# CHAPTER 8

# The State of Transportation Statistics

## Highlights

- Extensive data are available on local passenger travel and most long-distance freight movement, but data gaps exist for long-distance travel, domestic movement of international trade, and local freight movement.
- Cost data are available for most forms of passenger travel but are limited for freight movement, and the contributions of transportation to the economy have not adequately been quantified and are poorly articulated.
- Substantial data are available on crashes related to transportation, but the availability of data on causation of safety problems varies by mode of transportation, and the integration of data on motor vehicle crashes, the conditions surrounding each crash, and consequences of the crash remains elusive.
- "Big data" and other alternative data sources may offer ways to update and improve the detail of traditional statistics, but research is needed to determine the reliability and validity of statistics from these sources, to establish institutional arrangements for access to large proprietary databases, and to integrate these new data sources with traditional forms of data and analysis to provide effective information for decision makers. Real-time data may offer ways to validate traditional statistics.
- BTS strives to create increasingly robust, credible statistics that support evidence-based decision making that are useful and used throughout the Nation.

Congress requires that the *Transportation Statistics Annual Report* includes an assessment of the state of transportation statistics and efforts to improve those statistics. Transportation statistics cover transportation safety; the state of good repair of transportation infrastructure; the extent, connectivity, and condition of the transportation system; economic efficiency

across the entire transportation sector; the effects of the transportation system on global and domestic economic competitiveness; demographic, economic, and other variables influencing travel behavior; transportation-related variables that influence the domestic economy and global competitiveness; economic costs and impacts for passenger travel and freight movement; intermodal and multimodal passenger movement; intermodal and multimodal freight movement; and consequences of transportation for the human and natural environment.[1]

BTS highlighted the evolution of transportation issues requiring statistical information, sources of transportation statistics, and the Bureau's efforts to improve transportation statistics in *Two Decades of Change in Transportation: Reflections from Transportation Statistics Annual Reports, 1994–2014*. That report noted that most measures requested by public officials today are variations on those that BTS was mandated to collect or compile in the 1990s. *Two Decades* documented significant progress in providing the requested measures, identified persistent gaps in desired information that remain, and highlighted promising new data sources [USDOT BTS 2015]. A major challenge facing BTS today is how to interpret and establish the credibility of new data (such as "big data" and administrative records) that can be applied to long-standing topics for decision makers in transportation.

This chapter reviews the strengths and weaknesses of current transportation statistics, identifies major gaps in those statistics, and explores new data sources that could be used to fill the gaps. The chapter concludes with strategies for assuring that statistical information provides adequate support for evidence-based decision making.

## Strengths and Weaknesses of Current Statistics on the Extent, Use, Condition, and Performance of the Transportation System

Table 8-1 summarizes existing statistics on the extent, use, condition, and performance of the transportation system as well as gaps in those statistics. Statistics are generally available to the public for aviation, highways, transit systems, and waterways because the Federal Government operates the aviation and inland waterway systems and provides financial assistance for highways and transit systems. Publicly available statistics on railroads and ports are limited because those entities are either privately owned or privately operated on leased public facilities.

While extensive statistics exist on the extent and use of the transportation system, some of the underlying data were collected for different reasons and are consequently inconsistent:

- States developed their own highway inventory systems,
- various studies of highway traffic required different information about vehicle use,
- railroad networks were mapped at different levels of detail and completeness for different reasons, and
- ports customized local performance measures to support promotional material.

[1] 49 U.S.C. § 6302(b)(3)(B)(vi)

