

Measuring Personal Travel and Goods Movement

*A Review of the Bureau of
Transportation Statistics' Surveys*

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

TRANSPORTATION RESEARCH BOARD
SPECIAL REPORT 277

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Preface

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 established the Bureau of Transportation Statistics (BTS) within the U.S. Department of Transportation. This new federal statistical agency was charged with developing transportation data to support strategic planning and policy making. The ISTEA legislation also mandated that the National Academy of Sciences [National Research Council (NRC)] review the statistical programs and practices of BTS to improve the relevance and quality of transportation data. The NRC Panel on Statistical Programs and Practices of the BTS issued its report in 1997, approximately 5 years after BTS began operations.¹ In 2001, BTS itself asked NRC to conduct another review of the agency's activities. Specifically, BTS requested a study to review the agency's current survey programs in light of transportation data needs for policy planning and research, and in light of the characteristics and functions of an effective statistical agency.

In response to BTS's request, the Transportation Research Board (TRB) and the Committee on National Statistics (CNSTAT) of the National Academies convened a study committee of 12 members under the leadership of Joseph Schofer, Associate Dean for Faculty Affairs and Professor of Civil Engineering and Transportation at Northwestern University. Panel members have expertise in transportation policy and planning, transportation data, and survey methodology and statistics.

The committee met four times between February 2002 and March 2003. Each of the first three meetings was devoted to review of one of the

¹ Citro, C. F., and J. L. Norwood (eds.). 1997. *The Bureau of Transportation Statistics: Priorities for the Future*. Panel on Statistical Programs and Practices of the Bureau of Transportation Statistics, National Research Council, Washington, D.C.

BTS survey initiatives—the National Household Travel Survey, the Omnibus Survey Program, and the Commodity Flow Survey. After each of these meetings, the committee issued a letter report presenting its findings and recommendations concerning the relevant survey. These letter reports are reproduced in Appendixes A, B, and C. Appendix D lists the invited presentations given at committee meetings. The final meeting was devoted to committee discussions of major themes and crosscutting issues and to preparation of this final report.

The committee's conclusions and recommendations are necessarily based on the programs and organization of BTS at the time of this study. As a result of its interactions with BTS staff over the course of the study, the committee is aware that the agency is engaged in planning activities that may address items raised in the letter reports and also relate to some of the issues discussed in this report.

This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the Report Review Committee of the National Academies. The purpose of this independent review is to provide candid and critical comments that will assist the authors and the National Academies in making the published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The contents of the review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their participation in the review of this report: William P. Anderson, Boston University, Massachusetts; Daniel Brand, Charles River Associates, Inc., Boston, Massachusetts; Konstadinos G. Goulias, The Pennsylvania State University, University Park; Ronald E. Kutscher, Vienna, Virginia; Martin E. H. Lee-Gosselin, Université Laval, Quebec City, Canada; and Frank Potter, Mathematica Policy Research, Inc., Princeton, New Jersey.

Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the committee's conclusions or recommendations, nor did they see the final draft of the report before its release. The review of this report was overseen by Lester A. Hoel, University of Virginia, Charlottesville, who was responsible for making certain that an independent examination of the report

was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

The committee wishes to thank the many individuals who contributed to this study through presentations at meetings, correspondence, and telephone calls. The assistance of Mike Cohen, Lori Putman, and Joy Sharp of BTS; John Fowler of the Census Bureau; Susan Liss of the Federal Highway Administration; and Frank Southworth of Oak Ridge National Laboratory in arranging briefings and responding to committee requests for information is gratefully acknowledged.

Jill Wilson managed the study under the supervision of Stephen R. Godwin, Director of Studies and Information Services, TRB, and with advice from Andrew A. White, Director, CNSTAT. Frances E. Holland assisted in logistics and communications with the committee. Suzanne Schneider, Associate Executive Director of TRB, managed the report review process. The report was edited by Gail Baker and prepared for publication under the supervision of Nancy Ackerman, Director of Publications.

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Executive Summary

The Bureau of Transportation Statistics (BTS) was established within the U.S. Department of Transportation (USDOT) by the 1991 Intermodal Surface Transportation Efficiency Act. The agency was charged with providing comprehensive, systemwide transportation data for policy making, planning, and research purposes. Today, BTS's statistics are used to support transportation decision making by all levels of government, transportation-related associations, private businesses, and consumers.

The Transportation Equity Act for the 21st Century (TEA-21) authorized BTS at an annual funding level of \$31 million for the 6-year period from 1998 through 2003. Against the backdrop of the impending reauthorization of TEA-21, BTS asked the National Academies to review the agency's current survey programs in light of (a) transportation data needs for policy planning and research and (b) the characteristics and functions of an effective statistical agency. In response to this request, the Transportation Research Board and the Committee on National Statistics of the National Academies established a 12-member committee to conduct the review. The committee reviewed BTS's three major surveys—the National Household Travel Survey (NHTS), the Commodity Flow Survey (CFS), and the Omnibus Survey Program—and issued a letter report on each survey providing specific guidance to BTS on approaches for improving future versions of the surveys. In this report, major themes identified from the reviews of individual surveys are addressed, and crosscutting guidance to BTS about its portfolio of transportation surveys is offered.

FLAGSHIP SURVEYS

The committee characterized the NHTS and CFS as BTS's flagship personal travel and freight surveys, respectively. These major, multiyear

survey programs with budgets on the order of \$10 million to \$15 million serve a broad constituency of organizations and individuals interested in transportation, providing essential data that are not available from other sources. Users include USDOT, other federal agencies, the U.S. Congress, state departments of transportation, metropolitan planning organizations, consulting companies, academia, think tanks, and industry associations.

The committee views the flagship surveys as essential to the BTS mission of providing statistical information to support transportation decision making. Therefore, the committee's analyses and recommendations focus on opportunities for BTS to improve these flagship surveys. The Omnibus surveys, by contrast, are small-scale, quick-response efforts with relatively modest budgets. Initiated in 2000, the Omnibus program of customer satisfaction surveys serves primarily clients within USDOT and, in the committee's judgment, constitutes a small component of the BTS survey portfolio. Nonetheless, the committee was concerned that the variable quality of surveys conducted under the Omnibus program, combined with inadequate procedures for approving these surveys, could undermine BTS's credibility as an independent provider of transportation data.

RESPONDING TO DATA USERS' NEEDS

To develop cost-effective, high-quality surveys responsive to the needs of data users, BTS has to communicate effectively with its customers. A better understanding of the types of questions and analytical problems addressed by users would help BTS develop relevant data products. In addition, many users could provide BTS with valuable suggestions about data concepts, methods, and products in the context of a dialogue about the agency's survey development and design activities.

In general, BTS's outreach activities for communicating with users of its personal travel and freight surveys have been sporadic. Some initiatives, such as the 1999 conference to discuss the proposed new personal travel survey (the NHTS),¹ have been valuable in facilitating discussions of spe-

¹ The 1999 conference, *Personal Travel: The Long and Short of It*, addressed issues associated with merging the Nationwide Personal Transportation Survey and the American Travel Survey to form the NHTS.

cific issues. Nevertheless, the agency does not appear to have a rigorous, systematic strategy for interacting with its customers on a regular basis.

BTS's efforts to develop its flagship surveys are further complicated by a lack of clearly defined survey objectives. For example, in the case of the CFS, a decision about whether the survey is to provide data on state-to-state flows in addition to general national flows is key to developing a cost-effective sampling design. For transportation surveys in general, parameters such as sample size need to be determined on a rational statistical basis that reflects user requirements for reliable data at specified levels of geographic detail. In the absence of clear objectives, the statistical foundation needed to inform quality/quantity/cost trade-offs inherent in the survey design process is lacking, and the survey scope itself may be ambiguous. As a result, available resources may not be used effectively to meet the needs of data users.

INSTITUTIONAL ISSUES

From a user's perspective, an important feature of the NHTS and CFS is stability. Users count on the data products being made available on a regular, periodic basis, with the quality and content at least as good as that of earlier surveys. However, the history of the flagship personal travel and freight surveys has been characterized by variations in budgets and changes in survey ownership that threaten to undermine survey stability and quality. Budget variations have resulted in irregular survey frequency and reductions in sample size. The former limit the ability to measure trends, while the latter are likely to have adverse effects on data usability. As a result of changes in ownership, both flagship surveys now are funded and conducted by BTS in conjunction with survey partners.² BTS is largely dependent on the institutional memory of these partners to provide continuity and build on experience with previous surveys.

Ensuring the stability and quality of major national surveys such as the NHTS and CFS requires long-term planning and technical development,

² The NHTS is funded by BTS, the Federal Highway Administration (FHWA), and the National Highway Traffic Safety Administration, and is conducted by BTS, FHWA, and their contractors. The CFS is funded and conducted by BTS and the Census Bureau.

and a clear and timely commitment by the survey partners to provide the necessary funding. Given the importance of the flagship personal travel and freight surveys to a broad spectrum of data users, the committee believes measures are needed to prevent a repeat of the 2002 CFS scenario in which delays in committing funds eliminated most opportunities for survey improvement and innovation, and almost resulted in cancellation of the survey.

The purpose of BTS's portfolio of survey programs is to provide transportation data products that are responsive to customer needs, relevant to policy and investment decisions affecting the transportation enterprise, and appropriate to a federal statistical agency. The development of products such as the CFS and NHTS needs to be driven not only by statistical considerations but also by a broad understanding of the nation's transportation system and sensitivity to related policy issues. The committee's reviews of individual survey programs led it to conclude that BTS lacks the balance of expertise needed to guide the development of data products for informing transportation decision making. In particular, a better understanding of transportation issues could have resulted in better survey design and implementation decisions in some instances. For example, the reduced budget for the 2002 CFS was accommodated by halving the sample size to 50,000 establishments, compared with 100,000 in 1997. More informed insights into the uses of freight flow data, and in particular the need for reliable data at specific levels of geographic detail, could have highlighted the importance of seeking additional funds or investigating creative ways to maintain the sample size for the 2002 CFS at a level comparable with that of the 1997 survey.

SURVEY METHODS

Continuing to provide useful, high-quality survey products over a period of many years requires an ongoing program to research and implement more effective survey methods. As a result of social and technological changes, survey methods that yielded good data 15 or 20 years ago may no longer give such satisfactory results. For example, defensive measures by consumers to deflect telemarketing calls, combined with the growing number of cell-phone-only households, are reducing the effectiveness

of many telephone surveys. These factors may have contributed to the 41 percent response rate for the 2001 NHTS—a value that gives cause for concern because of the potential for significant nonresponse bias in the results. At the same time, technical developments may provide opportunities for more cost-effective data collection—an important benefit for BTS as it seeks to fulfill users' data needs in the face of pressure on survey budgets. For example, while the 2002 CFS data were collected entirely by mail, the Census Bureau investigated electronic reporting as part of the 2002 Economic Census and has tentative plans to provide the option of a Web-based questionnaire for the 2007 CFS. Such an approach offers the potential to reduce data entry costs as well as to improve data quality through automated editing that assists respondents while they are in the process of completing the questionnaire.

As a relatively new statistical agency, BTS does not have an established tradition of research into survey methods. Nonetheless, many of the methodological issues the agency faces in developing the NHTS and CFS are common to surveys in general, and much of the extensive technical literature on survey methodology is pertinent to BTS's flagship surveys. Leveraging existing work on survey methods could allow BTS to focus its limited research budget on efforts to solve its particular survey problems and investigate topics specific to transportation surveys.

The committee identified five main topic areas in which improvements in the effectiveness of BTS's survey methods could enhance the quality and usefulness of the resulting data products:

- Response rates for household travel surveys,
- Data collection,
- Sample design,
- Questionnaire development and testing, and
- Data dissemination.

RECOMMENDATIONS

Recommendations 1 through 7 identify actions BTS could take to render its flagship surveys more effective in meeting the needs of a broad spectrum of data users. Recommendation 8 addresses the Omnibus program.

Recommendation 1

BTS should continue to conduct and enhance the NHTS and the CFS, its flagship surveys on personal travel and goods movement in the United States.

Recommendation 2

BTS, together with its CFS and NHTS partners, should establish a formal process for (a) eliciting and responding to the needs of the community of data users on a regular basis and (b) consulting these users about key decisions affecting future surveys.

Recommendation 3

BTS should use clear and explicit survey objectives (e.g., scope and scale), developed in conjunction with its survey partners and users, to inform the design and implementation of future editions of the NHTS and CFS.

Recommendation 4

BTS should establish institutional procedures and long-term financial plans that help ensure the stability and quality of its flagship personal travel and freight surveys.

Recommendation 5

BTS should work with its survey partners to establish a clear understanding of respective roles and to define clear lines of organization and management.

Recommendation 6

BTS should enhance and maintain the transportation expertise of its staff to achieve a balance between statistical and transportation knowledge.

Recommendation 7

BTS should address technical problems associated with its major surveys by making those problems a focus of its applied research program.

Recommendation 8

BTS should establish a process for conducting the Omnibus surveys that ensures the agency's credibility as an independent provider of statistical information.

Introduction

The Bureau of Transportation Statistics (BTS) was established within the U.S. Department of Transportation (USDOT) by the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA). A strategic planning initiative by USDOT in the late 1980s had led the Office of the Secretary and others to conclude that, for policy purposes, there were major gaps and deficiencies in available transportation data. These data did not readily support cross-modal, systemwide analyses; definitions and quality standards varied; and there were no up-to-date nationwide data on household travel and the shipment of goods across modes (TRB 1992; Citro and Norwood 1997). The creation of a statistical agency within USDOT was intended to establish a focal point for the activities necessary to provide high-quality, systemwide transportation data for policy making, planning, and research purposes. In particular, the establishment of BTS was intended to bring greater coordination and comparability to transportation data, to improve quality standards, and to fill data gaps.

In this report, the role of BTS's major survey programs in providing transportation data to fulfill the needs of a broad spectrum of users is addressed, and opportunities for improving these surveys in the future are identified.

PEER REVIEW OF BTS

Experience suggests that it takes many years to develop the capabilities, stature, and credibility required for an effective statistical agency in a cabinet department (Citro and Norwood 1997). Recognizing that external peer review can be a valuable mechanism in guiding this development process, ISTEA mandated two review processes to assist the new

BTS. First, it required the agency's director to establish a standing committee of external advisors (the Advisory Council on Transportation Statistics) to advise BTS on transportation statistics and analyses. Second, ISTEA called for the National Academy of Sciences [National Research Council (NRC)] to conduct a study of the adequacy of USDOT's data collection procedures and capabilities.

Previous NRC Review

BTS's start-up operations and achievements during its first 4 years are reviewed in the 1997 NRC report, *The Bureau of Transportation Statistics: Priorities for the Future* (Citro and Norwood 1997). The study committee found that BTS had achieved a great deal, even though, as expected, the agency had not accomplished all its assigned agenda in such a short period. The committee urged BTS to focus its future efforts on data quality issues and to address the relevance of transportation data for policy making, program planning, and research use. The committee also strongly recommended that the U.S. Congress reauthorize BTS for another 6 years. This recommendation was fulfilled in the 1997 Transportation Equity Act for the 21st Century (TEA-21), which authorized BTS at an annual funding level of \$31 million for the 6-year period from 1998 through 2003.

Charge to the Committee

The present review of BTS's survey programs was requested by the agency in 2001, against the backdrop of the impending reauthorization of TEA-21. The study committee was asked to review BTS's current survey programs in light of

- Transportation data needs for policy planning and research and
- Characteristics and functions of an effective statistical agency.

For each of the agency's three major surveys—the National Household Travel Survey (NHTS), the Commodity Flow Survey (CFS), and the Omnibus Survey Program—the committee was asked to comment on priority transportation data needs and recommend approaches that BTS can use to meet the needs of the variety of data users over time. The committee was also asked to provide guidance and suggest procedures BTS

can use to ensure sound methodology and improved timeliness. The study request anticipated that the guidance offered would differ for the specific surveys but that certain key themes would be important across the board. Specific guidance on each survey would be provided in letter reports, and major themes and crosscutting guidance would be offered in a final report.

At the request of BTS, the committee reviewed the NHTS first, followed by the Omnibus Survey Program, and finally the CFS. The committee conducted its reviews of the NHTS and the CFS while the latest editions of these surveys were in the field.¹ As a result, the committee's conclusions about the uses of survey data are based primarily on information relating to earlier editions of the NHTS and CFS. The committee's letter reports on the individual surveys are reproduced in Appendixes A, B, and C. In the present report, the committee draws on the outcomes of its reviews of individual surveys to identify major themes and crosscutting issues and to offer advice to BTS on ways of making its surveys more effective.

FRAMEWORK FOR EVALUATION

To inform its review of BTS's current survey programs, the committee sought to (a) understand the scope and nature of transportation data needs for policy planning and research and (b) identify the characteristics and functions of an effective statistical agency.

Transportation Data Needs

BTS's mandate (49 U.S.C. 111) charges the agency with

- Compiling and analyzing a comprehensive set of transportation statistics;
- Establishing and implementing a comprehensive, long-term program for the collection and analysis of data relating to the performance of the transportation systems of the United States;

¹ Data for the 2001 NHTS were collected between April 2001 and May 2002; the committee held its review meeting in February 2002. Data collection for the 2002 CFS was ongoing in November 2002, when the committee held its review meeting.

- Making the statistics it compiles readily accessible;
- Providing statistics to support transportation decision making by all levels of government, transportation-related associations, private businesses, and consumers;
- Issuing guidelines for the collection of information by USDOT to ensure that such information is accurate, reliable, relevant, and in a form that permits systematic analysis; and
- Developing an intermodal transportation database.²

The committee used the above mandate as a basis for identifying the scope of the transportation data needs to be met by BTS's surveys. Input from members and from the technical experts and policy analysts who participated in the committee meetings (see Appendix D) provided further information on the users (and potential users) of BTS's statistics and the kinds of transportation data they require to inform their analyses, planning, and research. Articles in the technical literature also were valuable in identifying needs for and uses of transportation data, particularly for research.

An Effective Statistical Agency

As discussed in the earlier NRC review of BTS, Congress could have chosen an organizational structure other than a separate statistical agency by which to remedy the gaps and deficiencies in transportation data (Citro and Norwood 1997, 19). However, the ISTEA mandate clearly identifies BTS as a statistical agency with responsibilities extending beyond the largely administrative tasks of data compilation and dissemination. Thus, BTS is responsible for functions such as establishing and maintaining statistical standards, and long-range planning to identify and meet evolving user needs for transportation information.

The previous review (Citro and Norwood 1997) found that BTS had not evolved into a statistical agency fulfilling a broad mandate to improve the quality and relevance of transportation data to address users' information needs. Rather, during its first 4 years, BTS operated primarily

² BTS is also charged with more specific tasks relating to the National Transportation Library, the National Transportation Atlas Database, international data, and aviation and motor carrier information.

as a data compilation and dissemination agency. In reaching this conclusion, the review committee evaluated BTS's performance against the expectations for a federal statistical agency defined in the report *Principles and Practices for a Federal Statistical Agency*. The 3 principles and 11 practices enumerated in Box 1-1 are taken from the latest edition of the same report (Martin et al. 2001).

During the course of the present review, the committee made frequent reference to the principles and practices and to the report from which they are taken. No attempt was made to grade BTS systematically on all the criteria listed in Box 1-1, but the committee drew on these principles and practices to guide its evaluation and develop its recommendations to BTS for improving the agency's survey programs.

BOX 1-1

Principles and Practices for a Federal Statistical Agency

Principles

- Relevance to policy issues
- Credibility among data users
- Trust among data providers

Practices

- Clearly defined and well-accepted mission
- Strong position of independence
- Continual development of more useful data
- Openness about the data provided
- Wide dissemination of data
- Cooperation with data users
- Fair treatment of data providers
- Commitment to quality and professional standards of practice
- Active research program
- Professional advancement of staff
- Coordination and cooperation with other statistical agencies

Source: Martin et al. 2001.

ORGANIZATION OF REPORT

The three major BTS surveys that the committee reviewed—the NHTS, the CFS, and the Omnibus Survey Program—are described briefly in Chapter 2, and the committee's assessments of each of these surveys are summarized. The detailed findings and recommendations are given in the letter reports reproduced in Appendixes A, B, and C. The committee's conclusions on major themes and crosscutting issues relevant to BTS's current survey programs are presented in Chapter 3. The committee's recommendations for making these surveys more effective in meeting the needs of a broad spectrum of data users are presented in Chapter 4.

REFERENCES

Abbreviation

TRB Transportation Research Board

Citro, C. F., and J. L. Norwood (eds.). 1997. *The Bureau of Transportation Statistics: Priorities for the Future*. Panel on Statistical Programs and Practices of the Bureau of Transportation Statistics, National Research Council, Washington, D.C.

Martin, M. E., M. L. Straf, and C. F. Citro (eds.). 2001. *Principles and Practices for a Federal Statistical Agency*, 2nd ed. Committee on National Statistics, National Research Council, Washington, D.C.

TRB. 1992. *Special Report 234: Data for Decisions: Requirements for National Transportation Policy Making*. National Research Council, Washington, D.C.

Description and Assessment of Bureau of Transportation Statistics' Surveys

In this chapter, an overview of the three Bureau of Transportation Statistics (BTS) surveys that the committee reviewed—the National Household Travel Survey (NHTS), the Commodity Flow Survey (CFS), and the Omnibus Survey Program—is provided, and the committee's assessments of each of these surveys are summarized. The committee's detailed findings and recommendations are provided in the letter reports reproduced in Appendixes A, B, and C. The purpose of this chapter is to set the context for the committee's conclusions and recommendations, presented in Chapters 3 and 4, rather than to provide detailed descriptions of BTS's survey programs. Further information on the surveys is given in the committee's letter reports and in the accompanying references.

Both the NHTS and CFS are funded and conducted by BTS in conjunction with survey partners, as discussed later in this chapter. Furthermore, both have evolved from surveys that predate the establishment of BTS in 1991. Thus, although the NHTS and CFS are described throughout this report as BTS's surveys, the agency does not bear the sole responsibility for these survey programs or for the manner in which they have evolved over time.

NATIONAL HOUSEHOLD TRAVEL SURVEY

The NHTS is a personal travel survey of the civilian, noninstitutionalized population of the United States. The survey is conducted by BTS, the Federal Highway Administration (FHWA), and their contractors, and funded by three agencies within the U.S. Department of Transportation (USDOT), namely, BTS, FHWA, and the National Highway Traffic Safety Administration (NHTSA). The total budget for the 2001

NHTS was \$10.7 million, of which \$300,000 came from NHTSA and the remainder approximately equally from BTS and FHWA. In 2001, the NHTS superseded two earlier federal government surveys of personal travel in the United States. The Nationwide Personal Travel Survey (NPTS) investigated daily travel and was conducted five times between 1969 and 1995. The American Travel Survey (ATS) investigated long-distance travel and was conducted twice, once in 1977 and again in 1995.

Purpose

The purpose of the NHTS is to provide information on personal travel within the United States. Detailed data from a sample of U.S. households on daily and longer-distance travel for all purposes and by all modes are expanded to provide national estimates of trips and miles by travel mode, trip purpose, and household attributes. Aside from information on journey-to-work trips reported in the Decennial Census and the American Community Survey, the NHTS is the only national source of information on the typical travel of U.S. residents. The survey provides data on the type and amount of travel, the use of various modes, the time and miles spent traveling for various purposes, ownership and use of the vehicle fleet, and relationships among household composition, life stage, and travel.

Approach

The NHTS collects data from a nationally representative sample of households to derive statistically reliable travel estimates at the national level. The size of the national sample is insufficient to provide statewide or area-specific estimates, but states and metropolitan planning organizations (MPOs) can purchase additional samples of households in their jurisdictions to support local studies. These add-on samples are surveyed as part of the larger NHTS effort. For the 2001 survey, the national sample comprised approximately 26,000 households. In addition, five state departments of transportation and four MPOs purchased supplemental samples for their local planning efforts. These supplemental samples involved a total of 40,000 additional households.

The 2001 NHTS data were collected using computer-assisted telephone interviewing (CATI) methods and a random digit dialing (RDD),

list-assisted sample. In common with many household travel surveys, data were collected in a two-stage process. A recruitment interview obtained demographic information and rosters of household members and vehicles. Map and diary packages were then mailed to recruited households to help them keep track of their travel. The subsequent data-gathering interview obtained information on household travel on a preassigned travel day as well as on longer-distance travel over a 28-day travel period.

Survey Products

Preliminary 2001 NHTS data for the national sample of 26,000 households were released in January 2003, approximately 8 months after the completion of data collection. Data on households, persons, vehicles, and daily trips can be downloaded from the NHTS website (nhts.ornl.gov/2001/), together with supporting documentation. The data are also available on CD. In addition, an online analysis tool allows users to generate travel statistics without having a detailed knowledge of data file structures. Further data for the national sample, together with data for the 40,000 households in the supplementary regional samples, are scheduled for release in October 2003.

Findings

The committee found that data from the NPTS and ATS have proved useful to policy makers and planners at national, state, and local levels, as well as to researchers, industry associations, and public interest groups. The data are used primarily for analyzing policy issues, setting funding priorities, and monitoring trends in travel behavior. Data from the 2001 NHTS are expected to prove similarly useful.

Despite their many uses, data from national surveys such as the NPTS, ATS, and NHTS do not meet the needs of all users. In particular, such national data do not generally provide the level of detail required to inform decisions about location-specific issues. In addition, the lack of contextual information—for example, information on the availability and quality of local transportation services—limits the usefulness and relevance of the data for model estimation and some policy analyses.

