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Understanding Sustainable Transportation Choices: Shifting Routine Automobile Travel to Walking and Bicycling

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Understanding Sustainable Transportation Choices: Shifting Routine Automobile Travel to Walking and Bicycling

By

Robert James Schneider

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

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in the

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University of California, Berkeley

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Abstract

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In the two decades since the United States Congress passed the federal Intermodal Surface Transportation Efficiency Act, there has been a surge of interest in making urban transportation systems more sustainable. Many agencies, representing all levels of government, have searched for strategies to reduce private automobile use, including policies to shift local driving to pedestrian and bicycle modes. Progress has been made in a number of communities, but the automobile remains the dominant mode of transportation in all metropolitan regions.

Sustainable transportation advocates are especially interested in routine travel, such as shopping and other errands, because it tends to be done frequently and for distances that could be covered realistically by walking or bicycling. According to the 2009 National Household Travel Survey, Americans made more trips for shopping than for any other purpose, including commuting to and from work. One-third of these shopping trips were shorter than two miles (3.2 km). However, 76% of these short shopping trips were made by automobile, while only 21% were made by walking and 1% by bicycling.

In order to identify effective strategies to change travel behavior, practitioners need a greater understanding of why people choose certain modes for routine travel. Choosing to walk or bicycle rather than travel by automobile may help individuals get exercise, save money, interact with neighbors, and reduce tailpipe emissions. Yet, in some communities, non-motorized modes may also require more time and physical effort to run a series of errands, be less convenient for carrying packages and traveling in bad weather, and be perceived as having a higher risk of traffic crashes or street crime than driving.

A mixed-methods approach was used to develop a more complete understanding of factors that are associated with walking or bicycling rather than driving for routine travel. An intercept survey was implemented to gather travel data from 1,003 customers at retail pharmacy stores in 20 San Francisco Bay Area neighborhoods in fall 2009. Follow-up interviews were conducted with 26 survey participants in spring and summer 2010 to gain a deeper understanding of factors that influenced their transportation decisions.

The methodological approach makes several contributions to the body of research on sustainable transportation. For example, the study:

- Explored multiple categories of factors that may be associated with walking and bicycling, including travel, socioeconomic, attitude, perception, and shopping district characteristics. Few studies of pedestrian or bicycle mode choices have included all of these categories of factors. Statistical models showed that variables in all categories had significant associations with mode choice.
- Documented and analyzed short pedestrian movements, such as from a parking space to a store entrance or from a bus stop to home. These detailed data provided a greater understanding of pedestrian activity than traditional travel survey analyses. Walking was used as the primary mode for 65% of respondent trips between stops within shopping districts, and 52% of all respondents walked along a street or between stops at some time between leaving and returning home. Maps of respondent pedestrian path density revealed distinct pedestrian activity patterns in different types of shopping districts.
- Used four different approaches to capture participant travel mode information. Respondents reported the primary mode of transportation they were using on the day of the survey, the mode they typically used, and all modes that they would consider using to travel to the survey store. They also mapped all stops on their tour and said what modes they used between each stop. These four approaches revealed nuanced travel habits and made it possible to correct inaccuracies in self-reported primary travel mode data.
- Measured and tested fine-grained local environment variables in shopping districts rather than around respondents' homes. These variables characterized the shopping district area (e.g., sidewalks, bicycle facilities, metered parking, and tree canopy coverage), the main commercial roadway (e.g., posted speed limit, number of automobile lanes, and pedestrian crossing distance), and the survey store site (e.g., number of automobile and bicycle parking spaces and distance from the public sidewalk to the store entrance). This dissertation adds to the small number of studies that have explored how the characteristics of activity destinations are related to travel behavior.

The study results contribute to the body of knowledge about factors that may encourage people to shift routine travel from automobile to pedestrian or bicycle modes. After controlling for travel factors such as time and cost, socioeconomic characteristics, and individual attitudes, mixed logit models showed that automobile use was negatively associated with higher employment density, smaller parking lots, and metered on-street parking in the shopping district. Walking was positively associated with higher population density, more street tree canopy coverage, lower speed limits, and fewer commercial driveway crossings. The exploratory analysis of a small number of bicycle tours found that bicycling was associated with more extensive bicycle facility networks and more bicycle parking. However, people were more likely to drive when they perceived a high risk of crime.

Results also suggest the magnitude of mode shifts that could occur if short- and long-term land use and transportation system changes were made to each study shopping district. The mode choice model representing travel only to and from the study shopping districts (N = 388) was used to estimate respondent mode shares under the following three scenarios: 1) double population and employment densities in each study shopping district, 2) double street tree canopy coverage in each study shopping district, and 3) eliminate half of the automobile parking spaces at the survey store. Based on the model, the combination of these three changes could increase pedestrian mode share among the 388 sample respondents from 43% to 61% and decrease automobile mode share from 50% to 31%. This shift could eliminate 129 (13%) of the 983 respondent vehicle miles traveled (208 of the 1,580 respondent vehicle kilometers traveled), and 110 (36%) of the 308 times respondents parked their automobiles in the shopping district.

The mode choice model of walking versus driving within survey shopping districts (N = 286) was used to test the combination of the following scenarios: 1) cluster separated stores around shared parking lots, 2) consolidate commercial driveways so that there are half as many driveway crossings along the main commercial roadway, 3) reduce all main commercial roadway speed limits to 25 miles per hour (40 kilometers per hour), and 4) install metered parking in all shopping districts. These changes could increase the percentage of the 286 sample respondents walking between shopping district activities from 32% to 54%. This shift could eliminate 29 (38%) of the 76 respondent vehicle miles traveled (47 of the 122 respondent vehicle kilometers traveled), and 105 (22%) of the 469 times respondents parked their automobiles in the shopping district. Note that these forecasted mode shifts are illustrative examples based on cross-sectional data and do not account for the process of modifying travel behavior habits.

Qualitative interviews provided a foundation for a proposed Theory of Routine Mode Choice Decisions. This five-step theory also drew from survey results and other mode choice theories in the transportation and psychology fields. The first step, 1) awareness and availability, determines which modes are viewed as possible choices for routine travel. The next three steps, 2) basic safety and security, 3) convenience and cost, and 4) enjoyment, assess situational tradeoffs between modes in the choice set and are supported by many of the statistically-significant factors in the mode choice models. The final step, 5) habit, reinforces previous choices and closes the decision process loop. Socioeconomic characteristics explain differences in how individuals view each step in the process. Understanding each step in the mode choice decision process can help planners, designers, engineers, and other policy-makers implement a comprehensive set of strategies that may be able to shift routine automobile travel to pedestrian and bicycle modes.

To my Beautiful Rese

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EXECUTIVE SUMMARY

In the two decades since the United States Congress passed the federal Intermodal Surface Transportation Efficiency Act, there has been a surge of interest in making urban transportation systems more sustainable. Many agencies, representing all levels of government, have searched for strategies to reduce private automobile use, including policies to shift local driving to pedestrian or bicycle modes. As of January 2011, 23 states and more than 150 local and regional governments had established official policies to improve pedestrian and bicycle conditions as a part of all transportation plans and projects (Complete Streets Coalition 2011).

Communities have viewed pedestrian and bicycle modes as a substitute for automobile travel and as a means to provide emissions-free mobility for people of all incomes and abilities, decrease reliance on fossil fuels, use public infrastructure and space efficiently, reduce long-term transportation system maintenance costs, create enjoyable streets and public spaces, and provide physical activity and opportunities for social interaction. Progress has been made in a number of communities, but pedestrian and bicycle planning efforts in the United States have not resulted in broad modal shifts. The private motor vehicle accounts for 83% of all trips and is the most common transportation mode used in every metropolitan region. Nationally, only 11% of trips are made by walking and 1.0% by bicycling (Federal Highway Administration 2009). By comparison, more than 20% of all trips in the United Kingdom, Germany, and Sweden are made on foot, and 15% of all trips in Denmark and 25% of all trips in the Netherlands are made by bicycle (Basset *et al.* 2008).

In order to identify planning, engineering, and design strategies that may encourage shifts from automobile to pedestrian or bicycle transportation, there is a need to recognize what motivates people to walk and bicycle. This includes understanding specific individual, travel, and neighborhood environment factors associated with walking or bicycling rather than driving. It also involves comprehending the thought process people use to select modes for routine travel purposes.

PURPOSE, DEFINITIONS, RESEARCH QUESTION, AND CONCEPTUAL FRAMEWORK

The Introduction (Chapter 1) provides an overview of the purpose of this dissertation, key definitions, the primary research question and subquestions, and conceptual framework used for data collection and analysis.

Purpose

The main purpose of this dissertation is to provide urban planners with a greater understanding of why people choose to walk and bicycle for routine travel. This information will help practitioners implement strategies that have the greatest potential to shift automobile travel to pedestrian or bicycle modes and improve the sustainability of land use and transportation systems. More specifically, this dissertation is intended to:

- Develop more complete methods for recording and analyzing pedestrian transportation.
- Understand why people choose to walk or bicycle rather than drive for routine travel purposes, such as shopping.

- Identify characteristics of shopping districts that may encourage people to walk rather than drive between stores.
- Propose a theory of the mode choice decision process and suggest planning strategies that may make walking and bicycling more attractive during all stages of this process.

The study was conducted in the San Francisco Bay Area in the United States. While some results of this dissertation may not apply to other urban regions outside of the San Francisco region, this research is intended to inform practice in all parts of the world, especially where the need for sustainable transportation is growing rapidly.

Definitions
Chapter 1 provides definitions of important words that are common in the activity-based travel analysis field, such as “trip”, “stage”, and “tour”. It also defines key terms used throughout the document, such as “sustainable transportation”, “shopping district”, and “routine travel”.

Primary Research Question and Subquestions

The overarching research question explored throughout this dissertation is:

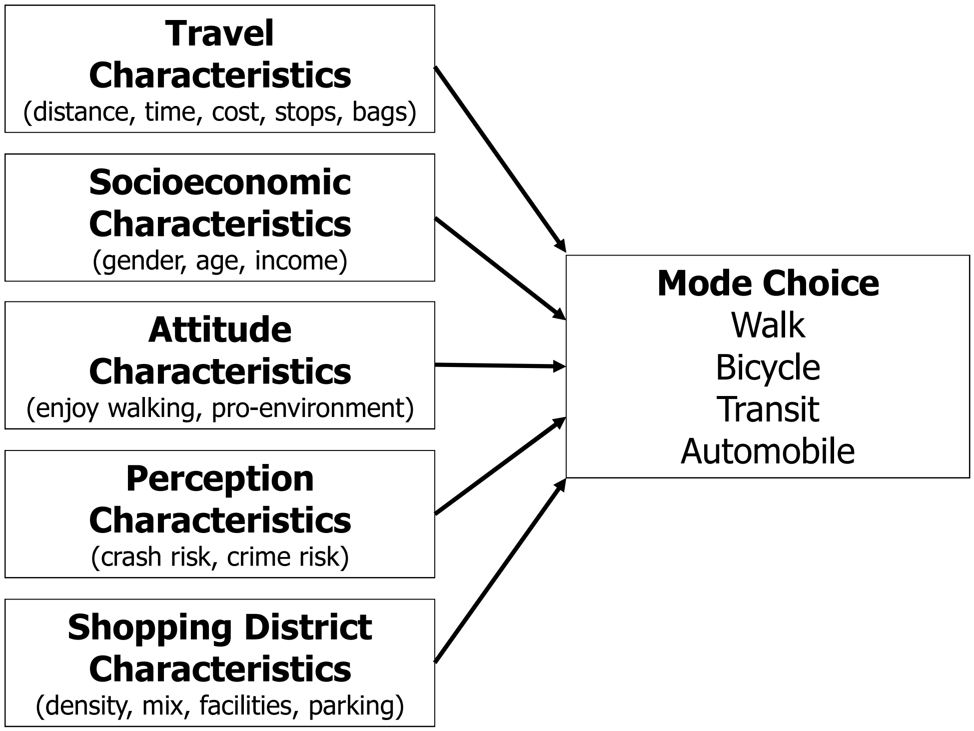
What factors are associated with walking or bicycling for routine travel?

Three research subquestions follow from this research question:

- *What methods are needed to record and analyze all modes of transportation that are used by a person on a tour from the time they leave home until they return home?*
- *What travel, socioeconomic, attitude, perception, and local environment characteristics are associated with walking or bicycling rather than driving to and from shopping districts?*
- *What travel, socioeconomic, attitude, perception, street, and site characteristics are associated with walking rather than driving between activities within the same shopping district?*

Conceptual Framework
The conceptual framework that guided the data collection and analysis process during this study is shown in Figure 1.

Figure 1. Conceptual Framework for Data Collection and Analysis



Note that the conceptual framework diagram illustrates the key associations that are being explored through the data collection and analysis process. There are also likely to be relationships between each of the categories of explanatory variables. In particular, socioeconomic characteristics may be related to all of the other characteristics. For example, people who have disabilities (socioeconomic characteristic) may not enjoy bicycling (attitude characteristic) as much as other people because bicycling is painful or not physically possible for them.

LITERATURE REVIEW

The literature review (Chapter 2) summarizes several methodological challenges raised by previous studies and provides an overview of factors that have uncertain relationships with walking and bicycling mode choices.

Methodological gaps identified in the literature include:

- Lack of a clearly-defined process to collect and analyze detailed pedestrian travel data
- Few tour-based analyses of pedestrian or bicycle mode choice
- Undetermined magnitude of impacts of residential self-selection on travel behavior
- Unclear understanding of the complex decision process individuals use to choose transportation modes

- Limited understanding of factors that have causal influences on mode choice

Researchers have found several categories of factors to be related to pedestrian or bicycle mode choices. These include travel, socioeconomic, attitudinal, perception, land use, and transportation system characteristics. Few studies have explored all of these categories of factors simultaneously within the same methodological framework. In addition, several factors in these categories have uncertain relationships with pedestrian and bicycle travel, including:

- Perceptions of crime and crash risk
- Roadway design characteristics
- Number of bags being carried and number of activity stops being made

This dissertation takes a first step toward filling several of these gaps.

METHODOLOGY

The methodological overview (Chapter 3) provides a summary of the mixed-methods approach used to explore how study participants made mode choice decisions. Quantitative survey data were gathered from 1,003 people traveling to, from, and within 20 San Francisco Bay Area shopping districts in fall 2009. The survey captured travel characteristics (e.g., trip-chaining, travel distance, socioeconomic characteristics, number of bags being carried, modes used), attitudes (e.g., views towards the environment, walking, and bicycling), and perceptions of neighborhood traffic safety and crime. These data were compared with local environment characteristics surrounding the survey store site. Qualitative follow-up interviews were conducted with 26 participants to provide a richer understanding of the results of the quantitative survey, including general information about factors that influence people's mode choices and specific information about how people travel in particular situations.

Specific approaches used to explore the survey and interview data included cluster analysis, mixed logit discrete choice modeling, and interview theme identification. Cluster analysis classified the 20 shopping districts into four general types of urban environments: 1) Urban Core, 2) Suburban Main Street, 3) Suburban Thoroughfare, and 4) Suburban Shopping Center. This made it possible to compare survey and interview responses between different types of shopping districts. Mixed logit models were used to identify factors associated with walking, taking transit, or using an automobile to travel to and from shopping districts and factors associated with walking or driving within shopping districts. Interview themes were identified by reviewing conversations with all 26 interview participants.

Innovative Approaches

There were several innovative aspects of the methodology used for this study. The study 1) explored multiple categories of factors that may be associated with walking and bicycling, 2) documented and analyzed short pedestrian trips and walking as a secondary travel mode, 3) used four different approaches to capture participant travel mode information, 4) collected fine-grained local environment variables in shopping districts rather than around respondents' homes, 5) used a tour-based framework to analyze pedestrian and bicycle mode choices, 6) quantified tradeoffs between modes for small-scale travel movements using discrete choice models, and 7) used qualitative data collection and analysis methods to propose a theory of how people make routine mode choice decisions.

<u>Explored Multiple Categories Factors that may be Associated with Walking and Bicycling</u>
Multiple categories of factors are related to the choices of walking and bicycling. This study evaluated the association between travel, socioeconomic, attitude, perception, and shopping district factors and pedestrian and bicycle mode choices. Most prior studies of pedestrian or bicycle mode choices focused on one or two of these categories of factors, but few have included all of them. The mixed logit models showed that variables in all categories had significant associations with mode choice.

<u>Documented and Analyzed Short Pedestrian Movements</u>
The methods used for this study showed that it is possible to capture human-scale travel data, including short walking trips between stores in the same shopping district and secondary waking movements, such as from a parking space to a store entrance or from a bus stop to home. Results from this method provided greater understanding of walking to, from, and within shopping districts:

- Walking was used as the primary tour mode of transportation (mode used for the longest distance on a tour) for 21% of all respondents.
- An evaluation of modes that were used at least once on each tour showed that 52% of respondents walked along a street or between stops at some time between leaving and returning home.
- Walking was used as the primary mode for 65% of respondent trips between stops within shopping districts.

<u>Used Four Different Approaches to Capture Participant Travel Mode Information</u>
The first three questions of the survey were 1) "What is the PRIMARY type of transportation you used to get to the store today?", 2) "What type of transportation do you TYPICALLY use to travel to this store?", and 3) "What types of transportation do you CONSIDER using to travel to this store?" The fourth method used to capture respondent travel modes was recording all modes used on each respondent's tour from leaving home until returning home on the survey map. These four approaches showed important nuances in travel behavior, made it possible to verify the accuracy of responses to the primary mode of transportation question, and helped address potential confusion about which mode to report as the primary mode on the survey:

- 104 (10%) of the 1,003 survey respondents reported that they typically used a different mode to travel to the store than they were using on the day of the survey.
- 563 (56%) respondents considered at least two different modes to travel to the survey store.
- Responses to Question 1 were compared with the actual primary respondent travel mode calculated from their geocoded tour data. This comparison showed that the initial response and geocoded tour data differed for 72 (7.5%) of the 959 respondents. Most of the incorrect responses to Question 1 were due to respondents reporting walking as their primary mode when they had either used transit or an automobile for the majority of their tour. It is likely that these respondents confused the walking that they had done from their last activity stop, bus stop, or parking space with their overall tour mode, so it was helpful to correct their primary mode response with the geocoded data.

Measured and Tested Fine-Grained Local Environment Variables Characteristics in Shopping Districts Rather than Around Respondents' Homes

Fine-grained data on the built and social environment in the shopping district around the survey store were collected and analyzed, including shopping district variables (e.g., sidewalks, bicycle facilities, on-street parking, and tree canopy coverage, roadway steepness, and perceptions of pedestrian and bicycle crash risk and crime risk), main commercial roadway characteristics (e.g., posted speed limit, number of automobile lanes, and pedestrian crossing distance on the main commercial roadway), and store site characteristics (e.g., number of automobile and bicycle parking spaces and distance from the public sidewalk to the building entrance). Most travel behavior studies have focused on characteristics of the neighborhood around a person's home (Shriver 1997; Clifton and Dill 2005; Frank *et al*. 2006; Forsyth *et al*. 2007). However, relatively few have explored characteristics of activity destinations, such as a respondent's workplace (Jonnalagadda *et al*. 2001) or other main trip destination (Cervero and Duncan 2003). This study contributes to the body of knowledge about how the local environment around activity destinations is related to travel behavior.

Analyzed Pedestrian and Bicycle Mode Choices within a Tour-Based Framework

The study used a tour-based analysis framework to control for the influence of trip-chaining on mode choice. Fewer than 13% of respondents traveled only from home to the survey store and back home, so most respondents made multi-stop tours. In addition, survey respondents made different types of tours. Of the 959 complete tours recorded, 397 (41%) involved traveling from home to a single shopping district and then returning home (e.g., all non-home stops were within one-half-mile (804 m) of the survey store). In contrast, 562 (59%) of the tours were multi-district tours, including at least one non-home stop outside of the shopping district. Respondents making these two types of tours had different characteristics. Walking or bicycling was the primary mode for 45% of respondents who traveled only to and from a single shopping district, but these modes were used by only 8% of respondents who made multi-district tours.

Quantified the Value of Pedestrian and Bicycle Design Characteristics Using Discrete Choice Models

The data collection method captured all respondent activity stop locations, even stops made at adjacent stores within the same shopping district. This level of geographic detail allowed pedestrian, bicycle, public transit, and automobile travel distances and times to be estimated for short-distance trips between home and the shopping district and between each pair of stop locations within the shopping district. Public transit and automobile out-of-pocket travel costs were also estimated. According to the model, the value of time was $9.23 per hour for transit users and $14.41 per hour for automobile users. This is in the same range as the value of time calculated from the 1990 Bay Area Travel Survey (adjusted to 2009 dollars) (Purvis 1997). Considering time and distance along with shopping district variables in the mixed logit models made it possible to evaluate the value of certain design characteristics to pedestrians and bicyclists.

For example, the model of mode choice to and from the shopping district suggested:

- A typical respondent was willing to walk (rather than use other modes) on tours that were 2.1 minutes longer when there was one percent more tree canopy coverage on multilane roads in the shopping district.

The model of tour mode choice for all survey respondents showed:

- A typical respondent was willing to bicycle for tours that were 1.6 miles (2.6 km) longer when there was one additional mile (1.6 additional kilometers) of bicycle facilities within the shopping district.
- Respondents were willing to choose to bicycle for tours that were 0.5 miles (0.8 km) longer when one additional bicycle parking space was provided at the survey store.

Finally, the model of walking versus driving within shopping districts indicated:

- A typical respondent was willing to walk for trips that were 2.5 minutes longer when there was metered on-street parking in the shopping district.
- Respondents were willing to walk for trips that were 1.0 minutes longer when there were 10 fewer commercial driveway crossings per mile (6 fewer commercial driveway crossings per kilometer) along the main shopping district roadway.
- Respondents were willing to walk for trips that were 1.1 minutes longer when the speed limit was five miles per hour (eight kilometers per hour) slower.

These results were intended to provide initial estimates of the value of certain pedestrian and bicycle design characteristics for a relatively small number of respondents traveling to and from shopping districts in one urban region. Further study is needed to refine these estimates.

<u>Used Qualitative Data Collection and Analysis Methods to Develop a Deeper Understanding of the Pedestrian and Bicycle Mode Choice Process</u>

In-depth interviews confirmed the importance of many model factors, identified additional barriers to walking and bicycling, and showed that mode choices were intertwined with family and work responsibilities. Participant feedback suggested that the mode choice process is complex, involving five steps: 1) awareness and availability, 2) basic safety and security, 3) convenience and cost, 4) enjoyment, and 5) habit. The in-depth interviews were also essential for uncovering other key themes related to the mode choice process:

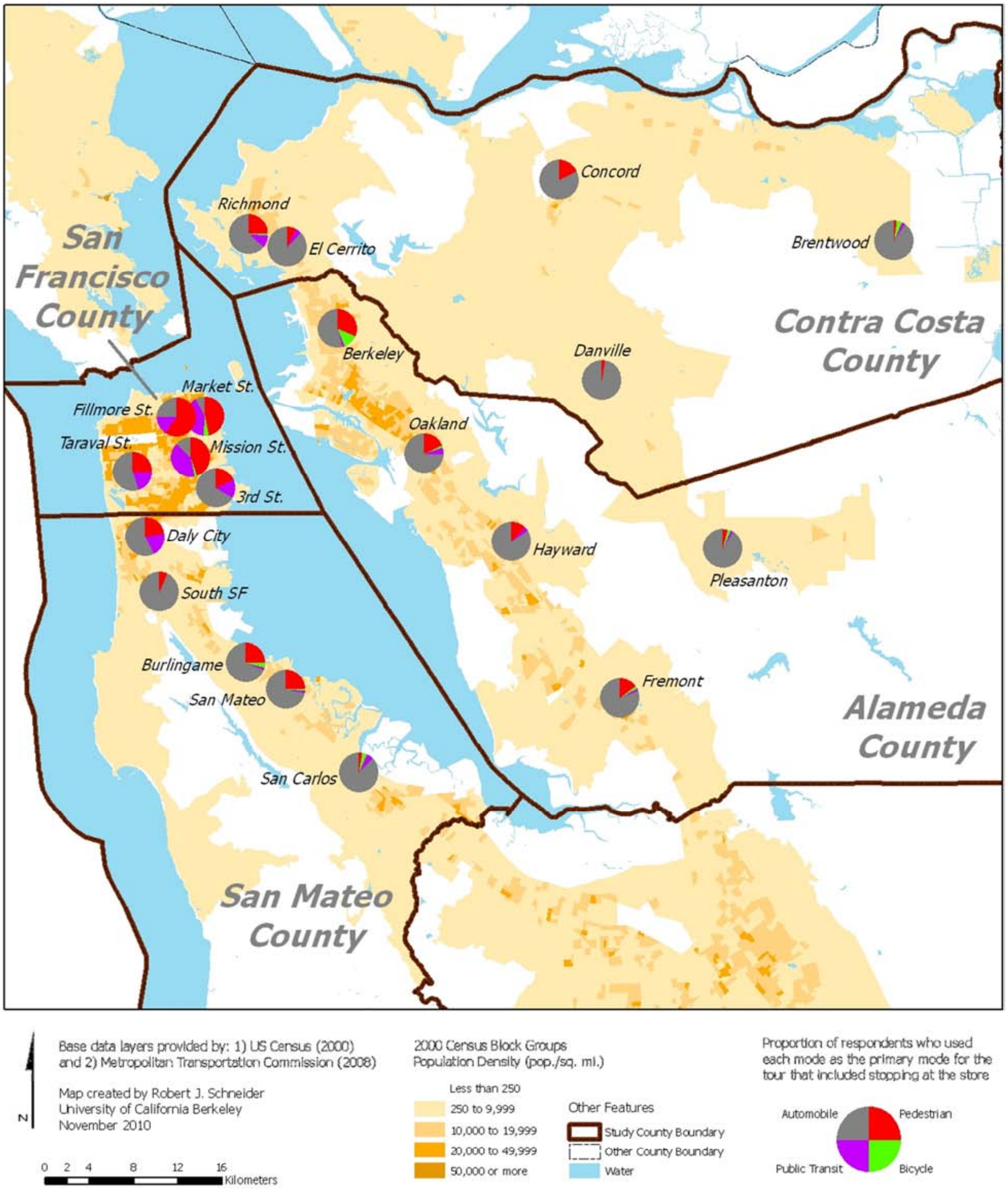
- Walking and bicycling were viewed positively because they provided both physical and mental health benefits.
- Most interviewees thought that reducing automobile travel would benefit the environment by conserving natural resources and limiting air pollution.
- A single family member or close friend inspired some interviewees to walk or bicycle more.
- Perceptions of traffic crash risk discouraged many interviewees from bicycling.
- Interviewees with little bicycling experience preferred bicycling on facilities that were physically separated from automobile traffic.
- Work- and family-related time constraints were a barrier to walking or bicycling.
- Travel planning time, bad weather, and carrying packages were barriers to walking and bicycling. These barriers were less significant when activity destinations were nearby.
- Changes in work location prevented some interviewees from walking and bicycling.
- Few interviewees changed modes when gas prices spiked in Summer 2008.

- Bicyclists were viewed negatively by some interviewees because they were perceived as being in the way of automobile traffic and/or exhibiting law-breaking or reckless behaviors.

RESULTS

This dissertation revealed several insights into pedestrian and bicycle mode choices. These insights included geographic differences in where certain modes are used in an urban region, factors associated with choosing walking and bicycling for routine transportation, and a theory of how mode choice decisions are made.

Figure 2. Primary Tour Mode Share for Survey Respondents by Shopping District



Note: 1 mile = 1.61 kilometers
1 square mile = 2.59 square kilometers

Geographic Differences in Transportation Mode Choices

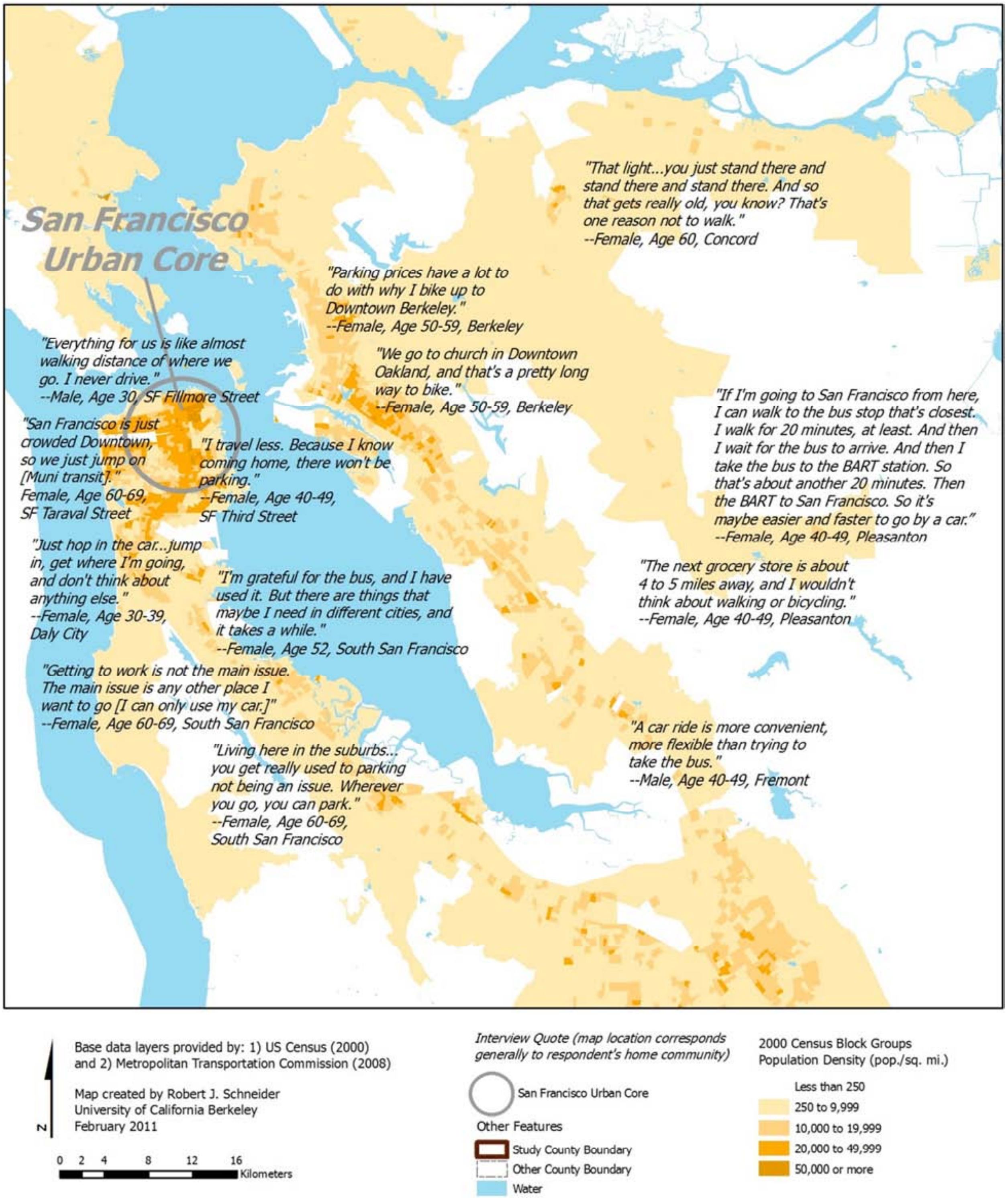
Chapter 4 shows geographic differences in the modes survey respondents used to travel to and from shopping districts. Of the 1,003 completed surveys, 959 (96%) included map data suitable for geocoding and analysis. Overall, the mode used for the longest distance on the 959 respondent tours was automobile (67%), followed by walking (21%), transit (10%), and bicycle (2%). While respondents traveled to the same type of store, there were significant differences in customer mode choice by shopping district. More than 50% of customers walked to three shopping districts in San Francisco, while more than 90% of customers drove to four shopping districts in newer suburban communities. Nearly 15% of customers bicycled to the shopping district in Berkeley (Figure 2). Of customers who traveled on a tour that was longer than two miles (3.2 km), 77% used an automobile as their primary travel mode and 9% walked or bicycled. However, for tours shorter than one mile (1.6 km), 22% drove and 78% walked or bicycled.

In general, these geographic differences in travel behavior reflected the convenience of each mode in different communities. For example, Urban Core shopping districts tended to have high population and employment densities and mixed land uses that created short trip distances between homes, workplaces, stores, restaurants, and other activities. This made walking convenient. They also had limited automobile parking, more traffic congestion, and frequent transit service, making it difficult to travel by automobile and attractive to use public transportation. In contrast, Suburban Thoroughfare and Suburban Shopping Center shopping districts often had buildings separated by large parking lots and commercial uses isolated from offices and residential areas. Buses ran infrequently and transit users often needed to make transfers to access multiple activity locations. Wide roadways and parking spaces near building entrances made automobile travel more convenient than other modes. The importance of convenience was expressed by interviewees throughout the study region (Figure 3).

However, convenience, in terms of travel time and cost, did not appear to explain all mode choices. For example, 66 (17%) of the 397 survey respondents who traveled only to and from the shopping district owned a bicycle, carried one or fewer packages on their tour, did not have a disability, and bicycling was estimated to have the lowest travel time on their tour. However, only 3 (4.55%) of these 66 respondents actually bicycled. Not bicycling when it was relatively faster than other modes may have reflected respondents not knowing how to ride a bicycle, concerns about the safety of bicycling on the existing system of streets, the difficulty of riding up hills, or other considerations. In addition, interviewees in higher-crime neighborhoods also reported concerns about the risk of crime while walking or taking transit, so perceptions of crime were also likely to prevent respondents from using modes that may have otherwise been convenient for them.

While aggregate data for each shopping district showed distinct geographic patterns of respondent travel behavior, additional analysis was needed to uncover specific factors associated with individuals choosing to walk and bicycle for routine transportation.

Figure 3. Interviewee Quotes about Local Transportation Convenience



Note: 1 mile = 1.61 kilometers
1 square mile = 2.59 square kilometers

Factors Associated with Walking and Bicycling for Routine Transportation
The study provided several insights into factors associated with choosing to walk or bicycle for routine travel. Some of these results were obtained directly from exploring the three research subquestions, while other findings were identified at various times during the research process.

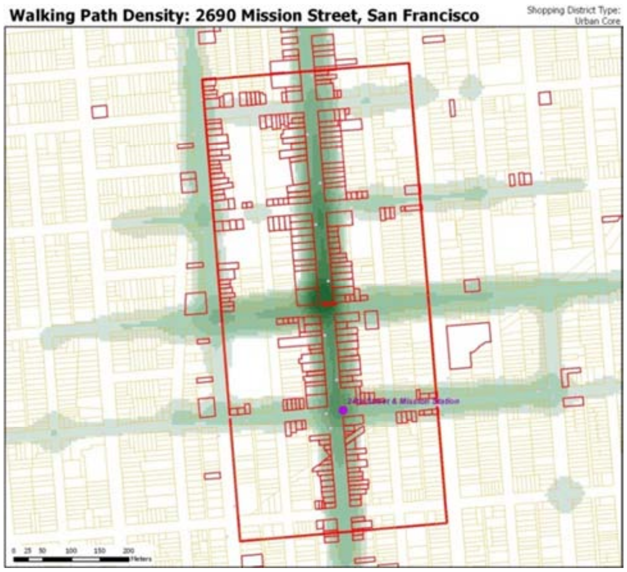
Research Subquestion 1: What methods are needed to record and analyze all modes of transportation that are used by a person on a tour from the time they leave home until they return home? (Chapter 4)

<u>It is possible to measure short-distance and secondary pedestrian movements to, from, and within shopping districts. This was demonstrated using an intercept survey and GIS analysis methodology at 20 shopping districts in the San Francisco Bay Area.</u> Respondents reported all modes of travel that they used from the time they left home until returning home, including secondary modes and short trips between adjacent buildings. Walking within store parking lots or to and from parking spaces directly in front of stores were the only excluded movements. Face-to-face interaction made it possible for surveyors to interpret and clarify responses. A carefully-structured GIS data entry method was used to record stop locations and detailed travel mode information. The survey data were used to develop a more complete understanding of multimodal travel to, from, and within the shopping districts.

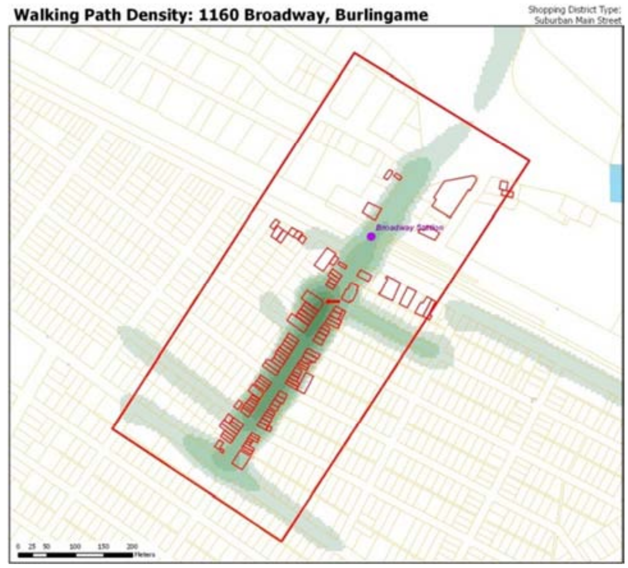
For example, all survey respondent pedestrian movements were geocoded and used to create maps of walking path density in different urban environments (Figure 4). Walking in higher-density Urban Core and Suburban Main Street shopping districts tended to be spread along the main commercial street and on streets accessing this roadway, while walking in lower-density Suburban Thoroughfare and Suburban Shopping Center shopping districts was typically concentrated in the shopping complex that contained the survey store.

Figure 4. Respondent Walking Path Density in Different Urban Environments

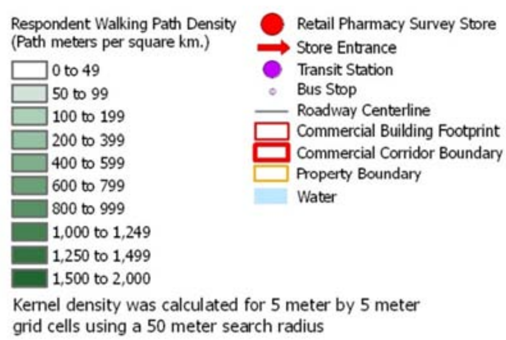
Urban Core



Suburban Main Street



Suburban Thoroughfare



<u>Traditional mode share analyses do not provide a complete picture of pedestrian travel, especially walking in urban, mixed-use environments.</u>
Traditional measures of mode share showed that walking was the mode used for the greatest distance on 21% of 959 respondent tours and represented only 5% of respondent distance traveled. However, alternative measures based on the detailed survey data showed that walking was a common element of respondent tours (52% of tours included some walking) and was the primary mode of transportation for a majority of trip segments within shopping districts (65% of trips between stops in shopping districts were made by walking) (Table 1).

Table 1. Mode Share Measures for All Survey Respondents

	Total from all 20 Stores					
Measure	Sample Size	Walk	Bike	Transit	Auto	Total
Primary Mode Measures						
Primary mode used on whole tour	959	21.3%	2.2%	9.9%	66.6%	100%
Primary mode used on trips within shopping district	1382	65.2%	2.0%	0.5%	32.3%	100%
Primary mode used on trips within store corridor	613	72.8%	2.1%	0.2%	25.0%	100%
Primary mode used on trip accessing survey store	959	32.8%	2.3%	5.0%	59.9%	100%
Total Distance by Mode Measures						
Total distance by mode on whole tour	959	4.5%	0.8%	9.8%	84.9%	100%
Total distance by mode on trips in shopping district	1378	54.6%	2.6%	0.8%	42.0%	100%
Total distance by mode on trips within store corridor	608	67.5%	2.6%	0.2%	29.7%	100%
Mode Use Measures						
Proportion of tours that included a specific mode	959	51.9%	2.4%	12.1%	68.4%	N/A
Proportion of trips within shopping district that included specific mode	1378	70.1%	1.9%	0.6%	32.6%	N/A
Proportion of trips within store corridor that included specific mode	608	75.5%	2.0%	0.2%	25.0%	N/A

Mode shares also varied by urban environment: 51% of all respondents walked on their tours to Urban Core shopping districts, but less than 10% walked on tours to Suburban Thoroughfare and Suburban Shopping Center shopping districts. For trip segments within shopping districts, nearly all (96%) respondents walked within Urban Core shopping districts, but less than half walked within Suburban Thoroughfare (30%) and Suburban Shopping Center (40%) shopping districts. More detailed measures of walking are important for representing pedestrian travel accurately, especially in urban, mixed-use shopping districts.

Research Subquestion 2: What travel, socioeconomic, attitude, perception, and shopping district characteristics are associated with walking, bicycling, and taking transit to and from shopping districts? (Chapter 5)

Results from mixed logit models suggested that certain travel, socioeconomic, attitude, perception, and shopping district factors were associated with walking and bicycling on respondent tours to and from shopping districts. Likelihood ratio tests showed that variables in the attitude, perception, and shopping district categories added predictive value to models with only travel and socioeconomic characteristics. Since these types of variables can be influenced through planning practice, this finding suggests that planning strategies have the potential to influence walking and bicycling mode choices.

After controlling for socioeconomic factors, respondents were more likely to drive when they perceived a high risk of crime, but automobile use was discouraged by higher employment densities, smaller parking lots, and metered on-street parking. Walking to and from shopping districts was associated with factors such as shorter travel distances, higher population densities, more street tree canopy coverage, and greater enjoyment of walking (Figure 5). The exploratory analysis of a small number of bicycle tours found that bicycling was associated with shorter travel distances, more bicycle facilities, and greater enjoyment of bicycling (Figure 6). All else equal, shopping districts located closer to a train station were more attractive for transit users. Creating communities with characteristics that support walking and bicycling rather than driving may make it possible for more people to live active lifestyles and make sustainable transportation modes more convenient, safe, and useful for traveling to routine activities, such as shopping.

Figure 5. Factors Associated with Walking on Tours to and from Shopping Districts

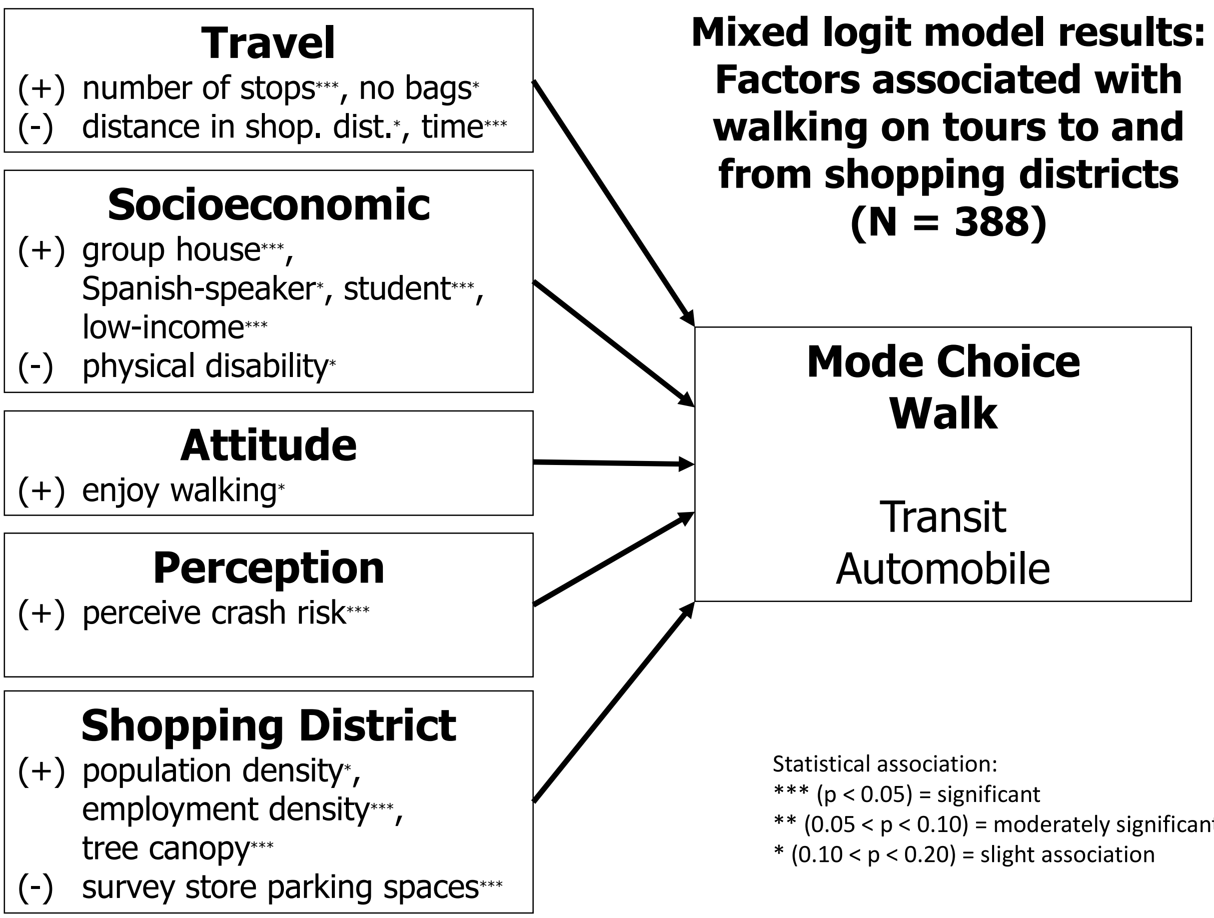
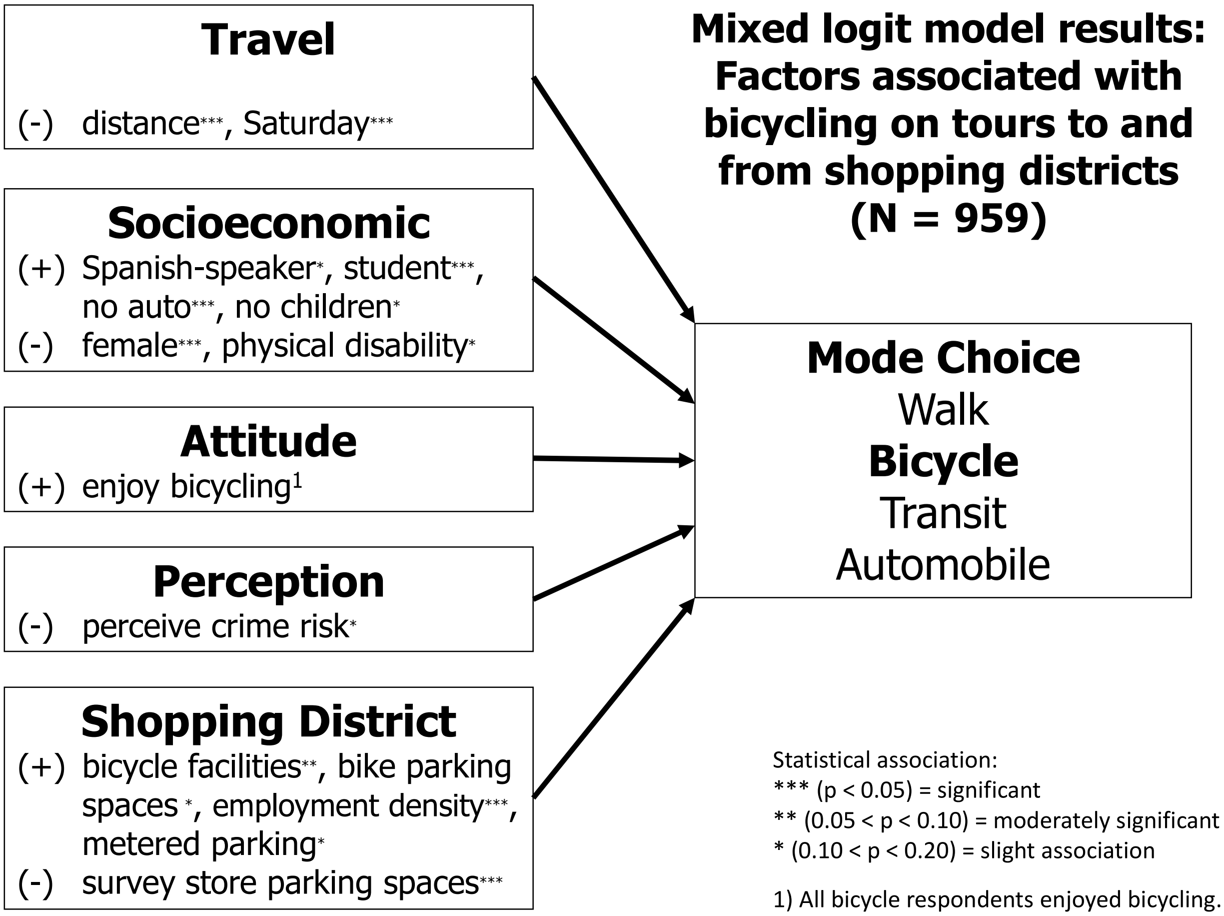


Figure 6. Factors Associated with Bicycling on Tours to and from Shopping Districts

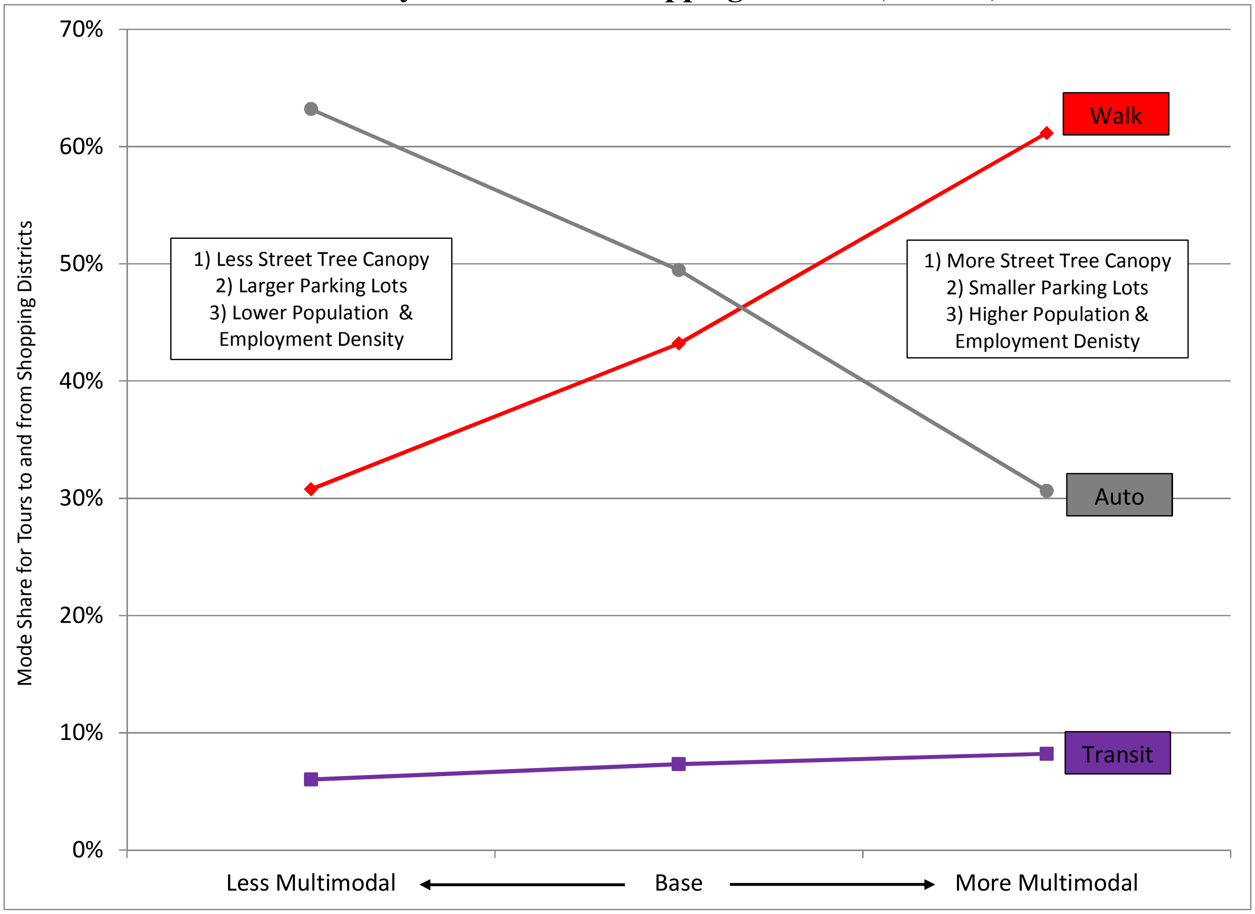


<u>Respondent Mode Share Forecasts for Travel To and From Shopping Districts</u>

The mode choice models made it possible to develop mode shift forecasts. For example, the mode choice model representing travel only to and from the study shopping districts was used to estimate the change survey respondent mode shares under the following three scenarios: 1) double population and employment densities in each study shopping district, 2) double street tree canopy coverage in each study shopping district, and 3) eliminate half of the automobile parking spaces at the survey store. Based on the model, the combination of these three changes could increase pedestrian mode share among the 388 sample respondents from 43% to 61% and decrease automobile mode share from 50% to 31% (Figure 7)[1]. This shift could eliminate 129 (13%) of the 983 respondent vehicle miles traveled (208 of the 1,580 respondent vehicle kilometers traveled), and 110 (36%) of the 308 times respondents parked their automobiles in the shopping district.

[1] Note that this forecasted mode shift is an illustrative example based on cross-sectional data. The forecast assumes that each of the variables that are changed would have a direct effect on mode choice and does not account for the process of modifying travel behavior habits, so it may overstate the potential impact of the changes.

Figure 7. Survey Respondent Mode Shares Under Different Scenarios, Based on Mode Choice Model for Travel Only To and From Shopping Districts (N = 388)

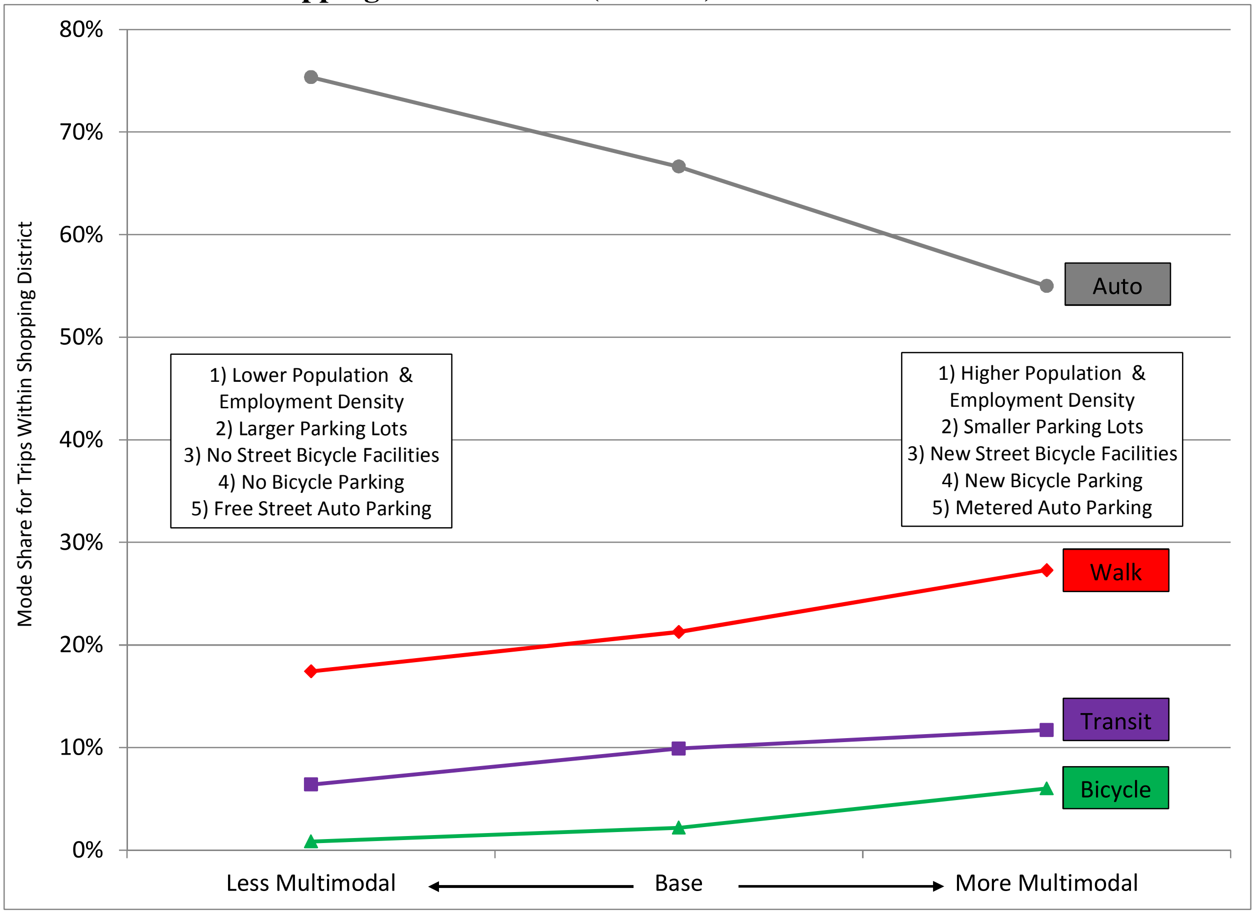


<u>Respondent Mode Share Forecasts for Complete Tours that Include Shopping District Stops</u>

The mode choice model for all 959 respondent tours was used to estimate respondent mode share that may occur under the combination of the following scenarios: 1) double population and employment densities in the shopping district; 2) add two additional miles of bicycle facilities within each shopping district; 3) provide 10 more bicycle parking spaces, half as many automobile parking spaces at the survey store, and metered on-street parking in the shopping district. This combination could increase respondent pedestrian mode share from 21% to 27%, increase bicycle mode share from 2.2% to 6.0%, increase transit mode share from 10% to 12%, and decrease automobile mode share from 67% to 55% (Figure 8)[2]. This shift could eliminate 247 (2.5%) of the 10,036 respondent vehicle miles traveled (397 of the 16,150 respondent vehicle kilometers traveled), and 206 (14%) of the 1,519 times respondents parked their automobiles to access a non-home stop.

[2] Note that this forecasted mode shift is an illustrative example based on cross-sectional data. The forecast assumes that each of the variables that are changed would have a direct effect on mode choice and does not account for the process of modifying travel behavior habits, so it may overstate the potential impact of the changes.

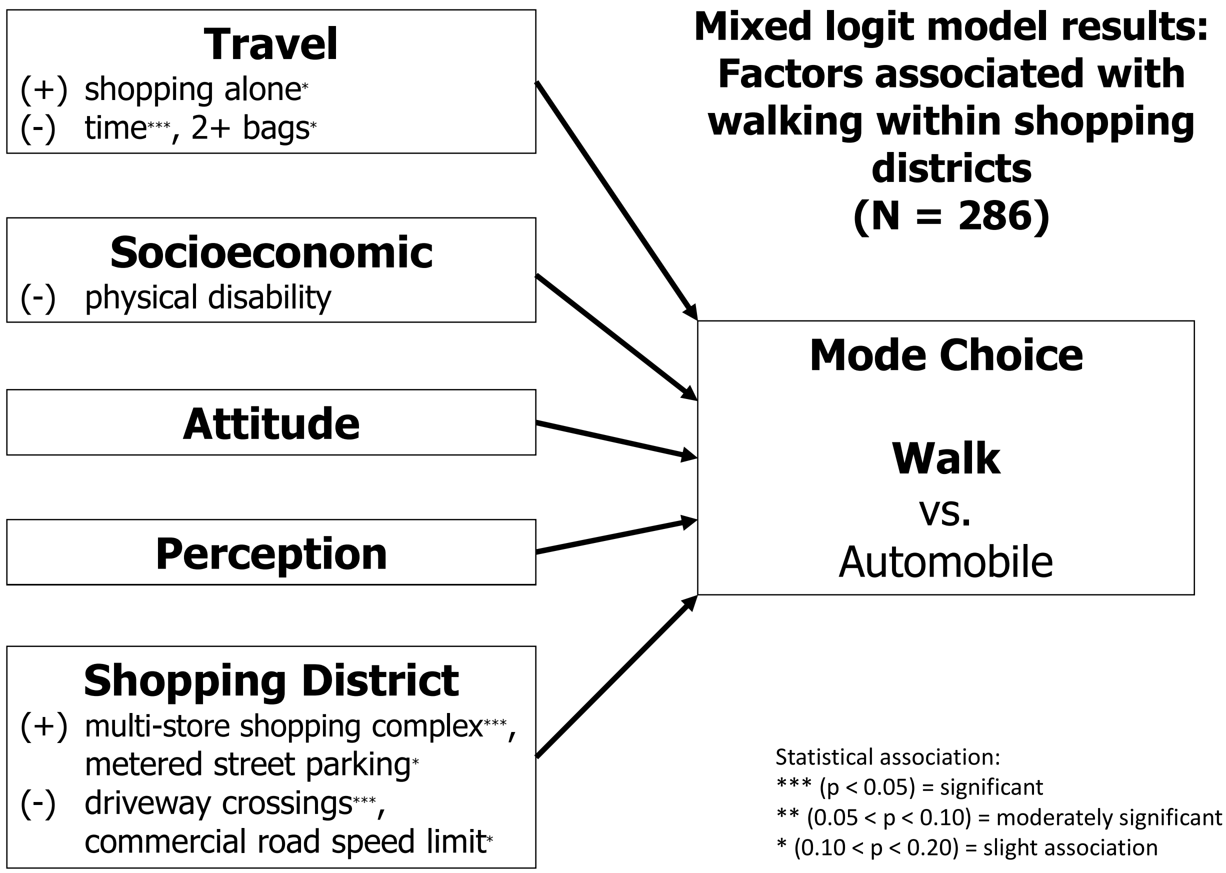
Figure 8. Survey Respondent Mode Shares Under Different Scenarios, Based on Mode Choice Model for Shopping District Tours (N = 959)



Research Subquestion 3: What travel, socioeconomic, attitude, perception, street, and site characteristics are associated with walking rather than driving between activities within the same shopping district? (Chapter 6)

Mixed logit modeling results showed that people were more likely to choose walking between stops in shopping districts with certain characteristics (Figure 9). This suggests that shopping districts can be designed to encourage walking rather than driving between stores. By facilitating walking, shopping districts do not need to have as many parking spaces per person per visit, which can reduce the total amount of space dedicated to parking. Consolidating space that would otherwise be used as separate parking lots into shared parking areas, either a pedestrian-oriented commercial street or a shared parking lot or structure, makes it possible to cluster stores within walkable distances. This reinforces the advantage of walking between stores, allows businesses and/or public agencies to share the cost of parking infrastructure, and reduces the overall cost of other water, sewer, and electric lines between buildings.

Figure 9. Factors Associated with Walking Within Shopping Districts



These results suggest two possible strategies for increasing walking within shopping districts. They are appropriate for two distinct types of urban environments.

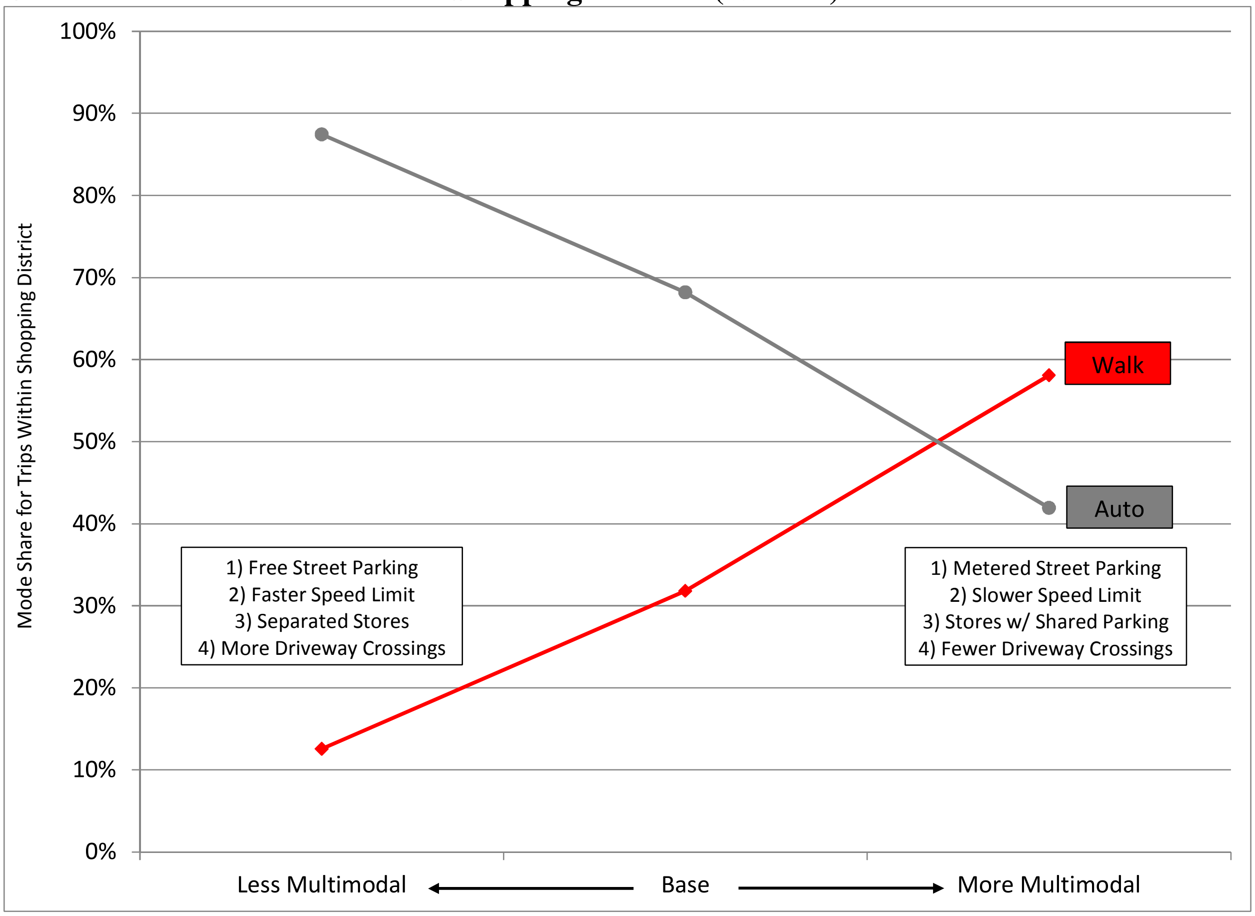
Design Pedestrian Oriented Commercial Corridors (Walkable Main Streets)
The first strategy is to develop walkable shopping streets that have a high level of sidewalk activity and little off-street parking. Storefronts in these districts are typically adjacent to the sidewalk and often have large windows inviting pedestrians to window-shop.

Develop Compact Commercial Hubs with Shared Parking (Shared Parking Oriented Development)
The second strategy is to create clusters of stores around shared parking areas so that it is convenient to park an automobile once and then walk between activities in the shopping district. The parking area may be a surface lot or a multi-level parking structure. In either case, pedestrian access through the parking area is encouraged by slow speeds and designated pedestrian walkways.

Respondent Mode Share Forecasts for Travel Within Shopping Districts
The mode choice model of walking versus driving within survey shopping districts identified the respondent mode shift that could occur under the combination of the following scenarios: 1)

cluster separated stores around shared parking lots, 2) consolidate commercial driveways so that there are half as many driveway crossings along the main commercial roadway, 3) reduce all main commercial roadway speed limits to 25 miles per hour, 4) install metered parking in all shopping districts. These changes could increase the percentage of the 286 sample respondents walking between shopping district activities from 32% to 54% (Figure 10)[3]. This shift could eliminate 29 (38%) of the 76 respondent vehicle miles traveled (47 of the 122 respondent vehicle kilometers traveled), and 105 (22%) of the 469 times respondents parked their automobiles in the shopping district.

Figure 10. Survey Respondent Mode Shares Under Different Scenarios, Based on Mode Choice Model for Travel Within Shopping Districts (N = 286)



Mode Choice Decision Theory

Qualitative interviews provided a foundation for a proposed Theory of Routine Mode Choice Decisions (Chapter 7). This five-step theory also drew from survey results and other mode choice theories in the transportation and psychology fields. It is intended to provide a framework

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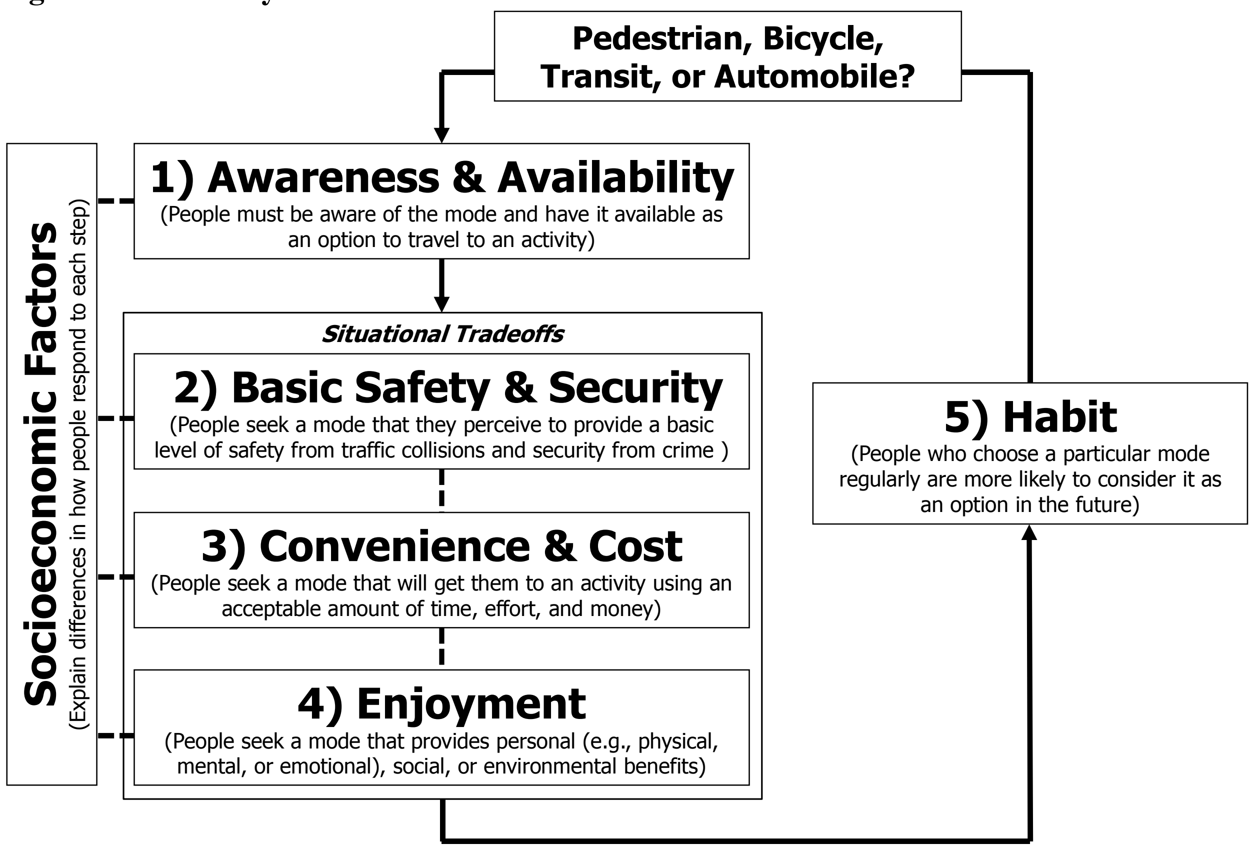
[3] Note that this forecasted mode shift is an illustrative example based on cross-sectional data. The forecast assumes that each of the variables that are changed would have a direct effect on mode choice and does not account for the process of modifying travel behavior habits, so it may overstate the potential impact of the changes. Slower speed limit means that all main shopping district roadways would be 25 miles per hour (40 kilometers per hour). Faster speed limit means that all main shopping district roadways would be posted as 5 miles per hour (8 kilometers per hour) faster.

for planners, designers, engineers, and elected officials to discuss strategies to change community travel behavior. The five steps are illustrated in Figure 11.

Figure 11. A Theory of Routine Mode Choice Decisions



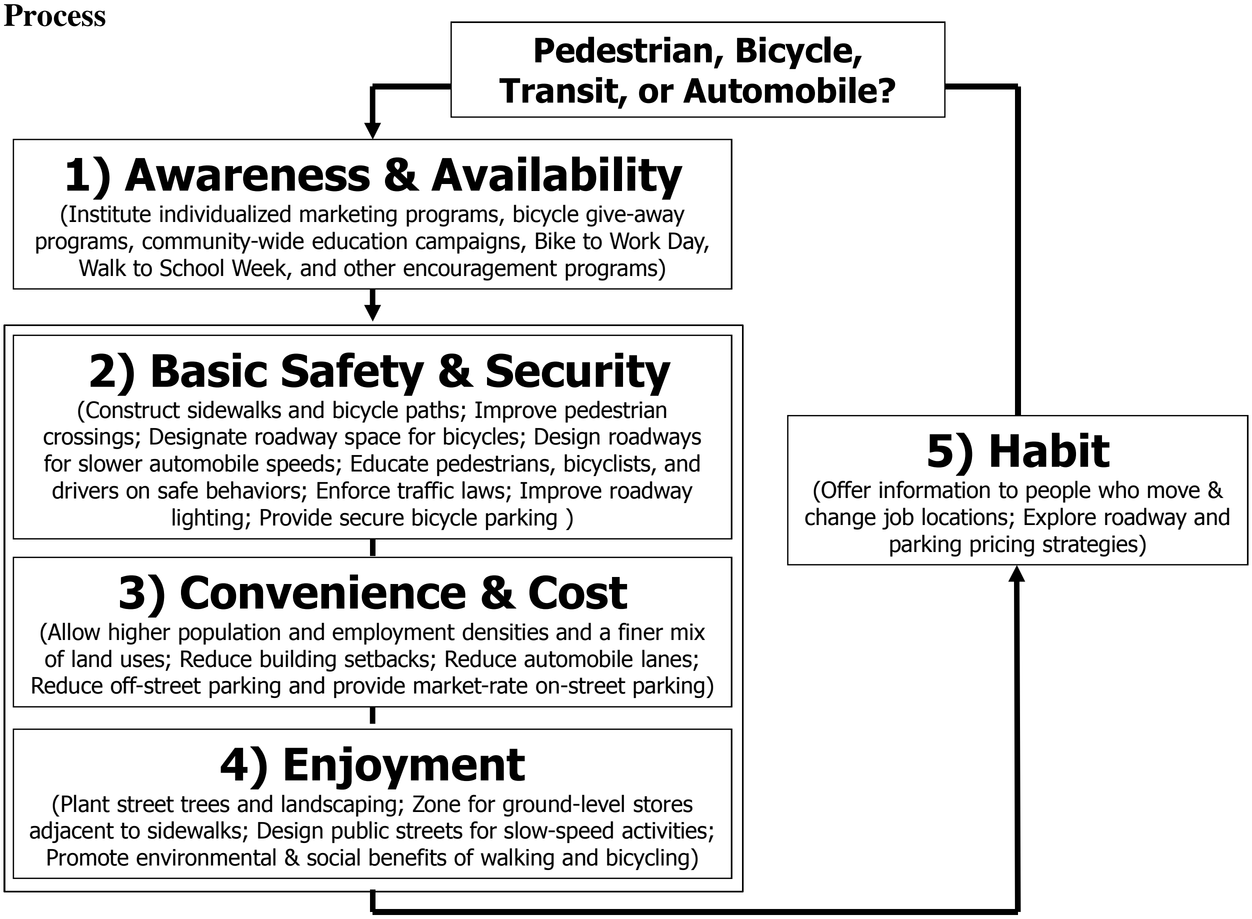
The proposed theory suggests that there are five key steps in the mode choice decision process. These steps are listed by order of importance, as suggested by most interviewees. The first step, 1) awareness and availability, determines which modes are viewed as possible choices for routine travel. The next three steps, 2) basic safety and security, 3) convenience and cost, and 4) enjoyment, assess situational tradeoffs between modes in the choice set and are supported by many of the statistically-significant factors in the mode choice models. The order of steps two, three, and four is intended to reflect the relative magnitude of these three categories, as emphasized by interviewees, but they may be given different levels of importance depending on the situational context. This order could be tested in the future under various scenarios through ranked preference methods. The final step, 5) habit, reinforces previous choices and closes the decision process loop. Socioeconomic characteristics explain differences in how individuals view each step in the process.

More research is needed to determine the order of the middle three steps in the theory. However, basic safety and security was listed before convenience in the mode choice process. This was done because some study participants avoided walking or bicycling when they perceived them to be too risky, even though these modes could have potentially been more convenient than driving. Enjoyment was listed after both basic safety and security and convenience because of the large discrepancy between the proportion of survey respondents who reported enjoying walking and bicycling and the proportion who actually used these modes to travel to and from the store. Since many people enjoyed the activities of walking and bicycling, it is likely that the barriers of lack of awareness, perceived crash and crime risk, and inconvenience prevented these modes from being used for routine travel.

LESSONS FOR PLANNING PRACTICE

While this study identifies a number of specific characteristics that were associated with increasing the attractiveness of walking and bicycling, the impact of any individual treatment may be minimal unless a comprehensive set of actions is implemented. Chapter 7 presents strategies that could be included in a comprehensive approach to promote pedestrian and bicycle transportation, including actions that can improve awareness, provide basic safety and security, increase convenience, make walking and bicycling more enjoyable, and change mode choice habits. Example strategies that could be implemented by planners, designers, engineers, and other policy-makers through each of the five mode choice steps are shown in Figure 12.

Figure 12. Strategies to Increase Walking and Bicycling through the Mode Choice Decision Process



CONSIDERATIONS FOR FUTURE RESEARCH

Chapter 8 suggests a number of possibilities for future research. New knowledge can be gained from studies that revise and expand upon the existing research scope and explore additional findings that were not related to the main research question or subquestions.

Revise and Expand the Study Scope

Several aspects of the study could be revised or expanded in the future. These include the study area and survey implementation.

Study Area

- The San Francisco Bay Area provided a range of urban and suburban environments for the survey and interviews. However, like any urban region, the Bay Area has distinct characteristics that may be related to transportation mode choices. Future research could develop models and analyze interview responses in other regions to see if the results of this dissertation are consistent in different geographic contexts.
- The survey was done in shopping districts, so it captured travel for shopping or errands, among other purposes. Future surveys could be done in employment centers, sports and entertainment zones, residential neighborhoods, or recreational areas to capture travel data in other types of locations.

Survey Administration

- Some respondents may have added unanticipated stops to their tour before returning home but didn't have a chance to report them on the survey. It was not possible to know how many people revised their travel plans. This highlights a challenge of relying on self-reported travel behavior, especially anticipated future behavior.
- Most questions on the survey were answered by more than 99% of all 1,003 respondents, but several attitude and perception questions had lower response rates and could be rephrased to improve respondent understanding.
- Of all 1,003 customers surveyed, 24 reported using a bicycle as their primary mode to travel to the store. This number of bicyclists was only adequate for evaluating factors associated with bicycling in a secondary model. Results describing factors associated with bicycling should be viewed as preliminary.

Explore Additional Findings

The study also generated a number of findings that were not related directly to the main research question and subquestions. Findings related to travel planning, walking and bicycling for recreation, bicycle facility design, predispositions toward walking and bicycling, and causal relationships could also be explored further through follow-up research.

Travel Planning

- Planning time was an important consideration for choosing a travel mode. Interview respondents suggested that walking, bicycling, and transit took more planning than using an automobile in many suburban parts of the San Francisco Bay Area. However, driving to Downtown San Francisco required thinking about how to navigate through congested streets and plan where to park. Follow-up studies could take an in-depth look at factors that influence travel planning time for each mode in different communities.

- Many respondents considered an automobile as their only transportation mode option for traveling to the survey store. Of the 736 respondents who lived within two miles (3.2 km) of the survey store, 218 (30%) did not consider walking or bicycling to the survey store. Automobile reliance was prevalent among people traveling to suburban shopping districts. Additional research could explore the characteristics of people who only consider an automobile for routine transportation.

Walking and Bicycling for Recreation

- Most survey respondents enjoyed walking and bicycling. Of survey participants who reported their attitudes, 866 (87%) of 1,000 said they enjoyed walking, and 603 (61%) of 990 said they enjoyed bicycling. However, only 204 (21%) of the 959 respondents who reported complete tours used walking and 21 (2.2%) used bicycling as their primary mode. This may be due to study participants viewing walking and bicycling as good for exercise and recreation but not considering walking and bicycling as transportation modes that they would use to access activities. Additional research may uncover factors related to safety, convenience, social status, and habit that make recreational walking and bicycling more common than walking and bicycling to routine activities in some communities.

Bicycle Facility Design

- Nearly all interview respondents reported a fear of bicycling on roadways without designated bicycle facilities, and most preferred lower-volume streets and separated bikeways over on-street bicycle lanes. Follow-up studies could examine individual factors associated with fear of bicycling on roadways and relative comfort of being separated from moving automobiles. These studies could investigate bicycling experience, driving experience, understanding traffic laws, physical ability, demographic characteristics, attitudes about how roadway space is used, and other factors.

Predisposition Towards Walking and Bicycling

- The results shed additional light on the influence of self-selection, or predisposition towards walking and bicycling, on travel behavior. Respondents who walked and bicycled to and from shopping districts were more likely to enjoy walking and bicycling. This suggests that people who are predisposed to using active modes of transportation may choose to live and shop in locations where they can walk and bicycle. However, results also showed that different types of urban environments may affect how people travel. Longitudinal studies are needed to understand the influence of predisposition towards walking and bicycling on the use of these modes.

Causal Relationships

- Interviewees provided little evidence that the gas price spike during Summer 2008 caused them to walk or bicycle more. All interviewees were aware of the high gas prices, but most automobile users said that they simply traveled less, consolidated their automobile trips, or planned more efficient automobile routes. However, out-of-pocket cost was identified as a significant factor associated with public transit and automobile use in the statistical models. Further research could explore how gas, toll, parking, and other price changes impact pedestrian and bicycle mode shares in the short- and long-run.

- Additional research is needed to determine the likely magnitude of shifts to non-automobile modes due to specific actions. This research should include longitudinal studies that compare communities where a particular strategy has been applied (e.g., charge for on-street parking, increase population and employment density, install new bicycle lanes and pathways) with control communities.

CONCLUSION

The results of this dissertation emphasize the need for a comprehensive approach to shift routine automobile travel to other modes. Planners, designers, engineers, and other policy-makers should implement strategies that make walking, bicycling, and public transit more attractive at all stages of the mode choice decision process. A limited focus on a single step, such as improving pedestrian and bicycle infrastructure, without increasing awareness of walking and bicycling, decreasing distances to stores, schools, and workplaces, or encouraging community support for active transportation modes may do little to reduce automobile use. However, if pedestrian and bicycle safety and network development projects are coupled with increases in population and employment density, conversion of extra parking lot space into housing or retail stores, and efforts to encourage walking and bicycling as acceptable forms of routine transportation in the community, this set of changes may result in more walking and bicycling. Similarly, increasing automobile parking costs in a main street shopping district may be counterproductive unless there are a sufficient number of residents living within walking distance, safe street crossings, bicycle facility connections, and good transit service to the district so that people can shift from driving to these other modes. It is likely that many of the factors identified in this study have a positive relationship with walking and bicycling because they are part of a broader set of conditions that support pedestrian and bicycle activity. Therefore, comprehensive approaches that address awareness, basic safety and security concerns, convenience and cost, enjoyment, and habits are important for encouraging sustainable transportation.

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CHAPTER 1. INTRODUCTION

This chapter offers a brief description of the background issues that motivated this dissertation, provides several definitions that are used throughout the document, presents the central research question and three research subquestions, shows the conceptual framework used for data collection and analysis, and outlines the contents of the rest of the document.

1.1. MOTIVATION

In the two decades since the United States Congress passed the federal Intermodal Surface Transportation Efficiency Act, there has been a surge of interest in making urban transportation systems more sustainable. Agencies at all levels of government have searched for strategies to reduce private automobile travel and increase multimodal options. For example, the City and County of San Francisco Municipal Charter (as amended in 2007) states, "Decisions regarding the use of limited public street and sidewalk space shall encourage the use of public rights of way by pedestrians, bicyclists, and public transit, and shall strive to reduce traffic and improve public health and safety." The Transportation 2035 Plan for the San Francisco Bay Area includes a performance objective to "Reduce daily per-capita vehicle miles traveled (VMT) by 10 percent from today by 2035" (Metropolitan Transportation Commission 2009). As of January 2011, 23 states and more than 150 local and regional governments had established official policies to improve pedestrian and bicycle conditions as a part of all transportation plans and projects (Complete Streets Coalition 2011).

This dissertation focuses specifically on efforts to shift local automobile travel to pedestrian or bicycle modes. Communities have viewed pedestrian and bicycle transportation as a substitute for automobile travel and as a means to provide emissions-free mobility for people of all incomes and abilities, decrease reliance on fossil fuels, use public infrastructure and space efficiently, reduce long-term transportation system maintenance costs, create enjoyable streets and public spaces, support public transit, and provide physical activity and opportunities for social interaction.

Federal policy also supports pedestrian and bicycle transportation. Walking and bicycling are integral to the Livability Principles established by the US Department of Transportation (DOT), Department of Housing and Urban Development, and Environmental Protection Agency (2009). These include: "Develop safe, reliable, and economical transportation choices to decrease household transportation costs, reduce our nation's dependence on foreign oil, improve air quality, reduce greenhouse gas emissions, and promote public health," and "Enhance the unique characteristics of all communities by investing in healthy, safe, and walkable neighborhoods—rural, urban, or suburban." According to the 2010 US DOT Policy Statement on Bicycle & Pedestrian Accommodation: Regulations and Recommendations, "Transportation programs and facilities should accommodate people of all ages and abilities, including people too young to drive, people who cannot drive, and people who choose not to drive…Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems."

Progress has been made in a number of communities, but pedestrian and bicycle planning efforts in the United States have not resulted in broad modal shifts. The private motor vehicle accounts for 83% of all trips and is the most common transportation mode used in every metropolitan region (Federal Highway Administration 2009). Nationally, only 11% of trips are made by walking, 4.3% by public transit, and 1.0% by bicycling. By comparison, more than 20% of all trips in the United Kingdom, Germany, and Sweden are made on foot, and 15% of all trips in Denmark and 25% of all trips in the Netherlands are made by bicycle (Basset *et al.* 2008). United States automobile use is even higher among the 22% of home-based trips that are made for shopping purposes, accounting for 89% of all shopping travel (Federal Highway Administration 2009).

In order to identify planning, engineering, and design strategies that may encourage shifts from automobile to pedestrian and bicycle transportation, there is a need to recognize what motivates people to walk and bicycle. This includes understanding specific individual, travel, and neighborhood environment factors associated with walking and bicycling rather than driving. It also involves comprehending the thought process people use to select modes for routine travel purposes.

Interview participants from different parts of the San Francisco Bay Area suggested many factors that may be associated with pedestrian and bicycle mode choices. Some of the most common reasons why people chose to walk or bicycle or avoid walking or bicycling are highlighted by the quotes below. Positive aspects of walking and bicycling included personal and public health, enjoyment, social interaction, convenience, environmental-consciousness, and cost savings.

<u>Personal and public health</u>

- "If I walk more, I'll be thinner and healthier." *--Female, Age 60, Concord*
- "I have noticed that my stress level has gone down since I have walked and bussed more than I drive." *--Male, Age 30, San Francisco Fillmore Street*
- "It's a good way to get some exercise, and it's less pollution and all that stuff…I think maybe, part of it may be that it's kind of trendy…It's kind of like the cool thing to bike…which is probably a good thing." *--Male, Age 30, San Francisco Fillmore Street*
- "When you care for your employees and you create an atmosphere where you help them get from point A to point B and keep them physically and mentally fit in the workplace, there's a lot to be said about production and achieving the goals of the company." *--Male, Age 60-69, Brentwood*

<u>Enjoyment</u>

- "Walking alone…gives me a sense of solace and a time to meditate and reflect and just take in what's out there and stuff." *--Male, Age 30, Burlingame*
- "I've gotten to where I just love the simplicity of walking. I get to be with my own thoughts…" *--Male, Age 50-59, San Francisco Fillmore Street*
- "A bicycle is a very convenient thing…you are interacting more with the environment, you are interacting more with the people, you feel that fresh air…you have that chance of seeing…architecture, or smell…" *--Male, Age 30-39, Berkeley*

- "[My girlfriend and I] prefer to walk. We enjoy walking in San Francisco and looking at things…she loves to read restaurant menus."
  --Male, Age 50-59, San Francisco Fillmore Street

<u>Social interaction</u>

- "We would be less isolated from one another…if we were…on a bicycle, or even walking." *--Female, Age 60-69, San Carlos*
- "I think people walking is a good thing. It makes for interesting city life."
  --Male, Age 55, San Francisco Third Street
- "I don't see a lot of neighbors out on the street because people just get in their cars and drive…it reduces my quality of life not to interact with neighbors."
  --Female, Age 40-49, San Francisco Third Street

<u>Convenience</u>

- "I just thought it would be silly to drive because it was only a couple of blocks, and because I have able-bodied legs that are functioning. And number two, I wouldn't want to create any emissions from a car just to go down the street two blocks."
  --Male, Age 30, Burlingame
- "The parking…is…the big reason why I walk around my neighborhood. I could drive if I wanted to, but I mean, it's more inconvenient to find my car where I finally found a parking spot. Then go find another parking spot somewhere else."
  --Male, Age 30, San Francisco Fillmore Street
- "The parking is definitely such a pain in the butt, that you just say, 'I'd rather walk.'"
  --Male, Age 30, San Francisco Fillmore Street
- "[It is] certainly cheaper to park downtown if you have to park and lock your bicycle rather than your car. And I think it probably gives you greater flexibility and mobility than walking because it's faster. More flexible opportunities than public transportation because you can turn the corner where a bus can't."
  --Male, Age 55, San Francisco Third Street
- "Some of them are walking because it is just more convenient than driving or taking the bus in the City." *--Female, Age 60-69, South San Francisco*
- "Sometimes I think [people bicycle as] a political statement…being conscious of the environment and pollution. And sometimes I think it's because it is a fairly easy and convenient way of getting around in San Francisco, except for the big hills, of course. And sometimes I think it is for exercise…" *--Female, Age 60-69, South San Francisco*

<u>Environmental-consciousness</u>

- "I'm a big advocate of green. And every small little thing we can do it's going to help…the less cars we have on the road, less carbon emissions, the greenhouse gasses are not generated as much, the bicycle is good…" *--Female, Age 40-49, Pleasanton*
- Do you think that changing how people travel is a good way to improve the environment? "I definitely think it is good for the environment. Basically, less pollution…is a big thing…Cars have to go somewhere, and that's usually a junkyard…And also…noise pollution. Cars are generally pretty dirty…All the chemicals that are in cars…oil, old transmission fluid." *--Male, Age 30, San Francisco Fillmore Street*

Cost savings

- "We just walk because we can be together and we save money and we try to get our exercise." *--Male, Age 50-59, San Francisco Fillmore Street*
- "I know friends who have never driven…They do not have a car—they do not have the resources to buy a car or insure it." *--Male, Age 55, San Francisco Third Street*

Interview participants also suggested barriers to shifting from automobile to pedestrian or bicycle modes. These included travel distance and time, planning time, the need to make multiple stops, carrying packages, traveling with other people, physical effort and ability, bad weather, family and work responsibilities, perceptions of crash and crime risk, social expectations, community design, and habits.

Travel distance and time

- "The next grocery store is about four to five miles away, and I wouldn't think about walking or bicycling." *--Female, Age 40-49, Pleasanton*
- "Where I previously lived in a more commercial area, I did walk to the stores or just take in a walk, or to the movie, or whatever else. But again, now I'm in a more residential area and it's not as convenient, so I do drive my car more."
  --Female, Age 50-59, Berkeley
- "If it's more than [a mile or two], you're not going to walk, you're not going to cycle, you're going to take the car and go." *--Male, Age 40-49, Fremont*

Planning time

- "Walking requires that I get up on time and out the door sooner…"
  --Female, Age 30-39, Daly City

The need to make multiple stops

- "I could take a bike, but normally when I'm going, it's because I'm between two places, and it's just more convenient to drive because I happen to have the car."
  --Female, Age 40-49, Danville
- "The time commitment is a lot longer on any of them—walking, biking, or taking the bus. There's going to be a lot more time involved in getting this errand accomplished. And if I have multiple errands, it's even more complicated."
  --Female, Age 60-69, San Carlos

Carrying packages

- "I could walk, but I couldn't buy as many groceries and walk back home if I do."
  --Female, Age 60-69, San Carlos
- "I usually take things with me in my car to work back and forth—laptop and stuff like that—which makes it a little bit tougher to ride my bike."
  --Female, Age 50-59, San Carlos

Traveling with other people

- "If I'm bringing my dogs, that's not going to happen on a bike. Or if I'm bringing more people, like picking up someone. Those get in the way of walking or bicycling."
  --Female, Age 50-59, Berkeley

<u>Physical effort and ability</u>

- "I'm at an age, and I also have a disability that…I don't walk as fast as I used to. I can't physically do it. *--Female, Age 40-49, San Francisco Third Street*
- "My kids are all gone, and because of my arthritis, it is harder for me [to bicycle]." *--Female, Age 52, San Carlos*
- "If there weren't as many hills, we might go out and walk more." *--Female, Age 52, South San Francisco*

<u>Exposure to bad weather</u>

- "Maybe in the summer I'll walk more. That would be good. It's warmer; I like the warmer weather." *--Female, Age 60, Concord*
- "The weather affects whether I choose to drive or bike." *--Female, Age 50-59, Berkeley*
- "Sometimes I feel like [walking], and sometimes I don't feel like [walking], so I try to catch it the next day. If it's raining, it's really bad, I ain't going nowhere." *--Male, Age 57, Oakland*

<u>Family and work responsibilities</u>

- "In this time of my life…everything I'm trying to do it…in the least time possible, so a car seems very convenient." *--Male, Age 30-39, Berkeley*
- "Although I live very close to work, I choose to use my car because I have a very busy schedule. And sometimes I only have a few minutes to run from one place to another." *--Male, Age 30-39, Berkeley*
- "My kids were still younger…we always used to be on the time crunch. They would wait for me to come home. There was something else for them that I had to drop them off…things like that, I would always go for car. That's faster and more convenient." *--Female, Age 40-49, Pleasanton*

<u>Perceptions of crash risk</u>

- "I'm not a skilled bicyclist…bicycling on the road, so I don't really feel very safe at all." *--Female, Age 30-39, Daly City*
- "I like to ride on my bike, but some places in [my community] they don't have a bike lane. It's not designated or marked prominently, so it's not really safe." *--Female, Age 40-49, Pleasanton*

<u>Perceptions of crime risk</u>

- "When you are walking in this neighborhood, there's nobody else walking. You look like a target here." *--Female, Age 40-49, San Francisco Third Street*
- "I don't like to walk too much in the dark unless I have to." *--Male, Age 30, Burlingame*

<u>Social expectations</u>

- "It's a cultural thing…social pressure, if you will…If you had a car, why would you cycle?" *--Male, Age 40-49, Fremont*
- "Most of the families I know, their hope and expectation is that each of their kids have their own vehicle once they are driving age." *--Female, Age 30-39, Daly City*

Community design

- "I come from Cuba. The cities are planned in a different way…Here everything is so huge. When you say 'one mile'…there's nothing in between there and yourself…you feel like you are walking two miles. The distance[s] are huge…from here to there, what is there to see? Nothing. There's not even a person to say, 'Hello,' 'Good morning,' 'How are you today?'" *--Male, Age 30-39, Berkeley*

Habits

- "A car is *easy*. It's easy. It's comfortable. So it means that to not do that and to walk more, ride a bicycle more, or even take public transportation is less comfortable." *--Female, Age 60-69, San Carlos*
- "Just hop in the car…jump in, get where I'm going, and don't think about anything else." *--Female, Age 30-39, Daly City*
- "I'm used to using a car. It's easy. I can get in; I can park in my driveway at night. I get in, I go." *--Male, Age 55, San Francisco Third Street*

1.2. PURPOSE

The main purpose of this dissertation is to provide urban planners with a greater understanding of why people choose to walk and bicycle rather than travel by automobile. This information will help practitioners implement strategies that have the greatest potential to shift automobile travel to pedestrian or bicycle modes and improve the sustainability of land use and transportation systems. More specifically, this dissertation is intended to:

- Develop more complete methods for recording and analyzing pedestrian transportation.
- Understand why people choose to walk or bicycle rather than travel by automobile for routine purposes, such as shopping.
- Identify characteristics of shopping districts that may encourage people to walk rather than drive between stores.
- Propose a theory of the mode choice decision process and suggest planning strategies that may make walking and bicycling more attractive during all stages of this process.

While this study was conducted in the San Francisco Bay Area, land use and transportation systems are also changing, often more rapidly, in other urban regions of the world. As urbanization continues on a global scale, these developing metropolitan regions may have an even larger impact on the global environment than the United States if they choose to follow similar patterns of land use and transportation system development. Between 1960 and 2002, automobile ownership grew by an average of 4.4% per year in a sample of 45 countries, and the number of automobiles in the world increased from 122 million to 812 million. Growth in automobile use is expected to accelerate in the 21st Century, with the world automobile fleet projected to more than double to 2.08 billion by 2030 (Dargay, Gately, and Sommer 2007).

The vision that national, regional, and local governments set for land use and transportation system development today will impact the long-term cost of infrastructure, use of public space, availability of transportation choices, ability of people of all incomes and physical abilities to access activities, and character of the natural environment for decades into the future. While some results of this dissertation may not apply to other urban regions outside of the San

Francisco Bay Area, this research is intended to inform practice in all parts of the world, especially where the need for sustainable transportation is growing rapidly.

1.3. DEFINITIONS

This dissertation explores travel behavior within a tour-based framework. Therefore, it uses several terms that are common in the activity-based travel analysis field. It is important to understand the following fundamental definitions that are used throughout this document.

- <u>Trip</u>: A trip is a movement by an individual between a pair of activity locations, or stops (e.g., between home and work or between a store and a park). In general, a trip does not include travel on the same property. Travel between two different stores in the same shopping complex is considered to be a trip, as long as it involves travel outside of a building.
- <u>Stage</u>: Each trip includes at least one stage. A stage represents movement using a single mode of transportation. If a person changes modes in the middle of a trip between two activity locations (e.g., changing from walking to riding the bus), he or she is changing stages of his or her trip.
- <u>Tour</u>: A tour (i.e., trip chain) is the set of all trips that a person makes from the time he or she leaves home until he or she returns home.

In addition, several other terms are used in the document to refer to particular transportation modes, travel purposes, and geographic areas.

- <u>Sustainable transportation</u>: Sustainable transportation modes include pedestrian, bicycle, and public transit modes. In general, these transportation modes produce fewer pollutants, use less infrastructure, and take up less public space per traveler than private automobiles. While an empty bus tends to produce more pollution and take up more space per traveler than a single automobile, this study recommends land use strategies that would increase the use of existing transit systems towards their full capacity. Therefore, transit is included in the definition of a sustainable mode.
- <u>Shopping district</u>: For this study, a shopping district is defined as the area within a half-mile (804-m) radius of a retail pharmacy store survey site. This distance was chosen to create consistent measures of the built environment in each shopping district. This distance captured more than 60% of the non-home stops made by survey respondents. Only 20% of non-home stops were located between 0.5 miles (804 m) and two miles (3.2 km) from the store, and 19% were located further than two miles from the store. The shopping districts included many commercial establishments, such as retail stores, banks, post offices, gas stations, and movie theaters, but they also included a range of other land uses, including industrial, government, and residential properties. One specific part of the shopping district is the store corridor. This is defined as the area 0.2-miles (321-m) wide and 0.5-miles (804-m) long—0.25 miles in (402 m) in either direction—along the commercial street adjacent to the store.
- <u>Routine travel</u>: Routine travel includes movement through space to participate in an activity at a specific location. This may involve driving to a friend’s house, bicycling to work, or walking between stores. Routine travel does not include movement that is done exclusively for recreation or exercise (starting and ending at the same location without stopping along the route to participate in an activity). It also excludes travel made

outside of a person's local urban region (e.g., the nine-county San Francisco Bay region). Note that many people who walk and bicycle to work, shopping, church, or the gym enjoy the benefit of exercise, but these movements are still classified as routine travel because they involve a person participating in an activity outside of his or her home at some point on his or her tour.

1.4. RESEARCH QUESTION AND CONCEPTUAL FRAMEWORK

The overarching research question explored throughout this dissertation is:

What factors are associated with walking or bicycling for routine travel?

In particular, what travel, socioeconomic, attitude, perception, and shopping district characteristics are associated with walking or bicycling rather than driving to, from, and within shopping districts?

Research Subquestions

This question led to three specific research subquestions. These subquestions are explored in depth in the main body of this dissertation:

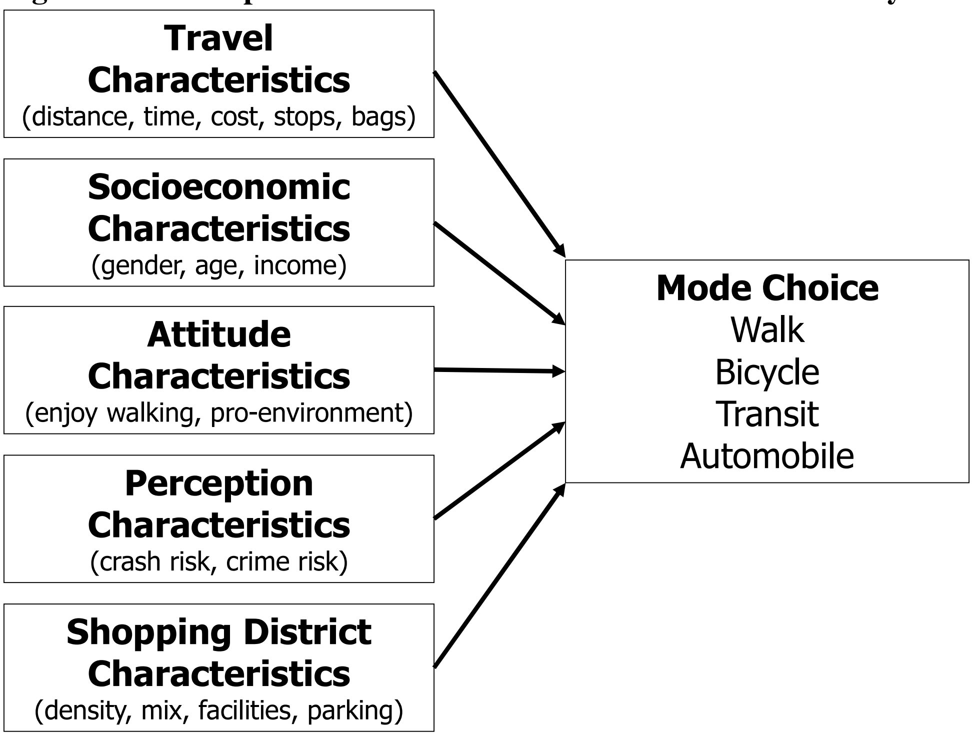
Chapter 4: *What methods are needed to record and analyze all modes of transportation that are used by a person on a tour from the time they leave home until they return home?* This includes detailed information about short pedestrian trips and walking done as a secondary mode of transportation (e.g., walking from a street parking space to a store entrance or walking from home to a bus stop).

Chapter 5: *What travel, socioeconomic, attitude, perception, and local environment characteristics are associated with walking or bicycling rather than driving to and from shopping districts?*

Chapter 6: *What travel, socioeconomic, attitude, perception, shopping district, street, and site characteristics are associated with walking rather than driving between activities within the same shopping district?*

Conceptual Framework
The conceptual framework that guided the data collection and analysis process during this study is shown in Figure 1.1.

Figure 1.1. Conceptual Framework for Data Collection and Analysis



Note that the conceptual framework diagram illustrates the key associations that are being explored through the data collection and analysis process. There are also likely to be relationships between each of the categories of explanatory variables. In particular, socioeconomic characteristics may be related to all of the other characteristics. For example, people who have disabilities (socioeconomic characteristic) may not enjoy bicycling (attitude characteristic) as much as other people because bicycling is painful or not physically possible for them.

DOCUMENT ORGANIZATION

This dissertation is organized into eight chapters. Following this introduction, Chapter 2, "Literature Review", includes a summary of existing literature related to pedestrian and bicycle mode choice, and Chapter 3, "Methodology", provides a general overview of the mixed-methods methodology applied in this study. Both Chapter 2 and Chapter 3 provide general information. Additional topics from the literature and specific details of the methodological approaches related to particular research subquestions are described in Chapters 4, 5, and 6.

Chapter 4, "Measuring Transportation at a Human Scale: An Intercept Survey and GIS Approach to Capture Pedestrian Travel," Chapter 5, "Factors Associated with Sustainable Travel to and from Shopping Districts," and Chapter 6, "Walk or Drive Between Stores? Factors Supporting Sustainable Transportation within Shopping Districts," are the core chapters of this document. Each covers one of the research subquestions. Chapter 7, "Lessons for Planning Practice," discusses overall conclusions from the study and presents a theory of how people choose transportation modes. It also suggests how the study findings can lead to practical strategies to increase walking and bicycling for routine transportation. Finally, Chapter 8, "Considerations and Future Research," provides an overview of follow-up studies that could be conducted to build on the findings of this dissertation.

CHAPTER 2. LITERATURE REVIEW

This dissertation is intended to improve upon existing research methodologies and provide new insights into several theoretical debates in the sustainable transportation field. Therefore, this literature review chapter presents several overarching issues that are discussed in greater detail in later chapters. The first section covers existing methodological challenges, and the second section describes factors that have uncertain relationships with walking or bicycling in the existing literature. These issues drove the development of this research project.

2.1. METHODOLOGICAL ISSUES IN MULTIMODAL TRANSPORTATION RESEARCH

Pedestrian and bicycle transportation choices have often been analyzed within methodological frameworks developed for analyzing the choice of automobile versus public transportation. These existing frameworks have several limitations. They typically:

- Analyze only the primary mode of transportation used for a trip rather than accounting for walking or bicycling that occurs after parking a car or getting off a bus or train.
- Use large geographic zones (e.g., traffic analysis zones) to quantify, analyze, and predict future travel between different parts of urban regions, when most walking and bicycling activity occurs within these zones.
- Ignore the influence of tour-level decisions on mode choice (e.g. choosing to leave home with a car or with a bicycle may make it less likely to walk for a short trip distance within a trip chain), although activity-based approaches are addressing this issue.
- Rely almost exclusively on statistical models to understand transportation mode choices, when the complex set of factors that influence travel behavior (especially walking and bicycling behavior) are very difficult to distill into a small number of predictive variables.
- Discount the influence of cultural norms and perceptions of safety and security on travel behavior, but these factors may be particularly important for pedestrian and bicycle mode choices.

Several methodological challenges identified from previous pedestrian and bicycle travel behavior studies are described below.

<u>Lack of a clearly-defined process to collect and analyze detailed pedestrian travel data</u>
A limited number of studies have gathered and analyzed detailed data on short pedestrian trips or secondary walking movements, such as the time spent walking to and from transit stops or walking across the street from a parking space to a store. Several regional travel surveys have attempted to capture all modes used between activity locations (Metropolitan Transportation Commission 2000; Delaware Valley Regional Planning Commission 2000; Chicago Metropolitan Agency for Planning 2008). However, most studies using regional household travel survey data do not analyze secondary walking trips. Even when short pedestrian stages are captured, it is not common for analysts to examine these data. According to a summary report for the Chicago Regional Household Travel Inventory, "If every single walking movement were gathered, the final mode to almost every location would be by foot" (Chicago Metropolitan Agency for Planning 2010).

Detailed information about walking has been captured in studies that have used global positioning systems and/or accelerometers (Rodriguez, Brown, and Troped 2005; Forsyth *et al*. 2007; Dill and Gliebe 2008; Forsyth *et al*. 2008). However, it was necessary for researchers to pre-select study participants to use these technologies. These studies did not solicit participants while they were conducting routine travel. Participants in these studies had time to think about their travel, think about researcher or social expectations for their behavior, and potentially adjust their routine travel patterns consciously or unconsciously.

Other researchers have gathered walking data from mobile devices (Ratti *et al*. 2006) or bicycle route data from smart phone global positioning systems (GPS) applications (Charlton *et al*. 2011) to map paths in urban environments. However, these studies do not use controlled samples—only people who own particular mobile devices and have them turned on are able to be tracked. Maps of pedestrian or bicycle tracks from mobile devices do not represent all walking or bicycling activity in a particular location or represent the share of total travel in a community that is done by walking or bicycling. In addition, it is not possible to match geographic walking or bicycling tracks with traveler socioeconomic information or other important attitude and perception characteristics unless the subjects enter data into a smart phone or other application (Charlton *et al*. 2011).

There are few studies that have captured detailed walking movements while also capturing respondent socioeconomic information and their attitudes and perceptions related to walking. The method used in this dissertation gathered both types of data from a sample of people who were in the process of doing routine travel.

<u>Few tour-based analyses of pedestrian and bicycle mode choice</u>

This study captured information about the entire tour made by survey participants, rather than viewing individual trip links in isolation. Previous pedestrian, bicycle, and physical activity studies have tended to either examine the characteristics of individual trips, such as home to work, school, or transit station (Loutzenheiser 1997; Purvis 1997; Dill and Carr 2003; Cervero and Duncan 2003; Schlossberg *et al*. 2006; Kim and Ulfarsson 2008; Ryley 2008) or general levels of walking, bicycling, or physical activity during a particular time period (Ball *et al*. 2001; Clifton and Dill 2005; Frank *et al*. 2006; Forsyth *et al*. 2007; Brown, Khattak, and Rodriguez 2008; Forsyth *et al*. 2008). However, there are many short trips that appear to be good candidates to be made by walking or bicycling, but they are made by automobile because they are part of an entire tour that can be made more conveniently by automobile. Therefore, several researchers have considered walking and bicycling as a part of entire tours, or trip-chains, which include the set of trips from the time a person leaves home until they return home (Bowman and Ben-Akiva 2000; Jonnalagada *et al*. 2001). Chen, Gong, and Paaswell (2008) suggest that trip chains, rather than individual trips, should be used for analyzing mode choice. Controlling for trip-chaining characteristics in this study revealed factors that were associated with pedestrian mode choice (such as more street trees, lower commercial roadway speed limits, and fewer busy commercial roadway driveway crossings).

<u>Undetermined magnitude of impacts of residential self-selection on travel behavior</u>

Some researchers suggest that the characteristics of a neighborhood do not have as much influence on residents' choices to walk and bicycle as their predisposition towards walking or bicycling. People who have pro-environment attitudes or who enjoy walking and bicycling will do these activities more, regardless of where they live (Kitamura, Mokhtarian, and Laidet 1997; Shriver 1997). While changing the design of a neighborhood may motivate some changes in the travel behavior of existing residents, people who prefer walking and bicycling also self-select into neighborhoods where walking and bicycling are convenient and comfortable (Handy and Mokhtarian 2005; Cao, Mokhtarian, and Handy 2009). Compared to people who do not bicycle at least once per week, regular bicyclists are more likely to choose to live in a bicycle-friendly community (Handy, Xing, and Buehler 2010). This indicates that it is important to control for personal attitudes when studying neighborhood factors that may be associated with pedestrian and bicycle mode choice.

<u>Unclear understanding of the complex decision process individuals use to choose transportation modes</u>

A number of researchers have suggested that new approaches are needed to understand the complex causal mechanisms involved in travel decisions (Lee and Moudon 2004; White 2007; Forsyth *et al*. 2008; Saelens and Handy 2008; Handy, Xing, and Buehler 2010). These new approaches include talking with individuals about general influences on their travel behavior and more specifically about how they make mode choice decisions for particular trips. This study supplemented survey data with in-depth interviews to explore how several study participants considered time and travel distance, personal environmental values, and social norms related to walking and bicycling within their local community when making mode choice decisions. This approach provided a deeper understanding of individuals' mode choice decision-making processes than survey data alone.

<u>Limited understanding of factors that have causal influences on mode choice</u>

Many studies have identified significant associations between built environment variables and pedestrian and bicycle activity levels through cross-sectional studies. However, these associations do not prove that causal relationships exist (Handy, Xing, and Buehler 2010). For example, adding bicycle facilities to a shopping district may make it a more attractive place to bicycle, which could increase bicycling for routine trips. But communities often add bicycle facilities in areas that already have high bicycle volumes in order to make conditions safer and more comfortable for existing bicyclists. In this case, a high level of bicycling would precede the bicycle facilities. Therefore, bicycle facilities and bicycle mode choice may have an endogenous relationship.

Showing that a particular factor caused a change in walking or bicycling requires quantifying the level of pedestrian or bicycle activity in an area before and after the intervention was done while showing that this change was greater than the change in walking or bicycling that occurred in a similar control area over the same time period. As a cross-sectional study, this dissertation does not imply that particular planning strategies will cause more walking or bicycling. However, planning shopping districts with higher population and employment densities, a greater mix of uses, more street trees, less expansive parking, more designated bicycle facilities; designing commercial streets to have lower speed limits and fewer busy driveway crossings; and clustering stores around shared parking areas are likely to make these activity centers comfortable for walking and bicycling. Even if residents living near a shopping district that is redeveloped with these characteristics do not immediately shift to walking and bicycling more, they may change their behavior slowly over time. The shopping district may also attract new residents who prefer to walk and bicycle more.

2.2. FACTORS THAT HAVE UNCERTAIN RELATIONSHIPS WITH PEDESTRIAN AND BICYCLE TRAVEL

It is not clear which planning strategies may have the greatest potential to increase pedestrian and bicycle activity in different types of urban environments. Researchers have found several categories of factors to be related to pedestrian or bicycle mode choice. These categories include travel time and cost (Purvis 1997; Bowman and Ben-Akiva 2000; Jonnalagadda *et al*. 2001; Cervero and Duncan 2003; Mackett 2003; Kim and Ulfarsson 2008; Ryley 2008), socioeconomic (Bowman and Ben-Akiva 2000; Cervero and Duncan 2003; Kim and Ulfarsson 2008), attitudinal (Kitamura, Mokhtarian, and Laidet 1997; Handy and Mokhtarian 2005; Walton and Sunseri 2007; Handy, Xing, and Buelher 2010), perception (Saelens *et al*. 2003; McMillan *et al*. 2006; Handy, Xing, and Buelher 2010), neighborhood land use (Purvis 1997; Cervero and Duncan 2003; Kim and Ulfarsson 2008; Krizek, Forsyth, and Baum 2009; Schneider, Arnold, and Ragland 2009; Ewing *et al*. 2010; Ewing and Cervero 2010; Handy, Xing, and Buehler 2010), and transportation system factors (Black, Collins, and Snell 2001; Jonnalagada *et al*. 2001; Dill and Carr 2003; Cervero and Duncan 2003; Ewing *et al*. 2010; Ewing and Cervero 2010; Handy, Xing, and Buehler 2010).

While many studies have found associations between travel time and cost, socioeconomic characteristics, attitudes towards walking and bicycling, and certain local environment characteristics and higher levels of walking and bicycling, most studies have looked at only one or two categories of factors. Few existing studies have attempted to control for a wide range of factors within the same research framework. Therefore, practitioners have little guidance about which factors may be most effective at changing travel behavior to increase walking and bicycling.

This study also explores several specific types of factors that have not shown definitive relationships with walking and bicycling in detail. These factors include perceptions of crime and crash risk, urban design characteristics, and the number of activity stops being made and bags being carried by travelers their tours.

<u>Perceptions of Crash and Crime Risk</u>
This study explored the relationship between people's perceptions of traffic safety (e.g., crash risk) and personal security (e.g., crime risk) and walking and bicycling in the shopping district study areas. This issue was also discussed during in-depth interviews. Several previous studies had explored perceptions of traffic safety and personal security. Some found that perceptions of safer streets were associated with more walking and bicycling (Saelens *et al*. 2003; Cao, Handy, and Mokhtarian 2006; McMillan *et al*. 2006). However, perceptions of crime had a significant association with walking and bicycling in some studies (Hooker *et al*. 2005), but not others (Saelens *et al*. 2003). Some studies analyzed perceptions of "safety", including both crime risk and crash risk in a single factor (Suminski *et al*. 2005). This study made a distinction between these two concepts, as done by Saelens *et al*. (2003). It also explored how people's perceptions were different between daytime and night. Concerns about both traffic safety risk and crime risk

were mentioned by many interview participants as influencing their travel behavior, and the survey showed that crash risk perceptions had a statistically-significant relationship with mode choice.

Roadway Design Factors

Researchers have struggled to identify how roadway features such as sidewalks, bicycle lanes, median islands, traffic signals, roadway speed limits, and driveway crossings impact pedestrian and bicycle use. This is because few have had resources to develop detailed measures of these features, quantify walking and bicycling that occurs on or near these features, and use research designs that control for the influence of travel distances and land use characteristics on mode choice. For example, it is common for researchers to classify entire neighborhoods or traffic analysis zones as "traditional", "suburban", "new urbanist" or "transit-oriented" and use aggregate measures of neighborhood walking and bicycling conditions, such as "pedestrian accessibility", "walkability", "route-comfort", or "bicycle-friendliness" (Parsons Brinckerhoff 1993; Kitamura, Mokhtarian, and Liadet 1997; Shriver 1997; Ewing and Cervero 2001; Cervero and Duncan 2003; Clifton and Dill 2005; Cao, Handy, and Mokhtarian 2006; Handy, Cao, and Mokhtarian 2006; Brown, Khattak, and Rodriguez 2008). These aggregate measures do not capture the effects of pedestrian and bicycle facilities on specific roadway segments or intersections. This dissertation used detailed measures of urban design characteristics as variables in mode choice models and identified significant relationships between several of these features and walking and bicycling.

Many studies have found that people prefer walking on streets with important aesthetic features such as street trees (Appleyard 1980; Southworth 2005; Ewing *et al*. 2006), low noise levels (Appleyard 1980; Gehl 2002), inviting windows and fences (Ewing *et al*. 2006), good views (Gehl 2002), and street lights (City of San Francisco 2008). Other studies have shown that people prefer to bicycle on multi-use trails, bicycle lanes that are separated by barriers from moving vehicles, and quiet residential streets rather than sharing roadways with high-speed, high-volume automobile traffic (Schneider *et al*. 2006; Winters and Teschke 2010; Winters *et al*. 2010). However, few of these studies quantify the effect of these design features on pedestrian and bicycle volumes or mode choice. This study was able to quantify the relationship between several urban design features and the choice of walking or bicycling to, from, and within shopping districts.

Number of Bags and Number of Activity Stops

This study gathered information about the total number of activity stops and total number of items subjects were carrying on their tours. While this would seem to be an important barrier to walking, bicycling, and taking transit, few studies have identified the significance of this factor using empirical data. Richards and Ben-Akiva (1974) inferred that walking for shopping trips was more onerous than walking to work because a person was more likely to be carrying bags, and qualitative responses to a journey-to-school survey showed that heavy backpacks were a barrier to walking (Schlossberg *et al*. 2006). Carrying heavy packages was cited as a primary reason for using a car instead of walking or bicycling for shopping trips shorter than five miles (Mackett 2003) and listed as one of the top 10 deterrents of bicycling (Winters *et al*. 2010). However, Amado (2006) observed shoppers at several grocery stores in the Seattle region and concluded that the number of bags carried by customers did not influence mode choice.

In addition, it is not clear whether the number of activity stops on a trip chain have any association with mode choice. Compared with driving, people may be less likely to bicycle and much less likely to take transit and walk on tours that have a greater number of stops (Jonnalagadda *et al*. 2001). However, a study of four Austin neighborhoods showed that between 82 and 92 percent of walking trips were made for more than one activity (Shriver 1997).

2.3. SUMMARY OF RESEARCH NEEDS

Methodological gaps identified in the literature include:

- Lack of a clearly-defined process to collect and analyze detailed pedestrian travel data
- Few tour-based analyses of pedestrian and bicycle mode choice
- Undetermined magnitude of impacts of residential self-selection on travel behavior
- Unclear understanding of the complex decision process individuals use to choose transportation modes
- Limited understanding of factors that have causal influences on mode choice

Researchers have found several categories of factors to be related to pedestrian or bicycle mode choices. These include travel, socioeconomic, attitudinal, perception, land use, and transportation system characteristics. Few studies have explored all of these categories of factors simultaneously within the same methodological framework. In addition, several factors in these categories have uncertain relationships with pedestrian and bicycle travel, including:

- Perceptions of crime and crash risk
- Roadway design factors
- Number of bags being carried and number of activity stops being made

This dissertation takes a first step toward filling several of these gaps.

CHAPTER 3. METHODOLOGY

This chapter provides an overview of the methodology used for this study of sustainable transportation mode choice. It includes background information about the study area, survey site selection process, survey instrument and administration procedures, interview questionnaire and administration procedures, built environment variable measurements, and data analysis approaches. More detail about certain methodological approaches, as they relate to specific research subquestions, is provided in Chapter 4, Chapter 5, and Chapter 6.

3.1. STUDY AREA

Twenty shopping districts located within four San Francisco Bay Area Counties were chosen for the study. Alameda, Contra Costa, San Francisco, and San Mateo counties have a combined population of approximately 4 million residents (US Census Bureau 2008). Environments within this study area range from the San Francisco central business district and surrounding dense residential neighborhoods to moderately-dense suburbs developed along streetcar lines to low-density, automobile-oriented suburbs. The Bay Area Rapid Transit (BART) system has regional rail stations in all four counties, and San Francisco operates a light rail system within its city limits. Several transit companies provide bus service throughout the study area.

Each shopping district was defined as the area within a 0.5-mile (804-m) radius of the retail pharmacy store where the survey was administered. This distance captured more than 60% of the non-home stops made by survey respondents. Only 20% of non-home stops were located between 0.5 miles (804 m) and two miles (3.2 km) from the store, and 19% were located further than two miles (3.2 km) from the store. The shopping districts included many commercial establishments, but they also included a range of other land uses, including industrial, government, and residential properties.

3.2. SURVEY SITE SELECTION

This section describes the rationale for choosing to survey at retail pharmacy stores and the process used to select store sites for distributing the survey.

Rationale for Choosing to Survey at Retail Pharmacy Stores

The survey was conducted at retail pharmacy stores in 20 shopping districts, five in each of the four counties. Retail pharmacy stores were used for several reasons: 1) the stores were located in a variety of built environments (urban and suburban) and have a variety of site designs (parking lot vs. no parking lot; different setbacks; different square footage); 2) the stores were patronized by customers with a wide range of ages, incomes, professional backgrounds, and other socioeconomic characteristics; 3) the stores sold a relatively consistent basket of goods; 4) the stores were distributed throughout the Bay Area in such a way that most people are within two miles of a store, which was a “comfortable” bicycling distance and possible for walking; and 5) the stores had only one entrance, which prevented the systematic bias of surveying people from one entrance by the sidewalk versus a different entrance by the parking lot.

Grocery stores were not chosen because people shopping for groceries often need to carry multiple bags, which tends to favor driving to the store and between locations within the shopping district. Each store was selected from the same national retail pharmacy chain in order to control for individual store and brand preferences.

Surveys were administered at stores rather than at people's homes for several reasons: 1) In order to analyze associations between shopping district and store site characteristics and travel behavior, it was necessary to have a sufficient number of surveys completed at specific sites. If neighborhood residents were surveyed at their homes, it would not be possible to invite a sufficient sample of people who had been to a specific retail pharmacy store site recently; 2) Survey participants were surveyed systematically on site, which could be done more quickly than sampling from a list of neighborhood addresses; 3) Respondents were more likely to recall the specific stops and short walking trips that they had just made and were about to make on their tour than if they had been trying to recall a tour from earlier in the day or from a previous day. In fact, some survey respondents needed to think for several seconds to remember where their first stop had been and where they had transferred modes on more complex tours. This loss of accuracy would have been more significant if more time had passed before a respondent was asked to recall the characteristics of his or her tour.

Survey Store Site and Surrounding Shopping District Selection Process

In order to explore how site and shopping district characteristics were associated with different transportation mode choices, it was important to conduct surveys at retail pharmacy stores in a variety of urban and suburban environments. This required collecting detailed local environment data at a sample of potential store sites and then selecting 20 specific study sites that had a range of characteristics.

A two-step process was used to select store locations. First, since the national retail pharmacy chain had more than 150 locations in the four-county study area, it was not feasible to collect detailed neighborhood and site data for all stores. Instead, a preliminary list of 30 stores was selected by reviewing all store addresses in each county and selecting locations that represented different geographic areas. Each county had between seven and nine stores in the preliminary list. Store site and surrounding shopping district characteristics were collected for each of the 30 preliminary stores. Second, 10 variables were used to select a subset of 20 stores that had a wide variety of characteristics representing land use and proximity, transportation infrastructure and metered parking, urban design elements, and crime risk. This was done by generating several possible sets of 20 stores from the list of 30 stores. Each set had five stores from each county. These sets were reviewed, and the set with the greatest range of values for the 10 variables was chosen for the study (Table 3.1).

The 20 study shopping district locations are shown in Figure 3.1. The characteristics of these 20 shopping districts are summarized in the following paragraphs. Each of the variables discussed was hypothesized to have an association with store customer mode choice. Note that many additional variables were measured and used in the analysis, but these preliminary measurements ensured that a variety of urban environments were represented in the study.

Table 3.1., Part 1. Characteristics Considered for Initial Selection of 20 Retail Pharmacy Store Sites

Survey Location		*Land Use & Proximity*		*Transportation Infrastructure & Metered Parking*				*Urban Design Elements*			*Crime Risk*	*Other Characteristics*							
Name	County	1) Total residential population within 0.5 miles (804 m)[1]	2) Total number of commercial properties within 0.5 miles (804 m)[2]	3) % sidewalk coverage on arterial & collector streets within 0.5 miles (804 m)[3]	4) Kilometers of bicycle facilities within 0.5 miles (804 m)[4]	5) Kilometers of automobile through-lanes within 0.5 miles (804 m)[5]	6) Presence of pay parking within 0.1 miles (161 m)[6]	7) Meters from store door to public sidewalk[7]	8) Meters from store to closest BART station[8]	9) Tree coverage category of streets within 0.25 miles (402 m)[9]	10) Crime risk category of neighborhood within 0.5 miles (804 m)[10]	Median annual household income (Dollars) within 0.5 miles (804 m)	Proportion of population living within 0.5 miles (804 m) that is White	Proportion of households within 0.5 miles (804 m) that have no automobile	Total number of jobs within 0.5 miles (804 m)	Store has a drive through window	Number of parking spaces in the store parking lot	Number of through-lanes on adjacent street with the most through-lanes
Berkeley	Alameda	12233	112	100	8.96	81.74	1	10	564	Medium	Medium	35934	0.52	0.21	6331	0	37	4 00
Oakland	Alameda	12542	72	90	1.45	88.01	0	2	1497	Low	High	30787	0.15	0.20	1594	1	51	4 00
Hayward	Alameda	6246	69	90	0.00	78.68	0	20	1506	Low	High	45779	0.60	0.10	1711	0	44	6 00
Fremont	Alameda	6475	15	100	3.41	60.98	0	10	412	Medium	Medium	63094	0.48	0.13	4205	1	197	6 00
Pleasanton	Alameda	3798	21	100	1.71	65.00	0	52	3646	High	Low	92688	0.88	0.03	1208	0	442	4 00
Danville	Contra Costa	1635	51	90	7.74	53.74	0	20	11997	High	Low	93413	0.90	0.02	609	0	290	4 00
Brentwood	Contra Costa	1655	40	70	8.69	52.94	0	28	24280	High	Low	57478	0.76	0.10	195	1	193	4 00
Concord	Contra Costa	4320	141	100	0.00	69.67	0	10	997	High	Medium	44435	0.63	0.31	11634	0	59	4 00
Richmond	Contra Costa	10899	82	95	2.72	86.08	0	33	430	Medium	High	28243	0.21	0.30	3229	0	310	4 00
El Cerrito	Contra Costa	6358	95	100	10.18	79.81	1	40	227	Medium	High	54250	0.27	0.13	2216	1	250	5 00
SF--Market St.	San Francisco	22148	528	100	5.87	109.89	1	1	342	Medium	Medium	31216	0.42	0.81	145200	0	0	4 00
SF--Fillmore St.	San Francisco	23960	122	100	0.00	84.96	1	1	1899	High	Medium	63896	0.60	0.33	14561	0	10	3 00
SF--Taraval St.	San Francisco	12732	71	100	2.82	66.13	1	1	3605	Low	Medium	71323	0.45	0.11	2132	0	0	4 00
SF--Mission St.	San Francisco	32190	204	100	3.14	90.75	1	1	203	Medium	High	55520	0.57	0.33	7584	0	0	4 00
SF--Third St.	San Francisco	12733	70	100	0.53	70.64	0	3	3403	Low	High	43055	0.10	0.19	3359	0	44	4 00
S. San Francisco	San Mateo	8635	9	80	2.65	67.58	0	90	2295	Medium	Medium	72741	0.27	0.04	778	0	420	5 00
Daly City	San Mateo	12000	155	80	0.00	82.06	1	1	538	Low	Low	58819	0.27	0.11	2394	0	78	6 00
Burlingame	San Mateo	4411	86	70	0.00	69.51	1	3	2473	High	Low	90478	0.79	0.05	4375	0	20	2 00
San Mateo	San Mateo	9631	207	95	1.56	69.83	1	1	6826	High	High	73154	0.64	0.16	6332	1	60	2 00
San Carlos	San Mateo	4931	147	50	3.54	65.97	0	39	16727	Low	Low	74540	0.83	0.06	4195	1	85	5 00
	Mean	10477	115	91	3.25	74.7	0.45	18 30	4193			59042	0.52	0.19	11192	0.30	129 50	4 20
	Std. Dev.	7849	112	14	3.30	13.7	0 51	23 20	6356			20336	0.25	0.18	31757	0.47	142.14	1.11
	Median	9133	84	98	2.69	70 2	0 00	10 00	1703			58148	0.54	0.13	3294	0.00	59.50	4 00
	Minimum	1635	9	50	0.00	52 9	0 00	1 00	203			28243	0.10	0.02	195	0.00	0 00	2 00
	Maximum	32190	528	100	10.18	109 9	1 00	90 00	24280			93413	0.90	0.81	145200	1.00	442 00	6 00

Table 3.1., Part 1. Characteristics Considered for Initial Selection of 20 Retail Pharmacy Store Sites: Footnotes

1) Total population within 0.5 miles (804 m) was calculated from 2000 census block group data. The calculation of population only included portions of census block groups within the 0.5-mile (804-m) radius of the store.

2) Commercial retail/entertainment properties were defined by the four county assessor's offices. These commercial land uses included commercial, entertainment, store, service, tourism, store on first floor with other above, department store, single-story store, restaurant, post office, bank, supermarket, food store, lodge hall, car wash, gas station, auto dealer, movie theater, bowling alley, winery, stadium, commercial mix, and commercial building. This category did not include commercial office buildings. Note that one building structure could include multiple commercial properties.

3) The sidewalk coverage calculation assumed that complete coverage was continuous sidewalks on both sides of the street. Therefore, if a street had sidewalks on both sides, it had 100% sidewalk coverage. If a street had a complete sidewalk on one side, but no sidewalk on the other, it had 50% coverage.

4) Bicycle facilities included bicycle lanes, shared lane markings, bicycle boulevards, and multi-use trails. They did not include streets that only had bicycle route signs. Bicycle facility kilometers were calculated using the same methodology as automobile lane kilometers. If bicycle lanes or shared lane markings were on both sides of a one-kilometer-long street segment, this represented two kilometers of bicycle facilities (this avoided the problem of misrepresenting one-way bicycle facilities on one-way streets). Bicycle boulevards and multi-use trails are two-way facilities, so one-kilometer of centerline counted as two kilometers of bicycle facilities.

5) The calculation of automobile lane kilometers included only surface streets. It did not include limited-access highways or private drives. Automobile lane kilometers were calculated by direction. Therefore, a one-kilometer segment of two-lane roadway was counted as two lane kilometers. Exclusive turn lanes were not included in this calculation. Local streets (not arterial or collector roadways) were assumed to have one lane in each direction.

6) Presence of pay parking within 0.1 miles (161 m) was noted using Google Street View.

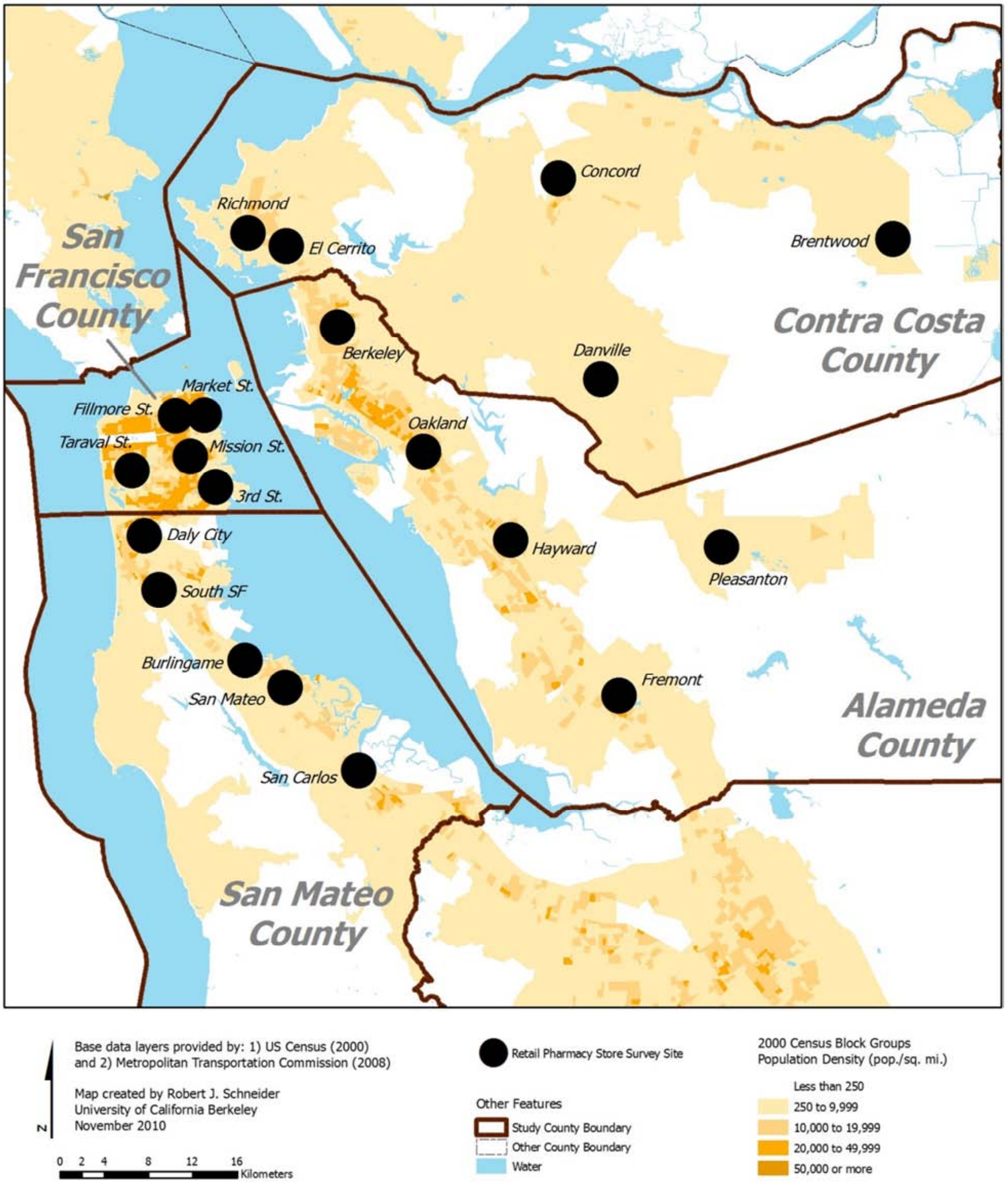
7) Meters from store door to public sidewalk was measured as the most direct path from the door to the sidewalk that did not involve crossing fences or landscaping. Measurement was done using the Google Earth measuring tool. Building doors were located using Google Street View.

8) Meters from store to closest BART station was measured as the straight-line distance from the store centroid to the BART station centroid. Measurement was done in GIS.

9) Tree coverage was based on an estimate of the total public right-of-way surface area within 0.25 miles (402 m) of the store that was covered by tree canopy. Estimates were made based on Google Earth aerial images from June 2007 and July 2007 (leaves were on the trees). The tree coverage estimates associated with each category were: High (>10%), Medium (5% to 9%), and Low (<5%).

10) Major crime risk was based on the four Part 1 violent crimes, as defined by the FBI Uniform Crime Report Categories. These crimes are homicide, rape, aggravated assault, and robbery. The crime data included all Part 1 violent crimes reported in June 2009 within 0.5 miles (804 m) of each store location. Data were collected from local police department staff, local police department websites, and CrimeReports.com. The data were normalized to a crime rate by dividing the number of reported crimes by the estimated weekly pedestrian volume at an intersection adjacent to the store and multiplying by 100,000. The pedestrian volume estimate was based on the model developed by Schneider, Arnold, and Ragland (2009), which predicts pedestrian volume based on population within 0.5 miles (804 m), employment within 0.25 miles (402 m), commercial properties within 0.25 miles (402 m), and regional transit stations within 0.1 miles (161 m). The crime rates associated with each category were: High (>80), Medium (20 to 80), and Low (<20). Crime data were not available for one location that was not selected.

Figure 3.1. San Francisco Bay Area Shopping District Survey Sites



Note: 1 mile = 1.61 kilometers
1 square mile = 2.69 square kilometers

Land Use and Proximity

- 3 selected survey stores had more than 20,000 people living within 0.5 miles (804 m); 6 selected locations had fewer than 5,000 people living within 0.5 miles (804 m).
- 5 survey stores had more than 140 commercial properties within 0.5 miles (804 m); 6 locations had fewer than 70 commercial properties within 0.5 miles (804 m).

Transportation Infrastructure and Metered Parking

- 10 survey stores had 100 percent sidewalk coverage on arterial and collector streets within 0.5 miles (804 m) and 5 had less than 90 percent coverage.
- 5 survey stores had more than 3 miles (4.8 km) of bicycle facilities within 0.5 miles (804 m); 8 survey stores had less than 1 mile (1.6 km) of bicycle facilities within 0.5 miles (804 m).
- 7 survey stores had more than 50 automobile lane miles (80 automobile lane kilometers) within 0.5 miles (804 m); 3 survey stores had fewer than 40 automobile lane miles (64 automobile lane kilometers) within 0.5 miles (804 m).
- 9 survey stores had pay parking spaces within 0.1 miles (161 m); 11 survey stores did not have pay parking nearby.

Urban Design Elements

- 5 survey stores had doors that were more than 30 meters from the closest public sidewalk; 9 survey stores had doors that were less than 3 meters from the sidewalk.
- 7 survey stores were located within 0.5 miles (804 m) of the closest BART station; 10 survey stores were located further than 1 mile (1.6 km) from a BART station.
- 7 survey stores had "high" tree coverage; 7 stores had "medium" tree coverage; 6 stores had "low" tree coverage. The tree coverage category represented the estimated percentage of public right-of-way surface area covered by tree canopy within 0.25 miles (402 m).

Crime Risk

- 7 survey stores had "high" crime risk; 7 stores had "medium" crime risk; 6 stores had "low" crime risk. Crime risk was estimated by the number of violent crimes reported within 0.5 miles (804 m) of the store in June 2009 normalized by estimated pedestrian volume.

Additional Characteristics

While the 10 variables listed above were used to select the 20 study shopping districts, several other measures indicated that there was good variety between the 20 sites:

- 7 survey store shopping districts had neighborhood median household incomes of more than $70,000; 4 shopping districts had neighborhood median household median incomes of less than $40,000.
- 5 survey store shopping districts had more than 30 percent of households without an automobile; 5 shopping districts had more than 90 percent of households with an automobile.
- 7 survey stores had parking lots with more than 100 spaces; 5 stores had parking lots with fewer than 50 spaces; 3 stores did not have parking lots.

- 6 survey stores were adjacent to main roadways with more than 4 lanes; 3 stores were adjacent to main roadways with fewer than 4 lanes.
- 6 survey stores had drive-through pharmacy windows; 14 stores did not have drive-through windows.

3.3. SURVEY INSTRUMENT AND ADMINISTRATION PROCEDURES

This section describes the survey instrument used at 20 retail pharmacy store study sites and provides an overview of how the survey was administered by three data collectors.

Survey Instrument

The survey was designed to capture customer travel patterns, socioeconomic characteristics, attitudes towards different travel modes, and perceptions of neighborhood crime and transportation safety (see Appendix A). General travel information included the number of stops (activity destinations) that the respondent had already been to and was planning to visit before returning home, out-of-pocket travel costs, number of people traveling with the respondent, number of packages or bags being carried by the respondent, and when the respondent decided to visit the store.

Socioeconomic information collected in the survey included household size, vehicle ownership (automobile and bicycle), employment, annual household income, age, and gender. Other questions gathered information about how easy it would be to change personal travel behavior, transportation and the environment, pedestrian and bicycle safety, personal attitudes towards walking and bicycling, perceptions of neighbors' attitudes towards walking and bicycling, and perceptions of crime and traffic safety in the area surrounding the retail pharmacy store.

Detailed travel data were collected within a two-mile (3.2-km) radius of the store. Surveyors marked the location of all stops within the two-mile (3.2-km) radius (exact location or the closest intersection) and also wrote the general locations of other stops made outside of the two-mile (3.2-km) radius (i.e., name of the city or neighborhood where each stop was made) on a map on the back side of the survey form. Respondents who lived outside of the two-mile (3.2-km) radius were included in the survey (they represented 23% of respondents).

A two-mile (3.2-km) radius was used to define the map area because this study focuses on pedestrian and bicycle travel. The 2009 NHTS showed that approximately 97% of walking trips and 74% of bicycling trips are two miles (3.2 km) or less (unweighted trip data) (Federal Highway Administration 2009). In addition, the map scale was approximately the smallest possible that allowed nearly all streets to be labeled.

As the surveyors recorded the route taken by the respondent, they asked about different travel modes used on the tour. If an automobile was used for any part of the tour, respondents were asked to report whenever they walked for one-half block or more from a parking spot to an activity or home (i.e., the only pedestrian movements that were not recorded were walking within a parking lot, from a driveway into a house, or from a street parking space directly in front of a destination). If transit was used, respondents were asked to report how far they walked to and from each transit stop (walking within a transit station or transit station parking lot was not recorded).

The survey instrument was pilot tested in spring 2009 and was approved by the UC Berkeley Committee on the Protection of Human Subjects in August 2009. English and Spanish versions of the survey instrument were used. The consent form that was offered to all survey participants is included in Appendix B.

Survey Administration

More than 1,000 retail pharmacy store customers took the survey between August 29, 2009 and December 9, 2009. 4,585 retail pharmacy store customers were invited to participate in the survey, and 1,003 customers (22%) took the survey. Permission to administer the survey was provided by the retail pharmacy store company, and the head data collector notified the store manager in person at the beginning of each survey period. Surveys were distributed relatively evenly between each of the 20 stores (between 45 and 56 customers from each store were surveyed). A summary of response rates from each of the 20 stores is presented in Table 3.2.

Approximately half of the surveys at each site were done on weekday afternoons between 4:00 p.m. and 6:00 p.m. (Fridays were excluded because they were expected to have substantially different travel patterns than other days of the week). The other half of the surveys at each site were done on Saturday late mornings and afternoons between 11:00 a.m. and 5:00 p.m. Most survey periods were two hours in duration, but some were 30 minutes or one hour. Surveys were done at more than one site on some days. All surveys were administered during daylight and fair weather conditions. Temperatures during survey periods ranged from 50 °F (10 °C) to 85 °F (29 °C). Surveys were not offered when it was raining or when the previous day's forecast predicted more than a 50 percent chance of rain.

Table 3.2. Number of Surveys Completed by Location

Survey Location				Completed Surveys					Refusals	
ID	Address	Municipality	County	Weekday Survey Dates	Weekday Surveys	Saturday Survey Dates	Saturday Surveys	**Total Surveys**	# of Refusals	**Response Rate**[1]
1	2801 Adeline Street	Berkeley	Alameda	9/3, 9/21, 10/21	26	8/29, 12/5	29	**55**	263	**17.3%**
4	8102 E 14th Street	Oakland	Alameda	10/22	27	10/24	24	**51**	135	**27.4%**
6	21463 Foothill Boulevard	Hayward	Alameda	9/2, 9/29	31	10/3	23	**54**	123	**30.5%**
7	2600 Mowry Avenue	Fremont	Alameda	9/15	23	10/24	26	**49**	176	**21.8%**
8	1763 Santa Rita Road	Pleasanton	Alameda	9/23	21	12/5	28	**49**	163	**23.1%**
9	611 San Ramon Valley Blvd.	Danville	Contra Costa	10/7	21	11/21	24	**45**	112	**28.7%**
10	4520 Balfour Road	Brentwood	Contra Costa	10/28	24	9/19, 11/21	21	**45**	121	**27.1%**
12	1800 Concord Avenue	Concord	Contra Costa	10/8	26	9/19, 11/21	21	**47**	174	**21.3%**
14	1150 Macdonald Avenue	Richmond	Contra Costa	9/14	23	10/10	28	**51**	140	**26.7%**
15	11565 San Pablo Avenue	El Cerrito	Contra Costa	8/31	25	9/5, 10/10	24	**49**	193	**20.2%**
16	730 Market Street	San Francisco	San Francisco	9/10, 12/9	26	10/17, 12/9	26	**52**	283	**15.5%**
17	1899 Fillmore Street	San Francisco	San Francisco	10/5, 12/9	27	11/14, 12/9	26	**53**	225	**19.1%**
19	1201 Taraval Street	San Francisco	San Francisco	9/30	21	11/7, 11/14	26	**47**	180	**20.7%**
20	2690 Mission Street	San Francisco	San Francisco	9/28	25	10/17	31	**56**	178	**23.9%**
21	5300 3rd Street	San Francisco	San Francisco	10/1	24	11/14	25	**49**	121	**28.8%**
24	2238 Westborough Blvd.	S. San Francisco	San Mateo	10/20	26	9/26	22	**48**	201	**19.3%**
25	22 San Pedro Road	Daly City	San Mateo	10/15	23	10/31	24	**47**	236	**16.6%**
26	1160 Broadway	Burlingame	San Mateo	10/26, 10/29	28	9/26, 12/5	26	**54**	155	**25.8%**
27	191 E 3rd Avenue	San Mateo	San Mateo	9/17, 10/26	27	10/31	26	**53**	223	**19.2%**
28	1414 El Camino Real	San Carlos	San Mateo	9/24	25	9/12	24	**49**	180	**21.4%**
			Total	**8/31 to 12/9**	**499**	**8/29 to 12/5**	**504**	**1003**	3582	**21.9%**

1) Response rate is calculated as (Number of surveys/Total number of people invited to participate in survey).

Distribution Process

Surveys were offered to customers exiting each of the retail pharmacy stores. The first person to exit the store at the beginning of the survey period was invited to participate in the survey. If that person refused, the next person to exit the store was invited. After each completed survey, the next customer who exited the store was asked to participate. Minors (younger than age 18) were not allowed to participate. Some customers shopped in a group. As a group exited, the first adult from the group was asked to participate. Only one member of each group was allowed to participate.

Surveyors used a variation of the following question to invite customers to participate: "Hi, could you help with a short survey?" In some cases, customers showed interest, but wanted additional information or required more convincing before agreeing to participate. In these cases, surveyors made statements, such as "I know you are in a hurry; I can do it fast", "It will only take three minutes", "It is about transportation", "It is about transportation and land use", "It is for my dissertation", or "It is for school research". When survey participants indicated an initial willingness to participate, they were given the survey consent form.

Survey questions were read aloud to each participant, and the surveyors recorded all responses. This was more efficient than having participants read through the questions and write their own responses. In addition, it was helpful for survey participants who may have had difficulty reading or writing. In some cases, surveyors were able to help respondents understand questions. In other cases, surveyors were able to ask follow-up questions to clarify respondents' answers.

Three different surveyors distributed surveys throughout the fall 2009 study period, including the lead researcher and two Spanish-speaking assistants (Table 3.3). Each specific survey period was covered by one or two of the surveyors. The surveyors stood approximately 10 feet (3 m) from the store exit. Each surveyor had a clipboard with surveys, and the back side of the clipboard had a sign that said "Student Survey." At times when two surveyors were used, at least one of the surveyors spoke Spanish. When one surveyor was administering a survey, the other invited exiting customers to participate. When neither surveyor was administering a survey, the surveyors typically alternated inviting customers to participate. If a customer said that he or she did not speak English, he or she was directed to the Spanish-speaking surveyor, if that surveyor was available.

Table 3.3. Number of Surveys Administered by each Surveyor

Surveyor	Total Surveys	Percentage
Robert Schneider	549	54.7%
Carlos Velasquez (S)	304	30.3%
Melissa Chinchilla (S)	150	15.0%
Total	**1003**	**100.0%**

(S) indicates that the surveyor spoke both English and Spanish.

The survey was designed to be completed in three minutes for someone who was on a relatively simple tour (e.g., one or two other stops besides the survey store) using a single travel mode. However, the average survey time was estimated to be five minutes, and some surveys took up to

10 minutes. During the survey, some participants added their own comments about specific transportation modes, problems with the local transportation system, opinions about the neighborhood, and other topics, so this extended the time needed to complete some surveys.

Non-Response

The gender, estimated age, and group size of all people who refused to participate in the survey were recorded. This information was compared to the characteristics of the survey participants to identify potential non-response bias.

- 59% of respondents were female; 41% of respondents were male (56% of non-respondents were female; 44% of non-respondents were male). The survey respondents were slightly more likely to be female than non-respondents at the 20 survey stores.
- 31% of respondents were between ages 18 and 34, 56% were between 35 and 64, and 13% were age 65 or older (30% of non-respondents were estimated to be between ages 18 and 34, 56% were estimated to be between 35 and 64, and 14% were estimated to be age 65 or older). The survey respondents had an age distribution that was similar to non-respondents at the 20 survey stores.
- 73% of respondents were traveling alone, 19% were traveling in two-person groups, 5% were traveling in three-person groups, and 2% were traveling in four-or-more person groups (78% of non-respondents were estimated to be traveling alone, 16% were estimated to be traveling in two-person groups, 4% were estimated to be traveling in three-person groups, and 1% were estimated to be traveling in four-or-more person groups). The data recorded as non-respondents exited the store suggested that the survey was more likely to capture people traveling in groups than is typical for the 20 survey stores. However, it is likely that some customers who declined to participate were traveling with other group members who were waiting in a car, shopping in a nearby store, or exiting the Walgreens store at a different time. Therefore, the actual group size for some customers refusing to participate in the survey could have been larger than recorded.

Note that it was not possible to offer the survey to all customers exiting the store. It is not known how many people exited the store while surveys were being administered to other customers or how many people were not offered the survey because they exited at the same time as another customer who was offered the survey. Insights into non-response were gained over three months of surveying. Reasons why people did not participate in the survey are discussed in Chapter 4.

Basic survey data are summarized in Appendix C. Some survey participants also provided additional comments as they responded to the survey. These comments are summarized in Appendix D.

3.4. INTERVIEW QUESTIONNAIRE AND ADMINISTRATION PROCEDURES

The goal of the interviews was to gain a deeper understanding of certain survey responses and to get a sense for which factors have the strongest influence on mode choice decisions. Several sets of questions were used to gather this information:

- Background information about the interview participants' families, professions, and how they traveled to different activities over the last day. These initial questions were also used to build rapport with the interview participants.
- Opinions about transportation and the environment, including how difficult it would be for the interviewees to change routine travel habits.
- General information about participants' tour characteristics and mode choice, including when they decided to use particular modes of transportation and how the number of activity stops they needed to make and number of packages they needed to carry on their tour.
- Thoughts about how neighborhood or built environment characteristics influence the interviewees' mode choices, including changes they would like to see in their neighborhood to make walking and bicycling safer or more convenient. This included information about types of locations where respondents liked to walk for pleasure.
- Feedback about the influence of parking cost, tolls, and transit fares on the interviewees' mode choices. This also included feedback about specific travel behavior changes when gas prices spiked in Summer 2008. It was anticipated that some participants could have difficulty recalling specific travel behaviors after more than one year, but nearly all of the interviewees recalled that there were higher gas prices and commented about them.
- Attitudes towards walking and bicycling, including what came to the interviewees' minds when they saw people walking or bicycling along a street in their community and reasons why people in their community chose to walk or bicycle. This section also explored whether or not the interviewees bicycled when they were children or teenagers, and how their attitudes towards bicycling and bicycling behavior changed over time.
- Thoughts about generational differences in walking and bicycling behaviors, attitudes, and perceptions, including whether the participants thought there were differences between their peers and people who were older or younger. Follow-up questions were often asked about how the interviewees had changed travel habits during different stages of life.

The interview questionnaire was pilot tested with three of the lead researcher's family members in February 2010 to practice taking notes, asking follow-up questions, and make sure that the questions were understandable to people who were not in the transportation planning field. The final version of the questionnaire is provided in Appendix E.

In-depth interviews were conducted with 26 of the retail pharmacy store participants between March 12, 2010 and July 15, 2010. The 26 interviewees were selected from the list of 172 survey participants who agreed to be contacted for a follow-up interview. An attempt was made to contact all 172 people on the list by phone and/or e-mail, but not all people provided correct contact information, and most people who had provided correct contact information did not respond to the request for an interview. The 26 interview participants represented all parts of the four-county study area. However, it is likely that these interviewees were more interested in the topics of transportation and urban planning than non-participants, so their responses may reflect this bias.

Nearly all interviews were conducted by telephone and recorded using a teleconferencing service (www.totallyfreeconferencecalls.com). One participant wished to do the interview in-person on the UC Berkeley campus, and this conversation was recorded using the lead researcher's mobile phone. The lead researcher forgot to activate the conference call recording capabilities for one participant, so the responses from this interview came from hand-written notes.

Before the interview started officially, the lead researcher went over the interview consent script and asked the potential participant for verbal consent to conduct and record the interview (Appendix F). There were no right or wrong answers, participants did not need to answer questions that they did not feel comfortable answering, and they could end the interview at any time. After receiving verbal consent, the recording was started, and the interview began.

Interview Theme Identification

Many important themes emerged from the interviews. Participant feedback suggested that the mode choice process is complex, involving several considerations: 1) awareness and availability, 2) basic safety and security, 3) convenience and cost, 4) enjoyment, and 5) habit. These key considerations formed the basis of a proposed Theory of Routine Mode Choice Decisions (Chapter 7). The in-depth interviews were also essential for uncovering insights about several key themes related to the mode choice process:

- Walking and bicycling were viewed positively because they provided both physical and mental health benefits.
- Most interviewees thought that reducing automobile travel would benefit the environment by conserving natural resources and limiting air pollution.
- A single family member or close friend inspired some interviewees to walk or bicycle more.
- Perceptions of traffic crash risk discouraged many interviewees from bicycling.
- Interviewees with little bicycling experience preferred bicycling on facilities that were physically separated from automobile traffic.
- Work- and family-related time constraints were a barrier to walking or bicycling.
- Travel planning time, bad weather, and carrying packages were barriers to walking and bicycling. These barriers were less significant when activity destinations were nearby.
- Changes in work location prevented some interviewees from walking and bicycling.
- Few interviewees changed modes when gas prices spiked in Summer 2008.
- Bicyclists were viewed negatively by some interviewees because they were perceived as being in the way of automobile traffic and/or exhibiting law-breaking or reckless behaviors.

Each of the specific themes are described in more detail with specific quotes from interviewees in Appendix G.

3.5. SHOPPING DISTRICT DESIGN VARIABLE MEASUREMENTS

More than 50 shopping district variables were measured using aerial photographs. Aerial photographs were available from two commercial sources, Google Earth and Microsoft Bing Maps. These aerial photographs had sub-one-foot pixel resolution, which made it was possible to see automobile and bicycle lane lines, curb lines, sidewalk edges, buffer zones between the curb and sidewalk, and building footprints. The aerial photographs were georeferenced, so they could be matched with data layers in GIS. However, they were not corrected for the angle of the camera when the photo was taken, so some sidewalk sections were hidden "under" the roofs of taller buildings in certain images. The width of these hidden sidewalks was estimated based on the sidewalk width at the corner of the block and sidewalk on the opposite side of the street. The aerial photographs from both sources had been taken between 2007 and 2009, so they provided a close representation of the built environment that was present when respondents took the survey at retail pharmacy stores in fall 2009.

The shopping district variables were measured and entered into the GIS database layers listed below. More details about the variables created from these measurements, including sample size, units of measurement, and summary statistics, are provided in Chapter 5 and Chapter 6.

- Multilane roadways (roadways with 3 or more through-lanes) within the shopping district around each survey store (e.g., within 0.5 miles (804 m) of the store). One measurement was taken for each block, and the measurement represented the average value for the entire block. Measurements were made to the closest 0.5 feet (15 cm). These data were entered into a GIS line shapefile database.
    - Roadway width (curb-to-curb)
    - Sidewalk width (both sides, each entered into a separate database field)
    - Buffer width (both sides, each entered into a separate database field)
    - On-street parking lane width (both sides, each entered into a separate database field)
    - Outside lane width (both sides, each entered into a separate database field)
    - Bicycle lane or shoulder width (both sides, each entered into a separate database field)
    - Raised median width
    - Number of automobile through-lanes
    - Number of alley and busy driveway crossings (busy driveways included non-residential driveways and driveways accessing residential buildings estimated to have 10 or more units)
    - Average building setback from the public sidewalk or roadway right-of-way
    - Steepness (difference in elevation between intersections at the end of each block—this was converted to grade by dividing the change in elevation by the block length)
    - Tree canopy coverage (estimated percentage of roadway and sidewalk right-of-way covered out of the total land area devoted to public right-of-way)
- Main commercial roadway within the shopping district (this street was the primary commercial street adjacent to the survey store, and measurements were taken 0.25 miles (402 m) in each direction from the store, constituting a 0.5-mile (804-m) corridor). One measurement was taken for each block, and the measurement represented the average value for the entire block. Measurements were made to the closest 0.5 feet (15 cm). These data were entered into a GIS line shapefile database.
    - Roadway width (curb-to-curb)
    - Sidewalk width (both sides, each entered into a separate database field)
    - Buffer width (both sides, each entered into a separate database field)
    - On-street parking lane width (both sides, each entered into a separate database field)
    - Outside lane width (both sides, each entered into a separate database field)
    - Bicycle lane or shoulder width (both sides, each entered into a separate database field)
    - Raised median width

- Number of automobile through-lanes
- Number of alley and busy driveway crossings (busy driveways included non-residential driveways and driveways accessing residential buildings estimated to have 10 or more units)
- Average building setback from the public sidewalk or roadway right-of-way
- Steepness (difference in elevation between intersections at the end of each block—this was converted to grade by dividing the change in elevation by the block length)
- Tree canopy coverage (estimated percentage of roadway and sidewalk right-of-way covered out of the total land area devoted to public right-of-way)

- Main commercial roadway intersection crossing characteristics (this includes all crossings 0.25 miles (402 m) in each direction from the store, constituting a 0.5-mile (804-m) corridor). These data were entered into a GIS point shapefile database.
  - Crossing distance (curb-to-curb) across the commercial roadway approaches to the intersection, representing the shortest line within the marked or unmarked crosswalk (both approaches, each entered into a separate database field)
  - Crossing distance (curb-to-curb) across the cross-street roadway approaches to the intersection, representing the shortest line within the marked or unmarked crosswalk (both approaches, each entered into a separate database field)
  - Number of through-, left-, and right-turning lanes that pedestrians must cross on the commercial roadway approaches to the intersection (both approaches, each entered into a separate database field)
  - Number of through-, left-, and right-turning lanes that pedestrians must cross on the cross-street roadway approaches to the intersection (both approaches, each entered into a separate database field)
  - Raised median width on the commercial roadway approaches to the intersection (both approaches, each entered into a separate database field)
  - Raised median width on the cross-street approaches to the intersection (both approaches, each entered into a separate database field)
  - Tree canopy coverage (estimated percentage of intersection and sidewalk corner right-of-way covered out of the total land area devoted to public right-of-way)
- Store site characteristics. These data were entered into a GIS point shapefile database.
  - Distance from store entrance to closest sidewalk
  - Gross store footprint area
  - Single-store vs. part of shopping complex with shared parking lot

Several other important shopping district variables were collected through field observations in spring 2010. These included:

- Main commercial roadway intersection crossing characteristics (this includes all crossings 0.25 miles (402 m) in each direction from the store, constituting a 0.5-mile (804-m) corridor). These data were entered into a GIS point shapefile database.
  - Posted speed limit
  - Running speed, observed by driving the length of each corridor three times in both directions. Since these measurements were not taken at the same time of day under similar traffic conditions, they were not used for further analysis.
  - Street activity (categorical variable: high, medium, low). Since these observations were not taken at the same time of day, they were not used for further analysis.

- Store site characteristics. These data were entered into a GIS point shapefile database.
    - Average mid-day on-street parking price per hour within 0.1 miles (161 m) of store
    - Number of bicycle parking spaces on store property only
    - Number of bicycle parking spaces within 0.1 miles (161 m) of store, including on store property and on sidewalks

Photographs were also taken in the field in spring 2010 to document shopping district commercial roadway characteristics. The following photographs were taken:

- Picture from street directly in front of the store
- Picture from street approach at left of the store from 30 degree angle
- Picture from street approach at right of the store from 30 degree angle

Several other data items were collected for each shopping district or survey store using secondary data sources. These included:

- Pedestrian and bicycle crashes reported in the shopping district over a 10-year period. Reported crashes from 1998 to 2007 were queried from the California Highway Patrol Statewide Integrated Traffic Records System (SWITRS) database.
- Euclidian distance between store entrance and nearest bus stop. These distances were calculated using the Metropolitan Transportation Commission transit stop GIS layer, which was updated in 2009.

The shopping district design variables that were measured were hypothesized to be associated with customer mode choices based on previous research and pedestrian and bicycle design practice. To date, relatively few of these characteristics have been demonstrated to have a clear connection with pedestrian or bicycle mode choices. For example, sidewalk presence and width are critical for providing accessibility for pedestrians of all ages and abilities, but they have not been shown conclusively to be related to higher levels of pedestrian activity. Several studies have identified a positive relationship between bicycle facilities such as bicycle lanes and multi-use trails and overall levels of bicycling at the community level, but more evidence is needed to show this relationship at the neighborhood scale. Many of the other urban design characteristics, such as buffer presence, median presence, number of automobile lanes, and automobile volume have been related to pedestrian and bicycle crash rates or perceived comfort, but they have not been connected to pedestrian or bicycle mode choice. Finally, few studies have had adequate data to test the association between walking or bicycling and design characteristics such as driveway crossings, roadway crossing distance, building setbacks, bicycle parking spaces, or tree canopy coverage. Therefore, this study represented an excellent opportunity to measure and test these design variables.

However, all of the shopping district design variables were not expected to show statistically-significant relationships with walking or bicycling in the statistical models. The survey sample was not large enough to include all of the measures in a single model, and many of the local environment variables were correlated. Therefore, different subsets of shopping district variables were explored in the models with other travel, socioeconomic, attitude, and perception characteristics. Tests of the overall model fit helped show which specific design variables had the most significant relationships with mode choice.

3.6. DATA ANALYSIS APPROACHES

Several data analysis approaches were used to develop a greater understanding of the characteristics of each shopping district in the study. Cluster analysis and factor analysis were preliminary steps in the process. Cluster analysis was used to classify the 20 shopping districts into four general categories. This was intended to develop a typology that could be used to analyze patterns of travel behavior in different urban environments. Factor analysis was used to group a variety of correlated shopping district variables into a smaller number of core explanatory variables. The main research hypotheses were tested using mixed logit modeling. Three mixed logit models were estimated to identify relationships between travel, socioeconomic, attitude, perception, and shopping district variables and the mode used by survey respondents to travel to, from, and within shopping districts.

Cluster Analysis

The 20 shopping districts were located in a variety of built environments. Cluster analysis identified types of shopping districts that had similar characteristics. Six built environment variables were used to identify these similarities. Three of the clustering variables described the shopping district (of the store (number of residents, number of jobs, and sidewalk coverage along multilane roadways), and three of the variables applied to the roadway corridor adjacent to the store (average number of through-lanes along the roadway in either direction within 0.25 miles (402 m) of the store, average number of major driveway crossings per mile along the roadway in either direction within 0.25 miles (402 m) of the store, and number of spaces in the store parking lot) (Table 3.4). None of the six variables were highly correlated ($|\rho| > 0.6$). Other shopping district variables not used in the cluster analysis are presented in Table 3.5.

Cluster analysis was performed on standardized measures of each variable for each store (range from -1 to 1). The furthest neighbor method was used, and the differences between clusters of shopping districts were identified by comparing the squared Euclidian distance between measures of each variable. Four categories of shopping districts were identified: 1) Urban Core, 2) Suburban Main Street, 3) Suburban Thoroughfare, and 4) Suburban Shopping Center. In general, the stores in each category had the following characteristics:

- Urban Core: Surrounding neighborhood has high residential and employment density and extensive sidewalk coverage. Roadway corridor has short building setbacks, metered on-street parking and minimal off-street parking, two to four general-purpose through-lanes, and few non-residential driveways. The roadway is lined with commercial retail properties over the length of the corridor.
- Suburban Main Street: Surrounding neighborhood has moderate residential and employment density and extensive sidewalk coverage. Roadway corridor has mostly small commercial stores with short building setbacks, on-street parking (some metered) and minimal off-street parking, and two to four through-lanes. The roadway is lined with commercial retail properties over the length of the corridor.
- Suburban Thoroughfare: Surrounding neighborhood has low residential and employment density with moderate sidewalk coverage. Roadway corridor is a high-speed, high-volume multilane street with commercial properties that are generally set back from the sidewalk behind moderate-sized parking lots. Roadway corridor has minimal on-street

parking. The roadway is lined with commercial retail properties over the length of the corridor.

- Suburban Shopping Center: Surrounding neighborhood has low residential and employment density with moderate sidewalk coverage. The store is in a shopping complex with extensive off-street parking and tends to be separated from surrounding areas by high-speed, high-volume, multilane streets. Roadway corridor has minimal on-street parking. Beyond the shopping area, the corridor has few commercial retail properties.

Output files from the cluster analysis are provided in Appendix H. The geographic distribution of the three Urban Core, eight Suburban Main Street, seven Suburban Thoroughfare, and two Suburban Shopping Center shopping districts is shown in Figure 3.2. Four example maps are provided in Figure 3.3 to illustrate differences between the each general category of shopping district at a small geographic scale. These detailed maps of the Mission Street (Urban Core), Burlingame (Suburban Main Street), El Cerrito (Suburban Thoroughfare), and Pleasanton (Suburban Shopping Center) shopping districts also list several of the fine-grained design measurements that were collected. Detailed maps of all 20 shopping districts are included in Appendix I.

An analysis of variance (ANOVA) procedure was used to test if there were statistically-significant differences in the automobile mode shares between types of shopping districts. The F-value calculated from the automobile mode share data (85.7) was significantly higher than the critical value of F for $\alpha = 0.01$ (5.29). Therefore, there was evidence that the automobile mode shares between the four categories of shopping districts were significantly different. The Tukey-Kramer method for identifying differences between group means was then used to determine if each pair of shopping districts had distinct automobile mode shares. This analysis showed that the automobile mode shares for Urban Core (16%) and Suburban Main Street (64%) shopping districts were different from all other groups for $\alpha = 0.01$. The automobile mode shares for the Suburban Thoroughfare (87%) and Suburban Shopping Center (93%) shopping districts were distinct from both of the other districts, but they were not statistically different from each other for $\alpha = 0.05$.