**TABLE 8-1 Statistics on the Extent, Use, Condition, and Performance of the Transportation System**

| Topic | Coverage of existing statistics | Major gaps in existing statistics | Why the gaps matter |
|---|---|---|---|
| **Extent of and geographic access to the transportation system** | • Multiple versions of the highway and rail networks.<br>• Detailed representation of the waterway network.<br>• Intermodal passenger connectivity database. | • Piecemeal representation of intercity and transit bus service coverage.<br>• Little data on social service and non-profit transportation coverage. | • Identify localities that are isolated from economic opportunities, social services, and upward mobility.<br>• Identify portions of the transportation network that are vulnerable to disruption. |
| **Vehicle, aircraft, train, and vessel volumes** | • Number of vehicles on highway segments.<br>• Number of aircraft by airport; number of car-loadings by rail segment; number of vessels by port and waterway. | • Inconsistent differentiation among types of highway vehicles (car, bus, truck).<br>• Pipeline volumes by segment. | • Different vehicle types have very different consequences for traffic flow and congestion, pavement and bridge wear, exposure to safety risks, and air quality.<br>• Pipeline volumes affect markets of competing modes and exposure to safety risks. |
| **Condition and performance** | • Condition and reliability of highways by segment, transit by property, and inland waterways by facility.<br>• Reliability of commercial aviation by flight and airport and by causes of delay. | • Condition and reliability of freight railroads.<br>• Non-comparable throughput data among ports.<br>• Condition of urban bus and rail transit maintenance facilities, and rail transit infrastructure. | • Identify bottlenecks, vulnerabilities to disruption, and other potential losses of efficiency in moving freight and passengers to guide investments in transportation facilities and rolling stock. |

Several initiatives are underway to improve the range and consistency of highway performance measures and to unify geospatial representations of the highway and railroad networks. Proposals to develop nationally consistent port performance measures are under consideration.

Most current and planned statistics on performance are from the perspective of those who build and operate the transportation system. This perspective is important but incomplete unless it is complemented by performance measures from the user's perspective. For example, a system that spreads delay evenly over all travelers works better than a system that concentrates the same total delay on only a portion of the travelers. Delay also matters more for some purposes than others. Delay is critical for responses to medical emergencies but may only be a minor irritant for leisurely sightseeing. Delay is generally a greater problem for perishable or high-valued goods than for bulk commodities. Statistics on travelers, shippers, and the carriers who use the transportation system; on the purposes of travel; and on the goods being moved are needed to understand whether problems with transportation system performance warrant public action.

## Strengths and Weaknesses of Current Statistics on Passenger Travel

Table 8-2 summarizes existing statistics on passenger travel and gaps in those statistics. Existing statistics include total travel on sections of the transportation system and characteristics of the travelers and trips.

**TABLE 8-2 Transportation Statistics on Passenger Travel**

| Topic | Coverage of existing statistics | Major gaps in existing statistics | Why the gaps matter |
|---|---|---|---|
| **Intercity and International Travel** | • Volumes and origin-destination patterns of commercial aviation passengers.<br>• Amtrak ridership.<br>• Volumes of people and number of motor vehicles at border crossings. | • Origins, destinations, and volumes of travelers by personal vehicles, buses, and general aviation.<br>• Amount of travel by demographic characteristics of travelers.<br>• Travel by general aviation<br>• Domestic travel of international visitors by traveler and trip characteristics. | • Guide investments in airports, intercity rail passenger service, and interregional highways.<br>• Maximize the economic benefits of travel and tourism.<br>• Evaluate regulations related to the total contribution of local and long-distance travel to safety risks and environmental problems. |
| **Local travel** | • Sporadic national volumes and demographic patterns of travelers by type of place.<br>• Transit ridership by property; detailed origin-destination patterns of journeys to work and demographic characteristics of commuters.<br>• Geographic and demographic patterns of all resident travelers in metro areas that have conducted local surveys. | • Pedestrian and bicycle travel.<br>• Local travel other than commuting in metro areas that have not conducted local surveys.<br>• Ridership and social and economic benefits of transportation services provided by social service and nonprofit organizations. | • Guide investments in streets and public transportation.<br>• Manage exposure to safety risks.<br>• Provide physical connections between mobility-challenged citizens and services and employment opportunities. |

National statistics on total travel by portion of the transportation system are drawn from sources such as the border crossing data from Customs and Border Patrol [USDHS CBP OFO 2015], the Federal Transit Administration's National Transit Database [USDOT FTA NTD 2014], the BTS monthly passenger enplanement data [USDOT BTS 2012a], and the National Census of Ferry Operators [USDOT BTS NCFO 2014].

