

Nashville Area

1998 Travel Behavior Study

Final Report

Household Travel Behavior Survey

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1998 Travel Behavior Study

EXECUTIVE SUMMARY

Introduction

This report presents findings of the Nashville Area Travel Behavior Study, which was a comprehensive study of travel patterns and transportation needs in Middle Tennessee. The study is an intensive effort by the Nashville Area Metropolitan Planning Organization (MPO) to collect and analyze travel behavior data from residents of the five county area of Davidson, Rutherford, Sumner, Williamson, and Wilson, and travelers coming into or through the region. The data will be used by the MPO and local agencies to update transportation and air quality models for the five-county area, and to identify transportation needs in the region.

This report documents the results of the 1998 Nashville Area Travel Behavior Study, conducted October 1997 through April 1998. This Travel Behavior Study was comprised of two surveys.

- The Household Travel Behavior Survey was designed to record a representative sample of all person movements by residents age 5 and older inside the study area for a 24-hour period.
- The External Travel Behavior Survey was designed to record a representative sample of trips made by vehicles that crossed the study area border.

Frequencies and cross-tabulations were performed to report most findings (across the two surveys), and these are included in this report as tables and graphs. Detailed documentation of survey methods and outcomes are presented in two separate documents, the Technical Reports on Methods that were prepared for each of the two travel surveys.

Household Travel Behavior Survey

The Household Travel Behavior Survey was designed to collect a complete weekday movement of persons from a representative sample of households with telephones in the five-county region. Demographic interviews were completed with 2,706 households and one-day travel diaries were collected from all members of 2,204 households. Of these households, 206 regularly use some form of transit (local bus service, commuter bus service, private bus service, or van pool), and persons in 144 households used a form of transit on their assigned travel day.

Census-type household information, obtained for use in data analysis, included dwelling type, ownership status, household size, household ethnicity, household income, and vehicles owned. Information was also obtained on people within the household including age, gender, drivers' licenses, mobility impairment, type and addresses of business in which employed, number of jobs, flexibility of employment, and type and addresses of schools in which enrolled. Trip data for a complete day's travel were collected for persons five years of age or older. These data included the origin and destination of each trip, allowing the assignment of latitude and longitude, the time the trip began and ended, mode of transportation used, activities done at each destination, and the trip purpose. Vehicle occupancy and rate

and type of parking facility used were reported for all auto-driver trips.

External Travel Behavior Survey

The External Travel Behavior Survey was designed to collect trip information from a representative sample of passenger and commercial vehicles crossing 16 of the 42 external station sites identified by the Tennessee Department of Transportation (TDOT). All of these stations are along the cordon lines of Davidson, Sumner, Wilson, Rutherford, and Williamson Counties. Vehicles were sampled during the approximate hours of 3:00 PM to 7:00 PM Tuesday through Thursday. In total, 1,162 drivers of vehicles completed questionnaires representing travelers in Tennessee and 9 other states. In addition to providing basic origin/destination information about each vehicle trip, the survey documented specific characteristics of trip purpose, vehicle type, and driver demographics.

1998 Travel Characteristics

This study was undertaken to collect travel behavior data from residents of the five county area of Davidson, Rutherford, Sumner, Williamson, and Wilson, and travelers coming into or through the region. Following are the principal findings of the Household and External Travel Behavior Surveys. The prior travel behavior study was conducted in 1959. Differences in survey methods make it difficult to compare 1959 and 1998 data. However, some comparisons have been made cautiously and are reported in this report.

- Approximately 35% of the travelers surveyed in the External Travel Behavior Survey were passing through the area. Nearly 65% originated from within the study area (i.e., were local). In 1959, 77% of traffic measured in the External Travel Behavior Survey was local.
- Two out of five travelers that "passed through" the Nashville area (i.e., external-external trips) stopped in the area for 30 minutes or longer.
- Work trips accounted for two-fifths (41%) of all 1998 external/internal trips. Work trips accounted for one-third of all pass-through trips. Sightseeing/vacation was the purpose of 17% of pass-through trips. In the 1959 survey, recreation was the most often cited purpose for pass-through trips.
- Trip generation rates (as measured in the Household Travel Behavior Survey) were higher than the national average as measured in the 1990 National Personal Transportation Survey. Person trip rates were highest in Davidson and Williamson Counties, whereas household trip rates were highest in Williamson and Sumner Counties.
- Work trips as a percent of total trips have declined from approximately one-third in 1959 to approximately one-fourth in 1998. On the other hand, trips for shopping (including eating out) have increased from 16% in 1959 to 29% in 1998.
- Job opportunities are centered in Davidson County. Shopping destinations are dispersed in all five counties. Residents of Wilson County make more trips to Davidson County to work and shop than those in Williamson, Sumner, or Rutherford Counties. Rutherford County residents tend to stay near at home for work and shopping opportunities.
- Family lifecycle, vehicle availability, and number of workers in the household caused significant variations in rates of trip production. Of these factors, family lifecycle (related to presence of

children and workers in the household) appeared to have the strongest influence. Williamson and Sumner Counties evidenced the strongest influence of the lifecycle factor.

- The majority of trips recorded in the Household Travel Behavior Survey were made via auto (93%). Non-motorized trips accounted for 2% of total trips.
- Ninety-seven percent (97%) of households reported the availability of one or more vehicles. Fewest vehicles per household were recorded in Davidson County (1.8), whereas the most vehicles per household (2.4) were found in Williamson County. Vehicle availability was strongly associated with household income and household size.
- Vehicles in the study were relatively new with a median vehicle year of 1992. Most vehicles were owned or leased by respondents, with only 3% reported as employer-provided.
- Five percent of vehicles were reported as having disability plates, whereas 4% of respondents were noted as having a mobility impairment that limits the type of transportation that they can use.
- Licensed drivers reported more travel than non-licensed individuals, and 94% of adult respondents were licensed drivers.
- Some form of transit (local bus service, commuter bus service, private bus service or van pool) was used on a regular basis by someone in 4% of all households contacted as part of the survey and 9% of households that completed travel logs.
- Transit (including school bus and car pool) was used in 4.8% of trips recorded in the travel logs. This statistic translates to 7% of households.
- 73% of respondents who used MTA/RTA bus or private bus were licensed to drive.
- Slightly more than half of the sample was female (51%) which is comparable to the study area population. Females reported significantly more travel than did males.
- Persons aged 35-44 reported the greatest amount of travel. The least amount of travel was recorded for persons age 5-15 and age 65 and older.
- Two-thirds of respondents (age 15 and older) were employed full- or part-time. Respondents in Wilson County reported highest levels of employment. Both household income and vehicle availability increased as the number of workers in a household increased.
- Employed persons in the Greater Nashville area work, on average, more than five days per week. About one in ten workers (8%) work more than one job. The majority of all employed persons (60%) have flexible job schedules. Persons with job flexibility had slightly higher trip rates than those with no job flexibility.
- One-fourth of respondents in the study was enrolled in some type of educational institution. Households in Wilson County reported a significantly higher percentage of children in grades K - 6 than did other counties, whereas respondents in Sumner and Williamson Counties reported significantly higher percentages of children in grades 7 - 12. The presence of children in grades 7 - 12 generates more trips for the household than do children in grades K - 6.

