1980 package provided more data, greater geographic and product flexibility, and more user aids. The few 1980 UTPP problems included place-of-work coding errors in some areas, problems with the data display program, errors in the zone equivalency files, and a lack of user knowledge. In all, 152 UTPPs covering 175 SMSAs and other areas were produced from the 1980 census. A greater proportion of larger SMSAs and SMSAs in the Northeast were covered by UTPPs. A lesser proportion of smaller SMSAs and SMSAs in the South were covered. In constant 1983 dollars, the average cost of purchasing a UTPP was about the same in 1980 as in 1970 ($11,000). On a per-capita basis, the cost in constant dollars declined significantly from $16.14 per 1,000 persons in 1970 to $11.81 per 1,000 persons in 1980.
A Retrospective Look at the Albuquerque Conference Recommendations
Alan E. Pisarski

In late summer of 1973, a conference was held in Albuquerque, New Mexico, regarding transportation uses of census data. The 1970 decennial census had obtained an extensive data set on journey-to-work information. For the first time, the federal government had made available a standardized package of special tabulations with locally defined geography to expedite and expand local use of the census data. The package, called the Urban Transportation Planning Package (UTPP), clearly met an important need. Before its development, users had the choice of using standard census reports and products, with limited treatment of transportation subjects, or making a request for custom-built tabulations for their area, with consequent high costs and a long wait for their order. With the extensive but standardized package of tabulations, users lost a little in the flexibility to custom tailor the product to their individual needs but gained substantially in reduced delays and costs in obtaining transportation-related census data. A major benefit of this approach was the comparability between cities in the data products developed.

The participants at the conference in Albuquerque met to share their experiences with that package, to work out joint approaches to its more effective use, to resolve problems, and to look ahead to the 1980 census with the intent of producing a better product for future users. Their deliberations, findings, and recommendations, which materially improved the 1980 census program, are recorded in Transportation Research Board Special Report 145 (1).

The Albuquerque conference met in August 1973 with much the same mission and context as this conference in Orlando. The Albuquerque conference occurred more than a year earlier in the decennial census planning time sequence, but delays in the production of the 1980 data due to litigation, additional field work, and so forth, actually place the two conferences closer together in the time sequence of events in their respective decades.

One of the problems at Albuquerque was that the conference occurred early in the distribution phase of U TPP production. Few metropolitan planning organizations (MPOS) had the package and fewer had had the time to gain real experience with its application. In August 1973, according to the conference record, 112 packages had been ordered and less than half had been delivered (7 in 1972, 44 in 1973). As of the date of this conference, 140 packages of the 1980 U TPP had been delivered, with another 15 or so in preparation. If 1983 is compared with 1973, the situation looks worse than last time. Only about 20 packages had been delivered by August 1983. This was attributable in part to delays in the availability of final census data tapes that are input to the U TPP. However, the small number of packages delivered by August 1983 was also a result of modifications made to the standard U TPP processing system at the request of several of the early purchasers. The standard U TPP was developed to cover one Standard Metropolitan Statistical Area (SMSA), but systems to produce multi-SMSA, statewide, nonmetropolitan-area, and other types of packages were developed by census programmers to meet user needs. If the U TPP had been produced without these modifications, many MPOS would not have found the data to be useful in their planning regions.
The main reason that the 1973 and 1984 conferences were held so early in the planning sequence is that even with a decade between censuses, the time period available between receipt of the old product and the start of planning for the next is brief. In fact, selecting a point in that brief window of opportunity is the major determinant of when these conferences must meet.

In that context it can be said that many of those who met in Albuquerque in 1973 had immediate, operational concerns on their minds. The recommendations reflect this. They are heavily focused on getting out the 1970 products; knowing more about the prospective quality of the data, especially geography, before ordering; and clearing up problems of ordering, costing, and initiating processing. But still the conference participants took the time and displayed considerable foresight in laying out recommendations for 1980.

SHORT-TERM RECOMMENDATIONS

Many of the recommendations produced in 1973 were focused on better handling of the 1970 data. These short-term recommendations are given in Table 1. The assessment of the results of those recommendations—the "scorecard"—treats them in terms of both the response in the 1970s and the current response to parallel problems in the 1980s. A summary of the scorecard on the short-term recommendations would probably be given a grade of B. Most of the recommendations resulted in some response, although not always of the recommended scale or scope.

Communication

At Albuquerque there was intense concern about improved communication among users and between users and producers. That concern manifested itself in a continuing level of activity and interchange throughout the decade. A

TABLE 1 Short-Term Recommendations

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>No (coverage in other places)</td>
</tr>
<tr>
<td>Journey-to-work newsletter</td>
<td>Exists (available on request from the Census Bureau)</td>
</tr>
<tr>
<td>Directory of users</td>
<td></td>
</tr>
<tr>
<td>Technical reporting</td>
<td>Yes (more needed)</td>
</tr>
<tr>
<td>Regular meetings</td>
<td>Yes (more needed)</td>
</tr>
<tr>
<td>National and statewide analysis</td>
<td>Yes—some national analysis and summarization of 1970 data; limited statewide analysis</td>
</tr>
<tr>
<td>UTPP analysis</td>
<td></td>
</tr>
<tr>
<td>Origin-destination studies versus UTPP</td>
<td>Yes—studies done</td>
</tr>
<tr>
<td>UTPP as update</td>
<td>No definitive method, updating frequent</td>
</tr>
<tr>
<td>Recode option (let MPO recode poor</td>
<td>Yes (in New York only)</td>
</tr>
<tr>
<td>geocoding</td>
<td></td>
</tr>
<tr>
<td>UTPP purchase conditions (Caveat Emptor, better prepurchase information)</td>
<td>Yes—fundamentally successful—quality and information on quality improved</td>
</tr>
<tr>
<td>Technical support</td>
<td></td>
</tr>
<tr>
<td>FHWA to assist in UTPP use</td>
<td>Yes</td>
</tr>
<tr>
<td>Better data processing</td>
<td>Yes—UTPS-UTPP achieved (at least partially)</td>
</tr>
<tr>
<td>Special tabulations</td>
<td></td>
</tr>
<tr>
<td>Worker files</td>
<td>No (done in 1970, but demand in 1980 low)</td>
</tr>
<tr>
<td>Costs and specifications</td>
<td>Yes (cost improvements)</td>
</tr>
</tbody>
</table>
None ever materialized, but other instruments picked up the topic, for example, the Census Bureau's monthly Data User News, the Transportation SIG newsletter of the Urban and Regional Information Systems Association (URISA), and documents from FHWA, UMTA, and TRB. The recommendation for a newsletter remains valid today. It was proposed that a directory of users and buyers of the package be produced. Such a directory exists for the 1980 UTPP and is available from the Census Bureau. Regular meetings and technical reporting were proposed. Obviously, this conference in Orlando is one positive response to that need. But throughout the 1970s and early 1980s, TRB's Committee on Transportation Information Systems and Data Requirements and FHWA sponsored many technical sessions on the topic. More could have been done, but the record was positive.

**National and Statewide Analysis**

The record on national and statewide analysis is poor. It was proposed that extensive comparative analysis be undertaken using UTPP data at the national and state levels. Information is not readily available on all that might have occurred, but certainly no major studies were undertaken. Summary documents were produced from the 1970 journey-to-work data but more for trend analysis. The picture for 1980 does not look much brighter.

**UTPP Analysis**

It was proposed that studies be undertaken to link the UTPP to traditional origin-destination studies and to use it to update local data bases. Studies were done to link the two data sources definitionally but no one method--no cookbook approach--emerged. Updating techniques were frequent, and data base updating became a key function of the UTPP.

**Recode Option**

Given high variability in the level of geographic coding in 1970, it was recommended that MPOs be enabled to recode the geography for their region. This created disclosure problems and only in the case of New York was recoding undertaken in 1970, at considerable expense to the Tri-State Regional Planning Commission. This may again become a concern for the 1990s, given the financial constraints being faced.

**UTPP Purchase Conditions**

The recommendation was concerned with the lack of adequate information on the prospective quality of geographic coding in a region before the commitment to purchase the package. This problem was considered seriously, and both the quality and the information about the quality of geocoding have improved for 1980.

**Technical Support**

The request for greater technical support regarding data processing and general assistance on UTPP achieved many of its goals. Certainly more extensive
FHWA-UMTA field support could be envisioned, but the general level of support has been effective.

Special Tabulations

Emphasis was placed on other needs not met by the 1970 UTPP. Worker files (individual worker records with coarse geography to avoid disclosure) and other special tabulations were proposed. Worker files were built in 1970, particularly for New York. In 1980, the capabilities exist but demand so far has been low.

LONG-TERM RECOMMENDATIONS

The long-term recommendations from Albuquerque were clustered into five major groupings (Table 2). The first group (first by design) dealt with geocoding, which was and still is a major source of concern. The next two groups treated data content, separated into needed modifications to existing data items and wholly new content needs. The fourth area dealt with administrative and processing problems and the fifth with organizing for the 1980 census. The overall scorecard or the long-term recommendations is good—at least a B and

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geocoding</td>
<td></td>
</tr>
<tr>
<td>Use local skills</td>
<td>Yes—to compile coding materials</td>
</tr>
<tr>
<td>Local major generator data</td>
<td>Yes</td>
</tr>
<tr>
<td>Evaluate address format</td>
<td>Yes (added text re major generators)</td>
</tr>
<tr>
<td>Use X-Y coordinates</td>
<td>No (possible)</td>
</tr>
<tr>
<td>Outside block areas</td>
<td>Yes—major improvements</td>
</tr>
<tr>
<td>Data items</td>
<td></td>
</tr>
<tr>
<td>Modifications</td>
<td></td>
</tr>
<tr>
<td>Actual automobiles (3+)</td>
<td>No (some resolution)</td>
</tr>
<tr>
<td>Mode choice</td>
<td></td>
</tr>
<tr>
<td>Add change of mode</td>
<td>No</td>
</tr>
<tr>
<td>Add motorcycle</td>
<td>Yes</td>
</tr>
<tr>
<td>Add bicycle</td>
<td>Yes</td>
</tr>
<tr>
<td>Part-time and multiple-job workers</td>
<td>No</td>
</tr>
<tr>
<td>New</td>
<td></td>
</tr>
<tr>
<td>Time of departure or travel time or both</td>
<td>Yes (travel time)</td>
</tr>
<tr>
<td>Nonwork total or detailed data</td>
<td>No</td>
</tr>
<tr>
<td>Workplace by land use categories</td>
<td>No</td>
</tr>
<tr>
<td>Administration and processing of UTPP</td>
<td></td>
</tr>
<tr>
<td>Cost reduction</td>
<td>Yes</td>
</tr>
<tr>
<td>Delivery-time reduction</td>
<td>No</td>
</tr>
<tr>
<td>Centralized DOT funding</td>
<td>No</td>
</tr>
<tr>
<td>Expanded prepurchase information</td>
<td>Yes</td>
</tr>
<tr>
<td>Expanded support software</td>
<td>Yes (UTPS)</td>
</tr>
<tr>
<td>Organization for 1980</td>
<td></td>
</tr>
<tr>
<td>Develop 1980 committee</td>
<td>Yes</td>
</tr>
<tr>
<td>Coordinate experience</td>
<td>No/Yes</td>
</tr>
<tr>
<td>Communicate</td>
<td>No</td>
</tr>
<tr>
<td>Guide 1980 plan</td>
<td>Yes</td>
</tr>
<tr>
<td>Alternative data sources</td>
<td>Yes (partly)</td>
</tr>
<tr>
<td>More conferences</td>
<td>Yes</td>
</tr>
<tr>
<td>Census liaison</td>
<td>Yes</td>
</tr>
</tbody>
</table>
perhaps an A-. This provides encouragement to the current effort. It suggests that if recommendations are properly structured and well-supported, the system is responsive. If this conference can achieve similar results, it will have been a success.

Geocoding

There was a family of recommendations dealing with geocoding; most of them focused on the real weaknesses in the 1970 geographic system. The first recommendation dealt with utilization of local coding skills in 1980. It was proposed that a mechanism be found to permit local transportation agency personnel to assist in coding addresses. Although this did not happen directly, local personnel were used to assist in compiling local coding materials. This was the subject of the second recommendation, which cited the need for special expertise in coding local major generator addresses. Linked to these, another recommendation proposed modification to the address-recording format on the census form. This was accomplished to the extent that text was added to explain that major generators could be entered by respondents as legitimate addresses and to explain how to record them. A fourth recommendation proposed greater use of X-Y coordinate systems to identify and present work data. Although the census capability in coordinate systems has expanded appreciably, they are not used as a regular product of census output. Finally, recommendations were made to clarify coding and processing outside the block areas. In this case the Bureau of the Census has made substantial improvements, expanding the block areas for coding and the commutersheds for processing.

Data Items

Modifications

The first recommendation in the group of modifications proposed that automobile ownership be recorded in actual numbers and the category for three or more automobiles be deleted. Although the proposed solution was not adopted, the problem it addressed was somewhat resolved by splitting the vehicle category into two groups: (a) automobiles and (b) vans and trucks.

A second recommendation proposed changes to the mode-choice question. It proposed a structure for obtaining information on change of mode where more than one mode of travel was used for work. This was not done and the problem persists. A second part of this recommendation proposed adding motorcycles and bicycles to the mode-choice list. Both of these modes were added by the Bureau of the Census. The final recommendation in this group dealt with modifications in job questions to identify part-time and multiple-job workers. No changes have been made in this area.

New

Three new areas for data items were proposed. The first recommended adding either departure time to work or travel time to work or both to the questionnaire. As is known, travel time was successfully added to the questionnaire. Departure time remains an issue. The second proposed area for new content was in nonwork-related travel. It was recommended that at a minimum a total trip count be recorded, or, if possible, detailed trip data for selected purposes be obtained. No progress was made in this area. Finally, it was
proposed that workplaces be classified by a set of land use categories. This proposal was not adopted by the Census Bureau.

Administration and Processing

There were a number of recommendations dealing with the logistics and financing of the UTPP. The first recommendation observed that both time to delivery and product costs needed to be reduced. In terms of cost, success was achieved. Package costs of the 1980 UTPP are about the same in dollars as in 1973 but the dollars are much inflated. Delivery times have actually worsened compared with 1970 due to delays in the preparation of the input data to the UTPP and user-requested modifications to the basic package. The UTPP program itself was better set up in 1980 than in 1970.

A third recommendation proposed that better information be available in 1980 regarding the prospective quality of geocoding before package purchase. This certainly has been achieved, for which the Census Bureau deserves considerable credit. A final recommendation on this group proposed that expanded software be developed to support UTPP. This goal has been partially achieved through the Urban Transportation Planning System. A series of procedures based on case studies to adapt UTPP data to urban applications is being produced. These activities are described in Transportation Planners' Guide to Using the 1980 Census (1).

Organization for 1980 Planning

A family of proposed actions to assist in planning for 1980 were recommended. These actions were to be undertaken by a working committee. They included coordination, communication, guidance, and evaluation. Although the committee that resulted was not as formal as the one proposed, it did in fact achieve most of the activities recommended.

SUMMARY

It should be noted that the Albuquerque conference provided a positive thrust to efforts to improve the journey-to-work data program. Its recommended actions were acted on to a degree rare in the process of changing large systems. Many of its observations and recommendations retain currency 11 years later and can serve usefully to guide the efforts at this conference.

REFERENCES

Part III  Data-User Experience with the 1980 Census
The purpose of this session is to describe the uses of the data collected in the 1980 census. Information presented in the papers that follow describes in detail such uses, ranging from national, state, local, and interregional planning to service to local government on land use and employment estimates.

The results from the census have been used by many organizations, agencies, and citizens for many purposes. Land developers use census data to study the economic viability of expensive projects. The census produces basic information that could not be collected by project sponsors to properly investigate the economic, environmental, and transportation alternatives of both public and private initiatives.

From a strictly transportation planning point of view, the transportation-oriented data have generally been used to develop a new data base for urbanized areas. Another important use has been in the application of existing models and in the development of new models, especially for mode-split analysis and shared-ride options. Data have been used for subarea planning, alternatives analysis, air-quality and energy studies, and land use forecasting. The data have highlighted the unserved transit patron and provided information for Title VI transit reports. Studies of hazardous waste transportation have been done for both night and day circumstances.

Overall, census data are being extensively used. As time progresses, information on other uses will be forthcoming. Because independent data collection is now prohibitively expensive, reliance on decennial census data has become universal. The need will continue to expand over time as more users become aware of the richness of the data.
Uses of Transportation and Place-of-Work Data from
the 1980 Census
Rolf R. Schmitt

The decennial census is increasingly a source of converging interests between the transportation community and other planners, analysts, and researchers. The transportation community has become increasingly dependent on the entire range of data in the decennial census, whereas the so-called transportation questions in the decennial census have become a major resource for a widening spectrum of data users. These converging interests are underscored by the papers in this part.

The portions of the decennial census questionnaire most closely associated with transportation include the questions on place of work, travel time, and vehicle availability. The place-of-work question is the key to understanding the growing constituency for these portions of the decennial census within and beyond the transportation community. This question provides the means to determine the number, social and economic characteristics, and travel behavior of workers at their workplaces. Nearly as much can be known about the nation's daytime geography as about its population at home. Such information is essential for planning and marketing virtually all kinds of facilities and services in both the public and private sectors.

The growing constituency for decennial census data within the transportation community is suggested in the first three papers. Richard Glaze examines from the Florida perspective a relatively new involvement of state transportation agencies in acquiring and using data from the decennial census. Thabet Zakaria reviews the ongoing, traditional uses of census data for urban transportation planning based on his Philadelphia experience. Sam Zimmerman focuses on the particular needs of transit based on nationwide experiences.

The growing constituency beyond the transportation community for the transportation elements of the decennial census is suggested by the next four papers. Hammel illustrates how the journey-to-work questions have been used by public agencies involved in economic development and social service planning in the New York area. Diamond indicates the diverse uses of similar census data in Southern California by private firms for marketing, site selection, and so forth. Bontempo and Surridge cover both public and private applications of the data by a statewide constituency of small agencies, firms, and individuals in Pennsylvania. Reed brings the discussion back to a national scale, explaining how one study is currently using the data to compare changes over time and among metropolitan areas in geography, demographics, and travel patterns.

Part III of this report concludes with a paper by McDonnell that summarizes comments by the users of the 1980 census data and compares those comments with those of users of the equivalent data from the 1970 census. These experiences and evaluations by the users of the 1980 census, in conjunction with their views of changing data needs over the next decade, suggest the perspectives on which their recommendations for the 1990 census are based.

Most of the papers in Part III were prepared as background presentations for this conference to provide an overview of the diverse experiences with the 1980 census data. The perspectives of these papers taken together should be viewed as representative rather than as comprehensive, however, because many applications and experiences are described in Transportation Research Record 981, which provides much detail that could not be accommodated here.
Statewide Transportation Planning and Coordination of the 1980 Urban Transportation Planning Package
Richard S. Glaze

Census Bureau data products have long played a vital role in transportation planning. They are of particular importance to states like Florida that have a rapidly expanding population base, which places ever-increasing demands on all levels of the transportation system. The Florida Department of Transportation (FDOT), because it serves as the primary resource for transportation-related data services to state, regional, and local agencies, has taken a leading role in the acquisition, processing, and distribution of transportation-related Census Bureau data products in the state of Florida. That role and the role of other selected transportation agencies throughout the country in the use of 1980 census products will be discussed.

FDOT ROLE

In 1980, following a study of data requirements for urban transportation planning modeling and evaluation, FDOT determined that its urban travel-demand models in the state’s 15 urbanized areas should be standardized and input data requirements should be simplified. Cross classification rather than regression equations was selected as the model structure for trip generation. In addition, FDOT decided to make extensive use of 1980 census products in the formulation of base-year data and model calibration activities. With support of local metropolitan planning organizations (MPOs), FDOT initiated an acquisition program for the purchase of Census Bureau Summary Tape Files and the Urban Transportation Planning Package (UTPP).

In November 1981, as part of the budget cycle, MPOs were provided with an estimate of 1981-1982 planning funding allocations that might be expected for Florida. With the subsequent passage of the Surface Transportation Assistance Act of 1982, however, the total allocation of planning funds to Florida amounted to approximately $100,000 more than the budget estimate. In a proposal to the MPOs, FDOT suggested that it be granted the authority to use the additional planning funding allocation to purchase the Census Bureau UTPP for all MPOs in the state, with FDOT providing the required 20 percent matching funds. On receipt of formal resolutions from each MPO to that effect, FHWA approved the proposal and FDOT programmed the necessary matching funds in its budget and executed a contract with the Census Bureau for purchase. The total contract price of Florida's UTPP was $118,000.

In addition to administrative and funding support mentioned above, FDOT provides the necessary funding for the purchase of Census Bureau Summary Tape Files as well as providing data processing services to the local MPOs. In the case of the UTPP, local MPO staffs provided the Census Bureau with an annotated listing of all census metropolitan geography by internal and external traffic analysis zones (TAZs) and FDOT provided the necessary data processing services. The final work product delivered to each MPO consisted of both a microfiche file
and a hard copy of the UTPP covering their Standard Metropolitan Statistical Area. In instances where the local MPO had the appropriate data processing facilities, a tape copy of the UTPP was also provided.

To date, FDOT has used the Census Bureau data products to generate trip tables, list external trips, describe residential and workplace population, and study carpooling. Although experience with the UTPP has not been without problems (such as factoring for other-than-work trips), FDOT has been pleased with the results.

SURVEY OF STATE TRANSPORTATION AGENCY ROLES

To provide some additional insight into the use of Census Bureau materials, FDOT contacted 26 geographically dispersed state and regional transportation agencies regarding their purchase or use of Census Bureau data products. Time and budget constraints precluded the inclusion of all states; however, the number of inquiries was sufficient to show a substantial variation in prevailing attitudes toward Census Bureau products and the UTPP in particular. For example, nine states purchased complete UTPP tabulations for each of their urbanized areas; two others, Louisiana and Wisconsin, developed purchase programs oriented toward the smaller areas in their states and left purchase as an option for the larger urbanized areas (see Table 1).

The interviews also indicated a variety of philosophies on the working relationships between state agencies and MPOs, which influenced the opinions presented on census data products. In some states, such as Florida, the department of transportation (DOT) has a close working relationship with the MPOs. Because FDOT not only serves as a primary data resource but also provides the majority of MPO data processing services and modeling support, it makes extensive use of census products. At the other extreme are states in which the MPO has the primary responsibility for data analysis and the development of data resources and the DOT has only a limited input. State DOT interest in Census Bureau data products, and the UTPP in particular, may be directly related to the working relationships established between the DOT and MPOs.

The interviews also indicated a general level of satisfaction with Census Bureau products and an equal level of dissatisfaction with delays in product delivery. The most common problems seem to have been associated with rapid urban growth. One problem commonly noted was the time lapse between the address reference file (GBF/DIME file) and the delivery of the UTPP. In Florida, considerable effort was expended in coding external zones because of development and annexations within the urban areas.

Acquisition of census data products varied from state to state. Some, like Florida, purchased Summary Tape Files from the Census Bureau, and others took advantage of the State Data Center program. With the UTPP, however, there was substantial agreement on funding sources. In most instances planning funding as used, usually amounting to 80 percent of the purchase price; the balance was provided by the state. The survey indicated only minor use of UMTA and Highway Planning and Research (HPR) funding.

Six states that did not purchase the UTPP were also interviewed and were asked to describe the basis for that decision. The results were as follows:

1. North Carolina: A state-conducted survey was used to provide information needed to develop trip-generation data. These data were available with less time lag for distribution and at relatively less expense than the UTPP and were specifically tailored to meet the state's needs.

2. California: Regions were not initially interested in sharing costs with the state. Later, the regions purchased UTPP independently.
### TABLE 1  State Transportation Agency Users of Census Bureau Data Products

<table>
<thead>
<tr>
<th>State Agency</th>
<th>Urbanized Area Coverage</th>
<th>Approximate Cost ($)</th>
<th>Funding Distribution (%)</th>
<th>Summary Tape Files</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut DOT</td>
<td>All</td>
<td>N/A</td>
<td>Planning, 85; state, 15</td>
<td>No</td>
</tr>
<tr>
<td>Florida DOT</td>
<td>All</td>
<td>118,000</td>
<td>Planning, 80; state, 20</td>
<td>Yes</td>
</tr>
<tr>
<td>Louisiana DOT</td>
<td>Somec</td>
<td>10,000</td>
<td>HPR</td>
<td>Yes</td>
</tr>
<tr>
<td>Massachusetts Department of Public Works</td>
<td>Somed</td>
<td>N/A</td>
<td>HPR</td>
<td>No</td>
</tr>
<tr>
<td>Michigan DOT</td>
<td>All</td>
<td>N/A</td>
<td>Planning, 40; UMTA, 40; state, 20</td>
<td>No</td>
</tr>
<tr>
<td>New Hampshire DOT</td>
<td>All</td>
<td>100,000</td>
<td>Planning and HPR</td>
<td>No</td>
</tr>
<tr>
<td>New Jersey DOT</td>
<td>All</td>
<td>100,000</td>
<td>HPR, 85; state, 15</td>
<td>No</td>
</tr>
<tr>
<td>North Dakota State Highway Depart-</td>
<td>All</td>
<td>N/A</td>
<td>Planning, 85; state, 15</td>
<td>No</td>
</tr>
<tr>
<td>ment</td>
<td></td>
<td></td>
<td>Planning, 80; state, 20</td>
<td>(Depository)</td>
</tr>
<tr>
<td>Rhode Island Department of Admini-</td>
<td>All</td>
<td>N/A</td>
<td>Planning, 80; state, 20</td>
<td>State data center</td>
</tr>
<tr>
<td>stration</td>
<td></td>
<td></td>
<td>Planning, 50; HPR, 50</td>
<td>State</td>
</tr>
<tr>
<td>Virginia DOT</td>
<td>Somee</td>
<td>N/A</td>
<td>Planning, 80; state, 20</td>
<td>Yes</td>
</tr>
<tr>
<td>Wisconsin DOT</td>
<td>Some</td>
<td>12,500</td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

Note: Data are from telephone interviews conducted by the Bureau of Policy Planning, Division of Planning and Programming, FDOT, Nov. 1984. N/A = not available, HPR = Highway Planning and Research.

aData processed by states.
bTapes acquired from State Data Center.
cFor all urbanized areas except the three largest SMAs.
dCensus Bureau provided a town-to-town trip table for state, excluding Boston SMA.
eFor all urbanized areas except the Washington/Maryland/Virginia SMA.
3. Colorado: The state DOT required each MPO to generate its own data for planning needs.
4. Pennsylvania: Project-specific data were obtained from local planning commissions. There was little systems planning, which might utilize UTPP data.
5. New Mexico: UTPP data were not needed. The current priority for state transportation planning was the development of a highway needs package.

In most instances, the urbanized areas within each state identify their own data needs and resources. One state commented that it was unable to generate any MPO enthusiasm for undertaking a shared purchase initially, although the MPOs eventually purchased the UTPP independently. It was also noted that nonpurchasing states made little use of other Census Bureau products, preferring to use alternative data sources.

SUBSTATE AGENCY ROLES

In addition to state agencies, selected regional purchasers of the UTPP were also interviewed. This group consisted of councils of government (COGs), coordinating councils, or regional planning agencies (see Table 2), in most instances from states that did not purchase the UTPP. In general, most were satisfied with their purchase, using their packages heavily for data base updates, local and regional system studies, and corridor studies.

APPLICATIONS

Applications of the Census Bureau products are as varied as the needs and problems facing the transportation planning community. In general, however, model calibration, land use and corridor planning, mass transit and special generator studies proved to be the most common. The following is a list of the applications cited by the agencies contacted during the survey:

- Transportation modeling
- Model calibration
- Mass transit studies
- Regional planning
- Location studies
- Population projections
- Trip generation
- Corridor planning
- Carpooling studies
- Subregion area planning
- Data base development
- Land use studies

FDOT is making extensive use of census products in development of the Florida Transportation Plan. Data from the 1980 census were used to compute population density and determine persons per household. Those data coupled with data from the 1977 Nationwide Personal Transportation Study were used in the development of a trip-density distribution table. These data will be part of an analysis of market potential for alternative future transportation modes.

Each user of census materials was also asked to comment on applications of data products utilizing microcomputers, specifically the downloading of census data to microcomputer diskettes (see Table 3). Nine agencies responded that downloading of some census products (Summary Tape Files) had been completed or was in the planning stages, and four indicated that downloading was under active consideration. Most, however, expressed an interest in future census products in microcomputer format.
### TABLE 2 Substate Area Agency Users of Census Bureau Data Products

<table>
<thead>
<tr>
<th>Agency</th>
<th>Purchased by</th>
<th>Approximate Cost ($)</th>
<th>Type of Funds</th>
<th>Data Processed by</th>
<th>Purchased by</th>
<th>Data Processed by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Council of Fresno County Governments (Calif.)</td>
<td>Agency</td>
<td>5,000-6,000</td>
<td>N/A</td>
<td>Consultant</td>
<td>County</td>
<td>County</td>
</tr>
<tr>
<td>Denver COG (Colo.)</td>
<td>Agency</td>
<td>20,000</td>
<td>N/A</td>
<td>Planning</td>
<td>Agency</td>
<td>Agency</td>
</tr>
<tr>
<td>Washington, D.C., COG</td>
<td>Agency</td>
<td>N/A</td>
<td>Planning</td>
<td>Agency</td>
<td>Agency</td>
<td>Agency</td>
</tr>
<tr>
<td>Central Massachusetts RPC</td>
<td>State</td>
<td>N/A</td>
<td>State</td>
<td>N/A</td>
<td>N/A</td>
<td>(Depository)</td>
</tr>
<tr>
<td>Strafford RPC (N.H.)</td>
<td>Agency</td>
<td>2,500</td>
<td>Planning</td>
<td>Agency</td>
<td>Agency</td>
<td>Agency</td>
</tr>
<tr>
<td>Middle Rio Grande COG (N. Mex.)</td>
<td>Agency</td>
<td>N/A</td>
<td>N/A</td>
<td>Agency</td>
<td>Agency</td>
<td>Agency</td>
</tr>
<tr>
<td>N.E. Ohio Coordinating Agency</td>
<td>Agency</td>
<td>N/A</td>
<td>Planning</td>
<td>Agency</td>
<td>Agency</td>
<td>Agency</td>
</tr>
<tr>
<td>Mid-Willamette Valley COG (Oreg.)</td>
<td>Agency</td>
<td>3,500</td>
<td>Planning</td>
<td>State (by request)</td>
<td>Agency</td>
<td>Agency</td>
</tr>
<tr>
<td>Puget Sound COG (Wash.)</td>
<td>Agency</td>
<td>N/A</td>
<td>Planning</td>
<td>Agency</td>
<td>Agency</td>
<td>Agency</td>
</tr>
</tbody>
</table>

Note: Data are from telephone interviews conducted by the Bureau of Policy Planning, Division of Planning and Programming, FDOT, Nov. 1984. N/A = not available; RPC = regional planning council.

