U.S. Department
of Transportation
Federal Highway
Administration

1990 NPTS

NATIONWIDE PERSONAL TRANSPORTATION SURVEY

URBAN TRAVEL PATTERNS

1990 NPTS Publications Series:

User's Guide for the Public Use Tape
(for tape or diskette users)

Summary of Travel Trends

Travel Behavior Issues in the 90's

1990 NPTS Databook

NPTS Urban Travel Patterns

NPTS Special Subject Reports

Abbreviations used in this report:

MSA--metropolitan statistical area

NPTS--Nationwide Personal Transportation Survey

PMT--person miles of travel

POV--personally operated vehicle/privately owned vehicle

VMT--vehicle miles of travel

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA-PL-94-018	N/A	N/A

4. Title and Subtitle

NPTS Urban Travel Patterns
1990 Nationwide Personal Transportation Survey (NPTS)

5. Report Date
June 1994

6. Performing Organization Code
N/A

7. Author(s)

Mary Jayne Vincent, Mary Ann Keyes, and Marshall Reed
Layout and Design, Donna Sabonis

8. Performing Organization Report No.

9. Performing Organization Name and Address

COMSIS Corporation
8737 Colesville Road, Suite 1100
Silver Spring, Maryland 20910

10. Work Unit No. (TRAIS)
N/A

11. Contract or Grant Nos.

12. Sponsoring Agency Name and Address

Office of Highway Information Management
Federal Highway Administration, HPM-40
Washington, D.C. 20590

13. Type of Report and Period Covered

14. Sponsoring Agency Code
N/A

15. Supplementary Notes

For more information on the NPTS Survey, contact the Office of Highway Information Management, Federal Highway Administration, (202) 366-0160, FAX: (202) 366-7742.

16. Abstract

This is one of a series of reports on the 1990 Nationwide Personal Transportation Survey (NPTS). The NPTS includes information about the amount and nature of personal travel in the United States, as related to the demographics of persons and households.

This report focuses on analyses of four urban size groups: urbanized areas under 1 million population, urbanized areas with 1 million or more population without rail, urbanized areas with 1 million or more population with rail, and non-urbanized areas. Topics include person and vehicle trip rates, vehicle occupancy rates, trip length in time and distance, mode choice, and commuting trip patterns. Comparisons of the 1983 and 1990 NPTS datasets are included.

17. Key Words	18. Distribution Statement
Urban Travel Trip Rates Vehicle Occupancy Vehicle Miles of Travel	This report is available from the Office of Highway Information Management Federal Highway Administration, HPM-40 Washington, D.C. 20590

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	152 pages	

Form DOT F1700.7 (8-72) Reproduction of complete page authorized

1990 NPTS

Urban Travel Patterns

Publication No. **FHWA-PL-94-018** *(Ordering number)*
HPM-40/8-94(10M)E

To order a copy, contact: Federal Highway Administration
Research and Technical Report Center
9701 Philadelphia Court
Unit Q
Lanham, MD 20706
(301) 577-0818
(301) 577-1421 (FAX)

Acknowledgments

The authors wish to thank the following individuals for their careful review and valuable suggestions regarding this publication:

J. Richard Kuzmyak, Ernest Mosbaek, Dieter Klinger of COMSIS Corporation, Kimberly Fisher of the Urban Land Institute, as well as the many individuals at the Federal Highway Administration.

The contributions of these individuals are greatly appreciated.

U.S. Department of Transportation
Federal Highway Administration

NPTS Urban Travel Patterns

Based on Data from the 1990 Nationwide Personal Transportation Survey (NPTS)

Prepared by:
COMSIS Corporation
Silver Spring, Maryland

Prepared for:
Office of Highway Information Management, HPM-40
(202) 366-0160, FAX (202) 366-7742

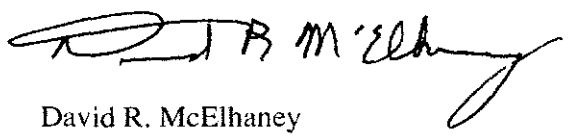
June 1994

Foreword

Because more than 60 percent of the U. S. population lives in urbanized areas, and 54 percent of the Nation's highway travel occurs in urbanized areas, it is important to understand travel characteristics in these areas. Not only are these urbanized areas centers of population, but also they are centers of education, culture, sporting events, and special services such as health care. In addition, many are centers of traffic congestion, air pollution, and aging infrastructures. Even within urbanized areas there are travel differences between the older central cities, post-war suburbs, and newly developing suburbs. Similarly, the travel demands in non-urban areas must be examined and understood so that we can plan our future. This report examines and documents travel behavior in various urbanized area size groups, using data from the Nationwide Personal Transportation Survey (NPTS).