The committee identified opportunities for BTS to improve its personal travel surveys in terms of both their value to a wide range of users and the quality of the data provided. The committee's concerns about data quality focused on the response rate for the 2001 NHTS. Although the final response rate of 41 percent is relatively high compared with response rates for household travel surveys conducted by MPOs across the United States, it is low compared with response rates for other federal policy-related surveys and raises questions about the validity of the data as a basis for decision making. The committee was also concerned about the lack of formal processes for identifying users of BTS's household travel data and for modifying surveys to meet user needs.

Recommendations

The diversity of analysis and decision needs to be met by the NHTS led the committee to conclude that it may become increasingly difficult to meet user requirements for both quality and subject coverage with a single periodic survey. Therefore, the committee recommended that BTS consider developing a family of personal travel surveys that take advantage of different survey designs and supporting technologies to collect household travel data. These surveys would likely differ from each other in content, coverage, methodology, and frequency, but would be designed such that data from different surveys could be readily combined. To inform both the development of this family of surveys and future enhancements of the NHTS, the committee recommended that BTS develop a formal program for identifying and interacting with current and potential users of its personal travel data. Such a program would help the agency better understand the needs of data users and their perspectives on issues such as data quality.

The committee also recommended that BTS take advantage of a range of design concepts and new technologies in its continuing efforts to improve the response rate and data quality for the NHTS. These efforts could benefit from related research, and the committee suggested, therefore, that BTS assume a leadership role in research into methodologies for conducting transportation surveys. This action would help ensure that current and emerging issues relating to survey quality are investigated and the results incorporated into the agency's future surveys.

COMMODITY FLOW SURVEY

The CFS is a national survey of business establishments in selected industries, namely, mining, manufacturing, wholesale trade, and certain retail establishments. The survey captures data on shipments of goods originating from a sample of such establishments located in the 50 states of the United States and the District of Columbia. The CFS is conducted by BTS and the Census Bureau of the U.S. Department of Commerce. The Census Bureau administers the survey as part of the 5-yearly Economic Census. The budget for the 5-year cycle of the 2002 CFS is \$13 million, of which 80 percent is provided by BTS and 20 percent by the Census Bureau. The CFS has been conducted three times—in 1993, 1997, and 2002.

Purpose

The purpose of the CFS is to supply information on the flow of goods by mode of transport within the United States. Data are provided on tons, miles, ton-miles, value, shipment distance, commodity, and weight. All major modes of freight transportation (air, motor carrier, rail, water, and pipeline) and intermodal combinations are covered. Despite gaps in shipment and industry coverage, the CFS is the only federal government data source that recognizes the need for such comprehensive information on freight flows.

Approach

The CFS sampling frame is drawn from the Census Bureau's Business Register of 6 million employer establishments, of which approximately 750,000 are in industries covered by the CFS. The sample size has been halved each time the survey has been conducted, falling from 200,000 establishments in 1993 to 100,000 in 1997 and 50,000 in 2002.

For all three editions of the survey, CFS data were collected entirely by mail. Respondents were asked to report the total numbers of their outbound shipments and, for a sample of these shipments, information on value, weight, commodity, domestic destination or port of exit, and mode (or modes) of transport. The survey questionnaire included instructions to respondents on how to take a sample of their shipments.

For the 2002 CFS, each establishment was assigned a 1-week reporting period every quarter, for a total of 4 weeks in the calendar year. By assigning different reporting periods to different establishments, the sample covered all 52 weeks of the year.

Survey Products

The Census Bureau makes a range of CFS data products available to the public in printed reports, on CD, and on the Web.¹ The published CFS data at the national level tabulate information on shipment characteristics by mode of transport and by commodity. Additional reports provide geographical breakdowns for flows between census divisions and regions, individual states, and major metropolitan areas. Reports on movements of hazardous materials and on exports are also published. Although such summary tables are useful, many analysts seeking to use the data as input to their own models and calculations would prefer a database providing access to origin–destination flow patterns.

Findings

The committee found that analysts and researchers in both the public and private sectors use data from the CFS—often in conjunction with data from other sources—for a variety of purposes. Uses of CFS data include the analysis of trends in goods movement over time, economic analyses, the development of models and other analytical products to inform policy analyses and management and investment decisions, and the analysis and mapping of spatial patterns of commodity and vehicle flows. Despite their many uses, CFS data are inadequate for some applications because of gaps in shipment and industry coverage, a lack of geographic and commodity detail at the state and local levels, and the inability of a 5-yearly survey to capture rapid changes in economic cycles.

The committee also found that the design of the 2002 CFS appears to have been compromised in important ways by the lack of a clear understanding between BTS and the Census Bureau about their respective

¹ At the time of writing, data from the 2002 CFS have not yet been released. Therefore, the discussion of CFS survey products addresses the 1993 and 1997 surveys. Preliminary national-level data for the 2002 CFS are anticipated by the end of 2003, with final data by the end of 2004.

roles and responsibilities. In particular, confusion over the responsibility for ensuring sufficient funding to produce a useful, quality product resulted in uncertainty about the availability and level of funding until late in the survey planning process. As a result, key design decisions were delayed, and opportunities for advance preparation and problem solving were limited.

Recommendations

The committee recommended that BTS continue to provide data on the flow of goods by mode of transport within the United States. To this end, it recommended that the CFS be continued—with some modifications—at least until a viable alternative source of national freight data has been established. BTS and the Census Bureau should proceed with planning for the 2007 CFS, and this planning effort should explore opportunities for conducting pilot studies of new methods in parallel with established designs. In the context of efforts to improve survey quality and cost-effectiveness, the committee recommended that BTS and the Census Bureau initiate a research program to investigate survey methods for the CFS and any successor surveys.

The committee also recommended that, in developing future versions of the CFS (or its successors), BTS and the Census Bureau solicit user input to the design process through dialogue with CFS users and other outreach mechanisms. Furthermore, the CFS partnership (BTS and the Census Bureau) needs to ensure that the rationale for major survey design decisions is documented and discussed in such a way as to engage users in decision making.

Finally, the committee recommended that BTS and the Census Bureau reevaluate their roles and responsibilities within the CFS partnership to make the most effective use of the expertise and experience of both parties.

OMNIBUS SURVEY PROGRAM

The Omnibus Survey Program currently comprises a monthly household travel survey that addresses a range of transportation issues, and up to a maximum of four targeted surveys per year that address special

transportation topics.² The Omnibus surveys are conducted and funded by BTS in conjunction with other administrations in USDOT, such as NHTSA and the Maritime Administration. The division of survey tasks and funding responsibilities among BTS and its survey partners varies on a case-by-case basis. The committee was unable to obtain estimates of the total costs of any of the Omnibus surveys because BTS staff time spent on these surveys is not itemized. Nonetheless, information on survey design features and contractor costs led the committee to conclude that the Omnibus Survey Program is a relatively modest effort compared with the NHTS and CFS.

The Omnibus monthly household survey was initiated in August 2000 and has been conducted on a monthly basis since then, apart from a 3-month hiatus between April and June 2001. The targeted surveys were also initiated in 2000 and, to date, eight surveys have been completed or are in progress.

Purpose

The core function of the Omnibus program is to assess customer satisfaction with various aspects of the transportation system, although the surveys also include questions designed to obtain factual (behavioral) information on transportation use or other transportation-related issues. The Omnibus program focuses on meeting some of the information needs of customers within USDOT. For example, data from the surveys assist the department in complying with the requirements of the Government Performance and Results Act of 1993 for federal agencies to measure their performance and effectiveness. The survey data also help inform transportation policy decisions. Thus, the monthly household survey delivers timely data on topical subjects such as travelers' experience with airport security screening, as well as providing a means of monitoring the public's use of and opinions about the transportation system. To date, the targeted surveys have been used to provide information on populations of special interest, such as mariners, air travelers,

² The Office of Management and Budget has also approved a quarterly establishment survey under the Omnibus program, but, to date, no such surveys have been conducted and none is planned.

cyclists and pedestrians, and travelers with disabilities. These surveys could also be used to investigate a wider variety of transportation policy issues.

Approach

Every month, the Omnibus household survey collects data from approximately 1,000 households nationwide using CATI and an RDD telephone methodology. The survey questionnaire includes a core set of transportation questions (which remain the same from month to month), questions to assess progress in achieving USDOT's strategic goals, and questions supplied by the USDOT modal administrations. Examples in the latter category include questions from NHTSA about headlight glare and tire pressure measurement.

In contrast to the monthly household survey, which relies on telephone methods to gather data, the targeted surveys use a variety of data collection methods—including mail out/mail back, telephone, and Web-based approaches—depending on the survey objective and the target population. For example, the 2001 Mariner Survey was conducted primarily by mail, but telephone interviews were conducted with some nonrespondents in an effort to increase the overall response rate. The data collection cycle for targeted surveys is determined by information requirements and, in contrast to the monthly household survey, is not routinely constrained by the need for a quick response. The sample size is determined by the purpose of the survey and the availability of resources.

Survey Products

Data from the Omnibus monthly household survey are made available on the BTS website (www.bts.gov) and are also used by the agency to prepare *OmniStats*, two- or three-page popular reports on items of widespread interest. Recent issues of *OmniStats* have addressed security screening at the nation's airports, recreational boating, and bicycle use among adults.

The results of the targeted surveys may be published in reports from BTS or other USDOT administrations. On occasion, the data may be made available to the public on the BTS website, subject to the agreement of the USDOT administration sponsoring the survey.

Findings

The committee found that the Omnibus Survey Program has value for USDOT because it delivers timely data to inform decision making. However, the features that make the Omnibus program an attractive tool for policy makers also raise concerns about the potential of the program to damage BTS's credibility as an independent provider of transportation data. The opportunity to obtain timely public opinion data on topical transportation issues carries a concomitant obligation for BTS, as a federal statistical agency, to make a clear distinction between statistical information and policy interpretation. The committee was particularly concerned that current BTS procedures for approving the Omnibus surveys may not adequately safeguard the agency's independence because they do not ensure that every survey is subject to rigorous, objective, and informed review of its content and method before being fielded.

The committee found the quality of surveys conducted under the Omnibus program to be variable. While some of the targeted surveys, notably the 2001 Mariner Survey, are of high quality, the monthly household survey gave cause for concern. In particular, there is a risk that the quality of the latter survey will be compromised by the time constraints imposed by the monthly schedule. The committee was also concerned that BTS analyses and reporting of the results of the Omnibus monthly household survey do not consistently meet the quality standards expected of a federal statistical agency.

Recommendations

The committee recommended that BTS continue its Omnibus Survey Program as a relatively low-budget activity providing timely information on a range of transportation issues. However, to safeguard the agency's independence, the committee also recommended that BTS establish an independent review mechanism for the Omnibus program involving experts from outside the agency. Such a mechanism should ensure that proposed surveys are consistent with BTS's overall mission and do not address inappropriate questions that could undermine the agency's independence.

The committee also recommended that BTS implement measures aimed at ensuring that all surveys conducted under the Omnibus program

are of a consistently high quality. These measures should include the establishment of effective procedures for developing and evaluating survey questionnaires and the aggressive pursuit of strategies for increasing the response rate for the monthly household survey. Reducing the frequency of the household survey from monthly to quarterly merits consideration because of the possible resulting improvements in survey quality. The committee further recommended that BTS take steps to ensure that its analyses of Omnibus survey data are technically robust and that the resulting products comply with established guidelines for the reporting of statistical data.

The next chapter draws on the outcomes of the committee's reviews of individual surveys, together with the evaluation framework described in Chapter 1, to identify seven major themes pertinent to BTS's current survey programs. In addressing these themes, the committee's conclusions emphasize crosscutting issues relating to the NHTS, the CFS, and the Omnibus program.

Conclusions

The committee's conclusions about the current survey programs of the Bureau of Transportation Statistics (BTS) are presented in this chapter. These conclusions are based on the outcomes of the committee's reviews of individual survey programs—the National Household Travel Survey (NHTS), the Commodity Flow Survey (CFS), and the Omnibus Survey Program—and address the following seven major themes:

- Essential value of the survey data (Conclusion 1),
- Substantive expertise to guide the development of data products (Conclusion 2),
- Survey stability and quality (Conclusion 3),
- Communication with data users (Conclusion 4),
- Clear and explicit survey objectives (Conclusion 5),
- Effective and efficient methods for conducting the surveys (Conclusion 6), and
- Clear separation between statistical information and policy interpretations in the Omnibus program (Conclusion 7).

After its reviews of individual survey programs, the committee observed that the NHTS and CFS differ in both substance and significance from surveys conducted under the Omnibus program. The committee characterized the NHTS and CFS as BTS's flagship personal travel and freight surveys. These major, multiyear survey programs have budgets on the order of \$10 million to \$15 million, and survey data are widely used by transportation analysts and researchers in both the public and private sectors. In contrast, the Omnibus surveys, which include a customer satisfaction component, are relatively modest, quick-response efforts serving clients primarily within the U.S. Department of Transportation

(USDOT). While recognizing the value of the Omnibus program, the committee sees the flagship surveys as far more important to the overall BTS mission of supporting decision making by organizations within the broad transportation enterprise. For this reason, the following conclusions draw primarily on the outcomes of the committee's reviews of the NHTS and CFS, and the recommendations in Chapter 4 focus on opportunities for BTS to improve its flagship surveys.

VALUE OF FLAGSHIP SURVEY DATA

Conclusion 1: BTS's flagship personal travel and freight surveys provide essential data not available from other sources.

The NHTS and CFS serve a broad constituency of organizations interested in transportation. USDOT, other federal agencies, the U.S. Congress, state departments of transportation, and metropolitan planning organizations (MPOs) are important public-sector data users. For example, the surveys provide policy makers at USDOT with national-level data to inform policy and investment decisions pertaining to the departmental goals of safety, mobility, economic growth, human and natural environment, and national security. Private-sector groups, such as consulting organizations, think tanks, and industry associations, also make extensive use of NHTS and CFS data, as do those in academia.

The widespread use of data from the NHTS and CFS indicates that these surveys provide essential data not available elsewhere. In the absence of the NHTS, nationwide personal travel data available from the federal government would be limited to journey-to-work trips reported in the Decennial Census and the American Community Survey. There would be no source of nationwide data on increasingly important non-work-related travel, making it difficult to assess trends in this market. While the CFS is one of many sources of freight transportation data, it is the only federal government data source that attempts to provide a comprehensive picture of freight flows across all modes of transportation. Trade databases provide some useful information, but they are intended for tracking economic transactions and provide only limited data on the physical movement of goods.

Information on the origin, quality, and limitations of the NHTS and CFS data is made available as part of the survey documentation. For ex-

ample, the sample size and response rate are reported for both surveys, as are limitations in shipment coverage for the CFS. Thus, users are able to assess the reliability of the data products. Not all sources of transportation data provide the same degree of transparency. For example, commercial data sets on freight movements may incorporate proprietary data, the origin and reliability of which are not reported. This lack of transparency raises concerns about the validity of the data as a foundation for decision making. A federal statistical agency such as BTS is required to “be open about its data and their strengths and limitations” (Martin et al. 2001, 8). Thus, users have come to rely on NHTS and CFS data because they bear the imprimatur of a federal statistical agency.

SUBSTANTIVE EXPERTISE

Conclusion 2: BTS lacks the balance of expertise needed to guide the development of data products for informing transportation decision making.

Some federal statistical agencies have clearly defined core programs providing the data needed to calculate high-profile national performance indicators. For example, the Bureau of Labor Statistics collects the data used in calculating the nation’s monthly employment statistics. In contrast, BTS is tasked with providing data to inform national transportation decision making “by all levels of government, transportation-related associations, private businesses, and consumers” [49 U.S.C. 111(c)(7)]. Thus, the data collected in the agency’s major surveys (the NHTS and CFS) are not defined by requirements for calculating specific metrics or indicators. Although it allows BTS more flexibility than some other federal statistical agencies in deciding what data to collect and how often to collect them, the broad nature of this mandate imposes an added burden on the agency. BTS has to assume responsibility for developing its own portfolio of programs. Development of this portfolio requires judgments about the kinds of data products that will be both responsive to user needs and relevant to policy and investment decisions affecting the transportation enterprise as a whole. Such judgments, in turn, require a broad understanding of the nation’s transportation system, as well as expertise in statistics and survey methods.

The committee’s reviews of the CFS and the Omnibus Survey Program revealed instances in which a better understanding of the transportation

context and its policy implications, and of the problems being addressed by data users in the transportation field, could have resulted in better survey design and implementation decisions. Consequently, the committee concluded that BTS lacks the quality and quantity of transportation expertise needed to inform important decisions about its surveys. The following example illustrates this point.

A greater understanding of transportation issues on the part of BTS could have been beneficial in informing decisions about the sample size for the 2002 CFS, particularly in the face of the reduced budget available for the survey.¹ During the early stages of the survey design process, BTS appears to have made few efforts to understand the requirements of transportation analysts for freight flow data at specific levels of geographic detail and reliability—levels that determine the minimum sample size. Consequently, opportunities to investigate creative ways of achieving this minimum sample size with limited resources, or to seek additional funding for the survey, were severely restricted. The eventual reduction in sample size to 50,000 establishments—compared with 200,000 in 1993 and 100,000 in 1997—has adversely affected the usefulness of the data. Furthermore, transportation analysts are concerned that reductions in sample size below 50,000 establishments could seriously compromise the ability of the CFS to provide even general-purpose statistics on commodity flows. Nonetheless, during design of the 2002 survey, BTS asked Census Bureau staff to produce cost estimates for sample sizes of 30,000 and 10,000 establishments.

SURVEY STABILITY AND QUALITY

Conclusion 3: Budget variations and changes in ownership threaten to undermine the stability and quality of BTS’s flagship personal travel and freight surveys.

The history of BTS’s personal travel and freight surveys is characterized by variations in survey frequency and sample size. These variations, which are linked to variations in survey budgets, potentially reduce the

¹ The budget for the 2002 CFS was \$13 million, compared with \$19 million for the 1997 survey.

usefulness of survey data in informing transportation decision making. Reductions in frequency limit the availability of timely data and the ability to detect new trends, while reductions in sample size may adversely affect data usability.

The personal travel surveys have been conducted with varying frequency since the late 1960s. The Nationwide Personal Transportation Survey (NPTS) was conducted in 1969, 1977, 1983, 1990, and 1995, while the American Travel Survey (ATS) was conducted in 1977 and 1995. In 2001, the two surveys were combined as the NHTS. The budget for the 2001 NHTS is \$10.7 million (\$411 per household surveyed). The cost of the 1995 NPTS was \$4.1 million (\$195 per household) and that of the 1995 ATS was \$18 million (\$269 per household), giving a combined cost for the 1995 surveys of approximately \$22 million. The freight surveys have generally been conducted on a regular 5-yearly basis, although a hiatus occurred in the 1980s and early 1990s before the initiation of the CFS. From 1963 through 1977, the Census Bureau collected data on commodity flows as part of its 5-yearly economic census program. The Census Bureau conducted a smaller commodity transportation survey in 1983 but did not release the results because of problems with data reliability. The CFS, which is linked to the mandatory 5-yearly Economic Census, was conducted in 1993, 1997, and 2002. The CFS budget has ranged from a high of \$19 million for the 1997 survey to a low of \$13 million for the 2002 survey.

In the case of the personal travel surveys, budget uncertainties appear to have been accommodated either by increasing the time between surveys or by reducing the sample size. For the NPTS, the period between surveys has been as long as 7 or 8 years; the ATS was conducted only twice, with an interval of 18 years between the two surveys. Clearly, such prolonged gaps limit the usefulness of the data for detecting trends and identifying shorter-term changes in travel behavior. The pace of economic, demographic, and technological changes may be such that a snapshot of personal travel behavior taken every 7 or 8 years does not provide an adequate basis for informing transportation policy decisions and related public- and private-sector investments. The reduction in budget for the 2001 NHTS, compared with that for the 1995 predecessor surveys, was accommodated in part by a reduction in sample size for

the long-distance travel component of the combined survey. The 1995 ATS surveyed 67,000 households, whereas the 2001 NHTS surveyed only 26,000 households. Consequently, in contrast to the 1995 ATS, the 2001 NHTS does not provide information on state-to-state travel patterns. While the full implications of this loss of geographic detail are not yet clear, the committee notes that the continuing interest in improving intermediate- and long-distance travel services, such as high-speed rail, defines a public policy need for quality data on longer trips.

The CFS sample size has been reduced by 75 percent over three survey cycles. Uncertainty about the availability and level of funding for the 2002 survey delayed key design decisions until late in the survey planning process. As a result, options for more cost-effective data collection could not be adequately explored because of time constraints—a deficiency that contributed in part to the greatly reduced sample size.

In addition to budget uncertainties, institutional changes have complicated efforts to ensure the stability and quality of the flagship personal travel and freight surveys. Before the establishment of BTS in the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA), national commodity transportation surveys were conducted by the Census Bureau. The successor survey (the CFS) is undertaken through a partnership between BTS and the Census Bureau. Similarly, the NPTS and ATS were the responsibility of other agencies before being assigned to BTS. The NPTS was conducted by the Federal Highway Administration (FHWA), and the ATS was conducted by the Census Bureau, first in 1977 as a component of the Census of Transportation and then in 1995 under a contract from BTS.

Both the NHTS and CFS are now funded and conducted by BTS in conjunction with survey partners. The NHTS is funded approximately equally by BTS and FHWA, with a small contribution (less than 3 percent) from the National Highway Traffic Safety Administration. The survey is conducted by BTS, FHWA, and their contractors. The CFS is funded by BTS (80 percent) and the Census Bureau (20 percent), which together are responsible for conducting the survey. The NHTS partnership appears to be functioning effectively. BTS and FHWA have established a good working relationship that allows them to build on experience with earlier surveys. However, the committee's review of the CFS revealed the

lack of a clear understanding between BTS and the Census Bureau about ownership of the survey; responsibility for ensuring sufficient funding to produce a useful, quality product; and their respective roles in developing survey methods.²

COMMUNICATION WITH DATA USERS

Conclusion 4: BTS and its survey partners have not adopted a sufficiently thorough and systematic approach for communicating with data users.

The quality of BTS products—notably the data from the agency’s personal travel and freight surveys—must be assessed in relation to clearly defined objectives. In particular, good survey design cannot be defined without reference to the data needs of users. Thus, Richardson et al. (1996, 80) note that “good survey design demands making trade-offs between the competing requirements of good design practice . . . to arrive at the most cost-effective, high-quality survey *meeting the needs of the client* within budget constraints” (emphasis added).

A major purpose of communication between BTS and its clients is to assist the agency in ensuring that its products are truly useful. The committee concluded that information from a range of sources—such as mailing lists, publications citing surveys, records of website usage, and the BTS products customer database—provides the agency with some indications of how and by whom its data are used. Meetings convened by BTS to facilitate interactions with survey users have also yielded benefits. For example, the 1999 conference *Personal Travel: The Long and Short of It* (TRB 2001) stimulated valuable discussion of methodological

² An important part of the institutional memory provided by an effective statistical agency is the proper archiving of data sets for which the agency is responsible. The report *Principles and Practices for a Federal Statistical Agency* suggests that agencies take measures “to ensure that data are preserved and accessible to the public for use in future years” (Martin et al. 2001, 8). The evidence available to the committee indicates that, despite the changes in survey ownership, data from the flagship personal travel and freight surveys have been archived for future use and are available. For example, data and reports from the 1990 and 1995 NPTS can be downloaded from the Web, as can reports from the 1993 and 1997 CFS. Data from earlier editions of the NPTS can be obtained from FHWA.

and content issues relating to the merging of the NPTS and ATS. Nevertheless, the committee observed that, to date, such outreach activities have been sporadic and have not provided a regular forum for interaction between BTS staff and data users. For example, in November 2000, BTS convened a meeting with public- and private-sector CFS users and Census Bureau representatives to initiate a dialogue on freight data needs for planning and policy purposes. Although this meeting resulted in valuable discussion, the committee is not aware of any efforts to continue the dialogue on a regular basis. The lack of an underlying strategy for eliciting feedback from the broad spectrum of data users also raises concerns that BTS's outreach activities may not always be effective in reaching interested groups.

The Advisory Council on Transportation Statistics (ACTS), appointed by and reporting to the BTS Director, is charged with advising the agency on transportation statistics and analyses, including whether the statistics and analyses disseminated by BTS are of high quality and based on the best available objective information.³ The ACTS members, five or six high-level managers and researchers, meet two or three times a year. Although ACTS provides some regular guidance on survey product requirements, meeting agendas must cover many topics and may include only limited opportunities for detailed discussion of user needs. Despite its considerable value, ACTS is not in a position to provide the detailed technical input that could result from regular dialogue between BTS staff and "hands-on" data users, such as midlevel professionals in research and consulting organizations, state departments of transportation, and MPOs. This input could assist BTS in developing a better understanding of its customers' requirements to inform the development of more effective surveys.

