PAPER

Older Travelers
Does Place or Race Make a Difference?

SANDI ROSENBLOOM
The Drachman Institute
University of Arizona

BRIGITTE WALDORF
Department of Geography and Regional Development
University of Arizona

ABSTRACT

Previous research suggests that race and ethnicity explain some aspects of travel behavior among the elderly. This paper uses new 1995 Nationwide Personal Transportation Survey location variables based on the size, density, and function of residential areas to question whether the mode choice of White, non-Hispanic elders differs from otherwise comparable ethnic and racial elders when controlling for residential location and other important variables. Described are two estimation models that use mode choice as the dependent variable and control for residential location and a variety of other factors including age, license-holding, income, sex, and transit availability. These initial analyses show important differences in mode choice by race and ethnicity even when other key variables are held constant. They also show that residential location is the most important variable in explaining differences in mode choice.

INTRODUCTION

The elderly are the fastest growing segment of the U.S. population and people of color are one of the fastest growing groups of those over 65 (*1*). In 1994 roughly one in seven American seniors were from a racial or ethnic minority; African Americans made up over 8 percent and Hispanics (of any race) well over 4 percent of the population over 65 (*2*). However, the Bureau of the Census predicts that the percentage of elderly people of color will more than double in the next 50 years. By 2050, 15 percent of all elders will be African American, 16 percent will be Asian and Pacific Islanders, 15 percent will be Hispanic (of any race), and over 12 percent will be Native American (*3*).

A growing body of research shows that there are sometimes major differences by race and ethnicity in the travel patterns of otherwise comparable people, both among those under and over 65. The 1990 Nationwide Personal Transportation Survey (NPTS) indicated substantial variations in the trip-making behavior of elders from different racial and ethnic groups, even when controlling for income. Previous work has questioned whether these variations are explained entirely or in part by ethnic and racial differences in attitudes and preferences, habits and culture, and family beliefs and norms (*4–6*).

However, many of the analyses reported in the literature relied on simple cross

tabulations and did not control for the large number of variables other than race/ethnicity that may impact the travel patterns of older (and younger) people. In particular, most previous studies did not address the role of residential location; a major exception is Wachs' 1975 study in Los Angeles that found that a combination of residential location, lifestyle, and race or ethnicity created important travel differences and preference (*7*).

Are travel differences linked to race and ethnicity or do they result from other factors, such as differences in living patterns? Older Hispanic or African-American elders are more likely to live in large, dense metropolitan regions; even in the West and Southwest they may live in the higher density areas of those regions—places more likely to have public transit (PT) services. In 1990 African Americans and Hispanics, for instance, were substantially more likely to live inside metropolitan areas than Whites. Roughly 80 percent of all African Americans and almost 90 percent of all Hispanics lived within metropolitan regions while only 73 percent of Whites did (*8*).

The 1995 NPTS for the first time includes residential location variables based on the size, density, and function of residential areas rather than defining areas by jurisdictional boundaries. These new variables allow us to begin to address the impact of where people live. This paper uses these data to question whether the mode choice of White, non-Hispanic elders differs from otherwise comparable ethnic and racial elders when controlling for residential location and other important variables. Questions of mode choice are important because the spatial layout of most areas requires people to depend on the car for transportation; not surprisingly the overwhelming percentage of all trips by older people are taken in a car, either as the driver or a passenger. At the same time many elders, particularly those of color, have limited access to a car; just as significantly there is growing concern about the large number of older people who continue to drive, perhaps after they should objectively stop. So an understanding of how, why, and when older people use the car and other modes has major policy dimensions.

Overall, the preliminary models used in our analyses seem to confirm the results of earlier studies—race appears to explain travel differences when income and residential location do not.

At the same time, many of our key findings are based on very small cell sizes; the NPTS does not over sample the elderly, so there are a limited number of elderly respondents. In addition there are few elders of color outside urban and suburban areas. By the time we have subdivided by age, residence, income, and race or ethnicity, many cells simply have no entries. Therefore our results are not as robust as we would like them to be—our standard errors are too high so many of our findings are not statistically significant.

However, because even preliminary findings have important policy consequences, we suggest additional analyses that might provide planners with data on differences in activity and travel patterns, which would allow them to develop more appropriate and responsive transportation alternative matched to the needs of a diverse aging population.

BACKGROUND

What We Know About Ethnicity and Race

While racial and ethnic differences in travel behavior have not been studied much, the limited literature shows important variations among otherwise comparable groups of travelers. Among younger travelers, an analysis of 1980 Bureau of the Census data found that Hispanics were more likely to carpool than comparable workers and less likely to use transit than others in comparable socioeconomic groupings (*9*). A 1982 study found that Hispanics in Denver used PT far less than comparably situated Whites because (*a*) they preferred to share cars and travel with friends on all trips; and (*b*) they were traveling to different places for activities than other travelers. A 1995 study in Los Angeles found that Asian commuters had a higher drive alone and a lower carpool rate than comparable travelers in other ethnic or racial groups (*10*).

A 1998 Transit Cooperative Research Program (TCRP) study of 1990 Bureau of the Census data found that African-American workers were 2 to 5 times more likely to commute via PT than the average worker in the same metropolitan area with the same income. Hispanic workers (of any race) were 1.5 to 3 times more likely to use PT than the average worker, largely independent of the size and density of the metropolitan area in which they lived or their income. Comparable analysis of non-work travel using the 1990 NPTS found that African Americans and Hispanics were also more likely to use PT for all their trips than White or other travelers even when controlling for income (*11*).

