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Trends in Commuting

TRAVEL INDICATORS AND TRENDS IN WASHINGTON STATE

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16. ABSTRACT

This review of travel indicators in Washington State aims to understand similarities and differences between the state and the nation and to detect changes or special conditions that need to be considered in the future. The work is intended to support general transportation policies and future state-level transportation plans.

None of the travel indicators reviewed strongly suggests that travel conditions in the state stand out in the national context. Two factors are prime in their association with travel demand: household income and development density. Stagnant income explains why the demand for car travel has slowed over the recent past, yet future demand for car travel may increase if the economy improves. On the other hand, demand could remain stable if development density continues to increase.

Residential and population densities are positively associated with demand for modes other than single-occupancy vehicle (SOV) travel. Living in more compact residential areas and in alternative housing types, and renting versus owning a home, also relate to lower demand for SOV travel.

Even at the aggregate level of national data, the Puget Sound region's transportation context differs from that of rural or other urbanized regions in the state. State policies need to recognize at least three different markets for transportation, which are found in rural, small town, and metropolitan areas.

Overall, Washington State needs to stay tuned to national projections about the likely impacts on travel demand and transportation of general economic trends, the slow down in household formation, growth in car ownership among new immigrants, an aging population with changing driving patterns, and population growth in densely populated areas --where transportation systems investments and land-use policies can affect future travel behavior.

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SUMMARY POWERPOINT PRESENTATION

A PowerPoint presentation titled *Washington State Travel Trends 1980-2001* highlights important findings. It is available electronically.

BACKGROUND

Purpose

The goal of this project was to better understand how Washington State travel indicators fare in relation to those from other states in the nation. The question is how similar or different is Washington State from others? A second goal was to review the state's travel indicators over time to detect changes or special conditions that need to be considered in the future. This work was intended to support the development of general transportation policies, as well as that of future state-level transportation plans.

Main travel indicators for the State of Washington were analyzed in relation to demographic and land use factors affecting travel behavior. Also addressed were trends in commuting and non-work travel over the past three decades (1980, 1990, 2000). The trends were investigated for Washington State as a whole, as well as for the urbanized areas of the state, including the Puget Sound and Spokane regions. They were compared to trends of the nation as a whole, as well as to those of selected metropolitan areas in the country.

The work was modeled on Alan Pisarski's "Commuting in America" (Pisarski 1996) and his more recent work on travel trends (Pisarski 2005). Pisarski has tracked changes in mode choice, length of travel, trip purpose, and other factors and has looked at future travel demand on the basis of socio-demographic factors, communication technology, work opportunities, and life style. He has also examined changes in metropolitan development patterns in the nation. Pisarski has speculated about the effects on transportation of future population growth, which will take place primarily in metropolitan areas. He has shown that while household formation is slowing down, growth in car ownership among new immigrants and the working poor will continue to exert pressure on transportation demand (Pisarski 2002a and 2002b).

This work also used recent analyses of national travel trends based on the Census 2000 and the National Household Travel Survey (Litman 2005).

Structure of Report

This report begins with an Introduction that summarizes principal differences in travel indicators among Washington State, the nation as a whole, and specific states in the

nation. It is then divided into two parts. Part 1 summarizes 2001 travel indicators for Washington State relative to demographic and land use factors affecting travel; this is based on data from the National Household Transportation Survey (NHTS 2001). Part 2 reviews trends in travel behavior over the past two decades; it is based on data from the Neighborhood Change Database (NCDB) 1980-2000.

Analyses for parts I and II are organized according to the grids shown in tables 1 and 2.

Table 1: Grid of analysis used in Part 1 (NHTS 2001)

TRAVEL INDICATORS AND MEASURES	CORRELATES OF TRAVEL					
Household VMT*	DEMOGRAPHIC FACTORS					
Household Vehicle Count	HH Income	Home Ownership	Life Cycle	Race	Place of Birth	Education
Personal Distance to Work						
P Number of Walking trips						
P Number of Biking trips	LAND USE FACTORS					
P Public Transit Use	Housing Unit Density	Population Density	Home Type	Urban/ Rural	Size of MSA*	
D Travel Mode (POV** Use)						
*VMT = vehicle miles traveled	** POV = Personal Vehicle * **MSA = Metropolitan statistical area					

Table 2: Grid of analysis used in Part 2 (NCDB 1980-2000)

TRAVEL INDICATORS	MEASURES
Travel Time to Work	Nationwide travel time to work MSAs with a greater and lower than average increase in travel time to work
Commuting Mode Choice	Percentage of commuters using public transportation Mean morning commute time in Puget Sound by mode
Labor Force	Percentage of employed female civilians Percentage of workers 16+ years old working within their metro area of residence
Socio-Demographic Factors	Distribution of population by race Distribution of population by age Distribution of foreign-born population Average family income Average household income
Access to Private Automobiles	Occupied housing units by number of cars Percentage of occupied housing units with at least one car Distribution of households with no car by race Proportion of households with no car by race

Parts I and II each comprise a summary, a review of data and methods, and a presentation of findings. The report concludes with a discussion of likely changes in travel behavior in the future.

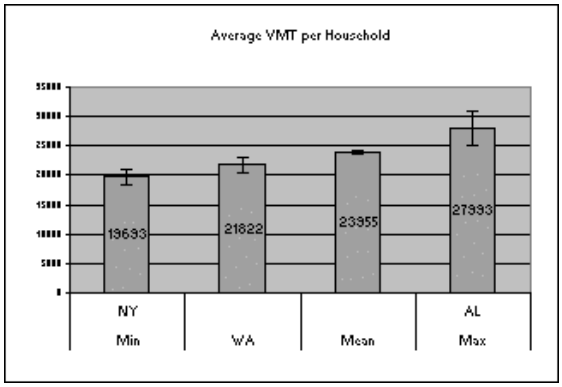
INTRODUCTION: HOW DIFFERENT ARE WE? WASHINGTON STATE VERSUS THE NATION

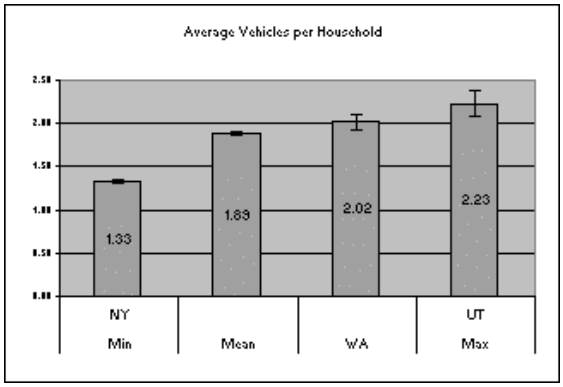
Table 3, based on the National Household Travel Survey (2001), features the principal differences in travel between Washington State and the nation. For better or worse, Washington State is not an outlier among the nation's 50 states.

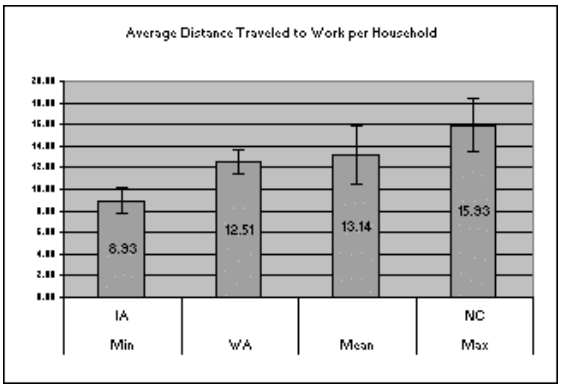
Table 3: Summary comparison between Washington State travel indicators and those of the nation

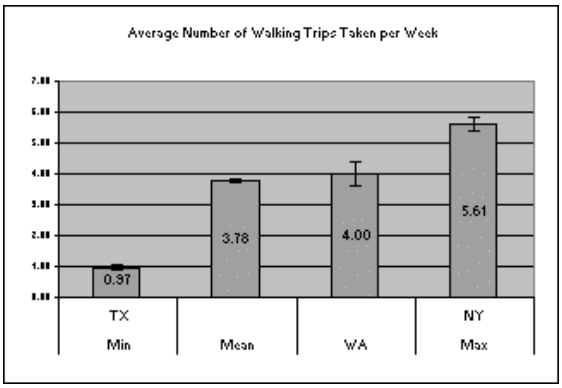
Travel Indicators	Washington State Versus Nation
Household Vehicle Miles Traveled	Below average
Household Vehicle Count	Above average
Person Distance to Work	Slightly below average
Person Public Transit Use	Average
Person Number of Walking trips	Slightly above average
Person Number of Biking trips	Below average

Figure 1 shows in greater detail differences between Washington State and the nation, indicating states that have minimum and maximum values for the travel indicators used.









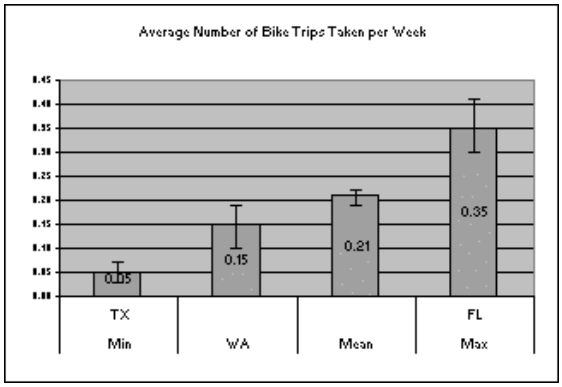


Figure 1: Travel behavior comparisons between Washington State and the nation.

PART 1: WASHINGTON STATE 2001 TRAVEL INDICATORS RELATED TO DEMOGRAPHIC AND LAND-USE FACTORS

Summary

Tables 4 and 5 summarize Washington State travel indicators as related to demographic and land-use factors, respectively (NHTS 2001).

Data and Methods

Data Sources

To derive estimates for Part 1 of this report, data from the 2001 National Household Travel Survey (NHTS 2001) were downloaded from the NHTS website: http://nhts.ornl.gov/2001/html_files/download_directory.shtml. Measures of housing and population densities were taken at the US Census block group level.

The National Household Travel Survey provides the only authoritative source of information at the national level on the relationships between the characteristics of personal travel and the demographics of the traveler. However, the sample data in the NHTS are not adequate to provide robust statewide or area-specific estimates. Estimates of travel behavior for Washington State summarized in this report are, therefore, less certain because large standard errors exist as a result of small sample sizes. If Washington State or a local jurisdiction wants to develop robust travel estimates for a specific area, it can purchase additional households in its jurisdiction to be interviewed and included in the NHTS.

Approximately 66,000 households are in the final 2001 NHTS dataset. About 26,000 households are in the national sample, while the remaining 40,000 households are from nine add-on areas. Of these households, 705 were located in Washington State.

Table 4: Travel indicators and demographic characteristics

Travel Variables	Correlates					
	HH Income	Home Ownership	Life Cycle	Race	Place of Birth	Education
Household Vehicle Miles Traveled (VMT)	VMT appears higher for households with higher incomes.*	VMT appears higher for households that own their home than for households that rent.	VMT generally increases with the number of adults and with the presence of older children. Only couples with small children have lower VMT than couples without children.	Non-white households appear to have lower VMT than white households.	na	There appears to be no correlation between education and vehicle miles traveled.
R^2	0.97					-0.032
Household Vehicle Count	The number of vehicles per household appears higher for households with higher income.	Households that own their home appear to have a greater number of vehicles than households that rent.	The number of vehicles per household appears higher in households with a greater number of adults and a greater number of children over the age of 5.	Non-white households appear to have fewer vehicles per household than white households.	na	There appears to be no correlation between education and household vehicle counts.
R^2	0.952					0.016
Pearson		0.000	0.000	0.425	na	0.423
RS2		0.000	0.000	0.520	na	0.457
P Distance to work	The distance traveled to work per household appears higher for households with higher income.	Households that own their home appear to travel greater distances to work than households that rent.	The distance traveled to work appears higher in households with a greater number of adults and a lower number of children, except for households of couples with children between the ages of 16-21.	Non-white and white households appear to travel similar distances to work.	It appears that foreign-born households travel shorter distances to work, but the standard error is large, making these differences statistically insignificant.	There appears to be no correlation between education and distance traveled to work.
R^2	0.764					-0.084
Pearson		0.333	0.002	0.343	0.173	
RS2		0.387	0.681	0.219	0.118	

Table 4: Travel indicators and demographic characteristics (continued page 2)

Travel Variables	Correlates					
	HH Income	Home Ownership	Life Cycle	Race	Place of Birth	Education
P Number of Walking trips	The number of walking trips taken per household appears higher for households with higher income. However, small differences and large standard errors make these differences statistically insignificant.	Households that own their home appear to take fewer walk trips per week than households that rent. However, small differences and large standard errors make these differences statistically insignificant.	Standard errors are high and differences are small, yet it appears that households with children under the age of 5 take fewer walk trips per week than other households.	White households appear to make more walk trips than non-white households. However, small differences and large standard errors make these differences statistically insignificant.	Households born in the US appear to make more walk trips than foreign-born households. However, small differences and large standard errors make these differences statistically insignificant.	Households with high levels of education appear to make more walk trips than households with lower levels. However, households with the lowest levels of education appear to make more walk trips than households with moderate levels of education.
R^2	0.856					0.504
Pearson		0.356	0.000	0.223	0.670	
RS2		0.150	0.124	0.593	0.071	
P Number of Biking trips	Large standard errors prevent statistically significant conclusions from being drawn. However, it appears that fewer biking trips are made by households with low incomes than households with median and high incomes.	Large standard errors prevent statistically significant conclusions from being drawn. However, it appears that fewer biking trips are made by households that rent than by households that own their home.	Large standard errors prevent statistically significant conclusions from being drawn. However, unlike any other variable the number of biking trips made per week appears to be higher for households with only one adult than for households with two adults except when children in the household are between 0 and 5.	Non-white and white households appear to take a similar number of bike trips a week. However, large standard errors prevent statistically significant conclusions from being drawn.	Households born in the U.S. appear to make more bike trips than foreign-born households. However, small differences and large standard errors make these differences statistically insignificant.	There appears to be no correlation between education levels and the number of bike trips taken per week.
R^2	0.419					0.061
Pearson		0.993	0.002	0.297	0.999	
RS2		0.779	0.592	0.048	0.931	

Table 4: Travel indicators and demographic characteristics (continued page 3)

Travel Variables	Correlates					
	HH Income	Home Ownership	Life Cycle	Race	Place of Birth	Education
P Public Transpor-tation Use	Public transportation use appears higher in households with lower incomes. Howeve,r the highest income bracket appears to have a high percentage of regular public transportation users as well.	Public transportation use appears higher in households that rent than in households that own their homes.	Public transportation use appears higher in one-adult households than in two-adult households, except when children are very young. Households with older children appear to use public transportation the most, especially if there is only one adult.	Public transportation use appears similar in both white and non-white households.	Public transportation use appears similar in households born in the U.S. and born abroad.	Public transportation use appears highest in households with high education levels.
Pearson	0.002	0.001	0.000	0.004	0.000	0.000
RS2	0.546	0.039	0.000	0.009	0.000	0.000
D Travel Mode Breakdown	Private automobile use appears to be similar for households in all income categories.	Private automobile use appears to be slightly lower for households that rent than for households that own their home.	Private automobile use appears to be lower for households that have one adult than for households with two adults, regardless of the number of children, except for retirees. Interestingly however, private automobile use appears to be higher for households without children than for households with children, except when the children are between the ages of 16 to 21.	Private automobile use appears to be lower for non-white households than for white households.	na	na
Pearson	0.000	0.000	0.000	0.000	na	na
RS2	0.791	0.289	0.226	0.863	na	na

Table 5: Travel indicators and land-use characteristics

Travel Variables	Correlates				
	Housing Unit Density	Population Density	Home Type	Urban / Rural	Size of MSA
Household Vehicle Miles Traveled (VMT)	Households living in areas with high housing unit (HU) densities appear to have lower VMT than households living in areas with low housing unit densities. The one discrepancy shown is where densities exceed 5000 HU/square mile. However this may be due to the large standard error for this category because of its small sample size.	Households living in areas with high population densities appear to have lower VMT than households living in areas with low population densities. The sample size for the highest density category was 1.0, making this estimate meaningless.	Households living in mobile and single family (SF) homes appear to have the highest VMT; households living in town-homes or row houses appear to have lower VMT; and households living in apartments and condominiums appear to have the lowest VMT.	Households living in rural areas appear to have higher VMT than households living in urban areas.	Not much difference in VMT exists between households living in different sized metropolitan statistical areas (MSAs). However VMT is greater for households living outside of MSAs
R^2	-0.7158	-0.0006			-0.1346
Household Vehicle Count	The number of vehicles per household appears lower for households living in areas with higher housing unit densities.	The number of vehicles per household appears lower for households living in areas with higher population densities.	Households living in SF and mobile homes appear to have a greater number of vehicles than households living in apartments and condominiums. Households living in row houses and townhomes also appear to have fewer vehicles, but the standard error for this category is too high to make the estimate meaningful.	Households living in rural areas appear to have a greater number of vehicles than households living in urban areas.	Not much difference in vehicle ownership appears to exist between households living in different sized MSAs, nor does there appear to be a difference in vehicle ownership between households living inside and outside of an MSA.
R^2	-0.9364	-0.8942			-0.0243
Pearson			0.000	0.000	
RS2			0.000	0.001	

Table 5: Travel indicators and land-use characteristics (continued page 2)

