

TCRP

REPORT 73

Characteristics of Urban Travel Demand

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TCRP REPORT 73

Characteristics of Urban Travel Demand

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SUBJECT AREAS

Planning and Administration • Public Transit

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TRANSPORTATION RESEARCH BOARD — NATIONAL RESEARCH COUNCIL

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TRANSIT COOPERATIVE RESEARCH PROGRAM

The nation's growth and the need to meet mobility, environmental, and energy objectives place demands on public transit systems. Current systems, some of which are old and in need of upgrading, must expand service area, increase service frequency, and improve efficiency to serve these demands. Research is necessary to solve operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the transit industry. The Transit Cooperative Research Program (TCRP) serves as one of the principal means by which the transit industry can develop innovative near-term solutions to meet demands placed on it.

The need for TCRP was originally identified in *TRB Special Report 213—Research for Public Transit: New Directions*, published in 1987 and based on a study sponsored by the Urban Mass Transportation Administration—now the Federal Transit Administration (FTA). A report by the American Public Transportation Association (APTA), *Transportation 2000*, also recognized the need for local, problem-solving research. TCRP, modeled after the longstanding and successful National Cooperative Highway Research Program, undertakes research and other technical activities in response to the needs of transit service providers. The scope of TCRP includes a variety of transit research fields including planning, service configuration, equipment, facilities, operations, human resources, maintenance, policy, and administrative practices.

TCRP was established under FTA sponsorship in July 1992. Proposed by the U.S. Department of Transportation, TCRP was authorized as part of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). On May 13, 1992, a memorandum agreement outlining TCRP operating procedures was executed by the three cooperating organizations: FTA, the National Academies, acting through the Transportation Research Board (TRB); and the Transit Development Corporation, Inc. (TDC), a nonprofit educational and research organization established by APTA. TDC is responsible for forming the independent governing board, designated as the TCRP Oversight and Project Selection (TOPS) Committee.

Research problem statements for TCRP are solicited periodically but may be submitted to TRB by anyone at any time. It is the responsibility of the TOPS Committee to formulate the research program by identifying the highest priority projects. As part of the evaluation, the TOPS Committee defines funding levels and expected products.

Once selected, each project is assigned to an expert panel, appointed by the Transportation Research Board. The panels prepare project statements (requests for proposals), select contractors, and provide technical guidance and counsel throughout the life of the project. The process for developing research problem statements and selecting research agencies has been used by TRB in managing cooperative research programs since 1962. As in other TRB activities, TCRP project panels serve voluntarily without compensation.

Because research cannot have the desired impact if products fail to reach the intended audience, special emphasis is placed on disseminating TCRP results to the intended end users of the research: transit agencies, service providers, and suppliers. TRB provides a series of research reports, syntheses of transit practice, and other supporting material developed by TCRP research. APTA will arrange for workshops, training aids, field visits, and other activities to ensure that results are implemented by urban and rural transit industry practitioners.

The TCRP provides a forum where transit agencies can cooperatively address common operational problems. The TCRP results support and complement other ongoing transit research and training programs.

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NOTICE

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The members of the technical advisory panel selected to monitor this project and to review this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. The opinions and conclusions expressed or implied are those of the research agency that performed the research, and while they have been accepted as appropriate by the technical panel, they are not necessarily those of the Transportation Research Board, the National Research Council, the Transit Development Corporation, or the Federal Transit Administration of the U.S. Department of Transportation.

Each report is reviewed and accepted for publication by the technical panel according to procedures established and monitored by the Transportation Research Board Executive Committee and the Governing Board of the National Research Council.

Special Notice

The Transportation Research Board, the National Research Council, the Transit Development Corporation, and the Federal Transit Administration (sponsor of the Transit Cooperative Research Program) do not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the clarity and completeness of the project reporting.

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FOREWORD

By Staff
Transportation Research
Board

This report presents a comprehensive set of data on urban travel demand and constitutes an update of previous editions of the *Characteristics of Urban Travel Demand* published in 1978 and 1988. This is a companion report to two other volumes: the *Characteristics of Urban Transportation Systems* (CUTS), last updated in 1992, and *Traveler Response to Transportation System Changes, Interim Handbook*, updated in 2000. These three references taken together are intended to provide a ready resource for information about urban transportation system characteristics. This report will be of interest to transit and transportation planning practitioners, educators, and researchers across a broad spectrum of transit operating agencies; metropolitan planning organizations; local, state, and federal government agencies; and educational institutions.