The data on the travel patterns of older people by race and ethnicity is even sparser. The seminal study, conducted by Wachs in Los Angeles in 1975, found important travel differences by ethnicity. For example, elderly Hispanic women were significantly less likely to have a driver's license but more likely to make trips in automobiles than comparably situated Whites or other minority women, generally traveling with relatives and family members (*12*). A 1976 study conducted in Los Angeles for the National Science Foundation (NSF) found significant differences in ride sharing and ride giving as well as variations in responses to transit cost and fear for personal safety among African-American, White, and Hispanic elders with comparable socioeconomic status (*13*). The NSF study concluded that "differences in cultural orientations and needs of minority groups, [were] not adequately taken into account" in transportation planning (*14*).

Rosenbloom's analyses of 1990 NPTS data found great differences among older people by race and ethnicity. Hispanics made fewer person trips than all other categories of travelers, even though they traveled for longer distances than African American or other workers. These patterns held true in rural as well as urban places and were not explained by income or license status (*15*). The 1990 NPTS analyses also showed that Whites and Hispanics (of any race) were much more dependent on the private car and much less dependent on walking or PT than African Americans or other older people. Moreover, the gap between the sexes was greater in some ethnic groupings. For example, Hispanic older men were much more likely to use a private vehicle and much less likely to walk than Hispanic women and this gender difference was greater than among other older travelers.

Rosenbloom's study also found that men and women from different ethnic and racial

backgrounds had different daily trip rates and covered different distances. For example, White older men made 32 percent more person trips than African-American older men and 22 percent more than Hispanic older men. White older women traveled more than three times the daily miles covered by African-American and Hispanic older women—and differences in income level did not explain these disparities in travel patterns. At all income levels White older women made substantially more trips per day than did older women from other backgrounds and there were important differences between those women. For example, Hispanic older women in households with incomes under $20,000 made 50 percent fewer daily trips than African-American older women in comparable households. Similar patterns were seen among older men from different backgrounds, although the differences were not as great.

What We Know About Travel Mode

Arguably one of the most important decisions made by an older person is the mode of travel used—and that is clearly linked to licensing rates. In 1997 almost 92 percent of all men and almost 67 percent of all women over 65 had a driver's license. But what is significant is that licensing is close to universal among those who will become 65 in the next 15 years; by 2012 almost every U.S. male and more than 9 out of 10 women will enter their retirement years as drivers. Even today almost 3 out of 4 men over 85 are licensed drivers. Older drivers now account for a significant, and growing, share of all drivers; those over 65 make up over 14 percent of American drivers.

Table 1, using unpublished data from the 1995 NPTS, shows the importance of the private car in the lives of older Americans. There is no cohort of the elderly who take fewer than 8 out of 10 trips in a car. At the same time, as people age they are more likely to be the passenger in the car and not the driver, but no cohort of the elderly drives themselves for less than half of all their trips, even those older than 85. For all cohorts the second most important travel mode is walking, not public transportation. In fact there are only small differences in the use of PT by cohorts of the elderly; no elderly group makes more than 2.4 percent of all trips by bus or train or tram.

However, the residential patterns of the elderly diverge, creating important differences among otherwise comparable people. Since 1960 more elderly people have

TABLE 1 Travel Mode for All Trips by Cohorts of the Elderly, USA, 1995

Mode	65–69	70–74	75–79	80–84	85+
Car	92.5	92.0	91.1	92.2	84.8
As Driver	73.1	69.1	64.7	59.1	50.7
As Passenger	19.4	22.9	26.4	33.1	34.1
Public Transit	2.0	1.7	2.3	1.7	2.4
Walking	4.6	5.7	6.0	5.4	11.2
Bikes	0.2	0.2	*	0.3	*
All Other Modes**	0.7	3.4	0.6	0.4	*

* less than 0.1 percent

** rounding errors

Source: Unpublished data from 1995 NPTS.

TABLE 2 Car Use by Older People, 1995

Mode	Urban	Suburban	Rural
Car	77.3	93.7	94.8
As Driver	54.9	71.7	68.1
As Passenger	22.4	22.0	26.7
Public Transit	8.5	0.9	0.3
Walking or Bike	13.3	4.6	4.6
All Other Modes	0.9	0.8	0.3

Source: Unpublished data from 1995 NPTS.

lived in low-density places than in the core of our nation's central cities; in 1990 almost three-fourths of all people over 65 lived outside the central cities. The travel implications can be seen in Table 2 (which displays only 3 of the 5 residential categories in the 1995 NPTS). Those living in suburban or rural areas made more trips, traveled longer, and did so more often in a car than those who lived in central cities, sometimes by striking margins. In general this represents both the lack of alternatives to the private car and the fact that origins and destinations are more widely spread in low-density areas.

Ethnic and racial differences may lead to differences in the travel mode of older people for a variety of reasons. There may be cultural differences about the perceived need for a license (or car), the appropriateness of traveling alone (particularly for women), and the safety risks posed by alternative modes. Substantial research shows vast differences by race and ethnicity in caregiving and support relationships among family members and between the generations; the travel choices of older people may be influenced by whether providing transportation is seen as part of a care-giving role. A 1998 report for the TCRP noted:

> Differences in cultural norms about family support may affect the amount of assistance offered to older people in carrying out their daily activities; these norms may equally affect the kind of help older people expect from friends and relatives (either the kind of assistance which reduces their own need to travel, or the offer of a ride or escort when travel is required)... Families, and many older people themselves, may vary in the degree to which they offer rides to others, accept rides instead of driving or staying at home, or accompany family members on a bus... (*16*).