The ANOVA for pedestrian mode shares showed similar results to automobile mode shares. The F-value from the pedestrian mode share data (44.2) was significantly higher than the critical value of F for $\alpha = 0.01$ (5.29), and the Tukey-Kramer analysis showed that the comparisons of pedestrian mode shares between shopping district groups were statistically distinct for all but the Suburban Thoroughfare versus Suburban Shopping Center comparison. The ANOVA F-test for bicycle mode shares showed no statistically-significant differences between shopping districts. The ANOVA F-test for transit mode shares was significant. Transit mode share for Urban Core shopping districts (31.8%) was distinct from the other three types of shopping districts, but there were no other statistically-significant differences.

Note that these ANOVA analyses assumed that the mode share for survey respondents in each shopping district was consistent for all travelers to the shopping district (since there were slight differences in the number of respondents at each survey store).

Table 3.4., Part 1. Variables Used in Cluster Analysis and Respondent Tour Mode Share by Type of Shopping District

1. Urban Core	Variables Used in Cluster Analysis						Respondent Primary Tour Mode Share[7]				
Shopping District	Residential population within shopping district[1]	Jobs within shopping district[2]	Sidewalk coverage on multilane roads within shop. district[3]	Average commercial street number of lanes[4]	Commercial street major driveway crossings per km[5]	Automobile parking spaces at the survey store[6]	N	Walk	Bicycle	Transit	Automobile
SF-Market St.	22100	145200	100%	4.00	0.00	0	49	46.9%	4.1%	40.8%	8.2%
SF-Fillmore St.	24000	14600	100%	2.00	0.00	10	52	59.6%	0.0%	15.4%	25.0%
SF-Mission St.	32200	7600	100%	4.00	0.00	0	53	45.3%	1.9%	39.6%	13.2%
Cluster Average	**26100**	**55800**	**100%**	**3.33**	**0.00**	**3**	**154**	**50.6%**	**1.9%**	**31.8%**	**15.6%**

2. Suburban Main Street	Variables Used in Cluster Analysis						Respondent Primary Tour Mode Share[7]				
Shopping District	Residential population within shopping district[1]	Jobs within shopping district[2]	Sidewalk coverage on multilane roads within shop. district[3]	Average commercial street number of lanes[4]	Commercial street major driveway crossings per km[5]	Automobile parking spaces at the survey store[6]	N	Walk	Bicycle	Transit	Automobile
Berkeley	12200	6300	100%	2.91	21.50	37	54	31.5%	13.0%	1.9%	53.7%
Oakland	12500	1600	89%	4.00	20.44	51	50	18.0%	2.0%	6.0%	74.0%
Richmond	10900	3200	95%	2.78	1.20	310	50	24.0%	2.0%	10.0%	64.0%
SF-Taraval St.	12700	2100	98%	4.00	1.25	0	47	25.5%	0.0%	19.1%	55.3%
SF-Third St.	12700	3400	96%	4.00	4.96	44	45	17.8%	0.0%	15.6%	66.7%
Daly City	12000	2400	81%	4.00	13.55	78	45	22.2%	0.0%	20.0%	57.8%
Burlingame	4400	4400	77%	2.77	16.19	20	52	25.0%	3.8%	1.9%	69.2%
San Mateo	9600	6300	100%	2.21	14.86	60	53	24.5%	1.9%	1.9%	71.7%
Cluster Average	**10900**	**3700**	**92%**	**3.33**	**11.75**	**75**	**396**	**23.7%**	**3.0%**	**9.1%**	**64.1%**

3. Suburban Thoroughfare	Variables Used in Cluster Analysis						Respondent Primary Tour Mode Share[7]				
Shopping District	Residential population within shopping district[1]	Jobs within shopping district[2]	Sidewalk coverage on multilane roads within shop. district[3]	Average commercial street number of lanes[4]	Commercial street major driveway crossings per km[5]	Automobile parking spaces at the survey store[6]	N	Walk	Bicycle	Transit	Automobile
Hayward	6200	1700	87%	5.72	44.82	44	51	11.8%	0.0%	3.9%	84.3%
Fremont	6500	4200	97%	6.00	14.70	197	47	14.9%	2.1%	2.1%	80.9%
Danville	1600	600	92%	4.00	28.63	290	42	2.4%	0.0%	0.0%	97.6%
Brentwood	1700	200	80%	4.00	8.86	193	43	2.3%	4.7%	2.3%	90.7%
Concord	4300	11600	97%	5.78	23.67	59	45	17.8%	0.0%	0.0%	82.2%
El Cerrito	6400	2200	100%	4.28	36.09	250	41	7.3%	0.0%	4.9%	87.8%
San Carlos	4900	4200	74%	5.00	19.98	85	47	2.1%	4.3%	6.4%	87.2%
Cluster Average	**4500**	**3500**	**90%**	**4.97**	**25.25**	**160**	**316**	**8.5%**	**1.6%**	**2.8%**	**87.0%**

4. Suburban Shopping Center	Variables Used in Cluster Analysis						Respondent Primary Tour Mode Share[7]				
Shopping District	Residential population within shopping district[1]	Jobs within shopping district[2]	Sidewalk coverage on multilane roads within shop. district[3]	Average commercial street number of lanes[4]	Commercial street major driveway crossings per km[5]	Automobile parking spaces at the survey store[6]	N	Walk	Bicycle	Transit	Automobile
Pleasanton	3800	1200	84%	4.87	11.49	442	47	4.3%	2.1%	2.1%	91.5%
S. San Francisco	8600	800	54%	4.53	9.51	420	46	6.5%	0.0%	0.0%	93.5%
Cluster Average	**6200**	**1000**	**69%**	**4.70**	**10.50**	**431**	**93**	**5.4%**	**1.1%**	**1.1%**	**92.5%**

Overall	Variables Used in Cluster Analysis						Respondent Primary Tour Mode Share[7]				
	Residential population within shopping district[1]	Jobs within shopping district[2]	Sidewalk coverage on multilane roads within shop. district[3]	Average commercial street number of lanes[4]	Commercial street major driveway crossings per km[5]	Automobile parking spaces at the survey store[6]	N	Walk	Bicycle	Transit	Automobile
Overall Average	**10500**	**11200**	**90%**	**4.04**	**14.59**	**130**	**959**	**21.3%**	**2.2%**	**9.9%**	**66.6%**

Table 3.4., Part 2. Footnotes

1) The calculation of population only included portions of census block groups that were within the 0.5-mile (804-m) radius of the store. Source: US Census (2000).
2) The calculation of jobs only included portions of traffic analysis zones that were within the 0.5-mile (804-m) radius of the store. Source: San Francisco Bay Area Metropolitan Transportation Commission traffic analysis zones (2005).
3) The sidewalk coverage calculation assumed that complete coverage was continuous sidewalks on both sides of the street. Therefore, if a street had sidewalks on both sides, it had 100% sidewalk coverage. If a street had a complete sidewalk on one side, but no sidewalk on the other, it had 50% coverage. Source: Google Earth & Bing Maps aerial photographs (2007-2009).
4) Travel lanes included all general purpose through-lanes in both directions. The number of through-lanes did not include left- or right-turn lanes, two-way center turn lanes, bicycle lanes, shoulders, or other auxilary lanes. In addition, it did not include lanes that ended within the segment. Source: Google Earth & Bing Maps aerial photographs (2007-2009).
5) Major driveway crossings inclued all active non-residential and more than 10-unit residential property driveways. Source: Google Earth & Bing Maps aerial photographs (2007-2009).
6) Number of parking spaces in the store parking lot (included shared parking with other stores in the same shopping complex). Source: Google Earth & Bing Maps aerial photographs (2007-2009).
7) Survey respondent transportation mode share was the mode that respondents used for the greatest distance on their whoe tour. Cluster average was weighted average of individual store mode shares based on surveys per store (2009).

Table 3.5., Part 1. Other Shopping District Characteristics by Type of Shopping District

1. Urban Core	Other Shopping District Characteristics not Used in Cluster Analysis											
Shopping District	Store has a drive-through pharmacy (1 Yes; 0 No)[1]	Length of bicycle facilities within shop. district (km)[2]	4-way intersections within shopping district[3]	Posted speed limit on main commercial street (mph)[4]	Auto traffic volume on main commercial street (AADT)[5]	Average main commercial street width (m)[6]	Average main commercial street on-st. parking cov.[7]	Avg. building setback along main commercial st. (m)[8]	Survey store area (gross square meters)[9]	Bicycle parking spaces at the survey store[10]	Median on-street parking price within 0.1 mi (161 m)[11]	Main commercial street ROW covered by tree canopy[12]
SF-Market St.	0	5.87	124	25.0	11800	16 0	0%	0	750	0	$3 50	13%
SF-Fillmore St.	0	0.00	113	25.0	9800	11.6	100%	0	490	2	$2 00	14%
SF-Mission St.	0	3.14	126	25.0	16500	15 9	100%	0	1040	2	$2 00	7%
Cluster Average	**0.00**	**3.00**	**121**	**25.0**	**12700**	**14.5**	**67%**	**0**	**760**	**1**	**$2.50**	**11%**

2. Suburban Main Street	Other Shopping District Characteristics not Used in Cluster Analysis											
Shopping District	Store has a drive-through pharmacy (1 Yes; 0 No)[1]	Length of bicycle facilities within shop. district (km)[2]	4-way intersections within shopping district[3]	Posted speed limit on main commercial street (mph)[4]	Auto traffic volume on main commercial street (AADT)[5]	Average main commercial street width (m)[6]	Average main commercial street on-st. parking cov.[7]	Avg. building setback along main commercial st. (m)[8]	Survey store area (gross square meters)[9]	Bicycle parking spaces at the survey store[10]	Median on-street parking price within 0.1 mi (161 m)[11]	Main commercial street ROW covered by tree canopy[12]
Berkeley	0	8.96	92	25.0	21000	22 3	100%	3	2160	12	$0 00	6%
Oakland	1	1.45	62	30.0	25300	22 0	100%	6	1270	0	$0 00	9%
Richmond	0	2.72	97	25.0	12000	18.1	85%	14	1330	6	$0 00	11%
SF-Taraval St.	0	2.82	83	25.0	12400	18 3	100%	1	530	0	$2 00	3%
SF-Third St.	0	0.53	73	25.0	24700	24.4	77%	4	1180	0	$0 00	3%
Daly City	0	0.00	61	35.0	25000	23 0	71%	7	780	0	$0 50	2%
Burlingame	0	0.00	45	25.0	12000	16.1	58%	1	690	0	$0 50	3%
San Mateo	1	1.56	74	25.0	12000	15 5	100%	1	1400	10	$0 50	13%
Cluster Average	**0.25**	**2.25**	**73**	**26.9**	**18100**	**20.0**	**87%**	**5**	**1170**	**4**	**$0.44**	**6%**

3. Suburban Thoroughfare	Other Shopping District Characteristics not Used in Cluster Analysis											
Shopping District	Store has a drive-through pharmacy (1 Yes; 0 No)[1]	Length of bicycle facilities within shop. district (km)[2]	4-way intersections within shopping district[3]	Posted speed limit on main commercial street (mph)[4]	Auto traffic volume on main commercial street (AADT)[5]	Average main commercial street width (m)[6]	Average main commercial street on-st. parking cov.[7]	Avg. building setback along main commercial st. (m)[8]	Survey store area (gross square meters)[9]	Bicycle parking spaces at the survey store[10]	Median on-street parking price within 0.1 mi (161 m)[11]	Main commercial street ROW covered by tree canopy[12]
Hayward	0	0.00	17	35.0	50500	29.4	50%	5	1380	0	$0 00	7%
Fremont	1	3.41	10	37.5	32300	32 5	13%	24	1390	0	$0 00	4%
Danville	0	7.74	6	30.0	25000	24.7	0%	14	2340	6	$0 00	16%
Brentwood	1	8.69	18	37.5	30000	24.4	0%	11	1340	4	$0 00	3%
Concord	0	0.00	37	35.0	35900	29 2	0%	10	1270	6	$0 00	9%
El Cerrito	1	10.18	30	30.0	26000	25 9	58%	26	1310	0	$0 00	5%
San Carlos	1	3.54	50	35.0	25600	26 5	78%	8	1710	0	$0 00	3%
Cluster Average	**0.57**	**4.79**	**24**	**34.3**	**32200**	**27.5**	**28%**	**14**	**1540**	**2**	**$0.00**	**7%**

4. Suburban Shopping Center	Other Shopping District Characteristics not Used in Cluster Analysis											
Shopping District	Store has a drive-through pharmacy (1 Yes; 0 No)[1]	Length of bicycle facilities within shop. district (km)[2]	4-way intersections within shopping district[3]	Posted speed limit on main commercial street (mph)[4]	Auto traffic volume on main commercial street (AADT)[5]	Average main commercial street width (m)[6]	Average main commercial street on-st. parking cov.[7]	Avg. building setback along main commercial st. (m)[8]	Survey store area (gross square meters)[9]	Bicycle parking spaces at the survey store[10]	Median on-street parking price within 0.1 mi (161 m)[11]	Main commercial street ROW covered by tree canopy[12]
Pleasanton	0	1.71	14	35.0	33500	28.4	56%	19	1010	0	$0 00	12%
S. San Francisco	0	2.65	14	35.0	25000	26.4	0%	25	1640	0	$0 00	9%
Cluster Average	**0.00**	**2.18**	**14**	**35.0**	**29200**	**27.4**	**28%**	**22**	**1330**	**0**	**$0.00**	**11%**

Overall	Other Shopping District Characteristics not Used in Cluster Analysis											
	Store has a drive-through pharmacy (1 Yes; 0 No)[1]	Length of bicycle facilities within shop. district (km)[2]	4-way intersections within shopping district[3]	Posted speed limit on main commercial street (mph)[4]	Auto traffic volume on main commercial street (AADT)[5]	Average main commercial street width (m)[6]	Average main commercial street on-st. parking cov.[7]	Avg. building setback along main commercial st. (m)[8]	Survey store area (gross square meters)[9]	Bicycle parking spaces at the survey store[10]	Median on-street parking price within 0.1 mi (161 m)[11]	Main commercial street ROW covered by tree canopy[12]
Overall Average	**0.30**	**3.25**	**57**	**30.0**	**23300**	**22.5**	**57%**	**9**	**1250**	**2**	**$0.55**	**8%**

Table 3.5., Part 2. Footnotes

1) Survey stores with drive-through pharmacy windows were identified through field observations in spring 2010.

2) Bicycle facilities include bicycle lanes, shared lane markings, bicycle boulevards, and multi-use trails. They do not include streets that only have bicycle route signs. Bicycle facility miles were calculated using the same methodology as automobile lane miles. If bicycle lanes or shared lane markings are on both sides of a one-mile-long street segment, this represents two miles of bicycle facilities (this avoids the problem of misrepresenting one-way bicycle facilities on one-way streets). Bicycle boulevards and multi-use trails are two-way facilities, so one-mile of centerline counts as two miles of bicycle facilities.

3) Street intersections include intersections of public streets. They do not include intersections of public streets and driveways. Source: Google Earth & Bing Maps aerial photographs (2007-2009).

4) Average posted speed limit along commercial roadway corridor 0.25 miles (402 m) in either direction of the store site). Commercial roadway was defined as the main roadway for commercial activity adjacent to the survey store. Source: Field observations (2010). Note: 10 mph = 16.1 kph.

5) Estimated main commercial roadway traffic volume in both directions (AADT) adjacent to store. Source: Local jurisdiction and California Department of Transportation traffic volume databases.

6) Main commercial roadway width was measured for each block from aerial photographs. Source: Google Earth & Bing Maps aerial photographs (2007-2009).

7) A block is considered to have on-street parking if on-street parking is legal (i.e., parked cars do not need to be present). Each side of the street was considered separately (e.g., on-street parking on both sides = 100% coverage; on-street parking on one side = 50% coverage). Source: Field observations (2010).

8) Average setback is a rough estimate of the average distance between the sidewalk or roadway edge and the front of each building. If a road segment does not have buildings (e.g., overpass, underpass, etc.), it is not considered in the average setback measurement for the neighborhood. Source: Google Earth & Bing Maps aerial photographs (2007-2009).

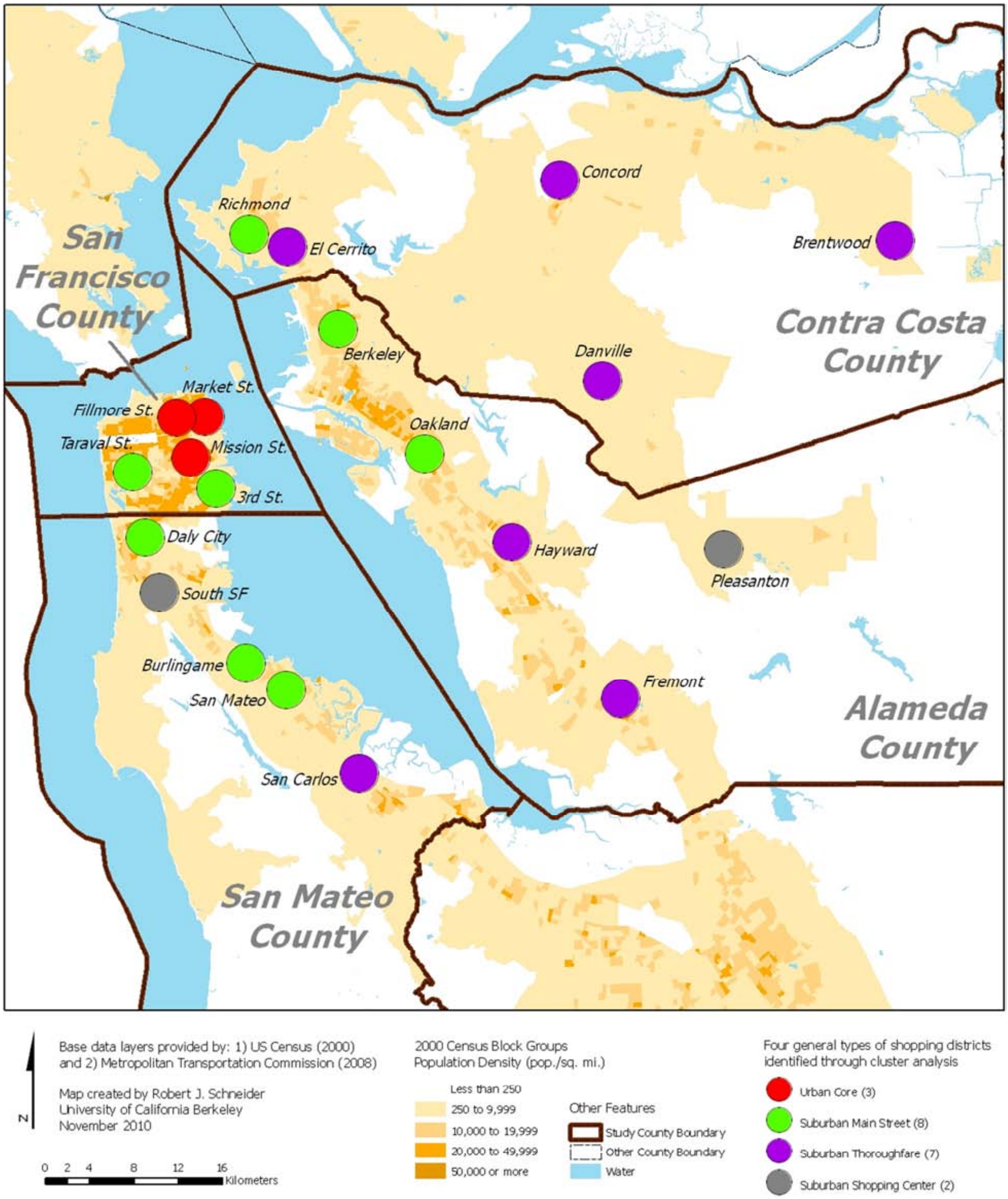
9) Store gross square meters was estimated from aerial photographs. Source: Google Earth & Bing Maps aerial photographs (2007-2009).

10) Bicycle parking spaces at the survey stores were counted during field visits in spring 2010.

11) Median weekday mid-day on-street parking price per hour within 0.1 miles of the survey store. Source: Field observations (2010).

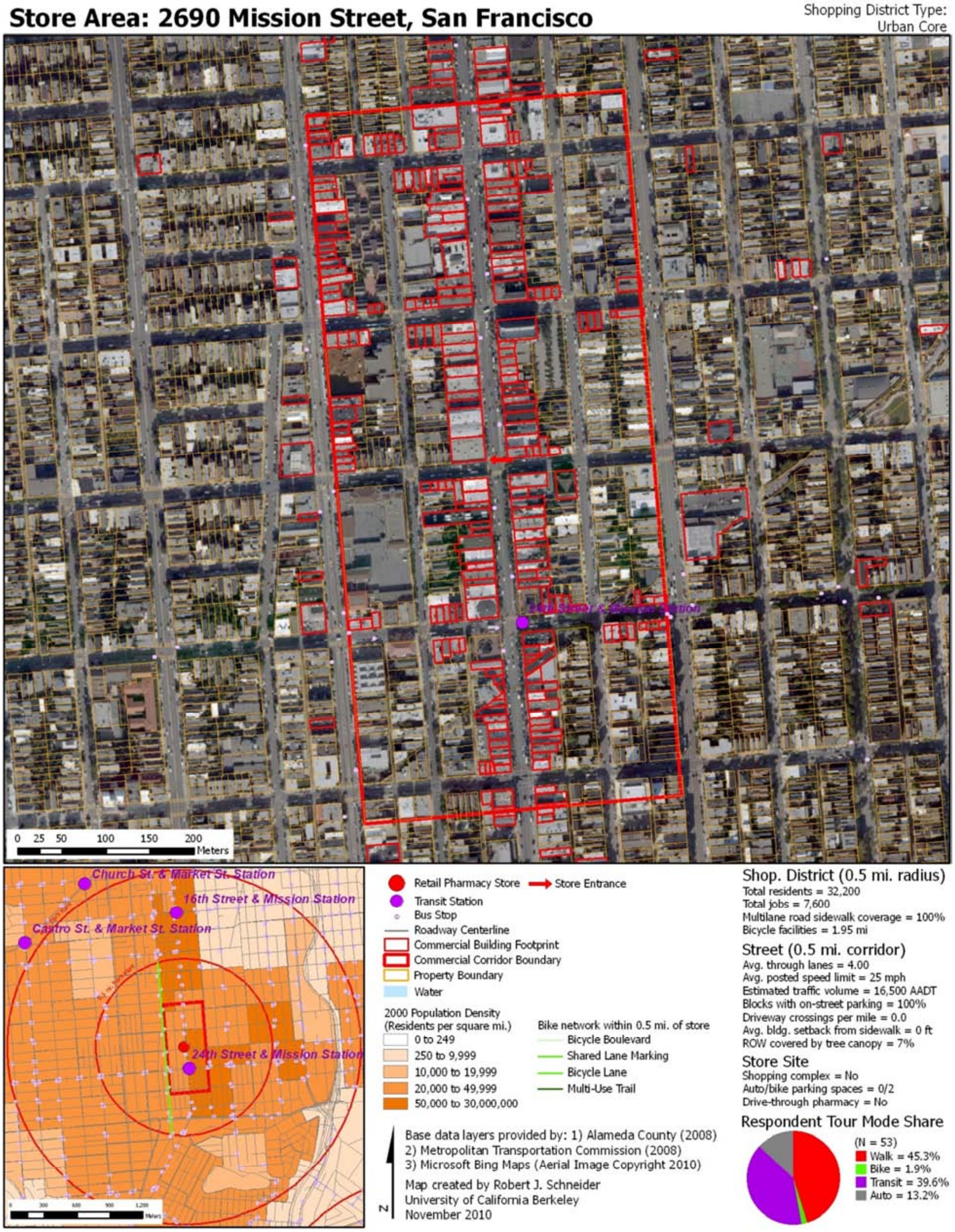
12) Tree canopy coverage of the commercial street right-of-way (ROW) was estimated from aerial photographs. Some aerial photographs were taken when leaves were not on trees, so canopy coverage was estimated for when leaves were present. Source: Google Earth & Bing Maps aerial potographs (2007-2009).

Figure 3.2. 20 San Francisco Bay Area Shopping Districts with Retail Pharmacy Store Study Sites: Four Types of Shopping Districts Identified through Cluster Analysis



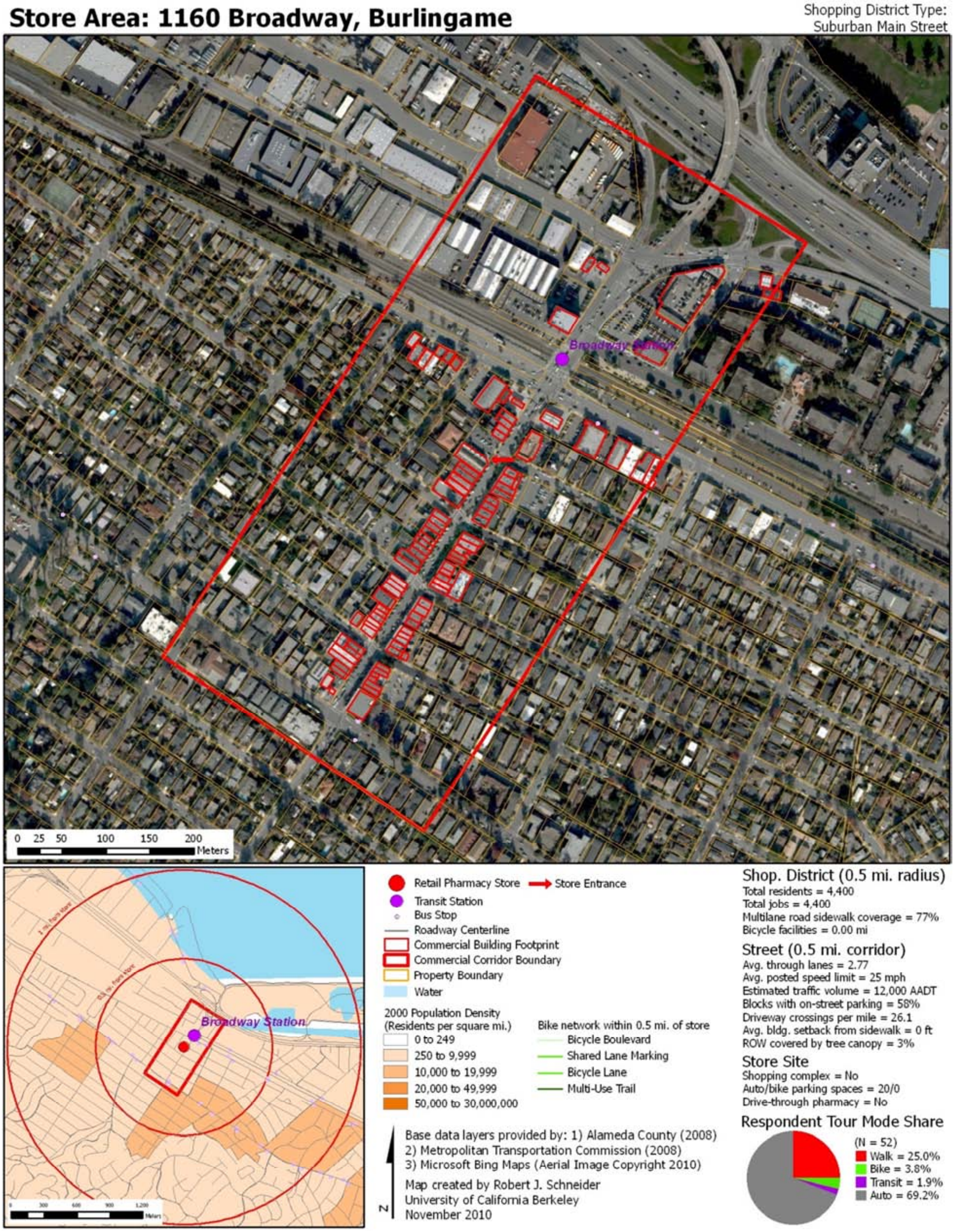
Note: 1 mile = 1.61 kilometers
1 square mile = 2.69 square kilometers

Figure 3.3., Part 1. Detailed Shopping District Characteristics: Urban Core



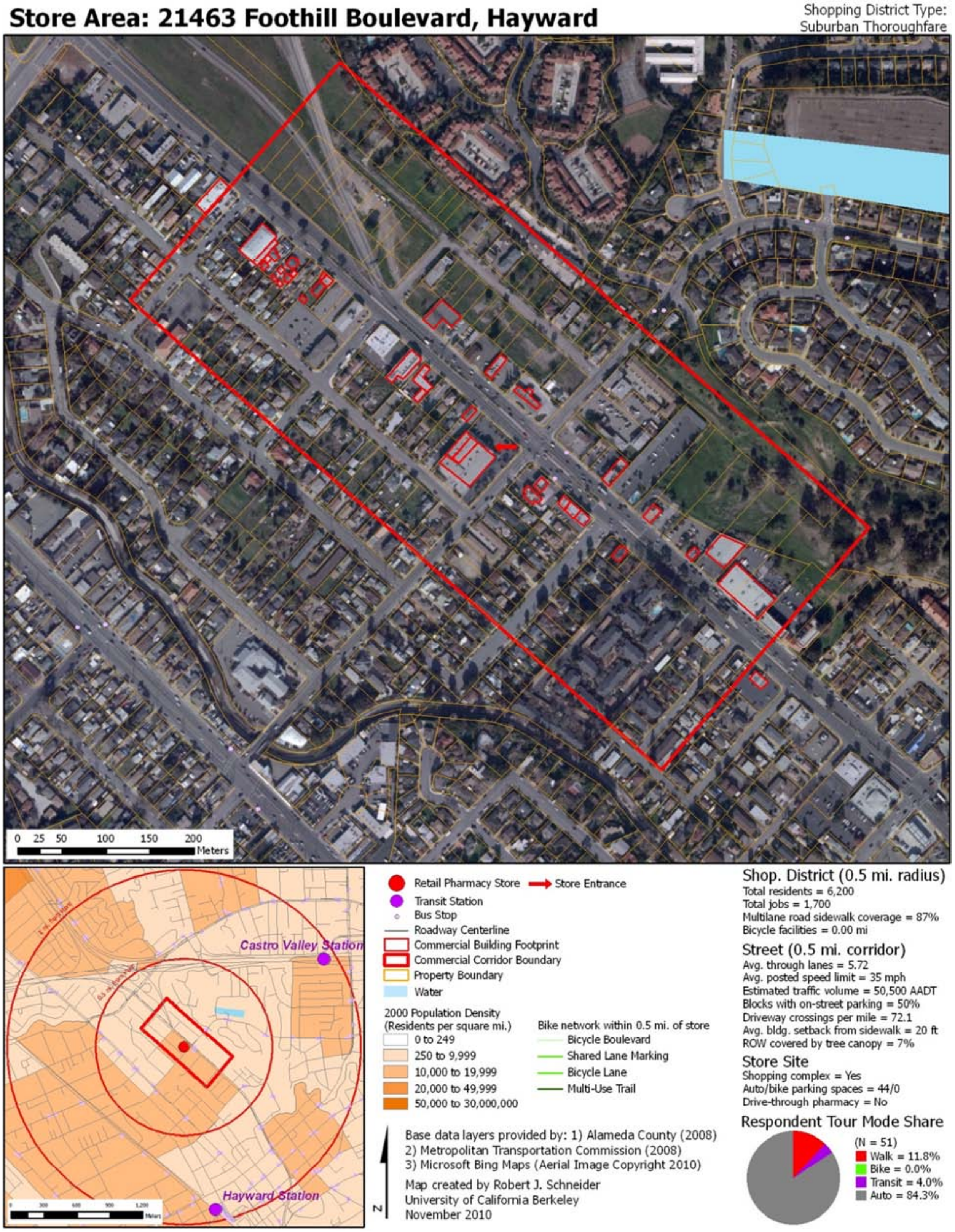
Note: 1 mile = 1.61 kilometers
1 square mile = 2.69 square kilometers

Figure 3.3., Part 2. Detailed Shopping District Characteristics: Suburban Main Street



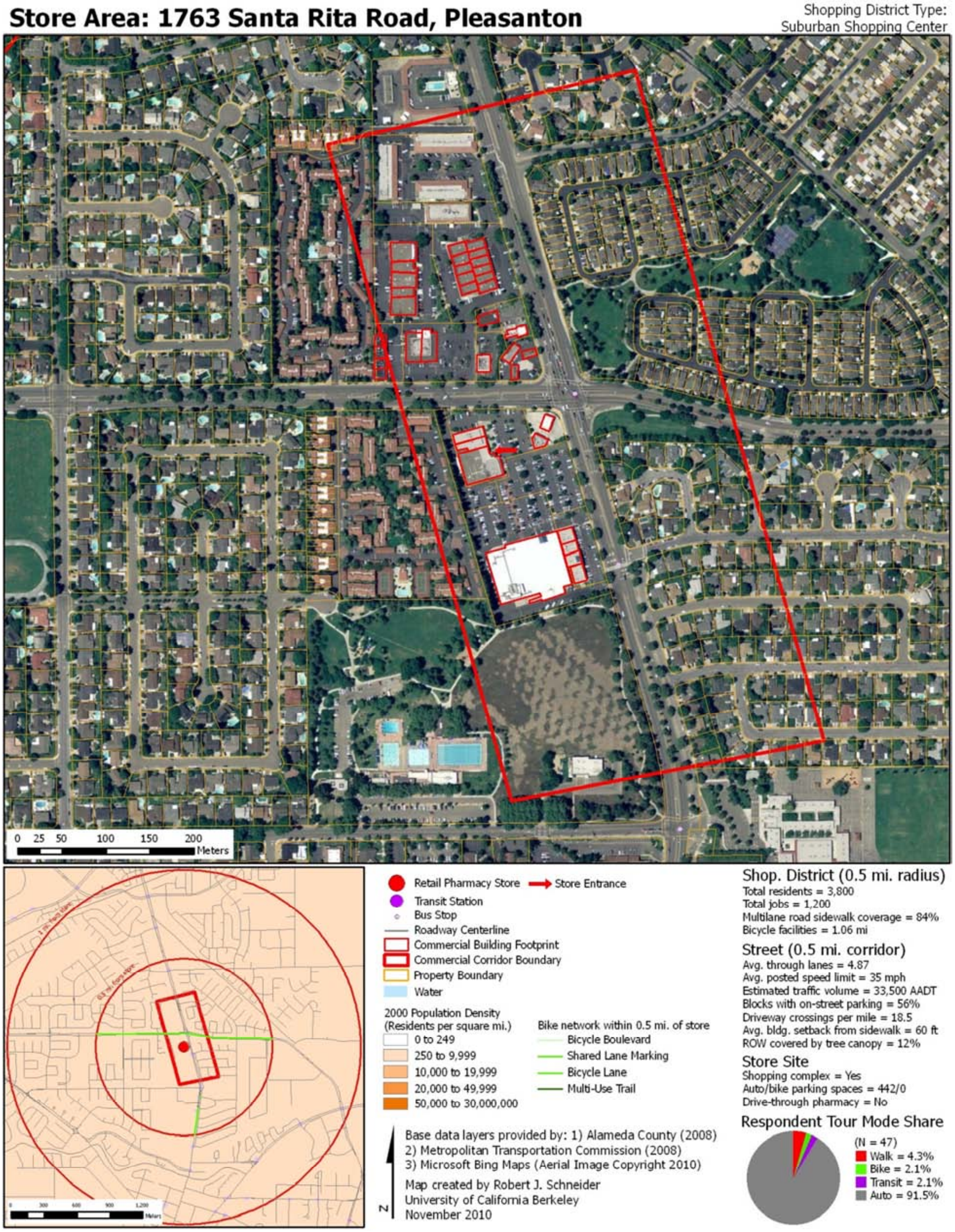
Note: 1 mile = 1.61 kilometers
1 square mile = 2.69 square kilometers

Figure 3.3., Part 3. Detailed Shopping District Characteristics: Suburban Thoroughfare



Note: 1 mile = 1.61 kilometers
1 square mile = 2.69 square kilometers

Figure 3.3., Part 4. Detailed Shopping District Characteristics: Suburban Shopping Center



Note: 1 mile = 1.61 kilometers
1 square mile = 2.69 square kilometers

Factor Analysis
The set of variables considered for models of mode choice included more than 50 measures quantifying different aspects of the shopping district, main commercial roadway, and survey store site. Many of these variables were correlated. For example, for the 959 respondents who reported complete tour data, the shopping district main commercial roadway curb-to-curb width was positively correlated with the number of automobile lanes, automobile traffic volume, and posted speed limit and negatively correlated with metered parking along the roadway ($|\rho| > 0.7$). Similarly, the average building setback along the main commercial roadway was positively correlated with the number of parking spaces in the survey store parking lot and distance between the store door and nearest public sidewalk ($|\rho| > 0.7$). Since these variables were correlated, they did not have independent relationships with the mode chosen by survey participants to travel to and from or within shopping districts. Including correlated variables in the same model would likely create multicollinearity problems when parameters were estimated.

One strategy to capture the influence of shopping district variables is to combine correlated variables into distinct factors using factor analysis. This approach has been used in previous studies to explore the relationship between built environment variables and pedestrian and bicycle mode choice (Cervero and Kockelman 1997; Cervero and Duncan 2003).

For this study, 17 correlated variables were considered for factor analysis. Each of these 17 variables had some correlation ($|\rho| > 0.6$) with at least one other variable, but most were correlated with several variables. Varimax rotation was used to calculate the loadings of each variable onto specific factors. Three factors were identified using a minimum eigenvalue of 1.5, and they represented a fairly high proportion (72%) of the variance between all 17 variables. These three factors were characterized as 1) "Automobile-Oriented Thoroughfare", 2) "Pedestrian Barriers", and 3) "Development Density":

- <u>Automobile-Oriented Thoroughfare</u>: The automobile-oriented thoroughfare factor had high loadings (> 0.7) for the following variables: commercial roadway width, percentage of commercial roadway with a buffer area between the street and sidewalk, commercial roadway posted speed, commercial roadway traffic volume, and less commercial roadway on-street parking. These variables are generally associated with wider, higher-speed, higher-volume main commercial roadways in shopping districts.
- <u>Pedestrian Barriers</u>: The pedestrian barriers factor has high loadings (> 0.7) for the following variables: number of parking spaces at the survey store, distance from the closest sidewalk to the store entrance, slope of multilane roadways within 0.5 miles (804 m) of the store, and less sidewalk coverage on multilane roadways within 0.5 miles (804 m) of the store. These variables are generally associated with greater walking distance, more challenging terrain, and disconnected pedestrian facility networks in shopping districts.
- <u>Development Density</u>: The development density factor has high loadings (> 0.7) for the following variables: number of housing units within 0.5 miles (804 m) of the store, number of jobs within 0.5 miles (804 m) of the store, and number of commercial properties within 0.25 miles (402 m) of the store. These variables are generally associated with close proximity between residences, jobs, and stores in shopping districts.

Overall, the factors were intuitive and had Eigenvalues greater than 1.5, indicating that each factor explained a distinct dimension in the data. Other studies have indicated that factors exhibit this "deep structure" when Eigenvalues are greater than 1.0 (Cervero and Duncan 2003; Pinjari *et al.* 2008). Output files from the factor analysis are provided in Appendix J. The variables derived through factor analysis were not used in any of the models in this dissertation. However, it may be possible to explore their associations with respondent mode choice in follow-up studies.

Mixed Logit Discrete Choice Modeling

Mixed logit models were used to identify factors that were associated with the choice of mode used by customers to travel to and from each shopping district and within each shopping district. Mixed logit models have several advantages over standard multinomial logit models. Like other discrete choice models, mixed logit measures the contribution of various explanatory variables towards the utility of choosing a particular travel mode. However, mixed logit has a flexible error structure that allows the covariance between the choice of two modes to be estimated (Hensher and Greene 2003; Train 2009). For example, people may have a preference for either walking or bicycling to shopping districts rather than taking transit or driving because they do not have access to an automobile or because they enjoy physical activity. Estimating the interdependence, or nested relationship, between walking and bicycling allows a mixed logit model to reflect the preference of respondents who choose walking to shift to bicycling with a greater probability than to transit or automobile. A basic multinomial logit model does not have this flexibility. It assumes that there is independence of irrelevant alternatives (IIA): respondents will have an equal probability of shifting to other modes when their first choice is not available. However, in reality, the IIA assumption does not hold if pedestrians are more likely to shift to bicycling than to transit or automobile.

The flexible error structure of the mixed logit model also makes it possible to evaluate multi-level, or panel, data collected from identical surveys distributed in different locations (Bhat and Gossen 2004). Multi-level data collection is a common approach to studying relationships between neighborhood characteristics, physical activity, and pedestrian travel (Shriver 1997; Steiner 1998; Mackett 2003; Brown, Khattak, and Rodriguez 2008). However, few previous studies have employed mixed logit models.

More details about the mixed logit models that were estimated as a part of this dissertation are provided in Chapter 5 and Chapter 6.

CHAPTER 4. MEASURING TRANSPORTATION AT A HUMAN SCALE: AN INTERCEPT SURVEY AND GIS APPROACH TO CAPTURE PEDESTRIAN TRAVEL

4.1. SUMMARY

Growing interest in sustainable transportation systems and livable communities has created a need for more complete measures of multimodal travel, including walking. Many common transportation analysis techniques consider only the primary mode used by travelers. Secondary modes, such as walking from a street parking space to a store entrance or walking from a bus stop to home are often ignored. This chapter presents an intercept survey and GIS analysis methodology used to measure multimodal transportation to, from, and within 20 shopping districts in the San Francisco Bay Area. Respondents reported all modes of travel that they used from the time they left home until returning home, including secondary modes and short trips between adjacent buildings. Walking within store parking lots or to and from parking spaces directly in front of stores were the only excluded movements. Face-to-face interaction made it possible for surveyors to interpret and clarify responses. A carefully-structured GIS data entry method was used to record stop locations and detailed travel mode information. Traditional measures showed that walking was the mode used for the greatest distance on 21% of 959 respondent tours and represented only 5% of respondent miles traveled. However, alternative measures based on the detailed survey data showed that walking was a common element of respondent tours (52% of tours included some walking) and was the primary mode of transportation for a majority of trip segments within one-half mile of Urban Core and Suburban Main Street survey stores (96% of trips within Urban Core shopping districts and 63% of trips within Suburban Main Street shopping districts were made by walking). These results suggest that traditional mode share analyses do not provide a complete picture of pedestrian travel, especially in urban, mixed-use environments.

4.2. INTRODUCTION

"How did you travel to the store today?"

This is a common way of asking survey participants to report their mode of transportation to an activity destination. Respondents might answer with the mode that they used for the longest distance since leaving home or the mode that they used for the longest distance since leaving their last activity. However, these responses leave out information about secondary modes. People often use more than one mode to access a series of activities, even if the secondary mode is walking one block between home and a bus stop or between an on-street parking spot and a store entrance. These walks use public infrastructure, represent exposure to potential traffic injury, generate physical activity for travelers, and provide mobility that does not consume fossil fuel or produce tailpipe emissions. Transportation systems are multimodal, and accurate pedestrian data are essential for making informed planning and policy decisions. Improved pedestrian data can:

- Provide a more complete representation of the amount of travel done by all modes in metropolitan areas.

- Be used to evaluate how well local, regional, and national transportation systems are helping communities achieve sustainability and livability goals.
- Quantify the amount of exposure that pedestrians have to traffic crashes in order to improve estimates of injury and fatality rates.
- Document the complexity of travel, especially for trip-chains that utilize multiple modes and involve multiple stops.

Purpose

This chapter has two main purposes. The first purpose is to present an intercept survey and GIS analysis method for capturing detailed information about walking on multimodal tours. This approach demonstrates that it is possible to survey retail pharmacy store customers and gather detailed data about all modes of transportation that they use from the time they leave home until they return home. The second purpose is to quantify the full extent of pedestrian travel on survey respondent tours. This includes showing differences in the amount of secondary pedestrian travel that occurs in different types of shopping districts.

Definitions

Several terms are used throughout this document to describe travel by individuals. A trip is a movement between a pair of activity locations, or stops (e.g., between home and work or between a store and a park). In general, a trip does not include travel on the same property. Travel between two different stores in the same shopping complex is considered to be a trip, as long as it involves travel outside of a building. Each trip includes at least one stage. A stage represents movement using a single mode of transportation. If a person changes modes in the middle of a trip between two activity locations (e.g., changing from walking to riding the bus), he or she is changing stages of the trip. Finally, a tour (i.e., trip chain) is the set of all trips that a person makes from the time he or she leaves home until he or she returns home. This tour definition is similar to the framework proposed for analyzing tours in the 2001 National Household Travel Survey (McGuckin and Nakamoto 2004). One difference between these definitions is that McGuckin and Nakamoto separate home-to-home tours into distinct tours if a respondent stays at one location for more than 30 minutes. For example, someone who is at work for eight hours would have a home-to-work tour and a work-to-home tour. The dwell-time distinction was not used in this analysis because it focused on mode choice. The choice of mode for individual trips or an entire tour was assumed to be independent of the amount of time spent at any particular stop on a tour.

4.3. LITERATURE REVIEW

Several types of multimodal transportation surveys have collected detailed pedestrian data. These include destination-based trip generation studies and household travel surveys.

Destination-based trip generation studies have traditionally focused on automobile traffic entering and exiting specific land use sites or developments, but pedestrian, bicycle, and transit modes have recently been added to the formal data collection methodology in the United States (Institute of Transportation Engineers 2008). However, most trip generation studies analyze only the primary transportation mode of survey respondents, typically defined as the mode used for the greatest distance between a person's home and the study site (Steiner 1998; Bent and Singa 2009).

Household travel surveys have been designed to collect detailed information about respondent socioeconomic characteristics and travel behaviors. Several regional travel surveys have attempted to capture all modes used between activity locations, including walking from a transit stop or parking lot to a destination (Metropolitan Transportation Commission 2000; Delaware Valley Regional Planning Commission 2000; Chicago Metropolitan Agency for Planning 2008). Others exclude walking that is done to get to and from a private vehicle or trips that are less than a specified distance or time (Puget Sound Regional Council 2006; United Kingdom Department for Transport 2008; Federal Highway Administration 2009a). Even when short pedestrian stages are captured, it is not common for analysts to examine these data. According to a summary report for the Chicago Regional Household Travel Inventory, "If every single walking movement were gathered, the final mode to almost every location would be by foot" (Chicago Metropolitan Agency for Planning 2010).

In general, multimodal travel survey data show that:

- The private automobile is the mode used for the greatest distance for most tours in metropolitan regions throughout the United States (Metropolitan Transportation Commission 2000; Delaware Valley Regional Planning Commission 2000; Puget Sound Regional Council 2006; Chicago Metropolitan Agency for Planning 2010; Federal Highway Administration 2009b).
- When walking is included in regional, state, or national analyses of person miles traveled (PMT), its mode share is often dwarfed by higher-speed modes (Hu and Reuscher 2004).
- Walking, bicycling, and public transit are common modes of access to activity sites in urban areas. This is shown by examples from California. Afternoon peak hour surveys found that these modes accounted for 43% of trips to a bakery in Berkeley, 83% of trips to a coffee shop in San Diego, and 40% of trips to a restaurant in San Francisco (California Department of Transportation 2009). More than one-third of customers used walking, bicycling, or public transit as their primary mode of transportation to access six traditional urban shopping areas in Oakland and Berkeley (Steiner 1998). Fewer than 20% of all people traveling to shopping areas in Downtown San Francisco used a private automobile (Bent and Singa 2009).
- The probability of a person choosing to walk decreases as tour distance increases (Bowman and Ben-Akiva 2000). People with poor accessibility to shopping destinations are more likely to drive to multiple-store locations on a single tour, while people who live close to neighborhood commercial streets are more likely to walk and bicycle to stores (Limanond and Niemeier 2004).
- Measuring pedestrian movement is one of the challenges to quantifying multimodal transportation. Pedestrian travel tends to be underreported because it usually covers short distances and is often done as the beginning or end stage of a longer automobile or public transit trip (Wittink 2001).

Research is needed to understand the advantages and disadvantages of different methodologies for collecting and analyzing detailed pedestrian data. This analysis of existing studies suggests that there is a need to:

- Recognize differences in how pedestrian travel distance, duration, and mode share are represented by different agencies and researchers.
- Compare how well different survey methods represent the actual amount of pedestrian travel within metropolitan areas.
- Understand the implications of setting minimum distance or duration thresholds for including or analyzing trips in survey databases, particularly for underreporting pedestrian travel.
- Identify different parts of urban regions where pedestrian travel is underrepresented by common travel survey analysis methods.

This chapter provides a foundation to address these issues.

4.4. METHODOLOGY

Detailed travel mode data were gathered from an intercept survey of retail pharmacy store customers in the San Francisco Bay Area. Information about the study area, survey distribution times and techniques, survey participant characteristics, and number of surveys completed by store location was provided in Chapter 3. The sections below focus specifically on how the survey distribution method and survey instrument were tailored to capture detailed pedestrian travel data.

Capturing Detailed Pedestrian Travel Data

Three aspects of the methodological approach were particularly important for gathering information about respondents' detailed pedestrian movements. These included building trust and engagement in the survey topic, preparing respondents to provide detailed walking information by asking particular questions early in the survey, and mapping activity stop locations to provide a framework for recording modes used between stops.

<u>Build Trust and Engagement in the Topic</u>

It is likely that survey respondents are more willing to provide detailed information such as short-distance pedestrian travel when they trust the surveyor, do not feel intimidated by the survey process, and are engaged in the survey topic. In addition to using standard confidentiality and consent procedures, the surveyors asked questions verbally and recorded responses on the survey form to build rapport with the participants and speed the survey process. This also allowed participants to ask clarifying questions about particular parts of the survey, which was likely to help respondents decide on answers more quickly and improve the accuracy of responses. Verbal questions and responses also avoided possible embarrassment for people who may have had difficulty reading questions or writing answers.

In addition, the front side of the survey included questions that could be completed relatively quickly (Appendix A). Surveyors oriented the clipboard so that the participants could see their answers being recorded, which built trust that their responses were documented correctly and showed that they were making steady progress through the questions. In addition, some participants could have been intimidated by the map on the back side of the survey, so it was not revealed until they completed all of the questions on the front. This allowed participants to become engaged in the survey before they were asked to provide detailed information about walking on their tour. Only 22 (2.2%) of the participants who began the survey quit before completing the map exercise on the back side, indicating a high level of buy-in to the survey topic.

<u>Prepare Respondents to Provide Detailed Walking Information</u>

Mode choice information was the central focus of the survey. Therefore, the following questions were asked first:

- “What is the PRIMARY type of transportation you used to get to the store today?”
- “What type of transportation do you TYPICALLY use to travel to this store?”
- “What types of transportation do you CONSIDER using to travel to this store?”

Possible responses to these questions included “Walk”, “Bicycle”, “Bus”, “BART”, “Car/Truck”, or “Other”. While these initial questions focused on the primary (greatest-distance) mode used on the respondent’s tour rather than secondary modes, the list of possible responses put respondents in the frame of mind to be thinking about transportation from a multimodal perspective. Even if they hadn’t walked to the store, they would recognize that walking was included in this transportation survey.

In addition, this set of three questions gave respondents an early outlet and framework for explaining nuance in their travel behavior. 104 (10%) of the 1,003 survey respondents reported that they typically used a different mode to travel to the store than they were using on the day of the survey, and 563 (56%) respondents considered at least two different modes to travel to the survey store. Therefore, if the survey had only asked for the primary type of transportation that the respondent used to travel to the store, some respondents may have wondered if they should report the mode that they usually used or the mode they were using on the day of the survey. Other respondents may have wanted to be recognized for making the effort to use a particular type of transportation to go to the store (such as walking), even if they did not use this mode on a regular basis. These questions helped clarify mode choice responses and provided interesting data about infrequent pedestrian travel for further research.

One of the final sets of questions on the front side of the survey was about the number of stops respondents made on their tour. The two questions were:

- “How many stops (work, daycare, etc.) have you made since leaving home (not including here)?”
- “How many more stops will you make after this (not including stopping at home)?”

Asking respondents to quantify the number of stops they had already made and were planning to make before returning home helped prepare them to think about their travel within the framework of a home-to-home tour. This may have made it easier for respondents to report the locations of all of their tour stops and the types of transportation they used to travel between these stops on the map on the back side of the survey form.

Map Stop Locations to Provide a Framework for Recording Modes Used Between Stops

Surveyors asked participants to identify the locations of their homes and all stops they made on their tours on the back side of the survey (Appendix A). While the survey initially specified that surveyors should mark an "X" on all stop locations, the surveyors quickly changed to numbering the stop locations in the order they were visited on the respondent's tour.

Since the surveyor already knew how many stops a respondent had made since leaving home from the question on the front side of the survey, he or she was able to prompt for the location of each stop efficiently. For example, it was often easiest to point to where the survey store was located on the map and say, "So this store is your third stop. Where did you stop before coming here?" This made it relatively easy to work backward to the respondent's home. Then the surveyor would say, "Where are you planning to stop next after you leave here?", which made it possible to work forward to the respondent's home. Knowing the total number of stops on the tour from the background questions also made it easy for the surveyor to prompt for the locations of stops that the respondent may have forgotten when going through the map exercise.

After locating all stops on the map, respondents were asked to report all modes of transportation that they used on trips between each stop. If an automobile was used for any stage within a trip, respondents were asked if they parked in a parking lot, in a driveway, or on the street directly in front of their stop location. If not, the distance or number of blocks that they walked between the parking space and each activity location was recorded. If transit was used, respondents reported how far they walked to and from each transit stop (walking within a transit station or transit station parking lot was not recorded). Surveyors took detailed notes on the map to indicate transitions between modal stages (Figure 4.1).

Surveyors estimated that between 15% and 25% of respondents did not look closely at the map even when the surveyor pointed to specific locations on it. This may have been because they were describing a short, simple tour or because they had a difficult time interpreting the map. Participants who did not look at the map tended to point towards particular intersections and landmarks when describing their tour. The surveyors were then able to translate the verbal description to the map and verify it with the participant. Therefore, the face-to-face survey method helped overcome some map interpretation barriers. Anecdotally, no particular demographic groups appeared to have an easier or more difficult time with the map exercise, but participants who walked generally seemed to be more familiar with local street names and intersection locations than participants who used other modes.

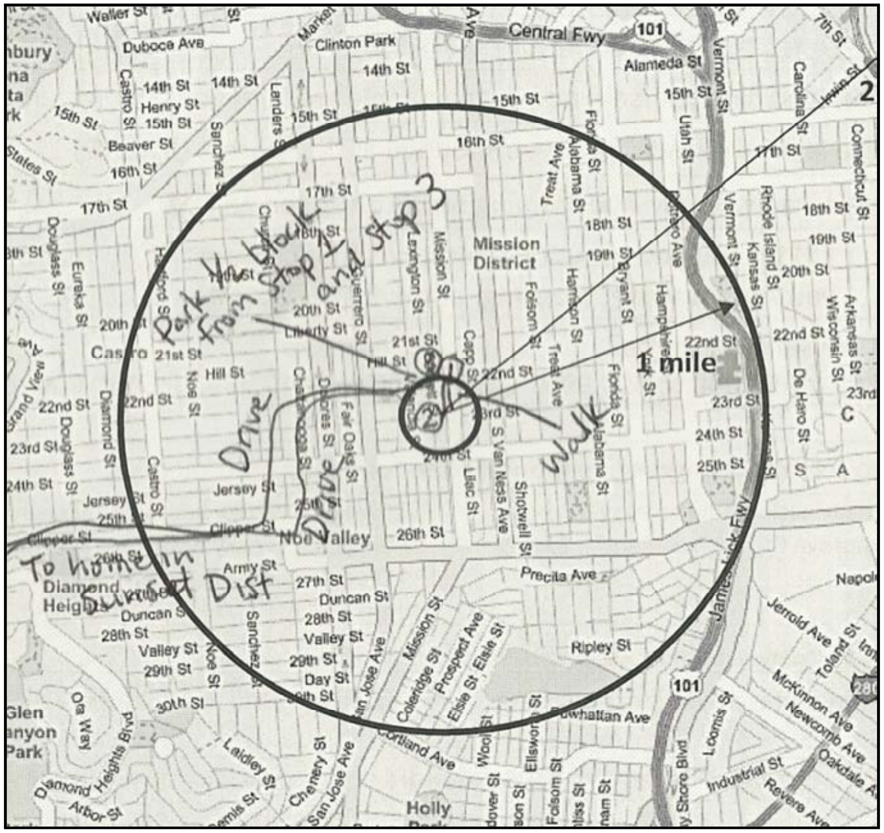
GIS Database of Detailed Travel Data

Of the 1,003 participants, 959 (96%) provided tour data suitable for geocoding. The data were mapped using geographic information systems (GIS) (Figure 4.2). A total of 5,028 home and activity stop locations were entered in a point database, and 4,945 tour stages were entered into a line segment database (the total number of trips was 5,028 – 959 = 4,069, but 604 trips included more than one stage). Stops from the survey map were entered first. These stops were given unique identification numbers that indicated the overall survey number and a sequential stop number representing the order of each stop on the tour. The respondent's home location was geocoded twice—first as stop zero, representing the start of the tour, and second as the final stop number, representing the end of the tour (Figure 4.3).

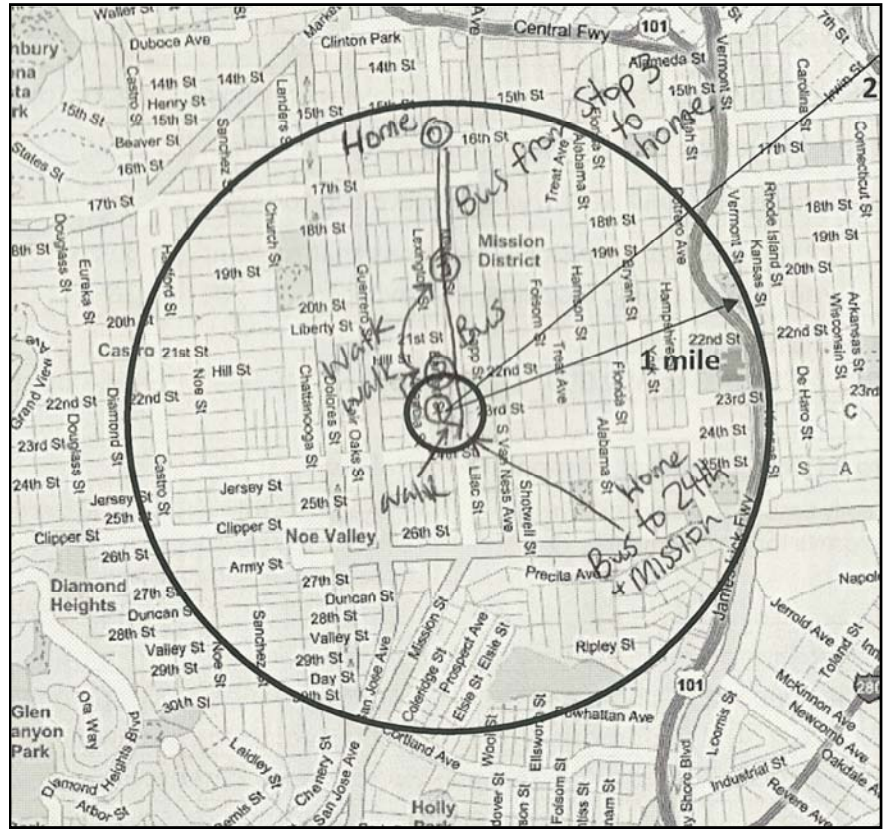
Individual stages in the tour were drawn as lines connecting each stop. Each line was assigned a trip identification number to indicate the overall survey number and a sequential trip number representing the order of each trip in the tour. The trip number corresponded with the number of the stop at the end of the trip (e.g., the trip from home to the first stop was trip number one). The mode used for each stage of the trip was recorded in a separate field (Figure 4.4). When respondents used more than one mode on a trip segment, such as walking to the bus stop and then taking the bus to reach an activity, each stage had the same trip identification number but a different mode. Note that the "Unique_ID" field in the stop database and the "Trip_ID" field in the stage database had corresponding identification numbers so that stop data (e.g., stop location, parking and land use characteristics around the stop) could be joined with line segment data (e.g., stage length, travel mode) during the analysis process.

Figure 4.1. Respondent Tour Information Recorded on Survey Maps: Mission Street Site

Example of Driving Tour with Secondary Walking Trips (Respondent #2007)



Example of Driving Tour with Secondary Walking Trips & Stages (Respondent #2009)



Note: 1 mile = 1.61 kilometers

Figure 4.2. Respondent Tour Data Entered into GIS Database: Mission Street Site

Example of Driving Tour with Secondary Walking Trips (Respondent #2007)

Example of Driving Tour with Secondary Walking Trips & Stages (Respondent #2009)

Note: 1 mile = 1.61 kilometers

Figure 4.3. Five Example Tours in GIS Stop Database

Shape *	SurveyID	StopID	Unique_ID	Home1	Store	Home2
Point	2005	0	2005000	1	0	0
Point	2005	1	2005001	0	1	0
Point	2005	2	2005002	0	0	0
Point	2005	3	2005003	0	0	0
Point	2005	4	2005004	0	0	1
Point	2006	0	2006000	1	0	0
Point	2006	1	2006001	0	0	0
Point	2006	2	2006002	0	0	0
Point	2006	3	2006003	0	1	0
Point	2006	4	2006004	0	0	0
Point	2006	5	2006005	0	0	1
Point	2007	0	2007000	1	0	0
Point	2007	1	2007001	0	0	0
Point	2007	2	2007002	0	1	0
Point	2007	3	2007003	0	0	0
Point	2007	4	2007004	0	0	1
Point	2008	0	2008000	1	0	0
Point	2008	1	2008001	0	0	0
Point	2008	2	2008002	0	1	0
Point	2008	3	2008003	0	0	0
Point	2008	4	2008004	0	0	0
Point	2008	5	2008005	0	0	1
Point	2009	0	2009000	1	0	0
Point	2009	1	2009001	0	1	0
Point	2009	2	2009002	0	0	0
Point	2009	3	2009003	0	0	0
Point	2009	4	2009004	0	0	1

Each record in this database corresponded with a specific tour stop location. For example, Respondent #2005 made four stops on her tour (including returning home). Her first stop was at the survey store. Respondent #2008 made five stops, and the second stop on her tour was at the survey store.

Figure 4.4. Five Example Tours in GIS Stage Database

Shape *	SurveyID	LinkID	Trip_ID	Mode	Len_Mi	Home_From	Store_To	Store_From	Home_To
Polyline	2005	1	2005001	Bike	0.3143	1	1	0	0
Polyline	2005	2	2005002	Bike	1.52881	0	0	1	0
Polyline	2005	3	2005003	Bike	1.40104	0	0	0	0
Polyline	2005	4	2005004	Bike	0.66742	0	0	0	1
Polyline	2006	1	2006001	Auto	2.90377	1	0	0	0
Polyline	2006	1	2006001	BART	10.5155	1	0	0	0
Polyline	2006	1	2006001	Walk	0.05748	1	0	0	0
Polyline	2006	2	2006002	Walk	0.04998	0	0	0	0
Polyline	2006	3	2006003	Walk	0.10746	0	1	0	0
Polyline	2006	3	2006003	BART	10.5191	0	1	0	0
Polyline	2006	3	2006003	Walk	0.14292	0	1	0	0
Polyline	2006	4	2006004	Walk	0.05649	0	0	1	0
Polyline	2006	5	2006005	Walk	0.05788	0	0	0	1
Polyline	2006	5	2006005	Auto	3.01434	0	0	0	1
Polyline	2007	1	2007001	Auto	4.84937	1	0	0	0
Polyline	2007	1	2007001	Walk	0.05157	1	0	0	0
Polyline	2007	2	2007002	Walk	0.13666	0	1	0	0
Polyline	2007	3	2007003	Walk	0.13666	0	0	1	0
Polyline	2007	4	2007004	Walk	0.05157	0	0	0	1
Polyline	2007	4	2007004	Auto	4.85807	0	0	0	1
Polyline	2008	1	2008001	Walk	0.44123	1	0	0	0
Polyline	2008	2	2008002	Walk	0.14939	0	1	0	0
Polyline	2008	3	2008003	Walk	0.22898	0	0	1	0
Polyline	2008	4	2008004	Walk	0.4382	0	0	0	0
Polyline	2008	5	2008005	Walk	0.31245	0	0	0	1
Polyline	2009	1	2009001	Bus	0.81673	1	1	0	0
Polyline	2009	1	2009001	Walk	0.07377	1	1	0	0
Polyline	2009	2	2009002	Walk	0.10932	0	0	1	0
Polyline	2009	3	2009003	Walk	0.29336	0	0	0	0
Polyline	2009	4	2009004	Walk	0.03884	0	0	0	1
Polyline	2009	4	2009004	Bus	0.41077	0	0	0	1

Each record in this line segment database corresponded with the location of a specific tour stage. For example, Respondent #2005 made all four trips in her tour by bicycle. Respondent #2006 drove from home to a BART station, took BART, and then walked the final 0.06 miles (100 m) to her first stop. From there, she walked to her second stop. Then she walked, took BART, and walked to the survey store. After walking to her fourth stop, she walked to her car and drove home. Respondent #2007 had his car at home, then drove and parked in the shopping district. He walked from his car to all three stops, and then walked back to his car and drove home. Respondent #2008 walked for her entire tour. Respondent #2009 took the bus from a stop in front of her home, walked between stops in the shopping district, and took the bus back to her home.

Note: 1 mile = 1.61 kilometers

Accuracy of Geocoded Tour Data

Of the 5,028 stop locations, 3,976 (79%) were within the 2-mile (3.2-km) radius of the survey store. These stops were marked on the survey map and geocoded to within approximately one-half block (within 0.02 to 0.05 miles (30 to 80 m)) of the actual stop location. For stops made outside of this radius, respondents listed the name of the city or neighborhood where they stopped. These locations were geocoded to a general location within the neighborhood or community. In addition, actual travel routes were approximated because it was not feasible to ask respondents to list specific roadways used on their tour within the short survey timeframe. Therefore, longer stage distances in the GIS line database were less accurate than shorter stage distances.

Types of Shopping Districts

In order to evaluate pedestrian activity in different urban environments, the 20 shopping districts were classified into general categories using furthest neighbor cluster analysis. Four categories of shopping districts were identified: 1) Urban Core, 2) Suburban Main Street, 3) Suburban Thoroughfare, and 4) Suburban Shopping Center (Figure 3.2 and Table 3.4). The cluster analysis methodology and the four types of shopping districts are described in Chapter 3.

4.5. RESULTS

Results showed that the human-scaled transportation survey provided a more thorough understanding of pedestrian travel than traditional metrics, quantified key differences in pedestrian travel by urban environment, and made it possible to illustrate geographic patterns of fine-grained walking movements near survey stores.

Comparison of Traditional Mode Share Metrics with Additional Metrics

Having detailed travel data that included short trips and secondary modes used for stages within trips made it possible to represent pedestrian transportation more completely than typical transportation mode share analyses (Table 4.1). Analysis of all 959 tours showed:

<u>Traditional Metrics</u>

- *Primary tour mode*. The mode used for the longest distance on most respondent tours was automobile (67%), followed by walking (21%), transit (10%), and bicycle (2%) (Figure 4.5).
- *Person distance traveled on entire tour*. Respondents reported traveling approximately 11,800 miles (19,000 km) on their tours (an average of 12.3 miles (19.8 km) per respondent). Less than five percent of total respondent travel distance was covered by walking. This is because automobile, public transit, and bicycle modes tended to cover greater distances in the same amount of time as walking. However, walking still represented approximately 533 miles (858 km) of travel by the 959 respondents (0.56 miles (0.90 km per respondent). Information about total walking distance on public streets in specific geographic areas is important for evaluating exposure to traffic crashes and understanding the potential for routine travel to provide physical activity.

<u>Additional Metrics</u>

- *Primary trip mode on trips within shopping districts*. Walking was used as the primary mode for 65% of respondent trips between pairs of stops within shopping districts (e.g., within one-half mile of the survey store) and for 73% of trips between pairs of stops within store corridors (e.g., within an area 0.2-miles (321-m) wide and 0.5-miles (804-m) long—0.25 miles (402 m) in either direction—along the commercial street adjacent to the store). In addition, 33% of respondents used walking as their primary mode on the trip accessing the survey store (e.g., between the last stop and the survey store, even if the last stop was outside the shopping district).

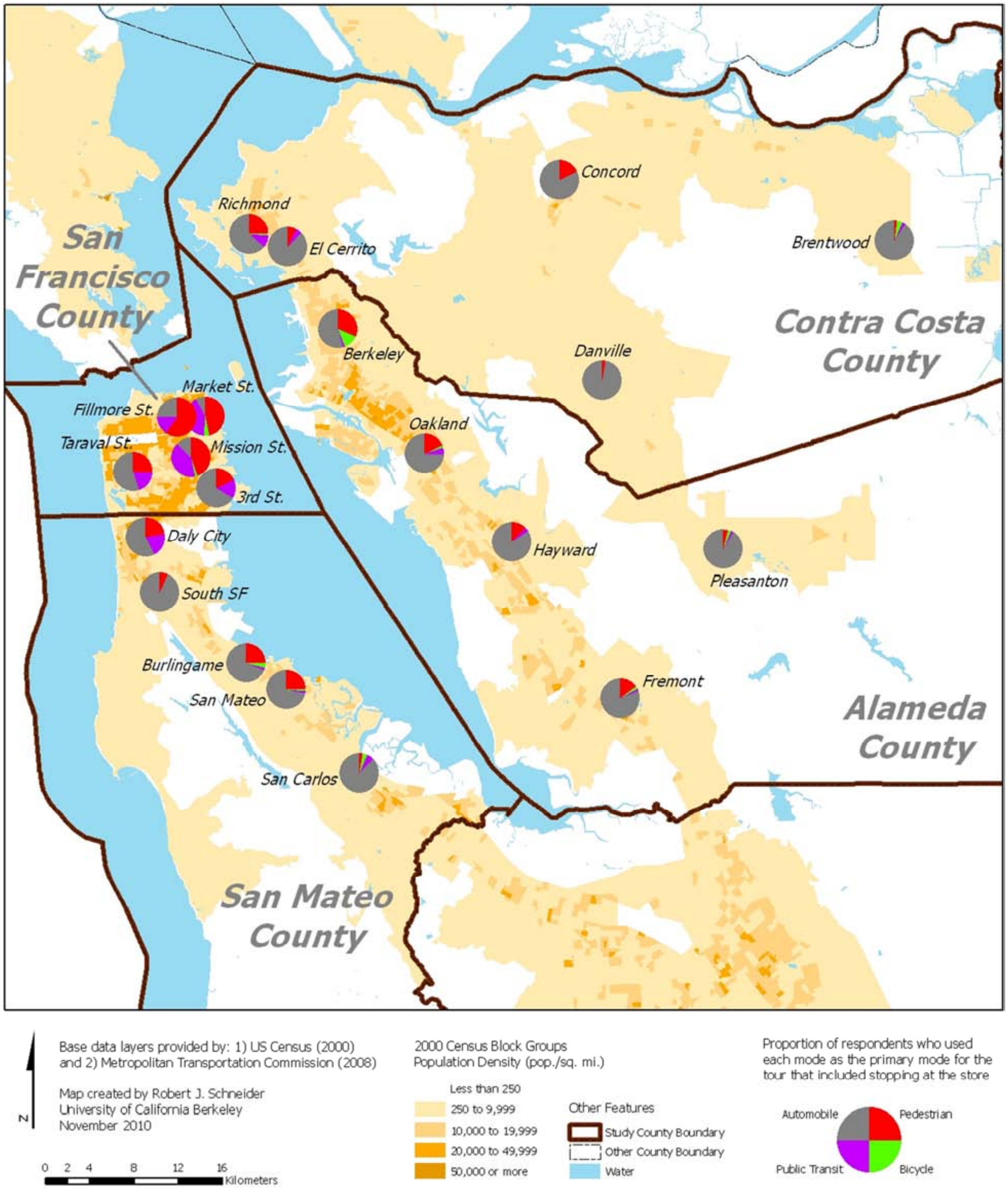
- *Person miles traveled on trips within shopping districts*. Of the 377 miles (607 km) respondents traveled between stops within shopping districts, 206 miles (331 km) (55%) were covered by walking. Walking accounted for 56 miles (90 km) (68%) of the 83 miles (134 km) of travel reported within store corridors.
- *Mode use*. An evaluation of modes that were used at least once on each tour showed that 52% of respondents walked along a street or between stops at some time between leaving and returning home. Walking was utilized for at least one stage of travel within the shopping district by 70% of respondents and for at least one stage of travel within the store corridor by 76% of respondents.

These additional metrics illustrate that it is common for people to walk as a part of routine travel. They are especially useful for understanding the prevalence of walking within specific geographic areas, such as shopping districts and activity centers, and for certain types of trips, such as accessing a specific type of store.

Table 4.1. Mode Share Measures for All Survey Respondents

	Total from all 20 Stores					
Measure	Sample Size	Walk	Bike	Transit	Auto	Total
Primary Mode Measures						
Primary mode used on whole tour	959	21.3%	2.2%	9.9%	66.6%	100%
Primary mode used on trips within shopping district	1382	65.2%	2.0%	0.5%	32.3%	100%
Primary mode used on trips within store corridor	613	72.8%	2.1%	0.2%	25.0%	100%
Primary mode used on trip accessing survey store	959	32.8%	2.3%	5.0%	59.9%	100%
Total Distance by Mode Measures						
Total distance by mode on whole tour	959	4.5%	0.8%	9.8%	84.9%	100%
Total distance by mode on trips in shopping district	1378	54.6%	2.6%	0.8%	42.0%	100%
Total distance by mode on trips within store corridor	608	67.5%	2.6%	0.2%	29.7%	100%
Mode Use Measures						
Proportion of tours that included a specific mode	959	51.9%	2.4%	12.1%	68.4%	N/A
Proportion of trips within shopping district that included specific mode	1378	70.1%	1.9%	0.6%	32.6%	N/A
Proportion of trips within store corridor that included specific mode	608	75.5%	2.0%	0.2%	25.0%	N/A

Figure 4.5. Primary Tour Mode Share for Survey Respondents by Shopping District



Note: 1 square mile = 2.59 square kilometers

Pedestrian Travel by type of Urban Environment

Detailed measures of walking made it possible to illustrate differences in pedestrian travel in particular urban environments. This indicated that it was especially important to capture short-distance pedestrian trips and secondary pedestrian stages in Urban Core and Suburban Main Street shopping districts.

- Walking was used as the primary tour mode by many respondents in dense, mixed-use, urban areas, but relatively few respondents in suburban areas. Walking was the primary mode used by 51% of participants surveyed in Urban Core shopping districts, 24% in Suburban Main Street, 9% in Suburban Thoroughfare, and 5% in Suburban Shopping Center shopping districts (Table 4.2).
- While walking may represent a small share of overall transportation movement in a metropolitan region, walking was used for greater distances on tours to Urban Core shopping districts. Pedestrian travel represented 244 (18%) of the 1,360 respondent miles traveled (393 of the 2,190 respondent km traveled) on these tours. Respondents traveling to Urban Core shopping districts walked much further during their tours (average of 1.58 miles (2.54 km) per tour) than respondents traveling to other types of shopping districts (average of 0.36 miles (0.58 km) per tour).
- Alternative measures of mode share showed that walking was very common in higher density, mixed-use shopping districts. Trips that began and ended within the shopping district were commonly made by walking in Urban Core corridors (96%) and Suburban Main Street corridors (63%). Considering overall tour mode use, 97% of respondents traveling to and from Urban Core shopping districts and 58% traveling to and from Suburban Main Street shopping districts did some walking on their tour.
- Walking was not as common among respondents in Suburban Thoroughfare and Suburban Shopping Center shopping districts, but these automobile-oriented shopping districts still had pedestrian activity. 30% of respondent trips starting and ending within in Suburban Thoroughfare shopping districts and 40% of respondent trips within Suburban Shopping Center shopping districts were made by walking. In addition, more than one-quarter of full tours to and from Suburban Thoroughfare (28%) and Suburban Shopping Center (32%) shopping districts included at least one pedestrian stage. This finding underscores the importance of making all urban areas accessible and safe for pedestrians because people will walk, even when land use patterns and neighborhood design make walking inconvenient.
- A majority of respondents considered using walking as an option to travel to the Urban Core (80%) and Suburban Main Street (62%) survey stores, but fewer considered walking to the Suburban Thoroughfare (35%) and Suburban Shopping Center (50%) stores. This may indicate that walking is less convenient in suburban locations because, on average, people live further from stores than in urban areas. However, it could also suggest that conditions for walking are viewed as uncomfortable or unsafe in suburban communities (e.g., disconnected pedestrian facility networks; difficult pedestrian crossings of multi-lane arterial thoroughfares). Greater consideration of walking in Urban Core areas may also reflect that automobile parking is limited and expensive, so driving is not viewed as an attractive mode choice (only 25% of respondents surveyed at Urban Core stores considered driving, compared to 74% at Suburban Main Street, 92% at Suburban Thoroughfare, and 95% at Suburban Shopping Center stores).

Table 4.2. Primary Mode Share Used by Respondents in Different Urban Environments

1. Urban Core	Respondent Mode Share[1]				
Shopping District	N	Walk	Bicycle	Transit	Automobile
SF-Market St.	49	46.9%	4.1%	40.8%	8.2%
SF-Fillmore St.	52	59.6%	0.0%	15.4%	25.0%
SF-Mission St.	53	45.3%	1.9%	39.6%	13.2%
Cluster Average	**154**	**50.6%**	**1.9%**	**31.8%**	**15.6%**

2. Suburban Main Street	Respondent Mode Share[1]				
Shopping District	N	Walk	Bicycle	Transit	Automobile
Berkeley	54	31.5%	13.0%	1.9%	53.7%
Oakland	50	18.0%	2.0%	6.0%	74.0%
Richmond	50	24.0%	2.0%	10.0%	64.0%
SF-Taraval St.	47	25.5%	0.0%	19.1%	55.3%
SF-Third St.	45	17.8%	0.0%	15.6%	66.7%
Daly City	45	22.2%	0.0%	20.0%	57.8%
Burlingame	52	25.0%	3.8%	1.9%	69.2%
San Mateo	53	24.5%	1.9%	1.9%	71.7%
Cluster Average	**396**	**23.7%**	**3.0%**	**9.1%**	**64.1%**

3. Suburban Thoroughfare	Respondent Mode Share[1]				
Shopping District	N	Walk	Bicycle	Transit	Automobile
Hayward	51	11.8%	0.0%	3.9%	84.3%
Fremont	47	14.9%	2.1%	2.1%	80.9%
Danville	42	2.4%	0.0%	0.0%	97.6%
Brentwood	43	2.3%	4.7%	2.3%	90.7%
Concord	45	17.8%	0.0%	0.0%	82.2%
El Cerrito	41	7.3%	0.0%	4.9%	87.8%
San Carlos	47	2.1%	4.3%	6.4%	87.2%
Cluster Average	**316**	**8.5%**	**1.6%**	**2.8%**	**87.0%**

4. Suburban Shopping Center	Respondent Mode Share[1]				
Shopping District	N	Walk	Bicycle	Transit	Automobile
Pleasanton	47	4.3%	2.1%	2.1%	91.5%
S. San Francisco	46	6.5%	0.0%	0.0%	93.5%
Cluster Average	**93**	**5.4%**	**1.1%**	**1.1%**	**92.5%**

Overall	Respondent Mode Share[1]				
	N	Walk	Bicycle	Transit	Automobile
Overall Average	**959**	**21.3%**	**2.2%**	**9.9%**	**66.6%**

1) Survey respondent transportation mode share is the mode that the person used for the greatest distance on their entire tour from the time they left home until the time they returned home. Cluster average is weighted average of individual store data based on surveys per store (2009).

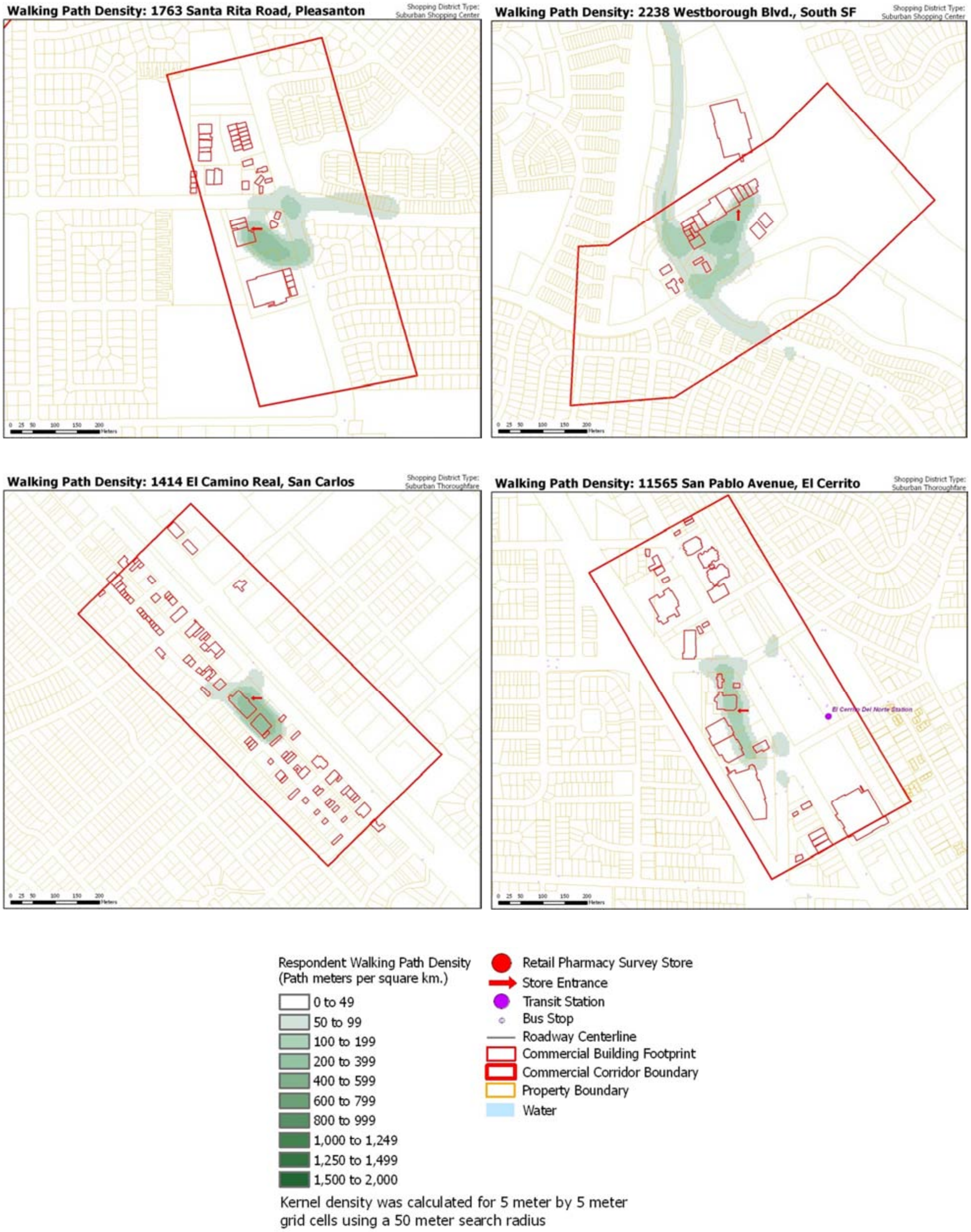
Pedestrian Path Density

Detailed data on short trips and secondary modes of transportation provided useful data for representing pedestrian movements geographically. Path density maps showed where concentrations of respondent pedestrian activity occurred. Survey respondents in Urban Core shopping districts tended to walk along the entire commercial street as well as along streets that provided connectivity to the main shopping area (Figure 4.6). Respondent pedestrian patterns in Suburban Main Street shopping districts tended to concentrate along the length of the main shopping street (Figure 4.7). In contrast, many pedestrian movements in Suburban Thoroughfare and Suburban Shopping Center shopping districts were contained within specific shopping complexes, indicating that most respondents traveled to the district by automobile and some walked between stores (Figure 4.8). Respondent walking path density maps are provided for all 20 shopping districts in Appendix I.

Figure 4.6. Respondent Walking Path Density in Urban Core Shopping Districts

Figure 4.7. Respondent Walking Path Density in Selected Suburban Main Street Shopping Districts

Figure 4.8. Respondent Walking Path Density in Suburban Thoroughfare and Suburban Shopping Center Shopping Districts



Potential Applications

Detailed tour mode data provide a foundation for analyzing travel movements at a human scale and offer potential to improve pedestrian planning, design, and engineering. More complete information about walking can help practitioners analyze pedestrian safety needs and improve pedestrian crossings with treatments such as new traffic signals, median islands, and curb extensions. Detailed pedestrian travel data can also help prioritize pedestrian network improvements, such as filling sidewalk gaps and enhancing streetscapes with new landscaping and street trees. More accurate information about pedestrian mode share can also help communities allocate street right-of-way space so that it serves existing and future users adequately, which may include removing or narrowing automobile travel lanes and widening sidewalks beyond minimum accessibility requirements.

Specific applications of fine-grained pedestrian data include:

- Performance measurement. Detailed information about walking mode shares and distances can be used to create more accurate transportation system performance measures. Pedestrian performance measures can be used to assess progress towards community transportation goals, such as increasing the use, comfort, and safety of walking. These performance measures can be documented at regular intervals to see how pedestrian travel changes over time.
- Transportation impact assessment. Pedestrian data can demonstrate how a particular type of development may impact the amount and type of walking in a community. This will make it possible for communities to make walking comfortable, convenient, and safe, which may include levying development impact fees for pedestrian infrastructure and safety improvements.
- Trip generation studies. The amount of walking generated by a store may be different depending on surrounding land uses, neighborhood socioeconomic characteristics, or transportation infrastructure. The number of pedestrian trips that are made to and from a particular store within a specific time period can be used to calculate pedestrian trip generation rates, which can be used in regional travel models. These more accurate trip generation rates can also be used to design sidewalks and other pedestrian facilities that go beyond minimum accessibility requirements and serve anticipated pedestrian demand.
- Safety analysis. Measures of walking within a specific geographic area can be used to quantify the amount of exposure that pedestrians have to traffic crashes and injuries. The number of reported crashes can be normalized by exposure to estimate the risk of walking in particular locations.
- Physical activity assessment. Quantifying the distance traveled by walking can provide estimates of the amount of physical activity done by people using this active mode. Incorporating more physical activity into routine travel can help reduce obesity and related diseases.
- Travel behavior analysis. Measures of pedestrian travel to, from, and within shopping districts allow researchers to identify how variables related to the store site, nearby roadway corridor, and surrounding neighborhood are associated with walking. Practitioners can use the research results to promote land use and transportation strategies that help achieve local and regional pedestrian mode share goals.

Survey Lessons Learned

Many lessons were learned by implementing the human-scaled transportation survey. The following lessons about the survey administration process and travel data accuracy and completeness may lead to advances in pedestrian data collection.

Survey Administration Process

The survey instrument and distribution process were designed to avoid systematic exclusion of any type of customer from participating. However, it was not possible to offer the survey to all customers exiting the store. The characteristics of customers who were invited to take the survey but declined to participate were documented, but people who exited the store while surveys were being administered to other customers were not recorded. Insights into non-response were gained over three months of surveying. Reasons for not participating in the survey included:

- *Lack of time*. People who declined to participate said things like: "I'm in a hurry", "Sorry, I don't have time", "My parking meter is expired, and I don't want to get a ticket", "I'm double-parked", "I need to get to an appointment", or "I'm at work—I'm not even supposed to be here". Several respondents said that they only had one or two minutes, but couldn't do the survey if it was three minutes.
- *Childcare responsibilities*. Parents refused the survey by saying, "Sorry, my kids are with me", "My kids are waiting in the car", "I've got to get my daughter to her soccer game", "I've got to get my son to a birthday party", "I'm late for picking up my daughter from daycare", and "I can't stop—my son needs to go to the bathroom".
- *Language barriers*. While the surveys were offered in English and Spanish, resources were not available to offer the survey in other languages. This prevented some customers from participating, especially Asian-language speakers at the stores in Daly City, in South San Francisco, and on Taraval Street in San Francisco. A common response from people who declined the survey was, "Sorry, I do not speak English."
- *Cell phones and other distractions*. A few people were talking on a cell phone as they exited the store. While many of these people were invited to participate in the survey, none stopped to take the survey. A few people answered their cell phone after they had started the survey, but all of these participants completed the survey.
- *Distaste for surveys or distrust of surveyors*. A few people refused the survey by saying, "I don't do surveys." Some people appeared to try to avoid being asked to participate by walking closely behind other customers exiting the store. Others appeared to simply ignore the surveyor's verbal invitation to participate. Several people were skeptical of the survey, saying "Yeah, right, you aren't a student", "I don't want to buy any", or "How much money do you want?"
- *Illness*. A few people declined to participate because they said they were sick. However, several people still took the survey even though they were congested, coughing, or said that they didn't feel well.

These common reasons for not participating in the survey may indicate certain types of non-response bias. For example, illness may have prevented some people who declined to participate from walking or bicycling, traveling long distances, or making multiple-stop tours. People who were in a hurry (e.g., working professionals or parents with childcare responsibilities) may have had more time pressure than people with more time available (e.g., people who were unemployed or retired), so they may have been more likely to choose a mode that had a higher travel speed, such as automobile, rather than walking. Since people who were in a hurry may have been less likely to participate, the modes reported by respondents may have been biased towards modes used by people who were less time-constrained. However, the value of time reported by respondents was similar to the value of time reported in the Bay Area Travel Survey, so this indicates that the time-constraint bias in this retail pharmacy store customer survey may not be very different from the well-established, larger-sample regional household survey. The value of time finding is discussed in more detail in Chapter 5.

Skilled surveyors were needed to gather high-quality data. While the lead researcher conducted 549 (55%) of the surveys, two research assistants conducted the remaining surveys. These assistants were Masters students in the UC Berkeley Department of City and Regional Planning, and they were trained by discussing the survey distribution method and each survey question in detail with the lead researcher. The assistants learned the survey method very quickly with minimal in-the-field training. However, the lead researcher and both assistants improved their survey technique with experience. For example, the response rate increased from 21.0% for the first 502 surveys to 22.8% for the remaining 501 surveys, and the number of surveys with complete tour information increased from 94.8% during the first half to 96.4% during the second half of data collection. Future training with less skilled assistants could be done by having the assistants conduct practice surveys or watch the lead surveyor administer several surveys.

Initially, the survey was designed to exclude people living more than two miles from the survey store in an attempt to ensure that most tour locations could be located on the map. This initial screening question was attempted on the first survey day, but it was determined to be disruptive to the flow of the survey. It was essential to engage the participant in the survey mode choice questions immediately to generate interest in the topic and move quickly through the initial socioeconomic questions to build rapport. In addition, some people who may have wanted an excuse not to participate would probably say that they lived too far away, while others would not have known if they lived within two miles. The screening question was also eliminated because the mapping exercise made it possible to classify respondents by geographic location: 736 (77%) of the 959 respondents who provided complete tour data lived within two miles (3.2 km) of the store.

<u>Travel Data Accuracy and Completeness</u>

Mapping respondent tour stops and routes was useful for improving the accuracy of the initial responses to the survey. The first survey question asked respondents to report the primary mode of transportation they were using on their tour. Responses to this question were compared with the actual primary respondent travel mode calculated from their geocoded tour data. This comparison showed that the Question 1 response and geocoded tour data differed for 72 (7.5%) of the 959 respondents. Most of the incorrect responses to Question 1 were due to respondents reporting walking as their primary mode when they had either used transit or an automobile for the majority of their tour. It is likely that these respondents confused the walking that they had done from their last activity stop, bus stop, or parking space with their overall tour mode, so it was helpful to correct their primary mode response with the geocoded data.

A small number of respondents did not begin or end the day at home. One respondent had been on a business trip in Las Vegas, flew to Oakland, went to the office, and stopped at the store before going home. Another respondent lived in Brentwood and stopped at the store on the way to a multi-day conference in San Jose. The route information from these respondents was not used.

Several respondents reported the locations of other stops they made before the store, but they did not know where they were going afterward. After prompting, these participants reported locations where they thought they might go. In addition, some respondents may have added unanticipated stops to their tour before returning home. It was not possible to know how many people revised their travel plans after completing the survey. Responses describing when participants decided to go to the survey store provided some insight into unplanned stops: 24% did not decide until after they left home, and 15% decided when they were passing by the store. Therefore, it was relatively common for people to make unplanned stops on a tour. This highlights a challenge of relying on self-reported travel behavior, especially for anticipated travel.

Global positioning systems (GPS) techniques may be able to collect similar complete tour data, and this technique has been used to document bicycle travel routes and speeds (Dill and Gliebe 2008; Charlton *et al*. 2011). Several challenges for using this type of approach include 1) participants being aware of carrying the devices and possibly modifying their travel behavior to conform with social norms, 2) representative sampling (i.e., if GPS units are used, only a certain type of person may be willing to travel with a device; if tracks from mobile devices are used, the analysis will only represent people who own these devices), 3) difficulty identifying the exact locations of transitions between modes such as walking, bicycling, and public transit based on the recorded speed of movement along a route, and 4) missing route data due to loss of contact with satellites, devices being turned off or running out of batteries, or other recording errors. However, this technology would be interesting to pursue through future research. If GPS units were used to collect respondent tour data, survey participants could correct route information and verify the mode used on each stage of their tour during a follow-up interview (Dill and Gliebe 2008).

The survey was designed to capture all walking respondents did on public streets and between stores in shopping complexes. As respondents used the map to describe where they parked their car or got off the bus, surveyors were able to ask if they walked for short distances. Many people reported these walking movements, but it is likely that others did not mention these short walking stages because they had already forgotten them, had survey fatigue, or did not anticipate that they would be walking from parking or bus stops later in their tour. Therefore, it is likely that the survey still underreported pedestrian travel.

However, it is likely that the face-to-face survey method was able to capture more complete data about respondent walking than a telephone, internet, or mail survey. Talking with the respondent while they were on their tour probably made it easier for them to recall walking stages that they had done. They would be less likely to remember these walking stages if they needed to wait until the end of the day or week to complete a trip diary or phone interview. In addition, other types of surveys are not able to relate to the respondent's specific tour in real time, but surveyors in the field can point to nearby buildings and refer to local landmarks to help respondents describe their travel.

4.6. CONCLUSION

Some existing surveys do not capture short-distance pedestrian movements. When walking information is collected, it may not be very accurate, and it is rarely analyzed. This chapter described an intercept survey and GIS analysis method that was used to capture and quantify short pedestrian trips and other walking movements that were part of automobile or transit tours to, from, and within 20 shopping districts in the San Francisco Bay Area. Short pedestrian trips and secondary pedestrian movements were most common in Urban Core and Suburban Main Street shopping districts.

While the San Francisco Bay Area provided a range of urban and suburban environments for capturing detailed walking data, it would be useful to do a similar study in a different region. In addition, the survey was done in shopping districts, so it captured travel for shopping or errands, among other purposes. Future surveys could be done in employment centers, residential neighborhoods, or recreational areas to capture more complete pedestrian travel data in other types of locations. Additional considerations for future research are described in Chapter 8.

Mode share analyses that only consider the primary transportation mode on a tour underrepresent all pedestrian travel, especially walking in urban, mixed-use environments. While it may not be feasible to include all walking done by respondents in every type of travel survey, it is important to recognize the amount and type of travel that is being left out by certain methods. Detailed mode share data provide a foundation for analyzing travel movements at a human scale and offer potential to improve transportation pedestrian planning, design, and engineering. Specific applications of detailed pedestrian data include performance measurement, transportation impact assessment, trip generation studies, safety analysis, physical activity assessment, and travel behavior analysis.

CHAPTER 5. FACTORS ASSOCIATED WITH SUSTAINABLE TRAVEL TO AND FROM SHOPPING DISTRICTS

5.1. SUMMARY

As communities search for ways to provide multimodal travel options for residents, it is important for planners to understand characteristics of the urban environment that are associated with walking and bicycling for routine travel. Prior research has identified several categories of factors that are associated with walking and bicycling, including travel time and cost, socioeconomic characteristics, attitudes towards walking and bicycling, perceptions of crime and traffic safety, neighborhood land use and transportation infrastructure characteristics, and site and corridor design. However, few studies have attempted to account for these factors simultaneously while controlling for the effect of trip chaining on mode choice.

This chapter describes how mixed logit discrete choice modeling and qualitative interviews were used to identify factors associated with traveling to and from shopping districts by walking, bicycling, public transit, or automobile. The analysis was based on survey data from 1,003 retail pharmacy store customers in 20 San Francisco Bay Area shopping districts in fall 2009 and 26 follow-up interviews with survey participants in spring 2010.

Two mixed logit model analyses were conducted to identify characteristics of communities that planners, designers, engineers, and other policy makers could influence to make pedestrian, bicycle, and public transportation more attractive. Both analyses controlled for important travel and socioeconomic variables, such as travel time and distance, travel cost, number of stops, the number of bags being carried, traveling with other people, gender, student status, income or automobile ownership, and physical disabilities.

The main analysis focused on 397 respondents whose tours involved stopping only within each study shopping district. It showed that respondents who enjoyed walking were more likely to choose to walk rather than use public transportation or automobile, and respondents who traveled to shopping districts with higher employment and population densities were more likely to walk or take transit than use an automobile. In addition, walking was more attractive when multilane roadways in the shopping district had greater tree canopy coverage, automobile was more attractive when the survey store had a larger parking lot, and public transit was more attractive when the survey store was located closer to a regional transit station.

The secondary analysis was conducted using complete tour data from all respondents. While the secondary analysis used tour travel distance as a predictive variable rather than travel time and did not control for the primary purpose of multi-district tours, it provided additional insights about factors associated with the primary mode used on all 959 respondent tours. The exploratory analysis of a small number of bicycle tours revealed that respondents who enjoyed bicycling were more likely to bicycle, and respondents who traveled to shopping districts where they perceived higher crime risk were more likely to drive on their tour than use other modes. Bicycling was a more attractive tour travel mode for people surveyed in shopping districts with more miles of bicycle facilities and at stores with more bicycle parking spaces. The utility of driving on a tour tended to be lower than other modes when the street adjacent to the survey store had metered on-street parking.

This chapter suggests that planning practice can help transform communities into places that support sustainable mode choices for routine travel. After controlling for socioeconomic factors, walking to and from shopping districts was associated with factors such as shorter travel distances, higher population densities, more street tree canopy coverage, and greater enjoyment of walking. The exploratory analysis of a small number of bicycle tours found that bicycling was associated with shorter travel distances, more bicycle facilities, and greater enjoyment of bicycling. People were more likely to drive when they perceived a high risk of crime, but automobile use was discouraged by higher employment densities, smaller parking lots, and metered on-street parking. Creating communities with characteristics that support walking and bicycling may make it possible for more people to live active lifestyles and make sustainable transportation modes more convenient, safe, and useful for routine activities, such as shopping.

5.2. INTRODUCTION

Over the past two decades, many United States communities have established policies to reduce private automobile use and increase the proportion of travel done by walking and bicycling. For example, the City and County of San Francisco Municipal Charter (as amended in 2007) states, "Decisions regarding the use of limited public street and sidewalk space shall encourage the use of public rights of way by pedestrians, bicyclists, and public transit, and shall strive to reduce traffic and improve public health and safety." The Transportation 2035 Plan for the San Francisco Bay Area includes a performance objective to "Reduce daily per-capita vehicle miles traveled (VMT) by 10 percent from today by 2035" (Metropolitan Transportation Commission 2009). As of January 2011, 23 states and more than 150 local and regional governments had established official policies to improve pedestrian and bicycle conditions as a part of all transportation plans and projects (Complete Streets Coalition 2011).

While some local strategies have resulted in more walking and bicycling in specific neighborhoods and for particular groups of people, broad modal shifts have not occurred. The private motor vehicle accounts for 83% of all trips and is the most common transportation mode used in every metropolitan region in the United States. Nationally, walking accounts for only 11% and bicycling accounts for only one percent of all trips. Automobile use is even higher among the 22% of home-based trips that are made for shopping purposes, accounting for 89% of all shopping travel (Federal Highway Administration 2009).

Many studies have explored factors associated with pedestrian and bicycle mode choice, but relatively few have accounted for trip-chaining behavior. This is important because some individual trips between activities (e.g., home to shopping) may be a short "walkable" or "bikable" distance when viewed by themselves, but the entire trip chain, or tour (e.g., home to work to daycare to shopping to home), is very difficult to complete without an automobile. Also, in recent years, researchers have identified associations between attitude, perception, neighborhood, and site characteristics and pedestrian and bicycle mode choice. However, few studies have attempted to develop statistical models that include traditional travel and socioeconomic variables and these new factors. Some variables may have weaker associations with walking and bicycling than previously reported when tested in combination with a full set of explanatory variables. Therefore, it is not clear which strategies available to urban planners may be the most effective for increasing walking and bicycling for routine trips.

5.3. PURPOSE

The purpose of this chapter is to provide planners with more complete information about the type of urban environments that support walking and bicycling for routine travel, such as to and from shopping districts. This information can be used to promote land use regulations, roadway corridor and site designs, parking guidelines, or other strategies that may be effective at increasing walking and bicycling. Therefore, this chapter explores the following research question: What travel, socioeconomic, attitude, perception, and local environment characteristics are associated with walking and bicycling to and from shopping districts?

5.4. LITERATURE REVEIW

Many travel behavior studies have explored factors associated with pedestrian and bicycle mode choice. Table 5.1 and Table 5.2 list factors shown by several discrete choice modeling studies to be associated with pedestrian and bicycle travel. These studies have used data from a variety of sources, including household travel surveys (Purvis 1997; Bowman and Ben-Akiva 2000; Kim and Ulfarsson 2008), intercept surveys (Walton and Sunseri 2007), and stated preference surveys (Ryley 2008).

Discrete choice modeling is a common approach for identifying factors that are associated with walking or bicycling. Binomial logit models have been used to compare between two alternatives, such as the choice of walking versus driving or the choice of bicycling versus using any other mode (Black, Collins, and Snell 2001; Berrigan and Troiano 2002; Cervero and Duncan 2003; Walton and Sunseri 2007; Ryley 2008). Multinomial logit models are used to compare three or more alternatives, such as walking, bicycling, and driving (Bowman and Ben-Akiva 2000; Kim and Ulfarsson 2008). This model structure assumes that each choice is independent (i.e., if the bicycle alternative is removed, survey respondents will be equally likely to choose between walking or driving). Nested logit models are used to account for interdependence between modes when there are three or more mode choices (Purvis 1997; Jonnalagada *et al*. 2001). For example, pedestrian and bicycle modes are sometimes grouped together into a “non-motorized” nest. This is appropriate when study participants are likely to either drive or use a non-motorized mode but are unlikely to switch between walking and bicycling if one of the non-motorized modes is not an option (e.g., if the bicycle alternative is removed, survey respondents will be more likely to walk than drive).

Mixed logit models that include nesting parameters also overcome the independence of irrelevant alternatives problem (Revelt and Train 1998; Hensher and Greene 2003; Train 2009). Most researchers have used them to analyze various types of automobile, public transit, and air transportation choices and have not included walking and bicycling (Viton 2004; Long, Lin and Proussaloglou 2010). The mixed logit structure also has the flexibility to account for multi-level data collected from identical surveys distributed in different locations. This data collection approach is common for studying relationships between neighborhood characteristics, physical activity, and pedestrian travel, but most previous studies have not employed mixed logit models (Shriver 1997; Steiner 1998; Mackett 2003; Brown, Khattak, and Rodriguez 2008).

Mode choice studies have also measured travel differently. Some have explored the choice of mode for individual trips between two activity locations (Purvis 1997; Cervero and Duncan 2003; Kim and Ulfarsson 2008; Ryley 2008). Others have considered entire tours, or trip-chains, which include the set of trips from the time a person leaves home until they return home (Bowman and Ben-Akiva 2000; Jonnalagada *et al*. 2001). Chen, Gong, and Paaswell (2008) suggest that trip chains, rather than individual trips, should be used for analyzing mode choice.

Table 5.1. Factors Associated with Pedestrian Travel in Discrete Choice Modeling Studies

	Context		Methodology		Significant Factors[1]				
Author(s) (Year)	**Study Area**	**Sample Size**	**Data Collection**	**Analysis**	**Travel**	**Socioeconomic**	**Attitude & Perception**	**Neighborhood & Site**	**Other**
Purvis (1997)	San Francisco Bay Region	10,838 households, unreported number of trips	1990 Bay Area Travel Survey 2-day activity diary	Nested logit model of work trip mode choice	Ln(Travel time) (-)			Employment density in zone of work (+)	
Purvis (1997)	San Francisco Bay Region	10,838 households, unreported number of trips	1990 Bay Area Travel Survey 2-day activity diary	Nested logit model of home-based shopping/other trip mode choice	Travel time (-)	Zero-automobile household (+)			
Bowman & Ben-Akiva (2000)	Boston Region	1,929 tours	1991 Boston MPO 1-day household travel diary	Multinomial logit model of non-work tours	Trip distance squared (-)	Automobiles per driver (-)			
Jonnalagadda et al. (2001)	San Francisco Bay Region	Unreported number of tours	Tour-based microsimulation of a synthesized population within San Francisco TAZs	Nested logit model of work tours	Travel time (-) Number of stops on tour (-)			Network connectivity within destination TAZ (+) Topological barriers within destination TAZ (+)	
Jonnalagadda et al. (2001)	San Francisco Bay Region	Unreported number of trips	Tour-based microsimulation of a synthesized population within San Francisco TAZs	Nested logit model of work trips	Travel time (-)			Network connectivity within destination TAZ (+) Ease of street crossings within destination TAZ (+) Urban vitality within destination TAZ (+)	
Berrigan & Troiano (2002)	United States	14,827 individuals	1988 to 1994 Third National Health and Nutrition Examination Survey	Odds ratios based on binomial logit model of walking one mile or more 0 to 19 vs. 20 or more times per month		Male (+) White (+) Age (-) High-school education or lower (-)		Home built before 1974 in urban and suburban areas (+)	
Cervero & Duncan (2003)	San Francisco Bay Region	7,836 trips	2000 Bay Area Travel Survey 2-day activity diary	Binomial logit model of trips < 5 miles (selected trip purposes)	Trip distance (-) Trip on weekend (+) Trip for recreation (+) Trip for eating/meal (+) Trip for socializing (+) Trip for shopping (+)	Disability (-) Male (+) African-American (+) Asian-American (-) White (-) # of household autos (-)		Emp. density within 1-mi. of trip origin (+) Land use diversity factor within 1 mi. of origin (+) Low-income nbhds. (-) Steeper slopes (-)	Rainfall (-) Darkness (-)
Walton & Sunseri (2007)	Auckland and Wellington, New Zealand	348 individuals	2005 intercept and mail survey of walkers and car users living within 1 km of a train or bus station	Binomial logit model of walking or driving regularly to the station		# of household autos (-)	Believe park & rides are only for people who are far from station (+) Believe it is sometimes more convenient to take the car (-)		Fine weather (+) Chance of rain (-)
Ryley (2008)	West Edinburgh, United Kingdom	627 individuals who regularly drive choosing among 5,643 stated choices	2003 stated preference survey of 9 scenarios varying 3 conditions: trip time, gas price, and parking price	Binomial logit model of walking or driving for a 10-min. driving trip in dry weather, traveling alone, and carrying no packages	Parking cost (+) Gas cost (+)				
Kim & Ulfarsson (2008)	Seattle Region	2,737 trips	1999 2-day household activity survey	Multinomial logit model of single-mode, single-purpose, weekday trips < 1.4 miles	Trip distance (-) Trip during daytime (+) Traveling with at least one other person (-) Trip to school (+) Trip for shopping (-) Trip for eating out (+) Trip for socializing/recreation (+) Total travel time in day (+)	Age (-) African American or Hispanic (-) College degree (+) Drivers license (-) Lived in home < 1 year (+) Vehicle availability (-) Married w/o children (-) Married with children (-) Non-family household (-)		Urban index (+)	

1) Significant factors include variables that are determined to be significant by the study author(s). A positive association between the factor and pedestrian mode choice is indicated by a (+), and a negative association is indicated by a (-).

Note: 1 mile = 1.61 kilometers

Table 5.2. Factors Associated with Bicycle Travel in Discrete Choice Modeling Studies

	Context		Methodology		Significant Factors[1]				
Author(s) (Year)	**Study Area**	**Sample Size**	**Data Collection**	**Analysis**	**Travel**	**Socioeconomic**	**Attitude & Perception**	**Neighborhood & Site**	**Other**
Purvis (1997)	San Francisco Bay Region	10,838 households, unreported number of trips	1990 Bay Area Travel Survey 2-day activity diary	Nested logit model of work trip mode choice	Travel time (-)			Ln(Employment density) in zone of residence (+) Stanford = zone of work (+) Palo Alto = zone of work (+) Berkeley = zone of work (+)	
Purvis (1997)	San Francisco Bay Region	10,838 households, unreported number of trips	1990 Bay Area Travel Survey 2-day activity diary	Nested logit model of home-based shopping/other trip mode choice	Travel time (-)			Stanford = zone of shop (+) Palo Alto = zone of shop (+) Berkeley = zone of shop (+)	
Bowman & Ben-Akiva (2000)	Boston Region	1,901 tours	1991 Boston MPO 1-day household travel diary	Multinomial logit model of work tours	Distance (-)	Automobiles per driver (-) Under age 20 (+)			
Bowman & Ben-Akiva (2000)	Boston Region	1,929 tours	1991 Boston MPO 1-day household travel diary	Multinomial logit model of non-work tours	Distance (-)	Automobiles per driver (-) Under age 20 (+)			
Jonnalagadda et al. (2001)	San Francisco Bay Region	Unreported number of tours	Tour-based microsimulation of a synthesized population within San Francisco TAZs	Nested logit model of work tours	Travel time (-) Number of stops on tour (-)				
Jonnalagadda et al. (2001)	San Francisco Bay Region	Unreported number of trips	Tour-based microsimulation of a synthesized population within San Francisco TAZs	Nested logit model of work trips	Travel time (-)				
Cervero & Duncan (2003)	San Francisco Bay Region	7,836 trips	2000 Bay Area Travel Survey 2-day activity diary	Binomial logit model of trips < 5 miles (selected trip purposes)	Trip distance (-) Trip for recreation (+) Trip for socializing (+)	Male (+) African-American (+) Number of household vehicles (-) Number of household bicycles (+)		Emp. density within 1 mi. of origin (-) Retail density within 1 mi. of origin (+) Pedestrian/bike-friendly design factor within 1 mi. of destination (+) Ped/bike-friendly factor within 1 mi. of origin (+) Slope (-) Land use diversity factor within 1 mi. of origin (+) Low-income nbhds. (-)	Darkness (-)
Kim & Ulfarsson (2008)	Seattle Region	2,737 trips	1999 2-day household activity survey	Multinomial logit model of single-mode, single-purpose, weekday trips < 1.4 miles	Traveling with at least one other person (-) Trip to school (+) Trip for socializing/recreation (+)	Age (-) Bus pass (+) Vehicle availability (-) Non-family household (-)			
Handy, Xing, & Buehler (2010)	Davis, Chico, Turlock, and Woodland, CA; Boulder, CO; Eugene, OR	571 individuals	2006 online survey and 2008 phone survey	Nested logit model of bicycle use and ownership (results presented here are characteristics of people bicycling at least once per week)		Age (-) Education level (+)	Concern about environment (+) Level of comfort with bicycling (+) Chose to live in bicycle-friendly community (+) Perceive bicyclists to have little regard for their personal safety (+)	Longer distances to destinations (-) Network of off-street bicycle paths (+)	

1) Significant factors include variables that are determined to be significant by the study author(s). A positive association between the factor and bicycle mode choice is indicated by a (+), and a negative association is indicated by a (-).

Note: 1 mile = 1.61 kilometers

Researchers have found several categories of factors to be related to pedestrian or bicycle mode choice. These include travel, socioeconomic, attitude, perception, and neighborhood and site factors.

Travel Factors

Pedestrian and bicycle modes are generally slower than automobiles and transit vehicles, so shorter travel time and distance are travel factors that tend to be associated with a higher likelihood of walking and bicycling for both trips and tours (Purvis 1997; Bowman and Ben-Akiva 2000; Jonnalagadda *et al*. 2001; Cervero and Duncan 2003). Higher costs of gas and automobile parking also make walking more attractive compared to driving (Ryley 2008). Traveling with another person has been associated with a lower likelihood of walking and bicycling compared with driving (Kim and Ulfarsson 2008). Compared with driving, people may be less likely to bicycle and much less likely to take transit and walk on tours that have a greater number of stops (Jonnalagadda *et al*. 2001). However, a study of four Austin neighborhoods shows that between 82 and 92 percent of walking trips are made for more than one activity (Shriver 1997). Specific trip purposes have also been shown to relate to pedestrian and bicycle mode choice. Trips for recreation, socializing, and eating out have a significantly higher likelihood of being done by walking than trips for other purposes (Cervero and Duncan 2003; Kim and Ulfarsson 2008). Walking and bicycling are also more likely for school trips (Kim and Ulfarsson 2008). Shopping trips have shown mixed results for walking. Carrying heavy packages and bad weather have been cited as reasons for using a car instead of walking or bicycling for shopping trips shorter than five miles (Mackett 2003).

Socioeconomic Factors

Many socioeconomic characteristics are related to the propensity to travel by walking or bicycling rather than driving. Automobile ownership and availability are negatively associated with walking and bicycling (Bowman and Ben-Akiva 2000; Cervero and Duncan 2003; Kim and Ulfarsson 2008). Other socioeconomic factors positively related to pedestrian and bicycle mode choice in multiple studies include being male, younger, and better educated.

Attitudinal Factors

Attitudes towards different modes of transportation have been linked to levels of walking and bicycling. People who choose to walk rather than drive to transit stations in New Zealand hold a belief that park-and-ride lots should be used by people who live far from the station (Walton and Sunseri 2007). People with pro-environment attitudes tend to walk and bicycle more (Kitamura, Mokhtarian, and Laidet 1997), and people with pro-walking and pro-bicycling attitudes tend to walk more than the general population (Handy and Mokhtarian 2005). Bicyclists who do not bicycle regularly are more likely to agree with the view that most bicyclists are too poor to own a car (Handy, Xing, and Buehler 2010). Compared with people who do not bicycle at least once per week, regular bicyclists are more likely to choose to live in a bicycle-friendly community (Handy, Xing, and Buehler 2010). This indicates that it is important to control for personal attitudes when studying neighborhood factors that may be associated with pedestrian and bicycle mode choice. While changing the design of a neighborhood may motivate some changes in the travel behavior of existing residents, people who prefer walking and bicycling also self-select into neighborhoods where walking and bicycling are convenient and comfortable (Handy and Mokhtarian 2005).

Safety and Security Perception Factors
Previous studies that have evaluated traffic safety (e.g., risk of being struck by a vehicle) have not shown consistent relationships with pedestrian and bicycle mode choice. Saelens *et al*. (2003) find that perceived neighborhood traffic safety is associated with higher levels of walking and bicycling. However, parent perceptions of neighborhood safety for walking and bicycling are not associated with whether or not children walked to school (McMillan *et al*. 2006). Bicyclists who bicycle regularly (at least once in the last week) are less likely to be concerned with traffic safety, which may indicate that more people bicycle in environments where they feel safe (Handy, Xing, and Buehler 2010).

Studies of personal security (e.g., risk of being a victim of crime) have also shown mixed results. Women are less likely to walk for exercise and walk dogs when they perceive their neighborhood to have below average traffic safety and crime security (Suminski *et al*. 2005). However, Saelens *et al*. (2003) find that neighborhood security is not associated with higher levels of walking and bicycling.

Neighborhood and Site Design Factors
Characteristics of the neighborhood, corridor, or site area near where a person starts or ends a trip are also associated with pedestrian and bicycle mode choice. There tends to be a greater utility for walking and bicycling in areas with higher population and housing unit densities, higher employment densities, greater land use mix, and shorter distances to activity destinations (Purvis 1997; Cervero and Duncan 2003; Krizek, Forsyth, and Baum 2009; Handy, Xing, and Buehler 2010). The combined effect of these land use variables into a single factor representing "urbanized" areas has also shown a positive association with pedestrian travel (Kim and Ulfarsson 2008). However, Forsyth *et al*. (2007) suggest that higher residential densities in the Twin Cities only increase walking for utilitarian purposes; recreational walking is actually more common in lower-density neighborhoods.

Transportation infrastructure, such as sidewalk and street network connectivity, bicycle lanes, and multi-use trails may have a positive association with the likelihood of walking and bicycling (Jonnalagada *et al*. 2001; Dill and Carr 2003; Cervero and Duncan 2003; Handy, Xing, and Buehler 2010). Yet, the quality of pedestrian and bicycle facilities may have more of an influence on walking to work, shopping, or other specific destinations than increasing physical activity (Forsyth *et al*. 2008). Parking availability may also be related to the choice to walk. Children were more likely to walk to school when their parents perceived a parking problem at the school (Black, Collins, and Snell 2001). Flatter terrain has also been associated with more walking and bicycling (Cervero and Duncan 2003).

Other Factors
Several other factors have also been shown to relate to pedestrian and bicycle mode choice. People are more likely to walk under pleasant weather conditions and less likely to walk when it is raining or there is a chance of rain (Cervero and Duncan 2003; Walton and Sunseri 2007). Pedestrian and bicycle modes are less attractive during darkness (Cervero and Duncan 2003).

Many studies have identified individual factors associated with walking and bicycling mode choice. Some have accounted for several different categories of variables. However, there is a need for more studies that:

- Control for the influence of all types of explanatory variables, including travel, socioeconomic, attitudinal, perception, and neighborhood and site variables on pedestrian and bicycle mode choice.
- Control for the influence of trip chaining on pedestrian and bicycle mode choice so that the results reflect people's actual mode choice decision-making process more accurately.

5.5. METHODOLOGY

Detailed travel data were gathered from an intercept survey of retail pharmacy store customers in the San Francisco Bay Area. Information about the study area, survey distribution times and techniques, survey participant characteristics, and number of surveys completed by store location was provided in Chapter 3. The sections below focus specifically on the characteristics of survey participants who made particular types of tours and how these different types of tours were analyzed during the modeling process.

Shopping District Tours versus Multi-District Tours

Of the 959 respondents with complete tour data, 397 (41%) made all of their stops within the shopping district around the retail pharmacy store. In contrast, 562 (59%) respondents made at least one stop further than one-half mile (804 m) from the retail pharmacy store. The 562 multi-district tours were different than the 397 shopping district tours (Table 5.3). Respondents who stopped outside of the shopping district traveled longer distances, made more stops, and were more likely to decide to go to the retail pharmacy store after they had already left home. In fact, approximately 45% of people who stopped outside the shopping district decided to visit the retail pharmacy store after leaving home or passing by the store compared to 28% of people who made all of their stops in the shopping district. This suggests that people traveling outside the shopping district may have been more likely to visit the shopping district as an afterthought rather than as their primary travel purpose.

Table 5.3. Comparison of Tour Characteristics

Travel Characteristics	All Stops Within Shopping District (N=397)	At least 1 Stop Outside Shopping District (N=562)
Mean Tour Distance (km)	6.3	29.4
Median Tour Distance (km)	2.7	15.4
Mean # of Stops[1]	3.3	4.9
Median # of Stops[1]	3.0	4.0
Carrying No Bags	16.4%	14.1%
Carrying 2+ Bags	24.7%	24.2%
Shopping Alone	74.4%	73.8%
Shopping on Saturday	51.6%	48.6%
Planning Characteristics (when decided to go to store)	All Stops Within Shopping District (N=397)	At least 1 Stop outside Shopping District (N=562)
Decide yesterday or before	16.4%	23.2%
Decide before leaving home	55.8%	31.7%
Decide after leaving home	16.4%	28.9%
Decide passing by store	11.4%	16.2%
Primary Mode Used on Tour (greatest distance)	All Stops Within Shopping District (N=397)	At least 1 Stop outside Shopping District (N=562)
Walk	42.6%	6.2%
Bicycle	2.3%	2.1%
Transit	6.8%	12.1%
Automobile	48.4%	79.5%

1) Stops include all non-home activity locations on the respondent's tour plus returning to home (i.e., total stops = non-home stops + 1).

Note: 1 mile = 1.61 kilometers

The 562 respondents who stopped outside of the shopping district were likely to have undertaken another major activity besides shopping, such as going to work, attending university classes, or transporting children to social and athletic events. This additional purpose may have influenced the mode chosen for the tour. Since this study seeks to identify characteristics of shopping districts that may be associated with walking and bicycling, the main analysis explores how the 397 respondents who made of all their activity stops within the shopping district traveled to and from the shopping district. A secondary analysis was conducted to provide additional insights about factors associated with the primary mode used on all 959 respondent tours. However, this secondary model used tour travel distance as an explanatory variable rather than travel time and did not control for the primary purpose of multi-district tours.[1]

[1] Travel time was not used in the secondary model because of resource limitations. Since the analysis explored the choice between modes for the respondent's entire tour, it would have been necessary to estimate travel times for walking, bicycling, public transit, and automobile for each of the 4,069 individual trip segments within the database.

5.6. MAIN ANALYSIS: MODE CHOSEN TO TRAVEL TO AND FROM SHOPPING DISTRICTS

The main analysis in this chapter explores the mode choice of respondents who made all of their stops within the shopping district where the survey store was located. Characteristics of the 397 respondents who made these shopping district tours are provided in Table 5.4, and the travel modes used by these respondents are shown in Table 5.5.

Mode Choice by Type of Shopping District

The 397 tours averaged 3.9 miles and included an average of 3.3 stops (2.3 non-home stops). 225 (57%) of the tours were less than two miles (3.2 km), and 126 (32%) were single-stop tours (i.e., home to the store and back home). Overall, 192 (48%) of the respondents used an automobile (including drivers and passengers) as their primary travel mode, while 167 (42%) walked, 29 (7%) took transit, and 9 (2%) bicycled. Primary mode was defined as the mode of transportation used for the greatest distance for traveling between the respondent's home and the first and last stop in the shopping district. There were considerable differences in respondent mode choice by type of shopping district (Table 5.5). Most customers traveling to and from San Francisco Urban Core shopping districts walked or took transit, while most customers traveling to Suburban Thoroughfare and Suburban Shopping Center shopping districts used an automobile. Suburban Main Street shopping districts had similar proportions of customers who walked and traveled by automobile.

Table 5.4. Completed Surveys and Participant Characteristics by Shopping District (N=397)

Survey Location		Completed Surveys				Participant Characteristics[2]													
						Language		Gender				Age						Group Size	
Name	County	Weekday	Saturday	Total	Store Response Rate[1]	Spanish	%	Female	%	Male	%	18-34	%	35-64	%	65+	%	Shop Alone	%
Berkeley	Alameda	9	8	**17**	**17.3%**	0	0.0%	9	52.9%	8	47.1%	9	52.9%	7	41.2%	1	5.9%	15	88.2%
Oakland	Alameda	11	10	**21**	**27.4%**	6	28.6%	12	57.1%	9	42.9%	7	33.3%	13	61.9%	1	4.8%	12	57.1%
Hayward	Alameda	10	9	**19**	**30.5%**	3	15.8%	10	52.6%	9	47.4%	7	36.8%	9	47.4%	3	15.8%	12	63.2%
Fremont	Alameda	12	12	**24**	**21.8%**	2	8.3%	13	54.2%	11	45.8%	9	37.5%	12	50.0%	3	12.5%	20	83.3%
Pleasanton	Alameda	6	8	**14**	**23.1%**	0	0.0%	8	57.1%	6	42.9%	2	14.3%	6	42.9%	6	42.9%	12	85.7%
Danville	Contra Costa	4	7	**11**	**28.7%**	0	0.0%	4	36.4%	7	63.6%	2	18.2%	5	45.5%	4	36.4%	10	90.9%
Brentwood	Contra Costa	10	3	**13**	**27.1%**	0	0.0%	6	46.2%	7	53.8%	3	23.1%	9	69.2%	1	7.7%	6	46.2%
Concord	Contra Costa	9	11	**20**	**21.3%**	5	25.0%	12	60.0%	8	40.0%	8	40.0%	9	45.0%	3	15.0%	11	57.9%
Richmond	Contra Costa	11	15	**26**	**26.7%**	6	23.1%	17	65.4%	9	34.6%	10	38.5%	13	50.0%	3	11.5%	11	45.8%
El Cerrito	Contra Costa	6	2	**8**	**20.2%**	2	25.0%	5	62.5%	3	37.5%	3	37.5%	4	50.0%	1	12.5%	6	75.0%
SF--Market St.	San Francisco	10	15	**25**	**15.5%**	0	0.0%	14	56.0%	11	44.0%	10	40.0%	13	52.0%	2	8.0%	19	76.0%
SF--Fillmore St.	San Francisco	16	18	**34**	**19.1%**	1	2.9%	20	58.8%	14	41.2%	8	23.5%	15	44.1%	11	32.4%	27	79.4%
SF--Taraval St.	San Francisco	6	14	**20**	**20.7%**	0	0.0%	12	60.0%	8	40.0%	6	30.0%	9	45.0%	5	25.0%	15	75.0%
SF--Mission St.	San Francisco	9	15	**24**	**23.9%**	6	25.0%	13	54.2%	11	45.8%	11	45.8%	12	50.0%	1	4.2%	18	75.0%
SF--Third St.	San Francisco	8	9	**17**	**28.8%**	3	17.6%	9	52.9%	8	47.1%	7	41.2%	8	47.1%	2	11.8%	14	82.4%
S. San Francisco	San Mateo	8	7	**15**	**19.3%**	0	0.0%	4	26.7%	11	73.3%	4	26.7%	5	33.3%	6	40.0%	13	86.7%
Daly City	San Mateo	10	8	**18**	**16.6%**	2	11.1%	9	50.0%	9	50.0%	5	27.8%	10	55.6%	3	16.7%	14	77.8%
Burlingame	San Mateo	11	16	**27**	**25.8%**	1	3.7%	17	63.0%	10	37.0%	7	25.9%	18	66.7%	2	7.4%	21	77.8%
San Mateo	San Mateo	16	12	**28**	**19.2%**	2	7.1%	16	57.1%	12	42.9%	5	17.9%	18	64.3%	5	17.9%	24	85.7%
San Carlos	San Mateo	10	6	**16**	**21.4%**	0	0.0%	9	56.3%	7	43.8%	4	25.0%	10	62.5%	2	12.5%	13	81.3%
	Total	**192**	**205**	**397**	**21.9%**	39	9.8%	219	55.2%	178	44.8%	127	32.0%	205	51.6%	65	16.4%	293	74.4%

1) Response rate was calculated as (Number of surveys/Total number of people invited to participate in survey).

2) The total number of surveys in particular categories may not sum to 397 because of non-response to certain questions.

Table 5.5. Primary Mode Choice by Shopping District, Sorted by Cluster (N=397)

1. Urban Core	Respondent Mode Share[1]				
Shopping District	N	Walk	Bicycle	Transit	Automobile
SF-Market St.	25	56.0%	4.0%	36.0%	4.0%
SF-Fillmore St.	34	82.4%	0.0%	5.9%	11.8%
SF-Mission St.	24	66.7%	0.0%	29.2%	4.2%
Cluster Average	**83**	**69.9%**	**1.2%**	**21.7%**	**7.2%**

2. Suburban Main Street	Respondent Mode Share[1]				
Shopping District	N	Walk	Bicycle	Transit	Automobile
Berkeley	17	64.7%	11.8%	0.0%	23.5%
Oakland	21	42.9%	0.0%	0.0%	57.1%
Richmond	26	38.5%	0.0%	7.7%	53.8%
SF-Taraval St.	20	55.0%	0.0%	5.0%	40.0%
SF-Third St.	17	47.1%	0.0%	23.5%	29.4%
Daly City	18	50.0%	0.0%	11.1%	38.9%
Burlingame	27	48.1%	7.4%	0.0%	44.4%
San Mateo	28	42.9%	0.0%	0.0%	57.1%
Cluster Average	**174**	**47.7%**	**2.3%**	**5.2%**	**44.8%**

3. Suburban Thoroughfare	Respondent Mode Share[1]				
Shopping District	N	Walk	Bicycle	Transit	Automobile
Hayward	19	21.1%	0.0%	0.0%	78.9%
Fremont	24	29.2%	0.0%	4.2%	66.7%
Danville	11	0.0%	0.0%	0.0%	100.0%
Brentwood	13	7.7%	15.4%	0.0%	76.9%
Concord	20	40.0%	0.0%	0.0%	60.0%
El Cerrito	8	25.0%	0.0%	0.0%	75.0%
San Carlos	16	0.0%	12.5%	6.3%	81.3%
Cluster Average	**111**	**19.8%**	**3.6%**	**1.8%**	**74.8%**

4. Suburban Shopping Center	Respondent Mode Share[1]				
Shopping District	N	Walk	Bicycle	Transit	Automobile
Pleasanton	14	14.3%	0.0%	0.0%	85.7%
S. San Francisco	15	13.3%	0.0%	0.0%	86.7%
Cluster Average	**29**	**13.8%**	**0.0%**	**0.0%**	**86.2%**

Overall	Respondent Mode Share[1]				
	N	Walk	Bicycle	Transit	Automobile
Overall Average	**397**	**42.1%**	**2.3%**	**7.3%**	**48.4%**

1) Survey respondent transportation mode share is the mode that the person used for the greatest distance on the portion of their tour where they were traveling in either direction between their home and the survey shopping district. Only respondents who made all of their stops within the shopping district were considered in this analysis. Cluster average is weighted average of individual store data based on surveys per store (2009).

Statistical Modeling
Mixed logit modeling was used to identify factors that helped explain the modes chosen by respondents. Since there were only nine survey participants who bicycled to and from shopping districts, the bicycle mode was not included in the main statistical model. Typically, 20 to 30 respondents need to choose an alternative in order to show significant results related to that mode in a discrete choice model. Therefore, the model was based on the remaining 388 responses.

The main mixed logit model assumed that each customer *n* of the N = 388 respondents chose the mode i of the I = 3 alternatives that maximized his or her utility. Each respondent was surveyed at store q of the Q = 20 stores, so the model was also structured to capture similarities between the modes chosen by individuals at each store. This multi-level data structure has been developed previously for a mixed logit model (Bhat and Gossen 2004).

The utility of a respondent choosing each mode (i = 1, 2, 3) to travel to and from a particular store was expressed in the following equations:

$$U_{q1n} = \alpha_1 + \beta_1 X_{q1n} + \gamma_1 \nu_{q1} + \mu_{12}\eta_{qn} + \varepsilon_{q1n} \quad (1)$$
$$U_{q2n} = \alpha_2 + \beta_2 X_{q2n} + \gamma_2 \nu_{q2} + \mu_{12}\eta_{qn} + \varepsilon_{q2n} \quad (2)$$
$$U_{q3n} = \alpha_3 + \beta_3 X_{q3n} + \gamma_3 \nu_{q3} + \varepsilon_{q3n} \quad (3)$$

Where:

- α_i are mode-specific constants.
- X_{qin} are column vectors of known variables (travel, socioeconomic, attitude, perception, and shopping district variables). Certain variables are generic (e.g., used in the column vectors for all modes), while other variables are mode-specific (e.g., only used in the column vector for one mode).
- β are row vectors of coefficients that quantify the relationship between each known variable and the observed utility of choosing each mode *i*.
- ν_{q1}, ν_{q2}, and ν_{q3} are variables representing the unobserved correlated error between people who used mode 1, 2, or 3 and took the survey at each of the 20 stores. These variables are assumed to be distributed independently identically normal across stores but constant across individuals who use the same store. It is possible that respondents at the same store had similar preferences that are not captured by the known variables, so it is important to control for this effect in the model.
- γ_i are coefficients that quantify the variance of the store-level error for each mode *i*.
- η_{qn} is a variable that represents the unobserved correlated error between mode 1 and mode 2. This accounts for potential interdependence between the choice of mode 1 and mode 2. This variable is assumed to be distributed independently identically normal across stores but constant across individuals who use the same store.
- μ_{12} is a parameter that quantifies the covariance of the error between modes 1 and 2. This covariance parameter is analogous to a nesting coefficient in a nested logit model. During the modeling process, covariance parameters were also estimated to test for interdependence between modes 1 and 3 and between modes 2 and 3.
- ε_{qin} are unobserved error terms. These errors are assumed to be independently and identically distributed type 1 extreme value across individuals.

For the model with unobserved error between mode 1 and mode 2, the unconditional probability of customer *n* selecting mode *i* to travel to and from store *q* was expressed as:

$$P_{qin} = \int_{v_q=-\infty}^{\infty} \int_{\eta_q=-\infty}^{\infty} \frac{e^{\beta_i X_{qin} + \gamma_i v_{qi} + \mu_{12}\eta_{qn}}}{\sum_{j \epsilon C_n = 1}^{I} e^{\beta_j X_{qjn} + \gamma_j v_{qj} + \mu_{12}\eta_{qn}}} \phi(\eta_q) f(v_q) d\eta_q dv_q \qquad (4)$$

Where:

- The variables η_q, v_{q1}, v_{q2}, and v_{q3} are independent.
- v_q is a vector of the variables v_{q1}, v_{q2}, and v_{q3}, such that $f(v_q) = \prod_{i=1}^{3} f(v_{qi})$.
- ϕ is the standard normal density function ($\mu = 0$, $\sigma = 1$).
- $f(v_q) = \phi(v_1)\,\phi(v_2)\,\phi(v_3)$
- C_n is the set of mode choices out of (i = 1, 2, 3) available to individual *n*. Note that some of the survey respondents did not have all three modes available. 121 (31%) lived in locations where it would have been as far or further to walk to the closest bus stop than to walk to the shopping district. One respondent lived on an island where walking was not an option to travel to the mainland shopping district.

The unconditional likelihood function for the full sample of respondents is:

$$L = \prod_{q=1}^{Q} \int_{v_{q1}=-\infty}^{\infty} \int_{v_{q2}=-\infty}^{\infty} \int_{v_{q3}=-\infty}^{\infty} \prod_{n=1}^{N_q} \left[\int_{\eta_q=-\infty}^{\infty} \left\{ \prod_{i=1}^{I} [P_{qin}(i|C_n)]^{y_{qin}} \right\} \phi(\eta_q)\, d\eta_q \right] \phi(v_{q1})\phi(v_{q2})\phi(v_{q3}) dv_{q1} dv_{q2} dv_{q3} \qquad (5)$$

Where:

- Q is the number of stores, where each specific store is designated by q = 1, 2, 3,…, 20.
- N_q is the number of respondents in the dataset from store q, where each individual respondent is designated by *n* = 1, 2, 3…
- I is the number of modes considered in the analysis, where each specific mode is designated by i = 1, 2, 3.
- y_{qin} is an indicator function that is 1 if person *n* at store *q* chooses mode *i* and 0 otherwise.

BIOGEME software was used to estimate the models (Bierlaire 2003). This software applied simulation techniques to approximate the integrals in the likelihood function. The software reported the parameter estimates of α, β, γ, and μ that maximized the logarithm of the likelihood function.

5.7. MODELING PROCESS: MODE CHOSEN TO TRAVEL TO AND FROM SHOPPING DISTRICTS

More than 70 explanatory variables were considered as factors that could potentially be associated with traveling to and from the shopping district by walking, public transit, or automobile. These variables were derived from responses to the intercept survey, aerial photographs, Census data, and field observations. Descriptive statistics for several key independent travel, socioeconomic, attitude, perception, and store area variables considered during the analysis are provided in Table 5.6. Dummy variables were included to account for missing responses for some survey variables in the database during the modeling process.

A series of models was estimated using different combinations of these explanatory variables. Each model included variables from all five categories. All 70 variables were tested in the first few models, but certain variables emerged as having consistently high statistical associations with mode choice during the process of estimating different models. Variables that showed consistent statistical associations with mode choice were included in the final model.

Table 5.6., Part 1. Variables Considered for Statistical Models: Travel and Socioeconomic Factors

Travel Factors		Summary Statistics[1]				
Variable Name	**Description**	Sample Size	**Mean**	**Std. Dev.**	Minimum	Maximum
Auto Distance	Estimated travel distance by automobile (km)[2]	388	6.130	13.215	0.322	132.743
Auto Time	Estimated travel time by automobile (Minutes)[3]	388	11.728	12.555	3.500	127.000
Auto Cost	Estimated total automobile cost (Dollars)[4]	388	2.728	6.435	0.027	93.775
Transit Time	Estimated travel time by transit (Minutes)[5]	266	39.026	35.427	6.000	299.000
Transit Cost	Estimated cost by transit (Dollars)[6]	266	3.240	3.136	0.000	40.000
Walk Distance	Estimated travel distance by walking (km)[7]	387	5.525	12.203	0.322	123.893
Walk Time	Estimated travel time by walking (Minutes)[8]	387	64.473	143.939	2.000	1534.000
Bike Distance	Estimated travel distance by bicycling (km)[9]	247	6.943	15.961	0.322	140.466
Bike Time	Estimated travel time by bicycling (Minutes)[10]	247	25.881	56.382	2.500	477.000
Home to Store Distance	Straight-line distance between home and survey store (km)	388	2.245	4.711	0.063	45.733
Total Tour Distance	Actual tour distance in miles (km)	388	6.272	12.862	0.364	148.958
Total Tour Distance <2 mi.	Actual tour distance less than 2 mi. (3.2 km) (1 = Yes, 0 = No)	388	0.575	0.495	0.000	1.000
Number of Stops	Total tour stops (including returning home)	388	3.320	1.402	2.000	11.000
Miles in Shopping District	Travel distance between first and last stop in shop. dist. (km)	388	0.420	0.513	0.000	2.782
Miles Per Stop in District	Distance per stop within shopping district (km)	388	0.137	0.148	0.000	0.756
Single-Stop Tour	Tour was to store and back home (1 = Yes, 0 = No)	388	0.314	0.465	0.000	1.000
No Bags	Carrying 0 bags (1 = Yes, 0 = No)	388	0.168	0.374	0.000	1.000
2+ Bags	Carrying 2 or more bags (1 = Yes, 0 = No)	388	0.253	0.435	0.000	1.000
Shopping Alone	Shopping alone (group size = 1) (1 = Yes, 0 = No)	385	0.743	0.438	0.000	1.000
Cool Temperature	Temperature <60° F (<16° C) (1 = Yes, 0 = No)	388	0.064	0.246	0.000	1.000
Saturday	Survey was on Saturday (1 = Yes, 0 = No)	388	0.518	0.500	0.000	1.000
Respondent Socioeconomic Factors		**Summary Statistics[1]**				
Variable Name	**Description**	Sample Size	**Mean**	**Std. Dev.**	Minimum	Maximum
Female	Female	388	0.559	0.497	0.000	1.000
Spanish Speaker	Survey completed in Spanish (1 = Yes, 0 = No)	388	0.101	0.301	0.000	1.000
Young Adult	Young adult (age 18 to 34) (1 = Yes, 0 = No)	388	0.320	0.467	0.000	1.000
Middle Age	Middle-age adult (age 35-64) (1 = Yes, 0 = No)	388	0.513	0.500	0.000	1.000
Senior Citizen	Senior citizen (over age 64) (1 = Yes, 0 = No)	388	0.168	0.374	0.000	1.000
Employed	Employed (includes employed students) (1 = Yes, 0 = No)	387	0.545	0.499	0.000	1.000
Unemployed	Unemployed (1 = Yes, 0 = No)	387	0.209	0.407	0.000	1.000
Student	Student (includes employed students) (1 = Yes, 0 = No)	387	0.111	0.315	0.000	1.000
Retired	Retired (1 = Yes, 0 = No)	387	0.150	0.357	0.000	1.000
Homemaker	Homemaker (1 = Yes, 0 = No)	387	0.021	0.142	0.000	1.000
No-Child Household	Household with 0 children (1 = Yes, 0 = No)	388	0.639	0.481	0.000	1.000
Single Adult	Household with a single adult (1 = Yes, 0 = No)	388	0.255	0.437	0.000	1.000
Group House	Household with 4 or more adults (1 = Yes, 0 = No)	388	0.129	0.335	0.000	1.000
Lower Income	Household income less than $50,000 per year (1 = Yes, 0 = No)	347	0.542	0.499	0.000	1.000
Higher Income	Household income more than $100,000 per year (1 = Yes, 0 = No)	347	0.205	0.404	0.000	1.000
Bus Pass	Owns a monthly or annual bus pass (1 = Yes, 0 = No)	384	0.193	0.395	0.000	1.000
Disability	Has a disability (self-reported) (1 = Yes, 0 = No)	388	0.147	0.354	0.000	1.000
No-Car Household	0 motor vehicles in household (1 = Yes, 0 = No)	387	0.191	0.394	0.000	1.000
Multi-Car Household	2 or more motor vehicles in household (1 = Yes, 0 = No)	387	0.491	0.501	0.000	1.000
Number of Bicycles	Number of bicycles in household	388	1.585	2.542	0.000	30.000

Table 5.6., Part 2. Variables Considered for Statistical Models: Attitude & Perception and Shopping District Factors

Respondent Attitude & Perception Factors		Summary Statistics[1]				
Variable Name	Description	Sample Size	Mean	Std. Dev.	Minimum	Maximum
Enjoy Walking	Respondent enjoys walking (1 = Yes, 0 = No)[11]	388	0.892	0.311	0.000	1.000
Enjoy Bicycling	Respondent enjoys bicycling (1 = Yes, 0 = No)[11]	383	0.624	0.485	0.000	1.000
General Walk Crash Risk	Perceive walking to be risky (in general) (1 = Yes, 0 = No)[11]	388	0.291	0.455	0.000	1.000
General Bike Crash Risk	Perceive bicycling to be risky (in general) (1 = Yes, 0 = No)[11]	383	0.559	0.497	0.000	1.000
Negative Walk Culture	People in nbhd. have neg. view of walking (1 = Yes, 0 = No)[11]	371	0.127	0.333	0.000	1.000
Negative Bike Culture	People in nbhd. have neg. view of bicycling (1 = Yes, 0 = No)[11]	366	0.180	0.385	0.000	1.000
Nbhd. Walk Crime Risk	Perceieve high crime risk if walking in shop. dist. during day (1 = Yes, 0 = No)[11]	386	0.106	0.309	0.000	1.000
Nbhd. Bike Crime Risk	Perceieve high crime risk if bicycling in shop. dist. during day (1 = Yes, 0 = No)[11]	362	0.086	0.280	0.000	1.000
Nbhd. Walk Crash Risk	Perceieve high crash risk if walking in shop. dist. during day (1 = Yes, 0 = No)[11]	383	0.138	0.346	0.000	1.000
Nbhd. Bike Crash Risk	Perceieve high crash risk if bicycling in shop. dist. during day (1 = Yes, 0 = No)[11]	358	0.288	0.453	0.000	1.000
Shopping District Factors		Summary Statistics[1]				
Variable Name	Description	Sample Size	Mean	Std. Dev.	Minimum	Maximum
Population Density	Total population living within 0.1 mi. (161 m) of store (00s)[12]	388	3.955	2.996	0.566	12.226
Employment Density	Total number of jobs within 0.5 mi. (804 m) (000s)	388	13.618	34.064	0.195	145.200
Commercial Density	Total number of commercial properties within 0.25 mi. (402 m)[13]	388	64.265	66.010	6.000	272.000
Median Income	Median annual household income within 0.5 mi. (804 m) ($)	388	57990	19659	28243	93413
Percent White	Proportion of population living within 0.5 mi. (804 m) that is White	388	0.510	0.224	0.101	0.898
Sidewalk Coverage	Proportion sidewalk coverage on multilane roadways[14]	388	0.913	0.112	0.536	1.000
Slope	Average percent slope along multilane roadways[15]	388	2.617	4.166	0.622	22.093
Bike Facility Density	Miles of bicycle facilities within 0.5 mi. (804 m)[16]	388	1.631	1.726	0.000	6.330
Intersection Density	Number of street intersections within 0.5 mi. (804 m)	388	117.858	31.117	56.000	174.000
Tree Canopy Coverage	Estimated % of street ROW covered by tree canopy within 0.5 mi. (804 m)[17]	388	6.469	3.586	1.594	18.144
Spanish-Speaking	% of households with adults who only speak Spanish within 0.1 mi. (161 m)	388	0.063	0.064	0.000	0.212
Asian-Speaking	% of households with adults who only speak an Asian language within 0.1 mi. (161 m)	388	0.060	0.069	0.003	0.272
Road Width	Adjacent roadway curb-to-curb width (m)[18]	388	21.367	6.073	11.583	32.501
Road Street Parking	On-street parking coverage on adjacent roadway[18,19]	388	0.621	0.394	0.000	1.000
Road Lanes	Average adjacent roadway number of travel lanes[18,20]	388	3.886	1.203	2.000	5.997
Road AADT	Traffic volume (AADT) on roadway adjacent to store	388	21631	10596	9771	50500
Road Speed Limit	Average posted speed limit along adjacent roadway (MPH)[18]	388	29.220	4.970	25.000	37.500
Road Setback	Average building setback along adjacent roadway (m)[18,21]	388	7.575	8.160	0.000	25.709
Crossroad Crossing Distance	Average crossroad pedestrian crossing distance (m)[18,22]	388	12.584	3.261	6.668	20.079
Store Square Meters	Gross area of store building (square meters)	388	1168	454	493	2338
Drive-Through Window	Store has a drive-through window (1 = Yes, 0 = No)	388	0.273	0.446	0.000	1.000
Store Parking Spaces	Spaces in the store parking lot (includes shared parking) (00s)	388	1.085	1.308	0.000	4.420
Store Bike Parking	Bicycle parking spaces on store property	388	2.479	3.607	0.000	12.000
Pay Parking on Road	Presence of pay parking within 0.1 mi. (161 m) (1 = Yes, 0 = No)[23]	388	0.505	0.501	0.000	1.000
Setback Distance	Distance from store door to public sidewalk (m)[24]	388	14.474	20.811	1.000	90.000
Distance to Train	Distance from store to closest train station (km)[25]	388	1.662	2.779	0.141	12.781

Table 5.6., Part 3. Variables Considered for Statistical Models: Footnotes

1) Non-responses were removed. This is reflected in the sample size for each variable.
2) Tour distance by automobile represents the estimated distance that the customer would need to travel by automobile from home to the first stop in the shopping district and from the last stop in the shopping district to return home. It represents the shortest time route selected by Google Maps directions.
3) Tour travel time by automobile represents the estimated total time that the customer would need to travel by automobile from home to the first stop in the shopping district and from the last stop in the shopping district to return home. Assumptions used to calculate respondent travel times are provided in Appendix K.
4) The total automobile cost represents the sum of the expected out-of-pocket gas, parking, toll, and/or taxi costs paid by a respondent driving to the shopping district. Assumptions used to calculate respondent travel costs are provided in Appendix K.
5) Tour travel time by public transit represents the total time that the customer would need to travel by transit from home to the first stop in the shopping district and from the last stop in the shopping district to return home. Assumptions used to calculate respondent travel times are provided in Appendix K.
6) Tour travel cost by public transit represents the total out-of-pocket fare that the customer would need to travel by transit from home to the first stop in the shopping district and from the last stop in the shopping district to return home (unless the customer has a pre-paid transit pass). Assumptions used to calculate respondent travel costs are provided in Appendix K.
7) Tour distance by walking represents the distance that the customer would need to travel by walking from home to the first stop in the shopping district and from the last stop in the shopping district to return home. It represents the shortest time route selected by Google Maps directions.
8) Tour travel time by walking represents the total time that the customer would need to travel by walking from home to the first stop in the shopping district and from the last stop in the shopping district to return home. Assumptions used to calculate respondent travel times are provided in Appendix K.
9) Tour distance by bicycling represents the distance that the customer would need to travel by bicycling from home to the first stop in the shopping district and from the last stop in the shopping district to return home. It represents the top route suggested by Google Maps directions.
10) Tour travel time by bicycling represents the total time that the customer would need to travel by bicycling from home to the first stop in the shopping district and from the last stop in the shopping district to return home. It represents the top route suggested by Google Maps directions. Assumptions used to calculate respondent travel times are provided in Appendix K.
11) Agreement with the statement included two of the five categories on a 5-point Likert scale (e.g., "Agree" or "Strongly Agree").
12) Total population within 0.1 mi. (161 m) is calculated from 2000 census block group data. The calculation of population only included portions of census block groups within the 0.1-mi. (161-m) radius of the store.
13) Commercial retail/entertainment properties are defined by the four county assessor's offices. These commercial land uses include commercial, entertainment, store, service, tourism, store on first floor with other above, department store, single-story store, restaurant, post office, bank, supermarket, food store, lodge hall, car wash, gas station, auto dealer, movie theater, bowling alley, winery, stadium, commercial mix, and commercial building. This category does not include commercial office buildings. Note that one building structure could include multiple commercial properties.
14) Sidewalk coverage is calculated on multilane roadways within 0.5 mi. (804 m) of the store. The calculation assumes that complete coverage is continuous sidewalks on both sides of the street. Therefore, if a street has sidewalks on both sides, it has 100% sidewalk coverage. If a street has a complete sidewalk on one side, but no sidewalk on the other, it has 50% coverage.
15) Percent slope is calculated on multilane roadways within 0 5 mi. (804 m) of the store. It is calculated as the change in elevation between the two segment endpoints (intersections) divided by the length of the street segment.
16) Bicycle facilities include bicycle lanes, shared lane markings, bicycle boulevards, and multi-use trails. They do not include streets that only have bicycle route signs. Bicycle facility miles were calculated using the same methodology as automobile lane miles. If bicycle lanes or shared lane markings are on both sides of a one-km-long street segment, this represents two km of bicycle facilities (this avoids the problem of misrepresenting one-way bicycle facilities on one-way streets). Bicycle boulevards and multi-use trails are two-way facilities, so one-km of centerline counts as two km of bicycle facilities.
17) Average percent tree coverage is an average of the percent tree coverage on each multilane street segment within 0.5 mi. (804 m) of the store. Tree coverage is an estimate of the total public right-of-way surface area (edge-of-sidewalk to edge-of-sidewalk) covered by tree canopy.
18) Adjacent roadway variables are measured within a 0.5-mi. (804 m) corridor (0.25 mi. (402 m) in either direction) along the commercial roadway adjacent to the store. Speed limit is posted in miles per hour (MPH), so it is reported using this measure. Note that 10 MPH = 16.1 KPH.
19) A block is considered to have on-street parking if on-street parking is legal (i.e., parked cars do not need to be present). Each side of the street is considered separately (e.g., on-street parking on both sides = 100% coverage; on-street parking on one side = 50% coverage).
20) Travel lanes include all general purpose through-lanes in both directions. The number of through-lanes does not include left- or right-turn lanes, two-way center turn lanes, bicycle lanes, shoulders, or other auxilary lanes. In addition, it does not include lanes that end within the segment.
21) Average setback is a rough estimate of the average distance between the sidewalk or roadway edge and the front of each building. If a road segment does not have buildings (e.g., overpass, underpass, etc.), it is not considered in the average setback measurement.
22) Crossroad street crossing distance represents the width of the roadway intersecting the mainline commercial roadway. The distance is measured in the direction of commercial street. Intersection crossings are considered in this measurement, but riveway crossings are not.
23) Presence of pay parking within 0.1 mi. (161 m) was noted using Google Street View.
24) Distance from store door to public sidewalk was measured as the most direct path from the door to the sidewalk that did not involve crossing fences or landscaping. Measurement was done using the Google Earth measuring tool. Building doors were located using Google Street View.
25) Distance from store to closest Bay Area Rapid Transit or other train station was measured as the straight-line distance from the store centroid to the train station centroid. Measurement was done in GIS.

Correlation between Predictive Variables

Some of the predictive variables considered during the modeling process were correlated, especially those describing shopping district characteristics. In general, variables with high correlations ($\rho > 0.5$ or $\rho < -0.5$) were not included in the same model. However, the moderately correlated transit travel time and transit travel cost variables ($\rho = 0.58$) were included in the same model because of the theoretical importance of both time and cost in mode choice decisions. In addition, the distance traveled within the shopping district and total number of stops made on the respondent's tour were also correlated ($\rho = 0.77$). These were included in the same model in an attempt to capture differences in mode choice between people who traveled to a few stops spread throughout the shopping district versus many stops concentrated in one part of the shopping district.

Mode-Specific Parameters

Parameters estimated in the model represented the contribution of their corresponding variables to the relative utility of using a specific mode. A parameter that was only included in one mode utility function showed the value of that mode relative to all other modes combined (e.g., automobile versus non-automobile modes). Parameters that were in two of the three mode utility functions indicated the unique contributions of each of the two variables relative to the third (base) mode. The models were initially tested using a single parameter for each variable. This initial parameter was placed by default in the utility equation for automobile, unless the variable was assumed to be related to a different mode (e.g., the "Enjoy Walking" parameter was placed in the walk mode utility function). Fourteen variables were tested to see if the model log likelihood would be significantly higher if they had one parameter in a single mode utility equation or had separate parameters in two or more mode utility equations. Likelihood ratio tests showed that only two of these variables (perception of pedestrian crash risk within the shopping district and population density near the survey store) improved the model significantly when they were tested with separate parameters in two mode utility equations.

Model Significance

The final mixed logit model included 27 parameters corresponding with 22 variables and a constant (the dummy variable accounting for unreported income is not shown in the table). Overall, the model log-likelihood (-154) was relatively high compared with the log-likelihood value for no model (-376) and the log-likelihood value of a model with only constants (-292). Its adjusted rho-squared value was 0.518 (Table 5.7). The model predicted the mode chosen by 322 (83%) of the 388 survey participants correctly.

Parameter estimates were provided for theoretically-important variables with p-values < 0.30. However, parameters were considered to be highly significant for $p < 0.01$, significant for $0.01 \leq p < 0.05$, and moderately significant for $0.05 \leq p < 0.10$. Parameters with $0.10 \leq p < 0.20$ were not considered to be statistically significant but were interpreted as indicating a slight association between the explanatory variable and mode choice. Parameter estimates with $p < 0.10$ are highlighted in Table 5.7. Nearly all of the variables in the final model showed some association with survey respondent mode choice.

Table 5.7., Part 1. Factors Associated with Mode of Travel to and from the Shopping District

Mixed logit model for survey respondents traveling to and from shopping district[1]

	Variable[3]	Tour Mode[2]					
		Walk		Public Transit		Automobile	
		Parameter Est.[4]	*p-value*	*Parameter Est.*[4]	*p-value*	*Parameter Est.*[4]	*p-value*
	Constant	-3.68	0.00	-3.67	0.01	0.00	Fixed
Travel Variables	Travel time (min.) (constrained across modes)[5,6]	-0.0766	0.00	-0.0766	0.00	-0.0766	0.00
	Out-of-pocket cost ($)[6]			-0.498	0.00	-0.319	0.00
	Distance Traveled within Shopping District (km)[7]					0.88	0.16
	Number of Tour Stops					-0.632	0.01
	No Bags					-0.745	0.11
	Shopping Alone					-0.431	0.29
Socioeconomic	Spanish Speaker					-0.833	0.13
	Student					-1.25	0.03
	Group House					-1.07	0.04
	Lower Household Income (< $50,000/yr)[8,9]					-1.07	0.01
	Disability					0.730	0.14
Attitude/ Perception	Enjoy Walking	0.789	0.15				
	Perceive Shopping District Walk Crash Risk	1.27	0.02	2.84	0.00		
Shopping District	Employment within 0.5 mi. (804 m) of store (000s)					-0.0342	0.00
	Population within 0.1 mi. (161 m) of store (00s)	0.158	0.10	0.255	0.04		
	Multilane Road Tree Canopy within 0.5 mi. (804 m) (%)	0.163	0.02				
	Survey Store Parking Spaces (00s)[10]					0.700	0.00
	Meters to Train Station (000s)			-0.790	0.03		
	Panel Variables[11]						
	Variable	*Parameter Est.*[4]			*p-value*		
Panel	Store Panel (Walk)	0.0101			0.98		
	Store Panel (Transit)	0.00444			0.99		
	Store Panel (Auto)	0.530			0.05		
Overall Model							
Sample Size (N)		388					
Log-Likelihood (0)		-376					
Log-Likelihood (Constant)[12]		-292					
Log-Likelihood (Restricted Model)[13]		-180					
Log-Likelihood (Full Model)		-154					
Adjusted Rho-Squared Value		0.518					

Table 5.7., Part 2. Factors Associated with Mode of Travel to and from the Shopping District: Footnotes

1) The dependent variable in the model is the primary (greatest distance) mode of transportation used to travel to and from the retail pharmacy store area for tours that had all non-home stops within 0.5 mi. (804 m) of the retail pharmacy store. The mode used for the 388 survey respondents was: Automobile = 192 (49.5%), Walk = 167 (43.0%), Transit = 29 (7.5%). 9 respondents who traveled by bicycle were removed from this model analysis. Parameter estimates were generated after 1,000 draws. They were varified as stable from 500 to 1,000 draws.
2) The automobile mode includes driving and riding as a passenger in a motorized vehicle other than a public bus or train (taxi is included within automobile mode). The walk mode includes all pedestrians, including people on foot, in wheelchairs, and using other assistive devices. The public transit mode includes bus, regional rail, light rail, commuter train, other train, and paratransit.
3) Several other variables were expected to have significant associations with respondent mode choice and were tested during the modeling process. These variables were taking the survey on Saturday, being female, living in a no-child household, being able to change modes easily, perceiving negative bicycle culture, perceiving a risk of crime when walking in the shopping district, number of commercial properties within 0.25 mi. (402 m) of the survey store, slope of multilane roads in the shopping district, number of intersections in the shopping district, and drive-through pharmacy window at the survey store. However, their parameter estimates were imprecise (p > 0.30) and had minimal influence on other parameters, so they were not included in the final model.
4) Parameter estimates represent coefficients in the utility function for choosing each transportation mode. The base mode for each variable is the mode with no parameter estimate.
5) Travel time was estimated as a generic parameter that was the same for all modes.
6) Out-of-pocket cost and travel time parameters were used to calculate the value of time at $9.23/hr. for transit and $14.41/hr. for automobile.
7) Travel distance within the shopping district is the distance the respondent traveled between his or her first stop within 0.5 mi. (804 m) of the retail pharmacy store and his or her final stop within 0.5 mi. (804 m) of the retail pharmacy store in miles.
8) 41 of the 388 respondents did not report their income category, so a dummy variable was estimated to account for missing values. The parameter for variable was included in the automobile utility equation, and it had a parameter estimate of 0.251 and p-value of 0.66.
9) The low household income variable was positively correlated with not owning an automobile. A variable representing respondents with no household automobiles was tested in place of the low income variable, but its parameter estimate was less precise and the overall model fit was not as good.
10) Survey store automoible parking spaces include all spaces in the entire parking lot if it is shared with other stores.
11) The store panel parameters capture the correlated error between respondents who were surveyed at the same store. Approximately 50 customers were surveyed at each store (and approximately 20 respondents at each store were used in this analysis), so they share identical shopping district variables and may have similar socioeconomic or attitude characteristics.
12) Log-likelihood (constant) is the log-likelihood of a constsnts-only model that includes the panel variables.
13) Log-likelihood (restricted model) is the log-likelihood of a model without the attitude & perception and shopping district variables.

An innovative aspect of the model is that it included two categories of variables that can be influenced through planning practice. One of these categories represented customer attitudes towards walking and perceptions of pedestrian crash risk near the retail pharmacy store. Planners can establish education, encouragement, and enforcement programs as well as implement traffic calming improvements to help residents become more interested in and feel more comfortable walking. They can also collaborate with other organizations to reduce crime and crash risk in specific neighborhoods. The second category of planning-related variables represented characteristics of the shopping district. Important factors such as employment density, population density, and transit station proximity can be influenced by long-range land use and pedestrian and transit plans, roadway design guidelines, and site development and transportation project review.

A likelihood ratio test was used to determine if the seven planning-related variables added explanatory power to the model. The restricted version of the model that included only the variables in the travel and socioeconomic categories had 18 parameters and a log-likelihood of -180. This produced a likelihood ratio test statistic of 2 * (-154.4 – (-179.6)) = 50.3. This test statistic was compared to the value of a Chi-Squared distribution with 27 – 18 = 9 degrees of freedom, which is 21.7 for $p = 0.01$. Since 50.3 is greater than 21.7, the null hypothesis that the additional variables did not contribute to the model was rejected (with 99% confidence). Therefore, after controlling for travel and socioeconomic factors, it was valuable for the model to include attitude and perception and shopping district variables that can be influenced through planning practice.

5.8. RESULTS: MODE CHOSEN TO TRAVEL TO AND FROM SHOPPING DISTRICTS

This section describes the results of the main mixed logit model, which identified factors associated with choosing between walking, taking transit, and using an automobile to travel to and from the 20 shopping districts. These findings are based on data from survey respondents who used these three modes (N = 388). Results related to specific variables are presented in the order that they are listed in the final model (Table 5.7). While bicycling was not represented in the statistical model, several sections of text below also discuss factors that may be associated with bicycling. These results were generated from the dataset that included the nine additional respondents who bicycled to and from a shopping district (N = 397) and from follow-up interviews.

Travel Characteristics

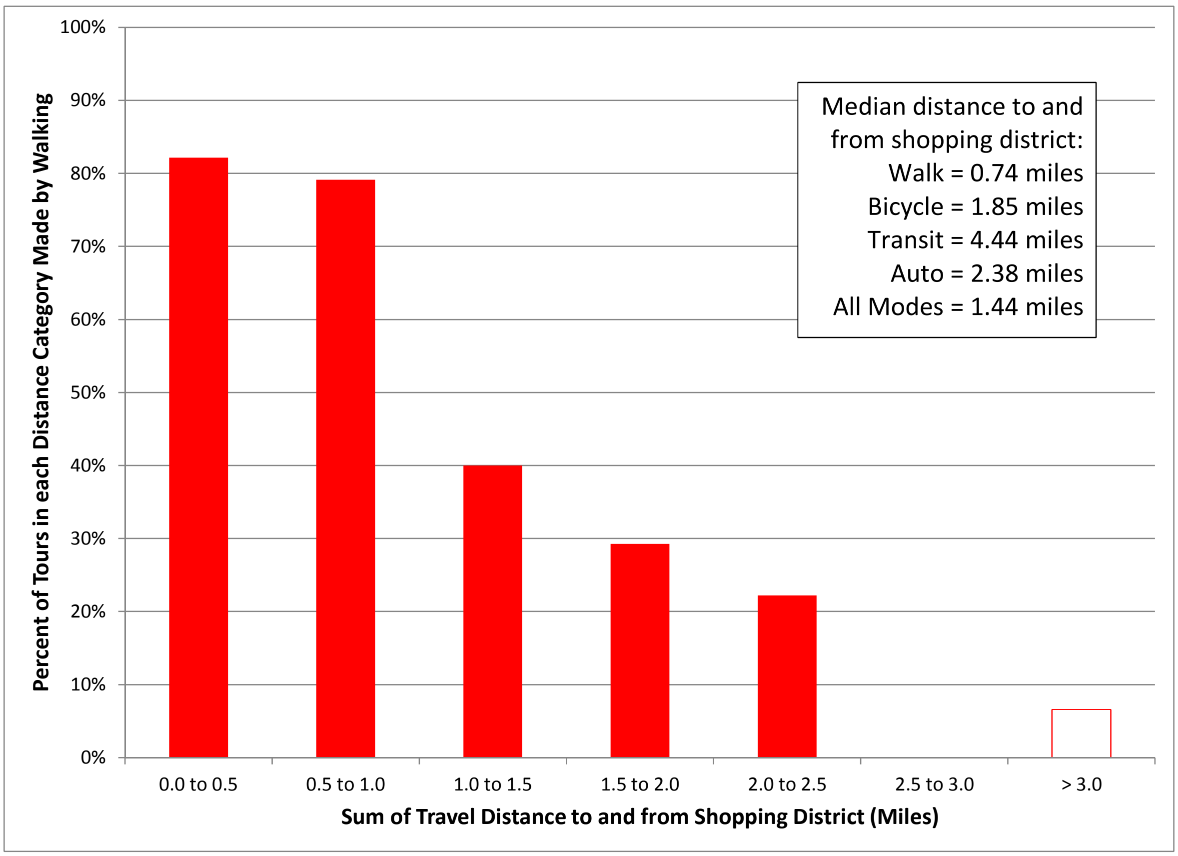
The mixed logit model results showed that several travel characteristics were associated with the mode chosen to travel to and from the shopping district. Most of these variables were consistent with previous travel behavior research.

Travel Time

Estimated door-to-door travel time was a significant variable across all three modes, indicating that longer travel times reduced the utility of each mode. Walking was typically the slowest mode, so it took the greatest amount of time to cover the distance to the shopping district and back home. Walking travel time calculations assumed an average speed of 3.23 miles per hour

(5.20 kilometers per hour), which accounted for hills but did not assume any differences in walking pace by age or gender. This speed is in a similar range as previous walking speed studies (Knoblauch, Pietrucha, and Nitzburg 1995; Milazzo *et al*. 1999). The walk travel time for each trip was calculated separately and summed to calculate the overall tour walk travel time. The difference in the utility of walking versus taking public transit and automobile increased as the distance between the respondent's home and the shopping district increased (i.e., it took much longer to walk than to use other modes to travel greater distances to the shopping district, so respondents who traveled further to the district were less likely to walk) (Figure 5.1). In contrast, the utility of automobile did not decrease as quickly as other modes at greater distances because it was generally the fastest mode. Interview responses highlighted the advantage of walking in urban neighborhoods with high accessibility to activity locations and difficulty of walking and advantage of driving in neighborhoods with more dispersed activities (Figure 5.2). Travel time calculations and assumptions are described in Appendix K.