NPTS is one source of data to help planners and decision makers understand current travel patterns and to examine historic trends. In 1995, the next NPTS will be conducted, adding to the series of data points from 1969, 1977, 1983, and 1990.

This report is part of the NPTS report series, documenting and exploring the nature of travel in our complex society.



David R. McElhaney
Director, Office of Highway Information Management

Table of Contents

List of Tables

Introduction

Chapter 1
Person and Vehicle Trip Rates

Chapter 2
Vehicle Miles of Travel (VMT)

Chapter 3
Trip Length in Distance and Time

Chapter 4
Mode Choice

Chapter 5
Occupancy of Privately Operated Vehicles

Chapter 6
Geographic Regions and Individual Metropolitan Areas

Chapter 7
Commute Trips by Time of Day

List of Figures

Chapter 1
Person and Vehicle Trip Rates

Chapter 2
Vehicle Miles of Travel (VMT)

Chapter 3
Trip Length in Distance and Time

Chapter 4
Mode Choice

Chapter 5
Occupancy of Privately Operated Vehicles

Chapter 6
Geographic Regions and Individual Metropolitan Areas

Chapter 7
Commute Trips by Time of Day

Introduction

This report focuses on urban transportation and the needs of urban transportation planners and metropolitan planning officials. Although the report is nationwide in scope, it is designed to provide a basis for judging the trip-making and travel implications associated with individual urban area demographic and socioeconomic changes. Accordingly, the information should be of special importance to engineers, economists, and planners who are responsible for developing the models needed to forecast urban area and corridor transportation demand.

This report centers on trips of 75 miles or less to provide greater comparability with regional household travel surveys. To show important urban trip-making trends, 1983 and 1990 NPTS findings are compared.

Overall Findings

The 1990 NPTS reveals that important trip-making changes occurred from 1983 to 1990. First, and perhaps most importantly, trips for family and personal business, other than shopping, overtook commuting trips as the predominant type of trip, when examining all trips of 75 miles or less on all days. Nevertheless, commuting vehicle miles of travel (VMT) still prevails as the most significant element of household VMT.

Second, although the average trip to and from work lengthened in distance and duration, the increase in commute trip length far outpaced the increase in commute duration. Therefore, it may be concluded that the average commute trip speed increased from 1983 to 1990.

Third, the average commute trip in 1990 was just over 10 miles, and took only 19 minutes to accomplish.

Fourth, short commuting trips of 1 mile or less decreased from 1983 to 1990, while commuting trips of more than 8 miles increased. Commuting trips of more than 8 miles in privately operated vehicles accounted for more than 80 percent of commuting VMT.

Fifth, the average occupancy rate for privately operated vehicles decreased from 1983 to 1990, and the greatest decrease — from 1.18 to 1.12 persons per vehicle — was for trips to and from work.

Sixth, in 1990, on average, households in large urban areas with rail/subway made fewer daily trips in privately operated vehicles (POVs) than households in similarly sized areas without rail/subway service.

Report Organization

The information is presented in seven chapters. Chapter 1, "Person and Vehicle Trip Rates," describes the average daily person and vehicle

trip rates for households by characteristics such as household size, household income, and number of vehicles. Person trip summaries are also included.

Chapter 2, "Vehicle Miles of Travel (VMT)," explores the vehicle miles of travel associated with characteristics such as trip purpose, household income, and vehicle availability.

Chapter 3, "Trip Length in Distance and Time," describes both the average length and duration of trips by trip purpose, travel mode, and gender.

Chapter 4, "Mode Choice," describes the variations in travel modes with particular emphasis on trips to and from work.

