

Travel of Diverse Populations: Literature Review

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Literature Review on the Travel of Diverse Populations:

Immigrants, Racial and Ethnic Groups, Native Americans, Elderly, and Youth

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Abstract

California is in the midst of a demographic transformation. According to the 2000 U.S. Census, nearly 30 percent of the California population is now foreign-born, more than 50 percent of the population belongs to a minority group, and the elderly (those 65 and older) comprise 11 percent of the population. Demographic forecasts suggest that these patterns will continue. California will continue to attract immigrants from throughout the world and will become increasingly diverse, racially and ethnically, with whites declining as a share of the population from 54 percent in 1995 to 30 to 34 percent in 2025, according to one forecast (Thomas and Deakin 2001). The percentage of seniors will also continue its upward trajectory in the coming decades, reaching over 13 percent by 2025 (Thomas and Deakin 2001). This demographic transformation raises an important question for transportation planners in the state: How can we ensure that the kinds of transportation systems and services we provide adequately meet the needs of our increasingly diverse population?

To answer that question, planners need a better understanding of the travel behavior of diverse demographic groups within the state. As a part of a larger project studying the needs, constraints, attitudes, and preferences that influence travel choices and the outcomes of those travel choices among diverse groups in California, this report provides a review of existing literature on the travel behavior among specific demographic groups. In particular, this report provides a review of what is currently known about the travel patterns and transportation needs of the following five demographic groups, nationwide and in California: immigrants, racial and ethnic groups (Blacks, Asians, and Hispanics), Native Americans, elderly, and youth.

Key Words: land use, travel behavior, diverse demographic groups

Executive Summary

This report provides a literature review of what is currently known about the travel patterns and transportation needs of the following five demographic groups, nationwide and in California: immigrants, racial and ethnic groups (Blacks, Asians, and Hispanics), Native Americans, elderly, and youth. In all populations we see an increasing dependence on automobiles. This trend may be alarming for youth and elderly populations, who have a limited ability to take advantage of driving independently. In addition, it makes the stakes higher for those who have difficulty affording a vehicle, who are disproportionately blacks, Hispanics, immigrants, Native Americans, and, to a lesser extent, Asians. Heightened transit use among immigrants, blacks, Hispanics, Asians, and youth means that these services are particularly important for these groups. Furthermore, these populations make up a significant share of overall transit ridership.

Immigrants

Immigrants are more likely to use transit and less likely to own cars than the rest of the population, on average, especially those who have been in the country for a shorter amount of time and especially among more recent cohorts of immigrants. With time spent in the U.S., immigrant travel patterns become more similar to the rest of the population, but in many cases differences persist that are not explained by differences in income. With respect to residential locations, immigrants tend to initially locate in ethnic enclaves in central cities, but many move into suburban neighborhoods over time, potentially still as part of an enclave. Immigrant jobs are often located in central cities, but this may be changing over time, and in addition, especially in California, many immigrants are farm workers, and therefore have different transportation needs. Still immigrants make up a large share of transit users, and therefore are a population of interest among transit agencies. In addition, immigrant communities have spawned a number of community-specific transportation options, such as intercity Chinatown buses and informal carriers such as *camionetas*. In California, farm-worker transportation is an important issue.

Racial and ethnic groups

Blacks, Hispanics, and Asians are more likely to use transit than whites, even after controlling for income and residential location, with particularly large gaps for blacks making non-work trips. Vehicle ownership is also lower among ethnic and racial minorities, with the lowest ownership rates among blacks, then Hispanics, Native Americans, and Asians. However,

licensure rates, access to cars, and daily per capita trip-making has been increasing among all groups over time. In general, Blacks, Asians, and Hispanics are more likely to live in urban areas than are the rest of the population. Blacks especially are more likely to live in neighborhoods with higher proportions of blacks, rather than as a part of integrated communities. As with the rest of the population, there are differences in the travel patterns of ethnic and racial minorities living in urban versus rural areas, with higher rates of transit use in urban areas. With lower income and education levels among ethnic and racial minorities, these groups may face particular transportation challenges related to limited pools of jobs available to them. Racial and ethnic minorities and especially blacks are more likely to be injured in traffic accidents, especially as pedestrians, than is the rest of the population.

Native Americans

Native Americans are less likely to own cars and also less likely to use transit, on average, than the rest of the population nationwide. Nationally, they are also more likely to travel more miles in a vehicle, on average, than the rest of the population, but this trend does not hold for those in California. Much of what might make Native Americans' transportation patterns different from the rest of the population may have to do with a higher propensity to have lower incomes and live in rural areas, although this trend is less prevalent in California than in other states. For Native Americans living on tribal lands, inter-jurisdictional challenges and developing transportation planning capacity are important issues for the sovereign tribal governments managing transportation systems in those areas. Rates of traffic accident fatalities are very disproportionately high among Native Americans, both as drivers and as pedestrians.

Elderly

Seniors tend to be as auto-dependent as the rest of the population, with low rates of transit use. Elderly appear to have the same types of objections to transit as the rest of the population, although amplified. Despite a shift from seniors making trips as drivers to making trips as passengers with age, trip-making appears roughly constant through around age 75. Elderly persons tend to make more off-peak trips and more unchained trips throughout the day than the rest of the population, and a higher share of trips are for social, recreational, or shopping purposes (with fewer work trips). When elderly begin making fewer trips, recreational trips appear to be the first to go. Licensure rates among elderly are expected to increase with future

cohorts of elderly, especially among women, due to successive generations' auto dependence. The number of elderly living in the suburbs appears to be growing, with many elderly preferring to age in their own homes, although there is some evidence of a shift in this trend, due to an evolving financing environment as well as changing preferences. Differences among races in the overall population appear to hold among the elderly in these groups.

Youth

Youth travel patterns mirror those for the rest of the population, with increasing auto dependence among newer cohorts, with the auto mode now dominating U.S. children's trips in general and trips to school. In California, the use of school buses is among the lowest in the country and declining over time. Children appear to make fewer independent trips than did previous generations of children, though as would be expected, independent travel increases with age. There appears to be latent demand for engaging in more active travel, such as biking and walking, with long distances and traffic safety most often cited by parents as barriers. Interest in active travel appears to wane with age, with the majority of children becoming drivers at age 16 or 17. Differences by race and income tend to mirror the trends found in the rest of the population. Girls' travel appears somewhat different than boys', with less independent and active travel occurring at all ages. Children's travel is highly correlated with that of their parents.

Table of Contents

Abstract	iii
Executive Summary	v
Chapter 1. Introduction and summary	1
Theoretical framework	2
Summary of findings.....	4
Chapter 2. Immigrants	7
Immigration Patterns and Projections	7
Transportation.....	8
Residential Location.....	12
Employment, Wages, Poverty	16
Use and Access to Public Services.....	17
Chapter 3. Racial and ethnic groups	20
Population Characteristics and Trends.....	20
Transportation.....	21
Vehicle Ownership.....	24
Travel Time and Distance.....	25
Health and Travel Safety	28
Residential Location, Mobility and Tenure.....	29
Mobility	33
Employment and Wealth	34
Chapter 4. Native Americans	38
Previous literature	38
Residential, economic, and sociodemographic characteristics.....	39
Mode choice, auto ownership, and mobility.....	42
Tribal transportation planning	42
Motor vehicle fatalities.....	44
Chapter 5. Elderly.....	46
Demographic Characteristics.....	46
Location Choice	49
Travel Behavior.....	51
Route Choice.....	55
Safety and Driving Cessation	55
Transit Barriers and Preferences.....	56
Chapter 6. Youth.....	58
Overall travel patterns	58
Age	61
Gender	62
Income, race, and ethnicity.....	63
Type of place	64

Parent and child attitudes and other determinants of children’s travel	66
Children’s influence on household travel.....	68
Strategies for better outcomes.....	68
Data needs.....	70
Chapter 7. Conclusions	71
References by chapter	72
1. Introduction.....	72
2. Immigrants.....	72
3. Race and ethnicity	75
4. Native Americans.....	82
5. Elderly	84
6. Children and youth.....	86

Chapter 1. Introduction and summary

California is in the midst of a demographic transformation. According to the 2000 U.S. Census, nearly 30 percent of the California population is now foreign-born, more than 50 percent of the population belongs to a minority group, and the elderly (those 65 and older) comprise 11 percent of the population. Demographic forecasts suggest that these patterns will continue. California will continue to attract immigrants from throughout the world and will become increasingly diverse, racially and ethnically, with whites declining as a share of the population from 54 percent in 1995 to 30 to 34 percent in 2025, according to one forecast (Thomas and Deakin 2001). The percentage of seniors will also continue its upward trajectory in the coming decades, reaching over 13 percent by 2025 (Thomas and Deakin 2001). This demographic transformation raises an important question for transportation planners in the state: How can we ensure that the kinds of transportation systems and services we provide adequately meet the needs of our increasingly diverse population?

To answer that question, planners need a better understanding of the travel behavior of diverse demographic groups within the state. As a part of a larger project studying the needs, constraints, attitudes, and preferences that influence travel choices and the outcomes of those travel choices among diverse groups in California, this report provides a review of existing literature on the travel behavior among specific demographic groups. In particular, the following five chapters provide a review of what is currently known about the travel patterns and transportation needs of the following five demographic groups, nationwide and in California (it is recognized that these groups are not mutually exclusive, and that an attempt to tease out the effects of cross-cutting characteristics that overlap among these categories is necessary):

- Immigrants,
- Racial and ethnic groups (Blacks, Asians, and Hispanics),
- Native Americans,
- Elderly, and
- Youth.

This chapter briefly describes a theoretical framework for the study of travel behavior in this context and then provides a summary of the findings from the more detailed sections that follow.

Theoretical framework

The standard model of travel behavior, based on economic theory, assumes that individuals seek to maximize their utility, where the utility of travel is primarily in bringing people to spatially segregated activities, such as work, school, and shopping (e.g. Domencich and McFadden 1975). That is, people try to optimally meet their needs for travel, such as getting to work, going shopping, and getting children to school—subject to whatever constraints they face, including their own constraints, such as limits on time, limits on income, or the inability to drive, and constraints imposed by the transportation system, such as the level of service provided by different modes.

However, this optimization process is complicated for several reasons. First, people must make longer-term choices that affect their shorter term choices for everyday travel, such as auto ownership and job location. Second, the types of considerations that make a particular choice optimum for someone are likely unique to that individual and to her particular circumstance. Furthermore, some of the considerations that are thought to be relevant for travel choices do not necessarily fit into the traditional notion of “rational” decisionmaking implied by economic theory. This rich set of considerations might include factors such as ability or willingness to pay, family responsibilities, residential location, risk aversion, perceptions of safety or comfort, previous travel experiences, cultural norms, sensitivity to features of the built environment, the desire to impress peers, and self-efficacy.

Because of the non-rational nature of some of these considerations, theories from the field of psychology are a useful supplement to utility-maximization in framing travel behavior choices. In particular, the “theory of planned behavior” (e.g. Ajzen 1991) and “social cognitive theory” (e.g. Bandura 1986) both contribute useful frameworks for understanding travel behavior in general and among the particular groups that are the focus of this project. The theory of planned behavior identifies three different types of beliefs that play an important role in explaining behavior: beliefs about likely outcomes of a behavior (e.g. if I go alone, I will get lost), normative beliefs about whether others approve or disapprove (e.g. driving a sports car is cool), and beliefs about factors that will facilitate or constrain particular behaviors (e.g. bus stops are dangerous places to spend time). Social cognitive theory recognizes that an individual’s behavior is not simply a product of her personal characteristics and the environment, as given inputs to a behavioral outcome, but rather that an individual’s behavior can influence her personal

characteristics (e.g. riding the bus changes her feelings about the bus) and can influence her environment (e.g. by riding the bus she is making it more crowded for others, and/or serving as an example for someone in her peer group who might then feel encouraged to ride the bus). The notions of “outcome expectations” and “self-efficacy” also come from social cognitive theorists, referring to, respectively, expecting something to happen based on previous experience, observations, hear-say, or gut feelings; and confidence about the ability to accomplish something (Baranowski, Perry et al. 2002). These concepts are useful in explaining many aspects of behavior that seem to fall outside of the utility-maximizing framework, such as resistance to riding transit due to associated stigmas or drunk driving.

With respect to the diverse populations that are the focus of this project, it will be useful to keep all of these theories in mind in our attempt to understand the travel choices that are made and what these outcomes mean for the members of these communities. For example, it is expected that some of the “rational” factors emphasized in the utility-maximizing theory, such as travel time and travel cost, will play a significant role, especially for populations very sensitive to those factors. For example, an undocumented immigrant or someone who has a very low income may face very real and dramatic constraints in their transportation choices and job- and residential-location choices, and therefore travel outcomes for these groups may be well explained by the cost-benefit framework provided by economic theory. At the same time, planned behavior and social cognitive theories may help explain why a previously transit-dependent immigrant who now has choices might choose either to continue riding transit or to purchase and drive a car.

In general, we might expect every individual to be unique, as no two people face the same circumstances or have identical perceptions and beliefs. However, there may be some consistency for individuals who share demographic characteristics. We might expect similarities along demographic lines for several reasons. First, whatever demographic characteristic they have in common may be associated with other choices they also have in common. For example, individuals with similar income levels or educational attainment may choose to live in the same neighborhoods, choose from the same pool of jobs, shop at the same nearby grocery stores, and make the same decisions about how to travel between these activities. Demographic commonalities may be associated with particular attitudinal and belief-oriented responses as well. For example, although the youth and elderly categories cut across all racial, ethnic, and

income groups, they may have similar responses to certain situations. For example, self-efficacy is thought to be a major factor in seniors' residential and travel decisions. Similarly, children and teenagers are notoriously susceptible to peer pressure, and may be particularly determined to prove their independence, both of which may be framed as normative beliefs which may have significant influence on their travel choices. A second reason we might expect similarities along demographic lines may have little to do with the characteristic they have in common, and more to do with the fact that they share a community, for whatever reason. For example, specific communities may produce normative beliefs that are specific to that particular culture or group, such as whether it is appropriate for women to travel alone or how much stigma there is about riding transit. Furthermore, outcome expectations may be shared within a specific community, making the choices within that community more similar to each other than to the rest of the population. For example, a belief that it is dangerous to take rides in taxis may lead to limited use of that mode by a particular group.

Summary of findings

In all populations we see an increasing dependence on automobiles. This trend may be alarming for youth and elderly populations, who have a limited ability to take advantage of driving independently. In addition, it makes the stakes higher for those who have difficulty affording a vehicle, who are disproportionately blacks, Hispanics, immigrants, Native Americans, and, to a lesser extent, Asians. Heightened transit use among immigrants, blacks, Hispanics, Asians, and youth means that these services are particularly important for these groups. Furthermore, these populations make up a significant share of overall transit ridership.

Immigrants

Immigrants are more likely to use transit and less likely to own cars than the rest of the population, on average, especially those who have been in the country for a shorter amount of time and especially among more recent cohorts of immigrants. With time spent in the U.S., immigrant travel patterns become more similar to the rest of the population, but in many cases differences persist that are not explained by differences in income. With respect to residential locations, immigrants tend to initially locate in ethnic enclaves in central cities, but many move into suburban neighborhoods over time, potentially still as part of an enclave. Immigrant jobs are often located in central cities, but this may be changing over time, and in addition, especially in

California, many immigrants are farm workers, and therefore have different transportation needs. Still immigrants make up a large share of transit users, and therefore are a population of interest among transit agencies. In addition, immigrant communities have spawned a number of community-specific transportation options, such as intercity Chinatown buses and informal carriers such as *camionetas*. In California, farm-worker transportation is an important issue.

Racial and ethnic groups

Blacks, Hispanics, and Asians are more likely to use transit than whites, even after controlling for income and residential location, with particularly large gaps for blacks making non-work trips. Vehicle ownership is also lower among ethnic and racial minorities, with the lowest ownership rates among blacks, then Hispanics, Native Americans, and Asians. However, licensure rates, access to cars, and daily per capita trip-making has been increasing among all groups over time. In general, Blacks, Asians, and Hispanics are more likely to live in urban areas than are the rest of the population. Blacks especially are more likely to live in neighborhoods with higher proportions of blacks, rather than as a part of integrated communities. As with the rest of the population, there are differences in the travel patterns of ethnic and racial minorities living in urban versus rural areas, with higher rates of transit use in urban areas. With lower income and education levels among ethnic and racial minorities, these groups may face particular transportation challenges related to limited pools of jobs available to them. Racial and ethnic minorities and especially blacks are more likely to be injured in traffic accidents, especially as pedestrians, than is the rest of the population.

Native Americans

Native Americans are less likely to own cars and also less likely to use transit, on average, than the rest of the population nationwide. Nationally, they are also more likely to travel more miles in a vehicle, on average, than the rest of the population, but this trend does not hold for those in California. Much of what might make Native Americans' transportation patterns different from the rest of the population may have to do with a higher propensity to have lower incomes and live in rural areas, although this trend is less prevalent in California than in other states. For Native Americans living on tribal lands, inter-jurisdictional challenges and developing transportation planning capacity are important issues for the sovereign tribal governments

managing transportation systems in those areas. Rates of traffic accident fatalities are very disproportionately high among Native Americans, both as drivers and as pedestrians.

Elderly

Seniors tend to be as auto-dependent as the rest of the population, with low rates of transit use. Elderly appear to have the same types of objections to transit as the rest of the population, although amplified. Despite a shift from seniors making trips as drivers to making trips as passengers with age, trip-making appears roughly constant through around age 75. Elderly persons tend to make more off-peak trips and more unchained trips throughout the day than the rest of the population, and a higher share of trips are for social, recreational, or shopping purposes (with fewer work trips). When elderly begin making fewer trips, recreational trips appear to be the first to go. Licensure rates among elderly are expected to increase with future cohorts of elderly, especially among women, due to successive generations' auto dependence. The number of elderly living in the suburbs appears to be growing, with many elderly preferring to age in their own homes, although there is some evidence of a shift in this trend, due to an evolving financing environment as well as changing preferences. Differences among races in the overall population appear to hold among the elderly in these groups.

Youth

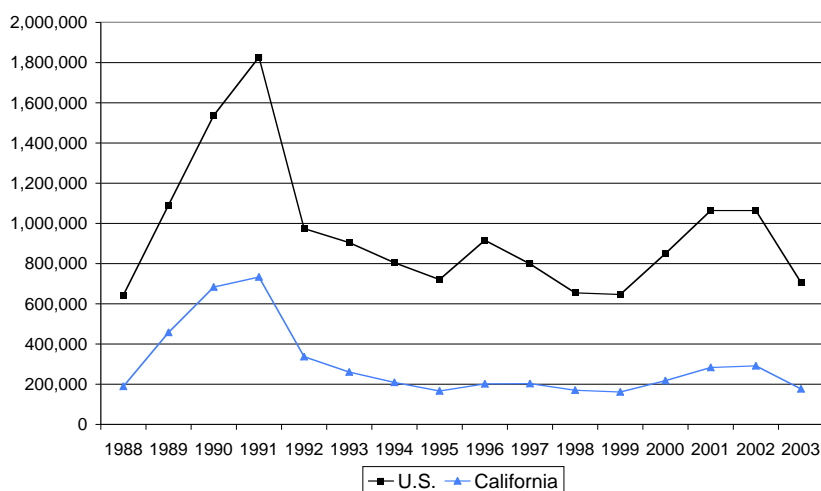
Youth travel patterns mirror those for the rest of the population, with increasing auto dependence among newer cohorts, with the auto mode now dominating U.S. children's trips in general and trips to school. In California, the use of school buses is among the lowest in the country and declining over time. Children appear to make fewer independent trips than did previous generations of children, though as would be expected, independent travel increases with age. There appears to be latent demand for engaging in more active travel, such as biking and walking, with long distances and traffic safety most often cited by parents as barriers. Interest in active travel appears to wane with age, with the majority of children becoming drivers at age 16 or 17. Differences by race and income tend to mirror the trends found in the rest of the population. Girls' travel appears somewhat different than boys', with less independent and active travel occurring at all ages. Children's travel is highly correlated with that of their parents.