Figure 5.1. Pedestrian Mode Share by Distance to and from Shopping District (N=397)



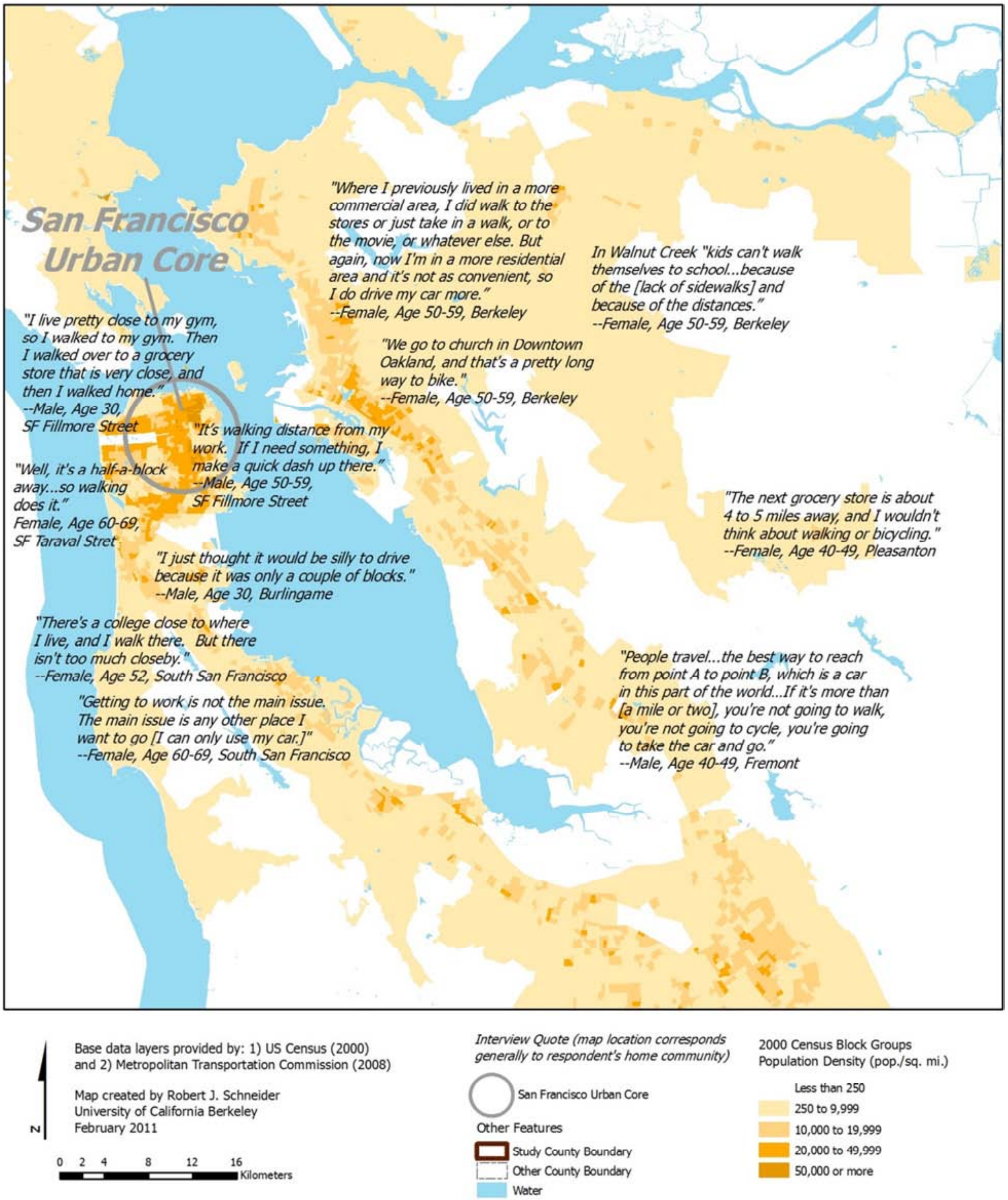
Note: A hollow bar is used to represent >3.0 miles because it does not cover the same distance range as the other categories.
1 mile = 1.61 kilometers

While automobiles traveled faster than other modes, they did not always have the shortest estimated door-to-door travel time. For very short tour distances (generally less than 0.25 miles (402 m)) between the respondent's home and the retail pharmacy store, walking took as much or less time than driving (Figure 5.3). In Urban Core shopping districts, the estimated time required to find a parking spot and walk from a parked car to the door of a store often made walking for short and moderate distances more practical than driving.

Bicycling had the lowest estimated travel time for 141 (36%) of the 397 respondents, including 83% of the respondents who traveled a total of less than 1.0 miles (1.6 km) to and from the shopping district (Figure 5.4)[2]. This is consistent with previous research on bicycle travel using GPS units in Portland, OR that found the difference between bicycle and automobile travel time to be less than five minutes for half of trips that were three miles (4.8 km) or less (Dill and Gliebe 2008).

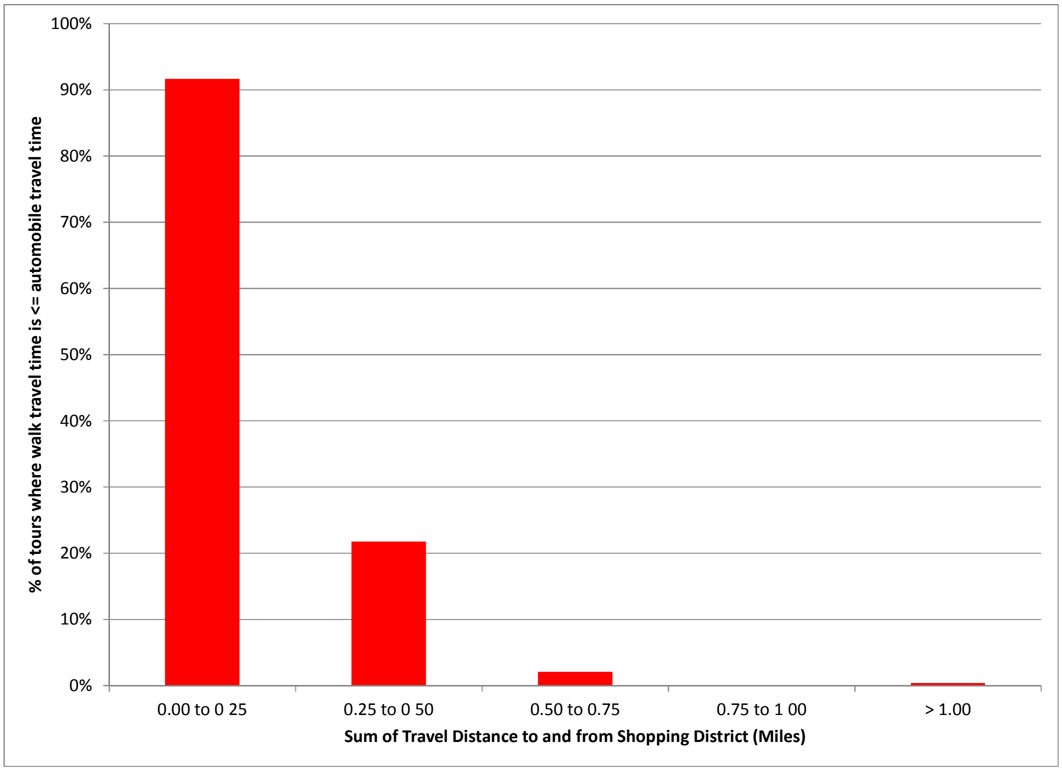
[2] The estimated bicycle travel time was equal the walking travel time for two of the twelve tours that were less than 0.25 miles (402 m).

Figure 5.2. Interviewee Quotes about Accessibility to Activities by Walking and Bicycling



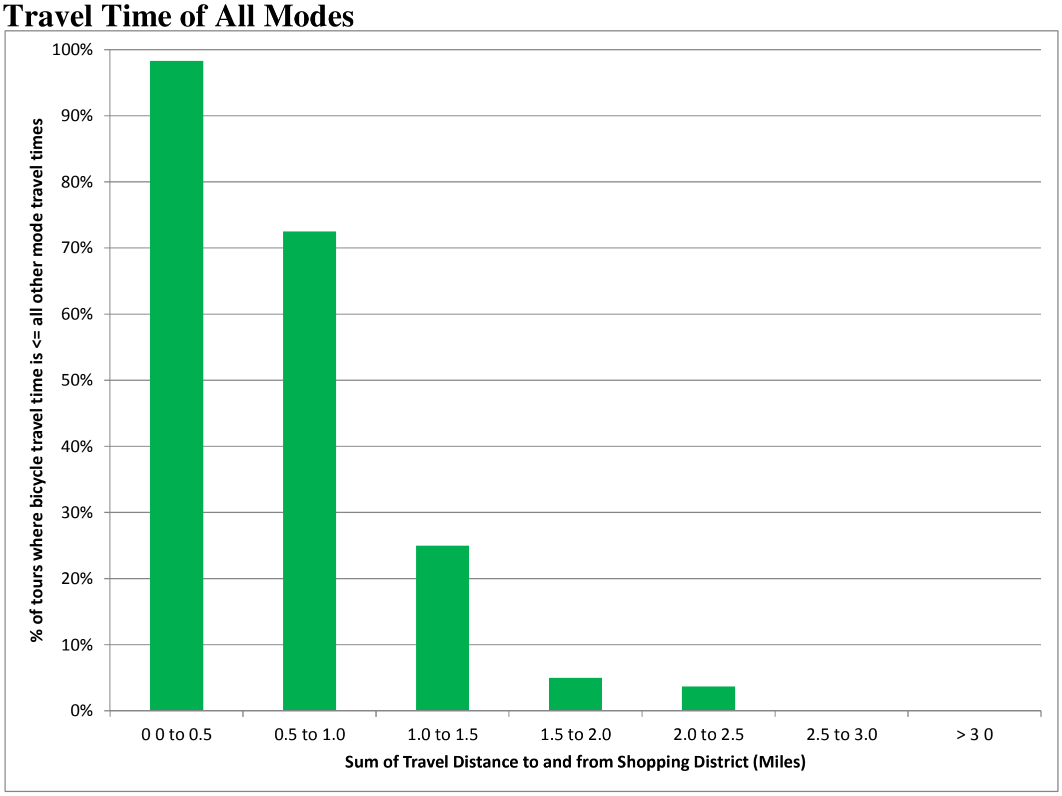
Note: 1 mile = 1.61 kilometers
1 square mile = 2.59 square kilometers

Figure 5.3. Distance to and from Shopping District where Walking had Lower Estimated Travel Time than Automobile



Note: 1 mile = 1.61 kilometers

Figure 5.4. Distance to and from Shopping District where Bicycling had Lowest Estimated Travel Time of All Modes



Note: 1 mile = 1.61 kilometers

The bicycle travel time calculations assumed a modest overall average travel speed of 10.3 miles per hour (16.6 kilometers per hour), which accounted for hills and included times when the bicycle was stopped but did not assume any differences in bicycling pace by age or gender. For comparison, the Portland, OR GPS study found a median bicycle travel speed of 10.8 miles per hour (17.4 kilometers per hour) for all trips and 9.6 miles per hour (15.4 kilometers per hour) for shopping trips, including times when the bicycle was stopped (Dill and Gliebe 2008). The bicycle travel time for each trip was calculated separately and summed to calculate the overall tour bicycle travel time. While bicycling had the lowest estimated travel time among all modes for 141 (36%) of the respondents, only 9 (2%) of the respondents actually bicycled to the shopping district. This suggests that there are other barriers that may prevent bicycling, such as not owning a bicycle, physical ability to ride a bicycle, the need to carry packages, traveling with others who may not bicycle, or concerns about traffic safety.

According to interview participants, these barriers are significant:

- "I wouldn't mind having a bike, but there's so many cars in the City, and people are getting hit all the time...there's kind of a safety factor...My work is actually close enough that I could bike, but...there's so much traffic and cars, I think it would be scarier than driving." *--Male, Age 30, San Francisco Fillmore Street*
- "So that for me is my personal barrier, too...is that I don't want to go on really traffic-heavy streets with my bicycling skills because I would be concerned for my safety." *--Female, Age 30-39, Daly City*
- "I usually take things with me in my car to work back and forth--laptop and stuff like that--which makes it a little bit tougher to ride my bike." *--Female, Age 50-59, San Carlos*
- "I got a bad leg, so I think my bicycling days are over...plus I'm kind of short-winded." *--Male, Age 57, Oakland*
- "We only have one bike in the house, so when I have friends in town, walking, BART, and bus are the only options." *--Male, Age 30-39, San Francisco Mission Street*

However, if these barriers can be eliminated, there may be potential to increase bicycle use for routine, short-distance tours.

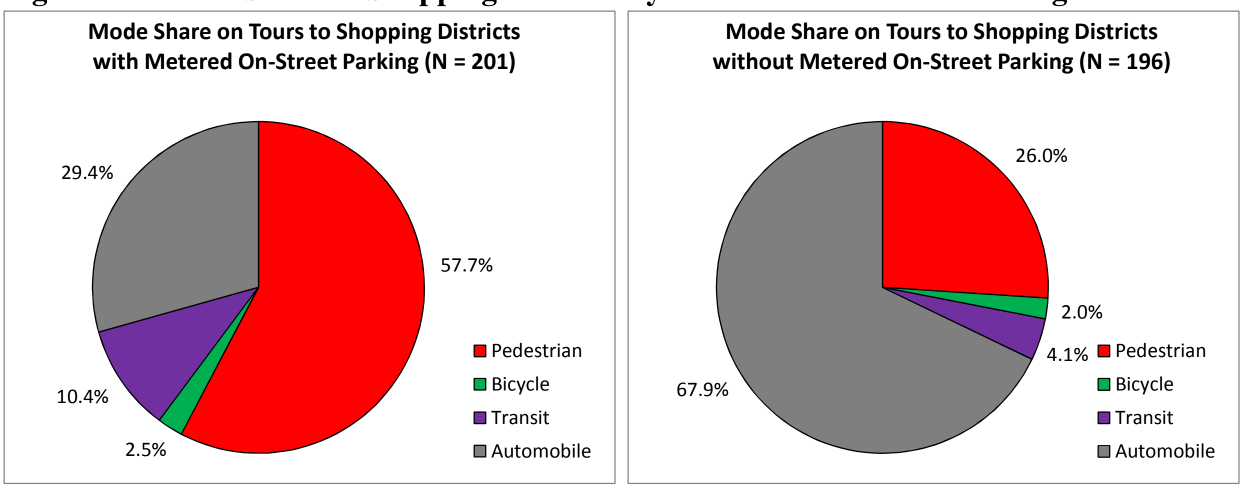
<u>Travel Cost</u>

Estimated out-of-pocket travel cost was evaluated for both public transit and automobile modes, and it showed that customers were less likely to use these modes when they were more expensive. Travel cost calculations and assumptions are provided in Appendix K. The value of time calculated from the model for transit users was $9.23 per hour and automobile drivers was $14.41 per hour. This is in the same range as the value of time calculated from the 1990 Bay Area Travel Survey, which was $15.96 per hour for work trips and $10.88 per hour for shopping trips (adjusted to 2009 dollars) (Purvis 1997).

These results also suggest that tours with a higher cost for driving are more likely to be done by other modes. For example, shopping districts with metered on-street parking had a greater portion of survey respondents who walked, bicycled, and took transit to the store than without pay parking (Figure 5.5). According to interviewees:

- “Parking prices have a lot to do with why I bike up to Downtown Berkeley. You know, it’s like, I don’t want to pay that much money to park somewhere.”
--Female, Age 50-59, Berkeley
- “I’m not willing to pay two dollars for 15 minutes [for parking in San Francisco]...so I will definitely end up driving around more to go to...less expensive parking meter situations, if I know there are certain blocks in that neighborhood that don’t have parking meters, I'll try to go find a spot there.” *--Female, Age 30-39, Daly City*
- “San Francisco is insane...just using meters in San Francisco...not everywhere, but down near the Ferry Building and down on the Embarcadero area...it’s like a dime for two minutes. I just don't do it too often. The meters in San Francisco definitely affect my decisions in what I'm doing...driving and parking.”
--Female, Age 52, South San Francisco

Figure 5.5. Mode Share to Shopping Districts by Presence of Metered Parking



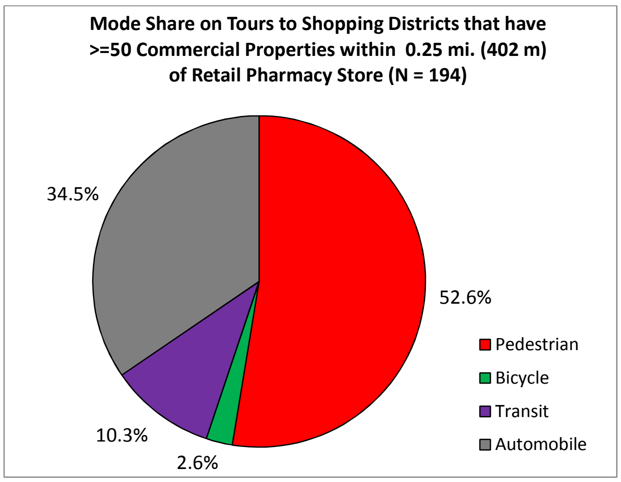
However, this relationship may not only reflect a higher cost of driving. Many of the shopping districts with metered on-street parking may have had a large portion of people walking and bicycling regardless of the price of parking because these districts tended to have limited parking and short, walkable and bikable distances between stores. Shopping districts with a mix of characteristics that make walking and bicycling more convenient and driving less convenient are more likely to attract customers using non-automobile modes.

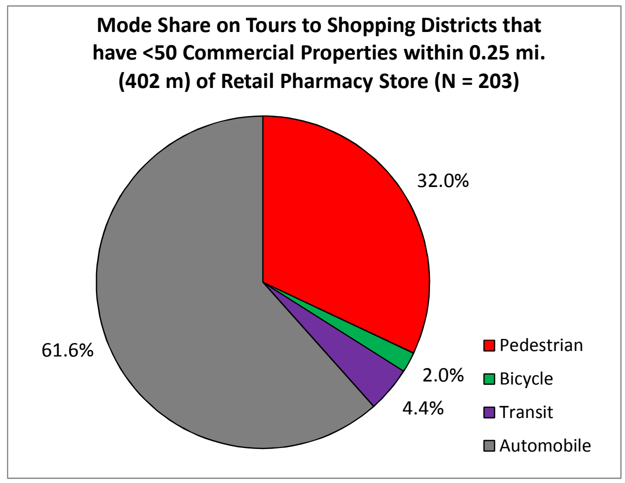
<u>Travel Distance within Shopping District</u>
The distance that the survey respondent traveled within the shopping district had a slight positive association with traveling by automobile to and from the shopping district. This variable indicated that even if a person lives close to a shopping district, they may choose to drive rather than walk or take transit to the district if they need to travel far between stops within the one-mile diameter area.

<u>Number of Tour Stops</u>
Respondents who made more stops on their tour were more likely to have walked or taken transit than traveled by automobile to the shopping district. Previous research suggested that the number of tour stops was negatively associated with walking (Jonnalagada *et al*. 2001) and

transit (Hensher and Reyes 2000). However, when viewed in combination with the travel distance within shopping district variable, the negative association between the number of tour stops and choosing automobile suggested that walking and transit could be viable modes if many stores were clustered together geographically within a shopping district (Figure 5.6)[3]. Urban Core and Suburban Main Street shopping districts, which tended to have stores clustered closely together, had an average pedestrian mode share greater than 50% and transit mode share greater than 10%, while Suburban Thoroughfare and Suburban Shopping Center shopping districts had an average pedestrian mode share less than 20% and transit mode share less than 2% (Table 5.5).

Figure 5.6. Mode Share to Shopping Districts by Concentration of Commercial Properties





<u>Number of Bags</u>

Carrying bags on a tour had a slight positive association with driving to and from the shopping district. For example, respondents who purchased several bags of merchandise at the retail pharmacy store or stopped at the store after shopping for groceries or other goods may have driven an automobile to the shopping district so that they could carry these items. Many people who were interviewed cited the need to carry bags as a reason to drive rather than walk, bicycle, or take transit:

- "If I go for groceries, I almost drive there all the time...I have a grocery store pretty close. But generally...I'll walk there and buy maybe a few things, but not like a whole bunch of stuff." *--Male, Age 30, San Francisco Fillmore Street*
- "I could walk, but I couldn't buy as many groceries and walk back home if I do." *--Female, Age 60-69, San Carlos*
- "I do a major shopping about once a week...I do take the car for that because I can't carry everything." *--Female, Age 60-69, San Francisco Taraval Street*

<u>Shopping Alone</u>

The model did not show a statistically-significant relationship between shopping alone and mode choice. However, the negative parameter for shopping alone in the automobile utility function suggested that people who walk and use transit are more likely to choose these modes when traveling alone. The choice of automobile was more attractive when several people were

[3] A variable representing the travel distance per stop within the shopping district was also tested in the model, but it was not statistically significant.

traveling together. This may reflect the unattractiveness of coordinating walking among people with different walking speeds and capabilities or the social value of being able to talk comfortably within the same automobile rather than on a crowded public transit vehicle. According to interview participants:

- "I take care of my mom, and I can't be away very long. And I usually take her with me… We can get down to the train; we can use the bus, but it involves more and more time, and we would be not able in an emergency to get somewhere quickly." *--Female, Age 52, South San Francisco*
- "I'm not going to spend $50 paying for BART tickets...four of us coming to the City would be about $50. A car ride is more convenient, more flexible than trying to take the bus." *--Male, Age 40-49, Fremont*
- "If I'm bringing more people, like picking up someone. Those get in the way of walking or bicycling." *--Female, Age 50-59, Berkeley*

Socioeconomic Characteristics

A variety of socioeconomic characteristics were associated with mode choice to and from the shopping district. These characteristics included taking the survey in Spanish, being a student, living in a group house, having a lower household income, and having a disability.

<u>Spanish Language</u>

Respondents who took the survey in Spanish had a slightly higher likelihood of walking and taking transit to and from the shopping district than using an automobile. This could reflect Spanish-speakers having a more positive cultural attitude toward walking and public transportation. It could also be a reflection of the high number of Spanish surveys administered in pedestrian-friendly shopping districts. However, the shopping districts with the highest percentage of Spanish surveys were Oakland, Concord, and El Cerrito, and Mission Street. Of these areas, Mission Street and Oakland were more pedestrian-friendly Urban Core and Suburban Main Street shopping districts with 67% and 43% pedestrian mode shares, respectively. In contrast, Concord and El Cerrito were automobile-oriented Suburban Thoroughfare shopping districts with 40% and 25% pedestrian mode shares, respectively. So it is unlikely that the high prevalence of walking among Spanish speakers was due only to the character of neighborhoods where they shopped. Spanish speakers also typically owned fewer automobiles than other respondents, but the model already controlled for the influence of automobile ownership through the income variable.

<u>Student Status</u>

Being a student had a statistically-significant association with choosing to walk or take transit to the shopping district. It is possible that students view walking as a routine travel mode because they often walk to and from classes and between classes, so they may be more likely than habitual drivers to consider walking for other travel purposes. Similarly, students may be more familiar and comfortable with using transit because they are more likely to utilize student transit passes and campuses often have limited automobile parking and frequent transit service. Finally, it is possible that students have fewer time constraints in their daily schedules, so they may have the extra time and flexibility that is associated with walking or taking transit to run errands. Students also tended to own fewer automobiles than other survey respondents, but this was controlled by including the income variable in the model.

Group House

The variable representing people living in a shared house with four or more adults was significantly associated with a higher likelihood of walking and taking transit. This may reflect that people living in group houses may be sharing automobiles, so they are less likely to have access to a motor vehicle. It could also reflect shared values between people living together. People living in group houses may have more environmentally-supportive values, so they may choose to walk or take transit rather than drive. There may also be some degree of social pressure within a group house to travel sustainably. However, group values may be different in some households, such as peer pressure that reinforces automobile driving habits. More research is needed to explore the social influence of housemates on mode choice.

Lower Household Income

Respondents with annual household incomes of less than $50,000 were significantly less likely to use an automobile than walk or take transit to and from the shopping district. People with lower household incomes were less likely to own automobiles due to high purchase, insurance, and maintenance costs. Of respondents who just traveled to and from the shopping district, 29% (54 of 192) with lower household incomes did not have an automobile and only 8% (6 of 72) with higher household incomes (greater than $100,000 per year) did not have an automobile. Therefore, lower household income may be a proxy for automobile ownership in the model. The role of automobile ownership in determining automobile use has been noted by Van Acker and Witlox (2010).

People with lower incomes may also be less likely to use automobiles that they owned in order to reduce gas and parking costs. Some interviewees were sensitive to automobile costs:

- "Sometimes, you know, errands come up and you are like, 'I'll just go', but when the gas prices were high, 'let's try to get as much bang for our buck as we can' and kind of get everything localized so that we weren't wasting gas." *--Female, Age 30-39, Daly City*
- "[Paying for gas] is kind of hard being on fixed income. So I mostly just get on the bus." *--Male, Age 57, Oakland*
- "With the amount of gas, tolls, wear and tear driving by myself…I'm saving about 30 dollars a month…that's not bad." *--Female, Age 50-59, Hayward*

However, the lower-income variable could also reflect social acceptability of walking and taking transit for people of different income classes. People who have lower incomes may be more experienced walking and taking public transit and feel that it is more socially-acceptable use these modes than those with higher incomes. On the other hand, people who have higher incomes may have greater environmental-consciousness, so they could have a preference for walking or taking public transit. These nuances suggest that further study is needed to clarify whether household income is related to mode choice through automobile ownership, social and cultural values, or other factors.

Physical Disabilities

As expected, people with physical disabilities were more likely to take an automobile to and from the shopping district. While this variable showed only a slight association with mode choice, it suggested that walking and taking transit are challenging for people who use assistive devices or have physical limitations. Several of the interviewees mentioned that physical limitations prevented them from walking more:

- "I'm at an age, and I also have a disability that…I don't walk as fast as I used to. I can't physically do it." *--Female, Age 40-49, San Francisco Third Street*
- "Walking is good for people that can walk well. It's not so good for people that have trouble walking." *--Male, Age 84, Richmond*
- "I would also like to be in better shape to be able to walk and have enough time to get where I'm going and show up without being sweaty and gross and exhausted." *--Female, Age 30-39, Daly City*

Attitude and Perception Characteristics

Only the enjoyment of walking and perception of high pedestrian crash risk within the shopping district variables were associated with mode choices in the main mixed logit model. However, evidence from additional survey data and interviews suggested that perceptions of traffic safety and personal security also affect the utility of walking and bicycling.

<u>Enjoyment of Walking</u>

People who walked to and from the shopping district tended to enjoy walking more than other survey respondents (Figure 5.7). This variable had a slight positive relationship with walking utility in the model. Efforts that make walking more enjoyable, such as improving the neighborhood environment, calming traffic, or establishing a walk to work day or walking month could have a positive effect on pedestrian mode choice.

Including this attitudinal variable in the model also helped account for the possible effect of neighborhood self-selection. Some people who enjoy walking may choose to live in places where they can walk to the local shopping district. Others who don't enjoy walking may choose to live in places where shopping requires driving. If this association is not measured, the impact of individual shopping district characteristics on the choice of walking versus using other modes may be overstated.

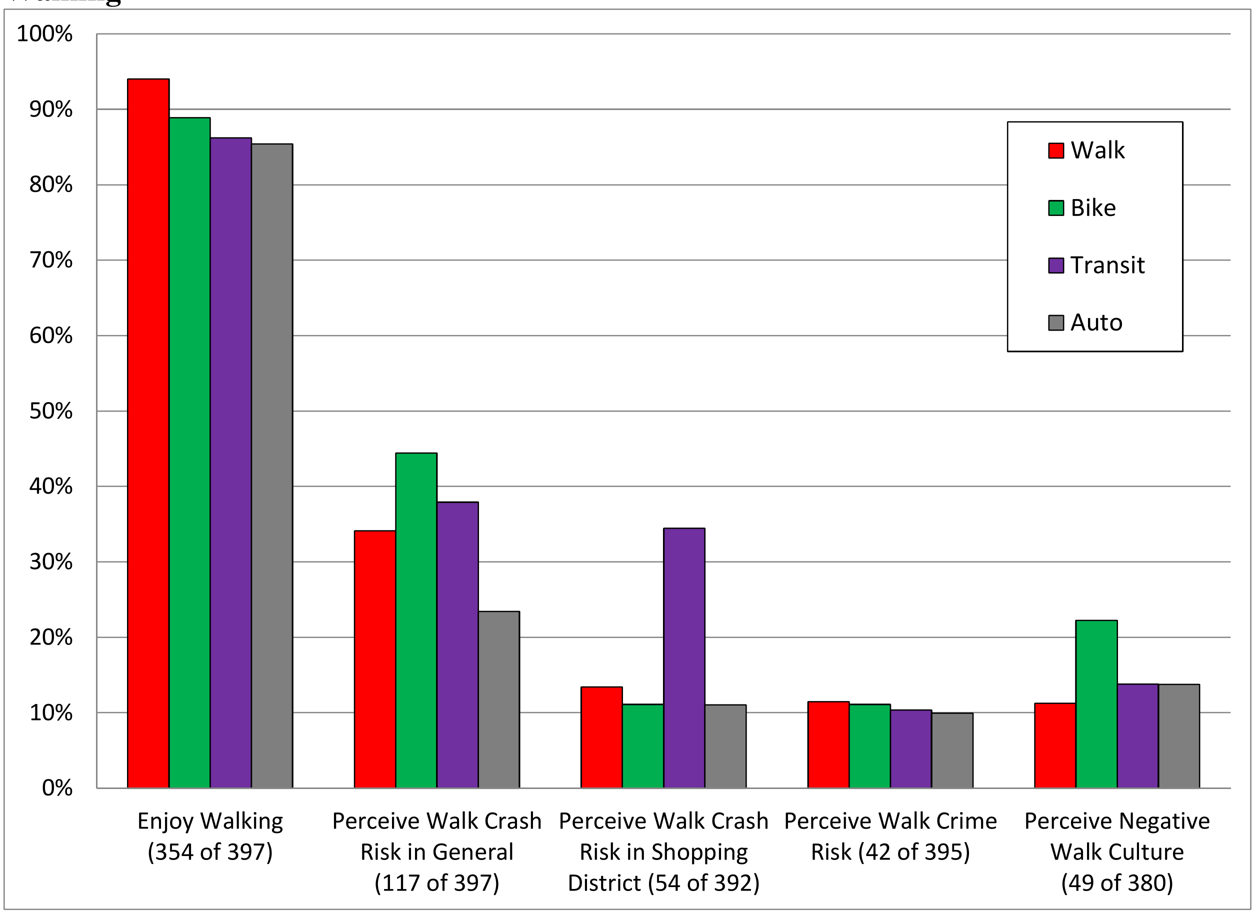
However, results also suggest that individual predisposition toward walking and self-selection into walkable neighborhoods may have only modest impacts on mode choice for shopping tours. This is because the survey and interviews revealed widespread public enjoyment of walking. More than 85% of respondents who used any mode of transportation to travel to and from the shopping districts said that they enjoyed walking. While many interviewees did not walk as much as they would have liked, they enjoyed walking because they could get physical exercise, appreciate nature, breathe fresh air, have time to be alone and think, and other reasons:

- "I think walking is good exercise." *--Female, Age 50-59, Hayward*
- "I have noticed that my stress level has gone down since I have walked and bussed more than I drive." *--Male, Age 30, Burlingame*
- "Walking alone and commuting like that gives me a sense of solace and a time to meditate and reflect and just take in what's out there and stuff." *--Male, Age 30, Burlingame*
- "We enjoy walking in San Francisco and looking at things...she loves to read restaurant menus." *--Male, Age 50-59, San Francisco Fillmore Street*

- "They are doing an ecological service...they are [walking] for the environment." *--Female, Age 52, South San Francisco*
- "We just walk because we can be together and we save money and we try to get our exercise." *--Male, Age 50-59, San Francisco Fillmore Street*

Even though these study participants enjoyed walking, there were other impediments preventing them from walking to and from the shopping district besides their personal attitudes. Some people may live far from the shopping district and others may have disabilities preventing them from walking.

Figure 5.7. Mode Share to Shopping Districts by Attitudes & Perceptions Related to Walking



<u>Perception of Traffic Crash Risk while Walking</u>

The model results and raw data showed a significant positive association between the perceived risk of pedestrian crashes in the shopping district and walking and taking transit to the shopping district (Figure 5.7). While this result may appear to be counterintuitive, it may be due to pedestrians and transit users interacting with traffic in the roadway environment on a personal level and developing more of a familiarity with pedestrian traffic safety risks than automobile users. Since the non-automobile users walk in the street environment, they may be more familiar with risks such as speeding traffic, drivers not yielding to pedestrians in crosswalks, and motorists turning right on red at signalized intersections without looking for pedestrians. As a result, they may have been more likely to respond that walking is dangerous. Interviewees said:

- "I'm very aware that we have goofy drivers that go through stop signs, so I try to be very mindful when I'm crossing the streets."
  --Female, Age 60-69, San Francisco Taraval Street
- "There are definitely certain intersections that I'm very cautious about because I know that drivers aren't really paying attention because I have seen drivers do crazy things in those particular intersections. There's definitely some 'hot spot' intersections that if I'm walking, I'm extra cautious."
  --Female, Age 30-39, Daly City
- "If there was less traffic, I mean, I probably would walk even more…People drive pretty fast...People turning. I'd probably say Van Ness and Pine...almost any of them crossing Van Ness, you've got to really watch yourself."
  --Male, Age 30, San Francisco Fillmore Street

In contrast, many people who drive to stores and other errands walk only on quiet neighborhood streets, in parks, or on trails, so they may have less understanding of how pedestrians experience the street environment in a shopping district:

- "When you walk you notice your environment a lot more than when you drive...I notice pedestrian access at like ramps...when you are pushing a baby stroller, you definitely notice that." *--Female, Age 40-49, San Francisco Third Street*
- How important are safe walking conditions when you go out for recreation or for shopping? "It is important. Yes. And if you would have asked me that a month and a half ago, it wouldn't have been as important. But because I'm walking now, I'm realizing that there are a lot of areas that don't have the sidewalks." *--Female, Age 52, San Carlos*
- Why don't people have consideration for pedestrians? "My honest answer, without sounding like a jerk, is that they are selfish. It's all about them...they are not aware of their surroundings. There's no situational awareness, unfortunately…they probably don't know the rules [about crosswalks]." *--Male, Age 30, Burlingame*

<u>Perception of Crime Risk while Walking</u>

The perceived risk of crime was cited by some interviewees as a reason they did not walk more often:

- "When you are walking in this neighborhood, there's nobody else walking. You look like a target here." *--Female, Age 40-49, San Francisco Third Street*
- "There's also a U-Haul around the corner on Bayshore where lots of guys--day laborers--hang out. And it's not pleasant...I don't ever walk down Bayshore because I don't want to be hassled." *--Female, Age 40-49, San Francisco Third Street*

Several interviewees also suggested that it was why many parents don't let their kids walk and play in their neighborhoods.

- "We don't live in a world that is as safe as it used to be…And that's probably why...well, not probably, I'm sure, that's why most parents don't have their children biking around or walking out on the streets alone." *--Female, Age 40-49, Danville*

- "When I was 10 I was taking Muni everywhere on my own by myself...my 10-year-old has not walked anywhere by herself her entire life just because I don't trust everybody else out there right now." *--Female, Age 30-39, Daly City*

However, the main model did not show any statistical association between respondent perceptions of high crime risk in the shopping district and mode choice (Figure 5.7). The lack of significance of this variable could have been due to other intervening factors, such as lower incomes and lower rates of automobile ownership, which are associated with both the perception of higher crime and higher levels of walking.

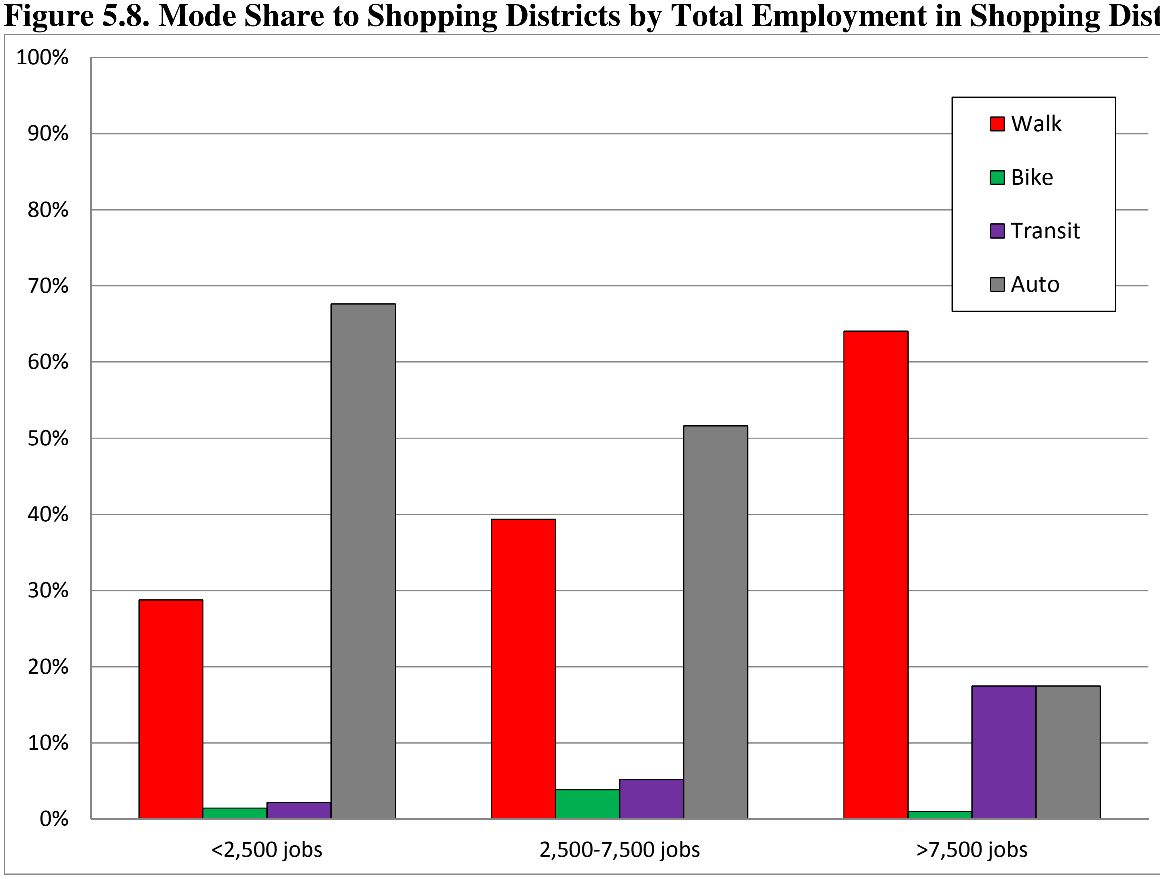
Shopping District Characteristics

Several shopping district characteristics were associated with walking and public transportation after controlling for travel, socioeconomic, and attitude and perception factors. These results suggest that pedestrian and transit modes can be supported through planning strategies that affect the employment and population density, proximity to transit, and design of shopping district streets and parking lots.

Employment Density

The model showed a significant negative relationship between employment density and automobile mode choice. Nearly 70 percent of survey respondents used an automobile to travel to and from shopping districts with fewer than 2,500 employees, but fewer than 20 percent used an automobile to travel to and from districts with more than 7,500 employees (Figure 5.8).

Figure 5.8. Mode Share to Shopping Districts by Total Employment in Shopping District



Since travel time is already included in the model, this variable indicates that shopping districts with a greater concentration of jobs have additional characteristics besides a large number of employees within a short travel time of shopping opportunities that support walking and transit and detract from driving. These other characteristics may include roadways with higher levels of traffic congestion, a high demand for automobile parking, and limited space for automobile parking. All of these factors decrease the utility of driving relative to the other three modes. In addition, areas with high employment densities often have a higher density of transit stops and more frequent transit service than other areas. They also tend to have wider and more complete sidewalks, which make walking more comfortable than in other shopping districts. However, there may be endogenous relationships between greater transit service and choosing transit and between wider sidewalks and choosing to walk. Communities with higher levels of walking and transit use may provide greater accommodation because many people already use these modes, so these attributes may not actually cause the demand for walking or transit to increase.

Population Density

There was a positive association between the population density near the retail pharmacy store where the survey was administered and traveling by walking and transit to the shopping district. Like employment density, higher population densities mean that more people live within a short travel time of shopping opportunities. However, the effect of population density was likely to have a positive association with walking and transit due to higher-density areas having less convenient automobile access (e.g., more traffic congestion, less available parking) and better transit service and walking conditions than lower-density areas.

Multilane Roadway Tree Canopy

Model results showed a significant positive relationship between the utility of walking and the tree canopy coverage along multilane roadways in the shopping district. This is not surprising since many interviewees expressed an appreciation for street trees:

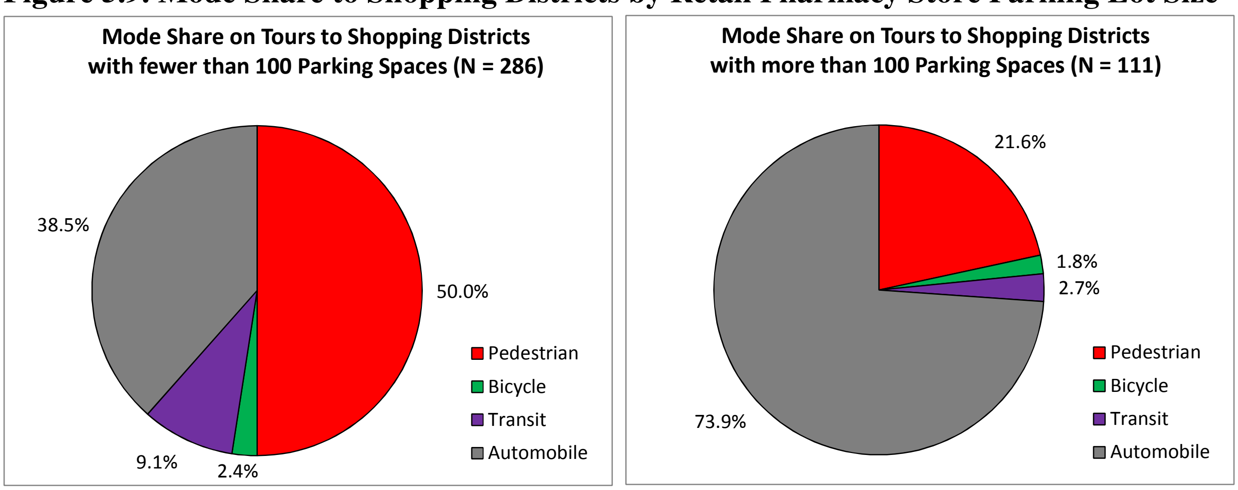
- "Generally streets that also have trees are nicer streets. There's a block of Shotwell Street...it's a beautiful block with beautiful trees, and I love walking down that street. I wish every street had trees." *--Female, Age 40-49, San Francisco Third Street*
- "We have good walking trails and sidewalks around this neighborhood...it's clean, and they have planted trees back 10 or 20 years ago, so they are now nicely grown, and they have some nice shade during summer." *--Female, Age 40-49, Pleasanton*
- "One of the things that I like about walking in the morning is you smell all the roses and the things that are blooming. But if the city doesn't care to beautify their roads or the sidewalk area or whatever with trees, you know, that sort of thing…"
--Female, Age 52, San Carlos

However, this finding is innovative because the model provides statistical evidence that people value street trees. Using the parameters from the tree canopy coverage variable and the travel time variable, it is possible to estimate the value of tree coverage in terms of walking time. According to the model, a typical respondent would be willing to walk (rather than use a different mode) on tours that were approximately 2.1 minutes longer when there was 1% more tree coverage along multilane roads in the shopping district[4]. More data are needed to study this relationship since this variable was not significant in the model of complete tour mode choice or walking versus driving within a shopping district. In addition, the association between street tree canopy and walking may vary by season, since many trees in the San Francisco Bay Area lose their leaves in the winter, as well as by time of day, since the benefit of shade is only provided during daylight hours. However, if additional study verifies this finding, it suggests that improving the quality of the street environment may extend walking distances and increase the pedestrian catchment area for shopping districts.

<u>Automobile Parking</u>
The number of off-street automobile parking spaces at the retail pharmacy survey store had a significant positive relationship with automobile mode choice. It was more common for people to travel by automobile to the shopping district when the survey store had more parking spaces (Figure 5.9). While all survey store parking lots were free, the model indicated that respondents were willing to spend an additional $0.22 to travel by automobile to a survey store that had 10 additional car parking spaces in its parking lot. Like other transportation infrastructure variables, the number of parking spaces may have an endogenous relationship with automobile mode choice. Local regulations often require parking generation studies, so parking lots are constructed to serve anticipated parking demand.

In addition, automobile parking lot size was correlated with several other shopping district characteristics that were not included in the model. Shopping districts with many large parking lots also tended to have lower employment densities, lower population densities, and generally longer travel times to reach the shopping district. This combination of characteristics favored automobile access to the shopping district. Note that the correlation between survey store parking spaces and employment density within 0.5 miles (804 m) of the store was $\rho = -0.27$, which was within $-0.5 < \rho < 0.5$, so these variables were allowed to be in the same model.

Figure 5.9. Mode Share to Shopping Districts by Retail Pharmacy Store Parking Lot Size



[4] The tree canopy coverage variable was an estimated percentage of the total multilane roadway right-of-way area covered by tree canopy. The range of values for this variable was 1.6% to 18.1%, with a mean of 6.4%. Qualitatively, this range of values represented shopping districts with very few street trees (<5% coverage) to full-grown street trees along most major roadways (>10% coverage). Given the importance of street trees to interview respondents, it is not surprising that 1% greater tree canopy coverage on multilane roadways throughout a shopping district was associated with more walking.

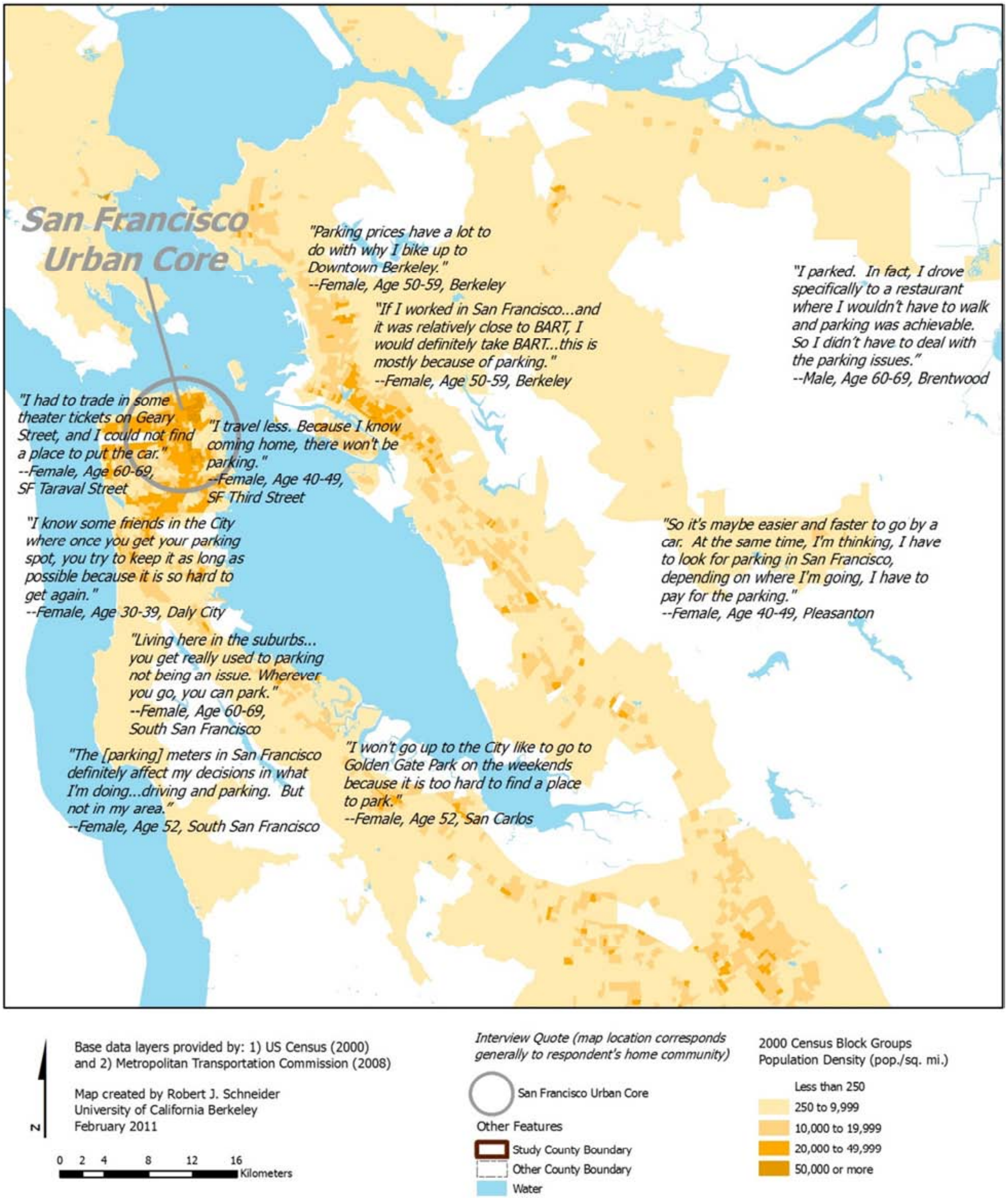
The importance of parking availability and convenience was mentioned by interviewees throughout the study region (Figure 5.10). Large parking lots surrounding stores in Suburban Thoroughfare and Suburban Shopping Center shopping districts made it convenient to travel by automobile:

- "I parked. In fact, I drove specifically to a restaurant where I wouldn't have to walk and parking was achievable. So I didn't have to deal with the parking issues."
  --Male, Age 60-69, Brentwood
- "Living here in the suburbs, the other thing that happens, I think, is that you get really used to parking not being an issue. Wherever you go, you can park."
  --Female, Age 60-69, South San Francisco

A limited, sometimes expensive supply of parking made it difficult to drive in denser, more urban shopping districts:

- "I know some friends in the City where once you get your parking spot, you try to keep it as long as possible because it is so hard to get again. So they'll use everything in their power to not move their car until they have to because they don't want to have to fight for getting another parking spot, so they'll make the most of the neighborhood that they live in to get what they need to get done without moving their car."
  --Female, Age 30-39, Daly City
- "Because there is a lack of parking in this neighborhood…I travel less. Because I know coming home, there won't be parking."
  --Female, Age 40-49, San Francisco Third Street
- "I won't go up to the City like to go to Golden Gate Park on the weekends because it is too hard to find a place to park." *--Female, Age 52, San Carlos*
- "The parking...is...the big reason why I walk around my neighborhood. I could drive if I wanted to, but I mean, it's more inconvenient to find my car where I finally found a parking spot." *--Male, Age 30, San Francisco Fillmore Street*
- "The parking is definitely such a pain in the butt, that you just say, 'I'd rather walk.'...The inconvenience and the price of parking."
  --Male, Age 30, San Francisco Fillmore Street
- "I probably wouldn't drive if I worked in San Francisco…and it was relatively close to BART, I would definitely take BART…this is mostly because of parking."
  --Female, Age 50-59, Berkeley

Figure 5.10. Interviewee Quotes about Parking Availability and Cost



Note: 1 mile = 1.61 kilometers
1 square mile = 2.59 square kilometers

Proximity to a Transit Station

Proximity to a BART or other regional train station also increased the likelihood of taking transit to the shopping district. Transit-oriented development initiatives to locate transit stations within shopping districts or develop shopping districts around transit stations may increase the likelihood of customers traveling to these areas by transit (Cervero, Ferrell, and Murphy 2002).

Panel Parameters

A panel error structure was used to account for unmeasured characteristics that may have been shared between survey participants in each of the 20 shopping districts. While the panel parameters for walking and transit mode choices were insignificant, the parameter for automobile was significant ($p = 0.05$). This suggests that the model variables of travel time, employment density, population density, and number of parking spaces at the survey store may not have captured shared store characteristics related to automobile mode choice, such as parking availability and traffic congestion during survey periods within a particular shopping district. It was important to include the automobile panel parameter to capture these unobserved relationships with mode choice.

Nesting Parameters

Several model alternatives were tested with nesting parameters between two of the three modes. Walking was nested with transit in the first alternative, walking was nested with automobile in the second, and transit was nested with automobile in the third. However, these nesting parameters did not even show a slight association with mode choice behavior ($p < 0.20$) in any of the model alternatives. This means that the respondents in the sample would be equally likely to shift to either of the two remaining alternatives if one alternative was not available. Therefore, no nesting parameter was included in the final model structure.

Forecasted Effects of Land Use, Urban Design, Attitude, and Perception Changes

The model includes several variables that could be changed through planning practice. Therefore, as an illustrative example, the model was used to estimate tour mode shares for the sample of 388 respondents traveling to and from the 20 shopping districts under different scenarios[5]. The scenarios included: 1) doubled population and employment densities in the shopping district, 2) doubled street tree canopy coverage, 3) half as many automobile parking spaces at the survey store, and 4) all of these changes combined (Table 5.8).

Table 5.8. Forecasted Mode Share to and from Shopping Districts Under Different Scenarios (N = 388)

Existing Mode Share			Potential Changes			
Mode	Survey Data	Base Model Prediction	1) Doubled Population & Employment Density	2) Doubled Street Tree Canopy Coverage	3) Half as Many Auto Parking Spaces at Survey Store	4) All Changes Combined
Walk	43.0%	43.2%	47.3%	54.0%	46.8%	61.2%
Transit	7.5%	7.3%	10.2%	5.8%	7.6%	8.2%
Auto	49.5%	49.5%	42.5%	40.2%	45.6%	30.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

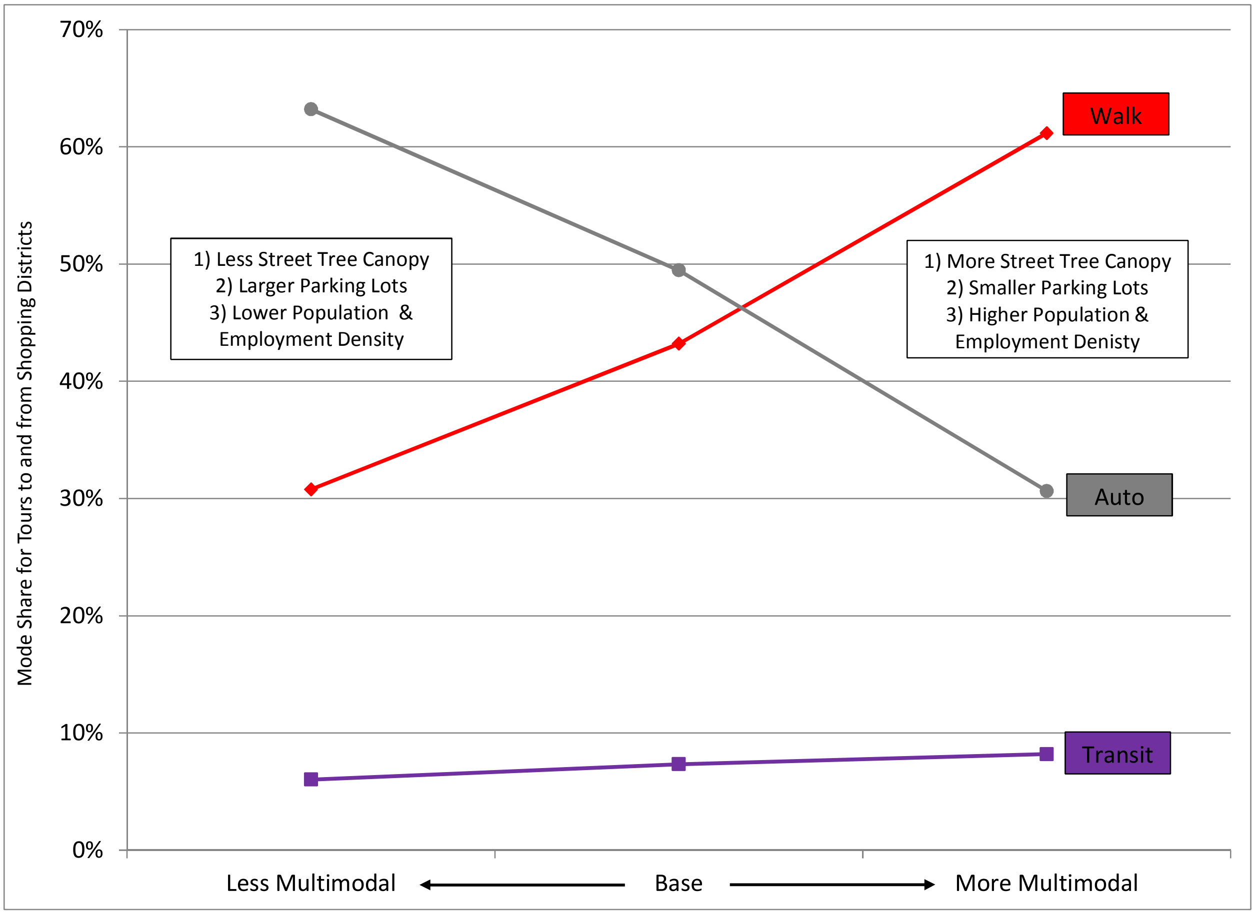
[5] Choice probabilities for each mode were estimated from the model shown in Table 5.7. Panel variable parameters were not used to estimate mode shares.

Based on the model, the combination of all three changes to the 20 shopping districts could increase pedestrian mode share among the 388 sample respondents from 43% to 61% and decrease automobile mode share from 50% to 31%. This shift would eliminate 73 of the 192 automobile tours. Assuming that the typical automobile respondent who shifted modes traveled less than four miles (6.4 km) on his or her tour, this shift would eliminate 129 (13%) of the 983 respondent vehicle miles traveled (208 of the 1,580 respondent vehicle kilometers traveled), and 110 (36%) of the 308 times respondents parked their automobiles in the shopping district. Additional analysis could identify the types of neighborhoods where these changes would be expected to have the greatest impact on mode share.

Note that this forecasted mode shift is an illustrative example based on cross-sectional data. The forecast assumes that each of the variables that are changed would have a direct effect on mode choice. In addition, the forecast does not account for the process of modifying travel behavior habits, so it may overstate the potential impact of the changes. The timeframe for each of these changes is also likely to be different. For example, new street trees can be planted throughout a shopping district within weeks (though the canopy will grow slowly over many years), but doubling population and employment density may take decades to occur.

If the three potential changes were made to all of the survey shopping districts, the model indicates that respondent travel would become more multimodal. Doing the opposite of these scenarios (e.g., half population and employment density, half tree canopy, and double store automobile parking spaces) would make respondent travel less multimodal. Figure 5.11 illustrates mode shifts that could occur under more multimodal and less multimodal scenarios compared to the current respondent mode share. The impacts of each of the three individual treatments on automobile mode share are presented in Appendix L.

Figure 5.11. Survey Respondent Mode Shares Under Different Scenarios, Based on Mode Choice Model for Travel Only To and From Shopping Districts (N = 388)



Future iterations of the model could also be used to forecast the potential mode share for tours to all retail pharmacy stores throughout the San Francisco Bay Area under different scenarios. This would require gathering additional data on the number of customers at each store (greater weight would be given to mode shifts at stores with more customers); obtaining land use, transportation system, and socioeconomic characteristics within all retail pharmacy store shopping districts; and accounting for a wider range of temporal and weather effects on mode choice throughout the year.

5.9. SECONDARY ANALYSIS: TOUR MODE CHOSEN BY ALL SURVEY RESPONDENTS

The secondary analysis was based on responses from the 959 retail pharmacy customers who provided complete tour data. Characteristics of the 959 respondents who made these shopping district tours are provided in Table 5.9, and the travel modes used by these respondents are shown in Table 5.10. As explained in Section 5.5, the model developed during this analysis process used tour travel distance rather than travel time and did not control for the primary purpose of multi-district tours.

Mode Choice by Type of Shopping District

The 959 tours averaged 12.3 miles (19.8 km) and included an average of 4.2 stops (3.2 non-home stops). 236 (25%) of the tours were less than two miles (3.2 km), and 126 (13%) were single-stop tours (i.e., home to the store and back home). Overall, 639 (67%) of the respondents used an automobile (including drivers and passengers) as the primary mode on their tour, while 204 (21%) walked, 95 (10%) took transit, and 21 (2%) bicycled. Primary tour mode was defined as the mode of transportation used for the greatest distance from the time the customer left home until he or she returned home. Respondent mode shares for overall tour mode by type of shopping district were similar to mode shares for traveling to and from the shopping district (Table 5.10). Most customers on tours to shopping districts in more dense, urban environments walked or took transit, while most customers on tours to shopping districts in lower-density suburban areas traveled by automobile.

Table 5.9. Completed Surveys and Participant Characteristics by Shopping District (N=959)

						Participant Characteristics[2]													
Survey Location		Completed Surveys				Language		Gender				Age						Group Size	
Name	County	Weekday	Saturday	**Total**	**Store Response Rate[1]**	Spanish	%	Female	%	Male	%	18-34	%	35-64	%	65+	%	Shop Alone	%
Berkeley	Alameda	26	28	**54**	**17.3%**	1	1.9%	35	64.8%	19	35.2%	26	48.1%	24	44.4%	4	7.4%	42	77 8%
Oakland	Alameda	27	23	**50**	**27.4%**	17	34.0%	30	60.0%	20	40.0%	18	36.0%	31	62.0%	1	2.0%	29	58 0%
Hayward	Alameda	29	22	**51**	**30.5%**	5	9.8%	28	54.9%	23	45.1%	18	35.3%	29	56.9%	4	7.8%	38	74 5%
Fremont	Alameda	22	25	**47**	**21.8%**	3	6.4%	25	53.2%	22	46.8%	18	38.3%	21	44.7%	8	17.0%	40	85.1%
Pleasanton	Alameda	20	27	**47**	**23.1%**	0	0.0%	30	65.2%	16	34.8%	7	14.9%	31	66.0%	9	19.1%	39	83 0%
Danville	Contra Costa	19	23	**42**	**28.7%**	0	0.0%	27	64.3%	15	35.7%	9	21.4%	22	52.4%	11	26.2%	36	85.7%
Brentwood	Contra Costa	24	19	**43**	**27.1%**	1	2.3%	26	60.5%	17	39.5%	10	23.3%	28	65.1%	5	11.6%	26	61 9%
Concord	Contra Costa	25	20	**45**	**21.3%**	6	13.3%	33	73.3%	12	26.7%	13	28.9%	28	62.2%	4	8.9%	31	70 5%
Richmond	Contra Costa	23	27	**50**	**26.7%**	15	30.0%	29	58.0%	21	42.0%	21	42.0%	25	50.0%	4	8.0%	25	52.1%
El Cerrito	Contra Costa	22	19	**41**	**20.2%**	4	9.8%	26	63.4%	15	36.6%	10	24.4%	25	61.0%	6	14.6%	30	73 2%
SF--Market St.	San Francisco	26	23	**49**	**15.5%**	2	4.1%	23	46.9%	26	53.1%	22	44.9%	24	49.0%	3	6.1%	37	75 5%
SF--Fillmore St.	San Francisco	26	26	**52**	**19.1%**	1	1.9%	33	63.5%	19	36.5%	17	32.7%	24	46.2%	11	21.2%	42	80 8%
SF--Taraval St.	San Francisco	21	26	**47**	**20.7%**	0	0.0%	23	48.9%	24	51.1%	15	31.9%	23	48.9%	9	19.1%	39	83 0%
SF--Mission St.	San Francisco	24	29	**53**	**23.9%**	18	34.0%	32	60.4%	21	39.6%	25	47.2%	25	47.2%	3	5.7%	37	69 8%
SF--Third St.	San Francisco	22	23	**45**	**28.8%**	5	11.1%	29	64.4%	16	35.6%	11	24.4%	27	60.0%	7	15.6%	37	82 2%
S. San Francisco	San Mateo	25	21	**46**	**19.3%**	1	2.2%	25	54.3%	21	45.7%	8	17.4%	30	65.2%	8	17.4%	38	82.6%
Daly City	San Mateo	22	23	**45**	**16.6%**	4	8.9%	28	62.2%	17	37.8%	17	37.8%	24	53.3%	4	8.9%	31	68 9%
Burlingame	San Mateo	27	25	**52**	**25.8%**	1	1.9%	34	65.4%	18	34.6%	13	25.0%	36	69.2%	3	5.8%	36	69 2%
San Mateo	San Mateo	27	26	**53**	**19.2%**	3	5.7%	32	60.4%	21	39.6%	13	24.5%	29	54.7%	11	20.8%	41	77.4%
San Carlos	San Mateo	24	23	**47**	**21.4%**	2	4.3%	25	54.3%	21	45.7%	7	14.9%	32	68.1%	8	17.0%	33	70 2%
Total		**481**	**478**	**959**	**21.9%**	89	9.3%	573	59.9%	384	40.1%	298	31.1%	538	56.1%	123	12.8%	707	74 0%

1) Response rate was calculated as (Number of surveys/Total number of people invited to participate in survey).

2) The total number of surveys in particular categories may not sum to 959 because of non-response to certain questions.

Table 5.10. Primary Mode Choice by Shopping District, Sorted by Cluster (N=959)

1. Urban Core	Respondent Primary Tour Mode Share[1]				
Shopping District	N	Walk	Bicycle	Transit	Automobile
SF-Market St.	49	46.9%	4.1%	40.8%	8.2%
SF-Fillmore St.	52	59.6%	0.0%	15.4%	25.0%
SF-Mission St.	53	45.3%	1.9%	39.6%	13.2%
Cluster Average	**154**	**50.6%**	**1.9%**	**31.8%**	**15.6%**

2. Suburban Main Street	Respondent Primary Tour Mode Share[1]				
Shopping District	N	Walk	Bicycle	Transit	Automobile
Berkeley	54	31.5%	13.0%	1.9%	53.7%
Oakland	50	18.0%	2.0%	6.0%	74.0%
Richmond	50	24.0%	2.0%	10.0%	64.0%
SF-Taraval St.	47	25.5%	0.0%	19.1%	55.3%
SF-Third St.	45	17.8%	0.0%	15.6%	66.7%
Daly City	45	22.2%	0.0%	20.0%	57.8%
Burlingame	52	25.0%	3.8%	1.9%	69.2%
San Mateo	53	24.5%	1.9%	1.9%	71.7%
Cluster Average	**396**	**23.7%**	**3.0%**	**9.1%**	**64.1%**

3. Suburban Thoroughfare	Respondent Primary Tour Mode Share[1]				
Shopping District	N	Walk	Bicycle	Transit	Automobile
Hayward	51	11.8%	0.0%	3.9%	84.3%
Fremont	47	14.9%	2.1%	2.1%	80.9%
Danville	42	2.4%	0.0%	0.0%	97.6%
Brentwood	43	2.3%	4.7%	2.3%	90.7%
Concord	45	17.8%	0.0%	0.0%	82.2%
El Cerrito	41	7.3%	0.0%	4.9%	87.8%
San Carlos	47	2.1%	4.3%	6.4%	87.2%
Cluster Average	**316**	**8.5%**	**1.6%**	**2.8%**	**87.0%**

4. Suburban Shopping Center	Respondent Primary Tour Mode Share[1]				
Shopping District	N	Walk	Bicycle	Transit	Automobile
Pleasanton	47	4.3%	2.1%	2.1%	91.5%
S. San Francisco	46	6.5%	0.0%	0.0%	93.5%
Cluster Average	**93**	**5.4%**	**1.1%**	**1.1%**	**92.5%**

Overall	Respondent Primary Tour Mode Share[1]				
	N	Walk	Bicycle	Transit	Automobile
Overall Average	**959**	**21.3%**	**2.2%**	**9.9%**	**66.6%**

1) Survey respondent transportation mode share is the mode that the person used for the greatest distance on their entire tour from the time they left home until the time they returned home. Cluster average is weighted average of individual shopping district data based on surveys per store.

5.10. MODELING PROCESS: TOUR MODE CHOSEN BY ALL SURVEY RESPONDENTS

The secondary model structure was nearly identical to the main model presented above. A mixed logit framework was used, including panel error terms to capture correlated responses among respondents at the same store and a nesting error term to quantify interdependence between related modes. One major difference from the main model analysis is that the secondary dataset contained enough respondents who bicycled on their tour to include bicycling in the choice set. This made it possible to test the secondary model with a nesting parameter between the walk and bicycle mode choices that represent potential correlation between the choice of non-motorized transportation modes.

More than 70 variables were considered as factors that could potentially be associated with each of the 959 survey respondents choosing to walk, bicycle, take transit, or use an automobile as their primary tour mode (Table 5.11). As done for the main model, each iteration of the secondary model was estimated using different combinations of these explanatory variables. Variables with high correlations ($\rho > 0.5$ or $\rho < -0.5$) were not included in the same model. There was a moderate correlation between the presence of metered street parking on the street adjacent to the survey store and the number of spaces in the survey store parking lot ($\rho = -0.53$). However, these two variables represented two theoretically-important aspects of automobile parking: a greater supply of parking at the store was expected to be associated with more utility for driving, and metered street parking was expected to be associated with less utility for driving on a tour that included stopping at the survey store. The parameter estimates for these variables appeared to be reasonable when the final model was estimated.

As done for the main model, the first iteration of the secondary model was tested using a single parameter for each variable. This initial parameter was placed by default in the utility equation for automobile, unless the variable was assumed to be related to a different mode (e.g., the "Miles of Bicycle Facilities" parameter was placed in the bicycle mode utility function). Twenty-six variables were tested to see if the overall model fit would be better with their corresponding parameters in a single mode utility equation or in multiple mode utility equations. Likelihood ratio tests showed that eight of these variables improved the model significantly when they had separate parameters in three mode utility equations.

Table 5.11., Part 1. Variables Considered for Statistical Models: Travel and Socioeconomic Factors

Travel Factors		Summary Statistics[1]				
Variable Name	**Description**	**Sample Size**	**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
Distance to Furthest Stop	Straight-line distance from home to furthest stop (km)	959	6.757	11.662	0.063	140.873
Home to Store Distance	Straight-line distance between home and survey location (km)	959	3.813	9.409	0.063	140.873
Total Tour Distance	Total tour distance (km)	959	19.831	32.540	0.364	387.816
Tour Distance <2 mi.	Total tour distance less than 2 mi. (3.2 km) (1 = Yes, 0 = No)	959	0.246	0.431	0.000	1.000
Number of Stops	Total tour stops (including returning home)	959	4.244	1.849	2.000	17.000
Single-Stop Tour	Tour was to store and back home (1 = Yes, 0 = No)	959	0.131	0.338	0.000	1.000
No Bags	Carrying 0 bags (1 = Yes, 0 = No)	959	0.150	0.357	0.000	1.000
2+ Bags	Carrying 2 or more bags (1 = Yes, 0 = No)	959	0.244	0.430	0.000	1.000
Shopping Alone	Shopping alone (group size = 1) (1 = Yes, 0 = No)	955	0.740	0.439	0.000	1.000
Cool Temperature	Temperature <60° F (<16° C) (1 = Yes, 0 = No)	959	0.074	0.262	0.000	1.000
Saturday	Survey was on Saturday (1 = Yes, 0 = No)	959	0.498	0.500	0.000	1.000
Respondent Socioeconomic Factors		**Summary Statistics[1]**				
Variable Name	**Description**	**Sample Size**	**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
Female	Female	957	0.599	0.490	0.000	1.000
Spanish Speaker	Survey completed in Spanish (1 = Yes, 0 = No)	959	0.093	0.290	0.000	1.000
Young Adult	Young adult (age 18 to 34) (1 = Yes, 0 = No)	959	0.311	0.463	0.000	1.000
Middle Age	Middle-age adult (age 35-64) (1 = Yes, 0 = No)	959	0.561	0.497	0.000	1.000
Senior Citizen	Senior citizen (over age 64) (1 = Yes, 0 = No)	959	0.128	0.335	0.000	1.000
Employed	Employed (includes employed students) (1 = Yes, 0 = No)	957	0.615	0.487	0.000	1.000
Unemployed	Unemployed (1 = Yes, 0 = No)	957	0.161	0.368	0.000	1.000
Student	Student (includes employed students) (1 = Yes, 0 = No)	957	0.118	0.323	0.000	1.000
Retired	Retired (1 = Yes, 0 = No)	957	0.129	0.335	0.000	1.000
Homemaker	Homemaker (1 = Yes, 0 = No)	957	0.023	0.150	0.000	1.000
No-Child Household	Household with 0 children (1 = Yes, 0 = No)	959	0.633	0.482	0.000	1.000
Single Adult	Household with a single adult (1 = Yes, 0 = No)	959	0.242	0.428	0.000	1.000
Group House	Household with 4 or more adults (1 = Yes, 0 = No)	959	0.112	0.315	0.000	1.000
Lower Income	Household income less than $50,000 per year (1 = Yes, 0 = No)	864	0.468	0.499	0.000	1.000
Higher Income	Household income more than $100,000 per year (1 = Yes, 0 = No)	864	0.263	0.440	0.000	1.000
Bus Pass	Owns a monthly or annual bus pass (1 = Yes, 0 = No)	954	0.177	0.382	0.000	1.000
Disability	Has a disability (self-reported) (1 = Yes, 0 = No)	959	0.131	0.338	0.000	1.000
Number of Autos	Number of motor vehicles in household (1 = Yes, 0 = No)	958	1.773	1.359	0.000	15.000
Number of Bicycles	Number of bicycles in household (1 = Yes, 0 = No)	959	1.586	2.066	0.000	30.000
No-Car Household	0 motor vehicles in household (1 = Yes, 0 = No)	958	0.128	0.335	0.000	1.000
Multi-Car Household	2 or more motor vehicles in household (1 = Yes, 0 = No)	958	0.549	0.498	0.000	1.000

Table 5.11., Part 2. Variables Considered for Statistical Models: Attitude & Perception and Shopping District Factors

Respondent Attitude & Perception Factors		Summary Statistics[1]				
Variable Name	**Description**	Sample Size	Mean	Std. Dev.	Minimum	Maximum
Enjoy Walking	Respondent enjoys walking (1 = Yes, 0 = No)[2]	959	0.867	0.340	0.000	1.000
Enjoy Bicycling	Respondent enjoys bicycling (1 = Yes, 0 = No)[2]	949	0.607	0.489	0.000	1.000
General Walk Crash Risk	Perceive walking to be risky (in general) (1 = Yes, 0 = No)[2]	959	0.236	0.425	0.000	1.000
General Bike Crash Risk	Perceive bicycling to be risky (in general) (1 = Yes, 0 = No)[2]	950	0.548	0.498	0.000	1.000
Negative Walk Culture	People in nbhd. have neg. view of walking (1 = Yes, 0 = No)[2]	916	0.092	0.289	0.000	1.000
Negative Bike Culture	People in nbhd. have neg. view of bicycling (1 = Yes, 0 = No)[2]	917	0.150	0.358	0.000	1.000
Nbhd. Walk Crime Risk	Perceieve high crime risk if walking in shop. dist. during day (1 = Yes, 0 = No)[11]	954	0.106	0.308	0.000	1.000
Nbhd. Bike Crime Risk	Perceieve high crime risk if bicycling in shop. dist. during day (1 = Yes, 0 = No)[11]	916	0.103	0.304	0.000	1.000
Nbhd. Walk Crash Risk	Perceieve high crash risk if walking in shop. dist. during day (1 = Yes, 0 = No)[11]	946	0.132	0.339	0.000	1.000
Nbhd. Bike Crash Risk	Perceieve high crash risk if bicycling in shop. dist. during day (1 = Yes, 0 = No)[11]	910	0.288	0.453	0.000	1.000
Shopping District Factors		**Summary Statistics[1]**				
Variable Name	**Description**	Sample Size	Mean	Std. Dev.	Minimum	Maximum
Population Density	Total population living within 0.1 mi. (161 m) of store (00s)[3]	959	3.668	2.854	0.566	12.226
Employment Density	Total number of jobs within 0.5 mi. (804 m) (000s)	959	11.472	31.258	0.195	145.200
Commercial Density	Total number of commercial properties within 0.25 mi. (402 m)[4]	959	57.328	61.908	6.000	272.000
Median Income	Median annual household income within 0.5 mi. (804 m)	959	58738	19905	28243	93413
Percent White	Proportion of population living within 0.5 mi. (804 m) that is White	959	0.518	0.236	0.101	0.898
Sidewalk Coverage	Proportion sidewalk coverage on multilane roadways[5]	959	0.902	0.118	0.536	1.000
Slope	Average percent slope along multilane roadways[6]	959	2.776	4.561	0.622	22.093
Bike Facility Density	Miles of bicycle facilities within 0.5 mi. (804 m)[7]	959	1.964	1.965	0.000	6.330
Intersection Density	Number of street intersections within 0.5 mi. (804 m)	959	115.293	31.013	56.000	174.000
Spanish-Speaking	% of households with adults who only speak Spanish within 0.1 mi. (161 m)	959	0.059	0.062	0.000	0.212
Asian-Speaking	% of households with adults who only speak an Asian language within 0.1 mi. (161 m)	959	0.056	0.065	0.003	0.272
Road Width	Adjacent roadway curb-to-curb width (m)[8]	959	22.283	5.628	11.583	32.501
Road Street Parking	On-street parking coverage on adjacent roadway[8,9]	959	0.591	0.393	0.000	1.000
Road Lanes	Average adjacent roadway number of travel lanes[8,10]	959	4.003	1.108	2.000	5.997
Road AADT	Traffic volume (AADT) on roadway adjacent to store	959	23028	10253	9771	50500
Road Speed Limit	Average posted speed limit along adjacent roadway (MPH)[8]	959	29.797	4.945	25.000	37.500
Road Setback	Average building setback along adjacent roadway (m)[8,11]	959	8.615	8.376	0.000	25.709
Road Tree Canopy	% of adjacent roadway right-of-way covered by tree canopy[8,12]	959	7.732	4.273	2.089	16.237
Crossroad Crossing Distance	Average crossroad pedestrian crossing distance (m)[8,13]	959	12.788	3.328	6.668	20.079
Store Square Meters	Gross area of store building (square meters)	959	1244	472	493	2338
Drive-Through Window	Store has a drive-through window (1 = Yes, 0 = No)	959	0.293	0.455	0.000	1.000
Store Parking Spaces	Spaces in the store parking lot (includes shared parking)(00s)	959	1.244	1.377	0.000	4.420
Store Bike Parking	Bicycle parking spaces on store property	959	2.484	3.712	0.000	12.000
Pay Parking on Road	Presence of pay parking within 0.1 mi. (161 m) (1 = Yes, 0 = No)[14]	959	0.465	0.499	0.000	1.000
Setback Distance	Distance from store door to public sidewalk (m)[15]	959	17.644	22.373	1.000	90.000
Distance to Train	Distance from store to closest train station (km)[16]	959	2.050	3.344	0.141	12.781

Table 5.11., Part 3. Variables Considered for Statistical Models: Footnotes

1) Non-responses were removed. This is reflected in the sample size for each variable.
2) Agreement with the statement included two of the five categories on a 5-point Likert scale (e.g., "Agree" or "Strongly Agree").
3) Total population within 0.1 mi. (161 m) is calculated from 2000 census block group data. The calculation of population only included portions of census block groups within the 0.1-mi. (161-m) radius of the store.
4) Commercial retail/entertainment properties are defined by the four county assessor's offices. These commercial land uses include commercial, entertainment, store, service, tourism, store on first floor with other above, department store, single-story store, restaurant, post office, bank, supermarket, food store, lodge hall, car wash, gas station, auto dealer, movie theater, bowling alley, winery, stadium, commercial mix, and commercial building. This category does not include commercial office buildings. Note that one building structure could include multiple commercial properties.
5) Sidewalk coverage is calculated on multilane roadways within 0.5 mi. (804 m) of the store. The calculation assumes that complete coverage is continuous sidewalks on both sides of the street. Therefore, if a street has sidewalks on both sides, it has 100% sidewalk coverage. If a street has a complete sidewalk on one side, but no sidewalk on the other, it has 50% coverage.
6) Percent slope is calculated on multilane roadways within 0.5 mi. (804 m) of the store. It is calculated as the change in elevation between the two segment endpoints (intersections) divided by the length of the street segment.
7) Bicycle facilities include bicycle lanes, shared lane markings, bicycle boulevards, and multi-use trails. They do not include streets that only have bicycle route signs. Bicycle facility miles were calculated using the same methodology as automobile lane miles. If bicycle lanes or shared lane markings are on both sides of a one-mile-long street segment, this represents two miles of bicycle facilities (this avoids the problem of misrepresenting one-way bicycle facilities on one-way streets). Bicycle boulevards and multi-use trails are two-way facilities, so one-mile of centerline counts as two miles of bicycle facilities.
8) Adjacent roadway variables are measured within a 0.5-mi. (804-m) corridor (0.25 mi. (402 m) in either direction) along the commercial roadway adjacent to the store. Speed limit is posted in miles per hour (MPH), so it is reported using this measure. Note that 10 MPH = 16.1 KPH.
9) A block is considered to have on-street parking if on-street parking is legal (i.e., parked cars do not need to be present). Each side of the street is considered separately (e.g., on-street parking on both sides = 100% coverage; on-street parking on one side = 50% coverage).
10) Travel lanes include all general purpose through-lanes in both directions. The number of through-lanes does not include left- or right-turn lanes, two-way center turn lanes, bicycle lanes, shoulders, or other auxilary lanes. In addition, it does not include lanes that end within the segment.
11) Average setback is a rough estimate of the average distance between the sidewalk or roadway edge and the front of each building. If a road segment does not have buildings (e.g., overpass, underpass, etc.), it is not considered in the average setback measurement.
12) Average percent tree coverage is an average of the percent tree coverage on each multilane street segment within 0.5 mi. (804 m) of the store. Tree coverage is an estimate of the total public right-of-way surface area (edge-of-sidewalk to edge-of-sidewalk) covered by tree canopy.
13) Crossroad street crossing distance represents the width of the roadway intersecting the mainline commercial roadway. The distance is measured in the direction of commercial street. Intersection crossings are considered in this measurement, but riveway crossings are not.
14) Presence of pay parking within 0.1 mi. (161 m) was noted using Google Street View.
15) Distance from store door to public sidewalk was measured as the most direct path from the door to the sidewalk that did not involve crossing fences or landscaping. Measurement was done using the Google Earth measuring tool. Building doors were located using Google Street View.
16) Distance from store to closest Bay Area Rapid Transit or other train station was measured as the straight-line distance from the store centroid to the train station centroid. Measurement was done in GIS.

Model Significance
The final mixed logit model included 47 parameters corresponding with 28 variables and a constant. Overall, the model log-likelihood (-399) was relatively high compared with the log-likelihood value for no model (-1,188) and the log-likelihood value of a model with only constants (-725). Its adjusted rho-squared value was 0.625 (Table 5.12). The model predicted the mode chosen by 814 (85%) of the 959 survey participants correctly.

Parameter estimates were provided for theoretically-important variables that had at least one mode-specific parameter with a p-value < 0.30. However, parameters were considered to be highly significant for $p < 0.01$, significant for $0.01 \leq p < 0.05$, and moderately significant for $0.05 \leq p < 0.10$. Parameters with $0.10 \leq p < 0.20$ were not considered to be statistically significant but were interpreted as indicating a slight association between the explanatory variable and mode choice. Parameter estimates with $p < 0.10$ are highlighted in Table 5.12.

Like the main model, a likelihood ratio test demonstrated that the planning-related (i.e., attitude, perception, and shopping district) variables added explanatory power to the model. The restricted version of the model included only the variables in the travel and socioeconomic categories and had a log-likelihood of -432. This produced a likelihood ratio test statistic of 2 * (-398.68 – (-431.79)) = 66.2. This test statistic is compared to the value of a Chi-Squared distribution with 47 – 32 = 15 degrees of freedom, which is 30.6 for $p = 0.01$. Since 66.2 is greater than 30.6, we can (with 99% confidence) reject the null hypothesis that the additional variables do not contribute to the model.

Table 5.12., Part 1. Factors Associated with Retail Pharmacy Store Tour Mode Choice

Mixed logit model for all survey respondents who provided complete tour data[1]

	Variable[4]	Walk		Bicycle[3]		Public Transit		Automobile	
		Parameter Est.[5]	*p-value*	*Parameter Est.[5]*	*p-value*	*Parameter Est.[5]*	*p-value*	*Parameter Est.[5]*	*p-value*
	Constant	-3.39	0.00	-2.40	0.02	-5.46	0.00	0.00	Fixed
Travel Variables	Total Tour Distance (km)	-0.326	0.00	-0.087	0.03	-0.000566	0.91		
Travel Variables	Tour Distance <2 mi. (<3.2 km)	1.62	0.00						
Travel Variables	Number of Tour Stops	0.298	0.00	-0.220	0.31	0.0145	0.87		
Travel Variables	No Bags	0.464	0.16						
Travel Variables	Shopping Alone	0.129	0.67	0.439	0.48	1.26	0.00		
Travel Variables	Saturday							0.409	0.06
Socioeconomic	Female			-1.31	0.01				
Socioeconomic	Spanish Speaker							-0.512	0.15
Socioeconomic	Student							-1.04	0.00
Socioeconomic	No-Child Household							-0.353	0.15
Socioeconomic	Group House	0.874	0.02	-0.625	0.56	1.16	0.00		
Socioeconomic	Bus Pass	1.25	0.00	-0.0711	0.93	1.87	0.00		
Socioeconomic	Disability							0.490	0.17
Socioeconomic	No-Car Household							-3.08	0.00
Attitude/ Perception	Enjoy Walking	0.607	0.19						
Attitude/ Perception	Perceive Shop. Dist. Walk Crime Risk							0.614	0.11
Attitude/ Perception	Perceive Shop. Dist. Walk Crash Risk	0.621	0.14	-0.0681	0.95	0.801	0.05		
Shopping District	Emp. within 0.5 mi. (804 m) (000s)							-0.0277	0.00
Shopping District	Pop. within 0.1 mi. (161 m) (00s)	0.129	0.01	0.0230	0.85	0.255	0.00		
Shopping District	Km of Bike Facilities within 0.5 mi. (804 m)			0.141	0.07				
Shopping District	Survey Store Parking Spaces (00s)[6]							0.234	0.03
Shopping District	Survey Store Bike Parking Spaces	0.0323	0.33	0.0766	0.18	-0.0878	0.11		
Shopping District	Metered Parking on Street							-0.356	0.20

Tour Mode[2] spans the Walk, Bicycle, Public Transit and Automobile columns.

Nesting & Panel Variables[7]

	Variable	*Parameter Est.[5]*	*p-value*
Nesting & Panel	Nest (Walk & Bicycle)	0.0753	0.88
Nesting & Panel	Store Panel (Walk)	0.0195	0.93
Nesting & Panel	Store Panel (Bicycle)	0.0131	0.98
Nesting & Panel	Store Panel (Transit)	0.00708	0.97
Nesting & Panel	Store Panel (Auto)	0.0138	0.96

Overall Model

Sample Size (N)	959
Log-Likelihood (0)	-1188
Log-Likelihood (Constant)[8]	-725
Log-Likelihood (Restricted Model)[9]	-432
Log-Likelihood (Model)	-399
Adjusted Rho-Squared Value	0.625

Table 5.12., Part 2. Factors Associated with Retail Pharmacy Store Tour Mode Choice

1) The dependent variable in the model is the primary (greatest distance) mode of transportation used on tours that involved stopping at a retail pharmacy store. The mode used for the 959 survey respondents was: Automobile = 639 (67%), Walk = 204 (21%), Transit = 95 (10%), and Bicycle = 21 (2%). Parameter estimates were generated after 1000 draws. They were varified as stable from 500 to 1000 draws. 2) The automobile mode includes driving and riding as a passenger in a motorized vehicle other than a public bus or train (taxi is included within automobile mode). The walk mode includes all pedestrians, including people on foot, in wheelchairs, and using other assistive devices. The public transit mode includes bus, regional rail, light rail, commuter train, other train, and paratransit. 3) Enjoyment of bicycling was associated with bicycle mode choice. However, all 21 resopndents who bicycled reported enjoying bicycling, so it could not be included in the model. 4) Several other variables were expected to have significant associations with respondent mode choice and were tested during the modeling process. These variables were: tour made only to the shopping district (versus multi-district tour), high respondent household income, respondent perception of general bicycle crash risk, respondent perception of negative cultural attitudes towards bicycling, multilane road tree canopy coverage within the shopping district, drive-through pharmacy window at the survey store, and distance between the survey store and closest regional train station. However, their parameter estimates were imprecise (p > 0.30) and had minimal influence on other parameters, so they were not included in the final model. 5) Parameter estimates represent coefficients in the utility function for choosing each transportation mode. The base mode for each variable is the mode with no parameter estimate. 6) Survey store automoible parking spaces include all spaces in the entire parking lot if it is shared with other stores. 7) The walk & bicycle nest paramter captures the correlation between the choice of walking and bicycling. The store panel parameters capture the correlated error between respondents who were surveyed at the same store. Approximately 50 customers were surveyed at each store, so they share identical shopping distrct variables and may have similar socioeconomic or attitude characteristics. 8) Log-likelihood (constant) is the log-likelihood of a constsnts-only model that includes the nesting and panel variables. 9) Log-likelihood (restricted model) is the log-likelihood of a model without the attitude & perception and shopping district variables.

5.11. RESULTS: TOUR MODE CHOSEN BY ALL SURVEY RESPONDENTS

Many of the statistically-significant variables in the tour mode model (secondary analysis) were similar to those identified in the model of modes chosen to travel to and from shopping districts (main analysis). Therefore, the following results focus on additional findings revealed by the tour mode model. Since the model database included small sample of 21 bicyclists, the results that identify factors associated with bicycling should be viewed as exploratory. Results related to specific variables are presented in the order that they are listed in the final model (Table 5.12).

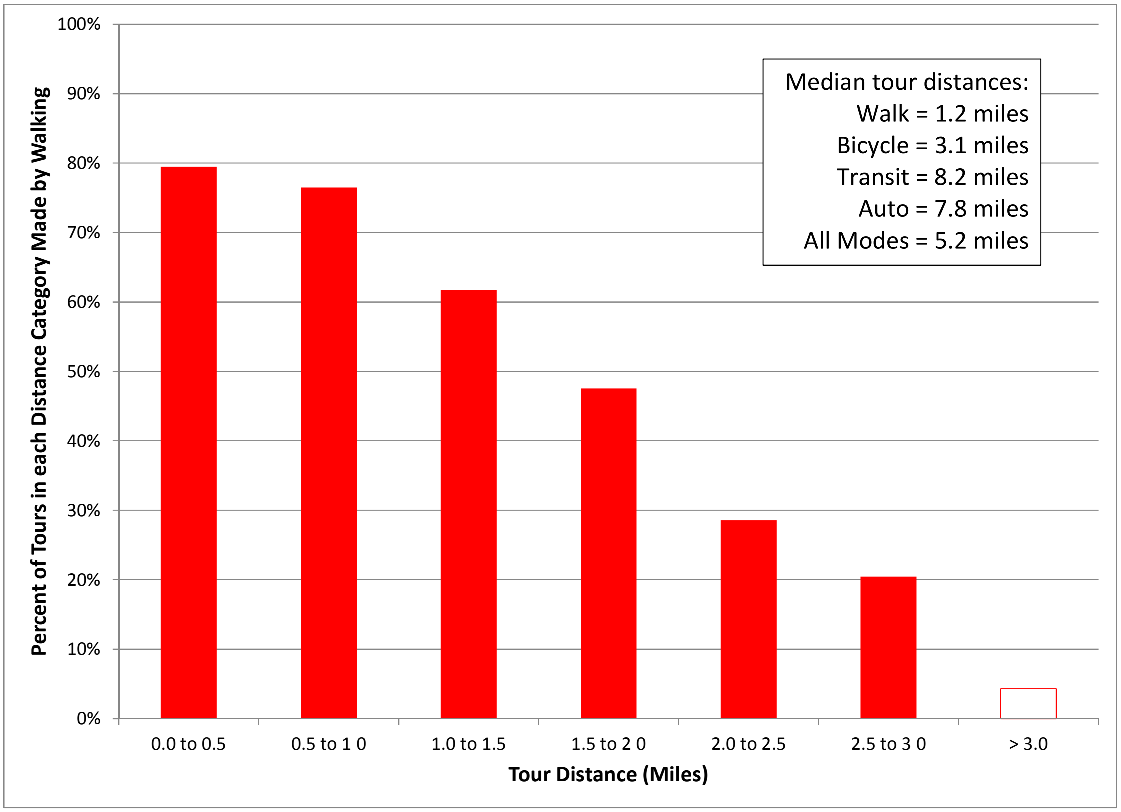
Travel Characteristics

Travel factors, such as tour distance, the number of activity stops, carrying bags on a tour, traveling alone, and traveling on a Saturday provided additional information about respondent tour mode choice.

Tour Distance

As expected, walking and bicycling were significantly less likely to be chosen than automobile for longer-distance tours. In fact, the choice of respondents to walk was not simply a linear function of distance (Figure 5.12). After accounting for the linear relationship between tour distance and pedestrian mode choice, tours less than two miles (3.2 km) were still significantly more likely to be made by walking. The parameter for tour distance was not significant for public transit, indicating that respondents were indifferent between automobile and transit tours of different distances. Tour distance may have been more of an impediment to walking and bicycling than transit because transit typically has shorter travel times over longer distances and requires less physical effort than walking or bicycling.

Figure 5.12. Pedestrian Mode Choice by Tour Distance (N=959)



Note: A hollow bar is used to represent >3.0 miles because it does not cover the same distance range as the other categories.
1 mile = 1.61 kilometers.

<u>Number of Tour Stops</u>
The mode-specific parameters in the tour model showed that the choice of walking had a significant positive association with making more stops. Respondents tended to walk on tours to shopping districts where they made multiple stops within a relatively small area. The parameters for the bicycle and transit modes were not statistically significant. However, the bicycle parameter had a negative sign, suggesting that people who made more stops on their tours were less likely to choose to bicycle.

<u>Number of Bags</u>
The main model showed that respondents who were not carrying any bags or packages on their tour were less likely to use an automobile to travel to and from the shopping district, and the secondary model revealed that these respondents were more likely to walk than use other modes on their complete tour. These results are complementary and expected. Besides being a barrier to walking, bags were viewed by interviewees as a barrier to bicycling:

- "Obviously, massive grocery shopping doesn't work on a bike."
  --Female, Age 50-59, San Carlos

<u>Traveling Alone</u>
Respondents who were traveling alone were less likely to have used an automobile in the main model and significantly more likely to have taken transit in the secondary model. The parameters for the pedestrian and bicycle modes were not significant in the secondary model, but

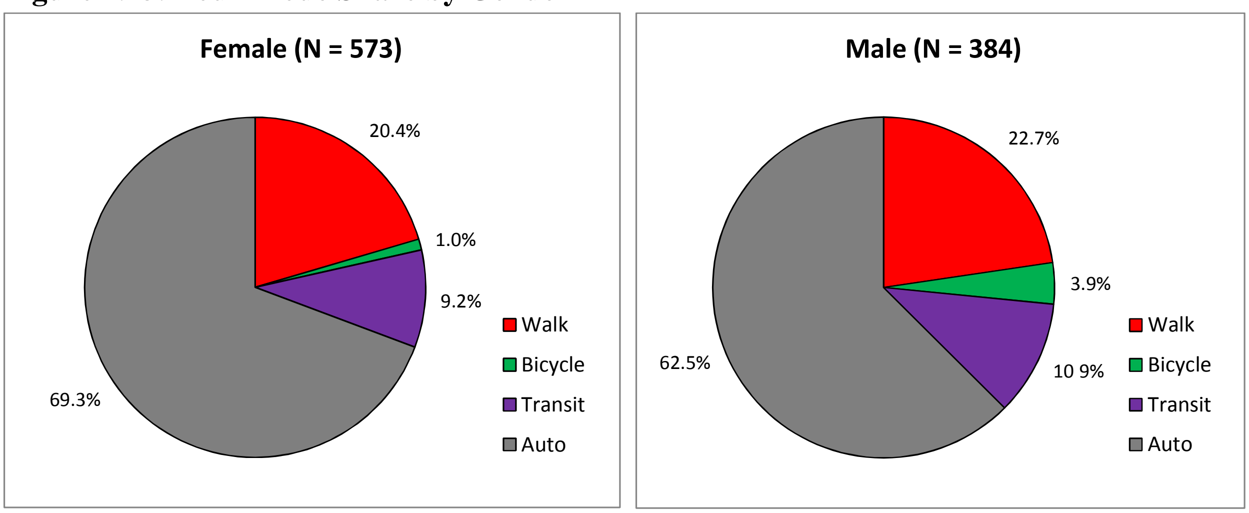
they were both positive, supporting the result from the main model. When people travel together, walking and bicycling are less attractive options.

<u>Traveling on Saturday</u>
There was a moderately significant positive relationship between respondents traveling on Saturday and using an automobile on their tours. This may be due to people doing different types of activities (such as purchasing larger items), facing lower parking costs, or having more limited public transit options on Saturdays.

Socioeconomic Characteristics
Several differences between the main model and the secondary model results were related to respondent gender, having no children, owning a bus pass, and not owning an automobile.

<u>Gender</u>
Gender did not show a statistical association with walking, transit, and automobile mode choice in the main model, but it had a significant association with bicycle mode choice in the secondary model. Overall, nearly four percent of males but less than one percent of females bicycled on their tours (Figure 5.13). In addition, after controlling for other factors in the model, females were significantly less likely to bicycle than males. This supports previous findings (Cervero and Duncan 2003).

Figure 5.13. Tour Mode Share by Gender



<u>Household with No Children</u>
The parameter for no-child household was negative for automobile mode choice, indicating that respondents living in homes with no children were more likely to use non-automobile modes (Figure 5.14). In contrast, respondents with children were more likely to take an automobile on their tour. Many interview responses suggested that families with children lack the flexibility and extra time in their schedules that is needed to travel by walking, bicycling, or transit (regardless of whether they are traveling with their children at any given time):

- "My kids were still younger…we always used to be on the time crunch. They would wait for me to come home. There was something else for them that I had to drop them off…things like that, I would always go for car. That's faster and more convenient. Now, my younger one goes off to college next year, so maybe I'll start thinking about the alternate options." *--Female, Age 40-49, Pleasanton*

- She reduced the amount of bicycling she did before she moved to Pacifica. "It changed when I had kids and I had to get them to child care or school and I had to work." *--Female, Age 60-69, South San Francisco*

Some study participants may also have been concerned about the risk of their children being struck by an automobile while walking or bicycling:

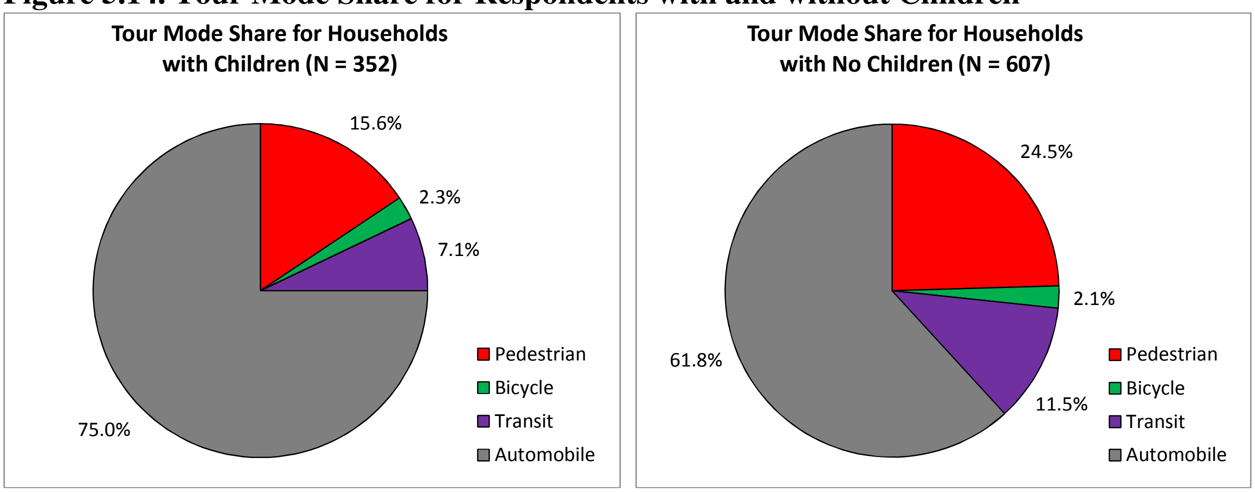
- "When you are taking about letting an 8 year old ride a bicycle 3 blocks away, even though it is a safe neighborhood, you are still contending with traffic." *--Female, Age 40-49, Danville*
- "Bicycling--I have a baby, so...I don't feel comfortable with my bicycling skills and the baby on the same bicycle." *--Female, Age 30-39, Daly City*

In addition, walking or bicycling with young children may be challenging because it requires carrying them, pushing a stroller, walking at their slower pace, or loading them in a bicycle seat, all of which may take more time or effort than walking alone.

- A 45-minute walk to the store would not be a realistic option: "Not with a baby, especially." *--Female, Age 30-39, Daly City*

More research is needed to identify the underlying reasons why parents with children are more likely to travel by automobile than other modes.

Figure 5.14. Tour Mode Share for Respondents with and without Children



<u>Bus Pass</u>

As expected, respondents who owned bus passes had a higher utility for taking public transit on their tours. However, this variable also had a statistically-significant positive parameter for walking mode choice, suggesting that people with bus passes are also more likely to choose walking as their primary tour mode (i.e., respondents with bus passes walked to and from transit stops but were also more likely to make walk-only tours). It is possible that people who own bus passes may have lifestyles that involve more walking and transit and less automobile use.

Automobile Ownership

Respondents who did not have an automobile in their household were significantly less likely to choose automobile rather than walking, bicycling, or taking transit on their tours. Since not having an automobile was related to lower household income, this result was similar to the negative relationship between lower household income and automobile use in the main model.

Attitude and Perception Characteristics

The results of the secondary model were similar to the main model for respondents who enjoyed walking and perceived a high risk of being struck by a vehicle while walking in the survey shopping district. However, analyzing data from all 959 respondents who provided complete tour information revealed additional relationships between mode choice and perceptions of crime risk in the shopping district and enjoyment of bicycling. Attitude and perception responses from the survey are summarized in Figure 5.15 and Figure 5.16.

Perception of Crime Risk while Walking

There was a slight positive association between respondents perceiving a higher risk of crime in the survey shopping district and using an automobile on their tour. As stated by interviewees in a previous section, people traveling to a higher-crime neighborhood may not want to risk walking between activities or waiting at transit stops because they do not want to be the victim of street crime.

Enjoyment of Bicycling

The survey data support previous research showing that people who enjoy bicycling are more likely to bicycle (Handy and Mokhtarian 2005; Handy, Xing, and Buehler 2010). All 21 bicyclists in the full sample reported enjoying bicycling (Figure 5.16). Since all of the respondents who chose bicycle had the same value for this variable, it was not included in the model. Interviewees enjoyed bicycling for many reasons:

- "I'm a big advocate of green. And every small little thing we can do it's going to help…the less cars we have on the road, less carbon emissions, the greenhouse gasses are not generated as much, the bicycle is good for the exercise, good for the person--heart rate, and to keep fit." *--Female, Age 40-49, Pleasanton*
- "[Bicycling is] a good way to get some exercise, and it's less pollution and all that stuff…I think maybe, part of it may be that it's kind of trendy...which is probably a good thing." *--Male, Age 30, San Francisco Fillmore Street*
- People bicycle "for exercise, for convenience, and for fun."
  --Female, Age 20-29, San Francisco Market Street
- "I think a lot of people feel they really accomplished something when they've gone on a long bike ride...and beyond that, if you can relax enough to really be able to enjoy what you are seeing when you are on your bike, that's even better."
  --Female, Age 40-49, Danville

People who thought bicycling generally had a relatively high risk of traffic crashes were more likely to have bicycled on their tour (Figure 5.16). While this variable was tested but not included in the model, this finding is similar to the finding that pedestrians and transit users perceive a higher risk of pedestrian crashes in the shopping district. People who bicycle regularly may be more familiar with the risks of bicycling through their experiences. As a result, respondents may have been more likely to respond that bicycling is risky. A similar result was found in a study of bicyclists who rated their perception of safety while bicycling along a set of roadway segments: more experienced bicyclists tended to give the segments lower grades (Landis *et al*. 1996).

Comparison of Pedestrian and Bicycle Attitudes and Perceptions

As a whole, more survey respondents enjoyed walking (87%) than enjoyed bicycling (61%) (Figure 5.15 and Figure 5.16). This could be due to differences in perceptions of crash risk and cultural attitudes towards each mode. When asked about general traffic safety, more than twice as many respondents perceived bicycling to have a high risk of crashes (55%) than walking to have a high risk of crashes (24%). Within the survey shopping district, bicycling was perceived to have a high risk of traffic crashes by 29% of respondents, but walking was perceived as risky by only 13% of respondents. These results support the findings of other researchers who have identified the fear of traffic safety as a primary deterrent of bicycling (Connerly *et al*. 2006; Horton 2009).

Concerns about safety while bicycling were widespread among interviewees in all parts of the San Francisco Bay Area (Figure 5.17):

- If you are a bicyclist, "you will eventually get hit…and it is usually not the fault of the bicyclist…Every bicyclist I know has been hit by a car, usually through no fault of their own." *--Male, Age 30-39, San Francisco Mission Street*
- "I would not feel as secure riding a bike in the street..." *--Female, Age 50-59, Berkeley*
- "I'm not a good enough bicyclist to be able to bicycle in San Francisco. You have to be like highly attuned to your environment."
  --Female, Age 40-49, San Francisco Third Street
- "I'm not a skilled bicyclist…bicycling on the road, so I don't really feel very safe at all...Bicycling for me is more like a leisure thing where I can get to a safe place, and then bike around, and then get back to my home base...I pretty much have my bike on a car and drive it somewhere because I really don't feel safe bicycling on the streets."
  --Female, Age 30-39, Daly City
- "Right now I wouldn't bicycle. I had a neighbor who had a terrible accident on a bicycle and was put on life support and was taken off life support…it was the one time he didn't wear his helmet. In general, streets are so busy, so bicycling is not an option."
  --Female, Age 52, South San Francisco
- "Sometimes I feel scared for [bicyclists]...sometimes it is very hard to see them...and sometimes they have no protection." *--Male, Age 30-39, Berkeley*
- "I like to ride on my bike, but some places in Pleasanton, they don't have a bike lane. It's not designated or marked prominently, so it's not really safe."
  --Female, Age 40-49, Pleasanton
- "Having been a cop for many years, I've worked too many accidents. Whether it's the bicyclist's fault or not, the fact of the matter is, it's a very vulnerable position to be if you get in an accident."
  --Male, Age 60-69, Brentwood
- Bicyclists have a "lack of fear of death."
  --Male, Age 30-39, San Francisco Mission Street

In addition, 15% of respondents thought their neighbors had a negative view of people who bicycle, but only 9% thought their neighbors had a negative view of people who walk. This suggested that social influences may be a greater barrier to bicycling than walking. A smaller percentage of people who bicycled on their tour (9%) thought their neighbors had a negative view of bicyclists than people who used other modes on their tour (15%). This may simply show that people who bicycle tend to think that others in their neighborhood also appreciate bicycling as much as they do. It may also indicate that people who think bicycling is viewed negatively by their neighbors are apprehensive about choosing to bicycle. Several interviewees expressed this concern:

- "It would be really helpful to both sides to have public education about bicycling and automobiles...I have heard that some people deliberately injure bicyclists, you know, people get so fed up." *--Female, Age 52, South San Francisco*
- Bicyclists may have people telling them "[*in a joking tone*] 'Get off the road!'..." *--Male, Age 30-39, Berkeley*
- "When they are jerks, it definitely impacts [me]. Because that person, if they were a jerk, and the car got mad at them, the next time that car sees a biker, he's not going to be as nice." *--Female, Age 50-59, San Carlos*

Figure 5.15. Tour Mode Share by Attitudes Towards Walking

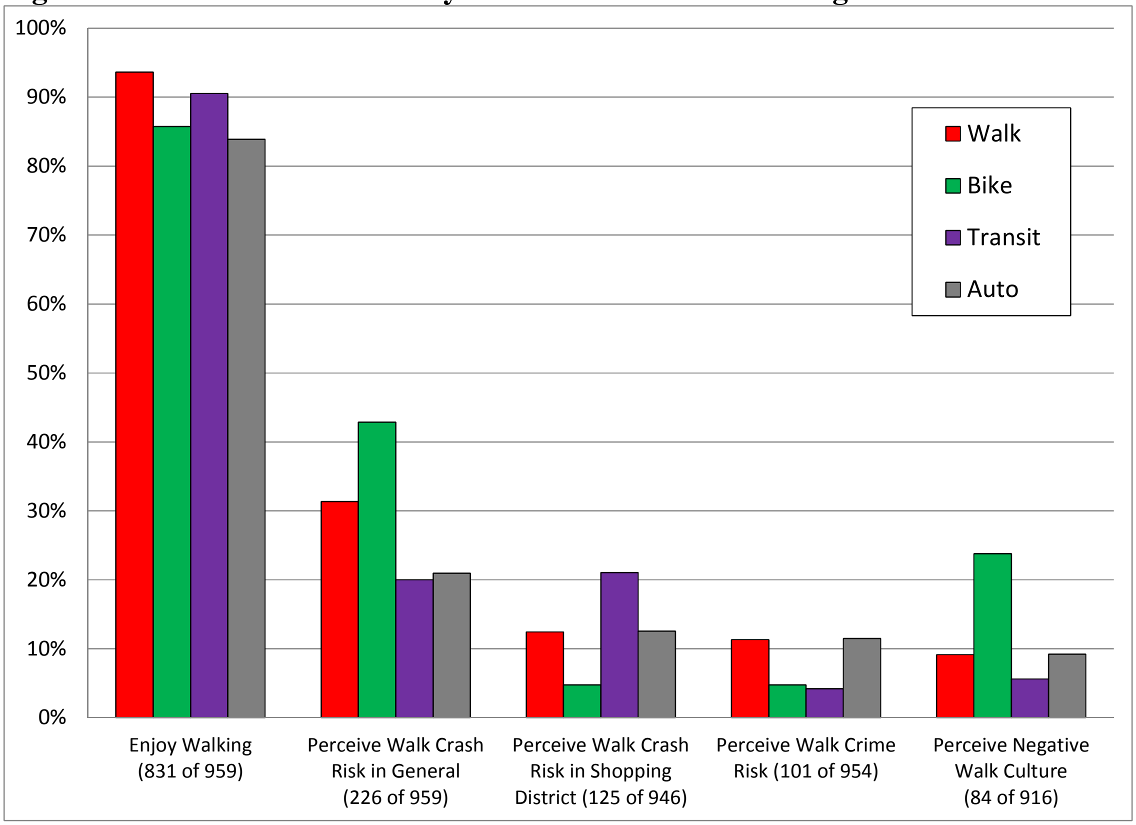


Figure 5.16. Tour Mode Share by Attitudes Towards Bicycling

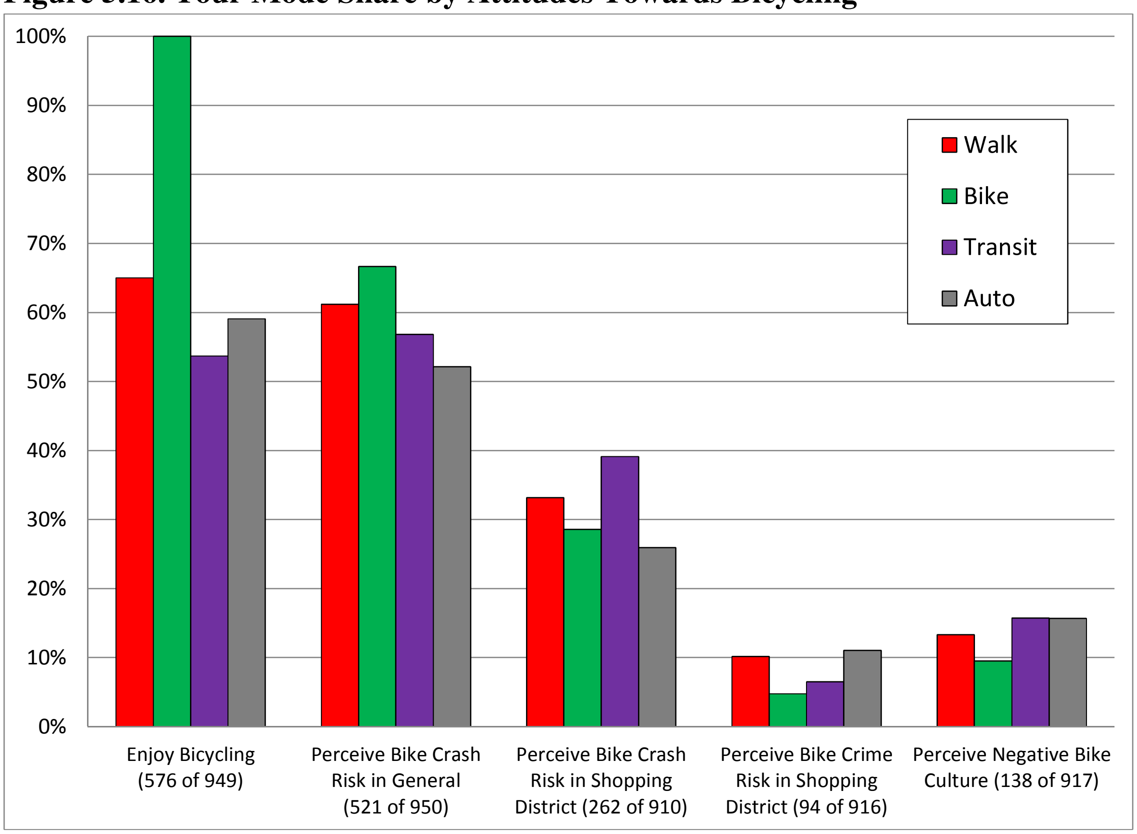
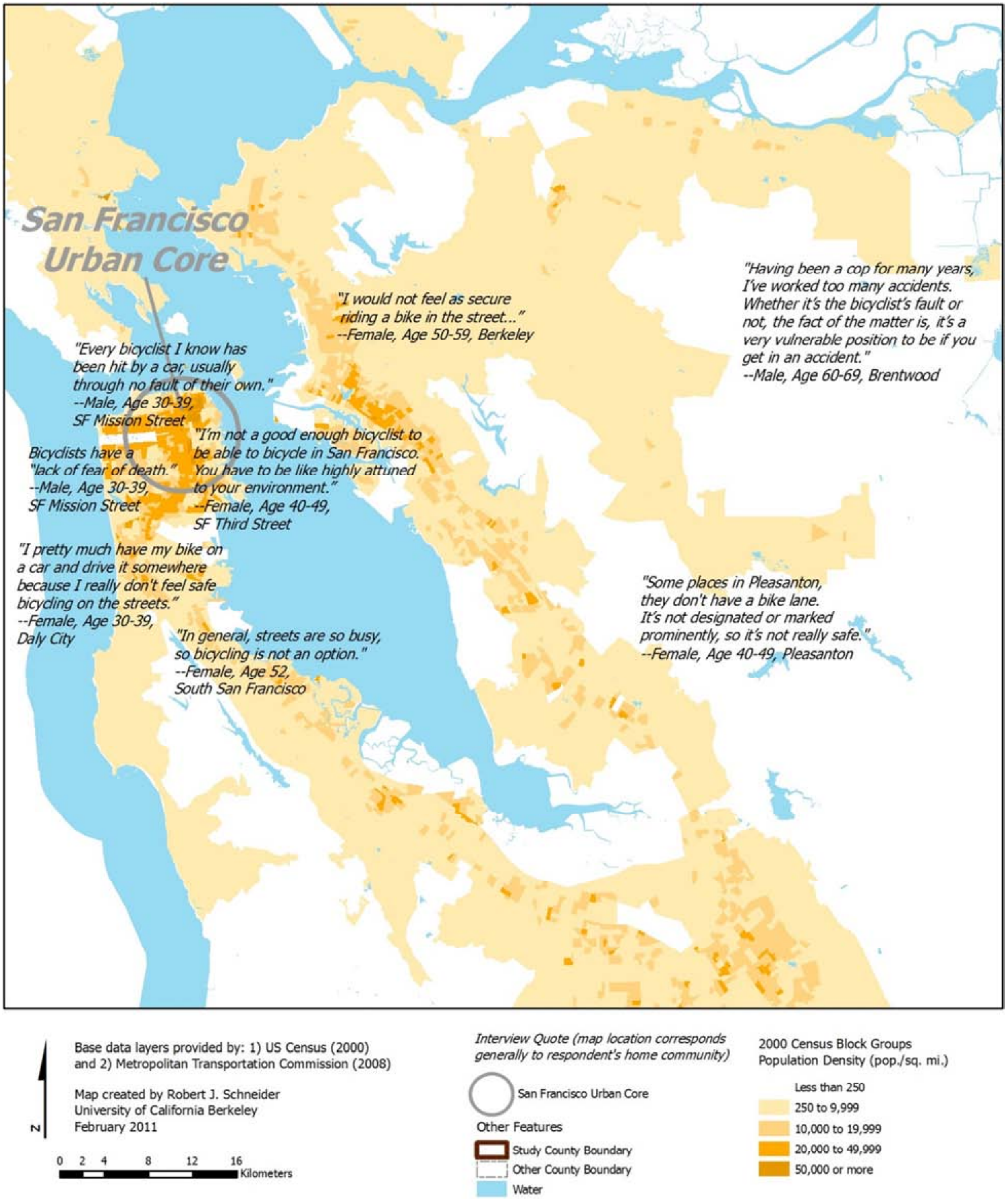


Figure 5.17. Interviewee Quotes about Perceptions of Bicycle Safety



Note: 1 mile = 1.61 kilometers
1 square mile = 2.59 square kilometers

In addition, a majority of interviewees mentioned negative attitudes towards at least some bicyclists. These attitudes were widespread throughout the San Francisco Bay Area (Figure 5.18). Reasons for negative attitudes towards bicyclists were similar to the findings of other qualitative studies from the United Kingdom and Florida (Bassford *et al.* 2002; Connerly *et al.* 2006).

Some interviewees were frustrated because they perceived bicyclists to be slowing motor vehicle traffic:

- "I think one issue, and it's a pet peeve for many people in the suburbs...When you have bike lanes on the major arteries within the suburbs...we have a lot of biking clubs in the area, and when the bikers are riding five bikes deep, it's a real issue with the drivers. And what happens, I wouldn't call it road rage, but it's darn close." *--Female, Age 40-49, Danville*
- "When they are packed up so much that their group is larger than the bike lane, and then they're slowing traffic down because their pack is kind of taking over the whole lane on top of their bike lane...yeah, that's a turn-off." *--Female, Age 30-39, Daly City*
- "I was a real distance cyclist...so I have a lot of experience cycling, as well...If you don't come up into the lane and make your presence known...if you don't claim your lane, they'll just kind of blow by you...and you are inches away from being pushed off the road. It's a bit of a balance between claiming your lane and pissing off the driver that's coming up on you." *--Male, Age 50-59, San Francisco Fillmore Street*
- "And I know that for bike riders that there...are certain streets that I travel to get to work that don't have bike paths because they are in my way when I'm trying to get to work." *--Female, Age 52, San Carlos*

Others were upset because they perceived that bicyclists were breaking laws and riding recklessly:

- "So I mostly have positive feelings, but there are occasions when it feels like the bicyclists are breaking the rules of the road and are aggressive about it." *--Female, Age 50-59, Berkeley*
- "There are certain times when bicyclists break the rules of the road and I say, 'Wow, you could really get hurt. And then both of you could get hurt, and boy, wouldn't that mess up the driver of the car that hurt you?' Like it's mean to put yourself in a position where you're breaking the law and you get hit. It hurts you, but it also hurts the person that hit you." *--Female, Age 50-59, Berkeley*
- What is your view of bicyclists? "Usually it's positive, unless they're not obeying the rules of the road. Sometimes bicyclists think that it doesn't apply to them." *--Male, Age 30-39, El Cerrito*
- "I think the bicycle people need to be aware of where they are--and the traffic--as well as the vehicles looking out for them also...that they are riding in a safe...in the bike lanes--not just out there all over the place." *--Female, Age 50-59, Hayward*
- "I think [bicyclists] are tempting fate. A lot of them are young—they probably don't have cars. But the way they weave in and out and zoom through on yellow lights. You know, it's like they are really testing God that He'll protect them, I guess." *--Female, Age 60-69, San Francisco Taraval Street*

- “I have almost gotten mowed down twice walking on the sidewalk on Van Ness Avenue by people who were riding their bicycles on the sidewalk. Aaah. One guy came so fast, and I jumped, and the man behind me thanked me because he hadn’t seen him...you know that’s against the law, but they don’t seem to get cited.”
  --Female, Age 60-69, San Francisco Taraval Street
- “Not all, but many bicyclists disobey laws.”
  --Male, Age 30-39, San Francisco Mission Street
- “[Bicyclists] like to run you over in the Mission.”
  --Female, Age 40-49, San Francisco Third Street
- Do you know that it is legal for bicyclists to ride in the street? “Yes...And it does make me mad when they don’t follow the laws, like I have to do...I see them go through stop signs all the time. ‘Like, come on, you are going to get hit if you don’t stop like you are supposed to.’” *--Female, Age 52, San Carlos*
- “I guess sometimes the bikers kind of bother me because they don’t really follow the road rules. Sometimes they do, and sometimes they don’t. So...they go flying in front of my car sometimes. I’m kind of like, ‘Man, you are above the rules.’ At the same time, I don’t blame them all the time because it’s kind of hard...It would be easier if they had certain streets just for biking, I think.”
  --Male, Age 30, San Francisco Fillmore Street
- “[Bicycle behavior can be] infuriating to a driver, not because they aren’t simply obeying the rules, but because it is astoundingly dangerous. As a driver...I’m very conscious--hyper-conscious now--of...looking behind me and to the right for potential bicycles. I’ve had situations where I will approach a stop sign...I’m looking ahead, looking left and right, and go to make the turn, and a bicyclist comes zooming past me on the right side, blasts through the stop sign, kicks the fender of the car, curses me out because he’s pissed because I’m making the turn. And then I realize [that] he didn't stop. That's a real problem.” *--Male, Age 55, San Francisco Third Street*
- “Some of these bicyclists are nuts! They are like driving down the middle of the street as if they were an automobile. And I don’t understand that at all. I don’t know what’s going through their minds when they do that. I would like to think that bicyclists are concerned about safety, but I think that [they aren’t].”
  --Female, Age 52, South San Francisco
- “[As a pedestrian,] I have seen bicyclists run red lights and stop signs with little regard to cross traffic. Even, just as a practical sense, take a look!”
  --Male, Age 50-59, San Francisco Fillmore Street

Some interviewees disliked the attitudes they perceived bicyclists to have:

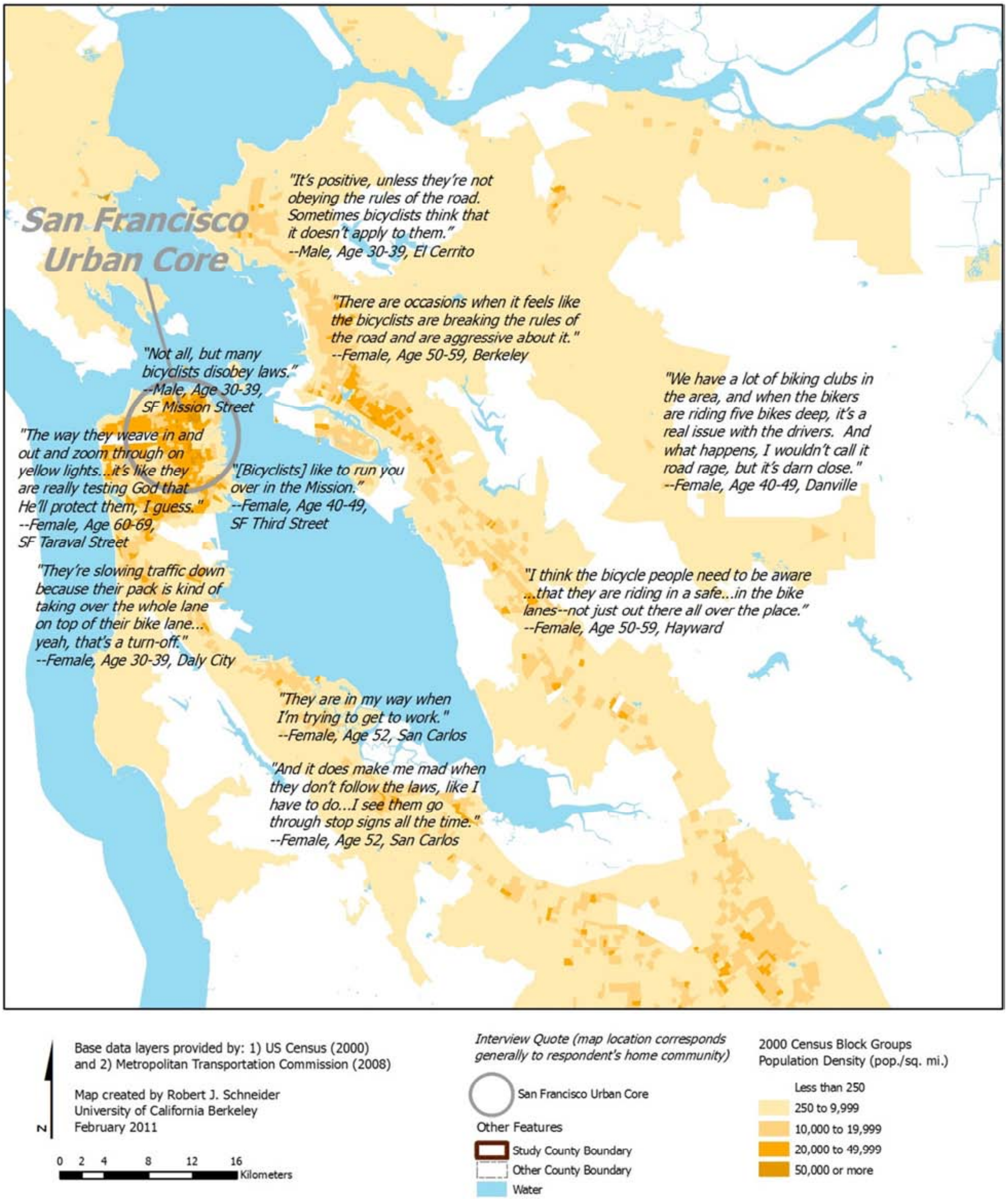
- “When I lived in the City, there are some pretty almost say militant bicyclists, and they felt like they owned the road maybe even more so than a car because they were on the bicycle. So that was a turn off with those kinds of people”
  --Female, Age 30-39, Daly City
- Bicyclists have a “counterculture”/“anti-authority” attitude.
  --Male, Age 30-39, San Francisco Mission Street
- “Let’s say I come to a stop sign, and it’s a four way stop. And I start to go, and there’s a bicyclist that comes up, and the bicyclist doesn’t even...you know, either doesn’t notice this...I mean acts like *I’m* being a jerk for going...so glares at me or flips me off or

something like that...and it's like, ‘While, you did have a stop sign...and I would let you go if I had noticed you coming, because I do like to let bicyclists go through...but I didn't see you coming.’”
--Female, Age 50-59, Berkeley

- “Car versus bike, the bike loses. I think that [bicyclists] realize that because they are in a less safe traveling situation, that people have to look out for them more, and sometimes they, you know, just are kind of careless about swerving into the car lane without even thinking about that there is a car that doesn’t want to hit them, but when they do that kind of thing it’s scary for the driver, too, not just the bicyclists.”
--Female, Age 30-39, Daly City

While the social attitude variable was tested but not included in the models, the interview responses and survey summary comparison in Figures 5.15 and 5.16 suggested that promoting bicycling as a normal, acceptable activity throughout a community may be a way to increase routine bicycle travel.

Figure 5.18. Interviewee Quotes about Attitudes towards Bicyclists



Note: 1 mile = 1.61 kilometers
1 square mile = 2.59 square kilometers

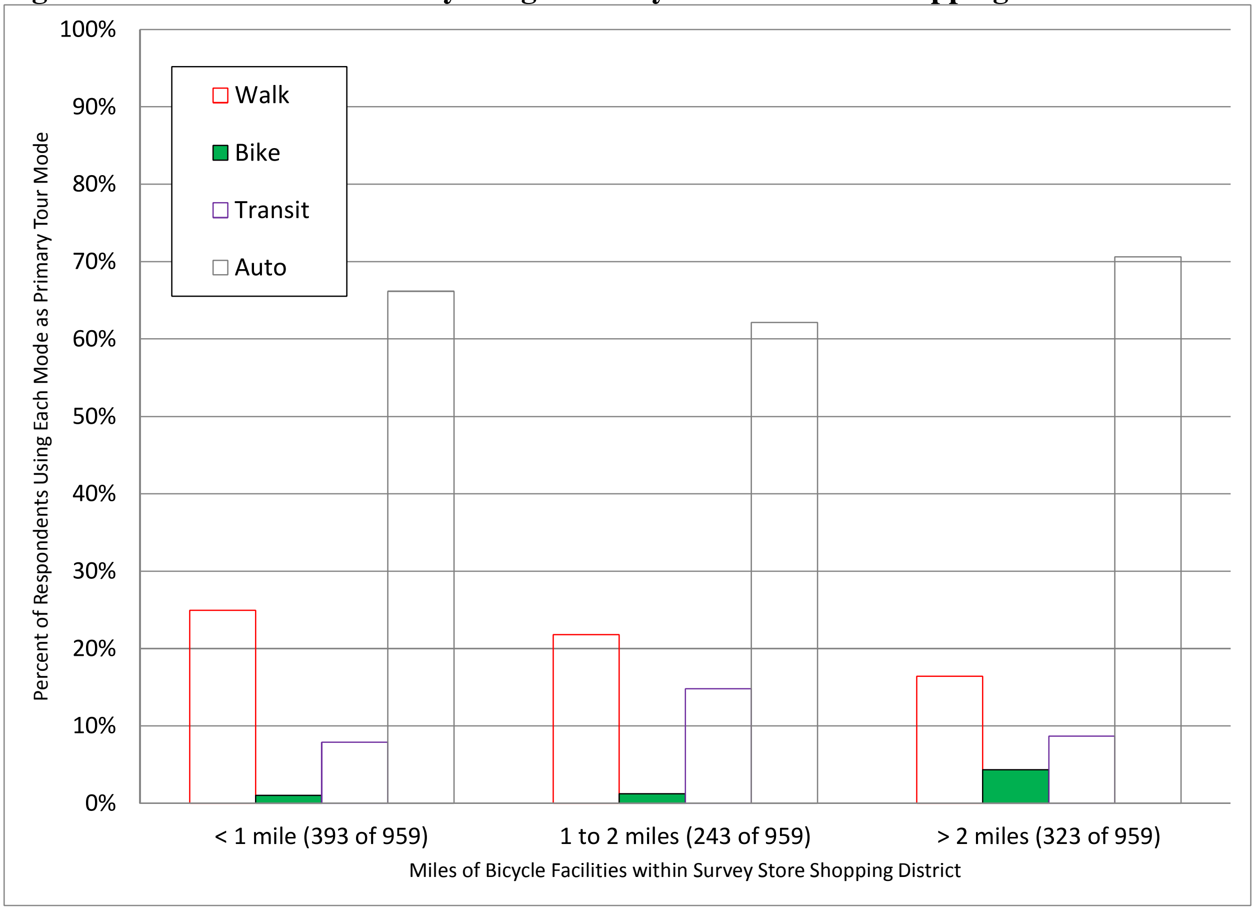
Shopping District Characteristics
Results from the secondary model were similar to the main model for employment density, population density, and number of automobile parking spaces. However, the secondary model of tour mode choice included variables representing miles of bicycle facilities, bicycle parking spaces, and the presence of pay parking on the street adjacent to the survey store.

<u>Employment and Population Density</u>
Employment density had a significant negative relationship with using an automobile on an entire tour. This suggests that bicycling, in addition to walking and transit use, may have a greater utility in districts with high concentrations of jobs. Mode-specific parameters were used to identify the association between population density near the survey store and walking, bicycling, and taking transit on the respondent tour. The parameter for population density was not significant in the bicycle utility function. Population density may be important for pedestrian mode choice because it means that there are more residents within walking distance of stores, and it may be important for transit mode choice because more people can walk to transit stops if residents are concentrated nearby. But localized population density may not be as critical for bicycle mode choice because, relative to pedestrians, bicyclists can access a shopping district from a greater distance in the same amount of travel time. In addition, bicyclists may prefer bicycling in areas with lower population densities because they are less likely to have as many stop signs and traffic lights as higher-density areas. These controlled intersections require bicyclists to stop and lose momentum.

<u>Length of Bicycle Facilities</u>
The total length of bicycle facilities within the shopping district had a moderately-significant positive association with respondents bicycling on their tours (Figure 5.19). The model suggests that a typical respondent would be willing to bicycle for tours that were 1.6 miles (2.6 km) longer if there was one additional mile (1.6 additional km) of bicycle facilities within the shopping district.

However, the length of bicycle facilities may have an endogenous relationship with bicycle mode choice. It is possible that adding bicycle facilities and providing a more complete network of bicycle facilities in a neighborhood may make it a more attractive place to bicycle, which could increase bicycling for routine trips. These facilities could also improve public perceptions of the safety of bicycling and overall cultural acceptance of bicycling, which could potentially increase the likelihood of bicycling through the attitude and perception factors mentioned above. On the other hand, communities often add bicycle facilities in areas that already have high bicycle volumes in order to make conditions more comfortable for existing bicyclists. In this case, a high level of bicycling would precede the bicycle facilities, so the positive parameter would not represent a causal relationship.

Figure 5.19. Tour Mode Share by Length of Bicycle Facilities in Shopping District



Note: 1 mile = 1.61 kilometers

Interviews provided support for the positive association between bicycle facilities and bicycle mode choice. Interviewees from all parts of the San Francisco Bay Area emphasized that bicycle facilities made them feel safer from moving traffic and suggested that providing more bicycle facilities that were separated from automobiles could encourage them to bicycle more (Figure 5.20):

- "I like to ride on my bike, but some places in Pleasanton, they don't have a bike lane. It's not designated or marked prominently, so it's not really safe."
  --Female, Age 40-49, Pleasanton
- "I think that we should more and more encourage people to bike and get off of the car...I think we should help them out--we should have designated bike lanes and the parking for bikes and things like that to encourage them to do that."
  --Female, Age 40-49, Pleasanton
- "I still would [like bike riding] if I didn't live in the city...Here there are some [separated paths for bikes], but there are streets before you get to them [that are uncomfortable to ride on]...but I like bike riding." *--Female, Age 60-69, San Francisco Taraval Street*
- "I wouldn't mind having a bike, but there's so many cars in the City, and people are getting hit all the time...there's kind of a safety factor...My work is actually close enough that I could bike, but...there's so much traffic and cars, I think it would be scarier than driving...If there were just one-way streets with just bikes...I would consider biking."

--Male, Age 30, San Francisco Fillmore Street

- "Having been a cop for many years, I've worked too many accidents. Whether it's the bicyclist's fault or not, the fact of the matter is, it's a very vulnerable position to be if you get in an accident. Again, unless there is public infrastructure that can accommodate bicycles." *--Male, Age 60-69, Brentwood*
- "I do think that...addition of the bike lanes in as many places as possible so that when people are out on the streets, that the cars are a little bit more aware, and also that when you are out on the bike, you feel safer." *--Female, Age 50-59, San Carlos*
- "Bicycling itself...I would do it if I wasn't right up next to cars. I would enjoy it. I wouldn't be afraid of just falling off a bike--that doesn't scare me...it's automobiles. If there actually were--which I can't imagine, but I would have to have an open mind--a separate area for people to bike. Or, I have never been to Davis, but I have heard that there are streets there that are only for bicycles…If that were done more, I would bicycle." *--Female, Age 52, South San Francisco*
- "It would be easier if they had certain streets just for biking, I think. I think that would make a lot more people bike, too, or walk. So I think that's a big factor. They have a lot of bike lanes here, which is good, but I don't think I'd personally feel that comfortable even [bicycling] in the bike lanes." *--Male, Age 30, San Francisco Fillmore Street*

The interview quotes provide qualitative support to GPS route choice results from Portland, OR (Dill and Gliebe 2008) and stated preference survey results from the Vancouver, BC region (Winters and Teschke 2010). These studies also found that off-street multi-use trails, cycle tracks separated by a physical barrier from automobile traffic, and quiet residential streets were preferred over bicycling on roadways with high-speed, high-volume motor vehicle traffic and no bicycle facilities.

<u>Number of Bicycle Parking Spaces</u>

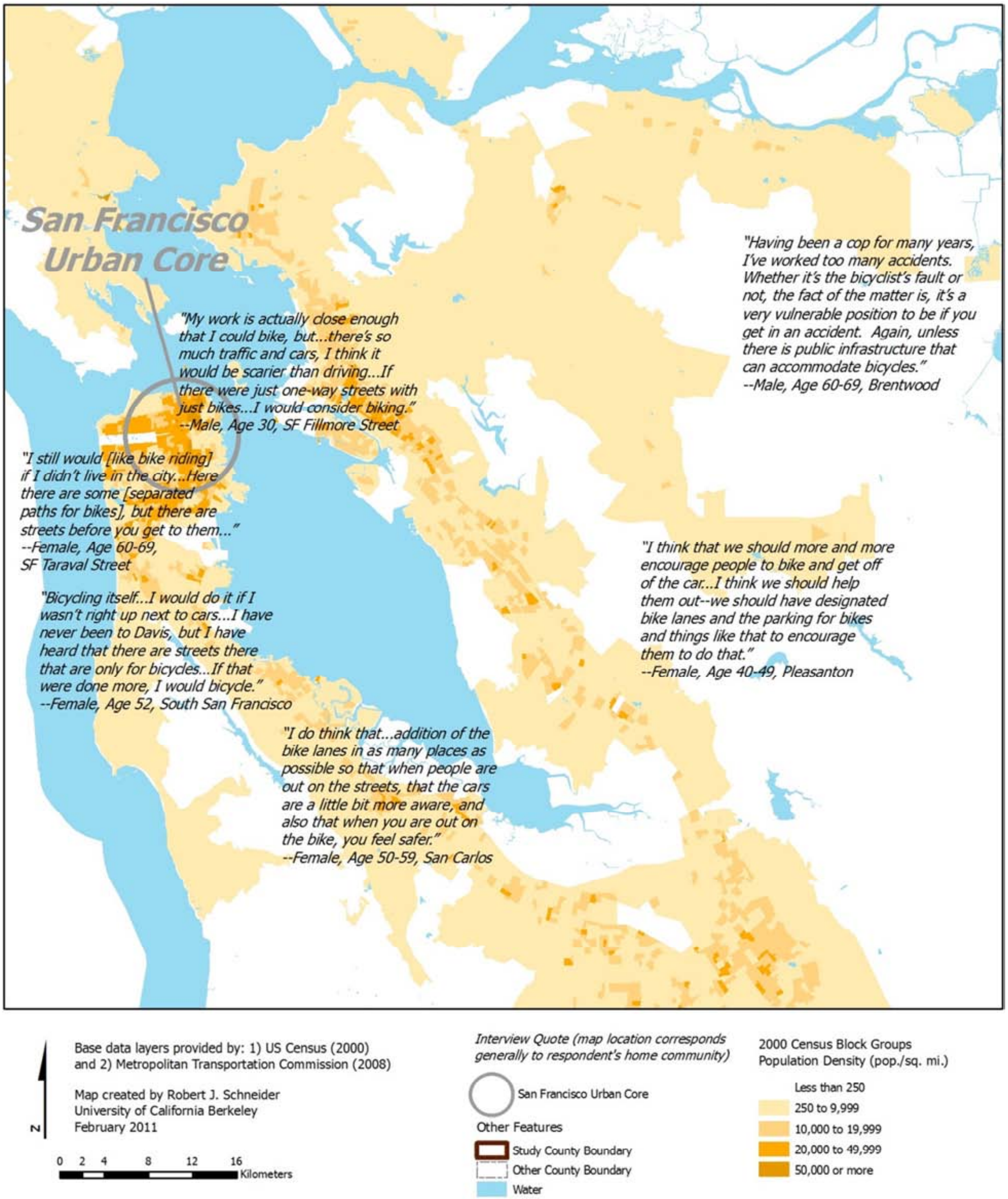
The number of bicycle parking spaces at the survey store had a slight positive association with the utility of bicycling and a slight negative association with the utility of taking transit on respondent tours. This may illustrate that survey respondents tended to treat bicycling and transit as substitutes, providing similar travel times and levels of comfort. If more secure, convenient bicycle parking is provided, bicycling may become an attractive alternative for transit customers. In contrast, if there is no bicycle secure parking, customers may use other modes to travel to shopping districts. According to one interviewee:

- "Places to park your bike can be a little bit of an issue." *--Female, Age 50-59, Berkeley*

The model indicated that respondents would be willing to choose to bicycle for tours that were 0.5 miles (804 m) longer if one additional bicycle parking space was provided at the survey store.

As with the length of bicycle facilities, bicycle parking may have an endogenous relationship with bicycle mode choice. For example, adding bicycle parking by a store entrance may make it a more attractive place to bicycle, which could increase bicycling for routine trips. But store managers may add bicycle parking after they see bicycles parked to signs, fences, and other landscaping in order to give their store a cleaner look. In this case, the high level of bicycling would precede the bicycle facilities.

Figure 5.20. Interviewee Quotes about Preferences for Bicycle Facilities

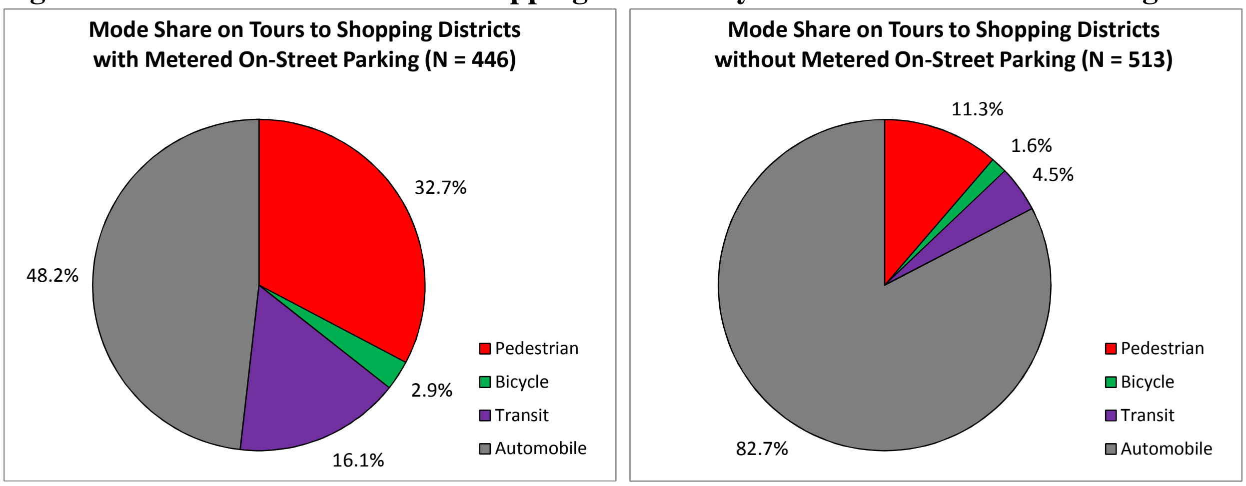


Note: 1 mile = 1.61 kilometers
1 square mile = 2.59 square kilometers

Metered On-Street Parking

The presence of pay parking on the street adjacent to the survey store had a slight negative association with the likelihood of the respondent using an automobile on their tour (Figure 5.21). This relationship was found after controlling for the number of parking spaces at the survey store, which was moderately correlated with the presence of metered parking.

Figure 5.21. Tour Mode Share to Shopping Districts by Presence of Metered Parking



Stores in districts with metered on-street parking tended to have small parking lots or no parking lot, so most respondents who drove needed to pay for street parking. Drivers in some districts may have also chosen to park in more expensive off-street lots and garages. In addition, many shopping districts with metered parking had a high demand for automobile parking, so lower-priced street spaces may have taken customers more time to find and required them to walk longer distances to reach stores. These characteristics combined to make driving less convenient and more expensive in areas with metered street parking than without metered parking. According to interviewees:

- "I'm not willing to pay two dollars for 15 minutes [for parking in San Francisco]...so I will definitely end up driving around more to go to...less expensive parking meter situations, if I know there are certain blocks in that neighborhood that don't have parking meters, I'll try to go find a spot there." *--Female, Age 30-39, Daly City*
- "San Francisco is insane...down near the Ferry Building and down on the Embarcadero area...it's like a dime for two minutes. I just don't do it too often. The meters in San Francisco definitely affect my decisions in what I'm doing...driving and parking." *--Female, Age 52, South San Francisco*
- "Parking prices have a lot to do with why I bike up to Downtown Berkeley. You know, it's like, I don't want to pay that much money to park somewhere." *--Female, Age 50-59, Berkeley*

While there is an association between metered street parking and less automobile use, there is likely to be some degree of endogenaity between these variables because limited automobile parking may be a barrier to driving but it also may cause agencies to install metered on-street parking. In addition, shopping districts with metered parking often have other characteristics that make driving more difficult and walking, bicycling, and transit more convenient, including stores clustered more closely together, higher population density in surrounding neighborhoods, and streets with slower, more congested automobile traffic. Therefore, this variable may be capturing some associations that were tested but not included in the model.

As a whole, the survey store parking spaces and metered parking variables suggest that shopping districts with a combination of factors, such as higher-density development, limited off-street parking, and metered on-street parking tend to support pedestrian, bicycle, and transit use.

Pedestrian and Bicycle Nesting Parameter

The parameter representing the correlation between the choice of walking and the choice of bicycling was not statistically significant in the mixed logit model ($p = 0.88$). This suggests that for travel to the 20 shopping districts in the study, people who chose to walk or bicycle were just as likely to switch to other modes (transit and automobile) as they were to switch to the other non-motorized mode if they did not have their original mode available.

This parameter did not have statistical significance, but it was important to test in the model because walking and bicycling are often grouped together in mode choice analyses. Yet, the data in this study do not support the claim that pedestrian and bicycle modes are similar and should be considered as a nested, "non-motorized" choice. This result confirms practical understanding that each of these modes has different travel speeds and other operating characteristics (Landis, Petritsch, and Huang 2004), different facility design requirements (AASHTO 1999; AASHTO 2004), different user comfort levels (Figure 5.15 and Figure 5.16), and other distinct characteristics. While both modes provide physical exercise and do not produce tailpipe emissions, the model suggests that they should be viewed as separate choices for tours that include stopping at retail pharmacy stores.

Panel Parameters

The panel error structure was used to account for unmeasured characteristics that may have been shared between survey participants in each of the 20 shopping districts. While the panel parameters for each mode were not statistically significant, it was important to use this error structure to account for potential error due to the multi-level structure of the survey dataset.

Forecasted Effects of Land Use, Urban Design, Attitude, and Perception Changes

The model includes several variables that could be changed through planning practice. Therefore, as an illustrative example, the model was used to estimate tour mode shares for the 959 respondents who stopped in the 20 shopping districts under different scenarios[6]. The scenarios included: 1) doubled population and employment densities in the shopping district; 2) two additional miles of bicycle facilities within each shopping district; 3) 10 more bicycle parking spaces, half as many automobile parking spaces at the survey store, and metered on-street parking in the shopping district; and 4) all of these changes combined (Table 5.13).

[6] Choice probabilities for each mode were estimated from the model shown in Table 5.12. Panel variable parameters were not used to estimate mode shares.

Table 5.13. Forecasted Shopping District Tour Mode Share Under Different Scenarios (N = 959)

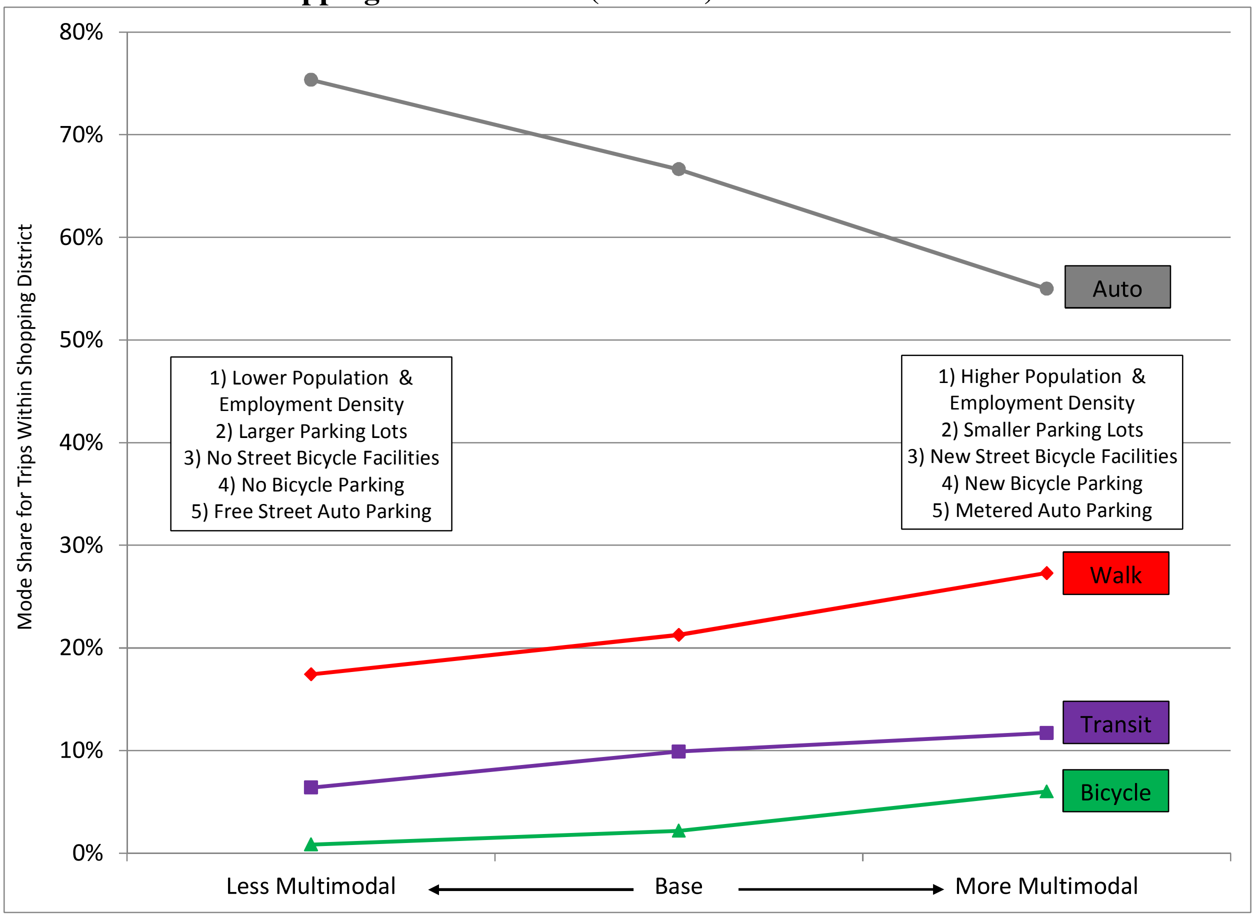
Existing Mode Share			Potential Changes			
Mode	Survey Data	Base Model Prediction	1) Doubled Population & Employment Density	2) 2 Additional Miles of Bicycle Facilities	3) 10 New Bike Spaces, 50% Auto Parking, & Metered On-Street Parking	4) All Changes Combined
Walk	21.3%	21.3%	22.7%	21.0%	25.9%	27.3%
Bicycle	2.2%	2.2%	2.0%	3.1%	4.5%	6.0%
Transit	9.9%	9.9%	16.7%	9.8%	6.2%	11.7%
Auto	66.6%	66.6%	58.6%	66.1%	63.4%	55.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Based on the model, the combination of all of these changes to the 20 shopping districts could increase respondent pedestrian mode share from 21% to 27%, increase bicycle mode share from 2.2% to 6.0%, increase transit mode share from 10% to 12%, and decrease automobile mode share from 67% to 55%. This shift would eliminate 112 of the 639 respondent automobile tours. Assuming that the typical automobile respondent who shifted modes traveled less than four miles on his or her tour, this shift would eliminate 247 (2.5%) of the 10,036 respondent vehicle miles traveled (397 of the 16,150 respondent vehicle kilometers traveled), and 206 (14%) of the 1,519 times respondents parked their automobiles to access a non-home stop. Additional analysis could identify the types of neighborhoods where these changes would be expected to have the greatest impact on mode share.

Note that this forecasted mode shift is an illustrative example based on cross-sectional data. The forecast assumes that each of the variables that are changed would have a direct effect on mode choice. In addition, the forecast does not account for the process of modifying travel behavior habits, so it may overstate the potential impact of the changes. The timeframe for each of these changes is also likely to be different. For example, if space is available, adding new bicycle parking and bicycle lanes can be done in several weeks, but doubling population and employment density may take decades to occur.

If the three potential changes were made to all of the survey shopping districts, the model indicates that respondent travel would become more multimodal. Doing the opposite of these scenarios (e.g., half population and employment density, no bicycle facilities in shopping district, no bicycle parking and twice as many store automobile parking spaces, and free on-street parking in the shopping district) would make respondent travel less multimodal. Figure 5.22 illustrates mode shifts that could occur under more multimodal and less multimodal scenarios compared to the current respondent mode share. The impacts of each of the three individual treatments on automobile mode share are presented in Appendix L.

Figure 5.22. Survey Respondent Mode Shares Under Different Scenarios, Based on Mode Choice Model for Shopping District Tours (N = 959)



5.12. POLICY IMPLICATIONS

Results from the main and secondary models are summarized in Figure 5.23 and Figure 5.24. The attitude, perception, and shopping district variables identified in these models can be influenced by planning practice. Therefore, certain types of policies may help reduce driving and increase walking and bicycling to and from shopping districts. For example, designing "complete streets"—roadways that provide safe and comfortable access for all travel modes—can make walking and bicycling more attractive. Complete streets designs minimize the number of automobile travel lanes and include sidewalks and safe street crossings for non-motorized users. They also include street trees and bicycle facilities within the public right-of-way, both of which were identified as factors associated with pedestrian and bicycle mode choices. Simply having better pedestrian and bicycle facilities can also increase the enjoyment of walking and bicycling. Supplementing complete streets efforts with pedestrian and bicycle promotion programs may result in even greater increases in enjoyment of these modes.

While complete streets efforts have focused mainly on roadway design, the significant association between perceived crime and automobile use suggests that complete streets should also be places where people do not feel threatened by crime. Personal security could be improved in and around shopping districts through targeted police crime prevention and enforcement activities as well as better street lighting.

Complete streets efforts may also have a minimal impact on bicycling to shopping districts if improvements are only made in isolated locations. Bicycling will be more attractive when there are extensive, community-wide bicycle facility networks connecting homes, workplaces, and other activity locations to shopping districts. In addition, shopping districts should have secure bicycle parking near store entrances when bicyclists arrive.

Providing safer and more comfortable pedestrian and bicycle facilities in and around shopping districts is only part of the solution to shift automobile travel to walking and bicycling. Model results show that land use and parking policies are also important for creating communities with a more balanced tradeoff between the convenience and cost of walking and bicycling relative to driving. Long-term land use plans should encourage redeveloping activity hubs with a higher-density mix of housing, offices, retail, schools, and other activities. In particular, shopping districts that are surrounded by medium- to high-density housing and offices and are served by complete streets can be reached by more people on foot and bicycle because these people don't have to travel far to reach their daily activities. Similarly, including retail stores as a part of transit-oriented developments can make it possible for people living or working close to a transit hub to do more of their shopping by walking or bicycling during their daily routine instead of making special effort on an evening or weekend to drive to a distant mall.

Figure 5.23. Factors Associated with Walking to and from Shopping Districts

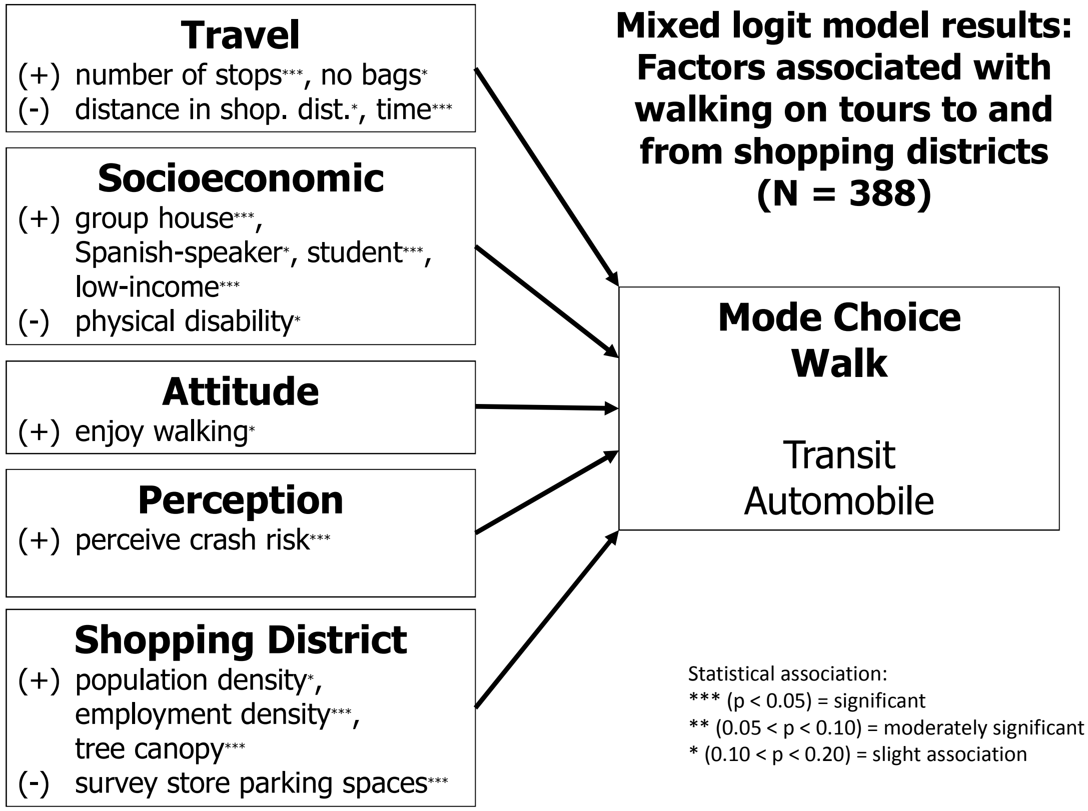
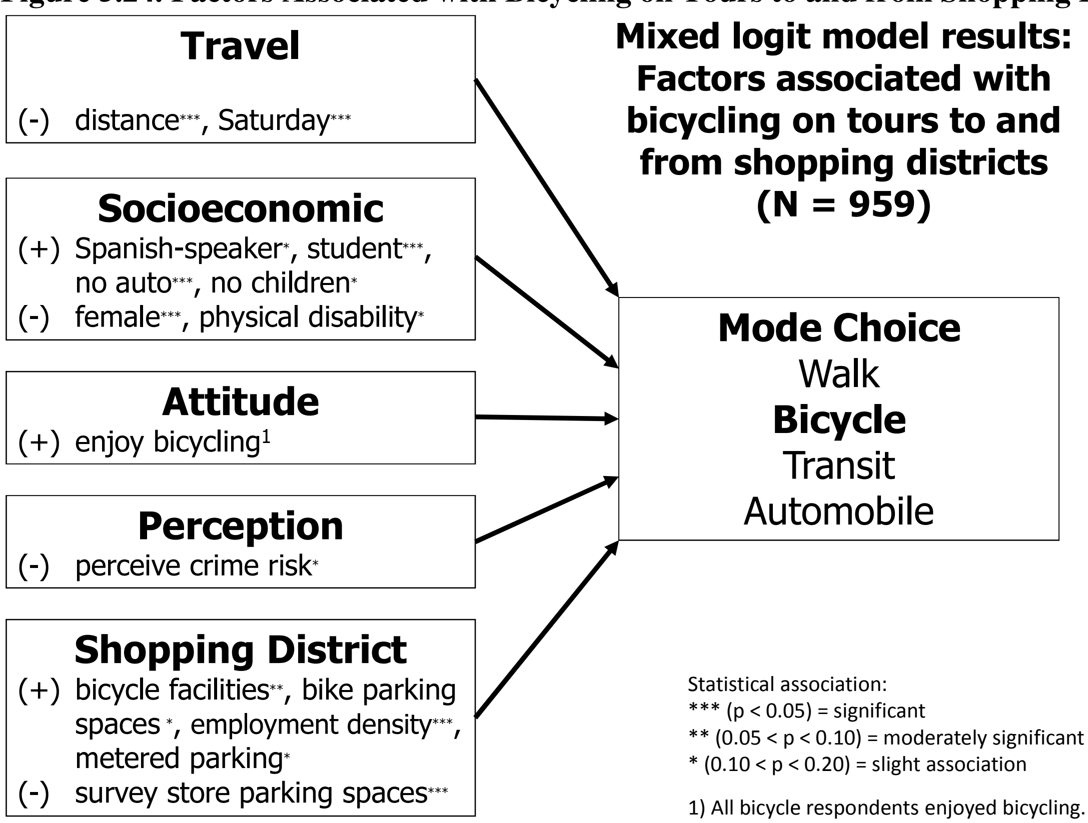


Figure 5.24. Factors Associated with Bicycling on Tours to and from Shopping Districts



Driving could also become less attractive if there is less off-street automobile parking at stores, offices, apartment complexes, and other activity sites. Parking lot sizes can be reduced by changing parking regulations from setting a minimum number of off-street spaces to establishing a desired number of spaces that is appropriate for a pedestrian-, bicycle-, and transit-oriented zone (e.g., areas that are being planned for dense, mixed-use development that will be served by high-frequency public transit should provide few off-street automobile parking spaces). Reducing the land area allocated to automobile parking also makes it possible to cluster buildings more closely together, creating shorter, more walkable and bikable distances between building entrances. At the same time, on-street parking spaces that are currently free can be metered, and the price of on-street parking can be changed to reflect market rates. In many places this will result in more expensive on-street parking—a change that will provide a better reflection of the true social cost of using limited public street space to park empty automobiles.

The policies suggested here are important components of an even broader approach to shifting routine travel from automobile to pedestrian and bicycle modes. The more comprehensive set of strategies to promote sustainable transportation also includes increasing people's awareness of walking and bicycling as travel options and changing their travel habits. This comprehensive approach is described Chapter 7.

5.13. CONSIDERATIONS AND FUTURE RESEARCH

Several aspects of the analysis of routine travel mode choice to and from shopping districts could be revised or expanded in the future. These are discussed below. Additional considerations related to the overall study are described in Chapter 8.

Of all 1,003 customers surveyed, 24 reported using a bicycle as their primary mode to travel to the store. Since the main model only considered respondents who mapped their entire tour and made all of their stops in the shopping district, only nine bicyclists were available in the dataset. This number of bicyclists was not adequate for including bicycle mode choice in the main model. The secondary model was estimated using full tour data from 21 bicyclists, which is near the lower limit sample size for including an alternative in a discrete choice model. Therefore, the factors associated with bicycling in this chapter should be viewed only as early exploratory findings. More analysis of bicycle use within a discrete choice framework is needed. Future efforts could either increase the survey sample size or supplement the randomly-chosen respondents with an additional sample that only targets bicyclists at each store. Both strategies could gather more responses from bicyclists for more robust statistical analysis.

Some customers in mixed-use shopping districts may have been employed within the shopping district and traveled to the retail pharmacy before or after work. If a person needed a car at work to have the flexibility to travel to distant meetings, she or he may have driven to and from the shopping district, even if they preferred a different mode. This detailed travel information was not collected in order to keep the intercept survey a reasonable length.

The models in this chapter showed significant associations between shopping district variables and the likelihood of walking, bicycling, and using transit for retail shopping tours, but they do not prove causal relationships. Making retail corridors and surrounding areas more attractive for non-automobile modes may not increase walking, bicycling, and transit use directly.

Additional research should include longitudinal studies that compare communities where a particular strategy has been applied (e.g., price on-street parking, increase population and employment density, install new bicycle lanes and pathways) with control communities. Documenting differences over time using this type of experiment can help quantify how many people in a certain type of community may shift from driving to walking, bicycling, or public transportation after a particular action is implemented.

5.14. CONCLUSION

This study of mode choice to and from shopping districts suggests that planning practice can help transform communities into places that support walking and bicycling for routine travel. After controlling for socioeconomic factors, walking to and from shopping districts was associated with factors such as shorter travel distances, higher population densities, more street tree canopy coverage, and greater enjoyment of walking. The exploratory analysis of a small number of bicycle tours found that bicycling was associated with shorter travel distances, more bicycle facilities, and greater enjoyment of bicycling. People were more likely to drive when they perceived a high risk of crime, but automobile use was discouraged by higher employment densities, smaller parking lots, and metered on-street parking. All else equal, shopping districts located closer to a train station were more attractive for transit users.

CHAPTER 6. WALK OR DRIVE BETWEEN STORES? FACTORS SUPPORTING SUSTAINABLE TRANSPORTATION WITHIN SHOPPING DISTRICTS

6.1. SUMMARY

As communities seek to make their transportation systems more sustainable, it is important to identify opportunities where walking can be substituted for automobile travel. Many shopping districts have the potential to support pedestrian trips because travelers may stop at several locations within relatively close proximity. Even people who drive to a shopping district may have the opportunity to walk between stores. This chapter uses a mixed logit discrete choice model to identify factors associated with the choice of walking versus driving between activity stops within 20 shopping districts in the San Francisco Bay Area. Travel behavior and supplemental data from 286 retail pharmacy store customers who drove to a shopping district and then stopped at one or more locations within one-half mile of the store were analyzed. The 91 customers who walked rather than drove within the shopping district tended to travel shorter distances, carry fewer bags, shop alone, and not have a physical disability. After controlling for these factors, people were more likely to walk when the main commercial roadway had fewer driveway crossings, a lower speed limit, and metered parking and when the retail pharmacy store shared parking with several other establishments.

This analysis adds to the body of knowledge about the characteristics of trips within developments. Each study shopping district could be considered to be a distinct development for a traffic impact assessment. If this level of geographic analysis were used, all of the trips evaluated in this paper would be internal capture trips. Therefore, this paper shows that many of the internal capture trips within mixed-use shopping districts were actually made by walking, even though shopping district patrons initially traveled to the shopping district by automobile. Further, the arrangement of buildings and parking lots as well as the characteristics of the main roadway within the shopping district can encourage a greater share of the internal trips to be made by walking rather than driving.

The results suggest two general strategies for encouraging walking within shopping districts: 1) design pedestrian-friendly commercial streets that have low-speed traffic, limited off-street parking, and metered on-street parking, and 2) create compact, walkable commercial hubs around shared parking areas.

6.2. INTRODUCTION

As communities search for ways to make their transportation systems more sustainable, it is important to identify opportunities where walking can be substituted for driving. Shopping districts are particularly important because travelers may stop at several locations within relatively close proximity. Even people who drive to a shopping district may have the opportunity to walk between stores. The choice of walking versus driving for short distances between stores is consequential. Driving requires using roadway travel lanes and taking up a parking space at each activity stop. In contrast, walking is a good form of exercise and uses less space, so it can be served by less roadway and parking infrastructure.

6.3. PURPOSE

The purpose of this chapter is to provide planners and developers with more information about the characteristics of shopping districts that support walking versus driving between stores. This information can be used to promote roadway corridor and site designs, land use regulations, parking pricing, or other policies that may be effective at increasing walking. Therefore, this paper explores the following research question: What travel, socioeconomic, attitude, perception, street, and site characteristics are associated with walking rather than driving between activities within the same shopping district?

6.4. LITERATURE REVEIW

Several categories of factors have been identified as being positively associated with pedestrian mode choice, including travel, socioeconomic, attitude and perception, and local environment characteristics. These relationships are described in the general literature review in Chapter 2.

A limited number of studies have focused specifically on walking for shopping purposes. Most highlight the influence of travel factors and socioeconomic factors on pedestrian mode choice. A nested logit model based on data from the San Francisco Bay Area Travel Survey showed that walking for home-based shopping trips was positively associated with shorter travel times and living in a household without a motor vehicle (Purvis 1997). Shorter distances to shopping opportunities were also cited as an important characteristic that supported walking in traditional (i.e., more mixed land use, greater transit service, more connected street pattern) Austin, TX neighborhoods (Shriver 1997). A study of six traditional shopping districts in the Berkeley and Oakland, CA area found that respondents who lived closer were more likely to walk to the shopping district. Residents who lived close to shopping areas but still drove were likely to be purchasing groceries or specialty food items (Steiner 1998). Carrying heavy goods was cited as the most common reason for choosing to drive rather than walk on shopping trips less than five miles in five London study areas. Travel distance was the second-most common reason (Mackett 2003). After controlling for trip distance, level of urbanization, and socioeconomic characteristics, respondents in the Seattle, WA region were less likely to walk than drive on short trips made for shopping. They were more likely to walk than drive when traveling for school, eating out, and social/recreational purposes (Kim and Ulfarsson 2008). The authors suggest that the need to carry groceries and other packages on shopping trips may discourage walking.

Note that most of these studies focus on shopping trips originating at home. The small amount of research on shopping-related pedestrian travel provides little information about why people choose to walk instead of drive within shopping districts. In addition, few shopping studies have explored land use, site and roadway design characteristics that may be associated with walking.