METHODOLOGY

To better address the impact of differences in residential patterns on travel behavior, we conducted an exploratory analysis that attempted to tease out the salient covariates of mode choices. We based our analyses on data taken from the 1995 NPTS. In total, 33,122 trips made by persons over 65 were included. As expected, only a small number of trips (542 or 1.7 percent) were made by public transportation. Using a privately owned vehicle (POV), either as driver or passenger, was by far the dominant mode of transportation, accounting for 91.8 percent of all trips.

We used a series of logit models to control efficiently for the effects of other

covariates and to obtain actual estimates of the magnitude of race and space effects. Two mode choices were used as the dependent variables: trips made in a privately owned vehicle and those made on PT. The variables expected to influence mode choice and used in the models are listed below. Table A-1 in the appendix gives further details.

Ethnicity	Hispanics of any race
Race	White African American Asian American
Location	Urban Suburban Second City Town
Household Income	
Gender	
Public Transit Availability	
Trip Purpose	
Age	
Driver Status	

All variables are based on the original 1995 NPTS data. The location variable is captured by four dummy variables, distinguishing whether the trip maker lives in a city (Urban = 1), suburb (Suburb = 1), second city (Seccity = 1), town (Town = 1), or a rural area (omitted category).

These locational variables are new to the 1995 NPTS and are based on the work of Miller and Hodges who developed a functional way to categorize each of the nation's 226,399 Census Block groups (*17*). Their five-part classification (urban, suburban, second city, town, rural) is an attempt to develop a consistent framework that does not depend on artificial and often inconsistent boundary definitions. People working with large databases (e.g., the Census or American Housing Survey) generally categorize all land within the legal or corporate limits of the main city in the metropolitan area as "central city." "Suburb" is usually defined as land outside the legal boundaries of the central city but within the county in which the central city resides and so forth. Unfortunately jurisdictional boundaries rarely correspond to land-use or development patterns; low-density developments are often defined as central city and very high-density development as suburban (or even rural) (*18*).

Miller and Hodges' classification is based instead on what they term lifestyle clusters, using contextual density—or measures that relate population density to housing to consumer markets, etc. The five residential categories are on a spectrum: areas with the lowest contextual density were designated rural; those areas on the other end of the spectrum, with the highest contextual density, are designated urban. Both urban areas and the smaller second cities can have suburbs although not all second cities do. While the researchers do not argue that their classification scheme is infallible or addresses all objections, it is clearly a decided improvement on boundary-based measures of place for our research because it captures the very lifestyle factors that impact activity and travel choice.

The effects of race/ethnicity on mode choice are captured via a series of dummy variables: Hisp distinguishes between Hispanics and non-Hispanics. The race variable is translated into three dummy variables that differentiate between Whites, African American, Asians, and "others" (omitted category). Unfortunately, the NPTS did not collect this information for each person, but only for the reference person of the associated household.

Trip makers' personal information included in the model are income (using a dummy variable for each income category, with the $100,000+ income group being the omitted category); gender (Male = 1 for men); age; whether the trip maker is a driver (Driver = 1); and the purpose of the specific trip (each purpose is captured as a dummy variable). In addition, the model controls for the effect of public transportation availability (PTA = 1).

We estimated two models to understand the effects of race and space on mode choice of the elderly. The first assessed the impact of the covariates described above on whether the trip was made by a POV, using the Bernoulli variable POV (POV = 1). The second model used PT use as the dependent variable (PT = 1). Since both models used a Bernoulli distributed variable (0-1 variable) as the dependent variable, a logit model was chosen as an appropriate modeling frame:

$$p_i / (1 - p_i) = \exp (b_o + b_1 X_{i1} + ...+ b_n X_{in})$$

where p_i is the probability that trip i was made by a particular mode (POV in the first model, PTC in the second model), X_{i1} to X_{in} are the personal and locational covariates associated with trip i, and b_o to b_n are the associated parameter estimates, describing the effects of X_i on mode choice probabilities. The left-hand side of the equation describes the relative odds of choosing a mode, and the right hand side is the exponential of the linear predictor. The estimation used the SUDAAN software (Logistic Procedure) and accounted for the weighting structure used in the NPTS sampling design.

The overall performance of the models was assessed via the chi-square distributed test statistic of the log-likelihood ratios referring to the estimated and the null model. For both models, the chi-square statistics is highly significant (p – value < 0.00).

TABLE 3 Mode Choice for All Trips by Race and Ethnicity, People 65+, 1995 (Percent)

	White		African American		Asian		Hispanic (of any race)	
	POV	PT	POV	PT	POV	PT	POV	PT
Urban	82.5	5.1	59.3	20.1	68.5	20.4	86.2	0.8
Town	94.9	0.4	98.6	0.4	88.9	11.1	92.9	0.0
Suburb	94.1	0.8	94.2	3.4	99.8	0.0	80.4	0.0
2nd City	95.2	0.7	91.5	3.8	85.6	0.0	92.0	1.0
Rural	95.3	0.3	95.8	0.0	100.0	0.0	95.1	0.3

Source: Unpublished data from 1995 NPTS.