Given the opportunity, users can play a dual role in helping BTS make its data products more useful. In addition to sharing information on their data needs with BTS, many users can also advise the agency on data concepts, methods, and products (Martin et al. 2001, 9). However, soliciting such advice requires BTS to share information with users about its survey development and design activities, and related decisions, so

³ ACTS is called for under Section 6007 of Public Law 102-240 (ISTEA).

that they can provide feedback. The aforementioned conference on the merging of the NPTS and ATS (TRB 2001) provided a feedback mechanism that enabled BTS to benefit from users' advice about the proposed new personal travel survey (the NHTS). In contrast, feedback from users on the 2002 CFS was very limited. The Census Bureau conducted fairly extensive investigations of alternative sampling schemes, but the results do not appear to have been shared with data users early in the survey planning process.⁴ Consequently, the decision to halve the sample size vis-à-vis the 1997 survey was taken by the CFS partnership with apparently little discussion with users of the advantages and disadvantages of the sampling options.

CLEAR SURVEY OBJECTIVES

Conclusion 5: A lack of clearly defined survey objectives complicates BTS's efforts to develop cost-effective, quality personal travel and freight surveys responsive to the needs of data users.

The committee's reviews of the NHTS and CFS revealed a lack of clearly defined objectives for these major national surveys. In the absence of such objectives, the robust foundation needed to inform quality/quantity/cost trade-offs inherent in the survey design process is lacking, and the survey scope itself may be ambiguous. As a result, available resources may not be used effectively in meeting the needs of data users. The following examples illustrate this point.

The committee observed that sample sizes for the NHTS and CFS do not appear to have been determined on a rational statistical basis that reflects user needs for statistically reliable data at specified levels of geographic detail, as well as mode and commodity detail as appropriate. Rather, decisions about sample size appear to have been dictated primarily by survey budgets. The example of the 2002 CFS has already been discussed. In the case of the personal travel surveys, it is not clear that reducing the sample size for long-distance travel from 67,000 in the 1995

⁴ One of the major design decisions was whether to obtain 200,000 reports over the course of the year by (a) sampling each of 50,000 establishments four times or (b) sampling each of 100,000 establishments twice.

ATS to 26,000 in the 2001 NHTS will provide sufficiently reliable and comprehensive data on longer trips to inform policy and investment decisions.

In the case of the CFS, a series of sample size thresholds can be identified. These thresholds are determined by the level of geographic detail at which commodity flows can be characterized. For example, the minimum sample size needed to provide useful data on state-to-state flows is much larger than that needed to characterize general national flows. Thus, selecting a sample size just below that needed to determine state-to-state flows would result in a particularly inefficient use of resources. The amount of data collected would be far in excess of that necessary to determine general national flows but insufficient to provide usable data at the level of state-to-state flows. Thus, a decision about survey objectives—namely, whether the survey is to provide data on state-to-state flows or general national flows—is key to developing a cost-effective design.

SURVEY METHODS

Conclusion 6: Improvements in the effectiveness of BTS’s survey methods could enhance the quality and usefulness of the resulting data products.

The committee identified five main topic areas in which more effective survey methods could improve the quality and usefulness of BTS’s survey products:

- Response rates for household travel surveys,
- Data collection,
- Sample design,
- Questionnaire development and testing, and
- Data dissemination.

BTS is not alone in needing to develop more effective survey methods. Many of the methodological issues the agency faces—including the decline in the effectiveness of telephone surveys, the search for more cost-effective ways of collecting quality data, and the need to expand the availability of survey data without compromising the confidentiality of data providers—are common to the wider survey community.

Response Rates for Household Travel Surveys

Survey methodologists generally agree that the changing characteristics of telephone usage, including defensive measures by consumers to deflect telemarketing calls and the growing number of cell-phone-only households, are reducing the effectiveness of many current telephone surveys and may be increasing bias in the results. Both the 2001 NHTS and the Omnibus monthly household survey, which rely exclusively on telephone interviews to collect data, are indicative of this trend. The low response rates for these surveys (41 percent for the NHTS and 43 percent for the Omnibus survey) give cause for concern because of the likelihood of significant nonresponse bias. There is reason to believe that the travel behavior of survey nonrespondents may differ significantly from that of respondents, leading users to question whether data provided by less than half the households surveyed form a valid basis for analysis and decision making. The Office of Management and Budget gave BTS only conditional clearance to proceed with the 2001 NHTS on the understanding that the agency will investigate the high nonresponse rate and find ways to reduce it in the future.

Data Collection

The experience with the NHTS illustrates clearly how changes in respondent behavior (willingness to participate in telephone surveys) can undermine the effectiveness of a chosen data collection method, resulting in low response rates that threaten the survey's validity. Furthermore, at a time when survey budgets are coming under increasing pressure, BTS is being asked to provide quality data in a timely and cost-effective manner. Thus, new data collection methods could bring important benefits by offering the potential to reduce respondent burden and increase respondents' willingness to participate, thereby increasing response rates. For example, electronic reporting options developed for the 2002 Economic Census allow businesses to extract data directly from their own spreadsheets and import it into survey software. Businesses can also complete electronic survey questionnaires on their own computers at their own pace.⁵ Similarly,

⁵ *Easier, Faster, Smarter: Census Bureau Features Electronic Reporting in the 2002 Economic Census*, www.census.gov/epcd/ec02/ec02electronic.htm.

Internet-based travel diaries for use in personal travel surveys allow respondents to complete the diary in a series of work sessions at convenient times. Such diaries also permit the implementation of user-friendly features such as context-sensitive instructions, a help feature, automatic addition of intrahousehold shared trips, and respondent-interactive geocoding to help describe trip origins and destinations.

Sample Design

Improving sampling techniques could make BTS's surveys more effective, as illustrated by two examples:

1. Because pricing structures may require users to pay for incoming calls, cell phones are excluded from random digit dialing lists used in telephone surveys such as the NHTS. However, these exclusions may lead to sampling bias because of the increasing number of cell-phone-only households. Acceptable and effective ways to include cell-phone users in the sample are needed.
2. The CFS requires respondents to report details of a sample of their shipments. Some reporting errors have been linked to respondent confusion in applying the current method by which firms are instructed to select a sample of shipments (Black 1997). An alternative sampling scheme, such as an approach that involves randomly selecting a starting point in terms of shipments and taking the next n records, could result in fewer reporting errors and improved data quality.

Questionnaire Development and Testing

Pilot surveys form an important component of the transportation survey process because they provide an opportunity to correct the inevitable errors in the original design (Richardson et al. 1996). However, because the time available for survey development and testing is always restricted, pilot surveys are sometimes limited or neglected entirely. In the case of the Omnibus monthly household survey, the committee is concerned that schedule constraints imposed by the quick-response nature of the

survey may prevent adequate cognitive testing of questionnaires. Thus, the resulting survey data may be difficult to interpret or inconsistent with survey objectives. Methods for testing survey instruments quickly and accurately could be very useful in improving the quality of both the NHTS and the Omnibus surveys.

Data Dissemination

A number of data users indicated to the committee that the release of additional survey microdata would greatly enhance the usefulness of the NHTS and CFS by providing greater geographic detail. However, in attempting to expand the availability of its data, BTS faces a dilemma. The requirement to suppress geographic location information that could be linked to individual data providers is at odds with the need to retain sufficient geographic detail for data to be more useful. Techniques such as statistical disclosure limitation methods (see, for example, Duncan et al. 1993) may offer the possibility of expanding the availability of the NHTS and CFS data sets to external users without compromising the confidentiality of data providers. Thus, such methods could add value to the surveys without the need for additional data collection.

STATISTICAL INFORMATION AND POLICY INTERPRETATIONS

Conclusion 7: A clearer separation between statistical information and policy interpretations in the Omnibus program would strengthen BTS's credibility as an independent provider of transportation data.

A strong position of independence is essential if BTS, as a federal statistical agency, is to be viewed as a source of objective, reliable information. Indeed, an important reason to establish a separate statistical agency is to meet the need for data series to be independent of control by policy makers or regulatory or enforcement agencies (Martin et al. 2001, 3). Any hint that data collection, analysis, and reporting procedures are being influenced to produce a particular outcome or support

a policy initiative can undermine both the trust of data users and the cooperation of data providers.⁶

The committee recognizes the value of the Omnibus program of customer satisfaction surveys in providing timely information to operating agencies and policy makers in USDOT. In so doing, the surveys also help BTS demonstrate its relevance and utility to major constituencies within the department. Clearly, operating agencies need to measure the impact of their programs and benchmark their progress, and decision makers need to measure the outcomes of their actions. Nevertheless, there is also a natural desire to paint such outcomes in a favorable light, thereby demonstrating the wisdom of decisions made and the success of programs administered and policies adopted. BTS's role in the Omnibus program involves the agency in measuring public opinion on topical items for internal USDOT customers whose missions differ from the mission of BTS. Consequently, the committee had serious concerns about the potential of the Omnibus surveys to compromise, or appear to compromise, BTS's independence.⁷

Continuing to provide the kinds of data obtained in the Omnibus program—while maintaining the essential objectivity and independence of a federal statistical agency—will require much wisdom on the part of BTS. For example, it will require sensitivity to the policy implications of questions included in the survey. Such sensitivity is not possible without a broad understanding of the transportation system and its financing, organization, and operating relationships. It will also require that BTS avoid interpretations directly linked to matters of policy, focusing instead on the technical elements of instrument design, sampling, and data analysis.

⁶ As discussed in the 1997 NRC review of BTS, the independence of the head of a federal statistical agency is important in ensuring the independence of the agency itself. Therefore, the review committee recommended continuing the provisions established by ISTEA that “the director of BTS be a presidential appointee with a fixed term of 4 years, who reports directly to the secretary of transportation and is a qualified professional with relevant training and experience” (Citro and Norwood 1997, 98).

⁷ In its letter report on the Omnibus surveys (Appendix B), the committee noted that federal agencies have generally tended to avoid quick response customer satisfaction surveys conducted on a continuing basis, such as the Omnibus monthly household survey.

The committee's recommendations to BTS for addressing the issues discussed above, thereby improving the quality and usefulness of its surveys, are presented in the following chapter.

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Abbreviation

TRB Transportation Research Board

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Recommendations

The Bureau of Transportation Statistics (BTS) is charged with providing data to support decision making by diverse organizations within the broad transportation enterprise. In light of this charge, the committee identified the National Household Travel Survey (NHTS) and the Commodity Flow Survey (CFS) as key components of the agency's portfolio of surveys. Seven of the committee's eight recommendations identify actions BTS could take to render these flagship surveys more effective in meeting the needs of a broad spectrum of data users. The eighth recommendation addresses the Omnibus Survey Program.¹

FLAGSHIP PERSONAL TRAVEL AND FREIGHT SURVEYS

Recommendation 1: BTS should continue to conduct and enhance the NHTS and the CFS, its flagship surveys on personal travel and goods movement in the United States.

Given the broad scope of BTS's mandate and inevitable resource constraints on its programs, the committee urges the agency to adopt a strategy for enhancing the NHTS, CFS, and successor surveys that maximizes the value of the data for users at national, regional, state, and local levels. To do this, BTS must have a good understanding of how the NHTS and CFS are used and how they fit into the broader picture of transportation data.

¹ Specific guidance on the three survey programs the committee has reviewed—the NHTS, the Omnibus program, and the CFS—has already been provided in letter reports (Appendixes A, B, and C).

In particular, the committee encourages BTS to explore opportunities that add value to the NHTS and CFS without involving major increases in survey cost. For example, it may be possible to assist users needing more detailed geographic data on freight movements by modifying the CFS such that national and local data sets can be readily combined.² Similarly, revisions to the NHTS could help link data to the contextual information needed for policy analysis and model estimation. A recent National Research Council (NRC) report (Martin et al. 2001, 7) recommends that federal statistical agencies seek opportunities to integrate data from more than one survey or from other sources as part of the continuing development of more useful data, and the committee urges BTS to follow this advice. In particular, dialogue with users could address opportunities to coordinate data collection initiatives in an effort to obtain consistent and comparable local, state, and national data.

In developing and enhancing its flagship surveys, BTS will need to take account of user demands for both data consistency to support survey-to-survey trend analysis and expanded survey coverage to include evolving phenomena such as e-commerce. As noted in the letter report on the NHTS (Appendix A), changes in survey scope and design can result in additional complexity in trend analysis incorporating data from earlier surveys. Thus, BTS will need to develop a strategy to meet the potentially conflicting requirements for data consistency over time and expanded survey coverage.

Recommendation 2: BTS, together with its CFS and NHTS partners, should establish a formal process for (a) eliciting and responding to the needs of the community of data users on a regular basis and (b) consulting these users about key decisions affecting future surveys.

While information on the needs of data users does not guarantee good surveys, BTS cannot produce quality products without understanding these needs. Information on how and for what purposes data will be used is extremely important in developing an effective survey design.

² A recent Transportation Research Board (TRB) report addresses approaches to ensuring compatibility between national freight data and supplemental state and local data sets (TRB 2003).

Because the market for transportation data is diverse and evolving, BTS faces challenges in eliciting, understanding, and balancing the needs of its various constituencies to inform the development of its flagship surveys. For example, changes in the national transportation agenda, such as the increased focus on security since September 11, 2001, have resulted in new data requirements. Similarly, changes in the business environment, such as the revolution in freight logistics, have resulted in a requirement for more detailed and timely information about freight flows. These challenges are compounded by the fact that, as a relatively new statistical agency, BTS does not have long-standing relationships with its data users.

The committee urges BTS to develop outreach and interaction processes that facilitate open, accessible, responsive, and timely communication between the agency and current and potential users of its personal travel and freight surveys. A variety of processes will likely be required because these users are so diverse. In the case of the CFS, for example, “power” users—those who employ CFS data in their own analyses and models—could provide BTS with detailed technical input. Regular users—those who include CFS-based data in briefing papers and reports but do not themselves undertake data analyses—could provide the agency with more general feedback on the usefulness of survey products. In general, in consulting with a broad spectrum of users, BTS needs to employ “a variety of formal and informal means of communication that are appropriate to the types of input sought” (Martin et al. 2001, 9).

The committee encourages BTS to be proactive in reaching out to users by diverse means so as to better understand how transportation data are being used and for what purposes. Conferences and workshops convened by professional societies, transportation associations, and BTS itself constitute valuable opportunities for discussion of data needs and uses, and survey methods and their application. Nonetheless, because resource limitations preclude some users from traveling to these events, BTS also needs to adopt other approaches, such as surveys of users and a user-friendly feedback opportunity on its website, to broaden the scope of its outreach activities.

BTS may wish to consider using expert committees under the auspices of professional associations to serve as forums for interacting with users

of transportation data, survey researchers, and the transportation and statistics communities in general. Other federal statistical agencies, such as the Energy Information Administration and the Bureau of Justice Statistics, already adopt this approach. Thus, the Committee on Energy Statistics of the American Statistical Association (ASA) is charged with considering energy statistics as they relate to energy policy analysis and the framing of a comprehensive energy data system, and with promoting the integration of energy statistics with other statistical programs and with existing bodies of national statistics. Similarly, the ASA Committee on Law and Justice Statistics helps disseminate information about legal and justice statistics activities throughout the statistics community, and promotes the development of quality statistical activities in civil and criminal justice settings. A number of TRB standing committees, such as the Freight Transportation Data Committee, the Travel Survey Methods Committee, and the National Transportation Data Requirements and Programs Committee, could assist BTS in assessing the data needs of users, obtaining feedback on survey products, and providing a forum for discussing survey methods.

BTS's outreach and interaction processes also need to include mechanisms for consulting users about decisions affecting the agency's surveys. Openness in decision making can enhance the usefulness of surveys by providing users the opportunity to intervene and question BTS's decisions during the survey planning process. Mechanisms for consulting users are also important for maintaining a relationship of mutual respect and trust between the agency and its customers. Thus, implementation of an open, interactive decision-making process is important if a customer-driven agency, such as BTS, is to fulfill its mission of providing data to meet client needs.

Recommendation 3: BTS should use clear and explicit survey objectives (e.g., scope and scale), developed in conjunction with its survey partners and users, to inform the design and implementation of future editions of the NHTS and CFS.

Clearly defined survey objectives provide the robust foundation needed to inform the decisions inherent in any major survey program. Therefore, the committee urges BTS to work with its survey partners and customers

(data users) in developing objectives that provide an explicit basis for defining the scope and content of proposed surveys. These objectives should be used in survey development and design to guide the agency's examination of trade-offs between resource expenditures and the character and quality of survey products.

Key trade-offs affecting data content, scale, and quality should be identified and taken into account when making decisions about the allocation of resources. For example, a major decision in designing future editions of the CFS is determining the level of geographic detail the data will provide. Because this decision defines a minimum sample size, it will give a reasonable indication of whether resources allocated for the survey are sufficient. Concerted efforts should be made to avoid disadvantageous breakpoints—such as a sample size just below that needed to determine commodity flows at the requisite level of geographic detail. Under such circumstances, efforts to obtain additional resources or to increase the sample size through more cost-effective data collection or other efficiencies could yield a valuable payoff.

Recommendation 4: BTS should establish institutional procedures and long-term financial plans that help ensure the stability and quality of its flagship personal travel and freight surveys.

The establishment of BTS by the 1991 Intermodal Surface Transportation Efficiency Act resulted in the agency's assuming important responsibilities for the flagship national transportation surveys (the NHTS and CFS). However, BTS currently lacks a history of intellectual investment in these surveys and the accompanying institutional memory needed to provide continuity and build on experience with previous surveys. Thus, the agency, in conjunction with its survey partners, needs to make special efforts to undertake the long-term planning and technical development required to support its NHTS and CFS programs.

In the committee's view, much-needed stability could result from a clear commitment by BTS to deliver quality flagship survey products to its users and set its priorities accordingly. The committee is concerned that without a long-term commitment to the flagship surveys, and the accompanying staffing and financial resources needed to ensure program continuity, future personal travel and freight surveys may suffer the

same fate as the 2002 CFS. Delays in committing funds eliminated most opportunities for survey improvement and innovation and almost resulted in cancellation of the survey.

The committee urges BTS to recognize its flagship personal travel and freight surveys as core elements of its portfolio of programs and to manage its resources accordingly. Analysis of the costs of earlier surveys can provide BTS and its survey partners with a basis for developing reasonable cost estimates for future surveys. These estimates, together with information about anticipated budgets, could help inform decisions about survey timing and scheduling. For example, avoiding concurrent peaks in effort and expenditure for the two major programs is clearly helpful for budgetary and staffing purposes. As discussed in the committee's letter reports on the NHTS and CFS (Appendixes A and C, respectively), continuous data collection may offer important benefits in this regard.

Recommendation 5: BTS should work with its survey partners to establish a clear understanding of respective roles and to define clear lines of organization and management.

One of the clearest lessons to emerge from the committee's review of the CFS was that funding uncertainties can undermine the planning and preparation needed to develop a cost-effective survey design responsive to user needs. In the case of the 2002 CFS, these uncertainties were related to the lack of a clear understanding between BTS and the Census Bureau about the responsibility for ensuring survey funding. The difficulties encountered by the CFS partnership may be partially attributable to the different funding priorities of the two agencies. The Census Bureau is concerned with the budget for the entire Economic Census, whereas BTS is concerned only with the budget for the transportation component (the CFS). Such problems do not arise with the NHTS because this survey is not part of a larger effort with broader objectives outside the transportation arena.

While recognizing the difficulties inherent in survey partnerships in general and the CFS partnership in particular, the committee urges BTS to work with its survey partners to establish a clear understanding of respective roles and responsibilities. When necessary, BTS should take a

leadership role in its survey partnerships to ensure the feasibility of the flagship surveys. Timely efforts to build consensus and establish memorandums of understanding (MOUs) addressing key aspects of a survey are a prerequisite to the development and conduct of major national surveys, such as the NHTS and CFS, that involve two or more survey partners. Dialogue among these partners needs to involve not only agency leadership but also midlevel technical experts. MOUs should address areas such as survey objectives, cost sharing, timing, the sampling frame, the development and testing of survey questionnaires, data collection, the use of subcontractors, data processing, and the dissemination of survey results.

Recommendation 6: BTS should enhance and maintain the transportation expertise of its staff to achieve a balance between statistical and transportation knowledge.

BTS's data-gathering, analysis, and dissemination activities require not only expertise in statistics and survey methodology but also an understanding of the socioeconomic context of passenger and freight movements; the supply, costs, and performance of transportation services; and all the modes providing these movements. A balance of statistical and transportation expertise is needed to guide the development of useful data products appropriate to a federal statistical agency. Making decisions about such product development is at the heart of effective management of BTS's survey programs.

An earlier examination of BTS's statistical programs found the agency's staff to have experience in the analysis of transportation data but relatively limited statistical expertise (Citro and Norwood 1997, 123). While progress has been made in developing the agency's statistical strengths, a considerable portion of the necessary transportation expertise appears to have been lost, as evidenced by some recent decisions about the scope and content of survey programs. The committee also observed that many of the BTS staff members participating in committee meetings were relatively new to the agency. Therefore, the committee encourages BTS to take measures aimed at recruiting and retaining staff who will provide the agency with the necessary balance of statistical and transportation expertise at both management and operational levels.

Recommendation 7: BTS should address technical problems associated with its major surveys by making those problems a focus of its applied research program.

The committee urges BTS, a relatively new statistical agency without an established research tradition, to draw on existing survey research and expertise before making major investments in its own research program. Much of the extensive technical literature on survey methodology is relevant to BTS's activities, and syntheses of research in specific areas could provide useful knowledge to inform the agency's surveys. In addition, BTS staff could benefit from interactions with other survey researchers through attendance at professional meetings and active participation in the work of professional societies.

BTS could learn from the experiences of other agencies through joining in the activities of the Federal Interagency Council on Statistical Policy, the body coordinating the work of federal statistical agencies, and the Federal Committee on Statistical Methodology (FCSM), an interagency committee dedicated to improving the quality of federal statistics.³ One of the major goals of FCSM is to provide a mechanism for statisticians in different federal agencies to meet and exchange ideas. Recent FCSM statistical policy working papers and seminars have addressed topics relevant to BTS's flagship surveys, including measuring and reporting on sources of error in surveys and interagency coordination and cooperation.

The committee encourages BTS to focus its own research program on

- Solving its particular survey problems, such as declining response rates in household travel surveys; and
- Investigating how recent developments in data collection methods and advanced statistical techniques can benefit transportation surveys. Examples include the use of the Global Positioning System (GPS) in personal travel and freight surveys and the use of new disclosure limitation methods to mask the identity of individual respondents in survey microdata.

³ Further information on FCSM is available on the committee's website, www.fcsm.gov.

A number of mechanisms are available for conducting applied research of the type envisaged. Studies could be conducted internally, or the services of experts not on the agency's staff could be enlisted through consulting or other arrangements (Martin et al. 2001, 11). For example, research could be contracted out to universities and small businesses, or qualified persons from academia could be brought into the agency temporarily under the Intergovernmental Personnel Act or BTS-sponsored fellowships to address specific problems. Studies could be conducted as stand-alone projects or could be an integral part of the surveys themselves. For example, pilot projects to investigate alternative data collection strategies could be conducted as part of the survey data collection effort.

According to a recent NRC report (Martin et al. 2001, 33), "the history of the statistical agencies has shown repeatedly that methodological research can lead to large productivity gains in statistical activities at relatively low cost." The committee identified five main topics within the broad area of survey methodology in which applied research could particularly benefit the quality and usefulness of future surveys.⁴

- *Response rates for household travel surveys.* The committee urges BTS to investigate ways of increasing response rates in its household travel surveys, both through improved understanding of the causes of non-response and associated bias in telephone surveys and through increasing knowledge about the effectiveness of alternative data collection techniques. As discussed in the letter report on the NHTS (Appendix A), a number of federal policy-related surveys have experienced declining response rates. Thus, in seeking to improve response rates in its household travel surveys, BTS may benefit from the findings of investigations by other statistical agencies. For example, an investigation of response rates for the National Household Education Survey, a telephone survey of the noninstitutionalized civilian population of the United States, found that a number of factors, including survey objectives, approaches to screening households, and interactions between interviewers and respondents, must be considered in assessing the impact of survey design and procedures on response rates in random digit

⁴ A discussion of various aspects of data quality is provided in the 1997 NRC review of BTS (Citro and Norwood 1997, 32–35).

dialing surveys (National Center for Education Statistics 1997). Much of the recent research on nonresponse has focused on the refusal of potential respondents to participate in a survey. This refusal research has examined issues such as the salience of the survey topic to the respondent, the organization conducting the survey (the Census Bureau or a commercial firm, for example), and the social psychology of responding to a request from a stranger.

- *Data collection.* Investigations of a range of options for gathering data from survey respondents could lead to methods for strengthening BTS's future personal travel and freight surveys. In particular, technological innovation and development may provide opportunities for new, more effective and efficient approaches. Web-based methods, such as electronic data collection forms with automated editing systems and Internet-based travel diaries, have shown promise and merit further investigation, probably as part of mixed-mode data collection initiatives that reach different respondents in different ways. Personal and in-vehicle GPS data loggers also offer opportunities to gather large amounts of detailed data on the movement of people and goods at low cost. However, issues of privacy and confidentiality associated with such passive data collection techniques, together with some technical problems, remain to be resolved.
- *Sample design.* Investigation of sample design issues could help BTS make its surveys more effective. For example, longitudinal panel surveys can provide useful information about changes in personal travel behavior over time and could be a valuable complement to the more traditional cross-sectional surveys. However, more research is needed to understand the cost–quality–usefulness trade-offs of panel data compared with cross-sectional approaches. Other sample design issues worthy of investigation include sampling approaches for telephone surveys that take account of the increasing number of cell-phone-only households and options for using shipment-based rather than establishment-based sampling for the CFS.
- *Questionnaire development and testing.* Extensive research on the cognitive aspects of surveys has been conducted by government agencies such as the National Center for Health Statistics, the Bureau of Labor Statistics, and the Census Bureau. There may be opportunities for BTS to build on this research in areas specific to transportation surveys as

part of an effort to develop methods for quick and accurate testing of survey instruments.