This analysis of walking within shopping districts also builds on the relatively new body of research on factors associated with internal capture trips, or trips contained completely within developments. A study of mixed-use developments in six U.S. regions found that 29% of trips generated and attracted by these areas had no impact on the external automobile roadway network (Ewing *et al*. 2010). On average, 18% of trips were made entirely within the development area, 6% of trips that left the development were done by walking, and 6% of trips that left the development were by transit. Examination of 239 mixed-use developments across the six regions showed that trips were more likely to be captured internally when the development had a more balanced mix of jobs and population, and analysis of 64 mixed-use developments in two regions revealed that internal capture was associated with higher floor area ratios for all properties and a greater diversity of land uses in the development. While many of these internal trips were likely to be made by walking, pedestrian mode shares within the developments were not reported.

6.5. METHODOLOGY

Information about the study area, survey distribution times and techniques, survey participant characteristics, and number of surveys completed by store location was provided in Chapter 3. The sections below focus specifically on the characteristics of survey participants who traveled between stops within shopping districts and how these movements were analyzed during the modeling process.

Travel Within Shopping Districts

This chapter explores why survey respondents chose to walk or drive between non-home stops within one-half mile of the retail pharmacy store. In order to represent this choice accurately, the analysis only considers people who drove to the shopping district and had an automobile with them. The people who walked on their entire tour were not included in the analysis because they did not have the option of driving (taking a taxi was not considered to be a realistic choice within the shopping district for people who had already walked there). In addition, people who bicycled or took transit to the shopping district or were dropped off by automobile in the shopping district were also removed from consideration. Therefore, the analysis uses data from 286 respondents who had an automobile available to them for traveling between stops in the shopping district. Characteristics of these 286 respondents are provided in Table 6.1. 124 (43%) of the respondents made all of their non-home stops within the shopping district, while 162 (57%) made at least one other non-home stop outside of the shopping district.

Table 6.2 shows how the respondents who drove to the shopping district and had an automobile with them traveled within the shopping district. Overall, 91 (32%) of the 268 respondents walked within the shopping district (walking was the mode they used for the greatest distance), while 195 (68%) drove. However, there were notable differences in the choice of walking versus driving by type of shopping district. Urban Core shopping districts had the greatest percentage of respondents who walked (72%), and Suburban Thoroughfare shopping districts had the smallest percentage who walked (18%).

Travel characteristics, socioeconomic characteristics, attitude and perception, and shopping district characteristics were compared for the 91 respondents who walked within the store corridor and the 195 respondents who drove (Table 6.3). Based on these univariate relationships, the estimated travel time and number of stops within the shopping district appeared to have a significant association with the choice of walking or driving. Respondents were more likely to walk when there were longer travel times for driving and more likely to drive when there were longer travel times for walking. They were also more likely to walk when they made more stops.

Several of the socioeconomic characteristics had significant associations: females, people who were unemployed, and people who were retired were more likely to drive and higher-income respondents were more likely to walk. The only attitude or perception variable that had a slight association with walking was respondent perception that their neighbors had a negative view of walking, which was counterintuitive. Many shopping district characteristics showed an association with walking versus driving within the district. Employment density, population density, commercial property density, intersection density, on-street parking coverage, tree coverage, metered parking, and the total number of parking spaces near the survey store were associated with walking. Greater values for roadway width, buffer and median coverage, number of lanes, automobile traffic volume, driveway crossings, posted speed limit, survey store size, and the survey store being a part of a multi-store shopping complex were associated with driving.

Overall, the strongest associations with the choice of walking versus driving appeared to be with travel time, number of stops within the shopping district, and many shopping district characteristics. However, this initial comparison did not account for the simultaneous effects of different variables or control for correlations between explanatory variables. For example, several shopping district characteristics were correlated ($\rho > 0.5$ or $\rho < -0.5$), such as employment density and commercial property density or population density and intersection density. Many commercial roadway characteristics within the shopping districts were also correlated. Commercial roadway width was positively correlated with number of lanes, median coverage, automobile traffic volume, posted speed limit, and average building setback and negatively correlated with on-street parking coverage and metered on-street parking. These correlations made it challenging to understand the complex relationship between these variables and to identify which of the variables actually had a significant association with the choice of walking or driving. Factor analysis was one approach used to explore these relationships. However, further analysis in this paper used a multivariate mixed logit modeling approach to explore associations between specific variables and walking or using an automobile within the shopping district.

Table 6.1. Completed Surveys and Participant Characteristics by Shopping District (N=286)

						Participant Characteristics[2]													
Survey Location		Completed Surveys				Language		Gender				Age						Group Size	
Name	County	Weekday	Saturday	Total	Store Response Rate[1]	Spanish	%	Female	%	Male	%	18-34	%	35-64	%	65+	%	Shop Alone	%
Berkeley	Alameda	5	6	**11**	**17.3%**	0	0 0%	11	100.0%	0	0 0%	3	27.3%	6	54.5%	2	18.2%	7	63.6%
Oakland	Alameda	2	5	**7**	**27.4%**	2	28.6%	5	71.4%	2	28.6%	2	28.6%	5	71.4%	0	0.0%	6	85.7%
Hayward	Alameda	6	12	**18**	**30.5%**	3	16.7%	12	66.7%	6	33 3%	6	33.3%	10	55.6%	2	11.1%	9	50.0%
Fremont	Alameda	7	6	**13**	**21.8%**	0	0 0%	8	61.5%	5	38 5%	1	7.7%	8	61.5%	4	30.8%	12	92.3%
Pleasanton	Alameda	8	13	**21**	**23.1%**	0	0 0%	15	71.4%	6	28.6%	3	14.3%	13	61.9%	5	23.8%	14	66.7%
Danville	Contra Costa	11	14	**25**	**28.7%**	0	0 0%	16	64.0%	9	36 0%	5	20.0%	12	48.0%	8	32.0%	22	88.0%
Brentwood	Contra Costa	5	10	**15**	**27.1%**	1	6.7%	8	53.3%	7	46.7%	5	33.3%	9	60.0%	1	6.7%	6	40.0%
Concord	Contra Costa	11	6	**17**	**21.3%**	1	5 9%	12	70.6%	5	29.4%	4	23.5%	11	64.7%	2	11.8%	13	81.3%
Richmond	Contra Costa	4	9	**13**	**26.7%**	3	23.1%	8	61.5%	5	38 5%	4	30.8%	8	61.5%	1	7.7%	6	54.5%
El Cerrito	Contra Costa	5	9	**14**	**20.2%**	1	7.1%	10	71.4%	4	28.6%	0	0.0%	11	78.6%	3	21.4%	11	78.6%
SF--Market St.	San Francisco	1	2	**3**	**15.5%**	0	0 0%	1	33.3%	2	66.7%	2	66.7%	1	33.3%	0	0.0%	1	33.3%
SF--Fillmore St.	San Francisco	5	5	**10**	**19.1%**	0	0 0%	6	60.0%	4	40 0%	2	20.0%	7	70.0%	1	10.0%	9	90.0%
SF--Taraval St.	San Francisco	5	8	**13**	**20.7%**	0	0 0%	6	46.2%	7	53 8%	4	30.8%	7	53.8%	2	15.4%	11	84.6%
SF--Mission St.	San Francisco	4	1	**5**	**23.9%**	2	40 0%	4	80.0%	1	20 0%	2	40.0%	2	40.0%	1	20.0%	3	60.0%
SF--Third St.	San Francisco	8	9	**17**	**28.8%**	0	0 0%	12	70.6%	5	29.4%	2	11.8%	13	76.5%	2	11.8%	14	82.4%
S. San Francisco	San Mateo	7	8	**15**	**19.3%**	1	6.7%	10	66.7%	5	33 3%	0	0.0%	11	73.3%	4	26.7%	11	73.3%
Daly City	San Mateo	4	2	**6**	**16.6%**	0	0 0%	5	83.3%	1	16.7%	2	33.3%	4	66.7%	0	0.0%	6	100.0%
Burlingame	San Mateo	6	11	**17**	**25.8%**	0	0 0%	15	88.2%	2	11 8%	5	29.4%	12	70.6%	0	0.0%	12	70.6%
San Mateo	San Mateo	15	11	**26**	**19.2%**	1	3 8%	17	65.4%	9	34.6%	6	23.1%	15	57.7%	5	19.2%	20	76.9%
San Carlos	San Mateo	11	9	**20**	**21.4%**	0	0 0%	15	75.0%	5	25 0%	3	15.0%	14	70.0%	3	15.0%	15	75.0%
	Total	**130**	**156**	**286**	**21.9%**	15	5 2%	196	68.5%	90	31 5%	61	21.3%	179	62.6%	46	16.1%	208	73.5%

1) Response rate was calculated as (Number of surveys/Total number of people invited to participate in survey).

2) The total number of surveys in particular categories may not sum to 286 because of non-response to certain questions.

Table 6.2. Mode Choice Within Shopping District for Respondents who Drove to the Shopping District

1. Urban Core	Mode Share Within Shopping District[1]		
Shopping District	N	Walk	Automobile
SF-Market St.	3	100.0%	0.0%
SF-Fillmore St.	10	60.0%	40.0%
SF-Mission St.	5	80.0%	20.0%
Cluster Average	**18**	**72.2%**	**27.8%**

2. Suburban Main Street	Mode Share Within Shopping District[1]		
Shopping District	N	Walk	Automobile
Berkeley	11	36.4%	63.6%
Oakland	7	0.0%	100.0%
Richmond	13	61.5%	38.5%
SF-Taraval St.	13	46.2%	53.8%
SF-Third St.	17	17.6%	82.4%
Daly City	6	16.7%	83.3%
Burlingame	17	52.9%	47.1%
San Mateo	26	46.2%	53.8%
Cluster Average	**110**	**39.1%**	**60.9%**

3. Suburban Thoroughfare	Mode Share Within Shopping District[1]		
Shopping District	N	Walk	Automobile
Hayward	18	0.0%	100.0%
Fremont	13	23.1%	76.9%
Danville	25	28.0%	72.0%
Brentwood	15	6.7%	93.3%
Concord	17	11.8%	88.2%
El Cerrito	14	21.4%	78.6%
San Carlos	20	30.0%	70.0%
Cluster Average	**122**	**18.0%**	**82.0%**

4. Suburban Shopping Center	Mode Share Within Shopping District[1]		
Shopping District	N	Walk	Automobile
Pleasanton	21	28.6%	71.4%
S. San Francisco	15	46.7%	53.3%
Cluster Average	**36**	**36.1%**	**63.9%**

Overall	Mode Share Within Shopping District[1]		
	N	Walk	Automobile
Overall Average	**286**	**31.8%**	**68.2%**

1) Survey respondent transportation mode share indicates whether the respondent walked or traveled by automobile in the survey shopping district. The mode represents the type of transportation used for the greatest distance on trips between stops located within the shopping district. It only considers respondents who traveled to the shopping district by automobile, and therefore, had an automobile available. Cluster average is weighted average of individual store data based on surveys per store (2009).

Table 6.3., Part 1. Univariate Relationships with Walking or Driving in the Shopping District

Travel Characteristics	Walked Within Shopping District (N=91)	Drove Within Shopping District (N=195)	T-Stat	P-value, two tail	Significance[1]
Mean Tour Distance (km)[2]	28.2	19.9	1.40	0.16	+
Median Tour Distance (km)[2]	12.2	10.0	n/a	n/a	n/a
Mean Shopping District Travel Distance (km)[3]	0.40	0.62	-3.48	0.00	---
Mean Shopping District Auto Travel Time (min.)[4]	4.27	3.25	2.08	0.04	+++
Mean Shopping District Walk Travel Time (min.)[4]	6.38	11.50	-6.00	0.00	---
Mean # of Tour Stops[5]	4.8	4.8	-0.05	0.96	
Median # of Tour Stops[5]	4.0	4.0	n/a	n/a	n/a
Mean # of Shopping District Stops[6]	2.6	2.4	2.04	0.04	+++
Carried No Bags	11.0%	16.4%	-1.28	0.20	
Carried 2+ Bags	19.8%	25.6%	-1.12	0.26	
Shopped Alone	73.6%	72.3%	0.23	0.82	
Shopped on Saturday	51.6%	55.9%	-0.67	0.51	
Socioeconomic Characteristics	**Walked Within Shopping District (N=91)**	**Drove Within Shopping District (N=195)**	**T-Stat**	**P-value, two tail**	**Significance[1]**
Female	61.5%	71.8%	-1.69	0.09	--
Took Survey in Spanish	3.3%	6.2%	-1.12	0.26	
Between Age 18-34	26.4%	19.0%	1.36	0.18	+
Over Age 64	13.2%	17.4%	-0.95	0.34	
Unemployed	8.8%	17.0%	-2.02	0.04	---
Student	5.5%	7.7%	-0.72	0.48	
Retired	8.8%	17.5%	-2.14	0.03	---
Had a Physical Disability	14.3%	19.0%	-1.01	0.31	
Had No Children	67.0%	59.0%	1.32	0.19	+
Was Single	25.3%	19.5%	1.07	0.28	
Lived in a Group House	7.7%	7.2%	0.15	0.88	
Lower-Income Household (<$50,000/yr)	30.5%	39.0%	-1.36	0.18	-
Higher-Income Household (>$100,000/yr)	40.2%	28.8%	1.69	0.09	++
Attitude & Perception Characteristics	**Walked Within Shopping District (N=91)**	**Drove Within Shopping District (N=195)**	**T-Stat**	**P-value, two tail**	**Significance[1]**
Enjoyed Walking	85.7%	84.1%	0.36	0.72	
Perceived General Risk of Crashes to Pedestrians	22.0%	19.5%	0.48	0.63	
Thought Neighbors had a Negative View of Walking	14.9%	8.6%	1.45	0.15	+
Perceived Risk of Crime to Pedestrians in Shopping Dist.	7.7%	9.8%	-0.58	0.56	
Perceived Risk of Crashes to Pedestrians in Shopping Dist.	11.0%	10.5%	0.19	0.85	
Shopping District Characteristics	**Walked Within Shopping District (N=91)**	**Drove Within Shopping District (N=195)**	**T-Stat**	**P-value, two tail**	**Significance[1]**
Average # of Jobs in Shopping District	9100	3610	2.05	0.04	+++
Average # of Residents within 1/10 mi. (161 m) of Survey Store	360	270	2.69	0.01	+++
Average # of Commercial Properties within 1/4 mi. (402 m) of Survey Store	65.8	42.9	3.27	0.00	+++
Average ROW Tree Coverage in Shopping District	9.02%	8.08%	1.56	0.12	+
Average # of Intersections in Shopping District	114	103	2.80	0.01	+++
Average Commercial Road Width (m)	20.8	24.4	-5.20	0.00	---
Average Commercial Road Buffer Coverage	8.1%	17.9%	-3.36	0.00	---
Average Commercial Road On-Street Parking Coverage	62.9%	50.9%	2.44	0.02	+++
Average Commercial Road Median Coverage	44.6%	66.2%	-4.13	0.00	---
Average Commercial Road # of Auto Lanes	3.6	4.3	-4.60	0.00	---
Average Commercial Road AADT	19200	26900	-6.79	0.00	---
Average Commercial Road Driveway Crossings per km	12.3	18.8	-4.76	0.00	---
Average Commercial Road Posted Speed	28.5	31.3	-4.69	0.00	---
Average Commercial Road Building Setback	28.5	34.4	-1.64	0.10	-
Average Commercial Road ROW Tree Coverage	8.8	7.7	1.80	0.07	++
Average Commercial Road Crossing Width (m)	20.4	23.8	-4.15	0.00	---
Average Distance Across Streets Intersecting Commercial Road (m)	12.7	13.3	-1.57	0.12	-
Average Survey Store Gross Floor Area (sq. m.)	1270	1380	-1.68	0.10	--
Survey Store is in a Multi-Store Shopping Complex	45.1%	57.9%	-2.04	0.04	---
Survey Store has a Drive-Through Pharmacy	27.5%	35.9%	-1.44	0.15	-
Average # of Parking Spaces within 1/10 mi. (161 m) of Survey Store	355	316	2.10	0.04	+++
Shopping District had Metered On-Street Parking	52.7%	29.2%	3.80	0.00	+++
Median Hourly On-Street Parking Rate	$0.59	$0.19	3.88	0.00	+++

Table 6.3., Part 2. Univariate Relationships with Walking or Driving in the Shopping District: Footnotes

1) Statistical significance is for a t-test of the difference between two sample means (walking vs. driving) with unequal variance using Welch's method. For variable values where walking > driving, +++ indicates significant difference (p < 0.05), ++ indicates moderately significant difference (p < 0.10), and + indicates slightly significant difference (p < 0.20). For variable values where driving > walking, --- indicates highly significant difference (p < 0.01), -- indicates significant difference (p < 0.05), - indicates moderately significant difference (p < 0.10), and (-) indicates slightly significant difference (p < 0.20). The p-value calculations are for a two-tail test (in order to test for any difference between means; one mean was not assumed to be greater than or less than the other prior to the comparison).
2) Tour distance includes the total length of travel between home and all stops that the respondent made before returning home.
3) Shopping district distance includes the total length of travel between all stops within the shopping district, starting with the first stop and ending at the last stop in the shopping district.
4) Automobile and walk travel times within the shopping district were estimated using Google Maps based on actual stop locations.
5) Stops include all non-home activity locations on the respondent's tour plus returning to home (i.e., total stops = non-home stops + 1).
6) Stops include all non-home activity locations within the shopping district. This only includes stops that were made sequentially.

Statistical Modeling

The mixed logit model is a useful discrete choice model structure that can account for panel data, such as groups of surveys collected at several different stores (Train 2009). The mixed logit model assumed that each customer n of the N = 286 respondents chose the mode i of the I = 2 alternatives that maximized his or her utility. Each respondent was surveyed at store q of the Q = 20 stores, so the model was also structured to capture similarities between the modes chosen by individuals at each store. This multi-level data structure has been developed previously for a mixed logit model (Bhat and Gossen 2004).

The utility of a respondent choosing each mode (i = 1, 2) to travel to and from a particular store was expressed in the following equations:

$$U_{q1n} = \alpha_1 + \beta_1 X_{q1n} + \gamma_1 \nu_{q1} + \varepsilon_{q1n} \quad (1)$$
$$U_{q2n} = \alpha_2 + \beta_2 X_{q2n} + \gamma_2 \nu_{q2} + \varepsilon_{q2n} \quad (2)$$

Where:

- α_i are mode-specific constants.
- X_{qin} are column vectors of known variables (travel, socioeconomic, attitude, perception, and shopping district variables). Certain variables are generic (e.g., used in the column vectors for both modes), while other variables are mode-specific (e.g., only used in the column vector for one mode).
- β are row vectors of coefficients that quantify the relationship between each known variable and the observed utility of choosing each mode i.
- ν_{q1} and ν_{q2} are variables representing the unobserved correlated error between people who used mode 1 or 2 and took the survey at each of the 20 stores. These variables are

assumed to be distributed independently identically normal across stores but constant across individuals who use the same store. It is possible that respondents at the same store had similar preferences that are not captured by the known variables, so it is important to control for this effect in the model.

- γ_i are coefficients that quantify the variance of the store-level error for each mode i.
- ε_{qin} are unobserved error terms. These errors are assumed to be independently and identically distributed type 1 extreme value across individuals.

The unconditional probability of customer *n* selecting mode *i* to travel to and from store *q* was expressed as:

$$P_{qin} = \int_{\nu_q=-\infty}^{\infty} \frac{e^{\beta_i X_{qin}+\gamma_i \nu_{qi}}}{\sum_{j \epsilon C_n=1}^{I} e^{\beta_j X_{qjn}+\gamma_j \nu_{qj}}} f(\nu_q) d\nu_q \quad (3)$$

Where:

- The variables $v_{q1}$and v_{q2} are independent.
- v_q is a vector of the variables $v_{q1}$and v_{q2}, such that $f(\nu_q)= \prod_{i=1}^{2} f(v_{qi})$.
- ϕ is the standard normal density function (μ = 0, σ = 1).
- $f(v_q) = \phi(v_1)\, \phi(v_2)$
- C_n is the set of mode choices out of (i = 1, 2) available to individual *n*. Note that all respondents considered for this model had walk and automobile modes available.

The unconditional likelihood function for the full sample of respondents is:

$$L = \prod_{q=1}^{Q} \int_{v_{q1}=-\infty}^{\infty} \int_{v_{q2}=-\infty}^{\infty} \prod_{i=1}^{I} \left[P_{qin}(i|C_n)\right]^{y_{qin}} f(v_{q1}) f(v_{q2}) dv_{q1} dv_{q2} \quad (4)$$

Where:

- Q is the number of stores, where each specific store is designated by *q* = 1, 2, 3,…, 20.
- N_q is the number of respondents in the dataset from store *q*, where each individual respondent is designated by *n* = 1, 2, 3…
- I is the number of modes considered in the analysis, where each specific mode is designated by *i* = 1, 2.
- y_{qin} is an indicator function that is 1 if person *n* at store *q* chooses mode *i* and 0 otherwise.

BIOGEME software was used to estimate the models (Bierlaire 2003). This software applied simulation techniques to approximate the integrals in the likelihood function. The software reported the parameter estimates of *α*, *β*, and *γ* that maximized the logarithm of the likelihood function.

6.6. ANALYSIS

More than 50 variables were considered as factors that could potentially be associated with traveling within the shopping district by walking rather than driving. These variables were derived from responses to the intercept survey, aerial photographs, Census data, and field observations. Descriptive statistics for several key independent travel, socioeconomic, attitude, perception, and store area variables considered during the analysis are provided in Table 6.4.

A series of models was estimated using different combinations of these explanatory variables. All 50 variables were tested in the first few models, but certain variables emerged as having consistently high statistical associations with walking versus driving within the shopping district during the process of estimating different models. Variables that showed consistent statistical significance were included in the final model.

Correlation between Predictive Variables

Many of the predictive variables considered during the modeling process were correlated. In general, variables with high correlations ($\rho > 0.5$ or $\rho < -0.5$) were not included in the same model. However, the variable representing shopping districts where the survey store was in a multi-store shopping complex was moderately correlated with the posted speed limit variable ($\rho = 0.65$) and the metered parking in the shopping district variable ($\rho = -0.62$). In addition, posted speed limit was moderately correlated with metered parking in the shopping district ($\rho = -0.65$). The parameter estimates for these three variables remained relatively consistent when different combinations of variables were included in different model alternatives, so they were assumed to represent different aspects of the choice of walking versus driving.

Model Significance

The final mixed logit model included 12 parameters corresponding with 10 independent variables and a constant. Overall, the model log-likelihood (-121) was relatively high compared with the log-likelihood value for no model (-198) and the log-likelihood value of a model with only constants (-173). Its adjusted rho-squared value was 0.323 (Table 6.5). The model predicted the mode chosen by 78.3% of the survey participants correctly.

Parameter estimates were provided for theoretically-important variables with p-values < 0.30. However, parameters were considered to be highly significant for $p < 0.01$, significant for $0.01 \leq p < 0.05$, and moderately significant for $0.05 \leq p < 0.10$. Parameters with $0.10 \leq p < 0.20$ were not considered to be statistically significant but were interpreted as indicating a slight association between the explanatory variable and mode choice. Parameter estimates with $p < 0.10$ are highlighted in Table 6.5.

Table 6.4., Part 1. Variables Considered for Statistical Models: Travel and Socioeconomic Factors

Travel Factors		Summary Statistics[1]				
Variable Name	**Description**	**Sample Size**	**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
Auto Distance	Estimated travel distance by automobile (km)[2]	286	0.578	0.467	0.161	3.057
Auto Time	Estimated travel time by automobile (Minutes)[3]	286	3.579	2.992	0.150	23.000
Auto Cost	Estimated total automobile cost (Dollars)[4]	286	0.299	0.845	0.010	7.070
Walk Distance	Estimated travel distance by walking (km)[5]	286	0.931	0.730	0.161	6.436
Walk Time	Estimated travel time by walking (Minutes)[6]	286	9.874	7.391	1.000	41.000
Total Tour Distance	Actual total tour distance (km)[7]	286	22.560	36.722	0.479	387.816
Total Tour Number of Stops	Total tour stops (including returning home)[8]	286	4.843	1.881	3.000	17.000
Miles in Shopping District	Travel distance between first and last stop in shop. dist. (km)[9]	286	0.554	0.488	0.051	3.255
Stops in Shopping District	Number of stops within shopping district[10]	286	2.483	0.815	2.000	7.000
No Bags	Carrying 0 bags (1 = Yes, 0 = No)	286	0.147	0.355	0.000	1.000
2+ Bags	Carrying 2 or more bags (1 = Yes, 0 = No)	286	0.238	0.427	0.000	1.000
Shopping Alone	Shopping alone (group size = 1) (1 = Yes, 0 = No)	285	0.730	0.445	0.000	1.000
Cool Temperature	Temperature <60° F (<16° C) (1 = Yes, 0 = No)	286	0.087	0.283	0.000	1.000
Saturday	Survey was on Saturday (1 = Yes, 0 = No)	286	0.546	0.499	0.000	1.000
Respondent Socioeconomic Factors		**Summary Statistics[1]**				
Variable Name	**Description**	**Sample Size**	**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
Female	Female	286	0.685	0.465	0.000	1.000
Spanish Speaker	Survey completed in Spanish (1 = Yes, 0 = No)	286	0.052	0.223	0.000	1.000
Young Adult	Young adult (age 18 to 34) (1 = Yes, 0 = No)	286	0.213	0.410	0.000	1.000
Middle Age	Middle-age adult (age 35-64) (1 = Yes, 0 = No)	286	0.626	0.485	0.000	1.000
Senior Citizen	Senior citizen (over age 64) (1 = Yes, 0 = No)	286	0.161	0.368	0.000	1.000
Employed	Employed (includes employed students) (1 = Yes, 0 = No)	285	0.667	0.472	0.000	1.000
Unemployed	Unemployed (1 = Yes, 0 = No)	285	0.144	0.352	0.000	1.000
Student	Student (includes employed students) (1 = Yes, 0 = No)	285	0.070	0.256	0.000	1.000
Retired	Retired (1 = Yes, 0 = No)	285	0.147	0.355	0.000	1.000
Homemaker	Homemaker (1 = Yes, 0 = No)	285	0.028	0.166	0.000	1.000
No-Child Household	Household with 0 children (1 = Yes, 0 = No)	286	0.615	0.487	0.000	1.000
Single Adult	Household with a single adult (1 = Yes, 0 = No)	286	0.213	0.410	0.000	1.000
Group House	Household with 4 or more adults (1 = Yes, 0 = No)	286	0.073	0.261	0.000	1.000
Lower Income	Household income less than $50,000 per year (1 = Yes, 0 = No)	259	0.363	0.482	0.000	1.000
Higher Income	Household income more than $100,000 per year (1 = Yes, 0 = No)	259	0.324	0.469	0.000	1.000
Disability	Has a physical disability (self-reported) (1 = Yes, 0 = No)	286	0.175	0.381	0.000	1.000

Table 6.4., Part 2. Variables Considered for Statistical Models: Attitude & Perception and Shopping District Factors

Respondent Attitude & Perception Factors		Summary Statistics[1]				
Variable Name	**Description**	**Sample Size**	**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
Enjoy Walking	Respondent enjoys walking (1 = Yes, 0 = No)[11]	286	0.846	0.361	0.000	1.000
General Walk Crash Risk	Perceive walking to be risky (in general) (1 = Yes, 0 = No)[11]	286	0.203	0.403	0.000	1.000
Negative Walk Culture	People in nbhd. have neg. view of walking (1 = Yes, 0 = No)[11]	272	0.107	0.309	0.000	1.000
Nbhd. Walk Crime Risk	Perceieve high crime risk if walking in shop. dist. during day (1 = Yes, 0 = No)[11]	284	0.092	0.289	0.000	1.000
Nbhd. Walk Crash Risk	Perceieve high crash risk if walking in shop. dist. during day (1 = Yes, 0 = No)[11]	281	0.107	0.309	0.000	1.000
Shopping District Factors		**Summary Statistics[1]**				
Variable Name	**Description**	**Sample Size**	**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
Population Density	Total population living within 0.1 mi. (161 m) of store (00s)[12]	286	2.974	2.250	0.566	12.226
Employment Density	Total number of jobs within 0.5 mi. (804 m) (000s)[13]	286	5.362	14.837	0.195	145.200
Commercial Density	Total number of commercial properties within 0 25 mi (402 m)[14]	286	50.2	48.7	6.0	272.0
Sidewalk Coverage	Proportion sidewalk coverage on multilane roadways[15]	286	0.891	0.120	0.536	1.000
Slope	Average percent slope along multilane roadways[16]	286	2.806	4.756	0.622	22.093
Bike Facility Density	Miles of bicycle facilities within 0.5 mi. (804 m)[17]	286	2.001	2.018	0.000	6.330
Intersection Density	Number of street intersections within 0.5 mi. (804 m)	286	107	30	56	174
Shopping District Tree Coverage	Proportion of shopping district right-of-way covered by tree canopy	286	8.4	4.8	1.0	15.0
Commercial Road Width	Curb-to-curb width of commercial roadway adjacent to store (m)[18]	286	23.3	5.4	11.6	32.5
Commercial Road Buffer Coverage	Proportion buffer coverage along commercial roadway[18,19]	286	0.148	0.270	0.000	0.774
Commercial Road Parking Coverage	On-street parking coverage on adjacent roadway[18,20]	286	0.547	0.388	0.000	1.000
Commercial Road Median Coverage	Proportion of commercial roadway segments with raised medians[18]	286	0.593	0.401	0.000	1.000
Commercial Road Auto Lanes	Average adjacent roadway number of travel lanes[18,21]	286	4.077	1.155	2.000	5.997
Commercial Road AADT	Traffic volume (AADT) on roadway adjacent to store[18]	286	24461	10453	9771	50500
Commercial Road Driveway Crossings	Major driveway or alley crossings per mile along commercial roadway[18 20]	286	26.9	19.2	0.0	72.1
Commercial Road Speed Limit	Average posted speed limit along adjacent roadway (MPH)[18]	286	30.4	4.9	25.0	37.5
Commercial Road Building Setback	Average building setback along adjacent roadway (m)[18,22]	286	9.9	8.3	0.0	25.7
Commercial Road Tree Coverage	% of adjacent roadway right-of-way covered by tree canopy[18,23]	286	8.0	4.6	2.1	16.2
Commercial Road Crossing Distance	Average commercial street pedestrian crossing distance (m)[18,25]	286	22.7	6.2	12.5	35.7
Crossroad Crossing Distance	Average crossroad pedestrian crossing distance (m)[18,24]	286	13.1	3.3	6.7	20.1
Store Square Meters	Gross area of store building (square meters)	286	1342	480	493	2338
Multi-Store Shopping Complex	Survey Store is in a Multi-Store Shopping Complex[25]	286	0.539	0.499	0.000	1.000
Drive-Through Pharmacy	Store has a drive-through pharmacy window (1 = Yes, 0 = No)	286	0.332	0.472	0.000	1.000
Store Parking Spaces	Spaces in the store parking lot (includes shared parking) (00s)	286	1.514	1.442	0.000	4.420
Nearby Parking Spaces	Number of possible parking spaces within 0.1 mi. (161 m) of survey store	286	329	147	126	614
Pay Parking on Road	Presence of pay parking within 0.1 mi. (161 m) (1 = Yes, 0 = No)[26]	286	0.367	0.483	0.000	1.000
Median Parking Price	Median weekday mid-day on-street hourly parking rate within 0.1 mi. (161 m) ($)[26]	286	0.318	0.681	0.000	3.500
Store Setback Distance	Distance from store door to public sidewalk (m)[27]	286	21.3	22.9	1.0	90.0

Table 6.4., Part 3. Variables Considered for Statistical Models: Footnotes

1) Non-responses were removed. This is reflected in the sample size for each variable.
2) Travel distance by automobile represents the estimated distance that the customer would need to travel by automobile from the first stop in the shopping district to his or her last stop in the shopping district. It represents the shortest time route selected by Google Maps directions.
3) Travel time by automobile represents the estimated total time that the customer would need to travel by automobile from the first stop in the shopping district to his or her the last stop in the shopping district. Assumptions used to calculate respondent travel times are provided in Appendix K.
4) The total estimated automobile cost represents the sum of the expected out-of-pocket gas and parking costs paid by a respondent driving within the shopping district. Assumptions used to calculate respondent travel costs are provided in Appendix K.
5) Tour distance by walking represents the estimated distance that the customer would need to travel by walking between all of his or her stops in the shopping district plus the distance required to return back to the first stop to get his or her car. It represents the shortest time route selected by Google Maps directions.
6) Tour travel time by walking represents the estimated total time that the customer would need to travel by walking between all of his or her stops in the shopping district plus the distance required to return back to the first stop to get their car. Assumptions used to calculate respondent travel times are provided in Appendix K.
7) Tour distance includes the total length of travel between home and all stops that the respondent made before returning home.
8) Tour stops include all non-home activity locations on the respondent's tour plus returning to home (i e., total stops = non-home stops + 1).
9) Shopping district distance includes the total length of travel between all stops within the shopping district, starting with the first stop and ending at the last stop in the shopping district.
10) Shopping district stops include all non-home activity locations within the shopping district. This only includes stops that were made sequentially on the respondent's tour.
11) Agreement with the statement included two of the five categories on a 5-point Likert scale (e g., "Agree" or "Strongly Agree").
12) Total population within 0.1 mi. (161 m) of the survey store is calculated from 2000 census block group population data. The calculation of population only included portions of census block groups within the 0.1-mi. (161-m) radius of the store.
13) Total employment within the shopping district is calculated from 2005 MTC traffic analysis zone employment data. The calculation of employment only included portions of traffic analysis zones within the shopping district.
14) Commercial retail/entertainment properties are defined by the four county assessor's offices. These commercial land uses include commercial, entertainment, store, service, tourism, store on first floor with other above, department store, single-story store, restaurant, post office, bank, supermarket, food store, lodge hall, car wash, gas station, auto dealer, movie theater, bowling alley, winery, stadium, commercial mix, and commercial building. This category does not include commercial office buildings. Note that one building could include multiple commercial properties.
15) Sidewalk coverage is calculated on multilane roadways within 0.5 mi. (804 m) of the store. The calculation assumes that complete coverage is continuous sidewalks on both sides of the street. Therefore, if a street has sidewalks on both sides, it has 100% sidewalk coverage. If a street has a complete sidewalk on one side, but no sidewalk on the other, it has 50% coverage.
16) Percent slope is calculated on multilane roadways within 0.5 mi. (804 m) of the store. It is calculated as the change in elevation between the two segment endpoints (intersections) divided by the length of the street segment.
17) Bicycle facilities include bicycle lanes, shared lane markings, bicycle boulevards, and multi-use trails. They do not include streets that only have bicycle route signs. Bicycle facility kilometers were calculated using the same methodology as automobile lane kilometers. If bicycle lanes or shared lane markings are on both sides of a one-km-long street segment, this represents two kilometers of bicycle facilities (this avoids the problem of misrepresenting one-way bicycle facilities on one-way streets). Bicycle boulevards and multi-use trails are two-way facilities, so one kilometer of centerline counts as two kilometers of bicycle facilities.
18) Adjacent roadway variables are measured within a 0 5-mi. (804 m) corridor (0 25 mi. (402 m) in either direction) along the commercial roadway adjacent to the store. Speed limit is posted in miles per hour (MPH), so it is reported using this measure. Note that 10 MPH = 16.1 KPH.
19) A block is considered to have a buffer when there is a space with a physical barrier, grass, trees, or other type of landscaping between curb and sidewalk. Each side of the street is considered separately (e.g., buffer on both sides = 100% coverage; buffer on one side = 50% coverage).
20) A block is considered to have on-street parking if on-street parking is legal (i.e., parked cars do not need to be present). Each side of the street is considered separately (e.g., on-street parking on both sides = 100% coverage; on-street parking on one side = 50% coverage).
21) Travel lanes include all general purpose through-lanes in both directions. The number of through-lanes does not include left- or right-turn lanes, two-way center turn lanes, bicycle lanes, shoulders, or other auxilary lanes. In addition, it does not include lanes that end within the segment.
22) Average setback is a rough estimate of the average distance between the sidewalk or roadway edge and the front of each building. If a road segment does not have buildings (e.g., overpass, underpass, etc.), it is not considered in the average setback measurement.
23) Average percent tree coverage is an average of the percent tree coverage on each multilane street segment within 0.5 mi. (804 m) of the store. Tree coverage is an estimate of the total public right-of-way surface area (edge-of-sidewalk to edge-of-sidewalk) covered by tree canopy.
24) Crossroad street crossing distance represents the width of the roadway intersecting the mainline commercial roadway. The distance is measured in the direction of commercial street. Intersection crossings are considered in this measurement, but driveway crossings are not.
25) Multi-store shopping complex indicates that the retail pharmacy store entrance connects to a parking lot that serves multiple stores.
26) Presence of pay parking within 0.1 mi. (161 m) and median hourly mid-day on-street parking rate were observed through field visits.
27) Distance from store door to public sidewalk was measured as the most direct path from the door to the sidewalk that did not involve crossing fences or landscaping. Measurement was done using the Google Earth measuring tool. Building doors were located using Google Street View.

Table 6.5. Factors Associated with Mode Choice within Shopping Districts

Mixed logit model for travel between stops within shopping district[1]

	Variable[3]	Tour Mode[2]: Walk — Parameter Est.[4]	Walk — p-value	Auto — Parameter Est.[4]	Auto — p-value
	Constant	1.70	0.27	0.00	Fixed
Control	Travel Time (min.)[5]	-0.307	0.00	-0.487	0.00
Control	2+ Bags	-0.535	0.16		
Control	Shopping Alone	0.549	0.14		
Control	Disability	-0.521	0.23		
Shop. Dist.	Multi-Store Shopping Complex[6]	1.08	0.05		
Shop. Dist.	Commercial Road Driveway Crossings[7]	-0.0318	0.00		
Shop. Dist.	Commercial Road Speed Limit (MPH)[8]	-0.0665	0.19		
Shop. Dist.	Metered Parking on Street	0.771	0.15		

Panel Variables[9]

Variable	Parameter Est.[3]	p-value
Store Panel (Walk)	0.131	0.74
Store Panel (Auto)	0.0404	0.92

Overall Model

Sample Size (N)	286
Log-Likelihood (0)	-198
Log-Likelihood (Constant)[10]	-173
Log-Likelihood (Restricted)[11]	-128
Log-Likelihood (Model)	-121
Adjusted Rho-Squared Value	0.327

1) The dependent variable in the model is the primary (greatest distance) mode of transportation used on parts of respondent tours that were made between stops within 0.5 mi. (804 m) of each retail pharmacy store. This analysis only includes people who traveled by car to the shopping district. Some respondents traveled only between 2 stops in the shopping district; others traveled between more stops in the shopping district. The primary mode used within the shopping district by the 286 survey respondents was: Automobile = 195 (64%), Walk = 91 (36%). Parameter estimates were generated after 1,000 draws. They were varified as stable from 500 to 1,000 draws.
2) The automobile mode includes driving and riding as a passenger in a motorized vehicle other than a public bus or train (taxi is included within automobile mode). The walk mode includes all pedestrians, including people on foot, in wheelchairs, and using other assistive devices.
3) Several other variables were expected to have significant associations with respondent mode choice and were tested during the modeling process. These variables were the number of tour stops made within the shopping district and perceiving a risk of crime when walking in the shopping district, and drive-through pharmacy window at the survey store. However, their parameter estimates were imprecise ($p > 0.30$) and had minimal influence on other parameters, so they were not included in the final model.
4) Parameter estimates represent coefficients in the utility function for choosing each transportation mode. The base mode for each variable is the mode with no parameter estimate. Therefore, all parameters except travel time for automobile indicate the likelihood of choosing walking relative to automobile.
5) Door-to-door travel times were estimated from Google Maps based on activity stop locations given by survey respondents. Automobile travel time includes the estimated time required to walk from parking to the door and from the door to parking at each stop.
6) Multi-store shopping complex indicates that the retail pharmacy store entrance connects to a parking lot that serves multiple stores.
7) Commercial road driveway crossings represents the number of major active non-residential and more than 10-unit residential property driveways per mile along both sides of the main roadway in the shopping district.
8) Note that 10 miles per hour = 16.1 kilometers per hour.
9) The store panel parameters capture the correlated error between respondents who were surveyed at the same store. Approximately 50 customers were surveyed at each store, so they share identical shopping district variables and may have similar socioeconomic or attitude characteristics.
10) Log-likelihood (constant) is the log-likelihood of a constsnts-only model that includes the panel variables.
11) Log-likelihood (restricted) is the log likelihood of a model without the shopping district variables.

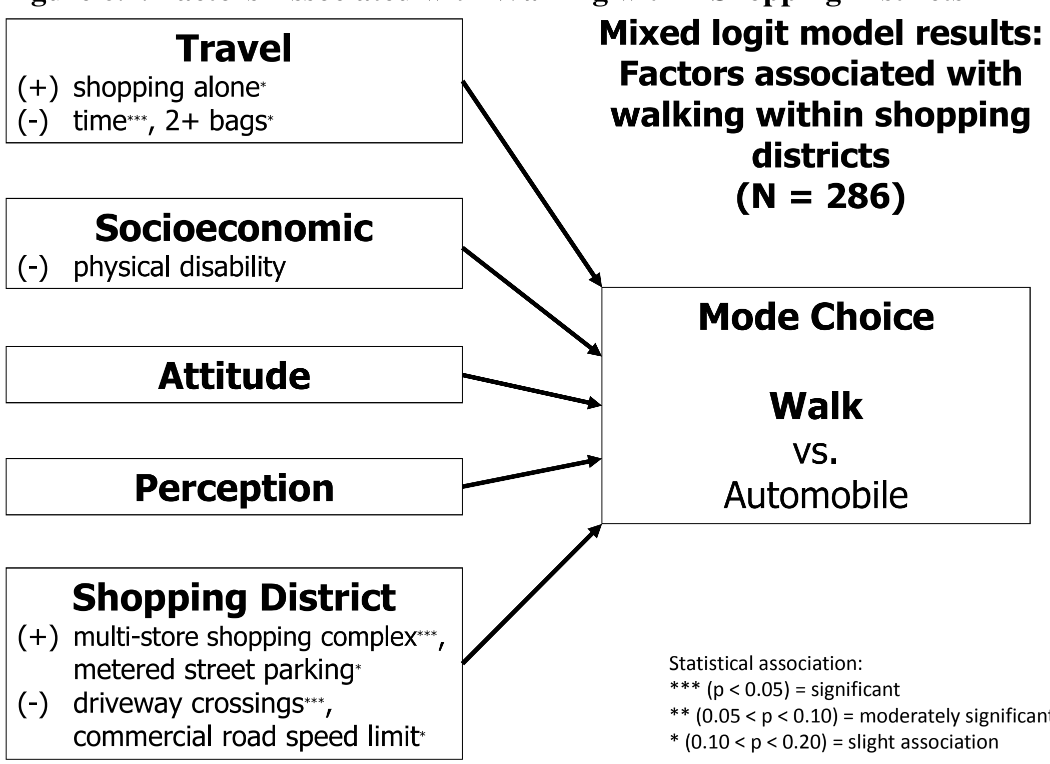
An innovative aspect of the model is that it included variables representing characteristics of the shopping district that can be influenced through planning practice. Important design elements such as shared parking lots serving multiple stores, commercial driveway crossings, posted speed limits, and metered on-street parking can be influenced through site development, automobile parking and roadway design policies as well as during site design and roadway project review.

A likelihood ratio test was used to determine if the five shopping district variables added explanatory power to the model. The restricted version of the model that included only the control variables representing travel characteristics had a total of eight variables and a log-likelihood of -128. This produced a likelihood ratio test statistic of 2 * (-121.4 – (-128.5)) = 14.2. This test statistic was compared to the value of a Chi-Squared distribution with 12 – 8 = 4 degrees of freedom, which is 13.3 for $p = 0.01$. Since 14.2 is greater than 13.3, the null hypothesis that the additional variables did not contribute to the model was rejected (with 99% confidence). Therefore, there is value including shopping district variables that can be influenced through planning practice.

6.7. RESULTS

Analysis of 286 intercept surveys from 20 shopping districts in the San Francisco Bay Area showed that retail pharmacy store customers who were more likely to choose to walk rather than drive between stops within the shopping district had certain characteristics. Controlling for travel and socioeconomic factors made it possible to identify shopping district characteristics that were associated with pedestrian mode choice (Figure 6.1). Results related to specific variables are presented in the order that they are listed in the final model (Table 6.5).

Figure 6.1. Factors Associated with Walking within Shopping Districts

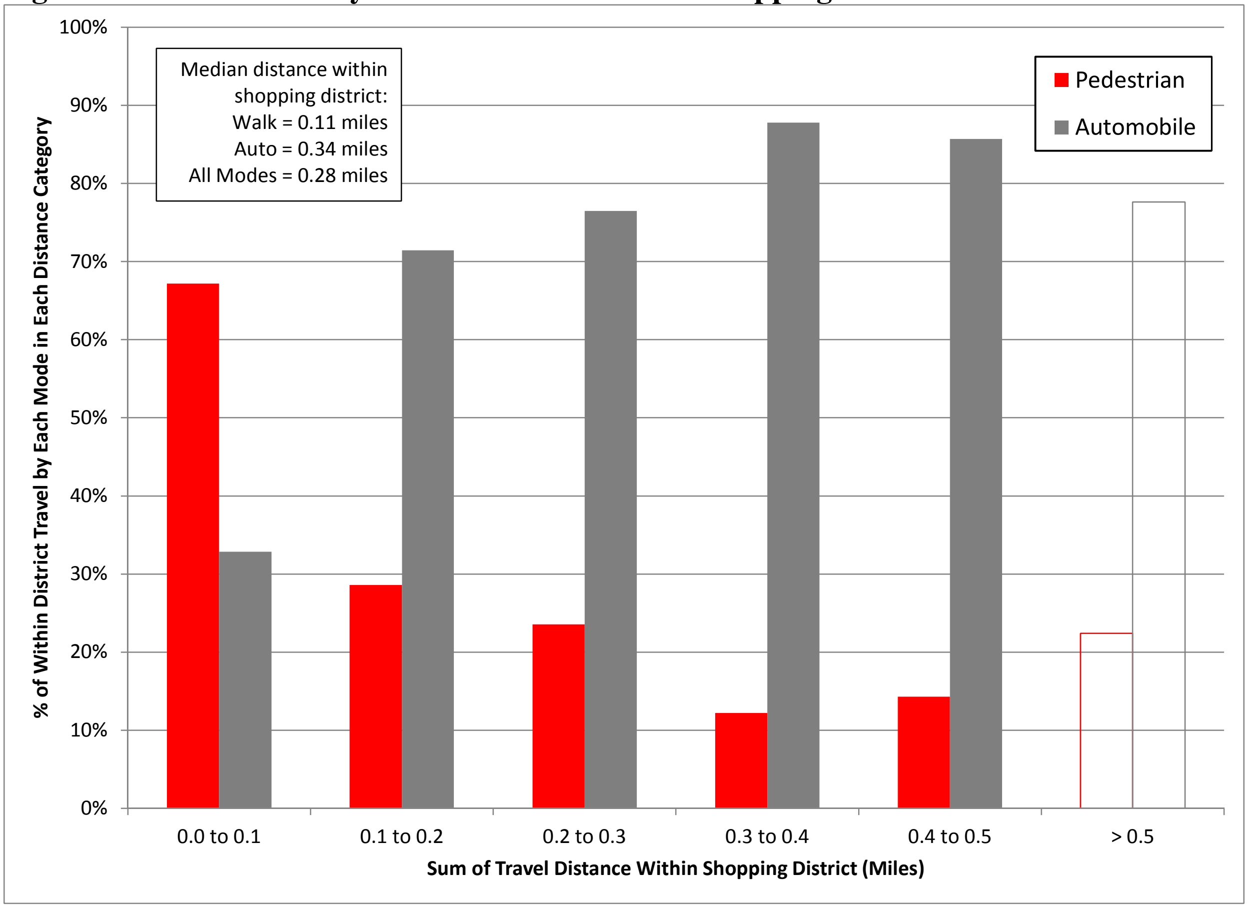


Travel and Socioeconomic Characteristics
The mixed logit model results showed that several travel and socioeconomic characteristics were associated with mode choice within the shopping district. Most of these control variables were consistent with previous travel behavior research.

Travel Time
Estimated door-to-door travel time within the shopping district had a highly significant association with walking and driving with the shopping district. Longer travel times reduced the utility of each mode. Walking was typically the slower mode, so the utility of walking decreased more rapidly than driving as the respondent's travel distance within the shopping district increased (i.e., it took much longer to walk than drive for greater distances) (Figure 6.2).

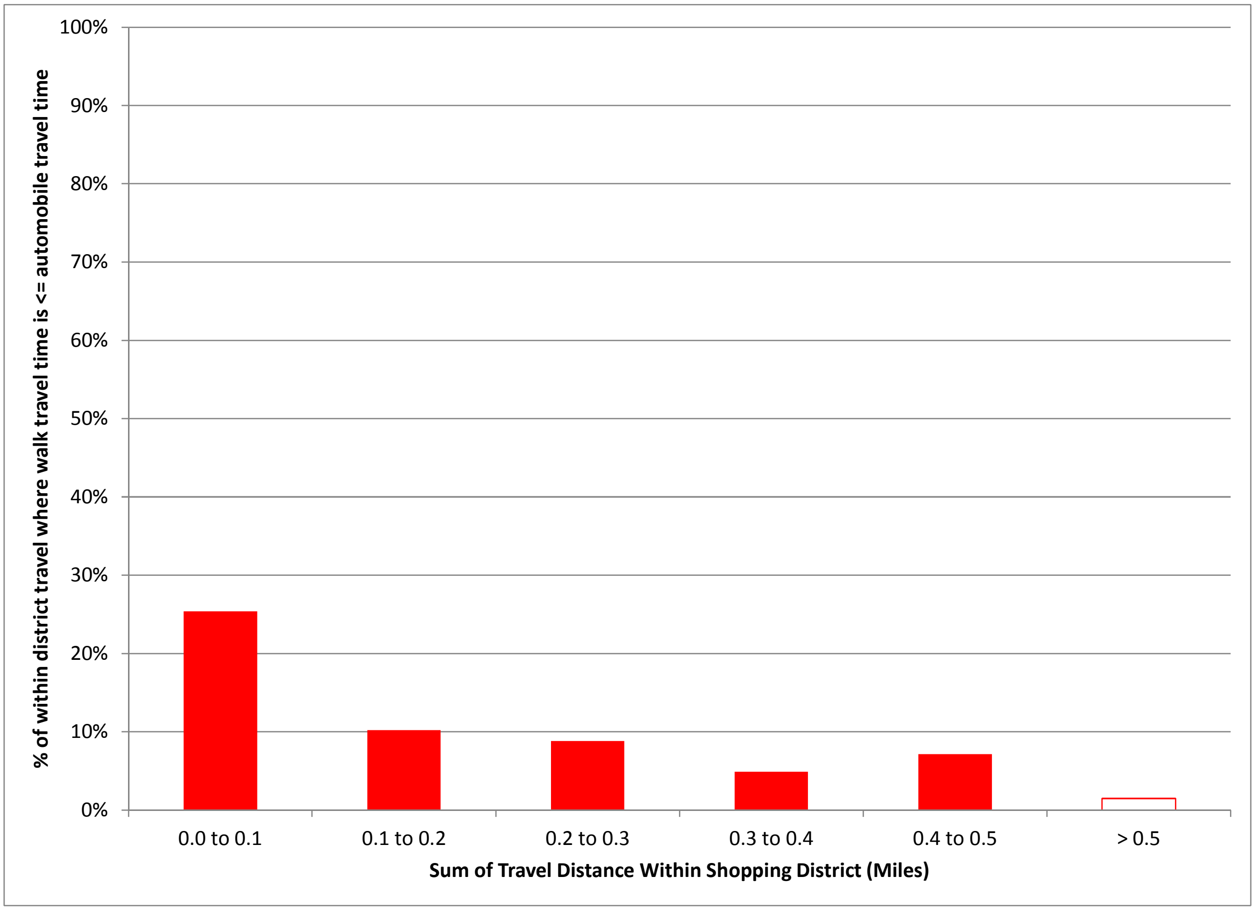
There were several key differences in how automobile mode and walking mode travel times were estimated. Automobile mode travel time between two stops included the time it would take to walk from the door of a building to a parked car in the parking lot (or nearby on-street parking space), drive the car along the roadway to the next parking spot (using Google Maps driving travel times), and walk from the parked car to the door of the building where the next activity took place. The walking time between a parked car and building door was assumed to be longer for urban core shopping districts with few surface parking lots and scarce on-street parking and shorter for suburban shopping districts with parking lots in front of each building (Appendix K). Walking mode travel time included the estimated door-to-door walking time between two stops (using Google Maps walking travel times, which were longer for walking in the uphill direction). The most significant difference in how travel times were calculated for each mode occurred after the respondent completed their final stop within the shopping district. At that point, the driving time calculation was finished because the person would drive from the shopping district to home or another activity area. However, the walking time calculation added the time that a person would need to walk back to a parked automobile at their first stop within the shopping district. This return travel time was short for people who walked to a series of activities in a loop and had only a short distance to return to their car, but it was much longer for people who made their final stop in a distant part of the shopping district. The extra return-to-automobile travel time was one reason why only 10% of all respondent routes within the shopping district had lower walking than driving travel times (Figure 6.3).

Figure 6.2. Mode Share by Travel Distance Within Shopping Districts



Note: A hollow bar is used to represent >0.5 miles because it does not cover the same distance range as the other categories.
1 mile = 1.61 kilometers

Figure 6.3. Travel Distance Within Shopping Districts where Walking had Lower Estimated Travel Time than Automobile



Note: A hollow bar is used to represent >0.5 miles because it does not cover the same distance range as the other categories.
1 mile = 1.61 kilometers

<u>Travel Cost</u>
Estimated travel cost was tested during the modeling process for automobile mode choice, but it was not a statistically-significant variable. However, the presence of metered parking in the shopping district is a proxy for the cost of driving and parking at different activity locations. This variable was included as a shopping district factor, and it showed that respondents were less likely to drive and more likely to walk when they had to pay for parking.

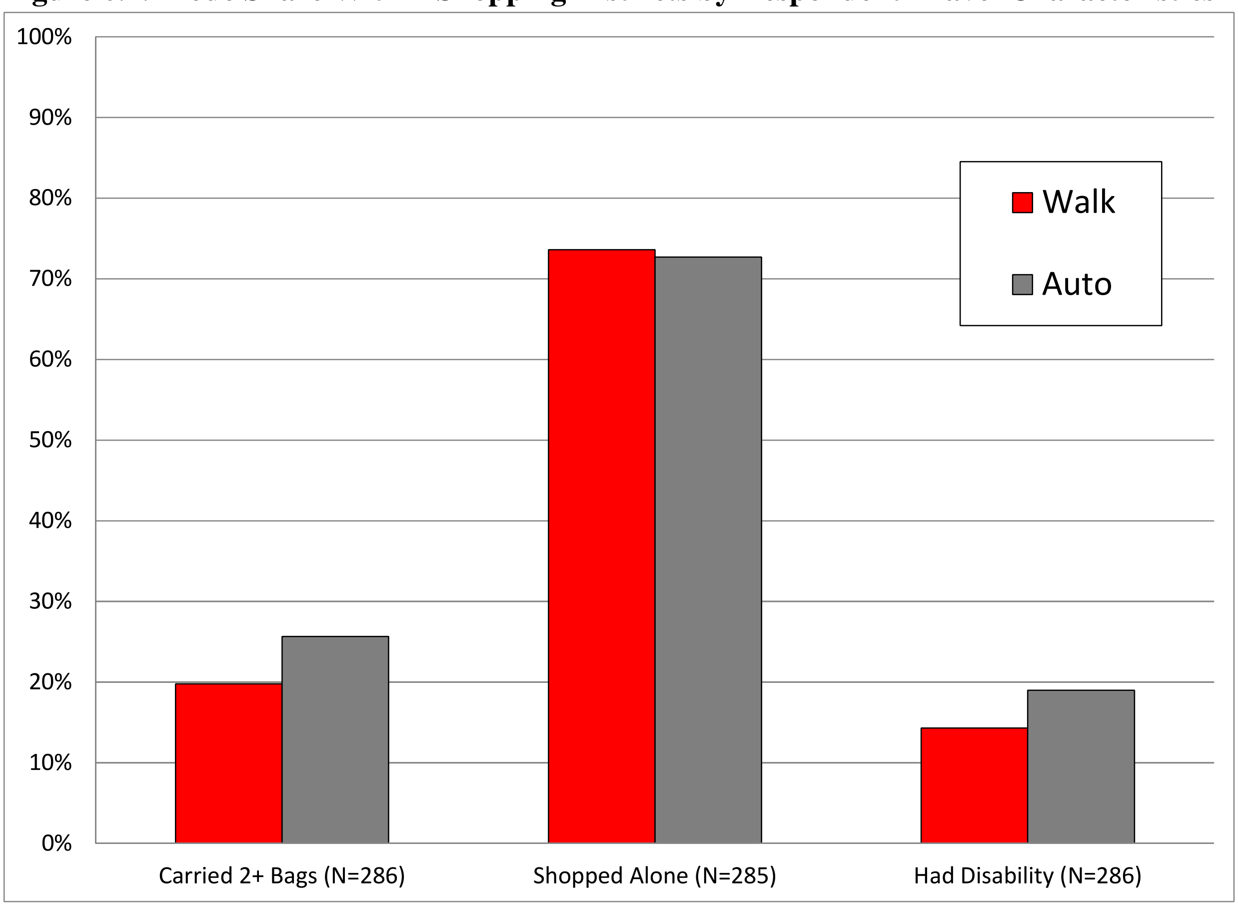
<u>Number of Tour Stops</u>
The number of stops made by the respondent within the shopping district had a positive relationship with walking in the univariate analysis. However, the number of stops variable was not significant after controlling for other variables in the mixed logit model. Travel time had a more significant association with walking and automobile mode choice than the number of stops within the shopping district.

Number of Bags
Respondents who were carrying two or more bags on their tour were more likely to choose driving over walking within the shopping district (Figure 6.4). Carrying bags is often more convenient by automobile. This variable had a slight association with mode choice in the model.

Shopping Alone
There was a slight positive association between shopping alone and walking between stops in the shopping district (Figure 6.4). People walking alone may have more flexibility in their schedules and can afford to spend the extra time required to walk between stores. Conversely, customers traveling with other people may have been transporting others who had less physical ability to walk. In districts with metered parking, these customers may have been more willing to drive and park at different stops because the parking costs could be shared among several people.

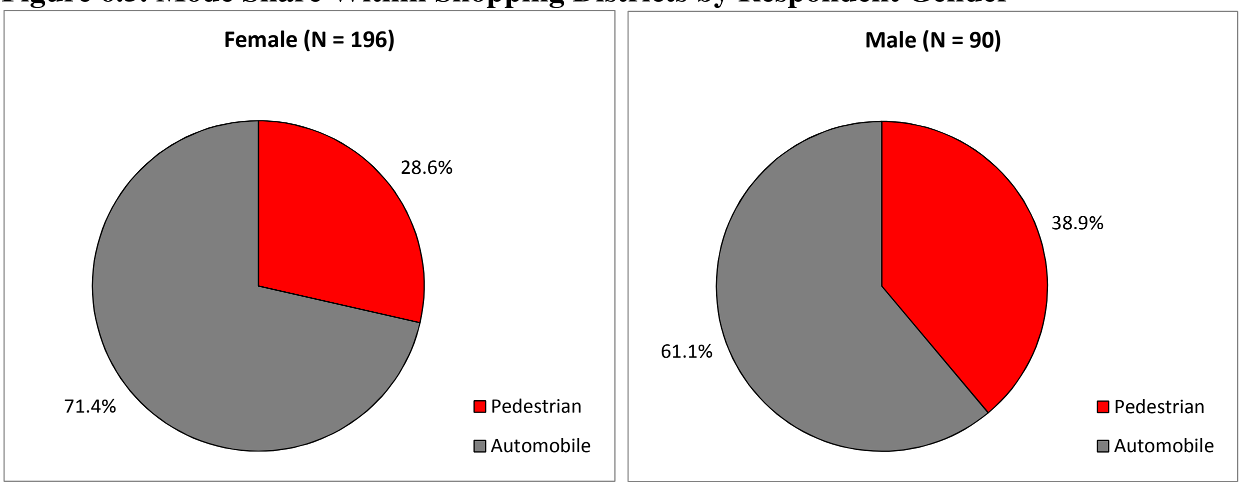
Disability
People who reported having physical disabilities were more likely to drive than walk within the shopping district (Figure 6.4). While this relationship was not statistically significant, the sign of the parameter estimate was negative, as expected. If a person with a disability is able to arrive in the shopping district with an automobile, it is likely that this vehicle provides the most convenient way to travel between stops.

Figure 6.4. Mode Share Within Shopping Districts by Respondent Travel Characteristics



A variety of other socioeconomic characteristics besides physical disabilities were tested during the modeling process. However, factors such as taking the survey in Spanish, gender, age, income, employment status, family and household characteristics did not have significant associations with walking or driving in the shopping district. Even though more male respondents walked between stores than female respondents, this gender difference was not significant in the model (Figure 6.5). While many socioeconomic factors had been important for predicting the utility of traveling by different modes to and from the shopping district, travel time and shopping district characteristics appeared to be more important factors for understanding why people walked or drove within the shopping district.

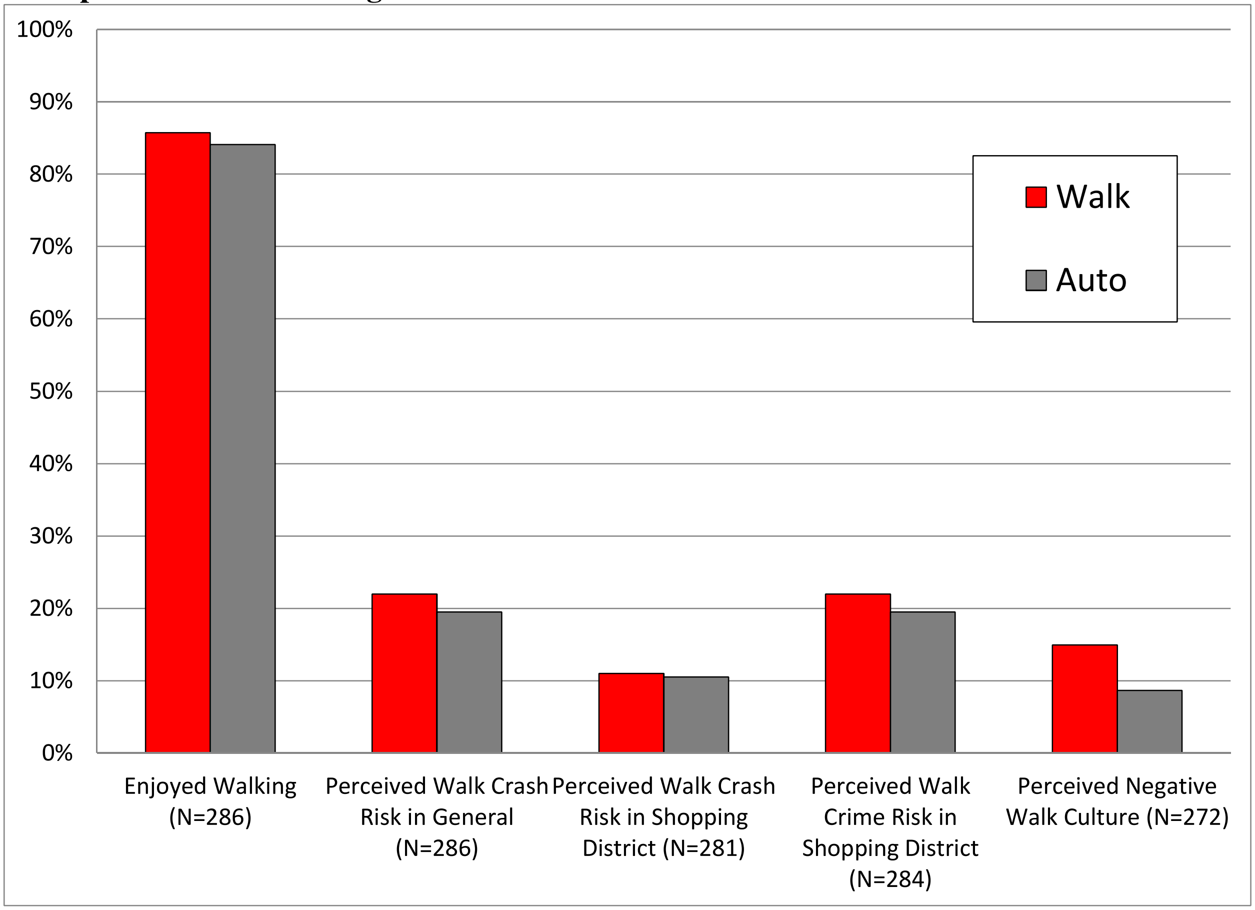
Figure 6.5. Mode Share Within Shopping Districts by Respondent Gender



Attitude and Perception Characteristics

Like socioeconomic characteristics, respondent attitudes and perceptions did not show significant associations with the choice of walking versus driving within the shopping district. Respondents who enjoyed walking, perceived a high risk of crashes while walking in general and within the shopping district, and perceived that their neighbors had a negative view of walking were not significantly more likely to choose one mode over another (Figure 6.6). The perception of crime risk while walking in the shopping district was tested in a different version of the model and had the expected negative sign, indicating people choose to drive rather than walk when they perceive a high risk of crime. However, the parameter estimate was imprecise ($p = 0.59$), so it was not included in the model.

Figure 6.6. Mode Share Within Shopping Districts by Respondent Attitudes and Perceptions About Walking



While the model results were not conclusive, a number of people who participated in interviews suggested that they enjoyed walking within shopping districts.

- "If it is a summer day, and you see people walking, or you go down to the flea market, and you feel good to be alive because you are interacting with someone else…I love to walk, and I love to see more people." *--Male, Age 30-39, Berkeley*
- "I could see myself stopping--window shopping. Stopping in stores or something like that, if I walked in that area…they have some antique stores, dress stores, a couple of cafes…" *--Female, Age 50-59, Hayward*
- He walks for pleasure up to Bernal Heights and walks with his girlfriend in the neighborhood and does "window shopping".
  --Male, Age 30-39, San Francisco Mission Street

Some interviewees were less likely to walk when they were concerned about crime.

- "When you are walking in this neighborhood, there's nobody else walking. You look like a target here." *--Female, Age 40-49, San Francisco Third Street*
- "But I think that for personal reasons, particularly for me, it's challenging to let go of my vehicle mostly because of safety and because I travel with materials and things...mostly because of crime." *--Female, Age 50-59, Berkeley*

This evidence suggests more robust survey data is needed to explore the relationship between attitude and perception factors and walking within shopping districts.

Shopping District Characteristics

After controlling for important travel factors such as travel time and carrying bags, several shopping district characteristics were associated with walking. These variables included the number of major driveway crossings and posted speed limit along the main commercial roadway, the presence of metered parking within the shopping district, and the survey store being in a multi-store shopping complex with shared parking.

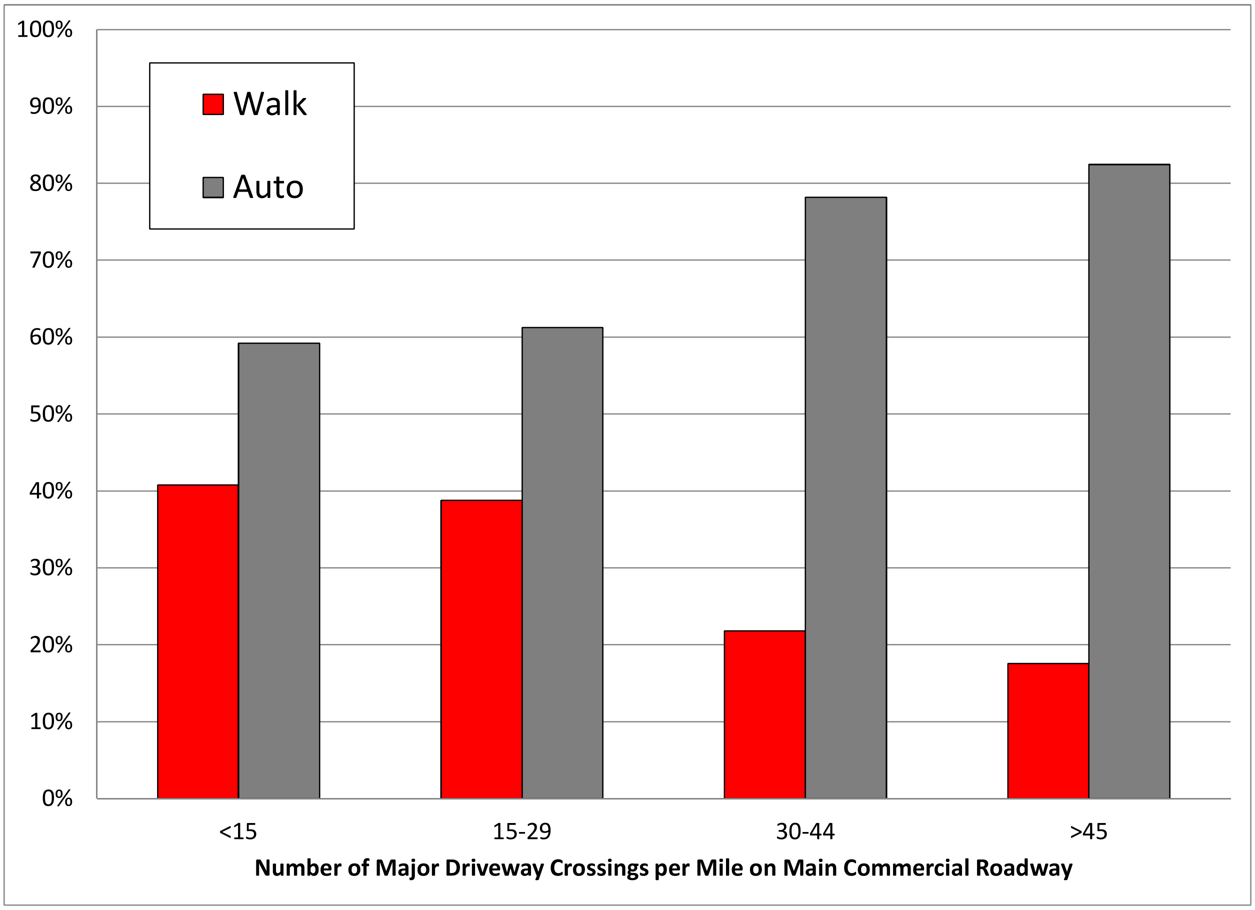
<u>Major Driveway and Alley Crossings Along Main Commercial Roadway</u>

Respondents who would need to cross more busy driveways to walk along the main commercial roadway in the shopping district were less likely to choose to walk and more likely to drive between stores (Figure 6.7). The number of driveway and alley crossings per mile was a highly significant variable in the model. Model parameters suggested that respondents would be willing to walk for trips that were 1.0 minutes longer when there were 10 fewer commercial driveway crossings along the main commercial roadway. In particular, it appeared that the pedestrian mode share dropped sharply between commercial roadways with less than 30 driveway crossings per mile and more than 30 driveway crossings per mile. However, this threshold requires further analysis with a much larger sample size and greater variety of roadway corridors.

Frequent driveway entrances to stores and other buildings may make automobile access to individual properties more convenient, but these driveways are a barrier to pedestrian travel. Especially in suburban thoroughfare shopping districts, drivers who are entering or exiting the high-speed thoroughfare roadway may not be looking for pedestrians at driveway access points. Driveways that have wide turning radii and are at roadway surface grade can also encourage high-speed turns, which are dangerous for pedestrians (AASHTO 2004). Consolidating multiple driveways into a smaller number of well-designed driveways may make conditions safer for pedestrians and encourage more people to walk between stores within shopping districts.

The relationship between the driveway crossings variable and other variables were examined to identify any potential confounding associations between driveway crossing frequency and walking within the corridor. For example, it is possible that shopping districts with fewer major driveway and alley crossings may have fewer off-street parking spaces than those with more driveway and alley crossings. A lack of off-street parking could made it more challenging for people to drive between stores, which might push more people to walk. However, there was little correlation between driveway crossings and off-street parking in the shopping districts that were studied (ρ = -0.01). This may be due to some of the largest parking lots in suburban study areas having a limited number of driveway entrances and several urban shopping districts with minimal off-street parking having several alley crossings that were included in the driveway count. No other variables correlated with driveway crossing frequency seemed to have the possibility of creating a confounding relationship with mode choice.

Figure 6.7. Mode Share Within Shopping Districts by Major Driveway Crossings



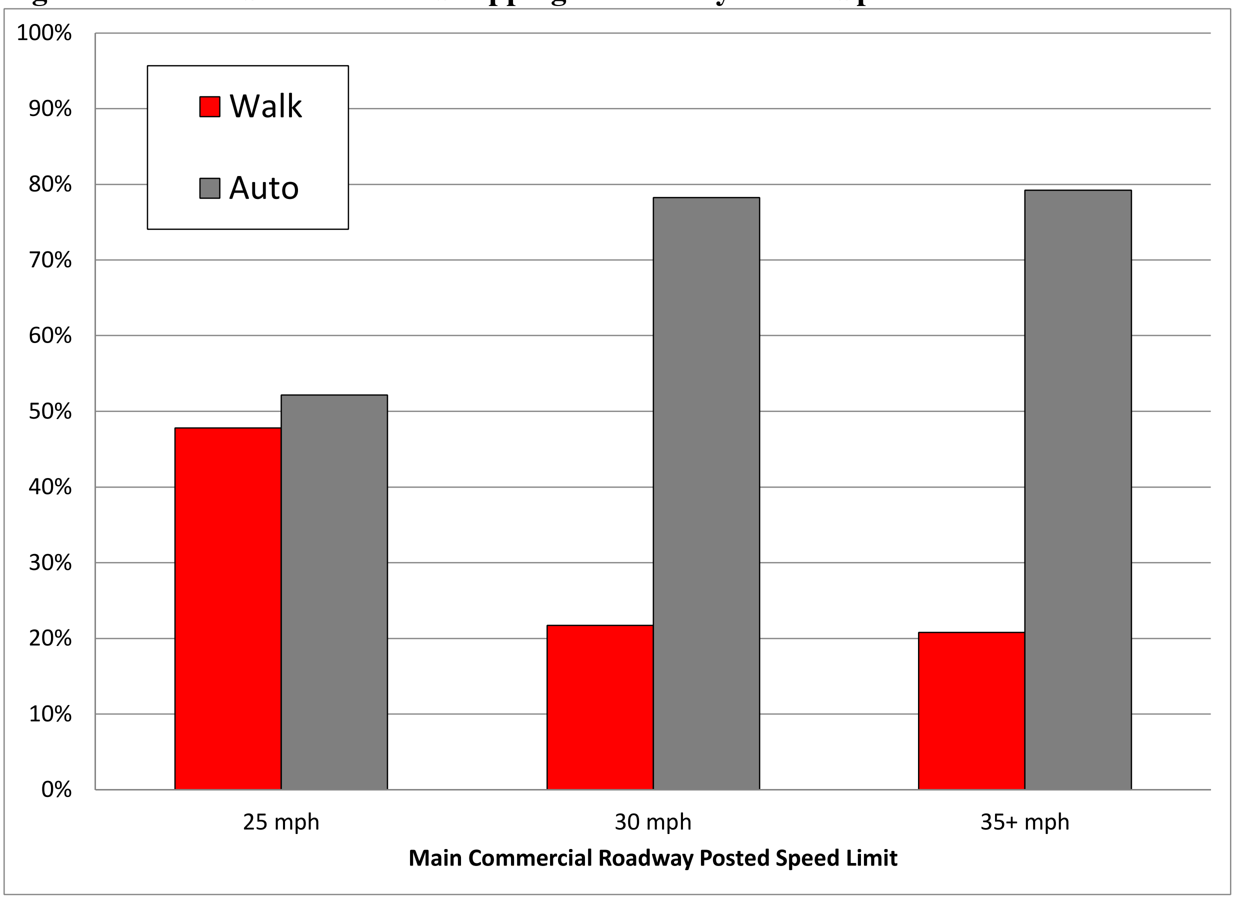
Note: 1 mile = 1.61 kilometers

<u>Posted Speed Limit on Main Commercial Roadway</u>
Lower posted speed limits had a slight association with respondents choosing to walk rather than drive within the shopping district (Figure 6.8). It appeared that there was considerably more walking within shopping districts that had 25-mile-per-hour (40 kilometer-per-hour) speed limits than within shopping districts that had 30-mile-per-hour or faster speed limits. While this relationship may also reflect the influence of shorter distances between stores or the presence of metered parking, which were also more common in shopping districts with 25-mile-per-hour (40 kilometer-per-hour) speeds, the association between walking and the posted speed limit was found even when these other factors were controlled in the model. The model indicated that respondents would be willing to walk for trips that were 1.1 minutes longer when the main commercial roadway speed limit was five miles per hour slower.

Since travel time was controlled in the model, the significance of this variable was not simply a reflection of slower traffic speeds being correlated with longer automobile travel times and a lower utility of driving. The significance of the speed limit variable was likely due to people being more comfortable walking along and across streets where traffic moved more slowly. This finding is consistent with interviewees who mentioned that being close to high-speed automobile traffic made them feel less safe when walking. It provides evidence that pedestrians may have an intuitive awareness that they have a greater risk of severe injury in a collision when motor vehicles are traveling faster (UK Department of Transport 1987). Several previous studies have also shown that pedestrians feel less comfortable walking along roadways with higher traffic speeds (Zein *et al*. 1997; Landis *et al*. 2001).

This study only had resources to analyze posted speed limits, which are a proxy for actual traffic speeds. Other roadway design and traffic characteristics may influence how closely actual traffic speeds match posted speeds. Future studies should collect actual traffic speed data and identify how speed is related to pedestrian and bicycle mode choices in different types of roadway corridors.

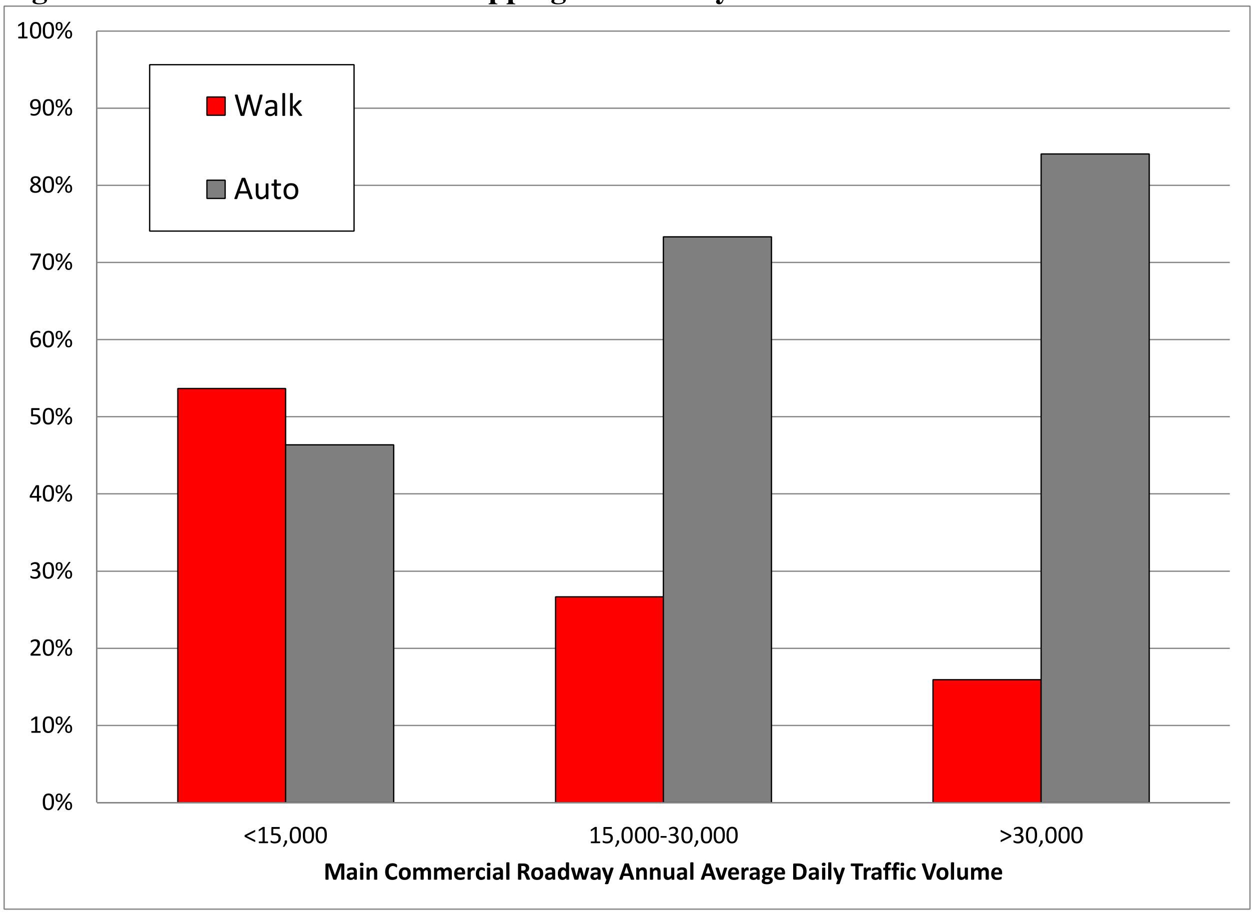
Figure 6.8. Mode Share Within Shopping Districts by Posted Speed Limit



Note: 10 miles per hour = 16.1 kilometers per hour

The posted speed limit was correlated with several other variables, including roadway width (ρ = 0.83), number of lanes (ρ = 0.81), and annual average daily traffic volume (ρ = 0.78) on the main shopping district commercial roadway. These variables were not included in the same model to avoid collinearity problems, but they were tested in separate models. The model with the posted speed limit variable had the best overall model fit. The posted speed limit parameter was also more precise than the parameter estimates for other variables in other models, so it was used in the final model. Though it had fewer significant variables, the model with roadway traffic volume produced similar results to the model with posted speed limit. Traffic volume had a slightly-significant negative relationship with walking within the shopping district (Figure 6.9).

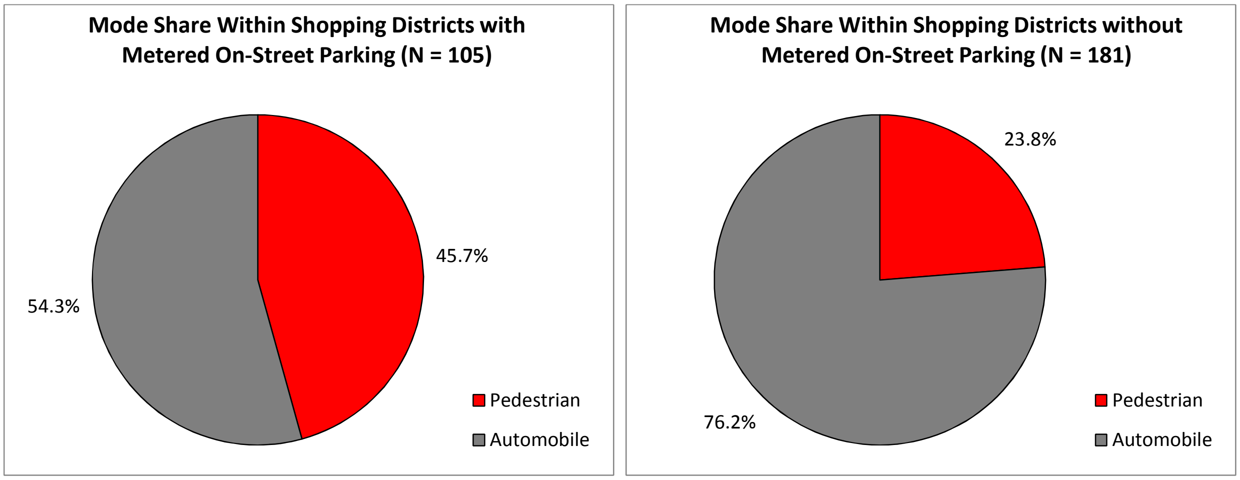
Figure 6.9. Mode Share Within Shopping Districts by Traffic Volume



Metered Parking Within the Shopping District

Shopping districts with metered on-street parking had a slight association with more survey respondents walking between stops (Figure 6.10). According to the model, a typical respondent would be willing to walk for trips that were 2.5 minutes longer when there was metered on-street parking. It is likely that respondents who had to pay for parking at their first stop were reluctant to move their car to additional paid parking spots. This would increase their overall travel cost. Paying for parking at multiple stops also takes extra travel time because it requires feeding parking meters several times. Paying more than once also serves as a psychological reminder that parking is not free. In addition, areas with metered parking often have other characteristics that support walking and detract from driving, such as short distances between a large number of jobs, retail shops, or restaurants, short building setbacks, and a limited supply of off-street automobile parking spaces. Since these other factors were not included in the model, the metered parking variable may also be capturing some of the association between these variables and walking.

Figure 6.10. Mode Share Within Shopping Districts by Presence of Metered Parking

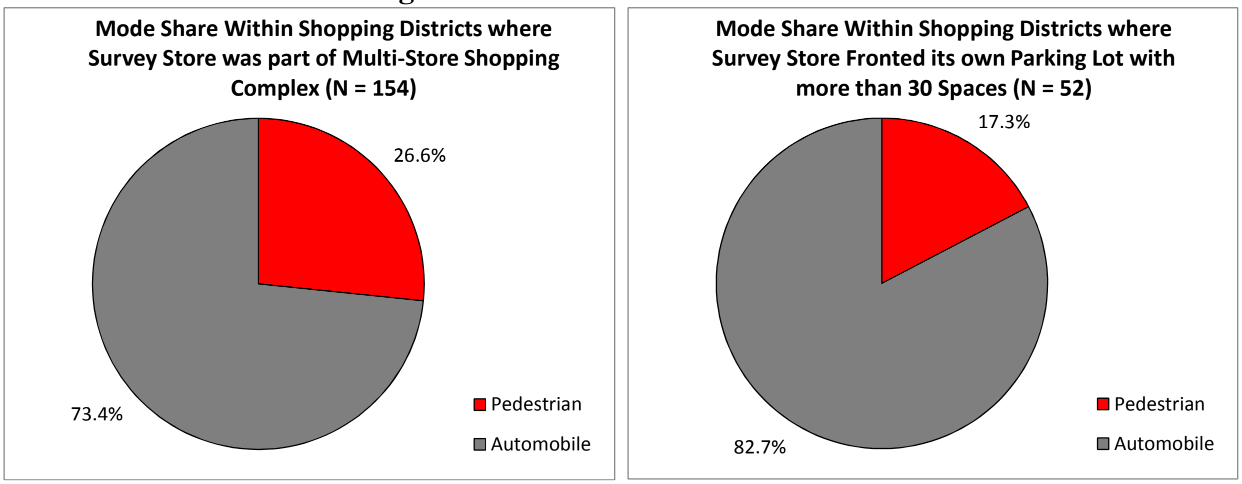


<u>Multi-Store Shopping Complex with Shared Parking</u>

After controlling for travel factors and other characteristics of the shopping district, the choice to walk rather than drive between stops was significantly associated with the retail pharmacy survey store being part of a multi-store shopping complex with shared parking. All nine of the shopping districts with this type of shopping complex were in suburban areas. While the majority of respondents drove to these shopping districts, many were able to do all of their shopping district activities within the same complex. As a result, some respondents used the walkway along the front of stores or walked through the parking lot to travel from one stop to another. Some respondents did drive from one part of a shared parking lot to another part of the lot to access two different stores, but this was relatively uncommon. This shows the importance of designing multi-store shopping complexes with safe and convenient pedestrian connections between storefronts. In addition, it suggests that there may be potential in some shopping districts to consolidate parking into shared parking structures that serve multiple stores. This reduces the surface area provided for automobile parking and allows to storefronts to be clustered more closely together, making pedestrian connections more convenient.

In contrast, it was more common for people to drive between stops within shopping districts where stores had their own parking lots (Figure 6.11). This may indicate that separate parking lots are a barrier to walking between stores. In some shopping districts where the retail pharmacy store had its own parking lot, parking once and then walking to other nearby stores was discouraged by signs that said, “CUSTOMER PARKING. 30 MINUTE LIMIT. TO ENSURE PARKING FOR OUR CUSTOMERS VIOLATORS MAY BE TOWED.”

Figure 6.11. Mode Share for Shopping Districts with Multi-Store Shopping Complexes and Stores with their own Parking Lots



This analysis did not evaluate parking supply in different shopping districts. It is possible that more people drove within shopping districts when stores had their own parking lot because parking was assumed to be available. However, field visits indicated that an ample supply of parking was available near all stores in shopping districts where stores had their own parking lots and in multi-store shopping complexes. Therefore, differences in parking availability did not appear to drive the association between shared parking areas and a higher likelihood of walking between stores.

<u>Tree Canopy Coverage</u>
Tree canopy coverage was tested in the model, but it was not statistically significant. It is possible that the sample size of walking versus automobile trips within the shopping district was too small to identify a significant association with the tree canopy variable or that the trips between shopping district stops tended to be too short for survey participants to notice the tree canopy. Further research should explore the influence of street tree canopy on walking within shopping districts.

Forecasted Effects of Shopping District Design and Parking Changes
The model includes several shopping district characteristics that could be changed through planning practice. Therefore, as an illustrative example, the model was used to estimate walking and bicycling mode shares for the sample of 286 respondents traveling within the 20 shopping districts under different scenarios[7]. The potential scenarios included: 1) Cluster separated stores around shared parking lots, 2) Consolidate commercial driveways so that there are half as many driveway crossings along the main commercial roadway, 3) Reduce all main commercial roadway speed limits to 25 miles per hour (40 kilometers per hour), 4) Install metered parking in all shopping districts, 5) Make all changes combined (Table 6.6).

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[7] Choice probabilities for each mode were estimated from the model shown in Table 6.5. Panel variable parameters were not used to estimate mode shares.

Table 6.6. Forecasted Mode Share Within Shopping Districts Under Different Scenarios

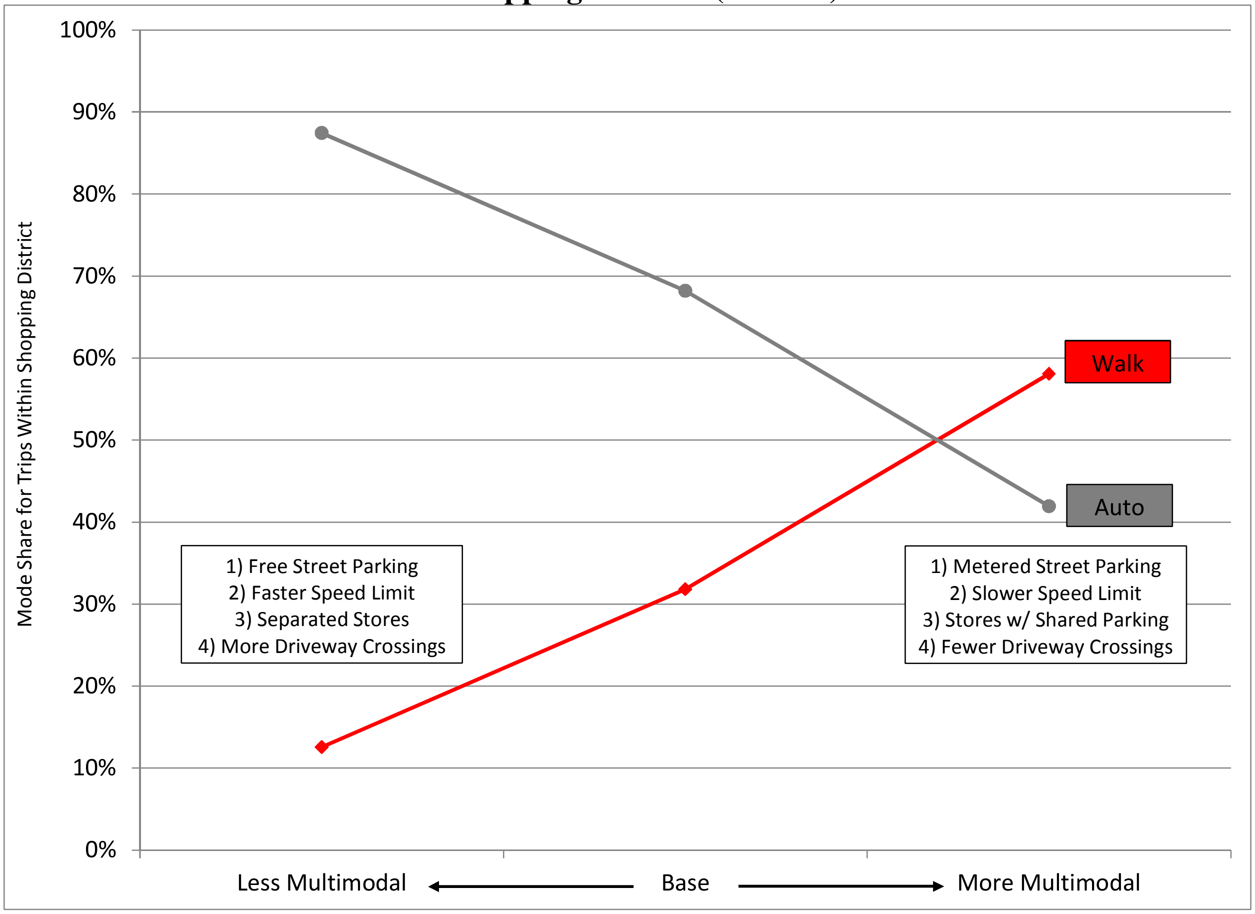
			Potential Changes				
Mode	Survey Data	Base Model Prediction	1) Cluster Separated Stores around Shared Parking Lots	2) Consolidate Commercial Driveways (half as many driveways)	3) Reduce All Speed Limits to 25 MPH	4) Install Metered Parking in All Shopping Districts	5) Make All Changes Combined
Walk	31.8%	31.9%	34.1%	37.8%	37.2%	38.5%	53.8%
Auto	68.2%	68.1%	65.9%	62.2%	62.8%	61.5%	46.2%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Compared to the base model prediction, the combination of all of these changes to the 20 shopping districts could increase the percentage of the 286 sample respondents walking between shopping district activities from 32% to 54%. This shift would eliminate 75 of the 195 automobile tours within the shopping district. Note that the average driving distance between all shopping district stops was 0.39 miles, and the average number of additional stops made by automobile users in the shopping district after their first stop was 1.4 stops. Assuming the typical automobile respondent who shifted modes had these average characteristics, the shift from driving to walking between shopping district stops would eliminate 29 (38%) of the 76 respondent vehicle miles traveled (47 of the 122 respondent vehicle kilometers traveled), and 105 (22%) of the 469 times respondents parked their automobiles in the shopping district.

Note that this forecasted mode shift is an illustrative example based on cross-sectional data. The forecast assumes that each of the variables that are changed would have a direct effect on mode choice. In addition, the forecast does not account for the process of modifying travel behavior habits, so it may overstate the potential impact of the changes. The timeframe for each of these changes is also likely to be different. For example, consolidating commercial driveways would likely require a major roadway reconstruction project, which may take several years to plan, design, and construct. In contrast, speed limits could potentially be changed with a city council vote.

If the four potential changes were made to all of the survey shopping districts, the model indicates that respondent travel would become more multimodal. Doing the opposite of these scenarios (e.g., all stores in shopping district have their own parking lots, twice as many driveway crossings along the main commercial roadway, posted speed limit is five miles per hour (eight kilometers per hour) higher on the main commercial roadway, and free-on street parking in the shopping district) would make respondent travel less multimodal. Figure 6.12 illustrates mode shifts that could occur under more multimodal and less multimodal scenarios compared to the current respondent mode share. The impacts of each of the four individual treatments on automobile mode share are presented in Appendix L.

Figure 6.12. Survey Respondent Mode Shares Under Different Scenarios, Based on Mode Choice Model for Travel Within Shopping Districts (N = 286)



Note: Slower speed limit means that all main shopping district roadways would be 25 miles per hour (40 kilometers per hour). Faster speed limit means that all main shopping district roadways would be posted as 5 miles per hour (8 kilometers per hour) faster.

Policy Implications

This analysis adds to the body of knowledge about the characteristics of trips within developments. Each study shopping district could be considered to be a distinct development for a traffic impact assessment. If this level of geographic analysis were used, all of the trips evaluated in this paper would be internal capture trips. Therefore, this paper shows that many of the internal capture trips within mixed-use shopping districts were actually made by walking, even though shopping district patrons initially traveled to the shopping district by automobile. Further, the arrangement of buildings and parking lots as well as the characteristics of the main roadway within the shopping district can encourage a greater share of the internal trips to be made by walking rather than driving.

The results also suggest two possible strategies for increasing walking within shopping districts. They are appropriate for two distinct types of urban environments.

Pedestrian-Oriented Commercial Corridors (Walkable Main Streets)
The first strategy is to develop walkable shopping streets that have a high level of sidewalk activity and little off-street parking. Storefronts in these districts are typically adjacent to the sidewalk and often have large windows inviting pedestrians to window-shop. Many people walk to these districts from nearby neighborhoods to do shopping and other activities, but most drivers park on the street. This may require automobile users to walk one or two blocks to reach a particular store, but the environment is very pleasant for walking. The main commercial streets in these districts tend to be narrower and have low speed limits. Traffic can be congested at times, but this is a reflection of robust commercial activity. In addition, pedestrians feel more comfortable walking along and crossing the street when cars are traveling more slowly. These types of shopping districts often exist in urban core and older suburban communities. They are often thought of as "Main Street" shopping districts in small towns. In addition to designing pedestrian-friendly shopping streets, more walking can be encouraged by having more housing and jobs within close proximity of these shopping districts. This can be done through redevelopment of surrounding neighborhood areas, but it can also be done by constructing mixed-use additions on top of existing buildings as opportunities arise. Higher densities make it possible for more nearby residents and employees to live close enough to walk and enjoy the pedestrian shopping experience without competing for limited parking space. It also creates a greater local customer base for the businesses located in the shopping district.

Compact Commercial Hubs with Shared Parking (Shared Parking Oriented Development)
The second strategy is to create clusters of stores around shared parking areas so that it is convenient to park an automobile once and then walk between activities in the shopping district. A term for this type of district is a "Shared Parking Oriented Development"[8]. The parking area may be a surface lot or a multi-level parking structure. In either case, pedestrian access through the parking area is encouraged by slow speeds and designated pedestrian walkways. The main corridors for pedestrian activity are sidewalks between storefronts. These sidewalks can be enhanced by benches, public gathering spaces, and landscaping. Ideally, store entrances are located within close proximity of each other and can be accessed without crossing through the main parking area. This is in contrast to many existing suburban shopping centers that consist of several separated buildings, each surrounded by their own parking lot.

These shared parking shopping districts can also benefit from higher residential and employment density nearby. This may be done by constructing mixed use additions on top of existing commercial buildings or developing new residential and office buildings on portions of existing parking lots and consolidating parking into structures. It can also be done by increasing job and population density on the periphery of the shopping complexes. As with the main street shopping districts, these changes allow more people to live within walking distance of stores and increase the local customer base for stores in the shopping district. Since many shopping districts that are accessed mainly by automobile are currently surrounded by high-volume arterial roadways, it is critical to slow automobile traffic and provide safe and convenient pedestrian

[8] The term "Shared Parking Oriented Development" was suggested by Professor Marc Schlossberg (University of Oregon) in an informal conversation at the Transportation Research Board Transportation Systems for Livable Communities Conference, Washington, DC, October 18, 2010.

crossing facilities to increase non-motorized connectivity to stores and other activities in these commercial hubs.

6.8. CONSIDERATIONS AND FUTURE RESEARCH

Several aspects of the analysis of travel within shopping districts could be expanded in the future. These are discussed below. Additional considerations related to the study as a whole are described in Chapter 8.

The density of driveway crossings along the main commercial roadway, posted speed limit along the main commercial roadway, clustering of stores around shared parking lots, and presence of metered street parking have been explored in only a few other studies. These characteristics were shown to have significant associations with walking rather than driving within the shopping district. However, there is a need to make more detailed measurements of these variables and test them in a greater number and variety of shopping districts.

The model in this chapter identified significant associations between store area variables and the likelihood of walking rather than driving between stops within shopping districts. However, it does not guarantee causal relationships. Making retail corridors and surrounding areas more attractive to walking may not increase pedestrian activity directly. However, as urban planners develop more pedestrian-friendly shopping streets with fewer driveway crossings, slower-speed traffic, and shorter distances between building entrances, it is likely that more people who drive to shopping districts will choose to walk between stores. In addition, these shopping districts may become more attractive to prospective shoppers who like walking and prefer an active lifestyle. Additional research is needed to determine the likely magnitude of shifting short shopping trips from driving to walking due to specific actions.

6.9. CONCLUSION

This study of mode choice within shopping districts suggests that planning practice can help transform shopping districts into places where people choose to walk rather than drive between activities. Shopping district characteristics provided valuable information for understanding why retail pharmacy store survey respondents chose to walk for short trips in the district. A combination of metered on-street parking, slower posted speed limits, fewer driveway crossings, and limited off-street parking created a supportive environment for walking between stores, particularly in Urban Core and Suburban Main Street shopping districts. In lower-density areas where automobile access to the shopping district is common, walking within the shopping district tended to be more common when stores were clustered around a shared parking area. Therefore, the results support two general strategies for encouraging walking within shopping districts: 1) design pedestrian-friendly commercial streets that have low-speed traffic, limited off-street parking, and metered on-street parking, and 2) create compact, walkable commercial hubs around shared parking areas.

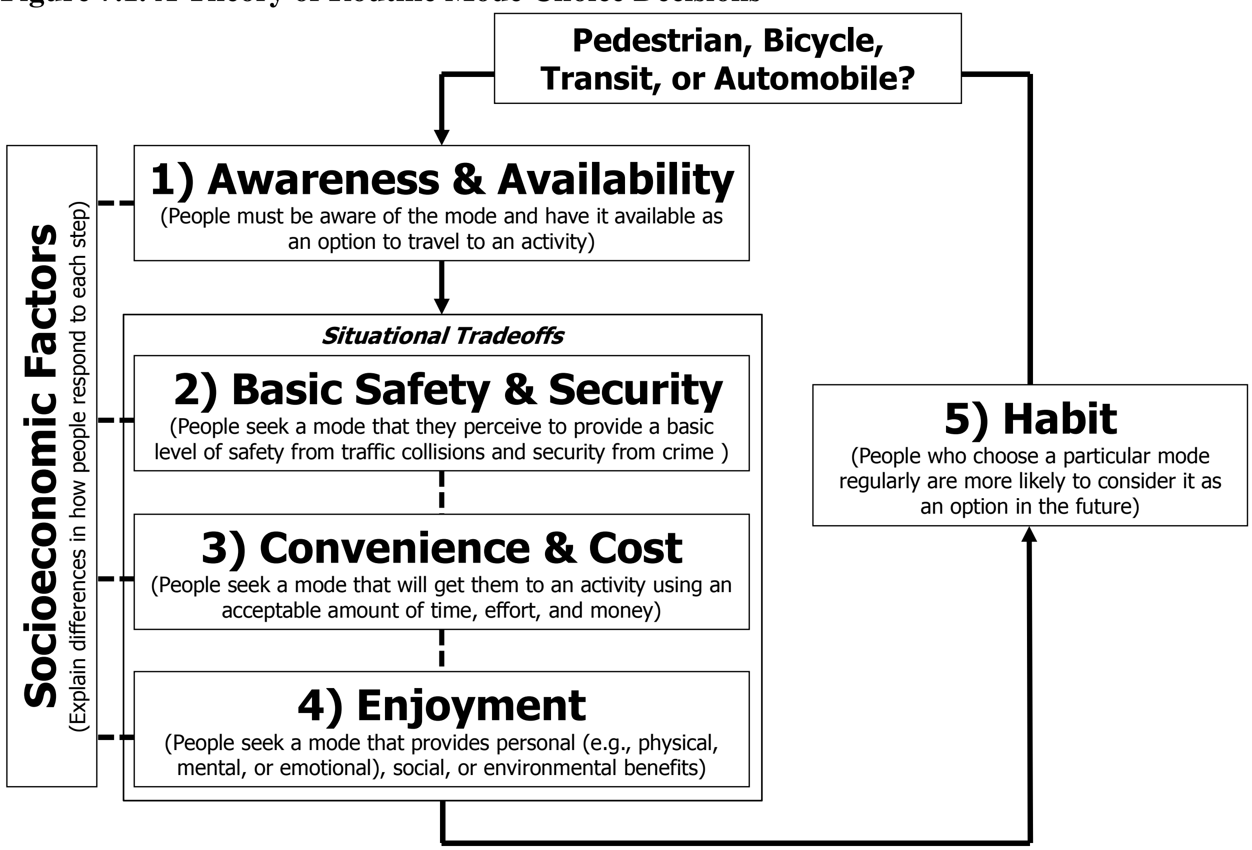
CHAPTER 7. THEORY OF ROUTINE MODE CHOICE DECISIONS

This chapter presents an overall theory of how people choose transportation modes. Understanding this process is important for developing urban planning strategies that may have the greatest potential to reduce driving and increase walking and bicycling.

7.1. MODE CHOICE DECISION THEORY

Feedback from the surveys and in-depth interviews made it possible to formulate a theory of how people make mode choice decisions. This Theory of Routine Mode Choice Decisions is illustrated in Figure 7.1. It is intended to provide a framework for planners, designers, engineers, and elected officials to discuss strategies to change community travel behavior.

Figure 7.1. A Theory of Routine Mode Choice Decisions



The proposed theory suggests that there are five key steps in the mode choice decision process. These steps are listed by order of importance, as suggested by most interviewees. The first step, 1) awareness and availability, determines which modes are viewed as possible choices for routine travel. The next three steps, 2) basic safety and security, 3) convenience and cost, and 4) enjoyment, assess situational tradeoffs between modes in the choice set and are supported by many of the statistically-significant factors in the mode choice models. The order of steps two, three, and four is intended to reflect the relative magnitude of these three categories, as emphasized by interviewees, but they may be given different levels of importance depending on the situational context. This order could be tested in the future under various scenarios through ranked preference methods. The final step, 5) habit, reinforces previous choices and closes the decision process loop. Socioeconomic characteristics explain differences in how individuals view each step in the process.

Theoretical Development

This Theory of Routine Mode Choice Decisions was developed from interview responses and survey data from the San Francisco Bay Area. It also draws on previous mode choice theories from the fields of transportation planning and psychology.

Mode Choice Theories from the Transportation Field

Many mode choice studies in the transportation field are based on utility maximization theory. According to this theory, people choose modes to maximize their anticipated utility of travel, which typically involves minimizing total travel time and cost, among other considerations. The utility of walking, bicycling, taking transit, or using an automobile for a particular tour includes a systematic component, which is made up of measurable variables, and a random component. The random component of the utility equation accounts for observer measurement errors and other nuances in travel behavior that result in people not always choosing the mode with the maximum measured utility (Ben-Akiva and Learman 1985; Meyer and Miller 2001; Handy 2005; Train 2009).

Many categories of variables have been explored within this utilitarian mode choice framework. Some of the most common variables used for mode choice models are travel time and travel cost of available modes and the socioeconomic characteristics of travelers (e.g., household size, automobile ownership) (Meyer and Miller 2001). The Theory of Household Decisions suggests that routine mode choices depend on the utility of using each available mode at a given time on a given day, but they also depend on longer-term choices such as mobility and lifestyle (e.g., home location, automobile ownership) (Ben-Akiva and Bowman 1998).

Ecological theories use a utilitarian framework that includes explanatory variables from the surrounding human and natural environments (Lee and Vernez-Moudon 2004; Handy 2005). Environmental factors may be at different geographic scales, including site-, neighborhood-, or community-levels (King *et al*. 2002). Examples of environmental factors associated with walking and bicycling rather than driving include higher population density, higher retail density, greater land use mix, and more bicycle facilities (Jonnalagada *et al*. 2001; Cervero and Duncan 2003; Dill and Carr 2003; Ewing and Cervero 2010). Sallis *et al*. (2006) propose an ecological framework that also includes policy influences (e.g., laws, guidelines, codes).

Recent transportation research has shown that mode choices may be related to normative attitudes, such as the desire to choose a non-motorized mode because it is good for the environment (Kitamura, Mokhtarian, and Laidet 1997; Mokhtarian and Salomon 2001). Personal enjoyment (e.g., obtaining physical exercise, breathing fresh air, having time to be alone with nature) can also be associated with bicycling and walking (Handy, Xing, and Buehler 2010). Social and cultural influences are also related to mode choice. For example, some people choose to drive because a car shows their social status (Mokhtarian and Salomon 2001; Dugundji and Walker 2005).

While the proposed Theory of Routine Mode Choice Decisions is not based exclusively on utility maximization theory, the mode choice process assesses the basic safety and security, convenience and cost, and enjoyment of available modes. Tradeoffs between modes evaluated during these three steps can be considered a utilitarian choice.

Mode Choice Theories from the Psychology Field

Research in the transportation field has focused mainly on measurable factors associated with mode choice. However, these measures often describe observable variables without attempting to explain the cognitive process involved in selecting a travel mode. Psychological theories focus on this cognitive process. For example, the Theory of Planned Behavior (TPB) emphasizes social behavioral controls that modify a person's original intention and influence the actual travel mode that is chosen (Bamberg and Schmidt 1998; Lee and Vernez-Moudon 2004; Montaño and Kasprzyk 2008). The Transtheoretical Model (TTM) describes processes involved in changing to a more healthy behavior, such as walking or bicycling rather than driving (Prochaska, Redding, and Evers 2008). These processes include several elements similar to steps of the proposed Theory of Routine Mode Choice Decisions, including raising consciousness (similar to awareness), making a firm commitment to change (similar to habit), and recognizing that social norms are supporting the healthier behavior (similar to enjoyment). However, the TPB and TTM tend to represent a thought process related to performing a particular behavior (typically a normative goal) rather than choosing between alternatives.

Schwartz and Howard (1981) proposed a Model of Normative Decision-Making (NDM) that can be used to explain mode choices made for altruistic, environmental reasons. This theory involves four main stages: 1) attention, 2) motivation, 3) evaluation, and 4) decision. Attention includes awareness and availability of a mode and also includes consideration of the environmental consequences of using a mode. Motivation encompasses acting consistently with a personal value system, meeting social expectations, and achieving "non-moral" motives (i.e., save money or time, feel comfortable and safe). Evaluation weighs the benefits and costs of each component of the motivation stage. Finally, a decision to use a particular mode is made if the benefits and costs show a clear preference for the mode. Klöckner and Matthies (2004) added the concept of habit to the NDM so that it applied to repeated, not necessarily altruistic, mode choices. While the NDM is not formulated as a five-step feedback loop, it contains most of the elements of the proposed theory.

Recently, efforts have been made to integrate more situational influences, or utilitarian factors, into psychological theories (Klöckner and Friedrichsmeier 2011). The Comprehensive Action Determination Model (CADM) was used to represent university students' choices of using an automobile versus other travel modes (Klöckner and Blobaum 2010; Klöckner and Friedrichsmeier 2011). The CADM includes four main components, including intentional influences (similar to awareness), normative influences (similar to enjoyment), situational influences (similar to basic safety and security and convenience), and habitual influences (similar to habit).

The Practical Cycling System Design Model (PCSDM) is a psychological theory oriented towards practitioners. Smith, Wilson, and Armstrong (2011) developed this theory as a part of an effort to increase bicycling for routine travel purposes in New Zealand. It draws on Diffusion of Innovations theory (Rogers 2003) and the Contemplation of Change Model (Sullivan and O'Fallon 2006) and includes three steps that are necessary to increase bicycling mode choice: 1) "Plant the cycle seed," 2) "Make it easy to choose to ride a bicycle," and 3) "Create a pleasurable experience." The first step involves raising awareness, the second suggests the importance of convenience, and the third emphasizes enjoyment. While this theory emphasizes concerns about perceived safety differently and has less focus on the relative utility of bicycling versus walking, public transit, and automobile modes than the proposed Theory of Routine Mode Choice Decisions, its steps are in a similar order. In addition, like the proposed theory, the PCSDM is designed to explain routine travel. It is likely that the three steps of the PCSDM could also apply to the choices of other modes.

Components of the Theory of Routine Mode Choice Decisions

While the proposed Theory of Routine Mode Choice Decisions has similarities to other theories, the details of its five steps are different from previous research. The steps were designed to be understood and described easily by practitioners and policy makers. The theory was originally derived from key mode choice themes expressed by interviewees in the San Francisco Bay Area, but previous travel behavior research and survey responses also provide evidence of the importance of its five steps. These steps are described in detail below.

<u>1. Awareness and Availability</u>. People must be aware of a mode and have it available as an option to travel to an activity. The important connection between awareness and mode choice has been emphasized in several recent travel behavior studies (Brög, Erl, and Mense 2002; Dieleman, Dijst, and Burghouwt 2002; Rose and Marfurt 2007; Outwater *et al*. 2011). For example, some people automatically choose to use an automobile any time they run errands, so walking or bicycling are not possible mode choices for them.

Survey respondents in urban communities were more aware of alternatives to traveling by automobile than suburban communities. For example, participants who lived within two miles (3.2 km) of the survey store were considered to be within possible walking or bicycling distance. However, 85 of 215 (40%) of Suburban Thoroughfare respondents and 23 of 74 (31%) Suburban Shopping Center respondents within possible walking or bicycling distance only considered traveling by automobile to the store. Participants traveling to shopping districts in denser, urban areas were more willing to use a variety of modes—only 49 of 325 (15%) of Suburban Main Street respondents and none of 122 (0%) of the Urban Core respondents living within two miles (3.2 km) of the store considered just using an automobile. Urban residents may be more aware of the options of walking and bicycling for routine travel because they tend to see their neighbors using these modes more regularly than suburban residents.

Interview respondents suggested the importance of awareness for encouraging walking and bicycling:

- "So if one person starts cycling, and everyone starts seeing it, everyone will start cycling." *--Male, Age 40-49, Pleasanton*
- "He rides his bike because the cost of gas and he's an environmental major…his attitude really did change when he became aware." *--Female, Age 52, San Carlos*

- "Just hop in the car...jump in, get where I'm going, and don't think about anything else." *--Female, Age 30-39, Daly City*
- "Working people that are driving…don't have the mind to think, 'Am I doing things right?' You are just surviving." *--Male, Age 30-39, Berkeley*

Mode availability is also a key component of the first step. The role of automobile ownership in determining automobile use has been noted by Van Acker and Witlox (2010). Bicycle ownership and availability is hypothesized to have a similar role in the mode choice decision process. Several interviewees emphasized the role of vehicle availability in mode choice decisions:

- "Some may simply have no vehicle. I know friends who have never driven...they take public transportation and have all their lives." *--Male, Age 55, San Francisco Third Street*
- "We only have one bike in the house, so when I have friends in town, walking, BART, and bus are the only options." *--Male, Age 30-39, San Francisco Mission Street*
- "I am unemployed and can't afford to buy a bicycle." *--Female, Age 20-29, San Francisco Market Street*

<u>2. Basic Safety and Security</u>. People seek to travel to activities using a mode that they perceive to provide a basic level of safety from traffic collisions and security from crime (Handy 1996; Saelens *et al.* 2003; Clifton and Livi 2005). This stage is similar to the safety, or self-preservation, tier in an adapted version of Maslow's Hierarchy of Needs (Kenrick *et al.* 2010).

Some interviewees mentioned that roadways with high-speed and high-volume automobile traffic prevented them from considering walking to nearby destinations because they were concerned about safety:

- "I can't walk there because of the cars that are speeding on Bayshore…and it really bothers me because it's the one little green open space that I could walk to…within 500 yards of my house, but I can't get there because of the traffic." *--Female, Age 40-49, San Francisco Third St.*
- "If there was less traffic…I probably would walk even more." *--Male, Age 30, San Francisco Fillmore Street*

Similarly, many interviewees did not consider bicycling because they perceived that riding to activity destinations using the existing system of streets, bike lanes, and paths had a high risk of being struck by an automobile:

- "I wouldn't mind having a bike, but there's so many cars in the City, and people are getting hit all the time...there's kind of a safety factor...My work is actually close enough that I could bike, but...there's so much traffic and cars, I think it would be scarier than driving." *--Male, Age 30, San Francisco Fillmore Street*
- "I'm not a skilled bicyclist…on the road, so I don't really feel safe at all." *--Female, Age 30-39, Daly City*
- "Right now I wouldn't bicycle. I had a neighbor who had a terrible accident on a bicycle…" *--Female, Age 52, South San Francisco*
- "Bicycling itself…I would do it if I wasn't right up next to cars." *--Female, Age 52, South San Francisco*

Many participants preferred lower-volume streets and separated bikeways over on-street bicycle lanes:

- "When you drive through the suburbs, you see all of the bike lanes...As a bicyclist, I don't know how safe I would feel riding a bike out on those major arteries because the drivers abuse them. When there aren't cyclists in them they are using them as another lane." *--Female, Age 40-49, Danville*
- "It would be easier if they had certain streets just for biking, I think…They have a lot of bike lanes here, which is good, but I don't think I'd personally feel that comfortable even [bicycling] in the bike lanes." *--Male, Age 30, San Francisco Fillmore Street*
- "If I could ride my bicycle on the sidewalk again, I would probably be more apt to riding my bicycle. But the way it is now, they want you riding your bicycle on the streets makes it not appealing." *--Female, Age 30-39, Daly City*
- "Whether it's the bicyclist's fault or not, the fact of the matter is, it's a very vulnerable position to be if you get in an accident. Again, unless there is public infrastructure that can accommodate bicycles…" *--Male, Age 60-69, Brentwood*

The interviews showed similar results to findings from a survey of bicyclists in the Vancouver, BC region (Winters and Teschke 2010; Winters *et al*. 2010) and a bicyclist route choice study in Portland, OR (Dill and Gliebe 2008). The Vancouver survey showed that concerns about safety had the highest influence on the likelihood that respondents would bicycle and that bicyclists preferred multi-use trails and other bicycle facilities separated from automobile traffic over roadways that required bicyclists to share lanes with motor vehicles. Similarly, the Portland route choice study showed that bicyclists would divert 31% further from the shortest route between activity locations to ride on bicycle lanes, 45% further to ride on bicycle boulevards, and 55% further to use an off-road trail.

Concerns about personal security also prevented interviewees from walking in some neighborhoods:

- "That's how I got mugged, walking from my car to my house…I thought I might be walking more, but when I actually [moved] here, I realized that I couldn't." *--Female, Age 40-49, San Francisco Third Street*
- "We don't live in a world that is as safe as it used to be…That's why most parents don't have their children biking around or walking out on the streets alone." *--Female, Age 40-49, Danville*
- "When you are walking in this neighborhood, there's nobody else walking. You look like a target here." *--Female, Age 40-49, San Francisco Third Street*

The secondary model in Chapter 5 showed that survey participants who perceived a higher risk of crime in the shopping district were more likely to drive on their tours. In addition, some interviewees did not bicycle because their bicycle had been stolen or they were concerned about their bicycle being stolen.

<u>3. Convenience and Cost</u>. People seek to travel to activities using a mode that requires an acceptable amount of time, effort, and money (Mackett 2003; Cao, Handy, and Mokhtarian 2006; Ewing and Cervero 2010). Convenience may also include having adequate personal space

and personal control over travel movements (Gardner and Abraham 2007). These components of convenience were evident in interviews with participants in the San Francisco Bay Area.

Two overarching factors were identified from the interviews as having the greatest influence on the convenience and cost of walking and bicycling: 1) accessibility of activity locations and 2) availability and price of automobile parking (Figure 7.2). First, better accessibility (i.e., shorter distances between activity locations) mitigated many barriers to walking and bicycling. Travel time was viewed as a prominent barrier to walking, bicycling, and using public transit. However, these modes were more time-competitive with or even faster than traveling by automobile when activity locations were nearby. Accessibility also reduced barriers such as travel planning time, having physical limitations, carrying packages, being exposed to bad weather, traveling over hilly topography, and coordinating travel with others. For example, transit planning time included understanding bus routes, schedules, and transfers, and bicycle planning time included identifying the best roads and trails for bicycling. Planning for these modes generally took longer when activities were dispersed and less time when activities were concentrated.

Second, the availability and price of automobile parking was an important determinant of mode choice for San Francisco Bay Area study participants. Shopping districts, employment centers, or other zones with scarce or expensive parking discouraged automobile use. Driving to these areas tended to require more planning time (to develop a parking strategy, such as searching for several blocks to find an open street parking space or paying more money to park in an off-street lot close to an activity location) and travel time (to find an available space and then walk to the activity location).

Figure 7.2. Factors Influencing the Relative Convenience and Cost of Walking and Bicycling

3) Convenience & Cost	
Accessibility of Activity Locations Short distances to activities decrease and long distances to activities increase barriers to walking and bicycling:	**Availability and Price of Automobile Parking** Limited automobile parking increases and plentiful parking decreases barriers to driving:
• Planning time • Travel time • Physical effort • Packages • Bad weather • Hills • Lack of lighting • Traffic risk • Sterile streets	• Planning time • Travel time (searching for spot & walking from parking) • Price (limited parking is often expensive)

The importance of accessibility between activity locations and automobile parking characteristics was highlighted by many interview quotes. Driving tended to be more convenient than other modes for suburban participants because of longer travel distances and plentiful automobile parking:

- "The next grocery store is about 4 to 5 miles away, and I wouldn't think about walking or bicycling." *--Female, Age 40-49, Pleasanton*
- In Walnut Creek "kids can't walk themselves to school…because of the distances." *--Female, Age 50-59, Berkeley*
- "We go to church in Downtown Oakland, and that's a pretty long way to bike." *--Female, Age 50-59, Berkeley*
- "A car ride is more convenient, more flexible than trying to take the bus." *--Male, Age 40-49, Fremont*
- "Living here in the suburbs...you get really used to parking not being an issue. Wherever you go, you can park." *--Female, Age 60-69, South San Francisco*

On the other hand, walking, bicycling, and transit tended to be viewed as more convenient than driving in many urban areas because daily activities were located in close proximity and parking was limited and expensive:

- "Everything for us is like almost walking distance of where we go. I never drive." *--Male, Age 30, San Francisco Fillmore Street*
- "San Francisco is just crowded Downtown, so we just jump on [Muni transit]." *--Female, Age 60-69, San Francisco Taraval Street*
- "The parking...is...the big reason why I walk around my neighborhood. I could drive if I wanted to, but I mean, it's more inconvenient to find my car where I finally found a parking spot. Then go find another parking spot somewhere else...It's faster and more convenient just to walk." *--Male, Age 30, San Francisco Fillmore Street*
- "Parking prices have a lot to do with why I bike up to Downtown Berkeley. You know, it's like, I don't want to pay that much money to park somewhere." *--Female, Age 50-59, Berkeley*
- "I travel less. Because I know coming home, there won't be parking." *--Female, Age 40-49, SF Third Street*

While traffic congestion was mentioned as a nuisance, relatively few interviewees cited it as a barrier that had caused them to switch travel modes, so it was not included as one of the two overarching factors related to convenience and cost. However, mode choice models based on survey data found travel time to be a significant explanatory factor, so additional travel time due to congestion is likely to play some role in choosing between driving or other modes.

This step does not assume that a person will necessarily choose the mode with maximum convenience or minimum cost. A person may use a mode because he or she thinks that it is safer or more enjoyable than other modes, even if it takes a few extra minutes or costs a few cents more.

The basic safety and security and convenience steps of the theory reflect extrinsic motivation to choose a particular mode. Extrinsic motivation has to do with receiving other benefits from doing the activity besides the experience of the activity itself (or avoiding negative consequences from not doing the activity). The activity is simply a means to an end, such as arriving at an activity location. People who are exclusively externally motivated may not care whether they are being healthy, polluting, or putting other people in danger; they may simply want to travel to their destination with the least amount of effort and without getting hurt. However, previous research has shown that people derive benefits from the act of traveling itself (Mockhtarian and Solomon 2001). Therefore, intrinsic motivations are captured by the broad concept of enjoyment.

4. Enjoyment. People seek to travel to activities using a mode that provides them with personal physical, mental, or emotional benefits or makes them feel good about benefitting society or the environment. In addition to these intrinsic motivations, extrinsic motivations to conform to peer expectations or achieve social status are also incorporated into the concept of enjoyment. Intrinsic and extrinsic motivations can occur at several levels, including individual, social, and global (Vallerand 1997). Individual benefits may include personal health (e.g., walking for exercise), social benefits may include status (e.g., driving to show off an expensive automobile), and global benefits may include supporting the natural environment (e.g., bicycling to reduce fossil fuel use and tailpipe emissions).

Many survey respondents said they enjoyed walking and bicycling. 869 (87%) of the 1,000 survey participants who reported their attitude about walking said they enjoyed walking and 603 (61%) of 990 survey participants said they enjoyed bicycling. Interviewees provided many reasons why they enjoyed these modes:

- "I think walking is good exercise." *--Female, Age 50-59, Hayward*
- "I have noticed that my stress level has gone down since I have walked and bussed more than I drive." *--Male, Age 30, Burlingame*
- "We enjoy walking in San Francisco and looking at things...she loves to read restaurant menus." *--Male, Age 50-59, San Francisco Fillmore Street*
- "It's a beautiful block with beautiful trees, and I love walking down that street. I wish every street had trees." *--Female, Age 40-49, San Francisco Third Street*
- "They are doing an ecological service...they are [walking] for the environment." *--Female, Age 52, South San Francisco*
- People bicycle "for exercise, for convenience, and for fun." *--Female, Age 20-29, San Francisco Market Street*
- "[Bicycling is] a good way to get some exercise, and it's less pollution…part of it may be that it's kind of trendy." *--Male, Age 30, San Francisco Fillmore Street*

However, enjoyment of walking or bicycling did not guarantee that survey respondents would use these modes for routine travel to the shopping district. In fact, only 191 (23%) of the 831 survey respondents who reported complete tour data and said they enjoyed walking actually used walking as their primary tour mode, and only 21 (3.7%) of the 576 respondents who said they enjoyed bicycling actually bicycled. It was especially common for interviewees living in suburban areas to walk and bicycle for exercise in their neighborhoods, in local parks, and on nearby trails, but very few used active transportation modes to travel to activity destinations. Some interviewees who enjoyed walking and bicycling even sought out comfortable places to walk and bicycle for pleasure and drove to them.

These findings provide evidence that enjoying the activities of walking and bicycling alone is not enough to get most people to use them for routine travel. Interviews suggested that walking and bicycling may also need to be recognized as options to travel to activity locations, perceived as safe and secure, and viewed as convenient before they are used more frequently.

5. Habit. People who choose a particular mode regularly are more likely to use it as an option in the future (Fuji and Kitamura 2003; Klöckner and Matthies 2004; Loukopoulos and Gärling 2005). For example, someone who has walked or bicycled to the store in the last month is likely to think about these modes as an option for their current tour. However, someone who has driven to all errands over the last decade is unlikely to think of the possibility of walking or bicycling. As people develop routine choices, they do not consider as much available information about other possible modes (Aarts, Verplanken, and van Knippenberg 1997). People who are in the habit of driving are more likely to drive on shorter-distance trips than people who drive less frequently (Gärling, Boe, and Golledge 2000). This may be because habitual drivers perceive walking to require greater effort than people who drive less frequently (Loukopoulos and Gärling 2005). The survey respondents emphasized the importance of habit: 625 of 1,001 (62%) thought that changing the type of transportation that they used on a daily basis would be difficult.

Mode choice habits may be interrupted and reconstructed when people experience significant life changes. Important "life events" include buying a car, getting a driver license, moving to a new town, starting college, or changing jobs (Klöckner 2004). People may be more likely to break a habit and use a new mode of transportation if their personal norms support the new mode (i.e., they believe that the new mode would be a positive change) (Matthies, Klöckner, and Preißner 2006; Eriksson, Garvill, and Nordlund 2008).

Habit is the final step in a feedback loop that increases or limits future awareness of using a particular mode. Of the 736 respondents living within two miles of the survey store, 157 (21%) only considered driving to the store. This habitual automobile use may have prevented interviewees from considering walking and bicycling for routine travel, even though many enjoyed walking and bicycling for recreation. According to several interviewees, habits are an important part of why they or people they know choose certain travel modes:

- "I'm used to using a car. It's easy. I can get in; I can park in my driveway at night. I get in, I go." --*Male, Age 55, San Francisco Third Street*
- "The younger ones—a lot of them drive their cars to high school or to college…That's probably all they know, really." --*Male, Age 30, Burlingame*
- "In the United States actually, we tend to think about the car being the first and the only mode of transportation, and we need to get out of that mindset."
  --Female, Age 40-49, Pleasanton
- "I think that getting into the habit of [walking and bicycling] early makes one…more likely to continue doing them into their later years."
  --Male, Age 55, San Francisco Third Street

The Role of Socioeconomic Characteristics

Previous research has identified many socioeconomic characteristics that are associated with mode choices, including age, gender, household size, employment status, income, household automobile ownership, and physical disabilities (Hanson and Hanson 1981; Berrigan and Troiano 2002; Cervero and Duncan 2003; Kim and Ulfarsson 2008). This Theory of Routine Mode Choice Decisions suggests that socioeconomic characteristics do not have a direct relationship with mode choice, but they influence each step in the decision process. For example, a family living in poverty may not own an automobile or a bicycle, so their only available modes are walking or public transit. An individual with disabilities may be more sensitive to traffic crash or crime risk while walking because they are not able to move quickly to avoid automobiles or evade perceived security threats. A parent with young children who works at a demanding job may have significant time constraints that make the convenience of driving more important than the social and environmental benefits of walking or bicycling. Socioeconomic characteristics can also influence the enjoyment of certain modes. At one extreme, women may not enjoy bicycling or driving in some societies because cultural norms and laws forbid them from doing these activities. More subtly, a resident living in poverty may not enjoy bicycling because many people in his community perceive that bicycling for errands is an indicator of low social status.

Socioeconomic characteristics can also be associated with changing mode choice habits over time. For example, a couple renting an apartment near shopping, work, social, and other activities in a neighborhood that is served by a good local bicycle network and frequent transit service may be able to travel easily without owning an automobile. In this situation, they may have developed habits to walk and bicycle for routine travel. However, the couple may make a long-term decision to take higher-paying, more demanding jobs and have a child. Under these new household size and income conditions, the couple is likely to re-examine their mode choice habits. Their new time constraints and need to travel with a child may make driving attractive enough to purchase an automobile. They may even choose to purchase a house in a residential subdivision on the periphery of the urban area, which would likely result in a full re-examination of their mode choice habits. While some of their habits to walk and bicycle may remain, it is likely that the relative attractiveness of traveling by automobile in their new suburban setting would increase their driving frequency and could lead to more habitual driving in the future.

Order of Basic Safety and Security, Convenience and Cost, and Enjoyment Steps

More research is needed to determine the order of the middle three steps in the theory. However, basic safety and security was listed before convenience in the mode choice process. This was done because some study participants avoided walking or bicycling when they perceived them to be too risky, even though these modes could have potentially been more convenient than driving. For example, bicycling appeared to be a very convenient choice for 66 (16.6%) of the 397 survey respondents: they owned a bicycle, traveled only to and from the shopping district, carried one or fewer packages on their tour, did not have a disability, and could have completed their tour faster by bicycle than using any other mode. However, only 3 (4.55%) of these 66 respondents actually bicycled. This low rate of bicycling may have been due partly to 34 (51.5%) of these 66 respondents perceiving that bicycling had a high risk of crashes.

Enjoyment was listed after both basic safety and security and convenience because of the large discrepancy between the proportion of survey respondents who reported enjoying walking and bicycling and the proportion who actually used these modes to travel to and from the store. Since many people enjoyed the activities of walking and bicycling, it is likely that the barriers of lack of awareness, perceived crash and crime risk, and inconvenience prevented these modes from being used for routine travel.

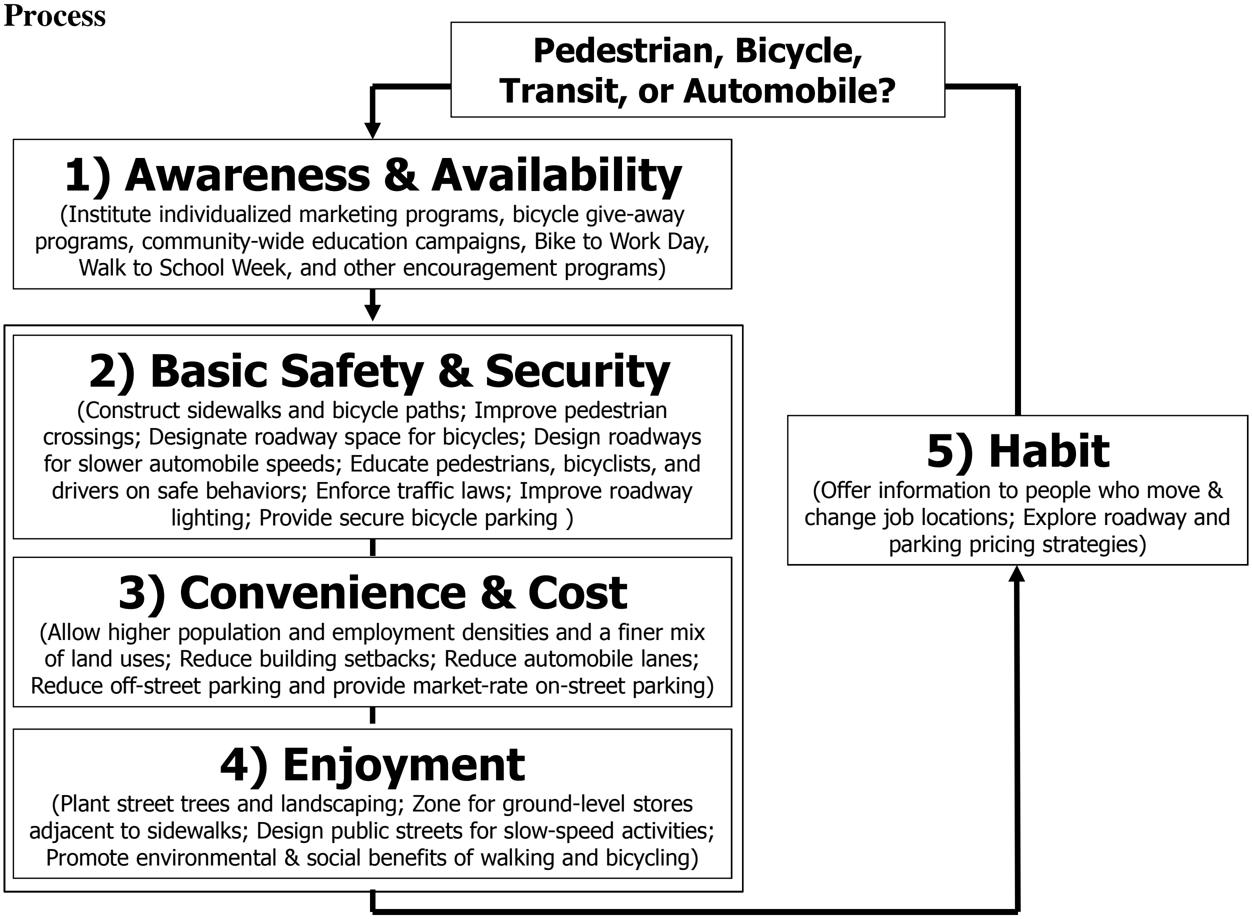
Walking and Bicycling were Important for Understanding the Mode Choice Process
Considering the options of walking and bicycling as possible choices were essential to developing this theory. In contrast to public transit and automobile options, some of the San Francisco Bay Area study subjects did not immediately think about walking and bicycling as possible modes to use for routine travel. This emphasized the importance of awareness in the mode choice process. Discussions about bicycling, in particular, highlighted the importance of perceived traffic safety when considering travel modes. While automobile and public transit networks have been developed over decades to include paved roadways, clearly-defined lanes, designated stops, and efficient intersection controls, bicycle facility networks in the region are relatively new and under development. It is common for a bicycle lane to extend several blocks, end when an additional automobile turning lane or on-street automobile parking is provided, and resume further down a roadway. Lack of accommodation for bicycling in the transportation system may discourage bicycling because people perceive crash risk to be high. Perceptions of traffic crash risk may be less influential in the choice between public transit or automobile options, so this step may have been overlooked by previous mode choice studies that did not include bicycling as an alternative. Many study participants across the San Francisco Bay Area enjoyed the activities of walking and bicycling but did not use them for routine travel because of other barriers. This suggested that enjoyment may not be as critical for routine travel as basic safety and security and convenience. Each of these steps in the mode choice process would have been more difficult to identify if the only modes discussed by interviewees were public transit or automobile.

7.2. PLANNING STRATEGIES TO INCREASE WALKING AND BICYCLING FOR ROUTINE TRAVEL

Understanding each step in the mode choice decision process can help planners, designers, engineers, and other policy-makers implement a comprehensive set of strategies that may be able to increase the attractiveness of walking and bicycling for routine travel. Example strategies related to each of the five steps are shown in Figure 7.3 and discussed below.

<u>1. Strategies to Increase Awareness and Availability</u>. Individualized and social marketing programs can be implemented to make people more aware of walking or bicycling as transportation options. These include targeted efforts, such as meeting with individual people to tell them about walking and bicycling options or actually bicycling with them to work or other activity locations. Awareness strategies also include broader encouragement efforts, such as Bike to Work Day or Walk to School Week. Adding new sidewalks, multi-use trails, bicycle lanes and pavement markings, and bicycle route signs may also make people more aware of the possibility of walking and bicycling for routine travel. Interview participants provided evidence that increased awareness may be effective. Several stated that they walked or bicycled because they had been inspired or encouraged by family members or close friends who used these modes frequently. In addition, teaching people how to ride a bicycle and offering bicycle give-away programs will make the option of bicycling available to more people.

Figure 7.3. Strategies to Increase Walking and Bicycling through the Mode Choice Decision Process



2. Strategies to Provide Basic Safety and Security. Education, enforcement, and engineering actions can be taken to improve the perceived safety and security of walking and bicycling. For example, constructing sidewalks, limiting driveway crossings along commercial streets, providing median crossing islands and other pedestrian crossing improvements, and ticketing drivers who speed and do not yield to pedestrians in crosswalks can reduce traffic safety concerns for pedestrians. Constructing new bicycle paths, designating roadway space for bicycle lanes, installing physical barriers between bicycle lanes and automobile traffic, and designing roadways for lower automobile speeds may help mitigate the perceived danger of bicycling. In addition, educating bicyclists on how to ride confidently according to traffic laws in a roadway environment and drivers about traffic laws related to bicyclists may help reduce the perceived traffic safety risk of bicycling. Perceived crime risk can be reduced by increasing law enforcement and improving roadway lighting. Monitored, secure bicycle racks and storage areas can also help reduce concerns about bicycle theft.

3. Strategies to Improve Convenience and Cost. Several planning strategies are critical for increasing the convenience of walking and bicycling. Long-term land use plans can permit higher housing and employment densities and encourage mixed-use buildings, streets, and neighborhoods. Roadway corridor design plans and standards can focus on reducing automobile through- and turning-lanes, providing on-street parking, and limiting building setbacks so that

entrances are adjacent to the sidewalk. Transportation impact assessments can focus on limiting off-street parking and providing pedestrian and bicycle connectivity from surrounding areas into commercial developments. These actions lead to activities being located more closely in space and to more direct pedestrian and bicycle connections between activity locations. This increases the possibility that people of all abilities in all stages of life can make a full tour to work, stores, and other stops by walking or bicycling in a similar or lower amount of time as using an automobile. Street parking can also be priced to market rates so that driving becomes more expensive relative to walking and bicycling. Other pricing strategies that increase the cost of driving may also improve the relative attractiveness of walking and bicycling.

4. Strategies to Increase Enjoyment. Pedestrian and bicycle travel can be made more enjoyable through physical design. This can include planting more street trees and landscaping, zoning for ground-level stores with windows adjacent to the sidewalk, and establishing more public spaces that are used for sidewalk cafés, street vendors, street performers, and traveling slowly rather than for high-speed automobile throughput. Providing sidewalks and bicycle lanes along roadways improve perceptions of safety, but these facilities can also make the experience of walking and bicycling more enjoyable. Information campaigns that emphasize the personal, social, and environmental benefits of walking and bicycling may also have the potential to build the enjoyment of these modes in a community.

5. Strategies to Build Habits. Strategies to build the habits of walking and bicycling are similar to the encouragement actions that increase awareness of these modes. However, it may be effective to target information about walking and bicycling options to people at specific times in their lives when they are re-examining their mode choice habits, such as moving to a new neighborhood or changing jobs. Individualized marking could be coordinated with through neighborhood welcome campaigns and employers' human resources departments. In addition, gas, parking, or toll price increases may cause some habitual drivers to consider other transportation options. Promotion of walking and bicycling could be increased when these events occur.

7.3. CONCLUSION

The Theory of Routine Mode Choice Decisions proposed in this chapter emphasizes the need for a comprehensive approach to shift routine automobile travel to other modes. Planners, designers, engineers, and other policy-makers should implement strategies that make walking, bicycling, and public transit more attractive at all stages of the mode choice decision process. A limited focus on a single step, such as improving pedestrian and bicycle infrastructure, without increasing awareness of walking and bicycling, decreasing distances to stores, schools, and workplaces, or encouraging community support for active transportation modes may do little to reduce automobile use. However, if pedestrian and bicycle safety and network development projects are coupled with increases in population and employment density, conversion of extra parking lot space into housing or retail stores, and efforts to encourage walking and bicycling as acceptable forms of routine transportation in the community, this set of changes may result in more walking and bicycling. Similarly, increasing automobile parking costs in a main street shopping district may be counterproductive unless there are a sufficient number of residents living within walking distance, safe street crossings, bicycle facility connections, and good transit service to the district so that people can shift from driving to these other modes. It is likely that many of the factors identified in this study have a positive relationship with walking and bicycling because they are part of a broader set of conditions that support pedestrian and bicycle activity. Therefore, comprehensive approaches that address awareness, basic safety and security concerns, convenience and cost, enjoyment, and habits are important for encouraging sustainable transportation.

CHAPTER 8. CONSIDERATIONS AND FUTURE RESEARCH

This dissertation suggests a number of possibilities for future research. New knowledge can be gained from studies that revise and expand upon the existing research scope and explore additional findings that were not related to the main research question or subquestions.

8.1. REVISE AND EXPAND THE STUDY SCOPE

Several aspects of the study could be revised or expanded in the future. These include the study area and survey implementation.

Study Area

The San Francisco Bay Area provided a range of urban and suburban environments for the survey and interviews. However, like any urban region, the Bay Area has distinct characteristics that may be related to transportation mode choices. Local built environments, topography, individual attitudes, and cultural values in these Northern California communities may be different from other regions in the United States and world. Future research could develop models and analyze interview responses in other regions to see if the results of this dissertation are consistent in different geographic contexts.

The moderate climate of the San Francisco Bay Area made it possible to control for the effects of weather on mode choice by only surveying during pleasant conditions. Future studies could incorporate weather variables such as rain, cold, wind, and snow to see how inclement weather affects the utility of walking and bicycling to, from, and within shopping districts.

In addition, the survey was done in shopping districts, so it captured travel for shopping or errands, among other purposes. Future surveys could be done in employment centers, sports and entertainment zones, residential neighborhoods, or recreational areas to capture more complete pedestrian, bicycle, transit, and automobile travel data in other types of locations.

Survey Administration

Several respondents returned to the store after being surveyed because they were picking up photos or prescriptions or because they forgot to purchase an item. Upon doing this, three prior respondents mentioned that they had visited other stops that they had not anticipated going to when they completed the survey. In these cases, no changes were made to the survey stops that had been recorded originally. This was done because there were likely to be other respondents who also added unanticipated stops to their trip before returning home but did not have a chance to report them. It was not possible to know how many people revised their travel plans after completing the survey. However, responses describing when people decided to travel to the survey store provided useful information about unplanned stops. 15% decided to go to the store when they were passing by the store, and 24% decided to go after they left home. Therefore, it was relatively common for people to make additional, unplanned stops on a tour. This highlights a challenge of relying on self-reported travel behavior, especially anticipated future behavior. Errors could be reduced by only analyzing travel data from respondents who stopped at the survey store near the end of their tour.

Global positioning systems (GPS) techniques may be able to collect similar complete tour data, and this technique has been used to document bicycle travel routes and speeds (Dill and Gliebe 2008; Charlton *et al*. 2011). Several challenges for using this type of approach include 1) participants being aware of carrying the devices and possibly modifying their travel behavior to conform with social norms, 2) representative sampling (i.e., if GPS units are used, only a certain type of person may be willing to travel with a device; if tracks from mobile devices are used, the analysis will only represent people who own these devices), 3) difficulty identifying the exact locations of transitions between modes such as walking, bicycling, and public transit based on the recorded speed of movement along a route, 4) missing route data due to loss of contact with satellites, devices being turned off or running out of batteries, or other recording errors, and 5) difficulty collecting sufficient travel data at specific non-home locations. However, this technology would be interesting to pursue through future research. If GPS units were used to collect respondent tour data, survey participants could correct route information and verify the mode used on each stage of their tour in a follow-up interview (Dill and Gliebe 2008).

Most questions on the survey were answered by more than 99% of all 1,003 respondents, but several attitude and perception questions had lower response rates. These included respondent perception of crime risk or crash risk while riding a bicycle in the shopping district during the day or at night (92% to 94% responded), respondent perception of their neighbors' attitudes towards people who walk and people who bicycle (95% responded). As expected, the highest level of non-response was for the household income question, but 90% of respondents were still willing to share this information. Future surveys could be redesigned to improve response rates for certain attitude and perception questions.

Of all 1,003 customers surveyed, 24 reported using a bicycle as their primary mode to travel to the store. Since the main model only considered respondents who mapped their entire tour and made all of their stops in the shopping district, only nine bicyclists were available for this analysis. Therefore, factors associated with bicycling were only evaluated in the secondary model. Future efforts could either increase the survey sample size or supplement the randomly-chosen respondents with an additional sample that only targets bicyclists at each store. Both strategies could gather more responses from bicyclists for more robust statistical analysis.

8.2. EXPLORE ADDITIONAL FINDINGS

The study also generated a number of findings that were not related directly to the main research question and subquestions. Findings related to walking and bicycling for recreation, travel factors, roadway and site design variables, perceptions of crime and crash risk, predispositions toward walking and bicycling, and causal relationships could also be explored through future research.

Walking and Bicycling for Recreation

Most survey respondents enjoyed walking and bicycling. Of 1,000 survey participants who reported their attitude about walking, 869 (87%) said they enjoyed walking, and 603 (61%) of 990 survey participants said they enjoyed bicycling. However, only 204 (21%) of the 959 respondents who reported complete tours used walking and 21 (2.2%) used bicycling as their primary mode. This may be due to study participants viewing walking and bicycling as good for exercise and recreation but not considering walking and bicycling as transportation modes that they would use to access activities. It was especially common for interviewees living in suburban areas to walk and bicycle for exercise in their neighborhoods, in local parks, and on local trails, but not use active transportation modes to travel to destinations for shopping or other errands. Additional research may uncover factors related to safety, convenience, social status, and habit that make recreational walking and bicycling more common than walking and bicycling to routine activities in some communities.

Travel Factors

Several travel factors could be explored in greater depth. These include travel planning time, characteristics of people who only consider traveling by automobile, and the influence of gas prices on mode choice.

- Planning time was an important consideration for choosing a travel mode. Interview respondents suggested that walking, bicycling, and transit took more planning than using an automobile in many suburban parts of the San Francisco Bay Area. However, driving to Downtown San Francisco required thinking about how to navigate through congested streets and plan where to park. Follow-up studies could take an in-depth look at factors that influence travel planning time for each mode in different communities.
- Many respondents considered an automobile as their only transportation mode option for traveling to the survey store. Of the 736 respondents who lived within two miles of the survey store, 218 (30%) did not consider walking or bicycling to the survey store. Automobile reliance was prevalent among people traveling to suburban shopping districts. Additional research could explore the characteristics of people who only consider an automobile for routine transportation.
- Interviewees provided little evidence that the gas price spike during Summer 2008 caused them to walk or bicycle more. All interviewees were aware of the high gas prices, but most automobile users said that they simply traveled less, consolidated their automobile trips, or planned more efficient automobile routes. This may suggest that gas prices were not high enough to make walking and bicycling competitive with driving for most people, that the duration of high gas prices was not long enough for people to make longer-term vehicle ownership and residential location choices that would make walking and bicycling more attractive, or the interview sample did not include participants who actually chose to shift modes. However, out-of-pocket cost was identified as a significant factor associated with public transit and automobile use in the statistical models. Further research could explore how gas, toll, parking, and other price changes impact pedestrian and bicycle mode shares in the short- and long-run.

Roadway and Site Design Variables

This dissertation provided preliminary evidence that several roadway and site design characteristics were associated with walking or bicycling to, from, and within shopping districts. These features included street tree canopy, number of driveway crossings, posted speed limit, and length of bicycle facilities. This is one of the first studies to find statistically-significant associations between these factors and mode choice at a local level. Since the mixed logit models were based on a relatively small number of surveys in 20 different shopping districts, qualitative themes were developed from 26 interviewees, and the study was done in one specific urban region of the United States, additional research is needed to validate and expand on these findings. Ideas for future research on each of these variables are suggested below.

- More tree canopy coverage along multilane roadways in the shopping district was associated with walking rather than driving or taking transit to and from shopping districts. Interviewees also stated that they enjoyed walking in neighborhoods with street trees. Previous research has also shown that the presence of street trees between travel lanes and the sidewalk makes pedestrians feel more comfortable when walking along a roadway (Landis *et al*. 2001). Yet, tree canopy coverage was tested in the model of travel within the shopping district, but it was not statistically significant. It is possible that the sample size of walking versus automobile trips within the shopping district was too small to identify a significant association with the tree canopy variable or that the trips between shopping district stops tended to be too short for survey participants to notice the tree canopy. Further research should explore the influence of street tree canopy on pedestrian comfort and pedestrian activity levels.
- Fewer driveway crossings along the main commercial roadway in the shopping district were associated with walking rather than driving within the shopping district. This is likely to reflect the discomfort that is caused by automobiles crossing the sidewalk zone and disrupting the pedestrian environment. However, data were not collected on the volume or speed of automobiles using each driveway or specific driveway characteristics such as turning radius or slope. In addition, it appeared that the pedestrian mode share dropped sharply between commercial roadways with less than 30 driveway crossings per mile and more than 30 driveway crossings per mile. However, this threshold requires further analysis with a much larger sample size and greater variety of roadway corridors. Additional studies should explore how pedestrians respond to commercial driveway crossing design and spacing in a variety of roadway corridors.
- Lower posted speed limits on the main commercial roadway in the shopping district had a slightly significant association with walking rather than driving within the shopping district. Interviewees also mentioned that high-speed automobile traffic made them feel less safe when walking. This finding supports previous research showing that pedestrians feel less comfortable walking along roadways with higher traffic speeds (Zein *et al*. 1997; Landis *et al*. 2001). It may also illustrate that pedestrians understand that there is a greater risk of injury in a collision when motor vehicles are traveling faster (UK Department of Transport 1987). Yet, this study only had resources to analyze posted speed limits, which are a proxy for actual traffic speeds. Future studies should collect actual traffic speed data and identify how speed is related to pedestrian and bicycle mode choices in different types of roadway corridors.
- The length of bicycle facilities in the survey shopping district was shown to have a significant relationship with bicycling in the model of tour mode choice. However, the bicycle facility variable did not distinguish between different types of bicycle facilities (e.g., multi-use trails, bicycle lanes, shared lane markings, and bicycle boulevards were all counted as bicycle facilities). Future studies could differentiate between different categories of bicycle facilities and test their associations with bicycle mode choice.
- Nearly all interview respondents reported a fear of bicycling on roadways without designated bicycle facilities, and most preferred lower-volume streets and separated bikeways over on-street bicycle lanes. The interviews provided qualitative evidence supporting findings from the Dill and Gliebe bicycle route choice study (2008), which

showed that bicyclists in Portland, OR would divert 31% further from the shortest network route to ride on bicycle lanes, 45% further to ride on bicycle boulevards, and 55% further to use an off-road trail. Interview responses also supported results from the survey of bicyclists in the Vancouver, BC region (Winters and Teschke 2010; Winters *et al*. 2010), which showed that concerns about safety had the highest influence on the likelihood that respondents would bicycle and that bicyclists preferred multi-use trails and other bicycle facilities separated from automobile traffic over roadways that required bicyclists to share lanes with motor vehicles. Follow-up studies could examine individual factors associated with fear of bicycling on roadways and relative comfort of being separated from moving automobiles. These studies could investigate bicycling experience, driving experience, understanding traffic laws, physical ability, demographic characteristics, attitudes about how roadway space is used, and other factors.

- Smaller store parking lots and metered parking in the shopping district were negatively associated with automobile mode choice. Parking availability and cost were also emphasized as key mode choice factors by interviewees. Future mode choice studies could explore more detailed parking variables, including parking availability in shopping district parking lots and on adjacent streets, the price of nearby parking garages, and the hourly rate for on-street parking at different times of day.

Perceptions of Crime and Crash Risk

More research is needed to explore perceived crime and perceived crash risk variables.

- Perceptions of crime risk were associated with a higher likelihood of driving in the model of all respondent tours. This suggests concerns about personal security may deter walking and bicycling, which is consistent with feedback from interviewees who lived in communities with higher levels of crime. However, perceived crime risk was not a significant variable in the model of tours only to and from the shopping district. Additional studies could seek gain a better understanding of which types of crime may have the closest relationship with perceived crime and actual mode choices.
- Perceptions of pedestrian crash risk had a counterintuitive result in both tour models. It showed that people who walked on their tours were more likely to perceive a higher risk of pedestrian crashes in the shopping district. This finding may reflect that pedestrians are more familiar with the risks of walking in roadway environments that have been designed mainly for automobile travel. Yet, it could also reflect that respondents did not actually report their true perception of pedestrian crash risk on the survey or indicate that other important variables are not being captured in the model. In order to improve measures of pedestrian crash risk perceptions, future research could ask multiple questions about different aspects of pedestrian risk, such as fears about walking near traffic lanes with high volumes and speeds, concerns about crossing streets and driveways, or worries about drunk or distracted drivers.

Predisposition Towards Walking or Bicycling

The results shed additional light on the influence of self-selection, or predisposition towards walking or bicycling, on travel behavior. Respondents who walked or bicycled to and from shopping districts were more likely to enjoy walking or bicycling. This suggests that people who are predisposed to using active modes of transportation may choose to live and shop in locations where they can walk and bicycle. In fact, some interview participants mentioned that being within walking distance of shops, restaurants, and other destinations was important when they were choosing where to live.

However, in order for self-selection to have an impact on mode choice, people must be able to afford neighborhoods where they can realize their preference for walking or bicycling. For people who can afford few housing choices, the self-selection effect may be minimal. Results also showed that different types of urban environments may affect how people travel. Many interviewees did not think about opportunities for walking or bicycling when they chose where to live. After moving in, the built environment of their community seemed to influence how much they walked or bicycled. In addition, many respondents who used an automobile in one type of built environment changed to walking or public transit when they were in a different type of built environment, even while traveling on the same tour. Longitudinal studies are needed to understand the influence of predisposition towards walking and bicycling on the use of these modes.

Causal Relationships

Some interviewees stated that they would walk more if there were safer street crossings and more destinations nearby and bicycle more if there were paths and streets designated only for bicycles. However, this does not guarantee that these people would actually change their behavior if these changes occurred. Likewise, the models in this study showed significant associations, but they are based on cross-sectional data and do not prove causal relationships. It is possible that habitual driving behaviors could limit the mode shift impact of any particular change to the local shopping district. People with ingrained habits may still not think about walking or bicycling as an option after bicycle lanes are added or parking rates are increased. Previous studies have shown that people who are in the habit of driving are more likely to drive on shorter-distance trips than people who drive less frequently (Gärling, Boe, and Golledge 2000). This may be related to habitual drivers perceiving walking to require greater effort than people who drive less frequently (Loukopoulos and Gärling 2005).

Additional research is needed to determine the likely magnitude of shifts to non-automobile modes due to specific actions. This research should include longitudinal studies that compare communities where a particular strategy has been applied (e.g., charge for on-street parking, increase population and employment density, install new bicycle lanes and pathways) with control communities. Documenting differences over time using this type of experiment can help quantify the magnitude of shifts from driving to walking or bicycling after particular actions are implemented.

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APPENDIX A. SURVEY INSTRUMENT

The following pages include English and Spanish versions of the retail pharmacy store customer intercept survey instrument. When printed, the form was on the front and back of a single 8.5-inch by 11-inch (22-cm by 28-cm) sheet of paper. Different maps were used at each survey site. The example map included in this appendix is from the Mission Street survey site in San Francisco. The survey instrument was reviewed and approved by the UC Berkeley Committee for Protection of Human Subjects.

As mentioned in Chapter 4, people were allowed to participate even if they lived further than two miles from the survey. During the first survey day this screening question was found to disrupt the flow of the survey, so it was not used.

"Hi. Could you help with a short student research survey? It is about transportation." **Survey #:______**

The information you provide on this survey will be used for a UC-Berkeley Ph.D. dissertation on transportation. Your personal responses will be anonymous and will only be analyzed together with other responses. You may refuse to answer any survey question. If you are younger than age 18, you cannot participate in this survey. If you do not live within 2 miles of this store, you cannot participate in this survey. This survey will take approximately 3 minutes to complete.

The first questions gather basic background information. | *i) ☐F, ☐M* *Surveyor use only [The surveyor will make their best judgment of female, male, or unknown]*

1) What is the PRIMARY type of transportation you used to get to the store today? ☐Walk, ☐Bicycle, ☐Bus, ☐BART, ☐Car/Truck, ☐Other_____

2) What type of transportation do you TYPICALLY use to travel to this store? ☐Walk, ☐Bicycle, ☐Bus, ☐BART, ☐Car/Truck, ☐Other_____

3) What types of transportation would you CONSIDER using to travel to this store? (Check all that apply) ☐Walk, ☐Bicycle, ☐Bus, ☐BART, ☐Car/Truck, ☐Other_____

4) # of adults/children in your household? __/__ | 5) # of autos in your household? ___ | 6) # of bicycles in your household? ___

7) Do you own a bus pass? ☐Y, ☐N | 8) Including yourself, how many people are with you on your trip today? ☐1, ☐2, ☐3, ☐4 or more

9) Including this visit, how many times in the last four weeks have you shopped at this store? ☐1, ☐2, ☐3, ☐4, ☐5 or more

10) What is the maximum number of bags/packages you will be carrying on your trip today? ☐0, ☐1, ☐2, ☐3, ☐4, ☐5 or more

11) Are you currently employed/a student? ☐Employed, ☐Student, ☐Unemployed | 12) Do you have physical limitations that prevent you from walking, bicycling, or driving? ☐Y, ☐N | 13) What best describes your age? ☐18-24, ☐25-34, ☐35-44, ☐45-64, ☐Over 64

14) What best describes your total annual household income?
☐Less than $25,000, ☐$25,000 to $49,999, ☐$50,000 to $99,999, ☐$100,000 to $149,999, ☐$150,000 to $199,999, ☐$200,000 or more

The next few questions ask for your opinion.

15) On a scale from 1 (strongly disagree) to 5 (strongly agree), respond to the following statements:

a) "Changing the type of transportation I use on a daily basis would be easy" ___
b) "Changing how people travel is a great way to improve the environment" ___
c) "Walking is an enjoyable activity for me" ___
d) "Bicycling is an enjoyable activity for me" ___
e) "Walking is risky because you could get hit by a car" ___
f) "Bicycling is risky because you could get hit by a car" ___
g) "People in my neighborhood have a positive view of people who walk" ___
h) "People in my neighborhood have a positive view of people who bicycle" ___

The next set of questions gathers information about your trip today, including travel to work, school, shopping, daycare, etc.

16) How many stops (work, daycare, etc.) have you made since leaving home (not including here)? ☐0, ☐1, ☐2, ☐3, ☐4, ☐5 or more | 17) How many more stops will you make after this (not including stopping at home)? ☐0, ☐1, ☐2, ☐3, ☐4, ☐5 or more

18) Will you pay any money for parking, tolls, or transit fares today? ☐Y, ☐N If yes, how much? $___.___ | 19) When did you decide that you would visit this store? ☐Before yesterday, ☐Yesterday, ☐Today before leaving home, ☐After leaving home, ☐Passing by

The questions below will be asked in reference to the map on the back side of this survey form.

20) What city do you live in? ______________________ | 21) What street intersection do you live near? ____________&____________

22) List locations where you have stopped and will stop on your trip: | 23) Based on responses to: "Tell me what type of transportation you used to go between each stop", I will estimate the PERCENT OF TIME the respondent spent using:

Stop #1: City_______________,
Near intersection of ______________ & ______________
Between Home & Stop #1: % of TIME using:
___Walking, ___Bicycling, ___Bus, ___BART, ___Car/Truck

Stop #N: City_______________,
Near intersection of ______________ & ______________
Between Stop #N & Home: % of TIME using:
___Walking, ___Bicycling, ___Bus, ___BART, ___Car/Truck

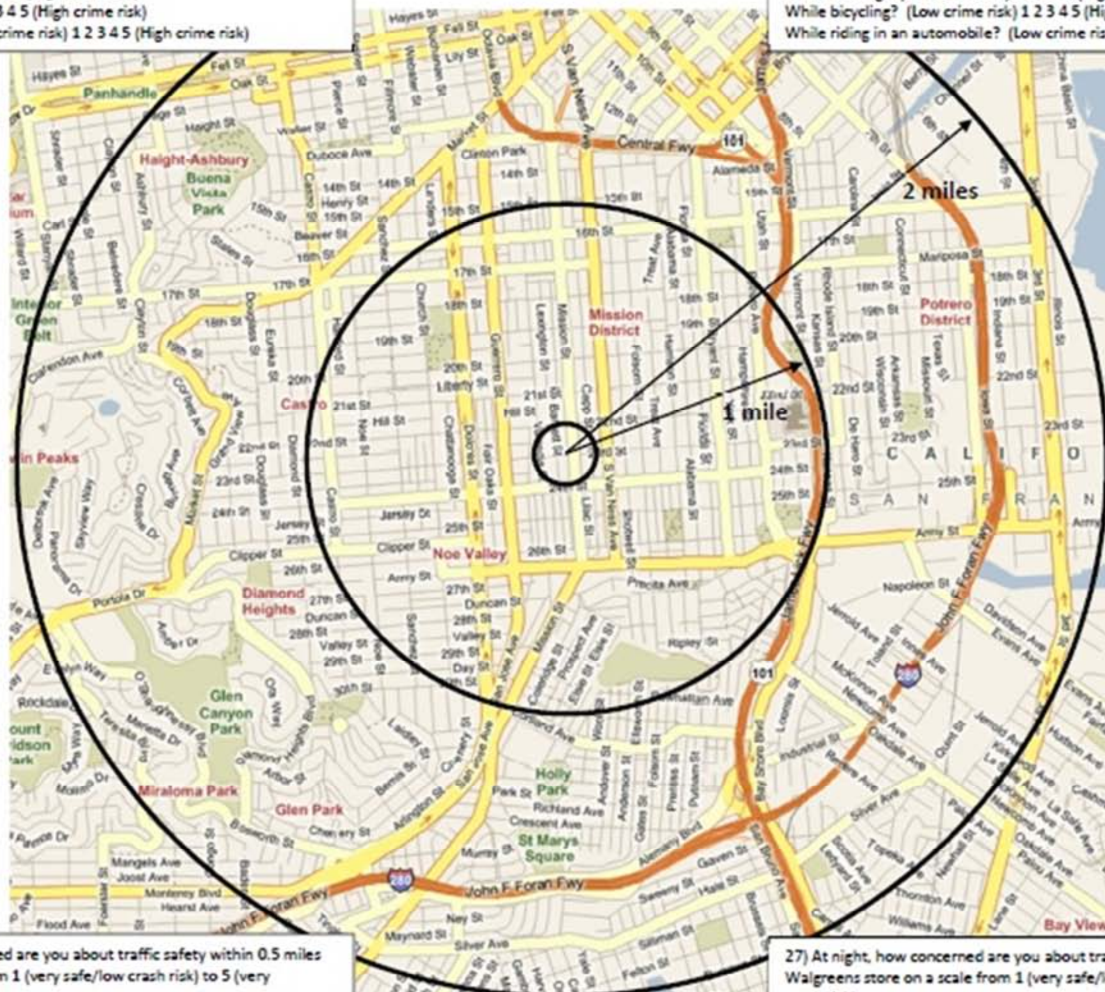
The map below shows all streets within two miles of this store. Please mark an "X" on all locations that you have made stops at in this area (including the intersection near your home). Also draw a line along the roadways and pathways you have used to travel between these locations.

24) During the daytime, how concerned are you about crime within 0.5 miles of this store on a scale from 1 (very secure/low crime risk) to 5 (very unsecure/high crime risk)...

While walking? (Low crime risk) 1 2 3 4 5 (High crime risk)
While bicycling? (Low crime risk) 1 2 3 4 5 (High crime risk)
While riding in an automobile? (Low crime risk) 1 2 3 4 5 (High crime risk)

25) At night, how concerned are you about crime within 0.5 miles of this store on a scale from 1 (very secure/low crime risk) to 5 (very unsecure/high crime risk)...

While walking? (Low crime risk) 1 2 3 4 5 (High crime risk)
While bicycling? (Low crime risk) 1 2 3 4 5 (High crime risk)
While riding in an automobile? (Low crime risk) 1 2 3 4 5 (High crime risk)



26) During the daytime, how concerned are you about traffic safety within 0.5 miles of this Walgreens store on a scale from 1 (very safe/low crash risk) to 5 (very unsafe/high crash risk)...

While walking? (Low crash risk) 1 2 3 4 5 (High crash risk)
While bicycling? (Low crash risk) 1 2 3 4 5 (High crash risk)
While riding in an automobile? (Low crash risk) 1 2 3 4 5 (High crash risk)

OPTIONAL: Are you interested in participating in an optional follow-up interview about your transportation decisions within the next month? If yes, I will record your contact information on a separate sheet.

27) At night, how concerned are you about traffic safety within 0.5 miles of this Walgreens store on a scale from 1 (very safe/low crash risk) to 5 (very unsafe/high crash risk)...

While walking? (Low crash risk) 1 2 3 4 5 (High crash risk)
While bicycling? (Low crash risk) 1 2 3 4 5 (High crash risk)
While riding in an automobile? (Low crash risk) 1 2 3 4 5 (High crash risk)

"Hola. ¿Podría hacerme el favor de tomar esta encuesta? Es sobre el transporte." **Encuesta #:______**

La información que proveerá en esta encuesta será usada en un tesis sobre el transporte urbano por un estudiante trabajando en su doctorado en UC Berkeley. Sus respuestas serán completamente confidenciales. No es necesario contestar cada pregunta. Si usted tiene menos de 18 años o vive a más de dos millas de esta sucursal Walgreens, no puede participar en la encuesta. Esta encuesta solo tomará un promedio de tres minutos.