Statistics on the characteristics of travelers and trips come from programs that collect data at the individual traveler's level (without identifying personal identifiable information) from which travel patterns and traveler characteristics for the population as a whole can be estimated. The most prominent program in this group is the National Household Travel Survey (NHTS), sponsored mainly by the Federal Highway Administration (FHWA) and with increased cosponsorship by states and metropolitan planning organizations [USDOE ORNL 2012].

The NHTS collects not only information on individual trips but also demographic, household vehicle ownership, and neighborhood characteristic data as well as other factors that influence a household member's decision on when, how, and how far to travel. Although the NHTS collects all personal travel taken by all modes of transportation, it mainly captures local travel. The high cost of conducting this type of nationwide survey has limited the frequency of this survey to once every 5 to 8 years. Despite these limitations, NHTS remains

the only national source that provides the comprehensive data needed to understand travel decisions and predict travel demand.

The Census Bureau's American Community Survey (ACS) is another commonly used source of passenger travel information. The ACS collects commute-to-work data from an annual survey of the population. This survey provides small-area information every year, unlike the once-per-decade information formerly provided by the decennial census. The ACS also provides statistics for small units of geography averaged over several years, while the 374 metropolitan statistical areas, as defined by the Office of Management and Budget, are the lowest levels of geography covered by the NHTS [USDOC ACS 2011].

## Strengths and Weaknesses of Current Statistics on Freight Movement

In addition to travelers, the transportation system serves the movement of freight. Table 8-3 summarizes existing statistics on freight movement and gaps in those statistics.

Due to the size and complexity of freight transportation, no single data collection provides a comprehensive picture of annual freight movement from origin to destination, by all modes of transportation, and by all commodity types. Among the various data sources, the Commodity Flow Survey (CFS), cosponsored by BTS and the Census Bureau, provides the most comprehensive coverage of U.S. freight flows. The CFS is the only source of nationwide data on domestic freight shipments by manufacturing, mining,

**TABLE 8-3 Transportation Statistics on Freight Movement**

| Topic | Coverage of existing statistics | Major gaps in existing statistics | Why the gaps matter |
|---|---|---|---|
| **International freight movement** | • Volumes and value of freight at international gateways.<br>• Value of trade by country. | • Domestic transportation of international trade, including domestic leg of imports, exports, and movements through the United States between other countries. | • Support connections between local and global economies.<br>• Assess the role international flows play in domestic travel.<br>• Assess the role of transportation in U.S. international economic competitiveness. |
| **Intercity freight movement** | • Tonnage and value of region-to-region flows by commodity and mode. | • Relationships between industry supply chains and region-to-region commodity flows. | • Guide investments in transportation facilities.<br>• Give local economies access to suppliers and markets.<br>• Manage exposure to safety risks.<br>• Understand the consequences of safety and other regulations.<br>• Expand access to international opportunities of poorly served areas.<br>• Diagnose and address freight bottlenecks that are barriers to economic development and competitiveness. |
| **Local freight movement** | • Freight movement only in the rare cases where state and metro area surveys are conducted. | • County-to-county and intra-county flows of freight.<br>• Freight passing through the local area to and from distant locations. | • Guide investments in last-mile transportation facilities.<br>• Support local supply chains.<br>• Assess the impacts on local congestion of freight movements.<br>• Manage exposure to safety risks. |

wholesale, and selected retail industries covering all modes of transportation. It also provides comprehensive data on domestic hazardous material shipments. The CFS is conducted every 5 years as part of the Economic Census.

The Freight Analysis Framework (FAF) builds on the CFS to provide national estimates of total freight movement by mode of transportation and type of commodity for over 130 regions based on states and metropolitan areas. The CFS covers roughly two-thirds of the tonnage and value measured in the FAF. The remaining freight is measured from multiple, publicly available data sources, such as the data on freight flows across U.S. land borders and data on the international movement of air cargo collected by BTS [USDOT BTS 2012b]. The FAF and other national data sources are described at USDOT's freight transportation website at freight.dot.gov.