### TABLE 3 Specific Data Processing Tasks for Urban Transportation Planning Package

<table>
<thead>
<tr>
<th>Agency</th>
<th>Tract or Block to TAZ Equivalency Data Processed by User Agency</th>
<th>Downloading to Microcomputer Diskettes</th>
<th>Complete or Planned</th>
<th>Under Consideration</th>
<th>Not Planned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut DOT</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Florida DOT</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Louisiana DOT</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Massachusetts DPW</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Michigan DOT</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Hampshire DOT</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Jersey DOT</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. Dakota Highway Department</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rhode Island DOT</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virginia DOT</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wisconsin DOT (with MPO assistance)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Council of Fresno County Governmentsb</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denver COG</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washington, D.C., COG</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central Massachusetts RPC</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strafford RPC</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle Rio Grande COG</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>N.E. Ohio Coordinating Agency</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid-Willamette Valley COG</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Puget Sound COG</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Data are from telephone interviews conducted by the Bureau of Policy Planning, Division of Planning and Programming, FDOT, Nov. 1984.  

a Tract or block to TAZ equivalency data not processed by user.  
bPreexisting equivalency data.  
cLocal jurisdictions processed equivalency data.
Evaluation and Use of the 1980 Urban Transportation Planning Package in the Delaware Valley Region

Thabet Zakaria

In 1983, the board of the Delaware Valley Regional Planning Commission (DVRPC) authorized $50,000 for the purchase of the 1980 Urban Transportation Planning Package (UTPP) for the Delaware Valley region, which includes portions of Pennsylvania and New Jersey. Specifically, the region includes four suburban counties in Pennsylvania (Bucks, Chester, Delaware, and Montgomery), four suburban counties in New Jersey (Burlington, Camden, Gloucester, and Mercer), and the city of Philadelphia. The Delaware Valley includes an area of 3,833 mile$^2$ and a population of more than 5 million. There are 352 municipalities, including such major cities as Trenton and Camden in New Jersey and Chester in Pennsylvania.

DVRPC received the UTPP data tapes in 1984, almost 4 years after Census Day in 1980. Work has been initiated to process and print data for various levels of geographic units for purposes of transportation planning analysis and evaluation and for project studies. Because the contents of the UTPP are extensive, work on the processing and evaluation of data is still under way and will continue into 1985.

The purpose of this brief paper is to discuss the experience of DVRPC with the UTPP data with special emphasis on the journey-to-work information and other socioeconomic information useful to transportation planning. Some specific problems with the 1980 UTPP are defined, the uses of data in several DVRPC planning projects are described, and some recommendations for improving the quality of the 1990 census data are offered.

CONTENTS OF THE 1980 UTPP AND AREAL SYSTEM

The UTPP information was collected from the 1980 long-form census questionnaire distributed to about 17 percent (1 in 6) of all households. However, because of census budgetary constraints, only one-half (1 in 12) of this sample was processed for work-trip information at the place of work (1). The UTPP consists of six parts containing 82 tabulations of data items, including basic socioeconomic characteristics of the population and workers such as income, sex, age, race, households, housing units, car ownership, and employed persons. The UTPP also includes information on work trips, travel time, car occupancy, carpools and vanpools, and vehicle types used in the journey to work. Nonwork trips, however, were not collected in either the 1970 or 1980 census (2).

The data were collected using census areal units consisting of blocks, block groups, tracts, Minor Civil Divisions (MCDs) (townships, boroughs, cities, and villages), counties, and Standard Metropolitan Statistical Areas (SMSAs). In 1975, the DVRPC grid system was converted to the census areal system to avoid the time-consuming preparation of a correspondence (equivalency) table between the two systems, which was necessary for the 1970 UTPP.

DVRPC requested the Census Bureau to produce all six parts of the 1980 UTPP
for the three Delaware Valley region, including information for 20 external counties and cities, which were specified for Part VI of the UTPP. Based on DVRPC experience with the 1970 data, it was felt that the 1980 UTPP would satisfy the majority of data requests for transportation planning studies that would be conducted by DVRPC staff, its member governments, or transportation consultants.

EVALUATION OF THE 1980 UTPP DATA

A review of the 1980 UTPP data for the Delaware Valley region indicated some programming, definitional, and statistical problems. Unlike the 1970 UTPP, however, the 1980 data on work-trip destinations do not contain trips not identified by block, tract, or MCD (1). Generally, the data on population, household, car ownership, employed persons, and other socioeconomic characteristics obtained from Part I are quite accurate and do not require any adjustment due to sampling errors or other errors. Part I data compare favorably with the 100 percent census counts. The magnitude of differences between the population produced from Part I and from the 100 percent counts for tracts, MCDs, and counties is small (less than 1 percent) and as such is acceptable for planning purposes.

Parts III, IV, V, and VI contain trip data to the place of work for various geographic units such as tracts, MCDs, and counties. If trip destinations by resident and nonresident workers living in commutershed areas are added together, the sum will be approximately equal to the number of jobs, or employment. A certain percentage of these work-trip destinations (employment) should be added to account for workers who were absent during the census week due to illness, vacation, or other personal reasons and for workers who had more than one job (3). Based on the Bureau of Economic Analysis (BEA) and DVRPC employment data, the UTPP employment, or number of trips to the place of work, was increased by 9.27 percent, 1.54 percent for absenteeism and 7.73 percent for multiple-job workers (4). A comparison of UTPP employment before and after adjustments for selected municipalities, counties, and the total region showed that the percent difference between the adjusted UTPP employment estimates and those estimated by BEA or DVRPC is small. The differences between the two sets of regional and county employment data range from 0.2 to 2.6 percent.

Most parts of the UTPP include information on the worker's mode of transportation to work. The travel-mode proportions appear to be reasonable because they compare favorably with DVRPC highway traffic counts and transit surveys for individual counties and the region. Table 1 shows that the

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Comparison of 1980 UTPP and DVRPC Work-Trip Estimates for Highway and Public Transportation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areal Unit</td>
<td>Mode</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Philadelphia CBD</td>
<td>Public transportation</td>
</tr>
<tr>
<td></td>
<td>Railroad</td>
</tr>
<tr>
<td></td>
<td>Subway-elevated</td>
</tr>
<tr>
<td></td>
<td>Surface</td>
</tr>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>DVRPC region</td>
<td>Public transportation</td>
</tr>
<tr>
<td></td>
<td>Highway</td>
</tr>
</tbody>
</table>
difference between the UTPP data and actual counts for total public transportation work trips is less than 1 percent. However, such a difference becomes large for travel submodes within smaller areas. In the Philadelphia central business district (CBD), the difference in the category of subway-elevated trips is about 33 percent. These large differences are mainly due to incorrect responses to the questionnaire. It appears that many respondents confused the access mode to the subway station with the subway mode, which is supposed to be the principal mode of travel to work according to the census definition. Bus or trolley rather than subway was reported as the principal means of transportation of workers in some areas. As shown in Table 1, the surface trips (bus and trolley) are overestimated as much as the subway-elevated trips are underestimated.

These problems are similar to those experienced with the 1970 UTPP (5). However, the magnitude of 1980 errors is smaller. For these reasons, the UTPP trip information should be adjusted before it is used for transportation planning.

USES OF THE 1980 UTPP AT DVRPC

Since the early 1970s, DVRPC has been forced to rely on census data for transportation planning and travel forecasting because of rising costs of large-scale data collection such as regional home interviews and employment and land use surveys. DVRPC used the 1970 census data to check and validate traffic simulation models for producing traffic analyses based on up-to-date information. Census work trips, housing statistics, car ownership, employed persons, and employment data were used to estimate trip generation and distribution patterns between transportation simulation zones. In addition, information about the journey to work and other characteristics of workers has been used by DVRPC, local and state governments, transit operating agencies, and private corporations to make a variety of decisions on transportation and locational matters.

The uses of the 1980 UTPP in the Delaware Valley region are somewhat similar to those applications outlined in the Transportation Planners' Guide to Using the 1980 Census (3). These include the study of bus circulation patterns, location of park-and-ride lots and express bus service, study of accessibility and special population segments, analysis of highway and transit trips, planning of highway and public transportation systems, planning and analysis of projects, update of traffic simulation models, analysis of work-trip trends, location of shopping centers and service industries, analysis of parking requirements, and studies of employment.

DVRPC has already used census data in various studies and will continue to use such data in transportation planning and nontransportation planning activities because it is the only comprehensive information at the regional and local levels. There are at least six major uses of the 1980 UTPP in the Delaware Valley region. Some of these have been completed and some will continue into the future.

Establishment of a Data Base for Transportation Planning

DVRPC has prepared a data bank for transportation planning at the block-group and tract levels. This information includes population, employment, work trips, car ownership, and other socioeconomic variables required for traffic simulation and transportation analysis and planning. Such data have been extracted from Parts I, III, IV, and V of the UTPP. All data items have been edited for reasonableness based on other census data and DVRPC surveys, traffic counts, and employment files. These data will be used in most transportation system and project planning studies.
Preparation of Data Summaries and Evaluation of Trends

DVRPC completed a report on the journey-to-work trends in the Delaware Valley region (4). This report compares the 1970 and 1980 journey-to-work information, means of transportation for commuting to work, employed persons, and employment at the county and regional levels. It also analyzes the commuting flow between the counties of the Delaware Valley region and surrounding counties and cities. The report was well received by planners and decision makers because it provides factual information about trends in development and travel patterns in the region. For example, Table 2, taken from the report, shows the 1970-1980 trend in the distribution of Montgomery County workers by place of work. Other tables show the trends in employment and mode of travel for all DVRPC counties.

Six short data bulletins were also published. Each includes one or two information items obtained from Parts I or VI of the UTPP. For example, a bulletin was prepared on car ownership growth between 1970 and 1980 for the counties in the Delaware Valley region. It also includes households stratified by the number of cars owned (zero, one, two, or three or more cars).

Update of DVRPC Traffic Simulation Models

A project has been initiated to update the DVRPC travel forecasting models using the 1980 UTPP. As mentioned before, the 1970 UTPP was used to check and update the DVRPC traffic simulation models. These models will be updated again using 1980 census data. The DVRPC travel simulation models follow the traditional steps of trip generation, trip distribution, modal split, and travel assignment and utilize the computer programs included in the federally sponsored Urban Transportation Planning System (UTPS). A careful review and evaluation of the results of each model will be conducted and necessary adjustments will be made.

<table>
<thead>
<tr>
<th>Place of Work</th>
<th>No. of Workers</th>
<th>Percent Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVRPC region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bucks County</td>
<td>8,488</td>
<td>14,325</td>
</tr>
<tr>
<td>Chester County</td>
<td>5,900</td>
<td>10,525</td>
</tr>
<tr>
<td>Delaware County</td>
<td>5,897</td>
<td>7,773</td>
</tr>
<tr>
<td>Montgomery County</td>
<td>158,966</td>
<td>204,673</td>
</tr>
<tr>
<td>Philadelphia</td>
<td>54,489</td>
<td>55,598</td>
</tr>
<tr>
<td>Burlington County</td>
<td>1,632</td>
<td>552</td>
</tr>
<tr>
<td>Camden</td>
<td>3,089</td>
<td>1,643</td>
</tr>
<tr>
<td>Gloucester County</td>
<td>883</td>
<td>225</td>
</tr>
<tr>
<td>Mercer County</td>
<td>1,877</td>
<td>354</td>
</tr>
<tr>
<td>Total</td>
<td>241,241</td>
<td>295,648</td>
</tr>
<tr>
<td>Outside DVRPC region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Berks County</td>
<td>2,499</td>
<td>3,070</td>
</tr>
<tr>
<td>Lancaster County</td>
<td>82</td>
<td>172</td>
</tr>
<tr>
<td>Lehigh County</td>
<td>633</td>
<td>773</td>
</tr>
<tr>
<td>New Castle County</td>
<td>513</td>
<td>282</td>
</tr>
<tr>
<td>Northampton County</td>
<td>665</td>
<td>196</td>
</tr>
<tr>
<td>Other</td>
<td>5,504</td>
<td>4,185</td>
</tr>
<tr>
<td>Total</td>
<td>9,896</td>
<td>8,678</td>
</tr>
<tr>
<td>Total workers</td>
<td>251,137</td>
<td>304,326</td>
</tr>
</tbody>
</table>
to achieve the most accurate calibration. The simulated traffic volumes will be compared with actual highway traffic counts and public transportation ridership to assure that acceptable accuracy of the simulated results is obtained from these models.

Use in Highway and Transit Corridor Studies

The 1980 UTPP data, especially the journey-to-work information contained in Part IV, have been used in three transit corridor studies to check the travel demand or ridership for each transit submode, including high-speed rail line, express bus and park-and-ride service, and local bus service. The 1980 data will also be used in many future highway and transit studies because it is the only information available for transportation planning. The use of these data minimizes any large-scale data collection and decreases the rising costs of surveys required for transportation planning.

Application in Strategic Planning and Economic Development

DVRPC has used the 1980 UTPP information on employment, particularly Part V, to evaluate the significant changes in the type and location of industries and commercial establishments. This evaluation will result in recommendations and strategies aimed at attracting new industries and high-technology firms to the Delaware Valley. Also, employment information is useful to the redevelopment of declining areas of old urban centers and provision of the required physical improvements for their rehabilitation.

Provision of 1980 UTPP Data to Public Agencies and Private Corporations

Finally, DVRPC intends to sell the 1980 UTPP data to any public or private agency involved in planning or urban studies. This may include studies for housing, finance, real estate, health facilities, social services, economic base, and economic development. It appears that some planning agencies and private companies in the Delaware Valley region are interested in obtaining the UTPP information for their various studies.

FINDINGS AND CONCLUSIONS

Generally, the 1980 UTPP for the Delaware Valley region contains data of good quality for transportation planning, economic base and employment location studies, urban development analysis, and planning and evaluation of public services. However, the evaluation of UTPP data indicates a few programming, statistical, and bias problems. Most of these problems were resolved before DVRPC used the UTPP for trend analyses, information purposes, traffic simulation, highway and transit project studies, and strategic planning. The errors in the 1980 data are generally smaller than those found in the 1970 UTPP. Trip and employment information should be adjusted before it is used in transportation planning studies because it does not include all workers or jobs.

Most of the 1980 UTPP problems and errors can be avoided in the 1990 census by quality control edits and a careful review of the census questionnaire, sample size, and the computer programs required for processing the information. Specifically, the journey-to-work questions should be simplified to prevent any confusion on the part of respondents on such questions as mode of travel and industry classification. The questionnaire should be redesigned to capture
multimodal trip information from the place of residence to the place of work. The employment categories should be simplified to avoid any error or misunderstanding in the employment sectors. The sample size (8.3 percent) for coding work-trip destinations should be increased 100 percent, as originally planned, to improve the quality of the trip matrix used to calibrate trip distribution models for travel forecasting. The format of the UTPP tapes should be simplified, and the print program should be made operational for any urban region. Concurrent with the 1990 census, samples of nonwork trips should be collected by density of development for several urban regions around the country. Finally, a more timely release of the 1990 data is obviously important to all census users.

ACKNOWLEDGMENT

This paper was financed in part by the Federal Highway Administration and Urban Mass Transportation Administration of the U.S. Department of Transportation and by the Pennsylvania and New Jersey Departments of Transportation.

REFERENCES


The author is responsible for the findings and conclusions in this paper, which may not represent the official view or policies of the funding agencies.
Transit Planning and the Census: Experience with 1980 and Lessons for 1990
Samuel L. Zimmerman

The purpose of this paper is to document the experience of the transit planning community with census products with the intent of helping to generate suggestions for 1990. In order to accomplish this in an orderly way, transit planning will be broken down into the series of planning processes normally associated with public transportation. These are strategic planning, long-range regional system planning, project or corridor planning, site or subarea planning, and operations or service planning. Each of these will be addressed first by defining its technical content and then by giving an overview of the utility of census products for that particular type of planning. Finally, national experience in the varied types of planning will be synthesized into a series of recommendations for 1990.

It is important to note that the perspective that will be reflected in the analysis that follows is one that defines transit planning as the process of providing objective information to decision makers associated with the provision of public mobility. As will be seen, this can be quite different from the planning that is totally focused on the provision of conventional fixed-route, fixed-schedule public transportation services.

STRATEGIC PLANNING

In the context of public mobility (i.e., public transportation) strategic planning involves the analysis of long-term trends in those social and demographic factors related to public mobility need and public transportation use. Questions typically addressed include the following: What are the emerging (and declining) markets for public transportation in terms of location and character? What kind of services and facilities will be most appropriate and how should they be financed, developed, and operated with an emphasis on institutional structure?

The major analytical tasks facing public transportation strategic planners are (a) determining which demographic, socioeconomic, and transportation supply factors most closely influence long-term public mobility needs; (b) developing ways of forecasting change in these factors at aggregate levels (e.g., regional, state, and national); and (c) analyzing various investment and operations options in the face of future forecast needs.

To characterize the utility of census data to public transportation strategic planning as it was just defined is easy; without the rich data resources provided by the census both in terms of travel-impacting demographics and transportation use, the task would be impossible. Since 1970, virtually no transportation strategic planning has been accomplished by any governmental entity that did not utilize at least some transportation-related census product. In fact, a strategic planning study is now being carried out by UMTA with assistance from the Joint Center for Political Studies using almost all transportation-related census products. The study is based on an analysis of
nationwide demographic and travel trends shown in the half-percent public use microdata sample and relies heavily on results of previous Nationwide Personal Transportation Surveys. These nationwide trends will be arrayed against changes identified in a parallel analysis at the regional level for 16 sample cities. The regional-level analysis will utilize data from the Census of Population and Housing as well as the journey-to-work reports from the census.

REGIONAL SYSTEM PLANNING

Regional system planning is that process by which specific, long-term (20 to 30 years) transportation problems in a given region are identified and priority ranked. Long-range regional transportation system planning is usually multimodal in nature and is charged not only with the identification of the corridor problems requiring longer-term major investment solutions but also with the specification of a reasonable set of alternatives worthy of further study at a reduced geographic and temporal scale. Key analytical tasks associated with regional system planning are the development and application of travel demand and supply simulation models capable of sensitivity to large-scale transportation investments and operational changes. Both the development (i.e., calibration) and application of these models require demographic or socioeconomic data, the former for a base or calibration year, the latter for a forecast or analysis year. Base-year data are, of course, measured whereas future-year demographic data, though an input to travel simulation models, must itself be forecast. Base travel demand or use data are typically used for model development and as an aid in checking forecast-year results for reasonability.

Comprehensive home interview surveys were once the major source of disaggregate-level demographic and travel data useful for regional transportation planning. Since 1970, however, their cost has become so prohibitive that few, if any, have been taken. The census has become virtually the sole source of basic, home-end demographic data, with travel data supplied by both the census journey-to-work survey results and various small-sample supplemental surveys focusing on nonwork trips and other demand issues. Although metropolitan planning organizations (MPOs) are the keepers of the regional models and data bases, they are utilized by transit operators in addition to state and local governments.

PROJECT OR CORRIDOR PLANNING

Project or corridor planning, known in UMTA parlance as alternatives analysis, is that process in which the range of investment options identified as potential ways of solving long-term regional transportation problems during regional systems planning are studied in detail. The travel demand (and system supply) simulation models used in transit corridor planning are similar to those used in regional system planning but generally reflect increased geographic detail and a shorter analysis time frame (e.g., 15 years). Cost-effectiveness, financial impacts, high-occupancy-vehicle (HOV) demand, and station capacity and congestion are key analysis issues. These usually require both simulation tools developed and applied at a more disaggregate level of detail than regional planning and totally new, add-on procedures. Unfortunately, the requisite additional demand data for model development, application, and checking are not available from any census source and must be supplied by supplemental counting and survey programs. These data include information dealing with mode of access or egress and parking and travel by time of day, data that must be collected on a highly disaggregate basis.
In recent years, transit project planning has become synonymous with the UMTA-mandated alternatives analysis process. The financial and cost-effectiveness criteria produced during various alternatives analyses across the country are used to rate proposals for discretionary federal (Section 3) funding in terms of their relative investment worthiness from a national perspective. This national investment rating process requires that the requisite evaluation factors be produced in a consistent fashion. This cannot be accomplished without the common data base that the census provides.

SITE OR SUBAREA PLANNING

Site or subarea planning is the process by which engineers and planners assist in the overall design of well-defined, encapsulated urban developments. To the degree that travel demand and supply simulation tools are used at all in site planning, they focus on estimating pedestrian and vehicle flows and impacts at a relatively microscopic level for a time horizon that is usually quite short (less than 10 years). Required demographic and travel demand data most frequently deal with the nonhome end of trips, requiring augmentation of the traditional data bases and analytical tools developed with census data.

It is likely that the major site or subarea planning exercises for the rest of this decade and the 1990s will focus on areas that have become known as major nondowntown activity centers. These are suburban development nodes that contain regional shopping malls, office space, and residential units spread over the highly accessible area at the confluence of a number of regional transportation facilities (e.g., freeways, commuter rail lines). Because they are relatively small compared with central business districts (CBDs) (usually under 50,000 employment) and because large urban areas may have more than one, the travel and demographic data necessary to support traffic analyses must usually be obtained from ad hoc special-purpose surveys taken outside the home (e.g., at parking lots, roadsides, and workplaces).

OPERATIONS OR SERVICE PLANNING

In operations or service planning, information germane to the potential cost-effectiveness of existing or proposed public transportation services is generated on a route-by-route basis. In these analyses, the same horizon is extremely short (e.g., tomorrow) and the level of geographic aggregation, closely related to access or egress walking distances, is incredibly detailed.

Though UMTA and others have expended much effort on the development of route-level demand (and operating cost) models in support of operations planners, most existing operations analysis tools are limited in market identification as opposed to actual demand forecasting. These tools use census address reference files or some other network representation and block- or tract-level census data (or both) to determine the number and character of households within walking distance of the route or routes under analysis. These data in turn can be subsequently input to an actual demand model.

In recent years, operations planners have become increasingly involved in the specification and analysis of nonstandard transit services. These include door-to-door paratransit services for the elderly and handicapped, carpooling and vanpooling programs, employer-provided transportation, and so forth. The great detail required for conventional transit service planning in terms of geography and socioeconomic character is even more pronounced for these increasingly popular service options because of their market-focused rather than available-to-the-public nature.
SUMMARY AND SYNTHESIS

The foregoing discussion has outlined the technical content of the various analytical processes that make up transit planning in an attempt to specify the uses of and need for census data by transit professionals. If there is any single conclusion that can be drawn, it is that virtually no analytical aspect of transit planning can proceed without at least part of the rich data resources provided by the census. Whether the technical work to be accomplished is cost-effectiveness assessment, financial forecasting, or simple market identification, demographic data describing the full range of factors affecting travel behavior are required. The level of the geographic aggregation of the data may vary as a function of the type of planning being accomplished, as may the need for supplemental travel and socioeconomic information. Nevertheless, the need of every state MPO, transit operator, and local government for the same data speaks to the efficiency of its collection by a national entity. Moreover, the need for federal strategic planning and project evaluation points to the need for a consistent data format and base year.

It should be kept in mind, however, that as urban areas and transportation needs have evolved, so have transit and transportation planning. Whereas once the concern was with the planning and implementation of wholly new transportation programs and regional systems, now the concern is mostly with the maintenance and upgrading of existing ones, with only incremental new additions. Although urban transportation problems were once associated strictly with CBDs, suburban activity center access and egress and internal circulation problems and suburban public mobility are now increasingly dominant concerns. Finally, although level-of-service, demand, environmental, and energy impacts were once the key transit planning issues, financial feasibility and cost-effectiveness have become increasingly important.

The impact of these changes on transit planning data needs is clear if the resultant shift in the mix of required analytical activities is examined. Future stress will be on strategic and financial planning, operations planning, subarea planning, and project analysis. This means an increased emphasis on activities that, though well served by current census products, require demographic and travel data that are supplemental to the data currently available. The need for increased geographic presentation flexibility is an additional factor that must be accounted for in planning for 1990.

None of the foregoing suggests less of a need for the current census programs and products now available to the transit community. Nor does it suggest the need for a massive increase in the types (and amount) of data collected by the census. It does suggest, however, that evolutionary changes in the existing data set are required, as are flexible techniques for integrating census data with needed supplemental data resources. Developing or disseminating these flexible tools and providing assistance and training in their use must be an important objective of any transit planning technical assistance program.

The views expressed in the preceding are those of the author and do not represent a statement of policy by the Urban Mass Transportation Administration.
Nontransportation Uses of the Urban Transportation Planning Package
Lawrence V. Hammel

The use of the Urban Transportation Planning Package (UTPP) in the New York metropolitan area from the perspective of the New York Metropolitan Transportation Council (NYMTC) is described in this paper. The council has been designated by the governor of New York as the metropolitan planning organization (MPO) for the southern 10 counties of the state. The focus here is on the nontransportation uses to which the package has been or is being put.

INTRODUCTION

The uniqueness of place-of-work information is its availability at the small-area geographic level and in combination with other socioeconomic characteristics. The sole publicly available source of these data is the UTPP. Although the principal users of the UTPP have been those MPOs that purchased it, the nontransportation sector is learning about the package and is beginning to use the data. That the UTPP has acquired many users is an added tribute to its broad appeal to a data-hungry community among both the public and the private sectors.

Five UTPPs were purchased at the census-tract level in the New York metropolitan area. The council purchased the package for the New York, N.Y.-N.J., Standard Metropolitan Statistical Area (SMSA); the Nassau-Suffolk, N.Y., SMSA; and the Poughkeepsie, N.Y., SMSA. The New Jersey and Connecticut Departments of Transportation purchased statewide UTPPs. The three agencies then exchanged the files. The council has provided copies of the files or tabulations therefrom to numerous governmental agencies and to requesters from the private sector. The uses of small-area place-of-work data for land use planning, social service and economic development planning, and local public decision making are described.

LAND USE PLANNING

A land use inventory was conducted for the New York metropolitan area in 1963. It was updated in 1970 through the use of aerial photography (for nonresidential uses) and the 1970 Census of Housing. Forecasts were then made for incremental future years beginning with 1980. The inventory and forecasts arrayed land use at the square-mile level. This 1980 land use forecast envisioned a growing metropolitan area, which has not been the case. In fact, the area actually lost population and showed no employment growth.

Before the arrival of the UTPP, it was necessary to revise the 1980 land use inventory in the metropolitan area. The residential land use inventory was updated by applying the ratio of housing units from the 1980 and 1970 censuses to the 1970 residential land use. Because the UTPP was not available, employment information from two other data sources was used to update the nonresidential land use. In New York City, private employment data were
obtained from Dun and Bradstreet, and governmental employment figures were available from the U.S. Bureau of Labor Statistics. Historical rates of nonresidential land use per employee were applied to the 1980 employment to obtain the revised 1980 nonresidential land use values.

Outside New York City the departments of labor for the states of Connecticut, New Jersey, and New York supplied 1980 employment at the Minor-Civil-Division (MCD) level. The ratio of 1980 to 1979 MCD employment was applied to the 1970 nonresidential land use at the square-mile level to derive the revised 1980 nonresidential values.

Admittedly, this methodology is less sophisticated than ideal. As a consequence the five UTPP files are being accessed to develop a file of worksites for each square mile. Historical comparisons from the special 1970 Worker File, which was developed from the 1970 census for the Tri-State Regional Planning Commission, are available and will be used to assess the validity of the revised 1980 nonresidential land use inventory. Adjustments are anticipated once this comparison has been completed. These adjustments will be carried forward to the existing land use forecasts for future years. The key ingredient will be the use of small-area worksites from the UTPP.

SOCIAL SERVICES AND ECONOMIC DEVELOPMENT PLANNING

Various uses have already been made of worksite information by the public health sector. The county health departments on Long Island are responsible for developing strict environmental regulations. It is known that such new regulations will have an impact on future growth in Nassau and Suffolk counties. The UTPP has been used to obtain the number of jobs in major employment centers. These employment centers are individual villages and unincorporated places. Employment statistics are not readily available except from the UTPP where tract-level worksites have been accumulated to form the base-year (1980) employment. Knowing the anticipated future number of jobs in each major employment center, the two health departments have been able to ascertain the number of jobs that will be affected by the stricter environmental regulations. The county commerce and industry and planning boards will now be able to propose alternative economic development schemes so as not to adversely affect the local economies.

An additional use of UTPP data in the health field involved a study of the dual health insurance coverage of interstate commuters. Information from the UTPP was provided to quantify the major concentrations of New Jersey and Connecticut residents working in New York City and New York State. The study is being carried out to reduce the medical costs for multiworker households, which may have dual insurance coverage.

Several uses of the UTPP have been made in economic development planning by the public sector. The two suburban counties on Long Island—Nassau and Suffolk—make up their own Primary Metropolitan Statistical Area. Having a population in excess of 2.6 million, the two counties have a large employment base in excess of 1 million jobs. The Long Island Regional Planning Commission is responsible for developing plans to keep Long Island's economy prosperous, which translates into ensuring that all current major employers remain there. These major employers require the availability of supporting services from smaller industries. The small-area worksite information from the UTPP has been incorporated into the economic series of data that the commission maintains. Besides the number of workers, the economic data include information on industries by type, occupations by category, and worker income levels, all from the UTPP at the tract level. This information has been supplemented with statistics on real property taxes, union contract pay scales, and so forth for use in maintaining existing firms and attracting new ones.
In recent years the major public utility company on Long Island prepared an economic statistical summary by small area. The Long Island Regional Planning Commission has taken over the publication of this annual report. Because the summary is prepared by small area of economic concentration, information from the UTPP is being incorporated into it. The place-of-work data from the 1980 census are being used to update the information, particularly that on office buildings and shopping centers. This statistical summary has been used extensively in the past by decision makers in both the private and public sectors and will continue to be so used. In addition, both county governments anticipate using the statistical summary to pinpoint specific industries that they desire to attract in the future.

Local governments are continually called on to locate a variety of services in proximity to the people requiring those services. This is relatively easy at the residence end, and services to minorities, the disadvantage, and the infirm can be planned using the regular Summary Tape Files from the census. However, when services are to be delivered to those at work, small-area geographic detail of the worksite is needed. A situation of this type arose in New York City. A city agency had previously acquired tract-level worksites from the council for 1970 and used the information to plan expanded services during normal working hours at major employment concentrations throughout New York City. Such services were in addition to its residentially oriented ones. One of the council's first requests for the 1980 UTPP was from this same agency because it wished to update its plans based on the latest tract-level employment concentrations.