Chapter 2. Immigrants

Immigration Patterns and Projections

Very little academic scholarship has focused on the travel patterns and behavior of immigrants. Yet legal immigration, after tapering off during the late 1990s, is once again rising. In 2002, almost 300,000 new immigrants entered California, the intended destination of 27 percent of all immigrants to the United States (California Department of Finance, 2002; U.S. Department of Homeland Security, 2004 (Figure 2.1)).¹ Over nine percent of immigrants to the U.S. intend to settle in the Los Angeles-Long Beach metropolitan area (U.S. Department of Homeland Security, 2004).² Although immigration to California tapered off in 2003 (U.S. Department of Homeland Security, 2003), population forecasts suggest that international migration to California will continue to be an important source of population growth in the state (Lee, Miller and Edwards, 2003).

Figure 2.1. Legal Immigration to the United States and California



Source: U.S. Department of Homeland Security (2004). *2003 Yearbook of Immigration Statistics*. Office of Immigration Statistics, September

More startling than data on the number of annual entrants to California is the cumulative effect of immigration on the composition of the California population. Data from the 2000 U.S. Census show that more than one-quarter of the California population is foreign-born. Forty-four

¹These figures underestimate the total percentage of immigrants to California since they exclude unauthorized or “illegal” immigration. The U.S. Immigration and Naturalization Service (2003) estimates that 2.2 million unauthorized immigrants resided in California in 2000, up from 1.5 million in 1990.

² In fiscal year 2003, 703,542 legal immigrants were granted lawful permanent residents in the U.S.; of these, 64,422 stated their intent to live in Los Angeles (U.S. Department of Homeland Security, 2004).

percent of the foreign-born population comes from Mexico and another 22 percent from Asia (U.S. Bureau of Census, 2004). The foreign-born population comprises over one-third of the population in Los Angeles, over one-quarter of the population in the San Francisco Bay Area, and over one-fifth of the population in the Southern, Coastal, and Central Valley areas.

Much of the research on California immigrants has focused on their economic assimilation and, therefore, has centered on educational attainment, labor market participation, income, and poverty status. A second body of research has focused on the effects of immigration on the California economy. However, very little of the scholarship on immigrants has focused on their travel behavior and, related, the effect of immigration patterns on California's transportation infrastructure.

In the following sections we review the small existing body of research on the travel behavior of immigrants. Additionally, we examine the residential location, economic and employment patterns, and public service utilization of immigrants, highlighting the potential implications of these factors for travel behavior.

Transportation

Travel Mode

A number of scholars find that assimilation decreases immigrants' propensity to use public transit. Myers (1996) has written the major piece of scholarship on immigration and transportation. Using data from the 1980 and 1990 Public Use Microdata Samples (PUMS) of the U.S. Census, he shows that recent immigrants are far more reliant on public transit than older immigrant cohorts. Over time, however, immigrants improve their economic status and become increasingly reliant on personal vehicles. Purvis (2003) draws from the 2000 Public Use Microdata Sample to analyze immigrants in the San Francisco Bay Area. Similarly, he finds that immigrants' use of public transit declines with time spent in the U.S. Using data from the 2001 National Household Travel Survey, Casas et al. (2004) divide Hispanics into three categories – U.S. born, “Newcomer Hispanics” who have lived in the U.S. less than one-third of their lives, and “Settled Hispanics” who have lived in the U.S. more than two-thirds of their lives. They also find that “Newcomer Hispanics” rely more heavily on public transit compared to both

native-born and “settled” Hispanics.³ Finally, Heisz and Schellenberg (2004) examine the public transit use of immigrants in three Canadian cities (Montreal, Toronto, and Vancouver). They, too, find that the initially high rates of public transit use among immigrants erode over time.

Despite these findings, public transit continues to play an important role for immigrants, particularly those new to the U.S. Myers (1996) finds that the share of transit users in Southern California who were recent immigrants increased from 27 to 42 percent from 1980 to 1990. In his study of the San Francisco/Bay Area, Purvis (2003) find that immigrants comprise 32 percent—more than one-third—of all transit commuters in the region, not surprising considering the influx of recent immigrants to California. Further, Heisz and Schellenberg (2004) find a cohort effect related to public transit use. New cohorts of recent immigrants have higher rates of transit use than earlier cohorts. This is likely the result of changes in sending regions and, related, differences in the characteristics of immigrant cohorts, particularly with respect to educational attainment. Recent immigrants to California from Mexico and Central America tend to arrive with very low levels of education (McCarthy and Vernez, 1998).

Vehicle Ownership

Studies show that auto ownership among immigrants increases with length of residence in the U.S.; however, immigrant households—regardless of their length of residence—remain more likely than native-born households to live in zero-vehicle households. Using data from the 1990 Public Use Microdata Sample (PUMS), McGuckin and Srinivasan (2003) find a positive relationship between length of U.S. residence and auto ownership. They find that new immigrants are twice as likely to live in households without vehicles than immigrants who have lived in the U.S. for ten years or more. However, their study shows that even after a decade in the U.S., immigrants are still twice as likely to live in households without automobiles compared to the U.S.-born population.

Casas et al. (2004) report similar findings for Latino households. They find that the percentage of zero-vehicle households among Hispanic immigrants declines substantially with time spent in the U.S. Almost one-quarter of “newcomer immigrants” live in households without automobiles compared to 13 percent of “settled immigrants.” They also find that older immigrants and native-born Latinos are significantly more likely to own newer—and perhaps

³In comparing data between the NHTS and the Current Population Survey of the U.S. Census, the authors also find that the NHTS significantly undercounts Hispanic immigrants and, in particular, newcomer immigrants.

more reliable—vehicles. Similar to the findings of McGuckin and Srinivasan (2003), Casas et al. find that “settled immigrants,” those living in the country more than two-thirds of their lives, are still twice as likely as non-Hispanics to live in households without automobiles.⁴

Explanations for low auto ownership rates among recent immigrants are varied. Income is clearly an important factor. Immigrants—particularly recent immigrants—have low incomes and, therefore, are less likely than other population groups to afford automobile ownership—both the purchase and the maintenance expenses. Also, many recent immigrants do not have automobiles because they do not know how to drive. Some immigrants may be less likely than others to have had drivers’ licenses, driven cars, or owned automobiles in their countries of origin. There are also cultural differences associated with driving. For example, women outside of the U.S. are much less likely to possess driver’s licenses or to know how to operate vehicles than U.S. women (Pisarski, 1999).

Immigrants may also face administrative obstacles to obtaining U.S. drivers’ licenses; this, too, may decrease the likelihood of auto ownership. Historically, states have had responsibility for the issuance of driver’s licenses and the establishment of driver’s rules. As of March 2005, driver’s license applications in 47 states, including California, required Social Security Numbers for those who have been assigned or are eligible for one (National Immigration Law Center, 2005).⁵ All but twelve states, including California, require “lawful presence,” meaning that immigrants must present evidence that they were lawfully admitted to the U.S. Anecdotal evidence suggests that legal immigrants may have difficulty providing the necessary documents. Further, some states, most recently New York, are denying license renewals and suspending the licenses of non-citizens who fail to provide documents (a Social Security card or a visa) “deemed satisfactory by a motor vehicles clerk” (Bernstein, 2005).

But the issue of driver’s licenses is clearly most pressing for illegal immigrants. In most states undocumented immigrants are not eligible for driver’s licenses. This issue has been highly controversial in California where in 2003 the State Legislature repealed SB60, a bill allowing illegal immigrants to obtain driver’s licenses. Public opinion polls in the state clearly support

⁴Aponte (1996) finds that Mexican men have strikingly higher car ownership rates (also lower unemployment rates) than African American men despite their lower schooling and English proficiency. The car ownership rate for African American men was 66% compared to 82% among Mexican men, a rate 2% points less than that for white men (84%). Unemployment rates for black, Mexican, and white men were 32%, 7%, and 16%, respectively.

⁵ In California, persons who are legally authorized to be in the state but are ineligible for a social security number are entitled to DMV documents (NILC, 2004).

this decision. A recent Field Poll shows that 62 percent of California residents oppose granting undocumented immigrants the right to obtain a California driver's license (DiCamillo and Field, 2005).⁶

Finally, low automobile ownership rates may be due to immigrants' disproportionate residential location in central-city neighborhoods. Many of these neighborhoods have well-established ethnic communities (as we discuss below) as well as extensive public transit service.

Intercity Travel

Anecdotal evidence suggests that there has been a growth in ethnic providers of inter-city transportation services. A number of newspaper articles have profiled ethnic inter-city bus carriers, particularly on the east coast (Fass, 2001; Newman, 2005). For example, Chinese buses make regular trips between Chinatowns in New York, Boston, and Washington, D.C. As Newman (2005) reports, Chinatown buses first emerged approximately eight years ago, transporting Chinese workers to restaurant jobs in nearby cities. Over time, their ridership has both expanded and diversified.

"Camionetas" serve a similar purpose in many Hispanic communities. Camionetas are informal van services used primarily by Hispanic immigrants for inter-regional and transnational travel. While the presence of this service is widely acknowledged by journalists (Hegstrom, 2003; Lewis 2001; Moreno, 1998), few scholars have examined the extent and role of this type of informal service. In a report sponsored by the Texas Department of Public Safety, Ellis (2001) chronicles some of the safety problems associated with camionetas, including the use of high mileage vehicles, the operation of vehicles for unsafe periods of time, the presence of defective seat belts, and low usage rates of seat belts.

More recently, Valenzuela (2004) examined camioneta services in Los Angeles. He found that camionetas provide many benefits usually associated with private transit services, "flexible routes and timing, more tailored destinations, better in-vehicle amenities, and faster trips due to the smaller vehicles." Camioneta service often is more expensive than Greyhound service, but typically provides faster service. Further, from Los Angeles, camionetas provide service as far as New York, Mexico, and Central America. The travelers reported they use the service from 1

⁶ The Field poll shows that there is a "large ethnic divide" on this issue. Latinos in the state are in favor of providing driver's licenses to undocumented immigrants by a two to one margin. Furthermore, 49 percent of residents support issuing undocumented immigrants a different kind of driver's licenses that would allow them to drive but would clearly identify their legal status.

to 60 times a year and 70 percent use the service for work-related travel. More than half of all survey respondents had a car available for their daily travel needs and only six of the 150 respondents reported using transit to get to work.

Farmworker Travel. Finally, in California farm worker transportation is an important issue. Following a series of accidents that involved farm labor vehicles, the California Highway Patrol conducted an enforcement sweep throughout the state. They pulled over 118 vehicles of which 36 (31%) were found to have serious safety violations. These violations included unregistered vehicles, defective lights, and license-related offenses, including driving without a license (Ingram, 1999). The growing number of injuries and fatalities of farm workers in the San Joaquin Valley, many of them immigrants, served as the impetus for a Farm Worker Transportation Services Pilot Project (FTSPP) funded as part of the Job Access and Reverse Commute program. The FTSPP program provides vanpool, fixed-route, and Dial-A-Ride service to farm worker families for employment-related, childcare, health and/or social purposes.

Residential Location

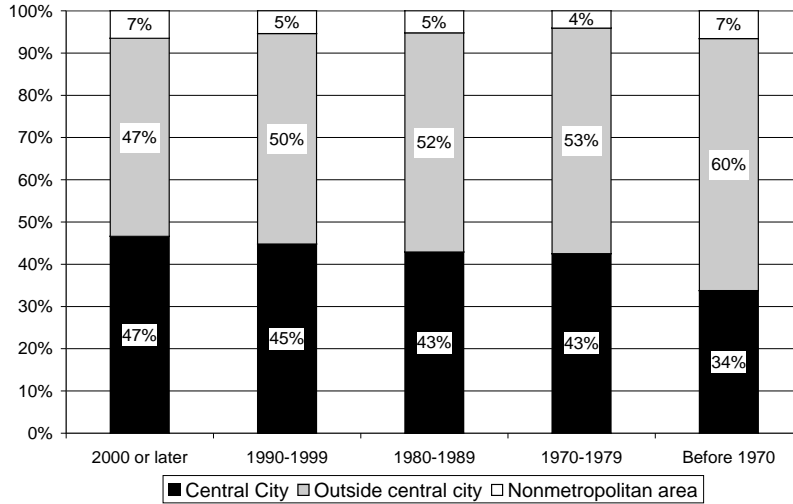
Two major theoretical models explain the adaptation of immigrants—spatial assimilation and ethnic resources models. These models provide two divergent perspectives on the spatial mobility of immigrants. The first model—spatial assimilation— theorizes that recent immigrants live in the central city until their economic conditions improve and they, like other central-city residents, relocate to higher-income neighborhoods perhaps located in the suburbs. The second theory—the ethnic resources model—posits that ethnic agglomerations or “ethnic enclaves” enhance the economic outcomes of immigrants through local and ethnic-specific economic and cultural networks. In this case, immigrants may choose to remain in ethnic neighborhoods long after they might have an economic imperative to do so.⁷

Data from the 2000 U.S. Census support the spatial assimilation theory. Figure 2.2 shows that the longer immigrants live in the U.S., the greater the likelihood that they reside in suburban neighborhoods. For example, only 33 percent of the foreign-born population entering the U.S. prior to 1970 lives in the central city compared to 47 percent of recent immigrants. Spatial assimilation is also apparent across generations. For example, Figure 2.3 shows that 43 percent of first generation immigrants live in the suburbs compared to 36 percent of their children, and

⁷ Whether residential location in a central city ethnic enclave facilitates or hinders relocation to the suburbs is unclear.

only 26 percent of the third generation. Alba et al. (1999) also find increasing suburbanization among some immigrant groups during the 1980s and 1990s due, in part, to declining barriers to the entry of new immigrants to suburban neighborhoods.

Figure 2.2. Residence of Foreign-Born Population by Year of Entry (U.S., 2004)



Source: U.S. Census Bureau (2004). Current Population Survey.

Figure 2.3. Residence of Foreign-Born Population by Generation (U.S., 2004)

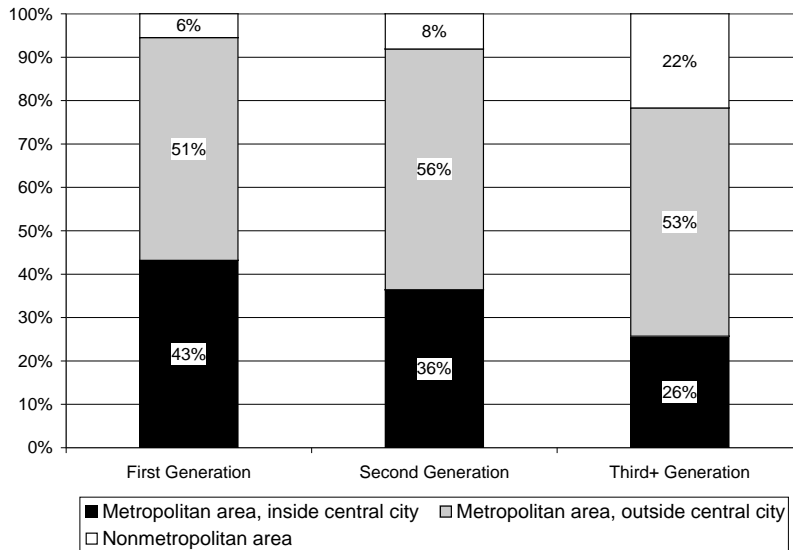
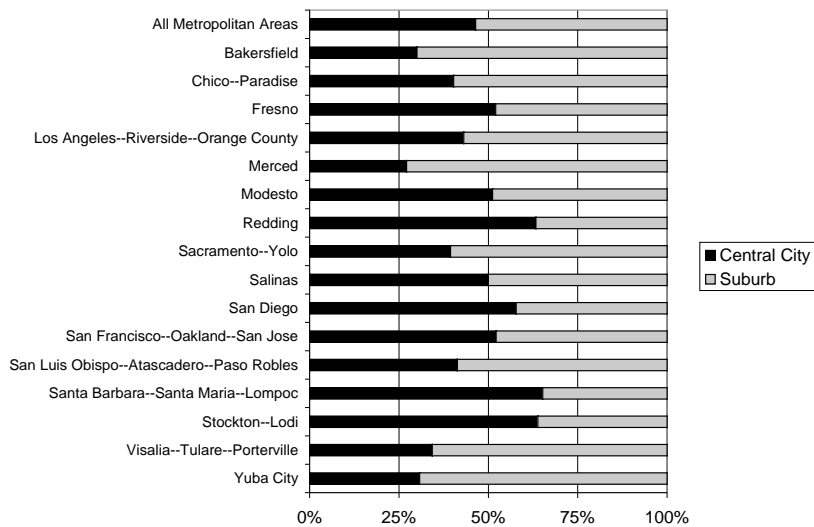


Figure 2.4. Foreign-born by Residence – California Metropolitan Areas (2000)

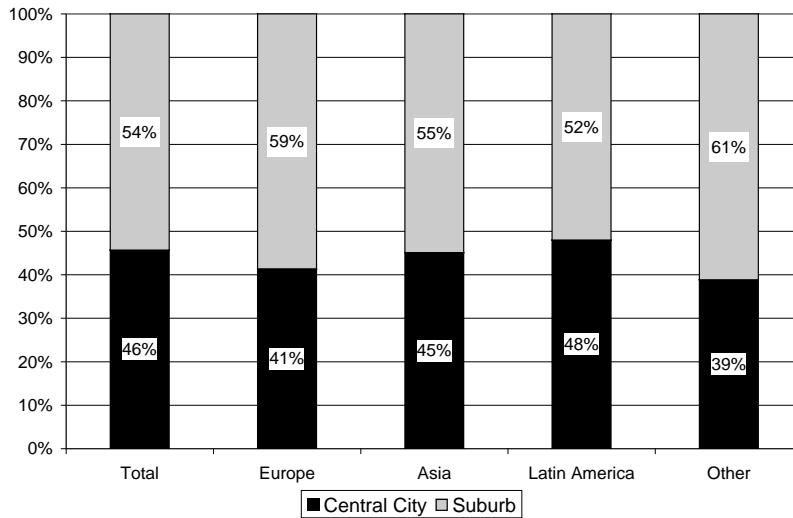


However, the rate of spatial assimilation into suburban neighborhoods varies by ethnicity (Allen and Turner, 1996; White and Sassler, 2000). As Figure 2.5 shows, only 41 percent of European immigrants live in the central city compared to 48 percent of immigrants from Latin America and 45 percent of immigrants from Asia. There is also variation by metropolitan location. Figure 2.4 shows the residential location of the foreign-born in California metropolitan areas. In Santa Barbara (MSA) 65 percent of the foreign-born live in the central city compared to less than 30 percent in Merced.