INITIAL ANALYSES

Table 3 describes the mode choice of older people in various residential locations. It is clear that all elderly travelers rely heavily on the private car—it accounts for between 60 and 100 percent of all trips taken by the elderly. But older African Americans, Asian Americans, and Hispanics (of any race) choose public transportation substantially more often than do White elderly trip makers, especially in urban core areas. However, these cross tabulations do not control for other salient covariates such as income, gender, age, and trip purpose.

Model One

Table 4 describes the outcome of our first model that did consider these other important covariates; the estimation results indicate that among elderly trip makers, ethnicity and race have an impact on choosing a POV even after controlling for income and residential location. The table lists parameter estimates, odds ratios, and mode choice probability for each covariate. For interpretation purposes, the parameter estimates are less suitable (less intuitive), although they indicate whether the effect of a covariate is positive or negative.

The odds ratio and probability, on the other hand, provide useful and intuitive interpretations of the effects of each covariate on mode choice. The odds ratio is defined as the ratio of the chances of choosing a POV versus not choosing it. In the case of dummy variables, this ratio is expressed relative to the omitted category keeping all other attributes constant. In the case of continuous variables the ratio refers to a one-unit change in the covariate, again keeping all other covariates constant. Similarly, there is a 50 percent probability (p = 0.5) that a trip made by person with a particular characteristic

TABLE 4 Choosing a Private Vehicle: Trips Made by the Elderly (1995 NPTS)

	Covariate	Parameter Estimate	Odds Ratio	Relative Probability
Ethnicity (Omitted category: non-Hispanic)	Hispanic	–0.14	0.87	0.46
Race (Omitted category: others)	White	+0.31	1.36	0.57
	African American	–0.26	0.77	0.43
	Asian	+0.07	1.07	0.52
Location (Omitted category: rural)	Urban	–1.55	0.21	0.17
	Suburban	–0.15	0.86	0.46
	Second City	+0.05	1.05	0.51
	Town	–0.05	0.95	0.48

Additional covariates see Appendix.
n = 33122
Chi-Square = 2621.08 (42 degrees of freedom, p - value < 0.00)

will be in a POV, assuming a trip made by an otherwise identical person who does not have this characteristic (omitted category).

In comparing Whites, African Americans, and Asian Americans, the model estimates that African Americans have the lowest probability of choosing a car, followed by Asian Americans. Whites have the highest probability of choosing a car. The odds that a White elderly trip maker will choose a POV is 1.76 times higher (1.36/0.77) than for an African-American elderly trip maker, controlling for the effects of all other covariates (i.e., ethnicity, age, gender, income, location, public transportation availability, and trip purpose). Although indicative of a racial minority-majority disparity, these results are not significant at a 0.05 significance level. Similarly, for the ethnicity variable the results suggest that Hispanics are less likely to choose a POV than non-Hispanics, the difference in probabilities amounting to 4 percentage points (0.46 versus 0.5). But this estimated difference is not significant at a 0.05 level.

Figure 1 displays the data in a different way, comparing people of color to White elders. The figure shows that, holding all the other covariates constant, African Americans and Asian Americans are less likely to travel via a private vehicle than are Whites. Independent of where they live or whether they drive, the availability of PT, or their household income, these people of color are less dependent on the private car than comparable White older travelers.

The location variable emerges as the most dominant covariate of POV choice. Living in an urban core (urban = 1) implies that the chances of taking a car is significantly and substantially lower than in any other location, all other things equal (that means, also accounting for the availability of public transportation). It is estimated, for example, that the difference in probabilities of taking the car between elderly residents of an urban core and elderly residents in suburbs is 29 percentage points (0.46–0.17).

Figure 2 shows these results in a different way, comparing those living outside rural

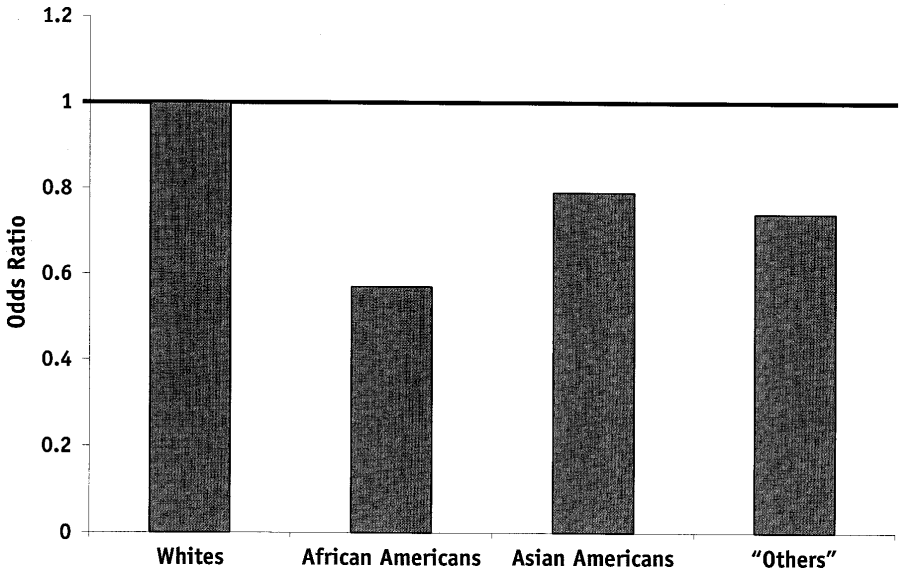

FIGURE 1 Comparative likelihood of using a private car by race, people 65+, 1995.