- *Data dissemination.* A report on the confidentiality and accessibility of government statistics recommended that federal agencies “strive for a greater return on public investment in statistical programs through . . . expanded availability of federal datasets to external users” (Duncan et al. 1993, 224). Research into ways of making more spatially specific microdata available to data users, while continuing to protect the confidentiality of data providers, could result in opportunities to add value to surveys without increasing data collection costs.

OMNIBUS SURVEY PROGRAM

Recommendation 8: BTS should establish a process for conducting the Omnibus surveys that ensures the agency’s credibility as an independent provider of statistical information.

The committee urges BTS to place greater emphasis on establishing a clear separation between statistical information and political policy in the Omnibus program. The example of the 2001 Mariner Survey—an Omnibus targeted survey—illustrates that such a separation not only is possible but also can result in a quality customer satisfaction survey on transportation-related issues. The objectives of this survey were clearly defined: the Maritime Administration (MARAD) needed information about the numbers of merchant mariners who would be willing to take an afloat position in a national defense emergency and the period of time they would be willing to serve. In designing the survey, BTS’s expertise in survey methodology complemented MARAD’s knowledge of the merchant mariner community—knowledge that is clearly reflected in the survey questionnaire. The report on the survey’s principal findings, prepared by BTS’s Office of Survey Programs, presents a thorough and careful analysis of the data but avoids commenting on policy issues (BTS 2001). Thus, this report is in marked contrast to some editions of *OmniStats*, BTS’s two- or three-page popular reports on the Omnibus monthly household survey, which sometimes draw interpretations reaching beyond the objective data.

The committee's letter report on the Omnibus Survey Program (Appendix B) recommends approaches that BTS can take to enhance and ensure the integrity of the surveys:

- Establish an independent review mechanism with participation from experts outside BTS,
- Implement a range of measures aimed at ensuring that all surveys are of a consistently high quality, and
- Take steps to ensure that analyses of survey data are technically robust and that the resulting products comply with established guidelines for the reporting of statistical data.

In addition, the committee urges BTS to consider restricting its role in the Omnibus program to technical guidance and conduct of the surveys, leaving to survey sponsors—MARAD, the National Highway Traffic Safety Administration, and others—the responsibility for survey content and interpretation. In the committee's view, this approach would be beneficial in helping BTS establish the clear distinction between statistical information and policy interpretation that is vital to the credibility of a federal statistical agency.

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Abbreviations

BTS	Bureau of Transportation Statistics
TRB	Transportation Research Board

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APPENDIX A

Letter Report on the National Household Travel Survey

June 18, 2002

Dr. Ashish Sen
Director
Bureau of Transportation Statistics
400 7th Street, S.W.
Washington, D.C. 20590

Dear Dr. Sen:

We are pleased to transmit this first letter report of the Committee to Review the Bureau of Transportation Statistics' (BTS) Survey Programs. This committee was convened by the Transportation Research Board (TRB) and the Committee on National Statistics¹ in response to a request from BTS. The membership of the committee is shown in Attachment A. The committee has been charged with reviewing the current BTS survey programs in light of transportation data needs for policy planning and research and in light of the characteristics and functions of an effective statistical agency.² This letter presents the committee's consensus findings and recommendations concerning the National Household Travel Survey (NHTS).

¹ The Committee on National Statistics is part of the National Academies' Division of Behavioral and Social Sciences and Education.

² Several National Research Council reports include discussion of the characteristics and functions of an effective statistical agency (TRB 1992; Citro and Norwood 1997; Martin et al. 2001). The present review is being conducted against the background of these earlier studies.

The committee held its first meeting on February 25–26, 2002, at the National Research Council facilities in Washington, D.C. The purpose of this meeting was for the committee to review the NHTS. To this end, the committee heard presentations from representatives of BTS, the Federal Highway Administration (FHWA), and Westat;³ users of personal travel data; and researchers investigating various aspects of survey methodology, including the use of new technologies for data collection. A list of the presentations and panel discussions at the meeting is provided in Attachment B. Following the data-gathering sessions, the committee met in closed session to deliberate on its findings and recommendations and begin the preparation of this report, which was completed through correspondence among the members. In developing its findings and recommendations, the committee drew on information gathered at its first meeting, articles in the technical literature,⁴ and the experience and expertise of individual members. The committee would like to thank all those who contributed to this review through their participation in the February meeting and their responses to follow-up questions. The assistance of Joy Sharp of BTS and Susan Liss of FHWA is particularly appreciated.

In summary, the committee found that data from the Nationwide Personal Transportation Survey (NPTS) and the American Travel Survey (ATS) have proved useful to a variety of entities for the purposes of analyzing policy issues, setting funding priorities, and monitoring trends in travel behavior. The committee believes that data from the NHTS, which has superseded the NPTS and ATS, will prove similarly useful. Therefore, the committee recommends that BTS continue to collect, analyze, and disseminate data on personal travel within the United States. Nevertheless, the committee identified opportunities for the agency to improve its personal travel surveys in terms of both their value to a wide range of users and the quality of the data provided. In particular, the committee recommends that BTS consider developing a family of personal travel surveys aimed at meeting the needs of a variety of users. These surveys are likely to differ in content, coverage, methodology, and frequency.

³ Westat conducted the pretest of the NHTS and has a major role in the conduct of the 2001 survey.

⁴ A list of all nonproprietary materials considered by the committee is available from the Public Records Office of the National Academies (e-mail: publicac@nas.edu).

The remainder of this report is organized as follows. First, some background information is provided on the NHTS and its predecessor surveys, the NPTS and the ATS. Survey nonresponse and approaches to its reduction are then discussed. The users of the NPTS and ATS data are identified and their uses of these data reviewed. Finally, the committee presents its recommendations to BTS for improving the agency's personal travel surveys.⁵

THE NHTS AND ITS PREDECESSOR SURVEYS

The purpose of the NHTS is to provide a timely inventory of personal travel within the United States. The survey provides information on local and long-distance trips, including miles traveled by mode, the purpose of the trip, and the demographic characteristics of traveling households. The uses of the NHTS, as indicated by the uses of its predecessor surveys, are likely to include policy analysis at the national and local levels, monitoring of trends, benchmarking, and calibration of models for forecasting. In the absence of the NHTS, nationwide personal travel data available from the federal government would be limited to journey-to-work trips reported in the decennial census and the new American Community Survey. There would be no source of nationwide data on increasingly important non-work-related travel, which would be much harder to investigate.

The 2001 NHTS is surveying 25,000 households nationwide. In addition, nine add-on surveys are being collected at the request, and expense, of several state and local agencies to increase the sample size in places of interest to those agencies.⁶ By purchasing an add-on sample, a state or metropolitan planning organization (MPO) receives both the national random samples for its area and the additional local area or state samples it has purchased. The add-on surveys are gathering data from an additional 40,000 households using the same methodology and instruments

⁵ At the time of writing, the design of the 2001 NHTS has been finalized, and data collection is ongoing. Therefore the committee's recommendations address future versions of the NHTS (and other personal travel surveys) for which designs have not yet been determined.

⁶ Add-on areas for the 2001 NHTS comprise five states (Hawaii, Kentucky, New York, Texas, and Wisconsin) and four local planning organizations (Baltimore, Md.; Des Moines, Iowa; Lancaster County, Pa.; and Oahu, Hawaii).

as the basic NHTS, thereby avoiding the compatibility issues that typically arise when separate surveys are undertaken.⁷

The NHTS supersedes two earlier personal travel surveys: the NPTS and the ATS. The NPTS investigated daily travel within the United States. This survey was conducted five times (1969, 1977, 1983, 1990, and 1995); the irregular frequency was determined, in large part, by the availability of funds. The questions included in the survey were constrained to support survey-to-survey trend analysis. The ATS investigated long-distance travel within the United States and state-to-state person-trip flows. This survey was conducted in 1977 as a component of the Census of Transportation and again in 1995, when it was conducted for BTS by the U.S. Census Bureau (FHWA 1998).

The cost of the 2001 NHTS is estimated to be approximately \$10 million. The combined cost of the 1995 NPTS and the 1995 ATS was approximately \$22 million.⁸ The cost breakdowns per household for the 1995 NPTS, the 1995 ATS, and the 2001 NHTS are as follows:⁹

<i>Survey</i>	<i>Total Cost (\$)</i>	<i>No. of Households</i>	<i>Cost per Household (\$)</i>
1995 NPTS	4,096,000	21,000	195
1995 ATS	18,000,000	67,000	269
2001 NHTS	10,275,000	25,000	411

These costs include survey design, pretesting, data collection and editing, and data set preparation. For the 1995 NPTS and the 2001 NHTS, slightly more than half the cost per household is spent on data collection, and slightly less than half on survey design, pretesting, and data set preparation.

Integration of the ATS and NPTS was recommended as a means of providing “useful data for federal, state, and MPO analysis and planning purposes, including consistent estimates of daily and long-distance household travel patterns, in a more cost-effective manner than two separate surveys,

⁷ According to a recent article on standardizing household travel surveys (NCHRP 2002, 1), the wide diversity in design, application, and analysis of these surveys makes it difficult, if not impossible, to compare results between one survey and another.

⁸ The costs for the 2001 NHTS are given in 2001 dollars; the costs for the 1995 surveys are given in 1995 dollars.

⁹ Budget data provided to the committee by BTS staff, March 8, 2002.

neither of which provides a complete picture of household transportation” (Citro and Norwood 1997, 139). Before deciding to proceed with an integrated survey, BTS investigated issues associated with the combination of the NPTS and ATS into a single survey. For example, the 1999 conference “Personal Travel: The Long and Short of It” (TRB 2001), sponsored in part by BTS, addressed both methodological and content issues relating to the merging of the NPTS and ATS.

BTS conducted a pretest of approximately 1,750 households to investigate the feasibility of a combined NPTS/ATS instrument. The pretest used a number of different survey designs. These designs were selected to assess both the feasibility of using a combined survey instrument for daily and long-distance travel and methods for improving response rates. Although a combined data set for long-distance and daily travel should facilitate in-depth analysis of overall travel patterns, there were concerns that the burden placed on households participating in the survey could result in a loss of data quality. The pretest included a qualitative analysis of respondent burden using interviewer feedback and interview monitoring to provide insights into problem areas.¹⁰

On the basis of the results of the NHTS pretest, BTS concluded that combining the NPTS and ATS into one survey is feasible. The agency also identified the most cost-effective survey design from among eight options considered for collecting nationwide data on U.S. travel.¹¹ The pretest results allayed concerns about overburdening respondents by asking them to report travel in trips of all lengths.¹²

The NHTS offers both advantages and disadvantages vis-à-vis the earlier surveys. A major advantage is the inclusion of more complete data for trips in the 30- to 100-mile range, which were poorly represented in the NPTS and ATS (TRB 2001, 12). Reporting of all travel by a single sample of households will also facilitate comparisons of local and long-distance travel. Previously the NPTS and ATS provided two different

¹⁰ NHTS 2001: The Pretest and Key Tests (www.bts.gov/nhts/keytests.html).

¹¹ NHTS 2001, Pretest Analysis Highlights, Update October 30, 2000 (www.bts.gov/nhts/update103000.html).

¹² The extended survey interview to collect information on all trips made on the travel day plus all long-distance travel during the travel period takes approximately 15 minutes per person, with an additional 3 to 4 minutes for the state add-ons.

samples with different criteria for sampling persons within a household.¹³ Possible disadvantages of the combined survey include additional complexity in survey-to-survey trend analysis incorporating data from earlier surveys and a much-reduced sample size for long-distance travel. The 1995 ATS surveyed 67,000 households, whereas the 2001 NHTS will survey only 25,000 households. The continuing interest in improving intermediate and long-distance travel services defines a public policy need for high-quality data on longer trips.

SURVEY NONRESPONSE

Some level of nonresponse occurs in every voluntary survey.¹⁴ A number of reports and papers discuss the reasons for nonresponse in household travel surveys (see, for example, Stopher and Metcalf 1996; TRB 1996; Zimowski et al. 1997). Some of these reasons, such as interviewer quality and the changing characteristics of telephone usage (see below), are not specific to travel surveys. However, the complexity and content of household travel surveys impose a significant burden on respondents and thus can result in a substantial fraction of nonrespondents. For example, to understand travel patterns and to provide data for estimating travel behavior models, travel surveys collect household and individual demographic characteristics as well as detailed descriptions of all trips taken during a specified time period. Trip data, which are needed for most or all persons in the household, include origin and destination, purpose, time of day, mode(s) of travel, and other characteristics. A household may make as many as 20 or 30 trips in a day. Recalling and reporting on these trips involve a major effort on the part of respondents, and there is some evidence that overall response rates decrease as a result of greater respondent burden. Consequently, some survey experts believe that household travel surveys have reached or surpassed their most cost-effective length (TRB 1996).

¹³ The ATS included information about trips made by all persons in the household, regardless of age, whereas the NPTS included trips made by household members aged 5 or over (FHWA 1998).

¹⁴ Nonresponse includes both unit nonresponse (i.e., the failure of a household to participate in a survey at all) and item nonresponse (i.e., the failure to complete a component of the survey, or the failure of the required number of household members to participate).

In addition, household travel surveys often involve a two-stage process: a recruitment interview to obtain information about the household is followed by an extended data-gathering interview to collect information on household travel. The 2001 NHTS is an example of such a two-stage survey. Since each interview has an accompanying level of nonresponse, the overall response rate—given by the product of the response rates for the two interviews—tends to be lower than that for a survey involving only one interview.

Nonresponse is a major concern because of the potential for bias and the resulting implications for data quality.¹⁵ If the travel behavior of nonrespondents is not significantly different from that of respondents, there may be no significant bias. However, there is reason to believe that the travel patterns of survey nonrespondents are significantly different from those of respondents. For example, in a survey that relies exclusively on telephone interviewing methods, those who travel extensively and are not home to answer the phone (high-income, high-mobility groups) are likely to be underrepresented, whereas those who are usually home to answer the phone and do not travel much (e.g., the elderly) may be overrepresented. Thus, the 2001 NHTS, which relies on telephone contacts for data collection, may give too much weight to the travel patterns of those who do not travel much and too little weight to the travel of more mobile groups in society—a serious deficiency for a personal travel survey. The underrepresentation of certain socioeconomic groups (e.g., low-income groups such as the urban poor and persons without phones) and certain age groups (e.g., teenagers, particularly boys) may also introduce bias into the survey results.

The changing characteristics of telephone usage are reducing the effectiveness of current telephone survey methods and may be introducing bias. Coverage and response rates are declining for the following reasons:

- *Consumer resistance*: Unsolicited phone calls, especially telemarketing calls, compete for respondents' attention and have a negative effect on response rates. These calls encourage households to adopt defensive measures, such as screening calls by using caller identification devices

¹⁵ Nonresponse error is only one of the factors affecting data quality. Other factors include sampling error, coverage error, and measurement error (see, for example, Sammer 2000).

and answering machines and requesting that their names and phone numbers be added to “do not call” lists.¹⁶

- *Cell-phone-only households:* Cell phones are excluded from random digit dialing (RDD) lists because of the pricing structure, which may require users to pay for incoming calls. There are concerns that these exclusions may lead to sampling bias because of the increasing number of cell-phone-only households.
- *Language difficulties:* The number of households in the United States for which the first language is not English is growing. Telephone communication may be far more difficult than some other types of interaction (e.g., face-to-face interviews) for survey respondents who are not native English speakers.

Various sources report typical response rates for household travel surveys. According to Zimowski et al. (1997, i), household travel surveys conducted in recent years by a combination of telephone and mail methods have typically obtained response rates in the range of 25 to 40 percent. A review of 55 U.S. household travel surveys conducted between 1989 and 1995 revealed similar rates (Stopher and Metcalf 1996). The mean response rates were 49.9 percent for the recruitment interview and 69.5 percent for the extended data-gathering interview, with considerable variation about the mean in both cases. Overall response rates varied from 10 to 75 percent, with a mean of 36.4 percent. In response to a question from the committee, one survey expert noted that response rates for personal travel surveys are generally in the high 50 percent range for recruitment interviews and on the order of 70 to 75 percent for extended data-gathering interviews, giving overall response rates in the high 30 percent to low 40 percent range.¹⁷

The overall response rate for the 1995 NPTS was 37.2 percent (51.6 percent for the recruitment interview and 72.1 percent for the extended data-gathering interview). The final household response rate for the

¹⁶ “Do not call” list legislation aims to prevent telephone sales solicitation calls rather than calls for the purposes of bona fide research. However, there is concern among some survey practitioners that consumers may mistakenly believe the lists prevent all unsolicited phone calls from strangers. Such consumers are likely to be antagonistic toward telephone interviewers seeking to recruit survey participants.

¹⁷ As reported by Johanna Zmud of NuStats in a presentation to the committee on February 26, 2002.

1995 ATS was 85 percent—a relatively high value for a household travel survey. BTS indicated to the committee that the markedly different response rates for the 1995 NPTS and the 1995 ATS are largely attributable to three factors: the sampling frame, the data collection mode, and the data collection methods.¹⁸

- *Sampling frame:* The ATS used an area-frame sample of households that had very recently been used by the Census Bureau in its Current Population Survey. In contrast, the NPTS used a list-assisted RDD sample. With RDD samples, there is always a significant percentage of households that cannot be contacted and contribute to the nonresponse rate. In the case of the 1995 NPTS, “no contacts” made up almost 7 percent of the sampled phone numbers. The use of an established sample of addresses rather than an RDD sample contributed to the higher response rate for the ATS vis-à-vis the NPTS.
- *Data collection mode:* The 1995 NPTS relied exclusively on computer-assisted telephone interviewing (CATI) methods. The 1995 ATS used primarily telephone interviewing, but in-person interviews were conducted with some respondents who could not be reached by telephone. Although such in-person interviews increase survey costs, they can be beneficial in increasing the response rate.
- *Data collection methods:* The 1995 NPTS used restrictive data collection methods to improve data quality over that obtained in the 1990 version of the survey. The definition of a “usable household” was rigorously constrained, a 6-day data collection window was applied, and the use of proxy reporting was limited. In the case of the 1995 ATS, the data collection methods were less restrictive, thereby contributing to the higher response rate vis-à-vis the 1995 NPTS. For example, the 1995 ATS considered a household to be complete if only one adult member provided information for everyone in the household. In contrast, the 1995 NPTS required 50 percent or more of the adults in the household to be interviewed for the data to be included in the survey.

The committee notes that, in addition to the above differences, the 1995 ATS was conducted by the Census Bureau whereas the 1995 NPTS

¹⁸ Information provided to the committee by BTS staff, April 30, 2002.

was conducted by Research Triangle Institute. There is evidence that the Census Bureau achieves higher response rates in voluntary surveys than other survey organizations (see, for example, NRC 1979).

BTS anticipates that the response rates for the 2001 NHTS will be about 60 percent for the recruitment interview and about 75 percent in the extended interview, giving a total response rate of 45 to 50 percent. Although this anticipated overall response rate for the 2001 NHTS is relatively high compared with response rates for household travel surveys conducted by MPOs across the United States (Stopher and Metcalf 1996), it is low compared with the response rates for the 1995 ATS and for other federal policy-related surveys, as illustrated by two examples.

The National Household Education Survey (NHES) is a telephone survey of the noninstitutionalized civilian population of the United States. Households are selected for the survey using RDD methods, and data are collected using CATI procedures. Response rates for the screener interview were 73.3 percent for NHES:95 and 69.9 percent for NHES:96. Response rates for the extended interviews varied according to subject, being highest for Early Childhood Program Participation (90.4 percent) and lowest for Youth Civic Involvement (76.4 percent). The resulting overall response rates were in the range of 53.4 to 66.3 percent. The response rates for the NHES have decreased since the early 1990s, falling from an average of 72 percent in 1991 and 1993 to an average of 58 percent in 1996. An investigation of the response rates for the 1991, 1993, 1995, and 1996 surveys indicated that no single factor, such as length of the interview, can be used to predict response rates. A number of factors, including survey objectives, approaches to screening households, and interactions between interviewers and respondents, must be considered in assessing the impact of survey design and procedures on response rates in RDD surveys (National Center for Education Statistics 1997).

The National Health Interview Survey (NHIS), initiated in 1957, is the principal source of information on the health of the civilian, noninstitutionalized, household population of the United States. In response to requirements for enhanced topic coverage, survey questionnaires in the period following the 1982 revision became increasingly unwieldy, running almost 300 pages and requiring interviews that averaged 2 hours. The resulting burden on respondents, interviewers, and the data collec-

tion budget, together with declines in both response rates and data quality, led the National Center for Health Statistics to redesign the questionnaire. The revised NHIS, fielded since 1997, is conducted using computer-assisted personal interviewing (CAPI). The total household response rate for the 1999 NHIS was approximately 87.6 percent (Centers for Disease Control and Prevention 2002).

The Office of Management and Budget (OMB), which must give approval for all federally funded surveys, has expressed reservations about proceeding with the 2001 NHTS because of the low response rates for the predecessor surveys—notably the NPTS—and resulting concerns about nonresponse bias. According to OMB, “levels of response below the levels expected of such surveys will mitigate against valid, generalizable results.”¹⁹ OMB has given BTS conditional clearance to proceed with the 2001 NHTS on the understanding that the agency will investigate the high nonresponse rate and find ways to reduce it in the future.

BTS is aware of many of the factors contributing to nonresponse for the NHTS and has supported related research investigations. For example, BTS was one of the sponsors of the TRB Personal Travel Survey Roundtable.²⁰ Participants in this meeting discussed survey methodology issues and identified problem areas and research needs relating to RDD methodology and low response rates. BTS and FHWA have drafted a nonresponse research plan for the 2001 NHTS. Research using both in-house and contract resources will investigate omissions resulting from noncoverage or nonresponse, the differing demographic and travel characteristics of respondents and nonrespondents, and possible adjustments to correct for any bias. In addition, investigations of potential changes in methodology for the next version of the NHTS will continue. These include the use of alternative definitions of a “usable household” in terms of the percentage of adults who respond and the feasibility of collecting long-distance travel information by asking respondents about their most recent trip.²¹

Several strategies that may help reduce nonresponse rates in the NHTS have been explored through field experimentation. For example, the

¹⁹ As reported in the Notice of Office of Management and Budget Action, Terms of Clearance—2001 NPTS/ATS.

²⁰ This group met on September 21–22, 2000, and again on March 19–20, 2001.

²¹ Information provided to the committee by BTS staff, April 18, 2002.

NHTS pretest used a modified CAPI approach to improve non-response follow-up. An interviewer with a cell phone visited non-respondents in person and encouraged them to call in using the cell phone and complete the survey. This approach reduced the nonresponse rate but was considerably more expensive than a CATI approach. Although potentially helpful, such strategies for reducing nonresponse may be differentially effective across various demographic groups. For example, some segments of the population may be suspicious of visitors, so follow-up visits in person may not always be effective in reducing nonresponse.

Other strategies for reducing nonresponse described by representatives of BTS, FHWA, and Westat include the following:

- *Use of refusal avoidance training for interviewers:* All Westat interviewers involved in the 2001 NHTS have received refusal avoidance training as part of their project-specific interviewer training for the survey. This training involves, among other items, scheduling call-back appointments for a person who is too busy to respond at the time the interviewer calls; alleviating respondent fears and concerns; leaving voice mail messages; overcoming language, speech, and hearing barriers; and role playing to gain practice in handling a range of refusals, questions, and other situations. Westat has not conducted a formal evaluation of the effectiveness of this training but believes that the resulting increased response rates vis-à-vis other similar travel surveys indicate its effectiveness.²²
- *Development of user-friendly survey materials:* Representatives of BTS and FHWA reported that such materials should aim for a sixth-grade reading level and make use of graphics.
- *Acknowledgment of respondent participation:* The use of very small monetary gifts (typically \$2 per person) serves to acknowledge the willingness of respondents to participate in the survey. The results of the NHTS pretest indicate that both a \$5 gift included with the initial contact letter and a \$2 per person gift have a positive effect on response rates.²³

²² As reported in an e-mail from Joy Sharp, BTS, to Jill Wilson, TRB, dated April 18, 2002.

²³ NHTS 2001, Pretest Analysis Highlights, Update October 30, 2000 (www.bts.gov/nhts/update103000.html).

- *Building on concept of social exchange:* Representatives of BTS and FHWA commented that using the same interviewer for both recruitment and data collection interviews helps to build a personal relationship between the interviewer and respondent and to increase the respondent's feeling of participation in the project.²⁴
- *Overcoming language barriers:* The use of Spanish-speaking interviewers can facilitate the interview for some respondents.

DATA USE AND DATA USERS

On the basis of its discussions with data users, a limited review of literature citations collected for BTS by Oak Ridge National Laboratory (2000),²⁵ and the experience of individual members, the committee determined that data from the NPTS and the ATS are widely used by a range of organizations and individuals, including

- Senior-level policy makers within the U.S. Department of Transportation;
- The National Highway Traffic Safety Administration;
- Analysts within other agencies of the federal government (e.g., the Department of Energy);
- State departments of transportation;
- MPOs;²⁶
- Members of Congress and their staffs;

²⁴ The committee is not aware of any empirical data demonstrating that response rates increase when the same interviewer conducts both the recruitment and extended interviews. However, practical experience suggests that establishing a relationship between the interviewer and the respondent is beneficial in overcoming reluctance to participate in and complete a survey. In conducting the National Health and Nutrition Examination Survey, for example, the same interviewer conducts the screening interview, the in-home interview, and any follow-up interviews, and provides household members with the results of their health examination (personal communication from Edward L. Hunter, National Center for Health Statistics, to Edward Spar, committee member).

