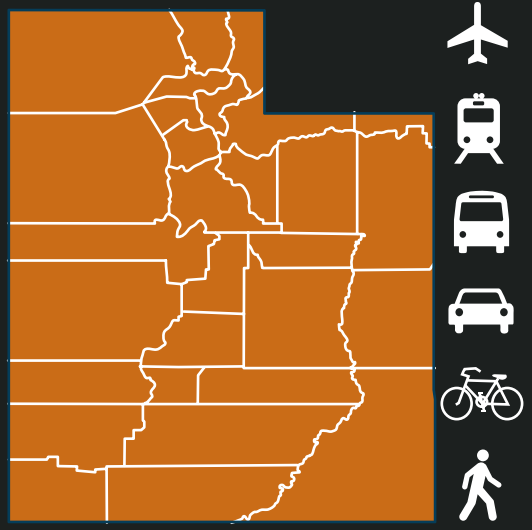
UTAH

TRAVEL STUDY



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WASATCH FRONT REGIONAL COUNCIL

UNIFIED TRANSPORTATION PLANNING DIXIE METROPOLITAN PLANNING ORGANIZATION

UTAH TRAVEL STUDY

PREPARED BY:

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RESOURCE SYSTEMS GROUP, INC.

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Wasatch Front Regional Council (WFRC)
Cache Metropolitan Planning Organization (CMPO)
Dixie Metropolitan Planning Organization (DMPO)
Mountainland Association of Governments (MAG)
Utah Department of Transportation (UDOT)
Utah Transit Authority (UTA)

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CONTENTS

EXECUTIVE SUMMARY.....I

1.0 Introduction i
2.0 household travel diary survey.....ii
3.0 additional surveys.....iii
4.0 Structure of this report v

I MAIN HOUSEHOLD DIARY.....1

1.0 Introduction 2
2.0 Administration 6
3.0 Questionnaire.....18
4.0 Data Preparation 22
5.0 Data Analysis.....33

II LONG DISTANCE TRAVEL DIARY....41

1.0 Introduction 42
2.0 Administration 43
3.0 Questionnaire.....48
4.0 Data Preparation 50
5.0 Data Analysis.....55

III COLLEGE DIARY.....63

1.0 Introduction 64
2.0 Administration 65
3.0 Questionnaire.....70
4.0 Data Preparation 76
5.0 Data Analysis.....81

IV BICYCLE & PEDESTRIAN SURVEY...89

1.0 Introduction 90
2.0 Administration 91
3.0 Questionnaire 97
4.0 Data Preparation 104
5.0 Data Analysis.....105

V ATTITUDE SURVEY.....125

1.0 Introduction 126
2.0 Administration 127
3.0 Questionnaire.....129
4.0 Data Preparation 133
5.0 Data Analysis.....134

VI DIXIE SUN TRANSIT ON-BOARD ..... SURVEY.....141

1.0 Introduction 142
2.0 Administration 144
3.0 Questionnaire.....146
4.0 Data Preparation 146
5.0 Data Analysis.....147

VII RESIDENTIAL CHOICE SURVEY 149

1.0 Introduction 150
2.0 Administration 151
3.0 Questionnaire.....154
4.0 Data Preparation 159
5.0 Data Analysis.....160
6.0 Concluding Remarks 173