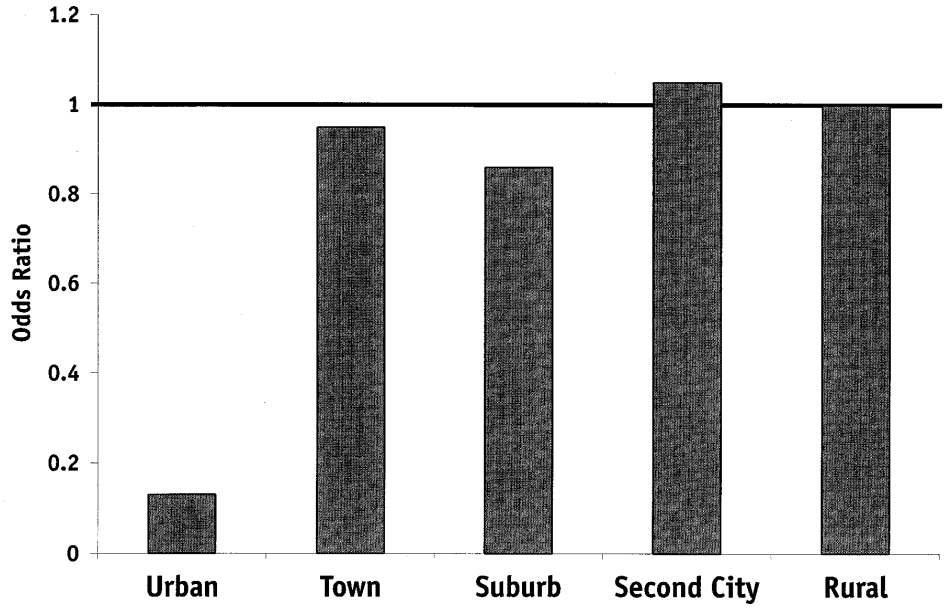

FIGURE 2 Comparative likelihood of using a private car by location, people 65+, 1995.

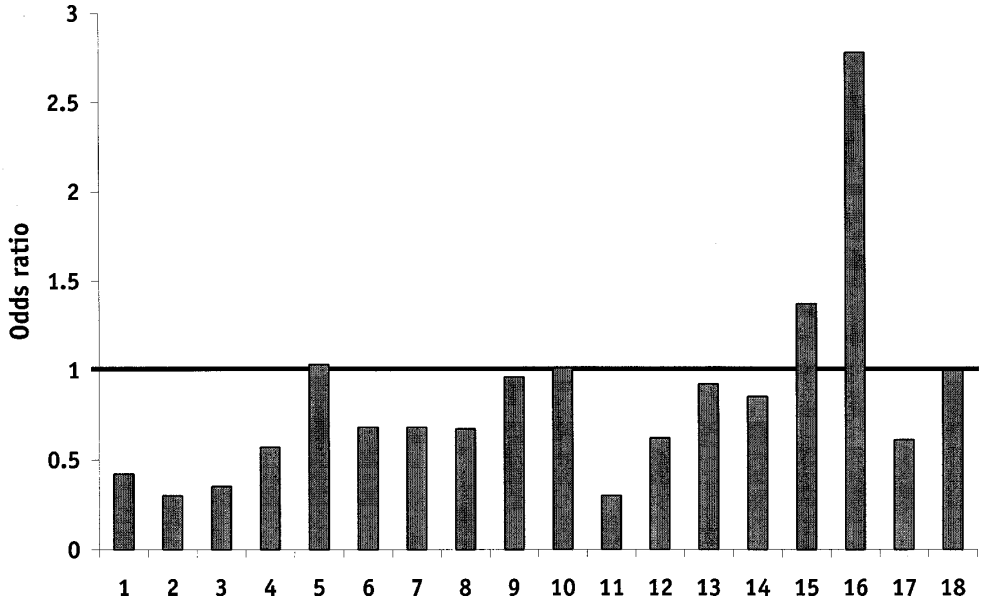

FIGURE 3 Comparative likelihood of using a private car by income, people 65+, 1995.

areas to those within. Regardless of any of the selected characteristics of the elderly traveler, those living in urban areas are substantially less likely to use a car than those in other residential areas by a considerable margin. These results are, perhaps, not surprising, although the magnitude of the effect may be.

Gender does not affect choosing to go by car significantly, although the estimated effect suggests that men are more likely to choose going by car than women. The age effect (above 65) is insignificant. For the income categories, the very low-income groups (less than $20,000) are significantly less likely to go by car than the very rich. Figure 3 shows that in comparing all elderly travelers to those with very high income we do not see the clear pattern that we would anticipate. Although we might expect auto use to increase steadily with income, it does not generally do so, holding all other variables constant.

Model Two

The second model estimates the effects of race, ethnicity, and location on the probability of choosing public transportation, controlling for the effects of gender, age, income, trip purpose, availability of public transportation, and whether the trip maker is a driver. The results are shown in Table 5. The estimation presents both surprising as well as expected results. First, all other things being equal, Hispanics are significantly and substantially less likely to choose public transportation than non-Hispanics. Specifically, the relative odds of choosing public transportation are estimated to be 25 times higher (1/0.04) for non-Hispanics than for Hispanics.