The FAF is based on observed data wherever possible, but must turn to models and assumptions to fill the remaining data gaps. Among the data gaps requiring significant modeling are shipments from farms, the movement of municipal solid waste, and the domestic transportation of foreign trade. While movements of goods between U.S. international gateways and foreign countries are tracked continuously, movements of international trade between gateways and domestic origins for exports and domestic destinations for imports has not been measured since the 1970s.

## Strengths and Weaknesses of Current Statistics on Transportation's Role in the Economy

Table 8-4 summarizes existing statistics on transportation's role in the economy and gaps in those statistics. Statistics cover how much the Nation spends on transportation, how transportation costs have changed, how many people are employed in transportation companies and occupations, and how transportation contributes to economic output.

Transportation's direct economic contribution is derived from statistics on the costs paid by households and businesses for transportation services, employment in transportation industries and occupations, and the value of transportation infrastructure and equipment. These statistics come from the Census Bureau, the Bureau of Economic Analysis (BEA), and the Bureau of Labor Statistics, each of which treats transportation as a significant sector of the economy.

For-hire transportation is one of the many sectors covered in the Economic Census, conducted every 5 years. This sector is also covered in the Census Bureau's Services Annual Survey, which collects operating revenue and other industry-specific data. BEA uses these data to estimate the flow of expenditures among sectors of the economy in order to understand how changes in the costs in a specific sector affect the rest of the economy. BTS expands on this accounting in its Transportation Satellite Account to include the sizable contribution to the economy made by in-house transportation services within

**TABLE 8-4 Statistics on Transportation's Role in the Economy**

| Topic | Coverage of existing statistics | Major gaps in existing statistics | Why the gaps matter |
|---|---|---|---|
| **Transportation capital stocks** | • National estimates of the value of transportation capital stocks.<br>• State inventories of public capital stocks for asset management systems. | • Up-to-date depreciation rates by type of transportation infrastructure. | • Asset management for efficient maintenance of transportation condition and performance. |
| **Transportation expenditures and investments** | • Total transportation expenditures and investments by households, businesses, and government. | • Business investments and expenditures by mode of transportation.<br>• Differentiation of own account (in-house) transportation services from purchased transportation services. | • Expenditures reflect transportation's contribution to the economy and the likely consequences on each sector of the economy of transportation investments and regulations.<br>• Transportation expenditures are also an indicator of general economic conditions. |
| **Transportation costs and prices** | • Gasoline and diesel prices.<br>• Costs of automobile ownership.<br>• Air carrier costs for selected categories.<br>• Carrier price indices.<br>• Cost to maintain highway and waterway condition. | • Trucking costs by type of cost.<br>• Rail costs based on actual operating expenses rather than regulatory formula.<br>• Comprehensive costs for bus, general aviation, pipeline.<br>• Cargo damage and loss. | • Cost data are used by businesses and consumers to make transportation choices and by government to identify the economic consequences of transportation investments and regulations. |
| **Transportation's contribution to the economy** | • Transportation as a share of Gross Domestic Product by sector of the economy.<br>• Transportation embedded in other industries (the Transportation Satellite Account).<br>• Transportation employment. | • Transportation as a share of state and metropolitan domestic product.<br>• Economic activity enabled by transportation.<br>• Value of the transportation system and services to the economy. | • Input to establishing the appropriate size of investment programs and levels of revenue collection. |

nontransportation industries, such as truck fleets operated by large retail companies.

Transportation is not often highlighted in monthly national economic statistics. To provide a perspective on transportation's role in a dynamic economy, BTS developed the monthly Transportation Services Index (TSI) [USDOT BTS 2012c]. This index is based on activity in all modes of for-hire passenger and freight transportation services, and affords a better understanding of the relationship between transportation and the current and future course of the economy. To provide a complete picture, the TSI is being expanded to include in-house transportation.

## Strengths and Weaknesses of Current Statistics on the Unintended Consequences of Transportation

In addition to the intended economic activity that transportation creates, transportation has unintended impacts on safety, energy consumption, the environment, and communities. Table 8-5 summarizes existing statistics and gaps in those statistics.