Cambridge Systematics, Inc., in association with PB Consult, Inc., provided the research team for this project and prepared the tables and spreadsheet files. The *Characteristics of Urban Travel Demand* (CUTD) provides basic information about travel demand in urban areas, reported in the form of tables. The topics include demographic and economic factors, trip making, and the characteristics of trips. The primary sources of information presented in the CUTD are travel surveys conducted or sponsored by specific metropolitan planning organizations. These are supplemented by tables from other sources, including federal surveys and other surveys of travel activity. Highway and public transportation passenger travel and highway freight travel modes are covered in the CUTD. Companion documents include the CUTS, available on the Federal Transit Administration website, and *TCRP Web Document 12: Traveler Response to Transportation System Changes, Interim Handbook*, available on the TRB/TCRP website.

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The research reported herein was performed under TCRP Project B-15 by Cambridge Systematics, Inc., and Parsons Brinckerhoff. Cambridge Systematics, Inc., was the contractor for the study. The work undertaken at Parsons Brinckerhoff was under a subcontract to Cambridge Systematics.

J. Richard Kuzmyak, Principal of Cambridge Systematics, and now an independent consultant, was the original Principal Investigator. Arlee Reno, Principal and Senior Vice President of Cambridge Systematics, was Principal Investigator at the time of completion of the study. The other authors of the report are Bruce Douglas of Parsons

Brinckerhoff; and Roger Berg, Reyes Barbosa, and Louisa Yue of Cambridge Systematics. Steve Decker of Cambridge Systematics and Rachel Weinberger, formerly of Cambridge Systematics and now with FR Harris, contributed to the early work of the study. Advice and assistance were provided by senior consultants Herbert Levinson, Alan Pisarski, Richard Pratt, and Jeffrey Zupan.

The work was done under the general supervision of Mr. Reno and Mr. Kuzmyak. The work at Parsons Brinckerhoff was under the supervision of Mr. Douglas.

CHARACTERISTICS OF URBAN TRAVEL DEMAND

SUMMARY

This report presents a comprehensive set of data on urban travel demand and constitutes an update of previous editions of the *Characteristics of Urban Travel Demand* (CUTD), published in 1978 and then in 1988. This is a companion report to two other volumes: *Characteristics of Urban Transportation Systems* (CUTS), last updated in 1992, and *Traveler Response to Transportation System Changes*, updated in 2000. These three references taken together are intended to provide a ready resource for information about urban transportation system characteristics.

A written survey distributed to metropolitan planning organizations (MPO) was the primary data gathering technique used for soliciting and assembling information for specific urban areas. The survey instrument, which was reviewed by the project panel, consisted of a comprehensive set of questions about travel parameters, including demographics, vehicle ownership, trip generation by mode and trip purpose, trip generation by characteristics or origin and destination, trip making by time of day, truck trip parameters, utilization of facilities, and parking and telecommuting. The survey instrument was designed to enable respondents to supply all available information in tables that allowed cross-classification among all parameters. The goal was to allow the richest possible set of relationships among variables to be analyzed as desired by CUTD users.

This edition provides information for specific urban areas, in order to highlight ranges and differences in travel parameters. Information is also provided from national summary data sources in order to provide coverage of parameters not compiled from the MPOs.

The tables included in this report are organized into chapters for various topics. The chapters subsequent to the introduction include the following:

- Survey characteristics,
- Demographic information,
- Overall trip rates,
- Modal trip rates,
- Trip purpose,
- Time,
- Truck trip information,
- Utilization, and
- Other information.

The data submitted by the MPOs provide the basis for almost all of the first five topics. Other data have been assembled for the remaining topics (i.e., time, truck trips, utilization, and other). The tables provide representative factual data for the parameters presented. A major use of this information in the past has been to provide numerical values for parameters of travel demand. Nothing in these table should be used to confuse local or project-specific information that has been assembled for a particular place or purpose.

Although the MPOs responded by providing a great deal of information about their latest surveys, some specific types of requested data proved problematic. First, because the MPOs had conducted personal travel surveys, and are only now turning attention to commercial travel, few responses were received regarding commercial vehicle travel. Other sources have been used to summarize commercial vehicle travel parameters. Second, geographic breakdowns (i.e., central city, suburb, exurb) were not compiled by MPOs. Data compilations from the National Personal Travel Survey (NPTS) by urban area size and central city versus non central city have been used to cover these parameters.