Further, spatial assimilation into suburban neighborhoods may not necessarily indicate residential integration. While suburban immigrants are more spatially dispersed than immigrants living in the central city (Clark and Blue, 2004), many still live in ethnic enclaves (Alba et al., 1999; Allen and Turner, 1996; Li, 1998, 1999; Logan, Alba, Zhang, 2002). Therefore, immigrant families may move from one ethnic enclave to another, perhaps combining some of the benefits of suburban living with those of living in ethnic concentrations.⁸

⁸However, in a study of Chinese immigrants in Los Angeles, San Francisco, and New York, Fang and Brown (1999) find that the characteristics of suburban Chinese immigrants in Monterey Park City were more similar to Chinese immigrants in the central city than their counterparts in the suburbs.

Figure 2.5. Central City Residence of Foreign-Born Population by Region of Birth (U.S., 2004)



Source: U.S. Census Bureau (2004). Current Population Survey.

What might this mean for the travel patterns of immigrants? First, recently arrived immigrants—particularly those with low-incomes—are more likely to live in dense central-city neighborhoods where public transit networks tend to be well developed. Central-city immigrants, therefore, are more likely to use public transit and to travel short distances. However, the effect of a suburban residential location on the travel patterns of immigrants is much less certain. Overall travel distances tend to be longer in the suburbs than in the central city since suburban employment is more spatially dispersed relative to central-city employment. In contrast, travel times tend to be shorter for suburban commuters since a high percentage of suburban residents commute within the suburbs. Suburban commute times are also reduced by the widespread use of automobiles as well as less congested streets and highways.

But if suburban immigrants are more likely than other suburban residents to maintain employment in traditional, central-city ethnic enclaves, their travel distances might be longer than those of other suburban workers. For example, an article in the *Los Angeles Times* tells the story of Jung-In Lee who moved from Koreatown in Los Angeles to the City of Walnut where she found better schools and lower crime rates. The article states that “Lee often spent three hours a day commuting to and from her Koreatown job in publishing” and “during her time in the suburbs, she was so stressed out from the commute that she barely had time to enjoy their four-bedroom ‘dream house.’” In contrast, low-wage suburban immigrants may commute

shorter distances than other low-wage suburban workers if they both live and work in suburban ethnic enclaves.

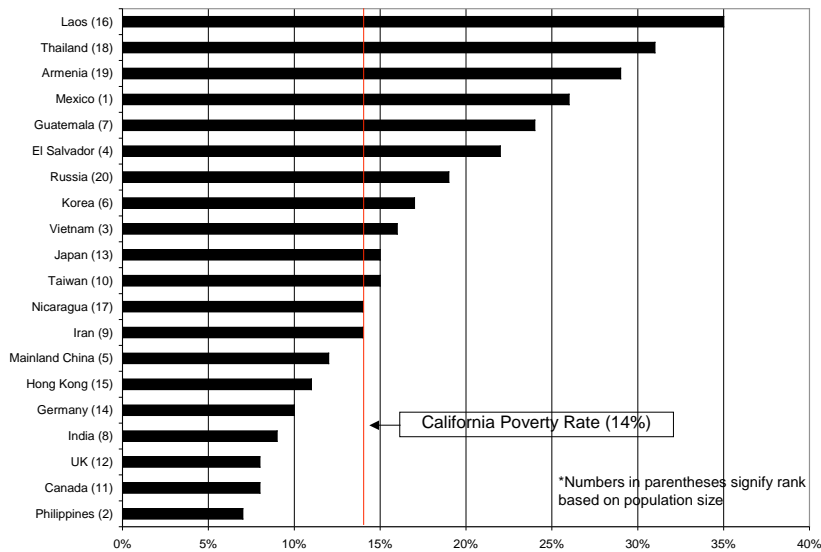
Employment, Wages, Poverty

Nationally, foreign-born workers are disproportionately represented in service (23%) and production occupations (18%) and, on average, have median weekly earnings 76 percent that of native-born workers (U.S. Bureau of Labor Statistics, 2004). In terms of labor force participation, there is a substantial gender gap. Foreign-born men are significantly more likely to be in the labor force (81%) than native-born men (72%). In contrast, foreign-born women are significantly less likely in the labor force (54%) compared to foreign-born men as well as native-born women (60%). The division of labor among foreign-born households should affect the distribution of work- and non-work trips.

The employment characteristics of immigrants clearly vary by ethnicity and region—across the U.S. as well as within California. Ong and Valenzuela (2001) analyzed immigrant labor in California. They find that foreign-born Latinos are significantly underrepresented in high-wage managerial and professional occupations and over-represented in low-wage farming and operator/laborer occupations. As a consequence, they earn significantly less than native-born workers. As Figure 2.6 shows, the poverty rate among Mexicans, Guatemalans, and Salvadorans in California is substantially above the state poverty rate. More disturbing, however, is that their economic prospects have increased only slightly since 1969.

In contrast, as a group, the economic attainment of Asian immigrants is quite good. Many find employment in high-wage managerial and professional occupations. As of the late 1990s, the median earnings of foreign-born Asians rivaled those of native-born workers. However, the occupational and earnings success of foreign-born Asians masks tremendous disparities across Asian ethnic groups. Figure 2.6 shows that immigrants from the Philippines, India, Hong Kong and China had poverty rates well below the state average. In contrast, immigrants from Laos and Thailand had the highest poverty rates, more than twice the state average.

Figure 2.6. Poverty Rate by Country of Origin (California, 2000)



Finally, the employment of immigrants clearly varies by region of residence. With respect to California, there are clear differences between agricultural and urban counties. In urban areas, such as Los Angeles, many immigrants live in ethnic enclaves, relying on their social networks to find employment in ethnic labor markets (Logan, Alba, Zhang, 2002).⁹ Some immigrants have relied on ethnic resources to establish businesses, some of which meet the growing demand for ethnic products (Light and Bonacich, 1988). In contrast, immigrants in the San Joaquin Valley are largely dependent on employment in the agricultural sector. The industry provides low-wage, seasonal employment for many migrant workers from Mexico and Southeast Asia; these workers tend to earn low wages and have incomes well below the poverty line (Martin and Taylor, 1998).

Use and Access to Public Services

There is very little research on immigrants and their awareness and use of public transit services. However, a broader literature on immigrants and their utilization of public services suggests that service use is affected by the structure of public benefits, English language proficiency, and the spatial location of services relative to the evolving residential location of the immigrant population.

⁹The one exception for Los Angeles is Koreans; they work in enclave sectors yet are less likely to live in ethnic neighborhoods (Logan, Alba, Zhang, 2002).

A number of scholars have examined immigrants' use of public services such as welfare, health care services, and other benefits. Compared to native-born families, immigrants are more likely to use federally-funded cash assistance such as welfare (AFDC or TANF) and SSI; however, poor immigrants are less likely to use welfare than poor natives (Fix, Passel and Zimmerman, 1996). Further, not all immigrants are equally likely to enroll in cash assistance programs. Hence, service use is concentrated among certain immigrant groups such as the elderly and refugees who comprise 21 percent of all immigrants, but 40 percent of all immigrant welfare users (Fix, Passel and Zimmermann, 1996b). Low-income households headed by non-refugee immigrants are less likely to receive cash assistance than poor households with native-born heads (Fix, Passel and Zimmermann, 1996). Historically, refugees have been eligible for welfare benefits upon their arrival as a component of refugee assistance (Fix, Passel and Zimmermann, 1996b).

English language ability also influences service use. Numerous studies show a positive relationship between English proficiency and the use of health care services (see, for example, Juon et al, 2000; Ngo-Metzger et. al, 2003; Tsai and Lopez, 1997). Length of residency in the U.S. is significantly related to English language proficiency (Fennelly and Palasz, 2003). While this is true overall, English language acquisition varies substantially by immigrant group. For example, in a three generational study of linguistic assimilation, Alba et al. (2002) find that the rates of speaking only English occurs slower among descendents of Spanish speakers than for Asians and Europeans. This difference likely is due to the sheer number of Spanish-speakers that make it possible for Hispanics to communicate for most purposes in their native language.

Immigrants' access to and use of services also varies by the spatial location of services relevant to particular immigrant groups. In a study of services for immigrant women in Toronto, Truelove (2000) finds that the suburbanization of immigrants negatively affects their access to services typically concentrated in central-city areas. While Truelove (2000) focuses on social services, the finding likely applies also to transit services. Immigrants who move to suburban neighborhoods will have less access to the extensive transit networks typically found in central cities. This may make little difference if—along with a suburban residence—immigrants also acquire automobiles. However, if suburban immigrants are more reliant on public transit than

native-born suburban residents, they will also be more isolated from jobs, services, and other destinations.

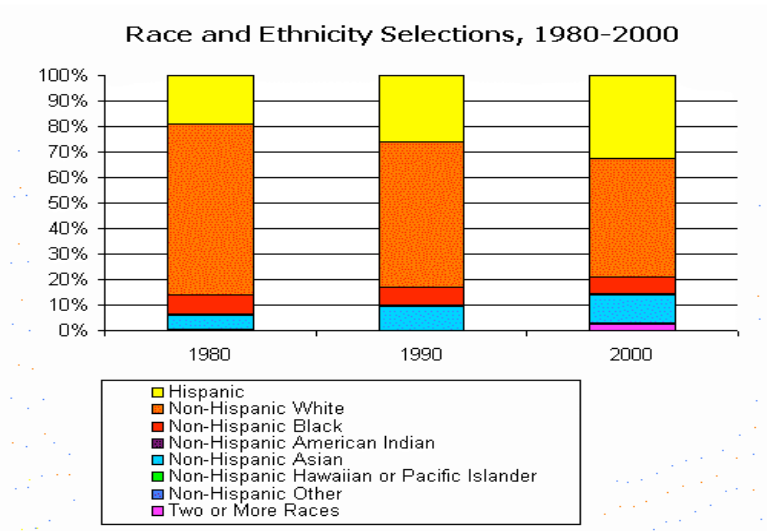
Finally, a recent study suggests that cultural differences may also influence the use of transit services. In focus groups with Latino, Somali, and Hmong immigrants in Minnesota, Douma (2004) finds that Latino immigrants are more open to transit and “social” types of travel, compared to Hmong immigrants who place a greater value on privacy.

Chapter 3. Racial and ethnic groups

Population Characteristics and Trends

When race and ethnicity are not explicitly accounted for, analysis of transportation behavior often yields a mere reflection of the behavior of the White majority (Giuliano, 2003). However, very little scholarly research has targeted the disaggregated travel behavior of non-immigrant Hispanics, Blacks and Asians. While many areas of the United States remain predominately White, the proportion of Whites in California is continuing to decline. In 1980, Whites made up almost 70% of the Californian population, but by the year 2000 they comprised less than 50% of the population (University of Michigan, 2002) (Figure 3.1).

Figure 3.1. Racial Composition of California's Population



Although the California's racial composition did not change significantly from 2000 to 2003, it is not likely to remain static (Heim, 2005). From 2000 to 2003 annual net migration decreased significantly, while the annual amount of natural increase grew. More conclusively, over that time span Blacks, Hispanics, Asians and those classified as 'Multirace' accounted for over 95% of the average annual natural increase, indicating that as immigration dwindles, California's population growth will be dominated by races other than White. In addition, from 2000 to 2003 the natural increases in Hispanic, Asian and Multirace populations outweighed any increase due to net migration, evincing the demographic change in these populations towards proportionally more non-immigrants (Heim, 2005).

There have not been many studies on race, ethnicity and travel behavior in California, and even fewer have accounted for immigrant status. What research has been done in California, has focused primarily on travel time and distance, spatial mismatch, health hazards, and housing tenure and location. On the national level, broader bodies of literature exist for these issues as well as travel mode and others, but even there few studies examine the cultural context and other specific factors affecting transportation decisions made at the margin.

In this review, we survey the Californian and national literatures on a wide range of issues affecting racial or ethnic differences in travel behavior. In particular, we address travel behavior itself, health consequences of transportation, residential location and tenure choice, employment and wealth. Owing to the dearth of travel behavior research that controls for immigrant status, not all the findings in this paper pertain specifically to non-immigrant groups.

Transportation

Travel Mode

For all trips combined, Blacks, Asians, and urban Hispanics are generally much more apt than Whites to use public transit, controlling for basic socioeconomic variables, though not immigrant status (Pucher and Renne, 2004; Pucher and Renne, 2003; Giuliano, 2003; Polzinn et al., 2001; Johnston, 2000). Using 1995 National Personal Transportation Survey (NPTS) data, Giuliano (2003) finds that Blacks travel on public transit more than twice as often as any other racial or ethnic group, and more than seven times as often as Whites. Pucher and Renne (2003), using 2001 National Household Travel Survey data, and Giuliano (2003) both assert that Hispanics use public transit more often than Whites, though Rosenbloom and Waldorf (2001) find that among the elderly respondents in the 1995 NPTS, Hispanics are the least likely to use it. Pucher and Renne (2003) find that Blacks and Hispanics are more likely to use public buses than Asians and Whites, and that Asians use rail transit more than all other groups, possibly due to their concentration in the largest cities in the United States where rail transit is most prevalent.

As pertains specifically to the commute to work, McLafferty and Preston (1997) reveal that Blacks and Hispanics in New York are much more likely than Whites to commute using public transit, with the differences being greatest amongst women and urban residents. They also show that the women, especially Blacks and Hispanics, are more likely than men to commute by transit. For non-work travel, Polzin, et al. (2001) conclude from 1983, 1990 and 1995 NPTS data that Blacks are the only group to use public transit significantly more than Whites. Polzin et

al. further find that Blacks make an approximately equal percentage of their non-work and work trips by public transit, whereas Whites and Hispanics are much more likely to use transit for work related trips. Zmud and Arce (2001) show that Blacks and Hispanics are much more likely than Whites to make shopping trips using public transit.

In terms of other travel mode alternatives to the automobile, Blacks, Hispanics and Asians also have higher walk shares than Whites out of all trips taken (Giuliano, 2003; Pucher and Renne, 2003). However, Whites and Hispanics, at least in urban areas, make a higher percentage of their trips by bicycle than Blacks and Asians, though for Whites bike trips are predominately recreational (Pucher and Renne, 2003).

Not surprisingly, data from the 2001 NHTS reveal that among households in urban areas, Blacks (78.9%) make a lower percentage of trips by automobile than do Asians and Hispanics (both 83.1%), who in turn have a lower automobile mode share than Whites (87.6%) (Pucher and Renne, 2003). These results echo Blumenberg and Haas' (2001) findings using data on welfare recipients from Fresno County. In addition, Zmud and Arce (2001) show that Blacks and Hispanics are much less likely than Whites to make shopping trips with a car. In terms of total automobile trips, Mallett and McGuckin (2000), using 1995 NPTS and ATS data, find that Blacks make about half as many recreational automobile trips per capita as Whites. Van Hengel et al. (1999) provide case specific evidence from the recently constructed Century Freeway in L.A. County that increases in highway and other auto-serving infrastructure benefit White more than minority households in terms of commute time savings, evincing urban minorities' lesser dependence on the automobile.

Waldorf's (2003) analysis of the elderly using 1995 NPTS trip data shows that amongst Blacks, automobile reliance greatly decreases for low-income households (<\$10,000 annually) and urban (as opposed to suburban) dwellers. He finds a Black-White differential in automobile reliance for low-income households, regardless of location, but no significant Hispanic-White differential. He also finds that urban Blacks and Black women rely more heavily on carpooling than their White and Hispanic counterparts, i.e. they are more likely to be passengers. Looking at 2001 NHTS data, Pucher and Renne (2004) find that carpooling is even more prevalent among Blacks in rural areas than in urban settings. One possible explanation for Blacks' higher propensity for carpooling is that they receive more practical support (e.g. with transportation)

from relatives and friends than other groups, a finding corroborated by Sarkisian and Gerstel (2004) in their study on kin support among Blacks and Whites.

Just as Waldorf (2003) and others find an urban-suburban differential in automobile reliance, so too have scholars uncovered an urban-rural split. Across all racial, ethnic, age and income groups, residents of rural areas are more likely to travel via automobile, a symptom of greater spatial spread and more limited transit service as compared to urban areas. In comparing their findings to NPTS and L.A. Transportation Needs Assessment data, Blumenberg and Haas (2001) show that recipients in Fresno, a relatively rural area, are 26% more likely than L.A. recipients to commute via auto (either as passenger or driver). Pucher and Renne (2004) find that Blacks (91%), Hispanics (90%), and Whites (91%) in rural areas make a virtually identical percentage of their respective trips by car. Interestingly, they also find that though Blacks use public transit more often than Hispanics in urban areas, the reverse is true in rural areas. Lastly, they find that despite such high dependency on the automobile, all three groups rely more on school bus service in rural areas.

In all, Rosenbloom and Waldorf (2001) find that residential location is one of the most significant predictors of travel mode choice, though there are also independent effects of race/ethnicity, a conclusion corroborated by the findings of Pucher and Renne (2004), Sinha (2003), Waldorf (2003), and McLafferty and Preston (1997). Waldorf (2003) proffers that apart from the socioeconomic and locational effects, the perceived independent racial differences in automobile use are also a function of cultural variations in the perceived need to obtain a driver's license and the propriety of certain populations, e.g. women, traveling alone.

Current Trends

As Polzin et al. (2001) and others note, the mobility of racial/ethnic minorities has risen proportionally greater than that of Whites in the past couple decades largely due to their increasing licensure and access to cars, rising income, and increasing consumer spending. This has contributed to the rising number of daily per capita trips as well as the expanding gap between the proportions of work related and non-work related trips. For all groups, especially minorities, driving is becoming an ever more prominent travel mode, especially for non-work travel. For work related travel, especially in urban areas, however, the amount of automobile use for all groups is still tempered by availability of transit. Ong and Houston (2002), in their study of L.A. County welfare recipients, confirm that propinquity and frequency of transit service still

have a positive effect on transit use across racial/ethnic groups, controlling for inability to borrow/use a vehicle. Thompson (2001) correspondingly finds that transit accessibility also reduces the likelihood of automobile ownership.

Vehicle Ownership

According to the 2000 U.S. Census Supplementary Survey data for California, the percentage of Black households that have at least one working automobile available for use is lower, at 84.3%, than for all other racial/ethnic groups. Non-Hispanic White households have the highest rate of access to automobiles at 94.1%, followed by Asians (91.6%), Native Americans (90.9%) and Hispanics (89.2%) (U.S. Census Bureau, 2002). 1997 Consumer Expenditure Survey data reveals similar racial/ethnic disparities on the national level (Zmud and Arce, 2001). Consistent with these numbers, Blumenberg (2004) finds that Black welfare recipients in California are much more likely to live in zero-vehicle households than their White, Hispanic and Southeast Asian counterparts. In addition, using 1995 NPTS data, Gardenhire and Sermons (2001) show that non-White status significantly diminishes the likelihood of vehicle ownership for non-poor female-headed households.

There are a number of factors that contribute to the racial/ethnic differences in vehicle ownership. In his analysis of the sustainability of urban transportation systems, Sinha (2003) posits that urban density, as measured by people and/or jobs per unit area, is the “key indicator” of automobile use and ownership. Incidentally, there is much evidence that Blacks, Hispanics and Asians tend to live in higher density areas than Non-Hispanic Whites, even after controlling for immigrant status (Yu, 2003; Bajari and Kahn, 2001). Income certainly affects vehicle ownership as well, though does not help much to explain the Asian-White gap since Asians on average have relatively similar incomes (Gardenhire and Sermons, 2001; U.S. Bureau of Labor Statistics, 2005). Lastly, family structure and race/ethnicity itself (via culture, e.g.) differentially affect each groups travel behavior, as exemplified by Black women’s higher tendency to engage in reciprocal exchange of practical support, including transportation aid, than White women (Sarkisian and Gerstel, 2004).