FIGURES

EXECUTIVE SUMMARY I

Table 1: Overview of Surveys Included in the Utah Travel Study iv

I MAIN HOUSEHOLD DIARY 1

Figure 1.1: Utah Travel Study Overview 3
Figure 1.2: Sampling Frame – All Households Invited to Participate 7
Table 1.1: Sample Plan 8
Figure 1.3: Pre-Notification and Reminder Postcards (front and back) 9
Figure 1.4: Invitation Packet Envelope 10
Figure 1.5: Invitation Letter and FAQ Sheet (English, front and back) 10
Figure 1.6: Invitation Letter and FAQ Sheet (Spanish, front and back) 10
Figure 1.7: Travel Log (front and back) 11
Figure 1.8: Long Distance Insert 11
Table 1.2: Pre-Test Goals and Tasks Performed 14
Table 1.3: Survey Invitation Schedule 15
Table 1.4: Final Sample Sizes and Response Rates 16
Figure 1.9: Household Data – Years at Residence 18
Figure 1.10: Person Data 18
Figure 1.11: Vehicle Data 18
Figure 1.12: Trip Roster 19
Figure 1.13: Google Map Geocoder 19
Figure 1.14: Trip Details – Automobile Trip 20
Figure 1.15: Trip Details – Walk/Bike Trip 20
Figure 1.16: Child Trip Roster 21
Figure 1.17: Survey Households by Existing Medium District 24
Figure 1.18: Survey Household Weight by Existing Medium District 25
Figure 1.19: Hybrid Districts with Weights 26
Figure 1.20: Raw Survey vs. Census Data 27
Figure 1.21: Iterative Survey Weighting Result 29
Figure 1.22: Survey Weights – Capped at 425 29
Table 1.5: Geography Equivalence Table 31
Table 1.6: Trip Purpose Categories 32
Table 1.7: 2012 Household Sample Size by Region 33
Table 1.8: 2012 Household Sample Size and Weights by Region 33
Table 1.9: Daily Trip Production Rates 34
Table 1.10: 2012 Trip Productions per Household 34
Table 1.11: 2012 Daily Trip Rates by Household Size 34
Table 1.12: 2012 Daily Trip Rates by Household Vehicles 35
Table 1.13: 2012 Daily Trip Rates by Household Income 35
Table 1.14: 2012 Daily Trip Rate by Household Life Cycle 35
Table 1.15: 2012 Daily Trip Rate by Number of Children in Household 35
Table 1.16: 2012 Personal Daily Trip Rate by Age 35
Table 1.17: 2012 Average Trip Lengths 36
Figure 1.23: Home-Based Work Trips – County to County Distribution 36
Figure 1.24: All Home-Based Trips – County to County Distribution 36
Table 1.18: 2012 Mode Shares 37
Table 1.19: 2012 Automobile Mode Share 37
Table 1.20: 2012 Automobile Mode Share – Trips to Central Business District (CBD) 37
Table 1.21: 2012 Statewide Vehicle Occupancy 37
Table 1.22: 2012 Transit Mode Share 38
Table 1.23: 2012 Transit Mode Share – Trips to CBD 38
Table 1.24: 2012 Transit Mode Share by Household Auto Ownership 38
Table 1.25: 2012 Transit Mode Share – Salt Lake County Areas 38
Figure 1.25: Salt Lake County Area Map 39
Table 1.26: 2012 Walk/Bike Mode Share 39
Table 1.27: 2012 Walk/Bike Mode Share – Trips Within CBD 39