TRAVEL BEHAVIOR OF GREATER NASHVILLE AREA RESIDENTS

Trip Rates

In total, 18,896 trips were reported by the persons over the age of 5 who completed one-day travel logs in the Household Travel Survey. The average number of trips reported by persons was 3.5 trips. The mean number of trips reported by household was 8.2 trips.

The trip rates vary across the five counties. The highest trip rates per person were found in Davidson and Williamson Counties. Households in Williamson County reported significantly more travel than households in Davidson and Rutherford Counties. One factor contributing to the high household trip rates reported in Williamson County was that the mean household size was greater in Williamson County than other counties.

Table 1
Trip Rates per Person and per Household

Trip Rate	Per Person	Per Household
Total Study Area	3.5	8.2
Davidson County	3.6	7.9
Rutherford County	3.3	7.8
Sumner County	3.5	8.8
Williamson County	3.7	10.1
Wilson County	3.4	8.3

Note: Data for the total study area are weighted by county to reflect population parameters. Data for individual counties are not weighted and reflect sample estimates.¹

Nashville residents reported significantly more travel in the 1998 household travel survey than was recorded in the 1959 survey. The 1959 home interview survey obtained 2.3 trips per person and 7.52 trips per dwelling unit (compared to 3.5 trips per person and 8.2 trips per household in the 1998 survey). The fact that Americans in the 1990s are traveling more than in previous decades was evidenced in the National Personal Transportation Survey (NPTS). Respondents in the NPTS reported 3.0 trips per person in 1990 compared to 2.9 trips per person in 1983.

Seventeen percent of persons reported "no travel" on their assigned travel day, whereas 10% of the sample reported visiting eight or more locations. The highest percentage of people (26.5%) reported going to three different locations on their assigned travel day.

¹ The survey sample for each of the five counties was drawn disproportionate to the true population distributions among the counties. This sampling design was used to ensure that the counties with relatively small percentages of the total population would be adequately sampled. Davidson County was undersampled and the other four counties were oversampled. Therefore, weights are applied when data are used to represent the entire study area.

Trip Purposes and Related Activities

Most respondents started their travel logs while at home. A small percentage of respondents were at work or traveling at the time of the travel log start (i.e., 3:00 am).

Table 2
Location of Travel Log Start

Place 1	Frequency	Percent
Home	4355	94.0%
Work	69	1.5%
School	6	0.1%
Other Place	206	4.4%
Total	4635	100.0%

Note: Data are weighted by county to reflect population parameters.

All household members age 5 and older were asked to record all activities conducted over a one-day period. When respondents went someplace other than their home, they were asked to write the exact location, note what they were doing, and indicate their arrival and departure times. The total number of activities reported was 34,821 activities. More than half of activities reported on the assigned travel days were activities done at home (assumes "sleep" in at home). In terms of "out of home activities", the most frequently named activities were work, eat meals, drop off/pick up someone, and shop.

Table 3
Reported Activities

Activity	Frequency	Percentage	Cumulative Percent
Other activities at home	10951	31.4%	31.4%
Sleep	9104	26.1%	57.5%
Work at regular jobs	2730	7.8%	65.3%
Eat meals away from home	2330	6.7%	72.0%
Drop off/pick up someone	1903	5.5%	77.5%
Shop	1901	5.5%	83.0%
Other family or personal business	1335	3.8%	86.8%
School at regular place	1161	3.3%	90.1%
Social/recreational/entertainment	925	2.7%	92.8%
Visit friends/relatives	754	2.2%	95.0%
Work activity at other place	785	2.3%	97.3%
Doctors/dentists/other professionals	278	0.8%	98.1%
Religious or civic	231	0.7%	98.8%
Other activities not at home	183	0.5%	99.3%
School activity at other place	145	0.4%	99.7%
Work at home	105	0.3%	100.0%
Total Activities	34543	100.0%	--

Note: Data are not weighted and reflect sample estimates. Activity was a multiple value item because respondents could record more than one activity at a single location. Many respondents record two to four activities per location. Cumulative does not total 100% due to rounding.

Of these activities, 16,388 involved travel. Trip rates and trip purposes were coded from the activities above that were associated with a change in location. Most respondents gave as their trip purpose (i.e.,

coded from the activity data) "going home." Second to this response, respondents' most frequent trip purpose was shopping. These percentages differ considerably from those reported in 1959. In this latter survey, work was the most frequently trip purpose.

Table 4
Activity/Trip Purpose

Activity/Trip Purpose	1998 Activities/Trips	1998 "Non-Home" Activities/Trips	1959 Trips
Home	57.6%	N/A	N/A
Work	10.4%	24.6%	29.4%
Personal Business	4.6%	10.9%	8.8%
Shopping	12.3%*	28.9%	16.3%
Visiting	2.2%	5.3%	14.0%
Recreational	2.5%	5.9%	9.7%
School	3.6%	8.4%	7.7%
Miscellaneous	6.8%*	16.0%	14.1%
Total Percent	100.0%	100.0%	100.0%
Total Activities/Trips	30,519	12,938	N/A

Note: For 1998 data, shopping includes eating meals away from home. Miscellaneous includes drop off/pick up someone and religious/civic.. Data are weighted by county to reflect population parameters.

Most of the trip segments picked up by the travel logs were home to "other place". Other place includes stores, restaurants, friends' homes, doctors and other professional offices.

Table 5
Trip "Segment" Types

Trip Type	All Counties	Davidson	Rutherford	Sumner	Williamson	Wilson
Home-Based to Work	11.6%	11.2%	13.2%	11.8%	11.2%	13.1%
Home-Based to School	5.2%	5.3%	7.9%	8.3%	8.6%	8.2%
Home-Based to Other	51.9%	52.1%	54.3%	51.7%	49.6%	48.8%
Non-Home-Based to Work, School, Other	30.1%	31.4%	24.6%	28.3%	30.6%	29.9%
Total Percent	100.0%	100.0%	100.0%	100.0%	100.0%	100.1%
Total Trip Segments	18,006	10,368	2274	2087	2437	840

Note: Trip segments are defined as a change from one location to another. This table does not reflect trip chains. All county data are weighted by county to reflect population parameters. Data for individual counties are not weighted and reflect sample estimates.

Mode of Travel

A total of 16,388 trips were associated with a transportation mode. Virtually all of these trips were made by auto. Of those persons using auto, 69% used parking away from home. Most persons (87%) parked in parking lots, compared to on-street parking (10%) or garage parking (3%).

Table 6
Mode of Travel
(n= 16,388)

Mode	Percent
Auto	93.3%
School Bus	4.0%
Walk	1.6%
Carpool	0.2%
Vanpool	0.2%
MTA/RTA Bus Line	0.2%
Private Bus Line	0.2%
Bike	0.1%
Other	0.2%
Total Trips	100.0%

Note: Data are weighted by county to reflect population parameters.

When the percentages for school bus, carpool, vanpool, MTA/RTA bus or private line are combined (4.8%), the resulting percentage is comparable to that found for all telephone contacts in answer to the question: Do you use any local bus service, commuter bus service, private bus service or van pool on a regular basis? Four percent (4%) of respondents answered yes to this question. Of these persons, 42% said they used local bus service, commuter bus service, private bus service or van pool once per week; 31% said 5 or more times per week; and 21% said 2-4 times per week. Seven percent of households for which travel logs were completed used transit on their assigned travel day.