Travel Time and Distance

The Work Commute

Travel time is largely a function of two things: distance from destination (which necessarily incorporates travel purpose) and travel mode. The majority of the literature on travel time and distance has focused on the commute to work in metropolitan areas. Generally it has been found that residents of job poor areas have longer commute times, manifesting the link between commute distance and time (Sultana, 2002; Thompson, 2001). Shen (2000) correspondingly finds that those who live farther away from the city center have longer average commutes. Ihlanfeldt and Sjoquist (1998), in their review of the spatial mismatch literature, and Taylor and Ong (1995) reveal that the commute times and distances for both minorities and Whites are and have been increasing. Interestingly, Giuliano (2003) also finds that access to a vehicle has a greater positive effect on commute distance for Hispanics than Whites, Blacks or Asians. However, neither Taylor and Ong (1995), nor Sastry et al. (2002) finds that Blacks or Hispanics have longer commute distances than Non-Hispanic Whites, though Sastry et al. show that non-immigrant Asians in L.A. might. In fact, Taylor and Ong (1995) conclude that Whites commute a mile further every day than both Blacks and Hispanics, and Giuliano (2003) consistently finds that being Black or Hispanic is significantly correlated with decreased commute distance. The commonly accepted reason for Whites' greater commute length is that White males have very high average incomes and are more willing or able to commute longer distances to earn them (Johnston, 2000; McLafferty and Preston, 1997 and 1992). On the other hand, research in Atlanta provides evidence that Blacks are less likely to relocate if their jobs decentralize (Helling, 1998) and that they are likewise less prone than Whites to move as a result of having longer distance (Clark and Huang, 2002), possibly due to their preferences for mixed-race neighborhoods or to housing and job market discrimination. However, neither of the Atlanta studies finds that Blacks in fact commute longer distances.

In contrast to the trends in commute distance, Blacks tend to have much longer commute times, especially in urban areas, as do urban Asians, whereas the verdict is more mixed for Hispanics. McLafferty and Preston (1992) find that Blacks and Hispanics in northern New Jersey have significantly greater commute times than White women. Giuliano (2003) also finds that being Hispanic is significantly associated increased travel time, though Taylor and Ong (1995) show just the opposite, albeit using data a decade older. Shen (2000) compares commute

times across intra-city neighborhoods and finds that residents of neighborhoods with a higher percentage of minorities, lower income and less educational attainment have greater average commute times. Specifically he finds that as the neighborhood percentage of Blacks or Asians increases, the average commute time also increases. For example, he shows that a 10% increase in percentage Black increases average travel time by 0.4 minutes. Lastly, Johnston (2000) finds that, at least for women, racial/ethnic differences in commute time are more pronounced for inner city residents.

These differences in commute time are in large part a factor of commute mode. Blacks, Hispanics and Asians are all more apt to use public transit. In particular, Blacks and Hispanics disproportionately use public buses, while Asians rely most heavily on rail transit (Pucher and Renne, 2003). Since buses are usually the slowest mode of public transit, it is no wonder that Blacks have the highest average commute times (Johnston, 2000; Shen, 2000; Taylor and Ong, 1995). Scholars have also adduced housing and job market mismatch and discrimination to help explain the racial/ethnic commute time differences (Chapple and Weinberger, 2000; McLafferty and Preston, 1997).

Despite the fact that commuting distances do not currently compound these differentials, it is possible that they will come to do so if, as many scholars have noted, new jobs continue to become available in the suburbs at a quicker rate than in urban centers, even replacing some urban jobs (Stoll, 2005; Blumenberg, 2004; Stoll and Raphael, 2001; Pollard and O'Hare, 1999). For example, Johnston (2000) shows that Black women who work in the suburbs have longer temporal commutes than do comparable White women. The palpable effect that job decentralization could have on racial commute time differentials is, however, necessarily contingent on continued racial residential segregation (esp. along urban-suburban lines), especially for Blacks.

Non-Work Travel

It is commonly the case that residents of low-income urban neighborhoods have much less access to large grocery stores and retailers, which are increasingly locating in growing suburban areas (Clifton, 2004; Chung and Myers, 1999; Alwitt and Donley, 1996; Andreasen, 1975). Thus, based on income and residential segregation of services alone Blacks and Hispanics, who have lower average incomes (U.S. Bureau of Labor Statistics, 2005; Zmud and Arce, 2001) and are more prone to live in urban centers than Whites, appear at face value to be more likely to

travel further and for longer to shop. Zmud and Arce (2001) support this hypothesis with their findings that Blacks and Hispanics are more likely to make shopping trips on foot or public transit. Clifton (2004), in his exploratory study of access to grocers and other retailers of low-income residents of Austin, TX, finds that reliance on slower modes of transport further compounds the travel time of low-income urbanites. Sastry et al. (2002), using data from the L.A. Family and Neighborhood Survey, find that in L.A. County Blacks, Hispanics and those in the “other” category (i.e. not White, Black, or Hispanic) travel greater distances to reach the grocery store than do Whites, regardless of immigrant status.

Sands and Smock (1994) analyze data from the Detroit Metropolitan Public Policy Survey and find that Blacks take longer to get to places of worship than do Whites, possibly because of their predominately Baptist affiliation, a relatively less territorial denomination that allows more freedom in deciding which parish to attend. Sastry et al. (2002) echo Sands and Smock’s findings, showing that Blacks on average travel farther than Asians, Whites and Hispanics to reach places of worship. Sastry et al. (2002) further reveal that, accounting for immigrant status, Asians traveled significantly farther than the other groups to receive health care. As for purely recreational trips, Mallett and McGuckin (2000) find that Blacks do not travel as far on average as Whites.

Gender Differences

The travel time and spatial mismatch literatures also evince gender differences in travel time that differ by race and ethnicity. McLafferty and Preston (1992), using northern New Jersey Public Use Microdata Sample (PUMS) data from the 1980 Census, find that men have longer commute times than women, with the difference being greatest for Whites, fairly large for Hispanics, and minimal for Blacks. Taylor and Mauch (2000) reveal that the only statistically significant gender difference in commute times for San Francisco Bay Area residents is for Whites. Though not significant, their analysis also shows that Hispanics have the smallest gender gap. In comportment with McLafferty and Preston’s (1992) results, Johnston (2000) finds that Blacks exhibit the smallest gender difference in commute times. In contrast to the putative gender differences for commute times across all travel modes, McLafferty and Preston (1997) show that amongst transit riders, all women have longer commute times regardless of race or ethnicity (Asians are not included in the study). For non-work travel, Taylor and Mauch (2000) find that the gender differences for Blacks, Hispanics and Asian/Pacific Islanders are about 1.5 times

greater than for Whites, irregardless of travel mode, income and household type, except for single parent Asians, where women spend more time per trip.

Health and Travel Safety

As a result of their travel mode choices and residential location patterns, Hispanics, Asians and especially Blacks disproportionately incur some negative health consequences. Morello-Frosch et al. (2001), in their study of the relationship between hazardous air pollutants (HAPs), as defined in the Federal Clean Air Act, and increased cancer risk in the Southern California Air Basin, find that Blacks, Asians and Hispanics have a much higher propensity to develop cancer from HAPs than do Whites. These racial disparities remain even when the authors control for land use, population density and other factors. Supporting the findings of Morello-Frosch et al. (2001), Macey et al. (2001) find that Hispanics and Blacks, though not Asians, in L.A. County are more likely to have high blood lead levels than Whites, accounting for, among other things, proximity to transportation corridors.

In addition to disproportionate exposure to vehicle-produced carcinogens, Blacks have a higher risk of injury as vehicle occupants, regardless of socioeconomic status. Using National Center for Health Statistics, 1990 NPTS and 1990 U.S. Census data, Baker et al. (1998) show that Black and Hispanic children and teenagers have much a much higher risk of being involved in a fatal automobile accident per billion vehicle-miles of travel than Whites. Braver (2003) uses 1995 NPTS and Fatality Analysis Reporting System (FARS) data to extend the scope to adults. He finds that Blacks are more likely to die when traveling in a vehicle than Whites or Hispanics, largely because of their disproportionate failure to wear seatbelts. Hispanic men, he shows, have a higher rate of fatalities per vehicle-mile traveled relative to Whites, but only when socioeconomic status and blood alcohol level (BAC) are not controlled for. The Insurance Institute for Highway Safety (IIHS) (2002) analyzes the same data sets as Braver (2003) and yields concurring results, except they find that after controlling for education, they find Hispanic men to still have a higher risk of getting into a fatal automobile crash. Romano et al. (2005) confirm Braver's and IIHS's conclusions in finding that race has a predominately indirect effect on fatal red light crashes, through BAC, possession of a valid driver's license, seatbelt use and others. Vivoda et al. (2004) show that high-visibility seatbelt enforcement programs (i.e. police can ticket you for not wearing a seatbelt whether or not you have transgressed any other traffic laws) raise Blacks' seatbelt usage levels significantly to equal those of Whites, a result, they

posit, of Blacks' perception that they are more likely than other racial/ethnic groups to be ticketed.

Blacks and Hispanics indeed also incur a disproportionate share of pedestrian injuries and fatalities. Ernst and McCann (2002) review 2001 FARS data and reveal that Blacks comprise more than 20% of the annual national pedestrian fatalities, yet they only constitute about 12% of the U.S. population. A 2001 National Medical Association consensus report confirmed their findings (Mosley, 2002). In addition, cited by Ernst and McCann (2002) is an article by Marosi (1999) addressing pedestrian injuries and fatalities in Orange County. Marosi (1999) shows that though Hispanics represent only 28% of the population there, they account for 40% of all pedestrian injuries and 43% of all fatalities. Ernst and McCann (2002) hypothesize that the higher relative rates of injury amongst Hispanics and Blacks is due in large part to the two groups' greater reliance on pedestrian travel modes (e.g. walking and biking).

Compounding their higher risk of transportation related injury, racial/ethnic minorities appear to sometimes be disadvantaged relative to Whites in their access to health care. As aforementioned, Sastry et al. (2002) find that Asians in L.A. County travel farther than Blacks, Hispanics and Whites to receive health care. Guidry et al. (1997) survey Texas cancer patients undergoing chemotherapy or radiotherapy and discover that Blacks and Hispanics are more likely than Asians and Whites to forgo treatments because of transportation barriers, including distance, access to an auto and availability of people to drive them.

Residential Location, Mobility and Tenure

Homeownership

In general, scholars have found significant differences in metropolitan homeownership rates between Hispanics and Blacks on one hand, and Whites on the other, independent of immigrant status. Schlottmann and Boehm (2004) analyze data from the Panel Studies of Income Dynamics from 1984-1992 and discover that minorities (i.e. everyone except Whites) have a lower propensity to both attain homeownership for a first time and move up the housing hierarchy (i.e. move into another house) than Whites. In addition, they find that minorities are increasingly less likely than Whites to become homeowners again (e.g. a second or third time) after having reverted back to renting. Lastly, they find that there are significant income effects for both minorities and Whites, though in both income categories, Whites are more apt to be homeowners.

Notably, the case is much different for Asians. In contrast to Hispanics and Blacks, Asians have homeownership rates that are very similar to Whites. Painter et al. (2001) even find, by decomposing Asians into 6 discrete groups, that, regardless of immigrant status, the Chinese have homeownership rates 20% higher than Whites in all the three Consolidated Metropolitan Statistical Areas studied (San Francisco-Oakland-San Jose, New York-Northern New Jersey-Long Island, and Los Angeles-Riverside-Orange County). The authors find no satisfactory explanation for the differential apart from race/group, suggesting the importance of cultural differences.

The observed Hispanic-White and Black-White gaps in homeownership are largely a function of income and credit constraints, though there are also locational and other effects, including putative discrimination in the housing market (Deng et al., 2003; South and Deane, 1993). Gabriel and Rosenthal (2005), Gabriel and Painter (2004, 2003), and Deng et al. (2003) all derive similar results showing that income and credit constraints can explain much of the Black-White and Hispanic-White homeownership, and that income has a greater effect on Blacks than on other groups. Gabriel and Painter (2003) find that Asians in the L.A. metropolitan area, on the other hand, are not so affected when bestowed with the endowment characteristics of Whites because of their already high incomes and homeownership rates, and lower propensity to experience credit constraints. In addition, all of the studies show a small residual or unexplained racial/ethnic gap.

The results are more mixed as to the effect of residential location on tenure choice. Using PUMS data from the 1990 Census, Gabriel and Painter (2003, 2004) analyze the determinants of housing tenure choice in samples of movers in L.A., Chicago and Washington D.C., while accounting for mobility and the endogeneity of residential location (i.e. the interdependence of location and tenure choices). They find that the “expected utility of residential location choice” (i.e. the desirability of a potential location) exerts a depressive effect on homeownership for Hispanics, Blacks and Whites, implying a trade-off for individuals between living in their more desired locations and owning a home. The effect is greatest for Blacks and then Hispanics, pointing to a greater trade-off between location and ownership for these groups. Deng et al. (2003), likewise accounting for the endogeneity of location to tenure choice, but not for mobility, reveal that Philadelphian Blacks’ existing residential location characteristics serve to increase homeownership over alternative locational options. They simulate the partial equilibrium effects

of reducing the variation in Philadelphia's locational characteristics such as percent Black, percent in poverty and the amenity/price index, and find an increase in the Black-White homeownership gap. The authors postulate that this could be the result of Blacks either self-sorting or being steered into poorer areas where owner-occupied housing is more affordable, processes that are hindered by a reduction in locational choice.

Location

There is somewhat of a common assumption in California and elsewhere that minorities, and especially Blacks, are more concentrated in higher density urban areas than and segregated from Whites. Many studies lend credence to this assumption for metropolitan areas generally. Reviewing the literature on race and residential location through 1975, Streitwieser and Goodman (1983) conclude that Blacks are still "highly segregated from Whites" in metropolitan areas along urban-suburban lines, though also in areas where Black suburban expansion has occurred. In their study on black urbanization in Philadelphia using PUMS Population and Housing data from the 1990 U.S. Census, Bajari and Kahn (2001) confirm that Blacks disproportionately reside in higher density urban areas. Yu (2003) finds that within the L.A. CMSA Blacks, Asians and Hispanics, in that order, are all more likely than Whites to live in high density areas and areas with older housing, controlling for immigrant status. Gabriel and Painter (2003, 2004) concur that the urban settlement patterns of Blacks, Asians and Hispanics are more concentrated than for Whites in the L.A., Chicago and Washington D.C. metropolitan areas.

Racial differences also persist in the composition of residential locations, Gabriel and Painter (2003, 2004), Deng et al. (2003) and Krysan and Reynolds (2002) all show that Blacks are much more likely than any other group to live in areas with greater minority representation, evincing residential racial segregation. In addition, Blacks are more likely than Whites to live in areas with higher poverty levels, like many central cities and old suburbs (Deng et al., 2003; Streitwieser and Goodman, 1983). Adelman (2004) finds that even just among the middle class, Blacks still have a higher propensity to live in more impoverished areas than Whites.

In terms of the factors affecting location choice, Gabriel and Painter (2003, 2004), accounting for other locational factors, find that housing prices have a negative effect on location choice for all groups, especially for Blacks, and that crime rates also have a large negative effect for Blacks. Likewise controlling for other locational factors, Deng et al. (2003) reveal that Black homeowners in Philadelphia are more likely than Whites to live in areas with high equity risk

(e.g. in poorer urban and old suburban neighborhoods). The propensity of Black homeowners to live in areas of high equity risk may reflect both an income effect (i.e. Blacks are poorer on average and tend to purchase homes where they can afford them, e.g. areas with high equity risk and high minority representation) as well as discrimination in the housing market and/or by local governments, a force suggested, though not tested for, by Deng et al. (2003), Bajari and Kahn (2001), McLafferty and Preston (1997), Streitwieser and Goodman (1983) and others. Deng et al. (2003) also find that employment access has a positive effect on location choice for Blacks and Whites. Bajari and Kahn (2001) correspondingly find that its effect on location choice has been one of the major causes of suburban sprawl and Black-White segregation along urban-suburban lines. But, they argue, as the Black population becomes more educated and racial tensions decline, they will have more suburban job opportunities and will thus be more likely to integrate into predominately White suburbs. These three effects appear to overpower most suburbanizing effects such as Blacks' high valuation of safety

Individual preferences and aversions to various racial compositions have also been shown to significantly affect residential location choice. Krysan and Reynolds (2002) find specifically that Blacks most prefer a 50-50 Black-White split, even over areas with a higher proportion of Blacks, with some respondents actually praising integration. However, overall, the authors stress that there is much fear of White hostility among the Black population. Similarly, Sermons (2000) finds that San Francisco Bay Area residents exhibit both in-group racial preferences, and more notably, out-group "avoidance" behaviors. His results reveal that the most significant aversions are Hispanics to Blacks, Blacks to Asians, and Asians to Whites. Clark and Huang (2002) proffer that preference for mixed-race neighborhoods helps explain Blacks' lower propensity to move as commute distance increases relative to Whites.

Gautreaux study

In 1966 Dorothy Gautreaux sued the Chicago Housing Authority and the U.S. Department of Housing and Urban Development alleging "systematic and illegal segregation" in their provisioning of public housing in Chicago. The case was eventually heard by the U.S. Supreme Court where the justices authorized, as one means of remediation, the Gautreaux residential mobility program. The program enabled low-income black families who were either living in public housing or on the waiting list to move to wealthier and predominately White (i.e. with 30% or fewer Blacks) suburban areas beginning in 1981. Recent research has looked at the

current locational characteristics of families who were relocated pursuant to the program, but subsequently moved again. Both Keels et al. (2005) and DeLuca and Rosenbaum (2003) derive similar results, showing that the families that have moved since their original placement currently live in areas with strikingly similar characteristics to where they were originally settled, including higher income, safer and predominately White. These results suggest that mobility to suburban locations can significantly alter Blacks' locational preferences.

Mobility

According to the March 1999 Current Population Survey (CPS) geographic mobility data Blacks (19.6%), Hispanics (19.7%) and Asians (20.3%) made proportionally more residential moves than non-Hispanic Whites (14.4%). The overall mobility of U.S. citizens has decreased substantially since then, but 2004 CPS data reveal that similar racial/ethnic disparities still exist. Hispanics have the highest current residential mobility rate, at 17.4%, followed by Blacks (16.7%), Asians (15.5%) and non-Hispanic Whites (12.2%). Another trend continued from 1999, is that Blacks and Hispanics are significantly more apt to move within their same county, while Asians and Whites make a much higher proportion of their moves out of county, a likely impact of income and family ties among others (U.S. Census Bureau, 2005).

In general, high unemployment, low income, low homeownership, low marriage rate, settlement in areas of high unemployment, fewer children and minimal education are all associated with high rates of residential mobility (Spilimbergo and Ubeda, 2004; Gabriel and Painter, 2003; South and Crowder, 1998). Differences in the aforementioned socioeconomic characteristics account for much of the gross racial disparity in mobility rates between Blacks and Whites, as Blacks, are more likely to live in impoverished areas, have lower incomes, and rent instead of own among others (Crowder and South, 2005; Adelman, 2004; Deng et al., 2003; South and Deane, 1993; Streitwieser and Goodman, 1983). Similar differences most likely help account for some of the overall Hispanic-White gap in mobility rates as well. Some of these factors also differentially affect the various racial/ethnic groups. Gabriel and Painter (2003,2004) show that in the L.A. metropolitan region, marriage exerts a much greater depressive effect on mobility for Whites than Blacks, Hispanics, or Asians, and that age has a negative effect on mobility that is only significant for Whites. They further find that income is a much greater predictor of mobility for Blacks than the other groups and that occupational status increases Hispanics' mobility, but decreases Asians' mobility.