In a similar vein, the private sector also is using the UTPP in the New York area to provide services at the worksite. One of the leading national banking institutions approached the council for selected block- and tract-level worksite information for the Borough of Manhattan. (Manhattan is one of the five boroughs of New York City. A borough is synonymous with a county. In 1980 Manhattan was the residence of 1,428,300 persons and the location of 2,396,500 jobs.) The bank wished to reassess its current branch locations and to study the potential for relocation or expansion to other locations in Manhattan. Following the successful completion of its study, the bank returned to the council and asked for similar worksite information for the remaining four boroughs in New York City and for four suburban New York counties. The small-area detail of worksites is permitting an analysis of economic factors that heretofore were unattainable from a direct source and that had to be deduced from secondary and tertiary sources. The result will be services that are more conveniently located for persons at their places of work, thus minimizing the disutility of travel and making for a more efficient delivery of services.

A further direct use of the UTPP data was for information to develop an emergency evacuation plan for a nuclear power plant. The package was able to provide information on travel time to work and vehicular availability near the facility. In this case, the strength of the UTPP was its availability and ease with which the data could be extracted and provided to the requester.

INPUT TO DECISION MAKERS

The UTPP is currently providing input to decision makers in the public sector. Locally, this input is other than that which goes into the development of the various Transportation Improvement Programs (TIPs), the 5-year capital program of the Metropolitan Transportation Authority, and other transportation capital plans and programs within the metropolitan area. Three organizations are making use of the UTPP in attempting to guide the economic development of the area.
The Long Island Regional Planning Commission has prepared reports containing in-depth analyses of industrial locations, commercial developments, and labor force and jobs. These three reports have been supplemented with an analysis of employment and labor force linkages from the UTPP. Of particular significance is the interaction between the two Long Island suburban counties and New York City. The purpose of the commission's work is to establish capital funding priorities for public officials.

There is a strong economic link between Long Island residents and New York City worksites. Although only one-quarter of Long Island's resident workers commute to New York City jobs, their earnings constitute a disproportionate share of the earnings of Long Island residents. These commuters represent a high proportion of the executives and administrators from Nassau and Suffolk. Thus, the vitality of New York City's economy is of prime concern to Long Island because of the significant amount of income that is returned to the island. In contrast, the reverse commuters—those living in New York City and working on Long Island—have significantly lower incomes because most are operatives, laborers, and service workers.

These statistics from the UTPP have definite policy implications. Although Long Island has become more economically self-sufficient over the last decade, its relationship with New York City remains—and will continue to remain—critical as an important source of income. Long Island's own economy continues to grow; jobs are expanding faster than population is growing. The island could exhaust its resident labor force in certain occupational categories, and its continued economic development will be dependent on attracting a greater number of reverse commuters from New York City. The findings from the UTPP indicate that this has already happened in the manufacturing sector. Thus, political leaders on Long Island are being faced with policy questions regarding the maintenance of economic linkages with New York City, both to retain the domicile of its executives and administrators and to expand its source of workers for its growing number of jobs. The UTPP has been able to quantify these policy implications both economically and geographically at 32 major employment centers on the island.

In a similar way, the Port Authority of New York and New Jersey (PANYNJ) is looking at economic linkages in the metropolitan area using the UTPP. PANYNJ is a bistate agency charged with operating port, aviation, and some local transportation facilities and maintaining the economic prosperity of the metropolitan area. Because Manhattan is the center of many world markets, PANYNJ has been studying Manhattan workers and the difference in their economic characteristics versus those of non-Manhattan workers. In order to have available the most recent statistics, PANYNJ selected portions of the UTPP through NYMTC and had the council process certain tables from the package as well.

The importance of suburbanites to the New York City economy is widely recognized. The prominence of the city as the world's financial center could not have taken place without the availability of the suburban labor force, both the eastern (Long Island, Westchester County, and Connecticut) and the western (New Jersey) components. Conversely, without Manhattan the affluent suburbs could not have developed as they have because there is an insufficient number of managerial, administrative, and professional jobs outside of Manhattan. PANYNJ is most interested in further understanding this phenomenon because its trans-Hudson River facilities have reached capacity. As a result of the economic recovery that began in Manhattan in 1977, commuters into the city are getting a larger-than-average share of the new jobs. Thus, the suburbs are participating more fully in the economic recovery of the city than expected. The impact of this inequality in prosperity has yet to be fully experienced. PANYNJ is developing proposals and plans for retraining city residents so that they may share more fully in the changing economy. These proposals and plans will be advanced on several levels: the city, the state, and the private sector.
The New York City Department of Planning is developing economic profiles for small areas throughout the city. These areas are combinations of census tracts and subdivide the city into 16 units of major and minor economic activity. Part III of the UTPP is being used to determine the levels of nonresidential concentration (measured in terms of trips to worksites) and modes of accessibility. The profiles will assist the city in several ways: in plans for rezoning, in attracting new workers to economic areas that have the capacity for growth, and in providing various city services at the worksite.

The states of New Jersey and New York have authorized the establishment of a bank for economic development. The plan is to direct surplus revenues from PANYNJ into a fund for maintaining, improving, and revitalizing the infrastructure of the metropolitan area. Information from the UTPP will become a ingredient in establishing a worksite data base to ensure the solvency of this venture.

In a similar concern for economic development, free trade zones have been established in the New York and New Jersey portions of the metropolitan area. The concept is to bring goods into the zones, add value to the goods, and then send them out without the imposition of a duty. Although two zones are in existence, there is as yet little economic activity in them. However, information from the UTPP is available at PANYNJ for use by entrepreneurs in acquiring the necessary skilled labor and services.

CONCLUSION

The preceding discussion gives only a sample of the nontransportation uses to which the UTPP is being applied. The UTPP is a readily available data source and as such is often preferred over other sources. For example, the New York State Legislative Task Force approached the council for a source of information regarding employment in, and commutation patterns to, the city of Yonkers, home to 195,400 residents. The state legislature was voting on a fiscal plan for Yonkers the next day and asked its task force for information. The council was able to provide the necessary statistics. Although Summary Tape File 4 could have provided residence information, worksite information is nearly nonexistent for Yonkers. The UTPP data are far superior to the limited worksite information in STF 4.

Public agencies that have used UTPP information from the council are as follows (as of November 15, 1984):

Federal Reserve Bank of New York
Long Island Regional Planning Commission
New York City Department of Environmental Protection
New York City Office of Economic Development
New York City Office of Management and Budget
New York State Department of Commerce
New York State Department of Labor
New York State Housing Finance Agency
New York State Legislative Task Force
New York State Tax Office
New York State Urban Development Corporation
U.S. Bureau of Labor Statistics

The private sector has used the UTPP to an even greater extent. (This is the subject of the following paper in this report). A list of those private-sector firms that have been served by the council (as of November 15, 1984) is as follows:
Anheuser-Busch, Inc.
Baruch College
Bergen Record
Blue Cross-Blue Shield of Greater New York
Brooklyn Union Gas Company
CBS Television
Center for Community Development and Preservation
Chemical Bank
CITIBANK
Greater New York Hospital Association
Liberty Mutual Insurance
Long Island Lighting Company
Manufacturers Hanover Trust Company
Marine Midland Bank
Market Statistics, Incorporated
Massachusetts Institute of Technology
National Resources Defense Council
New York Telephone Company
New York University
Newsday
NYNEX Mobile Communications Company
Regional Plan Association
RELOCOM
Rensselaer Polytechnic Institute
Stevens Institute of Technology
Syracuse University
J. Walter Thompson Advertising Company
University of Bridgeport
Westchester Federal Savings
Winston Network (library for advertising industry)
WNBC Radio

It should be noted that none of the preceding companies is involved in transportation planning. Consulting firms, many, but not all, of which obtained the information for projects related to transportation planning, that have acquired UTPP statistics as of November 15, 1984, are as follows:

Barton Aschman Associates
Boone Young Associates
Charles River Associates
Claritas Corporation
Fred Clark Associates
Dillon-Reid (law firm)
DMJM Architects and Engineers
Edwards and Kelcey, Inc.
Financial Marketing Group
KLD Associates
Marketing International
Miller-Kafes Associates
National Economic Research Associates
Parson, Brinckerhoff, Quade and Douglas
RBA Group
Scott, Fitton Associates
Storch Associates
Systems Design Concepts, Inc.
Urbitran Associates
URS Madigan Praeger
Vollmer Associates
Marketing UTPP Data to the Private Sector
Rube Diamond

I would like to share my experience, results, and views regarding the marketing of UTPP data to the private sector by Southern California Association of Governments (SCAG). The following areas will be covered:

1. How the private sector was reached but not really breached,
2. The kinds of firms that ordered UTPP data,
3. The type of data that was purchased, and
4. Some representative uses of the data purchased.

One view I would like to share at the beginning is about the processing of the data tapes received from the Census Bureau. If public agencies are to assist the bureau to maximize distribution of the data, to maximize our staff's professional efforts, to maximize market penetration, and to minimize our costs, the tapes must be cleaner and more accurate, and they must be provided much more quickly to our agencies. Otherwise, the bureau's efforts to disseminate the data through local census data centers will at best have modest success and at worst not be done at all. Local agencies cannot afford to absorb the kind of dollar investment it takes to get into the marketplace and not experience a reasonable return on this investment. It took our highly skilled professional staff 10 months to test and to feel professionally comfortable with the tape's validity and reliability. (In all fairness to the Census Bureau, I must quickly inform you that some of the 10-month delay should be attributed to our staff's decision to use the SAS program to process the UTPP data. It would have been faster had we used another computer language to reduce computer processing time and costs.) During this 10-month gestation period, we lost valuable market penetration; we lost a great opportunity to satisfy the private sector's then-existing need and want; and we lost a competitive edge to satisfy their need for other census data. Consequently, we lost substantial revenue that could have helped defray costs of acquisition and product development for UTPP. Bear in mind, even though product development cost for UTPP data in a format suitable for internal use at SCAG was absorbed by the overall work program budget, special development work is required to format UTPP and other census data for marketing and sale.

As you can imagine, when we first received the UTPP tape from the Census Bureau, there was a great deal of excitement and enthusiasm about its prospects. Upon receipt of the tape, we sent out a news release announcing its arrival, its use by business and industry, and its availability. We wanted to broadcast and transmit our own excitement to the private sector and, of course, to stimulate sales and a revenue stream as quickly as possible. Much to our pleasure, we received many inquiries, but much to our chagrin, dismay, and embarrassment, we were unable to deliver a viable product to satisfy the market demand. We could not strike while the iron was hot. The then-existing sales were lost and the market became somewhat disenchanted with a public agency. We raised expectations among our local users and lowered our credibility in the private-sector marketplace.
Our next effort to reach our local users of UTPP data began with a plan to hold a marketing and educational workshop. This was planned to be held about 4 months after the tape had been received. That seemed to us to be a reasonable amount of time to validate the UTPP data. Unfortunately, the tape was more difficult than our professional staff had imagined, and so our marketing effort was defeated again by having to postpone the workshop. The workshop was finally held 10 months from the day that we received the UTPP tape, after having been postponed twice.

The response to the workshop was quite satisfactory. Eight-four attended, representing 56 organizations from the public, private, and semipublic sectors. Of this group, 47 represented 30 private-sector firms, and 15 were from consulting firms specializing in transportation, economics, and general urban planning. The others represented firms such as chain department stores, a bank, hospital facilities, the chamber of commerce, an aircraft manufacturer, newspaper publishers, human service departments, a university, a mobile-telephone company, a private transportation company, and the visiting nurse association.

In addition to the efforts to market UTPP through news releases and the workshop, to promote orders we followed up with visits to many of the workshop participants and, of course, with visits to those who registered for the workshop but failed to attend. We also made presentations to a number of private-sector trade association meetings, various chambers of commerce, other interest groups, and business-oriented expositions.

However, the backbone, the centerpiece of our marketing efforts to disseminate the UTPP data is our UTPP mail-order catalog and related single-page brochure. They provide an easy, consistent method for us to reach users and a convenient way for UTPP data users to purchase the data at a predetermined price structure. The catalogs provide access to the data through standard reports by geographic areas or data profiles by geographic areas.

Our standard reports provide a limited amount of data. They are predetermined printouts of economic and transportation data by place of work and residence, income, industry of employment, occupation, commuting mode, travel time by commuting mode, and detailed cross tabulations.

The data profile reports provided many more variables and data—also for a single geographic area. Therefore, a UTPP data user who needs a great deal of information for several geographic areas would best be served by the data profiles. A user wanting to compare limited data sets across a number of geographic areas would best be served by the standard reports.

A third way data users can have access to the UTPP data tapes is to order customized tabulations and analyses. These orders come from firms whose data needs cannot be satisfied by purchasing either the standard reports or the data profile reports. Naturally, the customized reports are more complicated because they involve the combination of other transportation data, but they contribute to a larger dollar volume per order.

The periodic but regular mailing of the UTPP catalog and other census data catalogs is the principal way we consistently remind the private-sector data users that SCAG provides quick turnaround and is a valid, viable, reliable, and inexpensive resource for data. These mailings cause us to expand our marketing and sales staff of two and sometimes three people.

Another view I would like to share is that marketing data is unlike marketing other products. Information is only wanted when needed for a specific project, be it for marketing, research, or analysis purposes. Users do not buy data for the pleasure nor for the prestige of having it in their possession. When they do buy it, they want it to be accurate, reliable, timely, and usable.

In my view, customers have very little knowledge of how to use UTPP data, particularly in combination with or integrated with other data. There is a need for some federal agency to organize and present a program that informs and
educates the private sector on the use of UTPP data. Also, I do believe our orders would be greater if we had available a technical salesperson to confer with some clients. As a marketing manager, I see a need for a new marketing strategy. That is, data management with a computer-knowledgeable staff dedicated to designing and selling customized user needed and wanted products—technicians with a flair for selling.

We chose not to use costly media advertising. It has been our experience with other census data products that the revenue return just does not justify the cost. Besides, the need for repetitive advertising to get our message across becomes even more of a cost burden. Using the vehicle of catalog mail marketing techniques, we can target our market, penetrate new markets, stimulate customized sales, reactivate old customers, sell to marginal customers more profitably, and introduce new products.

Nonetheless, in my judgment, we have yet to breach the private-sector users and to realize the potential sales from UTPP. The limitations are too great within the public-sector agencies to enable them to marshall and focus their resources on a second level of priority called fee-based services. Our agency's first priority is its overall work program, funded by federal and state grants.

The kinds of firms that actually ordered UTPP data, other than local governments, are quite varied and sometimes surprising. There are transportation and economic planning organizations, university research, and, of course, the urban planning community. A variety of manufacturers, such as those who make stereo equipment and ready-to-wear clothes; newspaper publishers; radio stations; and health maintenance organizations have bought UTPP data. Two examples of unique organizations purchasing UTPP data are a CPA firm and a public law organization. Interesting to note, we have sold STF 1 and 3 data to other law firms and to private detective agencies representing law firms.

Much to my surprise and disappointment, we have not sold UTPP data to franchisers, outdoor advertising firms, delivery service companies, advertising agencies, banks, chain department stores, or churches. I include churches because several denominations are heavy, repeat users of STF 1 and 3 data.

The type of data some of the private-sector firms purchased covered trip origin and destination information; transportation-analysis-zone information; mode of travel and travel volume converted to computer graphic maps; and profiles by occupation, by place of work and residence, and by geographic location as well as by socioeconomic and transportation variables. Standard report data were requested for workers by income categories and for the civilian labor force by occupation, by sex, and by place of employment. One example of a customized tabulation was an analysis of the number of jobs in a geographic area by industry transposed to zip code. Another example was market analysis of employment data by place of work.

As near as I can find out, use of UTPP data ranged from marketing health plans to profiles of jurisdictions by zip code to better penetrate a targeted market not previously promoted. Also of interest is travel time by a firm's clients from home to the data-user's facility as well as the worst and best time scenarios for travel by looking at peak and off-peak travel volume.

I have three more views I would like to share with you. One deals with the balance of the uncoded UTPP data base. It would appear helpful to local marketers and planners to have the balance of the uncoded data sent to the state census data centers. Local census data centers, if they are able to find the resources, could encode the balance of the data to increase the reliability of the UTPP sample for local use.

A second view deals with minority marketing. It is now not only in vogue but will become more important by the year 1990. In Southern California and, I suspect, in other parts of the country, our minority population is increasing at a rapid rate. I would strongly urge that the 1990 survey document include questions about minority use of public and private transportation.
My last deals essentially with obtaining transportation-related data related to the physically handicapped person. In addition to finding out their behavior pattern in relation to public and private transportation availability, we must know how many, by handicapped category, have transportation concerns related to work, recreation, medical facilities, and housing.

In conclusion, I believe we have only scratched the surface of effective marketing and meeting the need of the private sector for UTPP data. Public agency staff is limited in broadening and deepening their penetration of the private-sector market. Public agencies have institutional constraints, financial limitations, and staff limitations as marketers and salespeople.

In my judgment, if marketing and sales of UTPP and other census data are to experience true success, there is need for greater organizational support. There is indeed a need for a separate division for a fee-based operation and it needs to be on par with other divisions within the organization. The UTPP data tape may be a goldmine of information, but to date it has produced more pyrite--fool's gold--than gold for the general fund. My modus operandi in marketing UTPP data and other products is to focus on business in areas where we can be successful, even if that success is limited. I know we can provide a public service, and it is a good feeling when there is an element of success attached to it.
State Data Centers: Meeting Statewide Data Needs
Lisa A. Bontempo and Robert W. Surridge

In August 1978, the Bureau of the Census started the National State Data Center Program with the creation of four State Data Centers (SDCs) in Alabama, Arizona, Louisiana, and North Carolina. Established with the purpose of facilitating access and application of 1980 census results, SDCs have been established in all states except Wyoming. The program now includes more than 200 state agencies, 1,300 local agencies, and 250 universities, all involved in the distribution of statistical data and related services. Jointly, the organizations in the program respond to over one-half million user requests annually.

PENNSYLVANIA

The Pennsylvania State Data Center (PSDC) was established by executive order of the governor in 1981. PSDC is located in the Institute of State and Regional Affairs at the Pennsylvania State University Capitol Campus in Middletown.

As the Commonwealth of Pennsylvania's representative to the National State Data Center Program, PSDC serves as the state's primary contact with the Bureau of the Census. In addition to this liaison role, PSDC provides numerous statistical products and services to the citizens of the commonwealth.

The PSDC staff of four professionals responds to about 3,000 requests for assistance each year. About one-half of these requests are satisfied over the telephone at no cost to the caller. The other 1,500 requests are more detailed and require a specific product or service. These requests are filled by the staff on a cost-recovery (time and materials) basis.

Pennsylvania is a large and complicated state. Data and information are required by public and private decision makers to serve the state's needs effectively. PSDC has much of this information. Customers range from the Boy Scouts, the House Appropriations Committee, or the governor's office to the local hospital, department store, or bank. The following is a list of the different services and products available at PSDC:

1. Inquiry handling and consultation on data availability and use;
2. PSDC and Census Bureau reports (detailing the results of the 1980 census) and reference maps;
3. Computer tape processing, including tape copy and printouts of data not available in reports;
4. Custom programming and report generation (for example, PSDC recently completed a project for the Pennsylvania Department of Health to target and map potential incidence of lead poisoning cases in large cities);
5. Survey processing and analysis (capabilities include entering the data, design and analysis, and interpretation of results);
6. Digitized files of map features such as political boundaries, land use, land cover features, and natural features;
7. Training and information sharing, including a PSDC newsletter and workshops on specific topics of interest;
8. Population estimates developed by PSDC detailing 1981 and 1982 population by age, sex, and race for the state, counties, and cities with more than 20,000 population;
9. Census data mapping service (statistical maps of the state by county and counties by municipalities detailing various statistics in color or black and white); and
10. Geographic access system (designed to aid both public and private sectors in using demographic data for facility siting and market analysis).

EXAMPLES OF PROJECTS

Like most SDCs, PSDC becomes involved with a large variety of data users and projects. Following is a brief description of a few of these projects.

Statistical Reports

In addition to general user reports and profiles, PSDC has worked with individual state agencies and local agencies to produce detailed reports for specific subject or geographic areas. An example is a recently completed monograph for the Pennsylvania Department of Aging. This report details statistics concerning Pennsylvania's elderly population.

Special Projects

Using a methodology developed by the state of Massachusetts, PSDC is working with the Pennsylvania Department of Health to determine the potential number and location of children at risk of exposure to lead poisoning.

Geoprocessing and Mapping

PSDC has developed the capability to generate data profiles based on the latitude-longitude location of any given point in the state. This program was completed initially for analysis of the population surrounding the Three Mile Island nuclear plant but is now used by a variety of customers including private business to do facility siting and market analysis.

Special Studies

Using the school district census file created by the Census Bureau for the National Center for Education Statistics, PSDC published a report providing 15 separate tables of census statistics at the school district level. To date, 300 copies have been distributed to users across the state.

ANTICIPATING TRANSPORTATION NEEDS

In order to efficiently serve the various users of census data PSDC has attempted to stay in close contact with its clients. To learn more about the needs of the transportation community PSDC surveyed 561 transportation-related organizations throughout the country.

The survey, developed by Lisa Bontempo of PSDC, was sent to a comprehensive mailing including all state data centers, metropolitan planning organizations
(MPOs), state highway departments of transportation, 1970 and 1980 users of the Urban Transportation Planning Package (UTPP), and approximately 50 transportation engineering consulting firms, all located in the 50 states, Puerto Rico, and the Virgin Islands.

All of the surveys included a self-addressed, prestamped envelope, which helped to achieve an extremely high response rate of 51.4 percent, or 288 respondents.

The survey focused on the UTPP. When asked about their familiarity with it, 91 percent of the respondents said that they were aware of the package existed. When asked where they learned of the UTPP, 51.4 percent named the state or federal department of transportation and 7.2 percent their state data center. Two-thirds of those informed by data centers were MPOs. The majority of those agencies that were not aware of the package were MPOs with 1980 populations of less than 500,000.

Of the 47 respondents from departments of transportation, 75 percent did not purchase the package in 1970 and do not plan to purchase the 1980 package. Of the agencies that are planning to purchase the 1980 package, 87 percent are MPOs (although this represents only 34 percent of the MPOs).

General characteristics of the agencies that purchased the package follow:

- Are large agencies with two or more full-time transportation planners on staff (74 percent)
- Had cost estimates of $2,600 to $20,000 for the 1980 package (60 percent)
- Had a 1970 population of 100,000 to 500,000 (50 percent)
- Had a 1980 population of a million or more (48 percent)
- Receive $25,000 to $100,000 annually from UMTA (46 percent)
- Receive other funds to help purchase UTPP (93 percent)
- Had 1-4 to 50 UTPP requests annually (45 percent)
- Had used the census and surveys as primary source of data (50 percent)

Those agencies that purchased the package were asked about its most important application. Because this was an open-ended question, the responses were grouped into nine categories. The most frequent response was origin and destination studies, which was indicated by 21.7 percent of the respondents. However, the range was so great that they were hard to categorize. For that reason the first 19 responses are listed to give a better feeling for the variety:

- Trip generation
- Automobile occupancy models
- Input to quick-response traffic forecasting models
- Employment by place of work
- Short-range traffic growth forecasting
- Data at zone level
- Update the comprehensive plan
- Validation of travel demand models
- Analysis of Baltimore-Washington commutershed
- Sale to the private sector
- Update of model input data
- Employment source for highway network model
- Corridor and spot analysis
- Modeling and demand forecasting
- Public information
- Socioeconomic forecasts
- Disabled-person work trip
- Recalibration of Urban Transportation Planning System model
- Origin-destination tables for subway operation
### PLACE OF WORK

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<th>WORKERS LIVING IN MIDDLETOWN (1)</th>
<th>MEANS OF TRANSPORTATION TO WORK (2)</th>
<th>TRAVEL TIME TO WORK (1,3)</th>
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### GENERAL POPULATION AND HOUSING SUMMARY

1) POPULATION TOTALS

- TOTAL POPULATION: 10172
- TOTAL MALES: 5327
- TOTAL FEMALES: 4750
- TOTAL HOUSEHOLDS: 3980
- TOTAL FAMILIES: 2703

2) AGE AND MARITAL STATUS

- MEDIAN AGE: 30.7
- MEDIAN AGE OF MARRIED: 30.1
- PERSONS 65+ IN MARRIED: 176

### COMMUTE TO WORK

- MEANS OF TRANSPORTATION TO WORK
  - CAR: 2509
  - BUS: 150
  - TAXI: 7
  - WALK: 20
- PUBLIC TRANSPORTATION
  - METRO: 150
  -サイクル: 17
- PRIVATE TRANSPORTATION
  - TAXI: 2

### SOCIAL AND ECONOMIC SUMMARY

1) INCOME
   - MEDIAN FAMILY INCOME: 19292
   - MEDIAN HOUSEHOLD: 16289

2) LABOR FORCE
   - TOTAL LABOR FORCE: 4861
   - UNEMPLOYED: 6.2

3) EDUCATION
   - H.S. GRADS: 70.8
   - COLLEGE GRADS: 9.5

4) POVERTY STATUS
   - PERSONS BELOW POVERTY: 936

**FIGURE 1** Transportation planning data in Dauphin County, Middletown.
The results of the survey indicate that only two areas in Pennsylvania (Philadelphia and Pittsburgh) were planning to purchase the UTPP. Because Pennsylvania has such a large rural population, most of the other areas do not have the staff or the funds to support the package. To meet the needs of these areas PSDC developed a rural profile with Summary Tape File 4 (STF 4) data that is available for all counties, municipalities, and tracts (Figure 1). This profile provides the most needed data as defined by transportation planners throughout the country.

The final development of the STF 4 profile resulted from the analysis of this survey and many hours of researching and interviewing. There was no doubt that journey-to-work data would be included; 30 percent said that this was the main reason they had purchased the package. Another 12 percent though travel time, mode of transportation, vehicle occupancy, and ridesharing information were the most important. One transportation planner from Idaho was going to use UTPP primarily to update a demographic report, which helped to explain why 11 percent said UTPPs were needed for population and housing data with special reference to the elderly and disabled. The social and economic category received a 25 percent response, with almost half of it focusing on employment and labor force.

In the few months that this profile has been available, PSDC has sold hundreds of copies. It is being used by consulting firms and county governments to acquire funds. When deciding who their market was, the Hershey Bank used the place-of-work data to see who would be traveling through their region.

CONCLUSION

The development of products and techniques tailored to meet the data and information needs of a statewide constituency is the primary purpose of PSDC and the data centers in other states. The history to date has been one of unqualified success. SDCs are now recognized as important contributors to the Census Bureau's programs and especially beneficial to the local user of census data.

Discussion is currently under way to involve SDCs more directly in supporting the taking of the 1990 census. Similar discussions should be initiated to develop the SDCs as an even better resource to users in the 1990s. This conference represents a starting point for the consideration of how SDCs can provide more support to users of transportation data.

What is evident from the PSDC survey and the response to the transportation profile developed by the PSDC is that a large number of transportation users do not have access to the UTPP data. Perhaps SDC involvement in the processing of UTPP files would be beneficial. This needs to be considered further by the planners of the package.
Monitoring Nationwide Trends and Comparing Metropolitan Areas

Marshall Reed

I am Marshall Reed of the Highway Users Federation for Safety and Mobility, known as HUFSAM to many of you. The Federation is a national organization that brings together highway using and business groups. It works for safe, efficient, and economical highway use in the public interest.

I am here today on behalf of HUFSAM and a number of other organizations to discuss with you a project we have initiated to produce a nationally comparable data set that will describe the important urban commuting trends using the census journey-to-work statistics.

Stimulated by a meeting called by the President of HUFSAM, a group of representatives of organizations decided to join together in a project to summarize and publish national trend information about the current state of urban development and the commuting patterns it produces. We recognized that each of our organizations could use such a document as an information source in our individual activities and public policy makers and the general public also would benefit from an objective, easy-to-understand description of these trends.

The organizations that came together in this project initially included the Urban Land Institute, the National Association of Regional Councils, the Institute of Transportation Engineers, National Association of Counties, National Governor's Conference, the National Conference of State Legislators, and the American Association of State Highway and Transportation Officials (AASHTO). Frank Francois of AASHTO serves as our Chairman and the Urban Land Institute serves as our administrative center. We now officially call our undertaking the National Commuting Study. Let me tell you a little more about it.

We have been working together now for almost a year; a technical committee has been working on the analytical issues, and a steering committee has been dealing with administration and overall policy. We have produced a prospectus of the planned activities of the study and received initial funding from our membership.

The work plan has several parts. The first part will assemble 1980 census data on commuting in America providing current data on the socioeconomic characteristics of the population, distributional patterns of residences and work places, and commuting patterns of the U.S. population. Comparable historical data for 1970 and even 1960 will be assembled where available, so we can describe the trends over the last 20 years. These will be summarized by city size, city type, and other characteristics to best depict current patterns and trends. Text will be used to interpret the data and describe the trends only. No policy or programmatic implications will be discussed. All of our participating organizations agree that this will be an information document, not a policy document.

An important accomplishment of the program to date has been that working with federal officials, we have received agreement that FHWA with UMTA assistance will produce large-scale national commuting summary data files from the census. These will be an important resource for our study and for other researchers and public agencies. Preparation of these files is now under way.
Another part of our program will be the preparation of a number of case studies in individual cities. We feel that these are needed to present a more detailed picture of trends that can be accomplished using only aggregated national statistics. We would expect that the UTPP would be valuable as a source for these case studies. The case study effort will be a wholly voluntary activity with a format jointly agreed on by the local entity and our technical subcommittee. We are finishing the definitional work now on what these case studies should contain. As soon as that is complete we will identify areas of interest for our document and solicit local entities to participate. Cities or regions will be selected based on the degree of national interest in the story that have to tell. For instance, areas that have had large population or economic shifts in recent years or significant transportation system changes, such as new transit system, would be of high interest.

The document we produce from all of this material will be broadly distributed as an informational tool about current commuting trends. We believe that such a document will be a valuable educational device in public discussions in the future.
User Evaluations of the Urban Transportation Planning Package: 1974 and 1984 Perspectives
James J. McDonnell

The purpose of this paper is to document the information received from the conference participants regarding the quality and use of the Urban Transportation Planning Package (UTPP) and to compare these responses with similar information presented by Robert C. Stuart and Michael R. Hauck in The Census and Transportation Planning: Survey of Evaluations and Recommendations as to the Usefulness of the 1970 Census Data in Urban Transportation Planning (1). The 25 participants who provided information at the conference represented both states and metropolitan planning organizations (MPOs). Of the MPOs, some were from small areas such as Sioux Falls, South Dakota, and Colorado Springs, Colorado. Large metropolitan areas were well represented by New York, Chicago, Los Angeles, St. Louis, and Dallas–Fort Worth. States were represented by Florida, Michigan, Arkansas, and Alabama.

TYPES OF CENSUS DATA USED

In 1980 the majority of the respondents used Parts I and IV of the UTPP more than any of the other parts. Part VI, the county-to-county data set, which was not available in 1970, was the next most widely used part of the package. Part III was also extensively used. Part II was used by only one of the 25 areas, and there were no reports on the use of the data shown in Part V.