Chapter 5, "Occupancy of Privately Operated Vehicles," describes the average occupancy rates for trips by purpose and distance.

Chapter 6, "Geographic Regions and Individual Metropolitan Areas," analyzes the trip-making characteristics of persons living inside and outside the central cities of urbanized areas. It also describes trip characteristics of 12 major metropolitan areas.

Chapter 7, "Commute Trips by Time of Day," examines time patterns by travel mode and gender, especially peak travel patterns.

Key Terms

A few basic terms and concepts are discussed in the following sections to help readers use and understand the tables in this report.

Urban Size Groups

For this report, each NPTS household has been categorized based on residence location in one of four urban size groups. The tables show the travel by residents of these four urban size groups, but the tables do not necessarily indicate where the travel by these households occurred. These groups are based on population and the presence or absence of rail/subway service in the urbanized area. Urbanized area is a Bureau of the Census term defined by total population, presence of a central city, and population density. There must be a total population of 50,000 or more, and population density must exceed 1,000 people per square mile. An urbanized area can be parts of counties, unlike metropolitan areas, which are defined by county boundaries. Small urban areas are smaller centers of population.

The four groups follow:

Under 1 Million—population of urbanized areas between 50,000 and 999,999. These areas generally do not have rail or subway service, but may have local bus service.

1+ Million without Rail—population of urbanized areas more than 1 million, but without rail or subway service. For example, Los Angeles is in this classification because the rail/subway service was not fully developed at the time of the survey.

1+ Million with Rail—population of urbanized areas more than 1 million, and with rail and/or subway service. This includes areas of both old and new rail and/or subway service such as New York, Chicago, Philadelphia, Boston, San Francisco, and Atlanta.

Not Urban—rural areas and small centers not in an urbanized area.

Some of the tables in this report show the total for urbanized areas. For this total, the three categories: Under 1 million, 1+ Million without rail, and 1+ Million with rail are summed.

Metropolitan Area—Metropolitan areas are defined by the Office of Management and Budget, using county boundaries. (In New England, city and town boundaries are used.) By current standards, an area qualifies for recognition as a metropolitan area if there is a city of at least 50,000 population, or a Bureau of the Census defined urbanized area of at least 100,000 (75,000 in New England). In addition to the county containing the main city, additional counties are included if they are socially and economically integrated with the central county.

Note that urbanized areas are contained within metropolitan areas. However, because metropolitan areas include entire counties, a significant portion of their land area is rural.

Person Trip—A person trip is a trip by one person by any mode of transportation. Unless otherwise specified, the tables on person trips contain travel data collected in the NPTS by *all* modes (private vehicle, public transportation, walking, bicycle, etc.). A person trip is counted regardless of whether the person is a driver or a passenger. Two people traveling together in one car are counted as 2 person trips.

Person Miles—Person miles are the number of miles traveled by each person on a trip. A 3 mile vehicle trip made by two people traveling together would count as 6 person miles.

Vehicle Trip—A vehicle trip is a trip by a single privately operated vehicle (POV), regardless of the number of persons in the vehicle. The trip defined above (two people travelling together in one vehicle) would be considered 1 vehicle trip. To be counted as a vehicle trip in the NPTS reports, a trip must be made in a POV, and the driver must be a member of a household in the NPTS sample. When the gender of vehicle trips is discussed, it refers to the gender of the driver.

Vehicle Miles of Travel (VMT)—VMT refers to miles traversed in privately operated vehicles (see below) and accounted for in trips made by those drivers who were in the households of NPTS survey respondents.

Privately Operated Vehicle (POV)—This term is used to describe automobiles, trucks, vans, and motorcycles, operated privately, to distinguish from public transportation such as buses and subways. A privately operated vehicle can include a rental car or leased vehicle; therefore, the term privately *owned* vehicle was rejected for this report.

Trip Purpose—This is the main reason for motivates the trip. For each destination, a main reason is associated with each trip. Unfortunately, like many other household-based travel surveys, the NPTS coding for trip purpose in the 1990 survey does not adequately address trip-chaining. Trip-chaining, particularly stops on the way home from work, are not neatly identified in the standard datasets. Thus, for example, to report a trip from work to the grocery store, and then to home, the first trip was coded as a shopping trip, and the second as a trip from work. This coding routine should be understood when examining trip purpose tables.