Travel Variables	Correlates				
	Housing Unit Density	Population Density	Home Type	Urban / Rural	Size of MSA
P Distance to work	Households living in areas with higher housing unit densities appear to travel shorter distances to work than households living in areas with lower housing unit densities. However, the large standard errors make these differences statistically insignificant.	Households living in areas with higher population densities appear to travel shorter distances to work than households living in areas with lower population densities. However, the large standard errors make these differences statistically insignificant.	Households living in rowhouses and townhomes appear to travel the shortest distances to work, and households living in mobile homes appear to travel the longest distance to work.	na	Households living in larger MSA appear to travel longer distances to work than households living in smaller MSAs and outside of MSAs. However, standard errors are large making differences statistically insignificant.
R^2	-0.4658	-0.4994			0.1361
Pearson			0.021	na	
RS2			0.122	na	
P Number of Walking trips	Households living in areas with lower housing unit densities appear to take slightly more than or similar numbers of walking trips per week as households living in areas with higher housing unit densities. However, the small differences and large standard errors make these differences statistically insignificant.	Households living in areas with lower population densities appear to take slightly more than or similar numbers of walking trips per week as households living in areas with higher housing unit densities. However, the small differences and large standard errors make these differences statistically insignificant.	Large standard errors and small differences prevent statistically significant conclusions to be drawn. However, it appears that a slightly greater number of walking trips are made by households living in rowhouses, townhouses and apartments than by households living in SF and mobile homes.	Urban Rural Not Available. Instead Presence of Sidewalks: Households living in areas where sidewalks are a problem take almost as many walking trips per week as households where sidewalks are not a problem. Large standard errors and small differences make any differences statistically insignificant.	The size of the MSA appears to have no consistent relationship with the number of walking trips taken by households living within or without them.
R^2	0.3251	0.3709			-0.0065
Pearson			0.000	na	
RS2			0.641	na	

Table 5: Travel indicators and land-use characteristics (continued page 3)

Travel Variables	Correlates				
	Housing Unit Density	Population Density	Home Type	Urban / Rural	Size of MSA
P Number of Biking Ttrips	Households living in areas with 1000 - 3000 housing units per mile appear to take more biking trips per week, and households living in areas with 3000-10,000 housing units per mile take fewer biking trips per week than other households. However, the small differences and large standard errors make these differences statistically insignificant.	The number of biking trips taken per week appears to peak for households living in areas with population densities between 500 and 1000 people per square mile and then again for households living in areas with densities greater than 4000 people per square mile. However, small differences and large standard errors make these statistically insignificant.	Large standard errors and small differences prevent statistically significant conclusions to be drawn. However, it appears that fewer biking trips are made by households living in apartments and duplexes than by households living in other types of homes.	na	Large standard errors and small differences make results statistically insignificant.
R^2	.228	0.0077			0.134
Pearson			0.085	na	
RS2			0.026	na	
P Public Transportation Use	Public transportation use appears higher in areas with high housing unit densities than in areas with low housing unit densities.	Public transportation use appears higher in areas with high population densities than in areas with low population densities.	Public transportation use appears highest for households living in apartments and duplexes and lowest for households living in mobile homes.	na	Public transportation use appears highest for households living in MSAs of 2 million to 2 million people.
Pearson	0.000	0.000	0.002	na	0.000
RS2	0.000	0.003	0.113	na	0.001

Table 5: Travel indicators and land-use characteristics (continued page 4)

Travel Variables	Correlates				
	Housing Unit Density	Population Density	Home Type	Urban / Rural	Size of MSA
D Travel Mode Breakdown	Private automobile use appears to be lowest for households living in areas of high housing unit density.	Private automobile use appears to be lowest for households living in areas of high population density.	Private automobile use appears to be lowest for households living in rowhouses, townhouses, and apartments.	Private automobile use appears to be highest for households living in areas surrounded by urban areas.	Private automobile use appears to be similar for households living in different sized MSAs.
Pearson	0.000	0.000	0.000	0.000	0.000
RS2	0.015	0.186	0.292	0.180	0.317

The sample sizes for Washington State in each survey data file category were as follows:

- Household: 705 (sample size); 2,612,077 (weighted sum)
- Vehicle: 1517 (sample size); 5,266,558(weighted sum)
- Person: 1715 (sample size); 7,092,654 (weighted sum)
- Travel day person trips: 6724 (sample size); 10,063,700,232 (weighted sum)

The travel behaviors considered in this report were taken from each of the above files. Household vehicle count was taken from the household file; vehicle miles traveled (VMT) was taken from the vehicle file and aggregated into households; distance to work, walk trips, bike trips and public transportation use were all taken from the person file; and transportation mode breakdowns were taken from the day trip file.

Samples, Weighs, and Sampling Errors

'The full sample of 'usable households' was used in this analysis. 'Useable households' were those in which interviews were completed with at least 50 percent of the adults in the household.

To obtain estimates that were minimally biased, full sample weights were used. Weights reflect the selection probabilities and adjustments to account for nonresponse, undercoverage, and multiple telephones in a household.

To calculate sampling errors, replicate weights were used. Sampling errors illustrate the variability in the estimated statistics. For this analysis, sampling errors were calculated by using the WesVar statistical software. WesVar software computes estimates and replication variance estimates by properly reflecting complex sampling and estimation procedures (Choudhry and Vallian 2002).

Correlations and Tests for Independence

Simple linear regressions were run for the dependent travel variables that were ratio in scale to determine whether, and how much, changes in travel behavior were correlated with changes in demographic or land-use factors. Chi-square tests were run for dependent travel variables that were ordinal in scale and for nominal independent variables to test hypotheses of independence. Pearson and RS2 chi-square statistics were calculated. The RS2 statistic is a modified chi-square statistic that reflects the complex

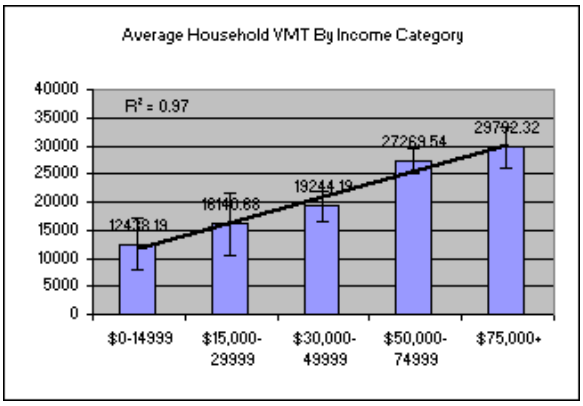
sample design. The Pearson chi-square statistic was adjusted by using the estimated "design effect,t" as suggested by Rao and Scott (1981).

Demographic Factors

Figures 2 through 8 explain the findings of relationships between travel indicators and demographic factors.

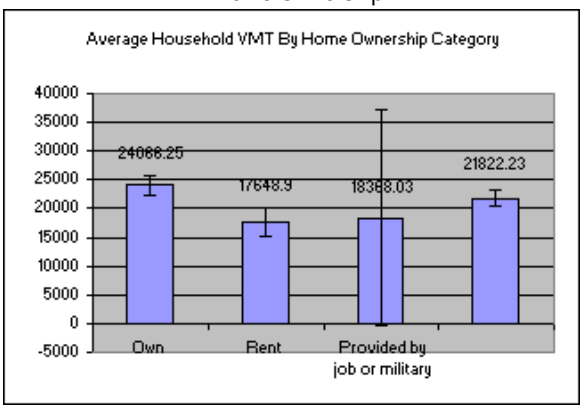
Annual Vehicle Miles Traveled (VMT) per Household in Relation to Different Demographic Characteristics

Income



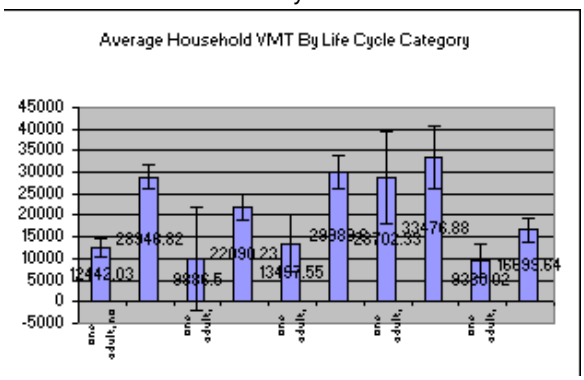
VMT appears higher for households with higher incomes.

Home Ownership



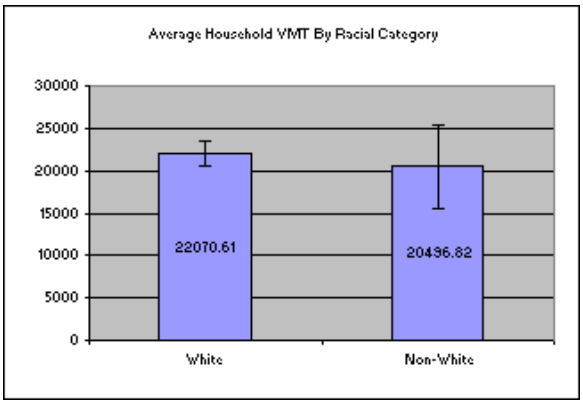
VMT appears higher for households that own their home than for households that rent. The standard error for households in the military is so large that the estimate is meaningless.

Life Cycle



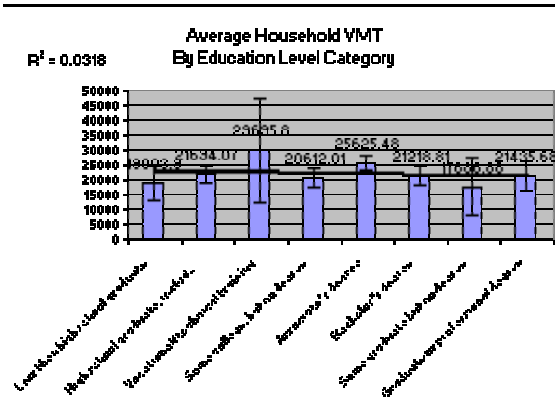
VMT appears higher in households with a greater number of adults and older children. Only couples with small children appear to have lower VMT than couples without children.

Race



Non-white households appear to have lower VMT than white households. However, the standard error for non-white households is large and therefore, no statistically significant difference can be assumed.

Education

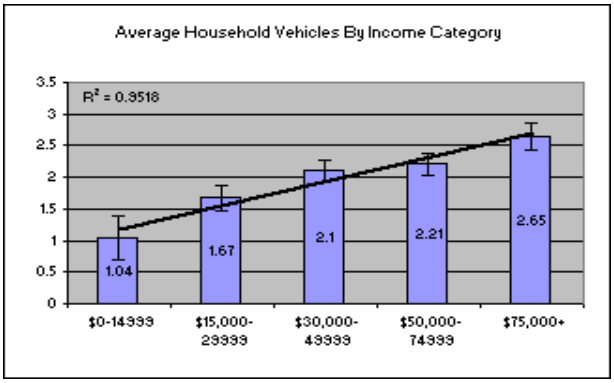


Not much difference in VMT exists between households with different levels of education.

Figure 2: Vehicle miles traveled (VMT) and demographic factors

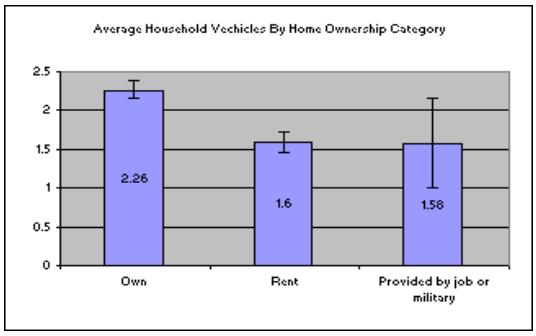
Number of Vehicles Owned per Household in Relation to Demographic Characteristics

Income



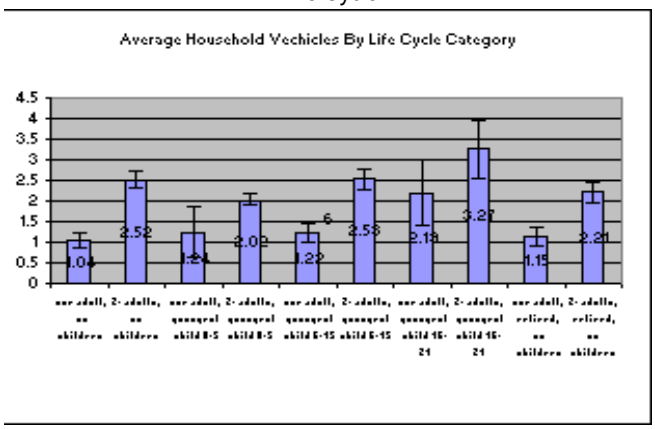
The number of vehicles per household appears higher for households with higher income.

Home ownership



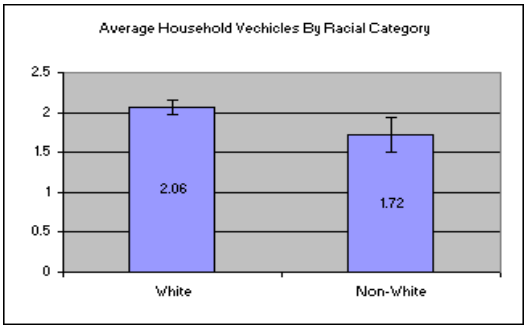
Households that own their own home appear to have a greater number of vehicles than households that rent.

Life Cycle



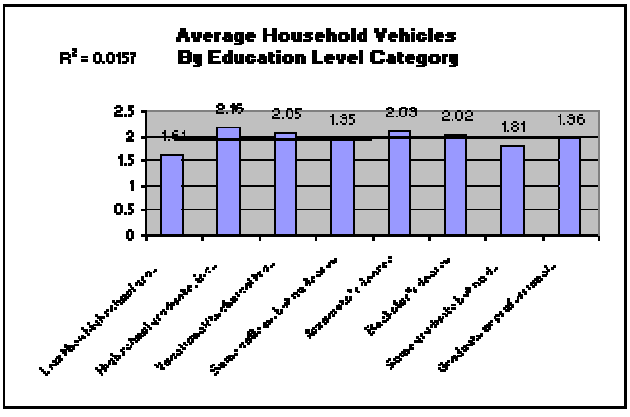
The number of vehicles per household appears higher in households with a greater number of adults and a greater number of children over the age of 5.

Race



Non-white households appear to have fewer vehicles per household than white households.

Education

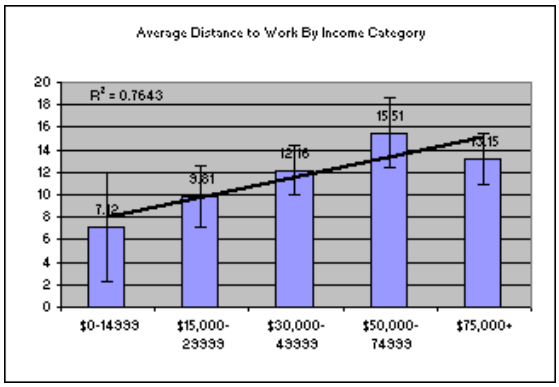


Not much difference in vehicle ownership appears to exist between households with different education levels.

Figure 3: Number of vehicles owned and demographic factors

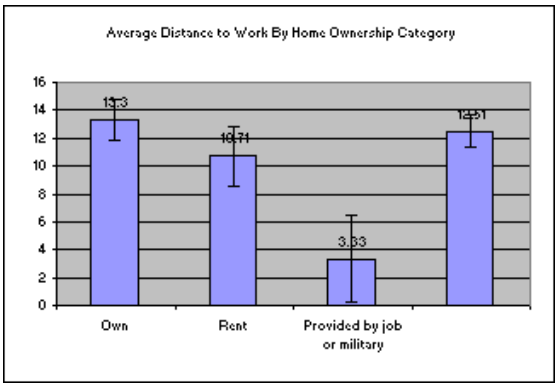
Distance Traveled to Work per Person in Relation to Demographic Characteristics

Income



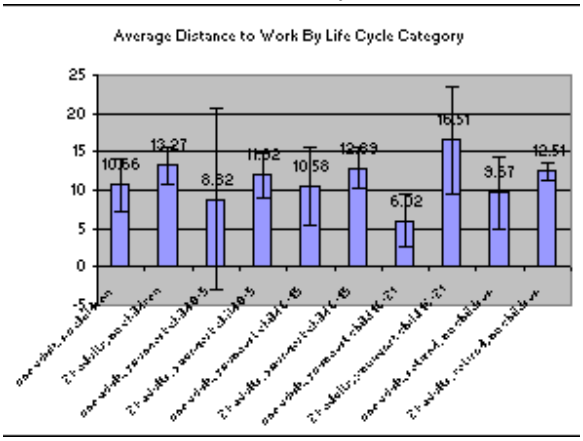
The distance traveled to work per household appears higher for households with higher income.

Home Ownership



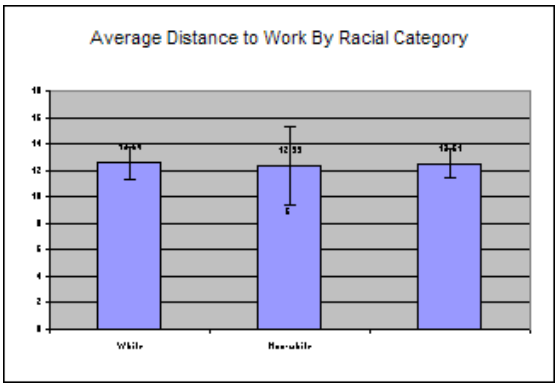
Households that own their own home appear to travel greater distances to work than households that rent.

Life Cycle



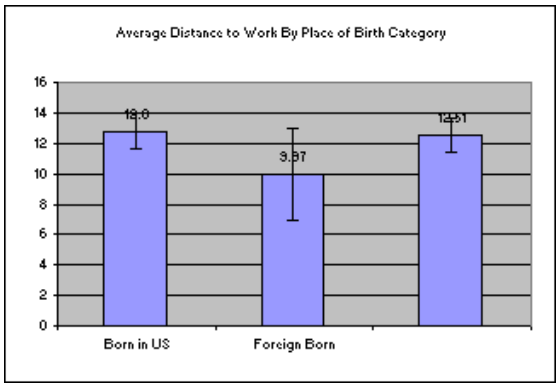
The distance traveled to work appears higher in households with a greater number of adults and a lower number of children, except for households of couples with children between the ages of 16-21.