²⁵ The experience of individual committee members suggests that there are likely to be additional investigations using the NPTS data—such as internal reports by MPOs—that are not identified in a literature search.

²⁶ Larger MPOs that develop their own travel forecasting models tend to conduct their own travel surveys and use the NPTS/ATS data to benchmark and validate their results, whereas smaller MPOs with limited resources may rely on national data to calibrate their travel model parameters.

- The General Accounting Office;
- Researchers in academia, think tanks, consulting organizations, and so forth;
- Public interest groups;
- The travel and tourism industry; and
- Local organizations (e.g., boards of trade, councils).

NPTS/ATS data are used for two main purposes: investigations of policy issues and benchmarking. For example, data from the NPTS have been used in research on motor vehicle safety, transportation problems of low-income households, commuting behavior and related planning efforts, transportation in rural areas, and mobility issues affecting minority groups. Data from the NPTS and ATS have been used by the U.S. Department of Energy, the Travel Industry Association, and MPOs as benchmarks against which to check their own projections and estimates. The results of policy studies based on these surveys may also be used in identifying problems, allocating resources, and setting priorities. Although the NPTS and ATS data do not provide statistically reliable information on personal travel in a specific location (e.g., Topeka, Kansas), they do provide policy makers with a guiding sense of what is happening in settings with similar demographics (e.g., locations with similar population densities and average household incomes).

Despite their many uses, data from the NPTS and ATS do not meet the needs of all users. In some instances, the data do not provide essential items of information. For example, national survey data are of limited use in informing decisions about location-specific planning issues, such as travel corridors. In addition, the relevance of the NPTS and ATS data may be limited by the lack of contextual information about the availability and quality of transportation facilities and services near the homes of the respondents.²⁷ For other applications, the data are not collected sufficiently frequently or made available quickly enough to be useful. For example, the Travel Industry Association requires recent data on long-distance travel for its consumer and economic impact research. While the association uses ATS results, the data quickly become out-

²⁷ The NPTS reports patterns of use of travel modes but does not include respondent-specific information about mode availability and quality of service.

dated. For example, the 1995 ATS data are now too out of date to be useful, and the 2001 NHTS data will be of limited use by 2004.

BTS does not have a formal process for identifying data users or modifying its surveys to meet user needs. Mailing lists, publications citing the surveys, and information on website usage provide BTS and FHWA staffs with some indications of by whom and how the data are used. However, there are no major, structured outreach activities to identify and query users of the NPTS/ATS. Questions have been added to the NHTS to meet the needs of specific users (e.g., questions on walking and biking trips in response to a request from the Centers for Disease Control and Prevention), and some modifications were incorporated in the 1995 NPTS to meet MPO needs. Nevertheless, such changes appear to be implemented on a largely ad hoc basis.

During the NHTS pretest, an effort was made to identify the types of users likely to use the combined NPTS/ATS results to support public planning and policy activities, and to define what information these users are likely to need (KPMG 1999). Information was gathered through telephone interviews with users of 1995 NPTS and ATS data and from other professionals with extensive experience and insights into state and local planning and modeling needs and issues. Budget limitations precluded the use of other outreach methods such as user panels, user conferences, and ongoing user involvement programs.

The six-member BTS Advisory Committee, appointed by and reporting to the Director, meets two to three times a year and provides some guidance on information product needs. The members of this committee are high-level managers and researchers, some of whom are not primary data users but may receive reports and analyses ultimately traceable to BTS data.

RECOMMENDATIONS

Recommendation 1

BTS should consider developing a family of personal travel surveys aimed at meeting the needs of a variety of users. These surveys are likely to differ in content, coverage, methodology, and frequency.

Data from the NPTS and the ATS have proved useful to a wide range of organizations and individuals for investigations of policy issues and for

benchmarking. However, declining survey response rates (see, for example, Stopher and Metcalf 1996, 14) have resulted in growing concerns about possible bias in the data collected. The conditional clearance from OMB allowing BTS to proceed with the 2001 NHTS reflects a general concern about the validity of survey results when response rates are low.

Low response rates in household travel surveys are attributable to a variety of factors, including the complexity of such surveys, the growing resistance to surveys in general and telephone surveys in particular, and the changing patterns of communications access to American households. Furthermore, the diversity of analysis and decision needs to be met by BTS's national travel surveys suggests that it may become increasingly difficult to meet user requirements for both quality and subject coverage with a single, periodic national household travel survey.²⁸ Therefore, BTS should consider a variety of survey options for measuring personal travel and should not necessarily limit its efforts to a cross-sectional household travel survey conducted once every 5 years using CATI methods. The agency should investigate a range of survey designs and supporting technologies that offer the potential to keep ahead of the growing challenge of collecting household travel data and to meet the current and emerging data needs of a variety of users. Additional, structured efforts are needed to identify these users and their data requirements.

The following recommendations elaborate on the need for outreach to users and potential users (Recommendation 2), efforts to improve survey response rates and data quality (Recommendation 3), and opportunities for research into methodologies for transportation surveys (Recommendation 4).

Recommendation 2

BTS should develop a formal program for identifying and interacting with current and potential users of its personal travel surveys to better understand their data needs and their perspectives on issues such as data quality. The following approaches are suggested.

²⁸ Information on the identity of users and their data needs is provided in the earlier discussion of data use and data users.

BTS should consider establishing two formal advisory panels:

1. A policy committee to advise on user needs and interface with users and potential users, and
2. A technical advisory committee to advise on issues such as survey design and research leading to improved methodologies.

BTS should consult with a range of constituencies—including those outside of the Washington, D.C., area—as part of the development of its personal travel surveys. Survey topics and possible new surveys should be discussed with potential users to assess their interest and inform subsequent survey development. Timeliness in providing survey results should also be considered. A survey that does not meet the needs of users in terms of both content and timeliness is not a worthwhile investment of resources. The community of users of BTS products is not limited to the current users. Different, better products are likely to attract, and satisfy, more users and thus may increase the cost-effectiveness of the surveys themselves.

BTS should view the identification of user needs as an ongoing process and should endeavor to anticipate data needs relating to emerging and future policy issues. Data needs evolve over time as travel, infrastructure conditions, and the national agenda change. For example, renewed interest in high-speed, intercity rail services suggests the need for timely and reliable data on long-distance travel.

Recommendation 3

BTS should continue its efforts to improve survey response rates and data quality, taking advantage of a range of design concepts and new technologies.

Survey Design

The selection of survey designs should be governed primarily by the purposes to which users will put the data, even though resource availability will inevitably influence design decisions. An understanding of user requirements for data quantity and accuracy is essential to determining the most cost-effective method of obtaining high-quality data that fulfill users' needs. In particular, the sample size should be determined on a

rational statistical basis, while taking account of resource constraints and requirements for geographic coverage. It is not clear to the committee whether the current NHTS sample size is driven by data quality needs or simply constrained by the available budget.

Given a fixed budget, there are two possible options for addressing the trade-off between data quantity and quality (Richardson et al. 1996). Either the decision to obtain data of a specified quality controls the quantity of data that can be collected, or specification of the quantity of data to be collected dictates the data quality. It is the committee's understanding that, under current circumstances, many users are more concerned about the quality and content of the data than about sample size. Nevertheless, trading quantity for quality can have detrimental consequences if the data set becomes too small to be representative of behaviors of interest. For example, reductions in the sample size can result in inadequate data to assess the travel behavior of specific groups within the population, such as minorities or low-income households.

In some instances, random stratified sampling techniques may be helpful in capturing sufficient data on "rare" behaviors—for example, trips involving walking, biking, or transit use—to permit calibration of models. For example, a geographically stratified sample of households might be used, where subgeographies containing larger fractions of transit users are oversampled. Demographic data from census or local administrative records would then be used to determine the oversampling rate and develop appropriate weighting factors. This method is an efficient way to gather data that, after weighting, can be used to characterize the behavior of the population as a whole.

To the extent possible within resource constraints, the frequency with which data are collected should be based on rates of change of travel patterns and the factors affecting them. In general, data for major surveys should be collected every 5 years, and preferably more frequently. One strategy that helps spread survey costs over time is the use of continuous data collection. For example, if a survey is to be conducted every 5 years, it may be advantageous for budgeting purposes to spread the sample out over the 5-year period to obtain more timely data that can be cumulated over time to yield the desired sample sizes for subgroups or national estimates. Another concept that BTS may wish to consider is the use of a

continuous sampling and updating strategy to capture dynamic behaviors and maintain the freshness of data sets.

Many of the behaviors of interest to policy makers and researchers are dynamic, involving the responses of households and individuals to changing circumstances and factors. Therefore, BTS—in consultation with its policy and technical advisory committees—should consider using longitudinal panel surveys as a means of capturing information on behavioral dynamics. Such surveys could either supplement or replace traditional cross-sectional household travel surveys.²⁹ Panel surveys can be essential for understanding location choices and moving behaviors, which have important influences on travel needs. Coupled with appropriate contextual data on transportation supply, they can also reveal the effects of changes in the transportation system that can guide future investment and service planning decisions.

Regardless of the survey design(s) selected, two features are important for obtaining high-quality data:

- A full-feature pilot survey conducted at the beginning of the project, and
- A follow-up investigation of nonresponse at the end to establish whether bias is present.

New Technologies

To overcome nonresponse and other data quality challenges, there is a need for multiple data collection methods (multi-instrument designs) that use different ways to reach people and measure their behaviors. Some encouraging results have been obtained using Internet-based travel diary surveys and handheld electronic travel diaries.³⁰

²⁹ According to Lawton and Pas (1996), longitudinal household travel surveys can take a number of forms: repeated cross-sectional surveys, before-and-after surveys, and panel surveys. The panel survey, which is the most commonly used longitudinal survey method in transport planning, is a repeated survey of the same sample of respondents. The period between surveys depends on the behavior being analyzed.

³⁰ Adler, T. 2002. Applications of Technology to Travel Survey Data Collection. Presentation to the Committee to Review the Bureau of Transportation Statistics' Survey Programs, Washington, D.C., February 25. Guensler R. 2002. Applications of Technology in Future Travel Survey Methods. Presentation to the Committee to Review the Bureau of Transportation Statistics' Survey Programs, Washington, D.C., February 25.

Internet-based travel diaries permit the implementation of user-friendly features such as context-sensitive instructions, a help feature, automatic addition of intrahousehold shared trips, and the ability to complete the diary in a series of work sessions at times convenient to the respondent. In addition, respondent-interactive geocoding provides a variety of ways for those completing the diary to describe the location of trip origins and destinations, including addresses, place names, and map pointing. Internet-based travel diaries also permit cost-efficient, high-capacity survey data retrieval and can increase unit and item response rates and resulting data quality. However, the up-front design cost is relatively high, and such diaries are susceptible to disruption by computer viruses and hackers.

Any use of Internet-based travel diaries will necessitate a multi-instrument survey design. Such diaries are limited to households with Internet access (currently more than 50 percent of all households³¹) and have an associated socioeconomic bias, with Web respondents having higher incomes and being younger than the population average. In addition, respondents' level of literacy is likely to influence the ease with which they can use an Internet-based diary.

In-vehicle and personal GPS data loggers are being investigated in the United States and overseas as means of gathering travel data. Certain measurement errors (e.g., in distance traveled) can have a significant effect on personal travel data needed by some users. The use of GPS tracking has the potential to provide insights into measurement errors associated with both the distance traveled and the number of trips reported. For example, a pilot study in Atlanta indicated that more accurate information on the number of trips is obtained by using an automated data logging device than by using a travel diary.³² Despite the early promise of data loggers, the associated issues of privacy and confidentiality require further study before such technologies can be widely used to gather survey data.

³¹ As of September 2001, 50.5 percent of U.S. households had Internet access in their home, and 56.7 percent of the total U.S. population lived in households with Internet access (U.S. Department of Commerce 2002).

³² As reported in a presentation to the committee by Randall Guensler on February 25, 2002.

Recommendation 4

BTS should assume a leadership role in research into methodologies for transportation surveys to help ensure that issues relating to survey quality are investigated and the results incorporated into the agency's future surveys. The agency should

- *Work with the user community and researchers to identify priority areas for study.*
- *Issue peer-reviewed grants for research to encourage and leverage investigations of methodological issues by organizations outside of the federal government, including universities and small businesses. Funding topics should be developed with assistance from the technical advisory board.*
- *Act as a clearinghouse for research activities relating to personal travel surveys.*

These activities fit well with the general model of a federal statistical agency (Martin et al. 2001). Some specific research opportunities are outlined below. An appropriate level of transparency in the grant award process is needed to encourage improvements in overall research quality. For example, those submitting research proposals could be provided with copies of proposal reviews and further guidance to help them make their proposals more responsive to BTS's requirements. The committee notes that external research is often a useful way to benefit from specialized expertise not available in-house and may offer the opportunity to experiment with a variety of methods in parallel. Such research can also be a valuable source of independent validation of methods and strategies.

New Survey Methods and Techniques

Given the shrinking response rates in personal travel surveys conducted using traditional telephone methods, BTS needs to invest immediately in research into new survey methods and techniques for implementation in 5 to 10 years' time. BTS and its user community have a vested interest in understanding the implications for survey research of trends in household structure, travel and activity patterns, and technologies, so that survey methods can be continuously adapted to ensure the availability of essential travel data. Such adaptations are likely to involve pursuing new technologies for data collection and investigating advanced statistical

techniques. The latter may include methods for updating and blending data collected at different time periods or under a continuous sampling scheme, techniques for detecting and adjusting for nonresponse bias, and tools for random stratified sampling.

Panel Survey Methodology

The use of longitudinal panel surveys requires effective methods for panel selection, retention, replacement, tracking, and data updating. There is a need to understand the cost–quality–usefulness trade-offs of panel data compared with cross-sectional approaches. Some lessons have been learned from transportation surveys conducted using longitudinal panel designs, including the Dutch National Mobility Panel, the Puget Sound Transportation Panel, and the German KONTIV³³ survey (Lawton and Pas 1996), but more research is needed to develop such approaches for a national study in the United States.

Empirical Investigations of Nonresponse

To date, relatively few empirical studies have investigated nonresponse in travel surveys. The question of how large a response is required to support the various applications of NHTS data should be addressed and answered. Investigations are needed to understand the implications of nonresponse in terms of bias and generalizability. Research is needed into approaches that may be helpful for (a) reducing nonresponse rates in general and (b) obtaining travel survey data from underrepresented groups, such as high-income households that travel extensively, non-English speakers, teenagers, and large households.

Addition of Contextual Data

For many users, nationally collected travel data could become significantly more useful for both policy analysis and model estimation if contextually defined supply (level of service) data were linked to travel behavior and demographics. Although the development of such contextual data requires the use of detailed geographic locations, the resulting

³³ The Continuous Survey on Travel Behavior (KONTIV) was conducted in the former West Germany in 1976, 1982, and 1989. A new travel survey, “Mobility in Germany,” is being conducted in 2001/2002 (www.kontiv2002.de/engl/background.htm).

information is unlikely to compromise the confidentiality of individual households. For example, information on the number of retail jobs within a half-mile or 10-minute walk of a household would fit not only the household in question but also thousands around it. Nonetheless, efforts to link contextual data to travel behavior and demographics must address two potentially conflicting requirements—the retention of sufficient geographic information for data to be useful and the suppression of any information that could undermine the confidentiality of individual households.

Advances in network modeling and the expanded availability of powerful computational resources should facilitate the linkage of contextual data to travel behavior and demographics, but remaining obstacles include limits on the availability of supply data and the absence of analysis tools for measuring service attributes as a function of respondent location. There is a need for significant methodological research associated with the addition of contextual data, but the payoff in terms of expanded usefulness of the resulting data sets may be very large.

CLOSING REMARKS

The committee appreciates this opportunity to review and comment on the NHTS and looks forward to continuing to work with BTS staff, contractors, and the professional community as a whole in its forthcoming reviews of the Omnibus and Commodity Flow Surveys.

Sincerely yours,

Joseph L. Schofer
Chair
Committee to Review the Bureau of
Transportation Statistics' Survey Programs

Attachment A: Committee membership³⁴

Attachment B: Data-gathering activities at the first committee meeting

³⁴ The information provided in Attachments A and B is made available elsewhere in this report. Therefore, these attachments are not reproduced here.

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Abbreviations

FHWA	Federal Highway Administration
NCHRP	National Cooperative Highway Research Program
NRC	National Research Council
TRB	Transportation Research Board

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APPENDIX B

Letter Report on the Omnibus Survey Program

November 5, 2002

Mr. Rick Kowalewski
Deputy Director
Bureau of Transportation Statistics
400 7th Street, S.W.
Washington, D.C. 20590

Dear Mr. Kowalewski:

We are pleased to transmit this second letter report of the Committee to Review the Bureau of Transportation Statistics' (BTS) Survey Programs. This committee was convened by the Transportation Research Board and the Committee on National Statistics in response to a request from BTS. The membership of the committee is shown in Enclosure A. The committee has been charged with reviewing the current BTS survey programs in light of transportation data needs for policy planning and research and in light of the characteristics and functions of an effective statistical agency. This letter presents the committee's consensus findings and recommendations concerning the Omnibus survey.

The committee held its second meeting on June 26–27, 2002, at the National Academies facilities in Washington, D.C. The purpose of this meeting was to review the Omnibus survey. To this end, the committee heard presentations from representatives of BTS and from Omnibus survey customers. A list of the presentations at the meeting is provided in Enclosure B. Following the data-gathering sessions, the committee met

in closed session to deliberate on its findings and recommendations and begin the preparation of this report, which was completed through correspondence among the members. In developing these findings and recommendations, the committee drew on information gathered at its June meeting, examples of Omnibus surveys and products, articles in the technical literature,¹ and the experience and expertise of individual members. The committee would like to thank all those who contributed to this review through their participation in the June meeting and their responses to follow-up questions. The assistance of Lori Putman of BTS is particularly appreciated.

In summary, the committee found that the Omnibus Survey Program has value as a source of timely data to inform decision making on a range of transportation issues. These data capture public opinion about a wide range of topics broadly related to transportation and provide a means of monitoring the public's use of and satisfaction with the transportation system. However, the committee is concerned that a BTS survey of public opinion on topical items has the potential to compromise the agency's credibility as an independent provider of statistical data and services. Therefore, the committee suggests that BTS take steps to safeguard the integrity of the Omnibus program as an independent source of high-quality data. In particular, the committee recommends that the agency (a) establish an appropriate review mechanism for all proposed Omnibus surveys, (b) implement measures aimed at improving and ensuring survey quality, and (c) take steps to improve the quality of data analysis products and reports.

This report presents the committee's findings and recommendations in four areas: the value of the Omnibus program, and three areas of action to safeguard the integrity of the program—review of proposed surveys, implementation of measures to improve and ensure survey quality, and steps to improve the quality of data analysis products and reports. Enclosure C provides an overview of the Omnibus Survey Program.

¹ A list of all nonproprietary materials considered by the committee is available from the Public Records Office of the National Academies (e-mail: publicac@nas.edu).

VALUE OF THE OMNIBUS SURVEY PROGRAM

Finding 1: The Omnibus Survey Program has value for the U.S. Department of Transportation (USDOT) because it provides

- *A flexible, quick-response mechanism for assessing public opinion about a range of transportation issues and delivering timely data to inform decision making; and*
- *A means of monitoring the public's use of and opinions about the transportation system on a frequent and regular basis.*

BTS is required to provide its customers with statistics that “support transportation decision-making by all levels of government, transportation-related associations, private businesses, and consumers” [49 U.S.C. 111(c)(7)]. The Omnibus Survey Program focuses on meeting some of the information needs of customers within USDOT. The program currently comprises two components: a monthly household survey and targeted surveys, up to a maximum of four per year, that address special transportation topics.²

The Omnibus program delivers timely data to inform decision making, as illustrated by two security-related examples. The monthly household survey provides a mechanism for conducting periodic assessments of traveler reactions to airport screening processes, thereby allowing the Transportation Security Administration (TSA) to track customer reactions to its programs. The 2001 Mariner Survey—a targeted survey—provided the Maritime Administration (MARAD) with information about the numbers of mariners who would be willing to take an afloat position in the event of a national defense emergency and the period of time they would be willing to serve (BTS/MARAD 2001).

The Omnibus survey is also being used to explore topics prior to, or in parallel with, more extensive investigations. For example, the National Highway Traffic Safety Administration (NHTSA) added questions to the monthly household survey to investigate drivers' complaints about headlight glare. The resulting data from a national sample of survey respon-

² The Office of Management and Budget (OMB) has also approved a quarterly establishment survey under the Omnibus program, but to date, no such surveys have been conducted, and none is planned. Therefore the present report addresses only the monthly household and targeted surveys.

dents will be used to supplement information from specific populations, namely, those who respond to NHTSA's recent notice asking for comments on drivers' complaints about headlight glare.

The committee anticipates that there will continue to be opportunities for BTS to support various Omnibus survey initiatives requested by other agencies within USDOT. The example of the 2001 Mariner Survey demonstrates that a clearly defined agency need (from MARAD), combined with BTS's survey expertise, can result in a useful, high-quality survey.

Indeed, the committee believes the Omnibus program has the potential to benefit a wider range of data users both inside and outside of USDOT. For example, the Omnibus surveys could be used to provide interim information on the transportation system between the periods of major surveys. Key aspects of the dynamics of the transportation system could be captured more frequently than once every 4 to 5 years when the National Household Travel Survey (NHTS) is conducted. To take advantage of its potential update capability, the Omnibus monthly household survey would require modification, with appropriate phrasing and structuring of survey questions to ensure that data are comparable with NHTS data.³

Recommendation 1: BTS should continue its Omnibus Survey Program as a relatively low-budget activity that provides timely information on a range of transportation issues.

SAFEGUARDING THE INTEGRITY OF THE OMNIBUS SURVEY PROGRAM

The opportunity to obtain timely public opinion data on key transportation issues makes the Omnibus program an attractive tool for policy makers. However, a recent National Research Council (NRC) report, *Principles and Practices for a Federal Statistical Agency*, notes that "one reason to establish a separate statistical agency is the need for data series to be independent of control by policy makers or regulatory or enforcement

³ For example, the NHTS collects data on daily travel patterns, while the current Omnibus monthly household survey collects data on monthly patterns.

agencies” (Martin et al. 2001, 3). The committee has some concerns that, in its role as a survey service organization within USDOT, BTS may be asked to conduct Omnibus targeted surveys, or add questions to the Omnibus monthly household survey, that could ultimately damage the agency’s credibility as an independent provider of transportation data. Therefore, the committee encourages BTS to take a proactive approach in ensuring that the Omnibus program is an independent source of high-quality data on the transportation system. The committee identified opportunities to enhance and ensure the integrity of the Omnibus program in three areas:

- Review of proposed surveys,
- Implementation of measures to improve and ensure survey quality, and
- Steps to improve the quality of data analysis products and reports.

Review of Proposed Surveys

Finding 2: Current BTS procedures for approving Omnibus surveys are unsatisfactory because they do not ensure that every survey is subject to a rigorous, objective, and informed review of its content and method before being fielded.

While the existing OMB blanket approval for the Omnibus program facilitates the rapid implementation of surveys, it imposes an additional responsibility on BTS to ensure that all Omnibus surveys are appropriately reviewed before being fielded. The committee is concerned about the effectiveness of current review procedures.

In the case of the monthly household survey, the review of each month’s draft questionnaire by a panel of experts selected by the survey contractor provides an important mechanism for identifying and correcting problems, although the time available to incorporate and test the panel’s suggestions may be insufficient (see Finding 3 below). Furthermore, the extent to which the expert panel considers the appropriateness of specific questions for a federal statistical agency is unclear. The committee’s review of questionnaires for the monthly household survey led it to conclude that the design and selection of questions would benefit from additional consideration of how the survey results will be used to inform analyses of the transportation system.

The current lack of an established mechanism for external review of proposed targeted surveys is of serious concern to the committee. In the committee's view, BTS is responsible for establishing and implementing an effective review mechanism (or mechanisms) for the Omnibus surveys. Because BTS staff may not have the experience and insights needed to understand all the policy implications of proposed surveys, these procedures should include external review of all targeted surveys. Starting in 2003, OMB will review a shortened clearance package for each targeted survey and will require a 30-day public comment period on proposed targeted surveys. These additional OMB requirements may help in remedying some of the present deficiencies, but more needs to be done in this area.

The Intermodal Surface Transportation Efficiency Act of 1991 established BTS as a statistical agency with responsibility for compiling transportation statistics—not as “a policy development office or an administrative unit” (Citro and Norwood 1997, 2). In the committee's opinion, effective review procedures for the Omnibus program would assist BTS in maintaining its independence from USDOT's policy-making activities, while allowing the agency to continue providing valuable statistical services to its customers within USDOT.