Información básica. *i) ☐M, ☐H* *Para el uso del encuestador.*

1) ¿Que tipo de transporte usó esta tarde para llegar a la tienda Walgreens? ☐Caminando, ☐Bicicleta, ☐Autobús, ☐BART, ☐Automóvil, ☐Otro___

2)¿Que tipo de transporte usa usualmente para llegar a esta tienda? ☐Caminando, ☐Bicicleta, ☐Autobús, ☐BART, ☐Automóvil, ☐Otro___

3) ¿Que otro tipos de transportación consideraría para llegar a esta tienda? (Note los que le apliquen) ☐Caminando, ☐Bicicleta, ☐Autobús, ☐BART, ☐Automóvil, ☐Otro___

4) ¿# de adultos/niños en su hogar? __/__ | 5) ¿# de automóviles en su hogar? ___ | 6) ¿# de bicicletas en su hogar? ___

7) ¿Tiene un pase del autobús? ☐S, ☐N | 8) ¿Incluyendo a usted, cuantos vienen en su viaje hoy? ☐1, ☐2, ☐3, ☐4 o más

9) ¿Incluyendo esta visita, cuantas veces en las últimas cuatro semanas ha visitado esta sucursal? ☐1, ☐2, ☐3, ☐4, ☐5 o más

10) ¿Cual es el máximo numero de bolsas/paquetes que cargará en su viaje esta tarde? ☐0, ☐1, ☐2, ☐3, ☐4, ☐5 o más

11) ¿Tiene empleo? ¿Estudiante? ☐Con Empleo, ☐Estudiante, ☐Sin Empleo | 12) ¿Tiene limitaciones físicas que no lo/a dejan caminar, ciclar, o conducir? ☐S, ☐N | 13) ¿Cuantos años tiene? ☐18-24, ☐25-34, ☐35-44, ☐45-64, ☐64+

14) ¿Que mejor describe sus ingresos anuales?
☐Más de $25,000, ☐$25,000 a $49,999, ☐$50,000 a $99,999, ☐$100,000 a $149,999, ☐$150,000 a $199,999, ☐$200,000 o más

Sus opiniones.

15) En una escala del 1 (no de acuerdo) al 5 (muy de acuerdo), responda a estas oraciones:

a) "Cambiar mi modo de transporte sería fácil" ___
b) "Cambiar como la gente viaja es un buen modo para mejorar el medio ambiente" ___
c) "Caminar se me hace agradable" ___
d) "Usar la bicicleta se me hace agradable" ___
e) "El caminar es muy riesgoso porque un automóvil me puede pegar" ___
f) "Usar la bicicleta es muy riesgoso porque un automóvil me puede pegar" ___
g) "Gente en mi vecindario tiene buenas opiniones sobre los que caminan" ___
h) "Gente en mi vecindario tiene buenas opiniones sobre los que ciclan" ___

Estas preguntas son sobre su viaje hoy; incluyendo su trabajo, compras, colegio, etc.

16) ¿A cuantos lugares ha visitado (trabajo, colegio, etc.) despues de dejar su hogar hoy (sin incluir este local)? ☐0, ☐1, ☐2, ☐3, ☐4, ☐5 o más

17) ¿A cuantos lugares visitará despues de aquí (sin incluir su hogar)? ☐0, ☐1, ☐2, ☐3, ☐4, ☐5 o más

18) Pagará por estacionamiento, quotas, o tarifas de transporte público hoy? ☐S, ☐N ¿Si respondió *si*, cuanto? $ ___.___

19) ¿Cuando decidió que visitaría esta tienda? ☐Antes de ayer, ☐Ayer, ☐Hoy, antes de salir ☐Saliendo de su hogar, ☐de pasada

Estas preguntas serán usadas con el mapa en la página siguiente.

20) ¿En que ciudad vive? ___________________________

21) ¿Cual cruce de calles le queda más cerca? _______________y_______________

22) Note en los lugares en cuales ha parado en su viaje:

Parada #1: Ciudad_____________________,
Cruce de calles _____________________y_____________________

Parada #2: Ciudad_____________________,
Cruce de calles _____________________y_____________________

23) Basado a la respuesta a esta oracion: "Digame que tipo de transporte usó entre cada parada," Yo estimaré el porcentaje de tiempo que el encuestado/a pasó usando:

Hogar a Parada #1: % de tiempo en:
___Caminar, ___Ciclar, ___Autobús, ___BART, ___Automóvil

Parada #1 y Hogar: % de tiempo en:
___Caminar, ___Ciclar, ___Autobús, ___BART, ___Automóvil

Este mapa muestra todas las calles a dos millas de la sucursal Walgreens. Favor de notar una "X" en todas sus paradas en esta area (incluyendo el cruce de calles más cercano a su hogar). También note una linea sobre las calles que usó entre estas paradas.

24) Durante el día y en una escala del 1 (muy seguro) a 5 (muy peligroso), cuanta preocupación le da el crimen a media milla de esta sucursal Walgreens...

Caminando? (Muy Seguro) 1 2 3 4 5 (Muy Peligroso)
En Bicicleta? (Muy Seguro) 1 2 3 4 5 (Muy Peligroso)
En automóvil? (Muy Seguro) 1 2 3 4 5 (Muy Peligroso)

25) Durante la noche y en una escala del 1 (muy seguro) a 5 (muy peligroso), cuanta preocupación le da el crimen a media milla de esta sucursal Walgreens...

Caminando? (Muy Seguro) 1 2 3 4 5 (Muy Peligroso)
En Bicicleta? (Muy Seguro) 1 2 3 4 5 (Muy Peligroso)
En automóvil? (Muy Seguro) 1 2 3 4 5 (Muy Peligroso)

26) Durante el día y en una escala del 1 (muy seguro) a 5 (muy peligroso), cuanta preocupación le da la posibilidad de un golpe o accidente a media milla de esta sucursal Walgreens...

Caminando? (Muy Seguro) 1 2 3 4 5 (Muy Peligroso)
En Bicicleta? (Muy Seguro) 1 2 3 4 5 (Muy Peligroso)
En automóvil? (Muy Seguro) 1 2 3 4 5 (Muy Peligroso

OPCIONAL: ¿Está usted interesado/a en participar en una entrevista opcional sobre sus respuestas acerca del transporte en el mes que entra? Si responde que sí, tomaré su información en esta otra página.

27) Durante la noche y en una escala del 1 (muy seguro) a 5 (muy peligroso), cuanta preocupación le da la posibilidad de un golpe o accidente a media milla de esta sucursal Walgreens...

Caminando? (Muy Seguro) 1 2 3 4 5 (Muy Peligroso)
En Bicicleta? (Muy Seguro) 1 2 3 4 5 (Muy Peligroso)
En automóvil? (Muy Seguro) 1 2 3 4 5 (Muy Peligroso)

APPENDIX B. SURVEY CONSENT FORM

This appendix includes English and Spanish versions of the survey consent form. This form was given to potential survey participants before they took the survey at the retail pharmacy store sites. The consent form was reviewed and approved by the UC Berkeley Committee for Protection of Human Subjects.

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Consent to Participate in Research
Study Title: *Understanding Mode Choice Decisions: Neighborhood Characteristics and Trip Chaining*

Introduction and Purpose
My name is Robert Schneider. I am a graduate student at the University of California, Berkeley working with my faculty advisor, Professor Robert Cervero in the Department of City and Regional Planning. I would like to invite you to take part in my research study, which concerns people's transportation decisions.

Procedures
If you agree to participate in my research, I will ask you to answer several questions, and I will record your answers on a survey form. The survey will involve questions about how you are traveling today, your perceptions of different forms of transportation, and basic background information, and should take about three minutes to complete.

Benefits
There is no direct benefit to you from taking part in this study. It is hoped that the research will provide detailed information about travel patterns and help communities develop better transportation systems.

Risks/Discomforts
Some of the research questions may make you uncomfortable or upset. You are free to decline to answer any questions you don't wish to, or to stop participating at any time. As with all research, there is a chance that confidentiality could be compromised; however, we are taking precautions to minimize this risk. (*See below for more detail.*)

Confidentiality
Your study data will be handled as confidentially as possible. If results of this study are published or presented, individual names and other personally identifiable information will not be used.

To minimize the risks to confidentiality, we will not collect your name. Subjects will be asked for oral rather than signed consent. In addition, we will not ask you to provide your specific street address. Instead, we will ask the closest intersection to where you live.

When the research is completed, I may save the data for use in future research done by myself or others. I will retain these records after the study is over. The same measures described above will be taken to protect confidentiality of this study data.

Compensation
You will not be paid for taking part in this study.

Rights
Participation in research is completely voluntary. You are free to decline to take part in the project. You can decline to answer any questions and are free to stop taking part in the project at any time. Whether or not you choose to participate, to answer any particular question, or continue participating in the project, there will be no penalty to you or loss of benefits to which you are otherwise entitled.

Questions
If you have any questions about this research, please feel free to contact me. I can be reached at 301-412-9995 or rschneider@berkeley.edu.

If you have any questions about your rights or treatment as a research participant in this study, please contact the University of California at Berkeley's Committee for Protection of Human Subjects at 510-642-7461, or e-mail subjects@berkeley.edu.

Consent
If you agree to participate, please say so. You will be given a copy of this form to keep for your own records.

UNIVERSITY OF CALIFORNIA AT BERKELEY

BERKELEY • DAVIS • IRVINE • LOS ANGELES • MERCED • RIVERSIDE • SAN DIEGO SAN FRANCISCO • SANTA BARBARA • SANTA CRUZ

Consentimiento para Participar en una Investigación
Título del Estudio: ***Understanding Mode Choice Decisions: Neighborhood Characteristics and Trip Chaining (Entendiendo decisiones de modos de Transportación: Características de vecindarios y cadenando los viajes)***

Introducción y Objetivo
Mi nombre es Robert Schneider. Estoy en estudios de posgrado en la Universidad de California, Berkeley trabajando junto a mi consejero académico, Profesor Robert Cervero, en el Departamento de Planificación (DCRP). Lo invito que participe en mis investigaciones sobre las decisiones del transporte que toma el público.

Procedimiento
Si usted participa en mis investigaciones, le preguntaré varias preguntas en forma de una encuesta. Las preguntas serán sobre sus impresiones de los distintos modos de transportación; solo tomará unos tres minutos para completar.

Beneficios
No hay ningún beneficio para usted en participar en este studio. Esperamos que las investigaciones nos darán información sobre patrones del transporte y mejorar los sistemas de transportación municipales.

Riesgos e Incomodidades
Algunas de las preguntas lo/a harán incomodo. Por esa razón, usted tiene el derecho de no responder o parar completamente con la entrevista. Como con todas las investigaciones, existe la posibilidad de que su confidencialidad puede ser violada; le aseguramos que tomaremos todas las precauciones para evitar ese riesgo. *(Mire abajo para más detalles)*

Confidencialidad
Su privacidad será completamente protegida. Si estos estudios son publicados, su nombre e identidad no será usada o divulgada.

Para no violar su privacidad, no tomaremos su nombre y se le pedirá su consentimiento oral. No le pediremos su domicilio, solo el cruce de calles más cercano a su hogar.

Cuando esta investigación termine, existe la posibilidad que yo o otros usarán estos datos para otras investigaciones. Me quedaré con estos datos pero su privacidad siempre será protegida.

Compesasión
No se le pagará por su participación.

Derechos
Su participación es completamente voluntaria. Usted no tiene que participar en estos estudios o responder a todas las preguntas. Si usted decide no participar o responder cualquier pregunta, no será penalizado.

Preguntas
Si usted tiene alguna pregunta sobre esta investigación, llame al 301-412-9995 o mande un correo electrónico a rschneider@berkeley.edu.

Si tiene caulquier pregunta sobre sus derechos, por favor hable con el comité de protección de sujetos humanos de la Universidad de California, Berkeley al 510-642-7461, o por correo electrónico a subjects@berkeley.edu.

Consentimiento
Si usted decide participar, por favor diga que participará oralmente. Se le dará una copia de esta forma para sus archivos.

APPENDIX C. SUMMARY OF SURVEY DATA

This appendix summarizes data provided by the 1,003 people who participated in the survey at the retail pharmacy stores in fall 2009. It includes respondent socioeconomic characteristics, travel behavior, attitudes towards walking and bicycling, and perceptions of traffic safety and crime risk. It also includes several considerations about the survey process.

Socioeconomic Characteristics

The survey respondents had a wide variety of socioeconomic characteristics. As a whole, the majority of survey respondents were female, between ages 35 and 64, and were traveling alone, but there were variations in respondent gender, age, and group size by shopping district (Table C.1). Survey participants were not asked to provide information about their race or ethnic origin. However, nine percent of the surveys were administered in Spanish. The Spanish surveys were concentrated at several store locations, including the Mission neighborhood in San Francisco, International Boulevard in Oakland, and downtown Richmond.

Participants lived in different types of households and had different employment status. 36% lived in households with children, 25% were single with no children, and 24% lived in households with more than two adults. The majority of participants (62%) were employed, but 16% were unemployed, 13% were retired, and 12% were students. Approximately five percent of all respondents were employed students, who were counted as employed and as students.

Survey participants also had a range of annual household incomes. 25% lived in households earning less than $25,000 per year, while 6% lived in households making more than $200,000 per year. There were also many respondents reporting incomes in middle-range categories. Note that 10% of participants did not report their household income.

Most survey respondents had at least one motor vehicle in their household (87%), and most had at least one bicycle (64%). A relatively small portion of respondents owned a bus pass (17%). Approximately 13% of respondents reported having a disability that prevented them from walking, bicycling, or driving. Survey respondents were not asked to specify their disability, so they may have had a disability that prevented them from only one or a combination of all three of these activities.

Some respondents shopped regularly at the survey store, while others did not. 30% had not been to the store at any other time in the past four weeks, while 27% had been to the store five or more times in the past four weeks.

Table C.1. Respondent Gender, Age, and Group Size by Survey Location

							Participant Characteristics[2]																			
Survey Location		Total			Refusals		Language		Gender				Age						Group Size							
Name	County	Weekday Surveys	Saturday Surveys	**Number of Surveys**	# of Refusals	**Response Rate[1]**	Spanish	%	Female	%	Male	%	18-34	%	35-64	%	65+	%	1	%	2	%	3	%	4+	%
Berkeley	Alameda	26	29	**55**	263	**17.3%**	1	1.8%	36	65.5%	19	34.5%	26	47.3%	24	43.6%	5	9.1%	43	78.2%	10	18.2%	2	3.6%	0	0.0%
Oakland	Alameda	27	24	**51**	135	**27.4%**	17	33.3%	31	60.8%	20	39.2%	18	35.3%	32	62.7%	1	2.0%	30	58.8%	14	27.5%	4	7.8%	3	5.9%
Hayward	Alameda	31	23	**54**	123	**30.5%**	5	9.3%	30	55.6%	24	44.4%	19	35.2%	31	57.4%	4	7.4%	39	72.2%	13	24.1%	1	1.9%	1	1.9%
Fremont	Alameda	23	26	**49**	176	**21.8%**	3	6.1%	25	51.0%	24	49.0%	19	38.8%	22	44.9%	8	16.3%	41	83.7%	5	10.2%	2	4.1%	1	2.0%
Pleasanton	Alameda	21	28	**49**	163	**23.1%**	0	0.0%	30	62.5%	18	37.5%	8	16.3%	31	63.3%	10	20.4%	40	81.6%	8	16.3%	1	2.0%	0	0.0%
Danville	Contra Costa	21	24	**45**	112	**28.7%**	0	0.0%	29	64.4%	16	35.6%	9	20.5%	24	54.5%	11	25.0%	39	86.7%	5	11.1%	1	2.2%	0	0.0%
Brentwood	Contra Costa	24	21	**45**	121	**27.1%**	1	2.2%	28	62.2%	17	37.8%	10	22.7%	29	65.9%	5	11.4%	27	61.4%	8	18.2%	6	13.6%	3	6.8%
Concord	Contra Costa	26	21	**47**	174	**21.3%**	6	12.8%	33	70.2%	14	29.8%	14	29.8%	29	61.7%	4	8.5%	32	69.6%	9	19.6%	4	8.7%	1	2.2%
Richmond	Contra Costa	23	28	**51**	140	**26.7%**	15	29.4%	30	58.8%	21	41.2%	21	41.2%	26	51.0%	4	7.8%	26	53.1%	17	34.7%	4	8.2%	2	4.1%
El Cerrito	Contra Costa	25	24	**49**	193	**20.2%**	4	8.2%	29	59.2%	20	40.8%	12	24.5%	31	63.3%	6	12.2%	33	68.8%	10	20.8%	3	6.3%	2	4.2%
SF--Market St.	San Francisco	26	26	**52**	283	**15.5%**	2	3.8%	24	46.2%	28	53.8%	22	42.3%	27	51.9%	3	5.8%	40	76.9%	10	19.2%	2	3.8%	0	0.0%
SF--Fillmore St.	San Francisco	27	26	**53**	225	**19.1%**	1	1.9%	34	64.2%	19	35.8%	17	32.1%	25	47.2%	11	20.8%	42	79.2%	9	17.0%	2	3.8%	0	0.0%
SF--Taraval St.	San Francisco	21	26	**47**	180	**20.7%**	0	0.0%	23	48.9%	24	51.1%	15	31.9%	23	48.9%	9	19.1%	39	83.0%	5	10.6%	2	4.3%	1	2.1%
SF--Mission St.	San Francisco	25	31	**56**	178	**23.9%**	19	33.9%	34	60.7%	22	39.3%	26	46.4%	27	48.2%	3	5.4%	39	69.6%	13	23.2%	3	5.4%	1	1.8%
SF--Third St.	San Francisco	24	25	**49**	121	**28.8%**	6	12.2%	30	61.2%	19	38.8%	12	24.5%	30	61.2%	7	14.3%	40	81.6%	7	14.3%	1	2.0%	1	2.0%
S. San Francisco	San Mateo	26	22	**48**	201	**19.3%**	1	2.1%	25	52.1%	23	47.9%	9	18.8%	31	64.6%	8	16.7%	39	81.3%	6	12.5%	1	2.1%	2	4.2%
Daly City	San Mateo	23	24	**47**	236	**16.6%**	5	10.6%	29	61.7%	18	38.3%	17	36.2%	25	53.2%	5	10.6%	31	66.0%	11	23.4%	4	8.5%	1	2.1%
Burlingame	San Mateo	28	26	**54**	155	**25.8%**	1	1.9%	35	64.8%	19	35.2%	14	25.9%	37	68.5%	3	5.6%	38	70.4%	9	16.7%	4	7.4%	3	5.6%
San Mateo	San Mateo	27	26	**53**	223	**19.2%**	3	5.7%	32	60.4%	21	39.6%	13	24.5%	29	54.7%	11	20.8%	41	77.4%	7	13.2%	4	7.5%	1	1.9%
San Carlos	San Mateo	25	24	**49**	180	**21.4%**	2	4.1%	27	56.3%	21	43.8%	8	16.3%	32	65.3%	9	18.4%	34	69.4%	14	28.6%	1	2.0%	0	0.0%
	Total	**499**	**504**	**1003**	3582	**21.9%**	92	9.2%	594	59.3%	407	40.7%	309	30.9%	565	56.4%	127	12.7%	733	73.4%	190	19.0%	52	5.2%	23	2.3%

1) Response rate was calculated as (Number of surveys/Total number of people invited to participate in survey).

2) The total number of surveys in particular categories may not sum to 1,003 because of non-response to certain questions.

Tour Characteristics
Of the 1,003 completed surveys, 959 (96%) included map data suitable for geocoding and analysis. Overall, the mode used for the longest distance on the 959 respondent tours was automobile (67%), followed by walking (21%), transit (10%), and bicycle (2%). While respondents traveled to the same type of store, there were significant differences in customer mode choice by shopping district. More than 50% of customers walked to three shopping districts in San Francisco, while more than 90% of customers drove to four shopping districts in newer suburban communities. Nearly 15% of customers bicycled to the shopping district in Berkeley (Figure C.1). Of customers who traveled on a tour that was longer than two miles (including visiting the retail pharmacy store and all other stops), 77% used an automobile as their primary travel mode and 9% walked or bicycled. However, for tours shorter than one mile, 22% drove and 78% walked or bicycled.

The 959 respondent tours covered approximately 11,800 miles, including 5,028 activity stops and 4,069 trips. 604 trips had more than one stage, so the total number of stages reported by respondents was 4,945.

The median tour length was 5.21 miles (8.38 km) (average = 12.3 miles (19.8 km)). The median number of stops per tour was four (average = 4.24 stops). Note that a respondent's home location was counted only once as a stop on the tour. 126 (13%) of the respondents made only one non-home stop (e.g., traveled to the survey store and back home), and 11% of respondents made seven or more stops (Table C.2).

Table C.2. Number of Stops Per Tour

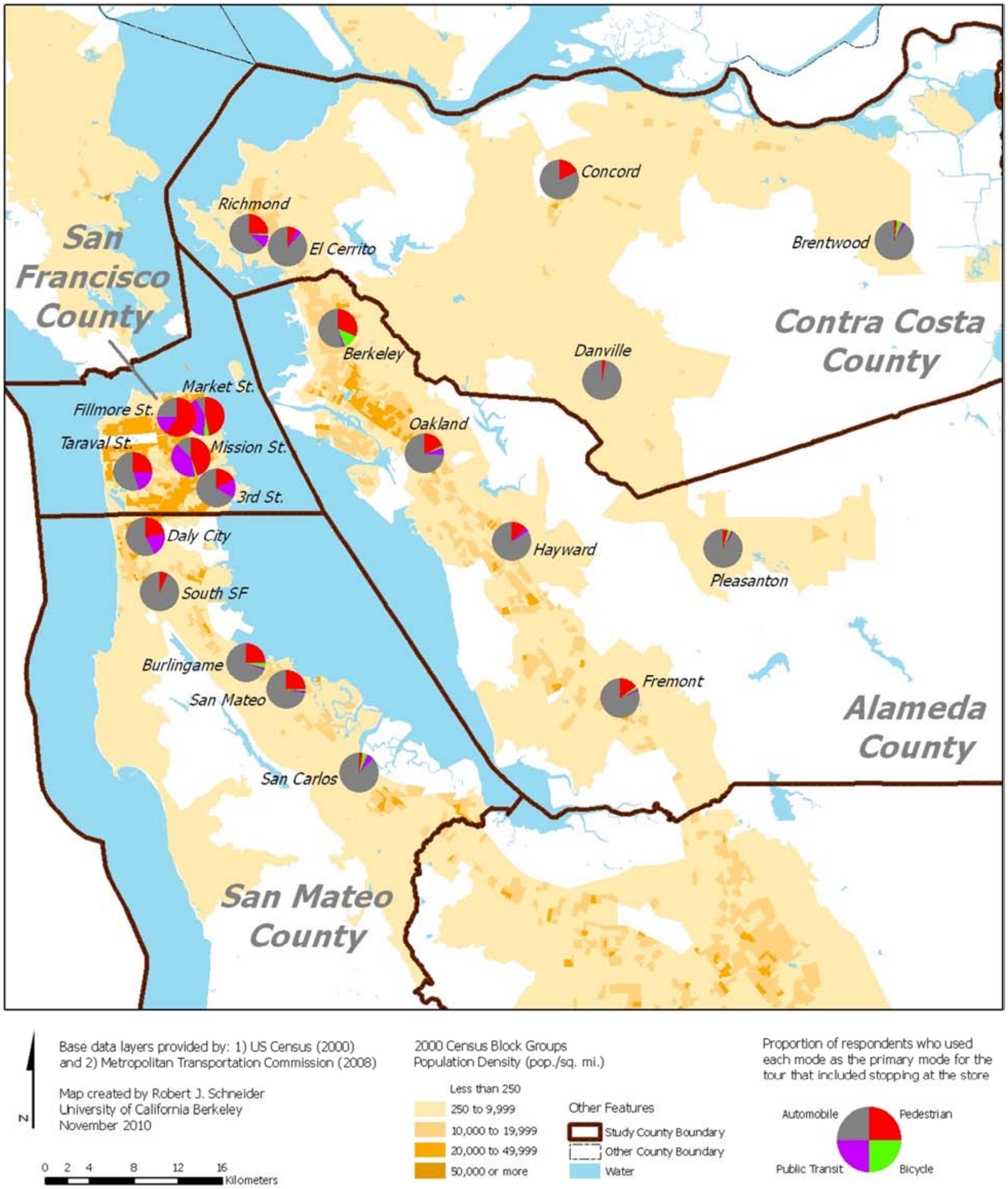
Number of Tour Stops	Number of Tours	Percent of Tours
2	126	13.1%
3	264	27.5%
4	237	24.7%
5	146	15.2%
6	79	8.2%
7+	107	11.2%
Total	959	100.0%

The majority of tours (68%) were made using a single transportation mode (Table C.3). Of the 959 tours, 439 (46%) were done completely by automobile, 188 (20%) were done exclusively by walking, and 20 (2%) were done only by bicycle. However, nearly one-third of tours involved more than one transportation mode.

Table C.3. Number of Modes Used Per Tour

Number of Tour Modes	Number of Tours	Percent of Tours
1	647	67.5%
2	290	30.2%
3	22	2.3%
Total	959	100.0%

Figure C.1. Primary Tour Mode Share for Survey Respondents by Shopping District



Note: 1 mile = 1.61 kilometers
1 square mile = 2.69 square kilometers

Travel Planning

Respondents made the decision to go to the retail pharmacy store at a variety of different times: 9% decided "before yesterday", 10% decided "yesterday", 41% decided "today before leaving home", 24% decided "today after leaving home", and 15% decided when "passing by" the store. These tour characteristics also varied by store location (Table C.4). The San Francisco stores were much more likely to attract customers who were not planning on shopping there when they left home. This may indicate a positive relationship between the amount of pedestrian activity on a street and proportion of impromptu shoppers.

Table C.4. Timing of Decision to go to Retail Pharmacy Store by Survey Location

Survey Location		**Total**	*Timing of Decision to go to Retail Pharmacy Store*									
Name	County	**Number of Surveys**	Before Yesterday	%	Yesterday	%	Today Before Leaving Home	%	Today After Leaving Home	%	Passing By	%
Berkeley	Alameda	**55**	2	3.7%	4	7.4%	25	46.3%	19	35 2%	4	7.4%
Oakland	Alameda	**51**	3	5.9%	7	13.7%	24	47.1%	11	21.6%	6	11.8%
Hayward	Alameda	**54**	2	3.7%	7	13.0%	24	44.4%	13	24.1%	8	14.8%
Fremont	Alameda	**49**	8	16.3%	5	10.2%	16	32.7%	14	28.6%	6	12.2%
Pleasanton	Alameda	**49**	1	2.0%	4	8.2%	25	51.0%	18	36.7%	1	2.0%
Danville	Contra Costa	**45**	4	8.9%	8	17.8%	10	22.2%	21	46.7%	2	4.4%
Brentwood	Contra Costa	**45**	3	6.7%	6	13.3%	24	53.3%	8	17 8%	4	8.9%
Concord	Contra Costa	**47**	6	12.8%	5	10.6%	15	31.9%	15	31 9%	6	12.8%
Richmond	Contra Costa	**51**	7	14.0%	7	14.0%	23	46.0%	6	12 0%	7	14.0%
El Cerrito	Contra Costa	**49**	8	17.4%	10	21.7%	14	30.4%	6	13 0%	8	17.4%
SF--Market St.	San Francisco	**52**	2	3.8%	0	0.0%	15	28.8%	14	26 9%	21	40.4%
SF--Fillmore St.	San Francisco	**53**	5	9.4%	5	9.4%	19	35.8%	11	20 8%	13	24.5%
SF--Taraval St.	San Francisco	**47**	3	6.4%	1	2.1%	21	44.7%	11	23.4%	11	23.4%
SF--Mission St.	San Francisco	**56**	8	14.3%	5	8.9%	18	32.1%	10	17 9%	15	26.8%
SF--Third St.	San Francisco	**49**	7	14.6%	8	16.7%	17	35.4%	6	12 5%	10	20.8%
S. San Francisco	San Mateo	**48**	4	8.3%	10	20.8%	18	37.5%	8	16.7%	8	16.7%
Daly City	San Mateo	**47**	6	13.0%	7	15.2%	21	45.7%	3	6 5%	9	19.6%
Burlingame	San Mateo	**54**	1	1.9%	2	3.7%	30	55.6%	14	25 9%	7	13.0%
San Mateo	San Mateo	**53**	3	5.8%	4	7.7%	32	61.5%	12	23.1%	1	1.9%
San Carlos	San Mateo	**49**	3	6.1%	7	14.3%	19	38.8%	15	30.6%	5	10.2%
	Total	**1003**	86	8.6%	112	11.3%	410	41.2%	235	23.6%	152	15.3%

*The total number of surveys in particular categories may not sum to 1,003 because of non-response to certain questions.

Number of Bags

Approximately 15% of survey respondents reported that they carried no bags on their tour. A majority (60%) carried one bag on their tour. However, some respondents may have interpreted this question to refer only to the number of bags that they had purchased from the survey store or were carrying at the time of the survey. Therefore, some respondents may have not reported other bags or packages that were in their car.

Attitudes

Retail pharmacy store customers represented people with a wide range of ages, incomes, ethnic backgrounds, types of employment, and other characteristics. Therefore, the sample of survey participants provided a good sample of public attitudes towards changing personal travel habits, changing transportation to improve the environment, and towards pedestrian and bicycle transportation modes (Table C.5).

Table C.5., Part 1. Attitudes by Survey Location

Survey Location		Total	*Changing Transportation is Easy*				*Chang ng T anspo tat on s G eat fo Env onmment*				*Enjoy Walking*				*Enjoy Bicycling*			
Name	County	Number of Surveys	Agree	%	Disagree	%	Agree	%	Disagree	%	Agree	%	Disagree	%	Agree	%	Disagree	%
Berkeley	Alameda	**55**	16	29.1%	33	60.0%	51	92.7%	0	0.0%	46	83.6%	3	5.5%	41	77.4%	8	15.1%
Oakland	Alameda	**51**	25	49.0%	23	45.1%	45	88.2%	4	7.8%	46	90.2%	3	5.9%	38	76.0%	9	18.0%
Hayward	Alameda	**54**	19	35.2%	30	55.6%	48	88.9%	2	3.7%	48	88.9%	4	7.4%	33	61.1%	13	24.1%
Fremont	Alameda	**49**	14	28.6%	31	63.3%	45	91.8%	1	2.0%	40	81.6%	6	12.2%	27	55.1%	16	32.7%
Pleasanton	Alameda	**49**	6	12.2%	37	75.5%	43	87.8%	3	6.1%	39	79.6%	7	14.3%	30	65.2%	11	23.9%
Danville	Contra Costa	**45**	8	17.8%	37	82.2%	41	91.1%	3	6.7%	40	88.9%	2	4.4%	27	60.0%	11	24.4%
Brentwood	Contra Costa	**45**	6	13.3%	35	77.8%	42	93.3%	1	2.2%	38	84.4%	7	15.6%	28	62.2%	12	26.7%
Concord	Contra Costa	**47**	13	27.7%	31	66.0%	42	89.4%	3	6.4%	41	87.2%	3	6.4%	24	51.1%	20	42.6%
Richmond	Contra Costa	**51**	22	44.9%	26	53.1%	42	84.0%	2	4.0%	41	82.0%	6	12.0%	36	72.0%	11	22.0%
El Cerrito	Contra Costa	**49**	17	34.7%	26	53.1%	42	87.5%	2	4.2%	36	75.0%	6	12.5%	29	60.4%	10	20.8%
SF--Market St.	San Francisco	**52**	24	46.2%	26	50.0%	48	92.3%	0	0.0%	48	92.3%	3	5.8%	35	67.3%	9	17.3%
SF--Fillmore St.	San Francisco	**53**	19	35.8%	30	56.6%	51	96.2%	0	0.0%	50	94.3%	1	1.9%	30	57.7%	17	32.7%
SF--Taraval St.	San Francisco	**47**	20	42.6%	23	48.9%	44	93.6%	1	2.1%	39	83.0%	4	8.5%	16	34.0%	21	44.7%
SF--Mission St.	San Francisco	**56**	20	35.7%	31	55.4%	50	89.3%	1	1.8%	54	96.4%	0	0.0%	37	66.1%	12	21.4%
SF--Third St.	San Francisco	**49**	18	36.7%	30	61.2%	42	85.7%	4	8.2%	36	73.5%	7	14.3%	26	53.1%	22	44.9%
S. San Francisco	San Mateo	**48**	12	25.0%	30	62.5%	44	91.7%	0	0.0%	42	87.5%	4	8.3%	22	45.8%	17	35.4%
Daly City	San Mateo	**47**	11	23.4%	33	70.2%	41	89.1%	1	2.2%	41	89.1%	1	2.2%	26	57.8%	14	31.1%
Burlingame	San Mateo	**54**	16	29.6%	36	66.7%	53	98.1%	0	0.0%	51	94.4%	0	0.0%	32	59.3%	13	24.1%
San Mateo	San Mateo	**53**	11	20.8%	39	73.6%	48	90.6%	1	1.9%	51	96.2%	1	1.9%	37	72.5%	12	23.5%
San Carlos	San Mateo	**49**	8	16.3%	38	77.6%	40	81.6%	2	4.1%	39	79.6%	6	12.2%	29	59.2%	13	26.5%
	Total	**1003**	305	30.5%	625	62.4%	902	90.2%	31	3.1%	866	86.6%	74	7.4%	603	60.9%	271	27.4%

*The total number of surveys in particular categories may not sum to 1,003 because of non-response to certain questions.

Table C.5., Part 2. Attitudes by Survey Location

Survey Location		Total	*Walking is Risky*				*Bicycling is Risky*				*Neighbors have Positive View of Walking*				*Neighbors have Positive View of Bicycling*			
Name	County	Number of Surveys	Agree	%	Disagree	%	Agree	%	Disagree	%	Agree	%	Disagree	%	Agree	%	Disagree	%
Berkeley	Alameda	**55**	9	16.4%	40	72.7%	29	54.7%	11	20.8%	44	81.5%	2	3.7%	38	70.4%	3	5.6%
Oakland	Alameda	**51**	24	47.1%	20	39.2%	32	65.3%	13	26.5%	31	64.6%	4	8.3%	28	59.6%	7	14.9%
Hayward	Alameda	**54**	11	20.4%	37	68.5%	24	44.4%	22	40.7%	29	55.8%	10	19.2%	24	45.3%	11	20.8%
Fremont	Alameda	**49**	14	28.6%	32	65.3%	25	51.0%	15	30.6%	25	56.8%	8	18.2%	28	63.6%	7	15.9%
Pleasanton	Alameda	**49**	8	16.3%	39	79.6%	20	44.4%	17	37.8%	42	91.3%	0	0.0%	37	82.2%	3	6.7%
Danville	Contra Costa	**45**	6	13.3%	37	82.2%	20	44.4%	22	48.9%	35	83.3%	3	7.1%	31	72.1%	7	16.3%
Brentwood	Contra Costa	**45**	5	11.1%	36	80.0%	18	40.0%	21	46.7%	31	68.9%	3	6.7%	26	57.8%	4	8.9%
Concord	Contra Costa	**47**	11	23.4%	34	72.3%	30	63.8%	13	27.7%	34	75.6%	6	13.3%	31	68.9%	9	20.0%
Richmond	Contra Costa	**51**	25	50.0%	21	42.0%	33	66.0%	12	24.0%	25	52.1%	11	22.9%	19	40.4%	15	31.9%
El Cerrito	Contra Costa	**49**	7	14.6%	33	68.8%	21	44.7%	20	42.6%	33	70.2%	5	10.6%	30	63.8%	7	14.9%
SF--Market St.	San Francisco	**52**	9	17.3%	39	75.0%	24	46.2%	18	34.6%	36	73.5%	4	8.2%	31	63.3%	6	12.2%
SF--Fillmore St.	San Francisco	**53**	7	13.2%	43	81.1%	30	56.6%	16	30.2%	39	75.0%	3	5.8%	26	50.0%	9	17.3%
SF--Taraval St.	San Francisco	**47**	15	31.9%	27	57.4%	32	68.1%	7	14.9%	26	65.0%	3	7.5%	20	50.0%	8	20.0%
SF--Mission St.	San Francisco	**56**	19	33.9%	31	55.4%	42	75.0%	6	10.7%	44	78.6%	0	0.0%	33	58.9%	3	5.4%
SF--Third St.	San Francisco	**49**	14	28.6%	30	61.2%	34	69.4%	11	22.4%	29	59.2%	8	16.3%	32	65.3%	8	16.3%
S. San Francisco	San Mateo	**48**	10	20.8%	32	66.7%	22	45.8%	14	29.2%	35	74.5%	3	6.4%	25	52.1%	12	25.0%
Daly City	San Mateo	**47**	11	23.9%	31	67.4%	26	56.5%	15	32.6%	24	55.8%	8	18.6%	21	47.7%	11	25.0%
Burlingame	San Mateo	**54**	7	13.0%	42	77.8%	28	52.8%	17	32.1%	47	92.2%	1	2.0%	40	78.4%	3	5.9%
San Mateo	San Mateo	**53**	10	18.9%	42	79.2%	29	54.7%	18	34.0%	41	80.4%	5	9.8%	32	64.0%	8	16.0%
San Carlos	San Mateo	**49**	10	20.4%	36	73.5%	22	44.9%	20	40.8%	39	86.7%	2	4.4%	34	73.9%	3	6.5%
	Total	**1003**	232	23.2%	682	68.2%	541	54.6%	308	31.1%	689	72.2%	89	9.3%	586	61.4%	144	15.1%

*The total number of surveys in particular categories may not sum to 1,003 because of non-response to certain questions.

More than 90% of respondents agreed that changing how people travel is a great way to improve the environment. There was a high level of agreement at all stores. The lowest level agreement with the statement was in San Carlos (82%). However, the majority of respondents (62%) also thought that changing the type of transportation that they used on a daily basis would be difficult. Attitudes towards changing individual travel on a daily basis varied by neighborhood: fewer than 20% of respondents living in Danville, Pleasanton, Brentwood, and San Carlos thought that it would be relatively easy to change, but more than 35% of survey respondents in most older neighborhoods in San Francisco and Alameda County thought that it would be relatively easy to change how they travel on a daily basis.

Between 74% and 96% of survey respondents at each store reported enjoying walking. However, enjoyment of bicycling varied much more between stores. While a high proportion of respondents enjoyed bicycling in Berkeley (77%), Oakland (76%), San Mateo (73%), and Richmond (72%), a relatively low proportion enjoyed bicycling on Taraval Street in San Francisco (34%), South San Francisco (46%), Concord (51%), and Third Street in San Francisco (53%).

Customers thought that bicyclists had a higher risk of being hit by a car than pedestrians. Overall, 23% of respondents thought that walking was risky and 54% thought that bicycling was risky. Survey respondents in Oakland and Richmond were much more likely to feel that walking had a high crash risk than other respondents. Stores on the south side of San Francisco (Mission Street, Third Street, and Taraval Street) had the highest proportion of respondents reporting that bicycling was risky.

Most respondents thought that people in their neighborhood have a positive view of people who walk (72%) and of people who bicycle (61%). The most positive neighborhood attitudes towards walking were in Burlingame, Pleasanton, San Carlos, Danville, Berkeley, and San Mateo, and the least positive neighborhood attitudes towards walking were in Richmond, Daly City, Hayward, Fremont, and Third Street in San Francisco. The most positive neighborhood attitudes towards bicycling were in Pleasanton, Burlingame, San Carlos, Danville, and Berkeley, and the least positive neighborhood attitudes towards bicycling were in Richmond, South San Francisco, and Daly City.

Perceptions of Neighborhood Crime and Traffic Safety

Survey respondents reported their level of concern with crime and traffic safety while walking, bicycling, and riding in an automobile in the area within one-half mile of the store. In general, riding in an automobile was perceived to have the lowest crime risk, bicycling was somewhat less risky, and walking had the highest crime risk (Table C.6). Respondents mentioned that they felt more protected from criminals if they were in their car and that could get away from someone more easily on a bicycle than on foot. However, a few people thought that the automobile and bicycle modes had a higher crime risk because they felt that these vehicles could be vandalized or stolen after they were parked. Nearly all people believed that there was a higher crime risk by all modes at night. Perceptions of neighborhood crime for each of the store locations generally reflected the level of reported crime in each neighborhood—the greatest proportion of customers thought that crime risk was high at the stores in Oakland, Richmond, El Cerrito, and Third Street in San Francisco.

In general, riding in an automobile was perceived to have the lowest crash risk, walking was somewhat risky, and bicycling had the highest crash risk (Table C.7). Like crime risk, crash risk for pedestrians, bicyclists, and automobile users was generally perceived to be higher at night than during the day. However, several people responded that crash risk was actually lower for all modes in some locations at night because traffic volumes were lower. Crash risk was perceived to be the highest for all three modes during the day and at night by respondents at the survey store on International Boulevard in Oakland. This may be related to the store being adjacent to International Boulevard, a high-speed, high traffic-volume arterial roadway that is heavily used by pedestrians, buses, and personal automobiles. It may also be related to higher levels of crime in the neighborhood. Several respondents in neighborhoods with higher levels of crime (East Oakland, Richmond, and Third Street in San Francisco) mentioned that lawlessness included frequent reckless driving, especially at night. Walking was also perceived to be risky in Daly City, Taraval Street in San Francisco, and El Cerrito (El Cerrito was perceived to be very risky at night but only moderately risky during the day). Bicycling was also perceived to be risky during the day at Taraval Street and Mission Street in San Francisco and risky during the night on Market Street in San Francisco and El Cerrito.

Table C.6. Perceptions of Neighborhood Crime by Survey Location

Survey Location		Total	*Crime during Day while Walking*				*Crime during Day while Bicycling*				*Crime during Day while in Automobile*				*Crime at Night while Walking*				*Crime at Night while Bicycling*				*Crime at Night while in Automobile*			
Name	County	Number of Surveys	High	%	Low	%	High	%	Low	%	High	%	Low	%	High	%	Low	%	High	%	Low	%	High	%	Low	%
Berkeley	Alameda	**55**	2	3.8%	50	94.3%	1	2.0%	48	94.1%	2	3.8%	48	92.3%	18	34.6%	17	32.7%	14	27.5%	25	49.0%	4	7.7%	41	78.8%
Oakland	Alameda	**51**	30	58.8%	18	35.3%	29	58.0%	17	34.0%	11	22.0%	27	54.0%	44	88.0%	3	6.0%	42	85.7%	5	10.2%	26	53.1%	15	30.6%
Hayward	Alameda	**54**	7	13.0%	40	74.1%	6	11.1%	39	72.2%	0	0.0%	50	92.6%	20	37.0%	17	31.5%	19	35.2%	19	35.2%	3	5.6%	46	85.2%
Fremont	Alameda	**49**	2	4.2%	42	87.5%	2	4.3%	44	93.6%	1	2.1%	45	93.8%	15	31.3%	21	43.8%	13	27.7%	23	48.9%	4	8.3%	39	81.3%
Pleasanton	Alameda	**49**	1	2.0%	46	93.9%	0	0.0%	45	97.8%	0	0.0%	48	98.0%	7	14.6%	31	64.6%	3	6.8%	33	75.0%	2	4.1%	45	91.8%
Danville	Contra Costa	**45**	0	0.0%	44	97.8%	0	0.0%	44	97.8%	0	0.0%	45	100.0%	4	8.9%	32	71.1%	3	6.7%	35	77.8%	0	0.0%	43	95.6%
Brentwood	Contra Costa	**45**	3	6.7%	40	88.9%	3	6.7%	40	88.9%	2	4.4%	43	95.6%	5	11.1%	29	64.4%	5	11.4%	30	68.2%	2	4.4%	41	91.1%
Concord	Contra Costa	**47**	4	8.5%	39	83.0%	4	8.9%	35	77.8%	3	6.4%	43	91.5%	17	36.2%	17	36.2%	14	31.1%	20	44.4%	5	10.6%	36	76.6%
Richmond	Contra Costa	**51**	13	26.5%	20	40.8%	14	29.2%	23	47.9%	10	20.4%	37	75.5%	39	83.0%	2	4.3%	37	78.7%	4	8.5%	22	46.8%	13	27.7%
El Cerrito	Contra Costa	**49**	13	29.5%	25	56.8%	11	25.6%	26	60.5%	5	11.9%	35	83.3%	30	68.2%	7	15.9%	27	62.8%	8	18.6%	9	21.4%	22	52.4%
SF--Market St.	San Francisco	**52**	1	1.9%	47	90.4%	2	3.8%	49	94.2%	0	0.0%	50	96.2%	9	17.3%	25	48.1%	8	15.7%	31	60.8%	2	3.9%	40	78.4%
SF--Fillmore St.	San Francisco	**53**	0	0.0%	46	86.8%	1	2.2%	41	89.1%	0	0.0%	52	98.1%	16	30.2%	26	49.1%	6	13.6%	27	61.4%	1	1.9%	40	75.5%
SF--Taraval St.	San Francisco	**47**	3	6.4%	41	87.2%	3	7.5%	34	85.0%	1	2.1%	45	95.7%	6	13.0%	29	63.0%	6	15.4%	26	66.7%	3	6.4%	42	89.4%
SF--Mission St.	San Francisco	**56**	6	10.9%	46	83.6%	5	9.3%	42	77.8%	1	1.8%	53	96.4%	24	45.3%	8	15.1%	20	40.0%	20	40.0%	6	11.5%	41	78.8%
SF--Third St.	San Francisco	**49**	15	31.9%	23	48.9%	11	26.8%	25	61.0%	6	13.0%	35	76.1%	35	74.5%	7	14.9%	22	55.0%	10	25.0%	17	37.0%	23	50.0%
S. San Francisco	San Mateo	**48**	2	4.2%	44	91.7%	1	2.1%	43	91.5%	1	2.1%	47	97.9%	7	14.6%	20	41.7%	9	20.0%	25	55.6%	4	8.3%	40	83.3%
Daly City	San Mateo	**47**	3	6.7%	37	82.2%	1	2.4%	39	92.9%	1	2.2%	42	93.3%	17	38.6%	19	43.2%	13	31.0%	20	47.6%	5	11.4%	35	79.5%
Burlingame	San Mateo	**54**	1	1.9%	51	94.4%	2	3.8%	50	94.3%	0	0.0%	53	98.1%	2	3.8%	48	90.6%	1	1.9%	48	92.3%	1	1.9%	50	92.6%
San Mateo	San Mateo	**53**	2	3.8%	49	94.2%	1	2.0%	48	96.0%	0	0.0%	52	100.0%	5	9.6%	41	78.8%	3	6.1%	43	87.8%	0	0.0%	50	96.2%
San Carlos	San Mateo	**49**	1	2.0%	48	98.0%	3	6.3%	45	93.8%	1	2.0%	47	95.9%	5	10.4%	36	75.0%	4	8.7%	38	82.6%	1	2.0%	46	93.9%
	Total	**1003**	109	11.0%	796	80.6%	100	10.6%	777	82.0%	45	4.6%	897	91.3%	325	33.3%	435	44.6%	269	29.0%	490	52.9%	117	12.0%	748	76.8%

*The total number of surveys in particular categories may not sum to 1,003 because of non-response to certain questions.

Table C.7. Perceptions of Neighborhood Traffic Safety by Survey Location

Survey Location		Total	*Crash risk during Day while Walking*				*Crash risk during Day while Bicycling*				*Crash risk during Day while in Automobile*				*Crash risk at Night while Walking*				*Crash risk at Night while Bicycling*				*Crash risk at Night while in Automobile*			
Name	County	Number of Surveys	High	%	Low	%	High	%	Low	%	High	%	Low	%	High	%	Low	%	High	%	Low	%	High	%	Low	%
Berkeley	Alameda	**55**	2	3.8%	45	84.9%	13	25.5%	20	39.2%	4	7.7%	37	71.2%	9	17.3%	28	53.8%	26	51.0%	7	13.7%	5	9.6%	32	61.5%
Oakland	Alameda	**51**	19	38.8%	20	40.8%	32	66.7%	5	10.4%	20	41.7%	18	37.5%	32	68.1%	9	19.1%	37	80.4%	4	8.7%	27	57.4%	12	25.5%
Hayward	Alameda	**54**	7	13.0%	39	72.2%	14	26.4%	23	43.4%	7	13.0%	41	75.9%	9	17.0%	26	49.1%	23	44.2%	14	26.9%	7	13.2%	36	67.9%
Fremont	Alameda	**49**	5	10.4%	35	72.9%	6	12.5%	27	56.3%	4	8.3%	42	87.5%	13	27.1%	23	47.9%	18	37.5%	13	27.1%	5	10.4%	38	79.2%
Pleasanton	Alameda	**49**	6	12.8%	37	78.7%	7	15.9%	21	47.7%	7	14.3%	33	67.3%	9	20.0%	26	57.8%	16	37.2%	12	27.9%	6	12.2%	36	73.5%
Danville	Contra Costa	**45**	0	0.0%	39	86.7%	3	6.7%	32	71.1%	1	2.2%	38	84.4%	3	6.7%	30	66.7%	9	20.0%	16	35.6%	0	0.0%	33	73.3%
Brentwood	Contra Costa	**45**	5	11.1%	37	82.2%	9	20.0%	31	68.9%	4	8.9%	35	77.8%	7	15.6%	27	60.0%	14	31.1%	22	48.9%	3	6.7%	31	68.9%
Concord	Contra Costa	**47**	3	6.5%	36	78.3%	14	31.8%	19	43.2%	3	6.7%	33	73.3%	12	26.7%	22	48.9%	19	43.2%	12	27.3%	6	13.3%	28	62.2%
Richmond	Contra Costa	**51**	11	22.9%	23	47.9%	18	37.5%	17	35.4%	12	25.5%	30	63.8%	19	41.3%	12	26.1%	28	60.9%	8	17.4%	13	29.5%	18	40.9%
El Cerrito	Contra Costa	**49**	6	14.3%	25	59.5%	14	32.6%	15	34.9%	7	16.7%	29	69.0%	21	50.0%	10	23.8%	26	60.5%	5	11.6%	8	19.0%	18	42.9%
SF--Market St.	San Francisco	**52**	2	3.8%	43	82.7%	16	30.8%	20	38.5%	3	5.9%	36	70.6%	4	7.7%	38	73.1%	28	53.8%	14	26.9%	4	7.8%	41	80.4%
SF--Fillmore St.	San Francisco	**53**	6	11.3%	38	71.7%	13	29.5%	17	38.6%	1	1.9%	40	75.5%	8	15.4%	28	53.8%	21	47.7%	6	13.6%	5	9.4%	31	58.5%
SF--Taraval St.	San Francisco	**47**	12	25.5%	25	53.2%	17	42.5%	11	27.5%	10	21.3%	26	55.3%	12	26.1%	26	56.5%	19	47.5%	10	25.0%	12	25.5%	28	59.6%
SF--Mission St.	San Francisco	**56**	6	10.9%	40	72.7%	21	38.9%	15	27.8%	9	16.4%	37	67.3%	11	20.4%	28	51.9%	26	49.1%	8	15.1%	9	17.0%	34	64.2%
SF--Third St.	San Francisco	**49**	10	21.7%	23	50.0%	22	52.4%	10	23.8%	9	20.5%	24	54.5%	18	40.9%	18	40.9%	27	67.5%	6	15.0%	14	33.3%	22	52.4%
S. San Francisco	San Mateo	**48**	4	8.3%	34	70.8%	7	14.6%	20	41.7%	3	6.3%	40	83.3%	15	31.9%	18	38.3%	23	48.9%	8	17.0%	6	12.8%	32	68.1%
Daly City	San Mateo	**47**	14	30.4%	28	60.9%	15	34.9%	18	41.9%	9	19.6%	28	60.9%	17	37.8%	23	51.1%	20	46.5%	17	39.5%	10	22.2%	28	62.2%
Burlingame	San Mateo	**54**	3	5.6%	42	77.8%	9	17.0%	27	50.9%	5	9.3%	43	79.6%	3	5.8%	40	76.9%	12	23.1%	23	44.2%	3	5.6%	43	79.6%
San Mateo	San Mateo	**53**	3	5.8%	43	82.7%	8	16.0%	30	60.0%	3	5.8%	44	84.6%	7	13.5%	39	75.0%	14	28.0%	23	46.0%	5	9.6%	39	75.0%
San Carlos	San Mateo	**49**	5	10.2%	39	79.6%	11	23.4%	28	59.6%	2	4.1%	43	87.8%	8	16.3%	31	63.3%	16	34.0%	19	40.4%	2	4.1%	39	79.6%
	Total	**1003**	129	13.2%	691	70.6%	269	28.6%	406	43.1%	123	12.6%	697	71.6%	237	24.7%	502	52.2%	422	45.3%	247	26.5%	150	15.6%	619	64.3%

*The total number of surveys in particular categories may not sum to 1,003 because of non-response to certain questions.

Considerations
Many respondents lived within two miles of the survey store, and nearly all respondents lived in the San Francisco Bay Area. However, there were several respondents who were visiting from outside of the region. Nearly all of the respondents who were tourists were surveyed at the store on Market Street in San Francisco. Most of these tourist respondents were staying in hotels in Downtown San Francisco, so their hotel was treated as their home location for the purpose of the survey. However, they were asked to respond to questions about their household and about their neighbors' attitudes towards walking and bicycling in the communities where they lived. One respondent at the El Cerrito store site lived in Sacramento and was passing through the Bay Area after stopping off of the freeway. This respondent's route information was not analyzed.

A small number of respondents did not begin or end the day at home. One respondent had been on a business trip in Las Vegas, flew to Oakland, went to the office, and stopped at the survey store before going home. Another respondent had been staying at home in Brentwood, stopped at Walgreens after leaving home, but was heading to a conference in San Jose for the next several days. The route information from these respondents was not used.

Several respondents reported the locations of other stops they made before the survey store but they did not know where they were going afterward. After prompting, some of these survey participants reported locations where they thought they might go. Therefore, these locations were recorded and used for analysis. The routes of survey participants who did not try to guess the locations of other stops they might make were not included in the analysis.

Several respondents returned to the store after being surveyed because they were picking up photos or a prescription or because they forgot to purchase an item. Upon doing this, three prior respondents mentioned that they had visited other stops that they had not anticipated going to when they completed the survey. In these cases, no changes were made to the survey stops that had been recorded originally. This was done because there were likely to be other respondents who also added unanticipated stops to their trip before returning home but didn't have a chance to report them. It was not possible to know how many people revised their travel plans after completing the survey. However, responses describing when people decided to travel to the survey store provided useful information about unplanned stops. 15% decided to go to the store when they were passing by the store, and 24% decided to go after they left home. Therefore, it was relatively common for people to make additional, unplanned stops on a tour. This highlights a challenge of relying on self-reported travel behavior, especially anticipated future behavior.

Most questions on the survey were answered by more than 99% of all 1,003 respondents, but several types of questions had lower response rates. Participants were asked several attitude and perception questions as a part of the survey to help identify other influences on travel behavior besides travel time, cost, and socioeconomic characteristics. A five-point Likert scale was used for these responses (e.g., 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). While the participants were able to interpret and answer most of attitude and perception questions without difficulty, between 5.8% and 7.6% of the participants did not report their perception of crime risk or crash risk while riding a bicycle in the shopping district during the day or at night. A majority of non-responses to these questions were from people who did not have a bicycle, so it is likely that they did not feel they could provide an accurate answer. Two attitude questions had lower response rates: 4.9% of participants did not respond to “People in my neighborhood have a positive view of people who walk” and 4.8% did not respond to “People in my neighborhood have a positive view of people who bicycle.” Several participants indicated that they did not respond to these questions because they did not want to try to guess their neighbors opinions. As expected, the highest level of non-response was for the household income question, but 89.8% of respondents were still willing to share this information.

APPENDIX D. QUALITATIVE SUMMARY OF SURVEY NOTES AND COMMENTS

The following notes and comments were recorded on survey forms as the survey was given to respondents at retail pharmacy stores in fall 2009. These extra notes were written on approximately 10% of the 1,003 survey forms. The first section summarizes several overarching themes from these notes, and the second lists each note or comment by the type of shopping district where the survey was taken.

Overarching Themes

Many respondents shared a common sentiment that pedestrians and bicyclists were at fault if they were involved in traffic crashes because they "weren't careful." Pedestrian and bicycle crashes were viewed as events that happened to other people who weren't watching out as carefully as they do. This was never stated explicitly, but it is an underlying theme for the following comments:

- She is alert and cautious, so she knows that she won't get hit walking.
- He is extra careful while walking. He wouldn't bicycle if he was given a $500/month incentive. Worried about drivers being so distracted.
- "If you bike in the street, it is risky."
- "You'd have to be stupid to get hit by a car [walking or bicycling]."
- "Bicycling is safe as long as bicyclists stay in bike lanes and don't weave all over the street."
- Need to be alert to reduce walking and bicycling crash risk.
- Cars and people and bikes don't mix. People should keep their bikes off the streets. [Bicyclists not wearing helmets and wearing earphones are a problem].
- Regarding crash risk, you've "Gotta watch out for yourself."
- Does not worry about traffic safety when walking or bicycling at night because "I'm a safe walker and biker."
- For walking and bicycling safety in general, "You've got to be careful."
- "You gotta be smart" [to keep safe while walking]. Distracted drivers [make it risky for bicycling].
- "You've just got to pay attention" to avoid pedestrian and bicycle crash risk.
- "I follow the traffic rules."
- [Pedestrians] need to stay on sidewalk. [Bicyclists] need to be alert.

People perceive traffic crash risk to be higher at night not only because of darkness but because of alcohol and drug use, bars, and drunk and reckless driving.

- Drunk drivers make it unsafe to travel at night.
- Bars in the area make it more dangerous at night for auto crash risk in the neighborhood.
- Drivers speeding at night make walking, bicycling, and driving dangerous in the neighborhood.
- Driving is a safety concern because there's lots of reckless driving in the neighborhood.
- Drinking and driving makes it risky for traffic crashes at night for all modes (especially bicycling).
- Worries about crash risk at night in automobile because of drunk drivers.
- Concerned about drunk drivers at night.

- Drinking drivers, etc. make it more dangerous to walk and bicycle at night.

However, some respondents thought that traffic risk was lower at night because there are fewer cars and more police.

- Less concerned about bicycling at night than during the day because there are fewer suburban drivers in the neighborhood.
- Thought it was safer for traffic crashes in the neighborhood at night for all modes because there are fewer cars and more police at night.
- There is less traffic at night, so walking crash risk is lower at night.

Several respondents shared negative views of bicyclists, often because they did not follow traffic rules and they felt that bicycling was a dangerous activity.

- "Bicycling is safe as long as bicyclists stay in bike lanes and don't weave all over the street."
- Respondent noted that she had been hit by a bicyclist. She thinks that bicyclists are more dangerous to pedestrians than cars.
- He thinks that bicyclists break the rules and he doesn't like them.
- Cars and people and bikes don't mix. People should keep their bikes off the streets. [Bicyclists not wearing helmets and wearing earphones are a problem].
- "It's the bicyclists who are the problem. They dart in and out of traffic, run stop signs, and think that they own the road. Then they look at me as a driver and think I'm wrong. But they are the problem."
- People in her neighborhood have a negative view of bicyclists because they are "law breakers".
- "Only little kids bicycle".
- Respondent had negative view of people who bicycle in her neighborhood because they are associated with drug traffic.

Some respondent attitudes about crime and traffic safety were fatalistic or rooted in religious faith fatalistic. They didn't worry about risk while walking, bicycling, or driving because they were with God or were resigned to dying when their time came.

- "I believe in Christ, so I don't worry about crime so much."
- Respondent was not concerned about crime or crash risk because "I'll leave it up to God".
- "If you're with God, you don't worry."
- She didn't worry about traffic safety because, "If your time is up…"

Some respondents didn't go out at night, especially older people and people living in higher-crime neighborhoods.

Notes by Type of Shopping District

<u>Urban Core</u>

- She is alert and cautious, so she knows that she won't get hit walking.
- She is from Napa, but she is staying in Pacific Heights with friend, so her home was in Pacific Heights for the survey.

- Drunk drivers make it unsafe to travel at night.
- Woman walked to store, but her tour included several cab rides
- Tourist.
- Got mugged at night, but he is not scared of crime in neighborhood. He has Parkinson's Disease.
- Wanted to leave home early this morning so she could find parking spots and so she would have parking on street when she got back home in the early afternoon.
- Respondent is nearsighted, which he listed as a disability for driving.
- Bars in the area make it more dangerous at night for auto crash risk in the neighborhood.
- Respondent is blind.
- Respondent uses an electric scooter (pedestrian).
- Respondent noted that she had been hit by a bicyclist. She thinks that bicyclists are more dangerous to pedestrians than cars.
- Respondent doesn't go out at night.
- Concerned about crime while riding in an auto because of kidnappings from cars; LESS concerned about bicycling at night than during the day because there are fewer suburban drivers in the neighborhood.
- He lives in Sunset district. He thinks that bicyclists break the rules and he doesn't like them.
- People in respondent's neighborhood only have a positive view of people who walk during the daytime (not at night).
- Crime was much worse in the neighborhood five years ago.

<u>Suburban Main Street</u>

- Thinks she has cultural biases about driving being safer.
- Buses are great here. Some of the bus drivers are not helpful.
- Hard to see bicyclists at night!
- Made many more stops during the day, but just now was driving to survey store and back.
- He was in the army, so he feels safe everywhere.
- "Walking with Jesus" [keeps her safe and secure].
- Doesn't go out at night. Need to be alert to reduce walking and bicycling crash risk.
- Took taxi home.
- She would walk to BART at 8 or 9 p.m., but she wouldn't be out at night.
- He doesn't go out after 9 p.m.
- She doesn't go out at night.
- Marked all 1's (is not concerned about crime or crash risk) because "I'll leave it up to God".
- Very concerned about impaired drivers and crash risk for all modes (drugs first half of month; alcohol second half of month).
- He is extra careful while walking. He wouldn't bicycle if he was given a $500/month incentive. Worried about drivers being so distracted.
- The respondent indicated that there was a high crime risk for automobile at night because she needed to walk from her street parking spot to her house.
- Many stops because he was serving subpeonas.

- Driving is a safety concern because there's lots of reckless driving in the neighborhood.
- "If you bike in the street, it is risky."
- Respondent doesn't go out at night.
- Drivers speeding at night make walking, bicycling, and driving dangerous in the neighborhood.
- "I agree that it would be good to change how people travel to improve the environment, but good luck." "You'd have to be stupid to get hit by a car [walking or bicycling]."
- "If you're with God, you don't worry."
- Respondent was drunk.
- Respondent said that there was a high risk of crashes for all modes in the shopping district because of the bad intersection right by the store.
- Drinking and driving makes it risky for traffic crashes at night for all modes (especially bicycling).
- Thought it was safer for traffic crashes in the neighborhood at night for all modes because there are fewer cars and more police at night.
- She has a big dog, so she doesn't worry about crime. She didn't worry about traffic safety because, "If your time is up…"
- Was picking up people at SFO and had extra time. This was on day Bay Bridge was closed.
- "Bicycling is safe as long as bicyclists stay in bike lanes and don't weave all over the street."
- Rated crime risk while riding in an automobile at night as higher than bicycling or walking because he is worried about people breaking in to his car.
- Walking and bicycling were not as enjoyable for him because he had a back injury.
- Respondent used a wheelchair.
- "I believe in Christ, so I don't worry about crime so much."
- Worries about crash risk at night in automobile because of drunk drivers.
- For walking and bicycling safety in general, "You've got to be careful." Width of street is too narrow, so bicycling has higher crash risk in the neighborhood during the daytime. It is riskier for traffic safety at night because people drive more recklessly.
- He can easily switch his mode choice to bicycle. He worries less at night about traffic safety sometimes because there is less traffic in Downtown San Mateo.

<u>Suburban Thoroughfare</u>

- People need to slow down.
- You gotta be smart [to keep safe while walking]. Distracted drivers [make it risky for bicycling].
- Lives in Texas. Was at hotel in Haward.
- Cars and people and bikes don't mix. People should keep their bikes off the streets. [Bicyclists not wearing helmets and wearing earphones are a problem].
- Respondent walks 2 hours home on Saturdays because there is no evening bus after he finishes work at 10 p.m.
- Respondent drives an ambulance.
- Berkeley and Oakland have a high risk of crashes at night while walking or bicycling, but not Danville.

- She doesn't see quite as well at night.
- People in her neighborhood have a negative view of bicyclists because they are "law breakers".
- Flew in from Las Vegas during the day, so large fare may have been cab from Airport
- "Dusk is a risky time around here." (Crash risk)
- Carries a gun.
- She doesn't go out at night.
- "You've just got to pay attention" to avoid pedestrian and bicycle crash risk.
- Drinking drivers, etc. make it more dangerous to walk and bicycle at night.
- Could have walked but was carrying lots of packages.
- Thought the survey was stupid.
- There is less traffic at night, so walking crash risk is lower at night.
- Doesn't go out at night
- Needed to drop kid(s) off at school on part of tour.
- Respondent drove because he was with his son and 78-year-old mother.
- Concerned about drunk drivers at night.
- She was being driven by her sister around to all these places.
- Dropped off at survey store; walking on the way home.
- Respondent walks on the job, so walking is not an enjoyable activity for him.
- She was not concerned about crime in the neighborhood, but a lady was recently mugged. Regarding crash risk, you've "Gotta watch out for yourself."
- Walking hurts his feet. Does not worry about traffic safety when walking or bicycling at night because "I'm a safe walker and biker."

<u>Suburban Shopping Center</u>

- [Pedestrians] need to stay on sidewalk. [Bicyclists] need to be alert.
- He bicycles because walking is too slow.
- Daytime traffic is worse.
- "It's the bicyclists who are the problem. They dart in and out of traffic, run stop signs, and think that they own the road. Then they look at me as a driver and think I'm wrong. But they are the problem."
- "Bicyclists break the rules." This is why she said that people in her neighborhood do not have a positive view of people who bicycle.
- "I follow the traffic rules."
- Respondent had negative view of people who bicycle in her neighborhood because they are associated with drug traffic.
- Respondent was taking it easy on Saturday. She had "nowhere to be." Respondent also indicated a high crime risk for using an automobile at night because of the need to walk to her car.
- Respondent tour included a 2-mile jog around the Candlestick Park area.
- Bicycling is risky at night because it gets foggy.
- Walking is risky; Bicycling is risky…Response: "Depends on where you are". Neighbors have positive view of bicyclists: "Only little kids bicycle".
- "It's more dangerous at night because it is foggy."

APPENDIX E. INTERVIEW QUESTIONNAIRE

This appendix presents the questions that were asked during in-depth phone interviews with 26 study participants in spring and early summer 2010. Since the interviews were conversational, the questions were phrased slightly differently or asked in a slightly different order for each participant. However, the same topics were covered with each interviewee.

Background Questions

The following questions were used to gather background information about the interview participant's family, profession, and "typical" travel habits. They were also used to build rapport with the interview participant.

- Describe how you traveled to different places today. How often do you travel with other family members? Where do you travel together?
- The last time you went to your local retail pharmacy store, how did you get there? Were there other types of transportation available to you? (this provides an opportunity to hear whether or not people think about walking or bicycling as transportation choices)

Contradiction between Changing Individual and Collective Transportation Habits

More than 90% of survey respondents felt that changing how people travel is a great way to improve the environment. However, when participants were first asked about how easy it would be to change the type of transportation they use on a daily basis, more than 60% said that it would be difficult. The following questions were used to explore this contradiction in more depth:

- Do you think that changing how people travel is a good way to improve the environment? Why do you think so? What types of changes do you think should be made?
- What are the barriers to changing how you travel on a daily basis? How difficult are these barriers to overcome? Do you see yourself traveling differently in five years?
- How important was transportation in your decision about where to live and work?
- How important are safe and convenient places to walk and bicycle in your decision about where to live, work, and shop?

Tour Characteristics and Mode Choice

The length of tours and number of stops may be related to mode choice. In addition, survey respondents planned their tour activities at different times. Several interview questions were used to gather more information about these issues:

- During the process of planning your last trip (that included stopping at the survey store), when did you decide what type of transportation to use?
- Do you use different types of transportation depending on the number of stops you are planning to make?
- Do you use different types of transportation depending on the number or size of the purchases you plan to make?

Neighborhood Characteristics and Mode Choice

There were significant differences in the transportation modes used by survey respondents to travel to each of the 20 retail pharmacy stores. It was likely that some of the measures of the neighborhood environment surrounding the stores (e.g., population density, employment density, availability of free parking) had a significant association with the primary travel mode used by customers. The following questions explored the influence of a variety of neighborhood characteristics on mode choice:

- What changes to your neighborhood, local buildings, or local streets would cause you to walk or bicycle more?
- Are there any neighborhood, building, and street characteristics that make it/would make it more pleasant when you walk or bicycle near your home or the Walgreens store?
- Do you ever walk for pleasure in order to experience nature, watch people, or look at buildings? Where do you do this type of walking?
- Do the costs of local parking, gas prices, or tolls ever affect how you travel? (e.g., summer 2008)

Attitudes Towards Walking and Bicycling

Survey respondents indicated that they had different reasons for feeling positively or negatively towards walking and bicycling. In addition, they also had different reasons for thinking that their neighbors had a positive or negative view of these modes. It was also assumed that attitudes about walking or bicycling may have changed throughout a participant's life. Therefore, the following questions were used to explore attitudes about pedestrians and bicyclists:

- What do you think about people who walk? Why do you think they choose to walk?
- What do you think about people who bicycle? Why do you think they choose to bicycle?
- Did you bicycle as a child or when you were younger? When do you think you developed your current attitude about bicycling? Who or what were the most important influences that shaped your current attitude about bicycling?

Generational Differences in Transportation Attitudes, Perceptions, and Behaviors

Responses to survey questions and additional comments from participants suggested that people of different generations may have had different attitudes, perceptions, and behaviors towards transportation. Therefore, the final part of the interview included the following questions:

- Did you and/or your family travel differently when you were younger?
- Do you think that you travel like other people who are about the same age as you? In general, do you think that people who are older or younger than you travel differently?
- Do you think that people who are older or younger than you have different attitudes towards walking, bicycling, and riding in an automobile?

APPENDIX F. INTERVIEW CONSENT SCRIPT

This appendix includes the interview consent script. This script was reviewed with potential interview participants before beginning the in-depth phone survey. The interview consent script was reviewed and approved by the UC Berkeley Committee for Protection of Human Subjects.

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Consent to Participate in Research (Verbal Script)
Study Title: ***Understanding Mode Choice Decisions: Neighborhood Characteristics and Trip Chaining***

Introduction and Purpose
My name is Robert Schneider. I am a graduate student at the University of California, Berkeley working with my faculty advisor, Professor Robert Cervero in the Department of City and Regional Planning. I would like to invite you to take part in my research study, which concerns people's transportation decisions.

Procedures
If you agree to participate in my research, I will conduct an interview with you at a time and location of your choice. The interview will involve questions about your everyday activities and travel patterns, opinions about transportation in your community, and perceptions about different forms of transportation. It should last about 30 minutes. With your permission, I will audiotape and take notes during the interview. The taping is to accurately record the information you provide, and will be used for transcription purposes only. If you choose not to be audiotaped, I will take notes instead. If you agree to being audiotaped but feel uncomfortable at any time during the interview, I can turn off the tape recorder at your request. Or if you don't wish to continue, you can stop the interview at any time.

Benefits
There is no direct benefit to you from taking part in this study. It is hoped that the research will provide detailed information about travel patterns and help communities develop better transportation systems.

Risks/Discomforts
Some of the research questions may make you uncomfortable or upset. You are free to decline to answer any questions you don't wish to, or to stop participating at any time. As with all research, there is a chance that confidentiality could be compromised; however, we are taking precautions to minimize this risk. *(See below for more detail.)*

Confidentiality
Your study data will be handled as confidentially as possible. If results of this study are published or presented, individual names and other personally identifiable information will not be used.

To minimize the risks to confidentiality, we will not store your interview data in the same database as your name or address.

When the research is completed, I may save the tapes and notes for use in future research done by myself or others. I will retain these records after the study is over. The same measures described above will be taken to protect confidentiality of this study data.

Compensation
You will not be paid for taking part in this study.

Rights
Participation in research is completely voluntary. You are free to decline to take part in the project. You can decline to answer any questions and are free to stop taking part in the project at any time. Whether or not you choose to participate in the research and whether or not you choose to answer a question or continue participating in the project, there will be no penalty to you or loss of benefits to which you are otherwise entitled.

Questions
If you have any questions about this research, please feel free to contact me. I can be reached at 301-412-9995 or rschneider@berkeley.edu.

If you have any questions about your rights or treatment as a research participant in this study, please contact the University of California at Berkeley's Committee for Protection of Human Subjects at 510-642-7461, or e-mail subjects@berkeley.edu.

Consent
If you agree to participate, please say so.

APPENDIX G. QUALITATIVE SUMMARY OF IN-DEPTH INTERVIEW THEMES

This appendix reports the main themes identified through in-depth interviews with 26 participants living in different parts of the San Francisco Bay Area between March and July 2010. It lists specific quotes from individuals according to each major theme.

INTRODUCTION

In-depth interviews with 26 of the retail pharmacy store survey respondents showed how transportation decisions are woven into people's lives. Neighborhood land use, local transportation system, and specific travel characteristics impacted the modes of transportation participants used for routine travel and recreation. However, this qualitative feedback also revealed a complex web of personal factors that had some relationship to mode choice. Housing choices, employment changes, child- and elderly-care obligations, interactions with family members and friends, physical limitations, concern about the environment, living in poverty, social pressures, and lack of experience or confidence were related to interviewees' choices to travel by walking, bicycling, transit, or automobile.

The main themes that emerged from the interviews highlighted different aspects of the mode choice process. They included:

1) <u>Awareness and Availability</u>. A person must be aware that a particular mode is possible to use and have it available as an option.
2) <u>Basic Safety and Security</u>. A person must perceive that using a particular mode will allow him or her to travel to an activity with a basic level of safety from traffic crashes and security from crime.
3) <u>Convenience and Cost</u>. A person will seek to use a mode that has an acceptable level of convenience and monetary cost. Interviews suggested that two factors had the greatest influence on the convenience and cost of walking and bicycling: 1) accessibility of activity locations (shorter distances between activity stops make walking and bicycling more time-competitive with traveling by automobile and reduce other barriers to pedestrian and bicycle travel, such as having physical limitations, carrying packages, traveling with others, and being exposed to bad weather), and 2) availability of automobile parking (scarce and expensive automobile parking discourage automobile use).
4) <u>Enjoyment</u>. A person may receive physical, mental, and emotional enjoyment from using a particular mode or feel good about choosing a mode that benefits society or the environment.
5) <u>Habit</u>. People who choose a particular mode regularly are more likely to consider it as an option.

These themes are illustrated by the quotes below.

1. AWARENESS AND AVAILABILITY

1.1. Some participants did not indicate that they were aware of or would consider walking or bicycling to travel to the store and other activity locations before they were mentioned in questions later in the interview.

Many interviewees thought of transportation as a choice between driving and transit only. Walking and bicycling were viewed as purely recreational activities (or something to do in their spare time) by some participants, especially those living in the suburbs. Walking and bicycling were viewed as options for traveling to stores or work in more urban communities. In situations where people don't think that transit takes them all places where they need to go, there may be a real opportunity for the flexible modes of walking and bicycling to fill the gap. However, people need to think of them as transportation options.

1.2. A single family member or close friend played a significant role in encouraging some interviewees to walk and bicycle.

Family members and close friends may have an important influence on peoples' choices to walk and bicycle. This suggests that social marketing may be an effective strategy to increase sustainable mode choices.

Family Members and Friends Inspire People to Walk More

"Often we would ask our mom to take us somewhere...maybe to some place that she knew was reasonably close to walk, and I was one of eight kids...And she would take us--she would drive us sometimes...But she was a busy mom, and she would turn and look at us and say: 'Footmobile.'...So we've always been walkers, even since I was a little kid."
--Male, Age 50-59, San Francisco Fillmore Street

Family Members and Friends Inspire People to Bicycle More

"If I see someone on the cycle trying to do things...that's motivating…I think [pedestrian and bicycle] infrastructure is there. We have a city where you can bike around everywhere...from an infrastructure point of view, it's there. For going to Walgreens, I could certainly take the bicycle and go. So it's a healthy way of doing it. I just haven't come around to doing it…It's a matter of if one person has an IPod, than everyone is going to have an IPod. So if one person starts cycling, and everyone starts seeing it, everyone will start cycling...So I think a bit of a campaign about it or marketing about it will certainly help to energize all the 'dead' people like me."
--Male, Age 40-49, Pleasanton

"My son who is going to Sonoma State, he has a big old truck, and he won't drive it unless he is coming home. Because that's all he has to come home. He rides his bike because the cost of gas and he's an environmental major. He doesn't like his truck anymore now that he is an environmental major...My son--his attitude really did change when he became aware...When he was in high school, he wanted the big truck--a Ford 350 or whatever--and then when he went to

college and became an environmental major, his attitude changed because he became aware and because he learned...so maybe that's a number one step, is awareness.”
--Female, Age 52, San Carlos

She bicycled when she was a child, but she didn’t have a bicycle with her until the late 1980s. “[My] lifestyle at that time was different, and I was doing different things to get exercise. Then I started dating my husband, and he was very into it.” Maybe your husband had something to do with you bicycling more after that? “Definitely, totally, and continually. I don’t think there has ever been a time in his life when the bike wasn't there.”
--Female, Age 50-59, San Carlos

“My daughter...has been on a back of a bike even before she could ride her own…My daughter, because of her father’s influence, would have that there are times that you ride the bike to get places because it is better for you and for the environment. That is definitely a mindset of hers because of her father's influence.”
--Female, Age 50-59, San Carlos

“[My husband] teases me. I say ‘I’m running down to the corner store.’ He says, ‘Are you really running?’ I say, ‘Shut up, I'm taking the car.’...I think because of his influence we take the bikes way more places than most of our friends because of his mindset. I don't know of anybody else who takes their bikes to the farmers market.”
--Female, Age 50-59, San Carlos

“Now my husband is planning on getting a bike together for me...and that would be an option then...and it has side baskets or something.”
--Female, Age 60-69, San Carlos

He is way more into the ‘biking should be a way of life versus something you do on the weekend’ than I am...that's why we have five bikes in the house.”
--Female, Age 50-59, San Carlos

She hasn't bicycled much as an adult: “It’s not like I have a lot of bicyclists in my family.”
--Female, Age 30-39, Daly City

What is your impression of bicyclists? “Mostly it’s a very positive impression. But I that’s because I’m married to a bicyclist. He belongs to a bicycle club, and I see all of them. And also he’s involved in learning how to use the road...He uses the road—he’s in the middle of the road--one of those guys. Always positive. Even if I see a kid riding down the wrong side of the road without a helmet. I think, ‘Good for him, he’s on a bike!’”
--Female, Age 60-69, San Carlos

1.3. Lower incomes limit the flexibility people have to consider using different modes or move to different locations with more transportation choices.

“For a family it is very complicated to make a living around the society that we have built. It's mostly working people that are driving and don't care, and don't have the mind to think, ‘Am I doing things right?’ You are just surviving. And when you are just surviving, you...overlook...So that's the society that people who are in power like us to live. If you are distracted with your daily things, of course you are not as concerned if you have a war in Afghanistan...you are concerned with your daily things--you are surviving. We overlook those details.”
--Male, Age 30-39, Berkeley

Many people don’t leave the low-income neighborhood for cultural and economic reasons. “I could never live in Noe Valley because I'm not in the economic bracket of the majority of people there. I don't like to feel like I’m a piece of shit, so I moved here because I earn the same amount as most people in the neighborhood. But I wish it was a [vibrant neighborhood].”
--Female, Age 40-49, San Francisco Third Street

“I just needed to find a cheap apartment...and the apartments are cheap out here because the quality of life isn't so good. And I knew the location because I used to work in the Bayview.”
--Female, Age 40-49, San Francisco Third Street

“The other in-law apartment that I looked at was in the Mission, which was within walking distance of where I work. It would have been wonderful. But the apartment itself was not very nice. And there had also been several murders within two blocks. But I remember thinking that ‘Boy, I would love to be able to walk to work again.’...That would have been the number one factor if I had taken that apartment was that I could have walked to work.”
--Female, Age 40-49, San Francisco Third Street

“The ones that are younger than I basically seem to be having a hard time just keeping afloat…they are at an age where they get laid off more often than I did. They are not sure if they are really going to have a secure job. And we own our house; we bought it at a time when it was affordable. Now their rents are sky high. So I think how they get around is not something they spend a whole lot of time thinking about, frankly. I think they are just trying to make due and do what they've got to do...The group we have next door, the two fellows I know the best both ride bikes a lot. And one works over at the Garden of the Environment, which is over on 7th Avenue. That's a pretty good bike ride from here. The other just finished his Masters in Engineering at San Francisco State, but he hasn't been able to find an engineering job...They are low on the economic level, we could say.”
--Female, Age 60-69, San Francisco Taraval Street

“I don't have a bicycle…I know how to ride a bike…I will probably buy a bicycle at some point because I love cycling…When I moved from Africa to the US, that's when I stopped cycling…because I am unemployed and can't afford to buy a bicycle.”
--Female, Age 20-29, San Francisco Market Street

“I've got friends with children in San Francisco where—you know I guess, being stereotypical San Francisco, they are kind of more ‘Let’s save the Earth’ sort of a thing, but if you go to where my husband's family is in the City, they're taking public transportation, but it's not because they are trying to save the Earth, it’s just because they don’t have the money to have other options. So I think it’s really a case-by-case basis.”
--Female, Age 30-39, Daly City

“Yesterday, my neighbor and her son walked their dog at least a half a block to the end of the street and back again, and I have to say that was the first time I have ever seen anyone walking their friggin’ dog. Nobody walks for pleasure here...when I saw somebody walking their dog, it was so strange because I never see that. I don’t see people walking for exercise or pleasure.”
--Female, Age 40-49, San Francisco Third Street

“A majority of people never leave the neighborhood…that’s what a ghetto is. It’s cultural. It’s economic…I mean how many black people do you see at Ocean Beach…None!...When I used to work here, I took kids to the Ocean; I took kids to Marin; I took kids down to camping in San Mateo...they just never left the neighborhood. And most of San Francisco doesn't even know this neighborhood exists. They have never been here, they wouldn’t come here. They drive to the football games, but they drive home.”
--Female, Age 40-49, San Francisco Third Street

“This city is not the very best place to live in…I went broke in business, and I lost the old family home to foreclosure. So I thought I could come to Richmond and live cheaper. But as it turns out, Richmond is more expensive because poor people pay more for everything...I made a bad mistake. There really wasn’t much I could do--I was forced into it. That’s the way life is…I bought a house here, and it was cheaper than anything I could have bought in San Rafael. So that was fine, but other things turned out to be way more expensive. Overall, it didn't work out too well...One of the things is the police...consider everybody here to be a thief or a drug dealer...they talk down to ordinary people, like you are a nothing...and they’ve gotten an attitude of arrogance--they don’t know anybody in the neighborhood, so they treat them all the same...Every little infraction that you do, you risk having your car towed away and impounded...if you don’t have the money [right away], it’s $100 a day...So expenses pile up very fast...Thievery is very bad. I have been strong armed mugged five times outside of my house. So when I go to check my mail, I put a gun in my pocket. By the time I get out to my mail box, I have had people attack me...You never know when you will have a problem. And I have had 16 batteries stolen from my cars over the last 5 years at about $100 a piece...One of my friends used...to say, ‘When you go out of your house, you don't expect to see no battery in your car.’”
--Male, Age 84, Richmond

2. BASIC SAFETY AND SECURITY

2.1. Concerns about crashes and personal safety kept some interviewees from walking or bicycling.

<u>Perceptions of Traffic Crash Risk Prevented Some People from Walking or made Walking Less Pleasant</u>

"Too many people get hit by cars in San Francisco. I take safety very seriously. I like being whole…I have had two friends who have been hurt running for buses. And I thought, 'You know, I'm just not going to run. If I miss it, I miss it.' That has made life much more leisurely."
--Female, Age 60-69, San Francisco Taraval Street

"I'm very aware that we have goofy drivers that go through stop signs, so I try to be very mindful when I'm crossing the streets."
--Female, Age 60-69, San Francisco Taraval Street

"At the end of my street there are no crosswalks anywhere. Once upon a time, there was a crosswalk at one end...but drivers ignore it completely, and there's no stop sign, so it's very hard to cross the street. And at the other end of my street, it intersects with Bayshore Highway...or what used to be the old Bayshore Highway, which people drive on like it's a freeway, not a city street...there's no way that you can cross that on foot. And it's on the top of a slight hill, so you don't see the cars coming up and over...I hate that."
--Female, Age 40-49, San Francisco Third Street

"For the most part I feel safe, but there are definitely certain intersections that I'm very cautious about because I know that drivers aren't really paying attention because I have seen drivers do crazy things in those particular intersections. There's definitely some 'hot spot' intersections that if I'm walking, I'm extra cautious."
--Female, Age 30-39, Daly City

"I wish people [were] a little bit more conscious about pedestrians...There's a reason why there are crosswalks. People need to be more considerate. I would be standing at a crosswalk, and it's my right-of-way. And cars see me standing there. And so I kind of like need to put my hand out and ask them to stop...When I'm driving, I'm very conscious about that--because being a pedestrian myself, you have to have some patience...As a driver, you get to your final destination whether or not you stop for the pedestrian, so I wish they had some more consideration, that's all." Why don't people have consideration for pedestrians? "My honest answer, without sounding like a jerk, is that they are selfish. It's all about them...they are not aware of their surroundings. There's no situational awareness, unfortunately…they probably don't know the rules [about crosswalks]."
--Male, Age 30, Burlingame

“I’m not afraid to walk anywhere…as long as there is a curb to walk on. There are some places...around here where people walk on the side of the road, and I wouldn’t do that either.”
--Female, Age 52, South San Francisco

“They should do enforcement of pedestrian safety laws. A number of times, on my walk to work and on my way home, frequently drivers do not yield…[at crosswalks] on very busy streets…I would like education for drivers to re-inform them of what the law is and how a person who is not driving a machine down the street is, number one, they’re not running a machine--you are--and you are privileged to be doing that. And I’m getting on my soap box here. But you are driving this huge vehicle down the road, and you have an awesome responsibility to keep that thing under control and allow people to have a pleasant walk and a pleasant day on their way to work. You can hear I’m getting a little emotional about this. But I feel very strongly about it. I have thought about it for many years...We give you a license, and we make it pretty darn easy to get one...There has to be an ongoing education campaign to re-inform drivers to let them know that these pedestrians--grandma, that little kid--they may do stupid stuff. They may be really doing the stupidest stuff you have ever seen as a pedestrian, but they are not driving a huge machine. They are not a threat to you. They may be stupid. They may be out of their minds. We have a lot of people wandering the street around here who are completely out of their minds...sometimes I coax them out of the street...It's so unfair to me...I had a dog that was killed by a car, right in front of me. I have seen stuff...When I was a young child, I was sled riding with a buddy of mine. I saw him get run over. So I have a kind of an inside fear...and realize that it’s really not about a machine, it's about a person who is sitting there driving the machine.”
--Male, Age 50-59, San Francisco Fillmore Street

“So I think when you take and you put pedestrians and bicyclists and vehicles all together, you...could be creating a safety issue because all people are not safe in what they do. And they think as long as they’re safe, they are okay, but what they don’t maybe take into consideration is the other person coming at them or coming up from behind them.”
--Male, Age 60-69, Brentwood

Would it be good if people drove less? “I would say it would stop a lot of accidents, for one. These youngsters, they drive so crazy, so I think it would kind of change the environment.”
--Male, Age 57, Oakland

“I drove them both home because it's not safe for old people to walk...plus they also didn't look like they could, but I guess if they got there, they could.”
--Female, Age 40-49, San Francisco Third Street

“I think...for walking, you are improving your health, as long as you don’t get run over. For biking, you are improving your health, as long as it’s a reasonably safe biking environment.
--Male, Age 50-59, San Francisco Fillmore Street

Multi-lane roadways with high-volume, high-speed automobile traffic made walking feel unpleasant and unsafe.

"Somebody has made a little green space under the freeway...a little sitting green park area...and I'd love to walk over there and sit on the bench and look at what he has planted, but I can't walk there because of the cars that are speeding on Bayshore...and it really bothers me because it's the one little green open space that I could walk to...that's like within 500 yards of my house, but I can't get there because of the traffic. I see it when I drive by it when I'm getting off the freeway."
--Female, Age 40-49, San Francisco Third Street

"You know, there's something about crossing Ashby and crossing Shattuck that are really stressful and difficult…Crossing Telegraph at Woolsey is the most difficult cross we have. And the second one is at Fulton at Ashby."
--Female, Age 50-59, Berkeley

"All of the suburbs have major arteries obviously to connect subdivisions together, so when people are looking to purchase something...they are looking for an area that is quiet and has less traveled streets. They are going to be surrounded at some point by a major artery, so the objective is obviously to keep your children in within the neighborhood and off of the major arteries because no parent is going to want their child out on the major streets."
--Female, Age 40-49, Danville

"When I first moved in, I would walk to the 'corner store', which was on San Bruno Avenue. And I would have to cross Bayshore, walk underneath the freeway, and then cross San Bruno, which is another busy street that...is very heavily trafficked to get to the corner store. So I just quit going, because it was like you risked your life crossing these major streets that aren't pedestrian-friendly whatsoever...plus you have to walk under the freeway..."
--Female, Age 40-49, San Francisco Third Street

"It's weird because my house is almost right across the street from Walgreens, but because of the train tracks, I have to go down quite a ways and then back up...so I usually don't walk. And then having to cross El Camino [Real] isn't a whole lot of fun…It would be nice to have, for somebody who walks like me, there's not always good areas to walk...like sidewalks, for instance...safe sidewalks...making crossing busy streets like El Camino safer, even with stop signs. Sometimes it's not real obvious that there is a pedestrian walkway...I know for a fact that right across from Walgreens there is a crosswalk to a bus stop, and people try to cross right there, and there's nothing that indicates there is a crossing right there."
--Female, Age 52, Redwood City

Would anything make it feel more comfortable or more enjoyable to walk? "Yeah. Probably just less traffic...You have to really watch yourself. I mean...drivers are on cell phones, people walking are on cell phones...If there was less traffic, I mean, I probably would walk even more…People drive pretty fast...People turning. I'd probably say Van Ness and Pine...almost any of them crossing Van Ness, you've got to really watch yourself."
--Male, Age 30, San Francisco Fillmore Street

Perceptions of Traffic Crash Risk Prevented Many People from Bicycling

Most interviewees perceived that bicycling on streets in the current roadway environment is unsafe. This perception was held in both urban and suburban areas. Most participants wanted to have bicycle facilities separated from motor vehicle traffic.

"A lot of my parents [of children at her school] ride their bikes; I admire them actually. I would not feel as secure riding a bike in the street, but I admire them that they will do that, especially that they bicycle with their children around, as well."
--Female, Age 50-59, Berkeley

"I still would [like bike riding] if I didn't live in the city...Here there are some [separated paths for bikes], but there are streets before you get to them [that are uncomfortable to ride on]...but I like bike riding."
--Female, Age 60-69, San Francisco Taraval Street

"I like to ride on my bike, but some places in Pleasanton, they don't have a bike lane. It's not designated or marked prominently, so it's not really safe."
--Female, Age 40-49, Pleasanton

"And bicycle is good actually, but with the traffic and everything...the people driving the cars they don't realize the lanes are also used by the bikers. Sometimes there are sharp turns, and you may tend to get hit or something."
--Female, Age 40-49, Pleasanton

If you are a bicyclist, "you will eventually get hit…and it is usually not the fault of the bicyclist…Every bicyclist I know has been hit by a car, usually through no fault of their own."
--Male, Age 30-39, San Francisco Mission Street

Bicyclists have a "lack of fear of death."
--Male, Age 30-39, San Francisco Mission Street

"Bicycling--I have a baby, so...I don't feel comfortable with my bicycling skills and the baby on the same bicycle."
--Female, Age 30-39, Daly City

"I'm not a skilled bicyclist…bicycling on the road, so I don't really feel very safe at all...Bicycling for me is more like a leisure thing where I can get to a safe place, and then bike

around, and then get back to my home base...I pretty much have my bike on a car and drive it somewhere because I really don't feel safe bicycling on the streets."
--Female, Age 30-39, Daly City

"I owned a bicycle for about three months [in San Francisco]...it got stolen, and I didn't even notice...I'm not a good enough bicyclist to be able to bicycle in San Francisco. You have to be like highly attuned to your environment...I would never bicycle in the City. I did it twice in my 20s, and no. Nope, I couldn't do it. I have friends that do, but I couldn't."
--Female, Age 40-49, San Francisco Third Street

"Right now I wouldn't bicycle. I had a neighbor who had a terrible accident on a bicycle and was put on life support and was taken off life support…it was the one time he didn't wear his helmet. In general, streets are so busy, so bicycling is not an option."
--Female, Age 52, South San Francisco

"Sometimes I feel scared for [bicyclists]...sometimes it is very hard to see them...and sometimes they have no protection."
--Male, Age 30-39, Berkeley

"In general, streets are so busy, so bicycling is not an option…Well, just experiencing both sides...because at the time I was bicycling, I wasn't driving, so I didn't have that perspective, and now I have both. So I'm afraid I'm more afraid to be on the street [on a bicycle now]. But I think it would be so great if they designed cities with bicycle-only areas. I mean, as a major design, a major part so people could really be using them as transportation. I would. And then now they have these cool like three-wheel things so that if I'm feeling a little unstable—I'm 52--and I don't feel that way so much now...but any age can go out now in those three wheelers and enjoy it...you sure don't want your parents out there [on two wheels]."
--Female, Age 52, South San Francisco

"I would love to take my bike downtown every day so that when I get off, I could go for my swim after work. But I don't have a safe place to store my bike...Then there is a safety issue of aggressive drivers."
--Male, Age 50-59, San Francisco Fillmore Street

"Bicycling for me probably, I'm more skiddish on a bicycle--I haven't really bicycled in years—but I'm wanting to again. And so for me, having it feel safe is probably important."
--Female, Age 60-69, San Carlos

"I thought about getting a scooter or something...it's better on gas, it's easier for parking, at the same time, I work at [the hospital] in trauma and I see people who have been hit by cars...and they are in pretty rough shape...I wouldn't mind having a bike, but there's so many cars in the City, and people are getting hit all the time...there's kind of a safety factor...My work is actually close enough that I could bike, but...there's so much traffic and cars, I think it would be scarier than driving...If there were just one-way streets with just bikes...I would consider biking."
--Male, Age 30, San Francisco Fillmore Street

“I wouldn’t say the neighborhood is that great for bikes because there is a fair amount of traffic and the streets aren’t that wide, but it’s a good walking neighborhood.”
--Female, Age 60-69, San Francisco Taraval Street

“In the suburbs, [safety] is one of the main focuses that people have. That’s why people move here from the urban areas...However, safety only goes so far...when you are taking about letting an 8 year old ride a bicycle 3 blocks away, even though it is a safe neighborhood, you are still contending with traffic.”
--Female, Age 40-49, Danville

“If I could ride my bicycle on the sidewalk again, I would probably be more apt to riding my bicycle. But the way it is now, they want you riding your bicycle on the streets makes it not appealing…Just because I’m not a very skilled bicyclist, I have some fears about going on major roads. So that for me is my personal barrier, too...is that I don't want to go on really traffic-heavy streets with my bicycling skills because I would be concerned for my safety. That would be my main concern, probably.”
--Female, Age 30-39, Daly City

“I'm afraid to ride a bike. I think older people are afraid. I think younger people are not afraid to ride bikes...younger people would more readily ride a bike than I would...I think when you are younger, you take more risks. You just don’t have the experience.”
--Female, Age 52, South San Francisco

“Also, of course, it is dangerous to ride a bike on a street because the people are forever getting hit on their bike or killed or injured badly.”
--Male, Age 84, Richmond

“I work at a laboratory, and we encourage going green. And a lot of our scientists and staff are on bicycles. The issue with bicycles for me is we really like it, but...they are vulnerable on the streets. I mean, that’s the way it is...Having been a cop for many years, I’ve worked too many accidents. Whether it’s the bicyclist's fault or not, the fact of the matter is, it’s a very vulnerable position to be if you get in an accident. Again, unless there is public infrastructure that can accommodate bicycles...The vehicle code gives them full allowance to be out there, but streets that are a kazillion years old don’t accommodate bicycles. And you’ve got a bunch of people out there riding them. Berkeley is a good example. You know, the hills. I mean, I come up over Grizzly Peak and drop down...to Cal...And there’s bicyclists all the time up on Grizzly Peak [Drive], and I think it’s a very dangerous environment. So I think bicyclists for me equate to the positive side is exercise--you can kill two birds with one stone--you can maintain a balance between your...mental and physical health, and at the same time get you where you are going. On the down side, you may not get to where you are going. That’s the down side. And it doesn’t have anything to do with you--you could be the best bicyclist in the world--but has everything to do with the environment you are bicycling in...”
--Male, Age 60-69, Brentwood

2.2. Concerns about crime and personal security kept some interviewees from walking and using taking public transportation.

It appears that "public" streets are not available to everyone in high-crime areas because many people don't feel secure in these public spaces.

<u>Perceptions of Crime Risk and other Personal Security Concerns Prevented Some People from Walking or made Walking Less Pleasant</u>

"I wouldn't walk down that street after it got dark nor leave home before it got light because of the animals; it was a quiet area."
--Female, Age 50-59, Hayward

"I think I live in a safe neighborhood, so I don't have a problem walking."
--Female, Age 20-29, San Francisco Market Street

"When you are walking in this neighborhood, there's nobody else walking. You look like a target here."
--Female, Age 40-49, San Francisco Third Street

"I don't walk as much as I used to when I lived in a different neighborhood for safety reasons…"
--Female, Age 40-49, San Francisco Third Street

"If I felt safe, which I don't feel safe walking in the neighborhood, I would walk out to the park…There are two parks within reasonable walking distance...When I had someone with me, I walked to one of those parks twice. I should be able to walk to both of them—they are reasonable walking distance, but I don't, just for fear of safety…People hang out on the streets, but they don't walk from place to place."
--Female, Age 40-49, San Francisco Third Street

"On my street, I was mugged in front of my house…Sometimes I don't feel safe walking to my car...that's how I got mugged, walking from my car to my house, because I had parked in a different place...I think that I thought I might be walking more, but when I actually [moved] here, I realized that I couldn't. I wish I could walk more."
--Female, Age 40-49, San Francisco Third Street

"I definitely think about the safety with walking because I have two children…I live in a safe neighborhood, but some of the more busy places that I have to go, I'm a little more skeptical about, so walking out after dark after a certain time isn't appealing to me just for those reasons."
--Female, Age 30-39, Daly City

He doesn't walk for pleasure. "I take care of business, and then [come] back home where it's safe."
--Male, Age 57, Oakland

“Bike riders that are bad are dangerous because you don't hear them coming, and they come very fast and very silently...the guys on bikes are the scariest ones...Also, of course, if they were on bikes, chances are they don't have a car and they are poor.”
--Male, Age 84, Richmond

“It feels like I have safe places to walk. So I probably don’t think about it. If I didn’t have them, I probably would think about it more. So I do have safe places to walk. That is important to me.”
--Female, Age 60-69, San Carlos

“There’s also a U-Haul around the corner on Bayshore where lots of guys--day laborers--hang out. And it’s not pleasant...I don’t ever walk down Bayshore because I don’t want to be hassled.”
--Female, Age 40-49, San Francisco Third Street

“If there were more cameras at the intersections, so that when people are being crazy and stuff, that they would be able to get it on camera [would make it more pleasant and would make her more likely to walk and bicycle]…Better lighting would be able to help with some of my safety concerns.”
--Female, Age 30-39, Daly City

“There’s an industrial area as part of where I’m walking. That makes me afraid of walking in that area because it's dark and nobody has lights like they would in a neighborhood.”
--Female, Age 52, San Carlos

Perceptions of Crime Risk and other Personal Security Concerns Prevented Some People from Using Public Transit or made Public Transit Less Pleasant

“The bus that I'm on—I like the bus…it's clean; the people. But there are certain buses that you don't even want to get on; at least I don't...I wouldn't ride downtown from where I am to Downtown Oakland...that has to do more with safety.”
--Female, Age 50-59, Hayward

“You know, a lot of times, the people itself, not so much the cleanliness of the bus, but it's just the people that get on the bus...now I'm going into something else I think, but that's one reason why I don't take the bus…I've experienced things when you get on the bus, and I did that...twice…Younger people were loud. Some people not really knowing where they are going...like mental problems and stuff like that...and then you have to sit among that, and you just don't know what might happen to you. And then once getting on the bus there was weed on the bus.”
--Female, Age 50-59, Hayward

“I drive my car for safety. There's not many places that I'm going to go and take public transportation mostly because of safety…I think that for personal reasons, particularly for me, it's challenging to let go of my vehicle mostly because of safety...mostly because of crime.”
--Female, Age 50-59, Berkeley

“You’ve got to watch for who’s on the bus and kind of worry about somebody grabbing your stuff or wallet...”
--Male, Age 30, San Francisco Fillmore Street

<u>Perceptions of Crime Risk and other Personal Security Concerns Made it Difficult for People to Use Modes other than Automobile</u>

“But I think that for personal reasons, particularly for me, it’s challenging to let go of my vehicle mostly because of safety and because I travel with materials and things...mostly because of crime.”
--Female, Age 50-59, Berkeley

He is a big white guy. However, he does worry about both safety and security for his girlfriend.
--Male, Age 30-39, San Francisco Mission Street

“The Mission is alive--this neighborhood is dead…The Mission feels like a vibrant, alive city, and the Bayview feels like a dead ghetto.”
--Female, Age 40-49, San Francisco Third Street

“[The neighborhood has lost a lot of its character, I think, because the older families left. And now these condos are all empty...I know somebody who bought one of the condos. She says she never goes outside. I’m like, ‘That's so fucking sad.’”
--Female, Age 40-49, San Francisco Third Street

“I used to have a car, but a year ago I got mugged in my kitchen. I was lying on the floor for four days…while I was in a coma at the hospital…the police seized my car…it hadn’t been moved for three days.”
--Male, Age 84, Richmond

“Most of the taxi drivers don't go by the meter...They are supposed to, but they don’t...They arbitrarily will tell me it’s $7 or $10 or whatever. I always pay it rather than get in an argument.”
--Male, Age 84, Richmond

“And if you are by yourself, there’s probably a greater fear if something were to happen to you, and you would be by yourself...whereas if you get in a car and you can go from Point A to Point B...there’s sometimes a fear of being stranded and not being able to get back, and you are at a distance from your home. I think a car gives you a feeling of security...and I think people only realize that when you become older and you have driven your entire lifetime, and all of a sudden, somebody takes away the vehicle. I think it’s a pretty tough situation, I think, to go through

mentally because you are giving up your freedom of movement to a certain extent...Transportation needs to be tailored to meet the needs of the community."
--*Male, Age 60-69, Brentwood*

"[Her husband] bicycles everywhere, so he makes wherever he is safe."
--*Female, Age 60-69, San Carlos*

2.3. Several interview participants perceived that parents are much more fearful for their kids today than they were 30 to 40 years ago. As a result, they don't let them walk or bicycle much in their community.

Respondents suggested that parents are afraid of criminals and people with mental disabilities, possibly because of broader exposure of these problems through media coverage. This may create a vicious circle in which there are fewer people and fewer eyes on the street, which makes a more conducive environment for criminals.

"Bicycling was what we did. We took our bikes to school, you took your bike to your friend's home. There was none of this have your mom or dad carpool you around...We bicycled a lot...I think a lot of that is because of the times. We don't live in a world that is as safe as it used to be. I think people are more concerned about the safety of their child not so much out on the road, but who's behind the wheel of those cars or who is walking down the street, or who is somebody who is going to be a predator of your child. And that's probably why...well, not probably, I'm sure, that's why most parents don't have their children biking around or walking out on the streets alone." Also, "Over the years from when I was a kid until now, the speed limits increased. Cars are more powerful. So when you put your child out on the street to bicycle or to walk, there's not a lot of room for error."
--Female, Age 40-49, Danville

"Oh gosh, it was so much different. We walked to school every day. We were like always on our own, no supervision...We were outdoors more than we were inside...run around, did what we wanted. [It is different today for kids who are growing up]--it's horrible. They just stay inside and watch video games and stuff...it's irrational kinds of fears and stuff...people don't want to let their kids out of sight..."
--Female, Age 60, Concord

"I was pretty independent…you wouldn't give a little girl the freedom that I had as a little girl. I went down to the woods by myself, made fires, had a great time. You just wouldn't do that today. And I would do that on my bicycle. Now it's a lot different than the way I was growing up…There so many 'bad' guys walking around now. During World War II, we probably just kept them in jail or we sent them into the army. Now, it's a volunteer army, and we seem to let an awful lot of people out on probation. And if somebody is nuts, we seem to just give them medicine and hope they take it freely...Growing up, I didn't have strange people sort of sitting on the sidewalk, looking miserable, and begging for money...They just weren't around...I tend to think there's more people out on the streets. I've talked to people that grew up in San Francisco...In the 50s, the area around Lake Merced really got built up. They used to talk about

playing in the sand dunes there and riding the bus Downtown by themselves, and things like that, which I don't think you'd let kids do today."
--Female, Age 60-69, San Francisco Taraval Street

"I think because safety has become such a concern over the last probably 20 years or whatever...where I could walk around and get back and forth to school when I was in elementary school, it's not seen as safe anymore—with good reason. So kids are almost always chaufferred to wherever they need to go by car because of the 'fear factor' involved with letting your kids walk the streets by themselves. I would say the younger generation is more in the car than even I am, and I consider myself in the car probably too much in the first place." Question: Why does this 'fear factor' exist? "There's websites with the Megan's Law that show where all the sexual predators live. There's kidnapping reports. There's people sitting at the bus stop getting their stuff stolen by kids roaming the streets. There are all kinds of things that I think are new to society, or more heavily publicized. There's more information available about where the 'bad guys' are, so people are really hesitant to let their kids be out on the street. I know I don't let my 10-year-old do any of the things that I was doing when I was 10 because when I was 10 I was taking Muni everywhere on my own by myself...my 10-year-old has not walked anywhere by herself her entire life just because I don't trust everybody else out there right now, and I don't really see how that can change unless society as a whole kind of shifts gears...Most people, in my community at least, don't know the other neighbors on the streets, which I know is way different than it used to be a long time ago. So there's not that sense of community where you know that if I'm not watching over my daughter than at least somebody else on the block might be looking out for her best interests, or know that *that* person doesn't belong with my daughter...so I think if there's kind of this 'we're a community again' mentality, that would help get kids out and have more safe outside activities where they are not being chaperoned 24-7, I guess."
--Female, Age 30-39, Daly City

"At the age of 9 and 10, I was taking the Long Island Railroad and the New York City subway system by myself in and out of New York every week. That's changed. No way would I put a 9-year-old on even Muni, much less on New York subway system. So I would say it's changed...I don't think that crime against children has actually increased; I think that people are just much more aware of it, in the same way that now we're aware that riding a bicycle without a helmet is dangerous...When I was younger, the world just didn't seem as dangerous...it was not as publicized...24 hours a day you can get coverage of crime on television, if you want."
--Female, Age 60-69, South San Francisco

3. CONVENIENCE AND COST

The convenience of different modes in each type of community had a strong influence on the choice of mode that the person used.

3.1. Traveling by automobile was more convenient than using other modes in certain communities, especially suburban areas. Many participants living in neighborhoods with dispersed activity locations felt that the activities were too far to reach by walking and bicycling/it would take them too long by walking or bicycling.

<u>Automobile was more Convenient than Walking</u>

In Walnut Creek "kids have to be driven everywhere--they can't walk themselves to school...because of the [lack of sidewalks] and because of the distances."
--Female, Age 50-59, Berkeley

"I have one [child] that is 26. She has to drive her car to college because she is too far to walk and she can't take a bus to get there because of where she lives."
--Female, Age 52, San Carlos

"I live on the border of San Carlos near 101, and I work at Kenyona College...so that's too far for me to walk."
--Female, Age 52, San Carlos

"[Work is] kind of a little too far. It would probably take me--I don't know how long it would take me to walk there--probably an hour...it's just a little bit too far for me to walk."
--Male, Age 30, San Francisco, Fillmore Street

"I love to walk, and I love to see more people. Unfortunately, there's not that much in the U.S. I come from a country where people walk a lot...I come from Cuba. The cities are planned in a different way. You feel at ease to walk. Here everything is so huge. When you say 'one mile'...there's nothing in between there and yourself...you feel like you are walking two miles. The distance[s] are huge...from here to there, what is there to see? Nothing. There's not even a person to say, 'Hello,' 'Good morning,' 'How are you today?'"
--Male, Age 30-39, Berkeley

"You can't believe sometimes how long the lights are on Gallindo when you are trying to cross over...oh my gosh! That light...you just stand there and stand there and stand there. And so that gets really old, you know? That's one reason not to walk."
--Female, Age 60, Concord

"I suppose I could walk [to the retail pharmacy store]. That would pretty much be my only other option because there's not really an easy bus route to get there." Walking would take her about 45 minutes to get there.
--Female, Age 30-39, Daly City

Why do you think people are out walking? "I just figure they are like me. Just trying to get to their destination and do what they do, and exercise or whatever they are doing, and hopefully be safe…There's nothing wrong with walking. It's just where you got to go to and where you are walking to. If you are walking...for your health, then that's okay. But if you have business to take care of, then that might be a little problem...It could take a long time. It's difficult, you know."
--Male, Age 57, Oakland

<u>Automobile was more Convenient than Bicycling</u>

"I guess the distance [is a barrier to walking and bicycling] as well. I'm thinking of all the places I go...we go to church in Downtown Oakland, and that's a pretty long way to bike."
--Female, Age 50-59, Berkeley

<u>Automobile was more Convenient than Walking or Bicycling</u>

"People travel which is the best way to reach from point A to point B, which is a car in this part of the world…If it's more than [a mile or two], you're not going to walk, you're not going to cycle, you're going to take the car and go."
--Male, Age 40-49, Fremont

"The next grocery store is about 4 to 5 miles away, and I wouldn't think about walking or bicycling."
--Female, Age 40-49, Pleasanton

<u>Automobile was more Convenient than Public Transportation</u>

"I think BART is a real good thing, and public transportation. But I admit sometimes if it is more convenient for me, I do drive."
--Female, Age 60, Concord

She is a public transportation user now because she can't afford a car: "I would buy a car 5 years from now because it is more convenient to have my own vehicle. Public transportation is dirty…It wouldn't be good for the environment, but since it would be better for me and more convenient for me, I would get a car."
--Female, Age 20-29, San Francisco Market Street

"For me, I would be open to taking mass transit, like BART, if it went down to the Peninsula, but it doesn't go as far as I need it for my job."
--Male, Age 30-39, El Cerrito

"Sometimes if I'm going into Berkeley, I'll drive rather than take the BART because of that awful connection where you have to get off at MacArthur and stand, and it's cold. And then you've got

to connect to the Richmond train, and if you don't run real fast on the way home, you might just miss it, and then you have to wait another 20 minutes. Ugh!"
--Female, Age 60, Concord

"There's also a time issue...If I'm going to San Francisco from here, I can walk to the bus stop that's closest. I walk for 20 minutes, at least. And then I wait for the bus to arrive. And then I take the bus to the BART station. So that's about another 20 minutes. Then the BART to San Francisco. So it's maybe easier and faster to go by a car."
--Female, Age 40-49, Pleasanton

"I used to work in Walnut Creek, and it's not really convenient to use the BART, too, because I have to change it twice...It's time consuming, so I ended up using my car. And I tried carpooling, but it didn't work."
--Female, Age 40-49, Pleasanton

"Caltrain is on one side of 101, and my office is on the other side, and it's not a walkable distance. So, first of all, taking BART to Caltrain would take another half an hour than it normally would just to get to the City, and then catching the train down, I would have to find a way to get from the station to work besides walking...because it would be like a 6-mile walk."
--Male, Age 30-39, El Cerrito

"One poor gal [that I work with is] having to pay bridge tolls for the Richmond-San Rafael Bridge and the Golden Gate to get to the museum. She would love to be able to just jump on BART, but where she lives, it just doesn't fit because of the museum [being too far from BART]."
--Female, Age 60-69, San Francisco Taraval Street

"There is a [bus route that] does drive up Skyline, which is right near my house, but it is a circle route, and for me to take it to get to BART, I would be going many miles the wrong direction before I got to the Colma BART station...It would take about 45 minutes; it takes me 8 or 9 minutes to drive. To get there at nine, that 45 minutes is a killer. It's not going to happen."
--Female, Age 60-69, South San Francisco

"There is a bus stop actually within a block of my house, but it...goes out to the Sunset...there's no bus that goes where I need to go. There's no direct public transportation to where I work."
--Female, Age 40-49, San Francisco Third Street

"My wife, when she didn't have the car, she always was complaining that the bus was not on time or they cut route or the schedule from one bus...that was very difficult for her...If we have the means to support our families at least locally...people might choose not even to ride a bus--even to ride a bicycle."
--Male, Age 30-39, Berkeley

"I'm grateful for the bus, and I have used it. But there are things that maybe I need in different cities, and it takes a while...everything I need is not in my city...I'm interested in holistic, organic

products that support health and good growing practices and all that, and I can't get what I need--so I'm trying to support good health and the environment in other ways, too. Yeah, everything isn't in my city. It isn't the fault of the bus service. They get you where you are going, but it is just very time intensive."
--Female, Age 52, South San Francisco

They don't go to San Francisco that often, but "If we are going out to dinner or something, we will usually drive so that we have the convenience of where we are going...if we are going to a baseball game, we will usually take the train because it stops right there at the ballpark. But it really is more of, 'do we want to hassle with the parking at the other end?', like going to the ball park, 'or do we want to get on the train and get up there?' You have to decide, depending on when you want to leave, you have to wait for the train...I can't say necessarily that the environment plays into that decision. It's more of, 'do we want the hassle of the parking and the cost of the parking versus the hassle of waiting for a train?'"
--Female, Age 50-59, San Carlos

"I'm sure there's a bus, but I have never taken it there. Actually, it would be a very circuitous route to get there by the bus...I'd walk before I would take a bus--put it that way…Convenience, obviously, is not having to wait for a bus, and that kind of thing."
--Female, Age 50-59, San Carlos

"They get around the best way they can. Those who have got the right to drive, they [are] lucky. And those like me who have to take the bus--we got to do the best we can. Get there the best way--the fastest way--that we can. That's bus...I got to transfer to about two different buses. You got to stand and wait in the rain if it's raining. There's all kinds of problems."
--Male, Age 57, Oakland

"The biggest barrier is kind of the convenience of a car, even though it is kind of bad for the Earth and everything, it's still kind of like the most convenient way, I think…basically, as soon as I get out of my work, I can go to my car. It's there. I can drive home. Instead of maybe waiting for the bus. And actually the problem with my work is that I would have to transfer at least once. It would take at least double the time to get to work. If I lived on a direct, direct bus route that just went there, I would almost for sure take the bus."
--Male, Age 30, San Francisco Fillmore Street

"Still cars are just like the most convenient way. Even though it's kind of stressful when I'm driving in a bunch of traffic, it's still easier I guess than standing up on a really busy bus and if you are carrying a bunch of bags and stuff."
--Male, Age 30, San Francisco Fillmore Street

"If you are in an area that doesn't have good transit or a taxi, I want my car! Right? So, it's freedom."
--Male, Age 50-59, San Francisco Fillmore Street

"Number one. Convenience. If I have to walk several blocks to get to the bus station, and you consider that if I could get in my car and be there in 10 minutes, but if I take public transportation and it takes me 30 minutes, so it takes me 3 times as longer to get there, and maybe 4 times. So that is really the determining factor…If you are in jobs where it's Monday through Friday, 8 to 5, public transportation might be a little easier than if you are in a job where you arrive and you leave, but each day, depending on what you do, it's at a different time. So whether you are trying to carpool or catch public transportation...if it doesn't accommodate you work schedule, is one. Number two, if the public transportation is not within range of where you work, that poses a second problem. And then number three...it depends on your time and availability and what your family situation is. If you are trying to pick up kids after school or after work, it presents a problem. Whereas public transportation might take an hour to get there, and in your [personal automobile] it might take 20 minutes to get there. And then the other side to that is it depends on your health...whether you are able to drive safely in a high urban, dense area versus being able to take public transportation and let somebody who has the skill drive you to get from Point A to Point B...The other thing that I think is important is...with all of the different electronic devices that public transportation I think is a better way to go if you are going to be texting or iPad or iPhone or all those different things."
--Male, Age 60-69, Brentwood

"…waiting for a bus. They've got benches out in the open with no cover. But if it's raining, you've got to be dressed for it, and it's not pleasant to sit on a bench in the rain...and it's cool. And in the summertime, it's the other way around. You are sweating in the hot sun because the bench is right out in the open. There is a bench though, so you can't complain too much. But it's certainly not as comfortable as when you were younger and you could jump in your car and turn on the air conditioner and go where you want."
--Male, Age 84, Richmond

"Older people...would be more likely to use public transportation if...they felt it was safe...if they felt it was accessible so that if they were in a wheelchair or they were in a walker or had a cane, that the units were easy to get in and out of, and that they actually went to places where they needed to go. Another factor...overall, is this sort of interlinking of the systems...you can have one electronic swipe device, and you can get around, I think more generations would be likely to use public transportation. The other part is...smaller bus services that are developed over time...Imagine if you had on some of these side streets a little electric shuttle [to connect more people to the main transit lines]."
--Male, Age 55, San Francisco Third Street

"Sunday I went to church. That's about 30 blocks from my house. I took the bus down there, and I got a ride home from...the pastor of the church...It's about four blocks [to the bus stop], and then it lets me off about four blocks from the church, so I walked about eight blocks."
--Male, Age 84, Richmond

How far do you have to walk from your home to the bus stop? "About 2 blocks." How far do you have to walk to the store after you get off the bus? "Depends on which store I want to go shopping at...Basically, I have to do a lot of walking."
--Male, Age 57, Oakland

"I don't prefer to take BART certain places because they don't get you close enough to where you are going. So you are either going to have to either get on a bus or walk."
--Female, Age 50-59, Hayward

"So, for example, over the weekend, if I want to get my family to the City, I'll take the car. I'm not going to spend $50 paying for BART tickets...four of us coming to the City would be about $50. A car ride is more convenient, more flexible than trying to take the bus."
--Male, Age 40-49, Fremont

"I feel that a great deal of the problem with the efficiency of the bus system is the cars. Individual rider in each car, or maybe two people in a car, all pushed together, causing a traffic jam. And here are all these good people riding the bus, they're stuck in the car traffic jam. When they should be, because they got on the bus, they should be whisked swiftly to where they are going. If you don't do that, well, people will go, 'Why shouldn't I be sitting in my fancy car?'…I would vote for transit-only streets."
--Male, Age 50-59, San Francisco Fillmore Street

<u>Automobile was more Convenient than Other Modes in General</u>

"Why do I rely on my car? One thing is distance. One thing is the amount of materials that I carry."
--Female, Age 50-59, Berkeley

"I pretty much travel everywhere with the car. Our home location is such that there is no public transportation around here for about 1.5 miles. The first bus stop is at about 1.25 miles. So car is the only option for us. I could use my bicycle, but it's not always convenient that way...When I went to get groceries, it's not the best option."
--Female, Age 40-49, Pleasanton

She lives in Pacifica and drives to all activities: "There's no other transportation available to me, period. Unless I drive some place...like I can drive to a BART station, but that's it…Getting to work is not the main issue. The main issue is any other place I want to go [I can only use my car.]"
--Female, Age 60-69, South San Francisco

"Every neighborhood I have ever lived in, I have been able to walk to the grocery store. But there is no grocery store within walking distance. I have to leave the neighborhood. That's something that bugs me the most, I think. That's why this is not a walking neighborhood...there's nowhere to walk to…I miss the neighborhood feeling. I miss being able to walk out of the house, walk to the store, see my neighbors, walk to the bus safely...I miss that. I hate that I have

to drive everywhere I go--I hate it. If this neighborhood had more accessible transportation, if it was more aesthetically pleasing, if the police patrolled regularly, it would be a wonderful neighborhood...because it has the best weather in town!"
--Female, Age 40-49, San Francisco Third Street

"I have to consider that the distances here are huge."
--Male, Age 30-39, Berkeley

Explaining tradeoff between automobile pollution and the need to travel by automobile: "You want to be efficient with your time, just like you want to be efficient with your car."
--Female, Age 52, South San Francisco

"The automobile has been horrible...They make 'em comfortable...You can live in there. You can smoke your cigarette in there if you want to...You can eat...Got your phone. You can have your whole office in there...Convincing people to come out of that comfort area [is very difficult]."
--Male, Age 50-59, San Francisco Fillmore Street

"A car is *easy*. It's easy. It's comfortable. So it means that to not do that and to walk more, ride a bicycle more, or even take public transportation is less comfortable. It's certainly not healthier. It would be healthier to walk...I'm thinking about effort...effort would be the physical energy expended if you are walking or biking. Now taking a bus, you have to wait for the bus. You have to catch the bus when the bus decides to come, not when you decide you want to jump in your vehicle and run off. Also, there is the discomfort of sitting right next to somebody that you don't know..."
--Female, Age 60-69, San Carlos

"But I would say that people that are older than me that haven't grown up with having the cars as being so easily accessible probably take opportunities like walking and public transportation more than my generation which is kind of the spoiled brat, you know? Just hop in the car...jump in, get where I'm going, and don't think about anything else."
--Female, Age 30-39, Daly City

"I lived in San Francisco until I was 10. Then we moved to San Rafael, and San Rafael was a small town with easy access to everything. But now all of San Rafael that has grown since then is suburbs, and they practically have to have a car. The whole idea of suburbs is 'anti-green.'"
--Male, Age 84, Richmond

3.2. Non-automobile modes were more convenient than driving in some communities, especially in dense, urban areas.

Walking was more Convenient than Automobile or Transit

"In the bigger city, it is easy to walk around everywhere, and you have places that you can walk and have your lunch and dinner or whatever you want to have."
--Male, Age 40-49, Fremont

He believes that people walk out of convenience--they are going somewhere local or walking from parking. People living in Bernal Heights walk for pleasure and exercise; less for convenience or to go to stores.
--Male, Age 30-39, San Francisco Mission Street

"Well, it's a half-a-block away...so walking does it."
--Female, Age 60-69, San Francisco Taraval Stret

She has a positive view of pedestrians: "I suppose a lot of them are walking for exercise, and some of them are walking because it is just more convenient than driving or taking the bus in the City."
--Female, Age 60-69, South San Francisco
"If [I need to pick up] something that is not urgent, I could walk because I live 5 to 6 blocks away from Walgreens."
--Male, Age 30-39, Berkeley

Why did you walk instead of drive to Walgreens? "A couple of reasons. I just thought it would be silly to drive because it was only a couple of blocks, and because I have able-bodied legs that are functioning. And, number two, I wouldn't want to create any emissions from a car just to go down the street two blocks."
--Male, Age 30, Burlingame

"Yesterday, I left my house, I walked four city blocks, I got on a bus for two blocks, got stuck in a traffic jam, got off, walked another city block, caught another bus for six city blocks, walked two blocks to run an errand, and then walked about 15 blocks to work, roughly, which is completely unusual for me. I generally just walk about 2 miles to work, and I walk home every day…I will generally walk Polk [Street] to avoid the car fumes that are usually stuck in traffic."
--Male, Age 50-59, San Francisco Fillmore Street

"There was a great bus. We had the 44 bus which was a terrific bus line…it ran all the way down Third…that was a great bus line, and it was fast. I used to take that all the time, actually. But it's gone. And you don't have that link any longer with the light rail. And, in fact, the dish on the light rail is that you could almost walk faster...I could walk faster to a meeting South of Market than I could taking the light rail--just about the same amount of time--I mean, I've done it. It takes 45 minutes."
--Male, Age 55, San Francisco Third Street

How do you usually get to Walgreens? “It’s walking distance from my work. If I need something, I make a quick dash up there.”
--Male, Age 50-59, San Francisco Fillmore Street

“Time is a factor. Because I have gotten on buses before, and I thought it was going to save me time, and I get off the bus, and I go ‘Jees, that was miserable.’ And, you know, it didn’t even get me here any faster. And I spent two bucks.”
--Male, Age 50-59, San Francisco Fillmore Street

“It’s so close walking--maybe 3 or 4 blocks--so I’m sure there is buses, but I don’t know that it would be worth it for only 3 or 4 blocks...It takes longer actually waiting for the bus.”
--Male, Age 30, San Francisco Fillmore Street

“Basically whenever I go out in the neighborhood, we walk everywhere...I have actually barely put any miles on my car since living in this spot...Everything for us is like almost walking distance of where we go. I never drive. Once in a while, I’ll take a taxi, but pretty rarely...We’ll take the bus once in a while actually to go down to the end of Oak Street...I’d say it’s pretty important--being able to like walk places and stuff like that, as opposed to driving.”
--Male, Age 30, San Francisco Fillmore Street

<u>Bicycling was more Convenient than Automobile or Transit</u>

People bicycle for convenience. It is often faster than taking the bus, they can go fast, and they can get exercise.
--Male, Age 30-39, San Francisco Mission Street

Promote bicycles and other small motorized vehicles as a “matter of efficiency”. This will make it possible to fit more people into the same amount of space.
--Male, Age 30-39, San Francisco Mission Street

<u>Transit was more Convenient than Automobile or Walking</u>

In Bombay, India transit is convenient enough so that you can live without a car. “I come from a place which was well-connected, and I come over here, and find it fairly handicapped...I have not lived in New York, but if you go and spend some time in New York, that is also well connected in a lot of ways. Look at the way people live and work over there...some of them will not even own a car or have a drivers' license. So it's a reflection of how the infrastructure is.” It is also “how the city is laid out...New York is densely populated, and it becomes easier and it is cost-effective...At some point in time, you've got to throw in and say which way you want to go...as a country, as a planet, as a whole. You've got to do certain things if you want to take that route.”
--Male, Age 40-49, Fremont

“Convenience, cost, and a lot of other factors would play up over there...so to go from point A to point B would take you 2 hours in a car and 30 minutes using public transportation, you are going to use public transportation to do it.”
--Male, Age 40-49, Fremont

“When we go to a sporting event...if there's a way we can take BART instead of having to take the car and deal with that, then we will do that. So that's when I do tend to rely on public transportation.”
--Female, Age 40-49, Danville

“San Francisco is just crowded Downtown, so we just jump on the [Muni] ‘L’ or if we go up to 19th Avenue, we get the ‘28’...It's really a nightmare to drive Downtown. It really is. There's cars, there's buses, there's delivery trucks, there's all kinds of bicycles, and there's people that just sort of pop out in the middle of the block, and there's an awful lot of one-way streets...the last time that I drove for any long stretch, I had to trade in some theater tickets on Geary Street, and I could not find a place to put the car, and I finally drove up to the valet, and said, ‘I don't want to stay, just come over to my car and let me trade the tickets,’ and he did!...The ‘L’ is the way to go Downtown.”
--Female, Age 60-69, San Francisco Taraval Street

“…in the City, sometimes, public transportation would actually be faster than driving, which would make it more appealing.”
--Female, Age 30-39, Daly City
“I do take public transportation once I'm in the City, but in order to get there, I have to drive to BART first or drive to the City and then park the car.”
--Female, Age 60-69, South San Francisco

“I telecommute most of the time...but I do have to go to other locations, including to my office, which is in Oakland. When I go to Oakland, I generally drive to BART, which is...maybe four miles, I park at BART, then I take BART over to the East Bay, and I walk a couple of blocks, and then reverse the process to come home.”
--Female, Age 60-69, South San Francisco

“Within walking distance, there is bus transportation to get everywhere.”
--Male, Age 30, Burlingame

“And in those cities that are generally busy, they are also busy with cars. So you have both [public transit and automobiles]. And then if you think for a moment that you eliminate the public [transit] component, it would be impossible to get around. And I’m thinking about places London or Paris or Rome or in South America in some places...the cities are already tremendously busy.”
--Male, Age 55, San Francisco Third Street

“If there was a bus stop right around here, I may think of taking a bus.”
--Female, Age 40-49, Pleasanton

"I usually take the bus because…my local Walgreens is three blocks away. I guess I could walk, but most of the time I just take the bus because it is faster."
--Female, Age 20-29, San Francisco Market Street

Other Modes were Generally more Convenient than Automobile

He does not own a car. Driving on a daily basis would be difficult because parking in Downtown San Francisco is inconvenient. Occasionally wishes he had a car to "get out of town."
--Male, Age 30-39, San Francisco Mission Street

Walking, bicycling, and transit are quite convenient in San Francisco.
--Male, Age 30-39, San Francisco Mission Street

Interviewee living in San Francisco generally makes "short trips because everything is so close."
--Male, Age 30-39, San Francisco Mission Street

Would she travel differently if she lived in San Francisco? "I think I would walk a lot more and I think I would use public transportation, but not bicycles!...If I were in the middle of a metropolis...both for pleasure and for getting around...and also the hassle! There comes a point where using a car is really a hassle, for parking and everything."
--Female, Age 52, South San Francisco

3.3. Several interview respondents had very significant time constraints that prevented them from using modes that they perceived would take longer than the lowest-time mode (which was often automobile). These people did not even have the few extra minutes that a short walk or bicycle trip might require.

Interview participants seemed somewhat more willing to walk or bicycle on weekends (especially with other family members) because their time was less constrained. However, the survey results suggested that people were more likely to walk on weekdays than on weekends.

Significant Time Constraints Prevented People from Walking or Enjoying Walking

"I feel they are very fortunate that they can go out and walk because that's kind of equated with health and with doing something for yourself to maintain...mentally and physical good well-being...When today's family unit has changed so dramatically...I grew up with a family that would eat dinner together every evening, would then go out, and on a sidewalk walk as a family. You really don't see that much anymore. The family unit has changed to the point that it has changed the way services are provided. When you work 10 or 12 or 14 hours a day, and you throw in commute on each side of that, there's not much time for walking. Then your life becomes, I think, more oriented towards an efficient and effective way of taking care of your family, working, paying your bills, and somehow maintaining a quality of life in between all that. People that have the time to walk, I applaud them. I leave for work when it's dark and I get

home when it's dark. On the weekend, it's not about as much walking as it is just trying to catch up, regain your breath, to start over again on Monday. So the family unit has changed pretty much dramatically. And both people in the family are working."
--Male, Age 60-69, Brentwood

"I think the older folks would be inclined more to walking...I think that has to do with exercise. I think the younger people...they are trying to get somewhere in a hurry...they are in more of a faster mode than older people…I'm probably even in walking distance of Walgreens, but due to time...I'll drive…for other things that I need to do that are right there around me."
--Female, Age 50-59, Hayward

"I really wanted to walk to the gym--that's what I normally do--but because I was pressed for time [to get to a particular class], I took the bus to the gym...the gym is only like 2 miles away, and it only takes me about 15 to 20 minutes or 30 minutes tops, depending on what pace I like that day, so I have no problem walking there. So I decided to walk home because I wasn't pressed for time."
--Male, Age 30, Burlingame

Do you ever walk for pleasure in order to experience nature, watch people, see people, or just enjoy walking? "I'm always too short of time to do that. I'm trying to do things, and I just don't have the time to spend that way."
--Male, Age 84, Richmond

"If I'm bored, I'll go for a walk. If I'm going to go somewhere, I'll just take an extra long kind of route and walk down on Polk Street where there's a lot of different stores and people walking around. I walk a lot, but not for a lack of not walking."
--Male, Age 30, San Francisco Fillmore Street

"Look out on the streets, and you will always see the elderly. They are out there every day walking...that's what they do...but I think when you look at people 60 and younger, I think it's all a function of time. I think because of who we are and what we do, the objective is to get to point B from point A as quickly as possible. And the car is going to provide that access."
--Female, Age 40-49, Danville

"Look at San Mateo...all of the area surrounding Hillsdale Mall is either assisted living or retirement communities. Why? Because people of that genre want to be able to walk to the mall, they walk to the food court. That's how they fill their days...walking through these areas."
--Female, Age 40-49, Danville

“What I see more frequently these days is a sad scenario…you see people with their cell phones walking; you see them doing business while they are walking. You know they are doing it because they need exercise; they want to get exercise, and it’s the only ‘down-time’…that they have…I think that everyone's trying to live a healthier lifestyle...when you see walkers with the headphones in, that’s terrific--then you know they are out there for the right reasons--but when you see them with their cell phone and the printer and computer strapped to their back...”
--Female, Age 40-49, Danville

Significant Time Constraints Prevented People from Bicycling

Did you bicycle when you were a child? “I did. And I loved it. I got my first bike when I was 12...And I bicycled until probably my mid-30s. And I’m not sure what happened or why I stopped...I had my kids...at 18, 20, and 21, so that was before I stopped bicycling. I think life just got busy...Life was busy for a long time...Life is less busy now. This is why I need to get bicycling again. I actually have time for it now.”
--Female, Age 60-69, San Carlos

“A lot of times, especially on the weekends, it will be spur of the moment…On the weekends, it's more the need to get the exercise, and then do we combine it with any other errands that we have to run that work on a bike.”
--Female, Age 50-59, San Carlos

Significant Time Constraints Prevented People from Using Public Transportation

She drives sometimes, “Especially if I'm really busy. Because I also teach a homebound student who lives on the other side of town. And so if I have something at the museum and am teaching him, I don’t have the time to take the bus, so I have to drive.”
--Female, Age 60-69, San Francisco Taraval Street

“I went to high school in Mill Valley...We had the electric train in those days. I used to take it sometimes or I rode in a car with somebody that was going there. Life was a lot more relaxed though, in those days.”
--Male, Age 84, Richmond

“Things happen. In this case, I had it planned out so that I could ride the bus to get to his place. But his mother requested a doubling of my teaching time, and so that took care of most of my spare time. It's worthwhile, and the child needs it, but my worked out schedule doesn't work anymore.”
--Male, Age 60-69, San Francisco Taraval Street

Significant Time Constraints Prevented People from Using Modes other than Automobile or from Driving Slowly

“Because of my line of work, it would not be feasible for me to take a bike or take a train or to take a bus because I have to have transportation available at all times because I'm in and out so frequently during the day with clients...Now in my spare time, that's different.”
--Female, Age 40-49, Danville

“Time is such a commodity these days. We are all leading such hurried lives that you want to get somewhere the quickest way you can so that you can have your down-time later.” Walking and bicycling are more prevalent in beach towns where people desire that kind of lifestyle to “unwind” and “feel like they are 100 miles from the city.”
--Female, Age 40-49, Danville

“I think my life is simpler than a lot of people. I probably travel a lot less than a lot of people...People my age seem to make a lot more money and drive a lot more...I wish I was making more money, of course”, but she is still happy with her life.
--Female, Age 60, Concord

“As you get older, you have other responsibilities that make you travel differently.”
--Male, Age 30-39, San Francisco Mission Street

“There's a number of people like me--thankfully not everyone's like me--but there are a number of people that are always running...and when you have so many things going on in your head, and you just want to get to everything now, you just let go of some priorities. Unfortunately, it is the environmental ones sometimes.”
--Female, Age 52, South San Francisco

“In this time of my life...everything I'm trying to do it...in the least time possible, so a car seems very convenient.”
--Male, Age 30-39, Berkeley

“Although I live very close to [within 2 miles of] work, I choose to use my car because I have a very busy schedule. And sometimes I only have a few minutes to run from one place to another. So I woke up at 5 and do my things. Then I come here [to work]--I start at 6. I drive my car. From there, I go to school at night from 5 to 8 in San Leandro. I get off at 4:30. I have to be at 5 down to school, so I use the car. I get off at 8 to 8:30 sometimes and arrive home around 9...I usually don't take the bus. The other transportation that I take is BART when I go to the City. But most of the time it's the car.”
--Male, Age 30-39, Berkeley

“If I wasn't pressed for time, I wouldn't have taken the bus, I would have just walked to the gym. Or I wouldn't have taken the cab; I would have just taken the bus to the airport.”
--Male, Age 30, Burlingame

“My work life for many years, for decades, was so busy that I just needed to be in, you know, frankly, more than one place at a time, often. And how I would do that was solved at times, just with a cell phone while driving in a car or two cell phones--this sort of manic behavior. But I

couldn't even consider solving my work life with walking or bicycle, given the locations of the projects--they were in disparate parts of the cities and that sort of thing."
--Male, Age 55, San Francisco Third Street

In her spare time on the weekends, "I try and take my kids out either walking...for example, we have tennis courts in our association, so we will walk to the tennis courts instead of taking the car, or we will bicycle...so we try and do something that doesn't involve a vehicle if it's feasible."
--Female, Age 40-49, Danville

"We used to go out on a Sunday ride...nobody was in the hurry they are in now. We used to ride along at 25 miles an hour, putting along. And we'd slow down, look at the cows in the field and sheep...we never had the people blowing the horn behind you, and giving you a hard time. Everybody was more relaxed, it seemed like. Now, the light changes to green, and right away some yo-yo behind you is blowing his horn at you."
--Male, Age 84, Richmond

3.4. Professional responsibilities required some interviewees to travel by automobile.

How important was transportation in your decision about where to live and work? "The house in the Bayview, frankly, I didn't even think about it because I knew I would have to drive...There were very few ways for me to get to work in those years without driving. I couldn't take a bus."
--Male, Age 55, San Francisco Third Street

"There's really no other way I can travel in my profession than with a car."
--Female, Age 40-49, Danville

"What we do for a living...really dictates what mode of transportation we're really locked into, if you will."
--Female, Age 40-49, Danville

3.5. Family responsibilities were cited by several interview participants as major impediments to walking and bicycling on a regular basis.

<u>Family Responsibilities Prevented People from Walking</u>

A 45-minute walk to the store would not be a realistic option: "Not with a baby, especially."
--Female, Age 30-39, Daly City

<u>Family Responsibilities Prevented People from Bicycling</u>

She reduced the amount of bicycling she did before she moved to Pacifica. "It changed when I had kids and I had to get them to child care or school and I had to work."
--Female, Age 60-69, South San Francisco

"Bicycling was what we did. We took our bikes to school, you took your bike to your friend's home. There was none of this have your mom or dad carpool you around."
--Female, Age 40-49, Danville

She stopped bicycling after having her second child at age 29 or 30. She couldn't fit all of the kids on a bike. When her older child got to be 11, they started family biking again.
--Female, Age 52, San Carlos

Family Responsibilities Prevented People from Using Public Transportation

"I think people who are older usually have a family and so buy a car because it is more convenient. When you have younger kids, it's better to have a car…I think people who are younger than me take public transportation because it's more convenient for them. Most of the time they are single, so they just prefer to take public transportation to work."
--Female, Age 20-29, San Francisco Market Street

"Sometimes if you are going to go to a specific place, you have to walk like...5 miles from the bus stop to where you are going to go...I'm with the baby carrying this and that. I would rather get the car and get there. For a family it is very complicated to make a living around the society that we have built."
--Male, Age 30-39, Berkeley

Some People Felt that it Was Necessary to Travel by Automobile to meet Family Responsibilities

"In 5 years, both my kids will, in theory, be out of the house. So there will be less of that 'Oh, can you come pick me up?' or 'Can you give me a ride to...?' So I'll actually probably be in the car a lot less in 5 years."
--Female, Age 50-59, Berkeley

"It seems like parents all drive their kids to school, or they take buses, but mostly they drive their kids to school."
--Female, Age 60, Concord

"I was delivering children to childcare. My husband took Muni and I took the car and delivered the children."
--Female, Age 60-69, San Francisco Taraval Street

"My kids were still younger…we always used to be on the time crunch. They would wait for me to come home. There was something else for them that I had to drop them off…things like that, I would always go for car. That's faster and more convenient. Now, my younger one goes off to college next year, so maybe I'll start thinking about the alternate options. No one waiting for me to be at home at a certain time, maybe then that's an option."
--Female, Age 40-49, Pleasanton

"I live in a combined household right now, so it is myself and my husband, along with my in-laws and their sons. So my brother in-law and then my mother- and father-in-law are all living in one happy home…I don't travel with my in-laws at all. My husband and I have a common interest, so we travel together when possible. But when it comes to day-to-day activities, we are pretty much each to our own car situation."
--Female, Age 30-39, Daly City

"I take care of my mom, and I can't be away very long. And I usually take her with me...Ordinarily, if she were in the best of health, we could be flexible, but lately she hasn't been. So [barriers to using non-automobile modes] would be due to health concerns and a limited time available to get to do something, and where I'm located. We can get down to the train; we can use the bus, but it involves more and more time, and we would be not able in an emergency to get somewhere quickly. I mean, I guess we could...you can call an ambulance....but it becomes so complicated…There's a whole spectrum of wellness in the population. That is a concern: how quickly can I get back home if I need to?...not necessarily get to a hospital, but also get back home. That's what [her mother who she is taking care of] wants. She's out, and she wants to be home right now...and she can get very upset."
--Female, Age 52, South San Francisco

How do you get to Walgreens? "It is mostly driving. I sometimes have emergencies where my daughter that suffers from asthma, I need to pick some medication up from there. If it is an urgent thing, I don't drive coming from home there…I usually drive from work...to get the medication and then drop it off at home."
--Male, Age 30-39, Berkeley

"I have dogs, and I have to take them to the vet. And that gets really expensive. I have tried a taxi, but it runs $20 each way because they don't go by the meter when you have a big dog...plus a long wait for the taxi each time, and a struggle to get the dogs into a strange car."
--Male, Age 84, Richmond

How do you think older people get around? "Most of them have daughters or sons or granddaughters, uncles, or somebody who can help them get around."
--Male, Age 57, Oakland

He travels with his family members "very, very often," but "I don't want to be a burden."
--Male, Age 57, Oakland

3.A. BARRIERS THAT MAKE TRAVEL MODES INCONVENIENT

3.A.1. Planning time is an important component of convenience. The need for advance planning reduces the attractiveness of particular modes for routine travel.

As an important component of convenience, the need for advance planning was viewed by many interviewees as a deterrent to using particular modes of transportation. Participants in suburban communities thought that public transportation required significant planning. They needed to look up bus schedules, understand how to make transfers, and know how far they would need to walk from transit to their final destination. If they were making more than one stop, the complexity of planning would increase since they would need to catch a different bus and potentially travel on a different route. In contrast, using an automobile was a choice that could be made at the spur-of-the-moment. It simply required going to the car in their garage or driveway and driving it to a parking lot (where spaces were almost always available close to the entrance of the store) at each activity stop.

In contrast, many participants living in urban communities thought that using an automobile required significant effort. Drivers thought carefully about how to navigate congested streets, tried to plan where they would park and how much they would pay for parking near their destination, and scheduled to return from their tour at a time when it would be possible to find parking close to their home. In contrast, walking required little planning and respondents were familiar with transit routes and didn't need to review transit schedules because of high transit frequencies.

People living in all types of urban environments also indicated that bicycling would require them to plan because they didn't know which streets or trails would be safe for them to use. People who had always driven to specific activity destinations, such as work or shopping, were not familiar with alternative street routes or trails that might be comfortable for them to use on a bicycle. In some areas, these routes may have been indirect or difficult to follow, so they were not given consideration.

Traveling by automobile can be done as a spur-of-the moment decision in the suburbs. The opposite is often true in the city. Bicycling, walking, and taking the bus were often viewed "altruistic", "virtuous", "taking patience", "requiring effort", "requiring planning", while driving was "convenient", "mainstream", "easy", and "didn't require planning."

Walking and Bicycling Require Significant Planning Time

"Walking requires that I get up on time and out the door sooner, so that's a barrier for me sometimes."
--Female, Age 30-39, Daly City

"I always plan my day out according to how I'm going to get there…If I had a car, my commute to work would probably be, literally be, five minutes. But because I don't have a car and I choose to either walk or use the bus, my commute would be anywhere between 15 minutes if I took the bus or 20 to 30 minutes if I went on foot. So I pretty much have it down to a science...how long it's going to take me to get to where...if I want to go to a library, if I want to go into the City...if I need to go to work...It is important, and it's a part of my daily life." Drivers "take it for granted."
--Male, Age 30, Burlingame

"There's a college close to where I live, and I walk there. But there isn't too much close by...I was taking a class, and I walked sometimes, but I did take the car, too...I should have been

walking, and the whole thing had to do with I'm not very well organized, so I would be running late...I started out walking...[the college] is probably a little less than a mile [away]...poor organization skills on my part...I tend to run late." Why did she stop bicycling and walking? Was it when she got her car? It was more about her lifestyle and scheduling: "I had a more free form schedule and worked when I wanted to," so that made it easier to walk and bicycle.
--Female, Age 52, South San Francisco

"For me it's such a hassle to get the bike on the rack on the bus if I'm going to take the bus…On nice weather days in the summer time, I would bike a little more frequently than I do during the other seasons...it's also finding spots to chain my bike, and having to worry about it."
--Male, Age 30, Burlingame

"We take the bikes and the backpacks down to the farmers market…I need to go for a bike ride—'oh, let's go to the farmers market'. So then we had to make sure that we had the backpack and the lock to lock the bikes while you are walking around...I don't think you can ever do it totally spur of the moment because you have to be prepared."
--Male, Age 50-59, San Carlos

"How to get there is probably thought about a lot more by people...who don't live in a convenient location..."
--Female, Age 60-69, San Francisco Taraval Street

Planning would be necessary to walk, bicycle, or take the bus to pick-up or drop-off their 11-year-old daughter. "If she has softball practice or something, one of us is picking her up from school and taking her to practice and that kind of stuff. My husband, every once in a while, will pick her up on the tandem bike and take her to practice on the bike and things like that. Obviously, those have to be planned in advance--make sure she is wearing the right shoes, you know, that kind of stuff to be able to do that."
--Female, Age 50-59, San Carlos

Public Transportation Requires Significant Planning Time

"It has to be convenient, frequent, affordable, and reliable. At this point in time, none of these are there in the valley…BART by itself is reliable, but if I have to take a bus service from my house, the frequency is not there, and I don't know how long...every one, every two hours, or two-and-a-half hours...unless you don't have a car, it just does not make sense to travel in that way…If you really want to change, you have to do a lot of investment and spending [in transit], and I don't see that happening."
--Male, Age 40-49, Fremont

Barriers to taking public transit versus walking: "Scheduling and availability."
--Male, Age 30-39, El Cerrito

“Carpooling could be an option, but my hours are kind of unpredictable, so I wouldn't want to put someone at the mercy of my schedule.”
--Male, Age 30-39, El Cerrito

“Daly City buses--none of them seem to start or stop where I need them to for it to be convenient, and they also have a really early ending schedule. If I went to the city and I come back on BART, if I come back too late, especially on a weekend, I have been stuck before, so that's a barrier. And then BART is just getting really more expensive every time I go on, so that's also a concern.”
--Female, Age 30-39, Daly City

What are barriers to driving less? “If they are driving a lot and they switch to public transportation, one of the first things that they are going to run into would be patience because it is obviously faster to take a car from point A to point B. Getting on the bus because...they have to do multiple stops and they are on a schedule, you won’t get from point A to point B in such a timely manner that you are used to, but if you plan accordingly, you could get there on time. It is totally doable. That would be the main barrier.”
--Male, Age 30, Burlingame

“There is a bus, if I walked to the bus station, I could take the bus up to [the college where she works]. But because it goes every 30 minutes, I would have to plan and make sure I got there in time, or I’d be late for work...It is probably 20 minutes by walking...I don’t know the bus schedule that well.”
--Female, Age 52, San Carlos

Automobile Requires Significant Planning Time

She doesn't travel with anyone else from her family to the museum [by car] because “nobody around here has the same schedule.”
--Female, Age 60-69, San Francisco Taraval Street

Do you travel with other people? “During the week, it’s pretty much on my own, and then weekend, it’s with my wife.”
--Male, Age 30-39, El Cerrito

“On the weekends, we travel together…From Monday through Thursday, I travel mostly by myself. And on Fridays, Saturdays, and Sundays, we travel mostly together--with my daughter and my son…sometimes my wife wants to be by herself.”
--Male, Age 30-39, Berkeley

3.A.2. Trip-chaining, or the need to make multiple stops on a tour, was a deterrent to walking, bicycling, and public transportation in suburban locations. Multiple stops did not appear to deter walking in urban, mixed-use areas with short distances between activity locations.

Multiple Tour Stops were a Barrier to Walking

"There are [places I could walk to], usually the bank. But I go to the drive through; I don't go to the walk-up window. And if the bank is open, I normally drive over...usually I'm doing that on a Saturday when the bank is the first stop, and then whatever else I have to do…I'm probably even in walking distance of Walgreens, but due to time...I'll drive…for other things that I need to do that are right there around me."
--Female, Age 50-59, Hayward

"Generally what I'll do is block my meetings in a day so that there are multiple occurrences, and so there is a reason to drive. The beauty of having [an] office South of Market is that if I had a meeting in the Financial District I would just simply walk. I would never drive. But if I have meetings like today—I'll have two or three—I'll just block all the meetings within one day, and then I'll do the driving. So I generally won't these days schedule a single meeting during the middle of the week downtown...or a meeting on a Tuesday and a meeting on a Thursday. That's highly inefficient. I'm very conscious of that. I'm very busy otherwise, so I just don't do that sort of thing."
--Male, Age 55, San Francisco Third Street

Have you ever driven to your local Walgreens store? "I might have just like stopped there on the way home from somewhere else. But I've never actually just made a specific trip driving there...I pretty much walk every time."
--Male, Age 30, San Francisco Fillmore Street

Multiple Tour Stops were a Barrier to Bicycling

"I could take a bike, but normally when I'm going, it's because I'm between two places, and it's just more convenient to drive because I happen to have the car."
--Female, Age 40-49, Danville

Multiple Tour Stops were a Barrier to Public Transportation

"What I normally tend to do is that if I have to do all those multiple errands, I will take the bus that will centralize me. For example, I'll take the bus from here to the grocery store. And not far from the grocery store is the library. So I'll get dropped off at the grocery store, walk to the library, and...Walgreens, do all of that. Then when I'm done with my errands, get back, and if I have energy, then walk home. If not, then I'll get on the bus...I would try to consolidate and centralize myself, and take the bus back. But if I had energy, I would walk home...If it's a little too far, then I'll get on the bus for one more leg, to run a quick errand. Or...if a friend is on their way there in the car anyway, I would hitch a ride with them and not necessarily come back with

them...but that's very rare...I try not to rely on other people for transportation; I can get there on my own."
--Male, Age 30, Burlingame

"If I want to go and do several things at once and get them over with...BART doesn't go everywhere, so it's taking buses...it's waiting for buses. It can be like half a day or a full day to do a few things if I have several things to do. So it's a time constraint."
--Female, Age 52, South San Francisco

"It's kind of hard [to make multiple stops] because you have to take a bus each time. It's a dollar each time. You can get transfers, but you have to use them up within a half-hour...the trouble is you might be waiting an hour for the bus each time. So it's hard to do a multiple-stop tour on the bus. It could take all day just to go to three places. And if you take a taxi, you are liable to spend $10 at each thing. It could be a $30 trip to go to three stores. And then $20 home, it could be $50 for one afternoon of shopping just for the taxis. So either way, it's not too good a system."
--Male, Age 84, Richmond

"I think for the South of Market meeting, the light rail, specifically on Third Street, then to a bus on 16th Street would likely solve the problem. But then the question would be how I would get from my meeting in San Francisco to my Marin County meeting. I suppose Golden Gate Transit could take me...There is no public transit from 101 to where I need to go in Marin."
--Male, Age 55, San Francisco Third Street

Automobile Transportation was seen as a Convenient Mode for Making Multiple Tour Stops

"I never just drive to Walgreens and drive home. I go to Walgreens when I'm doing some other errands." She only makes a single-stop trip to Walgreens when they have "an emergency out of something."
--Female, Age 50-59, Berkeley

"My office is only 5 blocks away, but I usually do drive…I think [that I do this] because sometimes I go from my office to the gym or to go swimming…and then get back in time for my client."
--Female, Age 60, Concord

"I also wanted to go a couple of different places, so I went to the Dublin Safeway store…I typically do that because either way, it saves my time, it saves gas, and I think that's the right thing to do. Rather than making trips for each individual errand, I combine them all together, typically."
--Female, Age 40-49, Pleasanton

"I think I used my car, and then probably on the way home, I thought I should pop into Walgreens and get such and such."
--Female, Age 60, Concord

"The time commitment is a lot longer on any of them--walking, biking, or taking the bus. There's going to be a lot more time involved in getting this errand accomplished. And if I have multiple errands, it's even more complicated. If I'm going one place--to Trader Joes [grocery store]--I could do any of the above, as long as I don't buy too many groceries. But if I'm also going to the Post Office...and when I'm going to work...I will wind up with three or four or five different places that I need to go. And then that's very hard to do on a bus. Not as hard to do on a bike, unless they are really divergent places, then it is."
--Female, Age 60-69, San Carlos

"Actually, today, I will probably just [go to the store and back home], but...usually when I go out to do errands, I line a whole bunch of them up. And then I'll trace a pattern that I'm able to get to each one without backtracking."
--Female, Age 60-69, San Carlos

"I will often go [to a Walgreens store] on my way home to pick up milk or something or soda."
--Male, Age 50-59, San Francisco Fillmore Street

3.A.3. Weather conditions made walking, bicycling, and taking public transportation unpleasant for many respondents.

Weather was a Barrier to Walking

"Maybe in the summer I'll walk more. That would be good. It's warmer; I like the warmer weather."
--Female, Age 60, Concord

Do you usually walk to the Walgreens store? "That's about pretty close to 4 blocks. Sometimes I feel like [walking], and sometimes I don't feel like [walking], so I try to catch it the next day. If it's raining, it's really bad, I ain't going nowhere."
--Male, Age 57, Oakland

"I live in a temperate climate. Walking to work, I don't go there sweaty, head to toe when I start my work day. But if I lived in an environment where it was 100 degrees, you'd need a good transit system or you would need to live very close to where you worked. And I know that's not practical for everybody...I understand the need for car. I'm not anti-car."
--Male, Age 50-59, San Francisco Fillmore Street

Weather was a Barrier to Bicycling

"The weather affects whether I choose to drive or bike."
--Female, Age 50-59, Berkeley

"I think the Bay Area is very bike friendly...it's got lots of places to ride that are conducive to getting there on the bike...and we can do it 365 days a year."
--Female, Age 50-59, San Carlos

My barrier to bicycling would be "you get to work, and you are kind of hot and sweaty...you have a change of clothes--that kind of thing."
--Female, Age 50-59, San Carlos

Weather was a Barrier to Public Transportation

Barriers to walking and taking the bus? "The weather. I think that's why I have this cough. Because last week when it started out sunny and then stormed in the middle of the day, I was in a fleece jacket and came home like a wet rag because I stood at the bus stop with no protection...And I'm sorry I didn't drive that day."
--Female, Age 60-69, San Francisco Taraval Street

Climate makes a big difference. "If it's a nice day, I like to ride Muni, and then I can mosey around. But if it's going to rain, then I will probably drive the car. So I try to know what the weather is supposed to be."
--Female, Age 60-69, San Francisco Taraval Street

Weather was a Barrier to Non-Automobile Transportation in General

"I don't know if you want call it a barrier...but it's something that you want to factor in is weather changes...to be prepared because it could be raining one day or sunny, especially in the Bay Area here, the weather changes throughout the day. So that would be something not necessarily that would hinder a person, but that would be something they will have to deal with. But mainly it's time."
--Male, Age 30, Burlingame

3.A.4. Carrying packages was a barrier to walking, bicycling, and public transportation.

Carrying Packages was a Barrier to Walking

"If I was going to Walgreens just for some white-out or something…or some batteries, I might just walk. But if I was going for some bottled water for my office…then I would drive."
--Female, Age 60, Concord

"I would probably take the bus [rather than walk] if I was carrying a heavier load."
--Female, Age 20-29, San Francisco Market Street

"I do a major shopping about once a week...I do take the car for that because I can't carry everything...I go to Walgreens by walking, and I can go to Safeway by walking...that's not too far to walk. But, you know, a half-gallon of milk gets really heavy when you're walking. For small things, I can walk to Safeway easily; I can walk to Walgreens easily."
--Female, Age 60-69, San Francisco Taraval Street

He walks less often when he is carrying lots of bags. He switches to bus.
--Male, Age 30-39, San Francisco Mission Street

"I do have a store that's not too far that I walk to every once in a while. It's not the store that I prefer to stop at, but it's just for something that I'm not going to buy a lot of things...but again, because of my health, I can't carry a lot. And I don't have a cart that I can push...If I really thought about it and really made it my priority, I would have one of those push carts that I could put my groceries in."
--Female, Age 52, San Carlos

"I walked to Safeway and Trader Joes, which is 2.5 miles from where I live. I walked there, then I went grocery shopping, and I walked back. Now I had a few bags of groceries with me...I bring my own cloth bags. So I filled five of those bags up, and I walked home. If I have to have like milk or other heavier stuff that I couldn't put over my shoulder, I would have taken the bus. But I walked home with all of those bags...I got a workout...The other benefit of walking is [that] I could go to the gym less."
--Male, Age 30, Burlingame

"I could walk, but I couldn't buy as many groceries and walk back home if I do...I would have to buy fewer. Now, if I walked there more often and bought fewer groceries, it would probably be healthier for me. And obviously I could ride a bike."
--Female, Age 60-69, San Carlos

"Yeah, I could see myself walking to…Lucky's on Mission and A Street, but I would be buying just a few things that I could bring home, but normally I don't do that."
--Female, Age 50-59, Hayward

<u>Some Respondents have Found Ways to Walk with Packages and Bags</u>

"I walked both ways [to Walgreens]...I have a little shopping cart that I took. And I pushed it...And that's about nine blocks [from my house]."
--Male, Age 84, Richmond

<u>Carrying Packages was a Barrier to Bicycling</u>

"If I couldn't drive a car, I would take the bus, I would take BART, or take a cab because I usually travel with a lot of bags or things that I use...it's not really feasible for me to ride a bicycle. But I do have staff members who ride bikes, who have families who ride bikes, and they transport their children...it's something that's like a cart or something like that. I think that's great. But I think that for personal reasons, particularly for me, it's challenging to let go of my vehicle…because I travel with materials and things."
--Female, Age 50-59, Berkeley

"Bicycling is not the best way for grocery shopping."
--Female, Age 40-49, Pleasanton

"Obviously, massive grocery shopping doesn't work on a bike...but going to the donut store, yeah. We bribe our daughter with...'We are going for a bike ride; we will stop at the donut store when we are done'."
--Female, Age 50-59, San Carlos

"I usually take things with me in my car to work back and forth--laptop and stuff like that--which makes it a little bit tougher to ride my bike. My husband, on the other hand, who is way more committed to it, tries to ride his bike to work with his laptop and everything--he tries to do it once a week--a lot of times just because he needs his car sometimes at work...(he has to go between buildings and stuff like that). His commute is much longer than mine...he tries to [bicycle] as often as possible."
--Female, Age 50-59, San Carlos

<u>Automobile Transportation was seen as a Convenient Mode for Carrying Packages</u>

"If I went to the places [close by] in my area, I probably would still drive my car, mostly because of the extent of time that I stay there or the things I'm carrying...I usually go to the coffee shop to study or work, but I have my computer and usually have two bags of books, so I probably would still drive."
--Female, Age 50-59, Berkeley

"The main barrier when I go to Berkeley Bowl or to that Walgreens is that I have stuff with me I have to bring back…I haven't invested in a cart for bringing back groceries."
--Female, Age 50-59, Berkeley

"If I go for groceries, I almost drive there all the time...I have a grocery store pretty close. But generally...I'll walk there and buy maybe a few things, but not like a whole bunch of stuff. If I have to buy a bunch of stuff, I'll go home and drive. It's kind of hard to carry everything...that's definitely a factor."
--Male, Age 30, San Francisco Fillmore Street

"I think that if there were…smaller food places…I like a lot of vegetables and fresh fruits and stuff. If there were smaller food places located in closer proximity of home...I would be shopping more frequently, buy less, and then be able to carry it home."
--Female, Age 60-69, San Carlos

3.A.5. Physical limitations or reduced physical capacity were cited by several survey and interview participants as barriers to using specific modes of transportation.

<u>Physical Limitations made it Difficult to Walk</u>

"I would also like to be in better shape to be able to walk and have enough time to get where I'm going and show up without being sweaty and gross and exhausted."
--Female, Age 30-39, Daly City

Physical Limitations made it Difficult to Bicycle

"I have Rheumatoid Arthritis, and I'm overweight--but I'm trying to remedy the second one there--so that hinders what I can do…My kids are all gone, and because of my arthritis, it is harder for me [to bicycle]."
--Female, Age 52, San Carlos

"I could ride my bike, but I'm not a biker, and that's simply because of health and age, I guess."
--Female, Age 52, San Carlos

"I got a bad leg, so I think my bicycling days are over...plus I'm kind of short-winded."
--Male, Age 57, Oakland

Physical Limitations made it Difficult to Walk, Bicycle, and Use Public Transportation

"Walking is good for people that can walk well. It's not so good for people that have trouble walking. Bicycling, of course, is beyond what some people can do. I wouldn't want to try riding a bike. I run out of breath now."
--Male, Age 84, Richmond

"I'm at an age, and I also have a disability that…I don't walk as fast as I used to. I can't physically do it. I'd say healthy young people walk from the bus stop to their house."
--Female, Age 40-49, San Francisco Third Street

It will be harder to use BART when she and her husband get into their 70s "because just in terms of navigating through the City and walking."
--Female, Age 60-69, South San Francisco

"The older you get, the tougher it is to move around."
--Male, Age 60-69, Brentwood

Physical Limitations were a Barrier to Driving

"If I was older, if I was 60 or 70, I would prefer public transportation if it was flexible and convenient…going in the car…would be riskier; stressing to go from point A to point B."
--Male, Age 40-49, Fremont

3.A.6. Traveling with other people was a barrier to walking, bicycling, and public transportation.

"If I'm bringing my dogs, that's not going to happen on a bike. Or if I'm bringing more people, like picking up someone. Those get in the way of walking or bicycling."
--Female, Age 50-59, Berkeley

“We only have one bike in the house, so when I have friends in town, walking, BART, and bus are the only options.”
--Male, Age 30-39, San Francisco Mission Street

3.A.7. Hills are a barrier to walking and bicycling.

“If there weren't as many hills, we might go out and walk more.”
--Female, Age 52, South San Francisco

“In San Francisco, there are a lot of hills and mountains, so older people probably wouldn't want to cycle up hills and mountains…it is a form of exercise for younger people, I guess.”
--Female, Age 20-29, San Francisco Mission Street

“The ones that live in the foothills--they are really in the hills--probably don't just jump on their bikes and go somewhere as much as we do. They might put their bikes in their car and go somewhere to do the ride, whereas we a lot of times would just leave from our house. Probably when they do it, they have to go back up that hill to get home.”
--Female, Age 50-59, San Carlos

“I walk for exercise. But with my mother, we would drive to the place to walk because of the hills.”
--Female, Age 52, South San Francisco

“Hills--I like doing flat stuff...I don’t like to walk too much in the dark unless I have to. But sometimes you kind of have to...I don’t care if there is a sidewalk or not. Less hills and more light.”
--Male, Age 30, Burlingame

“Living in the hills does not encourage me to bicycle. Because I tried bicycling hills when I was late-20s and early-30s. However my body works, it doesn’t work climbing hills on a bicycle.”
--Female, Age 60-69, San Carlos

3.A.8. Other Barriers to Walking

Another barrier to walking: “And also, just all the fumes from all the cars racing by. Tons of them. You know, real fast to get to the freeway.”
--Female, Age 60, Concord

3.B. ACCESSIBILITY

3.B.1. The type of neighborhood or community where people lived had a notable influence on mode choice. People who lived in urban neighborhoods were more likely to walk, bicycle, and take transit because activity locations were more accessible, and people who lived in suburban neighborhoods were more likely to use an automobile for routine travel because activities were less accessible. More accessible activity locations reduced barriers to walking and bicycling; less accessible activity locations magnified barriers to walking and bicycling.

<u>Barriers to Walking and Bicycling were less Significant When People Made Short Trips to Nearby Activities</u>

"If you look at downtown Danville, the areas surrounding the periphery of the old downtown area tend to be retirement areas so that people can walk to the store, they can walk to get their groceries, they can walk to the coffee shop, they can walk and just people watch all day long in the downtown historic areas. So I think you see a lot of that...I do think that people who are right now that are in the 70-year-old bracket and above really came from a generation of walking. But I think as generations progress in years...it's their only means of transportation--either their eyes have gone bad, their licenses have been taken away, or they are living in assistive care, or they are living in a retirement community where they can't house a car, so they are forced to get rid of it. Now they place themselves in one of these neighborhoods that happens to be within walking distance of some vibrant parts of the community."
--Female, Age 40-49, Danville

"When I used to live closer to Walgreens--because I lived on the other side of Daly City before--we definitely walked a lot more to the different little buildings and shops in our area because they were more accessible. But living up the hill means that anywhere I need to get to that has businesses is usually involving big hills. And Daly City weather is another factor, definitely, because you don't want to be freezing out on the streets trying to get back from somewhere that took a while to get to because you're walking."
--Female, Age 30-39, Daly City

"I live pretty close to my gym, so I walked to my gym. Then I walked over to a grocery store that is very close, and then I walked home."
--Male, Age 30, San Francisco Fillmore Street

"Just in terms of the shopping patterns that happen, just for food, for groceries. From the Bayview, one has to go to 16th and Portreo or to Mission and [Kearney]. And then the question is how do you lug back 40 pounds of groceries?...that's typically a car, if you are lucky enough to have a car. I mean, a lot of people do it by bus, and they are lugging around a lot of plastic bags…But if you have a food store on Third...then the likelihood of people to simply even walk with a cart or take the public transit for a few items and not have to store 40 or 50 pounds of stuff is more likely."
--Male, Age 55, San Francisco Third Street

Barriers to Walking and Bicycling were Generally less Significant Urban Communities

"My parents never owned an automobile. Where we lived was so close to Downtown, so close to shopping, so close to everything that my family didn't need a car. My father worked in construction, so he would get a ride every morning with someone who was going to the same job site."
--Female, Age 55, Hayward

"[San Francisco would be the only part of the Bay Area] that I could think of...I mean, why would I want to own a car if I'm living in the city? No way. It is...connected...definitely better than the place that I'm living in, Fremont, for sure."
--Female, Age 40-49, Fremont

"I think traveling differently is more a function of where you are starting from. I think that in the City, more people are using public transit, regardless of their age than people who are out in the suburbs...We have one son that lives in the City, and he rides a motorcycle or bicycles wherever he goes—he doesn't have a car."
--Female, Age 60-69, South San Francisco

"If I was living 50 years ago, I'd be walking to all these places, but then also all of the businesses and things that I would want to get to would probably be more centralized in one area...But then I do have other friends where their lifestyle is more committed to being 'green', I guess if you want to call it, and so they--most of them live in the City, which also means that they have more opportunities to walk and get to more places that they would want to be, walking-wise, but they use their car less because they have made that commitment. Or they live in a neighborhood that is such that they are able to get to all of the kinds of things that they need to without getting in their car."
--Female, Age 30-39, Daly City

"My sister lives...just off of Geary Street in San Francisco. She walks everywhere. But the thing is that the zoning is not modern. It's in an old area, and there's a post office, and a drug store, and a grocery store, and everything you could think of within a block or two. So it's very easy. She loves that kind of old-fashioned neighborhood. But the modern neighborhood is zoning, and you can't have a gas station anywhere near the residential area and things like that...So they are 'required' to have a car by law."
--Male, Age 84, Richmond

"I'm sure that people walk to the train station and to the store up on Laurel Street...people who live around there walk to those shops all the time."
--Female, Age 50-59, San Carlos

"I don't own a car. I have a membership--I haven't used it yet--I have a membership to Zipcar...I see that as my alternative to owning one right now...It's like people who live in New York. My

sister lives in Brooklyn, and she can afford a car, but she goes, 'I just don't want it.' So it's the wonderful transit systems that enable that, I think. And being able to walk."
--Male, Age 50-59, San Francisco Fillmore Street

"I think in San Francisco, most people my age take public transportation to work. Most people use a car outside San Francisco."
--Female, Age 20-29, San Francisco Market Street

"In college campuses...they don't have much choice. Either they have to walk or use bicycles."
--Female, Age 40-49, Pleasanton

"I love living in a place where I don't have to have one. I think that that would be a wonderful goal for the nation...to where we have good transit systems, including good rail systems across the country as an alternative to flying, and buses to make it easier for people to live in this country without a car."
--Male, Age 50-59, San Francisco Fillmore Street

<u>Barriers to Walking and Bicycling were Generally more Significant in Suburban Communities</u>

"When I was younger, we basically drove everywhere...to even walk somewhere, it would take like half an hour. It was a pretty residential like suburby area."
--Male, Age 30, San Francisco Fillmore Street

"Living out in the suburbs...I'm kind of generalizing, but think people tend to drive more. Simply because the options aren't available to them...People drive more to stores and malls and stuff like that."
--Male, Age 30, San Francisco Fillmore Street

"Where I previously lived, I would walk, but where I live now, it's so much more residential, I use my car more. Where I previously lived in a more commercial area, I did walk to the stores or just take in a walk, or to the movie, or whatever else. But again, now I'm in a more residential area and it's not as convenient, so I do drive my car more."
--Female, Age 50-59, Berkeley

"You don't see very many people riding bikes around Piedmont or Orinda or Moraga or places like that." Are people who ride bicycles around Berkeley different? "Probably everything is nearby, and it's easier for them."
--Male, Age 84, Richmond

"If you are a construction worker, as myself, if you live down in Hayward...they drive all the way here because that's a good place to work--you have benefits...Everything is interlinked...the basic things--education, good food, hospitals...you have to drive."
--Male, Age 30-39, Berkeley

"We have a situation where you live in a remote area...you have the situation where you don't have healthy food to eat, but you are concerned about that, then you have to drive all the way to where the food--the best food, or the cheapest food you could find for a reasonable price. So in some ways you are spending more in gas, but you are feeding your family better."
--Male, Age 30-39, Berkeley

She realizes that walking is important because she started walking recently. "If I lived in the neighborhood on the other side of Laurel [Street], I would walk more because I could walk to Downtown San Carlos to all those little stores or eateries....But because of where I am on the other side of [the railroad tracks and the State Highway, El Camino Real], it makes it a little harder, so I can see where that would make a big difference: where you live."
--Female, Age 52, San Carlos

When she lived in her old neighborhood: "I would walk to the grocery store; I would walk to the top of the hill for exercise; I would walk down the hill to catch the bus. I didn't always have a car when I lived there...I did a lot more walking there...There was a shopping district there where you would walk up and down the street...and we don't have that in the Bayview at all. It doesn't exist. It exists in the neighborhood adjacent to the Bayview--San Bruno Avenue--but there is no walking shopping area in the Bayview..."
--Female, Age 40-49, San Francisco Third Street

<u>General</u>

"Going from rural Vermont to San Francisco was an 'extreme change.'…Travel varies more by locale than by age."
--Male, Age 30-39, San Francisco Mission Street

3.C. AUTOMOBILE PARKING AVAILABILITY AND COST

3.C.1. Automobile parking availability is a key determinant of mode choice. Automobile parking tends to be plentiful, making it easy for people to park close to building entrances in the suburbs. This is a deterrent to walking, bicycling, and public transportation. However, parking is scarce and inconvenient in dense urban areas, so walking, bicycling, and public transportation are more attractive.