II LONG DISTANCE TRAVEL DIARY 41

Table 2.1: Overview of Long Distance Survey Approach 43
Figure 2.1: Long Distance Flyer 44
Figure 2.2: Email Invitation 45
Figure 2.3: Progress Dashboard 45
Table 2.2: Overview of Survey Retrieval 46
Figure 2.4: Cities Traveled 48
Figure 2.5: Number of Visits 48
Figure 2.6: When the Most Recent Long Distance Trip Occurred 49
Figure 2.7: Long Distance Trip Roster 49
Figure 2.8: Long Distance Trip Details 49
Figure 2.9: Survey(s) Completed 50
Table 2.3: Trip Ends Cleaning 50
Table 2.4: Imputed Trips 51
Figure 2.10: How Long Ago (in Days) That the Trip Occurred 53
Figure 2.11: Temporal Weight Distribution - Duplicate Trip Weight 53
Table 2.5: Duplicate Trip Weights 53
Figure 2.12: Reported Occupancy Trip Weight Distribution 54
Figure 2.13: Cities Visited in Past Year (by Region) 55
Figure 2.14: Number of Visits Per Year 56
Figure 2.15: When the Most Recent Long Distance Trip Occurred 56
Table 2.6: Trip End Locations 56
Figure 2.16: Trip Destinations (Internal Trips Only) 57
Figure 2.17: Trip Destinations (External Trips Only) 57
Figure 2.18: Trip Distances (by Trip Location) 58
Figure 2.19: Trip Distance Distribution (All Trips) 58
Figure 2.20: Primary Mode 59
Figure 2.21: Primary Purpose 59
Figure 2.22: Trip Purpose Segment 59
Figure 2.23: Trips Per Household (by Region) 60
Figure 2.24: Trips Per Household (by Household Size) 60
Figure 2.25: Trips Per Household (by Household Income) 60
Figure 2.26: When the Most Recent Long Distance Trip Occurred (Adults Who Took Both Surveys Only) 61
Figure 2.27: Trips Per Household (by Survey Period) 61

III COLLEGE DIARY 63

Figure 3.1: Agency Outreach Letter Example 65
Table 3.1: Participating Colleges Student Population 66
Figure 3.2: Participating Colleges 67
Figure 3.3: Utah Valley University Survey Invite 68
Figure 3.4. Dixie State College Special Advertisement 68
Table 3.2: Survey Administration Details from Each College 69
Figure 3.5: Demographic Information 71
Figure 3.6: Vehicle Information for Off-Campus Respondents 71
Figure 3.7: Google Map Geocoder 71
Figure 3.8: Travel Diary Introduction with Trip Example 72
Figure 3.9: Trip Roster 72
Figure 3.10: Mapping Trip Roster Locations 73
Figure 3.11: Trip Details Walk or Bike 73
Figure 3.12: Transportation Funding Priorities 74
Figure 3.13: Reasons for Not Biking 75
Table 3.3: Full- and Part-Time, On- and Off-Campus Students 77
Table 3.4: 2010 Enrollment 78

Table 3.5: Person Weights 78
Table 3.6. Geography Equivalence Table 79
Table 3.7: College Demographics – Student Category 81
Table 3.8: College Demographics - Gender 81
Table 3.9: College Demographics – Off-Campus Job 82
Table 3.10: College Demographics - Smart Phone Ownership 82
Figure 3.14: Household Member Types (Live Off-Campus and Not Alone) 82
Figure 3.15: Trip Rate by Purpose 83
Figure 3.16: Person Trip Rate - College Diary vs. Household Diary 83
Table 3.11: Trip Distance and Travel Time - HBC 84
Figure 3.17: Trip Length Frequency - WFRC 84
Figure 3.18: HBC Mode Shares – College Diary 85
Figure 3.19: HBC Mode Shares - Model 85
Figure 3.20: Auto Occupancy – Home-Based College 86
Figure 3.21: Auto Occupancy - Home-Based Other 87
Figure 3.22: Diurnal Distribution - HBC vs. WFRC HBW 87