Most of the remaining scholarly research done on racial differences in determinants of residential mobility has focused on comparing Blacks and Whites. Spilimbergo and Ubeda (2004) show that after controlling for socioeconomic characteristics, much of the remaining Black-White disparity in mobility rates is accounted for by differences in the effect of family ties, measured according to percentage of family members in the same Standard Metropolitan Statistical Area (SMSA). They find that Blacks are much more likely than Whites to move when they have minimal proximal familial ties. South and Deane (1993), using Annual Housing Survey data from 1980, find that Blacks are less likely than Whites to move when they are dissatisfied with their neighborhood. Their study also yields that residential segregation in metropolitan areas has a disproportionately depressive effect on Black mobility, and that large suburban populations and “high vacancy rates increase non-Black mobility,” suggesting an effect of in-group racial preference, out-group aversion and/or housing market discrimination. In contrast, South and Crowder (1998) find no evidence that housing market discrimination decreases Black mobility. They reveal that in areas with racial discrimination by real estate and rental agents, both Blacks and Whites are more likely to move (though the coefficients are not statistically significant) and are significantly more apt to move to tracts with a higher percentage of White residents. The authors do, however, concede that the measured discrimination and Whites increased mobility could both be effects rather than causes of Blacks’ increased mobility into predominately White areas. Lastly, Helling (1998), in her study of employment accessibility in Atlanta, finds that Blacks are less likely than Whites to move when their jobs decentralize.

Mobility can directly affect transportation needs and patterns in at least two ways. For one, higher mobility often necessitates greater access to a vehicle, even if just for the time of the moves. Secondly, constraints on spatial mobility can lead to increased commute time and distance if jobs decentralize, inconveniencing everyone, especially those without access to a vehicle.

Employment and Wealth

Employment

Nationally, Whites and Asians are disproportionately represented in managerial and professional occupations, while Blacks and Hispanics are disproportionately clustered in semi-skilled, unskilled and service occupations (Pollard and O’Hare, 1999). These patterns are generally replicated in California, though there are a few differences worth noting. After categorizing the

U.S. Equal Employment Opportunity Commission's occupational groups in the same way as Pollard and O'Hare (1999), U.S. Census 2000 data shows that Blacks are represented proportionally more than any other group by at least 5% in technical and administrative positions, while Hispanics are proportionally less concentrated in those fields by at least 5%. In addition, the data reveals that Blacks (13.3%), Asians (12.6%) and especially Hispanics (30.8%) are all employed proportionally more than Whites (8.7%) in semi- and unskilled labor (California Employment Development Department, 2005a). Hispanics' exceedingly high concentration in semi- and unskilled labor would be somewhat tempered if immigrant status were accounted for.

With such occupational differences exist racial/ethnic disparities in income. Nationally, for full-time workers, Blacks (including Hispanic Blacks) and especially Hispanics have much lower average personal incomes than Whites (including Hispanic Whites) and Asians, though some projections show the gaps decreasing at least for Blacks (U.S. Bureau of Labor Statistics, 2005; Zmud and Arce, 2001). As compared to the other groups, Zmud and Arce (2001) attribute Hispanics' relatively low average income and low annual income increases in part to the continuing influx of Latino immigrants, whose low wages exert a leveling effect on the average income of Hispanics as a group (Zmud and Arce, 2001).

The Black-White and Hispanic-White household income gaps also reflect their disparate employment rates. According to CPS data for California, the average monthly unemployment rates in 2003 were 6.1% for Whites (including Hispanic Whites), 10.6% for Blacks and 8.1% for Hispanics. Further compounding these racial/ethnic disparities in income are the racial/ethnic differences in wealth building, specifically in equity ownership and savings (California Employment Development Department, 2005b). Keister (2004) finds that Blacks and Hispanics are less likely than Whites to own homes and stocks and often start saving money proportionally later in life, differences due in part to family size and marital stability during childhood. Additionally, Bound et al. (2003) find that health differences, though they are somewhat endogenous, also contribute to the income disadvantage of Blacks relative to Whites.

Spatial and Automobile Mismatch

The spatial mismatch hypothesis (SMH), as first propounded by Kain (1968), states that segregation in the housing market affects Black employment patterns and reduces their job opportunities. Some subsequent researchers have expanded the scope of the hypothesis to

include Hispanics in addition to Blacks. Scholars have used many methods to test the SMH, including measures of accessibility to employment, distance traveled to work, commute times, the job/housing balance, employment decentralization or job sprawl, shifts in workforce occupational composition, minority residential location and residential segregation. Across all measures of spatial mismatch, the majority of the studies find some evidence for the SMH. In their review of the spatial mismatch literature, Ihlanfeldt and Sjoquist (1998) find that of the 28 studies they reviewed, only 7 rejected or found equivocal evidence for the existence of some sort of spatial mismatch.

In California, spatial mismatch has been studied most thoroughly in Los Angeles, and results have confirmed its existence there, at least for Blacks. Using 2000 U.S. Census data and the 1999 Department of Commerce's ZIP Code Business Pattern files, Stoll (2005) finds that across 30 metropolitan areas L.A. has the highest job sprawl and spatial mismatch, as measured by a standard dissimilarity index. Stoll and Raphael (2001) reveal that residential segregation is one of the most significant determinants of spatial job search quality, measured by average number of new job openings in areas searched, and that spatial job search quality can account for at least 25% of the Black-White gap in employment. Cooke (1996) also finds evidence of spatial mismatch in L.A. by comparing the employment probabilities of central city and suburban Blacks.

Generally, Blacks, and to a lesser extent Hispanics (though not accounting for immigrant status), residing in large metropolitan areas are found to have lower accessibility to employment, especially high paying jobs, and greater occupational mismatches where they reside than Whites (Cervero et al., 1999; Helling, 1998; Wyly, 1996; McLafferty and Preston, 1992). In addition, studies show that increasing job decentralization (Blumenberg, 2004) and persistent Black residential centralization decrease the employment probability and increase the unemployment duration for Blacks and Hispanics, even after controlling for socioeconomic and locational characteristics, though not immigration status (Stoll, 2005, 1985; Powell, 2002; Weinberg, 2000; Cooke, 1996). Residential suburban sprawl is found to have contributed significantly to such job decentralization as well as Black-White residential segregation (Powell, 2002; Bajari and Kahn, 2001).

Lastly, Blacks, and to some extent Hispanics, also suffer from an "automobile mismatch," whereby their lower access to vehicles, in addition to compounding their spatial mismatch via

diminishing spatial range of mobility, increases their commute times and can lead to stigmatization by employers (Taylor and Ong, 1995; McLafferty and Preston, 1992, 1997; Blumenberg and Haas, 2001). Using 1995 NPTS data for the New York-Northern New Jersey-Long Island CMSA, Macek et al. (2001) find that, regardless of race/ethnicity, the employment probability for urban residents reliant on public transit is “substantially lower” than for residents reliant on the automobile. Blumenberg (2004) finds that nationally, and specifically in California, reliable access to a vehicle, is strongly linked to employment among welfare recipients.

It is possible that increasing transit accessibility in minority and low-income areas could help alleviate the employment problems associated with automobile mismatch. Ong and Houston (2002) find that nearby transit moderately increases employment of single mother welfare recipients in L.A. County. Thompson (2001) reveals that high transit accessibility does not increase labor force participation (i.e. the proportion of working age people who are employed or unemployed) among Blacks, Hispanics or Whites, though he does find that it significantly increases wage rates, directly or indirectly, for auto-disadvantaged groups. Expanding transit service late at night, early in the morning and on weekends would likely help balance the effects of automobile mismatch as well, since Blacks, Hispanics and others are more likely than Whites to work nonstandard shifts (weekends and/or predominately after 4pm or before 8am) (Presser, 2003).

Chapter 4. Native Americans

About 2.5 million Native Americans¹⁰ reside in the United States, or about 0.9 percent of the total U.S. population. Nationwide, another 1.6 million people identify themselves as part Native American. California is home to about 33,346 Native Americans, which is about 1.0 percent of the total population in California. A total of 627,562 people (1.9 percent) in California identify themselves as part Native American (U.S. Census Bureau, Census 2000, SF 1). The Native American population has grown slightly faster than the rest of the population over the last decade, both nationwide and in California specifically, where Native Americans comprised about 0.8 percent of the population in 1990 (Ogunwole 2002, Table 2). Whether this population grows or remains a minority, understanding transportation issues particular to this population will enable transportation planners in California to better accommodate the needs of residents. The purpose of this chapter is to review what is known about the travel behavior and transportation needs of Native Americans, with special attention to those in California.

Previous literature

Published materials relating to transportation issues for Native Americans have primarily focused on three topics. One topic is the particular transportation challenges for Native Americans living on reservations that are geographically isolated, with few employment, healthcare, and shopping opportunities on-site, and limited economic resources (e.g. Bogren 1999, CTAA 1995). A second topic is the issue of transportation planning on tribal lands and/or by tribal governments, and how these bodies might interface with federal, state, and local jurisdictions and planning processes (e.g. Caltrans 2002a, TRB 2002, CTAA 1995, U.S. DOT 2005a, U.S. DOT 2006a, Shawn 2006). A third topic discussed in the literature is the disproportionately high rate of fatalities due to motor vehicle accidents among those who are racially identified as Native American, especially fatalities that are alcohol-related (e.g. Indian Health Service 1998a, Indian Health Service 1998b, Traffic Safety Center 2003, U.S. DOT 2006b).

¹⁰ We use the term “Native Americans” in place of the term “American Indians” as used by the U.S. Census Bureau. As defined by the U.S. Census Bureau, this includes people who identify themselves as American Indians or Alaska Natives, and no other race. We recognize that alternative definitions exist and may be justified.

This review found no literature describing overall travel patterns or transportation needs of Native Americans, neither for those in California nor at the national level. However, several sources provide information relevant to this theme:

- The U.S. Census provides information on Native Americans as a racial group and on particular Native American tribes, including residential, economic, and sociodemographic characteristics that inform transportation choices, auto ownership data, and journey-to-work data (available at the national or state levels);
- The National Household Travel Survey (NHTS) considers Native Americans as one of 17 racial categories, providing statistics on VMT, numbers of trips, travel time, and auto ownership by race (sample sizes appear to be large enough to calculate some state-level summary statistics for Native Americans);
- The National Highway Traffic Safety Administration (NHTSA) considers Native Americans as one of five racial categories in their data on motor vehicle fatalities;
- The Indian Health Service (part of the U.S. Department of Health and Human Services), provides a database of Native American health statistics that include deaths by motor vehicle accidents among other health indicators (available at the national and state levels); and
- Various case studies and anecdotal illustrations depict conditions in and strategies for particular Native American communities.

Residential, economic, and sociodemographic characteristics

Overall, Native Americans tend to be on average younger, less educated, less likely to participate in the labor force, with lower earnings among those that are employed and with higher poverty rates than the rest of the population (Ogunwale 2006). These trends appear to hold, on average, for Native Americans in California. See Table 4.1 below.

Native Americans are also more likely than the rest of the population to live in rural areas, both nationwide and in California (Census 2000, American Indian and Alaska Native SF). This means that Native Americans may face different transportation issues than other minority populations with comparably disadvantaged socioeconomic characteristics. In particular, greater distances may separate them from jobs, healthcare, and other services, making travel more necessary and more expensive than for those living in more densely developed areas. At the

same time, transit is more difficult to provide and is less likely to be available to rural populations than to the urban poor. Furthermore, Native American communities on reservations operate outside of the usual transportation planning and funding process that is in place in the

Table 4.1. Summary of residential, economic, and sociodemographic statistics for Native Americans from the 2000 Census, in the United States and in California

Statistic	United States		California	
	All races	Native Americans ^a	All races	Native Americans ^a
Total population	281,421,906	2,447,989	33,871,648	312,215
Percent ^b with high school diploma	80.4%	70.9%	76.8%	67.5%
Percent ^b with a bachelor's degree	24.4%	11.5%	26.6%	11.4%
Percent ^c participating in the labor force	63.9%	61.1%	62.4%	61.5%
Median male earnings	\$ 37,057	\$ 28,919	\$ 40,627	\$ 31,571
Median female earnings	\$ 27,194	\$ 22,834	\$ 31,722	\$ 26,253
Percent of male workers earning more than \$50,000	32.4%	17.7%	39.0%	24.4%
Percent of female workers earning more than \$50,000	14.5%	7.9%	22.7%	12.9%
Percent of families in poverty	9.2%	21.8%	10.6%	18.6%
Average household size	2.59	3.06	2.87	3.22
Median age	35.4	28.5	33.5	30.2
Percent of population in rural areas	21.0%	39.2%	5.5%	12.6%
Percent living on Indian reservations ^d		36.6%		5.9%

^a Includes those who identify themselves on census forms as American Indian or Alaska Native alone, not those who identify themselves as American Indian or Alaska Native in combination with one or more other races.

^{b, c} Of the population aged 25 or above and 16 or above, respectively.

^d Includes federally recognized Indian Areas, Alaska Native Areas, and Hawaiian Home Lands, as defined by the Census.

Source: Census 2000. In particular U.S. Census Bureau 2003 (Tables 3, 4, 7, 9, 11, 13, 41, 42, 45, 47, 49, and 51) for all statistics except percent living on reservations (calculated from Summary File 1) and percent rural (calculated from the American Indian and Alaska Native Summary File).

United States. While federally recognized tribes are eligible for government funds, there is no set process for developing tribal transportation plans and for coordination with regional, state, and national governments. Native American communities suffering from all of these factors may face particular transportation-related hardships. For example, Scott Borgen describes the “stunning” combination of poverty and isolation that challenge residents of the Rosebud reservation in

South Dakota, making the Rosebud Sioux Transit agency both a perpetual near impossibility and an essential lifeline for the reservation's residents (Borgen 1999). However it is unclear if and to what extent this experience is common to Native Americans nationwide and in California.

Although Native Americans are more likely to live in rural areas than the rest of the population, more Native Americans live in urban areas than in rural areas, especially in California, where just 13 percent live in rural areas (Census 2000, American Indian and Alaska Native SF). Nationwide, about 37 percent of Native Americans live on reservations.¹¹ In California, the share living on reservations is less, with about 6 percent living on reservations. (The share is even smaller for those identifying themselves as a mix between Native American and some other race, with about 3 percent of this group living on reservations in California.) Even among those living on reservations in California, only 42 percent of these are in rural areas. Thus, most Native Americans do not live on reservations, and most of those that do are not in rural areas, especially in California. For these reasons, it is unlikely that most Native Americans in California have experiences like the Rosebud Sioux.

However, the poverty rate among Native Americans living on reservations in California is 31 percent, much higher than that among all Native Americans statewide, which at 22 percent is still much higher than that among all races, at 14 percent (Census 2000, American Indian and Alaska Native SF, SF 4). In particular, the Big Valley Rancheria, the Karuk, and the Susanville Rancheria reservations all have poverty rates at or above 50 percent (the same level as the Rosebud reservation) (Census 2000, American Indian and Alaska Native SF).

In total, about 60,514 people live on reservations in or partially within California, about 17,445 of which identify themselves as at least part Native American (Census 2000, SF 4). Based on the size of their Native American populations, the largest reservations contained entirely within California are the Hoopa Valley Reservation (not far from the Oregon border and just inland from the Redwood National Park) the Bishop Reservation (in Inyo County, south of the Mammoth Lakes area), and the Pala Reservation (in San Diego County), with 2252, 1035, and 737 residents who are at least part Native American, respectively. In addition, the Colorado River Reservation and the Fort Yuma Reservation have 2505 and 1446 residents each, spanning the California and Arizona border.

¹¹ The term "reservations" here includes American Indian Areas, Alaska Native Areas, and Hawaiian Home Lands, as defined by the Census.

Mode choice, auto ownership, and mobility

The socioeconomic characteristics summarized above may have several implications for transportation. In particular, lower socioeconomic status is often associated with lower mobility levels (Pucher and Renne 2003). For example, members of low-income households may not own a car, may have less reliable vehicles, and may have to share a car with more people. Indeed, a higher share of Native American households have no vehicle and the average age of vehicles owned by Native Americans is greater than for the rest of the population, both nationwide and in California (Table 4.2). Although the share of Native Americans commuting by private vehicle is comparable to other groups, a larger portion of Native Americans carpool during their commute rather than drive alone. Since Native Americans are more likely to live in rural areas, as mentioned above, we may expect them to have less access to transit than other lower-income groups, and may have to travel longer distances to achieve the same level of accessibility as their counterparts in higher-density urban areas. Nationwide, Native Americans appear somewhat less likely to use transit for commuting and travel more vehicle-miles than the rest of the population, but this trend does not seem to hold in California (Table 4.2). In contrast to Native Americans in the rest of the nation, those in California appear to travel fewer vehicle-miles than the rest of the population, perhaps due to the fact that more live in urban areas but are still lower-income, on average, than the rest of the population.

Tribal transportation planning

Today there are 561 federally recognized tribes and about 300 reservations in the United States. Additional tribes and areas may be recognized by state governments, called “rancherias” in California. Caltrans lists 109 tribal governments in a 2002 directory (Caltrans 2002b). Tribal territories are governed by tribal councils, with varying degrees of immunity from federal and state laws.

In recent decades, transportation planning processes have evolved to incorporate more local participation and regional coordination in recent decades, and tribal governments have been included in this effort. In particular, federal code mandates that states and metropolitan bodies consider the needs of tribal governments when carrying out transportation plans and consult with them on the development of plans and programs. These efforts have been formalized by, for example, designating a Native American Program Coordinator in the Federal Highway Administration, designating tribal liaisons at state departments of transportation, and by

discussing and documenting best practices for collaboration and consultation between tribal and other government bodies (e.g. U.S. DOT 2005a and U.S. DOT 2006b, which is a collection of case studies that includes one in California).

Table 4.2. Summary of transportation-related statistics from the 2000 Census and the 2001 NHTS in the United States and in California

Statistic	United States		California	
	All races	Native Americans/ Alaska Natives ^a	All races	Native Americans/ Alaska Natives ^a
Percent of occupied housing units that have no vehicle available	10.3%	14.9%	9.5%	13.9%
Average vehicle age	8.3	10.4	9.3	12.5
Percent ^b commuting to work in a private vehicle	87.9%	86.5%	86.4%	85.2%
Percent ^b commuting in a carpool	12.2%	18.5%	14.5%	19.3%
Percent ^b commuting by public transportation	4.7%	3.8%	5.1%	5.2%
Average number of trips per person per day	4.03	4.02	4.01	4.35
Average vehicle miles traveled per driver per day	37.8	43.6	35.5	29.2

^a Includes those who identify themselves as American Indian or Alaska Native alone, not those who identify themselves as American Indian or Alaska Native in combination with one or more other races.

^b Of workers aged 16 or above.

Source: For percent with no vehicles and commute mode, Census 2000 (AIAN SF); for vehicle age, average VMT, and average trips, NHTS 2001.