In addition, use of Summary Tape Files (STFs) 1 and 3, which were available from the Census Bureau almost 1 year sooner than the UTPP, was extensive. In 1980 the STFs were available through State Data Centers, which were not in existence when the 1970 data were released. Some MPOs are adjuncts to or affiliates of State Data Centers, and this close relationship is an important organizational change between 1970 and 1980 that brought census data closer to the MPOs and other users.

The STFs provided single data elements for various geographic levels. They are similar to the data shown in the UTPP, Part I, except that the UTPP cross-classified up to three different data elements into unique tables. Parts I and II of the 1970 package contained information that was directly available on the many census tapes or publications. In 1980 there were many cross-classifications available in Parts I and II that were not available from any other census product. The major criticisms in 1970 were directed toward Parts III and IV. It was reported that MPOs also used the GSE/DIME files, printed reports, population tabulations (at the block level), and the Master Area Reference Files (MARFs) (to determine the distances between the centroids of census tracts).

The types of census data used by urban transportation planning agencies after the 1970 census were similar to those used after the 1980 census. Initially all agencies purchasing the UTPP in 1970 planned to use all four parts of the standard package. The overall quality of the package was initially considered to be favorable. However, after local agency review of Parts III and IV by the
early recipients of the package, it was determined that these parts did not produce reliable information. Therefore, other MPOs decided not to purchase the package, expecting problems in their areas also. These problems with the 1970 data were primarily the decisive factor in an agency's decision not to purchase the package in 1970 or 1980.

In 1980 purchasers could return a package for retabulation if errors were found, an option that was not available to purchasers of the 1970 UTPP. This allowed for a more complete product in 1980 and demonstrated the excellent cooperative attitude of the Census Bureau staff.

The 1970 UTPP was available for full Standard Metropolitan Statistical Areas (SMSAs) only. In 1980 the UTPP was based on counties, but purchase areas could include more or fewer counties than those in a particular SMSA and include counties from adjacent SMSAs.

Census items most frequently used in the 1970 UTPP, according to the Stuart-Hauck report, were population, households, age, sex, race, income, automobile availability, occupation, industry, class of worker, place of work, mode of journey to work, Spanish origin, number of units at address, value, and contract rent.

USES OF THE DATA

Most MPOs purchased the UTPP to establish a new data base for their area. This was reported by many participants and was often given as the basis of the need for census data. The data were used for existing model applications in most of the areas that purchased the package. In some cases existing models were validated against census data and then differences between the two sets of data were reconciled.

New models such as shared ride and transit use were developed. With a 10 percent sample of journey to work by transit available from the 1980 UTPP, old mode-split models were discarded as not being reflective of the present or as unreliable because they were developed on samples of 1 percent or less. Many participants mentioned the development of ridesharing and transit models for transit planning purposes and for UMTA grant information as important uses of the 1980 UTPP data.

Other reported uses of the data were subarea planning; alternatives analysis; air quality analysis; determining the unserved transit patron; providing Title VI transit information; energy analysis; impacts of hazardous waste transportation (night and day); land use forecasting; and providing data to local governments for many different types of planning studies and traffic impact analyses. In 1970 the UTPP was used as input to the three major models at the traffic-analysis-zone and district levels. These models were the trip-generation model, socioeconomic data for the trip-distribution model (gravity model), and the regional-growth model. Census data were used for studies of bus routes, carpools, economic bases, and housing; for analysis of unemployment and air pollution impacts; for energy conservation; and for retail location and marketing. In 1970 there were plans for similar uses, but the poor quality of Parts III and IV precluded using them for substantial planning analysis such as employment distribution.

There were two major differences between the uses of the 1970 and 1980 data. They were used extensively in 1980 for development of new models, for example, shared-ride and mode-split models. In the Stuart-Hauck report, however, there was no mention of using the 1970 data for developing new models. The second major difference was the data on external travel available in 1980 from 20 surrounding counties. In 1970 these data were not available. This was one serious problem mentioned in the Stuart-Hauck report that was apparently rectified in 1980 with Part VI of the UTPP. Without these trips there was
significant underreporting of journey-to-work data. It was estimated that underreporting could be as high as 20 percent of all work trips, although for the median SMSA it was probably about 4 percent.

In 1980 workplaces of residents of adjacent SMSAs were coded to block level in what were called commutershed. Also, Part VI reported travel by mode and shared-ride arrangements from 20 adjacent counties into individual SMSA counties. This correlated well with external travel in typical planning study surveys.

ACCURACY OF WORKPLACE CODING

There were seven attendees at the conference who reported that no work had yet been done on determining the accuracy of the workplace coding for the 1980 data. Others reported that although they had done some analysis, their effort was not complete. Nevertheless, there were enough general comments to determine the overall condition of the products received.

Five respondents reported that the data were generally good and that they had found no problems to date. Of the respondents that did mention specific problems, the predominant ones were GBF/DIME file coverage and errors within the GBF/DIME file area. Generally, the areas that caused problems were military installations, major retail centers that covered more than one census block, and industrial parks where workplace locations were not known by their street addresses.

Easily corrected errors were those in which workplaces were miscoded to adjacent tracts or across an arterial highway. The allocation process resulted in workplace errors at the traffic-zone level because certain land uses were coded to the tract only. These were easily corrected based on occupation and industry codes.

The accuracy of the workplace coding was directly related to the extent of the GBF/DIME file area and the accuracy of the file. Nine respondents indicated that the GBF/DIME file coverage was much improved over that in 1970. Generally, 1980 UTPP purchasers expressed a need for the GBF/DIME file to cover the entire SMSA or at least the entire MPO planning region. With the advent of federal planning (PL) funds in the mid-1970s, urban planning studies expanded to include full-county areas whose boundaries coincided with those of the jurisdictions that match the PL funds.

In 1970, according to the Stuart-Hauck report, there were similar problems regarding the accuracy of workplace coding. The main problem was the Address Coding Guides (ACGs), which were the 1970 version of the GBF/DIME files. Areas that were satisfied with their UTPPs in 1970 also had ACGs of high quality. Most agencies rated the need for improved ACGs as a critical element in planning for the 1980 census. Not only were there major errors in the 1970 ACGs, but the areas covered did not extend far enough into the suburbs to include the entire transportation planning area, which was defined as the current developed area plus the area expected to be developed in 20 years. There was little need in 1970 for coverage of the entire SMSA.

In 1980 workplace coding errors were corrected by the Bureau of the Census for those who requested the service. In 1970 if the workplace was not coded to block, it was coded to Universal Area Code (UAC), and it was not possible to make corrections for missing data. In New England UACs were towns that were small enough so that workplaces could be reallocated manually. In the sections of the country where UACs were counties, however, it was difficult to allocate to small areas manually. This aspect of small-area workplace data in 1970 precluded many data planning activities. In 1980 many places of work that were identified as "not reported" were allocated to small areas using a method developed by the Census Bureau. The uses of Parts III and IV of the 1980 UTPP
were extensive because of the improvement in the proportion of work trips tabulated to small areas.

Although it was not reported directly, the sample size for the data on the journey to work, which was 10 percent in 1980, was not a problem. In 1970 the sample size was 15 percent. It does not appear that in 1970 or 1980 the sample size contributed to any major errors in the data, except for those modes of travel that are in the minority. For those modes a substantially larger sample would be required than the 15 percent used in 1970. It should be pointed out that in 1980 the mode question was coded at the full 1 in 6 sample rate; only the place-of-work coding was limited to the one-half rate (1 in 12 in large areas and 1 in 2 in smaller areas).

UTPP FILE DOCUMENTATION, FLEXIBILITY, AND FORMAT

In 1980 there was little criticism of the documentation of the UTPP. The only comments received were that it could be improved but there were no specific recommendations. The extensive data dictionary provided in 1980 solved many potential documentation problems, although one respondent indicated that it was too cryptic.

Tape format problems in 1980 included the noncompatible IBM data set names, which caused universal consternation until the simple solution of the label bypass was found. The issue of long record length had to be solved, but once understood was quickly resolved. There was a general desire by the Urban Transportation Planning System users to have received the file in typical Z-file and J-file format. Also, it was noted that the print program at the beginning of the tape did not work for specific areas. A reformat by local users rectified this problem.

In the 1970 report the issue of file flexibility was raised. Basically in 1970, more cross-tabulations at the traffic-zone level of geography were needed than those provided. A study of the specifications of the 1980 UTPP file show that this issue was overcome by additional three-way cross-tabulations at small-area geography.

ALTERNATIVE DATA SOURCES

The participants reported extensive use of other data sources besides the decennial census data: local employment surveys, state employment files, and data from private commercial sources. In addition there were on-board transit surveys, data from utility companies, building permits, and other data collected by local governments.

In the Stuart-Hauck report, very little is mentioned about alternative data sources, probably because at that time funds were not so scarce as they are now and local urban planning organizations collected their own data. Also, in 1974 most of the primary data had been collected only a few years before, making the data bases of fairly recent vintage. By 1984 these data bases were obsolete, and a new sources need to be found, hence the current reliance on secondary sources of information such as state employment files and private commercial sources. In the Stuart-Hauck report it was concluded that alternative data sources were inferior, too expensive, or nonexistent.

CONCLUSIONS

The attendees at this conference who responded to queries about the UTPP were on the average more satisfied than those in the Stuart-Hauck survey of 1974.
Lessons learned in the 1970s were put into action in preparing for the 1980 census, resulting in significant improvements. Lessons learned from the 1980 census will be taken into account in planning for the 1990 census and for the data products that will be produced. With efficient transportation being a national goal, the value of a comprehensive data collection effort such as the census (conducted uniformly throughout the country and used to evaluate the investments required to provide for a safe, efficient, and cost-effective transportation system) cannot be overstated.

REFERENCE

Part IV  Plans for the 1990 Census
Introduction

Daniel B. Levine

The old adage says that history repeats itself. To that extent, the current discussion can be viewed simply as a repeat or a continuation of the conference that took place in Albuquerque in 1973 in preparation for the 1980 census. An evaluation of the 1980 census in preparation for the effort in 1990 certainly has both merit and value. This conference, however, has built on and, as a result, goes well beyond the 1973 effort. As users of census data, the transportation community has become more knowledgeable, more experienced, and more demanding. It also has become more realistic in understanding the importance of data as well as the limitations and costs. The producer of census data, the Census Bureau, on the other hand, has become more aware of and sensitive to the needs, more understanding of the concerns and problems, and even more responsive to the differences within the transportation field.

The session on Plans for the 1990 Census clearly illustrates how much progress has been made since 1973; it brings together in one forum three of the Census Bureau's senior, key decision makers and experts to inform transportation planners of the plans for 1990, in other words, to detail where the bureau is today, where it expects to go, how it expects to accomplish its objectives, what obstacles stand in the way, and how all of these matters will affect the transportation community. Certainly, this is information that is basic to the understanding and so necessary to the dialogue between transportation planners and the bureau in determining how the 1990 census can best serve transportation needs through the end of the 20th century.

The first paper, prepared by William P. Butz, Associate Director for Demographic Fields, presents an overview of the planning process for 1990 and contrasts the current approach with that leading to the 1980 census. As such, it highlights the issues and alternatives being considered by those at the bureau faced with planning and leading the 1990 endeavor. It carefully sets forth and describes the five areas in which the bureau fully expects to make improvements over the 1980 performance, namely, collection, automation, outreach and publicity, coverage improvement and measurement, and content. This understanding of the bureau's thinking is a vital backdrop to an intelligent discussion of transportation needs.

The second offering, by Peter A. Bounpane, Assistant Director for Demographic Censuses, focuses specifically on the issues concerning transportation data. Following some introductory detail on the planning process, Bounpane devotes much of his discussion to issues unique to transportation items in the census, including questionnaire content, coding, and tabulation. The hard questions he raises will certainly result in intensive discussion by transportation planners and form the basis of future dialogue with the Census Bureau.

The final paper, by Robert W. Marx, Chief of the Geographic Division, provides the transportation expert with a clear description of the bureau's proposed methodology for dealing with location, in other words, how the bureau plans to assign each housing unit and work location to the correct geographic location, be it street, tract, county, or political entity. A close reading of Marx' paper is of particular importance to the transportation community, given
their need to deal with truly small-area data. His paper describes clearly and in detail the bureau's bold new approach to provide the required support materials.

It is important to note that, taken together, these papers provide the background so necessary to a mutual and satisfactory interface between transportation planners and the Census Bureau, and one that can only lead to a successful conclusion, given the positive and constructive nature of these papers.
Issues and Alternatives in Planning the 1990 Census

William P. Butz

The next Census of Population and Housing will be conducted on April 1, 1990, and will mark the 200th anniversary of census taking in the United States. Although 1990 is more than 5 years away and may seem distant now, planning is well under way at the Census Bureau.

With the number of decisions to be made and the long lead times required, early planning is necessary. In preparing for the 1990 census, many difficult choices will have to be made, often among several good alternatives. In most cases there will not be one right answer or a perfect solution. In these cases, a balance between competing alternatives will have to be struck.

The approach to planning the 1990 census is different from that for the 1980 census. Planning for 1990 has begun earlier in the decade, yet some important decisions relating to the conduct of the census will be made later in the decade. As an example of earlier planning, the first major pretest will be conducted in 1985, a year earlier in the decade than the first pretest for the 1980 census. One of the major decisions that will be made later in the decade is what basic methodology to use in taking the census. Last time, the methodology was determined by 1973. The decision on methodology for the 1990 census is to be made by the fall of 1986. This will allow time to examine a wider range of alternative methods and procedures.

What makes early planning for the next census so important is the fact that the census will produce vital data to meet America's statistical needs. Census data will be used to apportion seats in the House of Representatives among the states and to draw congressional and state legislative district boundaries. Census data will be used by federal, state, and local governments to distribute money to the appropriate areas, by social service planners to get help where it is needed, and by business leaders to make sound decisions. The census also serves as a statistical snapshot of the nation at a point in time and as such serves valuable historical purposes.

The 1980 census provided data on place of work, travel time to work, mode of transportation, carpooling, and number of vehicles in the household—information of particular interest to planners in the transportation community. This conference will explore transportation data needs from the 1990 census, a topic that will be discussed in more detail in the following paper.

When one considers that the bicentennial of census taking in the United States is about to be observed, the next census takes on added importance: the Census Bureau wants to take a census that will be worthy of its long heritage. The 1990 census will be the 21st in an unbroken chain since 1790 and will produce data to carry us up to the 21st century.

1980 CENSUS

Progress comes from building on past experience of what worked well and what worked poorly. As a start, therefore, the bureau has made a thorough
examination of the 1980 census. On balance, the 1980 census was a success. Here are its major accomplishments:

- Preliminary estimates showed improvement in coverage over the 1970 census.
- Counts for reapportionment and redistricting were ready by the legally mandated deadlines.
- The public information and outreach programs were highly successful.
- Census data products contained more data for small areas and for ethnic groups than in 1970.

This is not to say that there were no problems with the 1980 census. Enumerating and collecting detailed characteristics for more than 226 million people and 88 million housing units are not simple tasks, particularly when the highly mobile nature of the American people and the diverse conditions and situations in which they live are considered. A careful look at some of the major problems of the 1980 census is a good starting point for 1990 planning. The problems the bureau faced in 1980 included the following:

- There was a shortage of funds that necessitated layoffs and disruption of data entry and processing efforts at a particularly critical time, which was one of the major causes for the delay in data dissemination.
- Large clerical operations independently produced the maps and other geographic materials. This method of production led to delays and inaccuracies in the materials and errors that had to be corrected before the bureau could release the data products.
- Many of the local field offices experienced delays in the receipt of necessary supplies and problems in hiring and retaining enough workers. These problems caused some offices to remain open much longer than budgeted.
- There were such unforeseen occurrences as a transit strike in New York, the eruption of Mount St. Helens, fires in two district offices, floods, and civil disturbances, all of which added to the time required to complete operations in selected offices.
- Finally, there have been a number of legal challenges related to concerns about the accuracy of the 1980 census.

Concentration on difficulties sometimes gives a distorted picture of what was essentially a successful census. Still, the Census Bureau must be realistic in facing shortcomings in the last census and direct its planning efforts toward recognizing the problems, identifying their underlying causes, and doing everything possible to prevent or lessen those difficulties in 1990.

The bureau has already begun to look at ways to alleviate those problems under its control. While the 1990 census was being evaluated, the bureau was busy looking for ways to make improvements in 1990. In the remainder of this paper, five of those areas will be discussed in which improvements are going to be made: collection techniques, automation, outreach and publicity, coverage measurement and improvement, and content.

COLLECTION TECHNIQUES

One area under examination in order to improve the 1990 census is the data collection methodology. For most of the country in 1980, the mail-out mail-back technique was used. The Post Office delivered questionnaires to each housing unit a few days before the census and householders were asked to fill them out and mail them back to a temporary census district office on April 1. Questionnaires were mailed back for about 83 percent of the occupied housing
units. A large work force (270,000 at peak) personally visited nonresponding units and vacant units about 2 weeks after the questionnaires were mailed. This approach proved successful and is likely to be the basic data collection approach in 1990. However, modifications to this methodology are being considered for certain parts of the country. For example, in difficult-to-enumerate areas such as parts of large cities, where mail-return rates were low in the 1980 census, a two-stage approach will be tested. Basic, short-form data will be collected in the first stage and then sample or long-form data will be collected later.

AUTOMATION

Another major area of improvement will be the increased use of automation. With the vast advances in the electronic industry, many possibilities exist for further automating the census process to save time and money and increase accuracy. Traditionally, the census has been a paper-and-people-intensive task. The use of automated equipment can help to deal with the mountains of paper and the thousands of clerical tasks in a much more efficient and controlled way. Hiring, training, and finding space for all the people who have been needed to perform the numerous operations in past censuses has taken much time and money. Although the 1990 census will also likely require a large number of temporary workers, bureau staff is looking at ways to cut down on the number of labor-intensive activities.

There are many possible ways to automate the census, but only a few of them will be discussed here. Perhaps the most promising is the ability to convert the data to a computer-readable format earlier in the census process. When the 1980 census field offices closed, they shipped questionnaires to three sites for automated processing. For 1990, the bureau is looking at ways to capture data on machine nearer the point of collection. Capturing the data on computer early will allow more time for review and correction. The earlier data are captured by computer, the more the computer can help with the process of editing. Also, the computer record could serve as a backup to the original questionnaires in case they were inadvertently destroyed.

Another major automation improvement, one that is already well under way, is the automation of the production of geographic materials used in the census. As was mentioned earlier, one problem in the 1980 census was the poor quality of the maps used by enumerators and inconsistencies between maps and other geographic listings. The bureau is developing a new system called the Topologically Integrated Geographic Encoding and Referencing, or TIGER, system. TIGER will combine maps, addresses, and census geographical areas into one base. To do this, the TIGER system will put into the computer the longitude and latitude of geographic boundaries (a process called digitizing). Census Bureau regional offices are already contacting local officials to determine changes that need to be made to update the local maps. In the final stages, the TIGER system will contain geographical information on the entire United States in a digitized file.

With this file, maps and area boundaries can be obtained quickly and accurately. TIGER will also automatically locate housing units within the appropriate geographical area for enumeration and data compilation purposes. Investments in automation may be helpful not only for 1990 but for future decennial censuses and other Census Bureau programs as well. The bureau is collaborating with the U.S. Geological Survey in producing this automated mapping system. The bureau also intends to automate the address control file for the next census. With an automated file, it will be much easier to determine whether a
specific address has actually been included in the file, update the file, and keep track of which addresses have returned questionnaires. Reminder notices can be sent to those addresses that do not return questionnaires and nonresponding housing units will be investigated by enumerators.

These automation possibilities are exciting, but some words of caution should be added. Whatever systems are developed must be simple, because they will be operated by a temporary work force with minimal training. The systems must also be fail safe. Because the bureau must plan conservatively to avoid a crippling breakdown in any essential automated system, the latest technology must not be chosen. The lead times involved in obtaining new automated data processing equipment are such that decisions must be made several years before 1990. The cost of the new systems must also be reasonable.

Another of the challenges the bureau faces in planning increased automation for the census is to procure equipment for 1990 that will continue to have value to the bureau or be marketable to someone else on completion of the census. It would make no sense to have a junkyard of specialized equipment that will become useless in 1991.

As the bureau looks to increasing automation in the census, care must be taken to ensure that the confidentiality of the data collected is maintained both in fact and in appearance. Only by maintaining the confidentiality of the census process can the bureau ensure a high level of public trust and cooperation. The bureau is proud of its record of protecting confidentiality and is constantly looking for ways to maintain and improve that protection. The arrival of 1984 with its Orwellian overtones and the menacing implications of technology require that efforts be increased to convince individuals that they cannot be harmed by answering the census and that the information they provide is strictly confidential by law.

OUTREACH AND PUBLICITY

Still another major area for improvements in the 1990 census concerns outreach and publicity. Public cooperation is essential to the conduct of a good census. The public must understand the important uses of the census, trust in the confidentiality of the data, and act on this understanding and trust by including themselves in the census and by mailing back their census questionnaires. Therefore, the bureau is working to assure that its outreach efforts for the 1990 census will be better than those of 1980.

As stated earlier, the public information and outreach programs for the 1980 census were highly successful. The bureau made many special efforts to encourage public support for the census. Some of these promotional efforts were designed specifically to reach minority racial and ethnic populations to help reduce coverage differential among these groups and the rest of the population.

In 1980, the bureau formed three minority census advisory committees: one each for blacks, Hispanics, and Asian and Pacific Islanders. Bureau representatives participated in some 50 meetings of national minority organizations. The bureau also conducted regional meetings to obtain advice from the many tribal groups of Native Americans. In addition to these national programs, the bureau created the Community Services Program, for which it hired specialists specifically for their expertise in this area. They contacted local leaders and organizations that could encourage their constituents to cooperate with the census. These various activities and programs were extremely productive and contributed to the overall success of the 1980 census.

To provide general publicity, the bureau asked the Advertising Council to choose an advertising agency to conduct a public service advertising campaign free to the bureau. Independent evaluations show that the public service announcements were worth about $38 million in air time. This dollar figure which
was for the period of January to June 1980, was greater than the paid advertising media expenditures in an average 6 months for all but two of the nation's largest commercial concerns--McDonald's Restaurants and Ford Motor Company.

A formal evaluation of the publicity campaign showed that it was extremely effective in increasing awareness of the census. In addition, the campaign significantly increased knowledge about the census among lower-income black and Hispanic households and had a positive effect on the mail response behavior of these same households.

In addition to the Advertising Council campaign, the bureau directed a series of major publicity activities at the minority media. For example, the bureau obtained testimonials from prominent minority leaders and celebrities, developed special television and radio spots designed to reach minority audiences, and printed special literature for distribution to minority populations. The bureau also encouraged local communities to set up complete-count committees to help generate local support for the census. More than 4,000 jurisdictions formed such committees.

Since 1980, the bureau has been examining the 1980 promotion efforts with the intention of repeating in 1990 those that were successful and supplementing them with new efforts. The bureau's Information Services Program, which operates in the regional offices, has absorbed the functions of the 1980 census Community Services Program. Thus, bureau staff will be maintaining contacts with community organizations throughout the 1980s, an important outreach effort leading up to the 1990 census. Through the activities of the Information Services Program, the bureau will also be able to fulfill the commitment it made to community groups in 1980 of providing data services to the organizations that were so helpful in publicizing the census.

The bureau has also already taken an important step toward ensuring that it receives national-level advice from minorities in 1990 census planning: it has recommended to the Secretary of Commerce that four minority advisory committees be chartered to aid in planning the 1990 census. The four committees would represent the black, Hispanic, Asian and Pacific Islander, and American Indian and Alaska Native communities. The committees would meet both as separate entities and jointly. Before deciding what course to take with regard to the advisory committees, the bureau convened a conference in January 1984 to discuss with representatives of the minority groups how best to proceed. The bureau is also continuing its program of participation at meetings of national minority organizations.

In preparation for the 1990 census, the bureau will continue to explore ways to reach out successfully to both minority populations and the general public. Many decisions remain to be made about how best to achieve this goal. For instance, the bureau has not yet decided whether to seek a public service campaign through the Advertising Council or to ask for funds to conduct a paid promotional campaign. Given the success of the pro bono advertising campaign for the 1980 census, the bureau would have to have strong justification for converting to paid advertising.

Bureau staff and outside experts met at a conference on outreach in September 1984 to discuss some of these issues. Participants were enthusiastic about their involvement in census planning at such an early stage and many excellent suggestions were offered for consideration and testing as part of the overall outreach plan.

COVERAGE MEASUREMENT AND IMPROVEMENT

After each census since 1950, the Census Bureau has attempted to measure the coverage of the population, that is, how well the people were counted. Although
statistical techniques are not available to measure coverage precisely, these studies have consistently shown that some groups of the population—blacks, for instance—are undercounted at a disproportionate rate to the rest of the population. Some persons have advocated that the census counts be adjusted to account for this disproportionate undercount.

Adjustment is a complex problem that involves statistical as well as legal, political, and perceptual issues. From the statistical standpoint, adequate measures of census coverage are needed for the nation, states, and smaller areas before adjustment can be made. For the 1980 census, the bureau had two major programs to measure coverage of the population. These programs provide a general idea of the degree of coverage in the 1980 census, but they do not provide the bureau with accurate enough information to adjust the 1980 census data for the undercount.

The issue of adjustment will be a major concern in planning the 1990 census. The bureau will continue to examine the use of different undercount measurement and adjustment techniques to determine whether a valid procedure can be developed for adjusting the census counts. A new organizational unit has been created to coordinate, monitor, and analyze undercount-related activities, and the National Research Council's Committee on National Statistics, a panel of technical experts, has also been working on this issue.

Regardless of whether the Census Bureau decides to adjust the 1990 census counts, both an accurate census and accurate measures of coverage in the census are needed. The bureau has embarked on a two-faceted approach that should achieve both of these goals. Both improving overall coverage and reducing differential coverage error by population group are of concern. Ideally, coverage in the 1990 census would be so good as to render academic the issue of whether to adjust the counts. Although such an ideal census is unlikely to occur, the bureau is working hard toward this goal.

Many steps are being taken to work on this problem. The improvements mentioned earlier in automation and collection techniques are aimed at making the census simpler and faster so that there is more time for review and appropriate corrections. Expanding the outreach and publicity efforts will also help to improve coverage. Also, good working relationships and a number of joint ventures with local officials are being established. In 1980 there was a local review program for the first time that allowed officials to review and comment on the census counts before the district offices closed. By working closely with local officials, that program can be made even more successful in the next census.

Finally, all the coverage improvement techniques used in 1980 will be examined and the ones that were effective will be kept or improved, the ones that were not will be dropped, and new ones will be developed. For example, the precanvas activity used in the 1980 census proved to be very successful. In the precanvas, census enumerators updated and corrected the precensus address lists by canvassing their assigned area, adding or deleting units or structures from the list, as appropriate, and making sure that housing units were listed in the correct geographical area. That operation will certainly be repeated and ways are being sought to improve it.

CONTENT

Because the purpose of the census is to meet data needs for 10 years, no part of census planning is more important than selecting the census questionnaire content. Census information is collected because it is constitutionally mandated or because federal agencies, state and local governments, business groups, demographers and economists, community organizations, and others have substantiated their need for information.
In determining which questions to ask in the census, the bureau consults with thousands of data users in numerous forums to ensure that it asks the most useful questions. The bureau determines the uses of existing census data and identifies current needs not being met; however, future data needs must also be anticipated. So in planning 1990 census content, the bureau will examine the 1980 census inquiries and ask such questions as the following: Which data will be needed in the 1990s? Are some of the questions no longer useful and can they be dropped from the 1990 census? Will new subject areas become critical in the 1990s? There are many decisions about census content to be made in the next few years. By law, the Census Bureau is obligated to report to Congress by April 1, 1987, on the subject areas for the census and by April 1, 1988, on the actual questions that will be asked.

Whatever decisions the bureau makes, four characteristics about the content of the 1990 census questionnaire are reasonably certain. First, only essential data will be collected—those needed to draw a picture of the American people and their housing and to administer federal, state, and local programs.

Second, many of the questions asked in 1980 will be repeated in 1990 to provide a continuum of vital socioeconomic and housing data: age, sex, race, marital status, income, housing tenure, value, and rent, for example. Thus, although there are likely to be important changes in census content, they will not be radical. The relative stability of census content over the last few decades stems in part from the relevance and usefulness of many basic items and the need to measure how they have changed over time.

Third, there will be no significant growth in the number of questions the bureau asks in 1990. One of the bureau's criteria for planning the 1990 census is to strike the proper balance between the need for information and the length of the questionnaire. This is necessary because the public cooperation essential for a successful census could be undermined by a questionnaire that the public finds too burdensome.

Fourth, the 1990 census form will not contain any question that is intrusive, offensive, or widely controversial. The bureau needs public cooperation for the census to work. In many countries there is a question about religion, but there has never been such a question in the U.S. census, and a law passed by Congress in the 1970s now forbids compelling a respondent to disclose information relative to his religious belief or to membership in a religious body.

As the census subjects are being determined, the bureau will work on the wording and format of individual questions. Wording and format are very important considering that the census is based on selfenumeration.

It must also be determined whether questions need to be asked for all persons and housing units or for only a sample or fraction of persons and housing units. The overall size of the sample must also be determined. The major determinants are the levels of geography and statistical reliability desired. The sample has included about 20 to 25 percent of the population in each of the last four censuses. For the 1980 census, one in six housing units (and its inhabitants) was in the sample, except for places with 2,500 or fewer people, where one in two housing units was in the sample.

Whether a question is asked on a 100-percent basis or on a sample basis depends on whether reliable data are needed for very small areas. For instance, if data on race are needed at the city-block level, the race question must be asked for all persons, because only a 100-percent sample can produce sufficiently accurate block-level data. The sample is adequate for producing basic data for census tracts and larger areas, such as most places, counties, Standard Metropolitan Statistical Areas, and states but not for blocks.

The planning for a census of population and housing is just as complex as carrying out those plans. It is hoped that this discussion has given an overview of the major issues that the Census Bureau faces in planning the next decennial census.
Issues Concerning Transportation Data in the 1990 Census Planning Process

Peter A. Bounpane

Although Census Day, April 1, 1990, still seems far distant, because of the many decisions to be made and the long lead time required, the Bureau of the Census has already begun extensive planning for the nation's 21st decennial census. Part of the planning process is to take a fresh look at the information collected and how that information is processed.

The fresh look includes being aware of the needs of the data users and the major issues with which they are contending. This conference provides one opportunity to inform an important user group of the planning process and to receive comment and instruction. In order to help this exchange, some detail will be given about how information is gathered about the concerns of data users and test procedures and methods. Also discussed are general content issues and ones specific to transportation. General content issues are presented in the first section, and transportation content issues are reviewed in the second section. Census Bureau criteria for selecting content are explained in the last part of the paper.