Recommendation 2: BTS should establish an independent review mechanism for the Omnibus program with contributions from experts outside BTS to ensure that

- **Proposed surveys are consistent with BTS's overall mission and do not address inappropriate questions that could undermine the independence of the agency; and**
- **The objective of every survey is clearly defined and the proposed design will achieve that objective.**

Implementation of Measures to Improve and Ensure Survey Quality

Finding 3: There is a risk that the quality of the Omnibus monthly household survey will be compromised by the time constraints imposed by the monthly schedule.

The availability of very timely information on topical issues is important to some data users. In addition, a monthly survey captures short-term

effects of factors influencing transportation use—effects that may be difficult to measure with a less frequent survey. Nevertheless, the committee is concerned that the quality of the Omnibus monthly household survey is being jeopardized by the limited time available to (a) develop and test the survey questionnaire and (b) collect the data.

Development and Testing of the Survey Questionnaire

The committee questions whether the time available for formulating the survey content and testing the questionnaire is sufficient to ensure that the resulting data will provide a sound basis for analysis. Because resource limitations preclude working on several months' surveys simultaneously, the monthly schedule does not allow time to conduct a pilot survey.⁴ The draft survey questionnaire is reviewed by an expert panel and subjected to cognitive testing using a mall intercept. These two activities are conducted in parallel over a 1-week period. During the course of the following week, BTS staff develop a revised questionnaire that addresses any problems identified as the result of the expert panel review and cognitive interviews. This revised questionnaire is then sent to the survey contractor without further evaluation.

Currently, a minimum of 20 people are interviewed for cognitive testing of the monthly household questionnaire.⁵ Potential interviewees are intercepted in a New Jersey shopping mall and screened on the basis of race, gender, age, and income “to ensure the ending sample of respondents [is] reflective of the United States population as a whole regarding the aforementioned characteristics” (BTS 2002). All the cognitive interviews are conducted on a single day, and the interviewers are required to compile results from their interviews and develop a summary of noteworthy issues and any suggested solutions by the end of the next day.

There is empirical evidence that the response to a survey question depends on the way in which the question is framed (see, for example, Sudman and Bradburn 1978; Schuman and Presser 1981). Therefore, careful cognitive testing of questionnaires is needed to ensure that they will yield

⁴ With more staff and resources, testing and development of one month's survey could begin earlier and be conducted simultaneously with the testing and development of other months' surveys. However, this approach would increase the total turnaround time from survey initiation to data delivery.

⁵ This cognitive testing is conducted by the survey contractor.

interpretable data consistent with survey objectives. Cognitive testing explores the mental process by which respondents reach an answer to a question, and in doing so it can show whether a question is working as intended. If modifications are made in response to test results, good survey practice requires that further cognitive testing be conducted to evaluate the modified questionnaire.

The committee is concerned about three features of the current cognitive testing, all of which appear to be adversely affected by the time constraints imposed by the monthly schedule.

- *Sampling procedure:* Quota sampling at a single location (a New Jersey shopping mall), while relatively quick, is unlikely to ensure that the sample reflects the U.S. population in terms of race, gender, age, and income. At best an attempt can be made to get some diversity on these four characteristics.
- *Scope of testing:* Insufficient time is available to conduct the necessary in-depth cognitive testing of each month's household survey questionnaire. For example, a question from the May 2002 Monthly Household Survey about security procedures at airports asks, "How satisfied were you with the time that you waited in line at the passenger screening checkpoint?" It is not clear to the committee that the very limited cognitive testing of the survey questionnaire, conducted in a single day with a small sample, is sufficient to establish what respondents understand by the possible answers to this question, which range from "very unsatisfied" to "very satisfied."
- *Absence of a test-modify-retest cycle:* Because there is insufficient time to conduct more than one iteration of the survey questionnaire, modifications to the draft questionnaire in response to cognitive testing and suggestions from the expert review panel are not adequately evaluated.⁶

Data Collection

In general, data for the monthly household survey are collected over a period of 10 consecutive days, although the data collection schedule may,

⁶ A total of 25 pretest telephone interviews are conducted prior to the initiation of actual calling to identify any problems associated with the data collection process, the survey instrument, specific questions, answer choices, questionnaire instructions, or question format (BTS 2002).

on occasion, be modified. For example, the data collection schedule for May 2002 was interrupted because the interviewers did not work on Mother's Day (Sunday, May 12). Data are collected using computer-assisted telephone interviewing (CATI) procedures.

The response rate for the monthly household survey has been a source of some concern to BTS and was a factor influencing the agency's decision to change contractor after the survey had been fielded for 8 months. During the initial period from August 2000 through March 2001, the response rate increased from 10 percent to 34 percent. Following a brief hiatus associated with the change in contractor, the survey resumed in July 2001, when the response rate was 38 percent. The response rate has now increased to a plateau of approximately 43 percent for the 4 months ending June 2002. The committee is concerned about the possibility of nonresponse bias associated with the relatively low response rate.

The survey contractor uses a range of strategies to maximize the number of completed interviews, including an unrestricted number of call attempts, callback scheduling, messages left on answering machines at the seventh call attempt, a toll-free number for respondents to call to complete the survey, the use of Spanish-speaking interviewers as necessary, and the use of refusal conversion specialists. Although the numbers of call attempts and callbacks are, in principle, unlimited, restricting the data collection period to 10 days effectively limits the total number of calls that can be made. An additional day of data collection was needed for the May 2002 survey to obtain the required 1,000 household interviews.

Increasing the data collection period for the monthly household survey could increase the response rate by increasing the numbers of call attempts and callbacks. However, in the absence of additional resources, a longer data collection period for the monthly household survey would reduce the already limited time available for questionnaire development and testing, thereby heightening concerns about the limited testing of the draft questionnaire.

Measures to Improve and Ensure Quality

Question Design and Evaluation The formulation and evaluation of proposed survey questions should ensure that the resulting questionnaire will provide a sound basis for analysis and assessment. Linking attitudi-

nal questions to operational information would be beneficial in ensuring that data are meaningful and are not readily susceptible to misrepresentation. For example, assessments of passenger attitudes toward airport security screening procedures would be more informative if they were linked to objective measures of passenger screening delays.⁷

The committee sees a need for BTS to be more proactive in examining issues relating to the purpose and use of survey data. If appropriate transportation expertise and experience are not available within the agency, BTS should enlist the help of outside experts in planning investigations of the transportation system and formulating appropriate survey questions.

Additional cognitive research may also be needed to better inform the development of questions that generate usable data. Several government agencies, notably the National Center for Health Statistics, the Bureau of Labor Statistics, and the Census Bureau, have professionally staffed cognitive laboratories that are recognized for their contributions to understanding the survey process. The committee urges BTS to seek advice on cognitive testing from the staffs of these laboratories.

Response Rate Response rate is one of a number of factors affecting total survey quality and is of concern because of the potential for nonresponse bias. Survey respondents may differ from nonrespondents in ways that are germane to the objectives of the survey, with associated implications for the validity of the survey results. The nonresponse bias associated with estimates from random digit dialing (RDD) telephone surveys—such as the Omnibus monthly household survey—is not known unless special studies are undertaken. Consequently, obtaining a high response rate is often the only way to reduce the potential for a significant nonresponse bias. There is likely to be a trade-off between response rate and survey cost, since achieving high response rates generally involves extensive calling procedures to reach households and a number of attempts to convert refusals and breakoffs (Massey et al. 1998).

An investigation of 39 RDD surveys sponsored by government and other organizations between 1990 and 1996 showed response rates

⁷ Establishing this linkage would require that data be collected and analyzed on an airport-specific basis.

ranging from 42 percent to 79 percent (Massey et al. 1998).⁸ The average response rate was 62 percent—significantly higher than the 43 percent currently obtained in the Omnibus monthly household survey. The committee recognizes that the average response rate reported by Massey et al. (1998) is only broadly indicative of typical RDD response rates during the period 1990–1996, and that today’s average may be lower.⁹ Nevertheless, the committee believes that, in the light of concerns about nonresponse bias, two additional efforts are warranted. First, a concerted effort is needed to increase the response rate in the Omnibus monthly household survey. Second, BTS should undertake methodological investigations to assess the consequences of reducing nonresponse and estimate differences between survey respondents and nonrespondents.

1. *Efforts to increase response rate.* The committee encourages BTS to continue investigating a range of approaches that may help reduce nonresponse, including providing incentives to respondents, increasing the number of calls, subsampling ring-without-answer numbers to increase calls for a subsample, and using bilingual/multilingual interviewers. Careful selection of the survey contractor¹⁰ and provision of the necessary technical guidance and support to that contractor are important mechanisms for achieving a high-quality survey in general and a high response rate in particular. It is generally acknowledged that different survey organizations achieve different response rates for the same voluntary survey—the so-called “house effect” (NRC 1979). In some instances, lower response rates may result from a lack of relevant experience and expertise. Therefore, the committee suggests that BTS consider appointing a consultant to assist the contractor responsible

⁸ The primary purpose of this investigation was to determine the best response rates one can expect to achieve in an RDD survey, rather than to identify the key factors influencing RDD response rates. The surveys included in the study addressed a variety of topics, from health and diet to personal transportation; had different designs and sample sizes; and used different methods to calculate response rates. For just over half the surveys, response rates were calculated according to standard industry guidelines. However, for more than 40 percent of the surveys, the calculation methods used tended to overestimate the response rate.

⁹ There is some evidence that response rates have been declining over time. See, for example, de Leeuw and de Heer (2001).

¹⁰ As part of its compliance with federal acquisition regulations, BTS has selected the contract for the Omnibus monthly household survey as a set-aside for 8(a) certified firms.

for the monthly household survey in implementing best industry practices with the potential to improve the response rate.

- Methodological investigations.* The committee encourages BTS to investigate the consequences of reducing nonresponse in the Omnibus monthly household survey. A recent study by Keeter et al. (2000) compared two RDD national telephone surveys that used identical questionnaires but very different levels of effort. The quick turnaround survey, conducted over a 5-day period, yielded a response rate of 36.0 percent, whereas the more rigorous survey, conducted over an 8-week period, had a response rate of 60.6 percent. Nevertheless, the two surveys produced similar results, with an average difference across 91 comparisons of about 2 percentage points. A comparable experiment with the Omnibus monthly household survey—comparing the present design with a more intensive effort yielding a substantially higher response rate—would allow BTS to better understand the effect of increased effort on estimates from the survey. The committee also urges BTS to launch methodological investigations of nonresponse on a continuing basis. These investigations should include examinations of the characteristics of nonresponding telephone households, longer-term follow-up of a subsample of nonrespondents to determine whether differences exist between respondents and nonrespondents, and experimental study of the use of incentives to reduce nonresponse rates.

Trading Frequency for Quality The committee urges BTS to consider replacing the Omnibus monthly household survey with a similar survey done quarterly (once every 3 months). The reduced survey frequency would allow more time to develop and test the survey questionnaire and collect data. It would also permit a threefold increase in sample size and an associated reduction in sampling error without increasing either the overall quantity of data collected over a 3-month period or the associated respondent burden time. Extending the data collection period beyond the current 10-day limit could also reduce nonresponse by providing more time for call attempts and callbacks. All these benefits could probably be achieved without substantial increases in survey cost.

The committee recognizes that some customers may have a genuine need for data on a monthly basis or at very short notice to measure public

reaction to a “hot topic.” The needs of these customers could be met by occasionally making one of the targeted surveys under the Omnibus program a very quick response survey with a short turnaround time. Such a survey could be conducted on a one-off basis or could be repeated several times over a period of several months, depending on customer requirements.

Recommendation 3: BTS should implement a range of measures aimed at ensuring that all surveys conducted under the Omnibus program are of a consistently high quality. In particular, BTS should

- **Ensure that procedures for developing and evaluating survey questionnaires are effective;**
- **Aggressively pursue strategies for increasing response rates, notably for the monthly household survey; and**
- **Consider trading frequency for quality in the monthly household survey.**

Steps to Improve the Quality of Data Analysis Products and Reports

Finding 4: BTS reporting of the results of the Omnibus monthly household survey does not consistently meet the quality standards expected of a federal statistical agency.

The data from the Omnibus monthly survey are made available on the BTS website (www.bts.gov) and are also used by BTS to prepare *OmniStats*, two- or three-page popular reports that offer “items of widespread interest from the BTS monthly Omnibus Household Survey.”¹¹ The committee examined six issues of *OmniStats*,¹² some of which gave cause for

¹¹ Omnibus Survey—OmniStats, Overview (www.bts.gov/publications/omnistats/).

¹² The issues of *OmniStats* reviewed by the committee were as follows:

- *OmniStats*, November 19, 2001, “Fewer Americans Plan Thanksgiving Travel.”
- *OmniStats*, December 17, 2001, “Nine Million Americans Change Holiday Travel Plans Because of September 11 Tragedies.”
- *OmniStats*, March 7, 2002, “American Public Is Concerned About National Security Issues but Satisfied with Federal Government’s Efforts.”
- *OmniStats*, March 28, 2002, “Passengers Quickly Adapt to New Baggage Rules.”
- *OmniStats*, April 23, 2002, “46% of Transit Users Bike or Walk (or Both) to Transit Stop.”
- *OmniStats*, June 27, 2002, “How Americans Use Our National Transportation System.”

concern. In general, *OmniStats* in its present form does not consistently reflect the considerable effort that goes into the Omnibus monthly household survey. The problems encountered include the following:

- *Providing interpretations of survey results without considering plausible rival hypotheses:* For example, the text entitled “Nine Million Americans Change Holiday Travel Plans Because of September 11 Tragedies” does not consider that plans and actual behavior may always show considerable differences. Such omissions could give the appearance of promoting a particular interpretation.
- *Inconsistently reporting the form of the question:* Since the wording of the question may affect both the answer and its interpretation, good practice calls for including the question in the report.
- *Presenting graphics that are difficult to interpret:* For example, it is not clear how the graphics in the report on new baggage rules support the assertion in the headline that “passengers quickly adapt to new baggage rules.”
- *Paying insufficient attention to statistical reliability:* For example, the report on new baggage rules notes that the average number of carry-on bags in February 2002 was 1.2, compared with 1.3 prior to December 2001. No comment is made about the statistical significance of this difference.

It is the committee’s understanding that the deficiencies in *OmniStats* are due largely to a lack of time and resources within BTS. The expertise needed for analysis of survey data is somewhat different from that needed to design and conduct a survey, and while BTS has considerable knowledge and experience in survey methodology, its expertise in data analysis and reporting is more limited. The committee also recognizes that BTS is anxious to disseminate its survey results to decision makers and the public and thereby gain credibility for the agency.¹³ *OmniStats* is an attempt to popularize the results of the Omnibus monthly survey for a general audience—including USDOT staff who are not technical specialists. Presenting survey results to a general audience without compromising

¹³ BTS staff members who described *OmniStats* to the committee cited the frequency of media coverage as one measure of success.

statistical rigor is a challenge, given the very technical nature of many statistical reports. In the committee's view, the fact that *OmniStats* is oriented toward a nontechnical audience places a special obligation on BTS to provide clear and objective analyses, to reveal rival hypotheses and data limitations, and to discuss possible uncertainties in data interpretation. While applauding BTS's intent to inform a broad audience about survey findings, the committee is concerned that the dissemination of inferior-quality products may diminish the reputation of BTS as a credible federal statistical agency of high professional standing.

In general, more substantive reports are needed, with more thoughtful and in-depth interpretations, effective graphics, and better integration. The *Bureau of Justice Statistics (BJS) Bulletin* provides a good model of high-quality statistical reporting. The publication of each issue of *BJS Bulletin* is accompanied by a press release highlighting the major features of the study and providing the appropriate link to the full report on the BJS website (www.ojp.usdoj.gov/bjs/). BTS may wish to consider producing reports analogous to those in the *BJS Bulletin*, accompanied by carefully constructed and vetted fact sheets and, on occasion, press releases. Given the challenges in "popularizing" statistical reports, extreme caution is needed in issuing press releases that attempt to convey sophisticated statistical information in a simplified form. In general, the task of preparing press releases that interpret survey results in terms of policy issues may be better left to the modal administrations responsible for transportation policy.

To encourage high-quality statistical reporting, it would be valuable for BTS to develop and promulgate guidelines for reporting on items such as sample design, standard errors, and response rates. These guidelines would assist BTS staff—as well as others within USDOT—in preparing survey reports.

The reporting of the results of surveys requested by the modal administrations within USDOT poses particular challenges for BTS because the missions of BTS and its internal customers differ. BTS needs to ensure that its own analyses and reports are of high quality and that it draws on the appropriate transportation expertise in preparing these products. There should be a clear demarcation between BTS's technical reports and the more interpretive, policy-oriented reports coming from other groups

within USDOT. For example, the latter reports could include a disclaimer noting that survey data were provided by BTS but that analyses and interpretation are the responsibility of the issuing administration.

Recommendation 4: BTS should take steps to ensure that its analyses of Omnibus survey data are technically robust and that the resulting products comply with established guidelines for the reporting of statistical data.

CLOSING REMARKS

The committee appreciates this opportunity to review and comment on the Omnibus Survey Program and hopes that the recommendations made in this report are helpful to BTS in building on its initial experience with this innovative program. We look forward to continuing to work with BTS staff, contractors, and the professional community as a whole in the committee's forthcoming review of the Commodity Flow Survey.

Sincerely yours,

Joseph L. Schofer
Chair
Committee to Review the Bureau of
Transportation Statistics' Survey Programs

Enclosure A: Committee membership¹⁴

Enclosure B: Data-gathering activities at the second committee meeting

Enclosure C: Overview of the Omnibus Survey Program

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¹⁴ The information provided in Enclosures A and B is made available elsewhere in this report. Therefore, these enclosures are not reproduced here.

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ENCLOSURE C

OVERVIEW OF THE OMNIBUS SURVEY PROGRAM

The Omnibus Survey Program¹⁵ currently comprises two categories of survey:

- A household survey, conducted monthly, that addresses a range of transportation issues; and

¹⁵ The term “omnibus” refers to the capability to “load” a variety of questions on a survey instrument scheduled to go into the field on a regular basis.

- Targeted surveys, up to a maximum of four per year, that address special transportation topics, such as transportation use by persons with disabilities and mariners' willingness to serve in a defense emergency.

Although the Omnibus monthly household and targeted surveys differ in many respects, as discussed later, they carry the same OMB clearance number. As such, they are subject to constraints defined in the OMB clearance package for the BTS Omnibus program.¹⁶ In particular, all surveys under the Omnibus program are required to include questions assessing customer satisfaction with various aspects of the transportation system—the core function of the Omnibus program. For example, the May 2002 household survey asked, “In terms of security from crime or terrorism, did you feel more secure or less secure flying on a commercial airline in April than a year ago?” This customer satisfaction component, which is a relatively unusual feature for federal government surveys, assists USDOT in complying with the requirements of the Government Performance and Results Act of 1993 for federal agencies to establish standards measuring their performance and effectiveness.

In addition to the customer satisfaction questions, the Omnibus surveys include questions designed to obtain factual (behavioral) information on transportation use or other transportation-related items. For example, the 2002 Mariner (targeted) survey asks merchant mariners, “Do you have a Standards of Training, Certification, and Watchkeeping (STCW) 95 certificate?”

The Omnibus program in general, and the monthly household survey in particular, offers opportunities for expediting the survey process so that data can be delivered to customers in a timely fashion:

- Surveys that fall within the scope of the Omnibus program can be initiated at relatively short notice because a blanket survey clearance has already been obtained from OMB.
- BTS staff, who have experience in conducting surveys of this type, provide methodological support to other administrations within USDOT, notably those with limited statistical expertise in-house.

¹⁶ The OMB approval for the BTS Omnibus program must be renewed every 3 years. The second 3-year approval period ends on May 31, 2003.

- The survey process for the monthly household survey is already established, so special questions from the modal administrations (see below) can be added relatively easily and at relatively low cost.

THE OMNIBUS MONTHLY HOUSEHOLD SURVEY

The purpose of the Omnibus monthly household survey is to “monitor expectations of and satisfaction with the transportation system and to gather event, issue, and mode-specific information” (BTS 2002). In addition to a core set of demographic questions to determine respondents’ age, gender, geographic area, and so forth, each month’s survey questionnaire contains three sets of questions:

- *A core set of transportation questions:* These questions, which remain the same from month to month, ask respondents about their use of different modes of transportation and their perceptions and experiences using these modes.
- *Questions to assess achievement of USDOT’s strategic goals:* The goals of safety, mobility, human and natural environment, and security¹⁷ are addressed on a rotating basis. For example, questions on the environment are asked three times a year (in January, May, and September). A particular question may be included only once or may be repeated in several editions of the survey.
- *Questions provided by the modal administrations within USDOT:* These questions address specific issues of immediate interest to the modal administrations. For example, NHTSA has asked opinion and behavioral questions about headlight glare and tire pressure measurement, and TSA has asked questions about security screening procedures at airports. Each question may be included only once or may be asked for several consecutive months.

Data are collected every month from approximately 1,000 U.S. households using an RDD telephone methodology. Data collection, which occurs over a 10-day period, is performed by a contractor, who also programs the CATI instrument. BTS provides the contractor with the survey questionnaire.

¹⁷ Questions on USDOT’s strategic goal for economic growth are not included in the survey.

The existing OMB clearance for the Omnibus program avoids the need for BTS to obtain approval for each monthly household survey individually unless deviations from the preapproved survey package are proposed.¹⁸ The draft survey questionnaire is reviewed each month by a panel of experts selected by the survey contractor and drawn from the statistical and transportation communities.

The committee was unable to obtain an estimate of the total cost of the monthly household survey because BTS staff time spent developing the questionnaire and processing the data is not itemized. However, this survey appears to be a relatively low-budget initiative. BTS spends \$109,000 per month (\$1.3 million per year) on contractor costs for the survey and charges \$800 for each modal administration question included in the survey.

The Omnibus monthly household survey is distinguished from many federal surveys not only by its customer satisfaction component but also by its ability to provide quick responses to a range of questions on a continuing basis.¹⁹ For example, the questions for the May 2002 survey were finalized on April 26, 2002, and the final data tabulations and microdata file were made available on June 20, 2002. Thus, the survey allows the modal administrations within USDOT to obtain answers to well-defined policy questions with a turnaround time of approximately 2 months.

THE OMNIBUS TARGETED SURVEYS

The Omnibus targeted surveys fulfill the needs of modal administrations within USDOT for information on special interest populations, such as air travelers, mariners, and travelers with disabilities.²⁰ In some cases

¹⁸ BTS is still required to provide OMB with each month's survey questionnaire 30 days before data collection commences.

¹⁹ Other customer satisfaction surveys conducted by federal agencies include the in-depth visitor survey and the customer satisfaction card survey conducted as part of the National Park Service Visitor Service Project (www.nps.gov/socialscience/waso/products.htm). However, these are not quick-response surveys; for example, the results of the customer satisfaction card survey are published annually. Federal agencies such as the National Science Foundation and the National Center for Education Statistics have on occasion conducted quick-response surveys, but not on a continuing basis.

²⁰ In a presentation to the committee on June 26, 2002, Michael Cohen of BTS reported that the following Omnibus targeted surveys have been completed or are in progress: Air Traveler I and II, Highway Use, Mariner I and II, Transportation Use (Disability), and Bicycle Use and Pedestrians.

these surveys originate from modal administration questions in the Omnibus monthly household survey. For example, TSA would like to correlate operational data on airport screening procedures (e.g., staffing levels, time of day, operation of screening equipment) with air travelers' experiences and opinions. The agency obtained some preliminary information from questions added to the monthly survey but is now considering using a targeted survey to investigate customer satisfaction and confidence in more depth.

In contrast to the monthly household survey, which relies on telephone methods to gather data, the targeted surveys use a variety of data collection methods—including mail out/mail back, telephone, and Web-based approaches—depending on the purpose of the survey and the target population. For example, the 2001 Mariner Survey was conducted primarily by mail, but telephone interviews were conducted with some nonrespondents in an effort to increase the overall response rate. The data collection cycle for targeted surveys is determined by information requirements and, in contrast to the monthly household survey, is not routinely constrained by the need for a quick response. The sample size is determined by the purpose of the survey and the availability of resources.

BTS is required to inform OMB in advance of its general plans for Omnibus targeted surveys for the forthcoming year. At present, senior BTS staff review proposed targeted surveys and have, on occasion, sought advice from OMB regarding a particular feature of a proposed survey. However, there is currently no formal review process for targeted surveys that fall within the scope of the OMB clearance package for BTS Omnibus surveys. This situation is about to change. Starting in 2003, a shortened version of a full OMB clearance package for each targeted survey will be submitted to OMB for review. The purpose of the truncated package is to ensure either that proposed surveys do not deviate from approved sample or survey designs or that any such deviations are justified. In addition, OMB will require a 30-day public comment period on proposed targeted surveys.²¹

²¹ As reported by BTS staff in response to a question from the committee, August 5, 2002.

As in the case of the monthly household survey, the committee was unable to obtain an estimate of the total cost for any given targeted survey because BTS staff time is not itemized. Funding for the targeted surveys is provided by BTS and the modal administration requesting the survey. In some instances the BTS contribution is “in kind” and consists of staff time to conduct a range of survey-related tasks.²² In other cases, BTS also provides funds for the survey. The reported costs of targeted surveys range from \$125,000 to \$745,000.

²² The BTS role in targeted surveys includes assisting the modal administrations in designing and developing survey questionnaires, advising on sampling procedures, monitoring the survey process, and assisting in data analysis.