<u>Automobile Parking is Easy in Suburban Communities and Difficult in Urban Core Areas</u>

"Living here in the suburbs, the other thing that happens, I think, is that you get really used to parking not being an issue. Wherever you go, you can park. Which is not true when I lived in the City. So I would plan my trips so that I wouldn't have to deal with a car and park. Parking was more difficult--not impossible, but more difficult."
--Female, Age 60-69, South San Francisco

"I know some friends in the City where once you get your parking spot, you try to keep it as long as possible because it is so hard to get again. So they'll use everything in their power to not

move their car until they have to because they don't want to have to fight for getting another parking spot, so they'll make the most of the neighborhood that they live in to get what they need to get done without moving their car."
--Female, Age 30-39, Daly City

"Because there is a lack of parking in this neighborhood…I travel less. Because I know coming home, there won't be parking."
--Female, Age 40-49, San Francisco Third Street

Parking availability affects how she travels: "For instance, I won't go up to the City like to go to Golden Gate Park on the weekends because it is too hard to find a place to park."
--Female, Age 52, San Carlos

"The endless parking battle. 'Oh, there's no parking. There's no parking!' We get so tired of hearing that. Well, stop driving!"
--Male, Age 50-59, San Francisco Fillmore Street

"I live in a spot where if you have a letter pass...on the bottom of your bumper, you basically can park there all day...If they got rid of that, that would probably make me sell my car. Parking is pretty thin as it is...If it got even like thinner, it might actually make me get rid of it. I just don't know what I'd do. I don't want to pay so much money for a car. I would have to think of different options...Or I might leave. So I guess that would do it...the parking."
--Male, Age 30, San Francisco Fillmore Street

"I have some friends whose entire schedules rotate around their parking schedule...that is a factor in people making decisions about when they are going, where they are going, if they are going. It's definitely more San Francisco than Daly City."
--Female, Age 30-39, Daly City

"I parked. In fact, I drove specifically to a restaurant where I wouldn't have to walk and parking was achievable. So I didn't have to deal with the parking issues."
--Male, Age 60-69, Brentwood

<u>Scarce Automobile Parking Makes Walking, Bicycling, and Public Transportation more Convenient in Urban Areas</u>

"The parking...is...the big reason why I walk around my neighborhood. I could drive if I wanted to, but I mean, it's more inconvenient to find my car where I finally found a parking spot. Then go find another parking spot somewhere else...It's faster and more convenient just to walk."
--Male, Age 30, San Francisco Fillmore Street

"It's a positive thing for the world to walk and bike...It could also be the fact that they can't afford a car or possibly...the parking is definitely such a pain in the butt, that you just say, 'I'd rather walk.'...The inconvenience and the price of parking."
--Male, Age 30, San Francisco Fillmore Street

"If I worked in San Francisco, I would probably do BART. I've done that before. I probably wouldn't drive if I worked in San Francisco…and it was relatively close to BART, I would definitely take BART…this is mostly because of parking, and if it was convenient where I could get where I was working near a BART station...it just makes more sense."
--Female, Age 50-59, Berkeley

3.C.2. Areas around the San Francisco region where parking was not free deterred some interviewees from driving to them.

Expensive Automobile Parking made Walking and Bicycling more Attractive

"Parking prices have a lot to do with why I bike up to Downtown Berkeley. You know, it's like, I don't want to pay that much money to park somewhere…If there's four of us, that's one thing...the four us we might bike up, but we don't. If it's just one person, it's like 'Oh, no.'."
--Female, Age 50-59, Berkeley

Some Drivers Parked Further from their Destinations to Avoid Paying for Parking

"It's the principle of the thing that gets me. You know, they expect us to volunteer at the museum and pay $2.50 to $3.00 an hour to park. No, no, no, no, no. That's not right. I'm not going to do that. I'll park on Fulton Street [for free], thank you."
--Female, Age 60-69, San Francisco Taraval Street

"I'm not willing to pay two dollars for 15 minutes [for parking in San Francisco]...so I will definitely end up driving around more to go to...less expensive parking meter situations, if I know there are certain blocks in that neighborhood that don't have parking meters, I'll try to go find a spot there...but I think it's funny because it ends up eating my time up--you know they say 'time is money'--but you have to walk further and you have to look longer and harder for it. And then it probably ends up wasting more gas because I'm busy being a cheapskate looking for alternative parking options."
--Female, Age 30-39, Daly City

Expensive Automobile Parking Prevented some People from Traveling to Certain Areas

"I go into the City, and it's less attractive to go into certain neighborhoods because if you don't have the right card that they have now or enough change, it's not even worth it because the ticket prices are outrageous, so it makes it less appealing to try to go into the City and do things I used to do."
--Female, Age 30-39, Daly City

"San Francisco is insane...just using meters in San Francisco...not everywhere, but down near the Ferry Building and down on the Embarcadero area...it's like a dime for two minutes. I just don't do it too often. The [parking] meters in San Francisco definitely affect my decisions in what I'm doing...driving and parking. But not in my area…[In San Francisco], if you shop in an area, they

validate your parking in a parking lot, so that makes it really helpful...being affordable to shop and do what you need to do there."
--Female, Age 52, South San Francisco

<u>Expensive Automobile Parking was viewed as a Nuisance but it did not Deter Some People from Driving</u>

Do parking prices in Downtown San Francisco prevent you from going there? "We don't like it, but it doesn't keep us from going."
--Female, Age 52, San Carlos

"So it's maybe easier and faster to go by a car. At the same time, I'm thinking, I have to look for parking in San Francisco, depending on where I'm going, I have to pay for the parking."
--Female, Age 40-49, Pleasanton

"When I'm working...it's more important to get to a destination on time, park…If I have a meeting [in] Downtown San Francisco, for instance, and can't find a parking meter, I'll just bite the bullet and put it in a lot...that becomes an expensive meeting."
--Male, Age 55, San Francisco Third Street

When she goes to San Francisco: "If I can't find street parking, than I park in the Whole Foods parking lot, and that's like ten bucks. And that's okay."
--Female, Age 60, Concord

"If you were alone [parking] would be a deterrent to driving, but if you are doing it with a family of four," it is still more convenient to drive.
--Male, Age 40-49, Fremont

3.C.3. Other cost factors were also related to the convenience of certain transportation modes.

<u>Owning a Bus Pass Encouraged Transit Use as well as Walking</u>

"I like to ride the bus…I also like to walk. I'm trying to use the car less and less, and I am using it less than I used to. Right now I am buying a fast pass, which gives me 15 bucks I can ride all month...that's a pretty good deal."
--Female, Age 60-69, San Francisco Taraval Street

<u>Automobile Insurance and Maintenance were seen as an Obstacle to Automobile Ownership by some Interviewees</u>

"The public transportation is affordable, and it's much cheaper than owning a car anyway…insurance and gas would be the main costs."
--Female, Age 20-29, San Francisco Market Street

"The cost of owning a car is $3,000 to $4,000 per year."
--Male, Age 40-49, Fremont

"I totally can afford a car. I could take a car. But I choose not to because, why should I? But that's just me personally…I have a car. It's up in Seattle. My mom is using it, because in her area where she lives, there's no public transportation…plus she's older and so she can utilize it. But I totally could go up there and take my car and drive it down here, but I don't feel the need to do that. So I don't use the car...my car is paid off, and I am paying insurance, but my mom is helping with that…I totally could afford it, but why invest in a car when I don't really need one? There's no dire need for me to have one out here."
--Male, Age 30, Burlingame

"The problem really is that most people aren't going to do it, anyway. If they've got to go three blocks to Walgreens, they'll take the car...If they can afford the gas and expenses, they'll continue to drive a car. I don't think there are many people who ride bikes that could afford a car. I see a lot of bike riders, but all the ones that I know don't have a car. They are riding their bikes because they have to..."
--Male, Age 84, Richmond

"I don't think I would often think about someone walking as being negative...Some may not have a choice. Some may simply have no vehicle. I know friends who have never driven...they take public transportation and have all their lives...Some do not have a choice. They do not have a car--they do not have the resources to buy a car or insure it. And so...it's a bit of an imposition, I suppose...it may be more difficult for them..."
--Male, Age 55, San Francisco Third Street

<u>Few Interview Participants Changed Modes when Gas Prices Spiked in Summer 2008</u>

Interviewees provided little evidence that the gas price spike during Summer 2008 caused them to walk or bicycle more. All interviewees were aware of the high gas prices, but most automobile users said that they simply traveled less, consolidated their automobile trips, or planned more efficient automobile routes. This may suggest that gas prices were not high enough to make walking and bicycling competitive with driving for most people, that the duration of high gas prices was not long enough for people to make longer-term vehicle ownership and residential location choices that would make walking and bicycling more attractive, or the interview sample did not include participants who actually chose to shift modes.

"The gas prices did affect how we traveled. We were definitely more conservative about how many times we went out to run errands...Sometimes, you know, errands come up and you are like, 'I'll just go', but when the gas prices were high, 'let's try to get as much bang for our buck as we can' and kind of get everything localized so that we weren't wasting gas."
--Female, Age 30-39, Daly City

“I had a friend--we used to go like Sunday-drive. We would just go off exploring. And we stopped doing that when the gas prices were so high.”
--Female, Age 40-49, San Francisco Third Street

“When [the Golden Gate Bridge toll] was $5 and the Bay Bridge I think was $3 or $2...if I was in Marin County, I would go across the Richmond Bridge and then the Bay Bridge to save money…I don't have to be out every day. If I did, [gas prices might enter into my decision making]. Right now, I just do what we need to do. So there’s no question that I’m going to do it, no matter what it costs...if gas prices doubled, I would be even more conservative [and go out less]...right now, with gas price where it’s at, it isn’t much of a concern.”
--Female, Age 52, South San Francisco

“If I have to go to this store or that store or different places that I commonly go to, I like to have a straight route so that I'm not going back and forth.”
--Female, Age 50-59, Berkeley

When gas prices were high in Summer 2008, “I was definitely more conscious about the trips that I took.”
--Female, Age 50-59, Berkeley

After gas prices were high in Summer 2008, “It has made me smarter about the way I do things...”
--Male, Age 40-49, Fremont

“Last summer, gas prices were pretty high, I wasn't driving as much…the bridge tolls are increasing, and gas is going up little by little, and wear and tear on the car as well.” But “It's pretty much the time and frustration of the traffic [that influences his choice to drive].”
--Male, Age 30-39, El Cerrito

When gas prices were high in Summer 2008, “We didn’t make the long trips that we might have made, like visit grandparents and things, but you have to go shopping; you have to go to work. The local things we still did.”
--Female, Age 52, San Carlos

“Gas prices affected us…when they got really skyrockety. It affected us some. It made us think a little bit more about how often we were using the car. Tolls? No. I work in Alameda, so tolls are like a commonplace thing...it goes with the job, so to speak.”
--Female, Age 60-69, San Carlos

“For people to take public transportation in an area like Brentwood...it has to be pretty convenient, or your economic situation has to be that you can’t afford a car or you can’t drive or whatever because it’s too convenient to jump in a car because you don’t have to spend a whole lot of money to drive your car from point A to point B in Brentwood. But commuting is a whole different issue.”
--Male, Age 60-69, Brentwood

Some Interviewees Responded to Automobile and Transit Price Changes by Considering Other Modes

Some respondents, especially people with lower incomes, did respond to automobile and transit price changes by considering or using other modes. The following comments suggest that there may be room to encourage walking and bicycling by increasing automobile transportation costs. Further research could explore how gas, toll, parking, and other price changes impact pedestrian and bicycle mode shares in the short- and long-run.

"Pretty much everywhere I go, I hop on the bus. Unless I can get a ride from somebody. Then I've got to pay gas money and all that."
--Male, Age 57, Oakland

"[Paying for gas] is kind of hard being on fixed income. So I mostly just get on the bus. Sometimes I'll be late."
--Male, Age 57, Oakland

"The price of the transit system here locally has gone up. That might be a barrier...I actually think about keeping that $2 in my pocket. I work at a non-profit. My salary is not that good."
--Male, Age 50-59, San Francisco Fillmore Street

"As we depend more on gasoline and the cost of gas goes up, then obviously public transportation becomes more [attractive]. It might be worth...depending on...the economy to take 3 or 4 times longer to get there...If you live in an outlying area like Brentwood, you might be paying $300 or $400 or $500 per month just in gas to get from point A to point B."
--Male, Age 60-69, Brentwood

When gas prices went up in 2008, "that made Muni look better...I started riding the Muni more."
--Female, Age 60-69, San Francisco Taraval Street

Commuting by transit with commuter checks rather than driving: "With the amount of gas, tolls, wear and tear driving by myself…I'm saving about 30 dollars a month…that's not bad."
--Female, Age 50-59, Hayward

Some Interviewees Were not Influenced by Automobile or Transit Price Changes

Some interviewees, especially people with higher incomes or living in wealthier communities, were not affected by automobile or transit price changes.

She and her husband are wealthy, so travel cost really doesn't make much difference.
--Female, Age 60-69, South San Francisco

"I wouldn't say the gas affects me too much."
--Male, Age 30, San Francisco Fillmore Street

4. ENJOYMENT

4.1. Interviewees valued certain elements of the street environment. These included sidewalks and street trees for pedestrians and bicycle lanes and separated paths for bicyclists. Interviewees liked being separated from motor vehicle traffic when walking and bicycling. This was especially true for people who had less experience using these modes.

Street Trees Made Walking More Enjoyable

Many interviewees enjoyed having street trees on local streets (even if they only walked for recreation or rarely walked in their neighborhood).

"I also notice things like sidewalk trees--that's a big one. I try to walk down the streets that have trees...the aesthetics; the shade; there's fewer cars parked on the sidewalk. Usually when there's trees...for some reason people [involved with crime] tend to hang out where there *aren't* trees...I don't know why. But you know, people sitting around playing craps or dominoes and drinking on the street corners; they don't do it underneath trees...And generally streets that also have trees are nicer streets. There's a block of Shotwell Street...it's a beautiful block with beautiful trees, and I love walking down that street. I wish every street had trees."
--Female, Age 40-49, San Francisco Third Street

"I wish I could walk more...I wish it was more pleasant to walk, but it is very unpleasant. There's cars and freeways and no trees."
--Female, Age 40-49, San Francisco Third Street

"We have good walking trails and sidewalks around this neighborhood...it's clean, and they have planted trees back 10 or 20 years ago, so they are now nicely grown, and they have some nice shade during summer."
--Female, Age 40-49, Pleasanton

"One of the things that I like about walking in the morning is you smell all the roses and the things that are blooming. But if the city doesn't care to beautify their roads or the sidewalk area or whatever with trees, you know, that sort of thing...lights are important too, especially for me because I walk either in the morning and at night."
--Female, Age 52, San Carlos

Sidewalks and Multi-Use Trails Made Walking More Enjoyable

The interviews didn't provide strong evidence that sidewalks made people walk more. However, many interviewees appreciated having sidewalks, and they probably made walking more comfortable and safer.

"There are a few spots...on my way to the gym...there is...a quarter of a mile on the street on El Camino where there is no sidewalk and no light, so I kind of like go in through the

neighborhood, and then I get back on El Camino when there's a sidewalk. So if there could be more light and a sidewalk in certain areas, then that could make my journey easier."
--Male, Age 30, Burlingame

What would make her walk more? "I suppose they could build sidewalks on Highway 35. I don't think that's very likely."
--Female, Age 60-69, South San Francisco

"Our neighborhood has sidewalks in it, which I figure is good...the little kids ride their bikes on them and obviously people walk on them."
--Female, Age 50-59, San Carlos

"It's very pedestrian- and bicycle-friendly here. We have sidewalks and we have bike lanes. So no changes really to make me walk more often. There's nothing hindering me."
--Male, Age 30, Burlingame

"I used to [walk for pleasure] quite a bit down on those trails...along a creek...I used to walk with a friend around Ridge Park..."
--Female, Age 60, Concord

"My neighborhood is very clean, and there are pavements for walking, so there is no reason why I shouldn't walk, and nothing that would make me walk more often."
--Female, Age 20-29, San Francisco Market Street

"We used to have a [grocery store] right around the corner...and my husband and I would walk to get groceries sometimes. This area is good for walking; there's a continuous trail along the side of the road…"
--Female, Age 40-49, Pleasanton

How important are safe walking conditions when you go out for recreation or for shopping? "It is important. Yes. And if you would have asked me that a month and a half ago, it wouldn't have been as important. But because I'm walking now, I'm realizing that there are a lot of areas that don't have the sidewalks, they even if they have sidewalks, they aren't safe to walk on because they are narrow or they are cracked. So it does make a difference."
--Female, Age 52, San Carlos

<u>Roadway Crossing Improvements Made Walking More Enjoyable</u>

"There are lights, and you can push the pedestrian things...to get the crosswalk signal."
--Female, Age 50-59, San Carlos

"If I had that type of power…Better stop signs…more caution signs." Is there anything that you would do to make speeding and running red lights less of a problem? "If I could, I would probably be a little more stricter."
--Male, Age 57, Oakland

More Social Activity on Streets and Interesting Buildings Made Walking More Enjoyable

She would like more places to walk and do window shopping (like B Street in Hayward). "I could see myself stopping--window shopping. Stopping in stores or something like that, if I walked in that area. I do know down on B Street, they have some antique stores, dress stores, a couple of cafes..."
--Female, Age 50-59, Hayward

"The streets sometimes feel kind of empty...you don't interact with people...If it is a summer day, and you see people walking, or you go down to the flea market, and you feel good to be alive because you are interacting with someone else…I love to walk, and I love to see more people."
--Male, Age 30-39, Berkeley

He walks mostly for utilitarian purposes around his San Francisco neighborhood, but he walks for pleasure up to Bernal Heights and walks with his girlfriend in the neighborhood and does "window shopping".
--Male, Age 30-39, San Francisco Mission Street

"In San Francisco there are some parts [that are] awesome to see...It's the coziness--those buildings together--that makes you walk...it's good to experience."
--Male, Age 30-39, Berkeley

"They are taking some of these streets and dead-ending them and putting little parks in. They have done that at Market and Castro. That is really nice. That does reduce the congestion there, too."
--Female, Age 60-69, San Francisco Taraval Street

"So I think people walking is a good thing. It makes for interesting city life."
--Male, Age 55, San Francisco Third Street

Bicycle Lanes Made Bicycling More Enjoyable

The interviews didn't provide strong evidence that bicycle lanes made people walk more. However, many interviewees appreciated having bicycle lanes, and they probably made bicycling more comfortable and safer.

"My husband actually...worked with the City to reconfigure the stripes on the road to create the bike lane...it is very nice to be out there and be on the bike lane instead of be with all the parked cars and stuff...when we are riding our bikes, especially if our daughter is with us, we choose the routes that have those bike lanes on them versus the ones that don't…I do think that...addition of the bike lanes in as many places as possible so that when people are out on the streets, that the cars are a little bit more aware, and also that when you are out on the bike, you feel safer. The more the better."
--Female, Age 50-59, San Carlos

“The bicycle lanes...make it way more pleasant.”
--Female, Age 50-59, San Carlos

“Not all the roads have designated bike lanes. For example, Santa Rita. I have to use Santa Rita if I have to go to Walgreens from home. It doesn't have the proper lane. It says that you can use the sidewalk...sometimes it works, and sometimes it's not the best solution.”
--Female, Age 40-49, Pleasanton

What sorts of things could be changed to make it easier to walk or bicycle to walk or bike for shorter trips, like to Walgreens? “Probably more dedicated bike lanes. I don't think there there's that on San Pablo. I don't believe there are.”
--Male, Age 30-39, El Cerrito

Bicycle lanes would help make bicycling safer. There are few bike lanes in the Mission.
--Male, Age 30-39, San Francisco Mission Street

Multi-Use Trails, Cycle Tracks Separated from Automobile Traffic, and Bicycle Boulevards Made Bicycling More Enjoyable

“When you drive through the suburbs, you see all of the bike lanes...As a bicyclist, I don't know how safe I would feel riding a bike out on those major arteries because the drivers abuse them. When there aren’t cyclists in them they are using them as another lane.”
--Female, Age 40-49, Danville

“I mostly do try to stay on the bike boulevards. I'm not a big Telegraph person or Shattuck person.”
--Female, Age 50-59, Berkeley

She would like to see more “paths or separated space for bicycles”. This would include Bicycle Boulevards and separated cycle tracks. “The streets that are bike streets in Berkeley are great…the bicycle boulevards are great in terms of traffic patterns.”
--Female, Age 50-59, Berkeley

“I liked bicycling. Bicycling itself...I would do it if I wasn’t right up next to cars. I would enjoy it. I wouldn’t be afraid of just falling off a bike--that doesn’t scare me...it’s automobiles. If there actually were--which I can't imagine, but I would have to have an open mind--a separate area for people to bike. Or, I have never been to Davis, but I have heard that there are streets there that are only for bicycles. That would be so cool. That would be great. If that were done more, I would bicycle.” Would a striped bicycle lane make her feel safer? “But I don't think that that's safe. I had a boyfriend--we used to bicycle everywhere up in Napa--I lived in Napa County. We were out late, and we were in the ‘safe’ area...a car saw me (because I had a light on my bicycle), and pulled around me and ran into him.”
--Female, Age 52, South San Francisco

"There's also that great path around the Bay." He stays on the trails when he bicycles.
--Male, Age 30-39, El Cerrito

He would like to see more dedicated bicycle facilities because it will make him feel safer. "If you're riding a bike, it's a little scary because you don't know who's paying attention to you."
--Male, Age 30-39, El Cerrito

"It would be easier if they had certain streets just for biking, I think. I think that would make a lot more people bike, too, or walk. So I think that's a big factor. They have a lot of bike lanes here, which is good, but I don't think I'd personally feel that comfortable even [bicycling] in the bike lanes."
--Male, Age 30, San Francisco Fillmore Street

"A good example is...the Iron Horse Trail. If they want people to walk; if they want people to bicycle, then they should do more than a sidewalk. They should make it efficient and appealing to do. And the Iron Horse Trail is a good example...that they incorporate bicycling and walking paths with features that...people would want to go out there and use...shops, retail, a Starbucks...good landscaping, an appealing place to be...whether they are rollerskating, bicycling, or walking."
--Male, Age 60-69, Brentwood

"I just had a thought I have never had before. You know what would be really cool--if there were streets were just for bicycles. [*Laughing*] If there were streets that were just for bicycles. Obviously, we can't get cars off of El Camino, but if there were some streets that sort of paralleled El Camino, so that you know you can hit all the spots up and down north to south on a bicycle, that would make me bicycle more...And I'm seeing it go through a residential area, but it wouldn't have to. It would be really cool if there were a street like Old County Road...that parallels El Camino that was just for bicycling traffic."
--Female, Age 60-69, San Carlos

"I'm very much in favor of car-free streets. Transit-, bicycle-only streets. You might include a taxi driver on there. I'm not sure."
--Male, Age 50-59, San Francisco Fillmore Street

Re-design transportation infrastructure in San Francisco. Make some streets designated for bicycles and pedestrians only.
--Male, Age 30-39, San Francisco Mission Street

<u>Bicycle Racks and other Parking Facilities Made Bicycling More Enjoyable</u>

"I think that we should more and more encourage people to bike and get off of the car...I think we should help them out--we should have designated bike lanes and the parking for bikes and things like that to encourage them to do that."
--Female, Age 40-49, Pleasanton

She would like more places to park her bicycle. "Places to park your bike can be a little bit of an issue."
--Female, Age 50-59, Berkeley

4.2. Many interviewees enjoyed walking in quiet places—trails and parks—or on neighborhood streets with low traffic volumes. Many also liked to walk for enjoyment in commercial areas. It was common for people drove to places so that they could walk or bicycle recreationally. Some of these interviewees liked to walk for recreation but rarely walked to routine activity locations.

<u>People Enjoyed Walking and Bicycling on Trails and in Parks</u>

"I go to Point Isabel probably two times a week, and I go to Skyline Gates once a week."
--Female, Age 50-59, Berkeley

"We have an Iron Horse Trail…that's a great gathering place; it's a great walking, jogging, whatever you want to do...so that tends to be the focal place. Plus it also borders where there are a lot of community activities, like the farmers market…I drive there and park" and then use the trail.
--Female, Age 40-49, Danville

"And because kids don't use biking or walking really as a means of transportation anymore...[Kids are] getting their bikes in the car with their parents and taking them down to the local park, and then biking around the local park. It's an activity more than a means of transportation."
--Female, Age 40-49, Danville

"I would walk around [the sports complex area] rather than sitting or doing some other errands for an hour around that area. It was for pleasure more than for exercise. It was my time alone, like down time and thinking time...Even my husband and I, when we go for a walk, we normally are discussing something, whether it's change jobs, or whether to do this, or the next plan. It's a good conversation tool."
--Female, Age 40-49, Pleasanton

"When you walk you notice your environment a lot more than when you drive...I notice what things are growing and what things are dying; I notice how many people there are in an area; I notice aesthetics, and I notice the condition of roadways and sidewalks. I'm a nanny, and I often walk during the day with the baby, and I notice all kinds of things. I notice how much open space there is; I notice how people use it. I notice traffic congestion. I notice pedestrian access at like ramps...when you are pushing a baby stroller, you definitely notice that."
--Female, Age 40-49, San Francisco Third Street

"I [walk for pleasure] at Ocean Beach where they have a path. Usually it's where there is a path. Lake Merced they have a path. I'd say those are my two main places that I walk. They all have paths, and they are all pretty to look at." She has to drive to get to these places to walk.
--Female, Age 30-39, Daly City

"I also walk in the City a lot...I walk on the Embarcadero; I walk at Still Lake in Golden Gate Park. And then here I walk on the trail that's behind the house. And then there is a bike trail...again, get in the car and drive a mile, and then there's a really nice trail to walk there that is along Crystal Springs Reservoir. I used to walk along Lake Merced, but that has gotten a little boring."
--Female, Age 60-69, South San Francisco

"My daughter and I go to Huddard Park and we hike...sometimes we go over to the Oracle buildings and walk around the water."
--Female, Age 52, San Carlos

"I go down to the Bay, along Aquatic Park. Sometimes I walk in the Marina Area in San Francisco. At the Bay is nice walking area there…I have future plans to go walk out on the Presidio here because I understand that there's a lot of new walking trails out there."
--Male, Age 50-59, San Francisco Fillmore Street

"I [walk for pleasure] in Candlestick Cove Park…it's a beautiful park down there along the Bay. I do it at times along the Embarcadero."
--Male, Age 55, San Francisco Third Street

"we do go up--sometimes riding a bike, but a lot of times driving--go up to some little regional park and go for a hike."
--Female, Age 50-59, San Carlos

She and her mom drive to "a high school that is about 2 to 3 miles away...because it's sunny."
--Female, Age 52, South San Francisco

"I'll go to...a park nearby...I have a friend that has a dog, so I'll take the dog there every once in a while."
--Male, Age 30, San Francisco Fillmore Street

"It's really pleasant to walk--we have Moore Park right around here one block away...There's a trail that is on the border of the quarry, so it's a very popular area--people like to walk around that trail all the time."
--Female, Age 40-49, Pleasanton

People Enjoyed Walking and Bicycling on Quiet Neighborhood Streets

"It used to be that I had two mornings a week that I walked from my house up to Claremont and back up Woolsey...but I haven't done that for awhile...the dogs are happier off leash, so we do

more off leash than I used to…I do like to [walk with my dogs] up Woolsey...it's just a calmer street...and there are only two or three places where I would need to wait for a stoplight."
--Female, Age 50-59, Berkeley

"I do walk to walk a dog. That's around in the immediate blocks of where I am."
--Female, Age 50-59, Hayward

"We do generally walk for health reasons…to a park close to the house or circle around the neighborhood that I live in, or go on a trail hike on the weekend. That is a very common thing that we do."
--Male, Age 40-49, Fremont

Concord "is great. It's a great place for strolling and people-watching…I might just walk along the park side down to the library."
--Female, Age 60, Concord

"[I walk for pleasure] in my neighborhood. I have a couple of dogs, so I walk them every day."
--Male, Age 30-39, El Cerrito

"I do [walk for pleasure]; I like to hear the birds sing. I teach over near McLearen Park, and there is a house on the corner that is kind of old with big trees, and sometimes it is like a symphony when I get there...I just go over there and listen to them."
--Female, Age 60-69, San Francisco Taraval Street

"Definitely in the neighborhood--do that all the time--with my daughter, we'll just go for a walk."
--Female, Age 50-59, San Carlos

"At times, I'll walk from my office…just walk through the neighborhood. Up north where I am, it's a very rural area, so I do a lot of walking up there."
--Male, Age 55, San Francisco Third Street

4.3. People's enjoyment of different types of transportation change as they move through different stages in life.

<u>Social Status and Cultural Expectations Encourage Some People to Travel by Automobile</u>

"Socially, you start doing well...and so you change your lifestyle, and cycling wasn't part of that lifestyle in Bombay."
--Male, Age 40-49, Fremont

"Walnut Creek people, they care about having a really nice clean, neat car; a late model-car...I just have a ten year old Camry...but around here, these people aren't as rich, so they don't care, they just have an older-model car or they walk or they don't drive because they are too old."
--Female, Age 60, Concord

Also, “Since I got older, I think I'll be more embarrassed about being on a bike than anything else...I can see other people doing it no problem...but being by myself, I’m a little bit more embarrassed...If I were to go up to Tilden Park and rode around, I wouldn't feel like that, but being out, say on the streets, maybe riding from here to there...I would be too embarrassed to do that...Thinking what someone else is thinking about: ‘look at that lady out there on that bicycle’...that’s embarrassing to me...and they might not be thinking anything but ‘Get out the way!’” “It’s just like going to a restaurant...and eat by myself...it feels like all the eyes are on me. I know it’s not, but that’s how it feels...and that’s the same feeling I have about bicycling or roller-skating by myself. But if I was with someone, I probably wouldn't think about it, but being by myself, I couldn’t do it…I think I would less embarrassed in Berkeley than I would be in Oakland or somewhere like that.”
--Female, Age 50-59, Hayward

“It’s a cultural thing...social pressure, if you will...‘if you had a car, why would you cycle?’...If I am cycling, and I am carrying 10 plastic bags with me, that would be odd. If I’m cycling in the park, that wouldn’t be odd. That would be in line with what people do...what is seen in the society.”
--Male, Age 40-49, Fremont

“Most of the families I know, their hope and expectation is that each of their kids have their own vehicle once they are driving age.”
--Female, Age 30-39, Daly City

“In the seven years I have lived here, I have seen one person bicycling, and he was lost...I said ‘put your bicycle…’—he was a White boy—‘put your bicycle in the back of my car, and I will drive you to where you think you are’...there is no bicycling here.”
--Female, Age 40-49, San Francisco Third Street

“Because I grew up with not having an automobile in our family, catching the bus didn’t bother me...I didn’t start driving until my mid-20s.” However, it did bother her friends.
--Female, Age 50-59, Hayward

“Not everybody likes to take bus lines because to some people it’s a status issue...going in a fancy car maybe. That’s not the case with me. I wouldn’t mind using a bus more.”
--Female, Age 40-49, Pleasanton

<u>Some Young Adults Have a Strong Preference to Travel by Automobile after they Reach Driving Age</u>

“My son who is in high school right now is always using a car. [He recently got his license and] is going crazy.”
--Female, Age 40-49, Pleasanton

"When I was old enough to move out of my parents' house at 19, I bought a car, and I pretty well had a car the whole time I lived in Cincinnati until the early 1980s...I was pretty car addicted. But when...the bus systems would stop running at 1 o'clock in the morning, and you are at some party somewhere or you went to a late movie, and it was either run out and get that last bus or hitchhike, after a while, you are going, 'I need a car.'"
--Male, Age 50-59, San Francisco Fillmore Street

"But younger...gosh, when I was 16, boy, I got my license, and I was thinking about girls and going to parties and dates, and rolling up to my school with a car and having my friends get in."
--Male, Age 50-59, San Francisco Fillmore Street

"I think mostly the young people don't appreciate what they have. I mean, that's just natural...I'm sure when I was young, I didn't understand what old people were going through...we all live in our own world...When I was a kid, there was only three kids in Tam High that had an automobile. And only half of the teachers had a car. That was in 1940 to 1943. The kids today expect to have a car as soon as they turn 16--many of the kids in better areas, anyway...that is a long way from what it used to be."
--Male, Age 84, Richmond

<u>Some People Perceive that Young Adults use Automobiles Less because they are more Environmentally-Conscious than other Age Groups</u>

"Younger people...a lot of them are more environmentally-conscious than actually I am. I mean, I am, but sometimes I do things for convenience. I mean, maybe some young people are more principled than I am, and I admire that."
--Female, Age 60, Concord

"The younger generation is probably more environmentally-conscious...the push towards biking and being better for the environment stuff...definitely kind of like a newer thing for newer generations...Older people probably don't even think about those kind of factors."
--Male, Age 30, San Francisco Fillmore Street

"The younger generation is much more likely to be early adopters and long-term users of public transportation because of...the realities of the environmental disasters around us, and the air quality and so on, that many young people really do think about and think about how to solve. So if public transportation was something that was driven into them early as just a natural part of the solutions: that not everyone needs to drive a car, public transportation is smart, this is the way you make efficient cities, denser cities that have more people is a lighter footprint. All of those arguments...if you instill that when they are young, then you have a better chance of more vibrant public transportation systems."
--Male, Age 55, San Francisco Third Street

“I was taking care of my mother-in-law...I asked her if she walked a lot, and she said, ‘Oh, no.’...I don’t think that that sense of body movement being healthy was in her generation. I think it’s in the younger generation, and it's in me anyway.”
--Female, Age 60-69, San Carlos

Not Being able to Drive is a Major Consideration of People as they become Elderly

“I tend to find older people more understanding of walking. Probably as they get older, they [are] less able to drive. They could be on fixed incomes. So they are watching their money.”
--Male, Age 50-59, San Francisco Fillmore Street

“I can hardly wait until I can hang up my drivers’ license…some people don't want to give up their independence, and driving is one of them…I think a lot of people, if they are driving, they don't want to give that up…In about 5 years, I could see myself giving up driving and getting in one of those paratransit [services]...”
--Female, Age 50-59, Hayward

“As you get into your 80s, it becomes very hard to be able to drive...so you are forced to change your system of transportation...actually the buses are dealing pretty well with the problems.”
--Male, Age 84, Richmond

4.4. Almost all of the interview participants thought that reducing the amount of automobile travel would benefit the environment. Conserving resources (e.g., fossil fuels) and reducing air pollution were the key environmental reasons cited by people as reasons to promote walking, bicycling, and public transportation. Interviewees indicated that these environmental benefits gave enjoyment to people who walked and bicycled.

Many interviewees stated that air pollution and use of oil are the main environmental reasons to walk and bicycle. This may suggest that if cars can be powered by alternative fuels or solar energy, they will have fewer reservations about driving for all of their travel. Fewer people cited other important environmental reasons to reduce automobile use, including the life cycle cost of automobiles, public expense and use of resources on infrastructure, increases in impervious surface area, and urban expansion into sensitive environmental areas.

Walking, Bicycling, and Public Transportation were Viewed as a Modes that Conserved Resources

Would it be better if people drove less and used other types of transportation more? "We live in a society which is spending things is a good way to show...we spend things we don't have...We have a big car...that consumes a lot of gas, but at least it's a new car. Brand new--that's what you are looking at, and you are disregarding the fact that you are consuming that much. I have a Corolla. That's the car that I have chosen to drive since I have been in this country. I tried to conserve, not even for my pockets, but for the things that are around. I don't have that much luxury--that much money to spend. So I try to save as much as I can and to drive as less as I can...I try to teach my kid the same thing."
--Male, Age 30-39, Berkeley

"Oh, I think the United States is going to change dramatically in the next 5 years. I don't see myself driving the same at all...I see myself doing a lot more walking...there will be a lot less oil and money for oil...I just see the economy is getting worse and worse pretty rapidly." [At end of interview, she mentioned that she had lived in New Orleans earlier in her life and saw the Katrina disaster on TV...she had suspected that it could happen, and she saw it play out.]
--Female, Age 60, Concord

She thinks promoting non-automobile modes of transportation is good "because the more people a vehicle moves at one time, the less fuel is used."
--Female, Age 60-69, South San Francisco

Having people drive less is good because it means "Less use of fossil fuels. Less rubber burned. More exercise for people."
--Female, Age 40-49, San Francisco Third Street

Walking and Bicycling and Public Transportation were Viewed as Modes that Reduced Air Pollution

"I think that public transportation, overall, is a more desirable solution to getting around, particularly in cities...To get around in large cities, efficient public transportation absolutely contributes to a cleaner environment. Because if you substitute the alternative, it's horrendous."
--Female, Age 55, San Francisco Third Street

"Pollution is caused by cars or vehicles; there would be fewer vehicles on the road, so it could potentially be safer."
--Female, Age 50-59, Berkeley

"If people don't drive so much, there will be less air pollution. That's the main reason. I guess people's actual health is better when the walk more or bicycle more."
--Female, Age 50-59, Berkeley

“I hear about the gas emissions and all the different pollutants that come out of cars...I could see that using that less would make an impact.”
--Female, Age 30-39, Daly City

“Walking or bicycling would probably be the two cleanest options, and then...BART or bus would be after that...or carpool, I suppose, too.”
--Female, Age 30-39, Daly City

Would it be good if people drove less? “There's cancer. Clear air, and, well, safer air, I would say...cars would be all smogged up, smog up your neighborhood, smoking all over the place.”
--Male, Age 57, Oakland

Having people diving less would be good for the environment because it would “reduce all the emissions from cars...less gas would be better for the environment. Obviously, it would be better for you if you ride a bike or something like that.”
--Female, Age 50-59, San Carlos

“Less wear on manufactured objects, which cause a lot of pollution to manufacture. So if you are using a car less, you are wearing it down less...If you are carrying more people in your car, then you are definitely saving on wear and tear and replacing of manufactured objects as well as the general pollution that comes from driving.”
--Female, Age 52, South San Francisco

Do you think having people drive less would be a good way to improve the environment? “Yes...Because hopefully we would have fewer polluting fumes from our gas engines.”
--Female, Age 60-69, San Carlos

Do you think that changing how people travel--having them use other transportation besides cars--do you think that’s a good thing for the environment? “It's really questionable because you see a lot of buses with only 3 or 4 people in them. They are certainly not saving carbon dioxide and all that. But it’s pretty hard to fill them up all the time...And of course, while we’re frantically trying to save the economy...here we’ve got this big thing in the Gulf where millions of gallons of oil are being poured out onto the beaches and everything.”
--Male, Age 84, Richmond

Do you think it would be good to shift people from driving to other forms of transportation? Do you think that is a good way to improve the environment? “Definitely. And I think it helps improve people’s lives. And, just strictly on the environment, I'm not burning anything. To me, it’s something of...an ethical issue. It has become that way in recent years for me. To get up on my high horse, but you are burning things. You know, you walk by a car, and you have somebody start their car right in your face. You go, ‘Well, if you would have waited 2 seconds, I would have been by.’ Anyway, I get a little crazy.”
--Male, Age 50-59, San Francisco Fillmore Street

"I am concerned about global warming. I believe it is happening."
--Male, Age 50-59, San Francisco Fillmore Street

"I'm a big advocate of green. And every small little thing we can do it's going to help…the less cars we have on the road, less carbon emissions, the greenhouse gasses are not generated as much, the bicycle is good for the exercise, good for the person--heart rate, and to keep fit."
--Female, Age 40-49, Pleasanton

"Because of the damage that cars do with their emissions. You know you put thousands of cars on the road in a day, and just their emissions alone, and the damage it does to the environment...In addition to just the emissions, vehicles that become involved in accidents...damaging the environment as well. Whether it be a large tanker truck either with some type of chemical or liquid or gas escaping into the environment. There is just a much greater chance...of an accident when you have thousands of cars on the road throughout the day. Add to that the lack of infrastructure to accommodate those vehicles, it even makes it worse...[if the road system isn't] maintained or updated to accommodate population growth and industry growth and retail growth and all that, it presents additional vulnerabilities to the environment."
--Male, Age 60-69, Brentwood

Do you think that changing how people travel is a good way to improve the environment? "I definitely think it is good for the environment. Basically, less pollution...is a big thing...Cars have to go somewhere, and that's usually a junkyard...And also...noise pollution. Cars are generally pretty dirty...All the chemicals that are in cars...oil, old transmission fluid."
--Male, Age 30, San Francisco Fillmore Street

<u>Walking and Bicycling and Public Transportation were Viewed as Modes that Conserved Resources and Reduced Air Pollution</u>

"The [Muni] 'L' is right at the corner...I don't have to use gas and pollute."
--Female, Age 60-69, San Francisco Taraval Street

"If everybody takes public transportation, there will be fewer pollution from gasses and stuff emitted from vehicles…It would reduce dependency on oil, and that would help, I guess, the environment."
--Female, Age 20-29, San Francisco Market Street

Environmental benefits of having less automobile travel include: "Less pollution and less destruction of natural resources or oil, and so forth."
--Male, Age 30-39, El Cerrito

"Because of oil, because of fossil fuel consumption…driving private cars is expensive for the environment."
--Female, Age 60, Concord

"Positive effects [of more walking and bicycling are] less emissions out into the environment...mainly that. Less gas. It's also economical...not having to take a car all the time...and if everybody were to take the bus...and we didn't have so many cars on the road, it's just a domino effect. It cuts back on so much energy that is spent on vehicles and automobiles."
--Male, Age 30, Burlingame

Changing how people travel is a good way to improve the environment "to save on energy, for people's health, and the environment...pollution, gas pollution…I think, if people thought about their health more…and I know in our society, health is not our number one priority--it's getting there fast that is the priority. I think if we thought about our health more, we would walk a lot more or bike more."
--Female, Age 52, San Carlos

<u>Cleaner Automobiles were Viewed as a Promising Means of Making Transportation Systems more Environmentally-Friendly</u>

"With smarter cars, I think that's good for the environment. I think when we have older cars on the roads that are certainly emitting all kinds of toxic fumes, that's not a good thing. So, yes, I certainly think there is a need to clean up the atmosphere, the environment, with what we are putting out in terms of pollutants. But with the cars that are coming out right now, that would be my mode of transportation, just because of the line of work I'm in."
--Female, Age 40-49, Danville

"I would like to be able to own a hybrid or something in five years...or whatever new technology would make it a cleaner car situation."
--Female, Age 30-39, Daly City

"My home in Mendocino is solar powered. It's off-grid. I also have solar power on my home in San Francisco...I'm hoping...that the next purchase I make is an electric hybrid that I plug in. I could charge the thing in San Francisco while I'm using solar during the day. I could drive up, and basically plug it in up north and have basically zero fuel costs. It's a hundred-mile trip...that's a very exciting possibility."
--Male, Age 55, San Francisco Third Street

4.5. Most interviewees had positive views of people who walk because walking provided the following benefits: enjoyment, exercise, personal physical and mental health, public health, low environmental impact transportation. However, some pedestrians were viewed negatively because they were perceived to be undesirable or dangerous.

<u>Walking was Viewed Positively because it Provided Physical and Mental Health Benefits</u>

"I think walking is good exercise."
--Female, Age 50-59, Hayward

"Any time you can move your body, I think it's great…Sometimes it is a stress relief…"
--Female, Age 40-49, Danville

She anticipates walking more in 5 years: "If I walk more, I'll be thinner and healthier. I think that will be good."
--Female, Age 60, Concord

"But I'm trying. I'm walking. I'm up to more than 2.5 miles a day at more than 3.5 miles per hour."
--Female, Age 52, San Carlos

"I have noticed that my stress level has gone down since I have walked and bussed more than I drive...Unfortunately there are drivers out there who are not as cautious, and so the stress level with driving on the freeway or anywhere--you are multitasking; you have to be aware; you really have to constantly be on your toes."
--Male, Age 30, Burlingame

"My kids—they're walkers. Maybe young kids just go to the gym today, and don't think that walking is healthy. I have no idea. I keep reading about how bloody healthy it is, not even for weight control, but just for all of our organs...seriously, amazingly good thing to do."
--Female, Age 60-69, San Carlos

"I think it's good they're out there walking instead of driving...it's good exercise. It's a positive thing for the world to walk and bike..."
--Male, Age 30, San Francisco Fillmore Street

"I've gotten to where I just love the simplicity of walking. I get to be with my own thoughts...meditative...I do the same thing when I swim. It allows me to drift off a little."
--Male, Age 50-59, San Francisco Fillmore Street

"I think the alternate means of transportation are really more in this day and age for either exercise or just enjoyment."
--Female, Age 40-49, Danville

"My gym I go to is not too far away—maybe a couple of miles away from here. But, again, if I'm going exercising, then I don't need to be bicycling there."
--Female, Age 40-49, Pleasanton

When she sees people out walking: "It's a very good thing. I feel happy for them, and I think, 'Oh, I should be doing that more, too.' It's definitely good, and more and more people should walk...A few of my friends walk every now and then for exercise because they didn't have a gym membership. Typically it's for exercise and pleasure. They're not necessarily...walking to a store and back."
--Female, Age 40-49, Pleasanton

"Walking is good. I think a fair number of people [who walk] don't have cars. And some of the younger folks have read enough so that they know it's good for them...it gets your heart pumping the way it ought to. For me, it clears my head when I walk. And sometimes I just feel sluggish...time for a walk…You can see a lot more when you walk, too."
--Female, Age 60-69, San Francisco Taraval Street

"I have a positive view of [pedestrians] because it's very good for us to exercise, and walking is a great form of exercise…Exercise and pleasure are the main reasons. Also, sometimes it is necessary for them to, for example, walk their dog or maybe take their child to school like I do." Some people are "walking for fun."
--Female, Age 20-29, San Francisco Market Street

"Exercise can't hurt…Typically, it's exercise, I think." He didn't suggest other reasons people might be walking.
--Male, Age 30-39, El Cerrito

"Because they want to stay fit, because it's a nice day."
--Female, Age 60, Concord

"Walking is good for you…Most of the people who I see out walking in the neighborhood [walk] because it's good versus walking to a destination. It's more health related. But we do walk down to the corner store if we need something or ride the bike down to the corner store versus getting in the car to do that. But most of the people that I see walking, especially around the neighborhood, it's because they are out walking for their health."
--Female, Age 50-59, San Carlos

"I do [walk for pleasure]. I'm doing it more to use my body...I love checking out neighborhoods. Every once in awhile, [my husband] and I will take really long walks, where we're walking an hour, hour and a half...We do them close to home. We'll climb Belmont Hill...we are less prone to going off to an open space preserve, although we have."
--Female, Age 60-69, San Carlos

"We live in a gated community, and there's hiking trails...You can walk to the…pool or the tennis courts. The local bus stop is probably a 15-minute walk away. On a Saturday, if we want to walk down to Starbucks, it's 30, 40 minutes down to Starbucks, and then back. That's a recreational thing."
--Male, Age 60-69, Brentwood

"I only walk out of necessity. And I get pretty much exercise just from taking my daughter to and from school. So I don't walk anymore."
--Female, Age 20-29, San Francisco Market Street

Walking was Viewed Positively because it was a Convenient Mode of Transportation

She has a positive view of pedestrians: "I suppose a lot of them are walking for exercise, and some of them are walking because it is just more convenient than driving or taking the bus in the City."
--Female, Age 60-69, South San Francisco

Walking was Viewed Positively because it was Enjoyable

"I love walking. I do it all the time. Believe it or not, when I do my errands...it's a time for me to...because I deal with the public a lot...walking alone and commuting like that gives me a sense of solace and a time to meditate and reflect and just take in what's out there and stuff. So that's also taking place when I'm walking and doing my errands. When I'm at a different city on my layovers when I'm at work for my airlines, I absolutely like to go on trails if I feel that it's safe for me to walk around just to enjoy...nature and look at buildings and stuff...that's something that I love to do."
--Male, Age 30, Burlingame

"[My girlfriend and I] prefer to walk. We are avid walkers." Why do you choose to walk rather than take the bus for free? "Congestion [on] Friday afternoon. Able to be next to each other...we don't get separated on a crowded bus...We enjoy walking in San Francisco and looking at things...she loves to read restaurant menus. So we think about maybe going to places."
--Male, Age 50-59, San Francisco Fillmore Street

"I like driving...but I think it's a good thing to have more options...I enjoy walking—that's nice, too."
--Male, Age 30, San Francisco Fillmore Street

"I walk in [Golden Gate] park when I'm going to and from the museum. I refuse to pay to park. That just bothers me that the city owns that parking lot at the Dejung Museum. So I usually park somewhere along Fulton Street; then I walk in through the Rose Garden or something like that, and just enjoy the walk. So I like to walk."
--Female, Age 60-69, San Francisco Taraval Street

Walking was Viewed Positively because it had Low Environmental Impacts

They might choose to walk "because it's more convenient for them, or they don't have a car, it makes more sense, or they are more ecologically-minded; there could be a number of reasons."
--Female, Age 50-59, Berkeley

"The other thing is...that they are doing an ecological service...they are [walking] for the environment."
--Female, Age 52, South San Francisco

Walking and Public Transportation were Viewed Positively because they Provided Social Interaction

"On my street, there are more cars than people, I think...as many cars as adults...I don't see a lot of neighbors out on the street because people just get in their cars and drive...which is sad...it reduces my quality of life to not interact with neighbors. I do interact with them because I seek them out, but..."
--Female, Age 40-49, San Francisco Third Street

"We would be less isolated from one another...if we were...using public transportation, or even on a bicycle, or even walking. You somehow have more contact with people. I think when we are in our little cars and in our own little singular worlds...I'm amazed at the way some car drivers can be with one another. It's almost as if another human being isn't in the vehicle."
--Female, Age 60-69, San Carlos

"Also...it's important for public transit systems for society, for the social network that we develop with the driver, with other riders. I used to take a long bus ride to go out to school here in San Francisco, and I would pretty well have most of the paper read by the time that I got there. So, for me, I didn't sit in traffic, I got to read the paper...I think good transit systems are good for communities. People talk with each other."
--Female, Age 50-59, San Francisco Fillmore Street

"There are a lot of leisurely people in San Francisco. So I don't know what drives them. And then there's the tourist population. So they are generally walkers, not on public transportation. So I think people walking is a good thing. It makes for interesting city life."
--Male, Age 55, San Francisco Third Street

Waking was Viewed Positively because it was seen as a Virtuous Activity in the Community

"My daughter is a Junior in high school--she is 17 years old. She has a permit, but she doesn't have a license. None of her friends have their licenses. None in Berkeley....her cousins who don't live in the city have their licenses at age 16...hardly anybody at Berkeley High has their driver's license." People in her neighborhood "Value walking places; Value bike riding."
--Female, Age 50-59, Berkeley

"And I think walking in cities is tremendous. New York is the greatest walking city in the world."
--Male, Age 55, San Francisco Third Street

Walking was Viewed Positively because it Cost Less Money than other Modes

"Mostly my girlfriend and I, we just walk because we can be together and we save money and we try to get our exercise. So we'll walk to the grocery store, even if we can't bring as much home with us. We walk both ways."
--Male, Age 50-59, San Francisco Fillmore Street

Walking was Viewed as a Mode that People Used when they couldn't Use an Automobile

"As much as I drive my car, I also wish I didn't have to, so I...kind of applaud [people who walk] in my head because they are able to get along with life without having to rely on the car so much. So I think I look at them in a positive light…Some [people may walk] may be financially unable to afford cars or bus passes and things like that. And others just want to be more healthy or more green. And some people that I know are scared of driving, so walking is one of the only other options."
--Female, Age 30-39, Daly City

People may be walking "because their car is in a shop."
--Female, Age 52, South San Francisco

"In Concord, you see a lot of women and children walking because they just don't have a car, like to go over to get groceries. I think that's kind of admirable, you know, that people do all their grocery shopping by foot...I see them walking home with their packages."
--Female, Age 60, Concord

Walking was Viewed Negatively because some People who Walk were Perceived to be Undesirable or Dangerous

"If I see somebody with a backpack or something like that...sometimes I wonder how far have they gone, or where they're going."
--Female, Age 50-59, Hayward

If she sees a backpack or jogging shoes, she might wonder if they are "up to something." Riding the bus is often for "teens"; people in their 20s are trying to get a car and be more responsible. How people in their 20s travel: "By that time, they are trying to get a car...or start out...a little more responsibility."
--Female, Age 50-59, Hayward

"They choose to walk because they can't afford to have a car…If I see someone with a shopping cart dragging around from Walgreens to his house, there is something wrong with that individual...he's not doing it for an environmental reason; he's doing it because he can't afford a car."
--Male, Age 40-49, Fremont

"[My attitude towards walking] is always positive…but sometimes when I'm out walking, the thought has come to me that people think...depending on how you are dressed...like if you are dressed in exercise clothes, it's like positive, and if you are dressed in street clothes, it's like you can't afford to do anything else…I have different impressions depending on how they are dressed."
--Female, Age 52, South San Francisco

“Some people have this strange attitude when they are crossing the street, especially adolescents...they are defiant...they have the green light, and they are walking with this attitude looking like maybe Western times...[*joking*] just ready to draw their revolver to kill you...that is an awful attitude.”
--Male, Age 30-39, Berkeley

“I'll see some couples out walking after what’s probably dinner time. And my feeling about them is, ‘Good for them! And aren't they healthy.’...If I see somebody who looks like they are homeless walking, do I think, ‘Yay! Good for them, healthy!’? No, I don't think that. And if I see somebody who looks like they are walking to the bus because they have to go to the bus because that’s the only transportation they have in the whole world, do I think, ‘Yay! Healthy!’? No I don’t. [*Guiltily*] Gosh, that sucks, doesn’t it?...[The people who are walking as a couple in the evening] I think that they are choosing to because it is a healthful thing to do. They are *choosing* to, and that makes a difference. [The people who don’t own a car or look homeless] I think they are walking because they *have* to.”
--Female, Age 60-69, San Carlos

“If I see people--men or women--that are walking with little kids, I figure they’re family people...they look like family people, and I like that. But if I see maybe three big...guys that are kind of ugly looking with the seat of their pants down at their knees and all that kind of stuff, I’d be very careful to keep an eye on ’em and not get too near them. Realistically, you have to be selective...Most people are of course just ordinary family people. It only takes one out of 100 people to ruin a neighborhood.”
--Male, Age 84, Richmond

He makes no judgment about people who walk in general. The demeanor of pedestrians is more important.
--Male, Age 30-39, San Francisco Mission Street

4.6. Most interviewees had mixed views of people who bicycle. Bicycling was viewed positively because it provided enjoyment, exercise, personal health, public health, low-environmental-impact transportation. However, bicycling was viewed negatively because of undesirable bicyclist behavior. Many bicyclists were perceived as lawbreakers and reckless or getting in the way of automobile traffic.

<u>Bicycling was Viewed Positively because it Provided Physical and Mental Health Benefits</u>

View of bicyclists: “I have a positive view, I think. It is a very good form of exercise.” People bicycle “for exercise, for convenience, and for fun.”
--Female, Age 20-29, San Francisco Market Street

“I think the [person who is bicycling to work] is combining both exercise and commute...I’m sure they enjoy it, too, so it’s also leisure.” Why to people bicycle? “In our area, they’re pretty much well-to-do, middle-class families. I don't think it’s economical reasons, like they can't afford to go in cars. I think it's because they want to do it.”
--Female, Age 40-49, Pleasanton

Her husband chooses to bicycle for several reasons: “With my husband, it is both health related and environment.”
--Female, Age 50-59, San Carlos

“I think I’m looking at them saying, ‘They are trying to be healthy, they are trying to be good to the environment.’...Maybe their car broke down, or maybe they don’t have a car…I think the people that bike to work do it because they want to stay healthy and want to stay young, and they think environmentally, too...The people that I know who take the bus, they have to ride the bus because they don’t have cars...they are different.”
--Female, Age 52, San Carlos

“There's a lot of added value to that. It's about employers caring for their employees. When you care for your employees and you create an atmosphere where you help them get from point A to point B and keep them physically and mentally fit in the workplace, there's a lot to be said about production and achieving the goals of the company.”
--Male, Age 60-69, Brentwood

“[Bicycling is] a good way to get some exercise, and it’s less pollution and all that stuff…I think maybe, part of it may be that it’s kind of trendy...It’s kind of like the cool thing to bike...which is probably a good thing.”
--Male, Age 30, San Francisco Fillmore Street

“If I had to change my attitude towards bicycling, it would be for health reasons.”
--Male, Age 40-49, Fremont

“I see ladies and men with their helmets on, and some men have on slacks with one leg slacked off...I think that’s good; that’s very good exercise.”
--Female, Age 50-59, Hayward

“Why do they choose to bicycle? Again, I think it’s mainly for exercise...for enjoyment, for family time...It’s a feel good. I think a lot of people feel they really accomplished something when they’ve gone on a long bike ride...and beyond that, if you can relax enough to really be able to enjoy what you are seeing when you are on your bike, that’s even better.”
--Female, Age 40-49, Danville

<u>Bicycling was Viewed Positively because it was a Convenient Mode of Transportation</u>

“I think frequently it is a choice...I think it’s faster than walking. I think that’s a good reason to choose a bike...If it’s a young person, doesn’t have a car yet, can’t drive, doesn’t have that

option...You know there are a lot of people who choose to ride bikes because they are healthier and less costly...I actually think more often they do it...from choice than from need...I my opinion, it's a good choice or a good thing to do whether you have a lot of choice in it or not."
--Female, Age 60-69, San Carlos

<u>Bicycling was Viewed Positively because it was Enjoyable</u>

"A bicycle is a very convenient thing...you are interacting more with the environment, you are interacting more with the people, you feel that fresh air...you have that chance of seeing...their architecture, or smell…"
--Male, Age 30-39, Berkeley

"I have a positive view [of bicyclists]...I think, at least in this neighborhood, there's a lot of trails here to bike, for one. And, two, there's the sidewalks on El Camino Real. And I think just because they enjoy it, really."
--Male, Age 30, Burlingame

<u>Bicycling was Viewed Positively because it had Low Environmental Impacts</u>

Why do people bicycle? "Sometimes I think [people bicycle as] a political statement...being conscious of the environment and pollution. And sometimes I think it's because it is a fairly easy and convenient way of getting around in San Francisco, except for the big hills, of course. And sometimes I think it is for exercise--it's a better way of covering the distance quicker than walking without using any sort of motorized transit."
--Female, Age 60-69, South San Francisco

People bicycle "either for pleasure or necessity, or to...have a smaller [environmental] footprint."
--Female, Age 52, South San Francisco

"I know people who bicycle because it's environmentally sound."
--Female, Age 60-69, San Carlos

"I think probably those who choose to bicycle do so for a higher-level of consciousness on the environmental end of things. I think also for health reasons. Perhaps a way to get around while staying in shape by riding a bike. Certainly cheaper to park downtown if you have to park and lock your bicycle rather than [parking] your car. And I think it probably gives you greater flexibility and mobility than walking because it's faster. More flexible opportunities than public transportation because you can turn the corner where a bus can't. Simple as that. Those are all very positive."
--Male, Age 55, San Francisco Third Street

"Some people are trying to consciously improve the environment. They are doing their part. They are doing more than I am. Especially I think young people in Berkeley, which is to conscientiously avoid having a car and to have a smaller carbon footprint."
--Female, Age 60, Concord

Bicycling was Viewed Positively because it was seen as a Virtuous Activity in the Community

"We're pretty environmentally-conscious out here. I think there's a lot of young kids who do ride bikes because they don't want to participate in the car thing...I think that's good and [a] sign of hope."
--Male, Age 50-59, San Francisco Fillmore Street

"Almost everybody I know has a bike. Or I mean a lot of people I know do…And I drive a little more than most people here."
--Male, Age 30, San Francisco Fillmore Street

"I was in Minneapolis recently, which I think is one of the bicycle-friendliest cities in America, and it was just a very upbeat, positive...thought around how the public transportation system works there seems very good...public and alternative: bicycles, walking, things like that."
--Male, Age 55, San Francisco Third Street

"If I see a biker on the side of the road, I'm not getting mad at them...[*impersonating a person with a negative view:*] 'Oh, blah blah, there's a biker!'"
--Female, Age 40-49, Pleasanton

"The Bay Area is bike-friendly for sure."
--Female, Age 50-59, San Carlos

Bicycling was Viewed as a Mode that People Used when they couldn't Use an Automobile

Why do you think people choose to bicycle? "I think it's a slightly different [than why people choose to walk]. Some people do it for exercise; some people do it out of necessity--because they don't have a car."
--Male, Age 30-39, El Cerrito

My attitude towards bicyclists is "very positive, whether they are commuting or doing it for recreation…There's lots of them that ride their bikes down to...you can see the bikes parked, locked up around Home Depot or Becky's Car Wash...you know, the people who work in those kind of places that ride their bikes there. I'm not sure if they ride their bike there because they don't have a car or if they have just chosen it. Sometimes it is their only method of transportation. But even that is not a bad thing."
--Female, Age 50-59, San Carlos

"There are people out there who are riding bicycles, and I think it's because they don't have a car."
--Female, Age 52, South San Francisco

"I used to teach drunk driving classes...and I never realized until I taught those classes...how many people were out riding bicycles because they had so many DUIs that they didn't have drivers' licenses."
--Female, Age 60, Concord

Why do they bike? "Cause they can't afford a car, I suppose…Some don't want a car; it's a hassle…Huge expense."
--Female, Age 60, Concord

<u>Bicycling was Viewed Negatively because Bicyclists were Viewed as Being in the way of Automobile Traffic</u>

"I think one issue, and it's a pet peeve for many people in the suburbs...When you have bike lanes on the major arteries within the suburbs...we have a lot of biking clubs in the area, and when the bikers are riding five bikes deep, it's a real issue with the drivers. And what happens, I wouldn't call it road rage, but it's darn close. You might get maybe 100, maybe 150 bikers, but when they start abusing, in my opinion, the bike lanes. I don't know what you can do to change that, because if you widen the bike lane, they are going to have 10 across...I can't tell you how many times I've heard from clients and new drivers...I've got a son who is a senior, and he says that's one of the pet peeves that many of them have…On the other hand, when people are out bicycling, just a family for example, they want that bike lane because you don't want to be in traffic."
--Female, Age 40-49, Danville

"It's terrific if [bicyclists] stay in their lane…"
--Female, Age 40-49, Danville

Bicyclists may have people telling them "[*in a joking tone*] 'Get off the road!'..."
--Male, Age 30-39, Berkeley

"In terms of all cities across the board, in the planning departments, that's probably the biggest dilemma that the planning departments have. That's trying to solve, how wide should that bike lane be, and how do you keep it from being utilized as an extra lane for traffic to keep the bicyclists safe, and how do you keep the drivers flowing at the normal speed and not having to basically stop because the bikers are four, five, six people across? I think if that could be solved within communities, that would be really significant."
--Female, Age 40-49, Danville

"Bicyclists are something to avoid in the street and to avoid injuring when you are driving."
--Male, Age 30-39, San Francisco Mission Street

"You know, or the ones that are...they'll be driving in packs...I see this especially in San Francisco...which I understand the pack thing, but at the same time, when they are packed up so much that their group is larger than the bike lane, and then they're slowing traffic down because their pack is kind of taking over the whole lane on top of their bike lane...yeah, that's a turn-off."
--Female, Age 30-39, Daly City

"Some of these bicyclists are nuts! They are like driving down the middle of the street as if they were an automobile. And I don't understand that at all. I don't know what's going through their minds when they do that. I would like to think that bicyclists are concerned about safety, but I think that [they aren't]." Are you aware that it is legal for bicyclists to ride in the center of a traffic lane? "I didn't know that...I get upset--and other people do too--there is some animosity towards bicyclists in this driving population...I didn't know that at all." That is the State Law according to the Motor Vehicle Code. "So you could be going like whatever the speed a bicycle goes, even though the speed in the area is a much higher speed, and everybody just has to go slow with you because you want to drive on the street." That's right. [*Asking in a more animated tone:*] "How is that...is that for their safety because there's no bike lane? Is that what it is? Is it 'If there is no bike lane, then they should be in the center of the street'?" Certainly in that case, they should. If there is no bike lane, the safest place for them to ride is the center of the lane. Legally, bicyclists are required to ride as far right as possible. But it is safer to ride in the middle of the travel lane if the right side isn't the safest place, like if there were parked cars that could open doors. "So it's all determined by what is safe…It's very complicated...It would be really helpful to both sides to have public education about bicycling and automobiles...I have heard that some people deliberately injure bicyclists, you know, people get so fed up. And you can just see by my tone of voice that these people [bicycling] down the side of the road...I'm upset at that time...and here I am wrong! So public education on that would be helpful, I think."
--Female, Age 52, South San Francisco

Her attitude toward bicyclists: "I'm afraid that I'm going to hit them, so I'm really cautious. And I don't like to go around them, so the cars behind me get mad. But it just makes me realize that there are no bike lanes. I'm not a person who would get angry if they are in my way...I'm not going to be angry at them making me slow down or anything."
--Female, Age 52, San Carlos

"There's always the danger of being doored on a bicycle. I haven't had a collision, but I have had a close call before...I was a real distance cyclist...so I have a lot of experience cycling, as well...If you don't come up into the lane and make your presence known...if you don't claim your lane, they'll just kind of blow by you...and you are inches away from being pushed off the road. It's a bit of a balance between claiming your lane and pissing off the driver that's coming up on you. The laws are such that you should stay as far to the right as possible. But I have found from my experience riding that if you don't claim your space...you are not seen...and they think that you don't have a right to be there. It's a balance…"
--Male, Age 50-59, San Francisco Fillmore Street

"And I know that for bike riders that there...are certain streets that I travel to get to work that don't have bike paths because they are in my way when I'm trying to get to work. And I know they are in the streets because there is no path."
--Female, Age 52, San Carlos

"[The T-Third light rail line] was a stupid, stupid project…It narrowed the street, so it is more dangerous to drive down that street now…when they put in the rail line, they narrowed the lanes."
--Female, Age 40-49, San Francisco Third Street

<u>Bicycling was Viewed Negatively because Bicyclist Behavior was often seen as Law-breaking or Reckless</u>

The actions that bicyclists take are very "public". They are in a public forum (the street). Few people may be aware that they are broadcasting their behavior publicly, but they are viewed by others in public positively or negatively. Bicyclists should realize that they may cause individual people and society as a whole to have negative perceptions of bicycling when they break rules. As one respondent said, "I have never jaywalked because, as a teacher, I think that is wrong, because you never know if a child will see you and do it, too." (*Female, Age 60-69, San Francisco Taraval Street*). Justified or not, convenient or not, bicyclists are creating a perception in other people's minds.

Nearly all of the interviewees had an opinion about bicyclists or bicycle behavior. While many said they thought that bicycling was a good form of exercise, most had negative opinions about bicyclists because of behaviors they had observed. As a whole, they tended to expand on this topic more than any other during the interview. They often had anecdotes about observing bicyclists breaking rules.

Her view of bicyclists: "It's definitely mostly positive...I get when you're biking, you don't want to stop. So a part of me like if I'm driving in particular, there's some etiquette stuff that I don't think is as clear as it could be. So I mostly have positive feelings, but there are occasions when it feels like the bicyclists are breaking the rules of the road and are aggressive about it...where as I understand breaking the rules of the road because you don't want to stop at a stop sign...but there is a way in which you have to check in with the driver of a car that's there...like, 'Are you going to stop for me, or am I going to?'."
--Female, Age 50-59, Berkeley

"Let's say I come to a stop sign, and it's a four way stop. And I start to go, and there's a bicyclist that comes up, and the bicyclist doesn't even...you know, either doesn't notice this...I mean acts like *I'm* being a jerk for going...so glares at me or flips me off or something like that...and it's like, 'While, you did have a stop sign...and I would let you go if I had noticed you coming, because I do like to let bicyclists go through...but I didn't see you coming.' So that, or riding on the wrong side of the street, or going through a red light,...or like a fast left-hand turn before...I'm like, 'You could have gotten yourself killed there...You were confident that that car wasn't going to zoom through...but I'm not so confident.' You know? So there are certain times

when bicyclists break the rules of the road and I say, 'Wow, you could really get hurt. And then both of you could get hurt, and boy, wouldn't that mess up the driver of the car that hurt you?' Like it's mean to put yourself in a position where you're breaking the law and you get hit. It hurts you, but it also hurts the person that hit you."
--Female, Age 50-59, Berkeley

"I think the bicycle people need to be aware of where they are--and the traffic--as well as the vehicles looking out for them also...that they are riding in a safe...in the bike lanes--not just out there all over the place...I never see any incidents or anything like that."
--Female, Age 50-59, Hayward

What is your view of bicyclists? "Usually it's positive, unless they're not obeying the rules of the road. Sometimes bicyclists think that it doesn't apply to them. But typically it's indifferent or positive…There's stop signs where that path crosses a road, and a lot of times people just don't stop. And it's easy to get in an accident, so you have to be very aware."
--Male, Age 30-39, El Cerrito

"I think [bicyclists] are tempting fate. A lot of them are young—they probably don't have cars. But the way they weave in and out and zoom through on yellow lights. You know, it's like they are really testing God that he'll protect them, I guess. The ones that are driving around late at night or who are being pretty reckless tend to be, I would say, under 25."
--Female, Age 60-69, San Francisco Taraval Street

"I have almost gotten mowed down twice walking on the sidewalk on Van Ness Avenue by people who were riding their bicycles on the sidewalk. Aaah. One guy came so fast, and I jumped, and the man behind me thanked me because he hadn't seen him...you know that's against the law, but they don't seem to get cited. These two--both of them went really fast…Van Ness is crowded...to ride a bike on Van Ness is really, ugh. The sidewalk--I guess they figured, 'oh well'."
--Female, Age 60-69, San Francisco Taraval Street

Peoples' perceptions of bicyclists change when they are in a car ("lawbreakers") versus walking ("okay"). "Not all, but many bicyclists disobey laws."
--Male, Age 30-39, San Francisco Mission Street

"[Bicyclists] like to run you over in the Mission."
--Female, Age 40-49, San Francisco Third Street

Do you know that it is legal for bicyclists to ride in the street? "Yes...And it does make me mad when they don't follow the laws, like I have to do...I see them go through stop signs all the time. 'Like, come on, you are going to get hit if you don't stop like you are supposed to.'"
--Female, Age 52, San Carlos

"Pretty positive, for the most part. I guess sometimes the bikers kind of bother me because they don't really follow the road rules. Sometimes they do, and sometimes they don't. So...they go

flying in front of my car sometimes. I'm kind of like, 'Man, you are above the rules.' At the same time, I don't blame them all the time because it's kind of hard...It would be easier if they had certain streets just for biking, I think."
--Male, Age 30, San Francisco Fillmore Street

"I think the negatives are the obvious ones in San Francisco and other places where you see it…[Bicycle behavior can be] infuriating to a driver, not because they aren't simply obeying the rules, but because it is astoundingly dangerous. As a driver...I'm very conscious--hyper-conscious now--of...looking behind me and to the right for potential bicycles. I've had situations where I will approach a stop sign...I'm looking ahead, looking left and right, and go to make the turn, and a bicyclist comes zooming past me on the right side, blasts through the stop sign, kicks the fender of the car, curses me out because he's pissed because I'm making the turn. And then I realize [that] he didn't stop. That's a real problem. I'm not sure how you address that unless you have a more vigilant police force writing tickets to bicyclists. And then the whole thing gets so crazy. But then people who run red lights...you approach an intersection, and there's a guy on a bike, and maybe he has his iPod on or something, and he's just oblivious and he goes right through...Those are negatives."
--Male, Age 55, San Francisco Third Street

"[As a pedestrian,] I have seen bicyclists run red lights and stop signs with little regard to cross traffic. Even, just as a practical sense, take a look! I have seen bicyclists weaving up and down...a crowded sidewalk...Usually it's local bicyclists who are commuting either on their way to or from work that just blow through the area. It's not so much the tourists I see with the rental bikes--they seem to be generally pretty careful. It's the too cool for school guys who will come by and come within inches of you and get some kind of kick out of it...as you get mad. And I have a hard time keeping my mouth shut...I mean, 'Sorry, you just about sent me to the hospital!'...There are some very very responsible bicyclists...they have got sensible gear, they are wearing a helmet. Safety is on their mind, too...It's the kind of, 'We're hip, we know what's up in San Francisco' [who are the problem]. And there's car drivers who are the same way."
--Male, Age 50-59, San Francisco Fillmore Street

Bicyclists who were not Perceived to be Protecting themselves were Viewed Negatively

"In San Francisco, I think [bicyclists] have a lot of courage. I just don't think this city is very well situated for bike riders. I know at night there are so many of them that ride around in black. I have to be so alert. Gosh!"
--Female, Age 60-69, San Francisco Taraval Street

"Considering that I used to bike to work myself, I have a somewhat negative view about many of the bicyclists in San Francisco. They have become extremely aggressive...I handle cases of...disability issues, and people who don't protect themselves--don't ride their bikes defensively and don't wear protective gear—really irritate me...I know how dangerous that can be...I have to say, 30 years ago, I didn't wear a helmet either, but that was 30 years ago [when we knew less about head injuries]."
--Female, Age 60-69, South San Francisco

The Attitudes of Some Bicyclists were Viewed as "Militant", "Anti-Authority", or "Entitled"

"[My opinion about bicyclists] kind of depends on what the attitude of the bicyclist is. When I lived in the City, there are some pretty almost say militant bicyclists, and they felt like they owned the road maybe even more so than a car because they were on the bicycle. So that was a turn off with those kinds of people...especially down in the Financial District with the bike messengers and stuff like that, but for the most part, when I see bicyclists, I think of them as positive—that's a positive thing to be doing. It's just kind of the entitled bicyclists or the more aggressive ones that can make me think negatively, but it's more on a case-by-case basis. I wouldn't think negatively about a bicyclist unless I saw them kind of having some of those aggressive characteristics...But the ones that are just getting around are fine."
--Female, Age 30-39, Daly City

Bicyclists have a "counterculture"/"anti-authority" attitude.
--Male, Age 30-39, San Francisco Mission Street

Explanation of "entitled" bicyclists: "Car versus bike, the bike loses. I think that [bicyclists] realize that because they are in a less safe traveling situation, that people have to look out for them more, and sometimes they, you know, just are kind of careless about swerving into the car lane without even thinking about that there is a car that doesn't want to hit them, but when they do that kind of thing it's scary for the driver, too, not just the bicyclists."
--Female, Age 30-39, Daly City

"I think [drivers are] very considerate when we are out there—especially if you have got the kids with you. They go very slow...Not that some bikers don't take advantage and are jerks when they are out on the road...And usually it is the packs of guys...that are in the clubs...sometimes I just want to say, 'Okay, you deserve to be hit.' Not really, but...they are not being courteous either...When they are jerks, it definitely impacts [me]. Because that person, if they were a jerk, and the car got mad at them, the next time that car sees a biker, he's not going to be as nice…It's kind of like the guy on the motorcycle that weaves in between people and you just want to punch him because he shouldn't be."
--Female, Age 50-59, San Carlos

There is a Need for Greater Understanding between Bicyclists and Motorists

"I see a great level of abuse on both sides."
--Female, Age 40-49, Danville

"There just needs to be...better understanding on both the car driver and the bicyclist...I don't know if there needs to be laws or what, but some kind of protocol in place so that people stick to the script...If I'm in a car, I'm not gonna go and try to drive in the bicycle lane if the car lane is clear, right. So if there's a bicyclist, they should try to stick in the bicycle lane if it's clear and not go into the car lane. But there needs to be some kind of...when you are getting your driver's license or you know, they should maybe hand out bicycle licenses, I don't know, but some

way...there needs to be something that both sides of the story can stick to a plan when they are on the road. And if there's going to be bike lanes, then let there be bike lanes, but if there's not, then let everybody know what we are supposed to do in that case. And that everybody is held accountable to those expectations."
--Female, Age 30-39, Daly City

"It would be really helpful to both sides to have public education about bicycling and automobiles...I have heard that some people deliberately injure bicyclists, you know, people get so fed up. And you can just see by my tone of voice that these people [bicycling] down the side of the road...I'm upset at that time...and here I am wrong! So public education on that would be helpful, I think."
--Female, Age 52, South San Francisco

"And then, you know, it's the bicycle-car...conflict that's going on because the drivers don't respect bicycle riders who do crazy things. You know, it's a back and forth. So, you put your bike out there and you cannot figure out why some driver is angry. Well, you know, maybe bicyclists have been doing a lot of stupid stuff. Not to put all the weight on them because they don't have a huge machine. They are quite a hazard to pedestrians as well."
--Male, Age 50-59, San Francisco Fillmore Street

"I think that some people have probably negative feelings about bicyclists because there are some bicyclists who think that cars shouldn't be on the road at all, and are nasty with cars. And I think that has a negative effect which is unfortunate...older generations might have a harder time with that than younger ones…I'm just really sorry that that antagonism is going on in San Francisco with the bikes. I think it's really unfortunate...It's stupid to think that you are going to get rid of all the cars, and it's stupid to think that bicyclists shouldn't be on the road."
--Female, Age 60-69, San Carlos

5. HABIT

5.1. Habits appeared to reinforce mode choices that people used. Many participants who drive have a predetermined mode choice for all trips, often because they don't have any other good choices. In addition, driving an automobile was viewed as an ingrained habit by some interviewees.

"I think that getting into the habit of [walking and bicycling] early makes one I think more likely to continue doing them into their later years. I'm 55, so I'm not much of a bicyclist anymore, probably unfortunately--it would probably do good for my gut."
--Male, Age 55, San Francisco Third Street

"[Driving] is a habit. It's not as easy as just switching over and saying that's the way people will change their lifestyle."
--Male, Age 40-49, Fremont

"It wasn't a factor because I was driving, and I didn't know that the bus went across the San Mateo Bridge until I saw the advertisement...also, they offered the commuter checks."
--Female, Age 50-59, Hayward

"It's just a mindset. You need to think out of the box. Otherwise, in the United States actually, we tend to think about the car being the first and the only mode of transportation, and we need to get out of that mindset."
--Female, Age 40-49, Pleasanton

What are barriers to changing how people travel? Are there particular barriers that you face? "Probably complacency is the biggest one. I'm used to using a car. It's easy. I can get in; I can park in my driveway at night. I get in, I go."
--Male, Age 55, San Francisco Third Street

"Almost everybody has a car here. The younger ones--a lot of them drive their cars to high school or to college...I think they just took it for granted. That's probably all they know, really."
--Male, Age 30, Burlingame

"I wanted to be the most responsible person, so I stayed away for a long time...It was more for practicality for helping my family out that I started to drive. And then it became so easy, so if you made it harder for people...had to pass more rigorous tests you might [keep more people from driving]."
--Female, Age 52, South San Francisco

"Living here in the suburbs, the other thing that happens, I think, is that you get really used to parking not being an issue. Wherever you go, you can park. Which is not true when I lived in the City."
--Female, Age 60-69, South San Francisco

5.2. Most interviewees bicycled as a child or young adult but stopped bicycling at some point in their lives. A few have started to bicycle again.

When the interviewees were kids, they bicycled both to travel to activity locations and purely for recreation.

Many People Bicycled as Children and Young Adults

"Bicycling was what we did. We took our bikes to school, you took your bike to your friend's home. There was none of this have your mom or dad carpool you around...We bicycled a lot."
--Female, Age 40-49, Danville

"I used to bicycle a lot. When I was like a student at Cal Berkeley. And that was like in the 70s."
--Female, Age 60, Concord

"When you are younger--say under 16--you don't have a drivers' license. That's the best way to get around, besides the bus...I do [bicycle] less now, but I still do it...I consider it a mode of transportation."
--Male, Age 30-39, El Cerrito

"As a kid, I lived out in the boondocks of Delaware. And if you wanted to go anyplace, you needed to be on a bike. But I started riding when I was in third grade..."
--Female, Age 60-69, San Francisco Taraval Street

"For awhile when I was a teenager, I lived in a flat city, and I could bicycle."
--Female, Age 40-49, San Francisco Third Street

"I didn't start driving until I was like 37. I used buses and bicycling and walking. So that's what I was doing until I was 37."
--Female, Age 52, South San Francisco

"I also grew up in a small community where you could walk to people's houses and shops...mom and pop stores, and arcades. So we biked or walked...this was in Guam."
--Male, Age 30, Burlingame

"I had a bike all the time. As a teenager, I biked quite a bit."
--Male, Age 30, San Francisco Fillmore Street

"A bicycle was my primary source of transportation when I was a kid...I remember...very proudly buying this ten-speed when I was 14. That was my primary source of transportation through college."
--Male, Age 55, San Francisco Third Street

"I had a bike when I was 10 years old. My dad got me a Christmas present bike…I rode it until I went to Stanford. I never had a lock or a chain on it…I never knew a kid in San Rafael to lose a bike or to steal a bike…
--Male, Age 84, Richmond

"[She bicycled] as a kid, but not as a way to get from A to B kind of a thing; just as child's play. But that was before they made the law where you couldn't bicycle on the sidewalk anymore."
--Female, Age 30-39, Daly City

Growing up in Sonoma, CA, "Bikes were recreational transportation--not how the family got around. I never saw my mother on a bike, let's put it that way."
--Female, Age 50-59, San Carlos

Growing up as a kid in San Bruno, CA: "We bicycled around here for pleasure, but not for getting places."
--Female, Age 52, South San Francisco

<u>Some People have not Bicycled since they were Children or Young Adults</u>

"I probably haven't ridden a bicycle since I have been in elementary school...I usually work long hours...I have to carry things."
--Female, Age 50-59, Berkeley

"I went to graduate school for a while at UC Davis...I think I was about 30 or 28...I guess I had a few bikes stolen and I gave up [bicycling]."
--Female, Age 60, Concord

"And then, I don't know, I haven't owned a bicycle in a while. I used to do bicycle classes at the Y. I don't have a bicycle right now."
--Female, Age 60, Concord

"I actually owned a bike here, and my daughter decided to 'fix' it. And after she quote, 'fixed it', I had no breaks. And I thought, 'Oh well, I will just walk.' I haven't ridden in probably 20 years."
--Female, Age 60, San Francisco Taraval Street

Why did you stop bicycling at age 30? "I got a car then; I was driving...my eyesight was getting bad, my leg is bad, so I just quit...from fear of accident myself."
--Male, Age 57, Oakland

After high school, I think I stopped biking...I didn't purposefully say I didn't want to do it anymore, but I think it fell by the wayside...It was more convenient to drive, I guess."
--Male, Age 30, San Francisco Fillmore Street

"I moved from my home state to California...I was living in the City [of San Francisco]. It was very urban and very congested, and there was no place for a bicycle--my apartment was a postage stamp...I took public transportation...my work was in the Mission. I was really in the City, and public transportation was what was happening."
--Male, Age 55, San Francisco Third Street

"I never got another bike after mine got stolen [in college]."
--Male, Age 84, Richmond

<u>One Interviewee Bicycled more as an Adult than as a Child</u>

"No, I biked more as an adult than I did as a child. I had a bike, but I...probably just biked like in the summertime...I didn't really bike a lot. Not as much as a lot of my friends and siblings did. But as an adult, I do." When did you develop your current attitude about bicycling? "I think it occurred when I realized that A, it's more ecological, and B, it's more economical...As a kid, for me, I didn't know...I'm saving energy and I'm getting my exercise...I knew, but it just didn't register...As an adult, it does."
--Male, Age 30, Burlingame

5.3. Some interviewees gave significant consideration to having multiple transportation options (e.g., the potential to walk, bicycle, or take public transportation) when they chose where they were going to live.

"We wanted to be within walking distance of a BART station. And we don't actually use it that often...neither one of us commutes by BART or anything, but I'm still really glad that we made that decision…We also wanted to live in a place where our kids could walk to school or take a bus...so they could get themselves to school with public transportation or their own feet…We live pretty close to Whole Foods, so we walk to Whole Foods for treats and stuff like that...and light shopping…We live within walking distance to restaurants...that was definitely important to us."
--Female, Age 50-59, Berkeley

"I'm working here, and I have the flexibility, if my daughter has an asthma attack, to get off of here and be on time or close to where she could be...so I was thinking ahead about that time. And also to provide for my wife a place where she could just walk to the store or she could just walk to the BART...I wanted to provide a very friendly environment for her."
--Male, Age 30-39, Berkeley

"I prefer to live in San Francisco because the buses are more frequent. That is why I chose to live here instead of elsewhere in the Bay Area."
--Female, Age 20-29, San Francisco Market Street

Where people live makes a big difference for how they travel: "That's something you really need to think about, and I don't think people realize that sometimes…We looked at two houses down by Pine Lake Park...I was driving by them the other day, and they are nice houses, but they are

really convenient to nothing. And I thought, 'I'm so glad that we didn't buy either of these houses.'"
--Female, Age 60-69, San Francisco Taraval Street

"Having things nearby is important."
--Male, Age 30-39, San Francisco Mission Street

"When we bought the house [in 1999], I was working in San Francisco and he was working in Redwood City, and we wanted to live on the Peninsula versus living in San Francisco. We wanted to be convenient to the train...I used to take the train a lot [to work]...being close to the train tracks was important when we were buying the house. But...we bought it during the housing boom, so we bid on four different houses...we actually bought the one we bought just because it is the one we found...We wanted a good school district, which [her daughter is in], but it is interesting because we drive by about four schools getting to her school. So her school district is one that requires a commute, but it is a really good school."
--Female, Age 50-59, San Carlos

"I would love to be in such an area, where I just walk down stairs...meaning if I'm in a condo building or something, I just go down and I walk to places, like I don't have to drive, and no car…It's a different requirement now...because earlier it was school districts and everything, so we have been happy here for the last 10 years...now that the kids move out of the house, we may go somewhere where it's a smaller condo, and it's more commutable, it's easily walkable to places...we're open to that."
--Male, Age 40-49, Pleasanton

5.4. Some interviewees did not consider having multiple transportation options (e.g., the potential to walk, bicycle, or take public transportation) as a significant factor when choosing a housing location. Their housing location choices tended to focus on price, house and apartment amenities, school district quality, proximity to work, proximity to friends and family, proximity to shopping and other activities, and finding a place to live within a certain timeframe. Some people found that having several convenient transportation mode choices was a benefit after moving in. Others didn't realize the value of walking and bicycling or until they moved to a different location without those opportunities.

Encouraging people to think more about transportation in their housing decisions could be a promising strategy to shift how people travel. If many people still aren't thinking of the ability to walk or bicycle as important when choosing a home location, there may significant potential for the demand for sustainable, pedestrian- and bicycle-friendly neighborhoods to increase.

<u>Proximity to Work was an Important Consideration for Choosing where to Live</u>

"To be quite honest with you, I didn't know, because I moved here in 2007 and I didn't know what kind of transportation there was here. So I had planned on driving my car down here, but after being here for...a few weeks...and getting to know the transportation situation that...would be here in this community, I decided that I didn't have to bring my car down here. I was also

going to buy a car...and I thought, ‘You know, I don't need one, so why buy one?’...I had to move here for work...but my decision to not purchase a car...is based on the availability of...public transportation...I had no clue [what the transportation system was like], so when I moved here I was like, ‘Oh, jackpot.’...I could talk about more improvements for the public transportation, but for the most part, it's pretty good.”
--Male, Age 30, Burlingame

“I came back to my parent's home [in the San Bruno hills], and that's where I take care of my mother. So transportation was not an issue. And my job is taking care of my mother, and so transportation is not an issue there, either. If I were getting another job, I would look in the immediate vicinity [of that job].”
--Female, Age 52, South San Francisco

“Because I have a vehicle, I don’t want to drive too far...I would like to work as close to my home as possible...I'm not a person who would be amenable to doing a 45 minute or an hour commute by car.”
--Female, Age 50-59, Berkeley

“My cat doesn’t like it here...she thinks it's too noisy. She used to be an outdoor cat. I feel so much regret like about, I like the quiet of where I was living before. It wasn’t as convenient, but the quiet was [nice]...It was in a little cul-de-sac...it was so peaceful...it is a hard tradeoff...quiet versus convenience.”
--Female, Age 60, Concord

“[Transportation] wasn’t too important to me. Basically, my girlfriend works over at UCSF. So basically our main...factor was to trying to live somewhere close to both of our works--kind of almost in the middle. So I guess that was kind of the main factor...I think our next place will maybe take that transportation thing a little more into play, because my girlfriend is thinking about selling her truck. So at least if one of us could live on a pretty direct [transit] route to go to work, and then the other person could probably just take the car.”
--Female, Age 30, San Francisco Fillmore Street

“I used to work in the East Bay and have to commute a lot longer than I do now...so when I took my new position, one of my requirements in my head was that I wasn't going to cross any more bridges because I didn't want to have that extra time and traffic and cost included. So that was some consideration for the jobs that I applied to when I stopped working in the East Bay.”
--Female, Age 30-39, Daly City

“Actually, we did pick to live in Redwood City because we both worked in Redwood City. So we didn't want to do the commute across the bay. So we chose to have a smaller house. So we did make choices to live in the city where we worked…We were looking for something we could afford that was in a neighborhood that was safe.”
--Female, Age 52, San Carlos

The location was closer to jobs and his daughter with his ex-girlfriend. "I am trying to right now at this moment to move to San Leandro or Hayward to be closer to school...and be closest to work. Work, school, it's a union. In order to reduce my expenses: gas and care of my car. I wanted to move closer to where most of my activities are going to be."
--Male, Age 30-39, Berkeley

How important was transportation in your decision about where to live and work? "It's very important. I have actually preached it to my family members. About the idea of 'Live where you work, and work where you live,' if possible. It never made sense to me to spend 2 hours of your day driving a car when you could have a little smaller home in the city, be part of your community. Or if your job is in the suburbs, live in the suburbs."
--Male, Age 50-59, San Francisco Fillmore Street

"We bought this house because it was on the [Muni] Metro line, and my husband worked Downtown, and I worked a mile and a half away. And neither of us wanted to commute [by car from a long distance away]. So that made it really simple. And now I'm real glad because I have so many friends who decided that they were going to get big lawns for their children and move to Novato or Sunnyvale. And now they are having to commute in to San Francisco. Their activities are here, but their children are all grown up."
--Female, Age 60-69, San Francisco Taraval Street

Timing was an Important Consideration for Choosing where to Live

"I chose Hayward when I was looking for apartments...I had to find something like *right now*...I had to move in a certain period of time...so I had never thought about it."
--Female, Age 50-59, Hayward

Price was an Important Consideration for Choosing where to Live

"Concord chose me; I didn't choose it...But it's very convenient having my office 5 blocks from where I live. Being [in] Downtown Concord is a delight, really...This place just came open when I was looking, and the price was right, and the landlord was good."
--Female, Age 60, Concord

Why not live in San Francisco? "In San Francisco, the cost of living is going to be greater, that's number one. Number two, you have a high-density urban area and everything that goes with that...parking issues. If we lived in the City...obviously public transportation is what I would use...the egress in and out of San Francisco is an issue...It wasn't even a consideration because the cost of living in East Contra Costa versus the cost of living in the City...you can buy a custom home in Brentwood...for $500,000 [to] $600,000...it's all about tradeoffs...And it's urban living versus more suburban living...it's two different styles."
--Male, Age 60-69, Brentwood

How important was transportation in your decision about where to live and work? "Alright, here's an admission. I didn't think about it. I had lived for 30-some years in Noe Valley in San

Francisco on the J-Church [transit] line. And when I was younger, I used to bicycle to my office, which at that point was in San Francisco, and I used public transportation all the time. And I just didn't really realize how inconvenient it was going to be to have to get in a car all the time...I know it sounds really silly, but I had never really thought about it before because everything was so convenient and I didn't realize how important that was to me. It's the main thing that I hate about where we live--there's no place to walk. The only place you can walk is within the development itself. Otherwise you're walking on the highway...it is Highway 35, and there's a lot of traffic, and there's *nothing* within walking distance...so I never walk anywhere, or bicycle. I mean I sold my bike. It would mean putting the bike on the back of the car...to go someplace, and then get on the bike…We moved because our kids were teenagers and we needed more space. We got twice as much space as we had in the City for the same amount of money. And now that they are gone, we have gotten used to having this amount of space, so anything else is downsizing and resulting in a significant increase in our housing expenses because of the increase in property tax. So it looks like we are going to stay here for the time being…I love the neighborhood because of the people who live here. It's really interesting--it is a very diverse group. Diverse in terms of ethnicity and age, although there's no economic diversity. I love the house itself…the view of the ocean. But that's it. I don't like where it's located; I don't like the weather…If I had to do over again, I would never have moved out here. It's partly a transportation issue, and it's partly this concept of living in the suburbs which doesn't really sit right."
--Female, Age 60-69, South San Francisco

<u>House Amenities were an Important Consideration for Choosing where to Live</u>

"We didn't choose this house because of its closeness to Caltrain, but that was definitely a selling point. We chose the house because it had a good place for my husband's speakers...his stereophonic speakers...At the time, he was traveling on Caltrain every day...We are like less than 10 minutes [by walking] from the Caltrain station...We were looking for a house that was a little bit in the hills...And yet it wasn't so high up that it was expending large amounts of gasoline to get up the hill. That was a plus, too. But probably the biggest thing is that we liked the house."
--Female, Age 60-69, San Carlos

"We moved in 2003, and the motivating factors were that my wife retired from UC, and we wanted to maintain a home and our lifestyle, and we felt we could achieve that financially based on what Brentwood offered...We lived in Danville...and basically for the same house in Brentwood you paid about two-thirds or one-half. So we could retire and maintain a quality of life, and to do that, that took a higher precedence than the convenience [of a] 20-minute commute versus an hour commute. So it was worth driving an hour based on maintaining our lifestyle, accommodating my wife's retirement..."
--Male, Age 60-69, Brentwood

Quality of Schools was an Important Consideration for Choosing where to Live

"My husband when we moved to Pleasanton 10 years ago...he used to work [in Menlo Park]...It was a really big decision whether we should do this at all because we used to live in the South Bay, and it was much more convenient for him to go from there to Menlo Park. Now that after moving here, he had to take San Mateo bridge, and it took longer. So [transportation] was a major consideration. But I guess you never know how long you will stay with one company, and also he could work from home a couple of days a week. So we finally ended up buying a home here...Our kids were still young--we wanted to make sure the school districts were good...We were renting then, and we were looking for newer houses, and Pleasanton seemed to be having reasonable prices...I think even a smaller condo would cost more around [the Menlo Park area]."
--Female, Age 40-49, Pleasanton

"We decided that we wanted to buy a house...we looked around, and we had the choice of one location that had a reputation of having better schools...what would be the best place to move to be able to put our daughter in a best school? One issue...was that I have to drive through that tunnel--sometimes there is a lot of traffic--making it impossible to be on time...the houses here in Berkeley are expensive, very expensive, but to have her get a 'better education' or [be in a] 'safe place.' So I [moved] here, but I find myself [in a] conundrum because it is very expensive. I have another kid, and my wife is not working, so I have to work extra."
--Male, Age 30-39, Berkeley

"You are concerned about where your kids are going to go in the school. You try to put them in the best school that you can...and you fight to get to that school for your kids, and then you drive to have to get to that school. I think it's...poor planning."
--Male, Age 30-39, Berkeley

Proximity to Friends and Family was an Important Consideration for Choosing where to Live

"If [transportation was important to her decision about where to live], I'd probably live in San Francisco where I have more public transit options available…Daly City is where my family lives; San Francisco is where my mom lives, so Daly City is...a centralized area to be with friends and family, and it is more affordable rent-wise than San Francisco."
--Female, Age 30-39, Daly City

Proximity to Shopping and other Activities was an Important Consideration for Choosing where to Live

"The one thing that we have in Brentwood that you don't necessarily have in Walnut Creek or Danville...or even in Oakland is that everything in Brentwood...All your retail is out there...You can live pretty much anywhere in Brentwood, and in your car, you can be 10 to 15 minutes at max to grocery stores, to retail, to restaurants, to...junior college, to the parks, etcetera, everything. And for senior citizens as well as families, if time is valuable, and time is money, you can be to those locations within a very short period of time...Now that's an advantage that I didn't realize until I moved to Brentwood…Two years ago, I asked my wife if she wanted to

move back to Danville and be in the 680 corridor...and she said ‘No.’ And one of the basic reasons she said ‘No’ is because the doctor, the dentist, the hospital, all the retail, the shopping, the stores, everything, is so close to her that...it’s just less traffic. And that’s a lifestyle that she has come to appreciate, and she doesn't want to give up.”
--Male, Age 60-69, Brentwood

5.5. Several interviewees walked, bicycled, or took public transportation less after their job location changed.

He had worked in San Francisco, and had chosen to live in El Cerrito so that he could take BART there. But then his job changed so that it was located down in Redwood Shores. “[Transportation] was pretty important, but situations change.”
--Male, Age 30-39, El Cerrito

“I just needed to find a cheap apartment...and the apartments are cheap out here because the quality of life isn't so good. And I knew the location because I used to work in the Bayview. Before I lived here I worked here. And I do remember thinking, ‘Oh, it's within walking distance of the office’ I used to work in on Third Street, but I'm not working there anymore.”
--Female, Age 40-49, San Francisco Third Street

“I think if I were in one location--I tried this, actually, a couple of years ago...where I moved my office from Bayview to South of Market because several of the architectural firms I worked with were nearby. And I figured, ‘I can walk to those.’ And that worked for a couple of months. And it worked beautifully. I mean, I really enjoyed it. I was healthier...I would discipline myself to walk...I would take the Third Street Rail all the way around. I would get off at...Powell Street Station, and I walked three blocks to my office South of Market...I had people at Eighth and Folsom and Third and Folsom, so I was walking a lot. It was terrific. A really urban, smart solution. And then I got hired to be a construction manager for a project in Napa for a year. So it sort of blew the whole thing apart, you know?”
--Male, Age 55, San Francisco Third Street

If he ends up working somewhere else in 5 years, he will make more use of a car.
--Male, Age 30-39, San Francisco Mission Street

A respondent moved from the Sunset District to Pacific Heights in San Francisco, but kept going to the same place for a good haircut. “I go to a hair dresser over there...It’s kind of a drive...It’s always risky going to somebody new.”
--Male, Age 30, San Francisco Fillmore Street

“Before I lived here I worked here. And I do remember thinking, ‘Oh, it's within walking distance of the office’ I used to work in on Third Street, but I'm not working there anymore.”
--Female, Age 40-49, San Francisco Third Street

5.6. Some interviewees thought that land use changes would cause them or their neighbors to change how they traveled.

Land Use Changes could Encourage Pedestrian Transportation

“If things were not so spread out...A lot of people don't work within walking distance of their job...If we lived and worked closer to some of the things that we needed to do, I think that would improve the environment...which you know, we don't have a lot of control over everything like that.”
--Female, Age 50-59, Hayward

“I think one…as things get built a little more densely around here...so if Walgreens was within 3 blocks of here, I would probably walk there just for the one errand things...I would go there just to get the shampoo and come back because that would be a nice walk and easy to carry, as opposed to I wait until I need a bunch of stuff…There used to be a Bank of America within walking distance here, and so I walked all the time to Ashby and Shattuck. When I needed to go to the bank, I just walked to the bank and came back home. But that’s left, to I tend to drive because it is a little further. As more urban density happens...I wonder what’s going to be in the Ed Roberts Center...I can get all the things that I need to get done on foot.”
--Female, Age 50-59, Berkeley

“The library is going to be a powerful magnet because they are expanding it…That's easy to walk to; that would be fun…it's great to have it right up at the corner…The streets in the neighborhood are pretty stable. We have Lincoln High School a couple blocks up the way, so there’s always kids around.”
--Female, Age 60-69, San Francisco Taraval Street

“The city is planning to have [the nearest arterial street extended]. So, eventually, down the line, maybe 5 years from now, it will be all connected...When that happens, I'm sure there will be more shopping opportunities; there will be more stores coming up close by. And once that happens, I have more options to walk to different stores. Not go to the same Safeway store, maybe. The urban plan is to do that.”
--Female, Age 40-49, Pleasanton

“When they build new developments...when they put too much of an emphasis on the individual car, with each individual person or each individual family having a car with a garage in every household right in front of your house, where you have to drive down your street, drive into your driveway, in your house. Whereas, I know there are developments--I think particularly it was Germany--where they set up these living communities. And they have taken it and put the parking garages on the edge outside. Each home does not have a garage...For you to walk to go get your car to drive to the grocery, you may just decide to walk to the grocery...and then you have a more walkable environment...We know how to do this stuff...It's a matter of political will. It's a matter of leadership.”
--Male, Age 50-59, San Francisco Fillmore Street

“There's a lack of the sort of commercial and business infrastructure [in the Bayview] now that would lend itself to my particular type of business. That's not to say that there aren't a lot of businesses here. There are thousands of businesses in the Bayview, and many successful ones. But they're just not in my industry. So walking to them wouldn't necessarily be a problem if those businesses were here.”
--Male, Age 55, San Francisco Third Street

How could you change your neighborhood so that you choose to walk more? “People want to walk to do their chores kind of thing. Make it easier for people to do that.”
--Female, Age 52, San Carlos

Land Use Changes could Encourage Public Transportation

“I think that transportation needs to be located conveniently to where people are living, so there needs to be more residential housing near transit hubs...and more varied housing near transit hubs. They are building a lot of small apartments and small condominiums within walking distance of the new BART stations down on the Peninsula, but they are all small apartments and they are right on top of each other...or townhomes. There's no single-family houses that are being built within walking range or even a short bus ride within range of those transit stations that I know of.”
--Female, Age 60-69, South San Francisco

“At the time they were building [the T-Third light rail line], they were also building a lot of condos, so they were hoping that people would move there...like white people with jobs. But I don't see them. So it was part of the gentrification that fell apart when the real estate market collapsed. We don't even have a grocery store...”
--Female, Age 40-49, San Francisco Third Street

Land Use Changes could Encourage Pedestrian, Bicycle, and Public Transportation

"If the neighborhoods were a mix of residential and commercial and industrial, and you had that blend throughout the city without these strict residential areas which would preclude any kind of commercial activities, then you would have a much more vibrant...potential for public transit, bicycling, and walking because there would be these businesses everywhere and activities everywhere…That kind of blend and opportunity for shopping and business and so on is precisely the kind of urban development that people desire. So that means you can leave your house, walk a couple of blocks, and you can get what you need. If it's food, or a cup of coffee, or you go to dinner, physician, whatever..."
--Male, Age 55, San Francisco Third Street

There is a need to Coordinate Land Use Changes with Transportation Improvements

"If the focus isn't a regional approach...to talk about the upside and the downside...on how that development is going to be phased in and the infrastructure will be phased in with it, what you have as a giant bottleneck called Highway 4."
--Male, Age 60-69, Brentwood

"Part of the public transportation problem...is [transcending] political subdivisions. Counties and cities, they all have their political agendas...Your only hope is regional planning for public transportation...I think the regional planning is really tricky, and politically can be very sensitive and sometimes damning...The spirit of cooperation, collaboration, and sharing of resources is very foreign to political subdivisions. It's not their nature."
--Male, Age 60-69, Brentwood

"When you live in outlying areas, I think...if the government...doesn't plan accordingly, and they develop industry and urban areas and they don't develop the infrastructure to...accommodate growth, it becomes a serious problem. I think that's one of the drawbacks of living out in more of a remote area like Brentwood or Oakley...I don't think the infrastructure--the road and transportation systems--has kept up with the...planned growth."
--Male, Age 60-69, Brentwood

APPENDIX H. SHOPPING DISTRICT CLUSTER ANALYSIS OUTPUT FILES

This appendix contains SPSS output files showing the results of the shopping district cluster analysis.

```
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  /MEASURE=SEUCLID
  /PRINT NONE
  /ID=Jurisdicti
  /STANDARDIZE=VARIABLE RANGE.
```

Proximities

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Case Processing Summary[a]

Cases					
Valid		Missing		Total	
N	Percent	N	Percent	N	Percent
20	100.0%	0	.0%	20	100.0%