Of persons who used transit, 53% were age 24 and under; 2% were between the ages of 25 and 34, 16% were between 35 and 44, 13% were between 45 and 54, and 15% were age 55 and older.

The mode used for travel did vary by the trip purpose. These differences can be associated with the ages of respondents (e.g., School as significant purpose for Transit and School Bus Passengers). However, they also indicate mode preferences.

Table 7
Trip Purpose by Mode of Travel

Trip Purpose	Auto Drivers (n=15,467)	Vehicle Passengers (n=4,550)	Non-Motorized Means (n=370)	Transit and School Bus Passengers (n=1,103)
Home	41.6%	42.8%	40.3%	47.0%
Work	17.8%	4.4%	11.5%	3.7%
Personal Business	6.4%	6.4%	8.2%	1.7%
Shop	16.7%	19.2%	16.0%	13.3%
Visit	2.8%	3.6%	8.4%	1.2%
Recreational	2.9%	4.8%	4.0%	1.6%
School	1.6%	10.4%	7.5%	28.9%
Miscellaneous	10.3%	8.3%	4.0%	2.7%
Total Trips	100.0%	100.0%	100.9%	100.0%

Note: Shopping includes eating meals away from home. Miscellaneous includes drop off/pick up someone and religious/civic. Data are weighted by county to reflect population parameters.

Job opportunities in the five-county region are centered in Davidson County. Shopping locations are dispersed in all counties. Residents of Wilson County make more trips to Davidson County to work and shop than those in Williamson, Sumner, or Rutherford Counties. Rutherford County residents tend to stay near at home for work and shopping opportunities.

Table 8
Cross-County Travel for Work

Live in/	Work in Davidson	Work in Rutherford	Work in Sumner	Work in Williamson	Work in Wilson	Other	Total
Davidson	87.1%	2.3%	0.9%	6.5%	0.6%	2.6%	100.0%
Rutherford	25.9%	66.8%	0.0%	2.9%	1.0%	3.5%	100.1%
Sumner	44.4%	1.1%	47.6%	2.0%	0.3%	4.6%	100.0%
Williamson	42.1%	2.0%	0.0%	48.2%	0.5%	7.1%	99.9%
Wilson	77.4%	1.9%	1.1%	1.7%	16.8%	1.1%	100.0%

Note: Percentages may not add up to 100% due to rounding. Data are weighted by county to reflect population parameters.

Table 9
Cross-County Travel for Shopping

Live in/	Shop in Davidson	Shop in Rutherford	Shop in Sumner	Shop in Williamson	Shop in Wilson	Other	Total
Davidson	91.0%	2.0%	0.4%	4.3%	0.1%	2.2%	100.0%
Rutherford	13.3%	81.0%	0.0%	2.4%	0.7%	2.7%	100.1%
Sumner	28.9%	0.2%	64.7%	1.8%	0.3%	4.1%	100.0%
Williamson	23.7%	0.8%	0.0%	70.4%	0.0%	5.0%	99.9%
Wilson	68.2%	0.6%	0.6%	1.2%	27.4%	2.1%	100.1%

Note: Percentages may not add up to 100% due to rounding. Data are weighted by county to reflect population parameters.

EXTERNAL/INTERNAL TRAVEL WITHIN THE GREATER NASHVILLE REGION

Trip Types

According to Tennessee Department of Transportation (TDOT) counts on data collection days, approximately 317,520 vehicles crossed the study area at one of 16 external survey sites. (See technical report for the External Travel Behavior Survey for details on data collection sites, days, and times.) Sixty-five percent (65%) of this traffic was captured on one of the six interstate sites surveyed rather than on the surface streets. The external survey data collection effort captured information from a sample of these vehicles' drivers.

Approximately 35% of the vehicles surveyed were passing through the study area, whereas 65% had either their origin or destination within the study area (i.e., were local). This latter percentage is lower than the 77% reported in 1959. The difference is likely due to increased pass-through travel via interstate routes. Slightly more than one-third (36%) of external survey respondents reported beginning and ending their "sampled" trip outside of the Nashville area (e.g., pass-through travelers). The "home" states of respondents in the external survey were captured via their vehicle license plate. The highest percentage of respondents originated in Tennessee (49%), followed by Kentucky (7%), Florida (2%), Alabama (2%), Georgia (1%), and Missouri (1%). Tennessee was the most often cited destination (42%), followed by Kentucky (7%), Florida (4%), Georgia (2%), and Alabama (1%).

Table 10
External Travel Survey Trips by Type
 (All Sites)

Trip Type	Number	Percentage
Origin and Destination Outside of Nashville Area (PASS THROUGH)	430	36.0%
Origin and Destination within Nashville Area (LOCAL)	207	17.3%
Origin Outside Nashville Area (EXTERNAL/INTERNAL)	297	24.8%
Destination Outside Nashville Area (INTERNAL/ EXTERNAL)	262	21.9%
Total	1,196	100.0%

Note: Nashville Study Area was defined for survey respondents as Davidson, Rutherford, Sumner, Williamson, or Wilson counties. Data are unweighted and reflect sample estimates. Columns do not total 100% due to rounding.

The major destination cities of vehicles passing through the Nashville study area were: Chattanooga, Memphis, and Jackson.

Based on survey responses, the majority of the pass-through traffic was recorded at the following external sites:

- 22.4% at I-24 East
- 15.8% at I-40 East
- 14.9% at I-40 West.

This was not the first time most of the pass-through travelers crossed the Nashville area study boundary. Nearly one-fourth of this traffic travels through the Nashville study area several times per week.

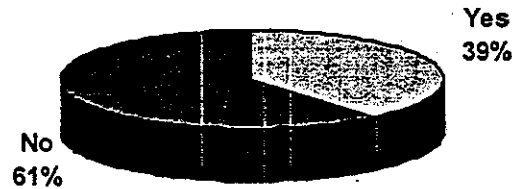
Table 11
Frequency of External Travel Survey Trips

Frequency/ Trip Type	Origin/Destination Within Nashville Study Area	Origin Outside Nashville Study Area	Destination Outside Nashville Study Area	Origin/Destination Outside Nashville Study Area
First Time	4.3%	8.8%	7.6%	11.2%
Less than 1 day/ month	23.2%	22.2%	23.7%	46.0%
1-3 days per month	19.8%	22.9%	19.1%	17.9%
1-3 days per week	7.2%	6.4%	9.5%	4.9%
2-3 days per week	17.9%	19.5%	11.8%	10.5%
4 or more days per week	22.7%	16.5%	26.3%	7.4%
Refused	4.8%	3.7%	1.9%	2.1%
Total Percent	100.0%	100.0%	100.0%	100.0%
Total Respondents	207	297	262	430

Note: Data are unweighted and reflect sample estimates.

The majority of respondents, whose trips ended outside of the Nashville area, did not make short stops of under ½ hour in the Nashville area. On the other hand, nearly half of the respondents whose license plates were captured at the survey sites at I-65 South, I-24 East, and I-40 West reported that they did make short stops in the Nashville area.

Figure 1
External/Internal Travel with Stops in the Nashville Area



Trip Purpose

Regardless of the trip type, the most prevalent purpose for travel across the study area boundary was work.