The race parameter estimates show that among elderly trip makers Asian Americans are most likely to choose public transportation, followed by African Americans, followed by Whites. The estimated differences between the three groups, although substantial, are not statistically significant. The only significance that can be established is between African Americans and the omitted category “others,” and between Asian Americans and

TABLE 5 PT Choice for Trips Made by the Elderly (1995 NPTS)

	Covariate	Parameter Estimate	Odds Ratio	Relative Probability
Ethnicity (omitted category: non-Hispanic	Hispanic	–3.18	0.04	0.038
Race (omitted category: “others”)	White	+0.33	1.39	0.58
	African American	+1.09	2.97	0.74
	Asian	+1.70	5.46	0.85
Location (omitted category: rural)	Urban	+2.57	13.08	0.93
	Suburban	+0.74	2.68	0.73
	Second City	+0.99	2.20	0.68
	Town	+0.79	2.09	0.67

Additional covariates see Appendix.
n = 33122
Chi-Square = 2268.77 (43 degrees of freedom, *p* – value < 0.00)

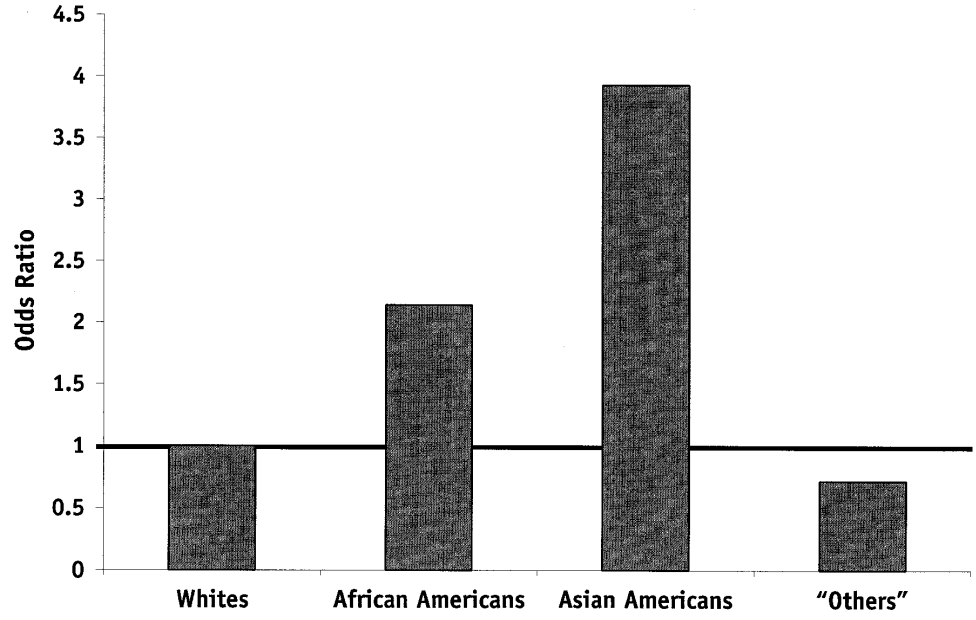

FIGURE 4 Comparative likelihood of using PT by race, people 65+, 1995.

"others." Figure 4 shows these data in a different format; elders of color are much more likely to use PT, even controlling for residential location, income, etc.

The parameter estimates referring to the locational dummy variables suggest that residents in urban cores have a substantially higher probability of choosing public transportation than residents in any other location, all other things being equal. However, only the comparison with trip makers living in rural areas is highly significant. For the remaining covariates, elderly men are estimated to have a higher chance of taking public transportation than elderly women. The income dummy variables show no discernible pattern of declining public transportation use with increasing income, choice of public transportation declines significantly as a person ages, and not surprisingly, drivers are less likely to choose public transportation than non-drivers. Figure 5 shows these data in another way—income does not appear to be linked as closely to transit use as might be expected, when race, ethnicity, income, and residential location are taken into account.

SUMMARY AND CONCLUSIONS

The literature suggests that race and ethnicity explain some aspects of travel behavior among both those over and under 65. To further explore this set of relationships we used 1995 NPTS data on the travel behavior of those 65 and above to estimate two different models. With mode choice serving as the dependent variable we controlled for residential location using the five location variables newly introduced into the NPTS and a variety of other variables, including age, license-holding, income, etc. These initial analyses show important differences in mode choice by race and ethnicity even when other key variables are held constant.

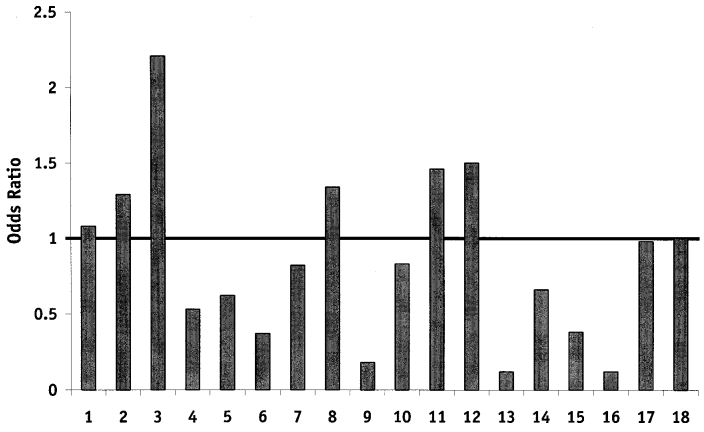

FIGURE 5 Comparative likelihood of using PT by income, people 65+, 1995.