a. Squared Euclidean Distance used

```
CLUSTER
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  /METHOD COMPLETE
  /ID=Jurisdicti
  /PRINT SCHEDULE CLUSTER(3,5)
  /PLOT DENDROGRAM HICICLE.
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Cluster

[DataSet1] W:\Working\!Bob\Dissertation\Schneider_WalgreensNeighborhoodData_20_061410.sav

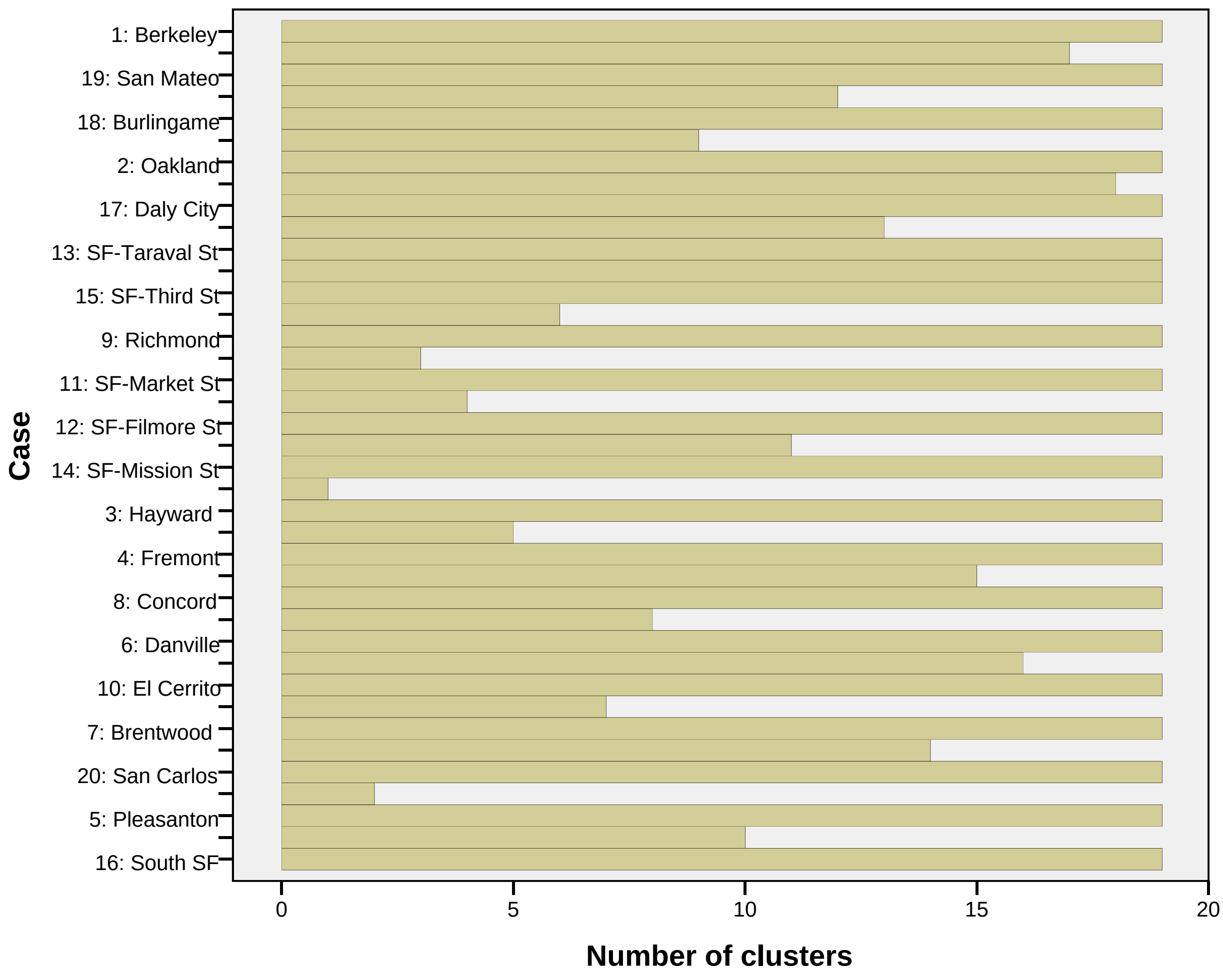
Complete Linkage

Agglomeration Schedule

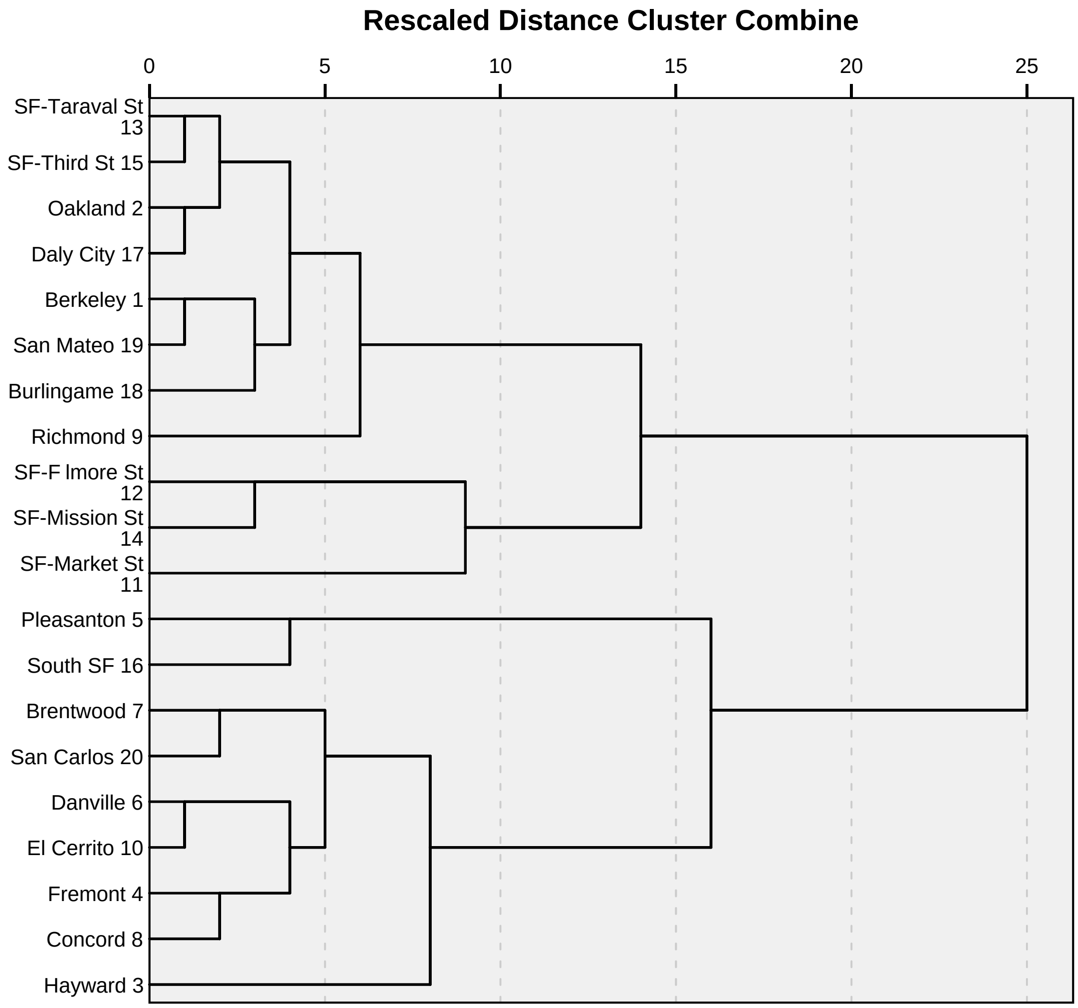
Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	13	15	.018	0	0	7
2	2	17	.062	0	0	7
3	1	19	.062	0	0	8
4	6	10	.096	0	0	12
5	4	8	.148	0	0	12
6	7	20	.215	0	0	13
7	2	13	.240	2	1	11
8	1	18	.323	3	0	11
9	12	14	.326	0	0	16
10	5	16	.457	0	0	18
11	1	2	.475	8	7	14
12	4	6	.511	5	4	13
13	4	7	.619	12	6	15
14	1	9	.732	11	0	17
15	3	4	.984	0	13	18
16	11	12	1.066	0	9	17
17	1	11	1.745	14	16	19
18	3	5	1.943	15	10	19
19	1	3	3.147	17	18	0

Cluster Membership

Case	5 Clusters	4 Clusters	3 Clusters
1:Berkeley	1	1	1
2:Oakland	1	1	1
3:Hayward	2	2	2
4:Fremont	2	2	2
5:Pleasanton	3	3	3
6:Danville	2	2	2
7:Brentwood	2	2	2
8:Concord	2	2	2
9:Richmond	1	1	1
10:El Cerrito	2	2	2
11:SF-Market St	4	4	1
12:SF-Filmore St	5	4	1
13:SF-Taraval St	1	1	1
14:SF-Mission St	5	4	1
15:SF-Third St	1	1	1
16:South SF	3	3	3
17:Daly City	1	1	1
18:Burlingame	1	1	1
19:San Mateo	1	1	1
20:San Carlos	2	2	2


Case
1: Berkeley
19: San Mateo
18: Burlingame
2: Oakland
17: Daly City
13: SF-Taraval St
15: SF-Third St
9: Richmond
11: SF-Market St
12: SF-Filmore St
14: SF-Mission St
3: Hayward
4: Fremont
8: Concord
6: Danville
10: El Cerrito
7: Brentwood
20: San Carlos
5: Pleasanton
16: South SF
0
5
10
15
20
Number of clusters

Dendrogram using Complete Linkage

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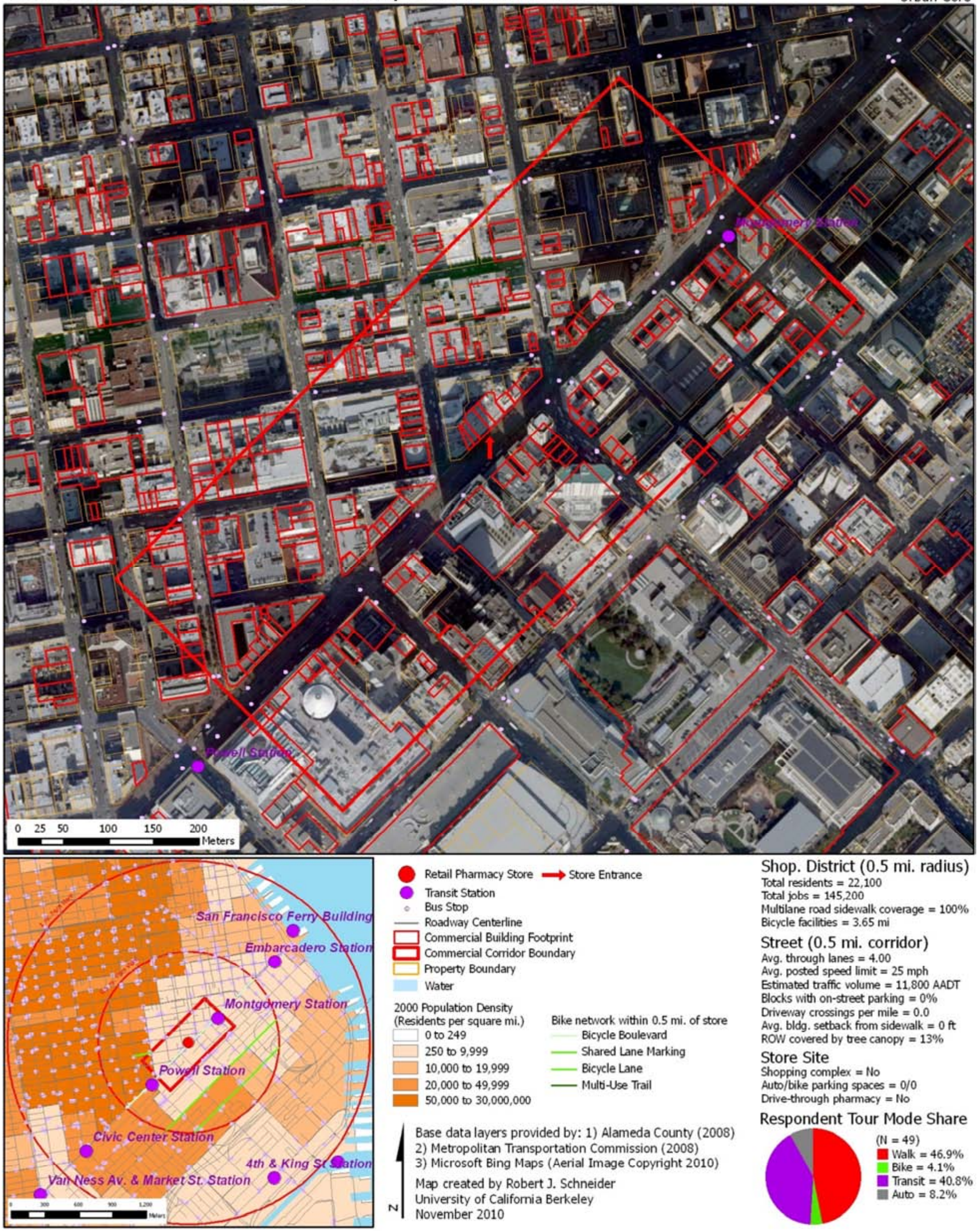
APPENDIX I. SHOPPING DISTRICT BASE DATA MAPS AND WALKING PATH DENSITY MAPS

This appendix contains a base data map and walking path density map for each of the 20 shopping districts where surveys were distributed for this study. Commercial building footprints in the commercial corridor were geocoded manually from Bing Maps aerial photograph images. Walking path density was generated using the Spatial Analyst extension in ESRI ArcGIS 9.3. To convert the map scales to metric units, note that 1 mile = 1.61 kilometers and 1 square mile = 2.59 square kilometers.

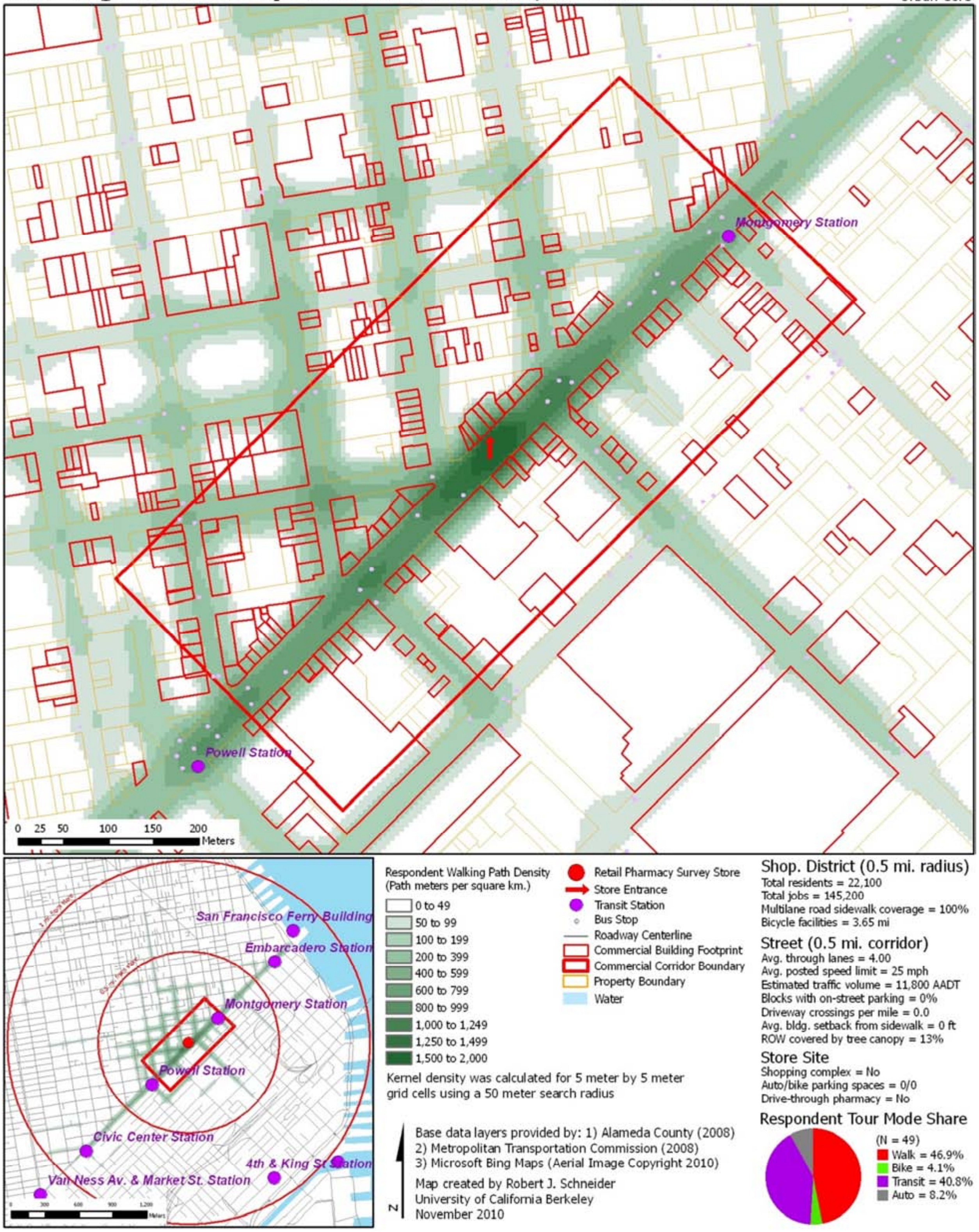
Store Area: 730 Market Street, San Francisco

Shopping District Type:
Urban Core



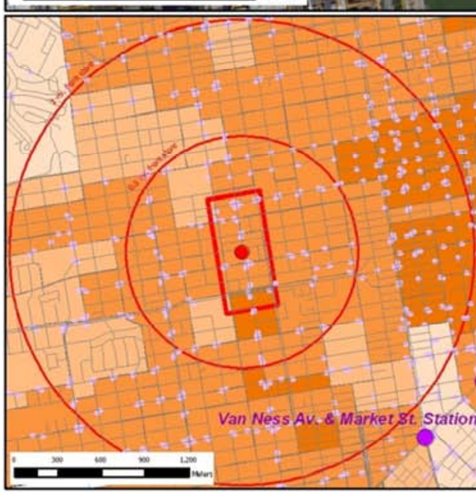
Walking Path Density: 730 Market Street, San Francisco

Shopping District Type:
Urban Core



Store Area: 1899 Fillmore Street, San Francisco

Shopping District Type:
Urban Core



Retail Pharmacy Store — Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water

2000 Population Density
(Residents per square mi.)
- 0 to 249
- 250 to 9,999
- 10,000 to 19,999
- 20,000 to 49,999
- 50,000 to 30,000,000

Bike network within 0.5 mi. of store
- Bicycle Boulevard
- Shared Lane Marking
- Bicycle Lane
- Multi-Use Trail

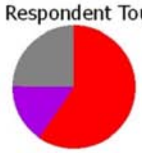
Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)

Map created by Robert J. Schneider
University of California Berkeley
November 2010

Shop. District (0.5 mi. radius)
Total residents = 24,000
Total jobs = 14,600
Multilane road sidewalk coverage = 100%
Bicycle facilities = 0.00 mi

Street (0.5 mi. corridor)
Avg. through lanes = 2.00
Avg. posted speed limit = 25 mph
Estimated traffic volume = 9,800 AADT
Blocks with on-street parking = 100%
Driveway crossings per mile = 0.0
Avg. bldg. setback from sidewalk = 0 ft
ROW covered by tree canopy = 14%

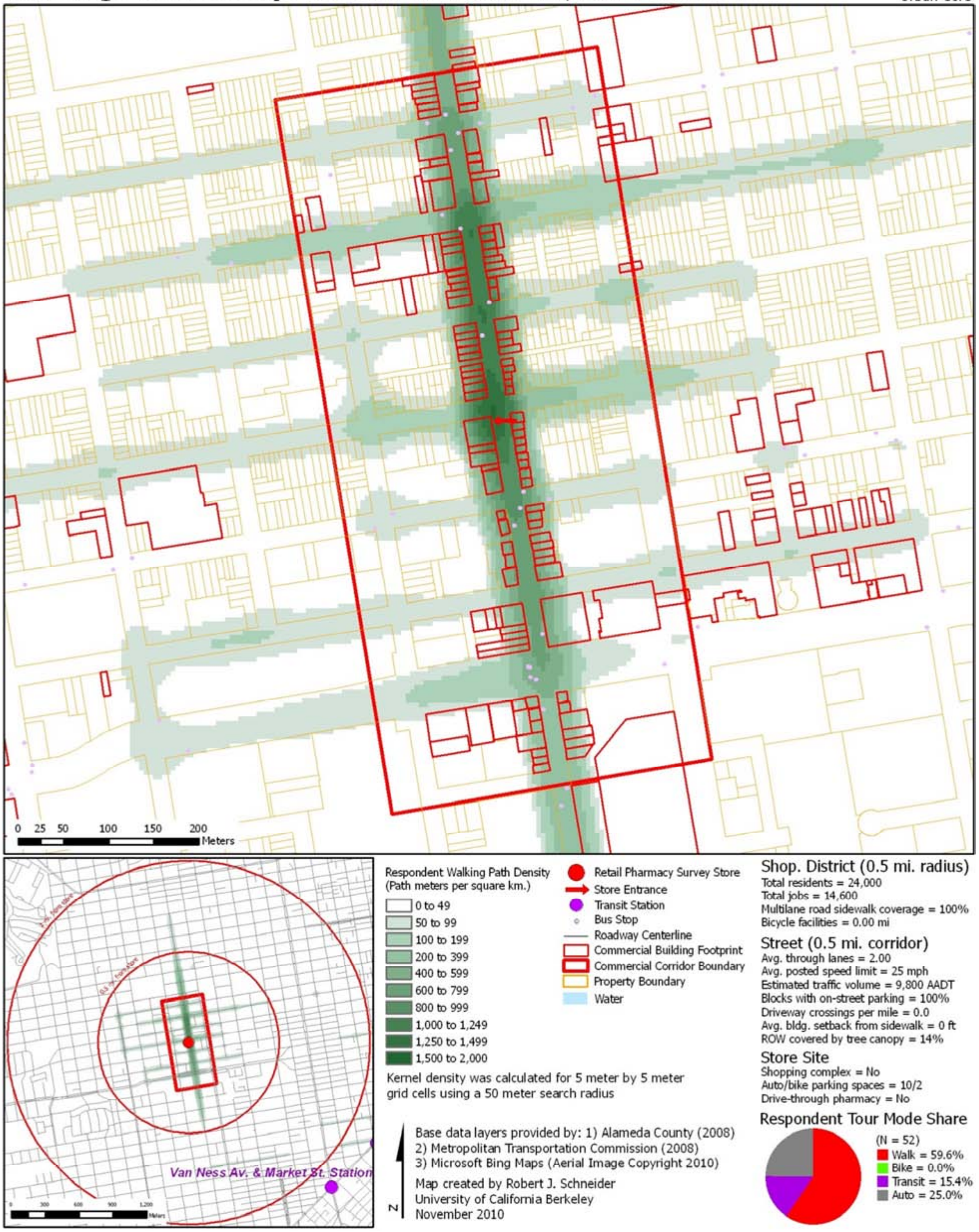
Store Site
Shopping complex = No
Auto/bike parking spaces = 10/2
Drive-through pharmacy = No

Respondent Tour Mode Share


(N = 52)
- Walk = 59.6%
- Bike = 0.0%
- Transit = 15.4%
- Auto = 25.0%

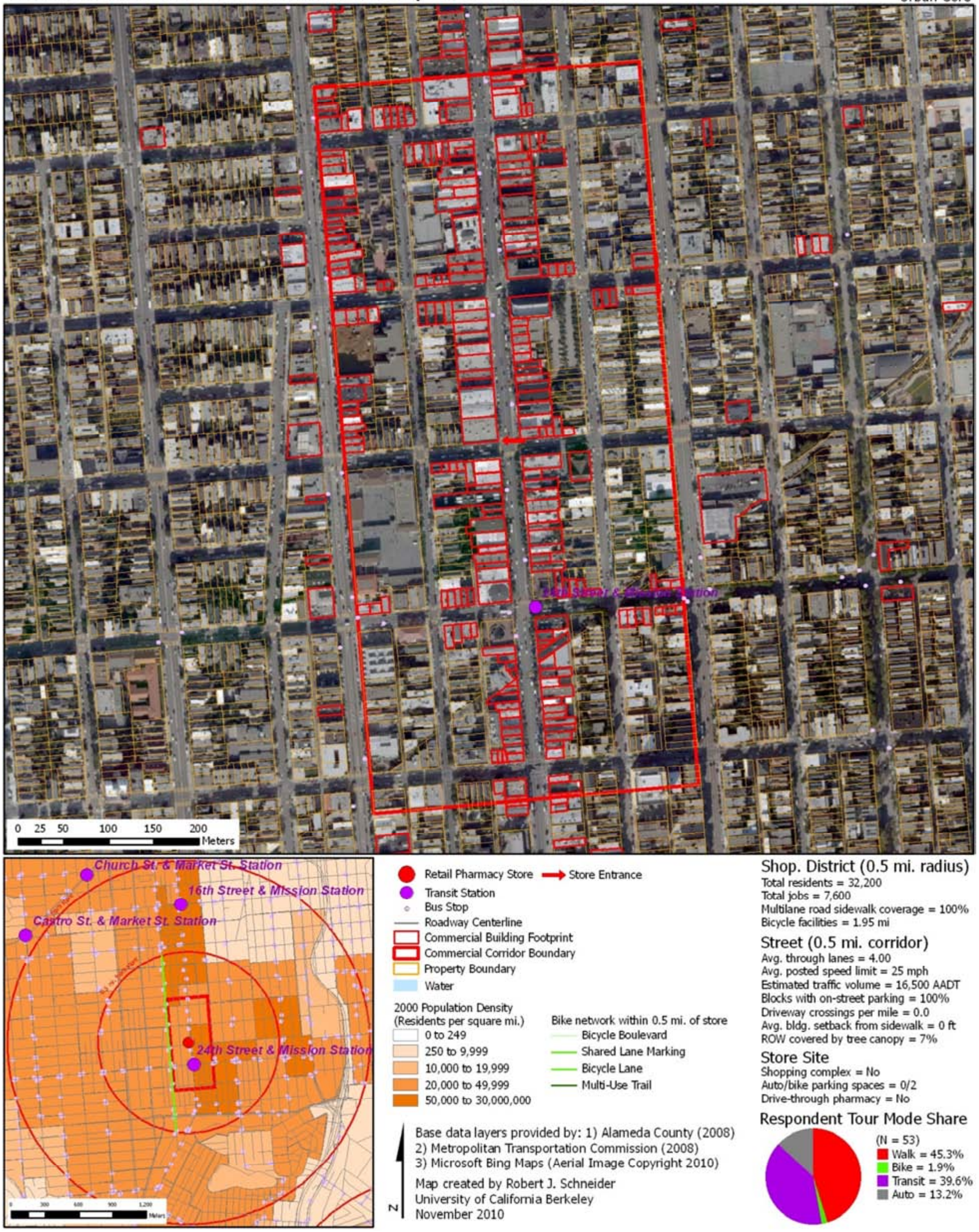
Walking Path Density: 1899 Fillmore Street, San Francisco

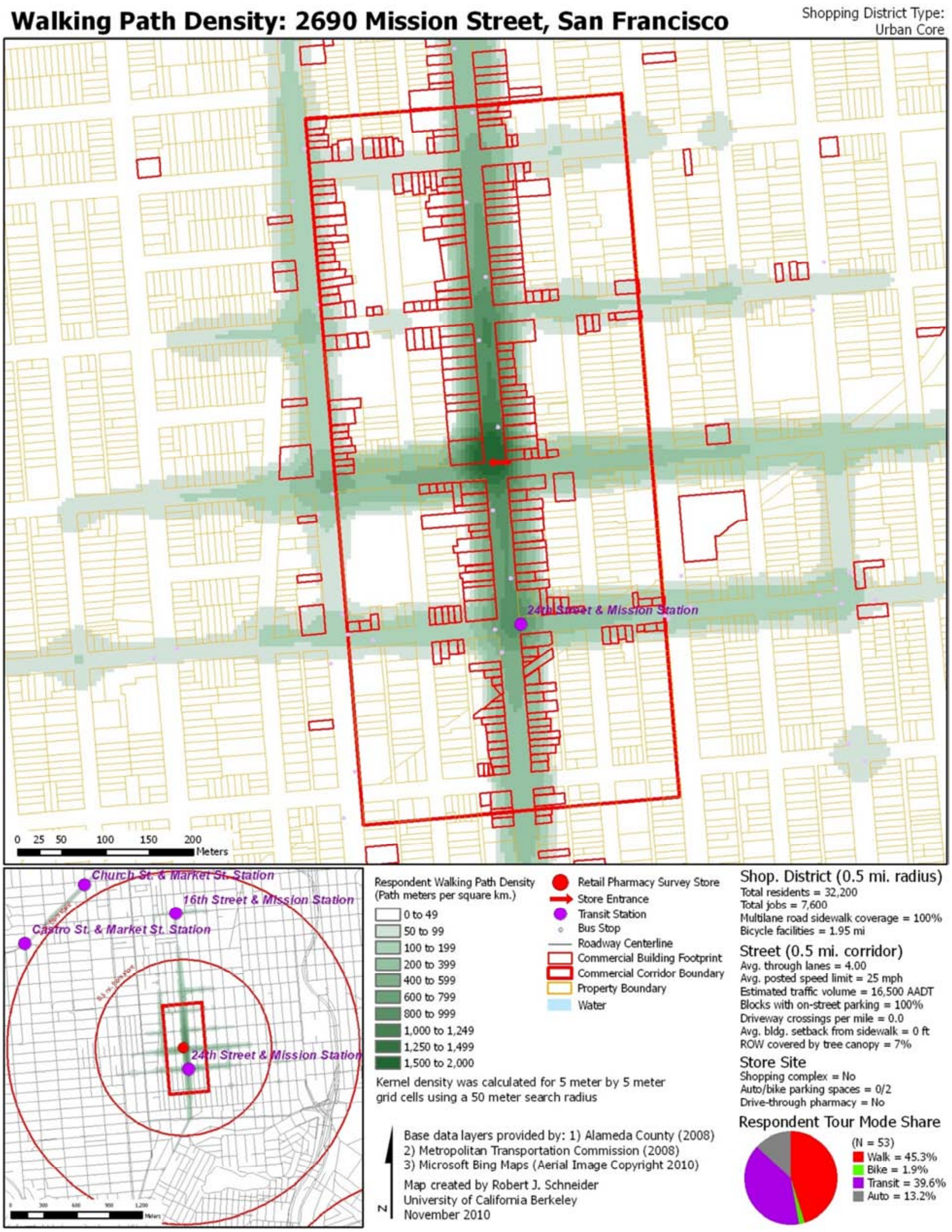
Shopping District Type:
Urban Core



Store Area: 2690 Mission Street, San Francisco

Shopping District Type:
Urban Core





Walking Path Density: 2690 Mission Street, San Francisco
Shopping District Type: Urban Core
24th Street & Mission Station
0 25 50 100 150 200 Meters
Church St. & Market St. Station
16th Street & Mission Station
Castro St. & Market St. Station
24th Street & Mission Station
Respondent Walking Path Density (Path meters per square km.)
0 to 49
50 to 99
100 to 199
200 to 399
400 to 599
600 to 799
800 to 999
1,000 to 1,249
1,250 to 1,499
1,500 to 2,000
Kernel density was calculated for 5 meter by 5 meter grid cells using a 50 meter search radius
Retail Pharmacy Survey Store
Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water
Base data layers provided by: 1) Alameda County (2008) 2) Metropolitan Transportation Commission (2008) 3) Microsoft Bing Maps (Aerial Image Copyright 2010)
Map created by Robert J. Schneider
University of California Berkeley
November 2010
N
Shop. District (0.5 mi. radius)
Total residents = 32,200
Total jobs = 7,600
Multilane road sidewalk coverage = 100%
Bicycle facilities = 1.95 mi
Street (0.5 mi. corridor)
Avg. through lanes = 4.00
Avg. posted speed limit = 25 mph
Estimated traffic volume = 16,500 AADT
Blocks with on-street parking = 100%
Driveway crossings per mile = 0.0
Avg. bldg. setback from sidewalk = 0 ft
ROW covered by tree canopy = 7%
Store Site
Shopping complex = No
Auto/bike parking spaces = 0/2
Drive-through pharmacy = No
Respondent Tour Mode Share
(N = 53)
Walk = 45.3%
Bike = 1.9%
Transit = 39.6%
Auto = 13.2%

Store Area: 2801 Adeline Street, Berkeley

Shopping District Type:
Suburban Main Street

Retail Pharmacy Store
Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water

2000 Population Density
(Residents per square mi.)
- 0 to 249
- 250 to 9,999
- 10,000 to 19,999
- 20,000 to 49,999
- 50,000 to 30,000,000

Bike network within 0.5 mi. of store
- Bicycle Boulevard
- Shared Lane Marking
- Bicycle Lane
- Multi-Use Trail

Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)

Map created by Robert J. Schneider
University of California Berkeley
November 2010

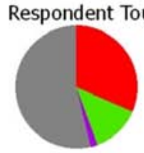
N

Shop. District (0.5 mi. radius)
Total residents = 12,200
Total jobs = 6,300
Multilane road sidewalk coverage = 100%
Bicycle facilities = 5.57 mi

Street (0.5 mi. corridor)
Avg. through lanes = 2.91
Avg. posted speed limit = 25 mph
Estimated traffic volume = 21,000 AADT
Blocks with on-street parking = 100%
Driveway crossings per mile = 34.6
Avg. bldg. setback from sidewalk = 10 ft
ROW covered by tree canopy = 6%

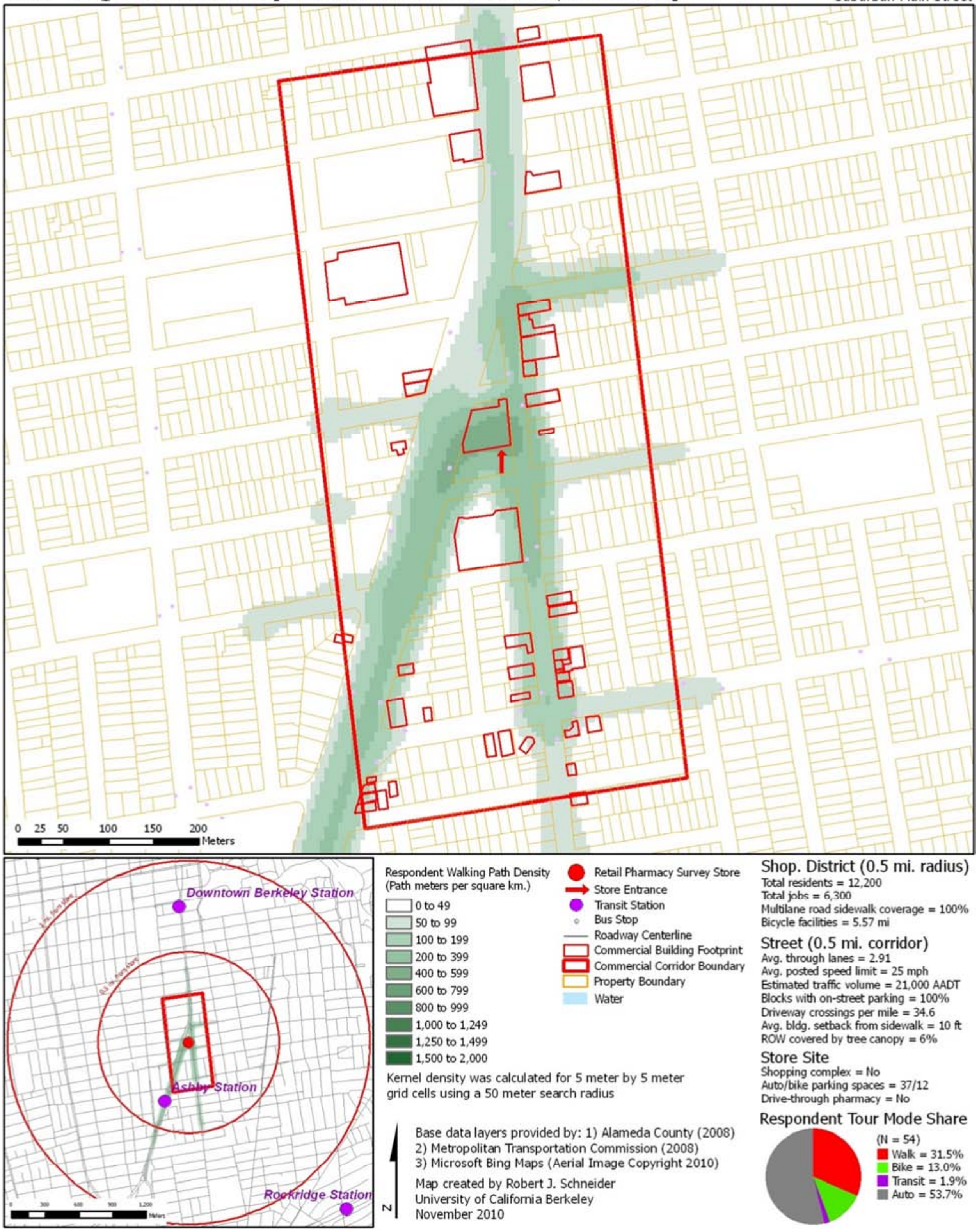
Store Site
Shopping complex = No
Auto/bike parking spaces = 37/12
Drive-through pharmacy = No

Respondent Tour Mode Share



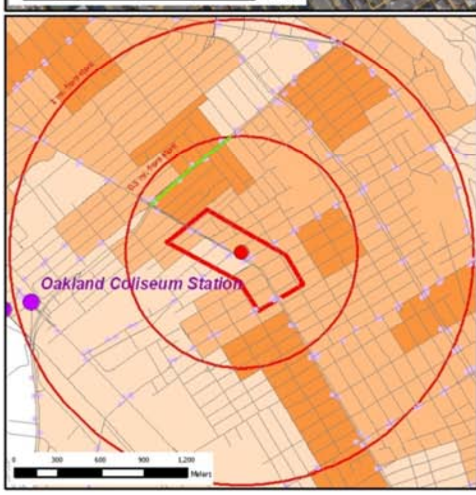
Walking Path Density: 2801 Adeline Street, Berkeley

Shopping District Type:
Suburban Main Street



Store Area: 8102 E 14th Street, Oakland

Shopping District Type:
Suburban Main Street



Retail Pharmacy Store
Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water

2000 Population Density
(Residents per square mi.)
0 to 249
250 to 9,999
10,000 to 19,999
20,000 to 49,999
50,000 to 30,000,000

Bike network within 0.5 mi. of store
Bicycle Boulevard
Shared Lane Marking
Bicycle Lane
Multi-Use Trail

N

Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)

Map created by Robert J. Schneider
University of California Berkeley
November 2010

Shop. District (0.5 mi. radius)

Total residents = 12,500
Total jobs = 1,600
Multilane road sidewalk coverage = 89%
Bicycle facilities = 0.90 mi

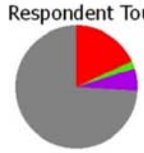
Street (0.5 mi. corridor)

Avg. through lanes = 4.00
Avg. posted speed limit = 30 mph
Estimated traffic volume = 25,300 AADT
Blocks with on-street parking = 100%
Driveway crossings per mile = 32.9
Avg. bldg. setback from sidewalk = 20 ft
ROW covered by tree canopy = 9%

Store Site

Shopping complex = No
Auto/bike parking spaces = 51/0
Drive-through pharmacy = Yes

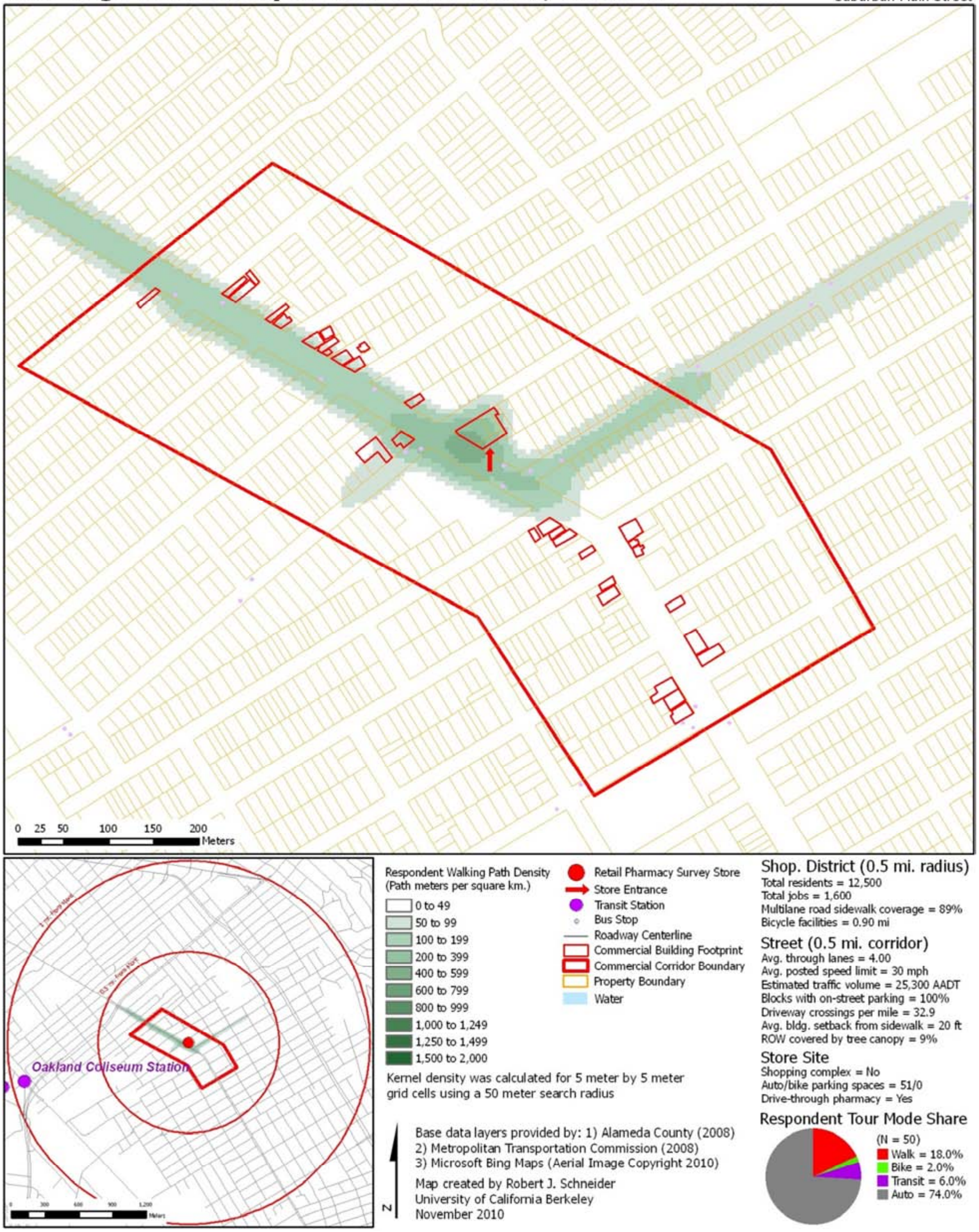
Respondent Tour Mode Share



(N = 50)
Walk = 18.0%
Bike = 2.0%
Transit = 6.0%
Auto = 74.0%

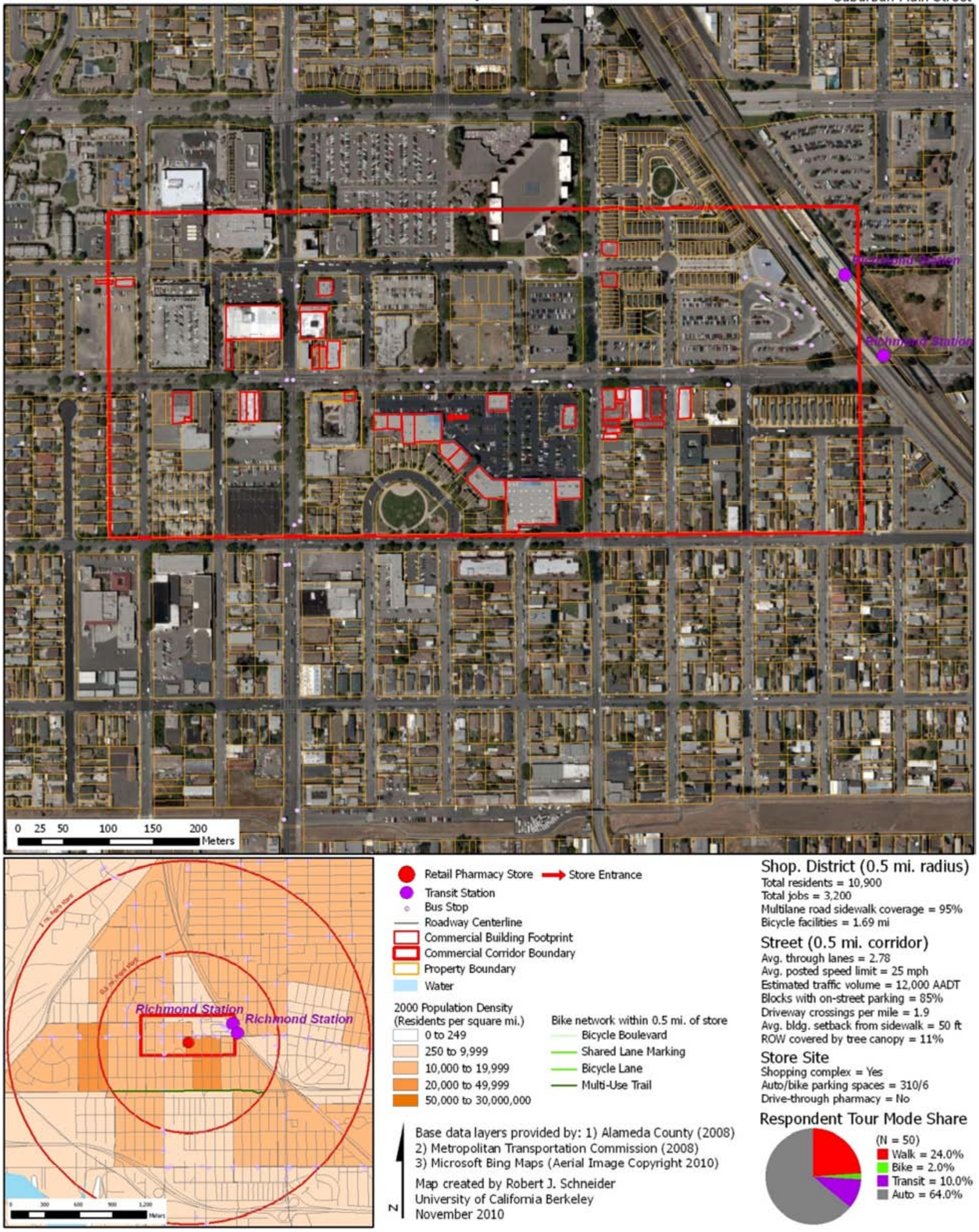
Walking Path Density: 8102 E 14th Street, Oakland

Shopping District Type:
Suburban Main Street



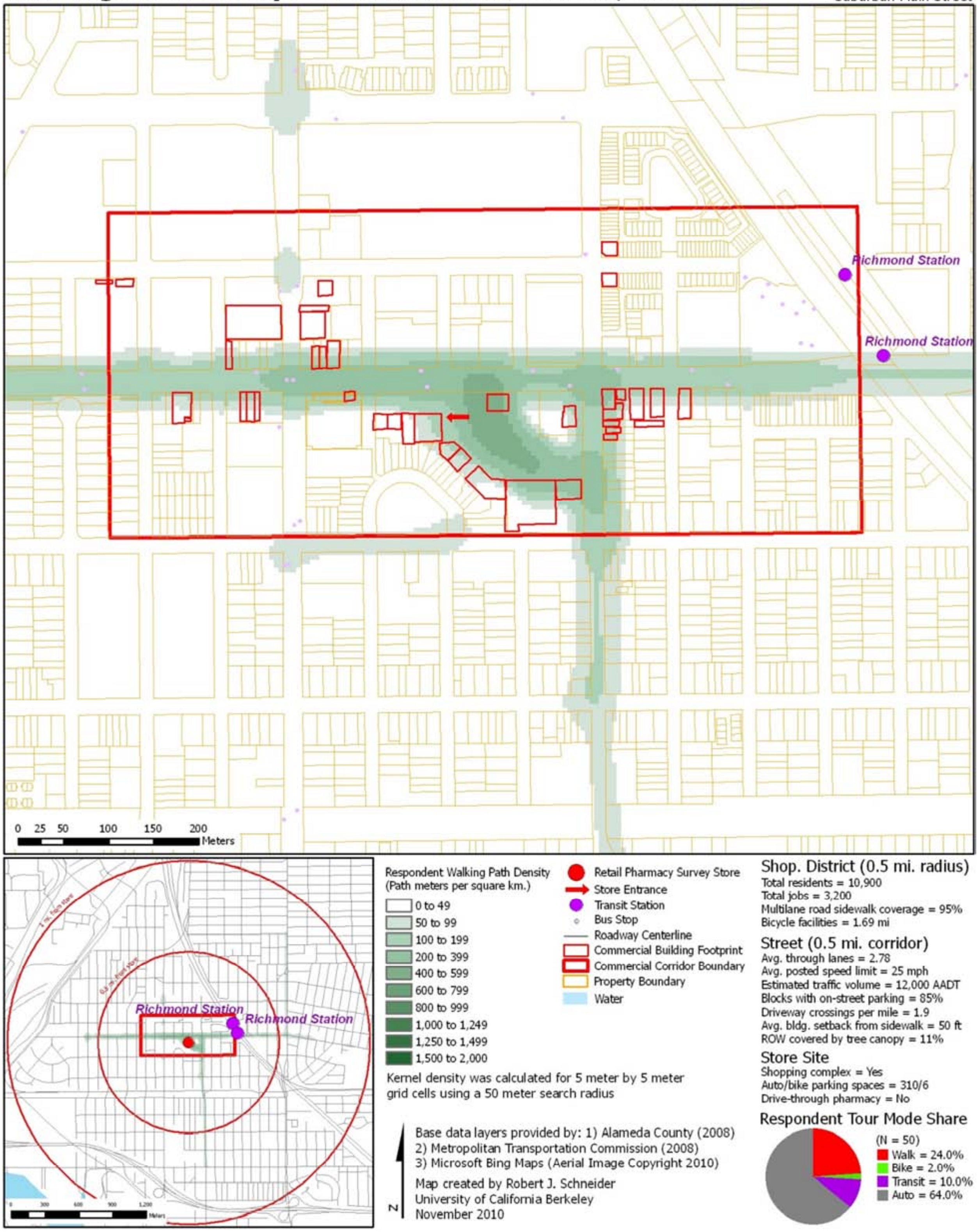
Store Area: 1150 Macdonald Avenue, Richmond

Shopping District Type:
Suburban Main Street



Walking Path Density: 1150 Macdonald Avenue, Richmond

Shopping District Type:
Suburban Main Street



Store Area: 1201 Taraval Street, San Francisco

Shopping District Type:
Suburban Main Street

Retail Pharmacy Store
Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water

2000 Population Density
(Residents per square mi.)
0 to 249
250 to 9,999
10,000 to 19,999
20,000 to 49,999
50,000 to 30,000,000

Bike network within 0.5 mi. of store
Bicycle Boulevard
Shared Lane Marking
Bicycle Lane
Multi-Use Trail

Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)

Map created by Robert J. Schneider
University of California Berkeley
November 2010

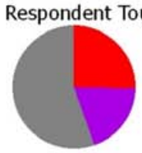
N

Shop. District (0.5 mi. radius)
Total residents = 12,700
Total jobs = 2,100
Multilane road sidewalk coverage = 98%
Bicycle facilities = 1.75 mi

Street (0.5 mi. corridor)
Avg. through lanes = 4.00
Avg. posted speed limit = 25 mph
Estimated traffic volume = 12,400 AADT
Blocks with on-street parking = 100%
Driveway crossings per mile = 2.01
Avg. bldg. setback from sidewalk = 0 ft
ROW covered by tree canopy = 3%

Store Site
Shopping complex = No
Auto/bike parking spaces = 0/0
Drive-through pharmacy = No

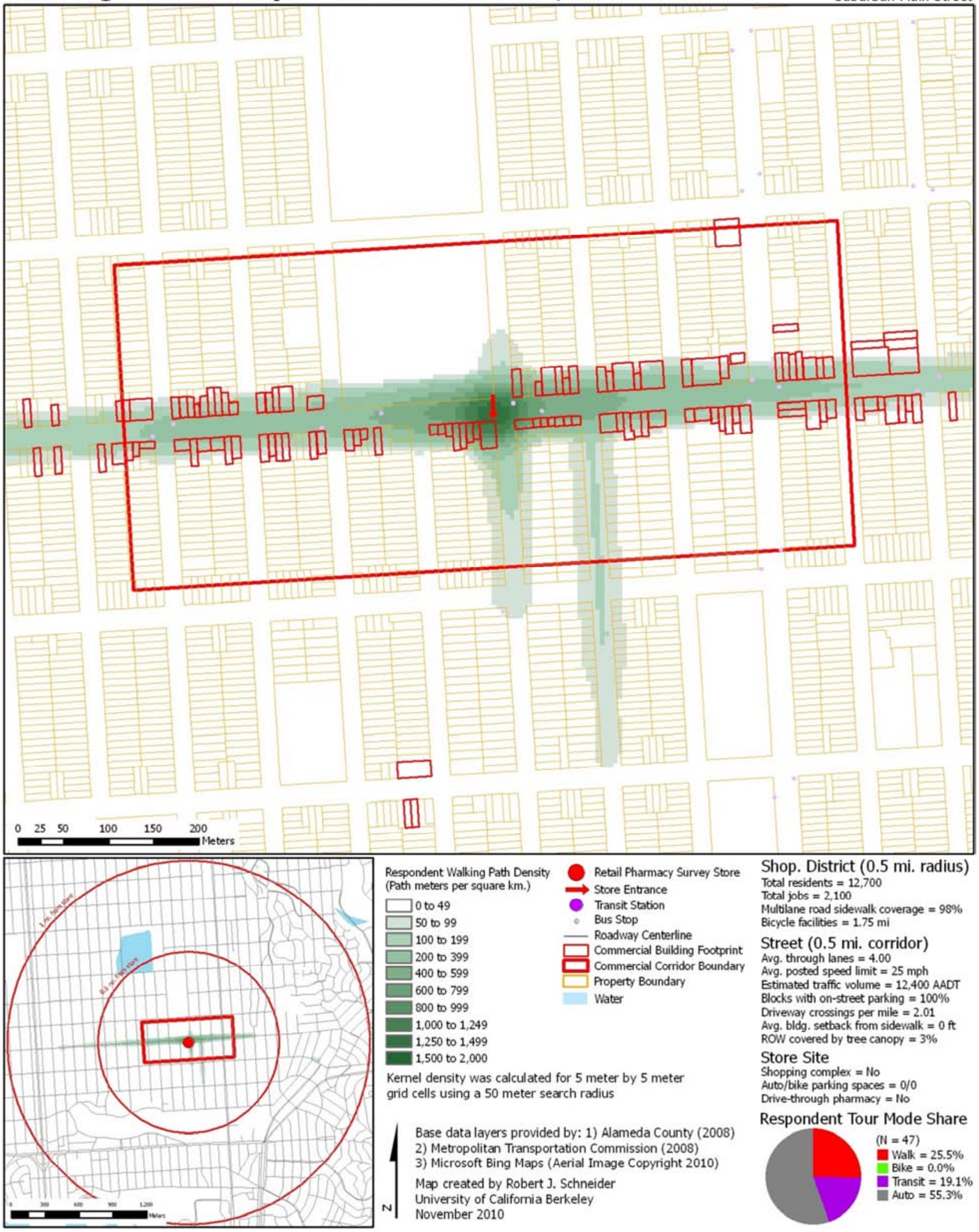
Respondent Tour Mode Share



(N = 47)
Walk = 25.5%
Bike = 0.0%
Transit = 19.1%
Auto = 55.3%

Walking Path Density: 1201 Taraval Street, San Francisco

Shopping District Type:
Suburban Main Street



Store Area: 5300 Third Street, San Francisco

Shopping District Type:
Suburban Main Street

Retail Pharmacy Store
Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water

2000 Population Density
(Residents per square mi.)
0 to 249
250 to 9,999
10,000 to 19,999
20,000 to 49,999
50,000 to 30,000,000

Bike network within 0.5 mi. of store
Bicycle Boulevard
Shared Lane Marking
Bicycle Lane
Multi-Use Trail

N

Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)

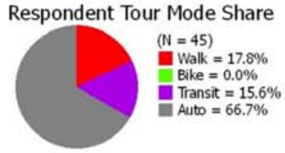
Map created by Robert J. Schneider
University of California Berkeley
November 2010

Shop. District (0.5 mi. radius)
Total residents = 12,700
Total jobs = 3,400
Multilane road sidewalk coverage = 96%
Bicycle facilities = 0.33 mi

Street (0.5 mi. corridor)
Avg. through lanes = 4.00
Avg. posted speed limit = 25 mph
Estimated traffic volume = 24,700 AADT
Blocks with on-street parking = 77%
Driveway crossings per mile = 8.0
Avg. bldg. setback from sidewalk = 10 ft
ROW covered by tree canopy = 3%

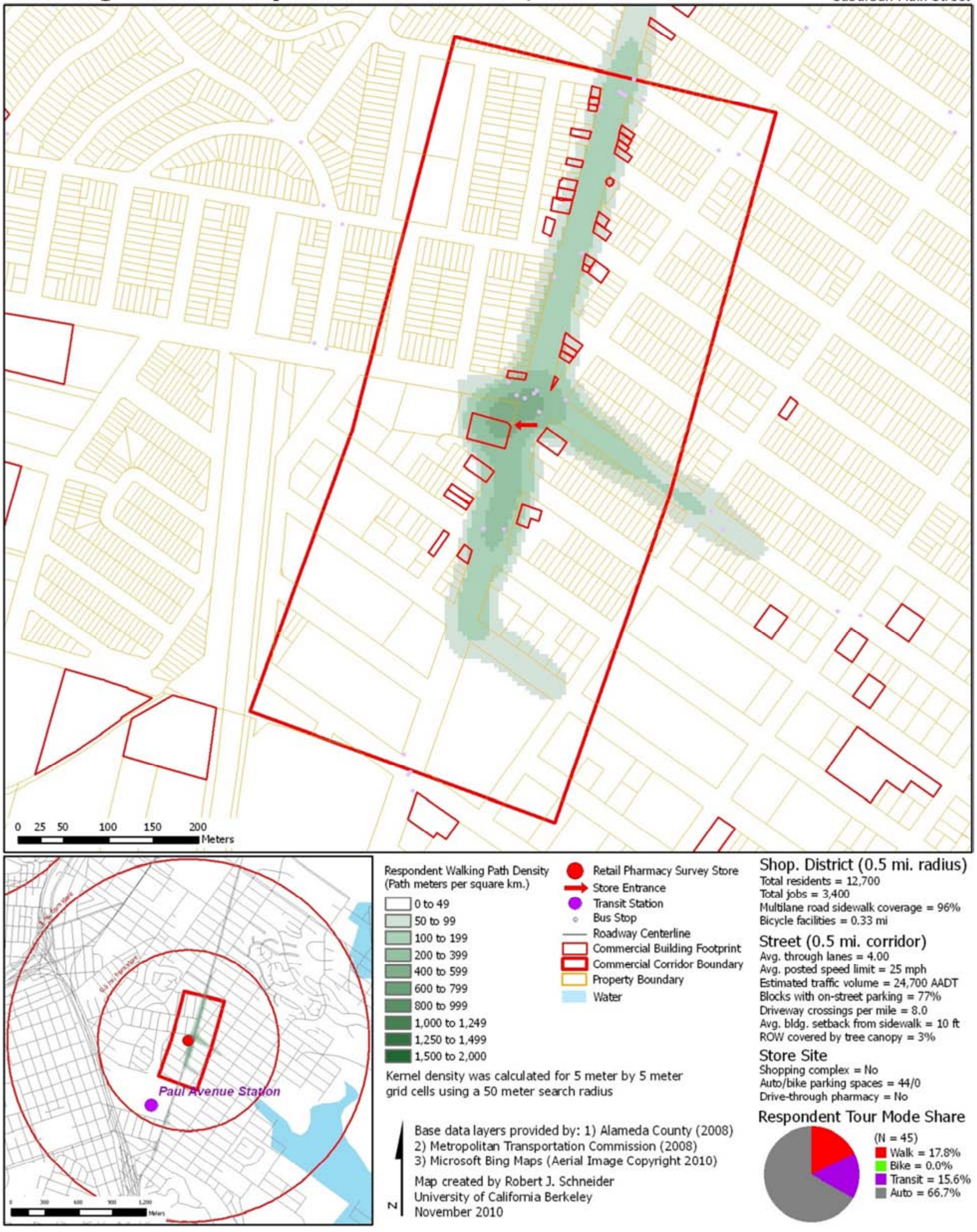
Store Site
Shopping complex = No
Auto/bike parking spaces = 44/0
Drive-through pharmacy = No

Respondent Tour Mode Share



Walking Path Density: 5300 Third Street, San Francisco

Shopping District Type:
Suburban Main Street



Store Area: 22 San Pedro Road, Daly City

Shopping District Type:
Suburban Main Street

Retail Pharmacy Store
Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water

2000 Population Density
(Residents per square mi.)
0 to 249
250 to 9,999
10,000 to 19,999
20,000 to 49,999
50,000 to 30,000,000

Bike network within 0.5 mi. of store
Bicycle Boulevard
Shared Lane Marking
Bicycle Lane
Multi-Use Trail

Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)

Map created by Robert J. Schneider
University of California Berkeley
November 2010

N

Shop. District (0.5 mi. radius)

Total residents = 12,000
Total jobs = 2,400
Multilane road sidewalk coverage = 81%
Bicycle facilities = 0.00 mi

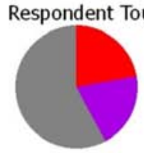
Street (0.5 mi. corridor)

Avg. through lanes = 4.00
Avg. posted speed limit = 35 mph
Estimated traffic volume = 25,000 AADT
Blocks with on-street parking = 71%
Driveway crossings per mile = 21.8
Avg. bldg. setback from sidewalk = 20 ft
ROW covered by tree canopy = 2%

Store Site

Shopping complex = No
Auto/bike parking spaces = 78/0
Drive-through pharmacy = No

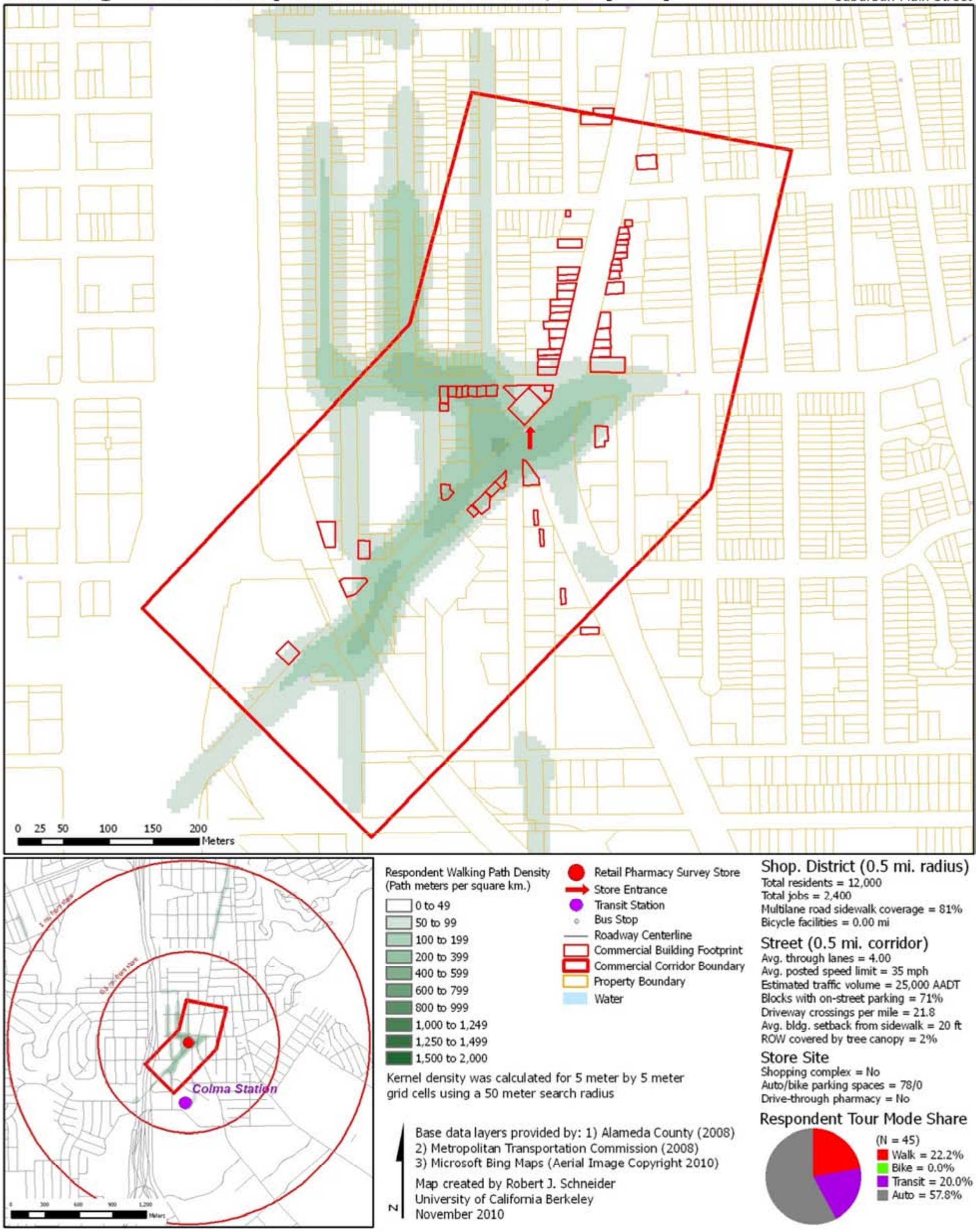
Respondent Tour Mode Share



(N = 45)
Walk = 22.2%
Bike = 0.0%
Transit = 20.0%
Auto = 57.8%

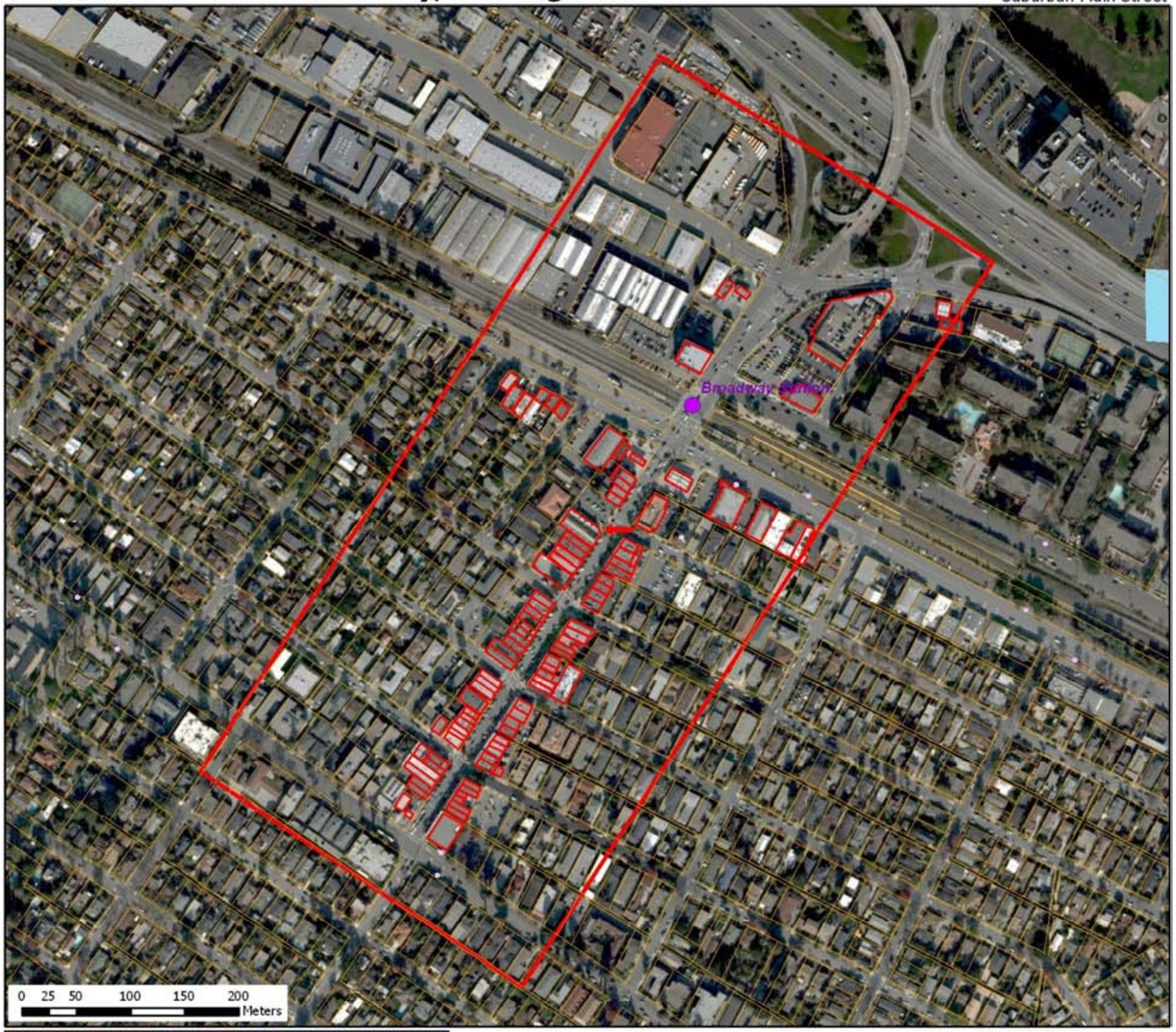
Walking Path Density: 22 San Pedro Road, Daly City

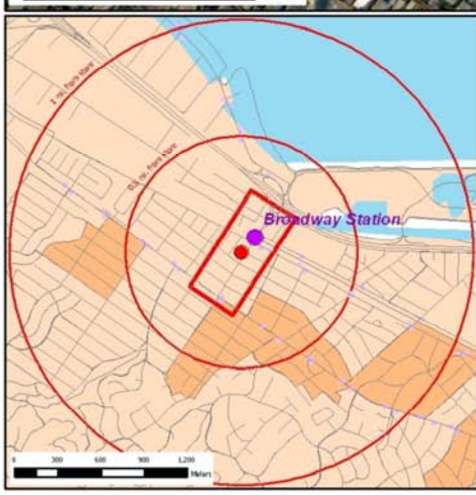
Shopping District Type:
Suburban Main Street



Store Area: 1160 Broadway, Burlingame

Shopping District Type:
Suburban Main Street





Retail Pharmacy Store — Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water

2000 Population Density
(Residents per square mi.)
0 to 249
250 to 9,999
10,000 to 19,999
20,000 to 49,999
50,000 to 30,000,000

Bike network within 0.5 mi. of store
Bicycle Boulevard
Shared Lane Marking
Bicycle Lane
Multi-Use Trail

Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
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Map created by Robert J. Schneider
University of California Berkeley
November 2010

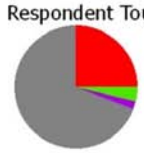
N

Shop. District (0.5 mi. radius)
Total residents = 4,400
Total jobs = 4,400
Multilane road sidewalk coverage = 77%
Bicycle facilities = 0.00 mi

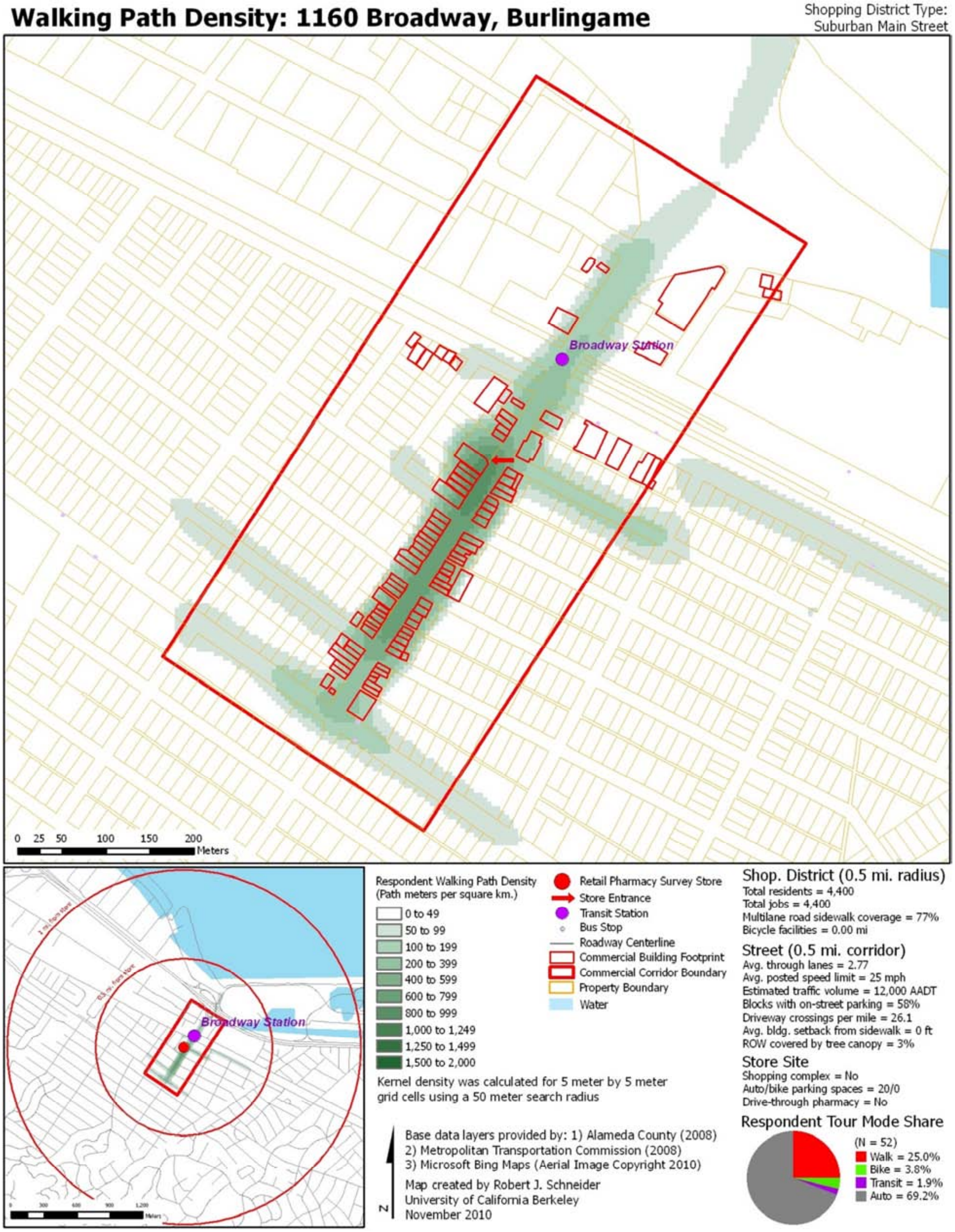
Street (0.5 mi. corridor)
Avg. through lanes = 2.77
Avg. posted speed limit = 25 mph
Estimated traffic volume = 12,000 AADT
Blocks with on-street parking = 58%
Driveway crossings per mile = 26.1
Avg. bldg. setback from sidewalk = 0 ft
ROW covered by tree canopy = 3%

Store Site
Shopping complex = No
Auto/bike parking spaces = 20/0
Drive-through pharmacy = No

Respondent Tour Mode Share

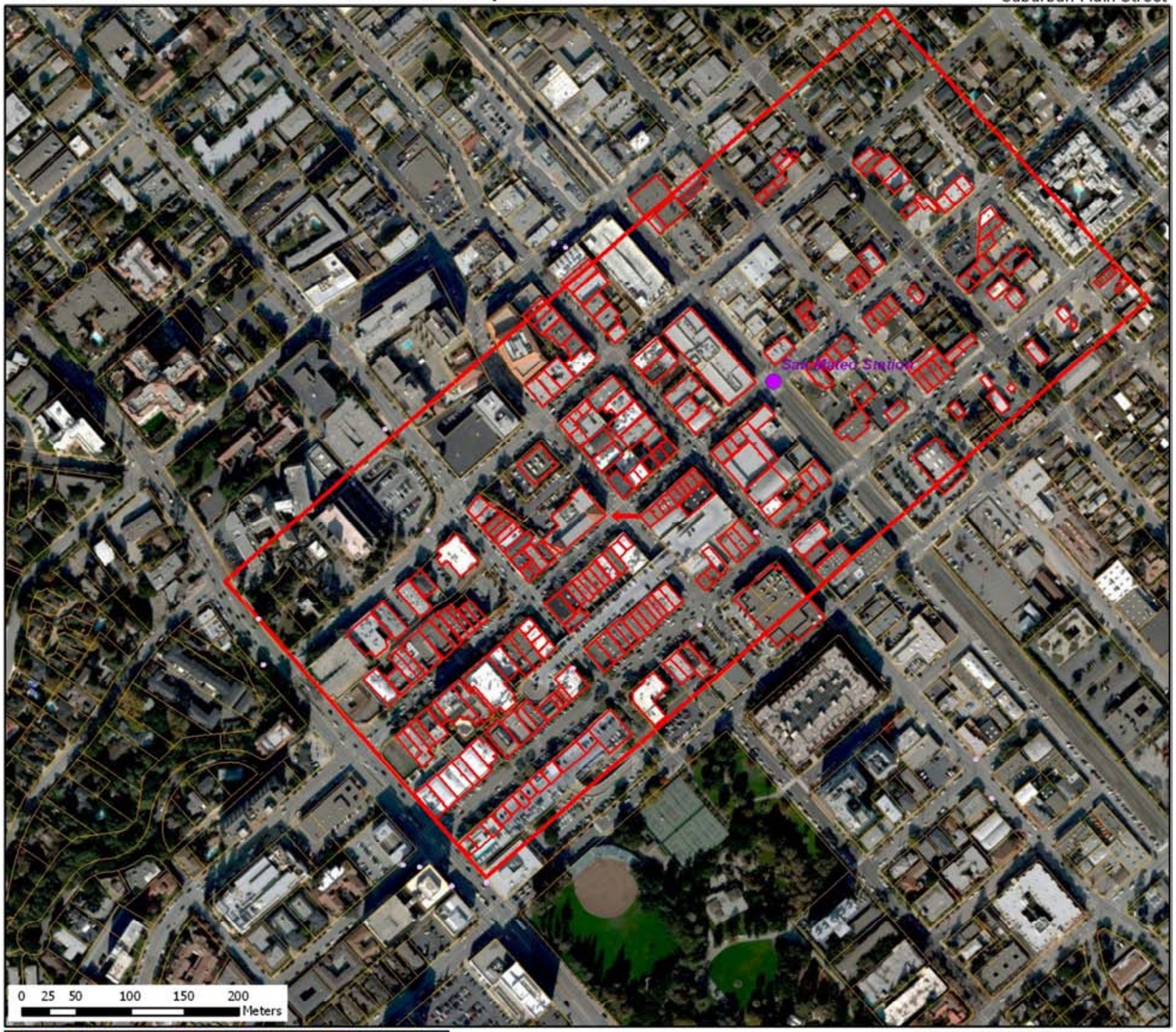


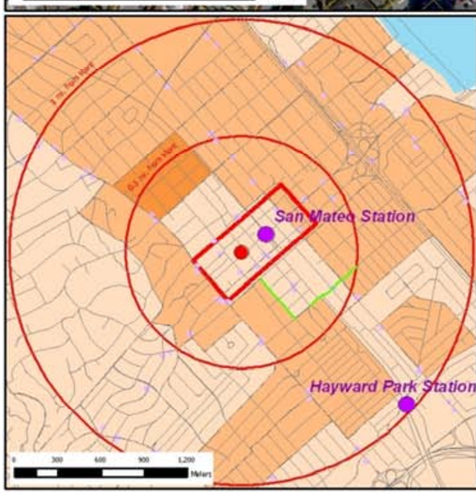
(N = 52)
Walk = 25.0%
Bike = 3.8%
Transit = 1.9%
Auto = 69.2%


Walking Path Density: 1160 Broadway, Burlingame
Shopping District Type:
Suburban Main Street
Broadway Station
0 25 50 100 150 200
Meters
Respondent Walking Path Density
(Path meters per square km.)
0 to 49
50 to 99
100 to 199
200 to 399
400 to 599
600 to 799
800 to 999
1,000 to 1,249
1,250 to 1,499
1,500 to 2,000
Kernel density was calculated for 5 meter by 5 meter
grid cells using a 50 meter search radius
Retail Pharmacy Survey Store
Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water
Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)
Map created by Robert J. Schneider
University of California Berkeley
November 2010
N
Shop. District (0.5 mi. radius)
Total residents = 4,400
Total jobs = 4,400
Multilane road sidewalk coverage = 77%
Bicycle facilities = 0.00 mi
Street (0.5 mi. corridor)
Avg. through lanes = 2.77
Avg. posted speed limit = 25 mph
Estimated traffic volume = 12,000 AADT
Blocks with on-street parking = 58%
Driveway crossings per mile = 26.1
Avg. bldg. setback from sidewalk = 0 ft
ROW covered by tree canopy = 3%
Store Site
Shopping complex = No
Auto/bike parking spaces = 20/0
Drive-through pharmacy = No
Respondent Tour Mode Share
(N = 52)
Walk = 25.0%
Bike = 3.8%
Transit = 1.9%
Auto = 69.2%

Store Area: 191 E Third Avenue, San Mateo

Shopping District Type:
Suburban Main Street





Retail Pharmacy Store — Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water

2000 Population Density
(Residents per square mi.)
- 0 to 249
- 250 to 9,999
- 10,000 to 19,999
- 20,000 to 49,999
- 50,000 to 30,000,000

Bike network within 0.5 mi. of store
- Bicycle Boulevard
- Shared Lane Marking
- Bicycle Lane
- Multi-Use Trail

N

Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)

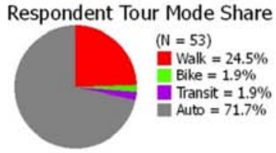
Map created by Robert J. Schneider
University of California Berkeley
November 2010

Shop. District (0.5 mi. radius)
Total residents = 9,600
Total jobs = 6,300
Multilane road sidewalk coverage = 100%
Bicycle facilities = 0.97 mi

Street (0.5 mi. corridor)
Avg. through lanes = 2.21
Avg. posted speed limit = 25 mph
Estimated traffic volume = 12,000 AADT
Blocks with on-street parking = 100%
Driveway crossings per mile = 23.9
Avg. bldg. setback from sidewalk = 10 ft
ROW covered by tree canopy = 13%

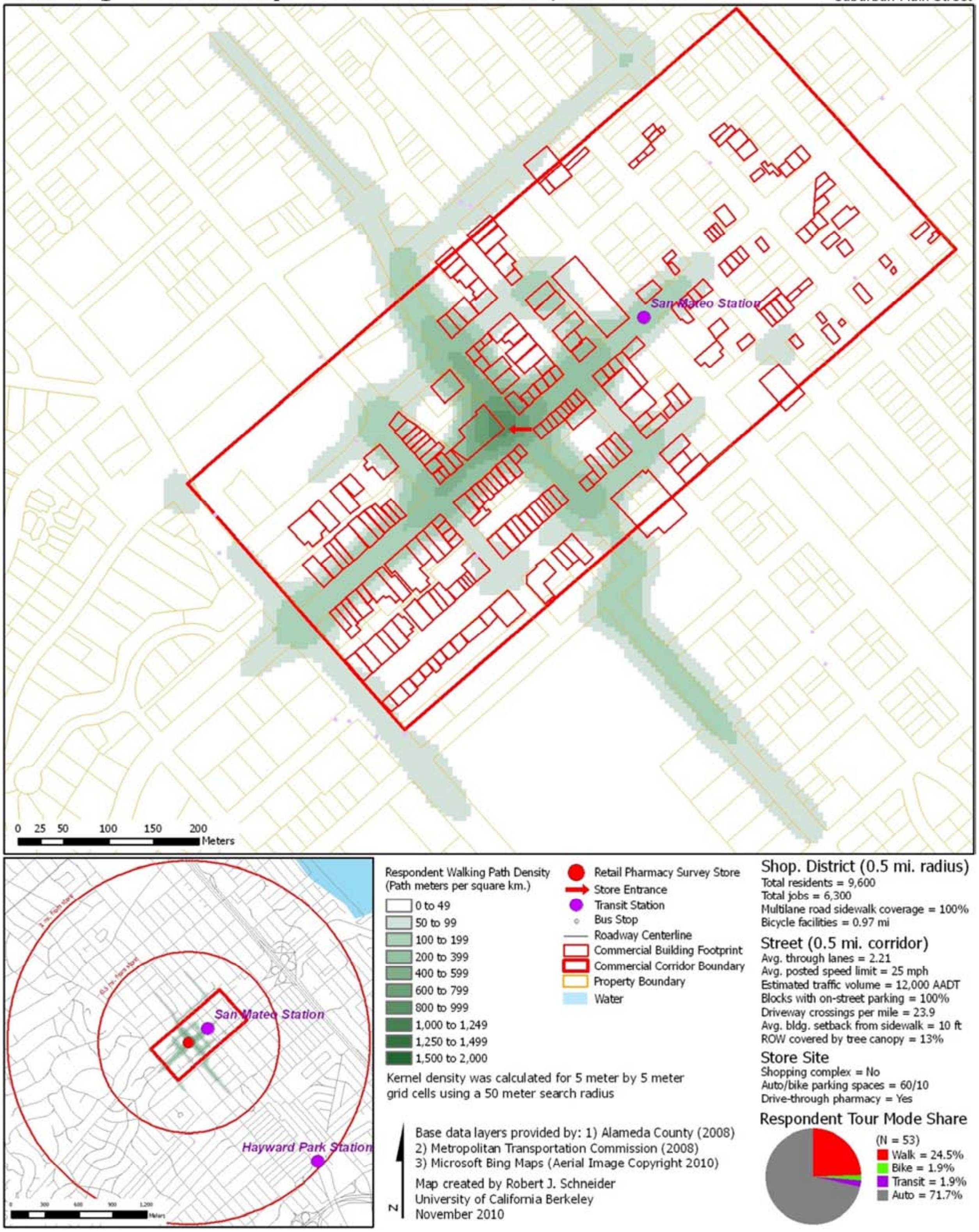
Store Site
Shopping complex = No
Auto/bike parking spaces = 60/10
Drive-through pharmacy = Yes

Respondent Tour Mode Share



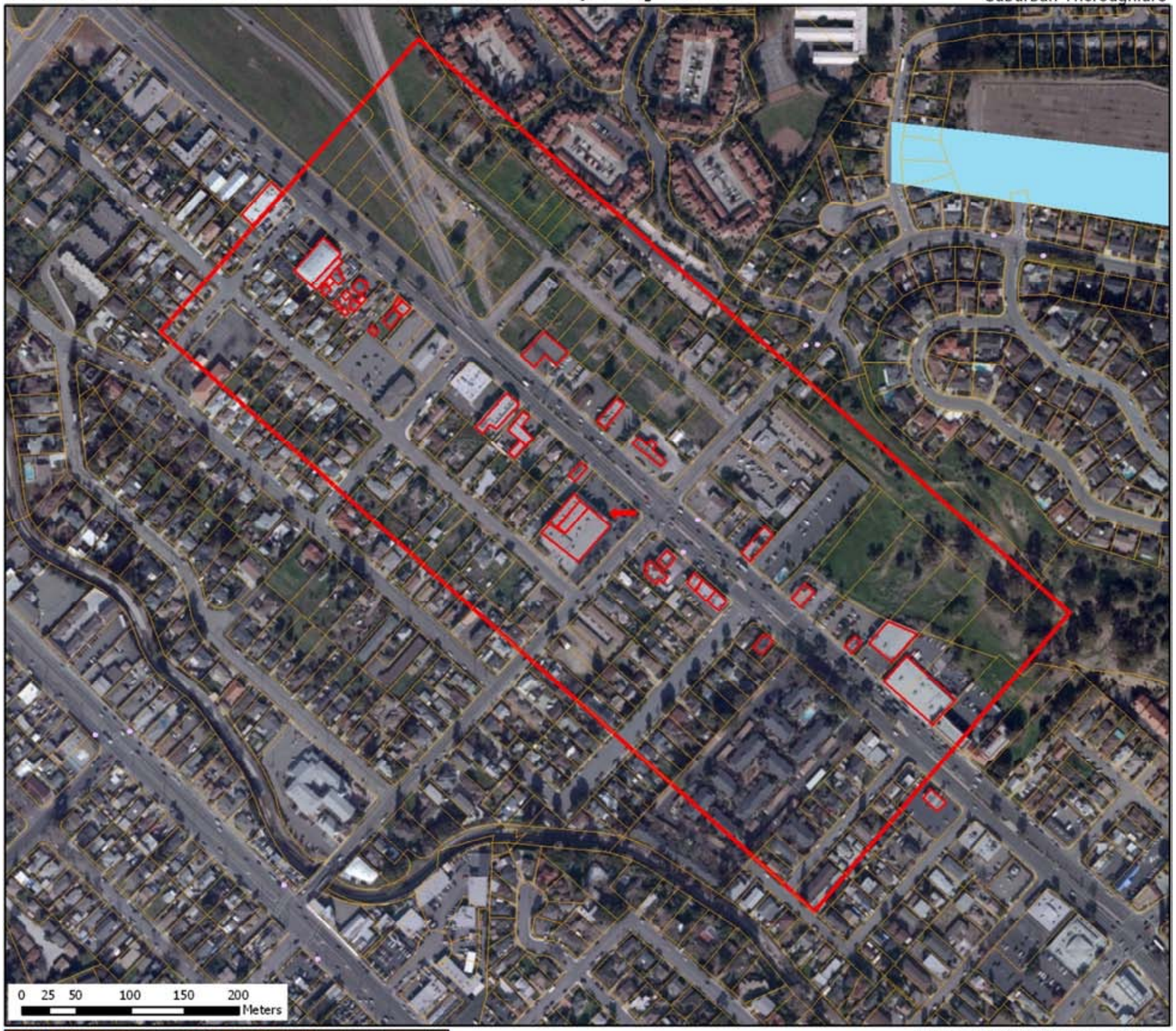
Walking Path Density: 191 E Third Avenue, San Mateo

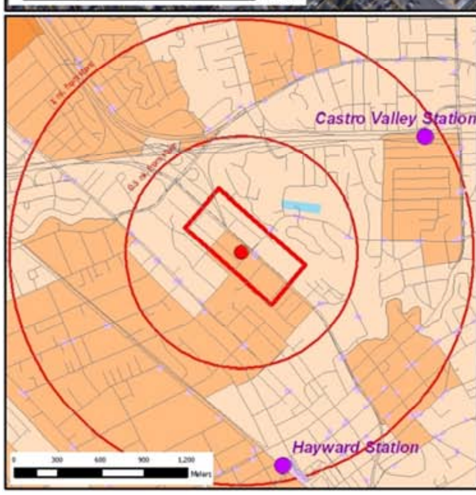
Shopping District Type:
Suburban Main Street



Store Area: 21463 Foothill Boulevard, Hayward

Shopping District Type:
Suburban Thoroughfare





Retail Pharmacy Store
Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water

2000 Population Density
(Residents per square mi.)
0 to 249
250 to 9,999
10,000 to 19,999
20,000 to 49,999
50,000 to 30,000,000

Bike network within 0.5 mi. of store
Bicycle Boulevard
Shared Lane Marking
Bicycle Lane
Multi-Use Trail

Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)

Map created by Robert J. Schneider
University of California Berkeley
November 2010

N

Shop. District (0.5 mi. radius)

Total residents = 6,200
Total jobs = 1,700
Multilane road sidewalk coverage = 87%
Bicycle facilities = 0.00 mi

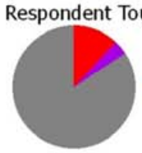
Street (0.5 mi. corridor)

Avg. through lanes = 5.72
Avg. posted speed limit = 35 mph
Estimated traffic volume = 50,500 AADT
Blocks with on-street parking = 50%
Driveway crossings per mile = 72.1
Avg. bldg. setback from sidewalk = 20 ft
ROW covered by tree canopy = 7%

Store Site

Shopping complex = Yes
Auto/bike parking spaces = 44/0
Drive-through pharmacy = No

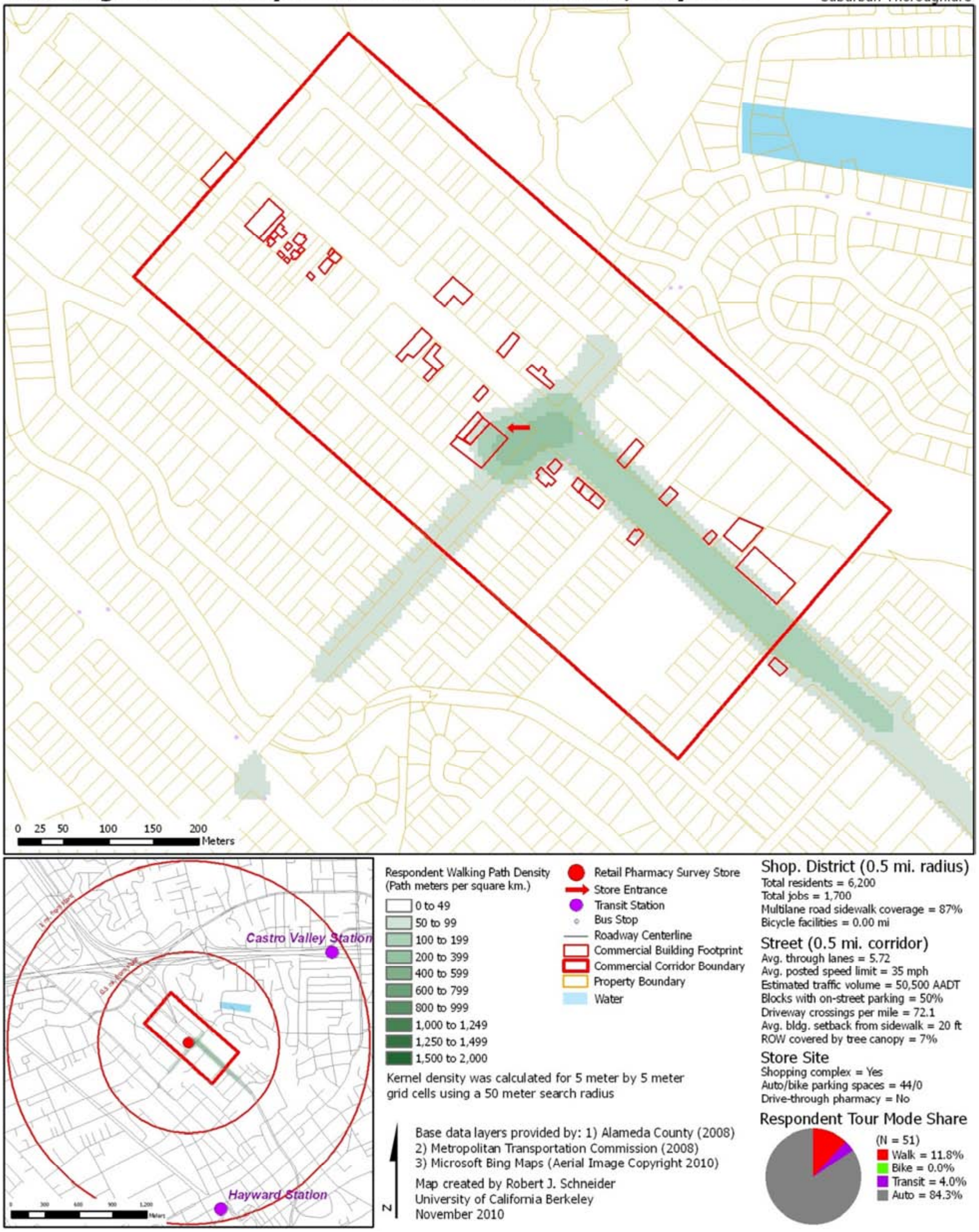
Respondent Tour Mode Share



(N = 51)
Walk = 11.8%
Bike = 0.0%
Transit = 4.0%
Auto = 84.3%

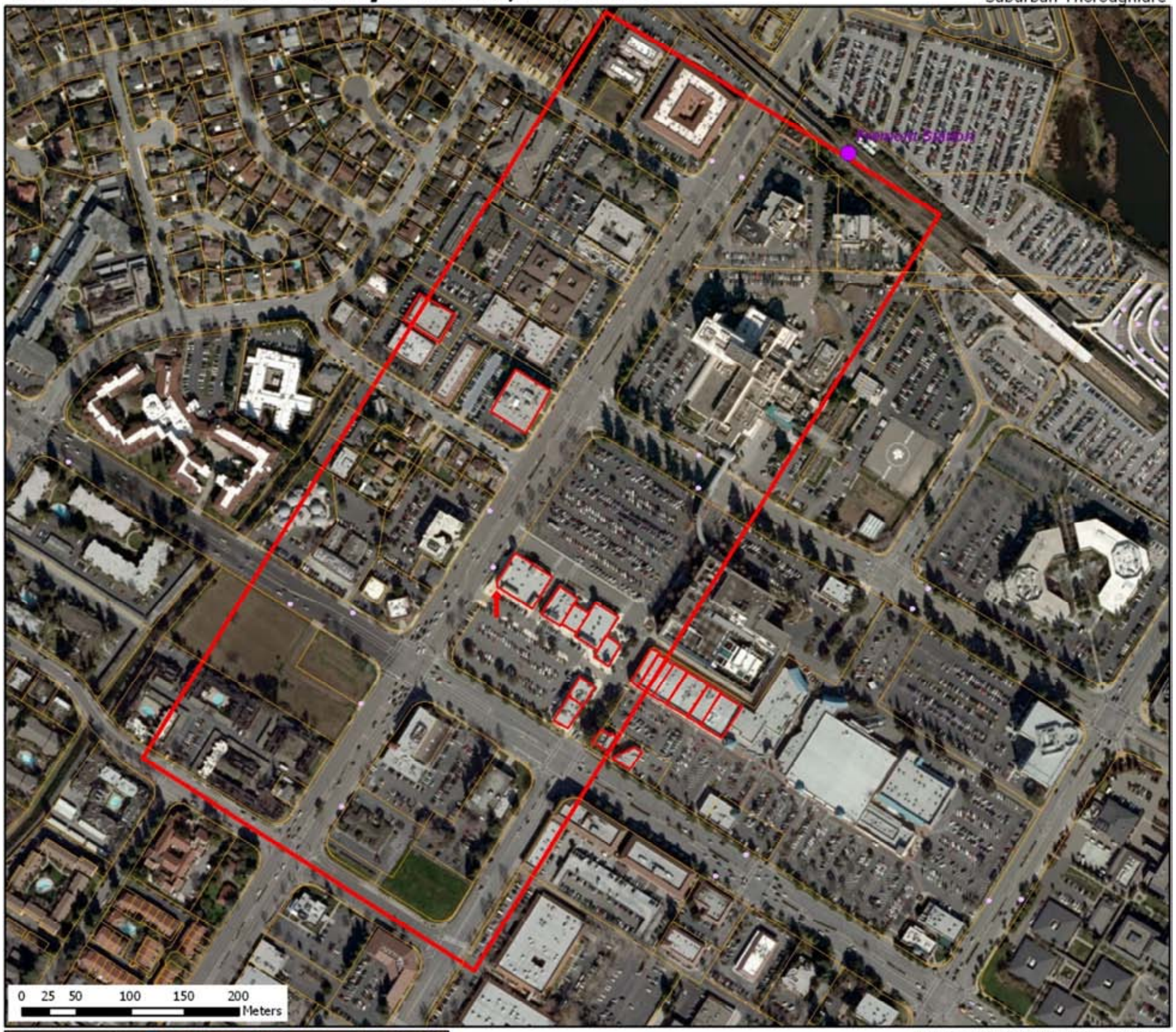
Walking Path Density: 21463 Foothill Boulevard, Hayward

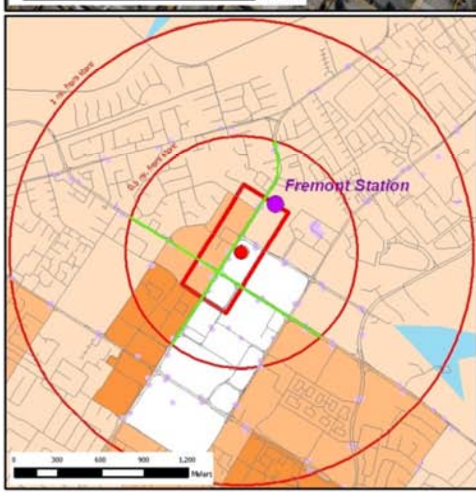
Shopping District Type:
Suburban Thoroughfare



Store Area: 2600 Mowry Avenue, Fremont

Shopping District Type:
Suburban Thoroughfare





Retail Pharmacy Store
Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water

2000 Population Density
(Residents per square mi.)
0 to 249
250 to 9,999
10,000 to 19,999
20,000 to 49,999
50,000 to 30,000,000

Bike network within 0.5 mi. of store
Bicycle Boulevard
Shared Lane Marking
Bicycle Lane
Multi-Use Trail

N

Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)

Map created by Robert J. Schneider
University of California Berkeley
November 2010

Shop. District (0.5 mi. radius)

Total residents = 6,500
Total jobs = 4,200
Multilane road sidewalk coverage = 97%
Bicycle facilities = 2.12 mi

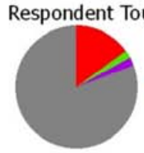
Street (0.5 mi. corridor)

Avg. through lanes = 6.00
Avg. posted speed limit = 37.5 mph
Estimated traffic volume = 32,300 AADT
Blocks with on-street parking = 13%
Driveway crossings per mile = 23.7
Avg. bldg. setback from sidewalk = 80 ft
ROW covered by tree canopy = 4%

Store Site

Shopping complex = Yes
Auto/bike parking spaces = 197/0
Drive-through pharmacy = Yes

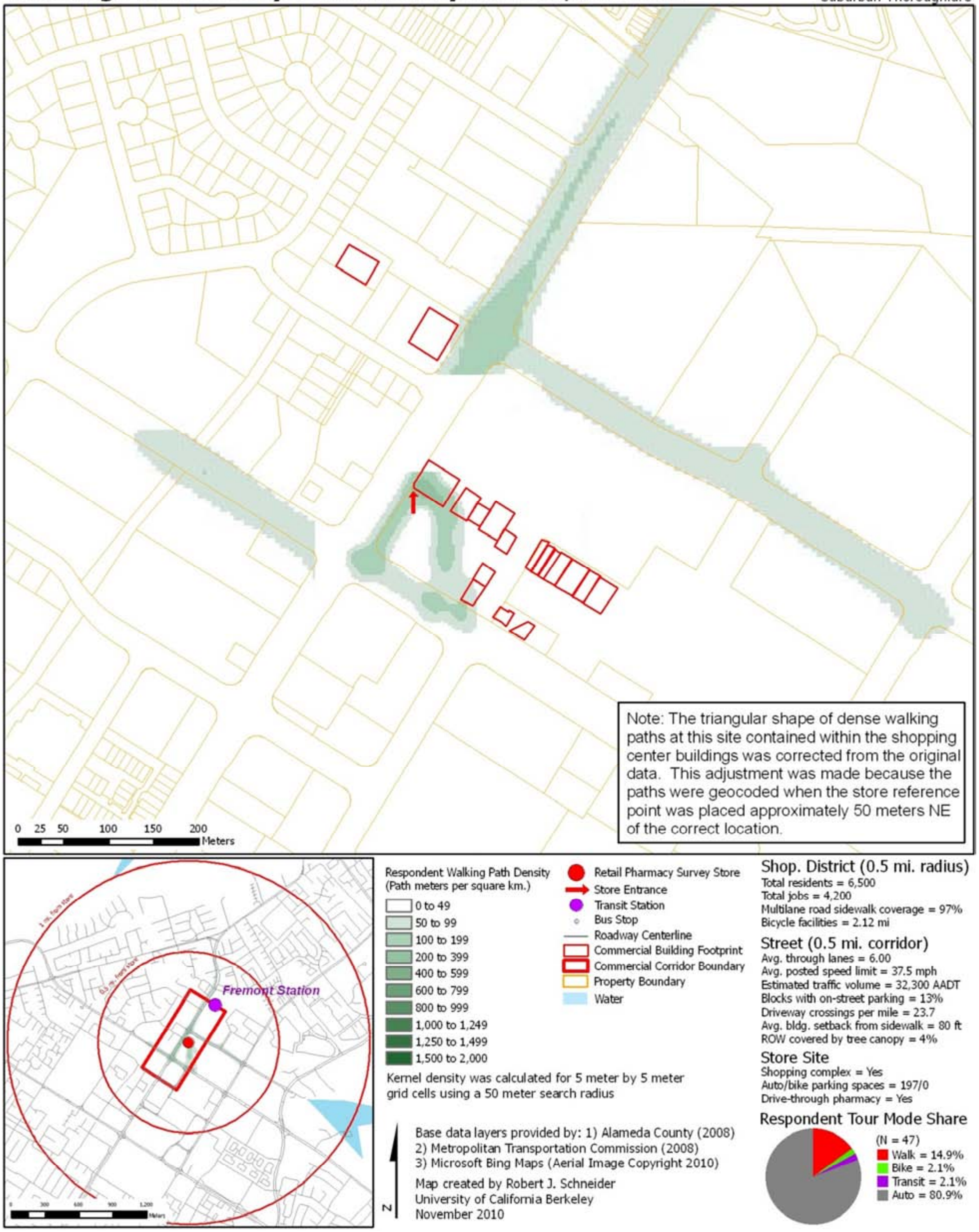
Respondent Tour Mode Share



(N = 47)
Walk = 14.9%
Bike = 2.1%
Transit = 2.1%
Auto = 80.9%

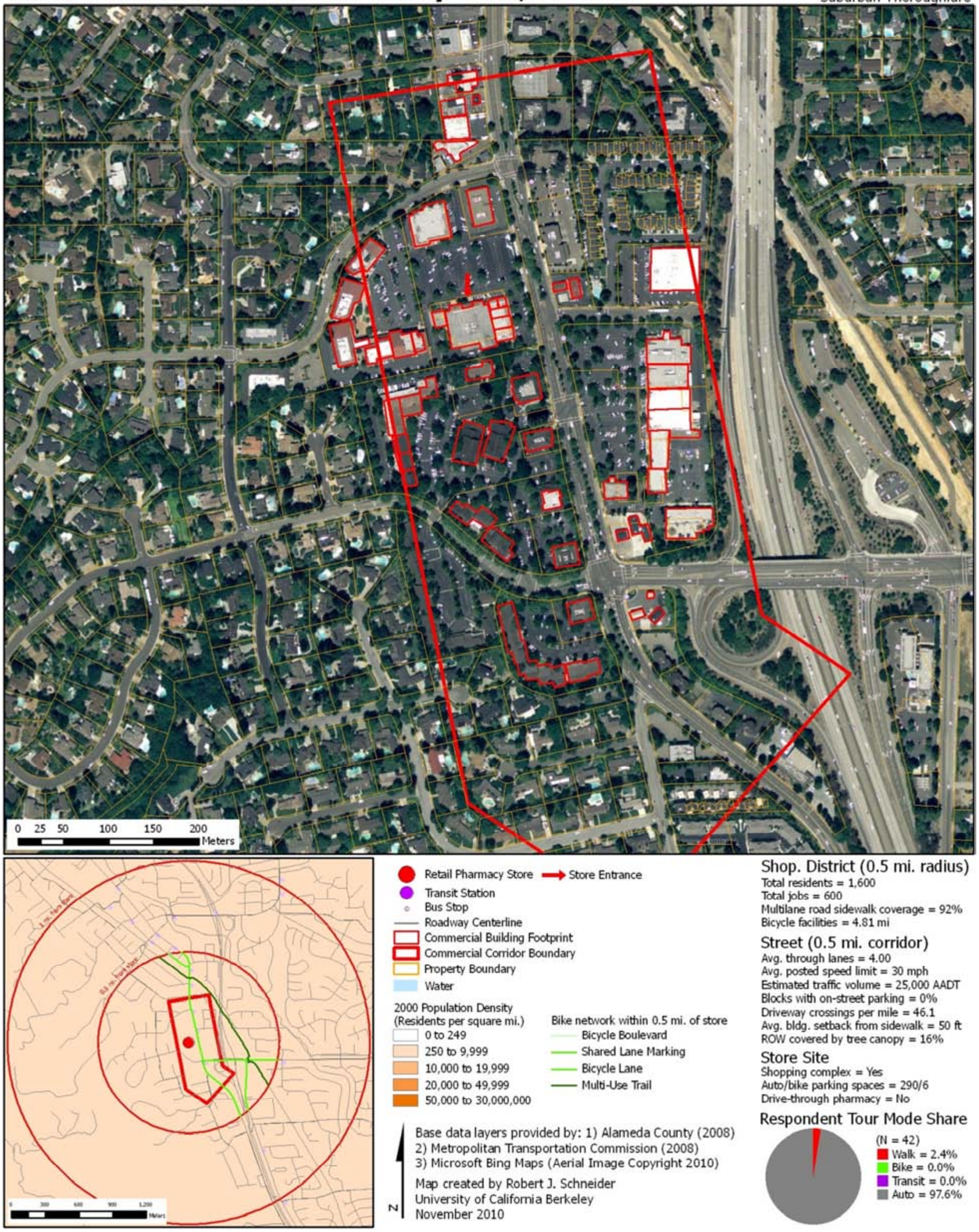
Walking Path Density: 2600 Mowry Avenue, Fremont

Shopping District Type:
Suburban Thoroughfare



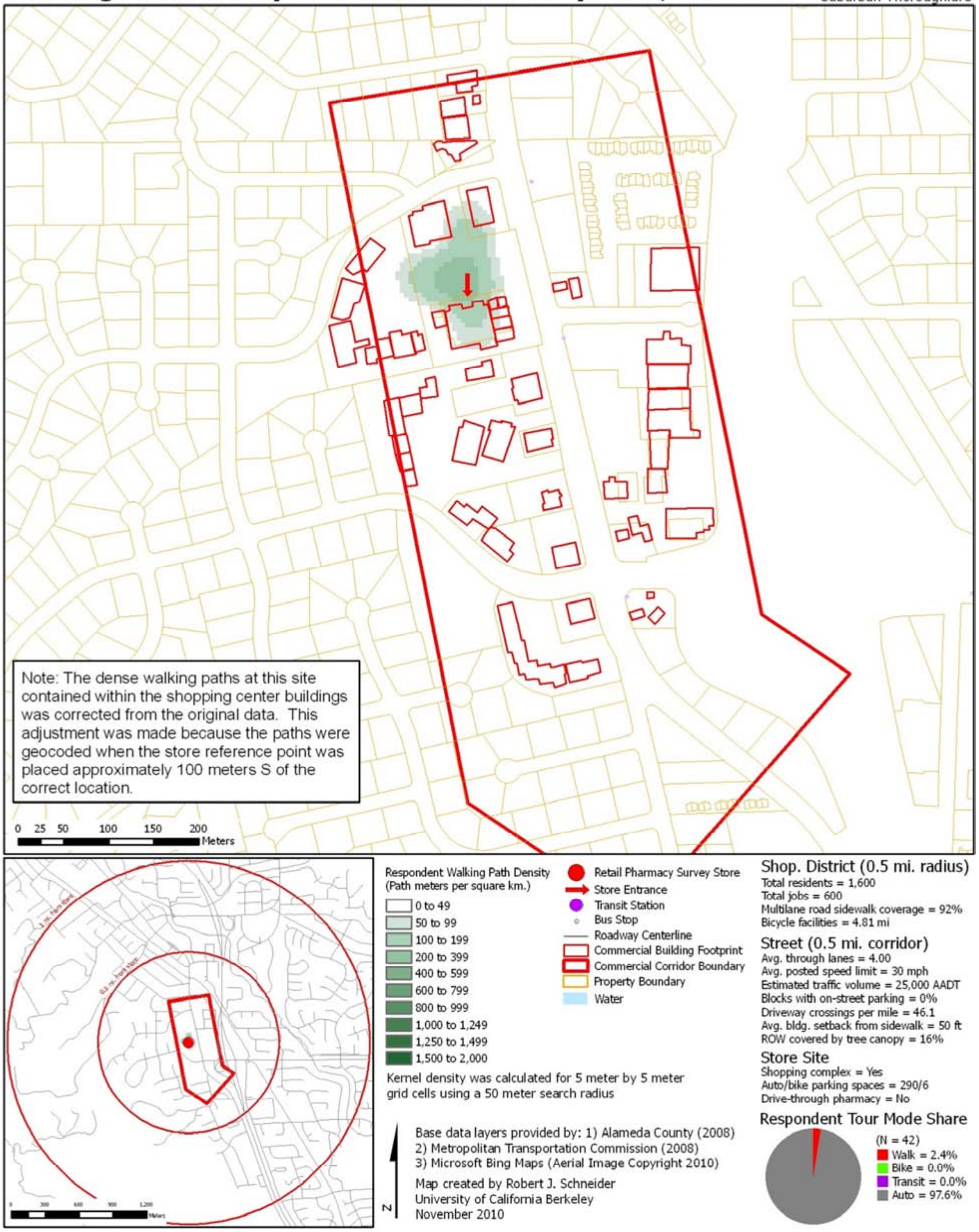
Store Area: 611 San Ramon Valley Blvd., Danville

Shopping District Type:
Suburban Thoroughfare



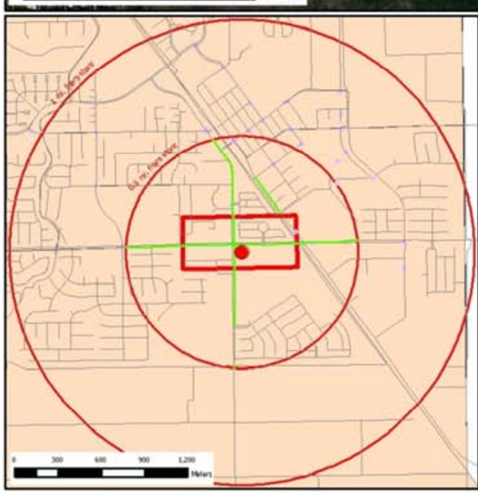
Walking Path Density: 611 San Ramon Valley Blvd., Danville

Shopping District Type:
Suburban Thoroughfare



Store Area: 4520 Balfour Road, Brentwood

Shopping District Type:
Suburban Thoroughfare



Retail Pharmacy Store
Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water

2000 Population Density
(Residents per square mi.)
0 to 249
250 to 9,999
10,000 to 19,999
20,000 to 49,999
50,000 to 30,000,000

Bike network within 0.5 mi. of store
Bicycle Boulevard
Shared Lane Marking
Bicycle Lane
Multi-Use Trail

Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)

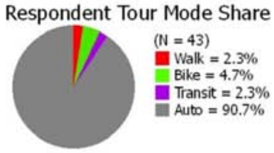
Map created by Robert J. Schneider
University of California Berkeley
November 2010

Shop. District (0.5 mi. radius)
Total residents = 1,700
Total jobs = 200
Multilane road sidewalk coverage = 80%
Bicycle facilities = 5.40 mi

Street (0.5 mi. corridor)
Avg. through lanes = 4.00
Avg. posted speed limit = 37.5 mph
Estimated traffic volume = 30,000 AADT
Blocks with on-street parking = 0%
Driveway crossings per mile = 14.3
Avg. bldg. setback from sidewalk = 40 ft
ROW covered by tree canopy = 3%

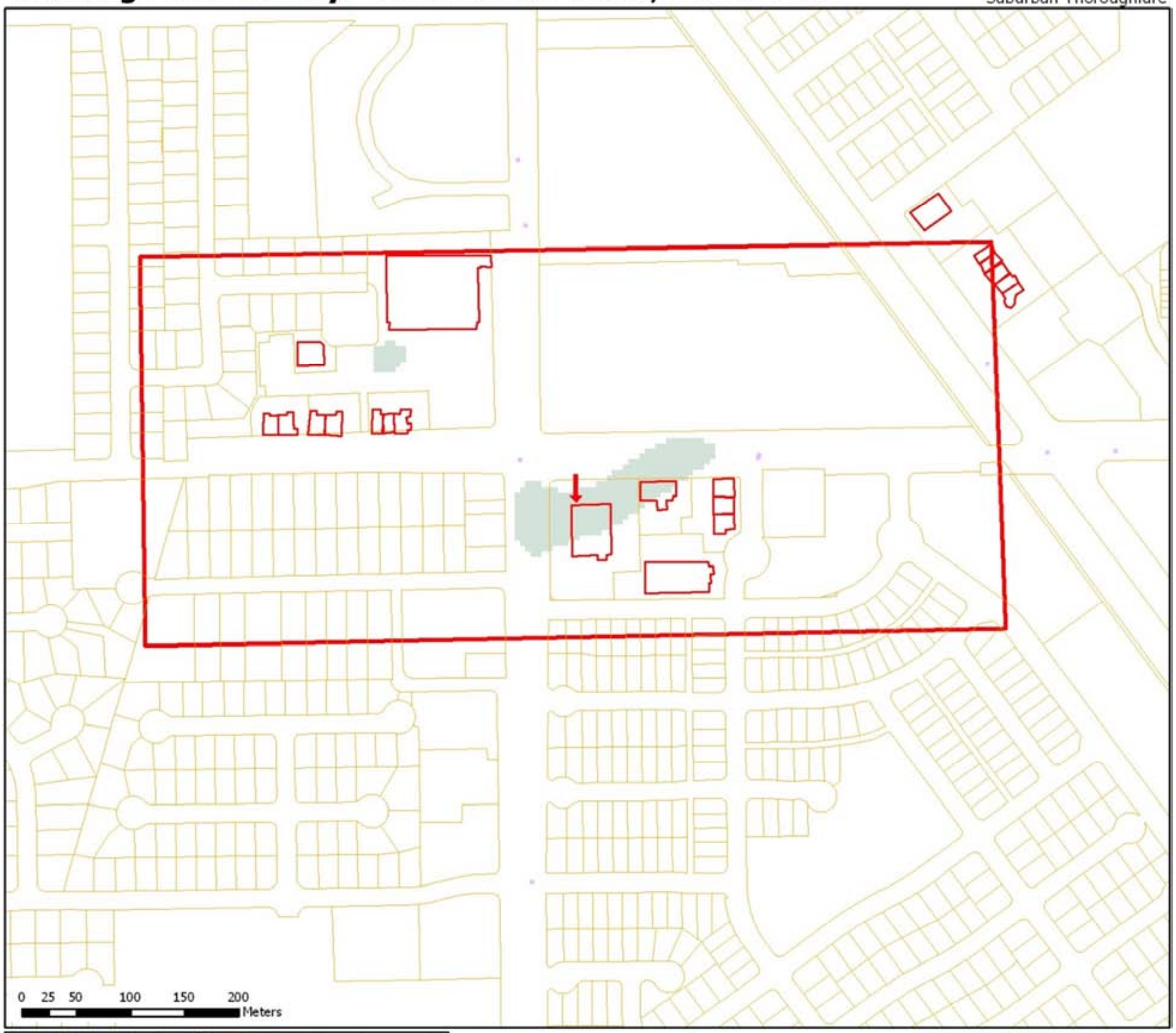
Store Site
Shopping complex = Yes
Auto/bike parking spaces = 193/4
Drive-through pharmacy = Yes

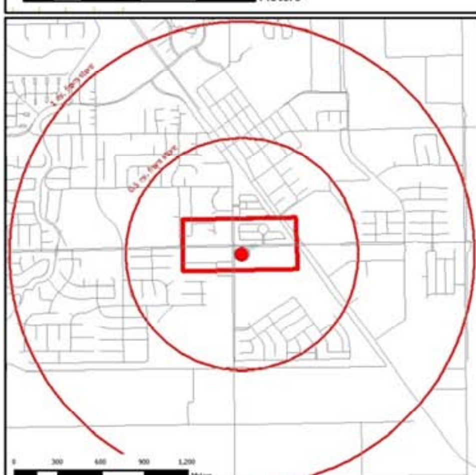
Respondent Tour Mode Share



Walking Path Density: 4520 Balfour Road, Brentwood

Shopping District Type:
Suburban Thoroughfare





Respondent Walking Path Density
(Path meters per square km.)

- 0 to 49
- 50 to 99
- 100 to 199
- 200 to 399
- 400 to 599
- 600 to 799
- 800 to 999
- 1,000 to 1,249
- 1,250 to 1,499
- 1,500 to 2,000

Kernel density was calculated for 5 meter by 5 meter grid cells using a 50 meter search radius

- Retail Pharmacy Survey Store
- Store Entrance
- Transit Station
- Bus Stop
- Roadway Centerline
- Commercial Building Footprint
- Commercial Corridor Boundary
- Property Boundary
- Water

N

Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)

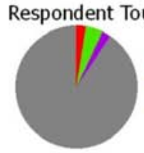
Map created by Robert J. Schneider
University of California Berkeley
November 2010

Shop. District (0.5 mi. radius)
Total residents = 1,700
Total jobs = 200
Multilane road sidewalk coverage = 80%
Bicycle facilities = 5.40 mi

Street (0.5 mi. corridor)
Avg. through lanes = 4.00
Avg. posted speed limit = 37.5 mph
Estimated traffic volume = 30,000 AADT
Blocks with on-street parking = 0%
Driveway crossings per mile = 14.3
Avg. bldg. setback from sidewalk = 40 ft
ROW covered by tree canopy = 3%

Store Site
Shopping complex = Yes
Auto/bike parking spaces = 193/4
Drive-through pharmacy = Yes

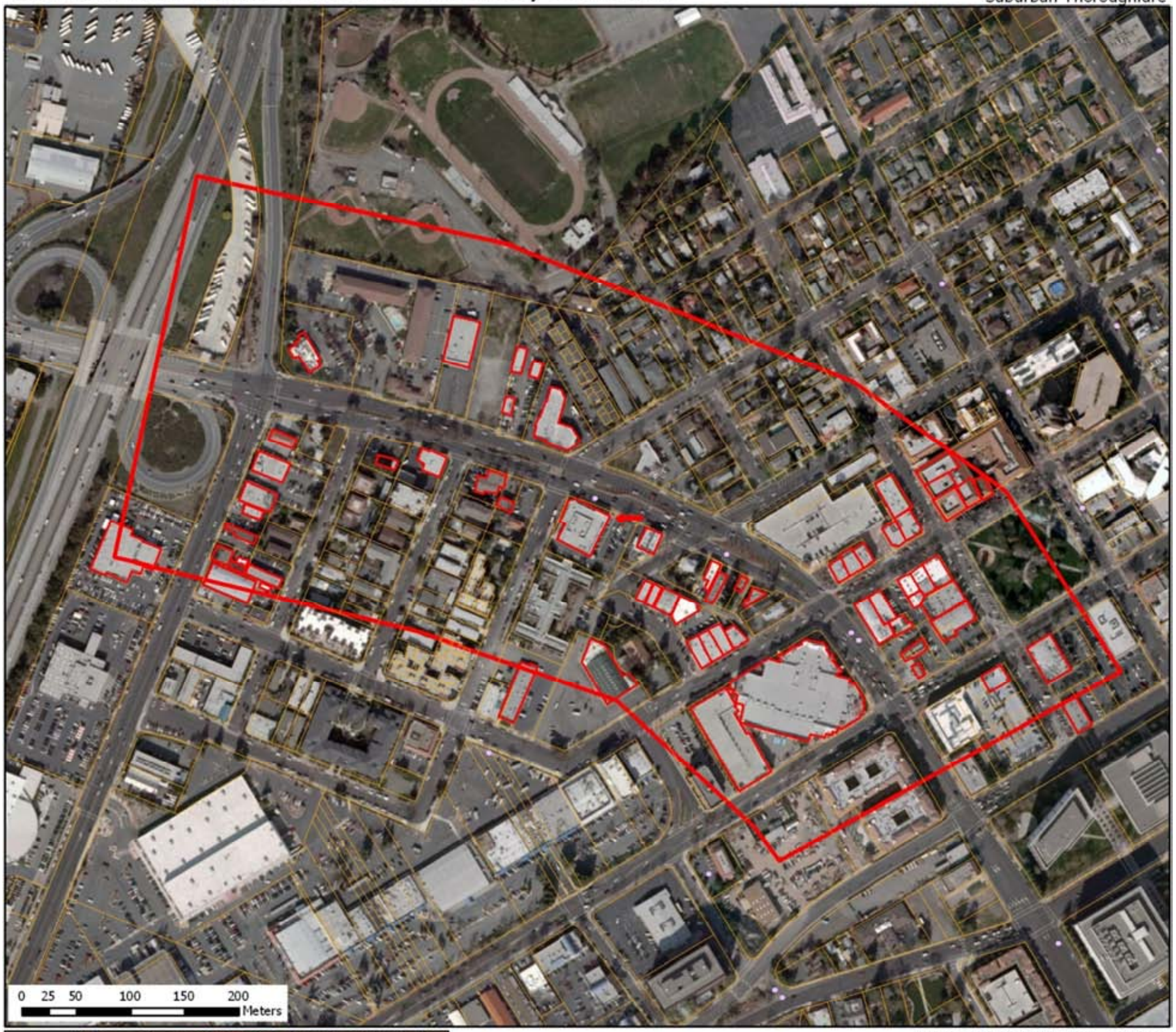
Respondent Tour Mode Share

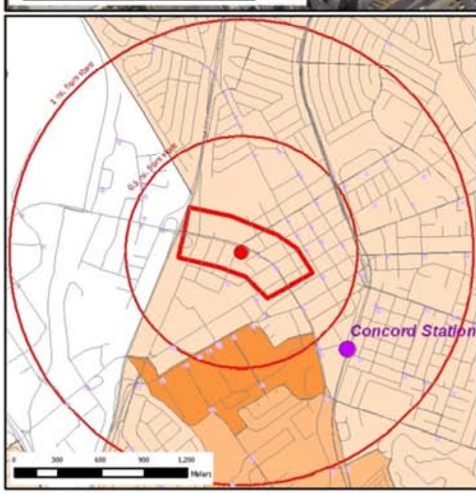


(N = 43)
Walk = 2.3%
Bike = 4.7%
Transit = 2.3%
Auto = 90.7%

Store Area: 1800 Concord Avenue, Concord

Shopping District Type:
Suburban Thoroughfare





Retail Pharmacy Store — Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water

2000 Population Density
(Residents per square mi.)
0 to 249
250 to 9,999
10,000 to 19,999
20,000 to 49,999
50,000 to 30,000,000

Bike network within 0.5 mi. of store
Bicycle Boulevard
Shared Lane Marking
Bicycle Lane
Multi-Use Trail

N

Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)

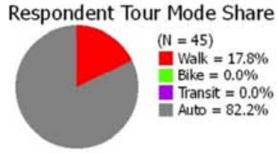
Map created by Robert J. Schneider
University of California Berkeley
November 2010

Shop. District (0.5 mi. radius)
Total residents = 4,300
Total jobs = 11,600
Multilane road sidewalk coverage = 97%
Bicycle facilities = 0.00 mi

Street (0.5 mi. corridor)
Avg. through lanes = 5.78
Avg. posted speed limit = 35 mph
Estimated traffic volume = 35,900 AADT
Blocks with on-street parking = 0%
Driveway crossings per mile = 38.1
Avg. bldg. setback from sidewalk = 30 ft
ROW covered by tree canopy = 9%

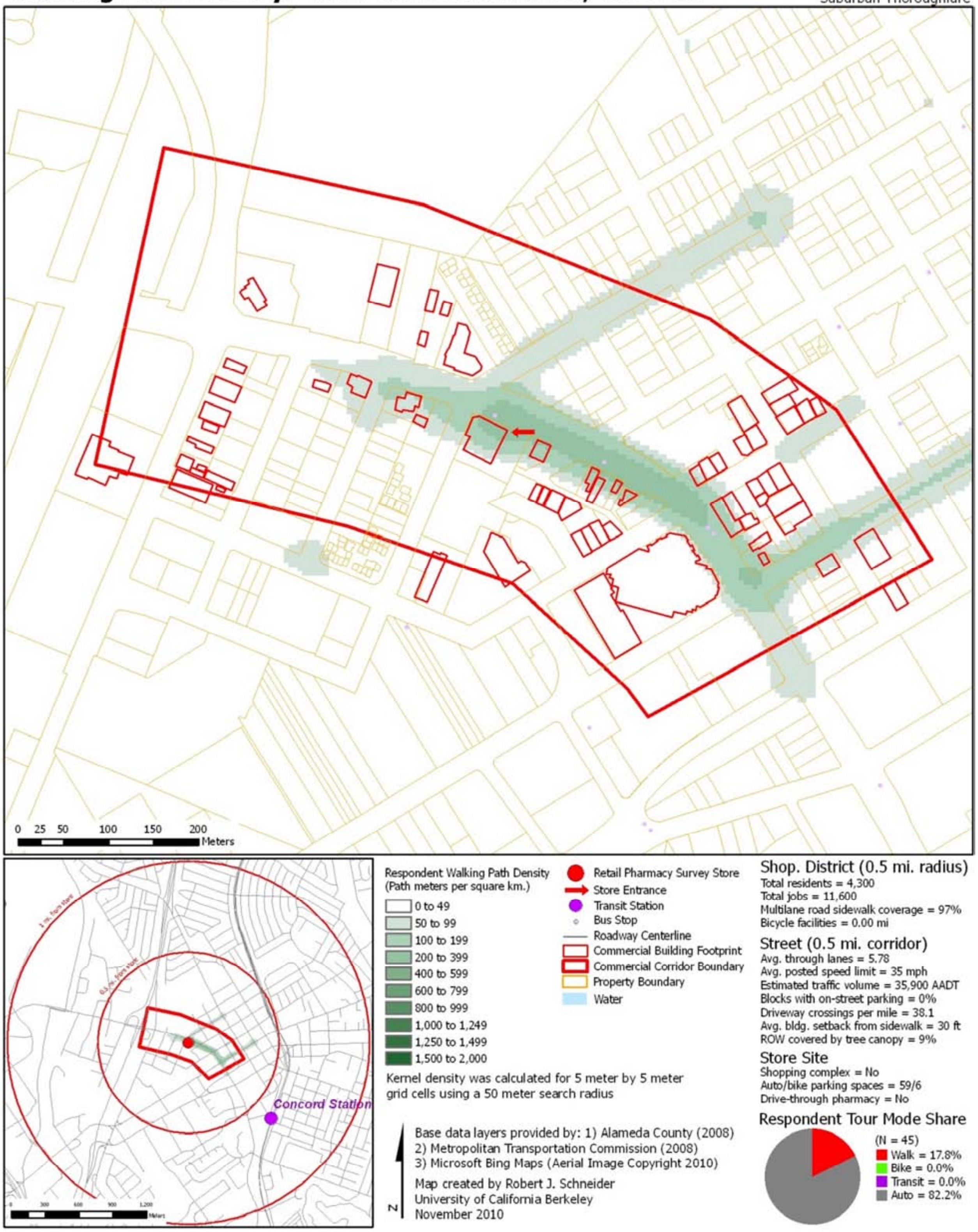
Store Site
Shopping complex = No
Auto/bike parking spaces = 59/6
Drive-through pharmacy = No

Respondent Tour Mode Share



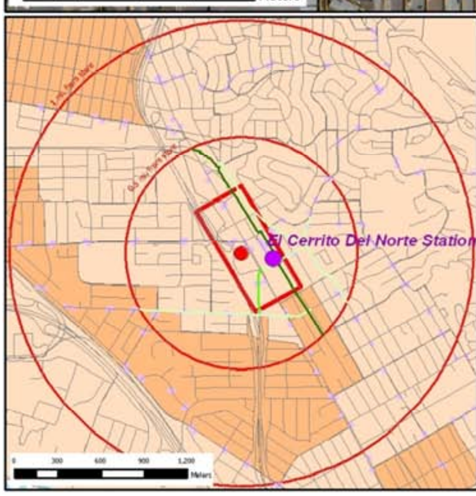
Walking Path Density: 1800 Concord Avenue, Concord

Shopping District Type: Suburban Thoroughfare



Store Area: 11565 San Pablo Avenue, El Cerrito

Shopping District Type:
Suburban Thoroughfare



- Retail Pharmacy Store
- Store Entrance
- Transit Station
- Bus Stop
- Roadway Centerline
- Commercial Building Footprint
- Commercial Corridor Boundary
- Property Boundary
- Water

2000 Population Density
(Residents per square mi.)
- 0 to 249
- 250 to 9,999
- 10,000 to 19,999
- 20,000 to 49,999
- 50,000 to 30,000,000

Bike network within 0.5 mi. of store
- Bicycle Boulevard
- Shared Lane Marking
- Bicycle Lane
- Multi-Use Trail

N

Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)

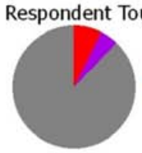
Map created by Robert J. Schneider
University of California Berkeley
November 2010

Shop. District (0.5 mi. radius)
Total residents = 6,400
Total jobs = 2,200
Multilane road sidewalk coverage = 100%
Bicycle facilities = 6.33 mi

Street (0.5 mi. corridor)
Avg. through lanes = 4.28
Avg. posted speed limit = 30 mph
Estimated traffic volume = 26,000 AADT
Blocks with on-street parking = 58%
Driveway crossings per mile = 58.1
Avg. bldg. setback from sidewalk = 80 ft
ROW covered by tree canopy = 5%

Store Site
Shopping complex = Yes
Auto/bike parking spaces = 250/0
Drive-through pharmacy = Yes

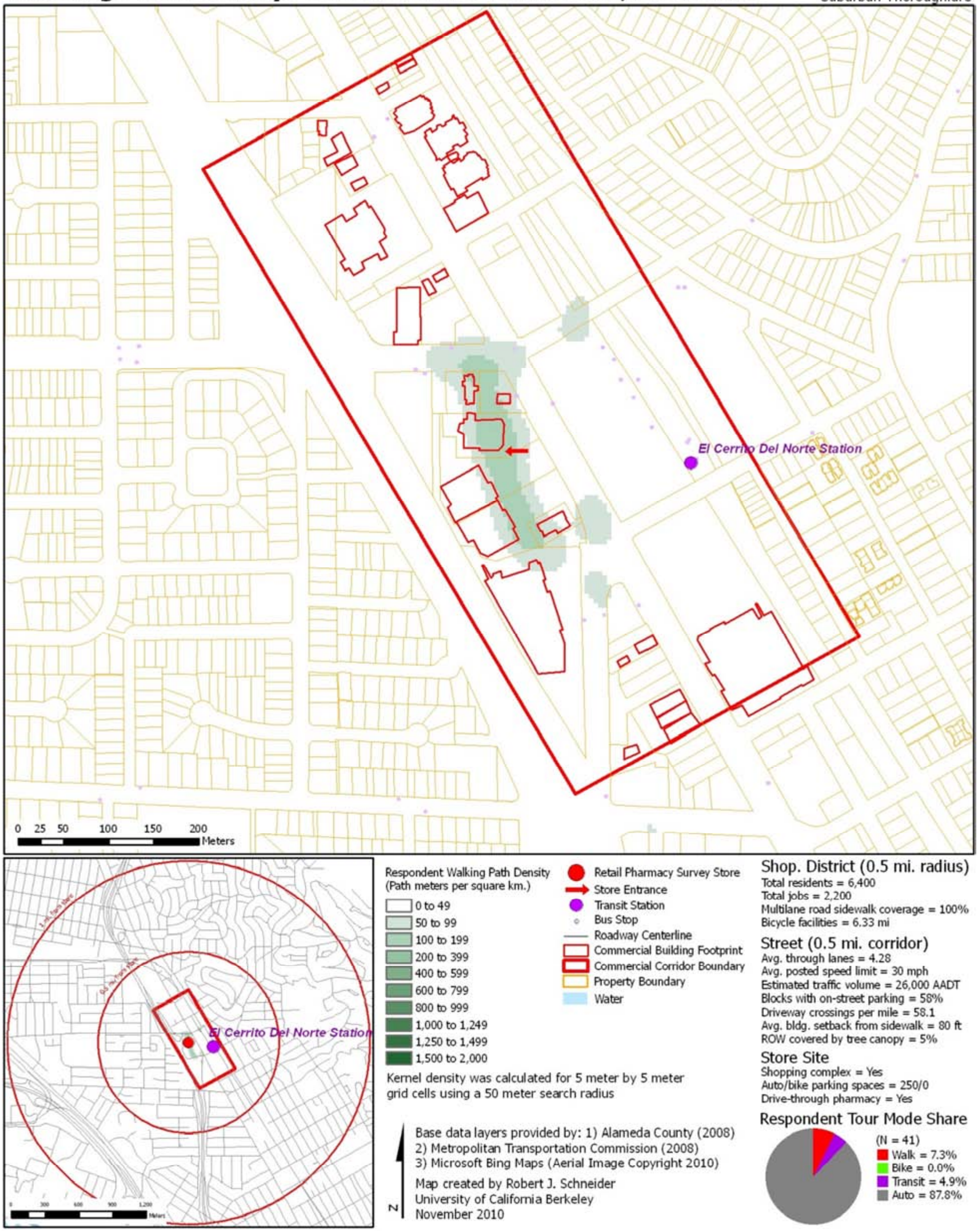
Respondent Tour Mode Share



(N = 41)
- Walk = 7.3%
- Bike = 0.0%
- Transit = 4.9%
- Auto = 87.8%

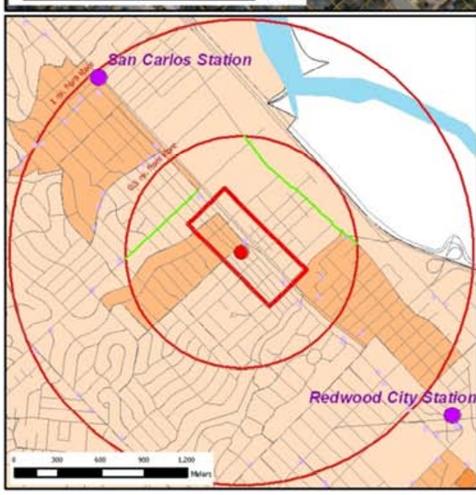
Walking Path Density: 11565 San Pablo Avenue, El Cerrito

Shopping District Type:
Suburban Thoroughfare



Store Area: 1414 El Camino Real, San Carlos

Shopping District Type:
Suburban Thoroughfare



Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)

Map created by Robert J. Schneider
University of California Berkeley
November 2010

Shop. District (0.5 mi. radius)

Total residents = 4,900
Total jobs = 4,200
Multilane road sidewalk coverage = 74%
Bicycle facilities = 2.20 mi

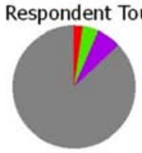
Street (0.5 mi. corridor)

Avg. through lanes = 5.00
Avg. posted speed limit = 35 mph
Estimated traffic volume = 25,600 AADT
Blocks with on-street parking = 78%
Driveway crossings per mile = 32.1
Avg. bldg. setback from sidewalk = 30 ft
ROW covered by tree canopy = 3%

Store Site

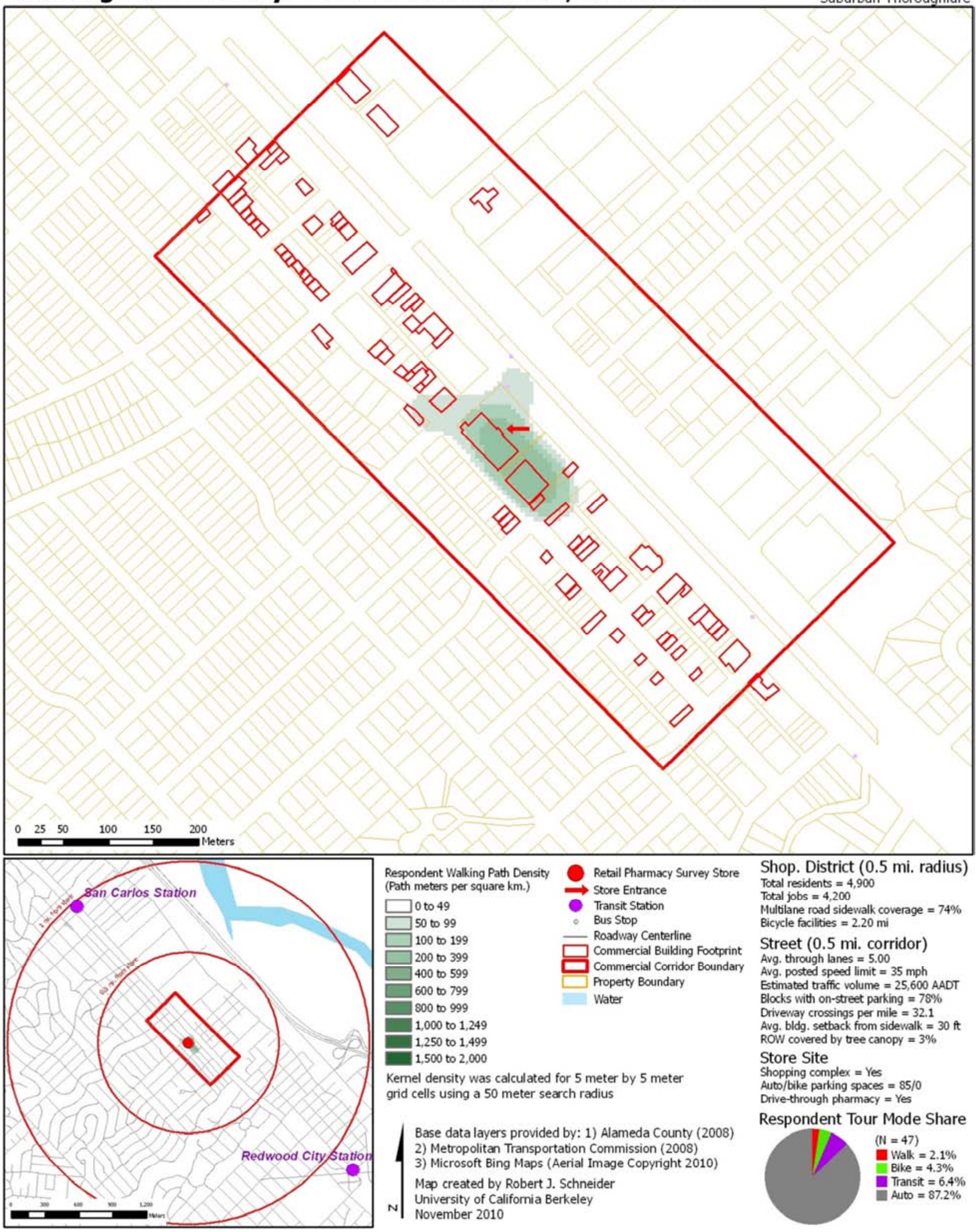
Shopping complex = Yes
Auto/bike parking spaces = 85/0
Drive-through pharmacy = Yes

Respondent Tour Mode Share



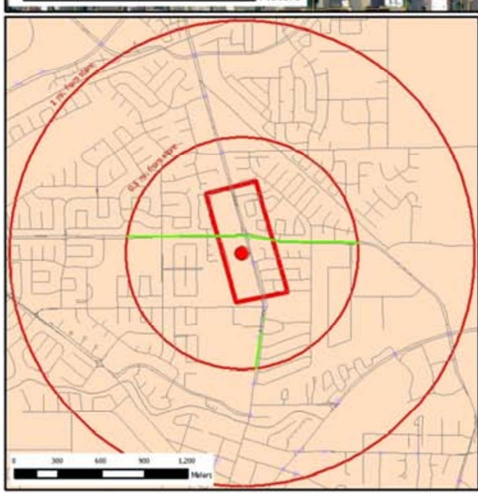
Walking Path Density: 1414 El Camino Real, San Carlos

Shopping District Type:
Suburban Thoroughfare



Store Area: 1763 Santa Rita Road, Pleasanton

Shopping District Type:
Suburban Shopping Center



- Retail Pharmacy Store
- Store Entrance
- Transit Station
- Bus Stop
- Roadway Centerline
- Commercial Building Footprint
- Commercial Corridor Boundary
- Property Boundary
- Water

2000 Population Density
(Residents per square mi.)
- 0 to 249
- 250 to 9,999
- 10,000 to 19,999
- 20,000 to 49,999
- 50,000 to 30,000,000

Bike network within 0.5 mi. of store
- Bicycle Boulevard
- Shared Lane Marking
- Bicycle Lane
- Multi-Use Trail

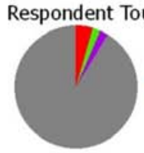
Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)

Map created by Robert J. Schneider
University of California Berkeley
November 2010

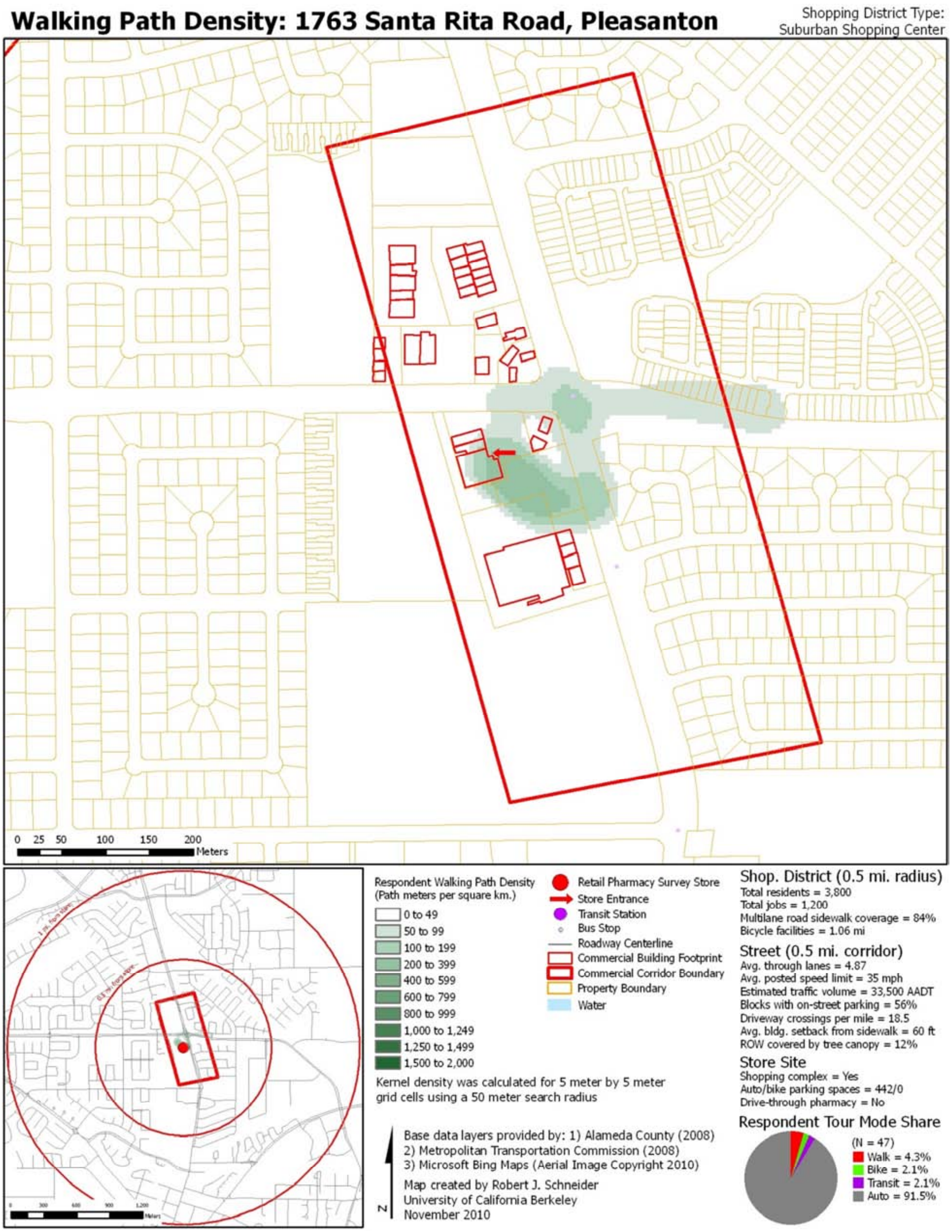
Shop. District (0.5 mi. radius)
Total residents = 3,800
Total jobs = 1,200
Multilane road sidewalk coverage = 84%
Bicycle facilities = 1.06 mi

Street (0.5 mi. corridor)
Avg. through lanes = 4.87
Avg. posted speed limit = 35 mph
Estimated traffic volume = 33,500 AADT
Blocks with on-street parking = 56%
Driveway crossings per mile = 18.5
Avg. bldg. setback from sidewalk = 60 ft
ROW covered by tree canopy = 12%

Store Site
Shopping complex = Yes
Auto/bike parking spaces = 442/0
Drive-through pharmacy = No

Respondent Tour Mode Share


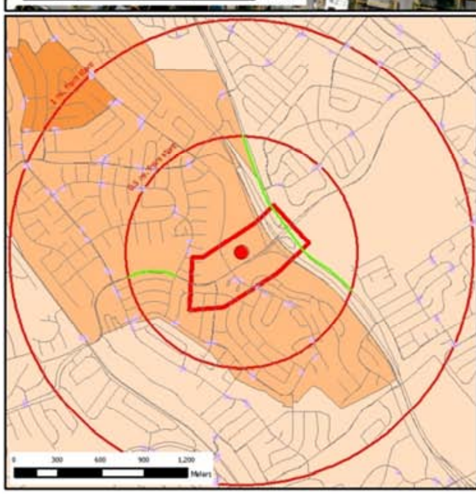
(N = 47)
- Walk = 4.3%
- Bike = 2.1%
- Transit = 2.1%
- Auto = 91.5%



Walking Path Density: 1763 Santa Rita Road, Pleasanton
Shopping District Type:
Suburban Shopping Center
0 25 50 100 150 200
Meters
Respondent Walking Path Density
(Path meters per square km.)
0 to 49
50 to 99
100 to 199
200 to 399
400 to 599
600 to 799
800 to 999
1,000 to 1,249
1,250 to 1,499
1,500 to 2,000
Retail Pharmacy Survey Store
Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water
Kernel density was calculated for 5 meter by 5 meter
grid cells using a 50 meter search radius
Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)
Map created by Robert J. Schneider
University of California Berkeley
November 2010
N
Shop. District (0.5 mi. radius)
Total residents = 3,800
Total jobs = 1,200
Multilane road sidewalk coverage = 84%
Bicycle facilities = 1.06 mi
Street (0.5 mi. corridor)
Avg. through lanes = 4.87
Avg. posted speed limit = 35 mph
Estimated traffic volume = 33,500 AADT
Blocks with on-street parking = 56%
Driveway crossings per mile = 18.5
Avg. bldg. setback from sidewalk = 60 ft
ROW covered by tree canopy = 12%
Store Site
Shopping complex = Yes
Auto/bike parking spaces = 442/0
Drive-through pharmacy = No
Respondent Tour Mode Share
(N = 47)
Walk = 4.3%
Bike = 2.1%
Transit = 2.1%
Auto = 91.5%

Store Area: 2238 Westborough Blvd., South SF

Shopping District Type:
Suburban Shopping Center



Retail Pharmacy Store
Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water

2000 Population Density
(Residents per square mi.)
0 to 249
250 to 9,999
10,000 to 19,999
20,000 to 49,999
50,000 to 30,000,000

Bike network within 0.5 mi. of store
Bicycle Boulevard
Shared Lane Marking
Bicycle Lane
Multi-Use Trail

N

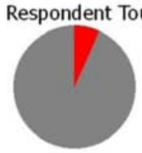
Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)

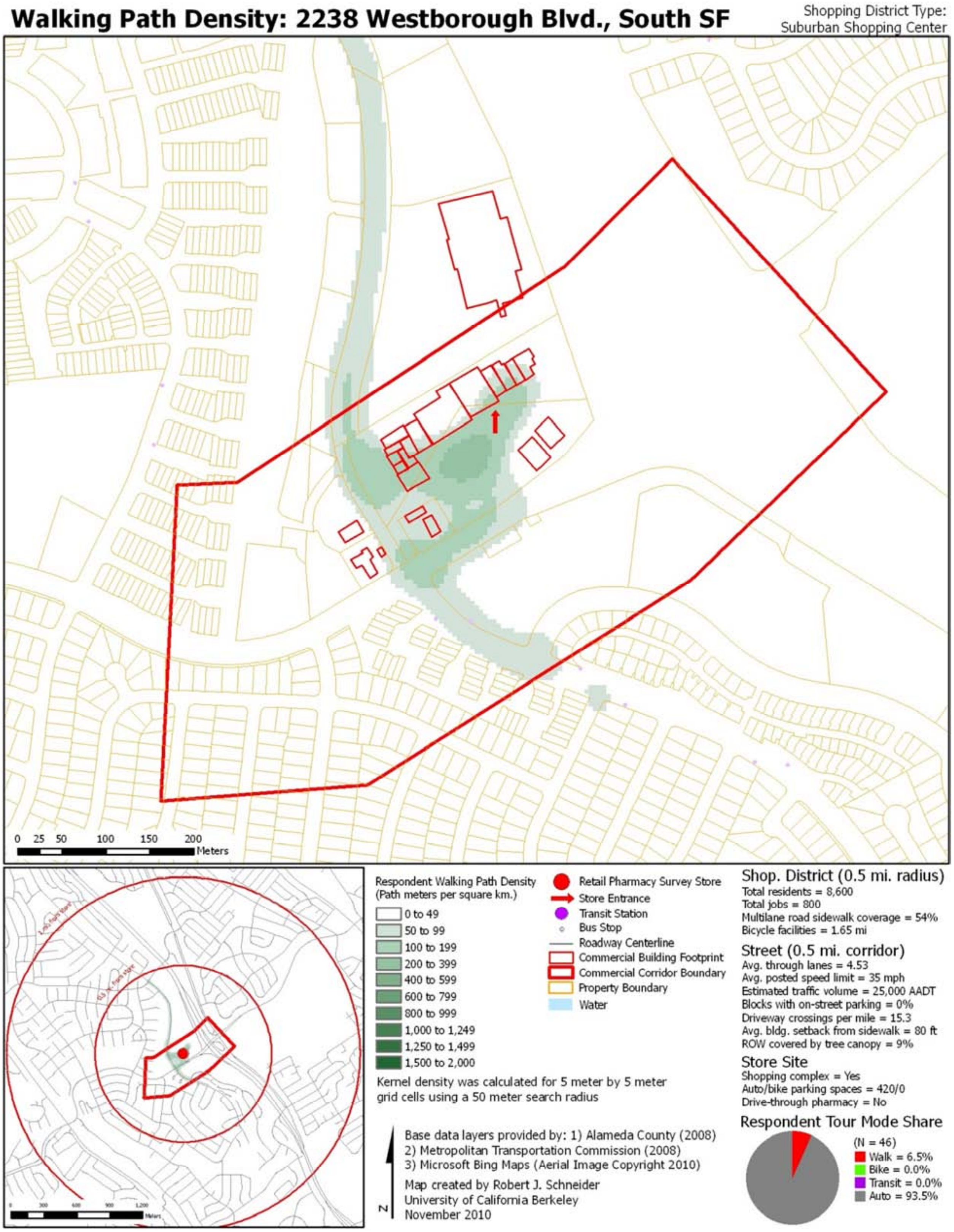
Map created by Robert J. Schneider
University of California Berkeley
November 2010

Shop. District (0.5 mi. radius)
Total residents = 8,600
Total jobs = 800
Multilane road sidewalk coverage = 54%
Bicycle facilities = 1.65 mi

Street (0.5 mi. corridor)
Avg. through lanes = 4.53
Avg. posted speed limit = 35 mph
Estimated traffic volume = 25,000 AADT
Blocks with on-street parking = 0%
Driveway crossings per mile = 15.3
Avg. bldg. setback from sidewalk = 80 ft
ROW covered by tree canopy = 9%

Store Site
Shopping complex = Yes
Auto/bike parking spaces = 420/0
Drive-through pharmacy = No

Respondent Tour Mode Share

(N = 46)
Walk = 6.5%
Bike = 0.0%
Transit = 0.0%
Auto = 93.5%


Walking Path Density: 2238 Westborough Blvd., South SF
Shopping District Type:
Suburban Shopping Center
0 25 50 100 150 200
Meters
Respondent Walking Path Density
(Path meters per square km.)
0 to 49
50 to 99
100 to 199
200 to 399
400 to 599
600 to 799
800 to 999
1,000 to 1,249
1,250 to 1,499
1,500 to 2,000
Kernel density was calculated for 5 meter by 5 meter
grid cells using a 50 meter search radius
Retail Pharmacy Survey Store
Store Entrance
Transit Station
Bus Stop
Roadway Centerline
Commercial Building Footprint
Commercial Corridor Boundary
Property Boundary
Water
N
Base data layers provided by: 1) Alameda County (2008)
2) Metropolitan Transportation Commission (2008)
3) Microsoft Bing Maps (Aerial Image Copyright 2010)
Map created by Robert J. Schneider
University of California Berkeley
November 2010
Shop. District (0.5 mi. radius)
Total residents = 8,600
Total jobs = 800
Multilane road sidewalk coverage = 54%
Bicycle facilities = 1.65 mi
Street (0.5 mi. corridor)
Avg. through lanes = 4.53
Avg. posted speed limit = 35 mph
Estimated traffic volume = 25,000 AADT
Blocks with on-street parking = 0%
Driveway crossings per mile = 15.3
Avg. bldg. setback from sidewalk = 80 ft
ROW covered by tree canopy = 9%
Store Site
Shopping complex = Yes
Auto/bike parking spaces = 420/0
Drive-through pharmacy = No
Respondent Tour Mode Share
(N = 46)
Walk = 6.5%
Bike = 0.0%
Transit = 0.0%
Auto = 93.5%

APPENDIX J. SHOPPING DISTRICT VARIABLE FACTOR ANALYSIS OUTPUT FILES

This appendix contains SPSS output files showing the results of the shopping district variable factor analysis. Note that coefficients less than 0.2 were suppressed when calculating the component matrix and rotated component matrix.

```
FACTOR
  /VARIABLES Wal_Spaces PayParkDum DoorMeters CRoadWidth CRoadBufCv CRoadPkCov
 CRoadSetbk CRoadAlgFt CPOSTSPEED TotPop_H Tot_HU_H TotEmp_H NINT_H MultiSWCov
 MultiSlope CommProp_Q CAADT
  /MISSING LISTWISE
  /ANALYSIS Wal_Spaces PayParkDum DoorMeters CRoadWidth CRoadBufCv CRoadPkCov
CRoadSetbk CRoadAlgFt CPOSTSPEED TotPop_H Tot_HU_H TotEmp_H NINT_H MultiSWCov
MultiSlope CommProp_Q CAADT
  /PRINT INITIAL CORRELATION SIG EXTRACTION ROTATION FSCORE
  /FORMAT BLANK(.2)
  /PLOT EIGEN
  /CRITERIA MINEIGEN(1.5) ITERATE(25)
  /EXTRACTION PC
  /CRITERIA ITERATE(25)
  /ROTATION VARIMAX
  /SAVE REG(ALL)
  /METHOD=CORRELATION.
```

Factor Analysis

[DataSet1] W:\Working\!Bob\Dissertation\Schneider_WalgreensNeighborhoodData_20_060210.sav

Correlation Matrix

		Wal_Spaces	PayParkDum	DoorMeters	CRoadWidth
Correlation	Wal_Spaces	1.000	-.515	.836	.464
	PayParkDum	-.515	1.000	-.470	-.692
	DoorMeters	.836	-.470	1.000	.458
	CRoadWidth	.464	-.692	.458	1.000
	CRoadBufCv	.166	-.397	.018	.497
	CRoadPkCov	-.417	.436	-.376	-.510
	CRoadSetbk	.857	-.500	.742	.694
	CRoadAlgFt	.534	-.136	.385	.524
	CPOSTSPEED	.450	-.611	.481	.823
	TotPop_H	-.488	.544	-.413	-.660
	Tot_HU_H	-.501	.593	-.419	-.689
	TotEmp_H	-.270	.294	-.223	-.315
	NINT_H	-.382	.473	-.354	-.612
	MultiSWCov	-.449	.385	-.693	-.306
	MultiSlope	.367	-.114	.609	.086
	CommProp_Q	-.455	.479	-.374	-.552
	CAADT	.259	-.633	.304	.880
Sig. (1-tailed)	Wal_Spaces		.010	.000	.020
	PayParkDum	.010		.018	.000
	DoorMeters	.000	.018		.021
	CRoadWidth	.020	.000	.021	
	CRoadBufCv	.242	.042	.470	.013
	CRoadPkCov	.034	.027	.051	.011
	CRoadSetbk	.000	.012	.000	.000
	CRoadAlgFt	.008	.283	.047	.009
	CPOSTSPEED	.023	.002	.016	.000
	TotPop_H	.014	.007	.035	.001
	Tot_HU_H	.012	.003	.033	.000
	TotEmp_H	.125	.105	.172	.088
	NINT_H	.048	.018	.063	.002
	MultiSWCov	.024	.047	.000	.094
	MultiSlope	.056	.316	.002	.359
	CommProp_Q	.022	.016	.052	.006
	CAADT	.135	.001	.096	.000

Correlation Matrix

		CRoadBufCv	CRoadPkCov	CRoadSetbk	CRoadAlgFt
Correlation	Wal_Spaces	.166	-.417	.857	.534
	PayParkDum	-.397	.436	-.500	-.136
	DoorMeters	.018	-.376	.742	.385
	CRoadWidth	.497	-.510	.694	.524
	CRoadBufCv	1.000	-.554	.338	.656
	CRoadPkCov	-.554	1.000	-.490	-.528
	CRoadSetbk	.338	-.490	1.000	.702
	CRoadAlgFt	.656	-.528	.702	1.000
	CPOSTSPEED	.610	-.573	.616	.541
	TotPop_H	-.407	.448	-.527	-.388
	Tot_HU_H	-.333	.273	-.546	-.359
	TotEmp_H	-.105	-.301	-.292	-.198
	NINT_H	-.403	.620	-.446	-.436
	MultiSWCov	.016	.327	-.338	-.126
	MultiSlope	-.208	-.243	.299	.218
	CommProp_Q	-.244	-.007	-.526	-.403
	CAADT	.425	-.416	.437	.334
Sig. (1-tailed)	Wal_Spaces	.242	.034	.000	.008
	PayParkDum	.042	.027	.012	.283
	DoorMeters	.470	.051	.000	.047
	CRoadWidth	.013	.011	.000	.009
	CRoadBufCv		.006	.073	.001
	CRoadPkCov	.006		.014	.008
	CRoadSetbk	.073	.014		.000
	CRoadAlgFt	.001	.008	.000	
	CPOSTSPEED	.002	.004	.002	.007
	TotPop_H	.038	.024	.009	.045
	Tot_HU_H	.076	.122	.006	.060
	TotEmp_H	.330	.099	.106	.202
	NINT_H	.039	.002	.024	.027
	MultiSWCov	.473	.080	.073	.298
	MultiSlope	.189	.151	.100	.178
	CommProp_Q	.150	.488	.009	.039
	CAADT	.031	.034	.027	.075

Correlation Matrix

		CPOSTSPEED	TotPop_H	Tot_HU_H	TotEmp_H	NINT_H
Correlation	Wal_Spaces	.450	-.488	-.501	-.270	-.382
	PayParkDum	-.611	.544	.593	.294	.473
	DoorMeters	.481	-.413	-.419	-.223	-.354
	CRoadWidth	.823	-.660	-.689	-.315	-.612
	CRoadBufCv	.610	-.407	-.333	-.105	-.403
	CRoadPkCov	-.573	.448	.273	-.301	.620
	CRoadSetbk	.616	-.527	-.546	-.292	-.446
	CRoadAlgFt	.541	-.388	-.359	-.198	-.436
	CPOSTSPEED	1.000	-.588	-.572	-.269	-.595
	TotPop_H	-.588	1.000	.913	.403	.734
	Tot_HU_H	-.572	.913	1.000	.633	.619
	TotEmp_H	-.269	.403	.633	1.000	.303
	NINT_H	-.595	.734	.619	.303	1.000
	MultiSWCov	-.527	.407	.452	.243	.415
	MultiSlope	.145	.040	-.043	-.116	-.293
	CommProp_Q	-.442	.443	.638	.839	.431
	CAADT	.789	-.524	-.543	-.296	-.555
Sig. (1-tailed)	Wal_Spaces	.023	.014	.012	.125	.048
	PayParkDum	.002	.007	.003	.105	.018
	DoorMeters	.016	.035	.033	.172	.063
	CRoadWidth	.000	.001	.000	.088	.002
	CRoadBufCv	.002	.038	.076	.330	.039
	CRoadPkCov	.004	.024	.122	.099	.002
	CRoadSetbk	.002	.009	.006	.106	.024
	CRoadAlgFt	.007	.045	.060	.202	.027
	CPOSTSPEED		.003	.004	.126	.003
	TotPop_H	.003		.000	.039	.000
	Tot_HU_H	.004	.000		.001	.002
	TotEmp_H	.126	.039	.001		.097
	NINT_H	.003	.000	.002	.097	
	MultiSWCov	.008	.037	.023	.151	.034
	MultiSlope	.271	.434	.429	.314	.105
	CommProp_Q	.026	.025	.001	.000	.029
	CAADT	.000	.009	.007	.102	.006

Correlation Matrix

		MultiSWCov	MultiSlope	CommProp_Q	CAADT
Correlation	Wal_Spaces	-.449	.367	-.455	.259
	PayParkDum	.385	-.114	.479	-.633
	DoorMeters	-.693	.609	-.374	.304
	CRoadWidth	-.306	.086	-.552	.880
	CRoadBufCv	.016	-.208	-.244	.425
	CRoadPkCov	.327	-.243	-.007	-.416
	CRoadSetbk	-.338	.299	-.526	.437
	CRoadAlgFt	-.126	.218	-.403	.334
	CPOSTSPEED	-.527	.145	-.442	.789
	TotPop_H	.407	.040	.443	-.524
	Tot_HU_H	.452	-.043	.638	-.543
	TotEmp_H	.243	-.116	.839	-.296
	NINT_H	.415	-.293	.431	-.555
	MultiSWCov	1.000	-.623	.296	-.247
	MultiSlope	-.623	1.000	-.206	-.007
	CommProp_Q	.296	-.206	1.000	-.503
	CAADT	-.247	-.007	-.503	1.000
Sig. (1-tailed)	Wal_Spaces	.024	.056	.022	.135
	PayParkDum	.047	.316	.016	.001
	DoorMeters	.000	.002	.052	.096
	CRoadWidth	.094	.359	.006	.000
	CRoadBufCv	.473	.189	.150	.031
	CRoadPkCov	.080	.151	.488	.034
	CRoadSetbk	.073	.100	.009	.027
	CRoadAlgFt	.298	.178	.039	.075
	CPOSTSPEED	.008	.271	.026	.000
	TotPop_H	.037	.434	.025	.009
	Tot_HU_H	.023	.429	.001	.007
	TotEmp_H	.151	.314	.000	.102
	NINT_H	.034	.105	.029	.006
	MultiSWCov		.002	.102	.147
	MultiSlope	.002		.192	.489
	CommProp_Q	.102	.192		.012
	CAADT	.147	.489	.012	

Communalities

	Initial	Extraction
Wal_Spaces	1.000	.714
PayParkDum	1.000	.545
DoorMeters	1.000	.880
CRoadWidth	1.000	.827
CRoadBufCv	1.000	.718
CRoadPkCov	1.000	.876
CRoadSetbk	1.000	.720
CRoadAlgFt	1.000	.511
CPOSTSPEED	1.000	.774
TotPop_H	1.000	.682
Tot_HU_H	1.000	.809
TotEmp_H	1.000	.872
NINT_H	1.000	.579
MultiSWCov	1.000	.625
MultiSlope	1.000	.720
CommProp_Q	1.000	.792
CAADT	1.000	.670

Extraction Method: Principal Component Analysis.

Total Variance Explained

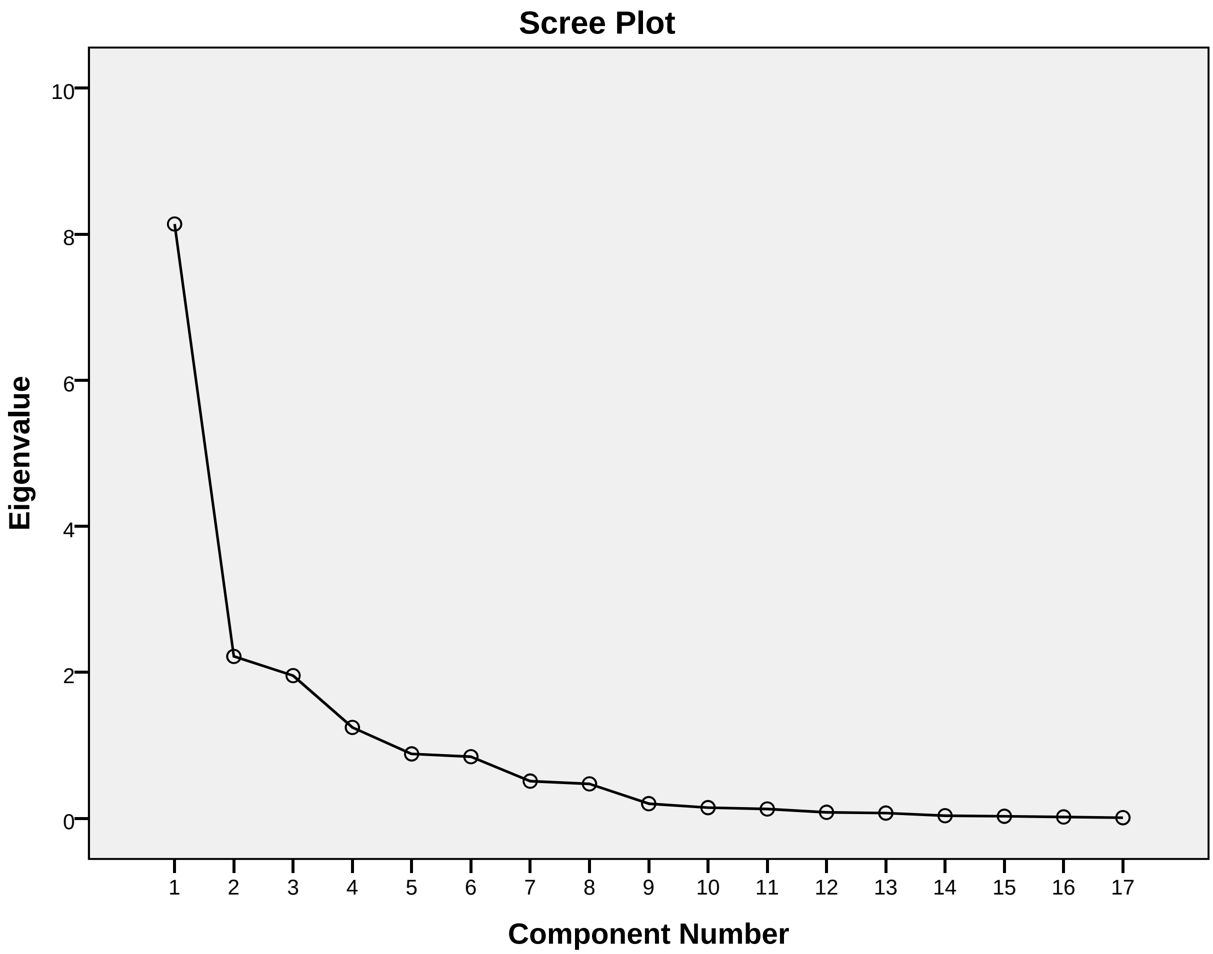
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.139	47.879	47.879	8.139	47.879	47.879
2	2.218	13.049	60.928	2.218	13.049	60.928
3	1.955	11.502	72.431	1.955	11.502	72.431
4	1.246	7.327	79.758			
5	.883	5.194	84.952			
6	.845	4.969	89.920			
7	.511	3.003	92.924			
8	.473	2.782	95.705			
9	.202	1.186	96.891			
10	.147	.867	97.758			
11	.129	.759	98.517			
12	.083	.491	99.007			
13	.073	.428	99.435			
14	.037	.216	99.651			
15	.029	.172	99.823			
16	.020	.118	99.941			
17	.010	.059	100.000			

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	5.496	32.330	32.330
2	3.500	20.590	52.920
3	3.317	19.511	72.431
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			

Extraction Method: Principal Component Analysis.


Scree Plot
Eigenvalue
10
8
6
4
2
0
1
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3
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5
6
7
8
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10
11
12
13
14
15
16
17
Component Number

Component Matrix[a]

	Component		
	1	2	3
Wal_Spaces	.724	.421	
PayParkDum	-.730		
DoorMeters	.688	.621	
CRoadWidth	.869	-.266	
CRoadBufCv	.524	-.608	.273
CRoadPkCov	-.600		-.706
CRoadSetbk	.815		
CRoadAlgFt	.639		.303
CPOSTSPEED	.845		
TotPop_H	-.789		
Tot_HU_H	-.805		.389
TotEmp_H	-.463		.808
NINT_H	-.750		
MultiSWCov	-.562	-.555	
MultiSlope	.300	.772	
CommProp_Q	-.668		.585
CAADT	.730	-.364	

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Rotated Component Matrix[a]

	Component		
	1	2	3
Wal_Spaces	.370	.723	-.232
PayParkDum	-.562	-.250	.408
DoorMeters	.251	.885	
CRoadWidth	.790		-.414
CRoadBufCv	.820	-.213	
CRoadPkCov	-.809	-.327	-.338
CRoadSetbk	.569	.577	-.253
CRoadAlgFt	.659	.276	
CPOSTSPEED	.795	.259	-.274
TotPop_H	-.628		.507
Tot_HU_H	-.494	-.204	.723
TotEmp_H			.928
NINT_H	-.646	-.276	.293
MultiSWCov		-.744	.224
MultiSlope		.842	
CommProp_Q	-.231	-.227	.829
CAADT	.707		-.412

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Component Transformation Matrix

Component	1	2	3
1	.749	.468	-.469
2	-.518	.855	.024
3	.412	.225	.883

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Component Score Coefficient Matrix

	Component		
	1	2	3
Wal_Spaces	-.008	.217	.013
PayParkDum	-.072	.000	.075
DoorMeters	-.052	.295	.030
CRoadWidth	.142	-.053	-.053
CRoadBufCv	.248	-.173	.086
CRoadPkCov	-.235	-.065	-.283
CRoadSetbk	.060	.137	.019
CRoadAlgFt	.148	.030	.099
CPOSTSPEED	.154	-.011	.014
TotPop_H	-.086	.046	.115
Tot_HU_H	-.015	.037	.223
TotEmp_H	.145	.038	.390
NINT_H	-.109	-.010	.013
MultiSWCov	.072	-.250	.013
MultiSlope	-.114	.336	.075
CommProp_Q	.075	.008	.302
CAADT	.138	-.106	-.077

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Component Scores.

Component Score Covariance Matrix

Component	1	2	3
1	1.000	.000	.000
2	.000	1.000	.000
3	.000	.000	1.000

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Component Scores.

APPENDIX K. TRAVEL TIME AND COST ASSUMPTIONS

This appendix describes the assumptions that were made to calculate the travel time and travel cost for each mode analyzed in the main mixed logit model.

Travel Time

Total tour travel time was estimated for pedestrian, bicycle, public transit, and automobile modes. Tour travel time represented the sum of travel times for all individual trip links in the home-to-home tour.

- Pedestrian tour travel time (minutes) was estimated using the shortest time route selected by Google Maps directions. Walking travel times were assumed to be slower in the uphill direction and faster in the downhill direction. Average estimated walking speed for the 397 respondent tours was 3.23 miles per hour (5.20 kilometers per hour). The analysis did not assume any differences in walking speed by age or gender. The walking travel time for each trip was calculated separately and summed to calculate the overall tour walking travel time.
- Bicycle tour travel time (minutes) was estimated using the preferred route suggested by Google Maps directions. Bicycling travel times were assumed to be slower in the uphill direction and faster in the downhill direction. Average estimated bicycling speed for the 397 respondent tours was 10.29 miles per hour (16.56 kilometers per hour). The analysis did not assume any differences in bicycling speed by age or gender. The bicycle travel time for each trip was calculated separately and summed to calculate the overall tour bicycle travel time. The total tour travel time by bicycling also included an additional 1 minute of total travel time at each non-home tour stop for parking, locking, and unlocking the bicycle (30 seconds to park and lock; 30 seconds to unlock). Bicycling was not available in the choice set for households without bicycles.
- Public transit tour travel time (minutes) was estimated by Google Maps directions or Bay Area 511.org. Transit travel time included walk, wait, and transfer time, as calculated by the online travel planning tools. Weekday trips were assumed to arrive around 5 p.m., and weekend trips were assumed to arrive around 2 p.m. The wait time was assumed to be 2 minutes when traveling from home to the bus or train stop and 2 minutes when traveling from an activity stop back to the transit stop (i.e., the person knows the transit schedule). The travel time assumed that the person would not take the bus/train if the total walk time as a part of the transit option was more than the total travel time by walking (i.e., walking to the shopping district was as long or shorter than walking to the closest bus stop). In these cases, transit time was assumed to equal walk time and transit cost was assumed to be $0, so transit was assumed to be unavailable in the choice set.
- Automobile tour travel time (minutes) was estimated using the shortest time route selected by Google Maps directions. "In-traffic" (congested) travel times were used for customers who completed the survey between 4 p.m. and 6 p.m. on weekdays. The automobile tour travel time included the time needed at each activity stop to walk through the parking lot (where there was one) or walk from street parking to the building entrance where there was no parking. The destination-end walking time assumptions were different for each store location based on the store site design and availability of parking in the shopping district around the store: Berkeley = 1 minute (30 seconds in each

direction through parking lot), Oakland = 1 minute (30 seconds in each direction through parking lot), Hayward = 1 minute (30 seconds in each direction through parking lot), Fremont = 1 minute (30 seconds in each direction through parking lot), Pleasanton = 1 minute (30 seconds in each direction through parking lot), Danville = 1 minute (30 seconds in each direction through parking lot), Brentwood = 1 minute (30 seconds in each direction through parking lot), Concord = 1 minute (30 seconds in each direction through parking lot), Richmond = 1 minute (30 seconds in each direction through parking lot), El Cerrito = 1 minute (30 seconds in each direction through parking lot, Market Street = 5 minutes (2.5 minutes in each direction from on-street parking or garage), Fillmore Street = 2 minutes (1 minute in each direction from on-street parking or parking lot), Taraval Street = 2 minutes (1 minute each direction from on-street parking), Mission Street = 3 minutes (1.5 minutes each direction from on-street parking), Third Street = 1 minute (30 seconds in each direction through parking lot), South San Francisco = 1 minute (30 seconds in each direction through parking lot), Daly City = 2 minutes (1 minute in each direction through parking lot), Burlingame = 1 minute (30 seconds in each direction from parking lot or on-street parking), San Mateo = 2 minutes (1 minute in each direction from parking lot or on-street parking), San Carlos = 1 minute (30 seconds in each direction through parking lot). The automobile tour time also included the home-end time needed to walk from home to a parked car (including getting in and starting the car) and park and walk back inside home (including turning off the car). These home-end walking times corresponded with the destination-end travel times listed above for each community.

Travel Cost

Travel cost was estimated for public transit and automobile modes. Total tour cost represented the sum of travel costs for all individual trip links in the home-to-home tour.

- Public transit tour travel cost (Dollars) represented the total fare that the customer would need to travel to all of their activity stop locations by transit. Total transit cost was assumed to be $0 if the respondent had some type of transit pass. Fares were calculated from fare information provided by Bay Area Rapid Transit, San Francisco Muni, AC Transit, SamTrans, Tri-Delta Transit, Wheels Transit, Central Contra Costa Transit, and 511.org: BART fares varied and were taken from the BART or 511.org website, SF Muni = $2.00 base fare, AC Transit = $2.00 base fare plus $0.25 per transfer ($1.75 per transfer from BART), SamTrans = $3.00 base fare ($2.00 to San Francisco and $4.00 return from San Francisco), Central Contra Costa Transit = $2.00 base fare ($1.00 per transfer from BART), Tri-Delta Transit = $1.75 base fare plus $1.00 per transfer from BART; Wheels Transit = $2.00 base fare. Reduced fares were assumed for respondents who were over age 64 and had disabilities: SF Muni costs $1.25 less for over age 64 or disabled, AC Transit costs $1.00 less for over age 64 or disabled, SamTrans is 50% off for over age 64 or disabled, Wheels Transit costs $1.00 for over age 64 or disabled, Central Contra Costa Transit costs $1.00 for over age 64 or disabled, Tri-Delta Transit costs $1.00 less for over age 64 or disabled. Transfers between buses were assumed to be free, but transfers between bus and rail were assumed to require fares for both systems. Respondents were assumed to pay a new fare after each activity stop rather than use free bus transfers. The total tour travel cost assumed that the survey respondent was paying only for themselves, not for other members of their travel party.

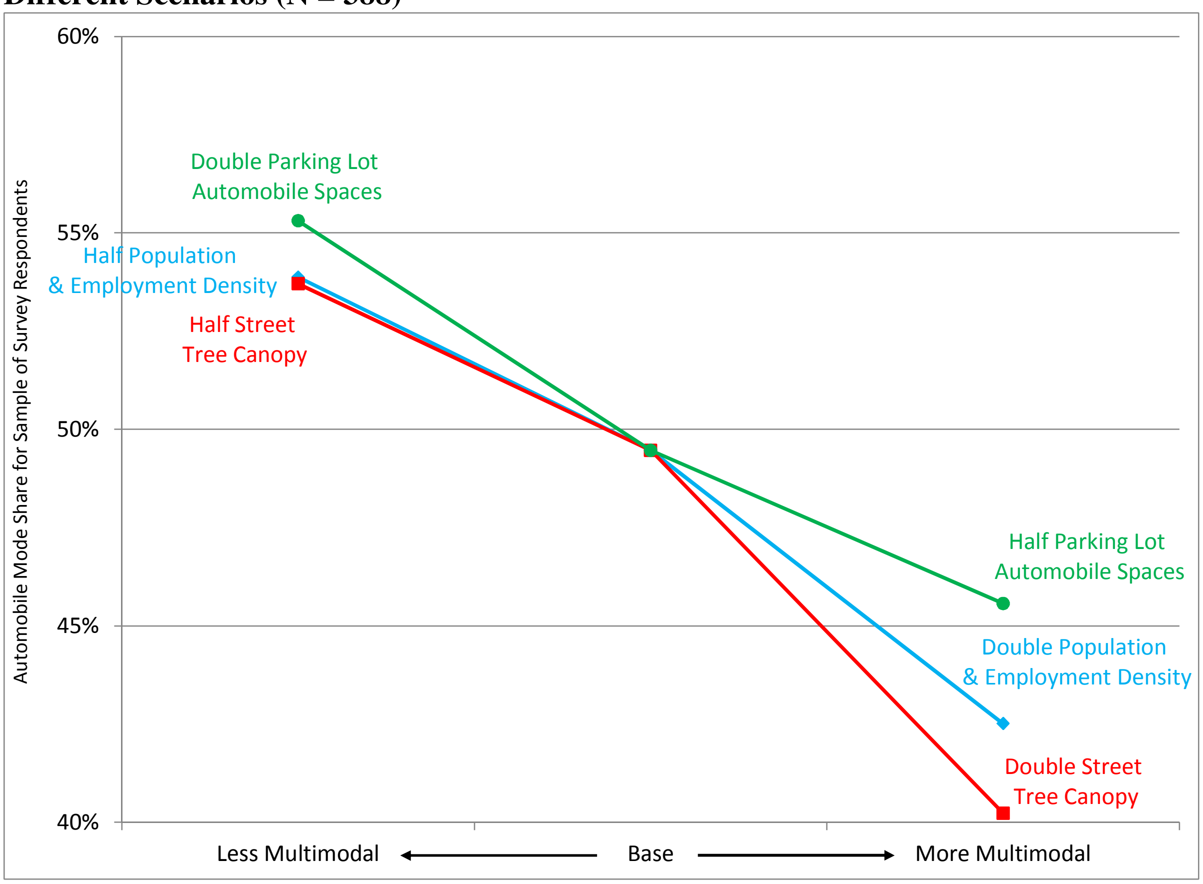
- Automobile tour travel cost (Dollars) represented the sum of the expected gas, parking, toll, and/or taxi costs paid by a respondent driving to the shopping district. Gas cost was assumed to be $3.05 per gallon ($0.806 per liter), the average gas price for San Francisco and Oakland in Fall 2009. Automobile fuel economy was assumed to be 22.5 miles per gallon (9.56 km per liter), the average US fuel efficiency based on 2009 Bureau of Transportation Statistics Research and Innovative Technology Administration data. Parking and toll costs were assumed to apply to respondents who had automobiles in their household (i.e., respondents with one or more cars could use them to go to the store--they were not being used by another household member at the time). Taxi costs applied to respondents who did not have a household automobile. Taxi fares were assumed to be $2 plus $0.25 per 0.1 miles (161 m) plus 10% tip. A different expected parking cost was assumed in each shopping district. It was assumed that drivers would park their cars at each stop within the shopping district for 30 minutes. Some shopping districts had metered on-street parking and survey stores with small, free parking lots. Depending on the size of the parking lot and overall parking demand, the probability of a customer needing to pay for street parking was estimated and used in the overall parking cost calculation. It was also assumed that customers did not have pre-paid monthly parking passes. The cost for parking at individual stops within in each shopping district was assumed to be: Berkeley = $0.00, Oakland = $0.00, Hayward = $0.00, Fremont = $0.00, Pleasanton = $0.00, Danville = $0.00, Brentwood = $0.00, Concord = $0.00, Richmond = $0.00, El Cerrito = $0.00, Market Street = $2.00 (All drivers need to pay an average of $2.00), Fillmore Street = $0.25 (Half of drivers need to pay $0.50), Taraval Street = $0.50 (All drivers need to pay $0.50), Mission Street = $0.50 (All drivers need to pay $0.50), Third Street = $0.00, South San Francisco = $0.00, Daly City = $0.00, Burlingame = $0.05 (20 percent of drivers need to pay $0.25), San Mateo = $0.25 (Half of drivers need to pay $0.50), San Carlos = $0.00.

APPENDIX L. FORECASTED CHANGES IN RESPONDENT AUTOMOBILE MODE SHARES UNDER DIFFERENT SCENARIOS

This appendix presents forecasted changes in automobile mode share according to each of the three models presented in the main body of this dissertation. Note that these forecasted mode shifts are illustrative examples based on cross-sectional data. The forecasts assume that each of the variables that are changed would have a direct effect on mode choice. In addition, the forecasts do not account for the process of modifying travel behavior habits, so they may overstate the potential impact of the changes.

Model of Respondent Primary Mode Choice on Tours To and From Shopping Districts
Relative to the base automobile mode share from the survey (49.5%), survey respondent automobile mode share could be reduced by limiting automobile parking lot size, increasing population and employment density, or providing more street tree canopy coverage (Figure L.1). Of these changes, the model suggests that greater street tree canopy would be associated with the largest decrease in automobile mode share. Note that the timeframe for each of these changes is likely to be different. For example, new street trees can be planted throughout a shopping district within weeks (though the canopy will grow slowly over many years), but doubling population and employment density may take decades to occur.

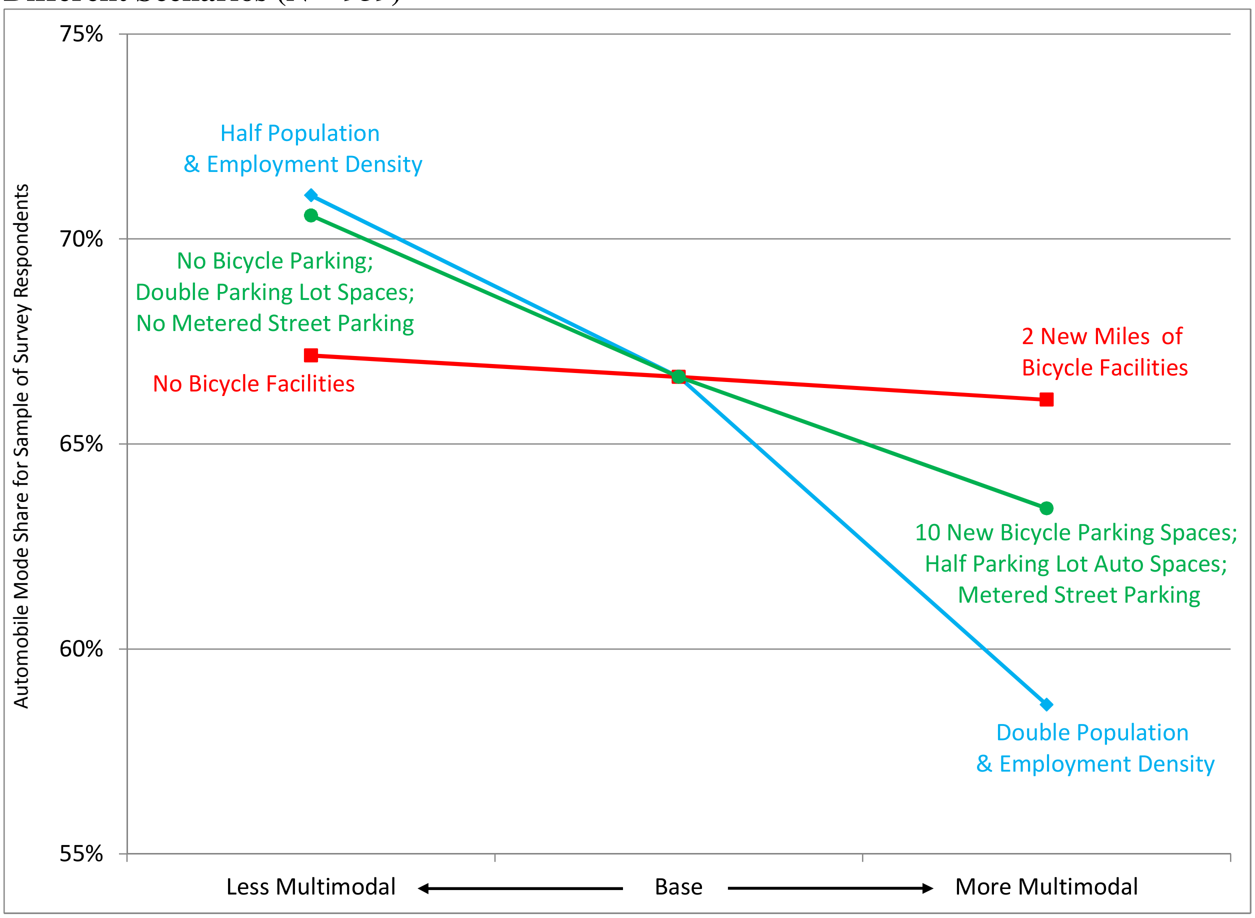
Figure L.1. Forecasted Changes in Survey Respondent Automobile Mode Share Under Different Scenarios (N = 388)



Note: The minimum automobile mode share shown on this chart is 40%, not 0%. This makes the changes more visible.

Model of Respondent Primary Mode Choice on All Tours
Relative to the base automobile mode share from the survey (67%), survey respondent automobile mode share could be reduced by constructing bicycle facilities on roadways, providing bicycle parking and reducing automobile parking, or increasing population and employment density (Figure L.2). Of these changes, the model suggests that greater population and employment density would be associated with the largest decrease in automobile mode share. Note that the timeframe for each of these changes is likely to be different. For example, if space is available, adding new bicycle parking and bicycle lanes can be done in several weeks, but doubling population and employment density may take decades to occur.

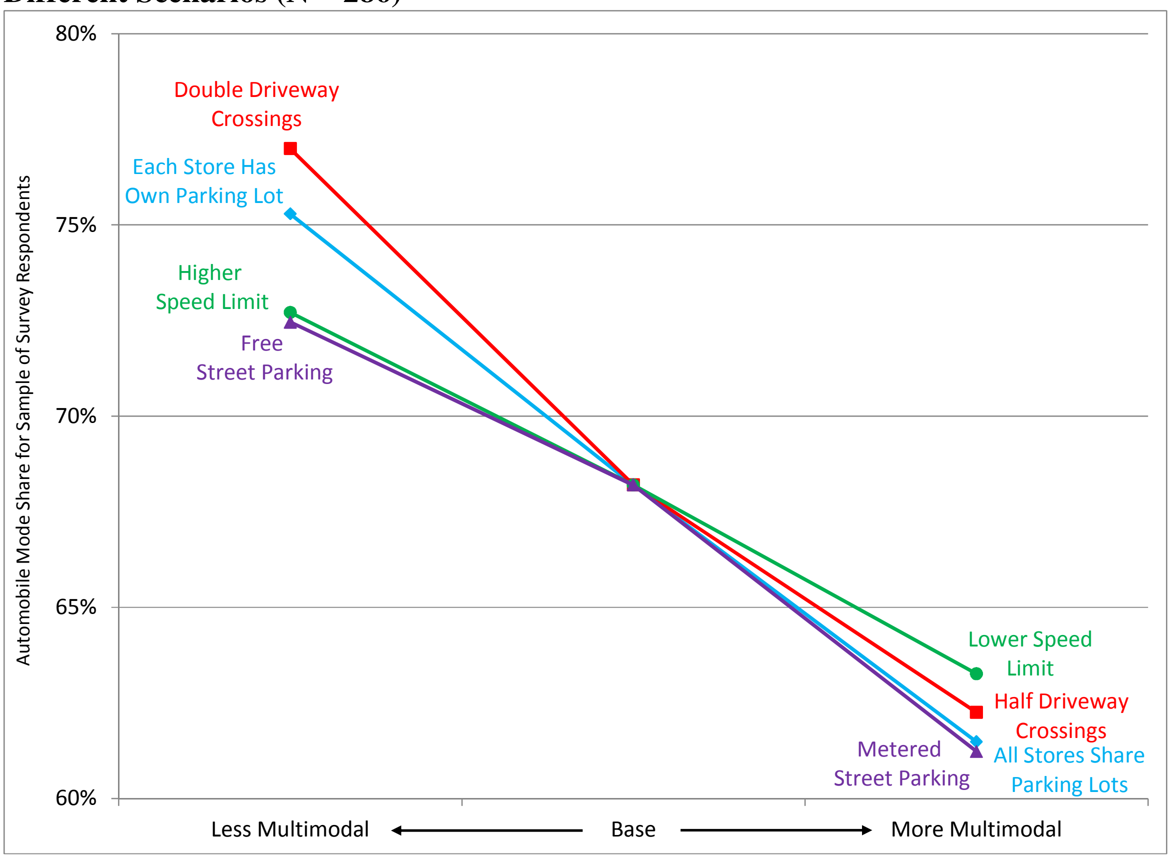
Figure L.2. Forecasted Changes in Survey Respondent Automobile Mode Share Under Different Scenarios (N = 959)



Note: The minimum automobile mode share shown on this chart is 55%, not 0%. This makes the changes more visible.

Model of Respondent Walk or Automobile Mode Choice Within the Shopping District
Relative to the base automobile mode share from the survey (68%), survey respondent automobile mode share could be reduced by clustering stores around shared parking lots, consolidating commercial driveway crossings, reducing speed limits, and installing metered parking (Figure L.3). Of these changes, the model suggests that metered on-street parking would be associated with the largest decrease in automobile mode share. Note that the timeframe for each of these changes is likely to be different. For example, consolidating commercial driveways would likely require a major roadway reconstruction project, which may take several years to plan, design, and construct. In contrast, speed limits could potentially be changed with a city council vote.

Figure L.3. Forecasted Changes in Survey Respondent Automobile Mode Share Under Different Scenarios (N = 286)



Note: The minimum automobile mode share shown on this chart is 60%, not 0%. This makes the changes more visible. Higher speed limit scenario is 5 miles per hour (8 kilometers per hour) higher posted speed limit on the main commercial roadway in each shopping district; lower speed limit scenario is posting a 25 mile per hour (40 kilometer per hour) speed limit.

APPENDIX M. STATISTICAL MODEL OUTPUT FILES

This appendix includes the statistical model output files that were generated by BIOGEME software. Hundreds of model iterations were tested, but these are the output files for the three mixed logit models discussed in the document. These models are:

- Mixed Logit Model of Primary Mode Used to Travel to and from Shopping District (N=388)
- Mixed Logit Model of Primary Tour Mode chosen by Respondents (N=959)
- Mixed Logit Model of Primary Mode Used to Travel Within Shopping District (N=286)

Mixed Logit Model of Primary Mode Used to Travel to and from Shopping District (N=388)

```
// This file has automatically been generated.
// 11/23/10 19:57:09
// Michel Bierlaire, EPFL 2001-2008

BIOGEME Version 1.8 [Sat Mar 7 14:36:56 CEST 2009]
Michel Bierlaire, EPFL

   Model specification file for mixed logit model of Bay Area Walgreens customer mode choice with
panel data
   Note that ASC0 is constrained to 0.0 and will not be estimated