Table 12
External/Internal Trip Purpose

Trip Purpose	Number	Percentage
Work	491	41.1%
Shopping	167	11.4%
Home	166	11.3%
Sightseeing	116	7.9%
Errand	57	3.9%
School	55	3.7%
Dining	47	3.9%
Entertainment	34	2.3%
Other	336	22.9%
Total	1469	100.0%

Note: Data are unweighted and reflect sample estimates. Data are based on a multiple value item. Respondents could provide more than one purpose.

Table 13
External/Internal Trip Purpose by Trip Type

Purpose/ Trip Type	Origin/Destination Within Nashville Study Area	Origin Outside Nashville Study Area	Destination Outside Nashville Study Area	Origin/Destination Outside Nashville Study Area
Work	46.4%	40.1%	49.2%	34.2%
Home	12.6%	11.1%	21.8%	11.6%
Shopping	22.2%	15.2%	8.4%	12.6%
Sightseeing/ Vacation	4.8%	6.7%	4.2%	17.4%
Errand	13.5%	1.7%	2.7%	4.0%
School	5.3%	5.7%	5.3%	3.0%
Dining	4.3%	6.7%	2.7%	2.6%
Entertainment	2.4%	5.1%	1.1%	2.6%
Other	20.3%	33.3%	24.0%	30.7%
Total Percent	100.0%	100.0%	100.0%	100.0%
Total Respondents	207	297	262	430

DETERMINANTS OF TRAVEL: HOUSEHOLD CHARACTERISTICS

Personal travel behavior is influenced by cultural, technological, demographic, economic, and geographic factors. Household characteristics impacted the number and type of trips reported in the 1998 Travel Behavior Study. For example, income not only serves as a constraint on travel expenditures, but strongly influences locational choices. Location (whether rural, suburban, or central city) determines the proximity of possible destinations and the travel mode options available. In this section, we explore the relationships among household demographics, income, location, vehicle ownership, and travel behavior.

Household Income

The reported household incomes varied considerably among the counties in the study area. Respondents in Davidson and Rutherford counties reported, on average, significantly lower total annual household incomes than those in Williamson County.

Table 14
Household Income by County

County/Income	Less than \$25,000	\$25,000 to \$74,999	More than \$75,000	Refused	Total
Davidson	21%	47%	14%	18%	100%
Rutherford	21%	49%	12%	18%	100%
Sumner	18%	47%	15%	20%	101%
Williamson	9%	43%	27%	22%	100%
Wilson	16%	50%	16%	18%	100%

Note: Data are not weighted to reflect population parameters, and reflect sample statistics only.

The household income distributions obtained for the entire sample differed from Census data. The Nashville Household Travel Survey may have resulted in an undercount of low-income households. The potential for an undercount of low-income households cannot be clearly defined because 19% of all households interviewed 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.

Household income is positively associated with increased trips.

Table 15
Household Trip Rates by Household Income

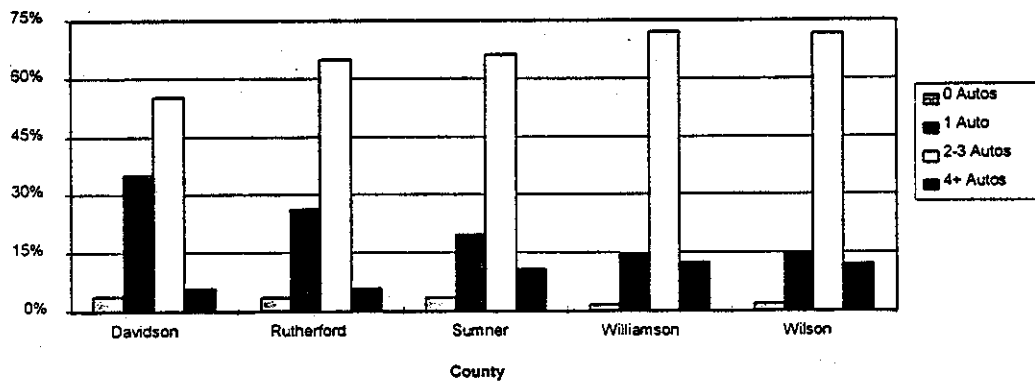
Household Income	Trip Rate
Less than \$10,000	4.10
\$10,000 - \$14,999	5.32
\$15,000 - \$24,999	5.65
\$25,000 - \$34,999	7.50
\$35,000 - \$49,999	9.13
\$50,000 - \$74,999	10.18
\$75,000 - \$99,999	10.88
\$100,000 - \$124,999	10.73
\$125,000 - \$149,999	11.88
\$150,000 and Greater	10.88

Highest household trip rates by county were reported in Williamson and Sumner Counties which suggests that frequency of travel is influenced by a complex set of factors of which household income is only one.

Vehicle Availability

Four percent (4%) of the sample reported being without any vehicles. Respondents in Davidson County reported the fewest number of vehicles per household, whereas those in Williamson and Wilson Counties reported the highest number of vehicles per household.

**Figure 2
Household Vehicles by County**



The sample data pertaining to vehicle availability was comparable to the 1990 Census data.

Virtually all vehicles (96%) "belonged" to (i.e., were owned or leased) the household. The vehicles available to respondents were relatively new. The median vehicle year for all counties was 1992. Vehicles in Williamson County were slightly newer (median of 1993). Respondents favored U.S. vehicle makes. Ford was the more frequently cited vehicle make (18%), followed by Chevrolet (15%) and Toyota (8%).

Of the nearly 3% of vehicles which were employer provided, most (32%) were located in Davidson County. Of the other counties in the study area, a fairly high percentage of Williamson residents (21%) also reported employer-provided vehicles.

**Table 16
Type of Vehicle Ownership**

Ownership Status	Total Vehicles	Percent of Total
Household owned/leased	4142	96.2%
Employer provided	111	2.6%
Borrowed from friend/relative	8	0.2%
Other	4	0.1%
Don't Know/Refused	40	0.9%
Total Vehicles	4305	100.0%

Note: Data are weighted by county to reflect population parameters.

Five percent of all vehicles sampled had a disability plate, whereas four percent of all persons reported some form of mobility impairment. As might be expected, trip rates for persons with mobility impairments were lower (2.26 per person) than those for persons without impairments (3.37 per person).

Table 17
Percentage of Vehicles with Disability Plates

Disability Plates	Number	Percent
Yes	216	5.0%
No	4053	94.1%
Don't Know/Refused	37	0.9%
Total Vehicles	4306	100.0%

Note: Data are weighted by county to reflect population parameters.

Vehicle ownership exhibited a strong influence on household trip rates. For example, households with zero vehicles reported an average trip rate of 3.55 per household, while households with four or more vehicles reported 13.01 trips per household. As the number of households in the Nashville area grows, the number of vehicles (and the associated travel) will only increase. The Nashville area can expect a particularly heavy impact as the area attracts more white collar, higher paying jobs. As the following table indicates, the number of vehicles per household increased as the household income increased. Forty-five percent (45%) of households without a vehicle reported incomes of less of \$10,000 compared to 4% of households with a vehicle. The majority of households regardless of income reported a minimum of one vehicle.