Race



Non-white and white households appear to travel similar distances to work.

Place of birth

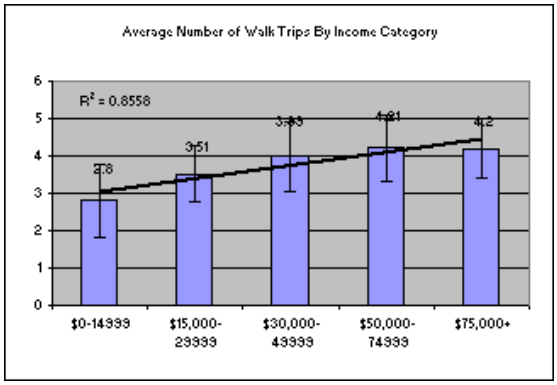


It appears that foreign-born household respondents travel shorter distances to work, but the standard error is large, making these differences statistically insignificant.

Figure 4: Distance to work and demographic factors

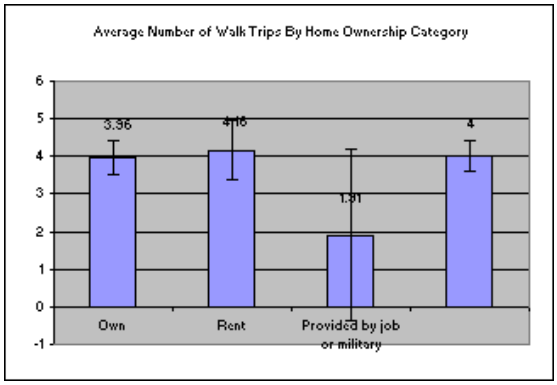
Number of Walking Trips Made per Person on a Weekly Basis in Relation to Demographic Characteristics

Income



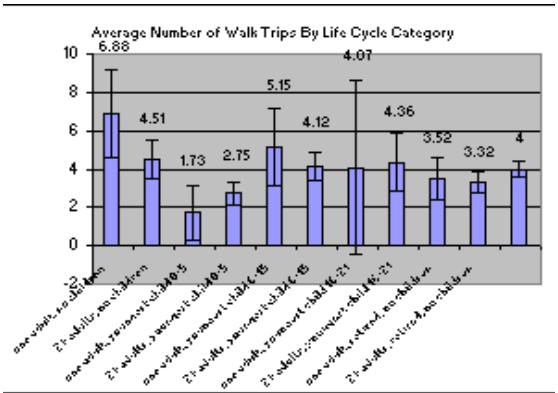
The number of walking trips taken per household appears higher for households with higher income. However, small differences and large standard errors make these differences statistically insignificant.

Home Ownership



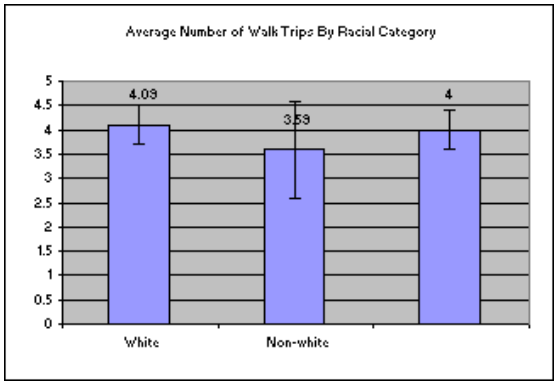
Households that own their own home appear to take fewer walk trips per week than households that rent. However, small differences and large standard errors make these differences statistically insignificant.

Life Cycle



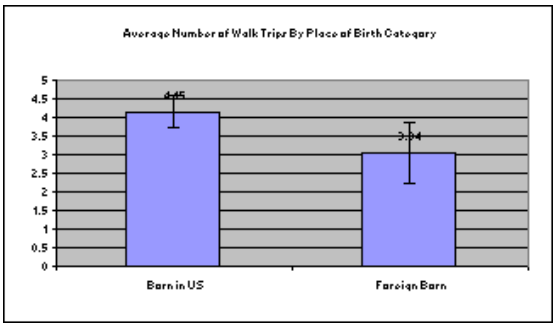
Standard errors are high and differences are small, yet it appears that households with children under the age of 5 take fewer walk trips per week than other households.

Race



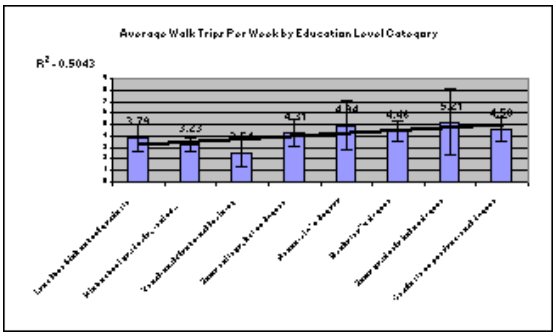
White households appear to make more walk trips than non-white households. However, small differences and large standard errors make these differences statistically insignificant

Place of Birth



Born in U.S. households appear to make more walk trips than foreign-born households. However, small differences and large standard errors make these differences statistically insignificant.

Education

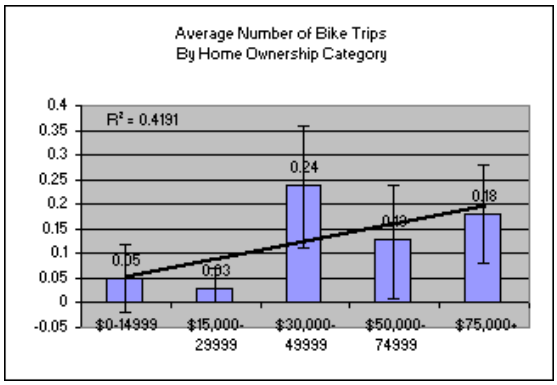


Households with moderate levels of education appear to make the least number of walk trips in comparison to households with higher and lower levels of education.

Figure 5: Walking trips and demographic factors

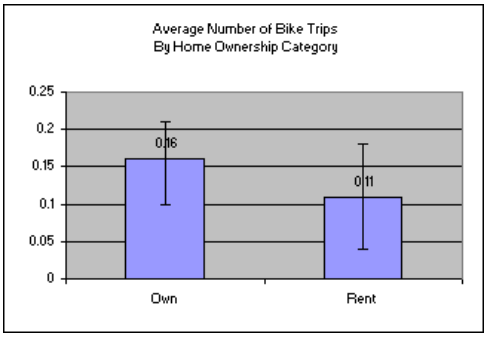
Number of Biking Trips Made per Person on a Weekly Basis in Relation to Demographic Characteristics

Income



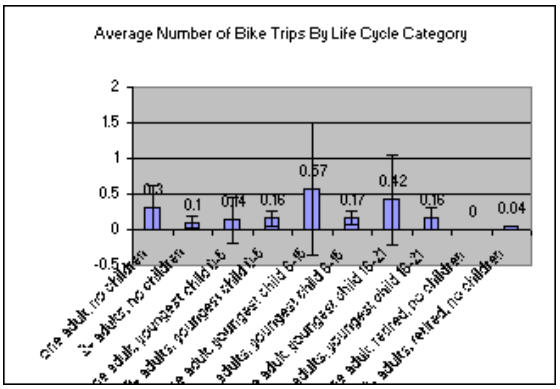
Large standard errors prevent statistically significant conclusions from being drawn. However, it appears that fewer biking trips are made by households with low incomes than households with median and high incomes.

Home Ownership



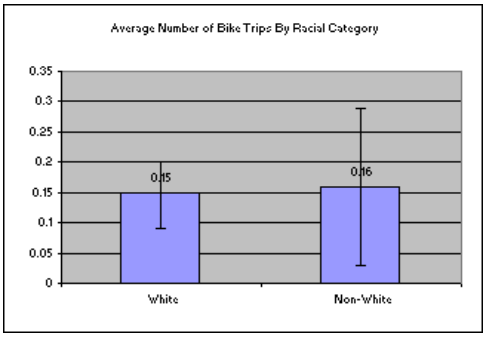
Large standard errors prevent statistically significant conclusions from being drawn. However, it appears that fewer biking trips are made by households that rent than by households that own their home.

Life Cycle



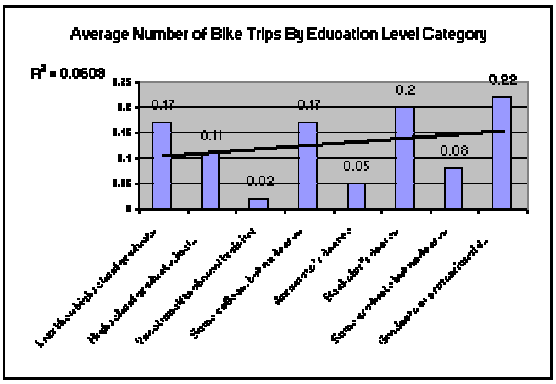
Standard errors are too large to draw conclusions. However, unlike any other variable, the number of biking trips made per week appears to be higher for households with only one adult than for those with two adults, except when children in the household are between 0 and 5

Race



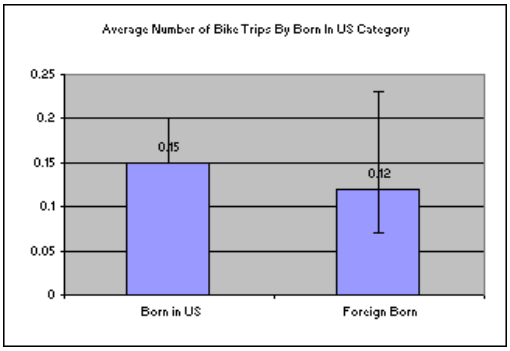
Non-white and white households appear to take a similar number of bike trips a week. However, large standard errors prevent statistically significant conclusions from being drawn.

Education



The average number of bicycle trips taken a week varies between households with different education levels.

Place of Birth

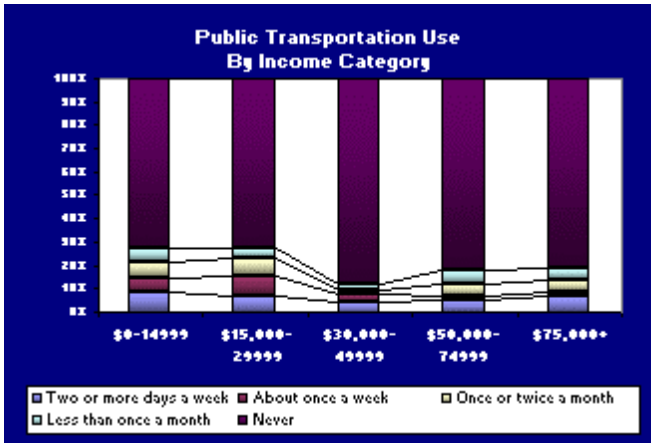


Households born in the U.S. appear to make more bike trips than foreign-born households. However, small differences and large standard errors make these differences statistically insignificant.

Figure 6: Biking trips and demographic factors

Public Transportation Use in Relation to Demographic Characteristics

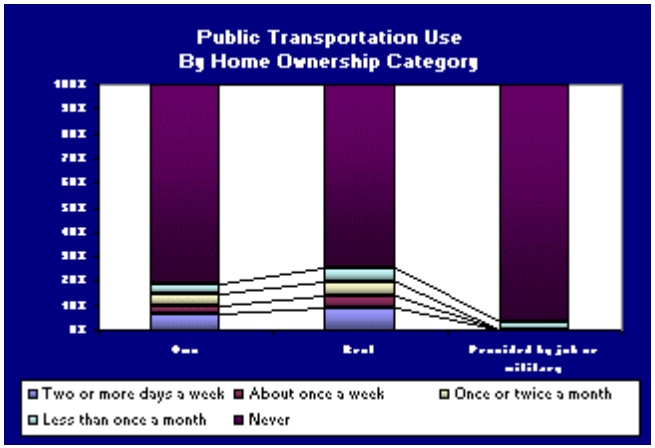
Income



Household Income	Public Transportation Use in the Last Two Months				
	Two or more days a week	About once a week	Once or twice a month	Less than once a month	Never
$0-14999	8.5%	6.3%	6.8%	5.7%	72.7%
$15,000-29999	6.4%	9.1%	7.3%	4.5%	72.8%
$30,000-49999	4.4%	3.4%	1.7%	2.2%	88.3%
$50,000-74999	5.0%	2.2%	4.6%	5.9%	82.3%
$75,000+	6.8%	2.0%	5.1%	4.5%	81.6%

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	20	43.727	0.002
RS2	20	20.196	0.446
RS3	11.89	11.928	0.442

Home Ownership

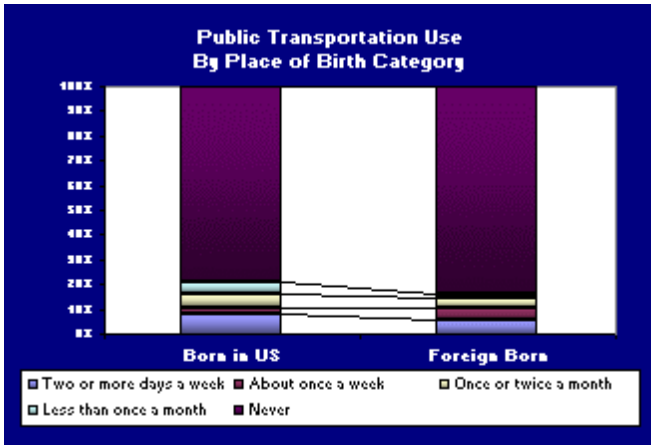


Home Ownership	Public Transportation Use in the Last Two Months				
	Two or more days a week	About once a week	Once or twice a month	Less than once a month	Never
Own	6.8%	2.7%	4.9%	4.4%	81.2%
Rent	9.0%	4.8%	5.8%	5.6%	74.7%
Military	0.0%	0.0%	0.0%	3.4%	96.6%

CHI-SQUARE		D.F.	VALUE	PROB
	PEARSON	8	8.972	0.345
	RS2	8	6.115	0.634

Figure 7: Public transportation and demographic factors

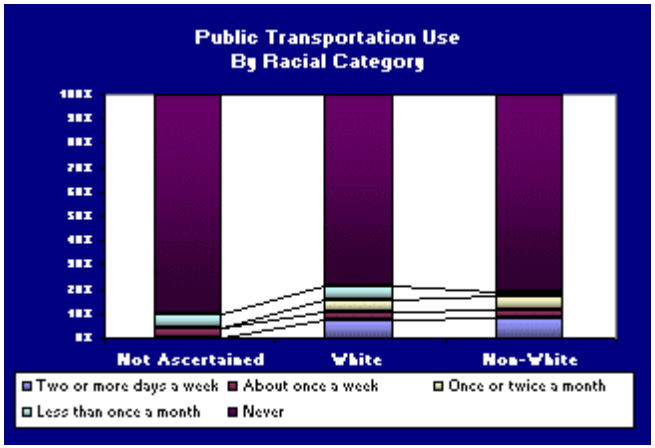
Place of Birth



Place of Birth	Public Transportation Use in the Last Two Months				
	Two or more days a week	About once a week	Once or twice a month	Less than once a month	Never
Born in US	7.7%	3.0%	5.2%	5.3%	78.8%
Foreign Born	5.3%	5.3%	4.3%	1.0%	84.1%

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	8	9.92	0.271
RS2	8	11.77	0.162

Race

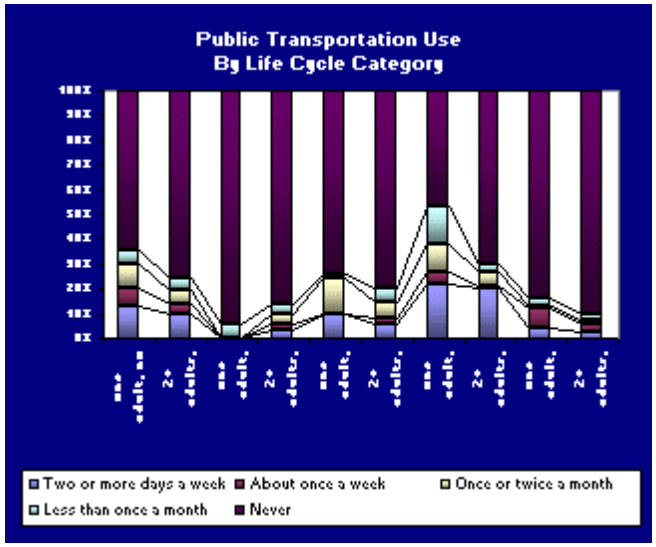


Race	Public Transportation Use in the Last Two Months				
	Two or more days a week	About once a week	Once or twice a month	Less than once a month	Never
Not Ascertained	0.0%	3.8%	0.0%	5.8%	90.3%
White	7.3%	3.3%	4.9%	5.4%	79.0%
Non-White	8.4%	2.8%	6.4%	1.5%	80.9%

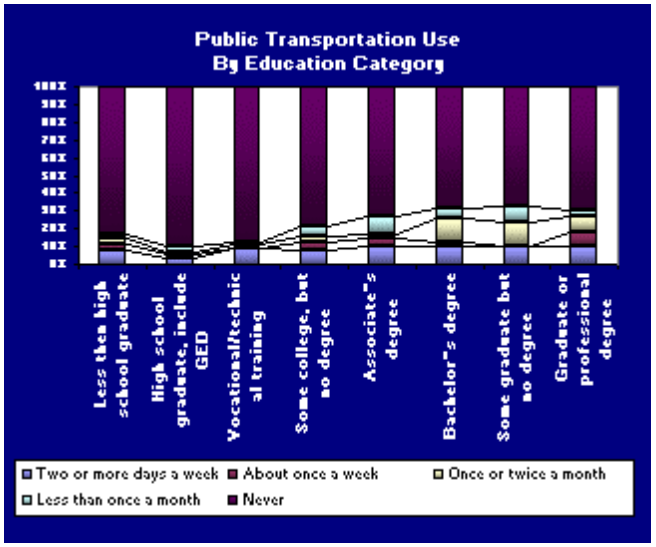
CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	56	108.278	0
RS2	56	54.407	0.535