While state and federal governments recognize the sovereignty of tribal governments, they also provide some assistance for transportation and other services. For example, the Bureau of Indian Affairs has long cooperated with the Federal Highway Administration for the appropriation of funding for road construction and maintenance on reservations through the Indian Reservation Roads program, established in 1928. Since then, the sources of transportation-related funding have expanded, including those related to Medicaid and programs serving the elderly and disabled in addition to funds administered by the Department of Transportation. SAFETEA-LU established a new allocation of funds for “Public Transportation on Indian Reservations” (49 U.S.C. 5311(c)), which is to include \$45 million over the next four years out of the “Non-urbanized Area Formula Program” explicitly for tribal needs (U.S. DOT, 2005b). Local, federal, and state governments have also contributed non-financial assistance. A variety of government entities have made efforts to encourage more and better transportation

planning within tribal governments by documenting best practices and producing guidance documents (e.g. U.S. DOT 2004 on transit planning, U.S. DOT 2005c on long-range plans, U.S. DOT 1999 on the IRR program, and Caltrans 2002a providing an overview of planning processes for tribal governments in California).

Motor vehicle fatalities

Nationwide, motor vehicle accidents account for a higher share of deaths among Native Americans than among any other race. About 7 percent of all Native American fatalities are due to motor vehicle crashes, making it the third leading cause of death in this group, compared with less than 2 percent for non-Hispanic Whites for whom it is the eighth leading cause of death (U.S. DOT 2006b). This difference has diminished since the 1970s, but remains significant (Indian Health Service 1998a).

Some of the risk factors associated with motor vehicle accidents are also highest among Native Americans compared to other racial groups, based on nationwide averages. In particular, fatally injured drivers who were Native American are on average the most likely to have been drinking, the least likely to hold a valid driver's license, the most likely to have a prior DUI conviction or license suspension. Native American passengers are also the least likely to have been wearing a seat belt or using a child safety seat. Finally, fatally injured Native American (along with Hispanic) motorcycle riders are less likely to have been wearing helmets at the time (U.S. DOT 2006b).

Nationwide, the fatality rate for Native American pedestrians is not as high as that for other minorities, such as African Americans, Pacific Islanders, and Asians. However, among non-occupant fatalities, Native American victims are the most likely to have been drinking at the time of the crash (U.S. DOT 2006b).

In California, the differences between Native Americans and the rest of the population may not be as great. Motor vehicle fatality rates among Native Americans in California are lower than among Native Americans in other parts of the country, although still higher than the rest of the population (Table 4.3). In addition, as an indicator of one risk factor, the alcohol-related fatality rate among Native Americans in California is also lower than in other parts of the country, although still higher than for the general population (Indian Health Service 1998b).

Table 4.3. Fatality rates among Native Americans in California versus the rest of the United States, 1995

Fatality rate ^a	All races	Native Americans	
	United States	All Indian Health Service areas	California Indian Health Service area
Motor vehicle accidents	16.3	54.0	23.7
Alcoholism	6.7	48.7	27.0

^a Age-adjusted rate per 100,000 population. Rate also adjusted to compensate for miscoding of Indian race on death certificates.

Source: Indian Health Service 1998b, Tables 4.18 and 4.23.

Chapter 5. Elderly

Both the U.S. and California face the imminent challenge of providing transportation services to a new and vastly larger population of older travelers. There are currently about 34 million senior citizens in the U.S. and this group is expected to more than double by the year 2030, constituting 20 percent of our nation's population (Burkhardt et al., 2002). In California, 3.5 million people, 12 percent of the total state population, are currently over the age of 65 (Scharlach et al., 2001). By the year 2040, the senior population is expected to grow by 172 percent (from 2000), and most of this growth is expected to occur in the next 20 years (Scharlach et al., 2001).

The next generation of older travelers (aged 45 to 64) is more likely to live in the suburbs (52 percent) and less likely to live in urban (27 percent) or rural (21 percent) areas (U.S. Census, Table DP-1, 2000). Activity destinations in the suburbs tend to be less accessible by transit than in urban areas because of differences in intensity and proximity of land uses. However, in urban and suburban environments older people travel most frequently by the auto (74 percent in urban areas and 91 percent in suburbs) and much less frequently by transit (eight percent in urban areas and less than one percent in suburbs) (Rosenbloom, 1999).

The dependence of older travelers on the auto is of some concern, however, because the cognitive and physical limitations associated with aging can lead to declines in driving performance and safety, particularly after the age of 75 (McKnight, 2006). Driving cessation and reductions in out-of-home activities have also been related to serious health problems including heart disease, strokes, fractures, and cognitive impairments (Marottoli et al., 2000).

In this chapter, the available literature on older travelers is reviewed to understand their demographic characteristics, patterns of household location, travel behavior (mode choice, frequency, purpose, departure time, and route choice), ability to continue driving, and transit preferences.

Demographic Characteristics

Ethnicity

The next generation of older travelers in California and the nation is expected to be more ethnically diverse (Scharlach et al., 2001; Lee et al., 2003). Currently, almost 33 percent of California's total population is Hispanic (relative to 13 percent nationwide) and 12 percent is Asian (relative to four percent nationwide) (Lee et al., 2003). These two groups are expected to

become the fastest growing senior ethnic groups in California (Lee et al., 2003). Most immigrant seniors will have lived in the U.S. for at least 30 years and are likely to speak English. The share of those who do not is expected to rise only from five to six percent by 2050 (Lee et al., 2003).

Income and Education

Seniors in California currently have higher average incomes (\$25,500) relative to the national average (\$22,500) (Lee et al., 2003). However, foreign born seniors in California tend to average \$6,000 less than the nationwide average (Lee et al., 2003). California seniors who were born in the U.S. average about \$6,000 more than the nationwide average (Lee et al., 2003).

The average level of educational achievement among seniors is expected to rise by 2020 (Lee et al., 2003). However, by 2050, the continued influx of immigrants may increase the proportion of Californians without a high school diploma from 20 to 24 percent while the proportion with a college degree will increase only slightly, assuming constant graduation rates for all racial and ethnic groups (Lee et al., 2003).

Aging and Employment

It is unclear how many Californians will continue to work after turning 65. Only about 13 percent of seniors in California are currently employed and most of those are aged 65 to 69 (Lee et al., 2003). The income from this labor contributes to approximately 20 percent of total senior income (Lee et al., 2003). Seniors may continue to work in greater numbers after the age of 69, if the decline in disability rates continues (currently about three percent annually nationwide) (Lee et al., 2003). On the other hand, the number of people aged 85 and over is predicted to triple, making them the fastest growing age group in the senior population (Scharlach et al., 2001). The life expectancy of a typical Californian is currently 78.8 years, one year longer than the nationwide average, and some predict that there is a 50 percent probability that life expectancy will be extended to 84.2 years by 2050 (Lee et al., 2003).

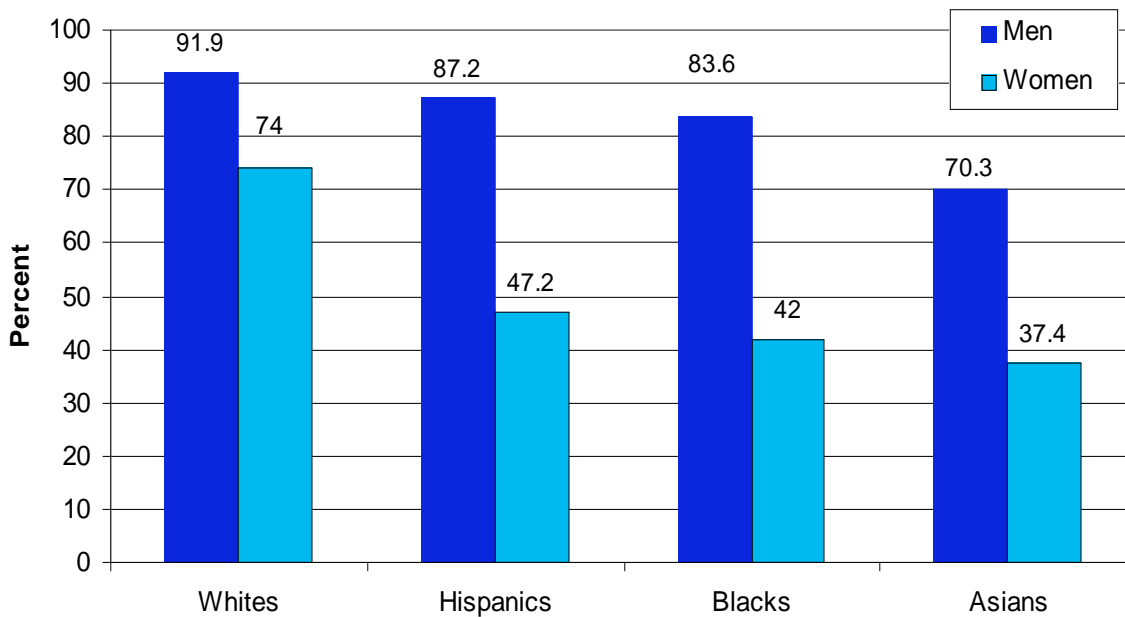
Gender and Licensing

In California, the current population is composed of more men than women of younger age and more women than men of older age (Lee et al., 2003). However, forecasts made by Lee et al. (2003, p. x) “show a decline in the mortality gap between men and women and a more equal ratio of men and women among the senior population.”

Nationally and in California, the next generation of seniors is also likely to have a higher licensing rate than the current generation of seniors (Rosenbloom, 2001). In 1997, a little over 90 percent of men in the U.S. over 70 years old had a driver’s license, and only 65 percent of women over 70 held a license (Rosenbloom, 2001). Five years earlier in 1992, about 50 percent of women over the age of 70 had a driver’s license (Rosenbloom, 2001). Thus, in the course of five years, the licensing rate of older women jumped 15 percent. Currently, 90 percent of women in their fifties have licenses, and it is likely that the licensing rate of these women will approach that level when they are in their seventies (Rosenbloom, 2001).

Among the current generation of seniors, there are some significant differences in licensing rates by gender and race/ethnicity (Rosenbloom, 1999). As illustrated in Figure 5.1., there is approximately a 20 percentage point difference between the licensing rate of Asian and white men aged 65 and over (Rosenbloom, 1999). Hispanic, black, and Asian women aged 65 and older are significantly less likely than white women to have a driver’s license (approximately 27, 30, and 35 percentage points, respectively) (Rosenbloom, 1999).

Figure 5.1. U.S. Rates of Licensing among Older People by Gender and Race/Ethnicity (1995 NTPS)

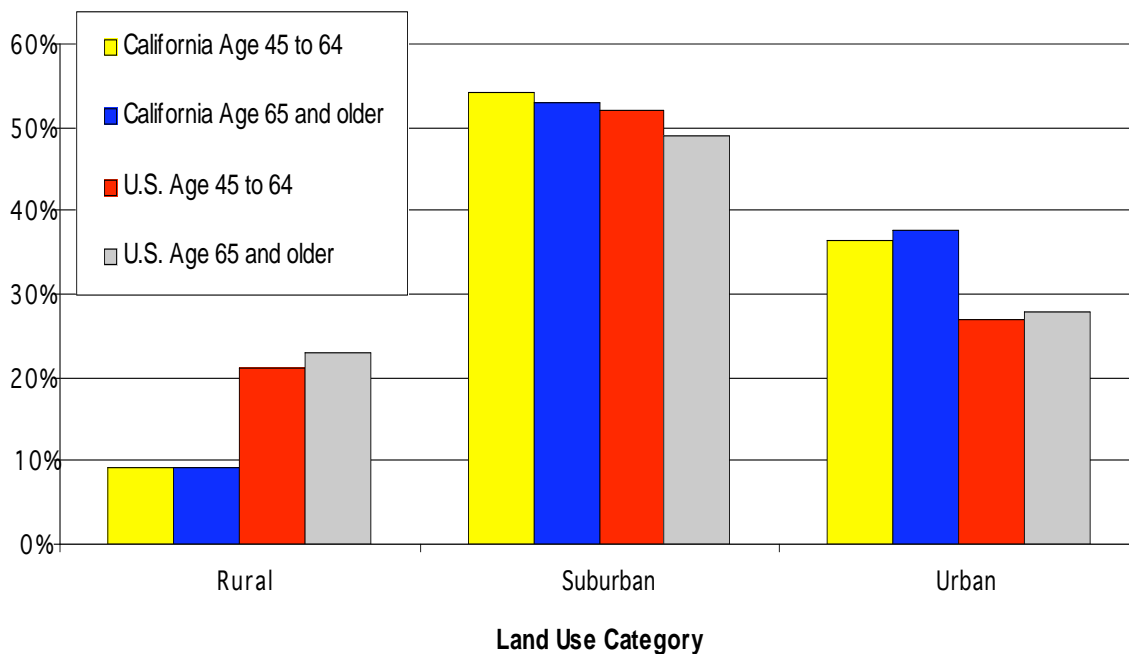


Source: Rosenbloom, 1999.

Location Choice

Residential location choice is often closely tied to the quality of available modal options; for example, activity destinations are less likely to be accessible by transit in suburban areas than in urban areas because of differences in the intensity and proximity of land uses. In the U.S., most seniors currently live in suburban areas (49 percent) and the rest live in urban (28 percent) or rural areas (23 percent) (U.S. Census, Table DP-1, 2000). The next generation of older travelers (those currently aged 45 to 64) is somewhat more likely to live in the suburbs (52 percent) compared to urban (27 percent) or rural (21 percent) areas (U.S. Census, Table DP-1, 2000). In California, however, both the current and next generations of seniors are more likely to live in the suburbs and urban areas, and less likely to live in rural areas (Census, Table GCT-P5 (California), 2000).

FIGURE 5.2 . Seniors and Next Generation Seniors by Residential Location Type in U.S. and California



Source: Census 2000

Research on the location choices of the current generation of seniors suggests that they have tended to stay in their original homes and communities as they age. One survey of 105 older households in Winnipeg, Canada, shows that 60 percent had lived in their current residence for over 20 years (Smith and Sylvestre, 2001). Another analysis of the Census Bureau's American Housing Survey data from 1995 finds that 80 percent of seniors had lived in their house for more

than 20 years (Hermanson and Citro, 1999). A survey of seniors by the American Association of Retired Persons (AARP) indicates that over 80 percent of retired people would prefer to age in their current homes (Pollak et. al., 1999). An analysis of public-use microdata (PUMS) from the 2000 Census shows that only about six percent of seniors moved to another state between the years of 1995 and 2000 (Longino and Bradley, 2003).

There is some preliminary evidence, however, that aging baby boomers may buck the prevailing trend of aging-in-place. A survey by Pulte Homes, Inc. (a.k.a. Del Webb Baby Boomer Survey) shows that 36 percent of baby boomers either have moved or intend to move once they become an empty nester (Del Webb Survey, 2004). The survey also shows that 44 percent of those intending to move want a smaller house or a home that requires less maintenance (Del Webb Survey, 2004). Anecdotal evidence (from newspaper articles over the last three years) suggests two emerging relocation trends among empty-nester baby boomers that are consistent with this housing preference. The first is an increased demand for smaller but high quality suburban homes (e.g., one-story, small lots, big kitchens, great rooms, and patios) (Booher, 2005; DeSimone, 2004; Amoruso, 1999). The second is an increased demand for high-density apartments, condominiums, and restored brownstones in downtown city areas across the U.S. (Baker, 2004; Martin, 2004; Peabody, 2003). Life-cycle immunity to problems with inner-city schools and falling city crime rates appears to make living in the city more acceptable to these market segments (Baker, 2004).

It is also possible that current or anticipated finances could be contributing to the expressed preferences of aging baby-boomers for smaller housing. The Del Webb Baby Boomer Survey (2004) finds that only 36 percent of baby boomers think that they will have enough money to live comfortably during retirement; 40 percent are unsure about their ability to live comfortably; and 25 percent do not think that they will live comfortably. Similarly, a report by the Congressional Budget Office (2003) finds that 50 percent of baby boomers will accumulate enough wealth to maintain their current standard of living; another 25 percent may or may not depending on their retirement age, social security qualification, and ability to draw on housing equity; and 25 percent will not have accumulated any significant savings and will be totally dependent on government aid. These studies suggest the possibility that a significant number of baby-boomer seniors may be required to fund their retirement by cashing in on their home-equity by moving to smaller, less expensive homes.

Travel Behavior

Mode Choice

Seniors' most frequent mode of travel is by car; although, this is less the case in urban areas than in suburban and rural areas. According to an analysis of the 1995 National Personal Transportation Survey (NPTS) (Rosenbloom, 1999; see Table 5.1 below), driving a car is the mode of choice for 53 percent of all trips made by older people in urban areas, 70 percent in suburban areas, and 66 percent in rural areas. The second most common mode for seniors is as a passenger in a car: 21 percent in the urban and suburban environments and 25 percent in the rural environment (Rosenbloom, 1999). Thus, in total, older individuals use the car for 74 percent of all trips in the city and 91 percent of all trips in the suburbs and in the countryside. Public transit is used for only 8.2 percent of all senior trips in urban areas and less than one percent in suburban and rural areas (Rosenbloom, 1999). Walking and biking is used more commonly than transit: 13 percent in urban areas, 3.1 in suburban areas, and 4.4 percent in rural areas (Rosenbloom, 1999).

Table 5.1. Senior Mode Choice (Percent of All Trips) by Residential Location Type (1995 NPTS)

Mode	Urban	Suburban	Rural
Total Automobile	74.0	91.2	91.0
Driver	53.0	70.1	65.7
Passenger	21.0	21.1	25.3
Public Transit	8.2	0.8	0.3
Walking or Biking	13.0	4.4	4.4
All Others	4.7	3.1	4.4

Percentages do not all sum to one hundred because of rounding error.

Source: Reproduced from Rosenbloom, 1999.

In fact, it appears that on average senior mode shares are not significantly different from those for adults aged 64 and under. According to the 2001 National Household Travel Survey (NHTS), see Table 5.2 below, seniors are only slightly less likely to travel by car and transit and more like to walk than younger adults (Collia et al., 2003). However, as Table 5.3 indicates, across successive older senior cohorts, there are small but increasing shifts from driving a private car to becoming a passenger (Rosenbloom, 1999). It is not until seniors reach the age of 85 that travel by private car decreases more significantly (by about eight percentage points) (Rosenbloom, 1999).

Table 5.2. Percent of Daily Trips by Mode of Transportation (2001 NHTS)

Mode of Transportation	Young Adults (19 to 64)	Older Adults (65+)
Automobile	89.5	89.3
Transit	1.8	1.2
Walk	7.5	8.4
Other	1.2	1.2

Source: Reproduced from Colia et al., 2003

Table 5.3. Senior Mode Choice (Percent of All Trips by Age Cohort (1995 NTPS))

Age Cohort	Private Automobile			Public Transit	Taxi	Walk	Bike	Other Modes
	Total	Driver	Passenger					
65-69	90.1	71.5	18.6	1.7	0.2	4.5	0.2	3.4
70-74	89.4	67.6	21.8	1.5	0.2	5.5	0.2	3.2
75-79	88.4	63.3	25.1	2.1	0.3	5.9	-- ^a	3.4
80-84	89.0	57.6	31.4	1.6	0.2	5.3	0.3	3.6
85+	81.5	49.3	32.2	2.3	0.9	11.0	0.0	4.4

^a Less than 0.01. Note: percentages do not all sum to one hundred because of rounding error.

Source: Reproduced from Rosenbloom, 1999.