Table 18
Vehicles Available per Household by Household Income

Vehicles/ Income	Less than \$15,000	\$15,000 - \$24,999	\$25,000 - \$34,999	\$35,000 - \$49,999	\$50,000 - \$74,999	\$75,000 or More
0 Vehicles	16.0%	4.8%	0.8%	0.5%	1.2%	0.0%
1 Vehicle	62.2%	51.6%	47.6%	26.6%	12.7%	7.1%
2 Vehicles	16.6%	33.8%	37.7%	49.3%	50.7%	55.2%
3 Vehicles	4.6%	7.7%	11.5%	16.2%	26.0%	21.7%
4+ Vehicles	0.6%	2.2%	2.4%	7.4%	9.4%	16.1%
Total	99.9%	100.1%	100.0	100.0%	100.0%	100.1%
Number of Households	182	196	264	361	317	303
Vehicles per Household	1.12	1.52	1.67	2.08	2.30	2.56

Note: 421 people refused or did not respond to the income question, therefore they are left off of this table. Data are weighted by county to reflect population parameters.

The number of vehicles per household increased also as the number of persons in the household increased. In the majority of one-person and two-person households, there was at least one vehicle available per household member.

Table 19
Vehicles Available per Household by Household Size

Vehicles/ Household Size	1-Person	2-Persons	3 Persons	4 Persons	5+-Persons
0 Vehicles	8.4%	2.1%	1.8%	1.8%	1.0%
1 Vehicle	78.5%	20.5%	13.7%	7.5%	6.3%
2 Vehicles	9.0%	59.5%	45.1%	55.1%	42.7%
3 Vehicles	2.8%	13.6%	30.1%	22.3%	24.6%
4+ Vehicles	1.3%	4.3%	9.4%	13.4%	25.4%
Total	100.0%	100.0%	100.01	100.0%	100.0%
Number of Households	458	762	353	295	132
Vehicles per Household	1.12	2.00	2.34	2.44	2.77

Note: Data are weighted by county to reflect population parameters.

Not unexpectedly, trips rates were associated with the number of vehicles available to the household and the number of persons in the household. The amount of travel that households reported increased as the number of vehicles and the household size increased.

Table 20
Household Trip Rates by Number of Vehicles Available and Household Size

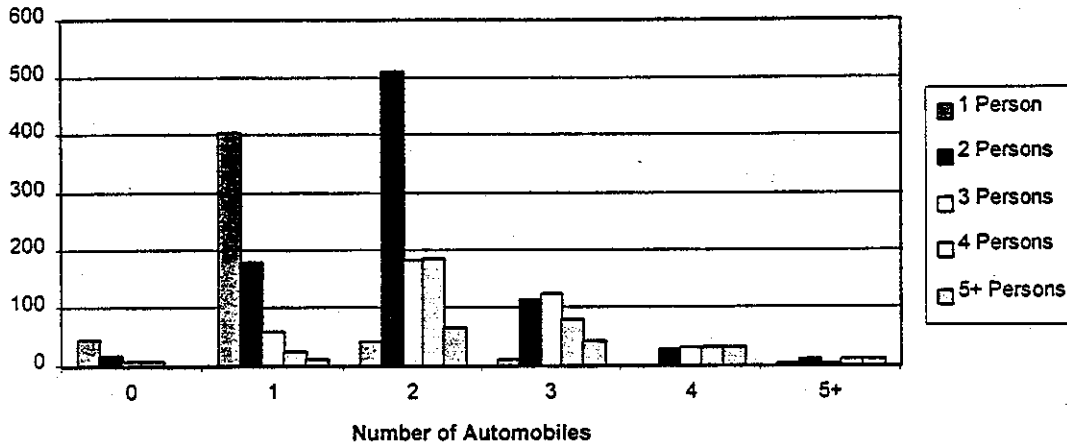
Vehicles /Household Size	All Households	1-Person	2-Persons	3-Persons	4+-Persons
0 Autos	3.56	1.04	2.45	8.74	*
1 Auto	5.12	3.71	5.74	8.98	12.49
2 Autos	9.17	3.46	6.49	9.71	15.41
3 Autos	10.0	3.66	6.93	9.69	14.41
4+ Autos	13.03	3.18	8.39	11.22	16.88

*This cell contained only 7 households that reported a minimum of 8 trips and a maximum of 22 trips.

Note: Data are weighted by county to reflect population parameters.

Three percent of all households reported zero vehicles available, and 30% of households reported the availability of one vehicle. Virtually all of the zero vehicle households and the majority of 1-vehicle households were one-person households. The majority of 2-vehicle households were 2-person households. However, this pattern changes among 3+ vehicle households, in which the multiple vehicles are likely to be owned by households of various sizes.

Figure 3
Vehicles Available per Household by Household Size

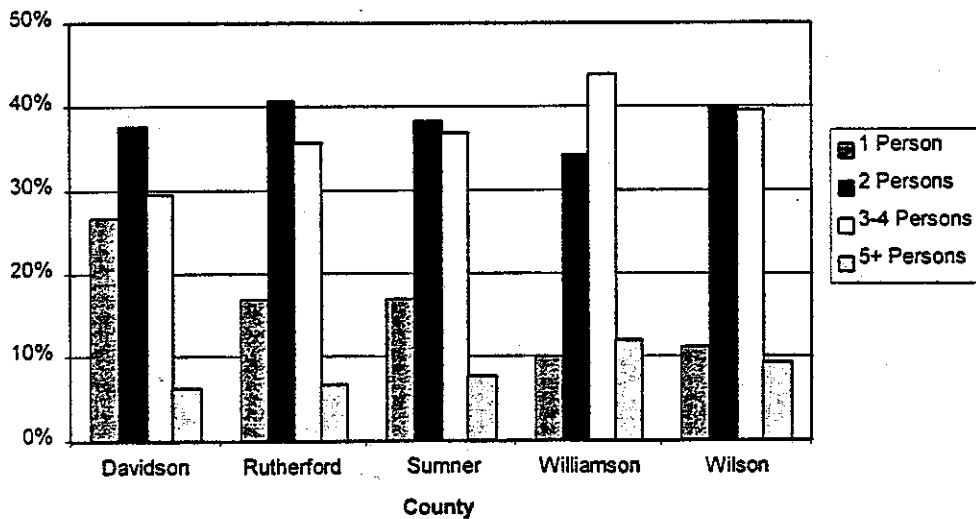


Note: Data are weighted by county to reflect population parameters.

Household Size

A considerably greater percentage of 1-person households in the study were located in Davidson County than were located in the other four counties. The lowest percentages of 1-person households were located in Williamson and Wilson Counties. These latter two counties, on the other hand, reported significantly more larger households than Davidson, Rutherford, or Sumner Counties.

Figure 4
Household Size by County



The number of trips per household increased as the household size increased, but the number of trips per persons was not positively associated with household size. People in one-person households made more trips than the individual persons in households with two or more people. The one-person households in Rutherford County made significantly more trips than did those in Sumner or Williamson Counties. At the same time, the 3 person households in Williamson County made significantly more trips than comparable households in other counties.

Table 21
Average Household Trip Rate by Household Size

Household Size	5-Counties	Davidson	Rutherford	Sumner	Williamson	Wilson
One	3.46	3.52	3.77	2.75	3.03	3.41
Two	6.39	6.57	5.65	6.55	6.04	6.32
Three	9.73	9.85	8.83	9.69	10.60	9.09
Four	13.61	13.88	12.25	13.98	14.05	13.29
Five or more	18.85	19.94	17.63	19.16	18.88	14.27

Note: Data for all 5-counties are weighted to represent population parameters. Data for individual counties are unweighted and reflect sample statistics. There were no households in Wilson county that reported six or more members.