In the NPTS base dataset, there are 11 trip purposes. For this report, however, the 11 NPTS trip purposes have been condensed into nine purposes with five major categories, as follows:

Earning a Living
- To or From Work
- Work-Related Business

Family and Personal Business
- Shopping
- Other Family/Personal Business

Civic/Educational/Religious

Social and Recreational
- Vacation/Pleasure Driving
- Visit Friends/Relatives
- Other Social/Recreational

Other

It should also be understood that the tables that present "commute" trips refer to trips "To and From Work," one of the two subclasses of "Earning a Living" trips. The other subclass of the Earning a Living trips, "Work-Related Business," is not included in commute summary tables.

In Chapters 1 and 6, NPTS trips are also subclassified into four home-based categories and one non-home-based category. The home-based categories are "Work", "Shopping", "Social/Recreational", and "Other". No trip purpose classifications are shown for the non-home-based trips.

Differences between 1983 and 1990 NPTS

This report contains many comparisons between the 1983 and 1990 NPTS results. The authors rely heavily on 1983 to 1990 comparisons because urban area residence was not included in earlier NPTS surveys. The reader should bear in mind that some of the 1983 to 1990 changes may be due to difference in the two surveys, as described below. The sum of these differences is that the nature of the change is likely to reflect actual conditions, but the amount of change may be overstated or understated.

The main differences in methodology and terminology between the 1990 NPTS and earlier surveys are as follows:

- The 1990 survey was a telephone survey, whereas the earlier surveys used in-person home interviews. Limiting the sample to households with telephones may result in an under-representation of lower income households.

- The 1990 survey allowed another household member (proxy) to report an individual's trips if the individual (14 and older) could not be contacted after several attempts, whereas the earlier surveys did not allow such proxy interviews.

- There are geographic differences between the 1990 NPTS and earlier surveys. Some metropolitan area and central city boundaries changed. Also, the definition of "central city" was changed by the Bureau of the Census between NPTS survey years 1983 and 1990.

- The 1990 survey data were edited by the computer-assisted telephone interviewing (CATI) software during the data collection process, whereas data from the earlier surveys were edited manually after the interview. The advantage of CATI over conventional home interviews is that many data inconsistencies and quality problems are immediately identified and corrected.

TABLE 1
Personal VMT Estimates, 1983 and 1990
(Millions)

	Highway Statistics[1]	NPTS[2]	Percent NPTS of Highway Statistics Estimate
1983	1,403,696	1,076,169	77%
1990	1,864,386	1,613,153	87%
Percent Increase	33 %	50 %	

[1]The sum of VMT for personal passenger vehicles (automobiles and motorcycles) and part of VMT for 2-axle 4-tire trucks as reported in Table VM-1. Based on data from the 1982 and 1987 Truck Inventory and Use Surveys, the percentages of travel that pickups (2-axle, 4-tire trucks) were used for personal transportation are estimated to be 60.1% in 1983 and 73.3% in 1990.

[2]Includes travel period trips (including trips 75 miles or longer).

- The sample size of the surveys varied considerably; 6,500 for 1983, and 22,000 for 1990. The small sample size in the 1983 survey (less than one-third that of 1990) might contribute to larger errors.

Recognition of the differences between the 1990 NPTS and earlier surveys is important because NPTS data show that the number of miles driven for personal travel increased by 50 percent between 1983 and 1990. The NPTS data were compared with data reported in FHWA's annual publication, *Highway Statistics*[1], which shows an increase of only 33 percent for the same period (Table 1). The *Highway Statistics*, data are based on state DOT traffic counts.

One possible explanation for the large increase in personal vehicle miles of travel (VMT) between 1983 and 1990 is that the 1983 NPTS underestimated VMT because of its smaller sample size.