Third, MPOs have generally not compiled information on the extent of roadways, overall roadway usage (including commercial vehicles), or overall transit service supplied and consumed. These data, however, are available by urban area from Highway Statistics (the Highway Performance Monitoring System database) for highway extent and usage and from the National Transit Database (NTD) for transit services and usage. In addition, we have compiled from the work of the Texas Transportation Institute (TTI) their annual estimates of levels of service for the primary highways in each urban area. The information used by TTI is from the Highway Performance Monitoring System data sets compiled for FHWA by the states.

Fourth, information on trip chaining and telecommuting was generally not compiled by MPOs. These factors are only now being given attention in travel research and data gathering. We have incorporated what could be gleaned from other research efforts.

Given the magnitude of the data requested, MPOs deserve substantial credit for assembling and submitting a great deal of useful information that is incorporated into this edition of the CUTD.

Additional data sources, such as the NPTS and NTD, have been used, along with specific studies of historical trends in various urban areas.

Additional data sources include information gathered from the websites of particular MPOs. This includes both information that was requested and additional information found to be very useful to the CUTD. Several tables compiled by companion project B-12 have also been incorporated. These relate to use of particular facilities.

The websites maintained by the U.S. DOT provide data sources and links to almost all other websites of interest to users of CUTD. FHWA is at www.fhwa.dot.gov, FTA is at www.fta.dot.gov, and BTS is at www.bts.gov.

The website maintained by the National Academy of Sciences, Transportation Research Board, contains an online set of TCRP reports. This report is also available at trb.org.

CHAPTER 1

INTRODUCTION

This report presents a comprehensive set of data on urban travel demand and constitutes an update of previous editions of the *Characteristics of Urban Travel Demand* (CUTD), published in 1978 and 1988. This is a companion report to two other volumes: *Characteristics of Urban Transportation Systems* (CUTS), last updated in 1992, and *Traveler Response to Transportation System Changes*, updated in 2000. These three references taken together are intended to provide a ready resource for information about urban transportation system characteristics.

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Data were also compiled from highway statistics (from the Highway Performance Monitoring System database) for highway extent and usage and from the National Transit Database (NTD) for transit services and usage. In addition, the research team compiled from the work of the Texas Transportation Institute (TTI) their annual estimates of levels of service for the primary highways in each urban area. The information

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Given the magnitude of the data requested, MPOs deserve substantial credit for assembling and submitting a great deal of useful information that is incorporated into this edition of the CUTD, particularly because these efforts were uncompensated.

The websites maintained by the U.S. DOT provide data sources and linkages to almost all other websites of interest to users of CUTD. FHWA is at www.fhwa.dot.gov, FTA is at www.fta.dot.gov, and Bureau of Transportation Statistics (BTS) is at www.bts.gov.

This document is organized by chapters as follows:

- Chapter 2 provides information about survey characteristics.
 - Chapter 3 provides demographic information.
 - Chapter 4 provides information about overall trip rates.
 - Chapter 5 provides information about modal trip rates.
 - Chapter 6 provides information about trip purpose.
 - Chapter 7 provides information about time.
 - Chapter 8 provides truck trip information.
 - Chapter 9 provides information about utilization.
 - Chapter 10 provides other information.
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CHAPTER 2