Preliminary Findings

Based on the estimation results for the models with respect to the key variables—ethnicity, race, and location—we can say

- Race is important in understanding variations in mode choice behavior among the elderly. Racial minorities are less likely to go by car and more likely to choose public transportation. However, the data and models have not provided sufficient evidence of statistical significance.
- Location is the most dominant covariate of mode choice. In particular, residence in an urban core significantly and substantially lowers the probability of going by car while increasing the chances of choosing public transportation.
- Ethnic variation (Hispanic versus non-Hispanic) among the elderly only has an effect on the use of public transportation. Surprisingly, Hispanics are significantly less likely to choose public transportation than non-Hispanics.

Unfortunately, although we believe that these analyses do indicate that race, and to a lesser extent ethnicity, are linked to mode choice decisions among older people, our findings are often not statistically significant. We feel that this is the result of including all of the NPTS residential categories, although there are few trips by elders of color in most of them.

Additional Research

In the next stage of our research we will constrain ourselves to suburban and urban locations rather than continuing to focus on a model that includes “the empty set.” In addition, we intend to respecify the models so that they take into account the joint effect of important variables:

- Race and location,

- Race and gender,
- Location and gender,
- Race and income,
- Location and income.

We will use interaction terms to allow us to assess, for example, whether the race effects are of different magnitude for women than for men, different for urban versus suburban residents, etc. Although methodologically we will lose some degrees of freedom, we can regain them by appropriately aggregating some trip-purpose categories (or even some income categories).

POLICY IMPLICATIONS

How will the growing number of older people meet their mobility needs in the future? How can we target the needs of a diverse population? What can we do to address the problems of people who cannot drive to meet their needs—whether or not they ever drove? The answer to these questions is linked to understanding how elders from different communities interact with their families and friends in ways that affect their activity choices and ultimately their transportation needs. We believe that this kind of research is an important beginning.

Most older people today depend on the car as a driver or a passenger; as they age they will experience greater and greater barriers—physical, economic, emotional—in continuing to drive and they may face serious difficulties in finding rides or replacing their need to travel with in-home services. People once mobile may become dependent on others, people who once had family or spouses assist them to meet their needs may now find it difficult to receive any assistance, people who once could live alone now may need to move into special facilities. Understanding differences in the travel patterns of older people may help society to fashion a range of responses to the diverse needs of a heterogenous older population.

REFERENCES

1. Smith, D. I. *The Elderly Population.* Population Profile of the United States, Current Population Reports, Special Studies. Bureau of the Census, U.S. Department of Commerce, 1998, pp. 23–194.

2. *U.S. Population Estimates by Age, Sex, Race and Hispanic Origin: 1990–93.* PPL-8. Bureau of the Census, U.S. Department of Commerce, 1994.

3. Goldstein, A., and B. Damon. *We the American Elderly.* WE-9. Economics and Statistics Administration, Bureau of the Census, U.S. Department of Commerce, Sept. 1993, p. 4.

4. Rosenbloom, S. The Travel Needs of the Elderly. In *Encyclopedia of Financial Gerontology* (L. Vitt and J. Siegenthaler, eds.), Atlantic: Greenwood Publishing, Westport, Conn., 1996.

5. Rosenbloom, S. The Transportation Needs of the Elderly. *Clinics in Geriatric Medicine: Medical Considerations in the Older Driver,* Vol. 9, No. 2, May 1993.

6. Rosenbloom, S. The Travel Patterns of Elderly Women Alone: A Research Note. *Specialized Transportation Planning and Practice,* Vol. 3, No. 3, 1989, pp. 295–310.

7. Wachs, M. *Transportation for the Elderly: Changing Lifestyles, Changing Needs.* University of California Press, Berkeley, 1976.

8. *1991 Estimates of the Population of States by Age, Sex, Race and Hispanic Origin.* PE-16. U.S. Census Bureau, U.S. Department of Commerce, 1991.

9. Millar, M., R. Morrison, and A. Vyas. *Minority and Poor Households: Patterns of Travel and Transportation Fuel Use.* Argonne National Laboratory, Ill., 1986.

10. Ho, A. Understanding Asian Commuters in Southern California: Implications for Rideshare Marketing. 94-0618. Presented at the 73rd Annual Meeting of the Transportation Research Board, Washington, D.C., Jan. 9–13, 1994.

11. Rosenbloom, S., with G. J. Fielding. *TCRP Report 28: Transit Markets of the Future: The Challenge of Change.* TRB, National Research Council, Washington, D.C., 1998.

12. Wachs, 1976.

13. Bengston, V.I., et al. *Transportation: The Diverse Aged.* Policy Report 1. Prepared for the National Science Foundation, RANN Research Applications Directorate, GPO, Washington, D.C., May 1976, pp. 37–42.

14. Bengston, et al., 1976, p. 39.

15. Rosenbloom, S. *Travel by the Elderly: 1990.* NPTS subject area report, FHWA, U.S. Department of Transportation, June 1994.

16. TCRP, 1998, p. 92.

17. Miller, D. R., and K. Hodges. A Population Density Approach to Incorporating an Urban-Rural Dimension into Small Area Lifestyle Clusters. Presented at the 59th Annual Meeting of the Population Association of America, Silver Spring, Md., May 1994.