Of the unintended consequences of transportation, safety dominates the statistical activities of the USDOT. The National Highway Traffic Safety Administration (NHTSA) and the Federal Motor Carrier

Safety Administration (FMCSA) account for 40 percent of the expenditures on major statistical programs in the Department [EOP OMB 2015]. The Pipeline and Hazardous Materials Safety Administration (PHMSA) and FHWA also have large-scale safety programs in place. Altogether, the Department's annual expenditures on safety data exceed $50 million.

The relatively low fatality rates in commercial aviation, railroads, transit, and pipelines do not reduce the need for data to understand risks and maintain or improve the safety of these modes. The focus of data programs for these modes goes beyond determining causes of infrequent crashes to understanding circumstances surrounding near misses or other mishaps that could have resulted in a serious incident. The National Aeronautics and Space Administration (NASA) provides a close calls reporting system for the Federal Aviation Administration that allows airline employees to make confidential reports that can be used to identify and mitigate safety problems. Nearly 5,000 reports are filed each month [NASA 2012]. NASA provides a similar reporting system for Amtrak. BTS has initiated the first urban close calls reporting system with a major transit system. The BTS program for confidential reporting of close calls, conducted

**TABLE 8-5 Statistics on the Unintended Consequences of Transportation**

| Topic | Coverage of existing statistics | Major gaps in existing statistics | Why the gaps matter |
|---|---|---|---|
| **Safety** | • Transportation fatalities and injuries for all modes.<br>• Safety incidents involving hazardous materials; precursor events (close calls) for aviation, selected railroads and transit, and off-shore oil extraction and transport. | • Risk factors.<br>• Exposure by type of safety risk.<br>• Precursor events (close calls) for most forms of surface transportation.<br>• Disabilities and medical costs related to transportation injuries. | • Effective reduction of transportation-related casualties and property loss depends on detailed understanding of safety risks and causes of safety incidents.<br>• Measures of safety program effectiveness guide public investments and regulations. |
| **Energy consumption, green house gasses, air quality** | • Air quality by type of pollutant and air shed.<br>• Relationship of vehicle emissions to type of vehicle and vehicle speed. | • In-use fuel economy and emissions.<br>• Amount of vehicle travel by type of vehicle and vehicle speed in each air shed. | • Estimates of air quality issues are based primarily on laboratory conditions and assumed operating patterns and should be tested against actual operating conditions. |
| **Noise, water quality, habitat dislocation** | • Noise footprints around airports.<br>• Environmental disruptions related to individual transportation projects. | • National and regional inventories of noise exposure from all modes.<br>• Natural habitat disruption. | • Geographic distributions of noise exposure and habitat disruption identify mitigation investment needs and target mitigation measures. |
| **Community disruption** | • Social and economic characteristics of populations adjacent to transportation facilities. | • Social and economic connections among neighborhoods. | • Improve planning to avoid or mitigate community disruption from transportation facilities and to provide physical connections between mobility-challenged citizens and services and employment opportunities. |

under the Confidential Information Protection and Statistical Efficiency Act,[2] is also being expanded to off-shore oil extraction and connecting pipeline operations.

The areas of energy consumption and related environmental emissions are another focus of statistics on unintended consequences of transportation. The transportation sector accounts for more than two-thirds of the petroleum consumed in the country and produces between one-quarter and one-third of all of the carbon dioxide ($CO_2$) emitted by the Nation's energy consumption. The U.S. Department of Energy has a major data program that tracks energy consumption by transportation sector [USDOE EIA 2015], and transportation's contributions to greenhouse gases and other emissions are tracked by the Environmental Protection Agency [USEPA OTAQ 2015]. While individual agencies compile information to meet specific needs, integrating these data and developing analytical techniques from many disciplines are the keys to effectively using these data sources to reduce transportation-related energy consumption and emissions. For example, the relationships between vehicle usage patterns and energy usage intensity are crucial to measuring and assessing the effectiveness of different energy and emission reduction opportunities and policies. Unfortunately, with the discontinuation of the Vehicle Inventory and Use Survey (VIUS) in 2002, much of the data necessary to help make these assessments are now more than 10 years out of date [USDOC CB VIUS 2002]. A plan by FHWA, BTS, the Department of Energy, the Environmental Protection Agency, and the Department of Agriculture to revive the VIUS is currently under development.