SURVEY CHARACTERISTICS

TABLE 2.1 Characteristics of latest regional travel survey

Site	Survey Agency	Survey Year	No. Hslds. Sampled	Season(s) Surveyed	Survey Budget	Type Travel Diary	Non-Motor. Trips?	Previous Survey Date
Albuquerque	Middle Rio Grande COG	1992	2,000		\$130,000	Travel (1-day)		1962
Amarillo, TX	City of Amarillo	1991	2,590			Travel (1-day)		
Atlanta	Atlanta Regional Comm.	1991	2,400		\$225,000	Travel (1-day)		1980
Baltimore	Baltimore Regional COG	1993	2,700	Fall	\$400,000	Travel (1-day)	No	1987
Boise	ADA Planning Association	1994	1,500	Spring	\$100,000	Activity (1-day)	No	1964
Boston	Cent. Transp. Planning Staff	1991	3,800	Spring	\$360,000	Travel (1-day)	No	1963
Brownsville, TX	City of Brownsville	1991	1,411			Travel (1-day)		
Buffalo	Niagra Frontier Trans. Com.	1993	2,700	Spring	\$180,000	Travel (1-day)	No	1973
Chicago	CATS	1990	19,314			Travel (1-day)	No	1979
Cincinnati	Ohio-Kent.-Ind. Reg. Coun.	1995	3,000	Fall	\$225,000	Activity (1-day)	No	1978
Cleveland	NE Ohio Areawide Coord.	1994	1,600					
Dallas	NCT COG	1996	6,000		\$75,000	Activity (1-day)	Yes	1984
Denver	Denver Regional COG	1997	5,000	Spring		Activity (1-day)		1985
Detroit	SE Michigan COG	1994	7,400	Fall	\$800,000	Activity (1-day)	No	1980
Ft. Collins	North Front Range Council	1995	1,000	Spring	\$68,000	Travel (1-day)	No	
Houston	HGAC	1994	2,433	Spring	\$275,000	Activity (1-day)		1984
Kansas City	Mid-America Reg. Council	1991	1,221	Fall/Spring	\$80,000	Travel (1-day)		
Los Angeles	SCAG	1991	16,086	Fall		Activity (1-day)	No	1976
Louisville	Kentuckiana RPDA	1993	2,643		\$170,000			1980
Milwaukee	SEWRPAC	1991	17,000	Spring/Summer	\$1,200,000	Travel (1-day)	No	1985
Minn./St. Paul	Metropolitan Council	1990	9,746			Travel (1-day)	No	1982
New York City	NYMTC	1997	12,000	Summer		Activity (1-day)	Yes	1982
Portland, OR	Portland-Vancouver Metro	1995	4,451	Fall	\$600,000	Activity (2-day)	Yes	1985
Raleigh-Durham	Trans. Advisory Comm.	1995	2,000	Spring/Fall	\$270,000	Activity (2-day)	Yes	
Reno	Washoe County RTC	1991	1,050		\$165,000			
Sacramento	Sacramento Area COG	1991	4,000		\$380,000	Travel (1-day)	No	
San Antonio	San-Ant./Bexar Co. MPO	1991	2,643	Spring		Travel (1-day)		1980
San Diego	SANDAG	1995	2,049	Winter/Spring	\$217,000	Travel (1-day)	Yes	1986
San Francisco	Met. Transp. Comm.	1990	10,900	Spring	\$900,000	Travel (1,3,5-day)	Yes	1981
Seattle	Puget Sound RPC	1998	1,700			Activity (2-day)		1977
Sherm-Den, TX	Texoma COG	1991	2,289			Travel (1-day)		
St. Louis	East-West Gateway	1990	1,400		\$180,000	Travel (1-day)		1966
Tampa	Pinellas Co. MPO	1991	1,800	Spring		Travel (1-day)		
Tucson	Pima Assoc. of Govts.	1993	1,913		\$215,000	Travel (1-day)	Yes	1980
Washington, DC	MWCOG	1994	4,800		\$585,000	Travel (1-day)		1988
Wilmington, DE		1998	4,807			Travel (1-day)	Yes	

Source: Surveys for each urban region.

TABLE 2.2 Regional demographic characteristics in survey year

Site	Year	Population*	Land Area	Persons per Square Mile	Households
Albuquerque	1992	398,000	226	1,761	
Amarillo, TX	1991	187,547	88	2,131	72,252
Anchorage	1995	221,883	161	1,378	
Atlanta	1991	2,157,806	1,137	1,898	
Baltimore	1993	1,889,873	593	3,187	
Boise	1994	167,941	71	2,365	
Boston	1991	2,775,370	891	3,115	
Brownsville, TX	1991	98,962	38	2,604	26,519
Buffalo	1993	954,332	286	3,337	
Chicago	1990	6,792,087	1,585	4,285	
Cincinnati	1995	1,212,675	512	2,369	
Cleveland	1994	1,677,492	636	2,638	
Corpus Christi	1996	270,006	156	1,731	
Dallas	1996	3,198,259	1,443	2,216	
Denver	1997	2,186,675	459	4,764	879,175
Detroit	1994	3,697,529	1,120	3,301	
Eugene	1994	189,192	65	2,911	
Ft. Collins	1995	105,809	54	1,959	
Houston	1994	2,901,851	1,178	2,463	
Jacksonville		738,413	508	1,454	
Kansas City	1991	1,275,315	762	1,674	
Las Vegas	1996	697,348	231	3,019	
Los Angeles	1991	11,402,946	1,966	5,800	4,952,658
Louisville	1993	754,956	283	2,668	
Madison		266,336	98	2,493	
Milwaukee	1991	1,226,293	512	2,395	
Minn./St. Paul	1990	2,288,721	1,063	2,153	
New York City		16,004,012	2,967	5,394	
Philadelphia	1988	4,222,211	1,164	3,627	
Phoenix	1988	2,006,239	741	2,707	
Portland, ME	1994	120,220	73	1,647	
Portland, OR	1995	1,172,158	388	3,021	
Raleigh-Durham	1995	305,925	176	1,738	
Reno	1991	213,747	93	2,298	
Rochester	1995	619,653	220	2,817	
Sacramento	1991	1,097,005	334	3,284	
San Antonio	1991	1,185,394	438	2,706	409,606
San Diego	1995	2,348,417	690	3,404	
San Francisco	1990	6,024,000	1,274	4,728	2,246,000
Seattle	1998	1,744,086	588	2,966	
Sherm-Den, TX	1991	95,021	63	1,508	36,799
St. Louis	1990	1,946,526	728	2,674	
Tampa	1991	1,708,710	650	2,629	
Tucson	1993	657,094	247	2,660	258,789
Washington, DC	1994	3,363,031	945	3,559	
Wilmington, DE	1990	71,529			28,556