Figure 7: Public transportation and demographic factors (continued page 2)

Life Cycle



Education Level



Life Cycle	Public Transportation Use (Last Two Months)				
	Two or more days a week	About once a week	Once or twice a month	< once a month	Never
one adult, no children	12.6%	7.5%	9.8%	5.3%	64.8%
2+ adults, no children	10.0%	3.9%	5.6%	5.0%	75.5%
one adult, youngest child 0-5	0.0%	0.0%	0.0%	5.8%	94.2%
2+ adults, youngest child 0-5	3.2%	2.4%	3.7%	4.4%	86.3%
one adult, youngest child 6-15	9.4%	0.0%	14.8%	1.4%	74.3%
2+ adults, youngest child 6-15	5.6%	2.4%	6.2%	6.0%	79.8%
one adult, youngest child 16-21	22.0%	4.7%	11.4%	15.0%	47.0%
2+ adults, youngest child 16-21	19.9%	1.0%	5.4%	3.7%	70.0%
one adult, retired, no children	4.3%	7.6%	1.3%	3.0%	83.8%
2+ adults, retired, no children	2.8%	2.9%	1.7%	2.6%	90.0%

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	36	84.757	0
RS2	36	46.522	0.113

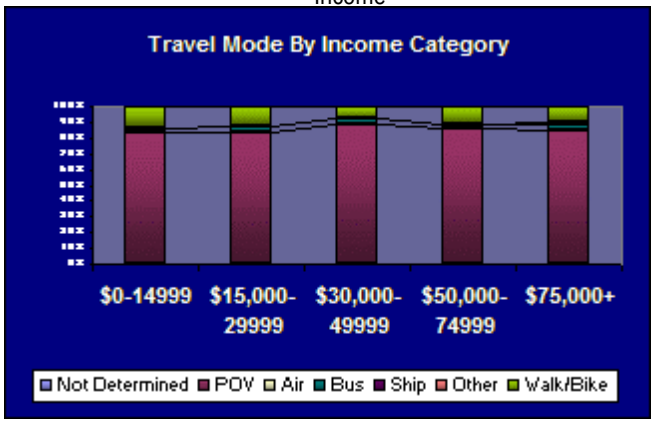
Education	Public Transportation Use in the Last Two Months				
	Two or more days a week	About once a week	Once or twice a month	< once a month	Never
< HS graduate	7.3%	3.7%	3.1%	2.6%	83.2%
HS grad., incl. GED	3.4%	2.3%	1.4%	3.3%	89.6%
Vocational/techn. training	8.5%	0.5%	2.3%	1.5%	87.2%
Some college, but no degree	7.7%	4.2%	3.3%	6.1%	78.7%
Associate"s degree	9.7%	4.8%	2.1%	10.3%	73.0%
Bachelor"s degree	10.6%	1.7%	13.4%	5.4%	69.0%
Some graduate but no degree	9.8%	0.0%	13.4%	9.0%	67.8%
Graduate or professional degree	10.1%	8.2%	9.1%	2.8%	69.8%

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	36	102.187	0
RS2	36	68.527	0.001

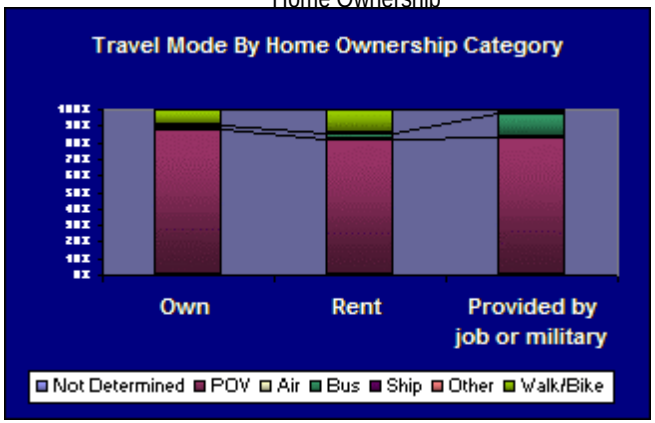
Figure 7: Public transportation and demographic factors (continued page 3)

Travel Mode Breakdown in Relation to Demographic Characteristics

Income



Home Ownership



Household Income	Travel Mode Breakdown						
	NA	POV*	Air	Bus	Ship	Other	Walk/ Bike
$0-14999	0.0%	83.1%	0.0%	2.7%	0.0%	0.4%	13.7%
$15,000-29999	0.0%	83.0%	0.2%	4.0%	0.4%	0.0%	12.4%
$30,000-49999	0.0%	89.0%	0.0%	3.0%	0.0%	0.2%	7.8%
$50,000-74999	0.0%	85.9%	0.0%	2.5%	0.2%	0.0%	11.4%
$75,000+	0.1%	84.7%	0.2%	3.6%	0.1%	1.0%	10.3%

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	30.00	87.37	0.00
RS2	30.00	23.57	0.79

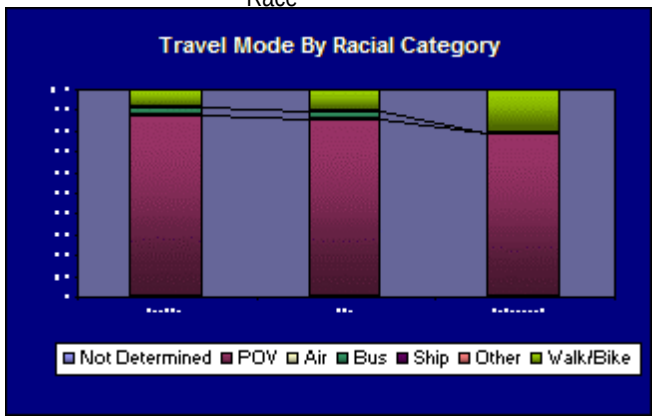
*POV= Personal Vehicle

Home Ownership	Travel Mode Breakdown						
	NA	POV	Air	Bus	Ship	Other	Walk/ Bike
Own	0.1%	87.4%	0.1%	2.8%	0.1%	0.4%	9.2%
Rent	0.1%	81.5%	0.1%	3.9%	0.2%	0.3%	13.9%
Military	0.0%	83.7%	0.0%	14.0%	0.0%	0.0%	2.3%

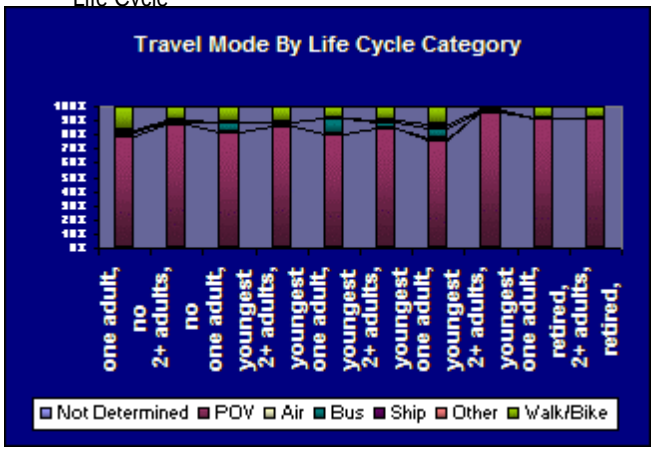
CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	12.00	68.19	0.00
RS2	12.00	14.18	0.29

Figure 8: Travel modes and demographic factors

Race



Life Cycle



	Travel Mode Breakdown						
Race	NA	POV	Air	Bus	Ship	Other	Walk/ Bike
Not Ascertained	0.0%	87.3%	0.1%	3.8%	0.0%	0.0%	8.8%
White	0.1%	85.7%	0.1%	3.1%	0.2%	0.4%	10.4%
Non-White	0.0%	78.9%	0.0%	0.0%	0.0%	0.0%	21.1%

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	12.00	41.82	0.00
RS2	2.00	26	.86

	Travel Mode Breakdown						
Life Cycle	NA	POV	Air	Bus	Ship	Other	Walk/ Bike
one adult, no children	0.0%	78.5%	0.4%	2.6%	0.5%	0.5%	17.5%
2+ adults, no children	0.0%	87.0%	0.2%	2.1%	0.4%	0.6%	9.7%
one adult, youngest child 0-5	0.0%	82.3%	0.0%	5.9%	0.0%	0.0%	11.8%
2+ adults, youngest child 0-5	0.0%	86.0%	0.0%	2.6%	0.0%	0.0%	11.4%
one adult, youngest child 6-15	0.7%	79.7%	0.0%	11.2%	0.5%	0.0%	7.9%
2+ adults, youngest child 6-15	0.1%	83.9%	0.1%	4.8%	0.0%	0.6%	10.5%
one adult, youngest child 16-21	0.0%	76.2%	1.7%	6.5%	0.0%	3.2%	12.4%
2+ adults, youngest child 16-21	0.0%	95.5%	0.0%	0.4%	0.3%	0.3%	3.4%
one adult, retired, no children	0.0%	91.2%	0.0%	1.1%	0.0%	0.0%	7.8%
2+ adults, retired, no children	0.0%	91.0%	0.0%	0.5%	0.0%	0.0%	8.4%

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	54.00	230.88	0.00
RS2	54.00	61.46	0.23

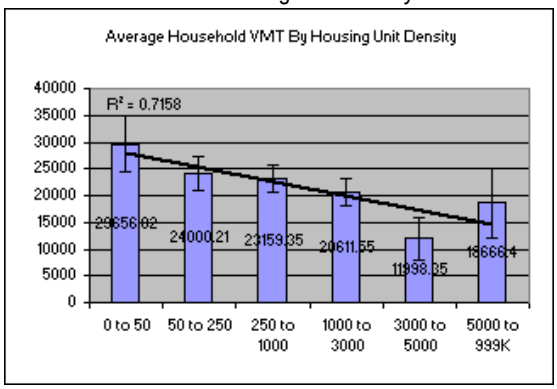
Figure 8: Travel modes and demographic factors (continued page 2)

Land-Use Factors

Figures 9 through 15 explain the findings of relationships between travel indicators and demographic factors.

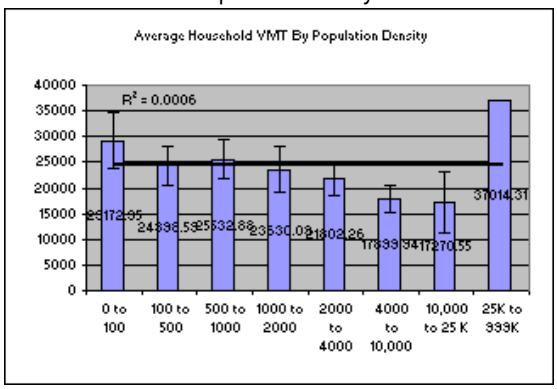
Annual Vehicle Miles Traveled (VMT) per Household in Relation to Different Land-Use Characteristics

Housing Unit Density



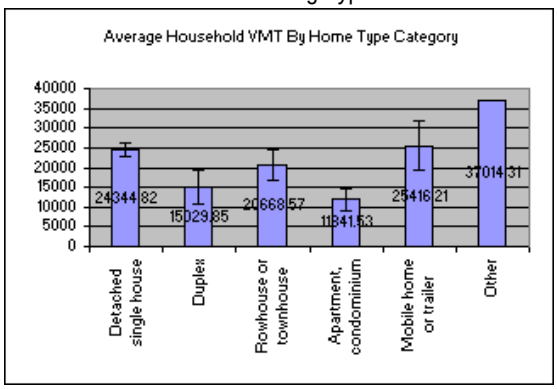
Households living in areas with high housing unit densities appear to have lower VMT than households living in areas with low housing unit densities. The one discrepancy shown is where densities exceed 5000 HU/square mile. However, this may be due to the large standard error for this category because of its small sample size.

Population Density



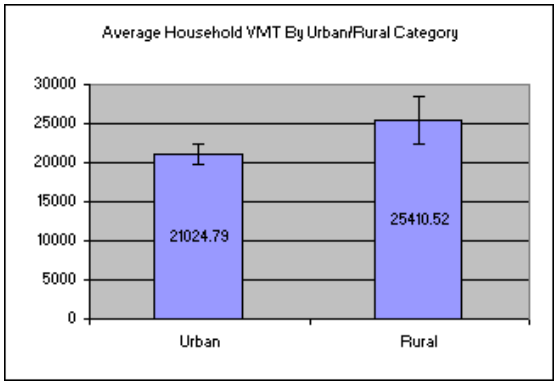
Households living in areas with high population densities appear to have lower VMT than households living in areas with low population densities. The sample size for the highest density category was 1.0, making this estimate meaningless.

Housing Type



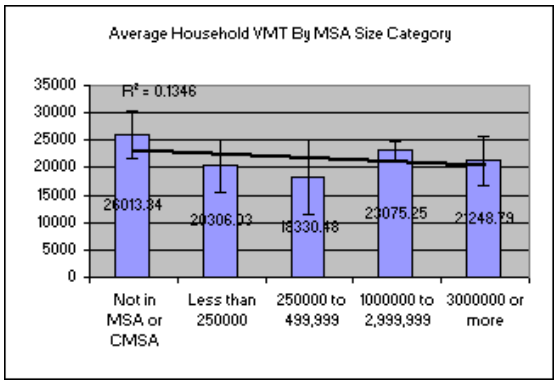
Households living in mobile and SF homes appear to have the highest VMT; households living in town-homes or row houses appear to have lower VMT; and households living in apartments and condominiums appear to have the lowest VMT.

Urban / Rural



Households living in rural areas appear to have higher VMT than households living in urban areas.

MSA Size

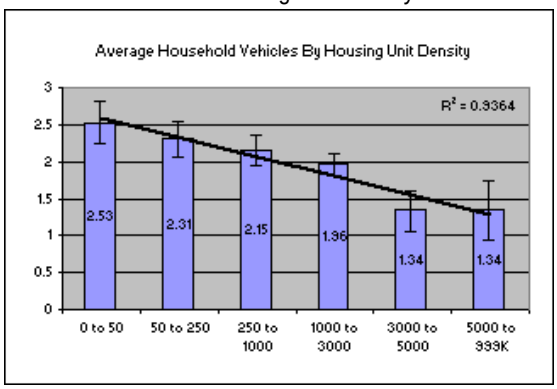


Not much difference in VMT exists between households living in different sized MSAs. However, VMT appears greater for households living outside of an MSA

Figure 9: Vehicle miles traveled (VMT) and land-use factors

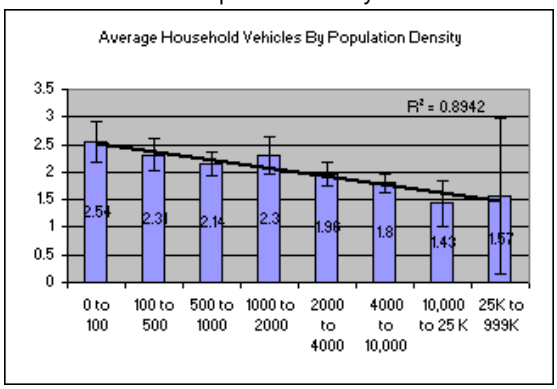
Number of Vehicles Owned per Household in Relation to Land-Use Characteristics

Housing Unit Density



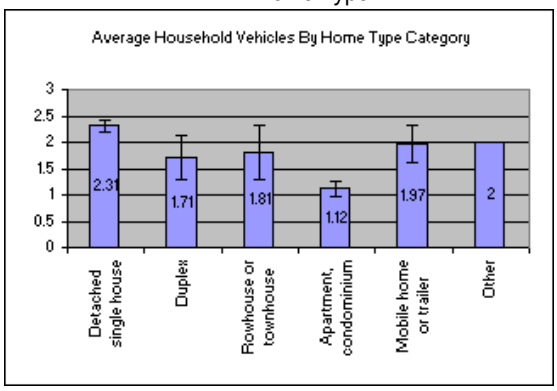
The number of vehicles per household appears lower for households living in areas with higher housing unit densities.

Population Density



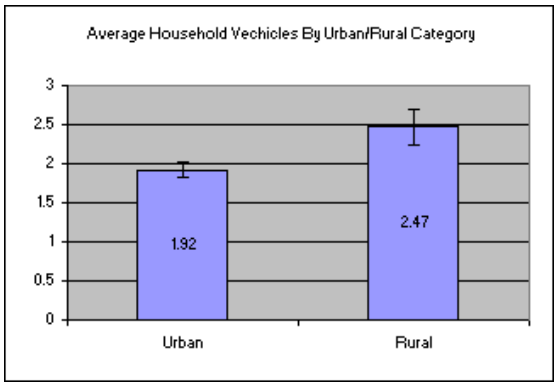
The number of vehicles per household appears lower for households living in areas with higher population densities.

Home Type



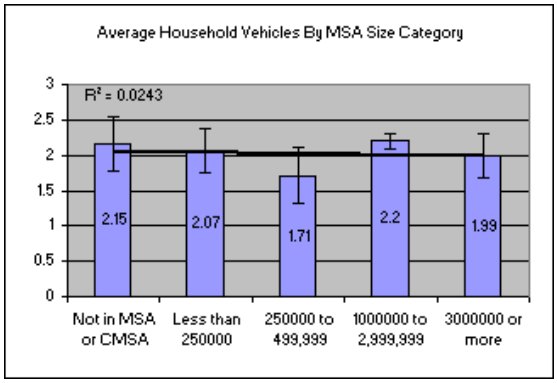
Households living in SF and mobile homes appear to have a greater number of vehicles than households living in apartments and condominiums. Households living in row houses and townhomes also appear to have fewer vehicles, but the standard error for this category is too high to make the estimate meaningful.