[2] Title V of Public Law 107-347, Dec. 17, 2002

## Statistical Information Gaps and Challenges

Considering the wide range of transportation data sources and information needs for public decisions, key gaps in statistical information are apparent:

- Long-distance, intercity travel remains poorly measured for surface modes of transportation.
- Understanding of the domestic movement of international trade is based on models and assumptions more than on data from observations.
- Basic performance measures for public use are much improved for some modes, such as trucking and commercial aviation, but are lacking for other modes, such as freight railroads.
- Cost data are available for most forms of passenger travel but are limited for freight movement.
- The value of transportation to the economy and society is poorly articulated.
- Availability of data on causation of safety problems varies by mode of transportation.
- Integration of data on motor vehicle crashes, the conditions surrounding each crash, and consequences of the crash remains elusive.
- Data on highway vehicle use by vehicle characteristics, type of user, energy

consumed, and economic activity have not been collected since 2002.

Of the major data gaps, intercity passenger travel is particularly significant. While data are available on the number of trips on commercial aircraft and intercity rail, long-distance travel in personal vehicles, intercity bus, and general aviation are poorly understood. The demographic characteristics of the long-distance traveler by any mode have not been measured for almost two decades. As a consequence, current discussions about trends in passenger travel and the consequences of travel are dominated by measures of local travel. This limitation may result in misguided conclusions because long-distance travel involves different trip purposes and conditions than local travel, and one long-distance trip can generate as many miles of travel as dozens or even hundreds of local trips. Without information on long-distance travel, decision makers do not know how local congestion affects long-distance travel, how long-distance travel contributes to local congestion and the local economy, and how the total of local and long-distance travel contributes to safety risks and environmental problems.

The tables in this chapter include many areas of improved statistical information in recent years. The FAF, built primarily on data collected by BTS, provides a comprehensive picture of goods movement throughout the United States. The Transportation Satellite Account, featured in chapter 6, provides a more complete accounting of transportation's role in supporting other sectors of the national economy. The safety tables in *National Transportation Statistics* enumerate fatalities and injuries across all modes of transportation with double counting removed. Many other improvements are highlighted in previous editions of the *Transportation Statistics Annual Report.*

Challenges facing BTS and its partners are not limited to filling data gaps. The simple availability of data does not assure that effective statistics exist to help answer the questions of decision makers. Significant quality issues and inadequate methods for summarizing data into useful information can undermine the effectiveness of key data programs. All data sources have quality issues, but some questions about statistical quality have greater potential consequences for misguiding decision makers and for undermining the credibility of evidence-based decisions with the public.

## New Data Sources

"Big data" is frequently proposed as an answer to data gaps and inadequate statistics, especially with the executive order making government data available to the public[3] and with increased awareness of applications in the private sector. Big data typically involves transactions or tracking systems that support government or private operations, ranging from bills of lading and sales transactions to real-time flight information from the air traffic control system and digital imagery from traffic monitoring cameras. Big data also refers to

[3] Executive Office of the President of the United States (EOP), Office of Management and Budget (OMB), *Open Data Policy-Managing Information as an Asset, Memorandum*, M-13-13, (May 9, 2013). Available at https://www.whitehouse.gov/ as of November 2015.

tweets and other postings to the Internet. Big data sources typically involve unstructured data that are frequently updated and require very large data storage and processing technology.

Big data analytics were originally developed to analyze markets, social and political trends, and the performance of professional athletes from very large datasets. These methods are being adapted by private shippers to monitor and manage supply chains, and are now being explored by public agencies as early indicators of changing social and economic conditions. The potential for revolutionizing transportation analysis is great, but research is needed to determine the reliability and validity of statistics from these data sources and methods, to establish institutional arrangements for access to large proprietary databases, and to integrate these new data sources with traditional forms of data and analysis to provide effective information for decision makers.