DETERMINANTS OF TRAVEL: PERSON CHARACTERISTICS

Demographic characteristics of people bear particularly strong relationships to travel behavior because of the associations between demographics, lifecycle stage, roles and functions in society, and resulting activity patterns. Because almost all persons of driving age in the U.S. hold drivers' licenses, the population's age structure is directly related to levels of vehicle ownership and vehicle use.

Gender

Reflecting national averages, slightly more than half (51%) of the study sample was female. The Nashville Metropolitan Statistical Area reports a gender distribution of 48% male and 52% female. Rutherford County was unusual in that slightly more than half of that sample was male. Females recorded a slightly higher trip rate than males but the difference was not statistically significant.

Table 22
Gender by County

Gender	Total	Davidson	Rutherford	Sumner	Williamson	Wilson
Male	48.4%	47.6%	51.2%	49.3%	48.3%	49.3%
Female	51.6%	52.4%	48.8%	50.7%	51.7%	50.7%

Table 23
Trip Rates by Gender

Gender	1998 Nashville Trip Rates	1990 NPTS* Trip Rates	1983 NPTS* Trip Rates
Male	3.42	3.03	2.92
Female	3.62	3.12	2.86

*National Personal Transportation Survey

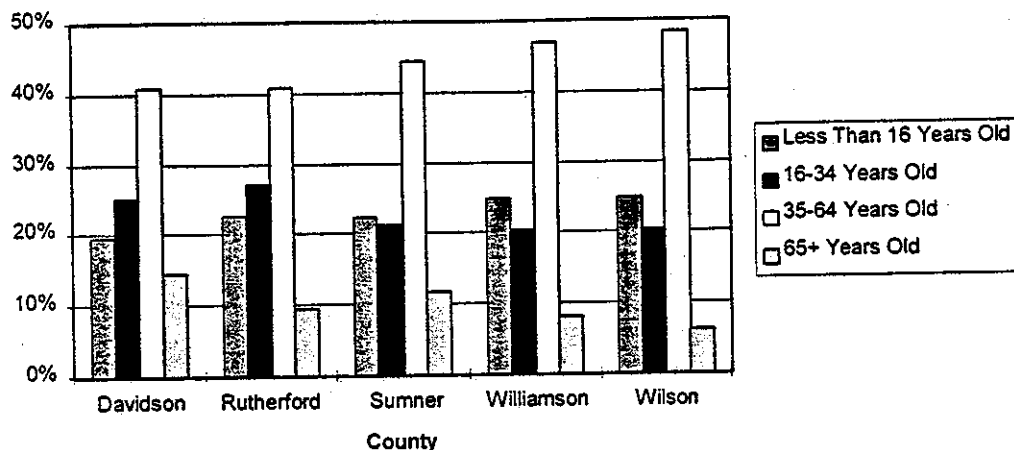
Data are weighted by county to reflect population parameters.

Age

Respondents from Davidson and Sumner Counties were older on average than persons in the other four counties. Rutherford County had the youngest respondents on average. Mean ages by county were:

- 37.77 in Davidson
- 37.28 in Sumner
- 34.84 in Wilson
- 34.67 in Williamson
- 34.15 in Rutherford.

Figure 5
Household Members Ages by County



Note: There were 91 persons who did not report age.

Trip rates were influenced by age. The lowest trips rates were recorded at the lower and upper ends of the age ranges. Persons in early middle age (35 – 44) reported the highest trip rates.

Table 24
Trip Rates by Age

1998 Nashville Survey Age Categories	Nashville 1998 Trip Rate	NPTS* Age Categories	1990 NPTS* Trip Rate	1983 NPTS* Trip Rates
5 - 15	3.12	5-15	2.59	2.29
16 - 24	3.28	16-19	3.46	3.31
25 - 34	3.69	20-29	3.58	3.43
35 - 44	4.34	30-39	3.66	3.47
45 - 54	3.76	40-49	3.40	3.12
55 - 64	3.33	50-59	2.89	2.80
65 - 74	3.14	60-64	2.68	2.39
75+	2.22	65+	1.95	1.83

*National Personal Transportation Survey

Note: Data are weighted by county to reflect population parameters.

Earlier tables indicated that trip rates were strongly related to number of vehicles available. The data suggest that persons between the ages of 5 and 16 and age 65 and older were more likely to use non-motorized and transit or school bus as modes of transportation. The reliance on non-motorized and transit may depress trip rates among these age groups.

Most of the people who did not travel on their assigned travel day were age 65 and older. The other age groups who reported no travel were aged 45 – 54. The main reason provided as to why these latter persons did not travel was “sickness.”

**Table 25
Zero Trip Breakdown Per Person**

Age	Number of Persons	Percent of Total Persons	Number of Zero Trips	Percent of Total Zero Trips
5-15	813	16.4%	60	7.3%
16-24	523	10.5%	82	10.0%
25-34	729	14.7%	98	11.9%
35-44	969	19.5%	104	12.7%
45-54	808	16.3%	134	16.3%
55-64	474	9.5%	98	12.0%
65-74	434	8.7%	143	17.4%
75+	221	4.5%	103	12.5%
Total	4972	100.1%	822	100.0%

Note: There were 91 number of people who did not report their age. Data are weighted by county to reflect population parameters.

Licensed Drivers

Given the association between vehicle availability and trip rate, more travel is expected of persons who are licensed to drive. Trip rate for licensed drivers was 3.72 trips per person compared to 1.84 trips per person for unlicensed drivers. On the other hand, persons without a license were no more likely to use transit than were persons with a license. Most respondents (73%) who used MTA/RTA bus or private bus for one or more of their reported trips were licensed to drive.

On average, 94% of adults had a driver’s license. The percentage of female (adults) licensed to drive was 92%, while 94% of males were licensed to drive.

**Table 26
Licensed Drivers among those Ages 15 and Older**

License Status	Completed Percentage (n=4159)
Licensed	94.0%
Non-Licensed	5.9%
Refused	0.1%
Total	100.0%

Note: Percent may not total 100 due to rounding. Data are weighted by county to reflect population parameters.

Non-licensed individuals tend to be young adults (age 16 – 24) or older adults (age 75+). The early middle age range (35 – 44) reported the highest percentage of licensed drivers.

Table 27
Licensed Drivers by Age

Age	Licensed	Non-Licensed
16 - 24	84.3%	15.7%
25 - 34	96.0%	4.0%
35 - 44	97.7%	2.3%
45 - 54	97.1%	2.9%
55 - 64	97.1%	2.9%
65 - 74	91.7%	8.3%
75+	81.7%	18.3%

Note: Data are weighted by county to reflect population parameters.

The proportion of licensed drivers in the adult population increased as household income increased. For example, 96% of adults in households of more than \$75,000 had a driver's license, while only 85% of adults in households with incomes less than \$25,000 had a license.