Urban / Rural



Households living in rural areas appear to have a greater number of vehicles than households living in urban areas.

MSA Size

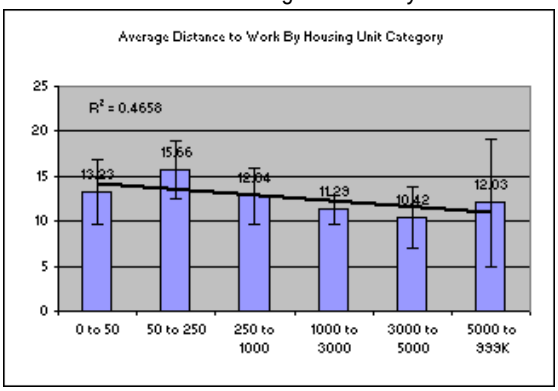


Not much difference in vehicle ownership appears to exist between households living in different sized MSAs, nor does there appear to be a difference in vehicle ownership between households living inside and outside of an MSA.

Figure 10: Number of vehicles owned and land-use factors

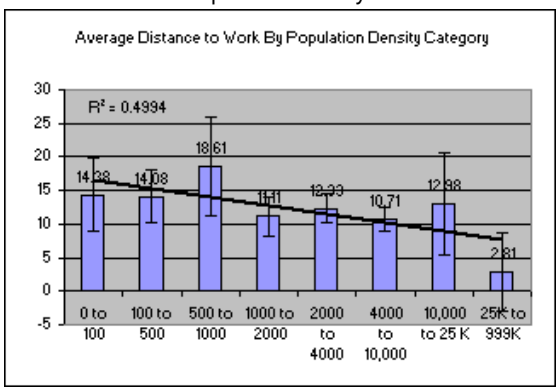
Distance Traveled to Work per Person in Relation to Land Use Characteristics

Housing Unit Density



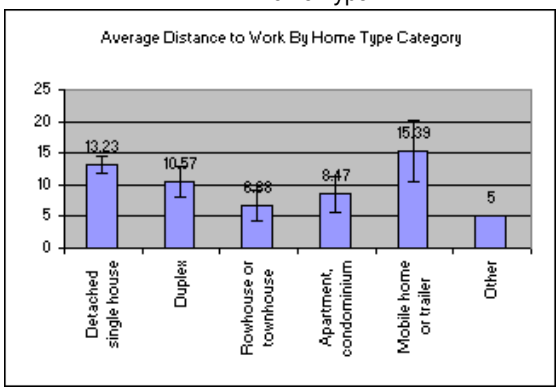
Households living in areas with higher housing unit densities appear to travel shorter distances to work. However, the large standard errors make these differences statistically insignificant.

Population Density



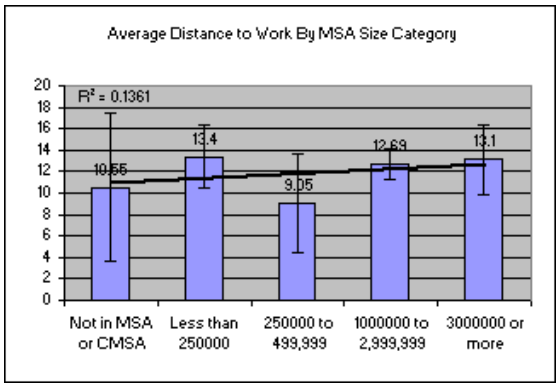
Households living in areas with higher population densities appear to travel shorter distances to work than households living in areas with lower population densities. However, the large standard errors make these differences statistically insignificant.

Home Type



Households living in rowhouses and townhomes appear to travel the shortest distances to work, and households living in mobile homes appear to travel the longest distance to work.

MSA Size

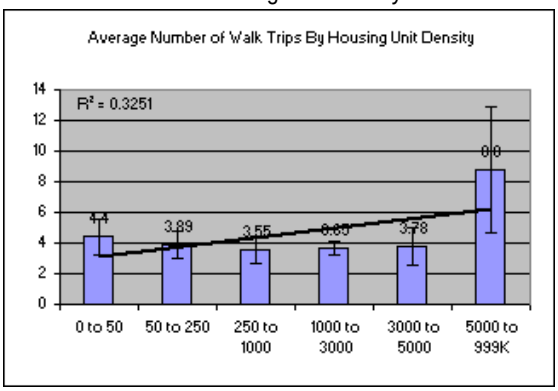


Households living in larger MSAs appear to travel longer distances to work than households living in smaller MSAs and outside of MSAs. However, standard errors are large making differences statistically insignificant.

Figure 11: Distance to work and land-use factors

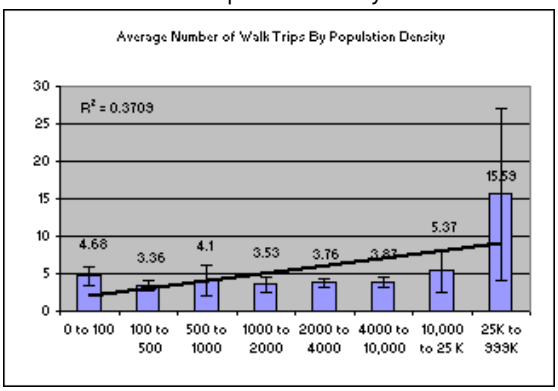
Number of Walking Trips Made per Person on a Weekly Basis in Relation to Land-Use Characteristics

Housing Unit Density



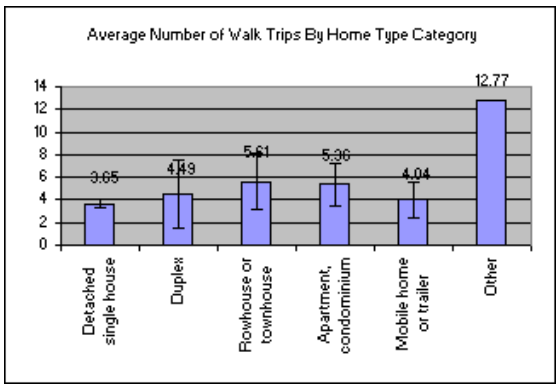
Households living in areas with lower housing unit densities appear to take slightly more walking trips per week than households living in areas with higher housing unit densities. Results are statistically insignificant because of small differences and large standard errors.

Population Density



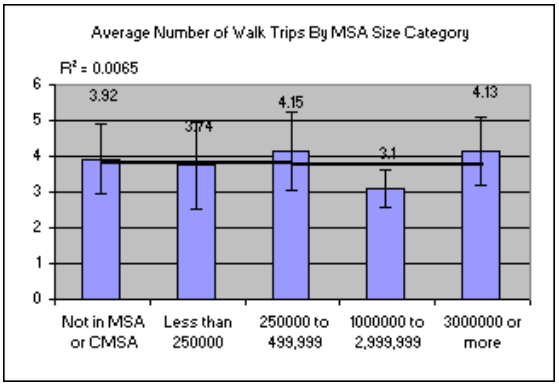
Households living in areas with lower population densities appear to take slightly more walking trips per week than households living in areas with higher housing unit densities. Results are statistically insignificant because of small differences and large standard errors.

Home Type



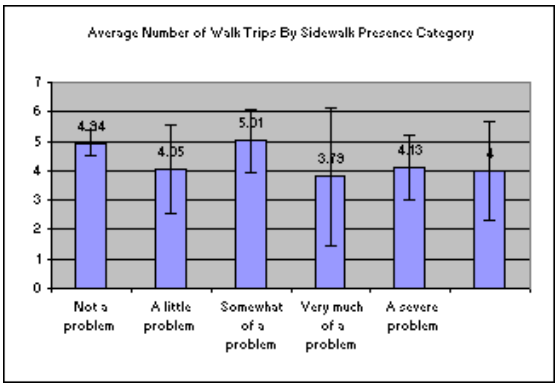
Results are statistically insignificant because of small differences and large standard errors. However, it appears that a slightly greater number of walking trips are made by households living in rowhouses, townhouses, and apartments than by those living in single family and mobile homes.

MSA Size



The size of the MSA appears to have no consistent relationship with the number of walking trips taken by households living within or without them.

Sidewalk Presence

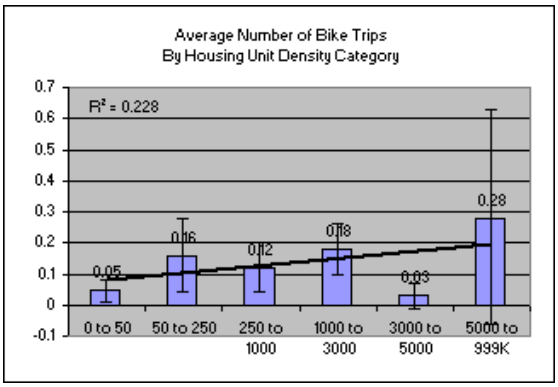


Households living in areas where sidewalks are a problem take almost as many walking trips per week as households where sidewalks are not a problem. Large standard errors and small differences make any differences statistically insignificant.

Figure 12: Walking trips and land-use factors

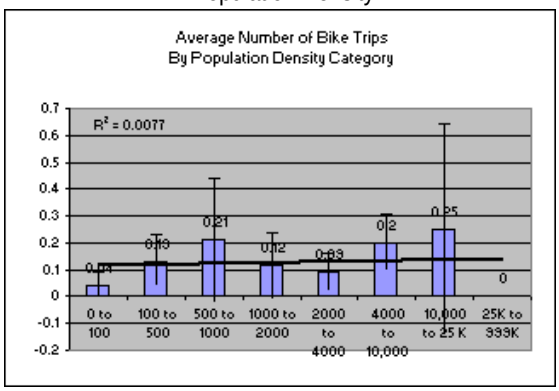
Number of Biking Trips Made per Person on a Weekly Basis in Relation to Land Use Characteristics

Housing Unit Density



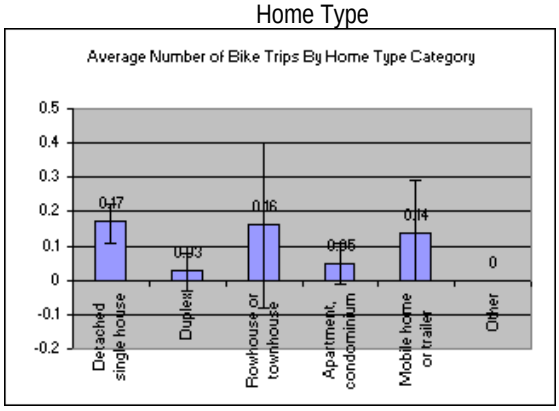
Households living in areas with 1000 - 3000 housing units per square mile appear to take more biking trips per week, and households living in areas with 3000-10,000 housing units per mile make fewer biking trips per week than other households. However, the small differences and large standard errors make these differences statistically insignificant.

Population Density



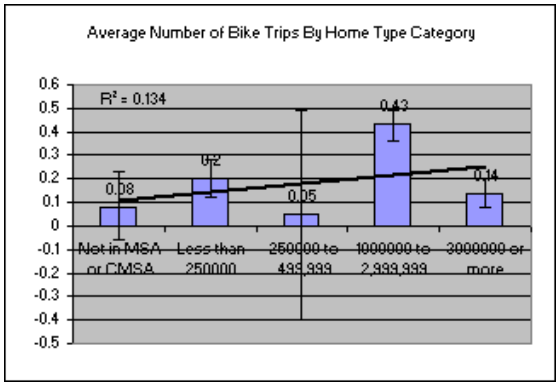
The number of biking trips taken per week appears to peak for households living in areas with population densities between 500 and 1000 people per square mile and then again for households living in areas with densities greater than 4000 people per square mile. However, the small differences and large standard errors make these differences statistically insignificant.

Home Type



Large standard errors and small differences prevent statistically significant conclusions to be drawn. However, it appears that fewer biking trips are made by households living in apartments and duplexes than by households living in other types of homes.

MSA Size

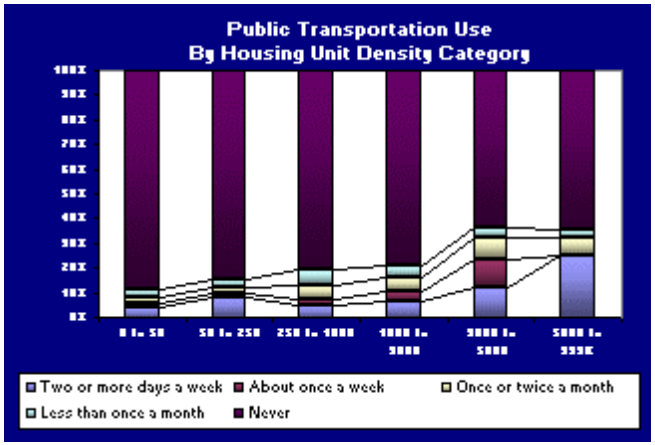


Large standard errors and small differences make results statistically insignificant.

Figure 13: Biking trips and land-use factors

Public Transportation Use in Relation to Land-Use Characteristics

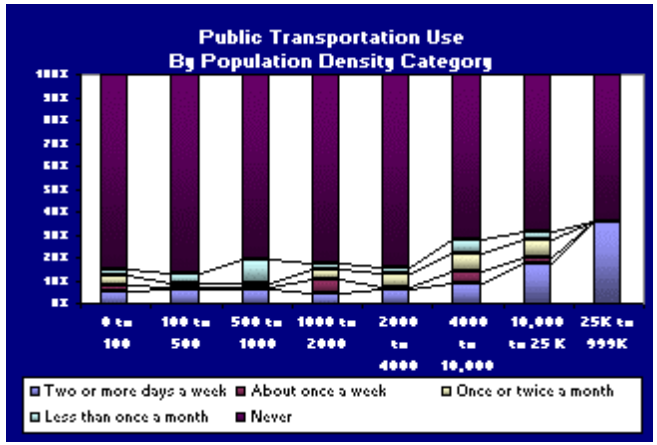
Housing Unit Density



Housing Units per Sq. Miile	Public Transportation Use in the Last Two Months				
	Two or more days a week	About once a week	Once or twice a month	< once a month	Never
0 to 50	3.9%	1.8%	2.3%	3.6%	88.4%
50 to 250	8.4%	0.9%	2.8%	3.2%	84.7%
250 to 1000	4.7%	2.7%	5.3%	6.3%	81.0%
1000 to 3000	6.5%	3.9%	5.7%	5.2%	78.7%
3000 to 5000	12.2%	11.3%	9.0%	3.7%	63.9%
5000 to 999K	25.4%	0.0%	7.1%	2.8%	64.8%

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	20	72.106	0
RS2	20	33.291	0.031

Population Density

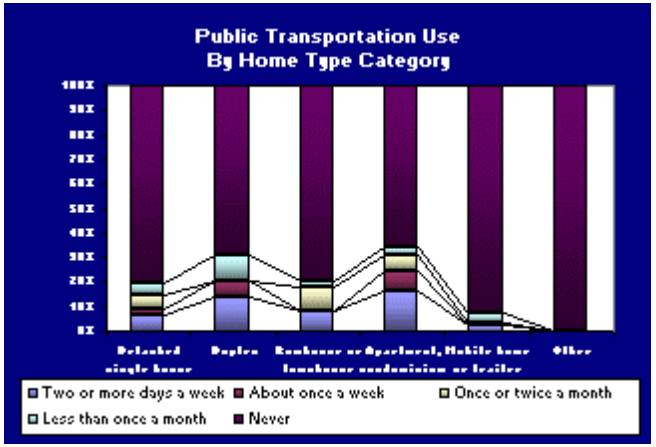


Population per Sq.Mile	Public Transportation Use in the Last Two Months				
	Two or more days a week	About once a week	Once or twice a month	< once a month	Never
0 to 100	5.4%	2.0%	4.4%	2.7%	85.5%
100 to 500	6.1%	1.0%	1.2%	4.4%	87.3%
500 to 1000	6.4%	0.5%	1.4%	11.1%	80.7%
1000 to 2000	4.2%	6.2%	4.0%	2.8%	82.8%
2000 to 4000	6.1%	1.0%	6.2%	2.3%	84.4%
4000 to 10,000	8.4%	5.9%	7.2%	6.5%	72.0%
10,000 to 25 K	17.8%	2.5%	7.9%	3.1%	68.8%
25K to 999K	35.6%	0.0%	0.0%	0.0%	64.4%

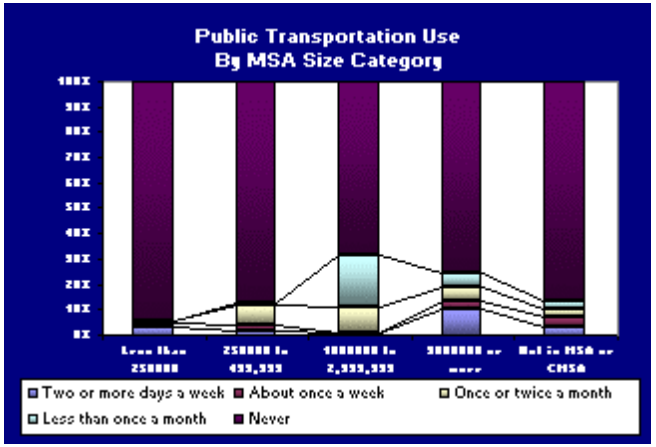
CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	28	81.782	0
RS2	28	33.366	0.223