PLANNING PROCESS

There are many difficult choices to be made before plans for the 1990 census are final. The process by which the Census Bureau will gather the information and advice it needs to make the decisions about which questions will be on the questionnaire is threefold and includes internal review, consultation with data users and the general public, and formal tests of procedures.

Internal Review

Between the summer of 1982 and the fall of 1983, the bureau organized 17 internal committees so that bureau staff, especially those heavily involved with the 1980 census, could help plan the 1990 census. Each committee represented a cross section of the organizational units and staff involved in carrying out the census. The committees set to work gathering information, preparing issue papers, and making recommendations. Census managers then reviewed the papers and recommendations to determine which ideas should be developed further or tested in the coming decade. Some of the group assignments were basic design methodology, field operations, geography, outreach, and coverage improvements.

Two groups examined census content issues. One was concerned with content evaluations to be conducted after the 1990 census. The other analyzed 1980 content evaluation studies and will address 1990 pretest evaluations to determine 1990 content and wording of questions. Some examples of the critical population content issues identified thus far by the bureau include the following:
Who should be included in the census? Should citizenship be determined on a 100-percent basis and how can these concepts be made operational?

- What population characteristic data are needed for tabulation and publication at the block level? At the block-group level? At the tract level?
- What are the federal and state requirements for race and ethnic data and how can the bureau best collect these data?
- What income measures are required, are these required on a 100-percent basis, and how can these concepts be put into operation?
- Will disability and health content be required and can it be reliably collected?
- Should small-area place-of-work coding or processing be funded by the U.S. Department of Transportation?

From a more general perspective, the major content problem to be dealt with internally is how best to meet user data requirements while ensuring that all critical data needs are met and that accurate response with minimal respondent burden is achieved. To help in this effort, the Census Bureau has asked for the counsel of numerous user groups as well as the general public.

Consultation

Census consultants represent many segments of society with a stake in the outcome of the 1990 census, including federal agencies, state agencies, the general public, professional organizations, the private sector, and user groups. By including these groups in the planning process, the bureau hopes to take advantage of as many informed networks as possible to discuss its plans for 1990 and receive comments.

With federal needs in mind, the bureau has asked the Office of Management and Budget (OMB) to form a Federal Agency Council on the 1990 census to advise the bureau on federal data needs, questionnaire content, and tabulations. The 1960, 1970, and 1980 censuses all had such councils, organized and coordinated by OMB, consisting of representatives from the 90 or so federal agencies that are major users of census data. The council members provide liaison between their respective units and the bureau, making known the agencies' legislative and program needs while considering the bureau's capabilities to meet them.

Reflecting state and congressional concerns about data for state legislative redistricting, Congress in December 1975 enacted Public Law 94-171. This law required that the Census Bureau transmit population tabulations to the states 1 year after the census date. Also required was the submission of technical criteria to the states earlier in the decade and, in turn, submission of geographic plans by the states to the Census Bureau. To meet the requirements for 1990, the Census Bureau first held a conference in October 1983 to discuss the data needs of state officials and technicians. Among the many issues discussed was how to identify key personnel involved in legislative redistricting in the states to serve as contacts with the Census Bureau. In 1985, the bureau will initiate a series of meetings with the key agencies and persons responsible for redistricting. In addition, the bureau plans to work with three to five states to conduct pretests to examine the feasibility of implementing a block boundary program. To obtain information about the use of census data for state planning purposes, the bureau will hold a series of regional meetings with state officials and planning personnel in 1986.

In April 1984, the bureau began holding a series of open Local Public Meetings to obtain and review the recommendations of as many users and potential users as possible in planning the decennial census. The objective is to hold at least one meeting in every state, the District of Columbia, Puerto Rico, and the
Virgin Islands over a period of a year and a half. Census staff members speak briefly at each meeting about current census planning efforts, answer questions, and bring the local comments and recommendations back to the bureau for review. To date about one-fourth of the meetings have been held. Thus far, at each meeting many comments about the transportation items on the 1980 census and suggestions for improved data in 1990 have been received. The major issues that have surfaced to date can be categorized into three topics: geographic level of place-of-work coding, funding for block coding, and content improvement.

With regard to the geographic level of place-of-work coding, planners from many of the largest metropolitan areas generally have expressed satisfaction with the census-tract level. Those from small and mid-sized areas think data for census tracts is not detailed enough, because the tracts are large, and therefore argue for block data that can be aggregated into traffic analysis zones.

The topic of cost sharing elicits three general opinions. Some transportation planners have suggested that federal funds earmarked for planning be provided directly to the Census Bureau by the U.S. Department of Transportation. Another set of comments makes it quite clear that many local planning agencies are not in a financial position to share the cost of block coding. Perhaps surprisingly, there are some agencies, often located in the fastest-growing areas of the nation, who are willing to assist in meeting the cost of getting the data they want.

The two major suggestions heard at Local Public Meetings for improving transportation content are adding a question on time of departure from residence and workplace, to identify peak commuting hours, and collecting data on multimodal commuting, as contrasted with collecting data on the principal mode, as is now done. The common complaint is that principal mode underestimates commutation on public transportation.

Other subject areas often commented about including adding measures such as distance to work and nonwork travel, the usefulness and timeliness of the Urban Transportation Planning Package, and sample size. Although some suggestions are not feasible within the limits the Census Bureau accepts, all are recorded and reviewed by bureau planners and subject-matter specialists.

Among the professional organizations that have been contacted for planning assistance is the Council of Professional Associations on Federal Statistics (COPAFS), which will hold a conference on concepts related to residence rules, that is, where to count people. COPAFS members include more than 125,000 users of federal statistics in private business, governmental units, public interest groups, and the research community.

The bureau has contracted with the National Research Council Committee on National Statistics to take a look at several aspects of the next census, particularly the issue of adjusting census counts. The committee will

1. Identify and evaluate possible methods for adjusting net census error in 1990,
2. Investigate the uses of sampling to improve the accuracy of the counts for both total and minority populations, and
3. Investigate the types of administrative records, both local and national, that can be used for various parts of the 1990 census procedures.

The committee and its appointed panel will also be available for consultation on topics such as statistical methodology, statistical measurement of immigration and emigration and its use in estimating net undercount, and studies to be carried out during the 1990 census. In general, the panel is to address the issues from a technical point of view, and the bureau will then consider other aspects, for example, the legal and policy issues. The panel's first report is due in early 1985.
In planning the 1990 census, the bureau will also draw on the expertise of its advisory committees. The Census Bureau has four standing advisory committees that review and comment on decennial census plans. These represent the Population Association of America, the American Statistical Association, the American Economic Association, and the American Marketing Association.

The Census Bureau has established relationships with many of the varied segments of its data-user community, and these relationships have provided the bureau with information about data-user needs and the data products that best fit those needs. Three major sources of feedback about data-user needs are the Association of Public Data Users (APDU); State Data Centers, now established in most states; and the Census Bureau's own 12 regional offices and their 9 satellite offices.

APDU is an association representing academic, government, business, and nonprofit organizations concerned about data use, production, and distribution. In November 1983 Census Bureau personnel took part in the annual APDU Conference, where many comments concerning data-user needs for the 1990 census were received, including such varied concerns as geographic units used in Census Bureau publications and summary tape technical design, subjects, and geography.

State Data Centers have been set up through cooperative agreements between the Census Bureau and participating states to improve access to and use of Census Bureau and related statistical resources. A number of national and regional meetings have been held since 1980 at which census planners have explored with State Data Center personnel ways in which the centers can participate over the decade in planning the 1990 census. Also, the centers have formed a steering committee to provide a mechanism to present state views on census planning and other census programs, and a conference addressing these topics was held in September 1984.

Two major objectives of the Census Bureau's regional offices are to assist the public in accessing the data they need and to answer inquiries about Census Bureau programs and products. However, regional offices also serve as two-way channels of communication by providing feedback to census planners on strengths and weaknesses of the 1980 census and suggestions on improving the 1990 census, which are grounded on their extensive field contacts. This advice is received through informal discussions with regional directors and other field personnel and at regional director's conferences.

In addition to the preceding formal agenda, other special meetings are held. For instance, the bureau has held a number of off-site meetings to address specific topics related to the 1990 census. These meetings are held close enough to Census Bureau headquarters to keep travel costs down but far enough away so that participants are not interrupted by everyday work. Some of the meetings have been attended only by bureau personnel, but others have also been attended by selected individuals in or out of government. Examples of the latter type were meetings on the meaning of enumeration (July 1982), on 1990 redistricting needs (October 1983), with representatives of minority groups (January 1984), on automation (July 1984), and on outreach and publicity (September 1984).

In addition to the four standing advisory committees mentioned earlier, the bureau has requested that the Department of Commerce grant authority to form four committees to represent four minority groups: blacks, Hispanics, Asian and Pacific Islanders, and American Indians and Alaska Natives. If the committees are approved, the bureau hopes to begin meetings in the spring of 1985.

Of course, the list would not be complete without referring to special-purpose subject-matter conferences, such as this transportation meeting. This conference provides an important opportunity to receive comments from the transportation community and reach a clearer understanding of what should and can be accomplished in the next census.
Testing

In addition to internal review and consultation with data users, the bureau is planned to conduct several tests between now and 1990. In 1984, the bureau conducted a test of procedures for compiling address lists. In 1985, it will carry out two pretest censuses, one in Jersey City, New Jersey, and the other in Tampa, Florida. In 1986, the bureau will continue to test alternative techniques and may conduct pretests in as many as three different sites. One of the 1986 tests will be devoted to special procedures for enumerating American Indians.

There will also be a national content test in 1986 to test new items proposed for the census questionnaire, as well as revisions of the standard questionnaire items to clarify the wording for respondents. This test, similar to one held before the 1980 census, is the major testing vehicle for determining questionnaire content, because it is national in scope. Special-purpose tests on certain types of questions are also planned.

The bureau will hold other pretests in 1987 and a full-scale dress rehearsal census in 1988. In the period 1985-1988, there will be a number of special-purpose tests related to the decennial census, including the test of an automated coding system to improve the accuracy of small-area place-of-work data.

In addition to the Census Bureau's internal deadlines, as the decade progresses there are a number of legal deadlines. The first comes on April 1, 1987, when Congress must be notified of the subject content of the 1990 census. This date also is the deadline for Census Bureau receipt of state redistricting plans (P.L. 94-171). One year later, April 1, 1988, Congress must be informed about all questions to be included in the census. These early deadlines of course provide an opportunity for congressional review and comment. Next in the series of legally mandated dates is Census Day, which will be April 1, 1990.

Eight months later, December 31, 1990, reapportionment counts must be delivered to the President. These are used to reapportion the House of Representatives. The last legal deadline in the decennial census cycle is April 1, 1991, when delivery of final Public Law 94-171 data products for legislative redistricting is required.

TRANSPORTATION ISSUES

Over the next 4 years, as part of the 1990 census planning process, the Census Bureau will be addressing several important issues that pertain to the transportation items in the census. These issues deal with the content of the questionnaire, coding, and tabulation.

Questionnaire Content

If data from the decennial census are to be an acceptable alternative to origin-destination surveys, the issue of census content must be considered. Will all of the transportation data from the 1980 census still be needed in the 1990s? Are any modifications to the questions needed? Given such constraints as keeping respondent reporting requirements at a reasonable level, holding the line on costs, and conserving questionnaire space, are there still additional subject areas critical to transportation planning that the Census Bureau should consider for inclusion in the 1990 census?

Place of work and means of transportation to work were the heart of the journey-to-work items on the 1980 census, although questions also were included on carpooling arrangements, the number of commuters in the carpool, and travel
time to work. The 1980 housing items included two transportation-related questions: the number of automobiles available for use by the members of each household and the number of light trucks and vans available. Another question identified persons with a disability that limited or prevented them from using public transportation.

Several specific content issues for 1990 already have been raised by transportation data users. For example, can the means-of-transportation question be asked and processed to obtain all modes of travel used to get to work as well as the principal mode? What effect would it have on data users if the questions on cars and trucks and vans were combined into one question on total vehicles available? Is travel time to work still preferable to distance to work because of response accuracy? How important would it be to ask a question on peak hours of travel to improve the utility of the journey-to-work data? Were the data on public transportation disability used by local planners? Should the question have asked whether the person had a condition that limited or prevented him from driving a car instead of using public transit? These are just some of the questions that the Census Bureau must answer before the 1990 census.

Coding

Foremost among the transportation issues that will receive a great deal of attention is continued improvement in the accuracy of small-area place-of-work coding. Since the place-of-work question first appeared in the census in 1960, responses have been coded clerically. The 1960 census asked only city, county, and state of work, so coding was fairly simple. In 1970, however, the development of Address Coding Guides provided the capability for the first time of geographically coding place-of-work addresses down to the level of the census block. For the 1980 census, place-of-work coding guides were prepared from the address reference files, in 1980 called the GBF/DIME files, and extensive precoded lists of major employers such as companies, businesses, office buildings, shopping centers, colleges, and military installations were created to help code responses that did not give complete addresses. Because many large employers do not have a commonly known street address—the Census Bureau is a good example—these lists resulted in a significant improvement in the quality of place-of-work coding in 1980. There is still progress to be made.

The bureau's ability to code places of work down to the block level varied from metropolitan area to metropolitan area. The reasons for this include variations in the quality of responses, the completeness of the coding reference materials, and the ability of the coders in different processing sites to carry out the complicated procedure of researching the block location of companies, businesses, buildings, shopping centers, or other workplaces. Wherever the rate of block coding was low, the detailed place-of-work data for that area were of limited utility.

Another issue to be examined is the geographic level of small-area place-of-work coding to be undertaken in the 1990 census. In the 1980 census, workers who lived within metropolitan areas were coded to the block level whenever possible. If the information in the place-of-work response was not sufficient to assign it to a block, the coders attempted to code to the census tract and so on up the hierarchy of census geography. One convenient measure of 1980 results is the proportion of workers who worked in central cities of metropolitan areas and were coded to census tract or block. In 1980, about 81 percent of the workers who reported working in central cities were coded at least to the census-tract level, whereas about 73 percent were coded to block.

As an alternative to block coding, coding the place-of-work questions to a
higher geographic level such as the census tract would have many advantages. Precoded reference files of addresses, companies and businesses, buildings, and other employment sites could be prepared more easily and could be more comprehensive. Coding itself would be more efficient because responses could be coded to a larger neighborhood type of unit rather than to individual blocks. The coding would be more accurate; more responses could be coded to census tract than to block. Many local planning agencies, notably in the largest metropolitan areas, are already using the census tract as an alternative to traffic analysis zones.

As part of the 1986 and 1987 pretest activities, the bureau plans to develop and test an automated coding system in an effort to improve the accuracy of small-area place-of-work data while providing savings in processing time and cost. Handwritten place-of-work responses from the questionnaires will be keyed and then matched against reference files by the computer to ascertain the appropriate geographic codes rather than being coded by clerks using computer-generated manuals. The reference files will include both address records and major employer records so that the coding algorithm can use whatever information the respondent provides. The success achieved by the automated coding approach will depend on obtaining as many complete address responses as possible during the enumeration phase of the census and on creating a comprehensive list of major employers from which to code those responses that are incomplete. Consequently, the pretests also will allow the evaluation of response quality and the identification of the best sources for obtaining lists of major employers. As in 1980, the bureau plans to contact local transportation planning agencies to obtain lists of traffic-generators with which to check the coverage of the major employer files.

Tabulation

The issue of the cost of producing small-area place-of-work data must also be addressed as the bureau plans for the 1990 census. Most nontransportation applications of geographically detailed place-of-work data, such as daytime population analyses for marketing, environmental impact studies, and disaster planning, utilize the data at the census-tract level. In 1970 and 1980, the only reason that place-of-work responses were coded down to the level of the city block rather than the larger census tract was so that the data could be aggregated to traffic analysis zones for tabulation in the Urban Transportation Planning Package (UTPP), which is a special tabulation of census data that is tailored to the geographic areas used in transportation planning. Local transportation planning organizations submitted specifications to the Census Bureau for the blocks that made up each of their traffic zones, and the bureau then produced a standard set of tabulations for those planning areas on a cost-reimbursable basis.

With the increasing cost of conducting home-interview origin-destination surveys, not to mention the difficulty in obtaining the cooperation of respondents, the UTPP has developed into a low-cost alternative source for benchmark planning data. The emphasis placed on the package by the U.S. Department of Transportation, both through funding for the project and teaching local planners how to use it, has institutionalized decennial census data in the urban transportation planning process. Nevertheless, given the need to hold the line on the overall cost of the census, the commitment of census resources to the needs of a unique group of data users raises the inevitable question of whether user fees should be charged for coding to the block level. Therefore, during the planning phase of the 1990 census, the bureau will be investigating the desirability and the feasibility of several alternative approaches to
small-area place-of-work coding. One possibility is to code to the census-tract level except in certain tracts that have a high concentration of employment or where block detail is absolutely needed to divide the tract into smaller zones. These tracts could be identified and contracted for by local transportation planning agencies during the development of the 1990 place-of-work coding system. Thus, depending on the need for local agencies for blocks, place-of-work coding may be entirely to block, partially to block, or to census tract only.

CRITERIA FOR CONTENT SELECTION

These are just some of the content issues that the Census Bureau must resolve before the 1990 content is set on April 1, 1988, when it is submitted to Congress. How will the choices be made? In all census planning, a number of criteria are considered.

First, the constitutional and legal requirements to deliver the counts for reapportionment to the President by December 31, 1990, and the counts for redistricting to the states by April 1, 1991, must be met. Also, the delivery of redistricting counts for those states that require them before April 1, 1991, will be expedited. In the course of planning, the ability to meet these dates must not be jeopardized.

Second, the total cost of the census must be kept reasonable. Considering the important uses of the census, the 1980 census costs were not out of line. Still, there is always room for cost efficiency, and the goal is keep the per-unit cost no higher, considering inflation, for the 1990 census than it was for 1980.

Third, the data will be produced in a more timely manner than ever before. Automation will be one of the keys to this goal, but there are many other decisions that will affect the ability to achieve this objective.

Fourth, the high level of accuracy of past censuses must be maintained, particularly in the area of coverage. This is a real challenge—to do the census faster and at a reasonable cost but not to lose, and in fact to improve, overall accuracy. One important aspect of this goal is to decrease the differential between the undercount rates for whites and for minorities.

Fifth, all decisions about the census must consider the necessity of maintaining the strictest confidentiality of each respondent's answers. This goal is one of the major considerations for 1990. Confidentiality must be protected at all costs, even if it means passing up the use of new technologies that can be perceived as a threat to confidentiality. As the public sees computers playing an even larger role in the census, they may fear for the protection of the data. Although automation and computers can have real benefits, the bureau must take care to ensure that the confidentiality of its data is maintained, not only in fact, which has always been the case, but in appearance as well. The success of the census depends directly on the willingness of the public to cooperate, and their trust in the pledge of confidentiality is the basis for that willingness.

Sixth, in deciding what questions will be asked, a proper balance must be struck between the need for information and the length of the questionnaire. There are more and more demands for data, and there are more reasonable questions than can be asked, so the challenge is to keep the questionnaire relatively short while trying to meet as many data needs as possible. As the bureau conducts the extensive testing and consultation program already described, it will be found that there are many more legitimate questions than can reasonably be asked. In making the final choices, the following six standards will be used:
- Demonstrated need
  Only essential data will be collected—those needed to describe the American population and housing stock—but those specifically needed to administer federal, state, and local programs have a high probability of being on the questionnaire.

- Small-area need
  If the data are needed for small geographic areas (census tracts, block groups, and blocks), the census is a good tool. If the data are only required for larger areas (such as the nation, regions, states, counties, and Metropolitan Statistical Areas), sample surveys might be more appropriate.

- Small population
  The small-area need refers to small geographic areas. Data needed for a small but dispersed population (for example, American Indians) are theoretically possible but quite difficult to collect on a sample survey. Therefore, the census may be more appropriate.

- Self-reportable and suitable for data processing
  The questions generally will be answered directly by respondents without an enumerator present; therefore the questions must be relatively easy to understand. In addition, the responses must be of a type that are easily translatable to machine-readable form and consistent with electronic data processing requirements.

- Public acceptability
  The 1990 census form will not contain any question that is intrusive or offensive. Also, the census will not include questions about opinions.

- Historical continuity
  Many of the questions asked in 1980 and earlier censuses will be reasked in 1990 to provide trend data on vital socioeconomic and housing characteristics.

Transportation is only one of the many subject areas in the census; similar analyses must be conducted with the others. Nonetheless, transportation is a critical issue, particularly considering ever-changing lifestyles affected by such decisions as migration from central cities and adoption of electronic communications advancements to eliminate journeys to the store or even journeys to work.
Implications of the 1990 Census Geographic Support System for Place-of-Work Coding

Robert W. Marx

Few groups of people in the United States have a greater appreciation for the problems of dealing with small-area data than do urban transportation planners. For this reason, it is especially useful for the Census Bureau in its geographic planning process to understand planners' concerns about the problems of the past and discuss plans for the 1990 decennial census.

In the development of the geographic support system for 1990 a fundamental improvement will be made in the way geographic work is performed at the Census Bureau and elsewhere, an improvement that will affect the Census Bureau and the nation for decades to come. In this paper some history is given that explains how geographic support activities fit into the Census Bureau's program, describes how geographic support work was performed in the past, and discusses some of the problems that resulted from the process. Then an overview of what will be done to improve the performance of these products for 1990 and the implications of this change for planners will be given.

A look at an organizational manual of the United States government would show that the mission of the Census Bureau is to provide basic statistics about the people and the economy of the nation to the Congress, the executive branch, state and local governments, and the general public. The success of a census rests not only on how well the data are collected but also on how well those data are linked to geographic areas. Figure 1 shows the types of geographic areas and number of each for which data were tabulated in the 1980 census.

FIGURE 1 Tabulation units recognized in the 1980 census.
This is where geographic support comes in. For the Census Bureau to accomplish its mission, the Geography Division must provide the mechanism for doing two basic jobs: first, each housing unit or business establishment must be assigned to the correct geographic location, for example, a city block, and second, each location must be classified according to all of the various tabulation areas represented in each particular census or survey. This same type of geographic support is needed for several major Census Bureau programs—the decennial census, the economic and agricultural censuses, and the intercensal population estimates.

GEOGRAPHIC SUPPORT SYSTEM FOR THE 1980 DECENTENIAL CENSUS

For 1980 the Geography Division provided three major geographic tools to assist the bureau's field staff in the completion of their data collection task and the bureau's processing office staff in the subsequent capture, editing, and tabulation of the collected data. These tools were maps, address reference files (called GBF/DME files), and a geographic reference file (called the Master Area Reference File).

Maps: The Cartographic Base for a Geographic Support System

Maps describe the earth in graphic form. Census maps (Figure 2) show the streets, railroads, streams, and other types of features an enumerator would expect to see while collecting data for an area. They also show the geographic chunks outlined by those features—which are called blocks—and the numeric codes that identify those blocks: the state, county, census tract, and block numbers. These same maps are used to show the boundaries for most of the higher-level geographic units into which blocks are classified: cities, townships, urbanized areas, and so forth.

Making the Maps for the 1980 Census

The map bases that have been used for the past several censuses came from state and local sources; the state highway or transportation agencies were the most significant single source. During the last 2 years before the 1980 census, one group of about 900 people at the bureau's primary processing office in Jeffersonville, Indiana, assisted by a contractor in California with an additional 400 people, prepared these map bases for census use; plotted the boundaries for all the counties, cities, townships, census tracts, and so forth.

<table>
<thead>
<tr>
<th>Serial Number</th>
<th>Address (House Number and Street Name)</th>
<th>Block Number</th>
<th>ED Number</th>
<th>Occupant Name(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td>104 Main Street</td>
<td>306</td>
<td>23</td>
<td>James</td>
</tr>
<tr>
<td>0002</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0003</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0004</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FIGURE 2 Portion of a census map and section of the related census address register.
in the country; and assigned by hand all of the block numbers—2.5 million of them in the major urban areas of the nation—to prepare the more than 32,000 map sheets that covered the United States for the 1980 decennial census.

In Figure 2, which represents a portion of a typical census map, 2nd Avenue is a census-tract boundary; census tract 14 is to the east or right of 2nd Avenue and census tract 15 is to the west or left of 2nd Avenue. This census-tract boundary and the boundary for Zebra City form field assignment area boundaries; these field assignment areas were called enumeration districts (EDs). ED 28 is to the east of 2nd Avenue, ED 27 is between 2nd Avenue and the city boundary, and ED 23 is to the west of the city boundary.

Many of the same people who made the 32,000 map sheets had to take each of the finished map sheets, which were in reproducible form at that stage of the process, and make enough diazo copies so that they could take scissors, cut out the appropriate sections of each map copy, and assemble approximately 300,000 individual assignment area maps for the field staff. These individual assignment maps were like a huge jigsaw puzzle in which no two pieces could overlap and no two pieces could leave a gap anywhere in the United States. This was a difficult task because the 32,000 map sheets were not all drawn to the same scale, they did not all use the same types of symbols, and the same feature often looked very different on one map than on the map next door.

The Map as a Tool

Once the map has been marked with the field assignment area boundaries, a census enumerator using such a map can walk around a block, list every address seen along each side of the block in a book called an address register, and then write down the number of the block in which that address is located. For example, the enumerator assigned to ED 23 would walk along Main Street listing each housing unit located there, such as the house at 104 Main Street, and show that it is in block 308.

In that simple act of writing down the block number, the enumerator has geocoded the address; that is, the enumerator has assigned it to a geographic location. This is the first of the two geographic support functions described earlier: assigning the address to a geographic location. It is important to understand that because the map is like a picture of the earth, it shows both geographic identification information and the relationships of one kind of area to another. When the enumerator uses a map, however, only the geographic identification information gets recorded; the relationships between the areas that our eyes can see when we look at the map are not written down in this process. The classification of each location into tabulation areas is done by the geographic reference file that is discussed later.

Address Reference Files: The First Step Toward an Automated Geographic Data Base

When the decision was made in the mid-1960s to use a mail-out, mail-back approach for future data collection activities in the economic and decennial censuses, the form in which geographic support was provided to the census-taking process also had to change. No longer would enumerators take their assignment area maps and actually visit each housing unit or every business establishment; now, many times they would visit only those units that did not return a questionnaire. For the 1970 and 1980 decennial censuses, because the enumerators did not visit every housing unit, they could no longer write down every block number next to each address in the address register. People were no longer the sole source of geocoding information.
To provide a tool that would do the job a map once did for an enumerator, the map had to be encoded in a way that would be understandable to a computer. The resultant geographic product was called an Address Coding Guide (ACG) at the time of the 1970 census. For the 1980 census, the ACGs were converted into a series of files called Geographic Base Files or Dual Independent Map Encoding Files, often referred to as GBF/DIME files. Generally, both the ACGs and the GBF/DIME files are address reference files. The U.S. transportation agencies played a major role in the development of these critical geographic files. This was done with support for the concept from the U.S. Department of Transportation, promotion of the idea by FHWA and UMTA, assistance from the state highway departments, and the direct participation of many regional transportation organizations.

Building the GBF/DIME Files for the 1980 Census

The GBF/DIME files describe the same geographic information shown on a traditional census map—streets, railroads, streams, census tracts, and blocks—and add information on the address ranges that apply to each side of a street between intersections (Figure 3). The process of preparing the GBF/DIME files also required that additional identifying information be added to the maps in the form of little dots at every intersection, called node dots, with identifying numbers, called node numbers. This included intersections of streets and boundaries.

Figure 3 shows the same area as in Figure 2. The maps for the GBF/DIME file areas were redrafted to make the streets appear as single lines rather than the double lines typical of the maps obtained from state and local officials. For purposes of illustration, the intersections on this sample map are identified as nodes 1, 2, 3, 4, 5, and 6, and the addresses at all four corners of the two intersections along Main Street are shown along with the addresses where the city boundary intersects Main Street. The address information usually is obtained from other source materials found at local agencies and does not appear directly on census maps.

To complete the process, a clerk fills out a worksheet for each section of the street, working in the direction of increasing address numbers—in this case, going first from node 3 to node 2 and then from node 2 to node 1. The GBF/DIME file records show the geographic information presented on the map, the range of address numbers for each section of Main Street, and the associated adjacent block numbers: block 303 on the left side and block 308 on the right side.

From 1975 to 1979, more than 300 local agencies across the country worked with the Census Bureau to create the GBF/DIME files following procedures and

![FIGURE 3 Portion of a census map and section of the related GBF/DIME file.](image-url)
using worksheets prepared by Census Bureau staff. They did this by transcribing
the street names shown on earlier versions of the census maps along with all of
the block numbers within the areas covered by the files and the address ranges
that went with those street names and block numbers. They hand wrote more than
7,000,000 individual lines of information that then had to be keyed and
converted to a series of computer files.

GBF/DIME File as a Tool

The additional information embedded in the GBF/DIME file allows the computer to
see what addresses fit into each block using computer matching algorithms that
perform the geocoding function previously done by an enumerator. In this
example, 104 Main Street comes to the bureau on a computer tape and the computer
determines that it fits in the address range 100 to 122 on Main Street. The
house at 104 Main Street is therefore in block 308 and in Zebra City. The
computer now is able to do the geocoding job once done by an enumerator.

Although the GBF/DIME files contain geographic information, such as the
geographic codes for the areas shown, they also contain some information about
the geographic relationships shown on the maps, for example, which block numbers
are across the street from each other and which census tract each block is part
of. At this state, the GBF/DIME files still do not contain spatial information,
such as the length of the street or position of the street on the earth; they
still must be used in conjunction with a map when people need to participate in
the geocoding process.

Adding the Spatial Dimension

For the parts of the Unites States covered by the GBF/DIME files (approximately
1 percent of the land area but 60 percent of the people), a first cut at
encoding the spatial information has been made. The node points at every
intersection in the areas covered by these files have had a latitude and
longitude coordinate value calculated using a process called digitizing. Some
curves, or inflection points in mathematical terms, also have had a coordinate
value calculated (Figure 4). There are more than 7,000,000 node points in the
1980 version of the GBF/DIME files. It took 3 years to do this job with limited
staff and equipment. Since 1980 more than 50 additional files have been created
for the newly designated urbanized areas, bringing the total number of GBF/DIME
files to more than 330.