Limitations of Data on Transit

The NPTS dataset permits analysis of user characteristics, such as demographic and socioeconomic characteristics, by various modes of transportation. This information is rarely available, especially on a national level, outside of NPTS. However, the reader is cautioned that the sample of transit trips in the 1990 NPTS may not be sufficient to draw specific conclusions regarding transit policy and funding. The remainder of this section provides further information on issues that may contribute to the differences in transit use between NPTS and the Section 15 reporting system of the Federal Transit Administration (FTA).

[1] Highway Statistics data include travel by all vehicles on the road, whereas NPTS data from travel day and travel period exclude "commercial driving" done by cab drivers, truck drivers, delivery persons, and others.

NPTS Sample Size Limitations

The NPTS data on transit use are based on information from 2,872 transit trips on travel day that were collected in the survey. The breakout of these trips follows:

- 1,909 by bus
- 639 by subway or elevated rail
- 294 by commuter rail and
- 30 by streetcar or trolleycar

Using these 2,872 trips, the NPTS results differ considerably from data in the Section 15 reporting system. The reader is cautioned that differences in the way the data are generated for NPTS and Section 15 make direct comparisons difficult. Section 15 data are based on reports submitted by each transit operator to the FTA as part of the requirements for receiving Federal funding. Transit operators generally obtain the Section 15 information using a combination of farebox receipts and on-board surveys. Section 15 data do not include demographic or socio-economic characteristics of transit users or trip purpose, distance, travel time, or other trip attributes available from the NPTS. The basic NPTS/Section 15 comparisons for unlinked trips in 1990 follow:

Unlinked Transit Trips
(Millions)

	NPTS	Sec. 15	NPTS as % of Sec. 15
Bus	4,352	4,576	95.1%
Rail/Subway	1,889	2,675	70.6%
Total Transit	6,241	7,250	86.1%

Transit Trip Definition

This table uses unlinked transit trips as a basis for comparison because the Section 15 data are reported as unlinked trips. An unlinked trip is basically defined as a boarding. For example, you take a bus and a subway to work; this is one linked trip and two unlinked (i.e., the bus boarding and the subway boarding). In NPTS, unlinked trips were recorded if only one portion of the trip was on transit. NPTS data for modes other than transit are presented as linked trips.

These comparisons show that NPTS data report 6.24 billion unlinked transit trips, while Section 15 data report 7.25 billion unlinked trips, for a difference of 1.01 billion unlinked trips. A likely explanation for this difference is that travel data collected by memory recall often result in an undercount. For example, the vehicle miles of travel generated from NPTS trip level data are 13 percent lower than the comparable vehicle miles estimate based on traffic counts.

This discussion has used the unlinked trip definition to seek comparability between NPTS and Section 15. However, the transit data presented in this report are for linked trips. The following comparison of linked and unlinked transit trips in NPTS is provided to show how the two relate:

NPTS Transit Trips
(Millions)

	Unlinked	Linked	Ratio Unlinked/ Linked
Bus	4,352	3,543	1.23
Rail/Subway	1,889	1,349	1.40
Total Transit	6,241	4,892	1.28

Misclassifications of Subway/Rail Trips

NPTS respondents had difficulty distinguishing between commuter rail and subway/elevated rail. Data from the 25 largest urbanized areas show that many trips were coded as commuter rail trips where there was a subway/elevated rail system, but no commuter rail, such as in Atlanta or Cleveland.

Additionally, in areas that had both commuter rail and subway/elevated rail, the NPTS data show considerably more commuter rail trips than Section 15 and considerably fewer subway trips. This occurred most notably in New York, which has a major proportion of the Nation's transit trips. The national totals are skewed if subway/elevated rail trips are misclassified as commuter rail. Because of this confusion between commuter rail and subway, the transit trip data are classified as follows:

Bus - which includes bus and streetcar

Rail/Subway - which includes commuter rail, subway and elevated rail

Coverage of Low-Income Households

There is concern that NPTS undercounted low-income households, and therefore, undercounted transit use.

The potential for an undercount of low-income households cannot be clearly defined because 28 percent of all households interviewed for the NPTS refused to report household income. There is a strong possibility that those who refused to provide income data were lower income households, but this cannot be proved. A comparison of the household characteristics did not identify any significant differences between those that did and those that did not report income.