                         Model:  Mixed Multinomial Logit for panel data
               Number of draws: 1000
Number of estimated parameters: 27
        Number of observations: 388
         Number of individuals: 20
           Null log-likelihood: -376.389
           Init log-likelihood: -154.426
          Final log-likelihood: -154.401
         Likelihood ratio test: 443.976
                    Rho-square: 0.590
           Adjusted rho-square: 0.518
           Final gradient norm: +7.394e-006
                    Diagnostic: Convergence reached
                      Run time: 08:26
           Variance-covariance: from finite difference hessian
                   Sample file: Schneider_Dataset_388_v4_112210.dat
```

Utility parameters
****

Name	Value	Std err	t-test	p-val		Rob. std err	Rob. t-test	Rob. p-val	
ASC1	-3.68	1.08	-3.40	0.00		0.788	-4.66	0.00	
ASC3	-3.67	1.15	-3.20	0.00		0.869	-4.22	0.00	
ASC4	0.00	--fixed--							
CostAU	-0.319	0.0717	-4.45	0.00		0.0918	-3.48	0.00	
CostTR	-0.498	0.156	-3.20	0.00		0.142	-3.50	0.00	
DisabilityAU	0.730	0.494	1.48	0.14	*	0.530	1.38	0.17	*
EnjWalkDumWK	0.789	0.553	1.43	0.15	*	0.493	1.60	0.11	*
GroupHouseAU	-1.07	0.515	-2.09	0.04		0.395	-2.72	0.01	
LowIncomeAU	-1.07	0.440	-2.44	0.01		0.406	-2.64	0.01	
MIncome	0.251	0.569	0.44	0.66	*	0.479	0.52	0.60	*
MultiTreeCWK	0.163	0.0684	2.39	0.02		0.0377	4.32	0.00	
NTourStopsAU	-0.632	0.240	-2.64	0.01		0.258	-2.45	0.01	
NoBagsAU	-0.745	0.466	-1.60	0.11	*	0.360	-2.07	0.04	
PANELMEAN1	0.00	--fixed--							
PANELMEAN3	0.00	--fixed--							
PANELMEAN4	0.00	--fixed--							
PANELSIGMA1	0.0101	0.448	0.02	0.98	*	0.0189	0.53	0.59	*
PANELSIGMA3	-0.00444	0.338	-0.01	0.99	*	0.00659	-0.67	0.50	*
PANELSIGMA4	0.530	0.265	2.00	0.05		0.183	2.91	0.00	
ShopAloneAU	-0.431	0.409	-1.05	0.29	*	0.266	-1.62	0.11	*
SpanishDumAU	-0.833	0.546	-1.52	0.13	*	0.327	-2.55	0.01	
StudentAU	-1.25	0.586	-2.13	0.03		0.433	-2.89	0.00	
Time	-0.0766	0.0113	-6.78	0.00		0.0235	-3.26	0.00	
TotEmp_H0AU	-0.0342	0.0122	-2.81	0.00		0.00533	-6.42	0.00	
TotPop_T0TR	0.255	0.123	2.07	0.04		0.0597	4.26	0.00	
TotPop_T0WK	0.158	0.0956	1.65	0.10	*	0.0721	2.19	0.03	
TranMeter0TR	-0.790	0.356	-2.22	0.03		0.124	-6.37	0.00	
Wal_Space0AU	0.700	0.221	3.17	0.00		0.132	5.31	0.00	
WalkCshDayTR	2.84	0.727	3.90	0.00		0.865	3.28	0.00	
WalkCshDayWK	1.27	0.526	2.42	0.02		0.574	2.21	0.03	
WithinMiAU	1.42	1.01	1.40	0.16	*	0.854	1.66	0.10	*

Variance of normal random coefficients
****

Name	Value	Std err	t-test
PANELMEAN1_PANELSIGMA1	0.000101	0.00901	0.01
PANELMEAN3_PANELSIGMA3	1.97e-005	0.00300	0.01
PANELMEAN4_PANELSIGMA4	0.281	0.281	1.00

Utility functions
****

4 Auto Auto_Av ASC4 * one + Time * AutoTime + CostAU * AutoCost + WithinMiAU * WithinMi + NTourStopsAU * NTourStops + NoBagsAU * NoBags + ShopAloneAU * ShopAlone + DisabilityAU * Disability + LowIncomeAU * LowIncome + MIncome * MIncome + GroupHouseAU * GroupHouse + SpanishDumAU * SpanishDum + StudentAU * Student + TotEmp_H0AU * TotEmp_H0 + Wal_Space0AU * Wal_Space0 + PANELMEAN4 [PANELSIGMA4] * one

3 Transit Tran_Av ASC3 * one + Time * TranTime + CostTR * TranCost + WalkCshDayTR * WalkCshDay + TotPop_T0TR * TotPop_T0 + TranMeter0TR * TranMeter0 + PANELMEAN3 [PANELSIGMA3] * one

1 Walk Walk_Av ASC1 * one + Time * WalkTime + EnjWalkDumWK * EnjWalkDum + WalkCshDayWK * WalkCshDay + TotPop_T0WK * TotPop_T0 + MultiTreeCWK * MultiTreeC + PANELMEAN1 [PANELSIGMA1] * one

Correlation of coefficients
****

Coeff1	Coeff2	Covariance	Correlation	t-test		Rob. covar.	Rob. correl.	Rob. t-test	
GroupHouseAU	LowIncomeAU	-0.0290	-0.128	-0.00	*	-0.0480	-0.299	-0.00	*
MIncome	TotPop_T0TR	-0.00240	-0.0342	-0.01	*	0.00881	0.308	-0.01	*
ASC1	ASC3	0.762	0.613	-0.01	*	0.475	0.693	-0.01	*
PANELSIGMA1	PANELSIGMA3	0.00124	0.00820	0.03	*	-9.53e-006	-0.0765	0.71	*
MultiTreeCWK	TotPop_T0WK	0.000187	0.0286	0.04	*	0.00114	0.417	0.08	*
DisabilityAU	Wal_Space0AU	0.00636	0.0583	0.06	*	0.0296	0.424	0.06	*
SpanishDumAU	TranMeter0TR	1.26e-005	6.47e-005	-0.07	*	-0.00747	-0.184	-0.12	*
NoBagsAU	TranMeter0TR	0.00416	0.0250	0.08	*	0.00709	0.159	0.12	*
DisabilityAU	EnjWalkDumWK	-0.00943	-0.0345	-0.08	*	-0.0173	-0.0661	-0.08	*
PANELSIGMA3	TotEmp_H0AU	1.90e-005	0.00461	0.09	*	1.58e-005	0.451	4.70	
PANELSIGMA1	TotEmp_H0AU	-2.94e-005	-0.00537	0.10	*	1.19e-005	0.118	2.33	
NoBagsAU	SpanishDumAU	0.00224	0.00880	0.12	*	-0.0538	-0.457	0.15	*
WalkCshDayWK	WithinMiAU	0.0642	0.121	-0.14	*	-0.0864	-0.176	-0.13	*
EnjWalkDumWK	Wal_Space0AU	-0.00420	-0.0344	0.15	*	-0.00562	-0.0864	0.17	*
MIncome	MultiTreeCWK	-0.000944	-0.0243	0.15	*	-0.00115	-0.0634	0.18	*
CostTR	ShopAloneAU	0.00160	0.0252	-0.16	*	-0.00258	-0.0681	-0.22	*
MIncome	TotPop_T0WK	-0.00198	-0.0364	0.16	*	0.00846	0.245	0.20	*
PANELSIGMA1	Time	-1.86e-005	-0.00366	0.19	*	3.10e-005	0.0699	2.98	
PANELSIGMA3	Time	1.35e-005	0.00352	0.21	*	1.67e-005	0.108	3.04	
GroupHouseAU	StudentAU	0.00207	0.00687	0.23	*	0.0356	0.208	0.34	*
NTourStopsAU	NoBagsAU	0.0144	0.129	0.23	*	0.0222	0.239	0.29	*
LowIncomeAU	StudentAU	-0.0281	-0.109	0.23	*	-0.0368	-0.209	0.27	*
CostAU	ShopAloneAU	-0.00216	-0.0738	0.27	*	0.00555	0.227	0.43	*
LowIncomeAU	SpanishDumAU	-0.0411	-0.171	-0.32	*	0.0149	0.112	-0.49	*
PANELSIGMA1	TotPop_T0WK	-0.000766	-0.0179	-0.32	*	0.000134	0.0980	-2.03	
MIncome	PANELSIGMA1	-0.00390	-0.0153	0.33	*	-0.00215	-0.238	0.50	*
GroupHouseAU	SpanishDumAU	0.0206	0.0731	-0.33	*	-0.0439	-0.340	-0.41	*
MultiTreeCWK	PANELSIGMA1	-0.000306	-0.00998	0.34	*	8.19e-005	0.115	3.80	
NTourStopsAU	SpanishDumAU	0.00894	0.0682	0.35	*	-0.00342	-0.0406	0.47	*
DisabilityAU	PANELSIGMA4	0.00867	0.0663	0.37	*	0.0254	0.263	0.39	*
NTourStopsAU	TranMeter0TR	0.00232	0.0271	0.37	*	0.00481	0.151	0.59	*
MIncome	PANELSIGMA3	0.000279	0.00145	0.39	*	0.000231	0.0731	0.53	*
EnjWalkDumWK	PANELSIGMA4	-0.000963	-0.00658	0.42	*	-0.0206	-0.229	0.46	*
MIncome	PANELSIGMA4	-0.0231	-0.153	-0.42	*	-0.0404	-0.462	-0.48	*
NTourStopsAU	ShopAloneAU	0.00817	0.0833	-0.44	*	0.00387	0.0566	-0.56	*
GroupHouseAU	TranMeter0TR	0.00113	0.00618	-0.46	*	0.0225	0.460	-0.80	*
GroupHouseAU	NoBagsAU	-0.0173	-0.0723	-0.46	*	0.0263	0.185	-0.68	*
PANELSIGMA3	TotPop_T0WK	1.61e-005	0.000499	-0.46	*	-0.000129	-0.271	-2.19	
MultiTreeCWK	PANELSIGMA3	-8.11e-005	-0.00351	0.49	*	-3.98e-005	-0.160	4.26	
CostTR	NTourStopsAU	0.00311	0.0833	0.49	*	-0.0192	-0.522	0.38	*
MIncome	TotEmp_H0AU	0.000259	0.0373	0.50	*	0.000262	0.103	0.60	*
LowIncomeAU	TranMeter0TR	0.00291	0.0185	-0.51	*	-0.0115	-0.228	-0.63	*
CostTR	NoBagsAU	0.00812	0.112	0.52	*	-0.0194	-0.378	0.57	*

LowIncomeAU	NoBagsAU	0.00936	0.0456	-0.52	* -0.0140	-0.0960	-0.58	*
PANELSIGMA1	TotPop_T0TR	0.000962	0.0175	-0.53	* 0.000185	0.164	-4.10	
EnjWalkDumWK	WithinMiAU	-0.0352	-0.0630	-0.53	* -0.0672	-0.159	-0.60	*
NoBagsAU	ShopAloneAU	0.0214	0.112	-0.54	* -0.0120	-0.126	-0.66	*
PANELSIGMA4	Wal_Space0AU	0.0110	0.187	-0.54	* -0.000351	-0.0146	-0.75	*
SpanishDumAU	StudentAU	0.0336	0.105	0.55	* -0.000566	-0.00399	0.77	*
MIncome	Time	-0.000704	-0.109	0.58	* -0.00483	-0.428	0.67	*
CostTR	SpanishDumAU	-0.000667	-0.00784	0.59	* 0.00159	0.0342	0.95	*
DisabilityAU	WithinMiAU	0.00711	0.0142	-0.61	* -0.159	-0.351	-0.60	*
DisabilityAU	MIncome	-0.0194	-0.0689	0.62	* -0.0251	-0.0990	0.64	*
EnjWalkDumWK	WalkCshDayWK	0.0247	0.0850	-0.66	* 0.0512	0.181	-0.70	*
EnjWalkDumWK	MIncome	-0.0156	-0.0497	0.66	* -0.0287	-0.122	0.74	*
ShopAloneAU	TranMeter0TR	0.00129	0.00882	0.66	* -0.00204	-0.0619	1.20	*
MultiTreeCWK	TotPop_T0TR	0.000598	0.0711	-0.67	* 0.000897	0.398	-1.62	*
NoBagsAU	StudentAU	-0.000415	-0.00152	0.67	* -0.0367	-0.236	0.81	*
ShopAloneAU	SpanishDumAU	0.0552	0.247	0.68	* 0.00226	0.0260	0.97	*
StudentAU	TranMeter0TR	0.00345	0.0165	-0.68	* 0.00781	0.145	-1.06	*
Wal_Space0AU	WithinMiAU	0.0228	0.102	-0.71	* 0.000887	0.00788	-0.83	*
MIncome	Wal_Space0AU	-0.00732	-0.0582	-0.72	* 0.00330	0.0523	-0.91	*
PANELSIGMA3	TotPop_T0TR	0.000414	0.00997	-0.72	* -8.70e-005	-0.221	-4.21	
CostAU	PANELSIGMA1	-0.000177	-0.00550	-0.72	* -0.000698	-0.403	-3.26	
PANELSIGMA1	ShopAloneAU	0.000716	0.00390	0.73	* 0.00124	0.248	1.68	*
DisabilityAU	WalkCshDayWK	0.0238	0.0915	-0.79	* 0.0220	0.0725	-0.72	*
GroupHouseAU	NTourStopsAU	0.00397	0.0322	-0.79	* -0.0196	-0.193	-0.86	*
PANELSIGMA3	ShopAloneAU	0.000127	0.000918	0.80	* -0.000392	-0.224	1.59	*
CostTR	TranMeter0TR	0.0107	0.193	0.81	* -0.000505	-0.0286	1.52	*
ShopAloneAU	Time	0.000161	0.0349	-0.87	* 0.000695	0.111	-1.34	*
PANELSIGMA4	WithinMiAU	0.0400	0.149	-0.88	* -0.0295	-0.189	-0.98	*
CostAU	NoBagsAU	0.000848	0.0254	0.91	* -0.000895	-0.0271	1.14	*
CostAU	PANELSIGMA3	2.75e-005	0.00114	-0.91	* 0.000265	0.439	-3.53	
DisabilityAU	TotPop_T0TR	-0.000423	-0.00696	0.93	* -0.00893	-0.283	0.87	*
MIncome	ShopAloneAU	-0.0202	-0.0868	0.94	* 0.0196	0.154	1.33	*
LowIncomeAU	NTourStopsAU	0.0152	0.145	-0.94	* -0.0126	-0.120	-0.87	*
CostAU	SpanishDumAU	0.00413	0.106	0.95	* -0.00272	-0.0905	1.48	*
EnjWalkDumWK	TotPop_T0TR	0.00289	0.0425	0.95	* -0.00172	-0.0586	1.07	*
ShopAloneAU	TotEmp_H0AU	4.23e-005	0.00847	-0.97	* -0.000563	-0.397	-1.48	*
GroupHouseAU	ShopAloneAU	-0.000912	-0.00433	-0.98	* -0.0238	-0.227	-1.23	*
CostAU	MIncome	-0.00389	-0.0953	-0.98	* 0.00447	0.102	-1.19	*
NTourStopsAU	StudentAU	0.00572	0.0407	0.99	* -0.0202	-0.181	1.14	*
PANELSIGMA1	PANELSIGMA4	0.00125	0.0106	-1.00	* 0.00138	0.401	-2.96	
Wal_Space0AU	WalkCshDayWK	0.00762	0.0656	-1.03	* 0.0118	0.156	-1.00	*
PANELSIGMA4	TotPop_T0TR	0.00759	0.233	1.04	* -0.000159	-0.0146	1.43	*
MIncome	WithinMiAU	0.0621	0.108	-1.06	* 0.149	0.365	-1.43	*
CostTR	PANELSIGMA1	-0.000393	-0.00564	-1.07	* -0.000269	-0.100	-3.49	
DisabilityAU	PANELSIGMA1	-0.00117	-0.00529	1.08	* 0.00247	0.247	1.37	*
CostTR	GroupHouseAU	0.00395	0.0493	1.09	* 0.00704	0.125	1.43	*
TotPop_T0TR	TotPop_T0WK	0.00819	0.696	1.09	* 0.00385	0.894	2.95	
CostAU	CostTR	0.00119	0.107	1.09	* 0.00276	0.211	1.18	*
EnjWalkDumWK	PANELSIGMA1	0.000491	0.00198	1.10	* 0.00149	0.160	1.59	*
EnjWalkDumWK	MultiTreeCWK	-3.65e-005	-0.000966	1.12	* -0.00259	-0.139	1.25	*
EnjWalkDumWK	TotPop_T0WK	0.000153	0.00289	1.12	* -0.00459	-0.129	1.24	*
LowIncomeAU	ShopAloneAU	0.0170	0.0946	-1.12	* 0.0198	0.183	-1.45	*
DisabilityAU	TotPop_T0WK	0.00116	0.0246	1.14	* -0.00713	-0.187	1.05	*
TotPop_T0TR	WithinMiAU	0.00272	0.0219	-1.15	* 0.0130	0.255	-1.38	*
DisabilityAU	MultiTreeCWK	0.00255	0.0757	1.15	* 0.000708	0.0354	1.07	*
NoBagsAU	PANELSIGMA1	-0.00134	-0.00641	-1.16	* -0.000937	-0.138	-2.08	
ShopAloneAU	StudentAU	0.0153	0.0637	1.18	* 0.0669	0.580	2.32	
PANELSIGMA1	SpanishDumAU	-0.00137	-0.00558	1.19	* 0.000489	0.0791	2.58	
WalkCshDayTR	WithinMiAU	0.0751	0.102	1.20	* 0.101	0.137	1.26	*
EnjWalkDumWK	PANELSIGMA3	0.000193	0.00103	1.22	* 0.000734	0.226	1.61	*
DisabilityAU	PANELSIGMA3	-0.000167	-0.00100	1.23	* -0.000858	-0.246	1.38	*
CostTR	StudentAU	-0.000738	-0.00809	1.24	* 0.00820	0.133	1.72	*
MultiTreeCWK	WithinMiAU	0.00271	0.0393	-1.24	* 0.00714	0.221	-1.48	*
PANELSIGMA3	PANELSIGMA4	-0.000581	-0.00650	-1.24	* -0.000526	-0.438	-2.88	
TotPop_T0WK	WithinMiAU	0.00476	0.0493	-1.25	* 0.0111	0.180	-1.49	*
NTourStopsAU	PANELSIGMA1	0.000962	0.00896	-1.27	* 0.00212	0.437	-2.57	
PANELSIGMA1	WithinMiAU	-0.00290	-0.00640	-1.27	* -0.00265	-0.164	-1.64	*
CostAU	NTourStopsAU	0.000942	0.0548	1.27	* -0.0118	-0.498	1.00	*
CostTR	MIncome	0.000881	0.00995	-1.27	* 0.0309	0.453	-1.73	*
NoBagsAU	PANELSIGMA3	0.000605	0.00384	-1.29	* 0.000323	0.136	-2.06	
PANELSIGMA3	SpanishDumAU	6.89e-005	0.000373	1.29	* -0.000446	-0.207	2.52	

CostTR	LowIncomeAU	0.00954	0.139	1.29	*	0.0259	0.448	1.57	*
CostAU	TranMeter0TR	0.000486	0.0190	1.30	*	-0.00176	-0.155	2.85	
PANELSIGMA4	WalkCshDayWK	0.0152	0.109	-1.32	*	-0.0364	-0.347	-1.12	*
MIncome	SpanishDumAU	-0.0238	-0.0766	1.33	*	0.0146	0.0933	1.96	*
CostTR	PANELSIGMA3	2.66e-005	0.000506	-1.33	*	0.000576	0.614	-3.56	
MIncome	NoBagsAU	-0.00903	-0.0341	1.33	*	-0.0685	-0.397	1.42	*
PANELSIGMA3	WithinMiAU	2.48e-005	7.26e-005	-1.33	*	0.00201	0.357	-1.67	*
SpanishDumAU	Time	0.000357	0.0578	-1.39	*	-0.00499	-0.648	-2.21	
PANELSIGMA1	Wal_Space0AU	0.00199	0.0202	-1.39	*	0.000158	0.0636	-5.23	
PANELSIGMA1	TranMeter0TR	0.000536	0.00336	1.40	*	0.000702	0.300	6.69	
MIncome	NTourStopsAU	-0.00809	-0.0593	1.40	*	-0.0324	-0.263	1.47	*
MultiTreeCWK	PANELSIGMA4	0.00319	0.176	-1.40	*	0.000981	0.142	-2.03	
ShopAloneAU	TotPop_T0WK	0.00264	0.0675	-1.42	*	0.000323	0.0168	-2.15	
MultiTreeCWK	ShopAloneAU	3.89e-005	0.00139	1.43	*	-0.000149	-0.0148	2.21	
TotEmp_H0AU	WithinMiAU	-0.00124	-0.101	-1.43	*	0.00135	0.296	-1.70	*
MIncome	WalkCshDayWK	0.0476	0.159	-1.43	*	0.0741	0.270	-1.59	*
PANELSIGMA4	TotPop_T0WK	0.00597	0.236	1.44	*	0.00159	0.121	1.98	
NoBagsAU	Time	0.000418	0.0794	-1.44	*	0.00356	0.421	-1.91	*
SpanishDumAU	TotEmp_H0AU	0.000221	0.0332	-1.46	*	-0.000743	-0.425	-2.42	
CostAU	GroupHouseAU	0.00342	0.0926	1.47	*	-0.000403	-0.0111	1.86	*
Time	WithinMiAU	-0.000379	-0.0332	-1.48	*	-0.000830	-0.0413	-1.75	*
EnjWalkDumWK	TotEmp_H0AU	-0.000107	-0.0158	1.49	*	0.000660	0.251	1.67	*
NTourStopsAU	PANELSIGMA3	-8.76e-005	-0.00108	-1.51	*	-0.000538	-0.317	-2.42	
NoBagsAU	TotEmp_H0AU	-5.51e-005	-0.00970	-1.52	*	1.12e-006	0.000583	-1.98	
DisabilityAU	TotEmp_H0AU	3.04e-005	0.00505	1.55	*	0.000736	0.261	1.45	*
MIncome	TranMeter0TR	-0.000818	-0.00404	1.55	*	0.000627	0.0106	2.11	
EnjWalkDumWK	Time	-0.000159	-0.0254	1.56	*	-0.00276	-0.238	1.73	*
GroupHouseAU	PANELSIGMA1	0.000400	0.00173	-1.59	*	-0.000710	-0.0952	-2.73	
CostAU	StudentAU	0.00272	0.0649	1.59	*	-0.00640	-0.161	2.04	
PANELSIGMA3	TranMeter0TR	0.00135	0.0113	1.61	*	0.000152	0.186	6.39	
ShopAloneAU	TotPop_T0TR	0.00300	0.0596	-1.63	*	0.00204	0.129	-2.59	
DisabilityAU	Time	-0.000221	-0.0395	1.63	*	0.000963	0.0773	1.53	*
GroupHouseAU	MIncome	-0.0305	-0.104	-1.64	*	0.00392	0.0207	-2.16	
CostAU	LowIncomeAU	-0.00354	-0.112	1.66	*	0.00927	0.249	1.92	*
TotPop_T0TR	Wal_Space0AU	-0.00257	-0.0946	-1.69	*	-0.00241	-0.306	-2.78	
CostAU	WithinMiAU	-0.0109	-0.150	-1.70	*	0.0230	0.293	-2.09	
PANELSIGMA1	StudentAU	0.000616	0.00235	1.71	*	0.00190	0.232	2.94	
LowIncomeAU	PANELSIGMA1	-0.00277	-0.0141	-1.71	*	-0.00147	-0.191	-2.64	
NTourStopsAU	WithinMiAU	-0.175	-0.722	-1.71	*	-0.161	-0.729	-1.94	*
DisabilityAU	ShopAloneAU	-0.0202	-0.100	1.73	*	-0.0563	-0.400	1.71	*
ShopAloneAU	WithinMiAU	0.0235	0.0568	-1.73	*	0.0453	0.199	-2.19	
EnjWalkDumWK	ShopAloneAU	-0.0112	-0.0495	1.73	*	-0.0411	-0.313	1.94	*
GroupHouseAU	PANELSIGMA3	0.000324	0.00186	-1.74	*	0.000414	0.159	-2.72	
PANELSIGMA3	Wal_Space0AU	-0.000170	-0.00229	-1.74	*	-9.02e-005	-0.104	-5.31	
SpanishDumAU	TotPop_T0WK	-0.00167	-0.0320	-1.78	*	-0.00143	-0.0604	-2.92	
MIncome	StudentAU	-0.0231	-0.0694	1.78	*	0.0489	0.236	2.66	
MultiTreeCWK	SpanishDumAU	-0.00158	-0.0422	1.80	*	0.00357	0.289	3.13	
PANELSIGMA1	WalkCshDayWK	-0.000321	-0.00136	-1.82	*	-0.00330	-0.304	-2.17	
NoBagsAU	WithinMiAU	-0.0757	-0.161	-1.83	*	-0.0979	-0.319	-2.10	
CostTR	WithinMiAU	-0.0191	-0.122	-1.84	*	0.0739	0.607	-2.47	
PANELSIGMA3	StudentAU	-8.88e-005	-0.000449	1.84	*	-0.000830	-0.291	2.86	
TotPop_T0TR	WalkCshDayWK	0.00170	0.0263	-1.89	*	-0.00579	-0.169	-1.73	*
NoBagsAU	TotPop_T0WK	-0.000413	-0.00927	-1.89	*	-0.00939	-0.362	-2.31	
SpanishDumAU	WithinMiAU	-0.0310	-0.0561	-1.91	*	-0.0485	-0.173	-2.33	
MultiTreeCWK	NoBagsAU	-0.000285	-0.00894	1.93	*	-0.00664	-0.489	2.39	
ASC3	StudentAU	0.0429	0.0638	-1.93	*	-0.00573	-0.0152	-2.47	
LowIncomeAU	PANELSIGMA3	0.000254	0.00171	-1.93	*	0.000412	0.154	-2.64	
SpanishDumAU	TotPop_T0TR	-0.00192	-0.0285	-1.93	*	0.00165	0.0843	-3.32	
GroupHouseAU	Time	0.000466	0.0801	-1.94	*	0.00419	0.451	-2.59	
TotEmp_H0AU	TotPop_T0WK	-0.000175	-0.150	-1.96	*	-7.16e-005	-0.186	-2.62	
CostAU	EnjWalkDumWK	-0.00126	-0.0317	-1.98		-0.0129	-0.285	-2.10	
Time	TranMeter0TR	0.000206	0.0512	2.00		0.000804	0.276	5.96	
StudentAU	Time	0.000279	0.0421	-2.00		-0.000275	-0.0270	-2.70	
GroupHouseAU	TotEmp_H0AU	-0.000147	-0.0234	-2.02		0.00104	0.492	-2.65	
PANELSIGMA3	WalkCshDayWK	-0.000203	-0.00114	-2.04		2.03e-005	0.00538	-2.22	
ASC1	StudentAU	0.0632	0.0996	-2.06		0.0959	0.281	-3.09	
TranMeter0TR	WithinMiAU	-0.000211	-0.000585	-2.06		0.0317	0.299	-2.67	
TotPop_T0WK	WalkCshDayWK	-0.00220	-0.0437	-2.07		-0.00526	-0.127	-1.89	*
StudentAU	TotEmp_H0AU	-3.77e-006	-0.000528	-2.08		0.000311	0.135	-2.81	
NoBagsAU	TotPop_T0TR	0.000902	0.0157	-2.08		-0.00747	-0.348	-2.60	
CostAU	DisabilityAU	-0.00160	-0.0452	-2.09		-0.0218	-0.449	-1.82	*

ASC3	GroupHouseAU	0.0295	0.0499	-2.10	-0.0790	-0.230	-2.51	
PANELSIGMA4	TotEmp_H0AU	-0.000453	-0.140	2.12	-0.000139	-0.143	3.08	
TotEmp_H0AU	TranMeter0TR	9.33e-006	0.00215	2.12	0.000116	0.176	6.14	
MultiTreeCWK	WalkCshDayWK	0.00422	0.117	-2.12	-0.00564	-0.260	-1.89	*
TotPop_T0WK	Wal_Space0AU	-0.00323	-0.153	-2.14	-0.00154	-0.162	-3.38	
PANELSIGMA4	ShopAloneAU	0.0180	0.166	2.14	0.0153	0.314	3.54	
PANELSIGMA4	SpanishDumAU	-0.0135	-0.0931	2.17	-0.0180	-0.301	3.25	
EnjWalkDumWK	NoBagsAU	0.0117	0.0455	2.17	0.0310	0.175	2.75	
DisabilityAU	SpanishDumAU	0.0169	0.0627	2.19	-0.0234	-0.135	2.37	
DisabilityAU	NoBagsAU	0.00412	0.0179	2.19	0.0493	0.259	2.65	
EnjWalkDumWK	SpanishDumAU	0.0341	0.113	2.21	0.0503	0.312	3.25	
CostTR	EnjWalkDumWK	-0.00200	-0.0232	-2.23	0.0118	0.168	-2.63	
ASC1	GroupHouseAU	0.0395	0.0709	-2.23	-0.0589	-0.189	-2.75	
EnjWalkDumWK	WalkCshDayTR	0.000858	0.00213	-2.24	-0.128	-0.301	-1.83	*
ASC3	TranMeter0TR	-0.0981	-0.240	-2.25	0.0154	0.143	-3.35	
LowIncomeAU	WithinMiAU	-0.00341	-0.00767	-2.25	0.00430	0.0124	-2.65	
PANELSIGMA4	Time	-0.000757	-0.253	2.27	0.00255	0.595	3.58	
GroupHouseAU	WithinMiAU	0.0402	0.0772	-2.27	0.102	0.301	-3.02	
LowIncomeAU	Time	0.000408	0.0821	-2.27	-0.00306	-0.320	-2.40	
TotEmp_H0AU	TotPop_T0TR	-0.000258	-0.172	-2.30	-5.91e-005	-0.186	-4.74	
StudentAU	WithinMiAU	0.0146	0.0247	-2.31	0.201	0.544	-3.72	
CostTR	DisabilityAU	-0.00741	-0.0964	-2.31	-0.0377	-0.499	-2.00	
ASC3	LowIncomeAU	0.126	0.250	-2.31	-0.0663	-0.188	-2.53	
NTourStopsAU	Time	0.000450	0.166	-2.33	0.00138	0.228	-2.19	
GroupHouseAU	MultiTreeCWK	-0.00472	-0.134	-2.34	-0.00264	-0.177	-3.07	
WalkCshDayTR	WalkCshDayWK	0.182	0.477	2.36	0.282	0.568	2.19	
LowIncomeAU	TotEmp_H0AU	0.000348	0.0650	-2.37	-0.000510	-0.235	-2.55	
GroupHouseAU	TotPop_T0WK	0.00304	0.0618	-2.38	-0.00579	-0.203	-2.96	
ASC3	SpanishDumAU	0.0980	0.156	-2.38	-0.0459	-0.161	-2.90	
MultiTreeCWK	StudentAU	-0.00129	-0.0323	2.39	0.00360	0.220	3.31	
NoBagsAU	PANELSIGMA4	0.00138	0.0112	-2.39	0.00733	0.112	-3.32	
StudentAU	TotPop_T0WK	0.00304	0.0543	-2.39	0.000386	0.0124	-3.21	
LowIncomeAU	MIncome	0.107	0.428	-2.41	0.0837	0.430	-2.78	
EnjWalkDumWK	NTourStopsAU	0.00846	0.0638	2.41	0.0174	0.137	2.71	
EnjWalkDumWK	TranMeter0TR	0.00349	0.0177	2.42	0.0203	0.332	3.38	
Time	TotPop_T0WK	1.56e-008	1.44e-005	-2.44	-0.000487	-0.287	-2.86	
DisabilityAU	TranMeter0TR	-0.00839	-0.0477	2.44	0.0115	0.176	2.91	
ShopAloneAU	Wal_Space0AU	0.00182	0.0201	-2.45	-0.00327	-0.0934	-3.67	
EnjWalkDumWK	StudentAU	-0.0208	-0.0642	2.45	-0.0484	-0.227	2.81	
ASC3	NoBagsAU	0.0582	0.109	-2.46	0.114	0.363	-3.60	
ASC1	SpanishDumAU	0.0658	0.111	-2.46	-0.0281	-0.109	-3.21	
DisabilityAU	NTourStopsAU	-0.00252	-0.0213	2.46	0.0375	0.275	2.61	
EnjWalkDumWK	GroupHouseAU	0.00122	0.00429	2.47	0.0205	0.105	3.11	
TotEmp_H0AU	WalkCshDayWK	-0.000571	-0.0891	-2.48	-0.000167	-0.0546	-2.27	
NTourStopsAU	TotEmp_H0AU	6.63e-007	0.000227	-2.49	-0.000244	-0.178	-2.31	
DisabilityAU	WalkCshDayTR	0.0338	0.0941	-2.51	-0.0771	-0.168	-1.94	*
GroupHouseAU	TotPop_T0TR	0.000310	0.00489	-2.51	-0.00171	-0.0727	-3.29	
DisabilityAU	LowIncomeAU	-0.0387	-0.178	2.51	-0.126	-0.584	2.16	
EnjWalkDumWK	LowIncomeAU	-0.0210	-0.0864	2.53	0.00935	0.0467	2.98	
StudentAU	TotPop_T0TR	0.00251	0.0349	-2.53	0.00427	0.165	-3.52	
ShopAloneAU	WalkCshDayWK	-0.00122	-0.00565	-2.55	-0.0128	-0.0838	-2.61	
ASC1	TranMeter0TR	0.00767	0.0199	-2.55	-0.00842	-0.0862	-3.57	
Time	WalkCshDayWK	-0.00141	-0.237	-2.55	-0.00570	-0.422	-2.31	
TotPop_T0WK	TranMeter0TR	-0.000641	-0.0188	2.56	0.00213	0.238	7.42	
SpanishDumAU	Wal_Space0AU	-0.00475	-0.0394	-2.57	0.0110	0.255	-4.79	
ASC1	LowIncomeAU	0.173	0.363	-2.58	0.0216	0.0675	-3.02	
ASC1	NoBagsAU	0.0600	0.119	-2.60	0.0429	0.151	-3.60	
MultiTreeCWK	TranMeter0TR	-0.00115	-0.0473	2.60	-7.50e-005	-0.0160	7.32	
DisabilityAU	GroupHouseAU	0.0220	0.0864	2.65	0.0318	0.152	2.96	
ASC3	CostTR	-0.0457	-0.256	-2.65	-0.0769	-0.621	-3.29	
GroupHouseAU	PANELSIGMA4	-0.0141	-0.103	-2.66	-0.00650	-0.0901	-3.57	
Time	TotPop_T0TR	-4.80e-005	-0.0345	-2.67	-0.000413	-0.294	-4.71	
LowIncomeAU	TotPop_T0WK	-0.00321	-0.0764	-2.69	0.00600	0.204	-3.09	
SpanishDumAU	WalkCshDayWK	-0.0133	-0.0464	-2.71	0.0166	0.0885	-3.31	
DisabilityAU	StudentAU	0.0283	0.0977	2.72	-0.00126	-0.00549	2.89	
CostTR	Time	0.000174	0.0988	-2.72	-0.00125	-0.372	-2.76	
LowIncomeAU	MultiTreeCWK	-0.00403	-0.134	-2.72	-0.00361	-0.236	-2.97	
TotPop_T0TR	TranMeter0TR	-0.00215	-0.0490	2.73	0.00237	0.320	8.77	
Time	TotEmp_H0AU	2.00e-005	0.145	-2.76	1.83e-005	0.146	-1.82	*
NoBagsAU	Wal_Space0AU	-0.00316	-0.0307	-2.77	-0.0132	-0.278	-3.47	
LowIncomeAU	PANELSIGMA4	-0.0319	-0.274	-2.80	-0.0387	-0.522	-3.05	

Wal_Space0AU	WalkCshDayTR	0.00381	0.0237	-2.83	0.0442	0.388	-2.60
MultiTreeCWK	Wal_Space0AU	0.00891	0.590	-2.84	0.00180	0.362	-4.36
LowIncomeAU	TotPop_T0TR	-0.00392	-0.0724	-2.86	0.00683	0.282	-3.37
MultiTreeCWK	TotEmp_H0AU	7.42e-005	0.0891	2.89	3.99e-006	0.0199	5.19
ASC3	NTourStopsAU	0.142	0.517	-2.91	0.183	0.815	-4.49
ASC3	CostAU	-0.000869	-0.0106	-2.91	-0.0205	-0.257	-3.73
PANELSIGMA4	StudentAU	0.0199	0.129	2.91	0.0150	0.189	4.07
ASC1	CostTR	0.0173	0.102	-2.95	-0.0371	-0.330	-3.76
MIncome	WalkCshDayTR	0.0419	0.101	-2.95	0.146	0.352	-3.12
CostAU	WalkCshDayWK	-0.00447	-0.119	-2.95	-0.00969	-0.184	-2.66
ASC3	ShopAloneAU	0.146	0.310	-2.96	0.0556	0.240	-3.83
ASC3	WithinMiAU	-0.298	-0.257	-2.97	-0.462	-0.622	-3.28
ASC3	PANELSIGMA1	-0.00445	-0.00867	-2.98	0.00594	0.362	-4.26
PANELSIGMA4	TranMeter0TR	0.000503	0.00534	2.98	0.00433	0.191	6.60
NoBagsAU	WalkCshDayWK	0.0216	0.0879	-3.00	0.0606	0.293	-3.47
CostAU	PANELSIGMA4	-0.00187	-0.0983	-3.02	-0.00273	-0.163	-3.91
GroupHouseAU	Wal_Space0AU	-0.0141	-0.124	-3.03	-0.00562	-0.108	-4.13
ASC1	WithinMiAU	-0.309	-0.283	-3.04	-0.203	-0.301	-3.84
GroupHouseAU	WalkCshDayWK	-0.0254	-0.0938	-3.05	-0.0490	-0.216	-3.07
PANELSIGMA4	WalkCshDayTR	0.0137	0.0713	-3.05	-0.0825	-0.522	-2.37
ASC3	PANELSIGMA3	-0.00439	-0.0113	-3.05	-0.00162	-0.282	-4.20
CostTR	TotEmp_H0AU	0.000713	0.376	-3.06	0.000365	0.481	-3.31
StudentAU	Wal_Space0AU	-0.00520	-0.0401	-3.07	0.00741	0.130	-4.47
ASC1	CostAU	0.000609	0.00784	-3.10	0.000575	0.00795	-4.23
NTourStopsAU	TotPop_T0WK	0.000914	0.0399	-3.10	0.00207	0.111	-3.04
NTourStopsAU	PANELSIGMA4	-0.00599	-0.0944	-3.11	0.0201	0.428	-4.77
ASC1	NTourStopsAU	0.139	0.535	-3.12	0.102	0.503	-4.38
ASC1	EnjWalkDumWK	-0.282	-0.470	-3.13	-0.162	-0.415	-4.10
StudentAU	WalkCshDayWK	-0.0153	-0.0496	-3.13	-0.0230	-0.0923	-3.36
ASC3	Time	0.00108	0.0832	-3.13	0.00523	0.256	-4.16
MultiTreeCWK	NTourStopsAU	-0.00102	-0.0621	3.14	-0.00139	-0.143	2.99
ASC3	MIncome	0.0489	0.0749	-3.16	-0.0636	-0.153	-3.72
CostTR	WalkCshDayWK	-0.00655	-0.0801	-3.16	-0.00218	-0.0266	-2.97
CostTR	PANELSIGMA4	-0.00561	-0.136	-3.17	-0.0173	-0.665	-3.46
ASC1	PANELSIGMA1	0.00834	0.0172	-3.17	0.00309	0.208	-4.70
NTourStopsAU	WalkCshDayWK	-0.0134	-0.106	-3.17	0.000828	0.00560	-3.03
ASC3	TotEmp_H0AU	0.00216	0.155	-3.17	-0.000627	-0.135	-4.18
TranMeter0TR	WalkCshDayWK	-0.00511	-0.0273	-3.20	-0.0276	-0.388	-3.26
ASC1	ShopAloneAU	0.159	0.359	-3.21	0.112	0.536	-4.75
ASC3	TotPop_T0TR	-0.0707	-0.501	-3.23	-0.0121	-0.233	-4.43
ASC1	PANELSIGMA3	0.000490	0.00134	-3.24	-0.00110	-0.211	-4.65
ASC3	TotPop_T0WK	-0.0278	-0.254	-3.26	-0.00833	-0.133	-4.34
PANELSIGMA1	WalkCshDayTR	0.00187	0.00575	-3.32	-0.00543	-0.333	-3.24
ASC1	Time	0.000285	0.0233	-3.33	0.00263	0.142	-4.58
ASC3	MultiTreeCWK	0.000447	0.00570	-3.33	-0.00940	-0.287	-4.35
NTourStopsAU	TotPop_T0TR	0.00101	0.0343	-3.34	0.00181	0.118	-3.44
TotEmp_H0AU	Wal_Space0AU	0.000548	0.204	-3.36	0.000106	0.151	-5.60
LowIncomeAU	Wal_Space0AU	-0.0180	-0.186	-3.36	-0.0280	-0.523	-3.63
ASC1	TotEmp_H0AU	0.00140	0.106	-3.37	-0.00111	-0.265	-4.61
ASC1	MIncome	0.0754	0.122	-3.39	0.0835	0.221	-4.75
MultiTreeCWK	Time	-5.45e-005	-0.0705	3.42	-0.000293	-0.330	4.74
ASC1	TotPop_T0WK	-0.0341	-0.329	-3.43	-0.0112	-0.197	-4.76
CostAU	Time	0.000144	0.178	-3.43	0.000428	0.198	-2.69
LowIncomeAU	WalkCshDayWK	0.00474	0.0205	-3.46	0.0151	0.0646	-3.44
ASC1	MultiTreeCWK	-0.0246	-0.333	-3.47	-0.0105	-0.354	-4.78
ASC3	PANELSIGMA4	-0.0367	-0.121	-3.47	0.0777	0.490	-5.27
ASC3	EnjWalkDumWK	-0.0104	-0.0164	-3.48	0.0323	0.0753	-4.61
TranMeter0TR	Wal_Space0AU	-0.00394	-0.0501	-3.48	-0.00411	-0.252	-7.36
TotPop_T0TR	WalkCshDayTR	-0.00326	-0.0364	-3.48	-0.00410	-0.0793	-2.96
ASC1	TotPop_T0TR	-0.0354	-0.266	-3.50	-0.00657	-0.140	-4.92
Time	Wal_Space0AU	-7.64e-005	-0.0306	-3.51	-0.00119	-0.383	-5.45
CostTR	TotPop_T0WK	-0.000674	-0.0453	-3.52	0.00132	0.128	-4.34
PANELSIGMA3	WalkCshDayTR	0.00200	0.00816	-3.56	-0.000407	-0.0715	-3.28
ASC3	DisabilityAU	0.0271	0.0479	-3.58	0.190	0.412	-5.43
TotPop_T0WK	WalkCshDayTR	-0.00194	-0.0279	-3.64	-0.00652	-0.104	-3.06
ASC1	PANELSIGMA4	-0.0382	-0.133	-3.66	0.0215	0.149	-5.38
MultiTreeCWK	WalkCshDayTR	0.00257	0.0518	-3.68	0.00272	0.0833	-3.10
ASC1	DisabilityAU	-0.00545	-0.0102	-3.69	0.0849	0.203	-5.15
ASC3	WalkCshDayWK	-0.0407	-0.0675	-3.82	0.0524	0.105	-4.99
CostAU	TotEmp_H0AU	-0.000103	-0.118	-3.84	-0.000111	-0.227	-3.06
ASC3	Wal_Space0AU	0.0413	0.163	-3.86	-0.00273	-0.0238	-4.95

CostTR	MultiTreeCWK	-0.000203	-0.0191	-3.86	0.000886	0.165	-4.68
NTourStopsAU	Wal_Space0AU	-0.00516	-0.0975	-3.90	-0.00921	-0.271	-4.17
ShopAloneAU	WalkCshDayTR	-0.000976	-0.00328	-3.91	0.0248	0.108	-3.73
ASC1	WalkCshDayWK	-0.0732	-0.128	-3.92	0.0553	0.122	-5.40
TotEmp_H0AU	WalkCshDayTR	-0.00176	-0.198	-3.93	-0.000621	-0.135	-3.32
ASC1	Wal_Space0AU	-0.00575	-0.0240	-3.94	-0.00392	-0.0377	-5.44
SpanishDumAU	WalkCshDayTR	-0.0195	-0.0490	-3.94	0.0824	0.291	-4.42
Time	WalkCshDayTR	-0.00217	-0.264	-3.99	-0.0113	-0.555	-3.32
CostTR	TotPop_T0TR	0.00202	0.106	-4.01	0.00223	0.262	-5.40
CostAU	TotPop_T0TR	0.000176	0.0199	-4.06	-0.00185	-0.337	-4.58
CostAU	TotPop_T0WK	0.000264	0.0386	-4.07	-0.00170	-0.257	-3.65
NoBagsAU	WalkCshDayTR	-0.000907	-0.00268	-4.14	-0.0957	-0.308	-3.47
TranMeter0TR	WalkCshDayTR	-0.0382	-0.147	-4.24	-0.0735	-0.686	-3.80
CostAU	Wal_Space0AU	-0.00178	-0.113	-4.25	0.000530	0.0438	-6.48
CostAU	WalkCshDayTR	-0.00540	-0.104	-4.28	0.0105	0.132	-3.68
StudentAU	WalkCshDayTR	-0.00859	-0.0202	-4.33	0.0725	0.193	-4.60
CostTR	WalkCshDayTR	-0.0183	-0.162	-4.34	0.0364	0.295	-4.00
GroupHouseAU	WalkCshDayTR	-0.00642	-0.0171	-4.35	-0.0615	-0.180	-3.86
CostTR	Wal_Space0AU	-0.00116	-0.0337	-4.37	-0.000937	-0.0499	-6.02
NTourStopsAU	WalkCshDayTR	-0.0174	-0.0999	-4.40	-0.0831	-0.373	-3.50
ASC3	WalkCshDayTR	-0.132	-0.158	-4.48	-0.267	-0.356	-4.56
LowIncomeAU	WalkCshDayTR	-0.00361	-0.0113	-4.58	0.0435	0.124	-4.30
CostAU	MultiTreeCWK	-0.000188	-0.0384	-4.78	-0.000613	-0.177	-4.58
ASC1	WalkCshDayTR	-0.0465	-0.0591	-4.86	0.0816	0.120	-5.93

Smallest singular value of the hessian: 0.435889

Mixed Logit Model of Primary Tour Mode chosen by Respondents (N=959)

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// This file has automatically been generated.
// 12/08/10 18:52:48
// Michel Bierlaire, EPFL 2001-2008

BIOGEME Version 1.8 [Sat Mar 7 14:36:56 CEST 2009]
Michel Bierlaire, EPFL

   Model specification file for mixed logit model of Bay Area Walgreens customer mode choice with
panel data
   Note that ASC0 is constrained to 0.0 and will not be estimated

                         Model:  Mixed Multinomial Logit for panel data
               Number of draws: 1000
Number of estimated parameters: 47
        Number of observations: 959
         Number of individuals: 20
           Null log-likelihood: -1187.507
           Init log-likelihood: -405.262
          Final log-likelihood: -398.684
         Likelihood ratio test: 1577.646
                    Rho-square: 0.664
           Adjusted rho-square: 0.625
           Final gradient norm: +8.356e-006
                    Diagnostic: Convergence reached
                      Run time: 54:14
           Variance-covariance: from finite difference hessian
                   Sample file: Schneider_Dataset_959_v7_120810.dat

Utility parameters
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Name	Value	Std err	t-test	p-val		Rob. std err	Rob. t-test	Rob. p-val	
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ASC1	-3.39	0.783	-4.33	0.00		0.845	-4.01	0.00	
ASC2	-2.40	1.05	-2.28	0.02		1.21	-1.99	0.05	
ASC3	-5.46	0.714	-7.65	0.00		0.533	-10.25	0.00	
ASC4	0.00	--fixed--							
BKPKGSPAATBK	0.0766	0.0563	1.36	0.17	*	0.0476	1.61	0.11	*
BKPKGSPAATTR	-0.0878	0.0552	-1.59	0.11	*	0.0486	-1.81	0.07	*
BKPKGSPAATWK	0.0323	0.0332	0.97	0.33	*	0.0325	0.99	0.32	*
BkFacMi_HBK	0.227	0.126	1.80	0.07	*	0.130	1.75	0.08	*
BusPassBK	-0.0711	0.824	-0.09	0.93	*	0.887	-0.08	0.94	*
BusPassTR	1.87	0.335	5.58	0.00		0.345	5.42	0.00	
BusPassWK	1.25	0.354	3.53	0.00		0.270	4.64	0.00	
DisabilityAU	0.490	0.355	1.38	0.17	*	0.413	1.19	0.24	*
EnjWalkDumWK	0.607	0.464	1.31	0.19	*	0.370	1.64	0.10	*
FemaleDumBK	-1.31	0.528	-2.48	0.01		0.545	-2.40	0.02	
GroupHouseBK	-0.625	1.07	-0.58	0.56	*	0.960	-0.65	0.51	*
GroupHouseTR	1.16	0.401	2.88	0.00		0.322	3.60	0.00	
GroupHouseWK	0.874	0.361	2.42	0.02		0.384	2.28	0.02	
NTourStopsBK	-0.220	0.217	-1.02	0.31	*	0.174	-1.26	0.21	*
NTourStopsTR	0.0145	0.0870	0.17	0.87	*	0.0650	0.22	0.82	*
NTourStopsWK	0.298	0.102	2.93	0.00		0.111	2.69	0.01	
NoBagsWK	0.464	0.332	1.40	0.16	*	0.260	1.78	0.07	*
NoChildrenAU	-0.353	0.244	-1.45	0.15	*	0.207	-1.70	0.09	*
PANELMEAN1	0.00	--fixed--							
PANELMEAN2	0.00	--fixed--							
PANELMEAN3	0.00	--fixed--							
PANELMEAN4	0.00	--fixed--							
PANELSIGMA1	0.0195	0.217	0.09	0.93	*	0.0288	0.68	0.50	*
PANELSIGMA2	0.0131	0.623	0.02	0.98	*	0.0398	0.33	0.74	*
PANELSIGMA3	-0.00708	0.206	-0.03	0.97	*	0.00824	-0.86	0.39	*
PANELSIGMA4	-0.0138	0.276	-0.05	0.96	*	0.0295	-0.47	0.64	*
PayParkDumAU	-0.356	0.277	-1.28	0.20	*	0.215	-1.66	0.10	*
SaturdayAU	0.409	0.218	1.87	0.06	*	0.246	1.67	0.10	*
ShopAloneBK	0.439	0.616	0.71	0.48	*	0.861	0.51	0.61	*
ShopAloneTR	1.26	0.411	3.06	0.00		0.322	3.91	0.00	
ShopAloneWK	0.129	0.302	0.43	0.67	*	0.256	0.50	0.62	*
SpanishDumAU	-0.512	0.359	-1.43	0.15	*	0.271	-1.89	0.06	*

StudentAU	-1.04	0.306	-3.41	0.00		0.280	-3.72	0.00	
TotEmp_H0AU	-0.0277	0.00530	-5.22	0.00		0.00207	-13.37	0.00	
TotPop_T0BK	0.0230	0.123	0.19	0.85	*	0.137	0.17	0.87	*
TotPop_T0TR	0.255	0.0520	4.91	0.00		0.0343	7.43	0.00	
TotPop_T0WK	0.129	0.0528	2.44	0.01		0.0514	2.51	0.01	
TourMilesBK	-0.140	0.0664	-2.11	0.03		0.0768	-1.83	0.07	*
TourMilesTR	-0.000910	0.00764	-0.12	0.91	*	0.00731	-0.12	0.90	*
TourMilesWK	-0.525	0.0974	-5.39	0.00		0.144	-3.65	0.00	
TourUnder2WK	1.62	0.388	4.18	0.00		0.505	3.21	0.00	
WBMEAN	0.00	--fixed--							
WBSIGMA	-0.0753	0.484	-0.16	0.88	*	0.0831	-0.91	0.36	*
Wal_Space0AU	0.234	0.107	2.19	0.03		0.0953	2.45	0.01	
WalkCrmDayAU	0.614	0.387	1.59	0.11	*	0.537	1.14	0.25	*
WalkCshDayBK	-0.0681	1.08	-0.06	0.95	*	1.07	-0.06	0.95	*
WalkCshDayTR	0.801	0.405	1.98	0.05		0.474	1.69	0.09	*
WalkCshDayWK	0.621	0.423	1.47	0.14	*	0.445	1.40	0.16	*
ZeroAutosAU	-3.08	0.437	-7.06	0.00		0.624	-4.94	0.00	

Variance of normal random coefficients
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Name	Value	Std err	t-test
PANELMEAN1_PANELSIGMA1	1.75	0.00848	206.11
PANELMEAN2_PANELSIGMA2	0.980	0.0163	60.03
PANELMEAN3_PANELSIGMA3	1.33	0.00292	456.52
PANELMEAN4_PANELSIGMA4	0.250	0.00761	32.82
WBMEAN_WBSIGMA	0.0511	0.0729	0.70

Utility functions
****

4 Auto Auto_Av ASC4 * one + SpanishDumAU * SpanishDum + NoChildrenAU * NoChildren + DisabilityAU * Disability + SaturdayAU * Saturday + StudentAU * Student + ZeroAutosAU * ZeroAutos + WalkCrmDayAU * WalkCrmDay + PayParkDumAU * PayParkDum + TotEmp_H0AU * TotEmp_H0 + Wal_Space0AU * Wal_Space0 + PANELMEAN4 [PANELSIGMA4] * one

2 Bike Bike_Av ASC2 * one + TourMilesBK * TourMiles + NTourStopsBK * NTourStops + ShopAloneBK * ShopAlone + FemaleDumBK * FemaleDum + GroupHouseBK * GroupHouse + BusPassBK * BusPass + WalkCshDayBK * WalkCshDay + TotPop_T0BK * TotPop_T0 + BKPKGSPAATBK * BKPKGSPAAT + BkFacMi_HBK * BkFacMi_H + WBMEAN [WBSIGMA] * one + PANELMEAN2 [PANELSIGMA2] * one

3 Transit Tran_Av ASC3 * one + TourMilesTR * TourMiles + NTourStopsTR * NTourStops + ShopAloneTR * ShopAlone + GroupHouseTR * GroupHouse + BusPassTR * BusPass + WalkCshDayTR * WalkCshDay + TotPop_T0TR * TotPop_T0 + BKPKGSPAATTR * BKPKGSPAAT + PANELMEAN3 [PANELSIGMA3] * one

1 Walk Walk_Av ASC1 * one + TourMilesWK * TourMiles + ShopAloneWK * ShopAlone + TourUnder2WK * TourUnder2 + NTourStopsWK * NTourStops + NoBagsWK * NoBags + GroupHouseWK * GroupHouse + BusPassWK * BusPass + EnjWalkDumWK * EnjWalkDum + WalkCshDayWK * WalkCshDay + TotPop_T0WK * TotPop_T0 + BKPKGSPAATWK * BKPKGSPAAT + WBMEAN [WBSIGMA] * one + PANELMEAN1 [PANELSIGMA1] * one

Correlation of coefficients
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Coeff1	Coeff2	Covariance	Correlation	t-test		Rob. covar.	Rob. correl.	Rob. t-test	
ShopAloneWK	TotPop_T0WK	-0.000861	-0.0540	-0.00	*	0.000635	0.0482	-0.00	*
NTourStopsTR	PANELSIGMA2	4.75e-005	0.000876	0.00	*	1.74e-005	0.00674	0.02	*
BusPassBK	WalkCshDayBK	0.0548	0.0615	-0.00	*	-0.166	-0.175	-0.00	*
BusPassBK	WBSIGMA	-0.00382	-0.00957	0.00	*	0.0335	0.455	0.00	*
WBSIGMA	WalkCshDayBK	-0.000792	-0.00151	-0.01	*	-0.0296	-0.333	-0.01	*
NoChildrenAU	PayParkDumAU	-0.00376	-0.0556	0.01	*	0.00413	0.0926	0.01	*
PANELSIGMA1	PANELSIGMA2	0.000998	0.00737	0.01	*	-0.000165	-0.144	0.12	*
EnjWalkDumWK	WalkCrmDayAU	-0.0129	-0.0720	-0.01	*	0.0890	0.448	-0.01	*
BusPassWK	ShopAloneTR	0.000254	0.00174	-0.01	*	-0.00604	-0.0695	-0.02	*
PANELSIGMA1	TotPop_T0BK	0.000230	0.00861	-0.01	*	0.000488	0.124	-0.03	*
PANELSIGMA2	TotPop_T0BK	-0.00260	-0.0340	-0.02	*	-0.00188	-0.346	-0.06	*
WalkCrmDayAU	WalkCshDayWK	0.0490	0.300	-0.02	*	0.157	0.659	-0.02	*
BKPKGSPAATTR	WalkCshDayBK	0.000695	0.0117	-0.02	*	-0.00130	-0.0249	-0.02	*
PANELSIGMA3	PANELSIGMA4	-0.000272	-0.00479	0.02	*	1.92e-005	0.0789	0.22	*
BKPKGSPAATTR	BusPassBK	0.000241	0.00530	-0.02	*	0.00344	0.0798	-0.02	*
NTourStopsTR	PANELSIGMA1	-7.06e-005	-0.00373	-0.02	*	-6.53e-006	-0.00349	-0.07	*
PANELSIGMA2	TourMilesTR	1.18e-006	0.000248	0.02	*	1.62e-005	0.0555	0.35	*

EnjWalkDumWK	WalkCshDayWK	0.0124	0.0632	-0.02	*	0.0752	0.457	-0.03	*
BKPKGSPAATTR	WBSIGMA	-9.70e-005	-0.00363	-0.03	*	-0.00122	-0.303	-0.12	*
PANELSIGMA3	TourMilesTR	-3.72e-006	-0.00236	-0.03	*	4.32e-006	0.0717	-0.58	*
BKPKGSPAATWK	PANELSIGMA2	1.23e-005	0.000593	0.03	*	-0.000434	-0.335	0.32	*
PANELSIGMA2	PANELSIGMA3	0.000800	0.00623	0.03	*	2.17e-005	0.0662	0.50	*
SpanishDumAU	TourMilesWK	-0.000150	-0.00428	0.03	*	-0.00680	-0.175	0.04	*
NoBagsWK	ShopAloneBK	-0.00651	-0.0318	0.03	*	0.0224	0.100	0.03	*
TotEmp_H0AU	WalkCshDayBK	-9.89e-005	-0.0173	0.04	*	-8.82e-005	-0.0398	0.04	*
PANELSIGMA2	PANELSIGMA4	0.00215	0.0125	0.04	*	0.000199	0.170	0.59	*
BkFacMi_HBK	Wal_Space0AU	0.00164	0.122	-0.04	*	0.00210	0.169	-0.04	*
SaturdayAU	ShopAloneBK	-0.00537	-0.0399	-0.05	*	0.0150	0.0711	-0.03	*
PANELSIGMA4	TourMilesTR	1.41e-005	0.00670	-0.05	*	6.86e-005	0.318	-0.46	*
PANELSIGMA4	WalkCshDayBK	-5.10e-005	-0.000171	0.05	*	-0.00415	-0.131	0.05	*
PANELSIGMA4	TotEmp_H0AU	1.13e-006	0.000774	0.05	*	1.62e-005	0.265	0.48	*
BusPassBK	TotEmp_H0AU	-4.43e-006	-0.00101	-0.05	*	0.000373	0.203	-0.05	*
PANELSIGMA3	WalkCshDayBK	0.000154	0.000691	0.06	*	-0.000289	-0.0328	0.06	*
NTourStopsTR	TotPop_T0BK	-0.000286	-0.0267	-0.06	*	0.000491	0.0553	-0.06	*
DisabilityAU	NoBagsWK	0.00471	0.0399	0.06	*	0.00453	0.0422	0.06	*
BKPKGSPAATWK	PANELSIGMA1	-2.36e-005	-0.00327	0.06	*	-0.000103	-0.110	0.28	*
TourMilesTR	WalkCshDayBK	4.05e-005	0.00491	0.06	*	-0.000602	-0.0768	0.06	*
PANELSIGMA2	WalkCshDayBK	-0.00529	-0.00787	0.06	*	0.0132	0.309	0.08	*
PANELSIGMA2	TotEmp_H0AU	-3.02e-006	-0.000914	0.07	*	-5.30e-006	-0.0642	1.02	*
BusPassBK	PANELSIGMA4	-0.00152	-0.00670	-0.07	*	0.0111	0.423	-0.07	*
TourMilesBK	WalkCshDayBK	-0.00371	-0.0516	-0.07	*	-0.0250	-0.304	-0.07	*
DisabilityAU	ShopAloneBK	0.00356	0.0163	0.07	*	0.109	0.306	0.06	*
BKPKGSPAATWK	TotPop_T0BK	0.000182	0.0446	0.07	*	0.000288	0.0649	0.07	*
BusPassBK	PANELSIGMA3	-0.000344	-0.00203	-0.08	*	0.000381	0.0522	-0.07	*
NTourStopsTR	WalkCshDayBK	-0.000597	-0.00635	0.08	*	0.00129	0.0185	0.08	*
PANELSIGMA1	WalkCshDayBK	0.000102	0.000434	0.08	*	-0.000794	-0.0258	0.08	*
BusPassBK	PANELSIGMA2	-0.00202	-0.00395	-0.08	*	0.0133	0.376	-0.10	*
TotPop_T0BK	WalkCshDayBK	-0.00228	-0.0172	0.08	*	0.00726	0.0496	0.08	*
BusPassBK	TourMilesBK	0.00287	0.0525	0.08	*	0.0104	0.152	0.08	*
BusPassBK	TourMilesTR	-8.81e-005	-0.0140	-0.09	*	0.00256	0.395	-0.08	*
PANELSIGMA1	PANELSIGMA3	-0.000166	-0.00370	0.09	*	-4.88e-005	-0.206	0.84	*
BKPKGSPAATWK	WalkCshDayBK	0.000536	0.0149	0.09	*	0.00668	0.192	0.09	*
GroupHouseBK	TourMilesWK	-0.000773	-0.00739	-0.09	*	-0.0110	-0.0795	-0.10	*
PANELSIGMA1	TourMilesTR	2.67e-006	0.00161	0.09	*	2.60e-005	0.124	0.71	*
PANELSIGMA1	PANELSIGMA4	0.000483	0.00805	0.10	*	-0.000590	-0.696	0.62	*
NTourStopsTR	PANELSIGMA3	-2.15e-005	-0.00120	0.10	*	-0.000205	-0.382	0.31	*
NTourStopsTR	PANELSIGMA4	-9.74e-005	-0.00406	0.10	*	-0.000619	-0.323	0.36	*
TotEmp_H0AU	WBSIGMA	3.09e-005	0.0120	0.10	*	3.05e-005	0.177	0.58	*
GroupHouseBK	SpanishDumAU	0.000187	0.000484	-0.10	*	0.0150	0.0577	-0.12	*
PANELSIGMA3	TotEmp_H0AU	-1.10e-005	-0.0101	0.10	*	-1.24e-006	-0.0723	2.39	
BKPKGSPAATBK	PANELSIGMA2	0.000649	0.0185	0.10	*	-9.37e-005	-0.0495	1.00	*
BusPassBK	NTourStopsTR	-0.00114	-0.0159	-0.10	*	-0.00289	-0.0501	-0.10	*
BusPassBK	PANELSIGMA1	0.000391	0.00218	-0.11	*	-0.00460	-0.180	-0.10	*
BusPassBK	TotPop_T0BK	-0.0123	-0.121	-0.11	*	-0.0455	-0.376	-0.10	*
PANELSIGMA4	WBSIGMA	0.0137	0.103	0.12	*	0.00164	0.668	0.92	*
PANELSIGMA2	WBSIGMA	0.0276	0.0915	0.12	*	0.00108	0.326	1.11	*
PANELSIGMA4	TotPop_T0BK	-7.55e-005	-0.00223	-0.12	*	-0.000554	-0.138	-0.26	*
PANELSIGMA3	TotPop_T0BK	2.71e-005	0.00107	-0.13	*	0.000103	0.0911	-0.22	*
BKPKGSPAATWK	BusPassBK	0.000820	0.0300	0.13	*	-0.00753	-0.261	0.12	*
PANELSIGMA3	WBSIGMA	0.00747	0.0747	0.13	*	0.000311	0.454	0.86	*
TourMilesBK	WBSIGMA	0.00118	0.0365	-0.13	*	0.00209	0.327	-0.70	*
GroupHouseWK	WalkCshDayTR	-2.60e-005	-0.000178	0.13	*	-0.0415	-0.228	0.11	*
BKPKGSPAATBK	WalkCshDayBK	0.00547	0.0898	0.13	*	-0.00343	-0.0673	0.13	*
NoBagsWK	SaturdayAU	0.000978	0.0135	0.14	*	0.0115	0.180	0.17	*
NTourStopsBK	WalkCshDayBK	0.0123	0.0525	-0.14	*	0.00419	0.0224	-0.14	*
TourMilesTR	WBSIGMA	-3.91e-005	-0.0106	0.15	*	0.000237	0.390	0.92	*
BKPKGSPAATTR	PANELSIGMA2	2.64e-005	0.000769	-0.16	*	-0.000591	-0.306	-1.41	*
BKPKGSPAATWK	PANELSIGMA4	-0.000116	-0.0127	0.17	*	3.70e-005	0.0386	1.07	*
PANELSIGMA2	ShopAloneWK	-2.77e-005	-0.000147	-0.17	*	-0.00132	-0.130	-0.44	*
BKPKGSPAATBK	ShopAloneWK	0.000325	0.0191	-0.17	*	0.00213	0.175	-0.21	*
TotPop_T0TR	Wal_Space0AU	-0.000844	-0.152	0.17	*	-0.000481	-0.147	0.20	*
BusPassBK	NTourStopsBK	-0.0129	-0.0721	0.17	*	-0.0570	-0.368	0.15	*
NTourStopsTR	TourMilesTR	-0.000177	-0.266	0.17	*	-0.000325	-0.684	0.22	*
BusPassWK	GroupHouseTR	0.00200	0.0140	0.17	*	-8.25e-005	-0.000951	0.22	*
PANELSIGMA1	WBSIGMA	-0.00573	-0.0544	0.17	*	-0.00118	-0.494	0.94	*
ShopAloneWK	WalkCshDayBK	0.000204	0.000625	0.18	*	-0.123	-0.447	0.16	*
GroupHouseTR	ShopAloneTR	0.00304	0.0184	-0.18	*	-0.0390	-0.377	-0.19	*
BKPKGSPAATBK	BusPassBK	0.00641	0.138	0.18	*	-0.00228	-0.0539	0.17	*

TotPop_T0WK	WalkCshDayBK	0.000234	0.00411	0.18	*	0.00573	0.104	0.18	*
NTourStopsTR	WBSIGMA	7.46e-005	0.00177	0.18	*	-0.00239	-0.443	0.71	*
PANELSIGMA2	TotPop_T0WK	-0.000111	-0.00339	-0.19	*	-0.000802	-0.392	-1.52	*
BKPKGSPAATWK	PANELSIGMA3	9.25e-006	0.00135	0.19	*	5.55e-005	0.207	1.23	*
BKPKGSPAATWK	NTourStopsTR	-4.89e-005	-0.0169	0.19	*	-0.000192	-0.0909	0.24	*
TotPop_T0BK	TourMilesTR	-1.11e-005	-0.0119	0.19	*	-0.000239	-0.240	0.17	*
TotPop_T0BK	WBSIGMA	-0.00110	-0.0184	0.20	*	-0.00357	-0.315	0.54	*
DisabilityAU	SaturdayAU	0.00295	0.0381	0.20	*	-0.00178	-0.0175	0.17	*
DisabilityAU	EnjWalkDumWK	-0.00262	-0.0159	-0.20	*	-0.0489	-0.319	-0.18	*
BkFacMi_HBK	TotPop_T0TR	5.09e-005	0.00778	-0.21	*	0.00156	0.350	-0.23	*
PANELSIGMA1	TotEmp_H0AU	-3.74e-006	-0.00325	0.22	*	4.94e-006	0.0828	1.65	*
EnjWalkDumWK	ShopAloneBK	0.00177	0.00618	0.22	*	-0.0778	-0.244	0.16	*
BKPKGSPAATWK	WBSIGMA	-0.000293	-0.0182	0.22	*	-0.000229	-0.0849	1.17	*
NTourStopsWK	ShopAloneBK	0.000463	0.00738	-0.23	*	0.0269	0.281	-0.17	*
BusPassBK	ShopAloneWK	-0.00267	-0.0107	-0.23	*	0.0169	0.0743	-0.22	*
DisabilityAU	WalkCrmDayAU	-0.0103	-0.0753	-0.23	*	-0.0176	-0.0790	-0.18	*
ShopAloneBK	WalkCrmDayAU	-0.000230	-0.000965	-0.24	*	0.0893	0.193	-0.19	*
GroupHouseBK	PayParkDumAU	-0.00981	-0.0329	-0.24	*	-0.00812	-0.0393	-0.27	*
BusPassBK	TotPop_T0WK	-0.00131	-0.0300	-0.24	*	-0.00545	-0.120	-0.22	*
EnjWalkDumWK	NoBagsWK	-0.0127	-0.0823	0.24	*	-0.0479	-0.498	0.26	*
DisabilityAU	WalkCshDayWK	0.00517	0.0345	-0.24	*	0.00959	0.0522	-0.22	*
ShopAloneBK	WalkCshDayWK	0.000813	0.00312	-0.24	*	-0.112	-0.292	-0.17	*
PANELSIGMA2	TourMilesBK	-0.000162	-0.00392	0.24	*	0.000217	0.0709	1.83	*
GroupHouseBK	NoChildrenAU	-0.00165	-0.00630	-0.25	*	0.0292	0.147	-0.29	*
BKPKGSPAATBK	PANELSIGMA1	3.27e-005	0.00267	0.25	*	-0.000191	-0.140	0.97	*
NoChildrenAU	WalkCshDayBK	-0.00496	-0.0188	-0.26	*	-0.0429	-0.193	-0.25	*
PayParkDumAU	WalkCshDayBK	0.00397	0.0133	-0.26	*	0.0950	0.412	-0.29	*
BKPKGSPAATTR	PANELSIGMA4	-3.33e-005	-0.00219	-0.26	*	2.67e-006	0.00186	-1.30	*
BkFacMi_HBK	WalkCshDayBK	0.00994	0.0730	0.27	*	0.0394	0.283	0.28	*
NTourStopsBK	WBSIGMA	0.000459	0.00436	-0.27	*	-0.00627	-0.432	-0.65	*
Wal_Space0AU	WalkCshDayBK	0.000665	0.00576	0.28	*	0.0217	0.213	0.29	*
NoBagsWK	WalkCshDayWK	-0.0143	-0.102	-0.28	*	-0.0704	-0.609	-0.25	*
NoBagsWK	WalkCrmDayAU	-0.00456	-0.0355	-0.29	*	-0.0729	-0.522	-0.21	*
PANELSIGMA1	ShopAloneWK	-0.000828	-0.0126	-0.29	*	0.000395	0.0536	-0.43	*
ShopAloneBK	TotPop_T0TR	-0.000783	-0.0244	0.30	*	0.00241	0.0814	0.21	*
TotPop_T0TR	WalkCshDayBK	0.000564	0.0100	0.30	*	0.00211	0.0575	0.30	*
BkFacMi_HBK	ShopAloneWK	0.000297	0.00780	0.30	*	0.000958	0.0288	0.35	*
BKPKGSPAATBK	WBSIGMA	-0.000235	-0.00863	0.31	*	0.000761	0.192	1.74	*
EnjWalkDumWK	WalkCshDayTR	0.00309	0.0165	-0.32	*	0.0427	0.243	-0.37	*
BKPKGSPAATWK	ShopAloneWK	0.000362	0.0361	-0.32	*	0.00202	0.242	-0.38	*
NTourStopsBK	TourMilesBK	-0.00561	-0.389	-0.32	*	-0.0111	-0.828	-0.33	*
BKPKGSPAATBK	PANELSIGMA4	-0.000148	-0.00952	0.32	*	0.000105	0.0752	1.67	*
ShopAloneWK	TotPop_T0BK	-0.000613	-0.0165	0.32	*	0.00234	0.0670	0.37	*
BusPassBK	PayParkDumAU	-0.00347	-0.0152	0.33	*	-0.0460	-0.241	0.30	*
ShopAloneWK	Wal_Space0AU	-0.000181	-0.00560	-0.33	*	-0.00696	-0.285	-0.35	*
BusPassBK	NoChildrenAU	0.000186	0.000925	0.33	*	0.0144	0.0782	0.32	*
ShopAloneBK	Wal_Space0AU	-6.95e-005	-0.00106	0.33	*	-0.0119	-0.145	0.23	*
BkFacMi_HBK	ShopAloneBK	-0.00162	-0.0208	-0.34	*	-0.0162	-0.144	-0.24	*
BkFacMi_HBK	PANELSIGMA2	-0.000906	-0.0115	0.34	*	-0.000521	-0.101	1.53	*
NTourStopsWK	WalkCshDayBK	-7.94e-005	-0.000722	0.34	*	-0.00556	-0.0467	0.34	*
ASC1	ZeroAutosAU	0.00818	0.0239	-0.34	*	-0.0627	-0.119	-0.27	*
PANELSIGMA4	ShopAloneWK	1.27e-005	0.000152	-0.35	*	-0.00111	-0.147	-0.54	*
PANELSIGMA2	Wal_Space0AU	-0.000495	-0.00745	-0.35	*	-0.000832	-0.219	-1.99	
BkFacMi_HBK	BusPassBK	-0.00929	-0.0895	0.35	*	-0.00949	-0.0823	0.33	*
NTourStopsBK	PANELSIGMA2	0.00159	0.0118	-0.36	*	-0.000932	-0.134	-1.27	*
ShopAloneWK	WBSIGMA	0.000994	0.00680	0.36	*	0.00410	0.193	0.80	*
BusPassBK	Wal_Space0AU	-0.00184	-0.0209	-0.37	*	-0.00476	-0.0562	-0.34	*
GroupHouseBK	WalkCshDayBK	0.0199	0.0172	-0.37	*	-0.0288	-0.0281	-0.38	*
NTourStopsTR	ShopAloneWK	0.00170	0.0647	-0.37	*	0.000213	0.0128	-0.43	*
PANELSIGMA3	ShopAloneWK	-2.82e-005	-0.000453	-0.37	*	0.000796	0.377	-0.54	*
GroupHouseBK	NTourStopsBK	0.00889	0.0382	-0.37	*	0.117	0.696	-0.48	*
BKPKGSPAATBK	TotPop_T0BK	-0.00121	-0.174	0.37	*	-0.00126	-0.193	0.35	*
WalkCshDayTR	WalkCshDayWK	0.0563	0.329	0.37	*	0.136	0.644	0.46	*
NTourStopsWK	TotPop_T0TR	-0.000153	-0.0290	0.38	*	0.00136	0.357	0.42	*
PayParkDumAU	SpanishDumAU	0.0169	0.169	0.38	*	0.0116	0.200	0.50	*
GroupHouseBK	StudentAU	0.0107	0.0326	0.38	*	-0.0738	-0.274	0.39	*
BKPKGSPAATTR	PANELSIGMA3	1.58e-005	0.00138	-0.38	*	-0.000169	-0.421	-1.53	*
WalkCrmDayAU	WalkCshDayTR	0.0364	0.232	-0.38	*	0.0917	0.360	-0.33	*
EnjWalkDumWK	SaturdayAU	1.72e-005	0.000170	0.39	*	-0.00911	-0.100	0.43	*
PANELSIGMA2	TotPop_T0TR	-6.62e-005	-0.00205	-0.39	*	-0.000425	-0.311	-4.03	
NTourStopsBK	PayParkDumAU	0.000867	0.0144	0.39	*	0.00247	0.0660	0.51	*

SpanishDumAU	WalkCshDayBK	0.00191	0.00493	-0.39	*	0.0866	0.298	-0.43	*
BKPKGSPAATBK	PANELSIGMA3	2.28e-005	0.00196	0.39	*	0.000149	0.381	1.86	*
BusPassBK	TotPop_T0TR	-0.000937	-0.0219	-0.39	*	-0.00824	-0.271	-0.36	*
NTourStopsBK	NoChildrenAU	-0.000715	-0.0135	0.40	*	0.00607	0.168	0.54	*
NoChildrenAU	SpanishDumAU	0.0189	0.215	0.41	*	-0.00676	-0.120	0.44	*
ShopAloneBK	WalkCshDayBK	0.00925	0.0139	0.41	*	-0.546	-0.593	0.29	*
TotEmp_H0AU	TotPop_T0BK	-4.35e-005	-0.0667	-0.41	*	-4.23e-005	-0.150	-0.37	*
ShopAloneWK	TotPop_T0TR	-0.000295	-0.0188	-0.41	*	0.00160	0.182	-0.50	*
BusPassBK	GroupHouseBK	0.0280	0.0317	0.42	*	-0.276	-0.324	0.37	*
TotPop_T0WK	WBSIGMA	-0.000626	-0.0245	0.42	*	-0.000375	-0.0877	2.01	
TourMilesWK	WalkCshDayBK	-2.77e-005	-0.000263	-0.42	*	-0.000524	-0.00341	-0.42	*
ShopAloneWK	TourMilesTR	-4.66e-005	-0.0202	0.43	*	0.000364	0.194	0.51	*
FemaleDumBK	StudentAU	-0.00134	-0.00829	-0.43	*	0.0133	0.0871	-0.45	*
SaturdayAU	WalkCshDayBK	0.00843	0.0357	0.44	*	-0.0342	-0.130	0.42	*
NTourStopsWK	Wal_Space0AU	8.72e-005	0.00803	0.44	*	0.00292	0.276	0.52	*
BkFacMi_HBK	NTourStopsWK	9.02e-005	0.00704	-0.44	*	0.00123	0.0851	-0.44	*
BusPassBK	NTourStopsWK	-0.00262	-0.0313	-0.44	*	-0.0155	-0.157	-0.41	*
SaturdayAU	WalkCshDayWK	-0.000426	-0.00461	-0.45	*	-0.00139	-0.0128	-0.42	*
PANELSIGMA4	TourMilesBK	0.000165	0.00903	0.45	*	0.000438	0.193	1.65	*
GroupHouseBK	TourMilesBK	-0.00457	-0.0641	-0.45	*	-0.0477	-0.647	-0.48	*
NTourStopsWK	PANELSIGMA2	-0.000211	-0.00333	0.45	*	-0.00232	-0.525	2.09	
EnjWalkDumWK	GroupHouseWK	-0.00121	-0.00725	-0.45	*	0.0113	0.0792	-0.52	*
NTourStopsWK	SaturdayAU	-0.000150	-0.00674	-0.46	*	0.000446	0.0163	-0.41	*
GroupHouseBK	WBSIGMA	0.000326	0.000627	-0.47	*	-0.00927	-0.116	-0.56	*
SaturdayAU	WalkCrmDayAU	0.00285	0.0337	-0.47	*	-0.0154	-0.116	-0.33	*
NoBagsWK	WalkCshDayBK	-0.00284	-0.00790	0.47	*	-0.147	-0.530	0.43	*
NTourStopsWK	NoBagsWK	-0.000328	-0.00972	-0.47	*	0.00186	0.0644	-0.60	*
GroupHouseWK	WalkCshDayWK	0.0136	0.0893	0.48	*	0.0181	0.106	0.45	*
BKPKGSPAATTR	PANELSIGMA1	3.79e-006	0.000316	-0.48	*	-0.000120	-0.0857	-1.83	*
BusPassTR	TourUnder2WK	-0.00175	-0.0134	0.48	*	-0.0440	-0.253	0.37	*
NTourStopsTR	TotEmp_H0AU	2.45e-005	0.0530	0.49	*	6.32e-006	0.0470	0.65	*
PANELSIGMA2	ShopAloneBK	0.000932	0.00243	-0.49	*	-0.0221	-0.645	-0.48	*
ShopAloneBK	WalkCshDayTR	-0.00261	-0.0105	-0.49	*	-0.0123	-0.0301	-0.36	*
PANELSIGMA1	TotPop_T0WK	3.10e-005	0.00270	-0.49	*	-0.000313	-0.211	-1.71	*
ShopAloneBK	ShopAloneWK	0.0344	0.185	0.49	*	0.0893	0.405	0.39	*
BusPassBK	SpanishDumAU	0.00543	0.0184	0.49	*	-0.0330	-0.137	0.46	*
BusPassBK	ShopAloneBK	-0.00291	-0.00573	-0.49	*	-0.215	-0.281	-0.36	*
DisabilityAU	WalkCshDayBK	0.0181	0.0471	0.50	*	0.106	0.240	0.53	*
BKPKGSPAATTR	GroupHouseBK	-0.000532	-0.00897	0.50	*	-0.0137	-0.294	0.55	*
ShopAloneBK	TotPop_T0WK	-0.000525	-0.0161	0.50	*	0.00394	0.0889	0.36	*
PayParkDumAU	WBSIGMA	-0.000547	-0.00407	-0.50	*	-0.00638	-0.357	-1.09	*
GroupHouseWK	WalkCrmDayAU	0.00827	0.0593	0.51	*	0.0448	0.217	0.44	*
PANELSIGMA4	TotPop_T0WK	-0.000136	-0.00936	-0.51	*	0.000297	0.196	-2.64	
GroupHouseBK	PANELSIGMA2	-0.00323	-0.00484	-0.51	*	-0.0104	-0.274	-0.66	*
DisabilityAU	NTourStopsWK	-0.00116	-0.0322	0.51	*	0.0299	0.651	0.55	*
NoChildrenAU	WBSIGMA	0.00177	0.0150	-0.52	*	0.00162	0.0941	-1.29	*
ShopAloneWK	TotEmp_H0AU	-4.74e-005	-0.0296	0.52	*	-6.59e-005	-0.124	0.61	*
PANELSIGMA2	PayParkDumAU	-0.00173	-0.0100	0.54	*	-0.00202	-0.237	1.62	*
BusPassBK	TourMilesWK	0.000701	0.00873	0.55	*	0.00905	0.0710	0.51	*
NoChildrenAU	PANELSIGMA2	8.41e-005	0.000553	-0.55	*	0.000146	0.0177	-1.74	*
NTourStopsWK	ShopAloneWK	0.00316	0.103	0.55	*	0.000754	0.0265	0.61	*
GroupHouseBK	PANELSIGMA4	0.000600	0.00203	-0.55	*	-0.000226	-0.00800	-0.64	*
GroupHouseBK	TotEmp_H0AU	9.67e-005	0.0170	-0.56	*	-0.000135	-0.0676	-0.62	*
FemaleDumBK	GroupHouseBK	-0.0314	-0.0554	-0.56	*	-0.139	-0.265	-0.56	*
BusPassBK	SaturdayAU	-0.00244	-0.0136	-0.56	*	0.0190	0.0870	-0.53	*
GroupHouseBK	PANELSIGMA3	-0.000200	-0.000901	-0.56	*	-3.32e-005	-0.00420	-0.64	*
EnjWalkDumWK	WalkCshDayBK	-0.00665	-0.0132	0.57	*	0.104	0.263	0.65	*
PayParkDumAU	TourMilesWK	0.000265	0.00983	0.57	*	0.00866	0.280	0.76	*
GroupHouseBK	TourMilesTR	5.96e-005	0.00727	-0.58	*	0.00131	0.186	-0.65	*
BKPKGSPAATBK	ShopAloneBK	-0.00226	-0.0651	-0.58	*	0.0127	0.310	-0.43	*
GroupHouseBK	PANELSIGMA1	0.000509	0.00218	-0.59	*	0.00389	0.141	-0.67	*
NTourStopsBK	PANELSIGMA4	-3.53e-005	-0.000590	-0.59	*	-0.00153	-0.297	-1.11	*
BKPKGSPAATTR	NTourStopsBK	-0.000241	-0.0201	0.59	*	-0.00141	-0.166	0.70	*
GroupHouseBK	NTourStopsTR	0.000300	0.00321	-0.59	*	-0.00733	-0.118	-0.66	*
ASC2	ZeroAutosAU	-0.0124	-0.0269	0.60	*	-0.0132	-0.0174	0.50	*
GroupHouseBK	TotPop_T0BK	-0.00427	-0.0323	-0.60	*	0.0150	0.115	-0.68	*
BusPassBK	NoBagsWK	-0.00349	-0.0128	-0.60	*	0.0673	0.292	-0.63	*
BKPKGSPAATBK	NTourStopsTR	1.70e-005	0.00346	0.60	*	-0.000362	-0.117	0.73	*
PANELSIGMA2	SaturdayAU	-0.000150	-0.00111	-0.60	*	0.00117	0.120	-1.62	*
DisabilityAU	WalkCshDayTR	0.0106	0.0739	-0.60	*	0.0591	0.301	-0.59	*
BkFacMi_HBK	WBSIGMA	-0.000384	-0.00629	0.60	*	-0.00190	-0.176	1.82	*

GroupHouseTR	WalkCshDayTR	-0.0111	-0.0683	0.61	*	0.0214	0.140	0.67	*
GroupHouseWK	ShopAloneBK	0.000192	0.000864	0.61	*	-0.0387	-0.117	0.44	*
GroupHouseTR	GroupHouseWK	0.0373	0.257	0.61	*	0.0122	0.0989	0.60	*
BKPKGSPAATWK	GroupHouseBK	0.000563	0.0158	0.61	*	0.0251	0.805	0.70	*
WalkCrmDayAU	WalkCshDayBK	0.0385	0.0921	0.61	*	0.0781	0.136	0.60	*
BKPKGSPAATTR	TourMilesBK	9.01e-005	0.0246	0.61	*	0.00112	0.299	0.68	*
PANELSIGMA3	TourMilesBK	3.65e-005	0.00267	0.62	*	-2.06e-005	-0.0326	1.72	*
NoBagsWK	TotPop_T0TR	-0.000484	-0.0281	0.62	*	0.000520	0.0584	0.80	*
WalkCshDayBK	WalkCshDayWK	0.0508	0.111	-0.62	*	0.329	0.692	-0.83	*
WBSIGMA	Wal_Space0AU	-0.000895	-0.0173	-0.62	*	-0.000824	-0.104	-2.33	
BusPassBK	DisabilityAU	0.000515	0.00176	-0.63	*	-0.162	-0.442	-0.50	*
NoBagsWK	PANELSIGMA2	0.000206	0.000994	0.64	*	-0.00111	-0.107	1.69	*
PANELSIGMA3	TotPop_T0WK	2.79e-005	0.00256	-0.64	*	9.81e-005	0.231	-2.71	
NoBagsWK	WalkCshDayTR	-0.00240	-0.0179	-0.64	*	-0.0366	-0.297	-0.56	*
PANELSIGMA1	ShopAloneBK	3.65e-005	0.000272	-0.64	*	0.00543	0.219	-0.49	*
ShopAloneTR	TourUnder2WK	0.000548	0.00343	-0.64	*	0.00145	0.00889	-0.61	*
EnjWalkDumWK	NTourStopsWK	-0.000897	-0.0190	0.65	*	-0.00903	-0.220	0.75	*
NoBagsWK	Wal_Space0AU	-0.00126	-0.0355	0.65	*	-0.00219	-0.0885	0.81	*
BKPKGSPAATBK	GroupHouseBK	0.00196	0.0325	0.65	*	0.0204	0.448	0.75	*
NoChildrenAU	TourMilesWK	0.000222	0.00936	0.65	*	0.00673	0.226	0.76	*
ShopAloneBK	WBSIGMA	0.000263	0.000880	0.66	*	-0.00612	-0.0855	0.59	*
DisabilityAU	TotPop_T0TR	0.000415	0.0225	0.66	*	0.00295	0.208	0.58	*
BKPKGSPAATWK	ShopAloneBK	0.000335	0.0164	-0.66	*	0.00656	0.234	-0.48	*
DisabilityAU	PANELSIGMA2	-0.000263	-0.00119	0.67	*	-0.00823	-0.500	1.10	*
BkFacMi_HBK	NoBagsWK	-2.39e-005	-0.000571	-0.67	*	-0.00110	-0.0325	-0.80	*
ShopAloneBK	TotPop_T0BK	0.00482	0.0636	0.67	*	0.0171	0.145	0.49	*
PANELSIGMA4	ShopAloneBK	7.14e-005	0.000420	-0.67	*	-0.00152	-0.0601	-0.52	*
GroupHouseBK	ShopAloneWK	-0.000216	-0.000667	-0.68	*	0.0195	0.0791	-0.77	*
TotPop_T0TR	WBSIGMA	-0.000579	-0.0230	0.68	*	-0.000416	-0.146	3.50	
NTourStopsTR	ShopAloneBK	0.000415	0.00774	-0.68	*	-0.00859	-0.153	-0.49	*
NTourStopsBK	SpanishDumAU	-0.00212	-0.0272	0.69	*	0.00297	0.0627	0.93	*
PANELSIGMA3	ShopAloneBK	-6.14e-005	-0.000483	-0.69	*	-0.000429	-0.0604	-0.52	*
BKPKGSPAATBK	TotPop_T0WK	0.000111	0.0374	-0.69	*	-0.000653	-0.267	-0.66	*
DisabilityAU	Wal_Space0AU	-0.000134	-0.00353	0.69	*	0.00383	0.0970	0.62	*
BkFacMi_HBK	DisabilityAU	-0.00133	-0.0298	-0.69	*	0.00285	0.0530	-0.62	*
SaturdayAU	TotPop_T0TR	0.000805	0.0710	0.70	*	-0.000350	-0.0415	0.62	*
GroupHouseBK	TotPop_T0WK	-0.00120	-0.0212	-0.70	*	-0.00606	-0.123	-0.78	*
PANELSIGMA1	TourMilesBK	-9.04e-005	-0.00626	0.70	*	-0.000980	-0.443	1.71	*
BKPKGSPAATTR	ShopAloneWK	2.41e-005	0.00145	-0.71	*	-0.00322	-0.258	-0.79	*
NTourStopsBK	PANELSIGMA3	-3.21e-005	-0.000718	-0.71	*	-0.000238	-0.165	-1.21	*
ShopAloneBK	TourMilesTR	-3.06e-005	-0.00651	0.71	*	0.000498	0.0790	0.51	*
SaturdayAU	Wal_Space0AU	-0.000711	-0.0305	0.71	*	-0.00440	-0.188	0.63	*
BusPassBK	EnjWalkDumWK	0.000466	0.00122	-0.72	*	0.0352	0.107	-0.73	*
GroupHouseWK	ShopAloneTR	0.00639	0.0431	-0.72	*	0.0134	0.109	-0.81	*
SpanishDumAU	WBSIGMA	-0.00153	-0.00878	-0.72	*	-0.00592	-0.263	-1.44	*
BkFacMi_HBK	SaturdayAU	-0.000112	-0.00406	-0.72	*	0.000647	0.0203	-0.66	*
BkFacMi_HBK	TotPop_T0WK	0.000133	0.0200	0.72	*	0.00183	0.273	0.78	*
PANELSIGMA2	SpanishDumAU	-0.00104	-0.00463	0.73	*	-0.00325	-0.301	1.84	*
SaturdayAU	ShopAloneWK	-0.00465	-0.0705	0.73	*	-0.0156	-0.248	0.71	*
BusPassBK	WalkCshDayWK	-0.00130	-0.00373	-0.75	*	-0.0864	-0.219	-0.64	*
BusPassBK	WalkCrmDayAU	-0.00560	-0.0176	-0.75	*	-0.0997	-0.209	-0.61	*
NTourStopsWK	WBSIGMA	-0.00181	-0.0367	0.75	*	-0.00424	-0.459	2.25	
DisabilityAU	GroupHouseWK	-0.00258	-0.0201	-0.75	*	-0.0248	-0.156	-0.63	*
PayParkDumAU	TourMilesBK	-0.000395	-0.0215	-0.75	*	-0.00274	-0.166	-0.90	*
NTourStopsWK	WalkCshDayWK	0.00272	0.0632	-0.75	*	-0.00490	-0.0993	-0.69	*
EnjWalkDumWK	TotPop_T0TR	0.00125	0.0517	0.76	*	-0.00134	-0.106	0.94	*
ShopAloneBK	TotEmp_H0AU	-2.83e-005	-0.00865	0.76	*	0.000188	0.105	0.54	*
BKPKGSPAATBK	BKPKGSPAATWK	0.000428	0.229	0.76	*	0.000837	0.541	1.09	*
BusPassWK	TourUnder2WK	0.0185	0.134	-0.76	*	0.0502	0.369	-0.78	*
EnjWalkDumWK	PANELSIGMA2	-0.000689	-0.00238	0.76	*	0.00268	0.182	1.63	*
WalkCshDayBK	WalkCshDayTR	0.0343	0.0784	-0.77	*	0.255	0.503	-0.94	*
NoBagsWK	ShopAloneWK	0.00718	0.0716	0.77	*	0.00252	0.0378	0.94	*
NTourStopsBK	PANELSIGMA1	4.29e-005	0.000909	-0.78	*	0.00269	0.536	-1.49	*
EnjWalkDumWK	Wal_Space0AU	-0.000364	-0.00735	0.78	*	0.00327	0.0926	1.00	*
BusPassWK	GroupHouseWK	0.0116	0.0910	0.78	*	0.0337	0.326	0.97	*
ShopAloneTR	WalkCshDayTR	-0.00333	-0.0200	0.78	*	-0.0544	-0.356	0.69	*
BkFacMi_HBK	GroupHouseBK	-0.00107	-0.00788	0.79	*	0.0305	0.245	0.91	*
BkFacMi_HBK	EnjWalkDumWK	-0.000289	-0.00494	-0.79	*	-0.00903	-0.188	-0.92	*
DisabilityAU	ShopAloneWK	0.00344	0.0321	0.79	*	-0.0162	-0.153	0.70	*
NTourStopsWK	WalkCrmDayAU	0.000176	0.00447	-0.79	*	0.000972	0.0163	-0.58	*
GroupHouseBK	Wal_Space0AU	-0.000976	-0.00851	-0.79	*	0.0158	0.173	-0.91	*

BkFacMi_HBK	PANELSIGMA4	0.000527	0.0152	0.80	*	0.000168	0.0439	1.83	*
PANELSIGMA2	WalkCshDayWK	0.000132	0.000503	-0.81	*	0.00446	0.252	-1.39	*
ASC1	ASC2	0.123	0.149	-0.82	*	0.0734	0.0719	-0.69	*
GroupHouseBK	TotPop_T0TR	-0.00140	-0.0251	-0.82	*	0.00364	0.111	-0.92	*
PANELSIGMA2	WalkCrmDayAU	-0.00105	-0.00436	-0.82	*	-0.00464	-0.217	-1.10	*
GroupHouseWK	NoBagsWK	-0.00492	-0.0411	0.82	*	-0.0117	-0.117	0.84	*
GroupHouseTR	TourUnder2WK	-0.000663	-0.00425	-0.83	*	-0.0309	-0.190	-0.72	*
PANELSIGMA4	Wal_Space0AU	-0.000777	-0.0264	-0.83	*	2.56e-007	9.12e-005	-2.48	
BkFacMi_HBK	PANELSIGMA1	0.000321	0.0117	0.83	*	0.000537	0.144	1.61	*
GroupHouseWK	WalkCshDayBK	0.00663	0.0170	0.83	*	0.0175	0.0426	0.84	*
BKPKGSPAATTR	TotPop_T0BK	0.000251	0.0370	-0.83	*	-0.000283	-0.0426	-0.75	*
TotPop_T0WK	Wal_Space0AU	-0.000735	-0.130	-0.84	*	-0.000737	-0.150	-0.91	*
BusPassWK	WalkCshDayTR	0.00215	0.0150	0.84	*	-0.0550	-0.430	0.70	*
NoChildrenAU	TourMilesBK	0.000273	0.0169	-0.85	*	-0.00423	-0.266	-0.89	*
BKPKGSPAATTR	ShopAloneBK	-2.06e-005	-0.000605	-0.85	*	0.00112	0.0269	-0.61	*
PANELSIGMA2	TourMilesWK	0.000114	0.00189	0.85	*	0.000861	0.151	3.75	
GroupHouseBK	NTourStopsWK	0.000516	0.00472	-0.86	*	0.0303	0.285	-0.99	*
PANELSIGMA4	PayParkDumAU	-0.00261	-0.0341	0.86	*	-0.00211	-0.333	1.51	*
TotPop_T0TR	WalkCshDayWK	0.000299	0.0136	-0.86	*	0.00378	0.248	-0.84	*
ShopAloneWK	TourMilesBK	-0.000243	-0.0121	0.87	*	-0.00328	-0.167	0.96	*
StudentAU	WalkCshDayBK	0.00587	0.0178	-0.87	*	0.0410	0.136	-0.91	*
GroupHouseBK	ShopAloneBK	0.0213	0.0321	-0.87	*	0.270	0.327	-1.00	*
TotPop_T0BK	TotPop_T0WK	0.00165	0.254	-0.88	*	0.00537	0.765	-1.03	*
SaturdayAU	WalkCshDayTR	0.00646	0.0731	-0.88	*	0.0165	0.141	-0.78	*
PANELSIGMA1	Wal_Space0AU	-7.82e-006	-0.000337	-0.88	*	-9.97e-005	-0.0364	-2.13	
Wal_Space0AU	WalkCshDayWK	-0.000521	-0.0115	-0.89	*	0.00729	0.172	-0.88	*
NTourStopsBK	TotEmp_H0AU	2.02e-005	0.0176	-0.89	*	-5.71e-005	-0.158	-1.10	*
EnjWalkDumWK	GroupHouseTR	-0.00250	-0.0134	-0.89	*	-0.0115	-0.0965	-1.07	*
EnjWalkDumWK	ShopAloneWK	0.0106	0.0758	0.89	*	-0.0290	-0.306	0.94	*
BkFacMi_HBK	WalkCshDayWK	0.000367	0.00689	-0.90	*	0.0121	0.210	-0.90	*
ASC2	FemaleDumBK	-0.0435	-0.0784	-0.90	*	-0.182	-0.276	-0.75	*
SaturdayAU	WBSIGMA	-0.000186	-0.00176	0.91	*	0.00595	0.291	2.06	
GroupHouseTR	WalkCshDayWK	-0.00240	-0.0141	0.91	*	0.0130	0.0909	1.02	*
TourMilesWK	WBSIGMA	0.00167	0.0353	-0.92	*	0.000442	0.0371	-2.75	
NoBagsWK	WBSIGMA	-0.000643	-0.00400	0.92	*	0.00338	0.157	2.07	
TotPop_T0TR	WalkCrmDayAU	0.00109	0.0545	-0.93	*	0.00592	0.321	-0.68	*
NoChildrenAU	PANELSIGMA4	0.000756	0.0112	-0.93	*	-0.00131	-0.215	-1.58	*
ShopAloneBK	TourMilesBK	-0.00217	-0.0529	0.93	*	-0.0109	-0.164	0.66	*
DisabilityAU	WBSIGMA	-0.00170	-0.00988	0.94	*	-0.0215	-0.626	1.20	*
NTourStopsBK	ShopAloneWK	-3.56e-005	-0.000543	-0.94	*	0.00247	0.0552	-1.16	*
NTourStopsBK	TotPop_T0BK	-0.00217	-0.0813	-0.94	*	0.00671	0.282	-1.29	*
BusPassBK	WalkCshDayTR	-0.00440	-0.0132	-0.95	*	-0.245	-0.582	-0.71	*
GroupHouseBK	SaturdayAU	0.00232	0.00987	-0.95	*	0.0818	0.347	-1.14	*
ShopAloneWK	WalkCshDayWK	0.00203	0.0159	-0.96	*	-0.0224	-0.196	-0.89	*
PANELSIGMA4	TotPop_T0TR	-1.37e-006	-9.57e-005	-0.96	*	-7.67e-006	-0.00758	-5.92	
BKPKGSPAATBK	BkFacMi_HBK	-0.00282	-0.397	-0.96	*	-0.00239	-0.387	-0.97	*
Wal_Space0AU	WalkCrmDayAU	0.00221	0.0535	-0.96	*	0.0106	0.208	-0.72	*
BkFacMi_HBK	WalkCrmDayAU	0.00299	0.0614	-0.97	*	0.00840	0.120	-0.72	*
BkFacMi_HBK	PANELSIGMA3	-2.56e-005	-0.000985	0.97	*	-0.000253	-0.236	1.77	*
BKPKGSPAATTR	PayParkDumAU	0.00170	0.111	0.97	*	0.00411	0.394	1.34	*
GroupHouseBK	NoBagsWK	0.00352	0.00986	-0.97	*	-0.0314	-0.126	-1.06	*
GroupHouseTR	ShopAloneBK	-0.00128	-0.00517	0.97	*	0.0668	0.241	0.85	*
BKPKGSPAATTR	NTourStopsTR	-0.000135	-0.0281	-0.98	*	0.000251	0.0794	-1.31	*
BKPKGSPAATWK	TourMilesTR	8.92e-006	0.0352	0.98	*	5.06e-005	0.212	1.04	*
NoBagsWK	TotPop_T0WK	-0.00116	-0.0661	0.99	*	-0.000656	-0.0491	1.25	*
DisabilityAU	GroupHouseBK	0.00108	0.00284	0.99	*	0.0581	0.146	1.13	*
GroupHouseTR	WalkCrmDayAU	0.00541	0.0349	0.99	*	0.0686	0.397	1.08	*
NTourStopsBK	TourMilesTR	-6.20e-005	-0.0374	-1.01	*	0.000290	0.228	-1.27	*
DisabilityAU	TotPop_T0WK	0.000280	0.0149	1.01	*	0.00355	0.167	0.89	*
EnjWalkDumWK	WBSIGMA	-0.00324	-0.0144	1.01	*	-0.00183	-0.0595	1.78	*
PANELSIGMA3	PayParkDumAU	0.000195	0.00342	1.01	*	0.000264	0.149	1.63	*
ShopAloneWK	WalkCrmDayAU	0.00587	0.0502	-1.01	*	0.0128	0.0929	-0.85	*
SpanishDumAU	TourMilesBK	1.39e-005	0.000581	-1.02	*	-0.00259	-0.124	-1.28	*
EnjWalkDumWK	TotPop_T0WK	-0.000138	-0.00563	1.02	*	0.00192	0.101	1.30	*
FemaleDumBK	WalkCshDayBK	-0.00971	-0.0170	-1.02	*	-0.140	-0.239	-0.94	*
NTourStopsBK	ShopAloneBK	0.00923	0.0690	-1.03	*	0.0425	0.283	-0.80	*
NTourStopsBK	NTourStopsTR	0.00150	0.0797	-1.03	*	-0.00125	-0.110	-1.22	*
PANELSIGMA3	Wal_Space0AU	-2.27e-006	-0.000103	-1.04	*	-0.000127	-0.162	-2.48	
EnjWalkDumWK	GroupHouseWK	-0.00510	-0.0102	1.05	*	-0.0714	-0.201	1.12	*
EnjWalkDumWK	ShopAloneTR	0.000919	0.00481	-1.05	*	0.0159	0.134	-1.43	*
BusPassBK	GroupHouseWK	0.00265	0.00892	-1.05	*	0.0456	0.134	-1.03	*

PANELSIGMA1	TotPop_T0TR	0.000213	0.0189	-1.06	* 2.84e-006	0.00287	-5.27	
NTourStopsWK	PANELSIGMA4	-0.000160	-0.00569	1.06	* -0.000186	-0.0568	2.68	
PANELSIGMA2	WalkCshDayTR	-0.000235	-0.000931	-1.06	* -0.00229	-0.121	-1.64	*
BKPKGSPAATTR	NoChildrenAU	0.000267	0.0198	1.07	* -0.000619	-0.0615	1.23	*
GroupHouseTR	WalkCshDayBK	0.00413	0.00953	1.07	* -0.0337	-0.0978	1.07	*
PANELSIGMA1	PayParkDumAU	0.000392	0.00651	1.07	* 0.00136	0.219	1.78	*
BKPKGSPAATTR	TotEmp_H0AU	-2.63e-005	-0.0900	-1.07	* -4.47e-005	-0.443	-1.21	*
WBSIGMA	WalkCshDayWK	-0.00205	-0.0100	-1.08	* -0.00939	-0.254	-1.47	*
GroupHouseBK	WalkCshDayWK	6.58e-005	0.000145	-1.08	* 0.0304	0.0713	-1.21	*
GroupHouseBK	WalkCrmDayAU	-0.000519	-0.00125	-1.08	* 0.108	0.210	-1.24	*
NoChildrenAU	PANELSIGMA3	0.000172	0.00342	-1.09	* 0.000414	0.242	-1.69	*
NTourStopsTR	TotPop_T0WK	-0.000351	-0.0765	-1.09	* -0.000774	-0.232	-1.25	*
PANELSIGMA4	SpanishDumAU	-0.000136	-0.00137	1.10	* 0.000278	0.0349	1.83	*
BusPassWK	EnjWalkDumWK	-0.000987	-0.00600	1.10	* -0.00229	-0.0230	1.39	*
ShopAloneTR	WalkCshDayWK	0.00668	0.0384	1.10	* -0.0322	-0.225	1.05	*
WBSIGMA	WalkCrmDayAU	-0.00301	-0.0161	-1.10	* -0.00773	-0.173	-1.24	*
NoBagsWK	PANELSIGMA4	-0.000492	-0.00537	1.10	* 0.00102	0.133	1.85	*
DisabilityAU	PANELSIGMA4	-0.00102	-0.0104	1.12	* -0.00406	-0.334	1.19	*
GroupHouseWK	SaturdayAU	0.00271	0.0344	1.12	* 0.0161	0.171	1.11	*
NoBagsWK	PANELSIGMA1	4.31e-006	5.96e-005	1.12	* 0.00165	0.221	1.74	*
BusPassBK	StudentAU	0.0135	0.0535	1.13	* 0.0462	0.186	1.10	*
DisabilityAU	PANELSIGMA1	0.000285	0.00369	1.13	* 0.00361	0.303	1.16	*
BKPKGSPAATBK	EnjWalkDumWK	0.000247	0.00947	-1.13	* -0.00299	-0.170	-1.39	*
ASC2	GroupHouseBK	-0.0849	-0.0752	-1.14	* -0.534	-0.461	-0.96	*
NoChildrenAU	PANELSIGMA1	-0.000251	-0.00472	-1.14	* 0.000534	0.0896	-1.80	*
BusPassWK	ShopAloneBK	-0.000913	-0.00418	1.14	* -0.0381	-0.164	0.86	*
BKPKGSPAATWK	NTourStopsBK	-0.000248	-0.0345	1.14	* 0.00274	0.483	1.57	*
BusPassWK	WalkCshDayWK	0.00137	0.00918	1.15	* -0.0447	-0.373	1.05	*
EnjWalkDumWK	PANELSIGMA4	-0.000525	-0.00410	1.15	* 0.00182	0.167	1.69	*
ShopAloneTR	WalkCshDayBK	0.000593	0.00133	1.15	* -0.0816	-0.237	1.12	*
EnjWalkDumWK	PANELSIGMA1	0.000459	0.00454	1.15	* -0.00379	-0.356	1.54	*
BKPKGSPAATBK	NoBagsWK	-0.000132	-0.00707	-1.15	* -0.00161	-0.130	-1.43	*
ShopAloneTR	WalkCrmDayAU	0.00219	0.0138	1.15	* -0.0632	-0.365	0.90	*
TotPop_T0WK	WalkCshDayWK	-0.000860	-0.0385	-1.15	* 0.00506	0.221	-1.13	*
BKPKGSPAATBK	DisabilityAU	0.000589	0.0295	-1.16	* -0.00188	-0.0958	-0.98	*
ShopAloneBK	ShopAloneTR	0.0246	0.0970	-1.16	* 0.00673	0.0243	-0.90	*
BusPassWK	WalkCshDayBK	0.00530	0.0138	1.16	* -0.0530	-0.184	1.15	*
NTourStopsWK	PANELSIGMA1	0.000273	0.0123	1.17	* -0.000384	-0.120	2.36	
TotPop_T0BK	TourMilesBK	6.67e-005	0.00817	1.17	* -0.00249	-0.238	0.95	*
PayParkDumAU	ShopAloneBK	-0.000947	-0.00554	-1.17	* -0.0388	-0.210	-0.86	*
BKPKGSPAATTR	SpanishDumAU	0.000895	0.0452	1.18	* 0.00485	0.368	1.65	*
PayParkDumAU	TotEmp_H0AU	-0.000245	-0.166	-1.18	* -0.000172	-0.385	-1.52	*
BusPassTR	ShopAloneTR	0.00697	0.0506	1.19	* 0.0201	0.181	1.44	*
SpanishDumAU	StudentAU	0.0117	0.107	1.19	* -0.0218	-0.287	1.20	*
NTourStopsWK	WalkCshDayTR	-0.00132	-0.0321	-1.20	* -0.00302	-0.0573	-1.02	*
GroupHouseWK	PANELSIGMA2	0.000459	0.00204	1.20	* -0.000177	-0.0116	2.23	
PayParkDumAU	ShopAloneWK	0.00208	0.0249	-1.20	* -0.00632	-0.115	-1.37	*
PANELSIGMA4	SaturdayAU	-6.83e-006	-0.000113	-1.20	* 0.00392	0.542	-1.83	*
NoBagsWK	PANELSIGMA3	-9.67e-006	-0.000141	1.20	* -0.000601	-0.281	1.80	*
EnjWalkDumWK	PANELSIGMA3	-9.98e-005	-0.00104	1.21	* -2.85e-006	-0.000935	1.66	*
BusPassWK	WalkCrmDayAU	-0.00160	-0.0117	1.21	* -0.00965	-0.0666	1.03	*
DisabilityAU	PANELSIGMA3	-0.000272	-0.00372	1.21	* -0.00150	-0.439	1.19	*
PANELSIGMA3	SpanishDumAU	-0.000106	-0.00143	1.22	* -0.000285	-0.128	1.86	*
EnjWalkDumWK	TotPop_T0BK	0.000579	0.0101	1.22	* -0.00909	-0.180	1.40	*
NoChildrenAU	ShopAloneBK	0.0109	0.0726	-1.23	* 0.0413	0.232	-0.95	*
BKPKGSPAATWK	EnjWalkDumWK	-0.000198	-0.0128	-1.23	* -0.00269	-0.224	-1.52	*
PANELSIGMA3	TotPop_T0TR	1.36e-005	0.00127	-1.23	* 4.92e-005	0.174	-7.74	
GroupHouseBK	WalkCshDayTR	-0.00591	-0.0136	-1.24	* 0.00887	0.0195	-1.34	*
NoBagsWK	TotPop_T0BK	-0.000588	-0.0144	1.24	* 0.000485	0.0137	1.51	*
DisabilityAU	TotPop_T0BK	0.000121	0.00276	1.24	* 0.0119	0.211	1.15	*
ASC2	StudentAU	0.00939	0.0292	-1.25	* 0.111	0.328	-1.18	*
EnjWalkDumWK	NTourStopsTR	-0.000390	-0.00965	1.25	* -0.00402	-0.167	1.53	*
TotPop_T0WK	WalkCrmDayAU	0.00117	0.0573	-1.25	* 0.00933	0.338	-0.93	*
PANELSIGMA4	WalkCshDayWK	-0.000929	-0.00797	-1.25	* -0.00155	-0.119	-1.41	*
FemaleDumBK	SpanishDumAU	0.00233	0.0123	-1.25	* -0.0121	-0.0822	-1.27	*
TotPop_T0BK	Wal_Space0AU	-0.000767	-0.0584	-1.26	* -0.000615	-0.0472	-1.24	*
BKPKGSPAATBK	Wal_Space0AU	-0.000465	-0.0773	-1.26	* -0.000329	-0.0725	-1.43	*
ShopAloneWK	SpanishDumAU	-0.0188	-0.173	1.26	* -0.00848	-0.122	1.62	*
PANELSIGMA1	SpanishDumAU	-3.30e-005	-0.000423	1.27	* -0.00141	-0.181	1.91	*
DisabilityAU	GroupHouseTR	0.00475	0.0333	-1.27	* 0.0223	0.167	-1.39	*
PANELSIGMA1	SaturdayAU	0.000203	0.00427	-1.27	* -0.00159	-0.225	-1.54	*

SaturdayAU	TotPop_T0WK	0.000807	0.0700	1.27	*	0.000428	0.0339	1.12	*
PANELSIGMA1	WalkCshDayWK	0.00104	0.0113	-1.27	*	0.000942	0.0736	-1.36	*
NTourStopsBK	TourMilesWK	-0.000259	-0.0122	1.27	*	0.00409	0.163	1.47	*
NTourStopsTR	PayParkDumAU	3.41e-005	0.00141	1.28	*	-0.00347	-0.248	1.55	*
BusPassBK	FemaleDumBK	0.00988	0.0227	1.28	*	-0.119	-0.247	1.08	*
PayParkDumAU	TourMilesTR	-9.97e-005	-0.0471	-1.28	*	1.95e-006	0.00124	-1.65	*
BKPKGSPAATBK	WalkCshDayWK	0.000398	0.0167	-1.28	*	-0.00138	-0.0652	-1.21	*
BKPKGSPAATWK	DisabilityAU	1.20e-005	0.00102	-1.28	*	0.00338	0.251	-1.13	*
BKPKGSPAATWK	NoBagsWK	-0.000152	-0.0138	-1.29	*	-0.00210	-0.248	-1.60	*
DisabilityAU	NTourStopsTR	-0.000868	-0.0281	1.29	*	0.00887	0.330	1.20	*
ShopAloneBK	SpanishDumAU	-0.0127	-0.0574	1.30	*	-0.0474	-0.203	1.00	*
NTourStopsTR	NoBagsWK	-0.000242	-0.00836	-1.31	*	0.000985	0.0584	-1.70	*
EnjWalkDumWK	TourMilesTR	-2.52e-005	-0.00711	1.31	*	-0.000596	-0.220	1.64	*
PayParkDumAU	TotPop_T0BK	0.00410	0.120	-1.31	*	0.00399	0.136	-1.59	*
PANELSIGMA4	WalkCrmDayAU	-0.000796	-0.00746	-1.32	*	-0.00218	-0.138	-1.16	*
NTourStopsWK	PANELSIGMA3	-4.56e-005	-0.00218	1.33	*	-0.000262	-0.287	2.69	
NoChildrenAU	TotEmp_H0AU	-6.18e-005	-0.0478	-1.33	*	-0.000169	-0.394	-1.56	*
PANELSIGMA3	WalkCshDayWK	6.95e-005	0.000797	-1.34	*	6.28e-005	0.0171	-1.41	*
GroupHouseTR	NoBagsWK	0.000807	0.00605	1.34	*	-0.0305	-0.365	1.44	*
ShopAloneWK	WalkCshDayTR	0.00115	0.00943	-1.34	*	-0.0405	-0.333	-1.10	*
TotPop_T0TR	WalkCshDayTR	3.24e-005	0.00154	-1.34	*	0.00445	0.273	-1.17	*
PANELSIGMA1	WalkCrmDayAU	0.000200	0.00237	-1.34	*	0.00242	0.156	-1.11	*
BKPKGSPAATBK	NTourStopsBK	0.000702	0.0575	1.34	*	0.00188	0.227	1.75	*
BusPassBK	GroupHouseTR	0.00230	0.00695	-1.34	*	-0.115	-0.401	-1.16	*
SpanishDumAU	TotEmp_H0AU	-1.81e-005	-0.00951	-1.35	*	-0.000125	-0.222	-1.78	*
Wal_Space0AU	WalkCshDayTR	-0.00101	-0.0233	-1.35	*	0.00872	0.193	-1.22	*
BkFacMi_HBK	TotPop_T0BK	0.00414	0.267	1.35	*	0.00594	0.335	1.33	*
BkFacMi_HBK	WalkCshDayTR	0.000242	0.00474	-1.36	*	0.0141	0.229	-1.24	*
TotPop_T0BK	WalkCshDayWK	-0.000339	-0.00653	-1.36	*	0.0155	0.256	-1.39	*
NoChildrenAU	ShopAloneWK	0.0125	0.170	-1.36	*	0.0341	0.643	-2.40	
EnjWalkDumWK	TotEmp_H0AU	-4.64e-005	-0.0189	1.37	*	-0.000144	-0.187	1.71	*
BKPKGSPAATBK	WalkCrmDayAU	-0.000835	-0.0384	-1.37	*	0.000503	0.0197	-1.00	*
BKPKGSPAATBK	TourMilesTR	9.49e-006	0.0221	1.37	*	-5.46e-006	-0.0157	1.61	*
WBSIGMA	WalkCshDayTR	-0.00373	-0.0190	-1.38	*	-0.00734	-0.186	-1.77	*
GroupHouseBK	GroupHouseWK	0.0511	0.132	-1.38	*	0.262	0.710	-2.03	
DisabilityAU	TourMilesTR	2.99e-005	0.0110	1.38	*	-0.000337	-0.111	1.19	*
PANELSIGMA3	SaturdayAU	-3.35e-005	-0.000744	-1.39	*	-0.000234	-0.115	-1.69	*
BkFacMi_HBK	NTourStopsTR	-3.29e-005	-0.00300	1.39	*	-0.00148	-0.176	1.37	*
NoChildrenAU	TotPop_T0BK	0.000650	0.0217	-1.39	*	0.00350	0.124	-1.61	*
NTourStopsTR	SpanishDumAU	-0.00325	-0.104	1.39	*	0.00482	0.274	2.02	
NTourStopsTR	WalkCshDayWK	-0.00133	-0.0363	-1.40	*	-0.00600	-0.208	-1.31	*
NoBagsWK	TourMilesTR	4.74e-005	0.0187	1.40	*	0.000437	0.230	1.80	*
BKPKGSPAATWK	WalkCshDayWK	0.00136	0.0970	-1.40	*	0.00105	0.0724	-1.33	*
NTourStopsTR	TourMilesBK	-9.44e-005	-0.0163	1.40	*	0.000676	0.136	1.65	*
GroupHouseWK	TourUnder2WK	-0.000692	-0.00494	-1.41	*	0.0749	0.386	-1.49	*
NTourStopsTR	NoChildrenAU	-0.000281	-0.0132	1.41	*	-0.00269	-0.200	1.60	*
PANELSIGMA3	WalkCrmDayAU	0.000218	0.00274	-1.42	*	0.00145	0.328	-1.16	*
DisabilityAU	ShopAloneTR	0.00107	0.00732	-1.42	*	-0.0113	-0.0847	-1.41	*
SpanishDumAU	TourMilesTR	0.000126	0.0459	-1.42	*	-0.000242	-0.122	-1.88	*
NTourStopsWK	TotPop_T0WK	-0.000520	-0.0968	1.42	*	0.00178	0.312	1.59	*
BKPKGSPAATWK	PayParkDumAU	0.00185	0.201	1.43	*	0.000905	0.129	1.82	*
SpanishDumAU	TotPop_T0BK	0.00231	0.0523	-1.43	*	0.0147	0.397	-2.14	
BusPassBK	ShopAloneTR	-0.000233	-0.000689	-1.44	*	0.0797	0.279	-1.55	*
NoChildrenAU	TourMilesTR	0.000110	0.0590	-1.45	*	0.000275	0.181	-1.71	*
ASC2	WalkCshDayBK	-0.150	-0.132	-1.45	*	0.500	0.386	-1.84	*
DisabilityAU	TotEmp_H0AU	6.32e-005	0.0336	1.46	*	0.000187	0.219	1.25	*
FemaleDumBK	TourMilesWK	0.000446	0.00867	-1.46	*	-0.0251	-0.320	-1.29	*
TotPop_T0BK	WalkCrmDayAU	0.00166	0.0348	-1.47	*	0.0248	0.337	-1.16	*
TourMilesTR	WalkCshDayWK	3.94e-007	0.000122	-1.47	*	-6.54e-005	-0.0201	-1.40	*
BusPassTR	GroupHouseTR	0.0196	0.146	1.48	*	0.0196	0.177	1.67	*
BKPKGSPAATBK	SaturdayAU	0.000138	0.0112	-1.48	*	0.00301	0.257	-1.40	*
NoBagsWK	TotEmp_H0AU	3.38e-005	0.0192	1.48	*	7.24e-005	0.135	1.89	*
TourUnder2WK	WalkCshDayBK	0.00818	0.0195	1.48	*	-0.0287	-0.0532	1.40	*
TourUnder2WK	WalkCshDayTR	0.00370	0.0235	1.48	*	-0.0232	-0.0968	1.13	*
BKPKGSPAATTR	EnjWalkDumWK	0.000151	0.00588	-1.49	*	0.00474	0.264	-1.93	*
NTourStopsTR	WalkCrmDayAU	-0.00165	-0.0491	-1.50	*	-0.0156	-0.446	-1.05	*
BKPKGSPAATWK	WalkCrmDayAU	-0.000157	-0.0122	-1.50	*	0.00302	0.172	-1.09	*
BKPKGSPAATWK	BkFacMi_HBK	9.12e-005	0.0218	-1.50	*	0.00117	0.277	-1.56	*
BKPKGSPAATWK	SpanishDumAU	0.000648	0.0543	1.52	*	0.00167	0.189	2.04	
NoBagsWK	ShopAloneTR	0.00281	0.0206	-1.52	*	0.0281	0.336	-2.34	
BusPassWK	DisabilityAU	0.000330	0.00263	1.52	*	-0.0595	-0.533	1.26	*

PANELSIGMA2	StudentAU	0.000289	0.00152	1.52	*	0.00140	0.126	3.79	
TotEmp_H0AU	WalkCshDayWK	-0.000109	-0.0487	-1.53	*	-0.000204	-0.222	-1.46	*
GroupHouseTR	PANELSIGMA2	-5.52e-005	-0.000221	1.55	*	-0.00750	-0.586	3.30	
ShopAloneBK	TourMilesWK	0.000677	0.0113	1.55	*	-0.0220	-0.178	1.07	*
GroupHouseWK	NTourStopsWK	0.00143	0.0390	1.55	*	0.00967	0.227	1.53	*
BKPKGSPAATBK	PayParkDumAU	0.00121	0.0774	1.55	*	-0.000266	-0.0260	1.95	*
NTourStopsBK	TotPop_T0WK	-0.000284	-0.0248	-1.55	*	-0.000608	-0.0678	-1.89	*
SaturdayAU	TotPop_T0BK	0.000745	0.0277	1.56	*	-0.00316	-0.0942	1.32	*
BKPKGSPAATTR	TourMilesTR	8.10e-006	0.0192	-1.56	*	-3.58e-005	-0.101	-1.74	*
NTourStopsTR	Wal_Space0AU	-0.000329	-0.0354	-1.56	*	0.000143	0.0231	-1.92	*
GroupHouseWK	WBSIGMA	-0.000831	-0.00476	1.57	*	-0.00360	-0.113	2.36	
EnjWalkDumWK	TourMilesBK	-0.000566	-0.0184	1.59	*	0.00923	0.325	2.12	
TourMilesTR	WalkCrmDayAU	0.000110	0.0373	-1.59	*	0.000209	0.0531	-1.14	*
BKPKGSPAATWK	NoChildrenAU	0.000916	0.113	1.59	*	0.000802	0.119	1.87	*
BusPassBK	BusPassWK	0.0609	0.209	-1.60	*	0.0580	0.243	-1.53	*
FemaleDumBK	PayParkDumAU	0.000837	0.00572	-1.60	*	-0.00569	-0.0485	-1.60	*
EnjWalkDumWK	NTourStopsBK	-0.000803	-0.00797	1.61	*	-0.0244	-0.378	1.78	*
GroupHouseBK	GroupHouseTR	0.0452	0.105	-1.61	*	0.0517	0.167	-1.86	*
BKPKGSPAATTR	DisabilityAU	0.000609	0.0311	-1.62	*	0.00305	0.152	-1.41	*
FemaleDumBK	PANELSIGMA2	-0.000567	-0.00173	-1.62	*	-0.00677	-0.312	-2.36	
BKPKGSPAATWK	TotPop_T0WK	0.000163	0.0930	-1.62	*	4.64e-005	0.0277	-1.61	*
BusPassTR	BusPassWK	0.0454	0.382	1.62	*	0.0100	0.108	1.50	*
PayParkDumAU	StudentAU	-0.00429	-0.0507	1.62	*	-0.0129	-0.215	1.77	*
GroupHouseWK	ShopAloneWK	0.00540	0.0495	1.62	*	-0.00128	-0.0130	1.60	*
BKPKGSPAATBK	SpanishDumAU	0.000521	0.0258	1.63	*	-0.00141	-0.109	2.10	
FemaleDumBK	NoChildrenAU	-0.00246	-0.0191	-1.63	*	0.0109	0.0963	-1.69	*
BKPKGSPAATTR	NoBagsWK	-0.000190	-0.0104	-1.64	*	0.00271	0.215	-2.17	
ShopAloneBK	TourUnder2WK	0.00387	0.0162	-1.64	*	-0.0394	-0.0906	-1.14	*
BusPassWK	NoBagsWK	0.00253	0.0215	1.64	*	0.00225	0.0322	2.14	
GroupHouseBK	ShopAloneTR	0.00388	0.00879	-1.64	*	0.0455	0.147	-1.95	*
EnjWalkDumWK	TourUnder2WK	-0.00741	-0.0411	-1.64	*	0.0348	0.186	-1.79	*
StudentAU	TourMilesWK	0.00193	0.0648	-1.65	*	0.00352	0.0874	-1.71	*
TotPop_T0WK	WalkCshDayTR	-2.08e-005	-0.000973	-1.65	*	0.00759	0.311	-1.46	*
PANELSIGMA4	WalkCshDayTR	-0.00107	-0.00954	-1.66	*	0.000421	0.0301	-1.72	*
GroupHouseTR	SaturdayAU	0.00243	0.0278	1.66	*	-0.00108	-0.0137	1.84	*
TotEmp_H0AU	WalkCrmDayAU	-1.16e-005	-0.00568	-1.66	*	-0.000150	-0.135	-1.19	*
BusPassWK	GroupHouseBK	0.00373	0.00980	1.66	*	0.0434	0.168	1.97	
PANELSIGMA2	ShopAloneTR	-0.000341	-0.00133	-1.67	*	0.00108	0.0840	-3.88	
BKPKGSPAATTR	WalkCshDayWK	0.00113	0.0485	-1.67	*	0.000467	0.0216	-1.59	*
NTourStopsTR	SaturdayAU	-9.21e-005	-0.00484	-1.68	*	-0.00572	-0.358	-1.43	*
GroupHouseWK	TotPop_T0TR	-0.000859	-0.0459	1.69	*	-0.00116	-0.0879	1.59	*
BkFacMi_HBK	GroupHouseWK	0.000124	0.00274	-1.69	*	0.0126	0.253	-1.73	*
StudentAU	WBSIGMA	0.000997	0.00673	-1.69	*	0.00268	0.115	-3.42	
TotEmp_H0AU	TourMilesBK	1.24e-005	0.0353	1.69	*	-2.75e-006	-0.0173	1.46	*
BkFacMi_HBK	NTourStopsBK	-0.00330	-0.121	1.70	*	0.00846	0.373	2.57	
PANELSIGMA1	WalkCshDayTR	-0.000107	-0.00122	-1.70	*	-0.000778	-0.0570	-1.64	*
BKPKGSPAATWK	SaturdayAU	8.08e-005	0.0111	-1.71	*	0.000975	0.122	-1.55	*
NTourStopsWK	TotPop_T0BK	-0.000180	-0.0144	1.71	*	0.00605	0.399	2.01	
GroupHouseWK	Wal_Space0AU	0.00139	0.0362	1.72	*	0.00839	0.229	1.71	*
BusPassTR	WalkCshDayBK	0.00528	0.0146	1.72	*	-0.0668	-0.181	1.64	*
DisabilityAU	NTourStopsBK	0.00137	0.0178	1.72	*	0.0151	0.209	1.72	*
BusPassWK	PANELSIGMA2	-0.000198	-0.000897	1.73	*	-0.000202	-0.0189	4.53	
BKPKGSPAATBK	NoChildrenAU	0.000453	0.0330	1.73	*	0.00164	0.166	2.10	
FemaleDumBK	WBSIGMA	0.00286	0.0112	-1.73	*	0.00498	0.110	-2.27	
ASC2	BusPassBK	-0.0110	-0.0127	-1.73	*	0.445	0.415	-2.00	
DisabilityAU	TourMilesBK	-0.000307	-0.0130	1.74	*	-0.00579	-0.182	1.45	*
TourUnder2WK	WalkCshDayWK	0.00124	0.00757	1.75	*	0.00440	0.0196	1.50	*
PANELSIGMA4	TourMilesWK	0.000429	0.0160	1.76	*	-0.000534	-0.126	3.40	
NTourStopsBK	WalkCshDayWK	-0.00170	-0.0185	-1.76	*	0.00365	0.0471	-1.79	*
ASC2	SpanishDumAU	0.0457	0.121	-1.77	*	0.00716	0.0219	-1.53	*
BKPKGSPAATWK	TotEmp_H0AU	-1.13e-005	-0.0643	1.77	*	-2.45e-006	-0.0364	1.84	*
NTourStopsBK	NoBagsWK	0.00399	0.0553	-1.77	*	0.00652	0.144	-2.35	
SaturdayAU	ShopAloneTR	-0.00673	-0.0750	-1.77	*	0.00889	0.112	-2.22	
NoChildrenAU	StudentAU	0.000653	0.00876	1.77	*	-0.0306	-0.526	1.61	*
ASC2	TourMilesWK	0.000135	0.00132	-1.78	*	0.0214	0.123	-1.56	*
PANELSIGMA3	WalkCshDayTR	-0.000252	-0.00302	-1.78	*	-0.000632	-0.162	-1.70	*
NoBagsWK	TourMilesBK	-0.000212	-0.00960	1.78	*	0.00191	0.0958	2.29	
TourMilesBK	WalkCshDayWK	-5.80e-005	-0.00207	-1.78	*	-0.00793	-0.232	-1.63	*
BKPKGSPAATBK	WalkCshDayTR	0.000629	0.0276	-1.78	*	-0.00220	-0.0975	-1.51	*
PayParkDumAU	TotPop_T0WK	0.00322	0.220	-1.79	*	0.00240	0.217	-2.31	
SpanishDumAU	TotPop_T0WK	0.00206	0.109	-1.79	*	0.00739	0.530	-2.59	

BKPKGSPAATTR	WalkCrmDayAU	0.000119	0.00559	-1.80	*	-0.00149	-0.0569	-1.29	*
BkFacMi_HBK	TourMilesTR	-6.27e-006	-0.00651	1.81	*	0.000369	0.388	1.79	*
NoBagsWK	PayParkDumAU	-0.00828	-0.0900	1.82	*	-0.0121	-0.217	2.21	
BKPKGSPAATWK	Wal_Space0AU	0.000145	0.0410	-1.82	*	0.000769	0.248	-2.17	
DisabilityAU	NoChildrenAU	-0.0137	-0.158	1.83	*	-0.0404	-0.471	1.55	*
EnjWalkDumWK	NoChildrenAU	-0.000131	-0.00116	1.83	*	0.00776	0.101	2.37	
EnjWalkDumWK	PayParkDumAU	0.00786	0.0610	1.83	*	0.0222	0.279	2.59	
ASC2	NTourStopsBK	-0.131	-0.574	-1.83	*	-0.123	-0.581	-1.65	*
BKPKGSPAATBK	TotEmp_H0AU	-1.62e-005	-0.0542	1.83	*	-2.26e-005	-0.230	2.17	
TotPop_T0BK	WalkCshDayTR	-1.21e-005	-0.000243	-1.84	*	0.0136	0.210	-1.67	*
TourUnder2WK	WalkCrmDayAU	0.00218	0.0145	1.85	*	0.100	0.370	1.72	*
BusPassBK	TourUnder2WK	0.00245	0.00768	-1.86	*	0.0391	0.0872	-1.72	*
NTourStopsBK	Wal_Space0AU	-0.000281	-0.0121	-1.87	*	0.000348	0.0210	-2.30	
NTourStopsBK	WalkCrmDayAU	-0.00133	-0.0158	-1.87	*	0.00810	0.0864	-1.52	*
SaturdayAU	TourMilesTR	-6.68e-005	-0.0401	1.87	*	0.000803	0.447	1.69	*
TotPop_T0BK	TotPop_T0TR	0.00136	0.212	-1.89	*	0.00409	0.872	-2.15	
FemaleDumBK	NTourStopsBK	-0.00269	-0.0235	-1.89	*	-0.0423	-0.445	-1.69	*
DisabilityAU	PayParkDumAU	0.00187	0.0190	1.90	*	0.00578	0.0650	1.87	*
BKPKGSPAATWK	WalkCshDayTR	0.000552	0.0410	-1.90	*	0.00128	0.0829	-1.63	*
NTourStopsTR	WalkCshDayTR	0.000341	0.00967	-1.90	*	-0.0113	-0.367	-1.57	*
BKPKGSPAATBK	NTourStopsWK	-3.43e-005	-0.00600	-1.90	*	2.46e-005	0.00465	-1.84	*
TourMilesBK	WalkCrmDayAU	-0.000380	-0.0148	-1.92	*	-0.00764	-0.185	-1.35	*
ASC2	PayParkDumAU	0.0262	0.0900	-1.92	*	0.0482	0.186	-1.72	*
NoChildrenAU	WalkCshDayWK	-0.00875	-0.0848	-1.93	*	0.0186	0.201	-2.16	
BkFacMi_HBK	SpanishDumAU	-0.000698	-0.0154	1.93	*	0.00593	0.168	2.64	
ASC2	NoChildrenAU	0.0225	0.0876	-1.93	*	-0.0790	-0.315	-1.59	*
ASC2	ShopAloneBK	-0.320	-0.494	-1.95	*	-0.729	-0.701	-1.48	*
NoChildrenAU	TotPop_T0WK	0.000637	0.0494	-1.95	*	0.000320	0.0300	-2.27	
GroupHouseWK	PANELSIGMA4	-0.000199	-0.00200	1.95	*	0.000801	0.0708	2.32	
GroupHouseTR	WBSIGMA	-0.00141	-0.00727	1.95	*	-0.00694	-0.260	3.50	
PayParkDumAU	WalkCshDayWK	0.00311	0.0266	-1.96	*	0.0500	0.523	-2.58	
GroupHouseBK	TourUnder2WK	-0.00179	-0.00430	-1.96		0.102	0.210	-2.28	
ASC2	PANELSIGMA2	0.00257	0.00392	-1.98		0.0223	0.463	-2.03	
TourMilesTR	WalkCshDayTR	-0.000127	-0.0410	-1.98		0.000135	0.0389	-1.69	*
NoBagsWK	SpanishDumAU	-0.00146	-0.0122	1.98		0.00707	0.100	2.74	
NoBagsWK	NoChildrenAU	4.13e-005	0.000510	1.98		-0.0157	-0.291	2.17	
BkFacMi_HBK	PayParkDumAU	0.00339	0.0971	1.99		0.00567	0.203	2.56	
EnjWalkDumWK	SpanishDumAU	0.0152	0.0912	2.00		-0.00619	-0.0618	2.37	
SaturdayAU	TotEmp_H0AU	-0.000112	-0.0964	2.00		-7.01e-005	-0.138	1.78	*
BKPKGSPAATTR	BKPKGSPAATWK	0.000284	0.155	-2.01		-0.000399	-0.252	-1.85	*
SpanishDumAU	WalkCrmDayAU	-0.0177	-0.127	-2.01		-0.0369	-0.253	-1.70	*
GroupHouseWK	TotPop_T0WK	-0.00223	-0.117	2.01		-0.00487	-0.247	1.86	*
BusPassTR	WalkCshDayTR	-0.00371	-0.0273	2.01		-0.0652	-0.398	1.55	*
ASC2	WBSIGMA	0.00587	0.0115	-2.02		0.0169	0.168	-1.94	*
BkFacMi_HBK	TotEmp_H0AU	-4.25e-006	-0.00635	2.02		-7.00e-006	-0.0260	1.96	
DisabilityAU	SpanishDumAU	0.00457	0.0358	2.02		0.0366	0.327	2.42	
SpanishDumAU	Wal_Space0AU	0.00217	0.0565	-2.02		0.000152	0.00587	-2.60	
BusPassWK	SaturdayAU	3.81e-005	0.000492	2.02		-0.00710	-0.107	2.19	
SpanishDumAU	WalkCshDayWK	-0.00275	-0.0181	-2.03		0.00759	0.0630	-2.24	
GroupHouseWK	PANELSIGMA1	0.000322	0.00411	2.03		5.01e-005	0.00454	2.22	
BusPassTR	ShopAloneBK	-0.00145	-0.00704	2.04		-0.00377	-0.0127	1.54	*
TotEmp_H0AU	WalkCshDayTR	-0.000227	-0.106	-2.04		-0.000199	-0.203	-1.75	*
ShopAloneWK	TourMilesWK	-0.000606	-0.0206	2.05		0.00314	0.0854	2.31	
BusPassTR	GroupHouseWK	0.00357	0.0295	2.06		0.0180	0.136	2.08	
GroupHouseTR	ShopAloneWK	0.00136	0.0112	2.06		0.00886	0.108	2.65	
ASC1	GroupHouseBK	-0.00342	-0.00407	-2.07		-0.0904	-0.111	-2.05	
ShopAloneTR	WBSIGMA	-0.00375	-0.0188	2.08		-0.00134	-0.0502	3.96	
GroupHouseTR	NTourStopsWK	0.000981	0.0240	2.09		0.0131	0.366	2.87	
TourMilesBK	TourMilesTR	1.22e-005	0.0241	-2.09		-0.000180	-0.320	-1.75	*
NTourStopsBK	SaturdayAU	0.00253	0.0534	-2.10		0.00940	0.219	-2.35	
GroupHouseBK	ZeroAutosAU	-0.00799	-0.0170	2.11		-0.125	-0.209	1.97	
BkFacMi_HBK	NoChildrenAU	0.000204	0.00663	2.12		0.00505	0.187	2.60	
GroupHouseWK	PANELSIGMA3	1.56e-005	0.000210	2.12		-4.40e-005	-0.0139	2.29	
NTourStopsWK	SpanishDumAU	-0.00313	-0.0857	2.12		0.0103	0.343	3.18	
NTourStopsBK	TotPop_T0TR	-0.000149	-0.0132	-2.12		0.00114	0.190	-2.78	
ShopAloneBK	StudentAU	-0.00400	-0.0213	2.14		-0.0343	-0.142	1.57	*
NoChildrenAU	WalkCrmDayAU	0.00335	0.0355	-2.15		0.0406	0.364	-1.93	*
ASC2	TourMilesBK	0.00306	0.0439	-2.15		0.0394	0.424	-1.92	*
PayParkDumAU	SaturdayAU	-0.000879	-0.0145	-2.15		-0.0151	-0.285	-2.07	
SpanishDumAU	TotPop_T0TR	0.00273	0.146	-2.16		0.00460	0.495	-3.00	
FemaleDumBK	ShopAloneBK	0.00204	0.00627	-2.16		0.141	0.299	-2.01	

DisabilityAU	TourUnder2WK	0.00290	0.0211	-2.18	-0.0669	-0.320	-1.51	*
FemaleDumBK	PANELSIGMA4	0.000367	0.00252	-2.18	-0.00101	-0.0630	-2.36	
SaturdayAU	SpanishDumAU	-0.00116	-0.0147	2.18	0.00308	0.0463	2.58	
PayParkDumAU	WalkCrmDayAU	0.0141	0.131	-2.18	0.0643	0.557	-2.13	
FemaleDumBK	TourMilesBK	-0.00232	-0.0661	-2.18	0.0144	0.344	-2.23	
BKPKGSPAATBK	GroupHouseWK	-5.37e-005	-0.00265	-2.18	0.00527	0.289	-2.14	
BusPassWK	WBSIGMA	-0.00426	-0.0248	2.18	0.0110	0.489	5.52	
TourMilesTR	Wal_Space0AU	-2.49e-005	-0.0305	-2.19	2.76e-005	0.0395	-2.46	
PANELSIGMA2	TourUnder2WK	-0.000958	-0.00396	-2.19	-0.000629	-0.0313	-3.17	
NoChildrenAU	Wal_Space0AU	-0.000486	-0.0186	-2.19	-0.00127	-0.0644	-2.51	
BKPKGSPAATBK	BKPKGSPAATTR	0.000290	0.0934	2.19	1.25e-005	0.00539	2.42	
ASC2	PANELSIGMA4	-0.00120	-0.00415	-2.19	0.00310	0.0870	-1.98	
ASC2	BKPKGSPAATTR	-0.000490	-0.00844	-2.19	0.00604	0.103	-1.92	*
BKPKGSPAATTR	SaturdayAU	-0.000261	-0.0217	-2.20	0.00185	0.155	-2.05	
ASC1	FemaleDumBK	-0.00124	-0.00301	-2.20	0.0258	0.0560	-2.12	
ASC2	TotPop_T0BK	-0.0456	-0.353	-2.20	-0.101	-0.613	-1.87	*
BusPassTR	EnjWalkDumWK	-0.000813	-0.00522	2.20	0.0295	0.231	2.85	
GroupHouseWK	TotPop_T0BK	-0.00185	-0.0416	2.20	-0.00452	-0.0862	2.03	
BKPKGSPAATTR	WalkCshDayTR	0.00250	0.112	-2.21	0.00608	0.264	-1.92	*
NTourStopsBK	WalkCshDayTR	-0.00128	-0.0145	-2.21	0.00528	0.0638	-2.06	
BkFacMi_HBK	GroupHouseTR	-1.05e-005	-0.000207	-2.21	0.00978	0.234	-2.93	
NTourStopsBK	StudentAU	0.00141	0.0213	2.22	-0.0124	-0.253	2.25	
GroupHouseTR	TotPop_T0TR	-0.000665	-0.0319	2.22	0.00366	0.331	2.89	
GroupHouseTR	Wal_Space0AU	-3.83e-005	-0.000893	2.22	0.00397	0.130	2.86	
BusPassTR	GroupHouseBK	0.00383	0.0107	2.23	-0.0161	-0.0485	2.41	
ASC2	PANELSIGMA3	0.000173	0.000798	-2.23	-2.62e-005	-0.00264	-1.98	
ASC2	PANELSIGMA1	-0.00150	-0.00654	-2.25	-0.00693	-0.200	-1.99	
ASC2	TotEmp_H0AU	0.000182	0.0327	-2.26	0.000417	0.166	-1.96	
PANELSIGMA1	TourMilesWK	-0.000387	-0.0183	2.27	0.000793	0.192	3.86	
PANELSIGMA3	TourMilesWK	-7.70e-007	-3.83e-005	2.27	0.000103	0.0869	3.61	
PayParkDumAU	TotPop_T0TR	0.00363	0.252	-2.27	0.00133	0.179	-2.89	
ASC2	ShopAloneWK	-0.0197	-0.0620	-2.27	-0.109	-0.351	-1.91	*
NoChildrenAU	SaturdayAU	-0.00261	-0.0490	-2.27	-0.0106	-0.209	-2.16	
ASC2	NTourStopsTR	-0.00515	-0.0563	-2.28	0.00627	0.0798	-2.00	
NTourStopsWK	PayParkDumAU	0.00234	0.0829	2.28	-0.00174	-0.0729	2.63	
ASC2	TourMilesTR	0.000137	0.0171	-2.28	1.99e-005	0.00225	-1.98	
NTourStopsBK	NTourStopsWK	0.00289	0.131	-2.28	0.00331	0.171	-2.73	
TourMilesBK	WalkCshDayTR	-0.000597	-0.0222	-2.29	-0.00165	-0.0452	-1.95	*
BKPKGSPAATWK	TourMilesBK	-8.79e-005	-0.0399	2.29	-0.00164	-0.657	1.70	*
NTourStopsWK	ShopAloneTR	0.00177	0.0424	-2.29	0.000544	0.0152	-2.83	
NTourStopsTR	TotPop_T0TR	-0.000387	-0.0856	-2.29	-0.000260	-0.117	-3.13	
BKPKGSPAATTR	BkFacMi_HBK	6.00e-005	0.00862	-2.30	-0.000446	-0.0705	-2.22	
FemaleDumBK	PANELSIGMA3	9.51e-006	8.74e-005	-2.30	0.00184	0.410	-2.40	
BKPKGSPAATTR	FemaleDumBK	0.000338	0.0116	2.30	-0.00270	-0.102	2.21	
BusPassBK	BusPassTR	0.0426	0.154	-2.31	0.0644	0.210	-2.20	
ASC2	BKPKGSPAATWK	0.000368	0.0106	-2.31	-0.0132	-0.337	-1.99	
ASC1	ASC3	0.160	0.287	2.32	0.0516	0.115	2.19	
PayParkDumAU	Wal_Space0AU	0.0118	0.399	-2.32	0.00574	0.280	-2.82	
FemaleDumBK	PANELSIGMA1	-3.33e-006	-2.90e-005	-2.33	-0.00396	-0.252	-2.40	
BKPKGSPAATWK	GroupHouseWK	0.000263	0.0219	-2.33	0.00733	0.587	-2.30	
GroupHouseWK	NTourStopsTR	0.000854	0.0272	2.33	0.00249	0.0996	2.24	
ASC2	BKPKGSPAATBK	-0.00372	-0.0628	-2.34	-0.0153	-0.266	-2.03	
FemaleDumBK	ShopAloneWK	-0.00140	-0.00881	-2.35	0.0440	0.315	-2.74	
BusPassTR	WalkCshDayWK	0.00486	0.0343	2.36	-0.0359	-0.234	2.01	
EnjWalkDumWK	TourMilesWK	-0.00144	-0.0319	2.37	0.0147	0.276	3.16	
NoBagsWK	TourUnder2WK	0.0116	0.0899	-2.38	0.0148	0.113	-2.14	
PayParkDumAU	WalkCshDayTR	0.00221	0.0197	-2.38	0.0558	0.547	-2.90	
SaturdayAU	TourMilesBK	-0.000558	-0.0385	2.38	-0.000155	-0.00821	2.13	
NoChildrenAU	WalkCshDayTR	-0.00548	-0.0554	-2.39	-0.0117	-0.119	-2.14	
BusPassWK	ShopAloneWK	-0.00196	-0.0184	2.39	0.0103	0.149	3.27	
ASC2	TotPop_T0WK	-0.00295	-0.0531	-2.40	-0.0193	-0.310	-2.06	
BkFacMi_HBK	ShopAloneTR	-4.67e-005	-0.000901	-2.40	-0.00271	-0.0648	-2.90	
ShopAloneTR	Wal_Space0AU	-0.000913	-0.0208	2.40	-0.00560	-0.183	2.91	
BKPKGSPAATBK	TotPop_T0TR	0.000180	0.0616	-2.41	-0.000503	-0.308	-2.68	
GroupHouseTR	PANELSIGMA4	0.000194	0.00175	2.41	-0.00194	-0.205	3.56	
ASC2	BkFacMi_HBK	-0.0295	-0.223	-2.42	-0.0451	-0.287	-2.10	
TotPop_T0WK	TourMilesTR	-1.11e-005	-0.0276	2.42	1.33e-005	0.0353	2.51	
GroupHouseWK	TourMilesTR	1.90e-005	0.00690	2.42	0.000197	0.0700	2.28	
FemaleDumBK	TotEmp_H0AU	1.13e-005	0.00405	-2.43	7.82e-005	0.0691	-2.35	
ShopAloneTR	TotPop_T0TR	0.000735	0.0344	2.43	0.000593	0.0537	3.11	
FemaleDumBK	TotPop_T0BK	-0.00300	-0.0463	-2.43	0.0235	0.316	-2.57	

SpanishDumAU	WalkCshDayTR	0.00159	0.0109	-2.44	0.0302	0.235	-2.69	
NTourStopsWK	NoChildrenAU	-0.000710	-0.0286	2.44	-0.00527	-0.229	2.54	
TotEmp_H0AU	Wal_Space0AU	7.33e-005	0.129	-2.46	8.09e-005	0.410	-2.76	
NoChildrenAU	TotPop_T0TR	0.000655	0.0516	-2.47	0.000654	0.0918	-2.94	
BusPassTR	WalkCrmDayAU	0.00127	0.00977	2.47	-0.0135	-0.0730	1.91	*
FemaleDumBK	NTourStopsTR	-0.000176	-0.00384	-2.47	0.00965	0.272	-2.49	
TotPop_T0TR	TotPop_T0WK	0.00144	0.525	2.47	0.00153	0.864	4.54	
FemaleDumBK	TourMilesTR	-1.39e-005	-0.00344	-2.48	-0.00228	-0.571	-2.38	
ASC1	WalkCshDayBK	-0.00115	-0.00136	-2.49	0.0396	0.0438	-2.49	
BKPKGSPAATWK	NTourStopsWK	9.24e-006	0.00274	-2.49	0.00152	0.421	-2.62	
GroupHouseTR	PANELSIGMA1	0.000220	0.00252	2.50	-0.000180	-0.0195	3.52	
GroupHouseWK	TotEmp_H0AU	1.41e-005	0.00738	2.50	-0.000136	-0.171	2.35	
PANELSIGMA4	StudentAU	2.46e-005	0.000292	2.50	0.000831	0.101	3.69	
BKPKGSPAATBK	TourMilesBK	6.03e-005	0.0161	2.51	-0.00110	-0.301	2.13	
ASC2	TotPop_T0TR	-0.00221	-0.0404	-2.52	-0.0178	-0.429	-2.17	
BusPassWK	NTourStopsWK	-0.00286	-0.0794	2.53	-0.00956	-0.319	2.95	
NTourStopsTR	NTourStopsWK	0.00267	0.302	-2.53	0.00339	0.470	-2.87	
ASC2	NTourStopsWK	-0.00880	-0.0823	-2.53	-0.0466	-0.347	-2.16	
BKPKGSPAATWK	FemaleDumBK	-9.72e-005	-0.00555	2.53	-0.00132	-0.0744	2.44	
BkFacMi_HBK	TourMilesBK	-0.000348	-0.0416	2.54	-0.00475	-0.476	2.04	
GroupHouseTR	TotPop_T0WK	-0.000316	-0.0149	2.54	0.00691	0.417	3.39	
ASC2	Wal_Space0AU	0.0211	0.188	-2.54	0.0238	0.207	-2.21	
PANELSIGMA4	ShopAloneTR	-0.000972	-0.00857	-2.56	0.000227	0.0239	-3.94	
WalkCshDayBK	ZeroAutosAU	-0.0111	-0.0236	2.57	-0.0155	-0.0231	2.41	
ASC2	NoBagsWK	-0.00875	-0.0251	-2.58	-0.0337	-0.108	-2.27	
GroupHouseTR	PANELSIGMA3	1.34e-005	0.000162	2.58	0.000475	0.179	3.64	
ASC2	ASC3	0.105	0.141	2.59	0.0392	0.0609	2.38	
GroupHouseWK	NTourStopsBK	-0.000187	-0.00239	2.60	0.0267	0.399	3.10	
BKPKGSPAATBK	FemaleDumBK	-0.00138	-0.0464	2.60	0.00447	0.172	2.57	
ASC2	DisabilityAU	-0.000935	-0.00251	-2.60	-0.0871	-0.174	-2.15	
TourMilesWK	WalkCshDayWK	-0.00274	-0.0664	-2.60	-0.000873	-0.0137	-2.44	
ShopAloneTR	ShopAloneWK	0.0361	0.291	2.60	0.00457	0.0554	2.82	
FemaleDumBK	ZeroAutosAU	0.00316	0.0137	2.61	0.0408	0.120	2.28	
GroupHouseWK	PayParkDumAU	-0.00713	-0.0713	2.61	0.0143	0.174	3.03	
BusPassTR	PANELSIGMA2	0.000116	0.000554	2.63	0.000338	0.0246	5.37	
ASC2	EnjWalkDumWK	0.00816	0.0167	-2.63	0.209	0.468	-2.77	
BKPKGSPAATTR	GroupHouseWK	4.34e-006	0.000218	-2.64	-0.00160	-0.0855	-2.46	
ASC2	SaturdayAU	0.0134	0.0582	-2.65	-0.0454	-0.153	-2.21	
ShopAloneWK	StudentAU	-0.00556	-0.0602	2.65	-0.0281	-0.391	2.62	
ASC2	WalkCshDayWK	-0.00820	-0.0185	-2.65	0.0827	0.154	-2.47	
PANELSIGMA1	ShopAloneTR	-6.30e-005	-0.000705	-2.66	0.000503	0.0543	-3.85	
BKPKGSPAATBK	GroupHouseTR	7.37e-005	0.00326	-2.67	-0.000567	-0.0370	-3.31	
TourUnder2WK	WBSIGMA	-0.00947	-0.0503	2.67	0.00201	0.0479	3.34	
GroupHouseTR	TotPop_T0BK	-0.00107	-0.0216	2.69	0.0210	0.478	4.01	
GroupHouseWK	SpanishDumAU	-0.00226	-0.0175	2.70	0.00180	0.0173	2.97	
ShopAloneTR	TotPop_T0WK	-0.00110	-0.0508	2.71	-0.000979	-0.0591	3.43	
BKPKGSPAATTR	Wal_Space0AU	0.000193	0.0328	-2.71	6.11e-005	0.0132	-3.02	
FemaleDumBK	TotPop_T0WK	0.000166	0.00594	-2.71	0.00636	0.227	-2.68	
ASC2	WalkCrmDayAU	0.0106	0.0262	-2.71	-0.106	-0.163	-2.15	
BkFacMi_HBK	BusPassWK	-0.000107	-0.00239	-2.72	-0.00261	-0.0745	-3.33	
EnjWalkDumWK	FemaleDumBK	0.000902	0.00368	2.73	-0.0210	-0.104	2.78	
BusPassWK	Wal_Space0AU	-0.000372	-0.00984	2.74	0.00373	0.145	3.73	
PANELSIGMA3	ShopAloneTR	-0.000361	-0.00426	-2.75	-0.00109	-0.411	-3.89	
GroupHouseWK	NoChildrenAU	-0.00425	-0.0483	2.76	0.00909	0.114	2.96	
DisabilityAU	TourMilesWK	7.21e-007	2.09e-005	2.76	-0.0255	-0.428	2.06	
GroupHouseWK	TourMilesBK	0.000180	0.00751	2.77	-0.0135	-0.459	2.39	
BusPassWK	TotPop_T0TR	-0.000170	-0.00922	2.78	-0.00179	-0.194	3.58	
SaturdayAU	TourUnder2WK	0.00428	0.0505	-2.78	-0.0369	-0.297	-1.94	*
BkFacMi_HBK	FemaleDumBK	-0.00411	-0.0618	2.79	-0.0220	-0.311	2.56	
BKPKGSPAATWK	GroupHouseTR	2.94e-005	0.00221	-2.80	0.00181	0.173	-3.54	
BusPassWK	PANELSIGMA4	-0.00150	-0.0153	2.80	0.00225	0.283	4.81	
FemaleDumBK	NoBagsWK	-0.00540	-0.0308	-2.80	-0.0355	-0.251	-2.68	
PANELSIGMA3	StudentAU	4.63e-005	0.000735	2.81	0.000618	0.267	3.72	
GroupHouseTR	NTourStopsTR	0.00229	0.0654	2.82	0.00131	0.0626	3.53	
BusPassTR	DisabilityAU	-0.000214	-0.00180	2.83	-0.0437	-0.306	2.25	
TourMilesWK	WalkCrmDayAU	-0.00108	-0.0287	-2.83	0.0101	0.130	-2.12	
PANELSIGMA1	StudentAU	0.000251	0.00378	2.84	0.000421	0.0522	3.79	
ASC2	WalkCshDayTR	0.00104	0.00245	-2.84	0.000353	0.000615	-2.47	
DisabilityAU	FemaleDumBK	0.00258	0.0138	2.85	0.00150	0.00666	2.64	
BKPKGSPAATBK	ShopAloneTR	0.000151	0.00654	-2.85	-0.00279	-0.182	-3.54	
NoBagsWK	TourMilesWK	-0.000215	-0.00664	2.85	0.00778	0.209	3.67	

ShopAloneTR	TotPop_T0BK	-0.00174	-0.0345	2.85	-0.00191	-0.0435	3.48
FemaleDumBK	Wal_Space0AU	-0.000282	-0.00500	-2.86	-0.00313	-0.0602	-2.76
ASC3	ZeroAutosAU	0.00941	0.0302	-2.88	0.0130	0.0391	-2.96
FemaleDumBK	WalkCshDayWK	0.00520	0.0233	-2.89	-0.0284	-0.117	-2.60
GroupHouseTR	TourMilesTR	0.000159	0.0520	2.89	-0.000429	-0.182	3.59
ASC1	StudentAU	0.0237	0.0990	-2.89	0.0119	0.0503	-2.67
EnjWalkDumWK	StudentAU	-0.00781	-0.0551	2.89	0.0105	0.102	3.74
StudentAU	TourMilesBK	0.000333	0.0164	-2.90	0.00292	0.136	-3.22
TotEmp_H0AU	TotPop_T0WK	-4.18e-005	-0.149	-2.91	-1.40e-005	-0.132	-3.03
NTourStopsWK	TourMilesTR	-7.60e-005	-0.0979	2.91	-0.000159	-0.195	2.66
ASC1	BusPassBK	-9.99e-005	-0.000155	-2.92	-0.0875	-0.117	-2.56
ASC2	GroupHouseWK	-0.00650	-0.0172	-2.93	-0.0213	-0.0459	-2.55
TourMilesBK	Wal_Space0AU	-0.000135	-0.0191	-2.95	-0.000695	-0.0949	-2.92
FemaleDumBK	TotPop_T0TR	7.89e-005	0.00288	-2.95	0.00261	0.139	-2.89
GroupHouseTR	TotEmp_H0AU	3.56e-005	0.0167	2.95	-0.000148	-0.222	3.68
BusPassTR	NoBagsWK	-0.00234	-0.0210	2.95	-0.0114	-0.127	3.08
BKPKGSPAATTR	TotPop_T0WK	0.000236	0.0809	-2.96	0.000400	0.160	-3.34
BusPassWK	PANELSIGMA1	0.000147	0.00191	2.96	-0.00163	-0.211	4.44
FemaleDumBK	WalkCrmDayAU	0.00509	0.0249	-2.97	0.0450	0.154	-2.73
BKPKGSPAATWK	ShopAloneTR	0.000241	0.0177	-2.98	-0.00131	-0.125	-3.74
FemaleDumBK	SaturdayAU	-0.00255	-0.0221	-2.98	-0.0564	-0.421	-2.50
FemaleDumBK	NTourStopsWK	-0.000385	-0.00717	-2.99	0.0105	0.174	-2.99
GroupHouseTR	NTourStopsBK	-0.000193	-0.00222	3.02	0.00129	0.0229	3.80
ShopAloneWK	TourUnder2WK	0.000203	0.00174	-3.04	0.0360	0.278	-2.99
GroupHouseTR	PayParkDumAU	-0.00496	-0.0446	3.04	0.0186	0.269	4.51
ShopAloneTR	TourMilesTR	2.49e-005	0.00793	3.06	9.11e-005	0.0387	3.91
NTourStopsTR	ShopAloneTR	0.00586	0.164	-3.06	0.00480	0.229	-3.97
BusPassWK	PANELSIGMA3	-0.000244	-0.00334	3.06	0.00137	0.616	4.75
BusPassWK	TotPop_T0WK	-0.00286	-0.153	3.06	-0.00197	-0.142	3.99
BKPKGSPAATTR	StudentAU	-1.56e-005	-0.000925	3.07	-0.00562	-0.413	3.14
BKPKGSPAATTR	GroupHouseTR	0.000152	0.00684	-3.08	0.00221	0.142	-3.91
StudentAU	WalkCshDayWK	-0.00781	-0.0605	-3.10	-0.0216	-0.174	-2.94
ShopAloneTR	SpanishDumAU	-0.0118	-0.0801	3.12	0.0273	0.312	5.06
ShopAloneTR	TotEmp_H0AU	-0.000236	-0.108	3.12	-4.34e-005	-0.0650	3.99
TotEmp_H0AU	TourMilesTR	6.43e-006	0.159	-3.12	2.25e-006	0.148	-3.67
GroupHouseTR	SpanishDumAU	0.00428	0.0297	3.15	0.0194	0.222	4.49
ASC2	GroupHouseTR	-0.00159	-0.00377	-3.16	-0.160	-0.412	-2.59
NTourStopsBK	ShopAloneTR	-0.000661	-0.00741	-3.17	0.00875	0.156	-4.33
TourMilesWK	WalkCshDayTR	-0.000699	-0.0177	-3.17	-0.000710	-0.0104	-2.67
GroupHouseTR	NoChildrenAU	-0.00299	-0.0306	3.17	0.0147	0.221	4.42
TotPop_T0WK	TourMilesBK	1.51e-005	0.00429	3.18	-3.98e-005	-0.0101	2.90
FemaleDumBK	WalkCshDayTR	0.00161	0.00752	-3.18	-0.0198	-0.0765	-2.81
StudentAU	WalkCrmDayAU	-0.0130	-0.110	-3.19	-0.00489	-0.0325	-2.70
GroupHouseTR	TourMilesBK	0.000156	0.00583	3.19	0.000609	0.0246	3.95
ASC2	ShopAloneTR	-0.0144	-0.0332	-3.20	0.0180	0.0462	-2.96
NTourStopsWK	TotEmp_H0AU	2.04e-005	0.0379	3.21	2.42e-005	0.105	2.94
PayParkDumAU	ShopAloneTR	-0.00311	-0.0273	-3.21	-0.0301	-0.435	-3.52
StudentAU	TotPop_T0BK	-0.000103	-0.00275	-3.23	-0.00515	-0.135	-3.25
BKPKGSPAATTR	ShopAloneTR	0.000277	0.0122	-3.25	0.00156	0.0999	-4.20
BusPassWK	TotPop_T0BK	-0.00102	-0.0234	3.25	-0.00843	-0.229	3.73
BusPassBK	ZeroAutosAU	0.00582	0.0162	3.25	-0.0207	-0.0373	2.73
BusPassTR	WBSIGMA	-0.00208	-0.0128	3.29	-0.00272	-0.0949	5.37
BKPKGSPAATBK	BusPassWK	0.000746	0.0374	-3.29	0.00332	0.259	-4.49
ASC2	BusPassWK	0.00346	0.00929	-3.30	0.0593	0.182	-3.07
TourMilesBK	TourMilesWK	0.000213	0.0330	3.31	-0.00158	-0.143	2.23
BKPKGSPAATTR	NTourStopsWK	-8.96e-005	-0.0160	-3.32	0.000735	0.136	-3.36
StudentAU	TotEmp_H0AU	0.000128	0.0791	-3.33	0.000389	0.669	-3.64
NoBagsWK	StudentAU	-0.000391	-0.00386	3.33	-0.00279	-0.0383	3.87
BusPassWK	NTourStopsTR	-0.00129	-0.0418	3.36	-0.00262	-0.149	4.31
ShopAloneTR	TourMilesBK	-1.89e-005	-0.000693	3.36	-0.000509	-0.0206	4.20
NTourStopsTR	StudentAU	0.00119	0.0447	3.37	-0.00168	-0.0924	3.60
ASC1	PANELSIGMA2	0.000300	0.000615	-3.40	0.00510	0.151	-4.05
StudentAU	TourMilesTR	-7.15e-006	-0.00307	-3.41	-0.000163	-0.0794	-3.71
DisabilityAU	StudentAU	0.00895	0.0826	3.42	0.00350	0.0302	3.11
BkFacMi_HBK	TourUnder2WK	-0.000124	-0.00254	-3.42	0.0178	0.271	-2.87
FemaleDumBK	GroupHouseWK	0.000548	0.00288	-3.42	-0.0654	-0.312	-2.88
NTourStopsWK	TourUnder2WK	0.00575	0.146	-3.42	-0.00109	-0.0194	-2.55
PANELSIGMA4	TourUnder2WK	-0.000495	-0.00462	-3.43	0.000174	0.0117	-3.24
BKPKGSPAATWK	BusPassWK	0.00119	0.101	-3.46	0.00207	0.236	-4.62
TourUnder2WK	Wal_Space0AU	0.00122	0.0295	3.48	0.00616	0.128	2.77
TotPop_T0TR	TourUnder2WK	-0.000330	-0.0164	-3.48	0.00575	0.332	-2.76

BusPassWK	NTourStopsBK	-0.00263	-0.0342	3.49	-0.00571	-0.121	4.35
BKPKGSPAATWK	StudentAU	-1.46e-006	-0.000144	3.50	-0.00211	-0.231	3.71
TotPop_T0BK	TourMilesWK	8.71e-005	0.00727	3.50	-0.000609	-0.0310	2.72
ASC1	TourMilesWK	-0.0224	-0.294	-3.51	-0.0672	-0.553	-3.07
BusPassWK	TourMilesTR	-9.67e-005	-0.0357	3.53	0.000128	0.0647	4.65
ASC1	SpanishDumAU	0.0425	0.151	-3.55	-0.0239	-0.104	-3.15
BusPassWK	SpanishDumAU	0.00408	0.0321	3.55	-0.00314	-0.0430	4.52
BusPassWK	PayParkDumAU	-0.000937	-0.00954	3.56	-0.00165	-0.0284	4.60
NTourStopsWK	TourMilesBK	-0.000233	-0.0346	3.56	-0.00118	-0.138	3.06
NoChildrenAU	ShopAloneTR	0.0124	0.123	-3.57	0.0121	0.181	-4.60
ASC2	TourUnder2WK	-0.00444	-0.0109	-3.58	-0.0244	-0.0400	-3.03
StudentAU	WalkCshDayTR	-0.00220	-0.0178	-3.60	-0.0327	-0.246	-3.04
BusPassWK	TotEmp_H0AU	-5.34e-005	-0.0284	3.61	0.000133	0.239	4.75
BKPKGSPAATBK	StudentAU	0.000176	0.0102	3.61	-0.00201	-0.150	3.84
PANELSIGMA1	TourUnder2WK	0.000935	0.0111	-3.62	0.000191	0.0132	-3.17
BusPassTR	SaturdayAU	-0.00150	-0.0206	3.62	0.0113	0.133	3.69
ASC1	EnjWalkDumWK	-0.190	-0.522	-3.63	-0.114	-0.364	-3.85
ASC1	WBSIGMA	0.0167	0.0441	-3.67	0.00676	0.0962	-3.94
FemaleDumBK	GroupHouseTR	-0.00218	-0.0103	-3.70	0.0848	0.483	-5.13
PANELSIGMA3	TourUnder2WK	-0.000214	-0.00268	-3.70	0.00142	0.341	-3.24
GroupHouseWK	TourMilesWK	-0.00103	-0.0293	3.72	0.00202	0.0366	3.45
ASC3	GroupHouseBK	-0.00808	-0.0105	-3.73	0.00587	0.0115	-4.43
ASC1	ShopAloneBK	-0.0282	-0.0584	-3.74	0.00934	0.0128	-3.19
BKPKGSPAATTR	BusPassWK	0.000395	0.0202	-3.74	-0.00442	-0.337	-4.62
ASC1	PayParkDumAU	0.0174	0.0801	-3.75	-0.0334	-0.184	-3.33
StudentAU	TotPop_T0WK	-0.000102	-0.00635	-3.77	-0.000271	-0.0188	-4.09
ASC1	ShopAloneWK	-0.0805	-0.340	-3.78	-0.0613	-0.283	-3.70
BusPassWK	NoChildrenAU	0.00277	0.0321	3.79	0.00205	0.0366	4.80
BKPKGSPAATWK	TotPop_T0TR	0.000174	0.101	-3.79	0.000161	0.144	-5.09
SaturdayAU	StudentAU	-0.00271	-0.0406	3.79	-0.0136	-0.197	3.56
TotPop_T0WK	TourUnder2WK	-0.000556	-0.0271	-3.80	0.00442	0.170	-2.99
BkFacMi_HBK	StudentAU	-0.000659	-0.0171	3.82	-0.0108	-0.296	3.71
FemaleDumBK	ShopAloneTR	-0.00139	-0.00641	-3.82	-0.0822	-0.468	-3.41
ASC1	NoChildrenAU	0.0223	0.117	-3.83	-0.0304	-0.174	-3.35
ASC2	BusPassTR	-0.00146	-0.00415	-3.87	0.0171	0.0410	-3.44
BusPassWK	TourMilesBK	0.000313	0.0133	3.87	-0.000780	-0.0376	4.91
BusPassTR	ShopAloneWK	0.000249	0.00246	3.87	-0.0166	-0.188	3.73
ASC1	NTourStopsBK	-0.00483	-0.0284	-3.87	-0.00762	-0.0517	-3.63
BKPKGSPAATTR	TourMilesWK	-6.26e-005	-0.0117	3.88	-0.000826	-0.118	2.78
StudentAU	Wal_Space0AU	-0.000876	-0.0268	-3.91	0.00220	0.0821	-4.42
StudentAU	ZeroAutosAU	0.00668	0.0501	3.92	-0.0262	-0.149	2.83
SaturdayAU	TourMilesWK	0.000355	0.0167	3.93	-0.0147	-0.416	2.81
TotPop_T0BK	TourUnder2WK	0.000766	0.0161	-3.95	0.0100	0.145	-3.17
BKPKGSPAATBK	TourUnder2WK	0.000440	0.0202	-3.95	-0.00181	-0.0755	-3.03
SpanishDumAU	TourUnder2WK	-0.00471	-0.0338	-3.97	-0.0171	-0.125	-3.54
BusPassWK	FemaleDumBK	-0.000246	-0.00132	4.02	0.0201	0.137	4.46
GroupHouseTR	TourMilesWK	-0.000677	-0.0173	4.06	-0.0209	-0.453	4.13
ASC1	PANELSIGMA4	0.000674	0.00312	-4.07	-0.00277	-0.111	-3.97
GroupHouseWK	StudentAU	0.00112	0.0102	4.07	-0.0279	-0.259	3.61
PANELSIGMA2	ZeroAutosAU	0.000694	0.00255	4.08	-0.00400	-0.161	4.90
BKPKGSPAATWK	TourUnder2WK	0.000143	0.0111	-4.09	0.00518	0.315	-3.21
NTourStopsWK	StudentAU	-0.00157	-0.0506	4.10	-0.00408	-0.131	4.26
NTourStopsTR	TourUnder2WK	0.00291	0.0863	-4.12	-0.00985	-0.300	-3.04
NTourStopsBK	TourUnder2WK	-0.00109	-0.0130	-4.12	0.0204	0.231	-3.72
ASC1	TourMilesBK	0.000340	0.00655	-4.14	0.00799	0.123	-3.87
StudentAU	TotPop_T0TR	-0.000908	-0.0572	-4.15	-0.00145	-0.150	-4.51
ASC3	WalkCshDayBK	-0.00492	-0.00638	-4.15	0.110	0.193	-4.90
ASC1	PANELSIGMA3	0.000361	0.00224	-4.18	-0.00113	-0.162	-3.99
TourMilesTR	TourUnder2WK	-5.33e-006	-0.00180	-4.18	0.000660	0.179	-3.22
ASC1	PANELSIGMA1	-0.000568	-0.00334	-4.19	0.00670	0.276	-4.07
ShopAloneTR	TourMilesWK	-0.00102	-0.0255	4.19	0.0101	0.218	5.52
PayParkDumAU	TourUnder2WK	0.00273	0.0254	-4.20	0.0374	0.344	-4.16
ASC1	BKPKGSPAATTR	-0.000392	-0.00907	-4.20	0.00203	0.0495	-3.91
NTourStopsTR	TourMilesWK	0.000370	0.0436	4.22	-0.00301	-0.322	3.07
NoChildrenAU	TourUnder2WK	-0.00408	-0.0431	-4.23	0.0200	0.191	-3.89
ASC1	NTourStopsTR	-0.0118	-0.173	-4.24	0.00308	0.0561	-4.03
TotEmp_H0AU	TourUnder2WK	-1.26e-005	-0.00610	-4.25	-8.96e-005	-0.0856	-3.27
ASC1	TotPop_T0BK	-0.00359	-0.0373	-4.28	-0.0290	-0.252	-3.83
ASC1	WalkCshDayWK	-0.0402	-0.122	-4.29	-0.00375	-0.00997	-4.18
ASC1	TotEmp_H0AU	0.000230	0.0555	-4.29	0.000251	0.143	-3.98
BusPassTR	PANELSIGMA4	-0.00191	-0.0206	4.30	-0.00168	-0.165	5.37

ASC1	TourMilesTR	0.000266	0.0444	-4.33	2.03e-005	0.00328	-4.01
ShopAloneTR	StudentAU	-0.00974	-0.0775	4.33	-0.0167	-0.185	4.95
ASC1	BKPKGSPAATWK	-0.00285	-0.110	-4.34	-0.00826	-0.300	-4.00
BKPKGSPAATTR	TourUnder2WK	-2.15e-005	-0.00100	-4.36	-0.00626	-0.255	-3.29
ASC1	BKPKGSPAATBK	-0.00192	-0.0437	-4.40	0.00650	0.162	-4.13
ASC1	NoBagsWK	-0.0162	-0.0622	-4.43	-6.51e-005	-0.000296	-4.35
ASC1	TotPop_T0WK	-0.00563	-0.136	-4.44	-0.0174	-0.401	-4.05
ASC1	NTourStopsWK	-0.0315	-0.396	-4.45	-0.0294	-0.313	-4.16
BusPassTR	NTourStopsWK	-0.000781	-0.0229	4.46	-0.00937	-0.245	4.06
TourMilesBK	TourUnder2WK	-0.000208	-0.00807	-4.47	-0.0113	-0.292	-3.31
FemaleDumBK	TourUnder2WK	4.76e-005	0.000232	-4.47	-0.0477	-0.173	-3.64
GroupHouseTR	StudentAU	0.0105	0.0854	4.55	-0.0235	-0.261	4.60
BKPKGSPAATTR	TotPop_T0TR	4.25e-005	0.0148	-4.56	-0.000179	-0.107	-5.49
SpanishDumAU	ZeroAutosAU	0.000792	0.00505	4.56	0.0644	0.381	4.45
ASC1	DisabilityAU	0.00948	0.0341	-4.57	0.0485	0.139	-4.37
ASC1	BkFacMi_HBK	0.00226	0.0229	-4.58	-0.0238	-0.217	-4.09
BkFacMi_HBK	BusPassTR	-0.000261	-0.00618	-4.58	-0.00295	-0.0657	-4.37
ASC1	TotPop_T0TR	-0.00373	-0.0917	-4.62	-0.0131	-0.452	-4.23
ShopAloneBK	ZeroAutosAU	-0.00576	-0.0214	4.62	-0.0174	-0.0324	3.26
BusPassTR	Wal_Space0AU	-0.000549	-0.0153	4.64	-0.00520	-0.158	4.40
TotPop_T0TR	TourMilesBK	-7.89e-005	-0.0229	4.64	-0.000515	-0.195	4.39
BusPassTR	PANELSIGMA1	6.15e-005	0.000844	4.64	0.000743	0.0748	5.38
ASC3	FemaleDumBK	0.00175	0.00465	-4.69	0.0289	0.0994	-5.74
WBSIGMA	ZeroAutosAU	0.00782	0.0369	4.70	0.00871	0.168	4.88
ASC1	WalkCrmDayAU	0.0205	0.0677	-4.71	-0.138	-0.303	-3.54
ASC1	WalkCshDayTR	-0.00638	-0.0201	-4.71	0.0445	0.111	-4.54
BkFacMi_HBK	TourMilesWK	8.21e-006	0.000668	4.72	0.00415	0.222	4.40
ASC1	Wal_Space0AU	0.0194	0.232	-4.73	-0.00417	-0.0518	-4.23
BusPassTR	TotPop_T0TR	-0.000593	-0.0341	4.74	-0.00615	-0.519	4.44
BusPassTR	PANELSIGMA3	-0.000232	-0.00336	4.77	-0.000303	-0.106	5.43
ASC1	SaturdayAU	0.0158	0.0922	-4.79	0.0581	0.280	-4.68
ASC1	GroupHouseWK	-0.0245	-0.0869	-4.79	-0.0979	-0.302	-4.14
ASC1	TourUnder2WK	-0.159	-0.524	-4.82	-0.358	-0.838	-3.86
BusPassWK	TourMilesWK	0.000447	0.0129	4.85	0.00954	0.246	6.52
BusPassTR	SpanishDumAU	0.00240	0.0199	4.90	-0.0245	-0.262	4.85
TotPop_T0TR	TourMilesTR	1.97e-005	0.0495	4.91	2.81e-006	0.0112	7.31
ASC3	BusPassBK	0.00241	0.00409	-4.96	-0.0497	-0.105	-4.98
ASC1	ShopAloneTR	-0.0335	-0.104	-5.04	-0.0520	-0.191	-4.84
BusPassTR	FemaleDumBK	-0.00226	-0.0128	5.06	-0.0215	-0.114	4.69
TotEmp_H0AU	TourMilesWK	1.32e-005	0.0256	5.10	-2.69e-005	-0.0904	3.45
NTourStopsWK	TourMilesWK	-0.00307	-0.309	5.11	-0.00695	-0.435	3.80
ASC1	GroupHouseTR	-0.00601	-0.0191	-5.13	0.0215	0.0790	-5.16
BusPassTR	TotPop_T0WK	0.000165	0.00930	5.14	-0.00552	-0.311	4.78
BusPassTR	PayParkDumAU	0.00120	0.0129	5.15	-0.0101	-0.136	5.17
BusPassTR	TotPop_T0BK	-0.000448	-0.0109	5.16	-0.0147	-0.313	4.52
BusPassWK	StudentAU	0.0117	0.108	5.19	0.0233	0.308	7.09
BusPassTR	NTourStopsBK	-0.000542	-0.00744	5.22	-0.00387	-0.0642	5.28
BusPassTR	NTourStopsTR	-0.00259	-0.0889	5.25	0.000619	0.0276	5.32
NoChildrenAU	ZeroAutosAU	-0.00981	-0.0921	5.25	-0.00509	-0.0393	4.10
TotEmp_H0AU	TotPop_T0TR	-6.63e-005	-0.241	-5.29	-1.19e-005	-0.168	-8.14
ASC1	BusPassWK	-0.0151	-0.0544	-5.29	-0.0311	-0.137	-5.03
BKPKGSPAATBK	BusPassTR	0.000490	0.0260	-5.30	0.00168	0.102	-5.23
BusPassTR	NoChildrenAU	-0.00201	-0.0246	5.31	0.0135	0.189	6.06
TourMilesWK	Wal_Space0AU	0.000238	0.0229	-5.31	0.000736	0.0537	-4.51
BKPKGSPAATBK	TourMilesWK	-3.31e-006	-0.000603	5.34	-0.00173	-0.253	3.70
StudentAU	TourUnder2WK	-0.00224	-0.0189	-5.35	0.00556	0.0393	-4.69
TourMilesTR	TourMilesWK	-1.12e-005	-0.0151	5.35	0.000126	0.120	3.66
PayParkDumAU	ZeroAutosAU	0.00675	0.0557	5.41	0.0348	0.259	4.51
BKPKGSPAATWK	TourMilesWK	2.77e-005	0.00857	5.43	-0.000451	-0.0965	3.70
BKPKGSPAATWK	BusPassTR	0.000270	0.0243	-5.47	-0.00285	-0.254	-5.19
BusPassTR	TourMilesTR	0.000164	0.0639	5.59	-0.000223	-0.0883	5.42
EnjWalkDumWK	ZeroAutosAU	-0.0107	-0.0529	5.64	0.0513	0.222	5.67
BusPassTR	TotEmp_H0AU	-0.000125	-0.0702	5.66	-0.000201	-0.281	5.50
TourMilesWK	ZeroAutosAU	0.000756	0.0178	5.74	0.0301	0.335	4.32
ASC3	PANELSIGMA2	-0.00143	-0.00322	-5.77	-0.000909	-0.0429	-10.21
BKPKGSPAATTR	BusPassTR	0.000968	0.0523	-5.82	0.00530	0.316	-5.89
BusPassTR	TourMilesBK	-0.000243	-0.0109	5.88	0.00573	0.216	5.97
ASC3	StudentAU	0.0197	0.0904	-5.89	0.0486	0.325	-8.58
ShopAloneWK	ZeroAutosAU	-0.00721	-0.0546	5.90	-0.0335	-0.209	4.44
NTourStopsBK	ZeroAutosAU	0.00123	0.0129	5.90	-0.0238	-0.219	4.19
TotPop_T0WK	TourMilesWK	5.99e-005	0.0117	5.93	-0.000259	-0.0350	4.23

PANELSIGMA4	ZeroAutosAU	0.00108	0.00895	5.97	0.00416	0.226	4.96
WalkCshDayWK	ZeroAutosAU	-0.00517	-0.0280	6.01	-0.00694	-0.0250	4.78
ASC1	BusPassTR	-0.00231	-0.00881	-6.16	0.0628	0.215	-6.25
ASC3	ShopAloneBK	-0.0126	-0.0286	-6.17	0.0279	0.0609	-5.99
WalkCrmDayAU	ZeroAutosAU	-0.00804	-0.0476	6.19	-0.0304	-0.0907	4.30
DisabilityAU	ZeroAutosAU	-0.00289	-0.0186	6.29	-0.0547	-0.212	4.37
PANELSIGMA1	ZeroAutosAU	-0.00101	-0.0106	6.33	-0.00370	-0.206	4.92
ASC3	WBSIGMA	0.0104	0.0300	-6.33	0.0127	0.287	-10.45
WalkCshDayTR	ZeroAutosAU	-0.00963	-0.0544	6.35	0.0866	0.293	5.85
PANELSIGMA3	ZeroAutosAU	0.000268	0.00298	6.38	-0.000160	-0.0311	4.93
TourMilesWK	TourUnder2WK	0.0235	0.622	-6.38	0.0564	0.778	-5.32
NoBagsWK	ZeroAutosAU	0.000879	0.00606	6.48	0.0376	0.232	5.74
ASC3	ShopAloneTR	-0.178	-0.607	-6.61	-0.120	-0.700	-8.48
ASC3	SpanishDumAU	0.0450	0.176	-6.69	-0.0520	-0.360	-7.29
TourMilesBK	ZeroAutosAU	0.00144	0.0497	6.71	0.0105	0.219	4.81
GroupHouseWK	ZeroAutosAU	-0.0112	-0.0711	6.75	-0.0386	-0.161	5.05
BusPassTR	StudentAU	0.0101	0.0983	6.77	0.000270	0.00279	6.56
BusPassTR	TourMilesWK	-0.000647	-0.0198	6.83	-0.00244	-0.0492	6.30
BKPKGSPAATTR	ZeroAutosAU	0.00177	0.0735	6.87	0.0132	0.435	4.95
ASC3	ShopAloneWK	-0.0300	-0.139	-6.88	-0.0200	-0.146	-8.96
ASC3	TourMilesWK	0.00259	0.0372	-6.89	0.0107	0.140	-9.28
TotPop_T0BK	ZeroAutosAU	0.00271	0.0505	6.94	0.0172	0.202	5.08
ShopAloneTR	ZeroAutosAU	-0.0144	-0.0799	6.96	0.0279	0.139	6.56
TotPop_T0TR	TourMilesWK	-0.000137	-0.0271	6.98	0.000458	0.0927	5.39
TotEmp_H0AU	ZeroAutosAU	-2.61e-005	-0.0113	6.99	-0.000426	-0.329	4.89
ASC3	NTourStopsBK	-0.00188	-0.0122	-7.00	-0.00230	-0.0248	-9.28
NTourStopsTR	ZeroAutosAU	0.00193	0.0508	7.02	-0.00620	-0.153	4.86
TourMilesTR	ZeroAutosAU	-0.000205	-0.0616	7.05	-0.00102	-0.224	4.92
GroupHouseTR	ZeroAutosAU	-0.00495	-0.0282	7.05	-0.0218	-0.109	5.79
ASC3	NoChildrenAU	0.0236	0.135	-7.07	-0.00431	-0.0390	-8.82
ASC3	EnjWalkDumWK	-0.00221	-0.00668	-7.11	0.0260	0.132	-9.99
ASC3	PayParkDumAU	0.0361	0.182	-7.12	0.0539	0.470	-10.83
BKPKGSPAATWK	ZeroAutosAU	0.000312	0.0215	7.12	-0.00432	-0.213	4.93
ASC3	PANELSIGMA4	0.00133	0.00677	-7.14	0.00317	0.202	-10.32
Wal_Space0AU	ZeroAutosAU	-0.00676	-0.145	7.14	-0.0133	-0.223	5.09
ASC3	NTourStopsTR	-0.0355	-0.571	-7.14	-0.0253	-0.731	-9.41
ASC3	WalkCshDayWK	-0.0166	-0.0552	-7.16	0.0802	0.338	-10.73
SaturdayAU	ZeroAutosAU	0.00120	0.0125	7.19	-0.0143	-0.0934	5.05
BKPKGSPAATBK	ZeroAutosAU	0.000859	0.0349	7.21	3.50e-005	0.00118	5.05
BkFacMi_HBK	ZeroAutosAU	-0.00159	-0.0289	7.23	-0.00134	-0.0165	5.17
ASC3	WalkCshDayTR	-0.0284	-0.0984	-7.33	0.113	0.446	-11.77
ASC3	PANELSIGMA1	-0.000634	-0.00409	-7.34	0.000667	0.0435	-10.30
ASC3	PANELSIGMA3	0.00126	0.00854	-7.36	0.00215	0.490	-10.31
TotPop_T0WK	ZeroAutosAU	0.00212	0.0919	7.38	0.0107	0.333	5.27
ASC3	TourMilesBK	0.000834	0.0176	-7.44	-0.00546	-0.133	-9.70
ASC3	BKPKGSPAATTR	-0.00394	-0.100	-7.45	-0.00370	-0.143	-9.92
ASC3	NoBagsWK	-0.00473	-0.0199	-7.47	-0.0338	-0.244	-9.16
ASC3	DisabilityAU	0.00482	0.0190	-7.53	-0.0382	-0.173	-8.17
ASC3	TotPop_T0BK	-0.000258	-0.00293	-7.57	-0.00506	-0.0695	-9.81
ASC3	GroupHouseTR	-0.0469	-0.164	-7.57	0.00951	0.0555	-10.91
NTourStopsWK	ZeroAutosAU	0.00166	0.0373	7.60	-0.0189	-0.273	5.10
ASC3	TotEmp_H0AU	0.000593	0.157	-7.62	0.000235	0.212	-10.21
TotPop_T0TR	ZeroAutosAU	0.000917	0.0404	7.62	0.00516	0.241	5.41
ASC3	TourMilesTR	-0.000243	-0.0446	-7.65	0.00126	0.323	-10.29
ASC3	WalkCrmDayAU	0.0139	0.0504	-7.65	0.159	0.556	-12.05
ASC3	BKPKGSPAATWK	-0.000117	-0.00494	-7.69	0.00215	0.124	-10.37
BusPassWK	ZeroAutosAU	-0.000375	-0.00242	7.70	0.0137	0.0813	6.57
ASC3	BKPKGSPAATBK	-0.00179	-0.0447	-7.71	0.00601	0.237	-10.58
ASC3	GroupHouseWK	-0.0179	-0.0696	-7.71	-0.0154	-0.0750	-9.32
ASC3	TotPop_T0WK	-0.00171	-0.0454	-7.79	0.00214	0.0780	-10.52
ASC3	TotPop_T0TR	-0.0104	-0.279	-7.83	-0.00115	-0.0628	-10.66
ASC3	NTourStopsWK	-0.0105	-0.144	-7.83	-0.0214	-0.362	-9.89
ASC3	BkFacMi_HBK	0.00331	0.0368	-7.90	0.000349	0.00504	-10.38
TourUnder2WK	ZeroAutosAU	-0.00614	-0.0362	7.91	0.0318	0.101	6.17
ASC3	SaturdayAU	0.0197	0.127	-8.16	0.00669	0.0511	-10.21
ASC3	Wal_Space0AU	0.0233	0.305	-8.27	0.0147	0.290	-11.09
ASC3	BusPassWK	0.000800	0.00316	-8.44	0.0386	0.269	-12.70
ASC3	TourUnder2WK	-0.0136	-0.0490	-8.55	0.0558	0.207	-10.84
ASC3	BusPassTR	-0.0359	-0.150	-8.81	-0.0384	-0.209	-10.59
BusPassTR	ZeroAutosAU	0.00349	0.0238	9.10	-0.0118	-0.0545	6.79

```
Smallest singular value of the hessian: 0.702786
```

Mixed Logit Model of Primary Mode Used to Travel Within Shopping District (N=286)

```
// This file has automatically been generated.
// 11/30/10 20:11:48
// Michel Bierlaire, EPFL 2001-2008

BIOGEME Version 1.8 [Sat Mar 7 14:36:56 CEST 2009]
Michel Bierlaire, EPFL

   Model specification file for mixed logit model of Bay Area Walgreens customer mode choice with
panel data
   Note that ASC0 is constrained to 0.0 and will not be estimated

                         Model:  Mixed Multinomial Logit for panel data
               Number of draws: 1000
Number of estimated parameters: 12
        Number of observations: 286
         Number of individuals: 20
           Null log-likelihood: -198.240
            Cte log-likelihood: -178.891
           Init log-likelihood: -121.446
          Final log-likelihood: -121.395
         Likelihood ratio test: 153.691
                    Rho-square: 0.388
           Adjusted rho-square: 0.327
           Final gradient norm: +3.962e-006
                    Diagnostic: Convergence reached
                      Run time: 01:58
           Variance-covariance: from finite difference hessian
                   Sample file: Schneider_Dataset_286_v4_111210.dat
```

Utility parameters
****

Name	Value	Std err	t-test	p-val		Rob. std err	Rob. t-test	Rob. p-val	
ASC1	1.70	1.53	1.11	0.27	*	1.36	1.25	0.21	*
ASC4	0.00	--fixed--							
CPOSTSPEED	-0.0665	0.0502	-1.32	0.19	*	0.0557	-1.19	0.23	*
CRoadDrvwy	-0.0318	0.0106	-3.01	0.00		0.0103	-3.09	0.00	
Disability	-0.521	0.431	-1.21	0.23	*	0.302	-1.73	0.08	*
PANELMEAN1	0.00	--fixed--							
PANELMEAN4	0.00	--fixed--							
PANELSIGMA1	-0.131	0.394	-0.33	0.74	*	0.249	-0.53	0.60	*
PANELSIGMA4	-0.0404	0.425	-0.10	0.92	*	0.0518	-0.78	0.43	*
PayParkDum	0.771	0.542	1.42	0.15	*	0.304	2.53	0.01	
ShopAlone	0.549	0.376	1.46	0.14	*	0.355	1.55	0.12	*
StripMall	1.08	0.557	1.94	0.05	*	0.320	3.37	0.00	
TimeAU	-0.487	0.105	-4.64	0.00		0.0942	-5.17	0.00	
TimeWK	-0.307	0.0509	-6.03	0.00		0.0662	-4.64	0.00	
TwoPlusBag	-0.535	0.378	-1.41	0.16	*	0.427	-1.25	0.21	*

Variance of normal random coefficients
****

Name	Value	Std err	t-test
PANELMEAN1_PANELSIGMA1	0.0171	0.103	0.17
PANELMEAN4_PANELSIGMA4	0.00163	0.0344	0.05

Utility functions
****

```
4      Auto    Auto_Av ASC4 * one + TimeAU * AutoTime + PANELMEAN4 [ PANELSIGMA4 ]  * one
1      Walk    Walk_Av ASC1 * one + PayParkDum * PayParkDum + TimeWK * WalkTime + TwoPlusBag *
TwoPlusBag + ShopAlone * ShopAlone + Disability * Disability + CRoadDrvwy * CRoadDrvwy +
CPOSTSPEED * CPOSTSPEED + StripMall * StripMall + PANELMEAN1 [ PANELSIGMA1 ]  * one
```

Correlation of coefficients
****

Coeff1	Coeff2	Covariance	Correlation	t-test	Rob. covar.	Rob. correl.	Rob. t-test

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CRoadDrvwy	PANELSIGMA4	-3.69e-006	-0.000819	0.02	*	-0.000103	-0.194	0.16	*
Disability	TwoPlusBag	0.00584	0.0358	0.02	*	0.00649	0.0503	0.03	*
CPOSTSPEED	PANELSIGMA4	8.73e-005	0.00409	-0.06	*	0.00174	0.604	-0.54	*
Disability	TimeAU	0.00450	0.0994	-0.08	*	-0.00941	-0.331	-0.10	*
TimeAU	TwoPlusBag	0.00412	0.104	0.12	*	0.00847	0.211	0.11	*
PANELSIGMA1	PANELSIGMA4	-0.0289	-0.173	-0.14	*	0.0118	0.919	-0.45	*
CPOSTSPEED	PANELSIGMA1	0.00251	0.127	0.16	*	0.0110	0.793	0.31	*
CRoadDrvwy	PANELSIGMA1	0.000287	0.0687	0.25	*	-0.000777	-0.303	0.39	*
PayParkDum	ShopAlone	0.0233	0.114	0.36	*	-0.00635	-0.0588	0.46	*
ASC1	StripMall	0.0813	0.0957	0.39	*	0.0802	0.184	0.46	*
PANELSIGMA1	TimeWK	0.00282	0.141	0.45	*	0.00270	0.164	0.71	*
Disability	TimeWK	0.00124	0.0564	-0.50	*	-0.00822	-0.412	-0.64	*
ASC1	PayParkDum	-0.438	-0.530	0.50	*	-0.230	-0.556	0.60	*
PayParkDum	StripMall	0.140	0.464	-0.54	*	-0.00313	-0.0322	-0.69	*
TimeWK	TwoPlusBag	0.00183	0.0951	0.61	*	0.000573	0.0203	0.53	*
PANELSIGMA4	TimeWK	0.000442	0.0204	0.62	*	0.000443	0.129	3.39	
CPOSTSPEED	CRoadDrvwy	-9.39e-005	-0.177	-0.65	*	-0.000335	-0.583	-0.56	*
ASC1	ShopAlone	-0.129	-0.224	0.70	*	-0.0264	-0.0548	0.81	*
Disability	PANELSIGMA1	0.0279	0.164	-0.73	*	-0.00688	-0.0917	-0.96	*
PANELSIGMA1	TwoPlusBag	0.00828	0.0556	0.76	*	0.00265	0.0250	0.83	*
Disability	PANELSIGMA4	0.00468	0.0255	-0.80	*	-0.00193	-0.124	-1.54	*
ShopAlone	StripMall	0.0364	0.174	-0.86	*	0.0264	0.233	-1.27	*
PANELSIGMA4	TwoPlusBag	0.00274	0.0171	0.88	*	-0.00461	-0.208	1.12	*
PANELSIGMA1	TimeAU	0.00923	0.223	0.93	*	0.0101	0.429	1.58	*
PANELSIGMA4	TimeAU	0.00161	0.0362	1.03	*	0.00127	0.261	4.71	
PANELSIGMA4	ShopAlone	0.00174	0.0109	-1.04	*	-0.00529	-0.288	-1.58	*
CPOSTSPEED	Disability	-7.93e-005	-0.00366	1.05	*	-0.00198	-0.117	1.45	*
ASC1	PANELSIGMA4	-0.00380	-0.00586	1.10	*	-0.0411	-0.585	1.25	*
ASC1	CPOSTSPEED	-0.0700	-0.914	1.12	*	-0.0722	-0.954	1.25	*
ASC1	PANELSIGMA1	-0.0705	-0.117	1.13	*	-0.249	-0.737	1.18	*
ASC1	CRoadDrvwy	0.00142	0.0876	1.14	*	0.00750	0.536	1.28	*
CRoadDrvwy	Disability	0.000636	0.139	1.14	*	0.000798	0.257	1.63	*
PANELSIGMA4	PayParkDum	0.000152	0.000659	-1.18	*	0.00290	0.184	-2.71	
CPOSTSPEED	TwoPlusBag	0.00120	0.0631	1.24	*	0.00554	0.233	1.12	*
PANELSIGMA1	ShopAlone	0.00696	0.0469	-1.28	*	-0.0346	-0.393	-1.34	*
ASC1	TimeWK	-0.00393	-0.0507	1.31	*	-4.88e-006	-5.42e-005	1.47	*
CRoadDrvwy	TwoPlusBag	9.08e-005	0.0227	1.33	*	-6.30e-005	-0.0143	1.18	*
PANELSIGMA1	PayParkDum	0.00304	0.0142	-1.36	*	0.0291	0.385	-2.91	
ASC1	TwoPlusBag	-0.0563	-0.0977	1.39	*	-0.162	-0.280	1.46	*
ASC1	Disability	-0.0171	-0.0261	1.39	*	0.0471	0.115	1.64	*
ASC1	TimeAU	-0.00853	-0.0533	1.42	*	-0.0345	-0.270	1.58	*
CRoadDrvwy	PayParkDum	-0.00179	-0.312	-1.47	*	-0.00218	-0.697	-2.58	
CRoadDrvwy	ShopAlone	-0.000656	-0.164	-1.54	*	-0.000129	-0.0353	-1.64	*
CPOSTSPEED	PayParkDum	0.0101	0.373	-1.60	*	0.0102	0.602	-3.05	
PANELSIGMA4	StripMall	0.00207	0.00876	-1.61	*	-0.00291	-0.175	-3.36	
CPOSTSPEED	ShopAlone	0.000669	0.0354	-1.63	*	-0.00324	-0.164	-1.67	*
PANELSIGMA1	StripMall	-0.0217	-0.0987	-1.70	*	-0.0256	-0.322	-2.61	
Disability	ShopAlone	-0.0110	-0.0676	-1.81	*	0.0126	0.118	-2.44	
Disability	PayParkDum	-0.00748	-0.0320	-1.84	*	-0.000215	-0.00234	-3.01	
PayParkDum	TwoPlusBag	-0.000219	-0.00107	1.98		0.0322	0.248	2.85	
PayParkDum	TimeWK	0.000258	0.00937	1.98		-0.00272	-0.135	3.37	
CRoadDrvwy	StripMall	-0.00160	-0.272	-1.99		-0.00114	-0.347	-3.43	
CPOSTSPEED	StripMall	-0.0102	-0.365	-1.99		-0.00525	-0.294	-3.37	
ShopAlone	TwoPlusBag	0.000378	0.00266	2.03		0.0180	0.119	2.08	
Disability	StripMall	-0.0221	-0.0918	-2.18		-0.0182	-0.188	-3.34	
ShopAlone	TimeWK	-0.00289	-0.151	2.21		-0.00713	-0.304	2.25	
StripMall	TwoPlusBag	-0.0281	-0.133	2.26		-0.0444	-0.325	2.64	
TimeAU	TimeWK	0.00385	0.722	-2.35		0.00504	0.809	-3.21	
PayParkDum	TimeAU	0.0111	0.196	2.37		0.00829	0.289	4.32	
StripMall	TimeWK	-0.000140	-0.00493	2.48		0.00228	0.108	4.34	
ShopAlone	TimeAU	-0.00355	-0.0898	2.59		-0.0114	-0.340	2.61	
StripMall	TimeAU	-0.00590	-0.101	2.71		-0.00374	-0.124	4.55	
CPOSTSPEED	TimeWK	-2.36e-005	-0.00925	3.35		-0.000270	-0.0731	2.68	
CPOSTSPEED	TimeAU	0.000656	0.124	3.80		0.00145	0.276	4.41	
CRoadDrvwy	TimeAU	-6.08e-005	-0.0547	4.29		-0.000113	-0.116	4.75	
CRoadDrvwy	TimeWK	6.41e-005	0.119	5.42		9.55e-005	0.140	4.19	

Smallest singular value of the hessian: 0.4114