Geographic Reference Files: Tabulation Base for Geographic Support System

Both of the geographic tools described so far have been concerned with the first

<table>
<thead>
<tr>
<th>Node</th>
<th>Longitude (x)</th>
<th>Latitude (y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>92.0763°W</td>
<td>34.1552°N</td>
</tr>
<tr>
<td>2</td>
<td>92.0770°W</td>
<td>34.1552°N</td>
</tr>
<tr>
<td>3</td>
<td>92.0785°W</td>
<td>34.1552°N</td>
</tr>
<tr>
<td>4</td>
<td>92.0763°W</td>
<td>34.1541°N</td>
</tr>
<tr>
<td>5</td>
<td>92.0770°W</td>
<td>34.1541°N</td>
</tr>
<tr>
<td>6</td>
<td>92.0763°W</td>
<td>34.1541°N</td>
</tr>
</tbody>
</table>

FIGURE 4 Portion of a census map and list of the related node point coordinate values.
of the geographic support functions—assigning an address to a geographic location. The second support function—classifying each geographic location according to the tabulation units recognized in a particular census or survey—is performed by a geographic reference file. For the 1980 decennial census, this file was called the Master Area Reference File (MARF). This file shows, in a computer-readable form, the relationships between and among the geographic units for the entire United States, its territories, and its possessions. These are the same set of geographic units that would result if a full set of census maps was spliced together into a single sheet. Many of these geographic units are the same ones that planners work with when they prepare traffic-zone equivalency listings.

Creating the MARF for the 1980 Census

Figure 5 shows how Census Bureau clerical staff recorded the geographic relationships depicted on the maps one ED at a time. In the last 18 months before the census, a group of about 300 people took the 32,000 map sheets and transcribed the same 2.5 million block numbers, along with the enumeration district numbers, census-tract numbers, place names and codes, county names and codes, and so forth, and wrote them on a set of worksheets. More than 300,000 lines were handwritten and then this information was keyed and converted into a series of computer files, state by state.

The MARF as a Tool

Using this file, the geographic location to which an address has been assigned—the specific block number written down by a field enumerator using a map or assigned by the computer using a GBF/DIME file—can be related to all higher-level geographic units for which data will be tabulated.

Each ED has a different set of geographic codes: ED 23 is in Zebra City and census tract 15, ED 27 is outside Zebra City but still in census tract 15, and ED 28 is outside Zebra City and in census tract 14. This information on geographic relationship is used to classify all of the housing units in the census to the correct tabulation areas—such as the house at 104 Main Street that was assigned to block 308. This geographic file shows that block 308 of ED 23 is in census tract 15, in state 01 (which is Alabama), in county 001 (which is Autauga), in Minor Civil Division 005 (which is Adams Township), and so forth.
Problems with 1980 Geographic Support Products

All three of the geographic products produced for the 1980 census—the maps, the GBP/DIME files, and the MARP—have several items in common; that is, they are simply three different ways of describing a part of the earth's surface. Problems with these geographic materials for the 1980 census caused confusion on the part of the bureau's field staff and the data-using public, including the transportation planning community. The problems resulted because all three of these geographic tools were prepared in separate, complex clerical operations using hundreds of people. Because different people worked on each product and the work took place at different times in different locations, different errors were made on each product. This led to inconsistencies between the final products. Although there were some true errors, cases in which a city boundary was in the wrong location or a census tract had the wrong number, it was the inconsistencies between the products that caused the greatest problems.

This type of problem is shown in Figure 5 where the place code for Zebra City was entered in the MARP as 8855 instead of 8855, a common type of transcription or keying error. The map in Figure 5 and the GBP/DIME file in Figure 3 show the code for Zebra City as 8855. In 1980 this type of mismatch caused a cascade of problems in all subsequent geographic products related to Zebra City and resulted in much of the discontent expressed by Census Bureau field staff and data users. The same reaction resulted when the data products, tabulated based on the codes in the MARP, showed a block number that did not appear on the maps. It is not surprising that errors were made; people are bound to make mistakes as they perform repetitive clerical tasks and write down or data-key so much information. The complex and functionally separate processes used to create the geographic materials invited problems. In retrospect, the people in Jeffersonville and elsewhere who prepared these products should be praised for having done as well as they did—congratulated on the 98 to 99 percent done correctly. The operations used to create the 1980 geographic products, like the processes used to create these products in earlier censuses, were not designed for the computer age.

Automating the Geographic Support System for the 1990 Decennial Census

An improved geographic support system is being built to meet the needs of the 1990 census, a system that will correct many of the problems of the past and provide a basis for future improvements that will benefit users of census data and result in geographic products with greatly increased capabilities. To begin the process, all available relevant information about an area will be recorded in a single computer file. This file is called the Topologically Integrated Geographic Encoding and Referencing (TIGER) file (Figure 6). Together with the attendant computer software and related operations, the TIGER system will permit the computer to assign residential and business addresses to the correct geographic location, to produce maps for field operations and publication, and to perform the data tabulation operations for any geographic unit whose boundaries have been recorded in the file.

Mathematical Basis and Structure of TIGER File

The design for the TIGER file has been created by adapting the theories of topology, graphs, and associated fields of mathematics (1). Using these theories, each segment of a line on the map between intersections is viewed as a key element, known as a 1-cell (Figure 7). The description of the line's curvature between intersections is recorded in a separate shape record used to
FIGURE 6 Components and functions of the TIGER system.

FIGURE 7 Topological elements on a map (top) and a schematic view of the TIGER file structure to store those elements (bottom).
drive computer plotters but not needed as part of the geocoding process. The end points of each 1-cell are known as 0-cells, and two 0-cells define each 1-cell. A cluster of three or more 1-cells bounds areas, which are known as 2-cells.

Using some of the latest concepts in computer science and operating on powerful new computer equipment, the TIGER file really is not a single file at all. As shown in Figure 7, it is a series of interlocked files, known as lists and directories, that are accessible through a master control program and a series of functional routines (2). The 0-cell, 1-cell, and 2-cell lists are characterized by random storage of the elements or records in the list. These elements contain the data items that describe each point, line, or area and pointers to the other related elements in the same list or other lists. It is these pointers that give the TIGER file its interlocking structure and set it apart from more conventional data-base systems.

Entry into each list is provided by a directory that is ordered by a B-tree structure. The directories provide rapid access to the lists with minimal computer storage requirements and ease of update. No decision has been made at this point on the need for a 1-cell directory, which is the reason for showing it with dashed lines in Figure 7. All geometric and topological relationships, along with the feature attributes, are stored either explicitly in the records or implicitly in the data-base structure (3).

Building the TIGER File

It is easier to say "TIGER" than it is to make one. The plan adopted for developing a nationwide TIGER file is ambitious but achievable when approached in well-thought-out, measured steps. To achieve this objective in time to meet the needs of the 1990 decennial census and to avoid duplicating geographic automation work done by others in the federal and private sectors, a series of contracts and interagency committees has been sponsored to identify and evaluate other automated geographic systems around the world, to assess the suitability of turnkey systems for this application, and to develop a statement of functional requirements for the automated geographic support system. As part of this process, the automated mapping activities of other federal agencies were explored to identify products and processes that could be of benefit.

As a result of these investigations, it was determined that one key to the plans for developing the TIGER file was having an accurate, consistent cartographic base. It was also learned that the U.S. Geological Survey, the agency in the Department of the Interior with responsibility for coordinating all federal civilian map-making activities, shared the Census Bureau's interest in automating a map base for the United States. As a result, a major cooperative project with the Geological Survey has been planned. Under the terms of the agreement, the survey and the Census Bureau will work together to use automated scanning and manual digitizing techniques, as appropriate, to convert their highly accurate maps for 48 states plus the District of Columbia into an automated file that will meet the mission responsibilities of both agencies. For Alaska, Hawaii, and Puerto Rico and other territories included in the census, a comparable machine-readable map is being prepared using available equipment. The resulting file of the United States will provide a more complete and useful product to both agencies than either agency would have achieved on its own and will do so at no long-term increase in cost to either agency. An overview of the major steps involved in building the TIGER file is shown in Figure 8.
FIGURE 8  Major steps required to create an integrated geographic data base.
Using the TIGER File for the 1990 Census

Building the initial TIGER file is only the beginning of the plan to support the geographic needs of the 1990 census. Another important aspect of the plan is to identify separately every individual block nationwide. This would provide the potential nationwide to aggregate at least the origin data for work trips upward from the block level into traffic analysis zones. These fundamental changes in geographic processing will enable the Census Bureau to automate many other aspects of the data collection, processing, and publication continuum—especially those that are based geographically. Similarly, these improvements have the potential to be of great benefit to those who use the Urban Transportation Planning Package (UTPP) because they should make the planner's job much easier, the processing more flexible, and the results much more accurate than ever before. The following sections describe some of the expected benefits.

More Flexibility for Map-Related Activities

The TIGER system offers the potential for greater flexibility in the map production process:

1. It will provide the ability to generate a nationally consistent set of maps for the first time in the history of the census, a set of maps that fit together from ocean to ocean and border to border so that there is no longer the struggle with the problems of matching place maps into county maps, one country map with another, and so forth. All the maps can exist in a common format and at a common scale.

2. It will provide the ability to select map formats tailored to the task at hand. For example, to support the data collection operation, a series of large-scale maps with double-line streets can be prepared that allow adequate room for Census Bureau enumerators to make their required map notations, and from the same file a smaller-scale map can be prepared for the office staff that shows all the enumerator assignment areas under the control of a particular manager in a format that can be mounted on the wall. Later, for data users, maps can be prepared from the same file to cover the geographic areas of interest, for example, a place, township, or urbanized area.

3. Because all the maps will be in machine-readable form, the computer will be able to produce directly the listings of geographic units in the TIGER file without any opportunity for clerical transposition or omission. In this way the maps and the geographic listings that appear in conjunction with the 1990 census will, by definition, be consistent one with the other because they both will be derived from the same files. This is a major accomplishment in itself.

4. The early field activities of the 1990 census provide an excellent opportunity for continuing improvement of the TIGER file. When Census Bureau staff are working with the maps to compile or verify the address list for 1990, they will find any new development that has taken place since the TIGER file was prepared. With the map in computer-readable form, it is expected that these changes can be made quickly so that corrected maps can be produced for later field operations and census data users. This is a major advance over 1980 when the traditional map-making process was so laborious that no base map changes could be made once the maps had been sent to the field.

There is something far more significant that will derive from this preparatory activity, something of much greater direct benefit to the transportation planning processes. In the past, to create the equivalency file the bureau requires to prepare the UTPP, it was necessary to transfer the zone boundaries to census maps, compare these marked maps to a listing of geographic
areas, and write the zone number next to each of the geographic area codes depicted on that listing. That was a tedious and time-consuming process with great opportunity for error. The wrong zone number could be written down, the digits could be transposed, or inconsistent entries could be made on the lines for the geographic identifiers that went with a particular zone. Furthermore, when that information was keyed, the opportunity existed to make the same types of mistakes again.

One of the most significant benefits of automating the geographic work as far as the transportation planning process is concerned is the potential that the work will be finished once zone boundaries have been transferred to the maps. By having the map in an automated format, the census map can be prepared by showing where the zone boundaries follow the block boundaries, the marked map can be mounted on a digitizing table, and an operator can run the cursor over the lines that have been plotted and record the position of those lines in the computer file. The computer then will be able to select the set of geographic units that fall within each of those boundaries. No longer will there be an opportunity for clerical error, omission, or transposition.

Other Benefits

The improved map production and update processes are only some of the advantages that are expected to derive from using the automated approach to providing geographic support services. Of perhaps equal importance to the transportation planning process is the concern with the accuracy of the geographic assignments the 1980 products provided for one or both ends of the work trip.

The TIGER system provides a mechanism to extend greatly the area of the country in which the housing units and business establishments in a census or sample survey can be assigned to a specific geographic location using automated geocoding processes. As mentioned earlier, address reference files have already been prepared for many of the recently designated urbanized areas, and all existing areas and other large population concentrations will be completed in the next 3 years. This pretty well takes care of the origin addresses.

There is a special problem with the workplace addresses. Often the place of work was not reported on the census questionnaire with a city-type street address that would permit rapid assignment to the correct geographic location. The concern about the ability to assign workplace addresses to the correct geographic location does, in fact, have some basis. Often the workplaces are listed by respondents on the census questionnaire only in terms of the name of a company, and many times a company does not have a street address. Street addresses for businesses are a very mixed bag of information. The Census Bureau, for example, does not have a street address: People that want to get to the bureau have to come to Federal Building 3 or Federal Building 4 at the corner of Suitland and Silver Hill Roads.

Corner-type addresses are a special problem when the objective is to assign structures at the city block level. At the typical corner, the intersection of two streets, there are really four blocks that come together. In this example, the Census Bureau could be located in any one of four blocks. Often major streets where businesses are located are also census-tract boundaries. When two major streets that are census-tract boundaries intersect, a corner address for a business could be in any one of four different census tracts. This is a problem.

Even a corner-type address is good by comparison with a response that simply lists an employer's name. This third category of work-trip address is even more difficult to assign at a detailed level. Some of the corner-type addresses and many of the employer-name addresses can only be assigned to higher levels of geography, census tract or place, for example.

Clearly, part of the solution to this problem is to work during the next
several years on improving the workplace and residential building reference files so that these files will list the exact geographic location of major employment centers or major residential structures. The automated geographic structure being developed provides a means to accomplish this objective because it allows for recording spot-type address locations, such as individual buildings or worksites, in relation to the street pattern reflected in the base map itself. This problem is one that seems to have a lot of potential for a cooperative program of some sort. For example, many planners, over the years, have developed indexes or reference files that pinpoint these major work locations or trip generators for transportation studies. This information would be invaluable to improving the Census Bureau's reference files and therefore the ability to assign work-trip addresses.

The Census Bureau would like to hear views on the possibility of a cooperative agreement whereby transportation planners' reference files could be incorporated into the geographic reference materials that are being prepared for 1990. They would also like to learn more about the level of geographic detail needed to carry out the transportation planning process. In 1980 many work trips could be assigned only at the census-tract level; is this adequate? Is there really a need for block-level assignment of work trips? Why? Is it worth the greater preparatory costs to achieve this level of detail, including the preparation of more detailed reference files and the research of work-trip destinations that are difficult to assign geographically?

TIGER, TIGER, Burning Bright

The qualities of a real tiger were described by Satyendra Singh Huja, the Director of Planning and Community Development in Charlottesville, Virginia, as follows: "The tiger is a very intelligent animal, and it is extremely fast, elegant, and goal oriented." The TIGER file will let the computer know more about the maps processed and the geographic relationships those maps depict than most humans can absorb. It will help meet the 1990 census goal for quick delivery of cartographic and geographic products. It promises efficient production of high-quality maps and related census geographic products while at the same time eliminating the source of many errors.

If the accuracy of place-of-work coding can be improved by having an improved reference file, if the general quality of the geographic products can be improved by making the maps and the geographic listings consistent, if the need for clerical coding of traffic-analysis-zone to census-block equivalency file can be eliminated, the quality and the timeliness of the 1990 UTPP can be improved immeasurably.

The TIGER file will benefit the United States Congress, the executive branch agencies of the federal government, state and local governments, and the public. In short, the nation will benefit by the TIGER file's providing an orderly framework for all other activities of the Census Bureau.

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Part V Data Requirements for the 1990s: Summary of Workshops and Recommendations
Introduction

The findings and recommendations of the conference were developed in the six workshops, each representing a different perspective on current experience and prospective needs.

The workshops met for a total of 8 to 10 hours spread over 2 days. Their first day's deliberations focused on experience with the 1980 census. In addition to their own experiences with decennial census material, they heard a series of presentations on the experiences of a broad array of organizations. These presentations are summarized as Part III of this report.

The focus of the final day's considerations was on providing detailed recommendations for improvements in the 1990 decennial census process. Before making their recommendations, workshop members received a briefing by Census Bureau officials on the current state of plans for 1990, which is reproduced here as Part IV; an historical look at the recommendations produced at the 1973 Albuquerque conference, reproduced here in Part II; and a panel discussion directed at anticipating some of the demographic, technological, and transportation changes that might occur during the time period in which the 1990 census will be providing information.

A summary of the panel discussion on the information needs of the 1990s is presented first, followed by the individual reports of the six workshops. For the reader's convenience, the questions that are being discussed are shown in Figure 1 as they appear on the census questionnaire. For the most part these reports are presented here just as they were developed in the workshops. Editing and rewriting has been kept to a minimum in order to retain the ideas and content of discussions as they occurred in the workshops. A summary of the conference recommendations concludes this part of the report.
22a. Did this person work at any time last week?  
- Yes — Fill this circle if this person worked full time or part time. (Count part-time work such as delivering papers, or helping without pay in a family business or farm. Also count active duty in the Armed Forces.)
- No — Fill this circle if this person did not work, or did only own household, school work, or volunteer work.

22b. How many hours did this person work last week? (at all jobs)  
Subtract any time off; add overtime or extra hours worked.  

23. At what location did this person work last week?  
If this person worked at more than one location, print where he or she worked most last week.  
If one location cannot be specified, see instruction guide.

a. Address (Number and street)  

24a. Last week, how long did it usually take this person to get from home to work (one way)?  

24b. How did this person usually get to work last week?  
If this person used more than one method, give the one usually used for most of the distance.

24c. When going to work last week, did this person usually —  
- Drive alone — Skip to 28  
- Share driving  
- Ride as passenger only

24d. How many people, including this person, usually rode to work in the car, truck, or van last week?  
- 2  
- 3  
- 4  
- 5  
- 6  
- 7 or more

25. Was this person temporarily absent or on layoff from a job or business last week?  
- Yes, on layoff  
- Yes, on vacation, temporary illness, labor dispute, etc.  
- No
Panel Discussion: Transportation Issues and Information Needs in the 1990s

Alan Pisarski chaired this open discussion of prospective 1990 data requirements. In his opening remarks he urged the audience to participate freely in what was intended to be an informal session. He introduced the three speakers, whose remarks were intended to stimulate thinking and discussion of data requirements for the 1990s.

George V. Wickstrom:

It is trite but true to say that data should respond to needs and not vice versa. A review of transportation issues over the last 30 years discloses a simple fact of life: As the urban area expands, more, not less, detail is needed within the urban area. The 1970s saw the birth of subarea and corridor planning, just as the 1960s dealt comprehensively with the urban area as a whole. This subregional planning is still a major focus of metropolitan-area work programs. Planning methods used at the subregional level differ from those at broader levels of analysis. Large-scale comprehensive inventories of total urban area travel movements were needed in the 1950s and 1960s because forecasts were heavily dependent on trend analysis or factoring up an existing travel pattern. As mathematical models calibrated on these existing data bases replaced real data in the late 1960s and early 1970s, smaller trip samples could be used to develop acceptable trip data. By mid-decade, disaggregate, targeted sample data tied to travel behavior could substitute for uniform sample data. A major need emerged to provide updated inputs to the models as well as to verify the stability of the parameters used in the models themselves. Census journey-to-work data can be used as a data base to meet these needs.

New planning issues have emerged at these finer scales of analysis, including private-sector (developer) provision of new infrastructure, traffic management of peak-hour congestion, parking, access to transit, and the provision of ridesharing and exclusive travel ways for high-occupancy vehicles. The scale of planning has shifted from designing a system of facilities to improving existing routes and services with funding from a variety of sources, including the private sector. In many areas it has also become a question of which transit routes within the urban area should be terminated and how ridesharing can be encouraged, not one of expanding transit service.

Comparison of the 1980 journey-to-work data with that of prior decades has established clearly that travel patterns are more diffuse than ever before. Suburban development is outpacing growth in older central areas many times over, and exurban and intrasuburban travel now dominate urban areas. By 1990 this growth will blur urban area boundaries as regions merge together. Multinucleated areas such as the Baltimore-Washington region will create new patterns of commuting and strain the capacity of existing suburban and rural transportation facilities.

Can the planning needs of these regions be met by relying on a one-shot small sample survey of commuting habits? Are the data provided by the census...
journey-to-work survey useful in addressing these issues? I believe the answer is a qualified yes based on my review of weighing the assets and comparing them with the options available.

The foremost asset of the census journey-to-work data is their comprehensiveness. The information covers the entire urban area, even biregional areas such as the Baltimore-Washington region. It provides data on commuting from exurban areas. It has proven useful in a variety of ways. It provides control totals, socioeconomic data such as vehicle ownership, as well as modal data including vehicle occupancy. It is regarded as an independent, unbiased source at the local, state, and national levels. Together with other census data it forms the basis for making forecasts of small-area household and employment growth and change that drive our travel demand models.

The decennial census is a marvelous data collection service. Collecting the data is three-quarters of the battle. Relatively minor additions to content can provide the additional data needed. This is not to say that data on work travel are all that is needed. MPOs and others will have to supplement census data to cover nonwork travel and to keep travel patterns up to date. This will require small-scale continuing surveys and site-specific studies in urban areas to add this information.

Certain additional data are needed in order to make the data base more relevant to current planning issues. These include information on the leaving and arriving time for the work trip (temporal distributions) and, most importantly, whether a work trip to the "usual" work location was made yesterday and all the modes of travel used (as opposed to the usual mode).

Despite their shortcomings, the census journey-to-work data are a valuable asset for transportation planning. Although changes need to be made in 1990 to improve turnaround time and reliability, planning in the 1990s will require the kind of comprehensive information provided by this type of survey.

Transit agencies would also be well served by a question asking whether any household member used transit yesterday for a nonwork transit trip. This latter item would complete the picture of transit use in a region and enable the MPO and transit authority to develop relationships that would be extremely useful to compare and forecast total transit demand. Above all, user-based geography is essential if the data are to be relevant to needs, and the data should be made available to the states and MPOs as soon as possible.

George E. Hall:

I would like to take a somewhat different perspective. It seems to me that the data on journey to work and ownership of automobiles and so forth is of course extremely useful information for transportation planners, but it is also useful information for other people. There is a great deal of information in the UTPP that would be useful for marketers, other kinds of planners, and the like. It seems to me that if we begin to look at the questions on the journey to work and the other transportation questions from a different perspective, it would be useful not only for the other people out there—the commercial marketers, the planners, and those in other areas—but it would also be useful for the transportation people, because as you begin to build a constituency for those data and for other uses for those data, the demand will increase.

I am glad that I don't have the responsibility for the next comment I am going to make, but as demand begins to increase, the Census Bureau begins to fold these kinds of things into their ongoing programs, and I think that would be extremely valuable. You would not be getting a free good, but you would be moving toward getting information as a regular census product without its being
on a reimbursable basis. I believe that it would be useful for this group to begin to think about that perspective.

Again on a slightly different issue, from the standpoint of the nontransportation user, I think that it would be useful to get more general socioeconomic data from the census from the perspective of the workplace rather than from the perspective of the residence. There is a great deal of value here. For instance, daytime population is extremely important for all sorts of planning--commercial, governmental, and so forth--beyond transportation needs. So I would like to see more information based on work geography in addition to residential geography.

I would like to simply, and finally, echo something that George Wickston said, which is that the world of work is changing rapidly. We have seen those changes at the end of the decade of the 1970s. We have seen them accelerate in the first half of the decade of the 1980s, and I suspect they will accelerate even more. In that I include multiple jobs and working at home.

Even though the unions and others aren't very happy about easing regulations on knitting at home and the like, the increase in high technology makes it less and less necessary to make a routine visit to a specific workplace, and it seems to me that these are the kinds of things that we do need to consider.

I would like to ask the Census Bureau to start thinking about the census of the year 2000 because I think by then there will be profound differences in the way we work and the way we travel, and I think this is exactly the right time to start thinking about the census in 2000, when you have a little time. As Peter Bounpane pointed out, even though you are starting 1990 pretests now, a lot of the information you get from testing in the 1980s will not be able to be incorporated into the process until the census of the year 2000. These are the perspectives I think are useful for the future, not only in transportation planning, but for all sorts of planning involving work, the labor force, place of work, and the like.

J. Douglas Carroll:

Well, I'm going to look at this a little bit differently than from an MPO perspective, because I've spent the last five years working with students. I am going to speculate about the issues that we are going to face in the 1990s. I've just received the first UTPP for New Jersey. We haven't really been able to use it yet, and this is the end of 1984. So the ability to get distance out of 1980 data in 1985 is what we are looking at today. This is late.

I think the kind of problems in the 1990s are going to be much more likely associated with social equity issues, tax impacts, and things of that kind, and these data will lend themselves rather neatly to a whole series of questions of this sort: "Who is taxed and who benefits?" These are also often geographic issues, and they can be dealt with better if your geographic framework is readily manipulated and displayed.

I think a major problem that I foresee is that the geographic framework that was talked about this morning is still not really available. We ought to be able to buy that package, look at boundaries, gather and pull them into larger areas, smaller areas, break them apart, look at them on the computer screen, not have to store them more than once. And we ought to be able to stuff data in and look at the geographic graphics that come back. Until you do that, you really can't use this material fully. It is just too cumbersome. So I think that packaging of the geography is an absolutely critical issue; whether the U.S. Geological Survey does it or the Census Bureau, or some commercial agent, it is going to be crucial to have easy access to it. For 1990 I hope the TIGER allows
us to replace the GBF/DIME files with a single, national, seamless coding and mapping system. This will allow users to manipulate and use these tools and the vast store of census data easily and creatively. I think what we need is visual output material so users can use the data—if you don't use the material, it is crazy to collect it. So my advocacy is to be able to put the housing and the other travel and work-related census material into the same packages, the same bundles. Put them together.

Another thing I would like to see the census do is develop an in-house screening capability that takes care of their agony over "disclosure" automatically and allows them to prepackage material in a much more effective way for users. If it's a matter of special samples or anything else, prepackaging in the UTPP with all of the screening done in advance makes it very cumbersome. You ought to be able to send a request to the Census Bureau for what you want in the way of tabulations by small area. They can repackage it in a way that takes care of the disclosure problem. For example, looking at the behavior of families with different car and work configurations in their work travel and work travel times, you can put individual records together and get output and still avoid disclosure. The Census Bureau could do that, but it is not available to the researcher and to other people.

I'm just loaded with things that I would like to see happen in this time period that almost have to happen. If you are going to market this stuff, it has to happen in a different way than it has in the past. There is no way that the UTPP should be the model we are thinking of for 1990, in my opinion.

Specific problems at local sites will be more common in the 1990s. The impacts of new development will be of great concern locally. We are going to have to assess these much more objectively, and the models that you have for 1990 are going to be the models we are going to use for the 1990s to say where the next major activity center (MAC) is going to be in the Houston area and what its impacts will be. We've got to measure that more accurately, and we've got to worry about its consequences, charging the private sector for the costs of their impacts. Impact measures require this kind of material. Only the Census Bureau can stand up in court on these cases. So we've got to be able to get at that material for these kinds of social uses.

Certainly in marketing, I think the packaging of the daytime population and its characteristics is going to be crucial. That has to be done.

I think in the transportation sector we are going to be dealing mainly with programming issues, not capital planning issues, and the equity and the timing of the programming options are going to depend heavily on the impacts of these projects on the people who live there and work there. Our ability to describe social and economic impacts in a more flexible and accurate way will be tested in the 1990s.

* * * * * *

A question and answer session followed in which the opening panel discussion was used as the base for a broad-ranging discussion of needed future elements of census-related data programs in the 1990s. The following summarizes some of the comments and questions generated in that discussion.

**Question:** How many of the things we've talked about using the decennial census for could be better handled in a survey like the NPTS where there is more space for dealing with complex ideas?

**Response:** Although the NPTS is very valuable as a research and policy tool at the national level, when we need local, small-area data, only the decennial census will do. For instance, travel-time patterns are a purely local phenomenon. A small national sample could not be usefully applied locally.
Comments

- We need to recognize that a lot of information we need for transportation purposes is of value to a broader audience as well. Our questions regarding working at home, for instance, are the only available data on a growing phenomenon of substantial social and economic implications. Cuts in data collection about this subject in the Continuing Population Survey make it even more valuable in the census.

- It might help us now to recognize that the 1980 census subject matter was defined in the mid-1970s and is a product of the concerns at that time; hence the substantial coverage of energy questions in the 1980 survey. This suggests that we need to think about what the concerns are likely to be in 1990 and beyond in our thinking about content. The workshops should consider whether we will still care about energy and carpooling as much in the 1990s. What new concerns will arise? For example, should the mode categories include electric vehicles?

- We should look at some of the other surveys of the Census Bureau, like the Census of Business. They could provide data on similar subjects from a different angle, for instance, obtaining responses on carpooling or support for carpools from the employer.

- Interaction of data sets, as suggested by the last comment, is a topic the workshops need to address. The NPTS has been mentioned but there are many others to be considered, particularly integration between the population and economic surveys.

Question: To what extent can the TIGER geographic system serve as an integrating device between surveys of the bureau?
Response: TIGER is already used as the geographic system for many economic census products, but generally at much coarser levels of detail than that needed in the decennial census.

Comments:

- We need to try to resolve the perennial problem of work-trip responses by people temporarily away from home in the census week. This always causes strange-looking data results that are used to question the survey's validity.

- We really must look at the emerging patterns in the way people will work in the future and the way that information will be reported. Many of the changes occurring, by the way, reduce the utility of administrative records for these purposes.

- It is surprising that the work-related information produced in 1980 has not been used more, particularly in nontransportation applications.

- We need to recognize that the problem we had in 1980 regarding multiple-SMSA patterns of commuting is only a small example of what the problem in the 1990s will be like. This problem delayed the data processing significantly in 1980.

- The UTPP should be reconsidered. Its great value in the 1970s and 1980s was that it reduced the long waiting for special requests and the costs of custom-built tabulations for each city. It was a standardized custom package. That meant trade-offs were involved, not everyone got what they wanted or they had to take a lot of things they didn't want in order to get the things they did. In the future new technology should permit rapid access and individualized packages, but the Census Bureau will have to adapt those technologies and adapt their institutional processes, like disclosure review, to the new capabilities.

- The traffic zones used in planning have been challenged in some of the discussions here. Do we really need them? Sometimes we need even finer detail than zones. It is often the land use planners, who prepare our forecasts of population, who are most locked into zones.
- If we were to trade zones for tracts, might we not just be trading one set of geographic distortions of data for another? At least we understand something about the effect zone design has on our models.
- Traffic zones are really only a part of the topic. If we fix our data into any rigid system, we limit substantially our ability to do useful analysis. Our geographic capabilities must be flexible to provide alternative kinds of geography for alternative problems.
- The traditional transportation origin-destination survey wording needs to be reconsidered as well. We still insist that the census match our accustomed wording of questions done for the most part in the 1960s. Maybe we need the research to permit change to occur.
- There has been a lot of discussion about funding of the geographic coding in 1990. We should focus more on the costs of preparing the materials in advance of 1990 to assure quality coding. We will need local materials and assistance and that will cost something, but it will be cheaper in the end than trying to recover after the data are collected and we can't do an adequate job of coding.
- There are many questions in this area that need research. It is asserted that it's cheaper to code at coarser levels, but we don't have solid cost data on varying levels of coding and the quality trade-offs involved. Does the need for tract versus block data vary by city size? How much does it cost and what alternatives do we have? What are the major contributors to cost and quality problems in coding? Is it level of coding, or bad addresses, or bad coding materials?
- Requisite sample size is another area that needs research. We don't have definitive cost and quality information on the impact of sample size on our needs. This is an issue particularly for the smaller metropolitan areas and for meeting transit-related needs.
- The disability question used in 1980 needs reconsideration. It does not relate to the ability to use automobiles, only transit. Also the level of disability would be very useful in some cases.
Workshop Reports

Statewide Transportation Planning and Coordination
Richard S. Glaze, chairman


Statewide planning is predominantly a policy-level activity and therefore is not a heavy user of detailed census data. The data are primarily used for technical activities rather than for program planning or fund allocation. Among valuable general state uses of the data are long-term trend analysis and comparative analysis of similar parts of a state. Because of continuing suburban and exurban growth, there is a growing need for regional and interregional transportation planning that will require data at levels consistent with the level of detail required for urbanized-area transportation planning. Among the interesting applications of the data, the following were mentioned:

- Connecticut used the data to plan diversion of traffic during Interstate reconstruction.
- Michigan has used the data to recalibrate statewide models and in needs studies.
- The data are being used in commuter rail studies in Virginia.
- The use of the data for efficiently designing samples for other surveys was also noted.