Source: Surveys for each urban region.

* Survey area population, from metropolitan area sources.

TABLE 2.2A Regional demographic characteristics

Site	Year	Avg. No. Pers./HH	% 1-Pers. Hslds.	Avg. No. Vehs./HH	% 0-Car Hslds.	Avg. No. Workers/HH	Avg. No. Drivers/HH
Albuquerque	1992	2.54	18.93	1.81	1.60		
Amarillo, TX	1991	2.59	21.41	1.80	4.18		
Baltimore	1993	2.70		1.05	16.50		
Brownsville, TX	1991	3.73	14.80	1.56	13.50		
Cleveland	1994	2.58		1.68	12.50		
Dallas	1996	2.60		1.33			
Denver	1997	2.49					
Detroit	1994				12.10		
Eugene	1994	2.44					
Ft. Collins	1995			1.57			
Kansas City	1991	3.10	15.60	1.80	4.00	1.00	1.60
Los Angeles	1991	3.10		1.94	9.50		
Madison	1990	2.54		1.62	9.90		
Minn./St. Paul	1990	2.56	25.40	1.74	9.50		1.77
New York City	1995	2.66		1.16	38.80		
Sacramento	1991	2.62					
San Antonio	1991	2.89	20.86	1.63	13.20		
San Diego	1995	2.61					
San Francisco	1990	2.68	26.00		10.30		
Sherm-Den, TX	1991	2.58	29.63	1.84	9.20		
Tucson	1993	2.54					
Wilmington, DE	1995	2.47	23.00	2.26	4.30	1.31	

Source: Surveys for each urban region.

TABLE 2.2B Regional demographic characteristics, prior survey

Site	Year	Avg. No. Pers./HH	% 1-Pers. Hslds.	Avg. No. Vehs./HH	% 0-Car Hslds.	Avg. No. Workers/HH	Avg. No. Drivers/HH
Atlanta	1972	2.90		1.38	12.10		
Baltimore	1975	N/A		N/A	20.90	N/A	
Boston					20.80		
Buffalo	1973			1.20	19.00		
Chicago					21.10		
Cincinnati					16.10		
Dallas	1980	2.71		1.84	6.80	1.42	
Denver	1980	2.60		2.27	8.60	1.46	
Detroit					13.10		
Kansas City					11.00		
Los Angeles	1976	2.84		1.60	11.10	1.18	
Louisville*	1980	2.76*		1.52	13.60	1.30	
Milwaukee	1972	3.22		1.24	16.10	1.34	
Minn./St. Paul	1982	2.69		1.58	11.70	1.49	
New York City	1982	N/A			36.10	N/A	
Philadelphia	1977	2.47		1.27	22.20	1.30	
Phoenix	1980	2.70		N/A	6.10		
Portland, OR	1977	2.36		N/A	11.90	1.13	
Sacramento	1978			1.60	9.40		
San Antonio	1980	N/A		N/A	11.90	1.13	
San Diego	1977	2.80		1.64	9.80	N/A	
San Francisco	1980-1981	2.56		1.70	15.80	1.39	
Seattle	1977	N/A		N/A	11.00	1.01	
Tucson	1980	N/A		N/A	8.00	N/A	
Washington, DC					14.70		

Source: Surveys for each urban region.

* Louisville is UZA.