APPENDIX C

Letter Report on the Commodity Flow Survey

March 20, 2003

Mr. Rick Kowalewski
Acting Director
Bureau of Transportation Statistics
400 7th Street, S.W.
Washington, D.C. 20590

Dear Mr. Kowalewski:

We are pleased to transmit this third letter report of the Committee to Review the Bureau of Transportation Statistics' (BTS) Survey Programs. This committee was convened by the Transportation Research Board and the Committee on National Statistics in response to a request from BTS. The membership of the committee is shown in Enclosure A. The committee has been charged with reviewing the current BTS survey programs in light of transportation data needs for policy planning and research and in light of the characteristics and functions of an effective statistical agency. This letter presents the committee's consensus findings and recommendations concerning the Commodity Flow Survey (CFS).

The committee held its third meeting on October 31–November 1, 2002, at the National Academies facilities in Washington, D.C. The purpose of this meeting was review of the CFS by the committee. To this end, the committee heard presentations from representatives of the CFS partnership, namely, BTS and the Census Bureau; from a representative of the Oak Ridge National Laboratory (ORNL), which plays a key role in analyzing the survey results; and from a range of public- and private-

sector users of CFS data. A list of the presentations at the meeting is provided in Enclosure B. Following the data-gathering sessions, the committee met in closed session to deliberate on its findings and recommendations and begin preparation of this report, which was completed through correspondence among members. In developing these findings and recommendations, the committee drew on the information gathered at its third meeting, articles in the technical literature,¹ examples of CFS products, and the experience and expertise of individual members. The committee would like to thank all those who contributed to this review through their participation in the third committee meeting and their responses to follow-up questions.

In summary, the committee found that the CFS plays a unique role in providing data on domestic freight movements to inform a wide range of economic and policy analyses and related investment decisions. However, gaps in shipment and industry coverage and a lack of geographic and commodity detail limit the usefulness of the CFS data for a growing number of applications. Moreover, limitations due to the lack of detail are being compounded by the shrinking sample size. A national freight data architecture could eventually result in a more comprehensive national picture of freight flows. In the meantime, the committee recommends that the CFS be continued at least until an improved alternative has been established. In an effort to make future editions of the CFS more useful and more cost-effective in providing data for a range of users, BTS and the Census Bureau should (a) investigate opportunities to update the survey methodology, with emphasis on the use of new technologies to support increases in sample size through more cost-effective data collection; (b) establish improved mechanisms for soliciting suggestions and feedback from users to inform design decisions and prioritize survey modifications; and (c) re-evaluate their roles and responsibilities within the CFS partnership to ensure adequate and timely funding for future surveys.

The remainder of this report commences with a brief overview of the CFS. The committee's findings on (a) data use and data users and (b) the

¹ A list of all nonproprietary materials considered by the committee is available from the Public Records Office of the National Academies (e-mail: publicac@nas.edu).

design of the 2002 CFS are then presented. The report concludes with the committee's recommendations to BTS and the Census Bureau for approaches to providing a variety of users with improved freight data. These recommendations address three main areas: the future of the CFS, meeting user needs, and the CFS partnership.

OVERVIEW OF THE CFS

The CFS, which is undertaken through a partnership between BTS of the U.S. Department of Transportation and the Census Bureau of the U.S. Department of Commerce, aims to provide information on the flow of goods by mode of transport within the United States.² All methods of freight transportation (air, motor carrier, rail, water, and pipeline) and intermodal combinations are covered. The survey was conducted in 1993 and 1997, and data collection for the 2002 CFS was ongoing at the time of the committee's third meeting.³ The budget for the 5-year cycle of the 2002 CFS is \$13.03 million, of which 80 percent is provided by BTS and 20 percent by the Census Bureau.

The CFS captures data on shipments originating from manufacturing, mining, wholesale, and selected retail establishments located in the 50 states of the United States and the District of Columbia. The sampling frame is drawn from the Census Bureau's Business Register of 6 million employer establishments, of which approximately 750,000 are in industries covered by the CFS. The 2002 CFS is collecting data from 50,000 establishments. The sample sizes for the 1993 and 1997 editions of the CFS were 200,000 and 100,000 establishments, respectively. As in 1993 and 1997, the 2002 survey is being conducted entirely by mail.⁴

² For a more detailed discussion of the CFS, the reader is referred to the websites of BTS (www.bts.gov) and the Census Bureau (www.census.gov) and to the final report on the 1997 CFS (Census Bureau 1999).

³ The CFS restores a data program on commodity flows that the Census Bureau conducted from 1963 through 1977 as part of its 5-year economic census program. The Census Bureau conducted a smaller commodity transportation survey in 1983 but did not release the results because of problems with data reliability.

⁴ Guidance on completing the questionnaire is available on the Census Bureau website or through a toll-free telephone number.

Because the CFS is administered by the Census Bureau as part of the 5-yearly Economic Census, survey response is mandatory under Title 13 of the U.S. Code. The response rate for the 1997 CFS was 75 percent, and as of October 2002, that for the 2002 CFS was estimated at approximately 70 percent.⁵ Respondents are required to report their total numbers of outbound shipments as well as information on value, weight, commodity, domestic destination or port of exit, and mode(s) of transport for a sample of these shipments. For the 2002 CFS, each establishment was assigned a 1-week reporting period every quarter, for a total of 4 weeks in the calendar year. By assigning different reporting periods to different establishments, the sample covers all 52 weeks of the year. It is anticipated that the 2002 CFS will gather information on a total of 2.7 million shipments.⁶

The Census Bureau makes a range of CFS data products available to the public in printed reports, on CD-ROM, and on the Internet. In accordance with federal law governing Census Bureau reports, no data are published that would disclose information about the operations of an individual firm or establishment. Thus, data at the level of individual establishments, known as microdata, are kept confidential, although researchers may on occasion be permitted very limited access to these data at the Census Bureau's Research Data Centers.

The published CFS data at the national level tabulate information on shipment characteristics by mode of transport (including intermodal combinations) and by commodity. Data are provided on tons, miles, ton-miles,⁷ value, shipment distance, commodity, and weight. Additional reports provide geographical breakdowns for flows between census divisions and regions, individual states, and major metropolitan areas. Reports on movements of hazardous materials and on exports are also published.⁸

⁵ As reported to the committee by Census Bureau staff, October 31, 2002.

⁶ For the 1993 CFS, each establishment was assigned a 2-week reporting period every quarter, and information was gathered on a total of 10.3 million shipments. For the 1997 CFS, each establishment was assigned a 1-week reporting period every quarter, and information was gathered on a total of 5.3 million shipments.

⁷ The Center for Transportation Analysis at ORNL computes shipment mileages from the CFS data by means of an intermodal transportation network modeling system. These mileages are used in preparing the values of ton-miles provided in the CFS reports.

⁸ Further information on CFS products is available on the Census Bureau's CFS website (www.census.gov/econ/www/cfsmain.html).

The final report on the 1997 CFS was published in December 1999, 2 years after the completion of data collection (Census Bureau 1999). A similar schedule is anticipated for the 2002 CFS. The final report is expected at the end of 2004, with preliminary national data available at the end of 2003.⁹

FINDINGS

Data Use and Data Users

Finding 1: Analysts and researchers in both the public and private sectors use data from the CFS—often in conjunction with data from other sources—for a variety of purposes, including

- *Analyzing trends in goods movement over time;*
- *Conducting national, regional, and sectoral economic analyses;*
- *Developing models and other analytical products to inform policy analyses and management and investment decisions;*
- *Forecasting future demand for goods movement and associated infrastructure and equipment needs;*
- *Cross-checking data from other sources and establishing benchmarks for estimating national accounts; and*
- *Analyzing and mapping spatial patterns of commodity and vehicle flows.*

CFS data are widely used by federal government agencies, including those outside the U.S. Department of Transportation; by academic researchers; and by consulting companies, whose clients include a range of businesses, state departments of transportation, federal government agencies, and associations. In their presentations to the committee (see Enclosure B), several users made the distinction between “power” users, who employ CFS data in their own analyses and models, and “regular” users, who include CFS-based facts in briefing papers and reports but do not undertake extensive calculations with CFS data.

Most power users make use of all the information provided by the CFS at all levels of geographic detail, with emphasis on states and metropolitan areas. This emphasis reflects the growing interest of states and

⁹ As reported to the committee by Census Bureau staff, October 31, 2002.

metropolitan planning organizations (MPOs) in freight issues. As a result of this interest, freight transportation data are needed at a finer level of geographic detail than in the past to inform policy and investment decisions relating to economic development and environmental goals. CFS data are aggregated at the level of states and Bureau of Economic Analysis regions to maintain statistical validity and protect the confidentiality of data providers. However, these aggregate data are of limited use for most state and metropolitan planners and engineers, who need to assign commodity and vehicle flows to corridors—and if possible to major highways and rail lines.

Examples of investigations using CFS data that were reported to the committee are (a) research on the geographic organization of production and trade in the United States; (b) a study of the economic impacts of highway construction in California; (c) benchmarking of the input–output accounts developed by the Bureau of Economic Analysis that show how industries provide input to, and use output from, each other to generate gross domestic product; (d) forecasting of motor carrier equipment requirements on the basis of information about length of haul and commodity carried; and (e) development of the Federal Highway Administration’s Freight Analysis Framework, which made extensive use of CFS data to build a comprehensive picture of national freight flows for policy analysis purposes.

Another example of the use of CFS data is of particular interest in the present context. Reebie Associates uses the CFS data, together with data from public and proprietary sources, to develop its Transearch database.¹⁰ Like the CFS, the Transearch database aims to provide a reasonably comprehensive picture of the flow of goods by mode of transport in the United States. Data are available for purchase at many different levels of modal, geographic, and commodity detail. Many power users reported that they use the Transearch database extensively, often because it provides greater geographic detail than the CFS and because it is updated annually. The Transearch database is generated with proprietary methods, and information about data reliability is not reported. In

¹⁰ Before 1993, when the CFS was first conducted, data from the 1977 Commodity Transportation Survey were used to develop the Transearch database.

contrast, the data reliability and sources of error for the 1997 CFS are discussed in the final report on the survey (Census Bureau 1999). Data that fail to meet certain reliability criteria are excluded from publication by the Census Bureau, resulting in gaps in the picture of national freight flows. With a larger sample size, these gaps would be fewer in number.

Many users reported to the committee that they frequently use CFS data in conjunction with data from other sources. For example, a recent study of the potential for economic integration between Canadian and U.S. regions (Brown and Anderson 2002) combined data from the CFS and from Statistics Canada's Trade Information and Retrieval System to obtain interregional trade flows. Such combining of data is often problematic, because differing data collection strategies and data definitions raise concerns about data quality and comparability.

On the basis of the committee's discussions with CFS users, it would appear that no single source of freight data is ever likely to meet all the needs of all data users. Participants in the 2001 Saratoga Springs meeting, *Data Needs in the Changing World of Logistics and Freight Transportation*, concluded that a national freight data architecture is needed to "streamline future data collection efforts and facilitate compatibility of various data sources at different levels of aggregation" (Meyburg and Mbwana 2002, 23). These issues are under consideration by the Committee on Freight Transportation Data: A Framework for Development, which expects to issue its report by mid-2003. In the absence of a national freight data architecture, the CFS is widely used—despite its deficiencies—because it goes some way toward meeting user requirements for data that provide a comprehensive picture of national freight flows.

Finding 2: Data from the CFS—a periodic 5-yearly survey of domestic shipper establishments—are of limited use for a number of applications because of

- *Gaps in shipment and industry coverage,*
- *Insufficient geographic and commodity detail at the state and local levels, and*
- *The inability to capture rapid changes in economic cycles.*

Although the CFS attempts to provide reasonably complete data on the movement of goods in the United States, there are some notable gaps

in both shipment and industry coverage. Some of these gaps have become increasingly significant in recent years because of (a) changes in the national economy, including greater emphasis on international trade and freight logistics; and (b) the need for an improved understanding of freight movements, particularly at state and local levels, to inform many policy, planning, and investment decisions.

Comprehensive information on international shipments is increasingly needed because of the growing importance of international trade to the U.S. economy. Because the CFS samples domestic shipper establishments, it cannot capture information on shipments from foreign establishments. Imported products are included in the CFS at the point that they leave the importer's domestic location (which is not necessarily the port of entry) for shipment to another location in the United States. Thus the first leg of import shipments is excluded. Export shipments are included in the CFS, with the domestic destination defined as the port of exit from the United States.

Shipper surveys have traditionally focused on firms in the mining, manufacturing, and wholesale sectors of the economy, on the assumption that such surveys capture information on the majority of goods transported by freight carriers. With the advent of freight logistics and a focus on finding the most efficient way to source, manufacture, and distribute products, transshipments between warehouses, distribution centers, and transportation terminals have grown in importance. The CFS covers selected auxiliary establishments, such as warehouses, but excludes transportation and service establishments and most retail establishments. These and other gaps in the CFS industry coverage—for example, in agricultural shipments from the farm to the first point of assembly—have become increasingly important as analysts and transportation planners try to develop a better understanding of freight movements to inform a range of policy and investment decisions.

There is widespread agreement, particularly among the power users, that increased geographic and commodity detail at the state and local levels would greatly enhance the usefulness of the CFS. The availability of such data depends on two major factors: (a) the survey sample size and (b) the statutory obligation to maintain the confidentiality of individual establishments. As the sample size decreases, the statistical variability of

the data increases. If the sample size is too small, the data may not be sufficiently reliable to be useful for analysis at the required level of geographic detail. Although the 1997 CFS, with a sample size of 100,000 establishments, collected potentially useful local-level data, these microdata cannot be made available to the public because their release could compromise the confidentiality of data providers. The publicly available CFS data are aggregated to avoid any possibility of disclosing information about individual establishments. Even if the sample size were increased to provide more reliable data at finer levels of geographic detail, large well-known companies could still be relatively easy to identify. Importantly, the reduction in sample size to 50,000 establishments in 2002 further restricts the availability of disaggregate data.

Some users expressed a need for data on transportation costs and service characteristics, which would be especially useful for tracking service quality and modeling mode choice. However, many shippers surveyed in the CFS are unlikely to be able to supply reliable reports of transportation service characteristics. Thus, meeting this need may require a survey of carriers, which is currently beyond the scope of the CFS.¹¹

The CFS is unable to capture rapid changes in economic cycles because of the 5-year interval between data collection cycles. The lack of coverage of the intervening 4 years means that time trends in freight activity, such as the effects of emerging from a period of recession or severe drought, cannot be studied satisfactorily using the CFS data alone. Several CFS users noted in their presentations to the committee that the 2-year time lag between the completion of data collection and release of the final data, combined with the 5-year interval between surveys, results in CFS data whose timeliness is “less than ideal.” Nevertheless, users generally indicated that they would be willing to sacrifice improved timeliness for greater richness in the data.

Design of the 2002 CFS

Finding 3: The design of the 2002 CFS appears to have been compromised in important ways by the lack of a clear understanding between BTS and

¹¹ While carrier surveys are useful in capturing data about shipments, shipper-based surveys are needed to obtain some important items of data, such as mode-independent flows.

the Census Bureau about ownership of the CFS; the responsibility for ensuring sufficient funding to produce a useful, quality product; and the respective roles of the two agencies in developing survey methods, which combined led to the following effects:

- *Because of uncertainty about the availability and level of funding, key design decisions were delayed until late in the survey planning process, which hampered advance preparation and problem solving.*
- *The reduction in survey sample size to 50,000 establishments has adversely affected the anticipated usefulness of the 2002 CFS data for many applications.*
- *The technical rationale for the survey design was not documented in a sufficiently clear and timely fashion for data users to (a) understand the trade-offs involved and the resulting implications for data quality and (b) provide input to the design process to help ensure the usefulness of the resulting data.*

On the basis of experience gained from the 1993 CFS, some changes were made to the design and questionnaire for the 1997 CFS (Black et al. 2000).¹² In addition, an automated editing system was introduced that enabled data collection staff and survey analysts to identify and correct problematic reports quickly. Census Bureau staff reported to the committee that they had hoped to implement further improvements in 2002 on the basis of experience with the 1997 CFS. It was not clear to the committee to what extent BTS staff were involved in identifying and prioritizing such improvements. However, because of uncertainties about the availability and level of funding for the 2002 CFS until very late in the design process, opportunities for improvement and innovation were severely limited.

The lead time for developing a new CFS questionnaire is on the order of 3 years, and guidance on data collection priorities is needed 2 years before the survey is fielded for changes to be implemented.¹³ Pilot studies

¹² The design changes focused on reducing (a) respondent burden, (b) the influence of large and infrequent shipments, and (c) the time between completing data collection and releasing the survey results to the public. Changes to the questionnaire aimed at facilitating the shipment sampling task for respondents.

¹³ As reported to the committee by Census Bureau staff, November 1, 2002.

of new data collection methodologies also require time for their planning and cannot be implemented with only a few months' notice. The 2002 CFS design had to be finalized at short notice because of funding uncertainties. Therefore the design makes only very limited use of statistical information from earlier editions of the survey to improve sampling strategies and other features, and does not incorporate any pilot studies of innovative techniques, such as Web-based data collection, that offer the potential to improve data quality and response rates.

Because of its effect on overall cost and data reliability, the choice of sample size is one of the most important design decisions for any survey. The budgets and sample sizes in numbers of establishments for the 1993, 1997, and 2002 editions of the CFS are as follows:

<i>CFS Survey Year</i>	<i>Budget (\$ million)</i>	<i>Sample Size</i>
1993	15.0	200,000
1997	19.0	100,000 ¹⁴
2002	13.0	50,000

For the 2002 CFS, the survey budget appears to have been the dominant factor determining the sample size. The estimated cost for a sample size of 100,000 was \$17.7 million, whereas the estimate for a sample size of 50,000 was \$13.0 million.^{15, 16} Thus, a 36 percent increase in cost would have resulted in a 100 percent increase in sample size. Furthermore, the cost per establishment would have dropped from \$260 to \$177—less than the 1997 cost per establishment of \$190.

¹⁴ Black et al. (2000) report that the reduction in the CFS sample size from 200,000 in 1993 to 100,000 in 1997 was to allow for intensive follow-up of problem reports early in the survey and thereby improve data quality and accuracy. With the larger sample, the delay in processing the data decreased the effectiveness of such follow-up efforts. The automated editing system introduced in 1997 also aimed at improving data quality through more rapid identification of problem reports.

¹⁵ As reported to the committee by Census Bureau staff, November 1, 2002.

¹⁶ Census Bureau staff reported to the committee that they were also asked by BTS to produce cost estimates for sample sizes of 10,000 and 30,000. The Census Bureau indicated to BTS that it would not participate in the survey if the sample sizes were reduced to these levels because the reliability of the associated data would be unacceptably low and the survey would not provide general-purpose statistics on commodity flows.

In 1997, each of 100,000 establishments was sampled four times over the course of the year for a total of 400,000 reports. For the 2002 CFS, one of the major design decisions was whether to obtain 200,000 reports over the course of the year by (a) sampling each of 50,000 establishments four times or (b) sampling each of 100,000 establishments twice. BTS and the Census Bureau jointly decided that the first option was preferable because it gave lower estimated coefficients of variation for freight flows. Nonetheless, reducing the sample size from 100,000 to 50,000 establishments degraded the quality of the publishable data.

A number of users of CFS data shared with the committee their concern that reductions in sample size are adversely affecting the data's usefulness. For example, such reductions limit the ability of the Bureau of Economic Analysis to estimate an interstate trade index and develop regional multipliers to measure the effect of changes in demand on industries and local economies. Similarly, the 1993 CFS data were used to estimate the ton-miles of trucking activity over the nation's highways (TranStats 1997). There are concerns that the 75 percent reduction in sample size to 50,000 for the 2002 CFS will result in much greater uncertainty in such estimates of infrastructure use, particularly for through-state shipments.¹⁷

The fairly extensive investigations of possible sampling schemes for the 2002 CFS conducted by the Census Bureau do not appear to have been shared with users of CFS data or made available to the public in any form. The decision to reduce the sample size from 100,000 to 50,000 establishments was taken by the Census Bureau and BTS with apparently little consideration of the advantages and disadvantages of the different sampling options from a user perspective. Thus, many users are not aware that a relatively small increase in funding for the survey (\$4.7 million over 5 years) could have offered very real benefits for data users by maintaining the sample size at the 1997 level of 100,000 establishments. In failing to share this information, the CFS partnership deprived itself of opportunities to enlist the support of users in seeking additional funding for the 2002 survey.

¹⁷ As reported to the committee by Frank Southworth, ORNL, November 1, 2002.

RECOMMENDATIONS

Scope

The committee recognizes that the CFS is only one source of data on freight movements and that not all the current deficiencies of freight data can be remedied by changes to the CFS. The following recommendations are intended to assist BTS and the Census Bureau in making the CFS a more useful data source for a range of users. These recommendations also provide a basis for developing successor survey(s) to the CFS, since they focus on meeting the need for cost-effective surveys that generate quality data and are responsive to user requirements.

The Future of the CFS

Recommendation 1. In view of the widespread use of CFS data for a diversity of applications, BTS should continue to provide data on the flow of goods by mode of transport within the United States. These data should be updated at intervals of no more than 5 years. To ensure that ongoing user needs are met, the CFS should be continued—with some modifications—at least until such time as a viable alternative source of national freight data has been established.

Although the CFS has been criticized, primarily because of gaps in data and a lack of geographic and commodity detail, a large—and growing—user market in the United States requires information on freight movements to inform economic and policy analyses and related investment decisions. The CFS currently plays a unique role in providing such data. In the committee's view, therefore, the CFS should be continued at least until an improved alternative is implemented to ensure the continuing availability of data on domestic freight flows.

Future versions of the CFS would benefit greatly from modifications that update the methodology and make the survey more responsive to the needs of data users. A reevaluation of the roles and responsibilities of the CFS partners—BTS and the Census Bureau—would also benefit the conduct of future surveys. The following recommendations address these items in more detail.

Recommendation 2. BTS and the Census Bureau should proceed with planning for the 2007 CFS. This effort should explore opportunities for conducting pilot studies of new methods in parallel with established designs. These new methods should be selected on the basis of their potential to reduce survey costs through more cost-effective data collection techniques and sampling strategies; reduce respondent burden; improve data quality; and provide more useful data for a range of users. Every effort should be made to investigate opportunities for achieving economies to permit much-needed increases in sample size.

In view of the long lead time necessary to implement changes in a major survey such as the CFS, the committee urges BTS and the Census Bureau to initiate work on the design of the 2007 CFS without delay. These early design initiatives should include investigations of the potential of new technologies for improving data quality and reducing both the respondent burden and the costs of data collection. The 2007 CFS provides an excellent opportunity to conduct pilot studies of Web-based surveys and the like and to compare the results with those obtained from more conventional approaches.

In view of the widespread user concerns about the implications of the reduced sample size for the 2002 CFS, the committee urges BTS and the Census Bureau to make every effort to increase the sample size for the 2007 CFS. The proposed uses of the data drive both the sample size and the sampling scheme. Therefore, it is essential for the CFS partnership to work closely with users in developing a survey design that will meet user needs.

Changes that allow the CFS to be conducted more cost-effectively offer the potential to support increases in sample size. The committee was pleased to learn that the Census Bureau has tentative plans to provide the option of a Web-based questionnaire for the 2007 CFS. This approach would build on the bureau's experience of electronic reporting for the 2002 Economic Census and other surveys. In addition to lowering the reporting costs incurred by many large establishments, such electronic reporting would reduce costs of data entry for the Census Bureau. The committee urges the CFS partnership to pursue the resulting opportunities to increase sample size as a matter of high priority.

Recommendation 3. The CFS partnership should initiate a research program to investigate survey methods for the CFS. To help stimulate creativity and innovation, organizations outside the federal government, including universities and small businesses, should be encouraged to participate in this research program. Topics to be investigated should include data collection, sample design, survey nonresponse, statistical estimation, and data processing.

Aside from some limited changes in the design and questionnaire for the 1997 CFS (Black et al. 2000), the CFS methodology has remained largely unchanged since the survey was initiated in 1993. In the committee's view, neither BTS nor the Census Bureau has taken a sufficiently active role in investigating opportunities to improve the overall quality of the survey and use available funds more effectively. The committee urges the CFS partnership to invest in research into possible improvements in CFS methods to stimulate creative thinking about new approaches to the survey, particularly in the areas of data collection, sample design, survey nonresponse, statistical estimation, and data processing.

Data Collection

A number of users cited as a deficiency of the survey its inability to capture rapid changes in freight activity trends. The CFS also needs to provide effective coverage of evolving shipment patterns, such as those associated with the growth of e-commerce. Research aimed at developing a better understanding of the rates of change of freight flows and trip characteristics (e.g., mode of shipment by shipment size and distance for selected commodities) over time could be helpful in informing decisions about how frequently to collect various types of data.

The CFS partnership should also investigate the possibility of eventually moving to a system of continuous data collection in which data are collected every month (or year), drawing new sample establishments monthly (or annually). Such continuous data collection affords more timely data than a periodic 5-yearly survey and could also provide greater geographic detail by accumulating data over longer time periods. An additional advantage, particularly from the perspective of the Census Bureau, is that the heavy workload associated with CFS data collection and processing would be broken into smaller tasks over a longer time

period and would no longer be concurrent with a similarly burdensome period for the 5-yearly Economic Census.