Figure 14: Public transportation and land-use factors

Home Type



MSA Size



Home Type	Public Transportation Use in the Last Two Months				
	Two or more days a week	About once a week	Once or twice a month	< once a month	Never
Detached single house	6.2%	2.8%	5.4%	5.0%	80.6%
Duplex	14.1%	6.1%	0.0%	10.8%	69.1%
Rowhouse or townhouse	8.0%	0.0%	10.1%	2.3%	79.6%
Apartment, condominium	16.6%	8.0%	6.7%	2.8%	66.0%
Mobile home or trailer	2.1%	0.8%	0.7%	3.6%	92.8%
Other	0.0%	0.0%	0.0%	0.0%	100.0%

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	20	60.275	0
RS2	20	29.561	0.077

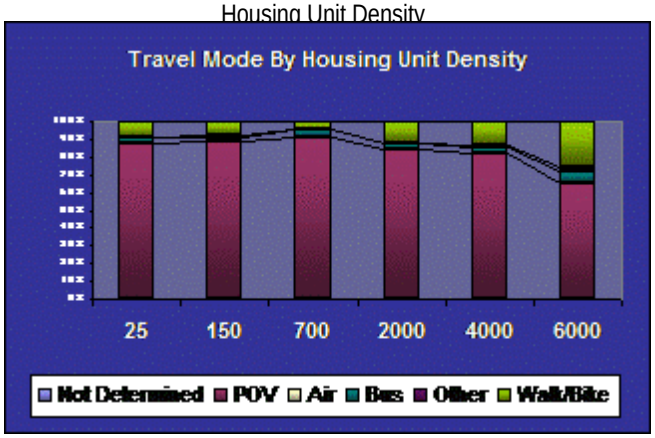
MSA Size	Public Transportation Use in the Last Two Months				
	Two or more days a week	About once a week	Once or twice a month	< once a month	Never
Less than 250000	3.3%	1.7%	0.8%	0.0%	94.2%
250000 to 499,999	1.8%	2.1%	7.8%	0.6%	87.7%
1000000 to 2,999,999	1.0%	0.0%	10.4%	20.3%	68.3%
3000000 or more	10.0%	3.8%	5.4%	5.0%	75.9%
Not in MSA or CMSA	3.5%	3.8%	3.4%	2.7%	86.7%

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	16	87.806	0
RS2	16	36.25	0.003

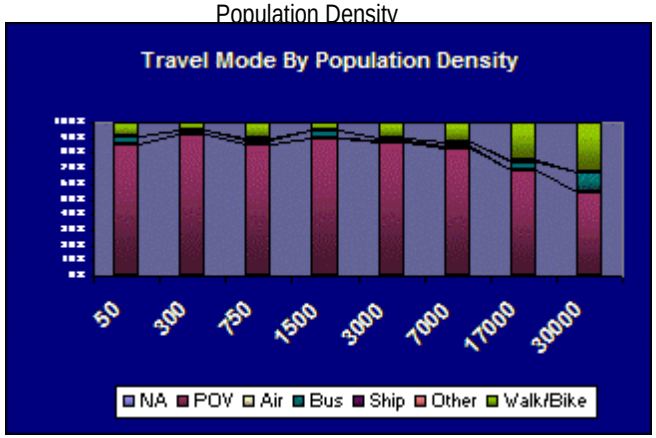
Figure 14: Public transportation and land-use factors (continued page 2)

Travel Mode Breakdown in Relation to Land-Use Characteristics

Housing Unit Density



Population Density



Housing Denity/sq. mi.	Travel Mode Breakdown						
	NA	POV	Air	Bus	Ship	Other	Walk/ Bike
0 to 50	0.0%	87.3%	0.0%	3.8%	0.3%	0.1%	8.6%
50 to 250	0.0%	88.4%	0.1%	2.2%	0.3%	0.8%	8.2%
250 to 1000	0.1%	90.9%	0.1%	3.7%	0.3%	0.1%	4.9%
1000 to 3000	0.1%	84.5%	0.0%	2.7%	0.0%	0.2%	12.5%
3000 to 5000	0.0%	82.0%	0.4%	3.1%	0.0%	0.7%	13.8%
5000 to 999K	0.0%	64.6%	0.4%	6.8%	0.0%	2.0%	26.2%

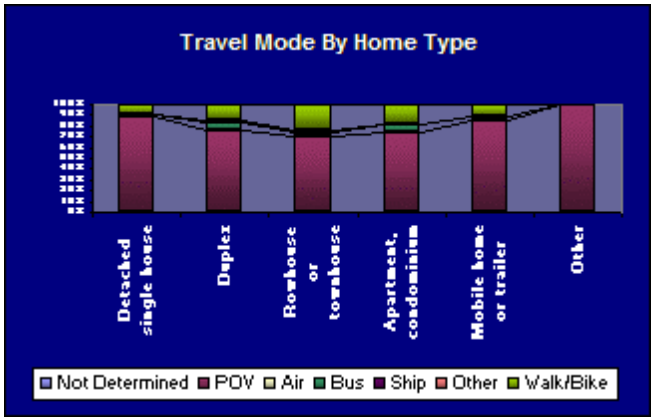
CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	30.00	232.04	0.00
RS2	30.00	49.24	0.02

Population Density/sq. mi.	Travel Mode Breakdown						
	NA	POV	Air	Bus	Ship	Other	Walk/ Bike
0 to 100	0.0%	86.2%	0.0%	4.2%	0.3%	0.0%	9.4%
100 to 500	0.0%	91.8%	0.2%	2.3%	0.7%	0.1%	4.9%
500 to 1000	0.0%	85.9%	0.0%	2.7%	0.1%	1.4%	9.8%
1000 to 2000	0.2%	90.0%	0.0%	4.4%	0.0%	0.0%	5.3%
2000 to 4000	0.2%	87.4%	0.1%	2.1%	0.0%	0.1%	10.2%
4000 to 10,000	0.0%	83.7%	0.1%	3.2%	0.0%	0.4%	12.6%
10,000 to 25 K	0.0%	68.3%	0.4%	4.9%	0.0%	2.0%	24.3%
25K to 999K	0.0%	54.1%	0.0%	13.1%	0.0%	0.0%	32.8%

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	42.00	272.78	0.00
RS2	42.00	50.00	0.19

Figure 15: Travel modes and land-use factors

Home Type

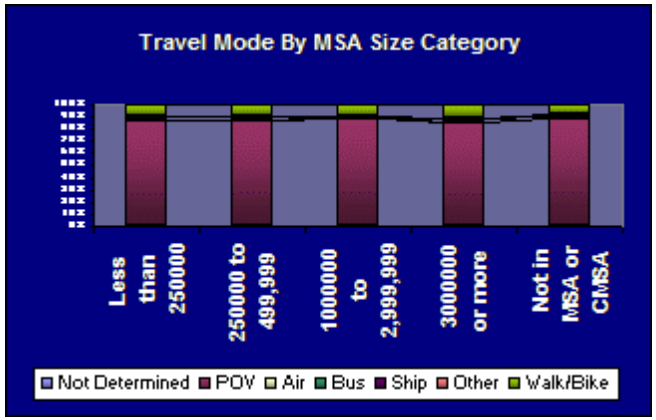


Travel Mode Breakdown

Home Type	NA	POV	Air	Bus	Ship	Other	Walk/ Bike
Detached single house	0.1%	88.4%	0.1%	2.4%	0.1%	0.3%	8.6%
Duplex	0.0%	75.5%	0.0%	7.8%	0.0%	2.2%	14.5%
Rowhouse or townhouse	0.0%	70.1%	0.0%	3.1%	2.2%	0.0%	24.6%
Apartment, condominium	0.0%	73.5%	0.3%	7.3%	0.0%	0.7%	18.2%
Mobile home or trailer	0.0%	85.9%	0.0%	3.3%	0.0%	0.0%	10.8%
Other	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	30.00	288.06	0.00
RS2	30.00	33.71	0.29

MSA Size



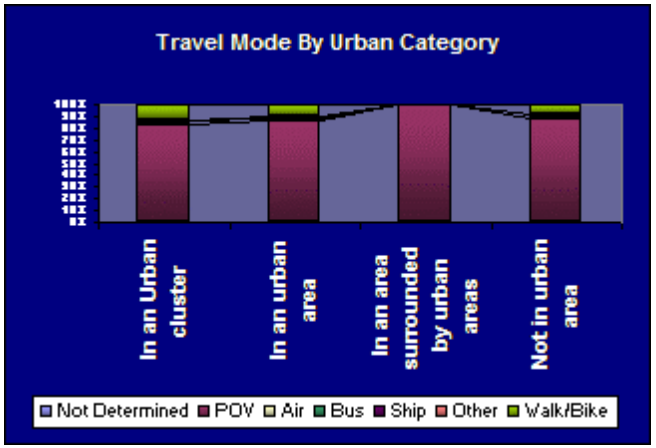
Travel Mode Breakdown

MSA SIze	NA	POV	Air	Bus	Ship	Other	Walk/ Bike
Less than 250000	0.4%	87.3%	0.0%	1.9%	0.0%	0.0%	10.4%
250000 to 499,999	0.0%	86.6%	0.0%	3.0%	0.0%	0.5%	9.9%
1000000 to 2,999,999	0.0%	89.0%	0.3%	0.3%	0.0%	0.3%	10.1%
3000000 or more	0.0%	84.5%	0.1%	3.9%	0.1%	0.5%	10.9%
Not in MSA or CMSA	0.0%	88.6%	0.0%	2.2%	0.6%	0.0%	8.7%

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	24.00	80.24	0.00
RS2	24.00	26.74	0.32

Figure 15: Travel modes and land-use factors (continued page 2)

Urban Category



Travel Mode Breakdown

Urban Category	NA	POV	Air	Bus	Ship	Other	Walk/ Bike
In an Urban cluster	0.0%	83.6%	0.0%	3.6%	0.0%	0.0%	12.9%
In an urban area	0.1%	85.6%	0.1%	3.1%	0.0%	0.5%	10.7%
In an area surrounded by urban areas	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Not in urban area	0.0%	87.6%	0.1%	3.4%	0.6%	0.1%	8.3%

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	18.00	47.84	0.00
RS2	18.00	23.28	0.18

Figure 15: Travel modes and land-use factors (continued page 3)

PART 2: TRENDS 1980-2000

Summary

The following is a summary of the analyses of trends based on the Neighborhood Change Database (NCDB) 1980-2000. Detailed data are provided for three study areas within Washington State: the state as a whole, the Puget Sound region, and the Spokane region.

1. Commute time to work: commute trip is getting longer. The use of private vehicles is lower in the state and the Puget Sound than the national average, but higher in Spokane.

- The proportion of workers commuting "more than 45 minutes" has increased over time in all study areas.
- The proportion of workers working at home has increased over time in all study areas.
- The average commute trip in the Puget Sound has increased by 3.6 minutes from 1990 to 2000 (this is higher than the 3.1minute national average increase).

2. Increases in transit use from 1990 to 2000 in Puget Sound raised the Washington State average to the same level as the national average, marking an increase in the use of transit in the state while the nation experienced a decrease.

- The proportion of workers using public transportation in the Puget Sound is higher than the national average, while Spokane and statewide averages are lower.
- The proportion of commute trips by public transportation in Washington State and the Puget Sound reached their lowest point in 1990 and increased slightly in 2000.
- Nationwide, the proportion of those who commute to work by public transportation has decreased over the last two decades.

3. Labor force: results are incomplete and inconclusive.

- The number of employed female civilians has steadily increased during the two decades.

- The proportion of employed female civilians in Spokane has been slightly higher than that of Washington State, the Puget Sound, and the national average.

4. Demographics: increases in working age and the Asian and Hispanic population in Washington State and the Puget Sound may affect future travel.

- The 18-64 age group shows the largest increase in Puget the Sound (from 61.3 percent in 1980 to 65.2 percent in 2000).
- Spokane has the highest proportion of those 65 years and older in the state.
- The proportion of the foreign-born population has been stable between 1980 and 1990 but increased substantially between 1990 and 2000

5. Income: trends are similar in Washington State to those of the nation, but the gap between the Puget Sound and Spokane is getting wider.

- The average income per family has more than doubled over the two decades.
- The average family income of Washington State is similar to the national average.
- The average family income in the Puget Sound is higher than the national average, but lower in Spokane.
- The gap in average income per household has widened between the Puget Sound and the Spokane regions over the last decade.

6. Access to private automobiles: on average, the population in Washington State has greater access to cars than that of the nation.

- The proportion of occupied housing units with no car available is smaller in Washington, the Puget Sound, and Spokane than the nationwide average.
- The proportion of occupied housing units with two vehicles available has increased over time for all study areas.
- The proportion of occupied housing units with two vehicles is higher in Washington, Puget Sound, and Spokane than the national average.
- The proportion of occupied housing units with three and more vehicles is higher in Washington, Puget Sound, and Spokane than the national average. It has slightly decreased over time, while the nationwide average has increased slightly.

- In Washington State and the Puget Sound, the proportion of people of color with no car is higher relative to that of the population; it is similar in Spokane.

Data and Methods

This trend analysis was based on data extracted from Neighborhood Change Database (NCDB) 1980-2000. The NCDB contains 1970, 1980, 1990, and 2000 Long Form data, with detailed data such as population, household, and housing characteristics, income, poverty status, education level, employment, housing costs, immigration, and other variables (U.S. Census1970-2000). The Neighborhood Change Database, however, is not as exhaustive as the full census and includes only a subset of the complete variable list for each decade.

The NCDB database indicates no boundary change at the county level during the two decades.

Trends

Travel Time to Work

- The proportion of workers commuting "more than 45 minutes" increased over time in all study areas.
- The proportion of workers commuting "less than 25 minutes" increased during the 1980s and then slightly decreased between 1990 and 2000.
- Because categories used in this analysis were aggregated from the 1990 and 2000 original data, which had 12 categories, it is not appropriate to conclude that travel time is getting shorter or longer. For example, use of the original 12 categories for comparing commute travel time between 1990 and 2000 indicates that, nationwide, the proportion of trips in all categories below 20 minutes declined, while the proportion in the category of 5 minutes or more increased.

Table 6. Percentage of workers 16+ years old by travel time to work

	1980				1990				2000			
	U.S.	WA	Puget Sound	Spokane	U.S.	WA	Puget Sound	Spokane	U.S.	WA	Puget Sound	Spokane
Workers 16+ years old with travel time to work less than 25 minutes or work at home	49%	49%	44%	58%	65%	66%	59%	76%	61%	61%	54%	71%
Workers 16+ years old with travel time to work 25 to 44 minutes	39%	41%	45%	38%	23%	23%	28%	19%	24%	24%	28%	22%
Workers 16+ years old with travel time to work more than 45 minutes	12%	10%	11%	5%	12%	11%	13%	5%	15%	14%	17%	7%

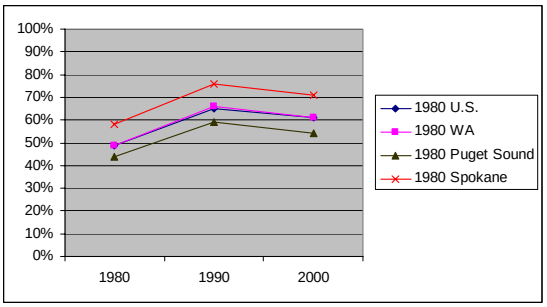


Figure 16. Proportion of workers with travel time less than 25 minutes

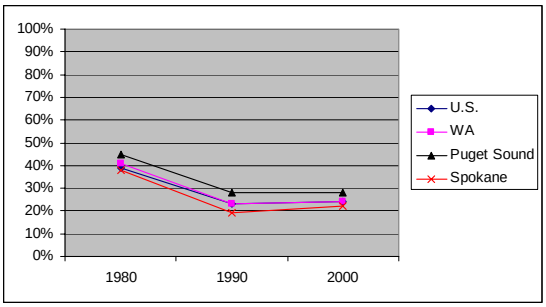


Figure 17. Proportion of workers with travel travel time 25 to 44 minutes

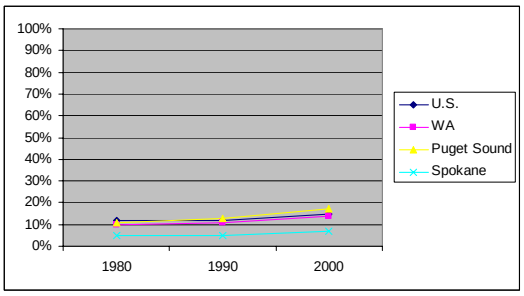


Figure 18. Proportion of workers with travel time more than 45 minutes

Nationwide Travel Time to Work

- Nationwide, travel time to work increased by 3.2 percent (0.7 minutes) between 1980 and 1990, and by 13.8 percent between 1990 and 2000 (3.1 minutes).

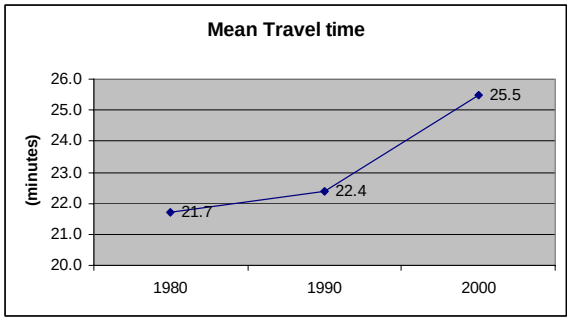


Figure 19. Mean travel time to work in the U.S. (minutes)

(Source: U.S. Census Bureau: http://www.census.gov/population/www/socdemo/journey.html) (2000)

MSAs with a Greater and Lower Than Average Increase in Travel Time to Work

- The Seattle metropolitan statistical area (MSA) had a greater increase in commute trip length than the national average.