Real-time data are frequently identified with big data as a source of effective information to guide decisions. Real-time data are essential for operating the transportation system, whether for keeping airplanes apart in the air traffic control system or synchronizing traffic signals in an urban street network or managing inventory in a warehouse or dispatching vehicles to deliver packages, pick up trash, or respond to emergencies. Public agencies and private entities that are directly responsible for these functions must maintain the instantaneous flow of data from sensors and transaction systems and act on moment-to-moment updates.

Beyond daily operations of the transportation system, most decisions involve more deliberative data and analysis. Investments in transportation infrastructure and equipment, safety and other regulations, and large-scale deployments of transportation services are based on an understanding of trends and their associated factors and future scenarios. Analysis of historical and aggregated real-time data are valuable for keeping traditional statistics up to date and for identifying important temporal and geographic variations in trends and current conditions, but are not a replacement for richer statistics that have the depth, breadth, and statistical rigor required to support transportation planning, programming, and policy.

## Evidence-Based Decision Making

Congress directed BTS to ensure that the Bureau's statistics support transportation decision making.[4] This mandate is consistent with the current emphasis of the Congress and the Executive Branch on evidence-based decision making throughout the Federal Government. "Agencies are encouraged to allocate resources to programs and practices backed by strong evidence of effectiveness while trimming activities that evidence shows are not effective" [EOP OMB 2013a].

Statistics for evidence-based decision making can be based on ongoing performance measurement, randomized controlled trials, and analyses of public actions that approximate controlled trails through careful monitoring of conditions surrounding the public action.

[4] 49 U.S.C. § 6302(b)(3)(B)(i)

Analyses that approximate controlled trials; also known as quasi-experimental designs, range from simple before-and-after studies to very sophisticated time-series analysis.

The Urban Mass Transportation Administration (predecessor to the Federal Transit Administration) made extensive use of quasi-experimental designs in its Service and Methods Demonstration Program, established in 1974 "to provide a consistent and comprehensive framework within which innovative transportation management techniques and transit services could be developed, demonstrated and evaluated, and the resultant findings disseminated in a timely manner to transportation planners, policymakers and transit operators" [USDOT UMTA 1979]. This systematic approach to evaluating technologies, projects, and programs could serve as a useful model for supporting evidence-based decision making throughout the field of transportation.

## Looking Ahead

The transportation community must juggle the demands of evidence-based decision making and the development and interpretation of new data sources with the maintenance and improvement of traditional statistics upon which decision makers and planers are dependent. BTS has direct control over a small portion of the data sources highlighted in this chapter, but it has a leadership role in many external data sources as the principal Federal Statistical Agency for transportation [EOP OMB 2014]. As part of its leadership role, BTS represents the transportation community in the Interagency Council on Transportation Statistics of the Office of Management and Budget. BTS provides advice to the rest of USDOT on sampling methods for proposed information collections under the *Paperwork Reduction Act*.[5] BTS also advises USDOT on the statistics used in the Department's annual Performance and Accountability Report. BTS is establishing the USDOT Statistical Policy Council to help departmental units validate the statistics in the Performance and Accountability Report and improve the quality of all statistics published by the Department.

BTS continues to improve its own data products, including the Commodity Flow Survey, Intermodal Transportation Database, the National Transportation Atlas Database, the National Ferry Database, data collected on commercial aviation, and the Bureau's compilations of statistics on transportation trends, performance, and impacts. BTS also continues to operate and improve the National Transportation Library, which is making transportation information, statistics, databases, and research findings from throughout USDOT transparent and accessible to the public under the government-wide Open Data Policy [EOP OMB 2013b]. All BTS products and the collections of the National Transportation Library are available on the internet at www.bts.gov. The website has grown over two decades, and is long overdue for restructuring to make its large and diverse collection of information easier to find and use by transportation decision makers and the public. BTS is initiating a major redesign of the website in 2016. BTS is also expanding its Facts and Figures series and developing new

[5] Public Law 104-13, May 22, 1995

visualizations for statistics in BTS reports and visual analytics on the website to highlight and explain the data collected and compiled by BTS.