18. TCRP, 1998, p. 85.

APPENDIX

TABLE A-1 Definition of Variables

	Variable Name		Variable Definition
Dependent Variables	**POV**		1 if a trip was made with a POV; 0 otherwise
	PT		1 if a trip was made via PT; 0 otherwise
Covariates	**Ethnicity** (omitted category: non-Hispanic)		1 if reference person in household is Hispanic; 0 otherwise
	Race (omitted category: "other")	White	1 if reference person in household is white; 0 otherwise
		African American	1 if reference person in household is African American; 0 otherwise
		Asian American	1 if reference person in household is Asian American; 0 otherwise
	Location (omitted category: rural); based on NPTS variable	Urban	1 if trip maker resides in urban location; 0 otherwise
		Suburban	1 if trip maker resides in suburban location; 0 otherwise
		Second City	1 if trip maker resides in second city; 0 otherwise
		Town	1 if trip maker resides in town location; 0 otherwise
	Household Income (omitted category: $100,000 +)		Series of dummy variables, one for each income category
	Gender (omitted category: female)	Male	1 if trip maker is male; 0 otherwise
	PTA (omitted category: no public transport available)	Public Trans A	1 if PT is available; 0 otherwise
	Trip Purpose (omitted category: "other purposes")		Series of dummy variables, one for each trip purpose (for trips home, the coding used, the origin of the trip)
	Age		Person's age in years
	Driver		1 if trip maker is a driver; 0 otherwise

TABLE A-2 Variance Estimation Method: Taylor Series (WR)
Response Variable POV: Trip Mode = POV

Independence Variable and Effects	Beta Coefficient	SE Beta	T-Test B = 0	P-Value T-Test B = 0
Intercept	1.17	1.19	0.99	0.3226
HH Hispanic/				
Hispanic	–0.14	0.42	–0.33	0.7439
Non-Hispanic	0.00	0.00	—	—
HH Race				
White	0.31	0.32	0.95	0.3422
African American	–0.26	0.35	–0.74	0.4582
Asian	0.07	0.59	0.12	0.9066
Other	0.00	0.00	—	—
Residence Type				
Urban	–1.55	0.26	–5.96	0.0000
Town	–0.05	0.23	–0.21	0.8304
Suburban	–0.15	0.26	–0.59	0.5527
2nd City	0.05	0.26	0.17	0.8623
Rural	0.00	0.00	—	—
Household Income				
Less than $5,000	–0.88	0.51	–1.70	0.0885
$5,000-9,999	–1.19	0.43	–2.78	0.0055
$10,000-14,999	–1.04	0.43	–2.44	0.0146
$15,000-19,999	–0.57	0.42	–1.34	0.1817
$20,000-24,999	0.03	0.46	0.06	0.9524
$25,000-29,999	–0.39	0.43	–0.91	0.3637
$30,000-34,999	–0.38	0.45	–0.84	0.4019
$35,000-39,999	–0.40	0.45	–0.87	0.3818
$40,000-44,999	–0.04	0.57	–0.07	0.9469
$45,000-49,999	0.01	0.48	0.01	0.9889
$50,000-54,999	–1.21	0.73	–1.66	0.0968
$55,000-59,999	–0.48	0.68	–0.71	0.4801
$60,000-64,999	–0.08	0.65	–0.13	0.8972
$65,000-69,999	–0.17	0.53	–0.31	0.7528
$70,000-74,999	0.32	0.71	0.45	0.6555
$75,000-79,999	1.02	0.83	1.24	0.2158
$80,000-99,999	–0.49	0.63	–0.78	0.4342
$100,000 and over	0.00	0.00	—	—
Gender				
Male	0.14	0.11	1.19	0.2339
Female	0.00	0.00	—	—

continued on next page

TABLE A-2 (*continued*) Variance Estimation Method: Taylor Series (WR)
Response Variable POV: Trip Mode = POV

Any Public Transportation				
Yes	–0.33	0.18	–1.84	0.0656
No	0.00	0.00	—	—
Trip Purpose (combined to and from)				
To work	2.34	0.80	2.94	0.0033
Work-related business	2.03	0.83	2.45	0.0142
Return to work	1.45	0.84	1.72	0.0859
Shopping	2.6	0.72	3.59	0.0003
School	2.15	0.79	2.73	0.0064
Religious activity	2.57	0.76	3.40	0.0007
Medical/Dental	2.12	0.74	2.85	0.0043
Other family or personal business	2.27	0.73	3.11	0.0019
Take someone somewhere	4.83	0.99	4.88	0.0000

TABLE A-3 Variance Estimation Method: Taylor Series (WR)
Response Variable POV: Trip Mode = POV

Independence Variables and Effects	Beta Coefficient	SE Beta	T-Test B = 0	P-Value T-Test B = 0
Trip Purpose (Combined to and from)				
Pick up someone	5.78	0.96	6.02	0.0000
Vacation	0.91	1.07	0.85	0.3965
Visit friends or relatives	2.12	0.74	2.86	0.0042
Went out to eat	2.52	0.72	3.48	0.0005
Other social/rec.	1.56	0.73	2.13	0.0334
Change means of transport	0.00	0.00	—	—
Other	0.00	0.00	—	—
Age	–0.00	0.01	–0.31	0.7556