Table 7. Metropolitan statistical areas with a greater than average increase in travel time (>3.1 min.) 1990-2000

MSA Name	1990 Average Travel Time	2000 Average Travel Time	Change in Travel Time
National Total	22.4	25.5	3.1
Atlanta	26	31.2	5.2
Miami	24.1	28.9	4.8
West Palm Beach	20.9	25.7	4.8
Raleigh	20.2	24.9	4.7
Charlotte	21.6	26.1	4.5
Boston	23.6	27.8	4.2
Orlando	22.8	27	4.2
New York	30	34	4.1
Jacksonville	22.6	26.6	4
Philadelphia	24	27.9	3.9
Austin	21.7	25.5	3.8
Tampa	21.8	25.6	3.8
Sacramento	21.8	25.6	3.8
Las Vegas	20.3	24.1	3.8
San Francisco	25.6	29.3	3.7
Denver	22.2	25.9	3.7
Providence	19.6	23.2	3.6
Seattle	24.1	27.7	3.6
Greensboro	18.8	22.4	3.6
Washington, DC	28.2	31.7	3.5
Dallas	24.1	27.5	3.4

(Source: Journey to Work Trends - http://www.fhwa.dot.gov/ctpp/jtw/jtw3.htm#tra) (FHWA 2000)

Table 8. Metropolitan statistical areas with a lower than average increase in travel time (<3.1 min.) 1990-2000

MSA Name	1990 Average Travel Time	2000 Average Travel Time	Change in Travel Time
National Total	22.4	25.5	3.1
Los Angeles	26.4	29.1	2.7
Louisville	21.3	22	0.7
Rochester	19.8	21.1	1.3
Kansas City	21.5	22.9	1.4
Buffalo	19.4	21.1	1.7
Oklahoma City	20.3	22	1.7
Cincinnati	22.4	24.3	1.9
Indianapolis	21.8	23.8	2.0
Columbus	21.2	23.2	2.0
Cleveland	21.9	24	2.1
Milwaukee	20	22.1	2.1
Hartford	20.7	22.9	2.2
St. Louis	23.2	25.5	2.3
Norfolk	21.8	24.1	2.3
New Orleans	24.3	26.7	2.4
Grand Rapids	18.3	20.7	2.4
Minneapolis	21.2	23.7	2.5
San Antonio	22	24.5	2.5
Salt Lake City	19.8	22.4	2.6
Houston	26.1	28.8	2.7
Pittsburgh	22.5	25.3	2.8
Memphis	21.8	24.6	2.8
Portland	21.5	24.4	2.9
Detroit	23.1	26.1	3.0
Chicago	27.9	31	3.1
Phoenix	23	26.1	3.1
San Diego	22.2	25.3	3.1
Nashville	22.7	25.8	3.1

Commuting Mode Choice

- Private vehicles are the most prevalent means of commuting travel.
- The proportion of workers working at home increased over time in all study areas.
- The proportion of workers using public transportation in Puget Sound is higher than the national average, while Spokane and statewide averages are lower.
- The proportion of commute trips by public transportation in Washington State and the Puget Sound reached their lowest point in 1990 and increased slightly in 2000.
- Nationwide, the proportion of commute to work by public transportation has decreased over the two decades.

Table 9. Commuting mode choice

	1980				1990				2000			
	U.S.	WA	Puget Sound	Spokane	U.S.	WA	Puget Sound	Spokane	U.S.	WA	Puget Sound	Spokane
Public Transportation	7.7%	6.0%	7.8%	4.2%	5.3%	4.4%	6.2%	2.8%	4.7%	4.7%	6.8%	2.8%
Private Vehicles	84.1%	82.5%	81.1%	86.5%	86.5%	83.0%	82.0%	88.8%	87.9%	82.5%	80.7%	89.0%
Walk or other means	6.6%	9.2%	9.1%	6.9%	5.2%	9.0%	8.4%	5.1%	4.1%	8.6%	8.5%	4.1%
Working at home	1.7%	2.3%	2.0%	2.5%	3.0%	3.6%	3.4%	3.4%	3.3%	4.2%	4.0%	4.1%

Percentage of Commuters Using Public Transportation

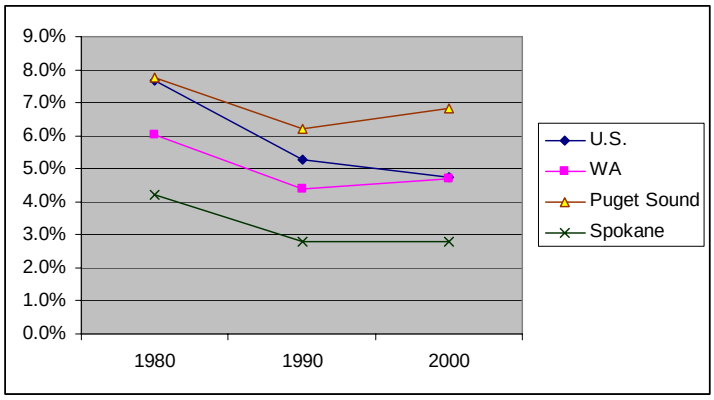


Figure 20: Percentage of commuters using public transportation

Mean Morning Commute Time in the Puget Sound by Mode

- Travel times remained fairly constant throughout the 1990s. Only in 1997, the most recent year of the survey, did travel times to work show a tendency to increase.
- Travel time by transit is 60 percent longer than by automobile or combined automobile and transit
- Travel time by non-motorized modes is about 15 minutes.

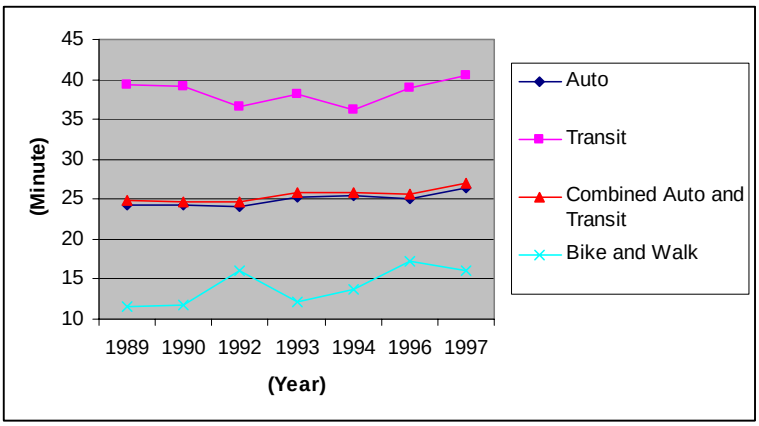


Figure 21. Mean morning commute time in Puget Sound by mode

* Data Source: PSRC, 1999, Puget Sound Transportation Panel (PSTP), a survey of approximately 1,700 households

- Evidence in the Puget Sound suggests that as employment grows faster in centers other than the central cities, workers select jobs and/or residential locations in a way to maintain an acceptable commute. People who have made the same commute over the past decade have noticed increased congestion as new employment and residential locations result in new trip patterns. Also, with the increased use of flex-time and the higher proportion of part-time jobs, more commute trips are being made during hours other than the traditional "rush" hours, stretching the time span of peak congestion (PSRC 1999).

Labor Force

Percentage of Employed Female Civilians

- The number of employed female civilians steadily increased during the two decades.
- The proportion of employed female civilians in Spokane has been slightly higher than that of Washington State, the Puget Sound, and the national average.

Table 10. Percentage of employed female civilians

	1980	1990	2000
U.S.	43%	46%	47%
WA	42%	45%	46%
Puget Sound	42%	45%	46%
Spokane	43%	46%	48%

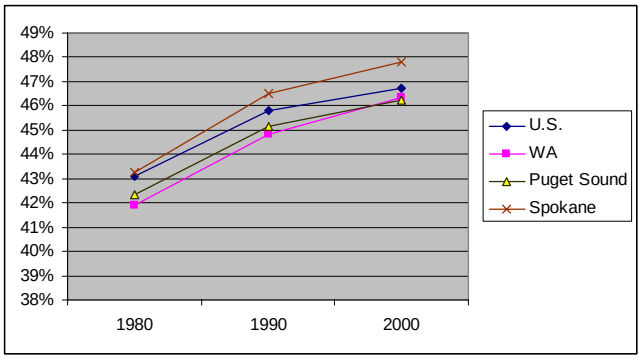


Figure 22. Percentage of employed female civilians

Percentage of Workers 16+ Years Old Working within Their Metro Area of Residence

Table 11. Percentage of workers 16+ years old working within their metro area of residence

	1980	1990	2000
U.S.	94%	75%	76%
WA	93%	79%	80%
Puget Sound	98%	93%	91%
Spokane	99%	99%	99%

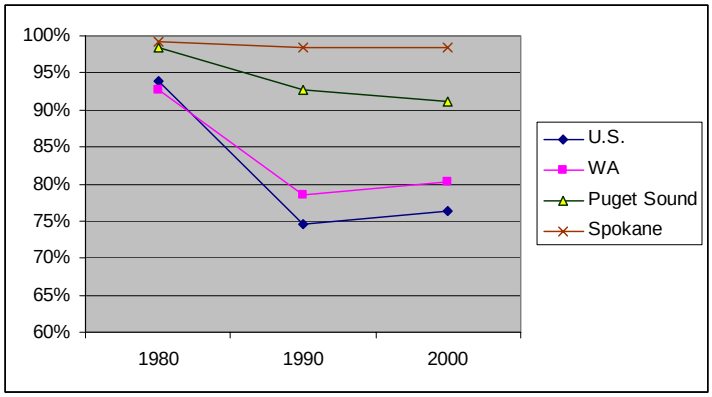


Figure 23. Percentage of workers 16+ years old working within their metro area of residence*

* Formula: Percentage of workers 16+ years old working within their metro area of residence

$$= \frac{\text{Number of Workers 16+ years old working within their metro area of residence}}{\text{Number of Workers 16+ years old working within their state of residence}}$$

Socio-Demographic Factors

Distribution of Population by Race

- The proportion of the white population in the U.S. and Washington decreased over time.
- On average, Washington State has a lower proportion of African Americans and Hispanics, and a higher proportion of American Indians and Asians, than the U.S.
- The proportion of the white population in the Puget Sound decreased over the past decades, reaching 80.1 percent in 2000.
- The ethnic composition of Spokane was relatively stable during the two decades.

Table 12. Percentage of population distribution by race

		White	Black	Am.Indian	Asian	Other	Hispanic
1980	U.S	82.2%	12.4%	0.5%	2.0%	2.9%	7.3%
	WA	91.2%	3.0%	1.4%	3.1%	1.4%	2.9%
	Puget Sound	90.0%	4.0%	1.2%	4.0%	0.8%	2.2%
	Spokane	95.6%	1.3%	1.2%	1.3%	0.6%	1.5%
1990	U.S	80.3%	12.0%	0.8%	2.9%	3.9%	8.8%
	WA	88.6%	3.0%	1.7%	4.3%	2.3%	4.2%
	Puget Sound	86.8%	4.6%	1.3%	6.3%	1.0%	2.8%
	Spokane	94.8%	1.4%	1.5%	1.8%	0.5%	1.6%
2000	U.S	76.4%	12.9%	0.9%	4.2%	5.5%	12.5%
	WA	83.3%	4.0%	1.6%	7.2%	3.9%	7.5%
	Puget Sound	80.1%	6.0%	1.1%	10.5%	2.3%	5.2%
	Spokane	92.7%	2.2%	1.4%	2.8%	0.8%	2.7%

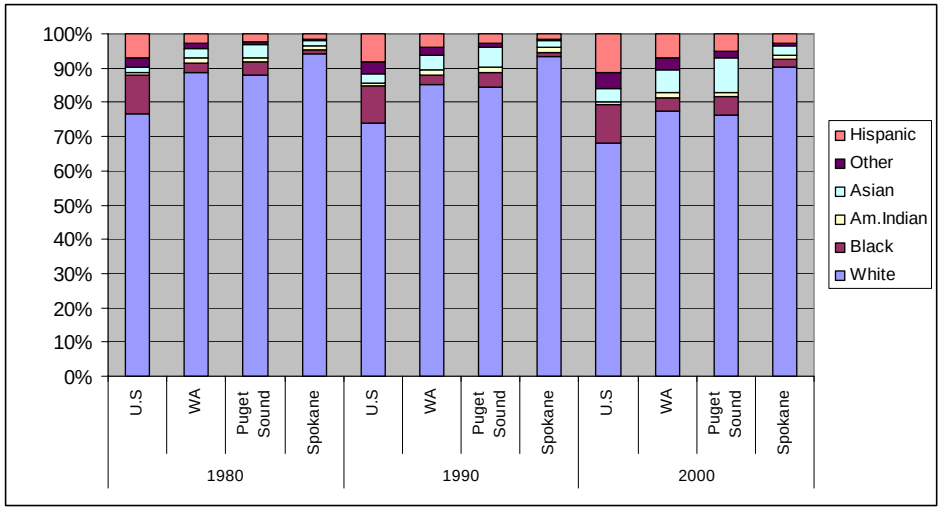


Figure 24. Percentage of population distribution by race

Distribution of Population by Age

- Overall, the proportion of the group 65 years and older increased slightly over the past decades.
- The 18-64 age group shows the largest increase in Puget the Sound (from 61.3 percent in 1980 to 65.2 percent in 2000).
- Spokane has the highest proportion of those 65 years and older in the state.
- The proportion of the 5-17 age group has been relatively stable over time (approximately 19 percent).

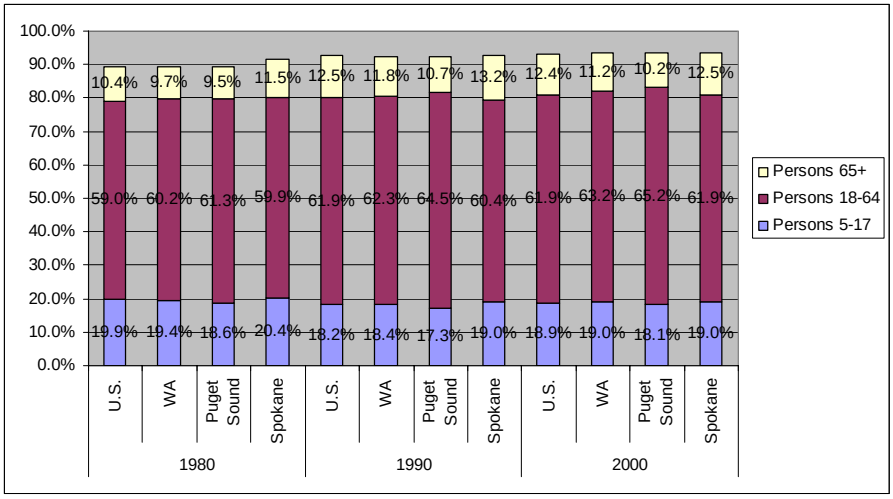


Figure 25: Percentage of population distribution by age

Distribution of Foreign-Born Population

- The proportion of the foreign-born population was stable between 1980 and 1990 but increased substantially between 1990 and 2000
- Washington State and Spokane have a smaller proportion of foreign-born population than the U.S.
- The foreign-born population in Puget Sound increased substantially over the last decade and was proportionally larger than that of the U.S. in 2000.

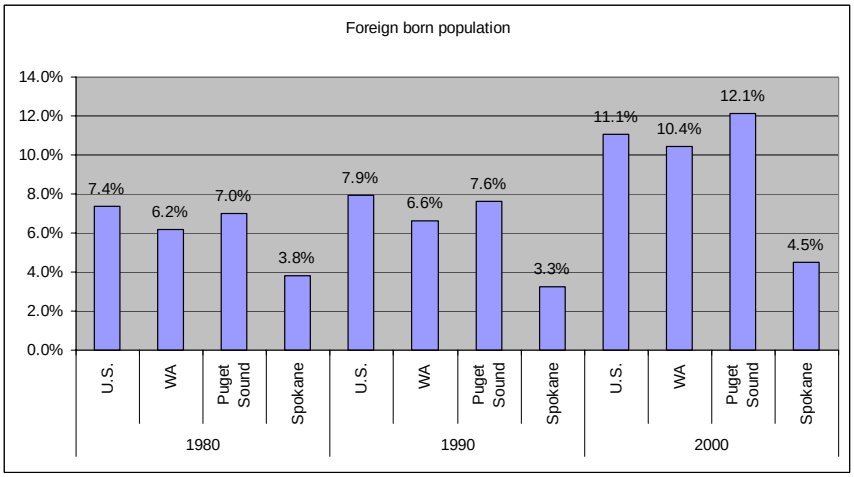


Figure 26: Percentage of foreign-born population

Average Family Income

- The unadjusted average income per family more than doubled over the two decades. Adjusted for inflation, family income remained similar over the same time period (see household income below).
- The average family income of Washington State is slightly higher than the national average.
- The average family income in the Puget Sound is higher than the national average.
- The average income per family in Spokane is lower than the national average.

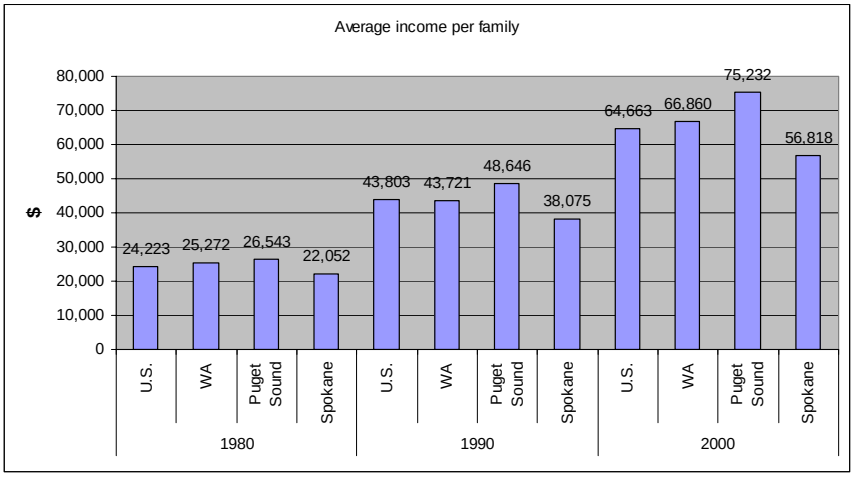


Figure 27: Average income per family ($) (last year of decade, not adjusted)

Average Household Income

- Trends in average household income are similar to those of average income per family.
- The average household income in Puget Sound is higher than the national average, while the average of Spokane is lower.
- The gap in average income per household widened between Puget Sound and Spokane over the last decade.