As resources permit, BTS is undertaking research to explore alternative data sources and new methods of estimating statistics on the extent and use of the transportation system and on the consequences of transportation. BTS is looking at new approaches to measure phenomena, such as passenger travel and freight movement, for which traditional surveys are decreasingly effective. BTS is working with the other principal federal statistical agencies to explore the use of administrative records, data from sensors, and advanced data mining analytics. In addition to research, BTS is continuing to work with its partners in USDOT and the principal federal statistical agencies to identify and resolve significant problems with comparability and quality of transportation statistics.

Under the 5-year plan BTS developed in November 2014, the Bureau strives to create increasingly robust, credible products in each of the topic areas identified in legislative mandates and departmental goals. BTS will continue to enhance timeliness, improve quality of its products, and produce statistics that are useful, relevant, and used throughout the nation.

## References

Executive Office of the President of the United States (EOP), Office of Management and Budget (OMB):

—2015. *Statistical Programs of the United States Government: Fiscal Year 2016* (September 30, 2015), p. 11. Available at http://www.whitehouse.gov/ as of November 2015.

—2014. Statistical Policy Directive No. 1: *Fundamental Responsibilities of Federal Statistical Agencies and Recognized Statistical Units*, Federal Register/Vol. 79, No. 231 (December 2, 2014), p. 71610. Available at http://www.gpo.gov/ as of November 2015.

—2013a. *Next Steps in the Evidence and Innovation Agenda* (July 26, 2013), Memorandum, M-13-17, p.1. Available at https://www.whitehouse.gov/ as of November 2015.

—2013b.*Open Data Policy-Managing Information as an Asset*, Memorandum, M-13-13, (May 9, 2013). Available at https://www.whitehouse.gov/ as of November 2015.

National Aeronautics and Space Administration (NASA). *Aviation Safety Reporting System, In-Depth ASRS Program Briefing*. Available at http://asrs.arc.nasa.gov/ as of April 2012.

U.S. Department of Commerce (USDOC). Census Bureau (CB):

—2011. American Communities Survey (ACS) Available at http://www.census.gov/ as of November 2015.

—2002. *Vehicle Inventory and Use Survey* (VIUS). Available at http://www.census.gov/ as of November 2015.

U.S. Department of Energy (USDOE), Energy Information Administration (EIA), Today in Energy (November 2015). Available at http://www.eia.gov/todayinenergy/index.

cfm?tg=transportation as of November 2015.

U.S. Department of Energy (USDOE), Oak Ridge National Laboratory (ORNL), National Household Travel Survey 2009. Available at http://nhts.ornl.gov/ as of November 2015.

U.S. Department of Homeland Security (USDHS), Customs and Border Protection (CBP), Office of Field Operations (OFO); Planning, Program Analysis and Evaluation Directorate; Enterprise Reporting and Data Systems Division.

U.S. Department of Transportation (USDOT). Bureau of Transportation Statistics (BTS):

—2015. *Two Decades of Change in Transportation: Reflections from Transportation Statistics Annual Reports, 1994–2014*. Available at http://www.bts.gov/ as of November 2015.

—2014. National Census of Ferry Operators (NCFO). Available at http://www.ncfodatabasebts.gov/ as of November 2015.

—2012a. Airport Snapshot. Available at http://www.transtats.bts.gov/ as of November 2015.

—2012b. Transborder Freight Data Program. Available at http://transborder.bts.gov/ as of November 2015.

—2012c. Transportation Services Index (TSI). Available at http://apps.bts.gov/ as of November 2015.

—2007. Commodity Flow Survey (CFS). Available at http://www.bts.gov/ as of November 2015.

U.S. Department of Transportation (USDOT). Federal Transit Administration (FTA). National Transit Database (NTD). Available at http://www.ntdprogram.gov/ as of November 2015.

U.S. Department of Transportation (USDOT), Urban Mass Transportation Administration (UMTA), *Service and Methods Demonstration Program Annual Report - Executive Summary* (August 1979). Available at http://ntl.bts.gov/ as of November 2015.

U.S. Environmental Protection Agency (USEPA). Office of Transportation and Air Quality (OTAQ). Available at http://www.epa.gov/ as of November 2015.