It should also be noted that when the weighting factors were developed for the 1990 NPTS, the 1990 Decennial Census data were not yet available. Thus, the NPTS sample was expanded using the Current Population Survey *projections*. The sample was expanded based on: Census region, household size, MSA status, race (black, non-black), and ethnicity (Hispanic, non-Hispanic). Household income was not a factor.

Undercounting in Urbanized Areas

Analysis of NPTS by urbanized area size shows fewer transit trips in the largest urbanized areas than Section 15 reports. This affects not only the total number of trips, but also the specific modes used. If fewer trips were reported by residents of the largest urbanized areas, the number of NPTS subway trips would be low relative to Section 15 data. In fact, this is the largest discrepancy between the NPTS and Section 15 datasets.

Urbanized Area Totals

Table 2 is included to show the relationship between NPTS results for the total United States and for the total of the urbanized areas between 1983 and 1990. Table 3 shows the relationship between capping the trip length at 75 miles and using all trips. It is important to keep these restrictions in mind when comparing the data presented in this report with other reports from the 1990 NPTS that do not contain the same restrictions.

Table 2 shows that the proportion of total households that are in urbanized areas has declined between 1983 and 1990, from 65 percent to 63 percent. However, for 1-person households, the decline was from 71 percent to 64 percent. Other changes include a decline in

the proportion of people age-65-and-over in urbanized areas, from 62 percent in 1983 to 55 percent in 1990.

Table 3 shows that although the 75-mile cap used in the report does not have much effect on the total number of vehicle trips or person trips, it has a significant affect on the VMT. Although nearly 98 percent of 1990 household vehicle trips were less than 75 miles, these trips accounted for only 87 percent of the vehicle miles of travel (VMT).

TABLE 2
Summary Statistics on Demographic Characteristics
1983 and 1990 NPTS

	1983		1990	
Households (000)	*Total*	*Urban Total*	*Total*	*Urban Total*
All	85,371	55,857	93,347	58,977
1 Person	19,354	13,810	22,999	14,945
2 Persons	27,169	17,633	30,114	18,685
3 Persons	14,756	9,149	16,128	10,176
4 + Persons	24,092	15,264	24,106	15,172
Persons (000)	Total	Urban Total	Total	Urban Total
All	229,453	146,180	239,416[1]	138,910
Under 16 Years	53,682	N/A	54,303	N/A
16-19	15,268	10,049	13,851	8,728
20-34	60,788	41,335	59,517	40,336
35-64	75,353	46,440	82,480	50,634
65 Years and Older	24,362	15,112	26,955	14,952
All Male	111,514	69,974	114,441	66,346
All Male - 16 and Older	83,645	52,817	86,432	54,248
All Female	117,939	76,206	124,975	72,512
All Female - 16 and Older	92,080	60,119	96,371	60,402
All - 5 and Older	212,932	135,641	222,101	136,677
Licensed Drivers (000)	Total	Urban Total	Total	Urban Total
All	147,015	92,574	163,025[1]	100,827
Male	75,639	47,089	80,289	49,969
Female	71,376	45,486	82,707	50,839
Workers (000)	Total	Urban Total	Total	Urban Total
All	103,244	66,541	118,343[1]	76,397
Male	58,849	36,779	63,996	40,885
Female	44,395	29,763	54,334	35,499
Household Vehicles (000)	Total	Urban Total	Total	Urban Total
	143,714	87,011	165,221	98,675

[1]Includes "don't know" and "refusals".
N/A = not applicable.

TABLE 3
Summary Statistics Total Travel
1983 and 1990 NPTS

	1983			1990		
	Total	Urban Total All Trips	Urban Total ≤ 75 Miles	Total	Urban Total All Trips	Urban Total ≤ 75 Miles
Household Vehicle Trips (000,000)	126,874	79,348	78,834	158,927	98,184	96,106
Household VMT (000,000)	1,002,139	597,086	515,705	1,409,600	797,164	690,847
Person Trips (000,000)	224,385	140,950	139,670	249,562	156,139	151,070
Person Miles of Travel (000,000)	1,946,662	1,152,222	848,827	2,315,300	1,345,529	1,004,367