Table 28
Licensed Drivers by Household Income

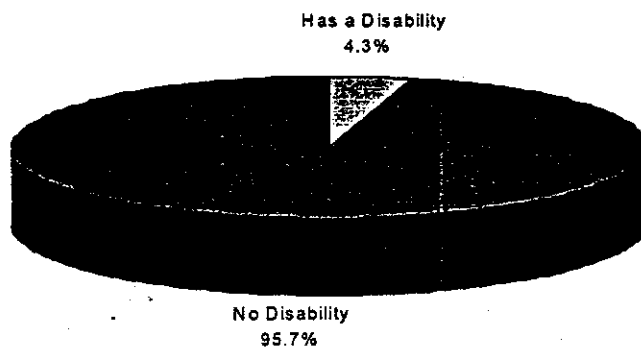
Income	Licensed	Non-Licensed
Less than \$25,000	85.3%	14.7%
\$25,000 - \$74,999	95.4%	4.6%
More than \$75,000	96.0%	4.0%

Note: Data are weighted by county to reflect population parameters.

Disability Status

A very small percent (4%) of the sample reported a disability that limits the type of transportation he/she can use.

Figure 6
Persons with Mobility Impairment



Employment Factors

As expected, employment has a significant influence on the number of trips made. Households with zero workers made significantly fewer trips than those with 1 or more workers. The trip rate for employed persons was significantly higher than the trip rate for unemployed persons (i.e., 3.8 and 3.2, respectively).

Table 29
Average Household Trip Rates by Number of Workers

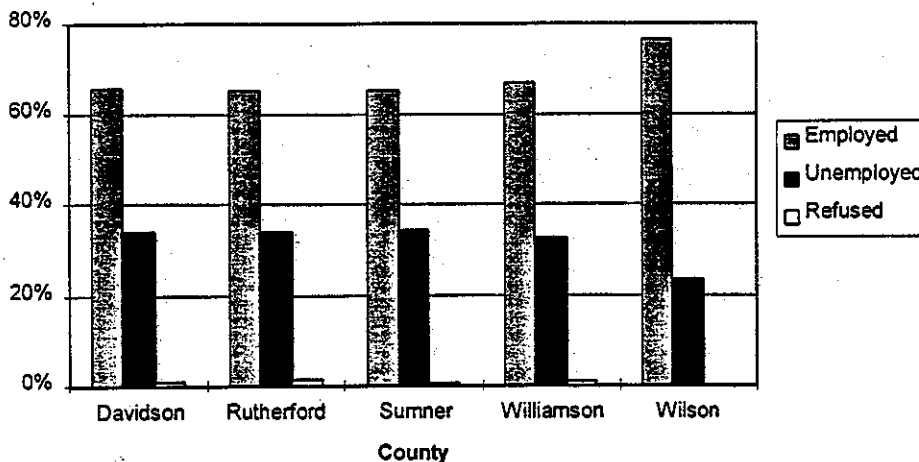
Number of Workers in Household	5-Counties	Davidson	Rutherford	Sumner	Williamson	Wilson
0 Workers	4.54	4.62	4.44	4.31	4.42	4.50
1 Worker	7.35	6.92	7.59	8.27	9.44	7.33
2 Workers	10.02	9.91	9.08	10.66	11.86	9.22
3 Workers	12.94	13.00	13.07	11.70	13.04	13.61
4+ Workers	22.68	*	*	*	15.43	*

*These cells have 6 or fewer households, thus, the statistics are not reported.

Note: 5-county data are weighted by county to reflect population parameters. Data are not weighted for individual counties but are sample statistics.

The percentage of employed persons recorded in Wilson County was significantly higher than the other four counties. The remaining four counties were comparable in the number of persons who reported being employed part-time or full-time.

Figure 7
Employment Status by County



Note: Data are for persons age 16 and older. Data are not weighted but reflect sample statistics.

The number of workers in the household influenced both the reported household income and the number of vehicles in the household. Both income and vehicle ownership increased with the number of workers. Thus, on average, respondents in Wilson County reported the greatest numbers of vehicles per household.

Table 30
Workers per Household by Vehicles Available

Workers/Vehicles	0 Vehicles	1 Vehicle	2 Vehicles	3 Vehicles	4+ Vehicles
1 Worker	54.4%	82.6%	37.1%	31.1%	26.1%
2 Workers	45.6%	16.2%	60.7%	51.6%	37.0%
3 Workers	0.0%	.8%	2.1%	16.1%	30.5%
4 or more Workers	0.0%	.4%	.1%	1.3%	6.4%
Total	100.0%	100.0%	100.0%	100.0%	100.0%
Total Households	25	405	742	295	139

Note: Columns do not total 100% due to rounding. Data are weighted by county to reflect population parameters.

Table 31
Household Income by Number of Workers

Income/Workers	1 Worker	2 Workers	3+ Workers
Less than \$15,000	10.9%	3.1%	2.6%
\$15,000-\$24,999	15.3%	6.3%	3.4%
\$25,000-\$34,999	20.0%	13.8%	5.3%
\$35,000-\$49,999	24.9%	24.0%	18.8%
\$50,000-\$74,999	16.6%	24.1%	37.8%
\$75,000 or More	12.3%	28.7%	32.1%
Total	100.0%	100.0%	100.0%
Total Households	629	612	109

Note: 422 households did not provide income and 288 households did not provide work status. Columns do not total 100% due to rounding. Data are weighted by county to reflect population parameters.

As the number of persons in the household increases (typically as family unit size increases), the number of workers in the household increases. Larger household sizes in the study area mean more workers in the area and therefore, greater numbers of people traveling.

Table 32
Workers per Household by Household Size

Persons per Household/ Workers	Households w/ 1 Worker	Households w/ 2 Workers	Households w/ 3+ Workers
1 Person in Household	35.8%	--	--
2 Persons in Household	33.6%	45.6%	--
3 Persons in Household	13.9%	25.0%	38.1%
4 Persons in Household	10.4%	22.5%	35.2%
5+ Persons in Household	6.2%	6.9%	26.7%
Total	100.0%	100.0%	100.0%
Total Households	751	730	124

Note: Columns do not total 100% due to rounding. Data are weighted by county to reflect population parameters.

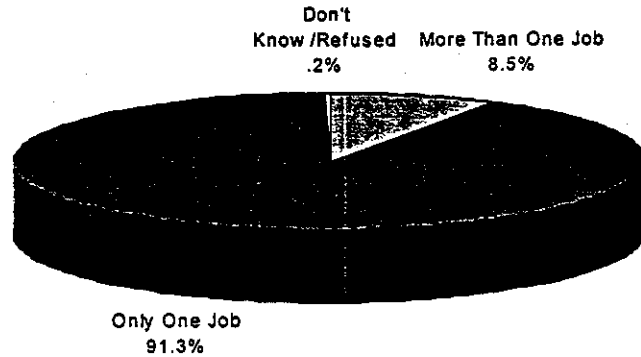
On average, workers in the five-county planning area reported working more than 5 days per week. This factor may contribute to the high trips rates found in the Nashville area when compared to the national average as measured in the NPTS. Persons in Sumner and Davidson Counties work more days per week than workers in the other counties.

Table 33
Average Number of Work Days by County

County	Average Number of Work Days
Davidson	6.35
Rutherford	5.69
Sumner	6.70
Williamson	5.58
Wilson	5.75

While many workers appear to be working more than 5 days per week, only a small percentage (8%) work more than one job. Workers in Davidson and Wilson Counties (9%) were slightly more likely to work more than one job than those in Rutherford (8%), Williamson (8%) and Sumner (7%).