Research has also explored differences in mode choice among older travelers of different races and ethnicities. Rosenbloom (1999) summarizes 1995 NTPS data on senior auto and transit mode share by location type and by race/ethnicity categories (see Table 5.4). These results indicate relatively lower auto shares and higher transit shares among older blacks in urban, second city, and suburban locations; Asians in urban and town locations; and Hispanics in town locations. Another study (Waldorf, 2003) examines racial differences (blacks and whites) in automobile reliance by controlling for location type, income, and gender in a discrete choice model analysis using 1995 NTPS data (Waldorf, 2003). The results indicate that the only significant difference in the reliance of whites and blacks on the car is in the central city, where blacks are more likely than whites to switch use transit (Waldorf, 2003).

Table 5.4. Senior Mode Choice (Percent of All Trips) by Race/Ethnicity (1995 NTPS)

Location	Whites		Blacks		Asians		Hispanics	
	Car	Transit	Car	Transit	Car	Transit	Car	Transit
Urban	78.8	6.4	52.3	24.1	61.5	22.8	76.1	1.0
Second City	93.0	0.8	80.7	8.6	85.5	0.0	76.0	4.2
Town	92.4	0.5	95.9	0.2	66.0	34.0	93.1	0.0
Suburb	92.6	0.9	84.5	4.5	95.1	0.0	95.5	0.0
Rural	91.5	0.5	97.1	0.0	100.0	0.0	98.7	0.0

Source: reproduced from Rosenbloom, 1999

Frequency and Purpose

Differences between the frequency of trip purposes between younger and older travelers are explored by Collia et al. (2003) with an analysis of 2001 NHTS data. See Table 5.4 below. As one might expect, as a percent of total trips, seniors make much fewer work and school trips, but more shopping, family/personal business, school, religious, medical, and social/recreational trips. In addition, the percentage of return home trips is somewhat higher for older people than for younger people, which indicates less trip chaining among older people. Overall seniors on average make one less trip per day than do younger adults (3.4 versus 4.4). However, seniors over 75 years old make much fewer trips than seniors under 65 (Collia et al., 2003).

Table 5.5. Percent of Total Daily Trips by Purpose for Senior and Non-Senior Adults (2001, NHTS)

Purpose	Young Adults (19 – 64)	Older Adults (65+)
Work / Work-related	16.1	3.1
Shopping	13.2	18.3
Family / Personal Business	16.4	17.5
School	0.9	0.1
Religious	1.3	2.6
Medical	1.3	2.9
Social / Recreation	17.1	19.4
Return Home	32.7	34.8
Other	1.0	1.2

Source: reproduced from Collia et al., 2003.

Douma (2004) conducts an analysis of 267 surveys (13 percent response rate) of those born before 1948 in an area known as the “Golden Crescent” of Minnesota, which includes urban, suburban, and rural areas. The analysis examines frequency and stated value of trip purposes for three categories of respondents, non-retirees (ages 57 to 61, 27 percent of respondents), new-retirees (ages 62 to 66, 20 percent), and old-retirees (ages 67 and over, 51 percent). Table 5.5 presents the average number of weekly trips by each senior category. It appears that many older adults in this community continue to work either full or part time after they “retire.” Work trips are the most frequent trip purpose across all respondent categories. Total trip frequency decreases for successively older age categories. As a percentage of total weekly travel, older retirees make fewer work trips and more trips to visiting friends, engage in social and recreational activities, and for medical appointments. Respondents were also asked to rate trip purposes by importance based on a scale of one to four (see Table 5.5). The results indicate that work trips are rated as most important across all respondent categories, but become less

important relative to other trip purposes with the increasing age of respondent categories (Douma, 2004).

Table 5.6. Average Number and Rated Importance of Weekly Trips by Purpose for Respondent Categories

Mean Number of Trips/Week	Work	Friends	Medical	Recreational	Social
Non Retirees	4.95	2.53	.89	1.96	1.81
New Retirees	3.42	2.15	.8	1.94	2.04
Old Retirees	2.1	1.93	.88	1.6	1.75
Importance of Trip Purpose	Work	Friends	Medical	Recreational	Social
Non Retirees	3.18	2.04	2.35	2.06	2.04
New Retirees	2.83	2.09	2.28	2.42	2.28
Old Retirees	2.02	2.01	1.78	2.26	2.03

Source: Douma, 2004

Smith and Sylvestre (2001) conduct a survey of 105 older travelers in Winnipeg, Canada, and explore the frequency of travel by destination type (or purpose). The results show that the grocery store is the most frequently visited destination, followed by places of recreation, homes of friends and relatives, the bank, and finally the pharmacy (Smith and Sylvestre, 2001).

Departure Time

Because older people travel less for work and more for social, recreation, and personal business, they can often avoid traveling during peak commute hours. However, as Holmes et al. (2002) report, many older people intentionally drive during the off-peak to avoid congestion, busier intersections, and aggressive drivers.

One of the more detailed examinations of departure time choices of older travelers was conducted by Okola (2003). Okola uses a discrete choice model to examine temporal preferences for non-work trips made by older drivers (age 50 and over) living in suburban and rural communities. The results reveal that this group prefers to conduct most of their activities during a morning peak between nine and noon and after noon and before during the afternoon hours between noon and four (Okola, 2003). Another study of older people in the Netherlands by Tacken (1998) finds that they prefer to make shopping trips during two periods of the day, ten in the morning to noon and two to four in the afternoon.

Rosenbloom (2001) summarizes the cumulative effect of the pattern of trip making (i.e., time, purpose, and frequency) by older travelers. Across all trip purposes, younger people travel more than seniors, however, for non-work trip purposes, seniors, under the age of 75, travel more than younger people. Because older travelers are less likely to make linked or chained trips, their

travel is more likely to increase the number of cold-starts (delayed functioning of the catalytic converter for about three minutes after a car is started) and thus air pollution. In addition, non-work trips are less conducive to public transportation systems, which are typically designed to serve commuters. An important implication of this dynamic is that former transit users who retire from the workforce are likely to turn into new drivers. (Rosenbloom, 2001)

Route Choice

The physical and cognitive challenges that often accompany aging can affect older travelers' choice of driving route. A number of studies indicate that older drivers perceive freeway speeds, left hand turns, and busy intersections to be difficult (Stowell-Ritter et al., 2002; Holmes et al. 2002), and thus they may choose a route that minimizes the likelihood of encountering these situations (Wachs, 2001). In addition, memory loss among seniors have been found to increase the occurrence of way-finding errors or navigational "waste", which was estimated to be about four percent of all travel in the United Kingdom (Burns, 1999). Beyond annoyance and frustration, increased incidences of way-finding errors increase fuel consumption and vehicle miles traveled.

Safety and Driving Cessation

Older people often find certain driving situations to be exceptionally challenging. After the age of 75, driving performance does begin to decline because of increased stimulus-reaction time, declines in visual cognitive performance, and side effects of medication (McKnight, 2006). Car crash statistics indicate that the fatality rate of seniors increases between the ages of 55 and 70, and this increase occurs exponentially after the age of 65 (National Highway Safety Administration, 2003). McKnight (2006) identifies specific mental processes that are exceptionally difficult for senior citizens while driving: attention sharing, judging gaps in traffic, conducting visual searches, navigation, and motor control. Attention sharing is frequently a required skill for making left hand turns because the driver must watch multiple events at once (2006). A survey of older travelers in San Diego, California, also found that the greatest perceived driving challenges involved making left hand turns and managing yield situations (Holmes et al., 2002). Motor control deficiencies involve events like misapplications of the accelerator or wide swings around corners (McKnight, 2006).

As a result of physical, cognitive, and financial challenges, driving cessation, either forced or voluntary, is inevitable for older travelers who live long enough. Aside from cessation caused by a discrete event such as a crash or an illness, there also appears to be a process of cessation. Focus groups, conducted in Florida, Maine, and Maryland, suggest that older drivers begin the cessation process by restricting the variety of trips made and increasing the amount of trip chaining (Burkhardt, 1999). Recreational trips are generally the first trip types to be eliminated, which are also the types of trips that older travelers tend to value more highly (Douma, 2004). As described above, personal driving is typically replaced by passenger trips that are provided by a family member or friend. Many seniors appear to dislike the feelings of dependence that accompany the increases in these trips (Stowell-Ritter et al., 2002).

Other research that examines the consequences of driver cessation has focused on the health changes a person experiences once they stop driving. A core study in this area by (Marottoli et al., 2000) reviews past research and concludes that after adjusting for socio-demographic and health related factors, driving cessation is still associated with a further decrease in out-of-home activities. The direct health effects of driver cessation are associated with a more inactive lifestyle, which increases the risk of heart disease, stroke and fractures (Marottoli et al., 2000). More recently, a decrease in out-of-home activities has been linked to declines in cognitive abilities as well (Marottoli et al., 2000).

Transit Barriers and Preferences

In response to driving difficulties, older travelers might be expected to turn to transit; however, as described above, many cannot for the simple reason that transit service is not available in their neighborhoods (Holmes et al., 2002; Stowell-Ritter et al., 2002). On the other hand, one study also suggests that some older travelers may intentionally avoid transit. A survey of seniors in San Diego (California) found that only two percent of respondents used transit regularly, and 56 percent of respondents said that they would not use transit even if service was improved to include more convenient stops, shorter headways, and increased safety (Holmes et al., 2002).

A number of studies in recent years have attempted to explore the reasons why older travelers do not take transit, even if it is available to them (Burkhardt et al., 2002; Holmes et al., 2002; Stowell-Ritter et al., 2002; Koffman and Salstrom, 2001; Suen and Sen, 2004). In general, the results of these studies suggest a number of significant concerns:

- Lack of direct service to local destinations;

- Limited transit service hours during off-peak periods and on weekends;
- Multiple transit connections;
- Transit service that is not prompt or reliable;
- Physical discomfort related to climbing stairs, paying fares, walking to and standing at stops, and standing on buses;
- Fear of crime including waiting for the bus after dark, park-and-ride lots, and on the bus after dark; and
- Difficulties understanding how to use transit.

Many of these studies have also recommended strategies to encourage transit use among older individuals. It appears that while all transit users respond favorably to service improvements, seniors may place more value on improvements to their physical and psychological comfort, their safety, and access to local destinations (Koffman and Salstrom, 2001). Recommendations have been made to improve access to information by making maps and schedules available at bus stops and improving general and real-time telephone information (Burkhardt et al., 2002; Koffman and Salstrom, 2001). In addition, service limitations may be addressed by the provision of shared-ride demand-responsive services (Burkhardt et al., 2002). Friendly and patient transit drivers may make the transit experience for older riders more pleasant and comfortable (Burkhardt et al., 2002; Koffman and Salstrom, 2001). Finally, Burkhardt et al. (2002) note that older travelers may be less familiar with transit and may have physical and cognitive challenges that make it more difficult to use. As a result, older travelers may need a higher level of support (e.g., information and help) to increase their actual use of transit (Burkhardt et al., 2002). He recommends “developing mobility planning and training programs to help older persons make a transition from driving to public modes of travel” (page 15). A recent report sponsored by the California Department of Transportation on the use of public transit by non-traditional riders also recommended the development of “senior education and outreach programs” (Caltrans, 2003).

Chapter 6. Youth

Research on children's travel is more limited than that on adult travel, but interest in children's travel behavior has been growing. One reason for the growing interest in children's travel is recognition that children's travel patterns have been changing, with fewer trips completed by active and independent modes, and more trips completed as passengers in private automobiles. Thus, research has focused on documenting these changes, on identifying contributing factors, on examining mental and physical health implications, and on evaluating strategies for producing better outcomes. Another reason for the interest in children's travel is their role as future adults: Whatever patterns are established in childhood will likely persist through adulthood. In this chapter we review what is known about the travel behavior of children and its implications, with special attention to children's travel in California.

Overall travel patterns

Children's travel is obviously different from adult travel because of children's limited autonomy. Children's lives are often more integrated into the lives of the rest of the household, with limited ability to travel alone and limited need to do so. However, they do have some travel needs such as commuting to school, and often tag along on trips made by other members of the household.

On average, children in the United States make 3.5 trips per day, about three quarters of them in a car, covering an average of 31 miles in 72 minutes (see Table 6.1 below) (McDonald 2006, based on the NHTS 2001). It is notable that automobile trips comprise such a large share of children's trips, with just 12 percent of trips made by foot and less than 1 percent by bicycle, although shorter non-auto trips may be most likely to be under-reported on travel surveys, especially since parents are reporting on children's behalf. The share of reported trips made on foot and by bicycle is higher for shorter trips, with about 42 percent of trips that are under a half mile long being completed on foot (McDonald 2006). In California, the mode split for children's trips shows a similar pattern with about 74 percent of trips made in a car and 15 percent walking (see Figure 6.1 below) (STPP, et al. 2003, based on the Caltrans 2000–2001 Household Travel Survey).

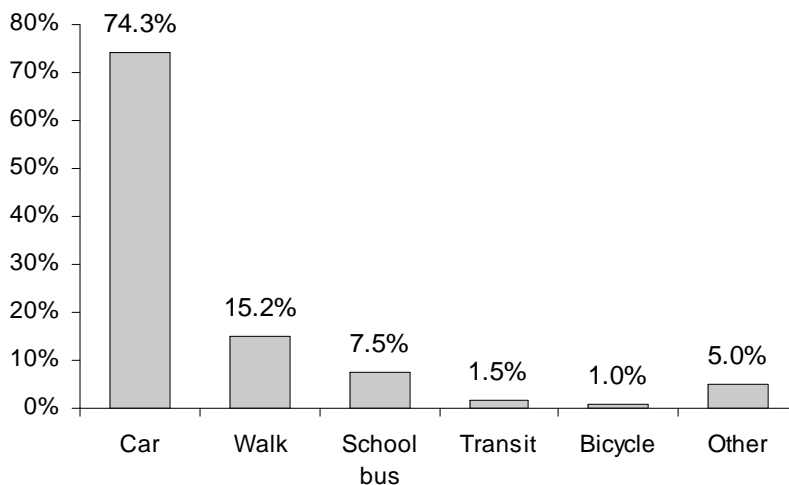
Table 6.1. Children’s versus adults’ travel, United States, 2001

Travel measure	Children, 18 and under ^a	Adults ^a	All ages ^b
Average number of trips per day	3.5	4.3	
Minutes spent traveling per day	72	98	
Miles traveled per day	31	51	
Percent of daily trips by...			
Automobile ^a	77		86
Walk ^a	12		9
Transit or school bus ^a	8		2
Bicycle ^a	1		1
Other ^a	1		3

^a Source: From the NHTS 2001, as reported in McDonald (2006).

^b Source: From the NHTS 2001, as reported in Pucher and Renne (2003).

Figure 6.1. Percent of children’s trips made by each mode, California, 2000



Source: Caltrans 2000–2001 Household Travel Survey, as reported in STPP, et al. (2003).

The prevalence of automobile travel for children represents a significant shift from the past when a larger share of both children’s and adults’ trips were made by using alternative modes (O’Brien and Gilbert 2003; STPP, et al. 2003). Nationwide, children’s walking decreased 37 percent between 1977 and 1995; adults’ decreased 42 percent (STPP, et al. 2003). While it may not be entirely surprising for children’s trip-making to parallel trends in the rest of the population, this shift has special implications for children. First, this shift is significant because children cannot drive, and so there are fewer opportunities for children to travel autonomously, such as by bike, on foot, or using transit. This is concerning because autonomous travel is thought to be important as a social experience and for cognitive development (e.g. Valentine

1997, Hillman, et al. 1990; Banerjee and Lynch 1977).¹² Second, the shift indicates fewer opportunities for active travel, such as biking or walking, which may provide much-needed physical health benefits for increasingly obese American children (e.g. Mackett, et al. 2005, Tudor-Locke, et al. 2001). Finally, children's travel patterns are thought to offer a glimpse of future trends among the population at large, since today's children's are tomorrow's adults.

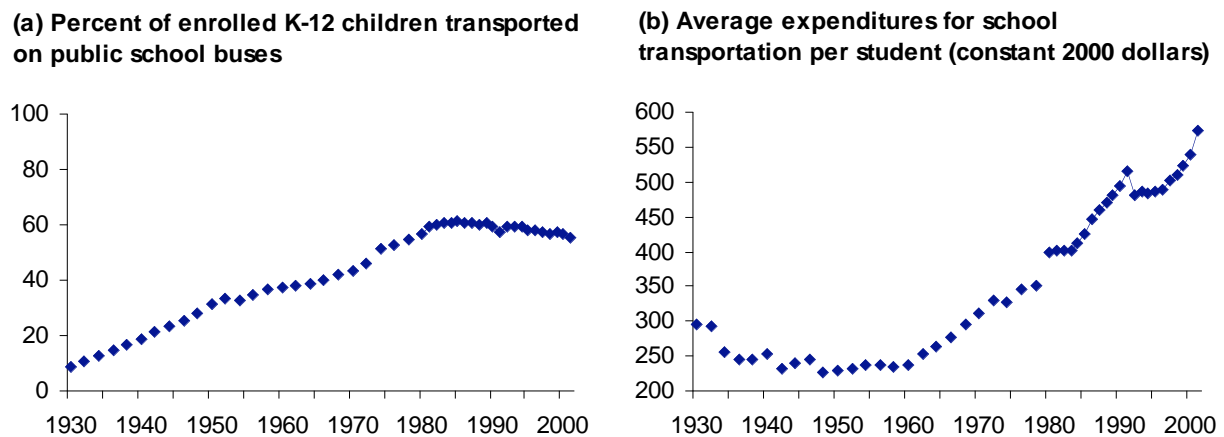
The trip to and from school is an important part of children's travel. For children five and older, about half of total trips are trips to and from school (McDonald 2006). It is one of the few destinations that is definitely for the child's benefit, in contrast to trips on which the child is tagging along with another household member. The trip to school offers many children an opportunity for independent and active travel: Nationwide, trips to school are less likely to be made by car and more likely to be made using alternative modes than are other types of trips that children take. However, school trips are mostly made by car (54 percent) in the United States, then by school bus (30 percent), walking (13 percent), transit (2 percent), and biking (1 percent) (McDonald 2006). Furthermore, the amount that children are driven to school has increased in recent decades. A nationwide survey conducted in 2002 found that 71 percent of adults walked or biked regularly to school, but only 22 percent of their children did (STPP, et al. 2003). Household travel surveys conducted in the Bay Area suggest that the percentage of children traveling to school by car increased by 100 percent between 1965 and 1990, while walking and biking decreased 50 percent in this period (Purvis 1994). While there are many reasons for increased auto dependence across all trip purposes and all members of the household, a bandwagon effect is particularly strong for school trips because once some children are driven to school, walking becomes more dangerous for other children, simply because there are more cars on the roads in the concentrated area around schools. For example, in Santa Ana, California, two-thirds of local pedestrian traffic accidents occur within a quarter-mile of schools and half of all victims are children; and 50 percent of children who are hit by cars near schools in Washington State are hit by cars driven by parents of other students (STPP, et al. 2003).

School buses are much more prevalent in the United States than in other countries (Osborne 2005). The provision of such services make school buses the second most common mode nationwide (McDonald 2006) and also one of the safest modes (TRB 2002). However in

¹² Some empirical evidence indicates children have less autonomy than previous generations. For example, Hillman's (1990) study of children in the U.K. found that children who were 7 to 15 years old in 1990 were granted significantly fewer privileges at a much older age than children who were that age in the 1970s.