Participants in the workshop were unanimous in their support for the continued collection by the census of transportation-related data to play an integral role in planning for major transportation investments. There was considerable improvement in the quality of data between the 1970 census and the 1980 census. However, delay in the dissemination of data summaries caused severe program bottlenecks and inefficiencies.

Participants felt strongly that the census should not be the sole source of transportation planning data. Rather, other data sources should be structured to complement and enhance the basic data collected during the census.

Efforts to improve the accuracy and timeliness of geocoding should continue. Participants agreed that knowledgeable MPO staff members could greatly assist the bureau in geocoding. As such, there should be a concerted effort to resolve confidentiality issues to take advantage of this resource.

Minor modifications to certain journey-to-work questions would dramatically improve the usefulness of the data. It is possible to make the modifications without drastically revising the survey form or incurring significant cost increases.

In the 1990s, transportation planners and many other users will want to use 1990s information-processing technologies. We are no longer interested in paper reports.
The participants of the workshop also concluded that there was a major need to improve communications at all governmental levels. This should include the establishment of a training program to assist users of census data in general and the UTPP in particular.

GENERAL RECOMMENDATIONS

The following general recommendations were made:

1. The Bureau of the Census should be commended for improvements in the quality of 1980 census data, and we encourage efforts to continue to make improvements.
2. There is a continued need for the type and relative magnitude of transportation-related questions to be used in conjunction with other federal, state, and local data sources to plan for transportation investments.
3. The Bureau of the Census should provide data on a timely basis; the release should be phased as data become available, just as STF 1 tapes are released before the more detailed information.
4. Dissemination of 1990 data should be designed to take advantage of the communications technology most likely to be available in the 1990s.
5. Communications between affected parties at federal, state, and local levels should be improved.

RESEARCH RECOMMENDATIONS

The following recommendations were made regarding research:

1. There should be a realistic evaluation of the issue of confidentiality as it relates to critical elements of census data.
2. There should be analyses of emerging communications technologies and information processing as they relate to the dissemination of census data to users.
3. There should be analyses of both theoretical and actual error related to sample size.

DETAILED RECOMMENDATIONS

Questionnaire Content

Participants agreed that the highest-priority changes in the questionnaire were as follows: (a) the two questions about number of vehicles at home (H28, number of automobiles; H29, number of vans or trucks) should be combined and read "number of four-wheeled vehicles," whereas the categories should be expanded to three and more and four and more; and (b) mode of travel for the journey to work should be determined both for that usually used last week and for that used on a specific day last week (question 24b). In addition, respondents should be asked to circle each mode used in the journey to work (question 24b), and the travel-time question should be replaced by questions asking time of departure and time of arrival (question 24a).

Procedures and Sample Size

Research should be done on both theoretical and actual error related to sample
size. The research recommendations mentioned earlier are primarily focused on procedural matters. The workshop agreed that the highest-priority procedural change involves timely delivery of data.

Geographic Coding

Regardless of level of geographic coding, detailed coding should not delay delivery of journey-to-work data as major components are completed (e.g., county data should not be withheld until zone-level data are available). It was recommended that data coding at the block level be continued and that all Metropolitan Statistical Area (MSA) workplaces be coded at the block level, including MSA workplaces for those who reside outside MSAs.

Data Products

Users should be able to obtain data characteristics summarized by traffic analysis zone. More useful user documentation also should be provided. The workshop participants agreed that all census products should be available to users in user-friendly media (e.g., for use with microcomputers).

Compatibility

Other sources of transportation planning information including supplemental data such as the Nationwide Personal Transportation Study (NPTS) and small sample surveys should complement census data. Users should plan additional periodic travel data collection to complement the work of the Bureau of the Census, to obtain information on nonwork trips, and to add public credibility to analyses utilizing the data. There is a need for comparability and continuity among decennial censuses at well as comparability, to the extent feasible, among all Bureau of the Census data products.

Institutional and Administrative Concerns

The Bureau of the Census should consider retaining the services of MPO staffs to assist with geocoding. There should be a strong state transportation agency role in the purchase and use of census data to improve cost-effectiveness and timeliness of delivery. In assuming that role, state transportation agencies should set, or appropriately delegate, policies and specifications for UTPP data formats, media, hardware, and software. Training courses should be sponsored by FHWA, UMTA, and the Bureau of the Census for uses of the UTPP.
Transportation Planning in Large Metropolitan Areas
Gordon A. Shunk, chairman


Initial discussions focused on differing uses of the 1980 data by the several metropolitan areas represented in the workshop. Many of the areas used the data for relatively conventional purposes such as travel model development and revision. Of more interest to the participants were novel or unusual uses. Albuquerque used the data for analysis of central business district (CBD) revitalization plans. Boston used the data for expanding GBF/DIME-file coverage and for studies of transit station areas. Chicago and Denver based subarea and major employer studies on the data. St. Louis prepared a marketing program for ridesharing with the data, and Washington used the information to prepare a data base for their Equal Employment Opportunity (EEO) program. Dallas is using the data for locating CBD employment as part of a major survey effort.

The discussion of uses eventually turned to the broader importance of these data to the MPO. Creative summaries and analyses can be important for building among the private sector an image of the MPO as a resource of useful information and related capability. In addition to the more familiar experiences of the Southern California Association of Governments (SCAG), Rice Center in Houston publishes development area briefs that other MPOs could prepare for their cities by using these data. One MPO representative mentioned their use of a private-sector broker to overcome possible legal problems associated with marketing information prepared or purchased with public funds.

A natural follow-on to the discussion of uses was a catalog of deficiencies, problems, or additional needs encountered using the data. Other than concerns about delays in availability, virtually the only problems cited with using the 1980 data were related to accurate coding of workplaces to traffic zones or census tracts. This in itself is a strong testimony to both the quality and the usability of the data. The usefulness was further underscored by comments on additional needs or changes to improve the data from the 1990 census, all indicating more potential ways to use the census data. The requests included more variety of tabulations and cross-tabulations, particularly for small areas, and similar control totals on all reports. The definition of the handicapped should not be based solely on restricted use of public transit. There were some complaints about usability of software provided and the usefulness and clarity of documentation. Factors for nonattendance at work should be provided to permit correcting the sample to a true employment estimate. The income levels should be reported according to relative stratifications, and the vehicle-availability question should permit any vehicle to be considered.

FINAL RECOMMENDATIONS

All aspects of the 1980 census should be retained as they were except for
changes recommended in the following. This recommendation is to endorse the
1980 census and to assure that no questions or procedures are deleted by virtue
of their not being specifically requested. Detailed recommendations for changes
are listed by subject category and according to the following priorities:
imperative needs, important needs, and additional consideration.

Questionnaire Content

Imperative Needs

The wording of the place-of-work question should be revised to improve response,
perhaps by permitting optional responses such as facility name. This of course
is an additional attempt to improve the accuracy of the location response. It
was agreed that coding to the nearest intersection should be the last resort.

Important Needs

The travel-time question should be augmented to obtain the starting time of the
trip. This information is needed to identify peaking characteristics.
Obtaining starting time and travel time permits calculating arrival time, and
this approach provides the travel-time information that some users find
valuable. The question that defines the handicapped should be revised to
enlarge the qualification beyond limitation of transit use; the definition
should be sufficiently specific to permit identifying the respondent’s level and
nature of impairment as related to various activities, particularly regarding
automobile as well as transit use. The mode use question should be modified to
obtain data on all modes used, including access mode to transit. This
information is needed to permit relating demographics and location to decisions
on how best to access transit, but it is also valuable for principal mode-choice
analysis. A change in the question on vehicle availability is needed to permit
indication of four or more vehicles and to consider pickup trucks equivalent to
automobiles. These additions are important in particular portions of the
country or certain urban areas.

Procedures and Sample Size

Imperative Needs

The processing and availability of final data should be speeded in whatever
manner this can be accomplished. This is probably the single most critical
improvement needed, and all participants are willing to assist in whatever
manner is acceptable to the Census Bureau. There are several recommendations in
this report that address this improvement in different ways, and probably as
many more will arise in further discussions and consideration. Now is the time
for the Census Bureau to consider these proposals and respond. Thereafter, the
Census Bureau and U.S. Department of Transportation should work with the MPOs
and resolve this problem early so both the Census Bureau and the MPOs can be
prepared when various actions are necessary.

The full sample should be coded and distributed. A larger sample should be
collected if this is justified by research on error reduction. There was a
general belief that a larger sample would be desirable, but some research on
errors and cost-effectiveness is necessary before we can present an unqualified
recommendation for a larger sample. Most of the MPOs would still like to obtain
the uncoded 1980 data, if possible, perhaps even by coding it themselves.
There appears to have been considerable difficulty in obtaining the desired results from the workplace location question. Research, perhaps of a psychological nature, is needed on strategies to obtain the best response from this question. Proposals to use the news media appear to offer some possibilities. Other creative ideas are sure to be forthcoming from professionals in related fields with sufficient time for consideration.

Multiple-stage surveys or processing or both, including follow-up surveys and supplementary surveys, should be considered for special needs. The purpose of these would be primarily for expediting availability and improving accuracy of results. The recommendation would be to obtain the most important or universally useful data in the initial survey followed by supplementary data collection to augment the original or to resolve questions arising from analysis of the original. The supplementary surveys would also be used to collect special-purpose information useful to or requested by only a few agencies or users. The Census Bureau should act as coordinator or clearinghouse for ideas and problems and should pretest useful ideas and procedures that aid MPOs in improving their assimilation and use of the data and reports.

Important Needs

The MPOs should provide publicity to clarify proper responses to the place-of-work question. This would of course have to be related to results of the previously recommended research. The census should obtain information on whether each respondent regularly has more than one job. This would be valuable information for relating jobs to work trips because interjob trips are not traditionally considered home-based work trips.

Additional Consideration

Consistent coding definitions should be established for industry type, for example, Standard Industrial Classification (SIC) codes. The current inconsistencies render the data difficult or impossible to use, whereas care in definition by either the Census Bureau or the MPOs at the planning stage might overcome this problem. If there are good reasons why the Census Bureau cannot change their definitions, those reasons might be strong justification for a universal change in these and similar definitions. A more important question is why some definitions vary within the census itself. Collecting nonwork data, especially for transit trips, should be considered. These data are more important for some urban areas than for others and might be candidates for supplementary surveys.

Geographic Coding

Imperative Needs

Census data should be coded to block geography, and the area covered by block coding should be expanded to the 1990 urbanized area. Coding to blocks permits aggregating to virtually any reasonable areal geography—traffic zone, census tract, neighborhood, and so on. This approach permits various users in different areas or in the same area to request aggregated data in the format that best suits their purpose. This also avoids the long arguments about which geography is best or should be the standard. It is important for MPOs to begin early to anticipate where their 1990 urbanized area will be and to define blocks or block groups in that area for use by the Census Bureau in coding. The extent
of coverage must be tempered by the understanding that the bureau will charge for block coding outside the area actually urbanized in 1990. However, it is better to be prepared with blocks identified and have to cut back the area coded than to be unprepared for necessary expansion when time is critical.

Work location should be coded to block for workers who reside outside the metropolitan area (guidance as to the feasibility of doing this is needed from the Census Bureau). These data are needed particularly in northeastern states where there is considerably more extensive suburbanization outside the Standard Metropolitan Statistical Area (SMSA) than in other parts of the country. These data are needed to capture internal and external commuting patterns. If it can be demonstrated that these patterns are not significant in individual cases, the workshop participants indicated a willingness to rescind their request for the data.

Geocoding should be further decentralized to census district offices, and MPO involvement in the geocoding process should be increased to improve accuracy and speed the availability of final data. This is an attempt to provide local assistance in whatever manner is feasible so as to facilitate earlier receipt of results. Centralized coding appears to increase the "black box" syndrome and to decrease interaction, responsiveness, and accuracy. Coding in district offices would permit MPO representatives to be available for coding assistance. There is strong sentiment that workplace coding can best be done by the MPO if census institutional problems can be overcome. The Census Bureau should also provide draft coding maps to MPOs early for checking.

The Census Bureau and the U.S. Department of Transportation need to identify and schedule tasks for MPO action to be completed earlier so as to avoid delays:

- Provide block-to-zone equivalency tables,
- Update GBF/DIME files (consider expansion areas), and
- Provide coding listing for major employers.

FHWA and UMTA should follow up to be sure MPOs meet schedules.

Important Needs

The Census Bureau should provide a tabulation of workers by tract or zone at an early stage before full data files are complete, to permit checking by MPOs and correction of errors before file preparation is complete.

Data Products

Imperative Needs

The UTPP should be a standard census product, provided along with other basic information. Supplementary data sets for particular purposes or metropolitan areas should be provided at later times and on special request. Perhaps such requests should be confined to a standard menu rather than being individually tailored. Summary tabulations of workers at workplace locations and by descriptions of workplace should be provided on tape as standard products in accordance with guidance from the TRB Committee on Transportation Information Systems and Data Requirements, which should review the list of census data tabulations to determine whether all those produced are used. The Census Bureau should improve data processing software, user guides, training, and descriptions of products.
Important Needs

The Census Bureau should provide software to facilitate the interface between tape and diskette media (for large MPOs). Data should also be available on diskettes for small MPOs. Census data processing software for users should be improved so that it is easier to use, and a census software user group to share problems and solutions should be established.

Additional Consideration

The Census Bureau should consider reporting income by percentile to accommodate changes in cost of living and forecasting models that deal with stratifications rather than absolute values. The same stratifications should be used in all reports; there is concern for lack of comparability or cross utility among standard reports. This should be addressed by the TRB Committee on Transportation Information Systems and Data Requirements. To permit improved estimates of employment, factors are needed to expand employment data to account for those not reporting to work. Control totals for employment should be the same in all census products. For whatever reasons, the census is reporting employment totals that differ from UTIP totals. This may require factoring the UTIP if the full sample is not coded or provided. The TRB committee should consider whether average automobile occupancy tables should be discarded.

Comparability

The U.S. Department of Transportation should develop data sets and analyses for trendlines and intercity comparisons. There is a great need in the field for comparative statistics to verify reasonableness and to help us understand what to expect and accommodate or reflect in our longer-range forecasting process.

Institutional and Administrative Concerns

There is a need for early direction and schedules for MPO activity prepared and monitored by the Census Bureau, FHWA, and UMTA. This recommendation is related to previous recommendations but is emphasized to assure that MPOs have early warning as to how to program their resources. Early post office approval and assistance with address coding listings should be obtained. This is related to other expediting recommendations, another base that needs to be touched to assure that key actors are not overlooked and do not cause delay. Funding sources are needed, because some agencies cannot afford to purchase the package with existing resources.
Transportation Planning in Small Metropolitan Areas
Larry R. Goode, chairman

Participants: G. Cravens, H.R. Sharp, R. Marx, S. Liss, M. Sanderson,
P. Weldon, J. Larsen, M. Wade, M. Cooper, B. Johnson,
J. Pascoli, and M. Lambson.

The decennial census is a valuable data base for transportation planning in small metropolitan areas. The residential population, housing, and employment information is useful in the determination of trip-generation patterns and their rate of change. In addition, the census provides information on the work trip such as trip length and mode of travel. The information is used for evaluation of regional growth models, corridor service, and the relationship of automobile ownership to income and household size.

The objectives of the small metropolitan area workshop were to (a) evaluate the utility and comprehensiveness of regular and special products of the 1980 census from the perspective of small metropolitan areas, with particular emphasis on the Urban Transportation Planning Package (UTPP); (b) discuss possible changes in questionnaire content, survey design, geographic coding, products, and other aspects of the 1990 census that affect small urban area transportation planning; and (c) identify continuing and anticipated data needs for transportation planning and determine which of the critical needs are best met by the decennial census.

In small urban areas, the transportation community needs the census data to be coded to block-level geography so that the information can be accumulated to the traffic-analysis-zone level for transportation planning purposes. In these areas, the census is the principal source of data used in the transportation planning process.

During the past three decades the Census Bureau has made great strides in quantity and quality of information provided to the transportation community. However, the 1980 census had its problems: timing of the delivery of the UTPP, errors in place-of-work coding, and delivery of information into the hands of the small urban area planning staffs in a desirable medium. Census personnel have been very cooperative with the transportation community. We continue to endorse the UTPP, realizing that it does not solve all problems for all users. We appreciate the participation of the Census Bureau in this conference and want to continue the communication with them regarding transportation data needs.

DETAILED RECOMMENDATIONS

Questionnaire Content

Question 24a, travel time, should be replaced with work-trip arrival time. This is needed to obtain the percentage of work trips that occur during peak hours. Travel-time data as now collected are not being used in most small urban areas.

Question 24c, driving or riding arrangement, should be deleted and a category of one person should be added to 24d (how many people rode to work in the car,
etc.). This would provide the same information and it would assist in strengthening the questionnaire.

Questions H28 and H29 should be combined. In the small urban areas, no one differentiates between automobiles and trucks or vans.

**Procedures and Sample Size**

To obtain a valid sample of workplace data in small urban areas, a higher percentage of the work force is required. The full sample obtained should be coded and tabulated.

In question 24, it is recommended that the wording "last week" be deleted but that the wording "usual" as opposed to "yesterday" be retained. It was believed important to get data on the typical or usual work trip. Use of "last week" may conflict with obtaining usual information.

**Geographic Coding**

The small urban areas need block-level data. Otherwise the UTPP will be of limited use. In small urban areas, census tracts are usually too large for transportation planning purposes. Small urban areas recommend blockface coding of the entire country to maintain the ability to aggregate the data to the locally desired units, which is particularly desirable in areas with large blocks. The small urban areas support the development of the Census Bureau's TIGER file and its utilization to the fullest extent possible.

It is recommended that the Census Bureau prepare and provide maps for the local planning agencies well in advance of the census to allow time for the development of traffic zone equivalencies before April 1, 1990. It is also recommended that the Census Bureau share their workload with local agencies in the development of the employer address list for coding work addresses. These two actions can expedite the delivery and quality of the UTPP.

**Data Products**

The standard products and the UTPP should be available for use on microcomputers. Many of the small urban areas do not have access to large mainframe computers. It is desirable that the UTPP be menu driven, allowing the small urban areas to order only data that are beneficial to their program and avoiding the burden of working with tables that are only useful in large metropolitan areas.

**Comparability**

The expanded sample should agree with the 100-percent totals at the county, place, and tract levels. The lack of agreement in the 1980 data caused some problems.

**Institutional and Administrative Concerns**

Census outreach should coordinate with local planning agencies in a program to have employers provide their employees with their work address immediately before Census Day. This would improve workplace coding.

Census outreach should keep local officials and planning groups advised of the status of the census. This was a problem in 1980.
It is recommended that there be more sharing of the workload between census and local agencies to ensure greater accuracy of the data and to obtain more local responsibility for the product. This work sharing could improve the quality control and the quality of supervision of census field workers. A technically qualified professional staff member of a local planning agency should be assigned to the local census office to monitor the quality of data collection and coding and to ensure some local responsibility for the quality thereof.
Transit and Traffic Analysis
Maurice M. Carter, chairman


The transit and traffic workshop focused its efforts on those planning areas that are more near-term in nature, including short-range planning, operations impacts, and alternatives analyses. The group contained representatives who are involved in transit and transportation planning and transit operations, but traffic operations were only marginally represented.

In its initial meeting, the group reviewed its expectations and preliminary findings of the 1980 census data and the Urban Transportation Planning Package (UTPP). Without doubt, there was a strong statement and consensus that the transportation planning data provided through the UTPP are essential to the urban transportation planner at all levels. Generally speaking, the data provided by the 1980 UTPP have been found to be useful and analyses have produced successful results. There was recognition that improvements are needed in place-of-work coding in order to achieve even greater success with the 1990 census data.

The group reviewed its findings for the 1980 UTPP versus its expectations in the major areas of transportation planning. The discussion that follows summarizes that discussion for each area.

UPDATING URBAN AND TRANSPORTATION PLANNING DATA SETS

Experience to date has yielded successful results. With general reductions in other data collection efforts, the census data are becoming the primary, and in some cases the only, source of information. The coding of the place of work in the 1980 data is far superior to that for the 1970 information. Even so, the group has encountered problems with this coding that should be investigated and addressed before coding of the 1990 information.

MODEL DEVELOPMENT, UPDATING, AND VALIDATION

The experience of the group suggests that the UTPP data are most useful for developing or validating distribution models. Attempts to use the data for trip-generation modeling have not been successful due to a lack of full travel information, but that shortcoming in no way diminishes the importance of the census data set. There were suggestions that the UTPP data may have enhanced value for trip-generation purposes by appending the public-use data (household level).

Mode-choice modeling does not lend itself to the data set. However, some mode-choice validation work has been conducted for the work trip. The group believed that the degree of difficulty in using the UTPP for mode-choice modeling will increase as the number of riders by choice (noncaptive)
increases. A primary problem is the lack of information on mode of arrival or departure and a recognition by the industry that the modes (e.g., automobile, walk, bus, rail) required for completing a trip are considered simultaneously. Generally speaking, the expectations have been realized for trip-distribution models but success has been limited to updating and validation for the other transportation planning models.

RIDESHARE DATA SETS

This is an area in which success has exceeded expectations. Group members report that the data obtained from the UTPP have provided, in many cases for the first time, a clear snapshot of rideshare activity in a given urban area. In those states where rideshare data files have existed, the 1980 census data have been useful to validate those files. It was the consensus of the group that it is imperative that this feature and information be retained in the 1990 questionnaire.

SPECIAL GENERATOR INFORMATION

The UTPP cannot be used for special generator information except in certain cases. Supplementary data collection efforts are necessary for this purpose. Some group members stated that they have found the data useful for general trend analysis, however. The primary difficulty in obtaining generator-specific data is that the coding geography is not fine-grained enough to permit acquisition of site data. However, in cases such as the central business district, the data are valuable for developing trends and understanding changes in subareas.

OBTAINING THE WORK-TRIP FILE

First, the group recognized that the file obtained from census data is a commuter file rather than a classical work-trip file. Given the form of the census survey, a true work-trip file cannot be generated directly.

Success has been realized in using the work-trip file, and the analyses it has permitted are invaluable. It is essential to the transportation planning community that the journey-to-work data continue to be collected because they provide not only information from the work-trip end but also destination data related to the residence end of the trip.

The companion information on travel time was not found to be useful for transportation planning. First, the times reported are subject to rounding (e.g., 15, 20, 25, 30 min), and they appear to be perceived rather than actual. One of the recommendations for the 1990 census is to obtain actual departure and arrival times rather than travel time.

There has been limited success in obtaining work-trip data by mode, due principally to the low incidence of transit trips in the survey. The group recognized that this shortcoming could only be remedied by altering the sampling methods in the 1990 census data gathering, probably by cluster sampling in areas with a high potential for transit use within any given SMSA. The group concluded that it is absolutely necessary to conduct on-board transit surveys, preferably in conjunction with the census, if transit planning is to be an essential element of transportation planning in a given urban area.
TRANSPORT MARKET ANALYSIS

This is an area with high potential for successful use of census data that to date has not been fully exploited. With increased demands for productivity, transit operations are seeking information that will yield direction on when and how to spend transit dollars. The census data are most useful when augmented by locally collected ridership data.

The census data can be analyzed to determine those characteristics that determine why an area yields high work-trip transit ridership and then transferred to determine either ridership potential or appropriate levels of service for other new or existing areas. As the choice rider becomes a higher percentage of the total transit market, understanding the attributes of that market becomes increasingly important.

MODE-OF-ACCESS INFORMATION

The group did not find the census data useful in providing mode-of-access data but agreed that the data are essential to transit demand estimating and systems planning.

The group would like to have access-mode data collection considered as a part of planning for the 1990 census. The group also recognized how difficult it would be in a questionnaire to explain each mode in sufficient detail to obtain reliable information. If, however, the wording issue could be successfully resolved, the 1990 census would be an excellent vehicle for obtaining the information.

VEHICLE OCCUPANCY

There has been a reasonable record of success in using the census data to calibrate vehicle-occupancy models. Generally, the data are applied to a standard set (e.g., the Twin Cities models) of models until local calibration is achieved. Their use for vehicle-occupancy analyses supports the need to retain both rideshare and journey-to-work data questions on the 1990 questionnaire.

RESIDENTIAL AND INDUSTRIAL DEVELOPMENT PLANNING

The UTPP data are useful for both residential and industrial development planning. This is an emerging area with which the group has had limited experience to date. However, it was believed to be a planning area that is becoming increasingly important. With increasing dollar constraints, urban areas are required to plan developments (including mixes of development type within large development proposals) to get maximum benefit from the transportation systems.

Also, the UTPP data have been found to be useful for analyzing issues related to equity and Title VI requirements. Some of these issues are not directly transportation related but accessibility has become important when an urban area is determining, for example, the location of a new library.

GENERAL OBSERVATIONS

The group believes, without any reservation, that the UTPP data are a tremendous value for the dollars expended and very cost-effective. Further, these data are absolutely essential to the transportation planner today.
The cost of obtaining a classical home interview today is around $250 per household. San Francisco recently conducted a limited-sample origin-destination survey by telephone for about 7,000 households that cost $370,000. The UTPP for the Bay Area cost $51,000. The group believes that the foregoing example clearly speaks in support of collecting the data as a part of the general census effort.

In addition to the cost-effectiveness of the data, being able to say that the data were collected by the Bureau of the Census aids in establishing their credibility. This is helpful not only to the technicians but also to the elected officials who must justify decisions based on analyses performed using the data.

Generally, the group discussed the data derived from the UTPP. However, the group also recognized the value of the demographic data provided by the census through the general data collection effort. The group voiced its support for retaining those data.

DETAILED RECOMMENDATIONS

In its subsequent workshop sessions, the group looked ahead to 1990 in order to formulate its recommendations for improving the UTPP. The recommendations discussed in the following range from specific questionnaire changes to general administrative changes. In several cases, a need is recognized but a specific recommendation could not be devised within the time provided by the conference. In those cases, the group recommends that further analysis and evaluation be conducted before critical deadlines for the 1990 census.

The following recommendations are classified by major category.

Questionnaire Content

It would be desirable to tailor the questions by metropolitan area, particularly in the large areas where the public or popular name for a mode varies. An alternative to achieve this would be to use local mass media to educate the public on mode definitions. There is concern, however, over losing trend-analysis data.

The mode question (24b) should be revised as follows:

1. Separate the category "bus or streetcar" into "bus" and "streetcar or trolley." These modes have varying characteristics, and there will be several new rail systems in operation by 1990.
2. Add "ferry" or at least code it as a subcategory.
3. Code the "other" category (by metropolitan area) when a grouping specified > 2 percent of the total. Currently, too many trips are falling into this category in some metropolitan areas. Guidance may be gleaned from a pretest.

In question 22b, instead of asking how many hours were worked, ask how many days the person left his home last week to go to work. The number of hours worked is flawed in terms of yielding frequency data. The number of weekly occurrences should yield more useful information to get an average weekday condition.

The travel-time question (24a) should be deleted and replaced with a question asking departure and arrival times. The travel-time measure will still be available for anyone who may wish to use it, and, more importantly to the transit and traffic professional, information would be available to conduct time-of-day analyses and home-based work distribution model validation.
The question on handicapped status (19c) should be revised as follows:

1. It should refer specifically to fixed-route public transportation, and the degree of limitation should be specified (e.g., no difficulty, minor difficulty, major difficulty, impossible rather than just yes or no). Public transportation includes demand-responsive modes and a need exists to determine the location of people with mobility problems who cannot use fixed-route service.

2. Questions 19c and 19a should be exchanged so that the disabilities related to work will not be confused with those related to transportation.

Question H28 should be changed to include a "4+ automobile" category. Higher automobile ownership is forecast, and just as the category was expanded around 1970 in urban studies, the correlation ability with other data is important.

A question on parking cost should be added to question 24 for those who indicate use of a vehicle for the journey to work. At least a yes or no response is desirable. A stratification of amount is preferred. Some pretesting of strata appears appropriate.

It is desirable to obtain information on nonwork transit trips. However, the group believes that the census is not a practical vehicle for collecting those data. On-board surveys are needed.

Access-mode and multimode transit information (additional data from question 24b) is necessary for transit planning. The issue was too complex for the group to resolve, but it recommends further study and pretesting of techniques in order to design a question that can be added. Access mode and mode transfer are essential to understanding mode selection for choice trips.

Procedures and Sample Size

On reporting the day or usual day for work trips, the group could not reach a conclusion but made several observations that should be studied further for 1990:

1. It is desirable to obtain information for a typical day. A typical day is best reflected by Tuesday, Wednesday, or Thursday. A typical day suggests specifying an actual day and date on the census questionnaire.

2. Specifying "usual" appears to minimize confusion to the respondent and will tend to maximize place-of-work reporting. It may tend to overstate the amount of carpolding (e.g., it might reflect the total seats or riders rather than reflecting absenteeism). It may tend to understate transit ridership (not accounting for the occasional transit rider, who represents about 15 percent of total transit ridership).

The group discussed sample size, particularly as it related to transit reporting, without discrete conclusions. In general, the user must recognize and respect limitations due to sample size, particularly with respect to the trip table. General agreement existed that the commute table is not statistically reliable at the zonal-interchange level. Also, the group recognized that it is not practical to increase the general sample size. The group recommends further investigation into a stratified sample to increase the potential of capturing transit commuters.

The TRB Committee on Transportation Information Systems and Data Requirements, through UMTA and PHWA, should prepare and distribute guidelines and procedures for conducting coordinated data collection efforts in 1990. Further, urban areas should be encouraged to prepare for those activities by designating funding in the Unified Work Program (UWP). Also, local areas should, as soon as possible, be encouraged to include geocoding update elements as a part of the UWP to assist the Census Bureau.
Geographic Coding

The Census Bureau should, to the greatest extent possible, code all data to the block level. The group recommends that the range of acceptable user materials fall between the block-group and census-tract levels of geography. Where difficulties are found in coding the place of work, the Census Bureau should use local area staff to assist or code the locations.