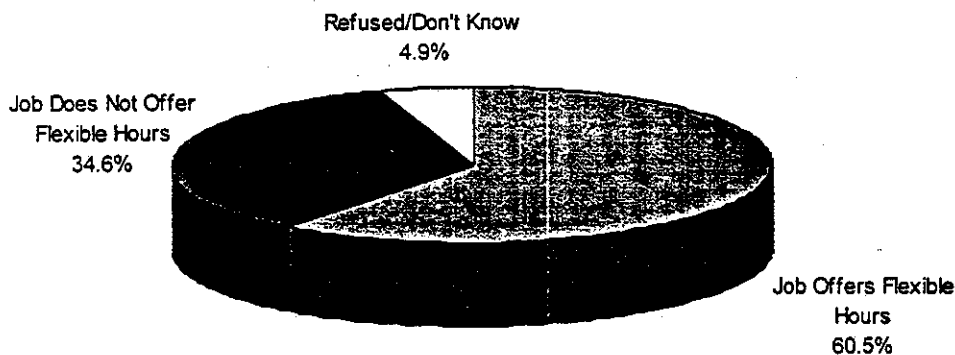
Figure 8
Workers with More than One Job



Note: Data are for persons age 16 and older. Data are weighted by county to reflect population parameters.

Reflecting the changing workplace, most workers (60%) indicated that their employer allows them to be flexible in their daily schedule as long as they work the required hours. Persons with job flexibility reported a slightly higher trip rate (4.1) than those with no job flexibility (3.7).

Figure 9
Workers with Flexible Job Schedules

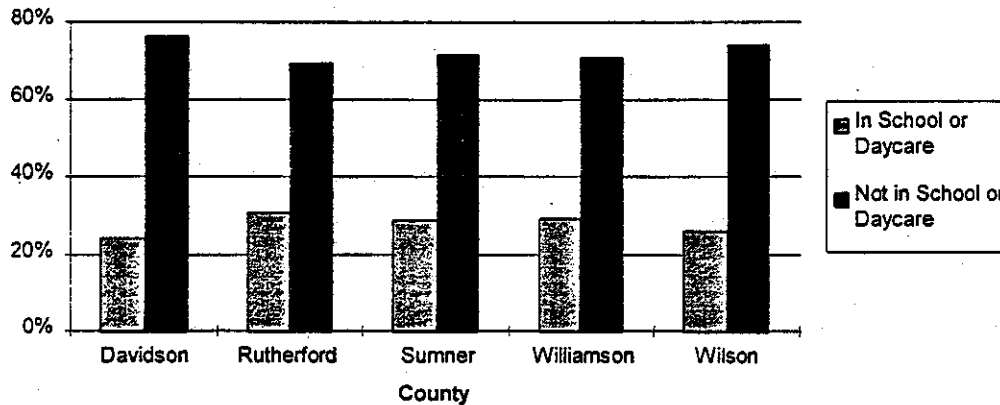


Note: Data are for persons age 16 and older. Data are weighted by county to reflect population parameters.

Education Factors

About one-fourth of the respondents in the study were enrolled in some type of educational institution. A greater percentage of persons in Rutherford County were enrolled in an educational institution than in the other four counties.

Figure 10
Student Status by County



Note: Data are for persons age 3 and older. Data are not weighted and reflect sample statistics.

Adults with children in grades K through 12 tend to travel more often as they transport their children to and from school and school-related activities. Households in Wilson County reported a significantly greater percentage of children in grades K-6 than those in other counties. On the other hand, households in Sumner and Williamson Counties reported significantly more children in grades 7 – 12 than other counties. Households in Williamson and Sumner Counties reported the highest trip rates per household (12.5 and 11.1, respectively) which may be related to the actions of parents of children in grades 7 – 12.

The largest percentage by county of college or university students was reported in Rutherford County, due to the influence of Middle Tennessee State University.

Table 34
Type of School Attended

Type of School/County	Total Percent (n=1485)	Davidson County (n=541)	Rutherford County (n=237)	Sumner County (n=240)	Williamson County (n=317)	Wilson County (n=150)
Daycare	5.4%	5.7%	5.9%	6.3%	4.7%	3.3%
Pre-School	4.3%	5.4%	1.3%	1.3%	6.0%	6.7%
K-6	36.7%	36.8%	28.7%	37.1%	36.9%	48.0%
7-12	33.7%	29.9%	32.1%	38.8%	39.4%	30.0%
Vocational/Technical	1.0%	2.0%	0.4%	0.8%	0.3%	0.0%
College/ University	18.0%	19.2%	31.6%	15.0%	11.4%	10.7%
Adult School	0.9%	0.9%	0.0%	0.8%	1.3%	1.3%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: Data are for persons age 3 and older. Data for the total sample have been weighted by county to reflect population parameters. Data for individual counties have not been weighted and reflect sample estimates.

Lifecycle

As the data above demonstrate, lifecycle variables (like presence of children) may influence household trip rates. A variable was created that looked at the complex relationship among age, employment, and presence of children.

Table 35
Lifecycle Variable

Category	Age	Employed	Children
Younger Household* w/o Children	19 - 35	Working	No
Older Household w/o Children	36 and over	Working	No
Household with Children	19 and over	Working	Age 18 and younger
Retired Household	n/a	Retired	No

*These households can include roommates as well as married couples.

The presence of children increased the trip rates by nearly 100 percent. The highest trip rates were recorded by households with children (nearly double those of other households). Lowest trip rates were reported by households with retirees. Of non-retiree households without children, households with older persons reported more trips than those with younger persons.

Table 36
Average Household Trips Rate by Lifecycle

Lifecycle	5- Counties	Davidson	Rutherford	Sumner	Williamson	Wilson
Younger Household w/o children	5.30	5.44	4.44	4.70	6.65	6.00
Older Household w/o Children	6.21	6.11	5.89	6.08	7.09	6.75
Household with Children	12.64	12.60	11.86	13.38	13.71	11.65
Retired Household	4.99	5.11	4.63	5.07	4.98	4.33

Note: Data for the five counties have been weighted to reflect population parameters. Data for individual counties has not been weighted and reflect sample estimates.

CONCLUSION

As has happened nationally, the number of trips per person and per households has increased from 1959 to 1998. In 1959, work was the major reason to travel. However, since 1959, shopping and family personal business have become major reasons to travel. Trips that were classified as shopping and family personal business included errand-running trips, eating meals away from home, and the purchase of services such as dry-cleaning, hair cut and banking.

Households with two or more adults and with children ages 13 to 18 took more trips per household than any other type of household. This might be due to the extra-curricular activities that children in this age group are involved which require transporting the child to-and-from the activity.

The percentage of trips by various household income groups increased as the household income increased. On a per-household basis, an average household with an income greater than \$50,000 took two and a half times more trips than an average household with an income of less than \$10,000.

Licensed drivers in the age group 35-44 took more trips than persons in other age groups. With the population getting older, the number of individuals in this age group will only increase in future years.

Men took fewer trips than females. The increased participation of women in the labor force and in their greater responsibility for transporting children may have contributed to increased driving among women.

There are separate technical reports for detailed information on the survey methods that were used to generate the data and findings presented in this report.