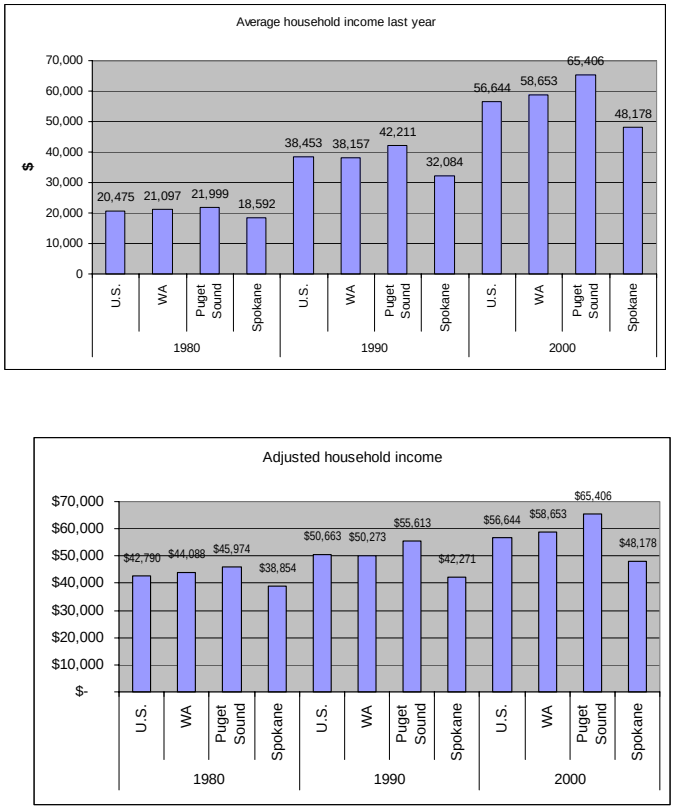


Figure 28: Average household income ($) (last year of decade, not adjusted and adjusted to 2000 dollars based on the Consumer Price Index)

Access to Private Automobiles

Occupied Housing Units by Number of Cars

- The proportion of occupied housing units with no car available is smaller in Washington, the Puget Sound, and Spokane than the nationwide average.
- The proportion of occupied housing units with two vehicles available increased over time for all study areas. A larger proportion of people 16 years and older may have contributed to the growth in vehicles per household (PSRC, Puget Sound Trends, 1999 (The proportion of the population age 16 and older increased from 67.8 percent to 77.5 percent from 1960 to 1990 (and to 78.0 percent in 2000) as "baby boomers" ages 0-14 years in 1960 grew to 26-44 years old in 1990, and to 36-54 years old in 2000).

- The proportion of occupied housing units with two vehicles is higher in Washington, Puget Sound, and Spokane than the national average.
- The proportion of occupied housing units with three and more vehicles is higher in Washington, Puget Sound, and Spokane than the national average. It slightly decreased over time, while the nationwide average increased slightly.

Table 13. Percentage of occupied housing units by number of cars

		Occupied housing units with no car available	Occupied housing units with one vehicle available	Occupied housing units with two vehicle available	Occupied housing units with three vehicle available
1980	U.S	13.6%	36.2%	33.5%	16.6%
	WA	9.0%	32.7%	34.6%	23.8%
	Puget Sound	9.6%	33.1%	34.3%	23.0%
	Spokane	9.8%	33.8%	33.8%	22.6%
1990	U.S	11.5%	33.8%	37.4%	17.3%
	WA	7.5%	31.1%	39.0%	22.3%
	Puget Sound	7.8%	31.4%	38.9%	21.9%
	Spokane	9.4%	32.6%	37.6%	20.4%
2000	U.S	10.3%	34.2%	38.4%	17.1%
	WA	7.4%	31.7%	39.4%	21.5%
	Puget Sound	7.9%	33.0%	39.0%	20.1%
	Spokane	8.8%	32.7%	38.6%	19.9%

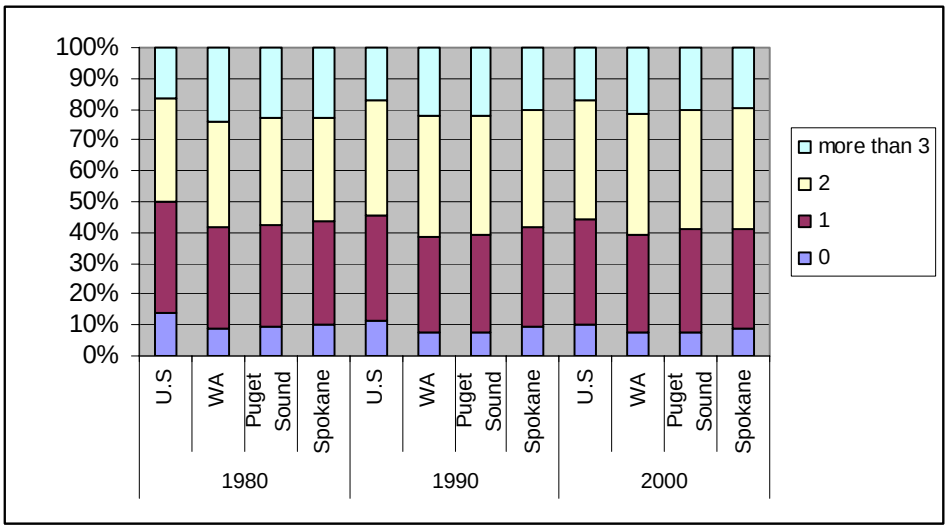


Figure 29: Percentage of occupied housing units by number of cars

Percentage of Occupied Housing Units with at Least One Car

- The percentage of housing units with at least one car is higher in Washington, Puget Sound, and Spokane than the national average.
- The percentage of housing units with at least one car increased over time in all study areas.

Table 14. Percentage of occupied housing units with at least one car

	1980	1990	2000
U.S	86%	88%	90%
WA	91%	92%	93%
Puget Sound	90%	92%	92%
Spokane	90%	91%	91%

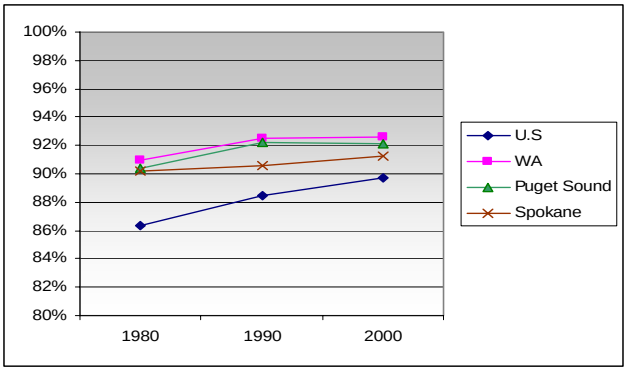


Figure 30: Percentage of occupied housing units with at least one car

Distribution of Households with No Car by Race

- In Washington State and the Puget Sound, the proportion of people of color with no car is higher relative to that of the population nationwide; it is similar in Spokane
- The proportion of people of color with no car increased slightly over time in Washington State
- In the Puget Sound and in Spokane, the proportion of people of color with no car decreased between 1980 and 1990 (likely an income effect) but increased between 1990 and 2000 (likely a population effect).

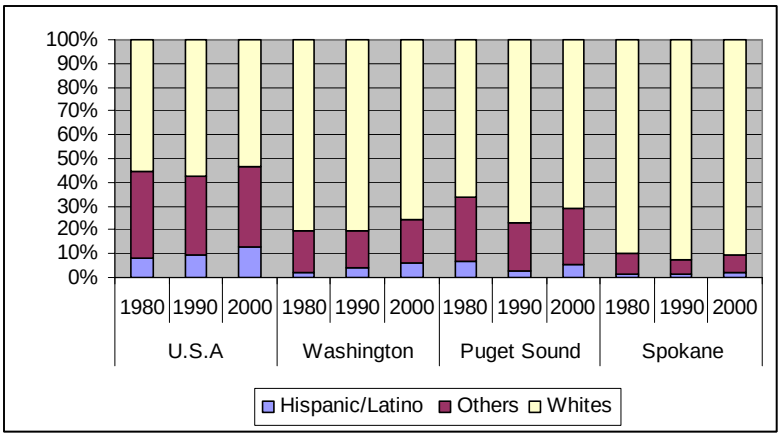


Figure 31: Hispanic, white, and other households with no car available

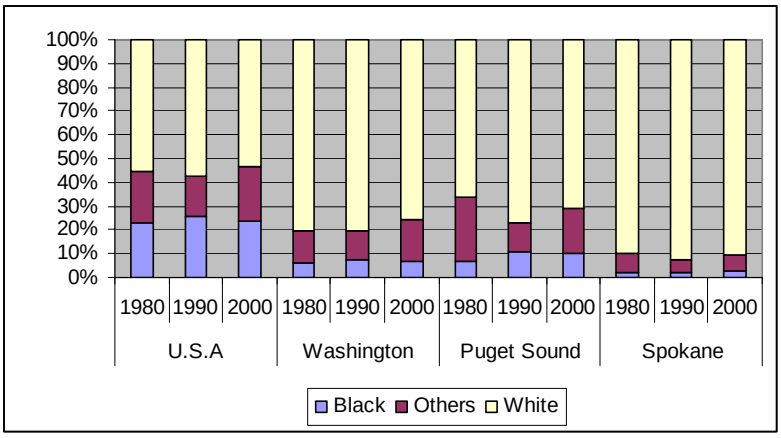


Figure 32: Black, white, and other households with no car available

Proportion of Households with No Car by Race

- Access to a private vehicle for African American and Hispanic households appear to be lower than that of other ethnic groups.[1] The proportion of African American and Hispanic households with no car available is disproportionately higher than that population in the entire population.
- The proportion of households with no vehicle available for other ethnic groups appears to correspond to that of the population.

[1] The lack of data makes it difficult to compare the proportion of household by ethnic groups with the proportion of households with no vehicle by race because data for the number of households by race are not available.

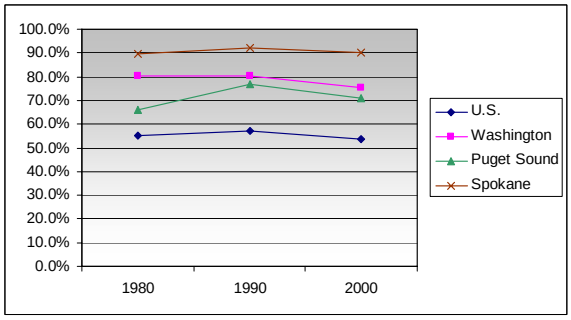


Figure 33: Proportion of white households among the households with no car available (%)

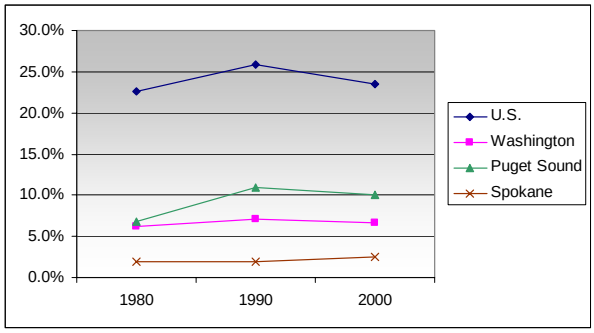


Figure 34: Proportion of black households among households with no car available (%)

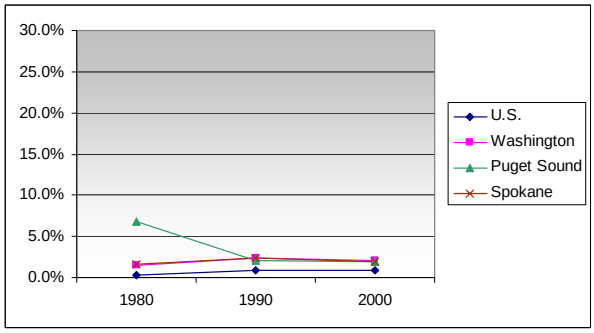


Figure 35: Proportion of American Indian households among households with no car available (%)

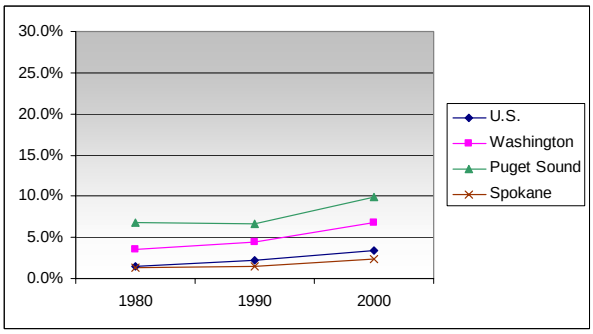


Figure 36: Proportion of Asian, Native Hawaiian and other Pacific Islander households among households with no car available (%)

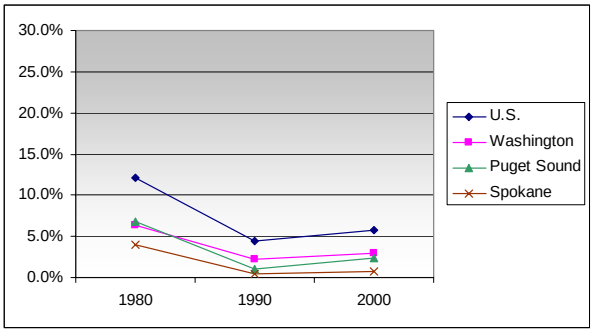


Figure 37: Proportion of other race households among households with no car available

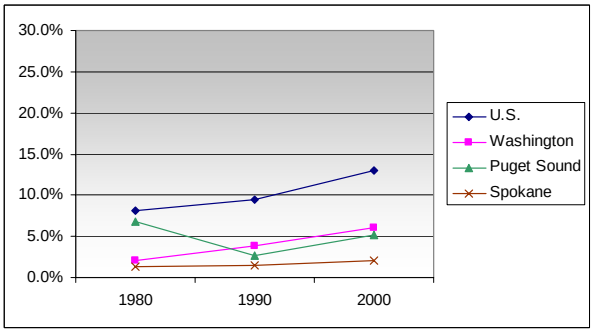


Figure 38: Proportion of Hispanic/Latino households among households with no car available

CONCLUSIONS

In comparison to those of the nation, travel indictors for Washington State do not generally raise "red" flags that are specific to the state. No indicator strongly suggests conditions in the state, whether socio-demographic or related to urban development, that are extreme enough to make the state stand out in the national context. For example, even though car ownership remains comparatively high in the state, it does not seem to translate into higher statewide VMT. One the other hand, the state does show a modest increase in the use of public transit, which is at odds with the nation's drop in public transit ridership between 1990 and 2000. The increase in public transit use comes primarily from the Puget Sound region. This and other statistics point to the different transportation "markets" in the state.

Two factors prime in their association with travel demand: household income and development density. This consistently strong association between income, residential density, and travel (VMT and car ownership) may explain the leveling of demand for car travel reported by Todd Litman (2005). Litman argues that in the early part of the 21st century, the slowing of the economy has dampened travel demand, as has continued increases in populations living in denser metropolitan areas. Future demand for travel will likely increase if the economy improves, but it could remain stable if development density continues to increase.

Socio-demographic factors continue to show that income and wealth are associated with higher demand for automobile transportation. As a result, monitoring increases in income and wealth should be an important tool for identifying growth in future demand for transportation.

Land-use factors also reflect demand for transportation. Residential and population densities matter, as they are positively associated with demand for modes other than single-occupancy vehicle travel. Living in more compact residential areas and in housing types such as row and town houses, and renting versus owning a home, also relate to lower demand for single-occupancy vehicle travel. As a result, continuing to work with growth management laws and programs in the state will be important for keeping track of, and attempting to stay ahead of, travel demand in the state.

The data used in this project were limited in that, being at the national level, they aggregated and eventually averaged out what are reasonably different situations not only within the country but within each state. In Washington State, differences in travel demand even between the Puget Sound and other parts of Western Washington remain wide ranging. Yet the study shows that, even at the aggregate level of national data, the Spokane region's transportation context has differed, and likely will continue to differ, from that of the Puget Sound. The more rural communities of the state have yet again different conditions, created by specific socio-demographic and land-use factors. Hence, state policies should recognize at least three different markets for transportation, which are found in rural, small town, and metropolitan areas.

Overall, Washington State should keep abreast of transportation issues raised at the national level: Pisarski (2002b) showed that while household formation is slowing down, growth in car ownership among new immigrants and the working poor will continue to exert pressure on transportation demand. Washington State will not be immune to these trends, as its immigrant population is growing, albeit at a slower pace than in other states of the nation. Pisarski also pointed to the effects of metropolitan development on transportation, as 80 percent of the population now lives in metropolitan regions. Land-use policies and transportation systems investments in densely populated areas will affect future travel behavior.

Both Pisarski and Litman suggested that the beginning of the 21st century is a turning point in transportation. In his analysis of travel and demographic changes between 2000 and 2004, Litman (2005) pointed to the fact that the aging population will drive less (those 65 years old and above drove 6000 miles per year in 2003, versus more than 12,000 miles for those between the ages of 25 and 54). He also indicated that the proportion of 17-year-olds licensed to drive has declined from 52 percent in 1992 to 43 percent in 2002.

In conclusion, the state needs to stay tuned to national projections about the possible impacts of population and immigration changes, as well as the impacts of economic trends. It must also rethink its policies in terms of how they might affect local situations because in transportation, "one size" often does *not* "fit all."

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