Data Products

Timeliness of receipt of the data is important. A goal of 2 years after collection is recommended for receipt of at least the county-to-county commuter summaries. The group recommends that the committee further evaluate the UTPP contents for 1990, working with UMTA, FHWA, states, and MPOs. Further, UMTA and FHWA should evaluate and define other related products such as program documentation, procedural guidelines and methods, and ancillary software to manipulate the census data.

Comparability

Temporal trends are important, and analyses should be performed to evaluate or preserve that capability based on any changes in survey content or data summary.

Other

The geocoding system (TIGER) should be available to users in computer-graphic form before April 1990. UMTA and FHWA should support local areas in appending supplementary data to census data through the development of procedures and methods.
Private-Sector Applications in Planning and Marketing

Frances Banerjee

The transportation data set collected as part of the decennial census has gradually replaced most metropolitan large-scale area surveys of travel. Federal, state, and local agencies have acted to create specialized data bases derived from the census in order to plan and monitor a wide range of ongoing public programs. Generally these agencies have been the primary users of the census transportation data.

Even the limited experience of local census data centers in serving the information needs of a wide range of users has indicated that a broad market exists for data application. In fact, if census data are merged with local data files, there is a significant opportunity for metropolitan governmental organizations to provide a more comprehensive range of information services. Little attention has been given to definition of an ongoing product line that merges census data with local data and provides a continuum of services between decennial censuses.

The key to creating more demand for the census data is in innovative manipulation of federal and local data files and in subsequent aggressive marketing. In this paper the focus is primarily on the marketing component. Some barriers to effective marketing that could be overcome in design and administration of the 1990 census are briefly:

1. The institutional and organizational process currently governing local census centers diminishes the likelihood of an aggressive marketing program;
2. Timing and reliability of the census tapes can undermine the viability and credibility of subsequently developed data files;
3. Costs of obtaining census data can be prohibitive to small users; data becomes available to them only after local public agencies bear extensive data management costs to verify and process the tapes;
4. Data should be formatted to increase the range of uses; and
5. New types of data should be developed for use in developing transportation policy.
With changes, an extensive secondary user market could be created for the 1990 census. Changes could be accomplished by 1990; however, the most difficult is that of institutional arrangements. If problems in this area cannot be overcome, subsequent marketing efforts are unlikely to succeed.

OVERVIEW

The decennial census collects a wealth of transportation data that has become the standard inventory of travel behavior information in metropolitan areas. At first glance, there would appear to be a wide range of users for this data set other than transportation planning organizations. These users could include

- Travel-related commercial organizations such as the insurance industry,
- Advertising organizations,
- Chain retail organizations,
- Development groups,
- New industry such as the cellular telephone business,
- Nonprofit organizations and private providers of public services.

To date, this seemingly broad demand for the data has not emerged. In asking why, one must review the barriers that have hindered an effective program.

BARRIERS TO MORE WIDESPREAD USE OF CENSUS TRANSPORTATION DATA

There are numerous barriers to a more widespread use of census transportation data. Following are five major barriers that appear to be pervasive.

Institutional Arrangements

Current processing and accessing of data from the U.S. census are generally undertaken at the local level, often by the Council of Governments (COG). Information is collected by the census; however, a small user must access the information through a metropolitan census data center or a private vendor. The census could not be responsive to requests from smaller users, and so serving this potential market was delegated to local governments. The COGs were selected as census data centers because of their extensive involvement in a range of public planning programs. Yet while this transfer in responsibility was being accomplished, there was no commensurate effort to fund and staff the COGs' transition into responsive data service providers. Few COGs have the money or means to transform their broader planning activities into a streamlined competitive data operation. Furthermore, although providing timely data to a range of private users is a service of considerable value in any metropolitan region, such services are not a priority item in ongoing funding programs of metropolitan planning organizations. In order to be successful, COGs must rely on the commitment of highly imaginative and qualified staff or must somehow bootleg the operation until it can operate as an independent cost center. In order to provide data services, the census center must have experience with marketing, advertising, mail-order sales, and direct sales. Deadlines become critical, as do customer services, and access to computer time must be guaranteed. Also, imaginative product development must be phased to generate ongoing sales. Few COGs have functioned in this overall working environment.

Within the near term, the Census Bureau should carefully assess the institutional arrangements for providing data at the metropolitan level and develop a set of measures to assess the resources and the performance of local
service providers. If there are indications (based on budget, staffing, and past experience) that a public provider cannot fulfill the functions of a census data center, that opportunity should be opened to the private sector. Joint ventures between public and private organizations should also be considered in this review of institutional arrangements. Alternative institutional arrangements should be presented to COGs so that the most appropriate institutional and organizational arrangement can be tailored for each metropolitan area.

Once metropolitan data centers are operating, every attempt should be made to promote cooperative efforts among major public centers throughout the country thereby allowing sharing of programming, sharing of comparable data files, and so forth. Ultimately, each major public census center should be able to access data of other metropolitan areas so that they will be able to compete in the national data market. This incentive for long-term growth potential is essential to creating an aggressive data unit.

Timing

Timing of the availability of census data is critical. The census is designated by year of collection so that to a casual potential user, the data are always released late. The 1980 census data were not made available until 1982 and certain portions were not released until 1983. Such a delay is usually not a problem for major users; however, smaller organizations who are not familiar with census data are apt to view the information as out of date. Little can be done to change the actual delivery date of the national census; however, a considerable amount of advance work can be done to change the attitude of potential users and to ensure that final editing and processing proceeds on a timely basis once the material has been received locally.

In 1990, as the data are being collected, census data centers should be contacting a wide range of potential users. The product should be marketed as the data are being collected in order to benefit from the overall public awareness level. Potential users should be informed of the possibility of creating merged files with local data sources so that advance orders can be secured and processing of coordinated data files can be prepared.

The availability of a usable metropolitan transportation file depends on agreement between public-sector transportation agencies to share the costs of editing and reprocessing the tapes. Often those costs are not known until the data are actually collected and processed. If the cost appears high, as it usually does, local agencies must undergo a lengthy process of trying to assemble a budget for the project. This process should begin before the period of data collection.

Cost and Budget

Cost of obtaining information is a major barrier for firms with limited budgets or analytical experience or both. This applies to public as well as private operations. Metropolitan travel data sets should be verified before they are released. This process, which has proven to be costly and cumbersome, must be undertaken to assure reliability of the information. To the extent that these costs can be minimized, the overall demand for census information should increase.

Currently, metropolitan areas have completed verifying the census data. This conference constitutes a carefully focused study to identify measures that could be applied to the 1990 census to improve reliability. After this conference, the Census Bureau should report back to major metropolitan areas regarding steps
to be taken at the national and local levels in order to assure major users that the issues of cost and reliability are being addressed. This is an interim marketing step that can help build a base of support for the 1990 census data. New product development is one area of the overall program that suffers most from management neglect and consequently contributes to budget overruns. Initially, the census data are relatively timely; however, by mid-decade, demand has usually slackened. The national census operation functions throughout the intervening census periods because of the scale and complexity of the undertaking. However, the local census centers have limited windows to market their services. Census centers are faced with two alternatives. One option is a relatively unprofitable course of adjusting overall work programs to process data on an intermittent basis. The second option is a more intensive effort to broaden services so that a full complement of varied data sets is made available on a continuing basis. Innovative methods of developing an entire product line are essential to preparing a balanced budget. However, during the initial start-up years, funds must be secured to initiate this process.

Format

Formatting data can be a real incentive to increase the range of potential census users. Most businesses now have personal computers, but the census data are currently available only on tape or in print. Use of floppy disks would be valuable, and by 1990 other methods are likely to be available. Data format can provide a marketing tool to the census centers and to the extent possible such measures should be fully explored.

Data

Transportation policies at the national level are undergoing considerable change. At all levels of government, efforts are being made to involve private-sector groups in providing transportation services to their employees. Ridesharing programs, transit passes, and carpool parking are all variations of this effort. It would be most valuable if the census could collect transportation information from the employee regarding the extent of transportation subsidy offered by his or her employer and then cross-check this information with data that should be collected by the Census of Business and Industry.

Employers faced with the prospect of developing transportation benefits to employees would be interested in comparative assessment data, user profiles, and so on. Public transit agencies could track this significant trend. Air quality agencies could monitor program participation.

CONCLUSION

Local census centers have a future but not a guaranteed one. Their status is that of a fledgling, and their biggest challenge will be performance during the 1990 decennial census program.

Many local planning agencies view designation as a census data center as a means of transitioning their organizational growth. Accordingly, many such agencies are eager to assume this new function. These local data centers are a key to providing public information to a wide range of users, and their performance will ultimately affect the overall demand for census data and the range of its application.

The adequacy of such agencies to assume this function has rarely been
questioned because creation of these data centers is still somewhat experimental. To many users, these centers are the census offices and their performance reflects directly on the census. In designing the 1990 census program, this conference offers an appropriate opportunity to focus on federal and local institutional arrangements and on program development plans for the local census centers.
A disparate group of users and producers of data came together in this workshop. It was immediately noted that the cited workshop title was probably too constraining. Some saw the need for direct focus on problems related to marketing transportation-related data from the census [i.e., the journey-to-work tabulations and the Urban Transportation Planning Package (UTPP)]; others identified the need to center on private-sector applications; and still others were concerned about nontransportation uses in the broadest sense.

There evolved an understanding that the appropriate role for the group was to consider all nontraditional uses of the data (as opposed to those of the five other workshops) and in that scope of concern to focus on actions needed to expand the use and utility of the data for both public and private applications.

At the beginning the discussion centered around the concerns regarding nonreported or uncodable place-of-work data within the central business district (CBD). The question of definition of CBD was discussed. The following concerns regarding the 1980 census were expressed:

1. Nonreported or uncodable place-of-work data should be allocated in all census products in addition to the UTPP and the number of workers who are allocated rather than "not reported" should be reported.

2. No public product provides detailed characteristics of workers by place of work for small areas. A subset of this issue is that the UTPP, Part III, did not include such tabulations as household income, age, and so on.

3. There was a vigorous discussion about the data dealing with the handicapped. A consensus was reached that the 1980 census did not provide adequate information related to the type of disability by age, sex, race, and mode of travel.

4. Agreement was reached regarding the lack of an information and education program pointing up the utility of UTPP data to meet private-sector interests and demonstrating how to integrate the UTPP with other census and local data.

5. There was concern about a lack of specificity with origin and destination information. Origin and destination data could be improved for user needs by having the respondent answer a question on the beginning and ending times of a work trip for a specific day, e.g., Thursday, March 29, 1990.

6. There appeared to be a lack of data from the 1980 census identifying mode of travel of the secondary part of a trip, for example, by car to a kiss-and-ride area and then continuing on to work by commuter train or light rail.

7. The 1980 census did not adequately reflect the demographic characteristics of people who remain at home to work and thus perhaps travel one day a week to the main office.
DETAILED RECOMMENDATIONS

Questionnaire Content

Classification of modes does not need to be revised, but all modes should be reported for the journey to work and the question needs some rewording. The present question about travel time to work can be retained or superseded by obtaining work departure and arrival time. Nonwork transit trip information was determined to be not necessary. Questions H26 and H29 should be combined, obtaining separate ownership levels for automobiles, vans, and trucks.

Procedures and Sample Size

In the collection of data, a specific day and time should be used and the question should refer to the usual place of work. The number of stages in which the census was conducted was not thought to be as important as that the data be reliable and timely. It was believed that the use of follow-on surveys was not to be depended on, but if there was such surveys, they should consider collecting information in more depth on the handicapped, multiple-job workers, and working students.

Geographic Coding

For private-sector use, workplace data should be collected to block and block-group levels. Greater use of local resources to help in geocoding was advocated. Coding should be to the lowest geographic level available. Nonreported or uncodable place-of-work data should be allocated in all census products in addition to the UTPP, and the number of workers who are allocated rather than "not reported" should be specified. Data collected by commutershed (contiguous Standard Metropolitan Statistical Areas in which the flow of workers extends from one to the other) should be recognized at whatever geographic level is appropriate.

Data Products

There should be a tight definition of what constitutes a reasonable time lapse between collection of the data and product delivery. Improved products in all media are needed and integration with other products needs careful study. The Census Bureau needs a rapid response system for special tabulations. Many portions of the UTPP should become standard census tabulations, for instance, allocations of place of work, machine-readable place-of-work geography, and STF 4W tabulations by place of work.
Travel Research
Joseph L. Schofer, chairman


Members of the workshop hold different perspectives on the concept of research. To some, research is the scholarly activity that produces fundamental contributions to knowledge; this usually requires highly disaggregate data of the type not commonly available from the census because of disclosure limitations. Some researchers focus on examination of trends in demography, the economy, or travel, and they are able in some cases to use census data.

Others, particularly those working with or for public agencies, consider policy analysis, especially in its exploratory stages, to be research. Others in similar environments engage in a variety of technical service applications, including model building, calibration, and forecasting, which they classify as research. In each of these categories, there are important opportunities to utilize census data.

In our deliberations we considered all of these activities to be research. It is relevant to note that only two members of our workshop are engaged in so-called pure research; the others are concerned with the more applications-oriented activities described earlier.

USES OF CENSUS DATA

Census data are less frequently used in travel behavior research, though they are commonly used in trend analysis studies, where both transportation and nontransportation data are in frequent use. Applications-oriented researchers make extensive use of census data for travel model calibration and recalculation, as inputs to forecasting, and for a variety of policy studies at the local, regional, state, and national levels. Census, and particularly UTPP, data are used directly and as a means for updating aging data bases collected through special-purpose studies (e.g., origin-destination surveys).

Bootstrapping one data set with another appears to be increasingly common as the resources for—and the political interest in—special-purpose data collection have declined. For example, census data may be used to update OD surveys, data from the Nationwide Personal Transportation Study (NPTS) may be used to update the census, and so forth. The use of census data along with new, special-purpose studies appears common when analyses are required for new services in rapidly developing areas where preexisting data offer incomplete coverage or no coverage at all. Obviously, geographic and definitional compatibility becomes a major requirement to the extent that the use of multiple data sets becomes more common.
EVALUATION OF CENSUS DATA

In general, the recent experience with the use of census data, particularly the 1980 data, has been favorable. To a significant degree this may be because census data are so attractive relative to the alternatives, that is, using an obsolete data set, collecting a new data set, or doing without the desired data and thus not performing the analysis or research. That is not to say that census data are an inferior good, only to be used when there are no other reasonable options. But it is useful to put the census in the perspective of the market and to recognize its relative attractiveness given its current quality.

That quality is viewed as relatively good, particularly compared with what has been available through the census in the past. It is clear that great strides have been made in data content and quality, and although there are clearly opportunities for improvement, the current level of use of census data is a measure of its success in meeting selected market needs.

Members of this workshop agreed that although it would be desirable to get 1980 data before 1983 (as was the case with most UTPP users), the timeliness of the data relative to alternative sources is acceptable. And, although some expressed frustration with the difficulty of finding funds to purchase the UTPP, there was agreement that the investment has become cost-effective.

The availability of census data on transportation now and in the future will not eliminate the need for special data collection efforts—small-sample OD surveys and on-board and cordon studies—but there seems no question that census data make the planning (and planning research) function more efficient.

ISSUES AND PROBLEMS

A number of issues and problems associated with currently available census data suggest opportunities for improvements in the 1990 census. These include the following:

1. There is concern for the delivered sample size of geocoded (workplace) data, especially for studies of fast-growing areas that were outside the urbanized area when data were collected. This is an important concern as the focus of transportation planning shifts from the regional scale to corridor, neighborhood, and special service planning.

2. There is agreement on the need for reasonable continuity in the questions and methods of data collection among census efforts, to assure that the capability to conduct trend analyses is retained.

3. There are a number of needs for better data. These include (a) more accurate determination of work-trip travel times, perhaps achieved by asking trip start and end time rather than travel times; (b) separation of peak and nonpeak trips by asking trip starting time; (c) collection of more accurate information on mode used, perhaps to encompass mixing of modes across days and/or within a single trip; (d) collection of data on access modes to the line-haul portion of the trip; (e) selection of a particular day for the work-trip mode questions rather than use of the previous day (this may permit controlling for biases in travel patterns across days, and it would clarify the meaning of the information gathered); and (f) collection of more information on transportation handicaps, perhaps including automobile-related handicaps and handicaps that are of shorter duration than 6 months, a definition based on the concept of disability.
OPPORTUNITIES FOR THE FUTURE

The use of multiple data sets in a single application suggests the importance of the capability to merge files from different sources. For example, a typical transportation application for forecasting or research on model development might involve matching and merging records on level of service (from a transportation survey) with travel and demographic records from the census. In an applications environment, this might be satisfactorily done at the traffic-zone, block, or even tract level. For research, this would normally be done at the household level. It is important that both the methodology and the technology to merge such data sets be available and efficient. To the extent necessary, methodological developments should be made to facilitate this. It appears that the required technology is either available or soon will be.

We suggest that, for the sake of efficiency, it may be desirable in some cases for the Bureau of the Census to perform such file merges and to supply the requesting organization with a data set of demography, travel, and level of service at the appropriate geographic scale. This would be done on a fee-for-services basis, with the level-of-service file supplied by the planning agency.

For purposes of more fundamental research, where household data are required, disclosure rules prohibit the Bureau of the Census from releasing the required data. It was suggested that perhaps the bureau could perform the required analysis, again on a fee-for-services basis. But a more attractive option would be for qualified transportation researchers to spend extended periods within the Bureau of the Census under the American Statistical Association/Census Bureau Research Fellowship and Associateship Program. In this way, researchers could gain access to unique data resources of a variety of types. No transportation researchers are known to have participated in this program, and it is worth promoting this opportunity within the transportation community because of the potential, long-term payoffs.

There are other, more specific needs for research and development related to the census. These include determining appropriate sample sizes, the most effective way to ask the questions denoted earlier, as well as techniques for merging data sets. Finally, it would be desirable to make use of census and other recent data to update generic planning tools that are in common use, such as the quick-response methods described in NCHRP Report 187 and implemented in the QRS microcomputer software.

DETAILED RECOMMENDATIONS

Questionnaire Content

As stated earlier, we believe that the priority should be on doing the field research necessary to resolve question content issues. But we have reached a tentative consensus on some of these:

1. There is little support for separating trucks and automobiles in the census.
2. We rejected proposals to attempt to collect data on school and shopping trip behavior and nonwork transit trips through the census.
3. The time of day for the work trip seems equally as important to users in this workshop as travel time. Consequently, it appears desirable to ask starting time and travel time (or stopping time).
4. Mode of access to the line-haul mode is important to planners; research is needed to determine effective and efficient ways to determine this through the census.
5. On the day of travel (related to the principal-mode question), we suggest asking questions in the following form:

(a) How many days last week did you work at home?
(b) How many days last week did you work elsewhere?
(c) Where was your place of work last Thursday?
(d) Was that the usual place?
(e) What mode did you use last Thursday?

More detailed data on work style (work at home sometimes, multiple jobs, female head of household, use of day care, etc.) are likely to be increasingly important from a variety of policy perspectives—including transportation—in the future. Some significant restructuring of census questions to capture these patterns appears warranted. Such efforts will benefit a variety of user constituencies. Yet these nuances may be more appropriate for the NPTS, which allows more questions to capture and refine transportation concepts.

Procedures and Sample Size

Because the geographic focus of much transportation planning has become more localized (corridors, growth areas, special market segments, routes), it is becoming increasingly difficult to rely on UTPP trip tables for planning. This is particularly true where there is a need to disaggregate further (race, ethnicity, sex, etc.) to support policy decisions. The use of higher sampling rates is desired by some census users, particularly those from large and rapidly growing areas. The possibility of areal variability of sampling rates based on user needs was discussed. This is likely to pose a cost problem, because the Census Bureau would probably want to recover incremental costs from user agencies. This may be resolved if the actual travel sampling rate is really 1 in 6 (rather than half that rate, as in 1980).

We believe that it is cost-effective for the U.S. Department of Transportation (DOT) to participate in efforts to prepare for the decennial census. This conference is an important element in that preparation, as is the role of DOT on the Federal Advisory Council and its advocacy of the census in negotiations with the Office of Management and Budget.

Because there are important questions about what transportation data should be collected by the census as well as widely differing opinions regarding how census questions should be asked, we think it appropriate for DOT to invest in research in support of the 1990 census. The need is for empirical tests to determine the efficacy of different ways to ask questions as well as to develop logical conversion procedures so that census users who need data in a form different from the way in which it was collected will still get good use from the available data. For example, if the principal-mode question is asked for a specific day (e.g., last Thursday) and a user is interested in average-week behavior, there is a need for a conversion procedure.

Issues that may be resolved by a single field survey include the following:

1. Trip time (length in minutes versus departure and arrival times),
2. Principal mode of travel (for a specific day or the typical mode, treatment of trips using several modes),
3. Workplace (better ways of asking the location of the place of work might reduce coding problems),
4. Principal workplace versus alternative workplaces, and
5. The general question of the costs and benefits of using travel analysis zones as opposed to converting to census aggregation units.
We envision a survey that asks one or several groups questions in different forms, for example, usual-day behavior, specific-day behavior, and weekly travel diaries. These results could be compared to support choice of census questions and to develop conversion procedures.

The need for solid answers to these questions warrants research. And this research must be initiated soon if the results are to affect the 1990 census. Indeed, it would be desirable to have results before the census pretests so that the latter opportunity can be used to verify the results.

An important problem associated with this recommendation is that DOT (or at least FHWA) research budgets are locked in for the coming year. Still, exploring options for securing research funds would be worthwhile; this research could be done for about $250,000 or less, and the results are likely to have an important effect on the usefulness of the 1990 census data. Funding from outside FHWA should be explored, as should the possibility of reprogramming committed funds. Because of the state and local interest in these issues, it may be worth trying to get money from nonfederal sources or from the National Cooperative Highway and National Cooperative Transportation Research Programs of TRB.

Even if funds cannot be programmed to accomplish this work in time to affect the 1990 census, the research is still worthwhile to assist users in interpreting and applying results derived from the questions used in 1990.

There are other research needs and opportunities related to the census that can be treated in a longer time frame, but which should be considered. First, the potential usefulness of the TIGER system for mapping and data analysis in noncensus (and particularly nonfederal) agencies appears significant. For example, it was suggested that TIGER be used to develop estimates such as vehicle miles of travel useful in planning and cost and revenue allocation. A modest research investment appears worthwhile to determine how TIGER might make interfacing travel, land use, infrastructure, and demographic data more efficient. This research appears to be a logical candidate for one or both of the cooperative research programs.

Second, the potential for accomplishing advances in travel behavior research through the use of individual census records linked to level of service and other data appears very real. Census disclosure rules prohibit releasing these disaggregate records, but the research fellows program in the Census Bureau, mentioned earlier, offers an important opportunity for accomplishing such studies. We encourage DOT and TRB to publicize this program and to work toward getting one or more qualified travel researchers to apply for it.

Geographic Coding

The promised enhancements in geocoding methods (TIGER), if they are achieved, seem likely to ameliorate a significant portion of the coding problems associated with the place of work, a data element that has become essential to transportation planning. Indeed, the transportation need for geocoding is so important that we urge the use of a failsafe strategy in the TIGER development process so that if the system does not work as planned, we can still get data of the quality delivered from the 1980 census.

The MPOs and other knowledgeable user agencies seem willing and able to participate in the geocoding process. Satisfactory mechanisms for taking advantage of their willingness should be found. In particular, it would be desirable to have primary workplace geocoding done at the census collection center nearest the point of survey, so that more local officials can provide support. The Census Bureau should provide local agencies with lists of uncodable locations from the 1980 census so that these problems can be resolved in advance of the 1990 census.

The use of computerized telephone directories should be considered to make
the census coding process more efficient; perhaps some elements of this task can be contracted out to telephone companies.

Data Products

The TIGER system and census outreach and cooperative efforts, as well as the interest in cooperation among state and local agencies, all appear to promise important improvements in workplace geocoding in the 1990 census. These developments, along with the evolution in computer technology and availability, suggest that rather than focusing on upgrading and standardizing the contents of the UTPP, the 1990 census may provide an opportunity to increase flexibility and responsiveness in UTPP products. For example, it would be desirable to give (at least to the major users) the freedom to define the contents of their UTPP more fully. To accomplish this, it will be important for the profession to work together, again perhaps under the aegis of the TRB Committee on Transportation Information Systems and Data Requirements to specify not the UTPP but the capabilities required in the preparation of the UTPP.

Comparability

Because census data alone cannot meet all transportation planning needs and because of the absence of resources and interest for large-scale local O-D surveys, specialized national transportation data collection efforts are likely to grow in importance. In particular, we believe that it is critically important to retain, enhance, and regularize NPTS, the use of which is growing, particularly in conjunction with census data. We suggest that NPTS be more closely coordinated with the decennial census, in terms of both content and timing. DOT and the Census Bureau should work together to find efficient ways to meet the need for other specialized national data collection efforts.

Institutional and Administrative Concerns

Because of the importance of census data to transportation planning and because transportation professionals represent a major census user group, there appears to be a need for ongoing and more formal communications between the transportation users and the Bureau of the Census. The important connection between DOT and the Census Bureau through the Federal Advisory Council serves as one mechanism for achieving this. Yet the interests of the wide variety of users might be better represented by the formation of a Transportation Census Users' Advisory Council, which can provide ongoing advice, ideas, and another channel for building cooperation between data users and suppliers. The TRB Committee on Transportation Information Systems and Data Requirements might serve this function.
Summary of Conference Recommendations

The National Conference on Decennial Census Data for Transportation Planning met with the purpose of making recommendations to the agencies concerned with the preparations for the 1990 decennial census. The conference was well attended by knowledgeable professionals representing public and private organizations from the local, state, and federal levels. Expertise in all areas of local passenger transportation, data collection, and census methods was present. The list of participants and their organizations is provided at the end of this report.

The following is a brief summary of those findings and recommendations.

GENERAL FINDINGS AND RECOMMENDATIONS

1. The 1980 census transportation products were significantly improved over those from 1970. The Bureau of the Census has done an exemplary job and is to be commended.

2. The products of the decennial census are now central elements in transportation planning and policy processes at all levels of government.

3. The full utility and value of the place-of-work data in the census are still to be realized, particularly in nontraditional applications.

4. The inherent limitations of the decennial census as a transportation data collection device are recognized. It cannot and should not meet all transportation data needs.

5. Complementary supplementary data sources are required at all levels of application.

6. An extensive research program is needed to fully and effectively use the resource provided by the 1990 census.

7. The geographic mapping and coding system under development by the Census Bureau, known as TIGER, should be strongly supported to assure its use in all areas of the census and transportation applications.

8. The Bureau of the Census and the U.S. Department of Transportation should plan now to assure that the full potential of new technological capabilities is employed to improve the speed and flexibility of assessing and tabulating census data in 1990.

9. Flexibility in the application of census data at varying levels and kinds of geographic units, based on coding of workplaces at the block level, is central to the utility of census products.

10. Local resources, particularly in geographic coding materials, should be fully utilized in the early stages of census system development and review. A formal program to support these efforts should be established.

11. Emerging changes in the characteristics of employment, such as multiple jobs, working at home, and flexible work schedules, need to be recognized in the 1990 census design for transportation and other applications.

12. Assistance and support of the decennial census by the transportation community should be focused on the preparation and review stages of census operations and on means of enhanced use of the data rather than on internal activities such as collection and processing of data.
13. The cooperative action between the Bureau of the Census and transportation agencies at all levels of government has been highly effective. This cooperation should be extended and supported in future efforts to create better census data for transportation applications.

DETAILED RECOMMENDATIONS

The coverage of decennial census matters at the conference was detailed and comprehensive. It is inappropriate to attempt to present them in summary fashion. Rather, the topics addressed are identified here with an indication of the direction of concern or response by the conference.

The workshops were asked to organize their consideration of the decennial census within six broad topical areas. These were:

- Questionnaire content,
- Procedures and sample size,
- Geographic coding,
- Data products,
- Comparability, and
- Institutional and administrative concerns.

The specific items taken under consideration by the conference within these topical areas are identified in the following as an index to their treatment in the Conference Findings and Recommendations in Part I.

**Questionnaire Content**

1. Mode of travel
   - Use specific day, if feasible
   - Separate categories for bus and streetcar
   - Specify "other" category locally
   - Acceptable to merge car, truck, and van categories
   - Use "automobile driver," "automobile passenger"

2. Travel time to work
   - Collect all modes used in trip
   - Substitute depart and arrive times
   - Obtain number of jobs per individual
   - Obtain days per week travel to work
   - Obtain days per week at home
   - Obtain hours worked per week per job
   - Differentiate between driver and passengers
   - Determine whether handicap precludes driving

3. Employment
   - Allow identification of nearest intersection
   - Add more categories to 4+ or 5+

**Procedures and Sample Size**

1. Sample size
   - Obtain larger samples of transit strata

2. Staged census
   - Recommend single-stage process

3. Mode of travel
4. Away from home

**Geographic Coding**

1. Block coding
2. TIGER
3. Local assistance
4. Interregional commuting
5. Geography

**Data Products**

1. Timeliness
2. Flexibility
3. Data access
4. Expanded products
5. Product marketing

**Comparability**

1. Coordination within Census Bureau
2. Complementary surveys
3. Trend analysis
4. Products

**Institutional and Administrative Concerns**

1. Advisory committee
2. Disclosure rules
3. Research needs
4. Meetings

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Use usual local address versus out-of-town address

Continue to code to block level—crucial for transit and traffic zones
Support fully
Formalize program of local assistance and local review of coding materials
Use commutersheds more extensively
Review outdated area definitions

Products late, adopt 2-year delivery goal
Use intermediate coding levels to expedite
Provide on-line access
Provide automated suppression
Provide floppy disk products
Merge transport-related reports
Tabulate characteristics at place of work and daytime population
Provide UTPP as standard census product
Expand and improve

Coordinate the decennial census with
Nationwide Personnel Transportation Study, Annual Housing Survey, National Travel Survey, and economic surveys
Coordinate local and state surveys with census data
Assure and enhance capability
Coordinate census products and special products

Organize transportation advisory committee
Develop on-line automated confidentiality review
Utilize research fellowship program at Census Bureau
Research needed by both Census Bureau and U.S. Department of Transportation
Develop work-trip public-use sample that combines census demographic and work-trip data with local level of transportation service data (e.g., travel time and cost) for travel demand estimation
Continue monitoring of progress
Prepare for 1988 review of status
5. Communication

6. State involvement

7. Research funding

8. Intergovernmental cooperation

Provide more communication with state and local users

Expand role for states in design and use of 1990 products

Use Census Bureau, U.S. Department of Transportation, NCHRP, and NCTRIP sources

Continue to expand good relationship among Bureau of the Census, U.S. Department of Transportation, and local and state governments
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