The CFS partnership should investigate options for using mixed-mode data collection methods to reach different establishments in different ways. Thus, establishments equipped to provide data electronically—through electronic data interchange systems, for example—could provide CFS data by e-mail, diskette, Web data entry, or other electronic media. Such electronic filing of survey data may be far more convenient for firms that have the necessary equipment and expertise, but would not preclude the use of mail-in questionnaires for other survey participants. Other firms could choose to enter data using a telephone keypad data entry system analogous to the Touchtone Data Entry used by the Bureau of Labor Statistics for its Current Employment Statistics Survey (see, for example, Rosen et al. 1999).

Sample Design

Investigations of ways to extend the industry and shipment coverage should be conducted in consultation with data users (see Recommendation 5). Although a survey of shipper establishments cannot fill all the current gaps identified by users, there may be opportunities to provide greater coverage in some areas. Possibilities for facilitating the linkage of CFS data with other data sources are also worthy of investigation.

Sampling existing establishments more effectively could improve data quality and reduce costs. Possible areas for investigation include the following:

- Alternative within-firm sample designs. These may offer opportunities to reduce reporting errors. For example, an approach that involves randomly selecting a starting point in terms of shipments and taking the next n records may be less susceptible to error for some firms than the current systematic sampling method (Black 1997).¹⁸
- Stratification of shipments by size. This may reduce the variability of estimates and thereby provide more accurate estimates of flows. For

¹⁸ The current sampling method involves using a lookup table to translate the total number of shipments into a “take-every” number that, properly applied, results in a sample of shipments.

example, all large shipments could be included over a longer period (1 month, 1 year) than the current 1-week reference period.

Nonresponse

Data provided by the CFS partnership do not enable the committee to obtain insights into CFS nonresponse such as the reasons for nonresponse, unit response rates by type of firm or other grouping (e.g., stratum), or item nonresponse rates. It is not apparent to the committee that the CFS partnership has conducted any detailed analyses of the 25 percent of establishments that failed to respond to the 1997 CFS and of the likely impact of this level of nonresponse on the final data set. Such analyses would offer valuable insights into bias in the survey results and could also help focus research efforts on specific problems.

In response to the large number of complaints when the survey was first conducted, efforts have been made to reduce the burden on CFS respondents. Nonetheless, research into the level of burden that firms are willing to tolerate may offer useful guidance for reducing survey nonresponse. Such respondent burden research could be investigated through focus groups or survey research among firms.

Statistical Estimation

The Census Bureau is already doing some research into the effect of large shipments or large firms on the precision of survey estimates (Black et al. 2000). These efforts should be pursued, because large firms that make either large numbers of shipments or high-value shipments can contribute disproportionately to estimates and increase the associated variances. Research on the distribution of shipment sizes and values, and on their impact on precision, may be useful in developing new, more efficient sample designs.

Data Processing

The committee encourages the Census Bureau to continue its work on developing data-editing systems for the CFS. If combined with a Web-based questionnaire, such systems could be useful in identifying potential problems and providing feedback to assist respondents while they are in the process of completing the questionnaire. Such automated edits

could be used to check that critical items (e.g., total number of shipments) are reported or that the respondent reports the expected number of individual shipments as determined from the total number of shipments. Experience in developing electronic data collection forms and automated editing systems for the Economic Census (Murphy et al. 2001) should yield important benefits for the CFS.

Meeting User Needs

Recommendation 4. BTS should establish a process to facilitate dialogue between private- and public-sector CFS users and technical professionals at the Census Bureau and BTS. This dialogue would assist both agencies in developing an in-depth understanding of the diversity of uses of CFS data and associated limitations. Such an understanding would

- **Assist BTS in identifying the role of the CFS, or its successor(s), in the broader context of efforts to develop a national freight data architecture; and**
- **Assist BTS and the Census Bureau in making future surveys more responsive to user needs by targeting particular content and problem areas and by prioritizing improvements.**

BTS solicits comments on the CFS from data users through a monthly customer feedback survey and has also sought comments from the modal administrations in the U.S. Department of Transportation on their use of CFS data. In November 2000, the agency convened a meeting with both public- and private-sector CFS users and Census Bureau representatives to initiate a dialogue on freight data needs for planning and policy purposes.¹⁹ However, the committee is not aware of any efforts to continue this dialogue on a regular basis, other than through informal discussions between users and individual staff members at BTS and ORNL.

The committee observed that many users of CFS data are extremely interested in the future of the survey and have valuable suggestions to make about a range of possible improvements. The establishment of an appropriate process for dialogue would provide a forum for regular user

¹⁹ As reported to the committee by Felix Ammah-Tagoe, BTS, November 1, 2002.

discussions with BTS and the Census Bureau on freight data needs in general and the CFS in particular. Through these discussions, the CFS partnership would benefit from the knowledge and expertise of informed users and would be better positioned to respond to evolving data needs. The CFS users could also provide valuable support to the partnership in its efforts to obtain the stable funding needed for effective survey planning and development.

Recommendation 5. In developing future versions of the CFS, or its successor survey(s), BTS and the Census Bureau should

- **Solicit user input to the design process through dialogue with CFS users and other outreach mechanisms; and**
- **Ensure that the rationale for major design decisions—notably those affecting sample size—is documented in such a way as to provide openness in decision making.**

A key decision in designing future editions of the CFS is determining the level of geographic detail the data will provide. Given that the purpose of the survey is to provide useful data for a variety of applications, the committee urges the CFS partnership to obtain substantive input from a range of public- and private-sector users about the levels of geographic detail and associated data reliability that they require to support their proposed uses of the CFS data. This input from users should be used to establish target levels of geographic detail to guide subsequent decisions about design and, notably, sample size. While the availability of funding will inevitably influence survey design, the committee believes that a sound technical rationale is needed to inform design decisions, ensure that the best use is made of available resources, and provide a basis for seeking sufficient resources for future surveys.

On the basis of its discussions with users, the committee anticipates that future editions of the CFS will need to provide usable data at least at the state level. The extent to which the CFS can realistically provide useful data at a finer level of geographic detail requires further investigation. Clearly a single national survey cannot meet all the needs of all users. For example, the CFS may not be able to provide measurements of vehicle flows in metropolitan areas in support of investigations of options for

relieving bottlenecks. In the longer term, a national freight data architecture that facilitates the integration of data from various sources probably offers the most promise for many local needs. For example, data from a national database, such as the CFS, could be combined with metropolitan area data to inform policy, planning, and investment decisions at the MPO level.

BTS receives requests from users for additional data items not currently available from the CFS. A number of users also commented to the committee that they would like to see the CFS provide additional information on shipments (e.g., transportation costs) as well as greater industry coverage (e.g., agricultural movements from farm sites to processing centers or terminal elevators and freight movements by service industries, such as lawn-care companies). It is not clear that the CFS, or any survey of shipper establishments, can provide all the additional data users would like. Nevertheless, the committee urges the CFS partnership to solicit user suggestions for additional data items and to use these suggestions in targeting improvements to future editions of the CFS. In some instances, relatively minor modifications to the CFS may facilitate the linkage of CFS data with data from other sources (e.g., quality of service data) to meet user needs. Such linkages could greatly increase the value of the CFS for many users.

The committee was unable to obtain any formal documentation on the 2002 CFS apart from the survey questionnaire and other materials provided to respondents. This situation is in marked contrast to both the National Household Travel Survey and the Omnibus Survey, for which publicly available reports describe the survey methodology and supporting rationale. Although delays in finalizing the design of the 2002 CFS likely contributed to difficulties in documenting the process, the lack of openness in decision making for a major national survey is of serious concern to the committee. Improved documentation of critical design issues for future editions of the CFS would provide greater opportunities for users to participate in and influence survey development and thereby enhance the usefulness of the final data set.

Recommendation 6. The CFS partnership should investigate options for improved delivery of CFS data to users. In particular, BTS should work with the Census Bureau to investigate technical and administrative

options for increasing access to the CFS microdata, while continuing to maintain the confidentiality of data providers.

The Census Bureau, in common with other federal statistical agencies, uses both technical and administrative procedures to protect the confidentiality of data providers. Technical methods for statistical disclosure limitation have been reported in the literature for more than 20 years, and research in this area is continuing in an effort to find better ways of accommodating the needs of statistical agencies, data providers, and data users.²⁰ Administrative approaches involve restricted access procedures, as implemented through the Census Bureau's Research Data Centers, for example.

Restrictions on the release of CFS microdata are a major source of frustration for many power users seeking to perform detailed analyses of freight activity. A National Research Council report on confidentiality and accessibility of government statistics recommended that federal statistical agencies should "strive for a greater return on public investment in statistical programs through [. . .] expanded availability of federal data sets to external users" (Duncan et al. 1993, 224). The same report also advocated a policy of "responsible innovation" in expanding access for external data users and recommended "experiment[ing] with some of the newer restricted access techniques, with appropriate confidentiality safeguards and periodic reviews of the costs and benefits of each procedure" (224). The committee urges the CFS partnership to follow this advice and examine the extent to which disclosure limitation methods can mask the identity of individual establishments in the CFS microdata.

The committee also encourages BTS to work with the Census Bureau to facilitate user access to the CFS microdata through the Census Bureau's Research Data Centers. The aforementioned National Research Council report recommended that statistical agencies should "make access conditions more affordable and acceptable to users" in instances for which restricted access procedures are needed (Duncan et al. 1993, 225). BTS needs to take an active approach in encouraging the Census Bureau to implement this recommendation.

²⁰ For further information, the reader is referred to *Information About Statistical Disclosure Methods*, American Statistical Association, Committee on Privacy and Confidentiality (users.eroles.com/dewolf/protect/sdlinfo.htm).

Although the final report on the 1997 CFS discusses data reliability and sources of error (Census Bureau 1999), the committee believes that power users could benefit from additional documentation about the quality of CFS data in the form of an error profile. More detailed reporting about the frequency of data imputation would also be helpful for users seeking an in-depth understanding of data reliability. Census Bureau staff reported to the committee that they use various imputation procedures to compensate for partial nonresponse—for example, if an establishment fails to provide data for one of the four reporting periods—but the level of imputation does not appear to be reported. Flagging all microdata values that are imputed rather than reported may be appropriate in the event that at least some of these data can one day be released.

Several users commented to the committee that the form in which the 1997 CFS data were made available to the public lacked versatility, particularly for analysts seeking to use the data as input to their own models and calculations. For example, many of the data are provided in summary tables rather than in a database format that provides access to basic origin–destination flow patterns. The Census Bureau has indicated that it will try to improve the CD-ROM for the 2002 CFS for power users. The committee urges BTS to play a role in investigating alternative formats for the public data file in an effort to provide power users with the versatility they require, while continuing to provide regular users with the information they need in a user-friendly format. The CFS partnership should also consider investigating alternative delivery mechanisms, such as a Web server, for making CFS data available to a broader set of users.

The change in commodity coding system between the 1993 and 1997 editions of the CFS and the lack of alignment with coding systems used for trade and production data were highlighted by some users as a source of difficulty in using CFS data. However, the issue of standardization among commodity coding systems has implications well beyond the CFS, and the committee decided against addressing such a complex issue in this report.

The CFS Partnership

Recommendation 7. BTS and the Census Bureau should reevaluate their roles and responsibilities within the CFS partnership to build on

the expertise and experience of both parties. Ways in which this can be done include the following:

- **As an element of the CFS partnership, BTS and the Census Bureau should work together to obtain the necessary funding for future versions of the CFS.**
- **In view of the linkage between the CFS and the Economic Census, the Census Bureau should assume an appropriate share of the responsibility for survey innovation.**
- **BTS should focus on developing priorities to guide the evolution of the CFS within the broad context of a national freight data architecture.**

The CFS partners need to work together as a team to avoid repetition of the 2002 CFS scenario in which delays in committing funds eliminated most opportunities for survey improvement and innovation and almost resulted in the cancellation of the survey itself. Both partners have a role to play in obtaining commitments for funding the 2007 CFS at a level appropriate to providing useful data at the chosen level of geographical detail and in a time sufficient to permit the preliminary investigations needed to inform decisions about survey design and methodology.

Although BTS provides much of the funding for the CFS (80 percent), the Census Bureau has a statutory requirement to conduct the Economic Census,²¹ to which the CFS is linked, and also maintains the register of employer establishments from which the CFS sample is drawn. Therefore, if the CFS is to be continued and improved, the Census Bureau needs to consider itself a partner in the CFS program rather than a contractor. Given the Census Bureau's role as the data collection agency for the CFS, the committee considers it appropriate that the Census Bureau, drawing on relevant experience that it has gained in other Census Bureau surveys, take a major role in proposing and investigating new survey designs and data collection methods.

As an agency in the U.S. Department of Transportation, BTS is well positioned to develop an understanding of freight data needs in general

²¹ Title 13 of the U.S. Code directs the Census Bureau to take the Economic Census every 5 years, covering years ending in 2 and 7.

and the extent to which future editions of the CFS, or its successor survey(s), can contribute to the development of a comprehensive national picture of freight flows. As a federal statistical agency, BTS clearly has a role to play in researching new methodologies for the CFS and in investigating issues of data analysis and data delivery. However, the committee suggests that BTS's major role within the CFS partnership should be to establish priorities to guide future development of the survey. Developing these priorities will require BTS to do the following:

- Engage in an active dialogue with data users (see Recommendation 4), and
- Establish alliances with other data providers in the federal and state governments and the private sector to coordinate data collection efforts in the context of a national freight data architecture.

CLOSING REMARKS

The committee appreciates this opportunity to review and comment on the CFS and looks forward to preparing its final report on crosscutting issues relating to the three BTS surveys it has reviewed—the National Household Travel Survey, the Omnibus Survey Program, and the CFS.

Sincerely yours,

Joseph L. Schofer
Chair
Committee to Review the Bureau of
Transportation Statistics' Survey Programs

cc: Tom Zabelsky, Census Bureau

Enclosure A: Committee membership²²

Enclosure B: Presentations at the third committee meeting

²² The information provided in Enclosures A and B is made available elsewhere in this report. Therefore, these enclosures are not reproduced here.

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Committee Meetings

FIRST COMMITTEE MEETING

FEBRUARY 25–26, 2002, WASHINGTON, D.C.

Review of the National Household Travel Survey (NHTS)

The following presentations were made to the committee by invited speakers:

The Bureau of Transportation Statistics' (BTS)

Perspectives on the NHTS

Joy Sharp, *BTS*

Susan Liss, *Federal Highway Administration (FHWA)*

Mark Freedman, *Westat, Rockville, Maryland*

User Perspectives on the NHTS

Robert Dunphy, *The Urban Land Institute*

Dwight French, *U.S. Department of Energy*

Andrea Stueve, *Travel Industry Association*

The committee also received a written submission on use of NHTS data from Stacy Davis of Oak Ridge National Laboratory (ORNL).

Issues in Travel Survey Methods in Today's Environment

Elaine Murakami, *FHWA*

Internet-Based Travel Diary Surveys

Tom Adler, *Resource Systems Group, Inc.,*

White River Junction, Vermont

Applications of Technology in Future Travel Survey Methods

Randall Guensler, *Georgia Institute of Technology, Atlanta*

Priorities and Options for Revising and Enhancing the NHTS

Sarah Campbell, *TransManagement, Inc., Washington, D.C.*

Jonathan Gifford, *George Mason University, Arlington, Virginia*

Johanna Zmud, *NuStats, Austin, Texas*

SECOND COMMITTEE MEETING

JUNE 26–27, 2002, WASHINGTON, D.C.

Review of the Omnibus Survey Program

The following presentations were made to the committee by invited speakers:

Overview of the Omnibus Survey Program

Michael Cohen, *BTS*

Overview of the Omnibus Monthly Household Survey

Lori Putman, *BTS*

Survey Design for the Omnibus Monthly Household Survey

Neil Russell, *BTS*

Omnibus Targeted Surveys

Neil Russell, *BTS* (Bicycle/Pedestrian Survey)

June Jones, *BTS* (Mariner Survey)

Sharon Durant, *BTS* (Disability Transportation Survey)

Omnibus Customers and Their Data Requirements

Lori Putman, *BTS*

User Perspectives on the Omnibus Survey

Michael Capel, *KPMG/Transportation Security Administration*

Nathaniel Beuse, *National Highway Traffic Safety Administration*

Linda Bailey, *Surface Transportation Policy Project*

THIRD COMMITTEE MEETING
OCTOBER 31–NOVEMBER 1, 2002, WASHINGTON, D.C.
Review of the Commodity Flow Survey (CFS)

The following presentations were made to the committee by invited speakers:

Objectives of the CFS

Michael Cohen, *BTS*

The CFS—Key Issues

John Fowler, *Census Bureau*

Frank Southworth, *ORNL/BTS*

Felix Ammah-Tagoe, *BTS*

User Perspectives on the CFS

Martin Labbe, *Martin Labbe Associates, Ormond Beach, Florida*

Paul Ciannavei, *Reebie Associates, Stamford, Connecticut*

Bill Anderson, *Boston University, Boston, Massachusetts*

Paul Bingham, *Global Insight, Inc., Washington, D.C.*

Bruce Lambert, *FHWA, Washington, D.C.*

Rick Donnelly, *PBConsult, Albuquerque, New Mexico*

Sue Okubo, *Bureau of Economic Analysis, Washington, D.C.*

Russ Hillberry, *U.S. International Trade Commission, Washington, D.C.*

Joel Palley, *Federal Railroad Administration, Washington, D.C.*

Agnes Muszynska, *Cambridge Systematics, Inc., Washington, D.C.*

Ed Weiner, *Office of the Secretary of Transportation, Washington, D.C.*

FOURTH COMMITTEE MEETING
MARCH 6–7, 2003, IRVINE, CALIFORNIA

Study Committee

Biographical Information

Joseph L. Schofer, *Chair*, is Associate Dean for Faculty Affairs and Professor of Civil Engineering and Transportation at Northwestern University. Throughout his career, he has been interested in evaluation and decision making for transportation systems. He has undertaken exploratory and conceptual research to define and understand the relationships among people, their behavior, and transportation system characteristics and operations. He has also investigated methods and applications for supporting infrastructure policy and action decisions. His current research addresses the implementation of variable speed limits, the development of tools to predict vehicle requirements for delivering demand-responsive transportation services, the economic impact of business aviation, and the assessment of bus signal preemption schemes. He serves on the U.S. Department of Transportation (USDOT) Advisory Committee for the Travel Model Improvement Program. He holds a B.E. from Yale University, and M.S. and Ph.D. degrees from Northwestern University, all in civil engineering.

Thomas B. Deen (NAE) is a transportation consultant and former Executive Director of the Transportation Research Board (TRB), a position he held from 1980 to 1994. He is former Chairman and President of PRC-Voorhees, a transportation engineering and planning consulting firm with clients worldwide. His research interests include intermodal planning of urban transportation systems, integration of transportation and land use in urban areas, and intelligent transportation systems. He has served on a number of National Research Council (NRC) committees and is active in the Institute of Transportation Engineers and other transportation engineering organizations. He holds a B.S. degree from the University of Kentucky.

William F. Eddy is Professor of Statistics at Carnegie Mellon University. His research interests include the analysis of functional magnetic resonance imaging data. He has published widely on the topics of statistical computation and statistical graphics, especially dynamic graphics. He was a founding editor of *Chance* magazine and of the *Journal of Computational and Graphical Statistics*. He is a former Chairman of the NRC Committee on Applied and Theoretical Statistics and has served on a number of other NRC committees, including the Committee on National Statistics and the Panel on Statistical Programs and Practices of the Bureau of Transportation Statistics. He holds an A.B. degree from Princeton University, and M.A., M.Phil., and Ph.D. degrees from Yale University.

T. Keith Lawton is Director of Technical Services with the Planning Department of Metro, the metropolitan planning organization for the Portland, Oregon, region. He is currently developing a new-paradigm model of travel demand that replaces trip generation with daily activity pattern generation. A prototype of this model is being used in a congestion pricing study. He is also working with Los Alamos National Laboratories on the development and implementation of the second demonstration of operating capability of the TRANSIMS microsimulation model in the Portland region, as part of USDOT's Transportation Model Improvement Program. He chaired the TRB Committee on Passenger Travel Demand Forecasting for 6 years and was a member of the NRC Committee for the Evaluation of the Congestion Mitigation and Air Quality Improvement Program. He holds a B.S. in civil engineering from the University of Natal, South Africa, and an M.S. in civil and environmental engineering from Duke University.

James M. Lepkowski is a Senior Research Scientist at the Institute for Social Research, University of Michigan, where he works as a sampling statistician developing new survey sampling methods and applying them to diverse problems. His current research focuses on telephone sampling methods, methods to compensate for missing survey data, and methods to analyze survey data that take account of the complexity of the survey sample design. He has served on a variety of national and international advisory committees on survey research methods for or-

ganizations such as the National Center for Health Statistics, the Food and Drug Administration, the Bureau of Labor Statistics, and the World Health Organization. He holds a B.S. in mathematics from Illinois State University, and M.P.H. and Ph.D. degrees in biostatistics from the University of Michigan.

Arnim H. Meyburg is Professor in the School of Civil and Environmental Engineering at Cornell University, where he has been a faculty member for more than 30 years. He is also Director of the Transportation Infrastructure Research Consortium of the New York State Department of Transportation, a position he has held since 1995. His research interests include the development and use of models for planning passenger and freight movements; improved methods for surveying travel behavior intended for the development of travel behavior models; and the economics of transportation regulations, infrastructure, and systems management. His work on travel survey methods addresses the need for reliable information to develop better models and implementation of the fundamental principles of sampling in empirical surveys of human populations. He is Chair of the NRC Committee on Freight Transportation Data: A Framework for Development. He holds a B.A. (equivalent) from the Free University of Berlin, and M.S. and Ph.D. degrees from Northwestern University.

Debbie A. Niemeier is Professor and Chair of the Department of Civil and Environmental Engineering at the University of California, Davis, and Director of the UC Davis–Caltrans Air Quality Project. Her research interests include air quality and land use, and travel demand modeling, and she has published extensively in these areas. She serves on the TRB Committee on Passenger Travel Demand Forecasting. She is an Associate Editor of the *Journal of the Air and Waste Management Association*. She holds a bachelor's degree in civil engineering from the University of Texas; a master's degree in civil engineering with a minor in geographic information systems from the University of Maine; and a Ph.D. in civil and environmental engineering, with a minor in statistics, from the University of Washington.

Alan E. Pisarski is a consultant in private practice. His specialties include travel behavior and statistics, transportation policy, and tourism. During the last 30 years, he has participated in all the major policy planning efforts by USDOT. He has also served on the United Nations (UN) Group of Experts on Transport Statistics and, more recently, supported the UN World Tourism Organization in assessing and expanding national travel statistical measurement. He currently is Chairman of the TRB Committee on National Transportation Data Requirements and has chaired or cochaired a number of other TRB committees, including the Steering Committee for the Conference on Information Needs to Support State and Local Transportation Decision Making into the 21st Century. He chaired the recent joint task force of TRB, the Federal Highway Administration, and the American Association of State Highway and Transportation Officials that examined long-term transportation policy research needs. He holds a B.A. in sociology and economics from the City University of New York.

Stanley Presser is Professor of Sociology at the University of Maryland, College Park, where he teaches in the Joint Program in Survey Methodology. He is interested in the interface between social psychology and survey measurement, and his research focuses on questionnaire design and testing, the accuracy of survey responses, and ethical issues stemming from the use of human subjects. He has served as Editor of *Public Opinion Quarterly*, is a former President of the American Association for Public Opinion Research, and is an elected fellow of the American Statistical Association. His published books include *Questions and Answers in Attitude Surveys*, *Survey Questions*, and *Survey Research Methods*. He holds an A.B. from Brown University and a Ph.D. from the University of Michigan, both in sociology.

G. Scott Rutherford is Professor of Civil and Environmental Engineering at the University of Washington. His previous positions include Director of Research for the Washington State Department of Transportation and Director of the Washington State Transportation Center; he also has several years of industry and consulting experience. His research interests include transit planning, transportation planning and policy, travel

forecasting, and travel demand management. He has served on several TRB committees and currently is Chairman of the National Cooperative Highway Research Program Project Panel on Consideration of Environmental Factors in Transportation. He holds bachelor's and master's degrees from Washington State University and a Ph.D. from Northwestern University, all in civil engineering.

Edward J. Spar is Executive Director of the Council of Professional Associations on Federal Statistics, where his major role is to encourage the development and dissemination of high-quality federal statistics. He conducts regular meetings and colloquia for users and producers of federal statistics to disseminate information about federal statistical developments and discuss user needs. He has consulted for national and international organizations, including the Environmental Protection Agency, the Census Bureau, the Organization for Economic Cooperation and Development, and the Association of Southeast Asian Nations, on marketing issues and ways of matching data produced by federal statistical agencies with the needs of public- and private-sector users. He holds a bachelor of business administration degree in statistics from the City College of New York.

Ronald W. Tweedie retired in 2001 from the New York State Department of Transportation, where his positions included Director of the Planning Bureau and Director of the Data Services Bureau. He was responsible for the development and direction of the state's comprehensive transportation planning program and for the coordination of program activities with other state agencies, metropolitan planning organizations, the federal government, and local jurisdictions. He also directed the activities of staff providing transportation data and analysis services essential to developing capital projects, setting priorities, and allocating funds in accordance with state procedures. He is Chair of the TRB Committee on Statewide Transportation Data and Information Systems and has served on a number of other committees, including the Federal Highway Administration Advisory Committee on Highway Statistics. He holds a B.S. in civil engineering from the Massachusetts Institute of Technology and an M.P.A. from the State University of New York at Albany.