California, school bus ridership is particularly low. California ranks last, along with Hawaii, in the share of children using school buses in the state: In 2004, 14 percent of public school students commuted by school bus in California, down from 23 percent in 1985 (School Transportation News 2006).¹³ In contrast, the states with the highest reported ridership in 2004 include Pennsylvania, Vermont, Delaware, Minnesota, Mississippi, and Georgia, all above 85 percent. Thus, in California especially, both active and independent travel are giving way to automobile travel for children's trips to school.

Figure 6.2. Ridership and expenditure on public school buses, United States, 1929–2001



Note: 1980-1989 includes capital outlays; other years do not.

Source: U.S. Department of Education 2003.

Age

As would be expected, children have increased autonomy as they grow older, with autonomy spiking around age 16 and 17, when kids often obtain driver's licenses (e.g. McDonald 2006, Clifton 2003). In their study of children aged 17 and younger in Calgary, Canada, Stefan and Hunt (2006) document the decline of trips completed with other household members as a child ages, starting with about 90 percent of trips for infants, 60 percent for 1 to 4 year olds, with a sudden dip to about 45 percent of trips once children start school at age 5, with a steady decline

¹³ One reason for the low school-bus ridership rates in California may be that schools in California are not required to provide transportation as is legally required elsewhere. Proposition 13 limited spending on school transportation services. By 2004, California had fewer school buses per student than any other state (School Transportation News 2006). As of 2001, California also had the highest percentage of school buses in the country that did not meet federal safety standards (10 percent) since they were purchased prior to 1977 (STPP, et al. 2003). In addition, about 30 percent of California school buses did not meet pollution standards set by the California Air Resources Board (STPP, et al. 2003).

from ages 10 to 14, and a final dip at age 15 at which point the children's level of autonomy is roughly equal to adults in the sample. This increased autonomy from the household (although not necessarily from other adults) corresponds to increased time spent outside the home as well as increased time spent traveling. However there is not a corresponding increase in overall numbers of trips, as Stefan and Hunt note that the number of trips peaks at around 3 to 3.5 trips per day, on average, around age four, and then remains roughly constant throughout childhood, until a sudden spike just after driver's license age.

The modes children use also differs for children of different ages. A distinct trend is the sudden transition when many children become drivers at age 16 or 17. Nationwide about 69 percent of teens aged 16 to 18 have a driver's license and drive themselves on nearly half of their trips (McDonald 2006). Among this group, McDonald (2006) associates driving trips with a 40 percent reduction in walking and 33 percent reduction in school bus trips. Studying children in California, McMillan, et al. (2006) also find that walking levels diminish with age, as do Stefan and Hunt (2006), studying children in Calgary Canada, where those aged five and older spend twice as much time walking as do 18- to 20-year olds. Stefan and Hunt also find that the amount of time spent biking and walking for transportation peaks at 25 to 30 percent of total travel time at age 11, dropping off to 10 to 15 percent for young children and older high schools students, and dropping to 7 percent among 18- to 22-year olds.

Gender

Travel patterns also differ across genders, with male children engaging in more autonomous travel at all ages (e.g. CDC 2002a, Clifton 2003, McMillan, et al. 2006, Timperio, et al. 2004). There is some evidence that parents may play a role in this trend. For example, in a study of students in California elementary schools, boys were more likely to be allowed by their parents to travel actively than were girls (McMillan, et al. 2006). Among five- and six-year-old children in Australia whose parents believed there was heavy traffic in the neighborhood, the boys were almost three times more likely to walk or cycle at least three times a week (Timperio, et al. 2004). Whatever the reason for these differences, they appear to persist through high school. In the 1995 Nationwide Personal Transportation Survey (NPTS), male teenagers made more after-school trips alone (41 percent) than did females (34 percent) (Clifton 2003).

Income, race, and ethnicity

As with adults, there are significant differences in the travel of children of different income levels. Children from lower-income households tend to make fewer trips, and among the trips they do report, a smaller share is by car and a larger share is by alternative modes. This pattern exists nationwide (McDonald 2006) and in California (STPP, et al. 2003). In California, children from households with less than \$25,000 in annual income travel in cars for 53 percent of their trips, and walk or bike for 30 percent, compared with 85 percent and 10 percent for children in households with over \$75,000 in annual income (STPP, et al. 2003). Because they travel more often by car, higher-income children spend less time traveling and cover more miles (McDonald 2006).

Also reflecting patterns found in the rest of the population, there are significant differences in children's travel patterns across racial and ethnic lines: White children travel by car more, and walk and ride transit and school buses less than other racial and ethnic groups. Nationwide, non-white children make fewer overall trips, and among the trips they do report, they make five times as many transit trips and one and a half times as many walking trips as do whites (McDonald 2006). These trends also hold for children in California (see Table 6.2) (STPP, et al. 2003). In California, the group with the lowest share of trips in a car is Hispanic children, who are still more likely to travel in a car than any other mode, but less than a third as much as white children do. This group also has the highest rates of walking, almost three times that of white children. Black children also have significantly lower rates of car use and higher walk rates, but they still walk for almost 50 percent fewer trips than do Hispanic children. Black children are the only group riding transit for a significant portion of trips, about 8 times more than children in other groups. Hispanic, black, and especially American Indian children use school buses much more than whites and Asians. More sophisticated analysis would be necessary to isolate factors that contribute to trends occurring along racial and ethnic lines among children. As with adults, it is likely that much of the observed differences are related to differences in income and residential location (Pucher and Renne 2003), but it is not known to what degree; among adults, differences remain even after controlling for these factors (Pucher and Renne 2003, Giuliano 2003).

Table 6.2. Modal split among children^a of different racial and ethnic groups, California, 2000

Racial or ethnic group	Car	Walk	Bicycle	School bus	Transit	Other
White	82.1	9.8	1.1	6.1	0.5	0.4
Hispanic (all races)	58.6	26.3	1.3	12.3	1.2	0.3
Black	61.0	14.1	1.9	12.1	8.4	2.6
Asian and Pacific Islander	79.8	12.2	0.5	7.1	0.2	0.1
American Indian	74.5	8.2	0.5	16.0	0.8	0.0
Other	72.6	11.7	1.1	6.5	7.5	0.5

^a Ages 0 to 17.

Source: Caltrans 2000–2001 Household Travel Survey, as reported in STPP, et al. (2003).

At the national level, an analysis of the differences in types of trips taken by children of different income levels and of different racial and ethnic groups offers some indication of the implications of the differences in mobility among these groups. McDonald (2006) finds that most of the difference in overall trip rates is due to differences in the trip rates for social and recreational trips, such as for sports and exercise, socializing, and dining out, for both the income gap and the racial/ethnic gap. While she points out that this finding may be due in part to differences in participation in organized sports versus neighborhood games, such findings may have implications for public health, particularly in light of the higher prevalence of overweight among low-income and minority children (McDonald 2006; STPP, et al. 2003).

Type of place

It is logical for children’s travel to differ according to whether they live in an urban, suburban, or rural environment, as with adults. Features of the built environment, such as distances between locations, and related attributes such as existing modal split, vary in each of these types of places and likely influence children’s travel. For example, the advocacy group Safe Kids Worldwide calculated a “pedestrian danger index” (PDI) for children 14 and under (based on a formula developed for the general population by STPP, consisting of a death rate from motor vehicle crashes, adjusted for the relative number of people who walk) for all the metropolitan statistical areas in the United States. They found that the safest cities for child pedestrians were those with high densities, large populations, and an already sizable walk mode share (Quraishi 2005). Such safety issues may impact the modes children use. In addition, there are other differences in safety levels for children’s travel in rural versus urban areas: Car travel is also more dangerous for children (among others) in rural areas. For example, in Alberta, Canada, motor vehicle crash fatality rates among children are five times higher, and injury-hospitalization rates are three times higher in rural areas than in urban areas (Kmet and Macarthur 2006).

Limited evidence illustrates differences in travel choices by type of place. For example, a study of children living in the Toronto area finds that inner-city children reported fewer overall trips, more trips using transit and active modes, and fewer trips in cars than children in two suburban communities (O'Brien and Gilbert 2003). The inner-city children also began riding transit at a younger age, with 10 percent and 0 percent of trips made by transit among 11-year-olds living in inner-city areas versus suburban areas, respectively (O'Brien and Gilbert 2003). In a study of children aged 5 to 15 in the state of Georgia, there were differences in walk rates for children in rural versus urban areas, even after controlling for distance between home and school (CDC 2002b). Nationwide, teens living in urban areas in the U.S. are less likely to have a driver's license than those living in non-urban areas (Clifton 2003).

While it is difficult to distinguish the effect of the type of place from sociodemographic factors, one implication of these trends is that children in cities engage in more active travel and have more opportunities for autonomous travel than suburban children. This difference may reflect the fact that the city children have higher levels of accessibility. While they report fewer overall trips (with fewer discretionary and non-house-based trips), O'Brien and Gilbert suggest that this may be due to a tendency to underreport casual, short trips such as to a corner store, whereas a comparable journey in the suburban areas may have required a car ride and therefore be more likely to be reported (2003). Data from the U.S. on youth transit ridership could also be interpreted to support the idea that city children have higher levels of accessibility: the share of transit passengers who are under 18 is lower in larger cities (see Table 6.3). One interpretation of this result is that outside of cities, those who drive can, and children, who cannot drive, are captive transit riders, comprising a disproportionate share of passengers in those areas, while children in big cities can walk rather than use transit for many destinations. (An alternative explanation might be that there are relatively more captive adult riders in cities, which may also be the case.)

Table 6.3. Youth share of transit ridership, by size of place, nationwide

Area, by population	Percent of passengers 18 and under
Less than 50,000 (rural)	21
50,000 – 200,000	19
200,000 – 500,000	15
500,000 – 1,000,000	9
More than 1,000,000	10

Source: Wilson (2004).

Parent and child attitudes and other determinants of children’s travel

Children have a different perspective on travel experiences than do adults because they cannot drive. For this reason, childhood offers a unique window during which the otherwise overwhelming attractiveness of the automobile is not in effect. For example, in a series of focus groups primary school children in Scotland showed excitement for biking and walking, which they associated with freedom and independence, in contrast to car travel, which they viewed as “restrictive and boring” (Davison, et al. 2003, p. 2). Furthermore, evidence suggests that children would prefer to travel by alternative modes more than they do. In an online survey based in the U.K., among a sample of 43,000 young people, half of those who were driven to school (a third of the sample) did not want to travel by car, and the number who reported wanting to bike to school was about ten times the number who actually did (Osborne 2005). In a smaller telephone survey in the U.S., only six percent of parents indicated that their children did not want to walk to school, though very few actually did (STPP, et al. 2003).

The reasons that these children do not use alternative modes even though they want to are many. In the nationwide HealthStyles survey conducted in the U.S., about 84 percent of parents reported that barriers prevented their children from biking or walking to school (CDC 2002a). The most often cited reasons among the choices offered were long distances between home and school and traffic danger (see Table 6.4). Children of parents who reported no barriers were six times more likely to walk or bike (CDC 2002a). The importance of distance in the decision to walk is an obvious one and one that affects adults, too. The importance of distance in the decision to walk to school is confirmed in another national survey (Table 6.5, STPP, et al. 2003), and in a logit analysis of mode choice among students in 16 California elementary schools (McMillan, et al. 2006).

Table 6.4. Parent’s perceived barriers to children walking or biking to school, United States, 1999

Barrier	Percentage of respondents reporting barrier (N = 661)
Long distances	55
Traffic danger	40
Adverse weather conditions	24
Crime danger	18
Opposing school policy	7
Other reasons	26
No barriers	16

Source: HealthStyles Survey, 1999, as reported in CDC (2002a)

Table 6.5. Reasons children do not walk to school, United States, 2002

Reason	Percentage of respondents citing (N = 166)
School is too far away	66
Too much traffic and no safe walking route	17
Fear of child being abducted	16
Not convenient for child to walk	15
Crime in the neighborhood	8
Your children do not want to walk	6
School policy against children walking to school	1
None of the above	8
Don't know or no response	1

Source: National survey conducted by Belden Russonell & Steward on behalf of STPP, as reported in STPP, et al. (2003).

A critical factor in children's travel decisions are the influence of their families—in granting permission to do things, passing on attitudes, and leading by example. Therefore, parents' attitudes and behavior are an important determinant of children's travel. For example, Timperio, et al. (2004) find that among Australian 5- to 6-year-olds and 10- to 12-year-olds, parental perceptions of the neighborhood are more strongly related to their child's walking and cycling behavior than their child's own perceptions of the neighborhood. (Perhaps not surprisingly, they found that children tend to consider their neighborhoods to be safer than their parents did.) Similarly, McMillan, et al. (2006) finds that among children in California, family support for walking/biking is an important factor in children's mode choice to school, and that children's walking is positively associated with whether their caregivers walk, even after controlling for trip distance and other factors. Even for older children such as licensed teenage drivers, parents continue to have an influence on children's travel, both on when, where, and with whom they go (Clifton 2003), and on their driving style itself, which lasts a lifetime (Taubman – Ben-Ari, et al. 2005).

As with adults, social desirability may be an important factor for children's travel, in children's case consisting of a mix of parental norms and peer pressure, perhaps with the latter becoming stronger among older children. However, it is not clear whether the messages children receive from peers about transportation are necessarily at odds from the examples their parents provide. In Scotland, Davison, et al. (2003) finds that the "cool/trendy" factor becomes increasingly important for 10- to 12-year-olds. An FTA survey of 13- to 26-year-olds found that peer pressure and stigma were a top reason for not using transit (STPP, et al. 2003), but another

study finds children as young as seven associating different travel modes with particular sociodemographic groups (Davison, et al. 2003).

It is unclear exactly what confluence of factors cause children to lose interest in active travel, but evidence suggests that as children age, interest in active travel wanes. Among the participants in the Davison, et al. (2003) study in Scotland, in which younger children reported car travel as restrictive and boring, nearly all participants expected cars to “play a key role in their future adult travel” (p. 3). Among older children, “being able to drive was a very widespread and relatively unquestioned desire” (p. 3). This matches observed behavior among American teens, many of whom abandon alternative modes in favor of driving themselves as soon as they are able (Clifton 2003).

Children’s influence on household travel

As children’s families influence their travel, so too do children influence the travel patterns of the rest of the household. On average, households with children are more likely to make more of their trips in cars, and are more likely to trip-chain (that is, accomplish errands as a part of another trip, especially a work trip) (Srinivasan and Ferreira 2002; Gliebe and Koppelman 2005). In general, the presence of children in a household is associated with task specialization, with fewer trips and tasks completed by two adult members of the household together (Gliebe and Koppelman 2005). Furthermore, children tend to travel with their mothers more than with their fathers, even after controlling for the parents’ employment status and occupation (McDonald 2006), and especially among parents with children under age five (Gliebe and Koppelman 2005).

Strategies for better outcomes

Many strategies have been employed or proposed to improve children’s safety and health, and to reduce their dependence on cars. These have included the following:

- Education / media on safe and healthy transportation practices, targeted either at parents or children (e.g. on using booster seats in cars, on the health benefits of biking, or on how to properly cross a street)
- Bike/walk to school day/week
- Having schools establish travel plans
- Providing free school bus services
- Bike-trailer lending programs for kindergarten parents

- Walking school buses (a supervised procession of children who walk to school together)
- Providing bicycle sheds and other infrastructure at schools
- Safe routes to schools programs
- Providing bikeways and footpaths away from traffic
- Pedestrian- and bike-friendly street design, including sidewalks, crosswalks, sidewalk bubbles, etc.
- Speed limits and traffic calming
- Pedestrian and cyclist right-of-way laws
- Bicycle helmet laws
- Car-free zones in neighborhoods
- Locating schools closer to where children live, such as by removing regulatory barriers that discourage in-neighborhood schools
- Neighborhood design to facilitate travel by alternative modes, including higher densities, shorter blocks, and mixed land use
- Involving young people in transportation and transit planning processes
- Providing free transit passes for children; tailoring transit service to meet children's and teens' needs
- Marketing transit, especially to older children
- Graduated license programs (to delay teen driving)
- Data collection of youth travel and safety

(See O'Brien and Gilbert 2003; Osborne 2005; Wilson 2004; Community Transportation Association 2004; Clifton 2003; STPP, et al. 2003; Ehiri, et al. 2006; Ramsey, et al. 2005; Ji, et al. 2006; Spinks, et al. 2005; Williams, et al. 2002; and Jowett 2000 describing specific examples.)

As with adult travel, many of these strategies may have limited efficacy without major changes in the built environment to shorten the distances children need to travel. Perhaps for this reason, the Safe Kids Worldwide study of U.S. metro areas found that the PDI index level for children in each metro area was not correlated with spending on bicycle and pedestrian projects in that area (Quraishi, et al. 2005). (However, this result may also be due to the fact that bike and

pedestrian projects need not be expensive in order to be effective.) There is also evidence that some campaigns to reduce auto dependence have been very successful. For example, a safe-routes-to-school demonstration project in Odense, Denmark reduced school-journey accidents by 82 percent, and having a travel plan in place at 40 schools in the U.K. was associated with a 23 percent reduction in car use (Osborne 2005).

Data needs

Better data would facilitate a better understanding of children's travel and its determinants. One challenge in studying children's travel is that it is difficult to survey children directly about their travel. For this reason, many surveys rely on parents to report their children's trip-making, which may result in under-reporting of short, independently completed trips. McDonald (2006) identifies several additional shortcomings of the NHTS dataset for researchers to consider in future efforts. These include the need to understand whether trips taken by children were for the child's benefit, the household's benefit, or as a form of babysitting; the need to understand how much independent travel is occurring; and the need to know how much families are paying for children's transportation to school.

Chapter 7. Conclusions

Transportation planners in California face this question every day: How can we ensure that the kinds of transportation systems and services we provide adequately meet the needs of our increasingly diverse population? To answer that question, they need a better understanding of the travel behavior of the diverse demographic groups within the state. This literature review has provided an overview of what is currently known about the travel patterns and transportation needs of the following five demographic groups, nationwide and in California: immigrants, racial and ethnic groups (Blacks, Asians, and Hispanics), Native Americans, elderly, and youth.

Although much is currently known, many questions remain to be answered (Table 7-1). These questions cannot be adequately answered using existing data sources, which tend to focus on travel patterns rather than the causes or effects of those patterns. Future research can expand the state knowledge by advancing in two directions: modifications to traditional transportation surveys to support quantitative research on these questions, and use of qualitative research techniques to explore causes and effects for specific population groups in depth.

Table 7.1. Key questions to be explored in future research

<i>Issues and questions</i>	<i>Especially applicable to:</i>				
	<i>Immigrants</i>	<i>Racial and ethnic groups</i>	<i>Native Americans</i>	<i>Elderly</i>	<i>Youth</i>
Are mobility needs being met, in an increasingly car-dependent system?	●	●	●	●	●
How are these groups coping, especially with limited vehicle access?	●	●	●	●	●
At what cost are these groups using cars? (e.g. share of income, families' expenditure on children's trip to school, risks being taken, etc.)	●	●	●	●	●
What are the trends in the amount of active and independent travel being undertaken? What are the health implications for these groups?				●	●
What is the role of culture in explaining travel among members of these groups?	●	●	●		
What policies could enhance mobility options for these groups?	●	●	●	●	●
What policies could enable more car-free travel among these groups, who may be predisposed against it (due to limited ability or access)?	●	●	●	●	●

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