IV BICYCLE & PEDESTRIAN SURVEY 89

Table 4.1: Overview of the Administration of the Debrief and Barriers Bicycle and Pedestrian Surveys 91
Figure 4.1: Organizations Recruited for Survey Distribution 93
Figure 4.2: Flyer for the Bicycle and Pedestrian Barriers Survey 93
Figure 4.3: Completed Surveys by Home Region 95
Figure 4.4: Number of Reported Bike and Walk Problems by Home Region 95
Figure 4.5: Completed Surveys by Invitation Source 96
Figure 4.6: Debrief Survey – Reasons for Walking for Transportation 97
Figure 4.7: Debrief Survey – Bicycle and Pedestrian Attitudes 98
Figure 4.8: Barriers Survey – Topic Screening 99
Figure 4.9: Barriers Survey – Walk Problem Location Roster 100
Figure 4.10 Barriers Survey – Walk Problem Details 100
Figure 4.11 Barriers Survey – Walk Problem Geocoder 101
Figure 4.12 Barriers Survey – Walking Environment Preferences 101
Figure 4.13 Barriers Survey – Typical Weekly Biking Distances by Purpose 103
Figure 4.14 Barriers Survey – Infrastructure Funding Priorities ... 103
Figure 4.15 Barriers Survey – Encouragement and Enforcement Priorities 103
Figure 4.16: Walk Frequency (Trips Last Week) by Region 105
Figure 4.17: Bike Frequency (Days Last Two Weeks) by Region . 105
Figure 4.18: Walk and Bike Purposes 106
Figure 4.19: Walk and Bike Motivations 106
Figure 4.20: Walk and Bike Barriers 107
Figure 4.21: Attitudes 107
Figure 4.22: Completed Surveys by ZIP Code 108
Table 4.2: Sample Size and Number of Barriers (Problems) Reported 108
Figure 4.23: Age Distribution 109
Figure 4.24 Household Size Distribution (Children and Adults) . 109
Figure 4.25 Household Income 109
Figure 4.26: Walk Barrier Locations, Statewide 110
Figure 4.27: Bike Barrier Locations, Statewide 111
Figure 4.28: Walk Barrier Locations, WFRC/MAG Region 112
Figure 4.29: Bike Barrier Locations, WFRC/MAG Region 113
Figure 4.30: Walk and Bike Barrier Hot Spots, WFRC/MAG Region 114
Figure 4.31: Walk Barrier Locations, Cache Region 114
Figure 4.32: Bike Barrier Locations, Cache Region 115
Figure 4.33: Walk and Bike Barrier Hot Spots, Cache Region 115
Figure 4.34: Walk Barrier Locations, Dixie Region 116
Figure 4.35: Bike Barrier Locations, Dixie Region 116
Figure 4.36: Walk and Bike Barrier Hot Spots, Dixie Region 117
Figure 4.37: Number of Walk Barriers Reported by Walk Frequency 118
Figure 4.38: Number of Bike Barriers Reported by Bike Frequency 118
Figure 4.39: Types of Walk and Bike Problems 119
Figure 4.40: Location of Walk and Bike Problems 119
Figure 4.41: Typical Walk and Bike Trip Purposes 120
Figure 4.42: Typical Walking Barriers by Walking Frequency 120
Figure 4.43: Typical Biking Barriers by Biking Frequency 121
Figure 4.44: Walking Environment Comfort by Walking Frequency 121
Figure 4.45: Biking Environment Comfort by Biking Frequency . 122
Figure 4.46: Important Funding Priorities 122
Figure 4.47: Important Safety Priorities 123

V ATTITUDE SURVEY 125

Table 5.1: Sample Size by Region 128
Figure 5.1: Example Agreement Question 129
Table 5.2: Statements Included for Each Region 130
Figure 5.2: Drag-and-Drop Ranking Question 132
Figure 5.3: Priority Rankings for Entire Sample 134
Figure 5.4: Top Priority by Region 135
Figure 5.5: Land Use Attitudes by Region 135
Figure 5.6: Taxes – Percent Agreement by Region 138
Figure 5.7: Driving Habits – Percent Agreement by Region 138
Figure 5.8: Transit Use – Percent Agreement by Region 139
Figure 5.9: Mode Choice – Percent Agreement by Region 139

VI DIXIE SUN TRANSIT ON-BOARD SURVEY 141

Table 6.1: SunTran Annual Ridership 142
Table 6.2: SunTran June 2012 Weekday Ridership 143
Figure 6.1: Paper Survey in English, Side A 145
Figure 6.2: Paper Survey in English, Side B 145
Figure 6.3: Paper Survey in Spanish, Side A 145
Figure 6.4: Paper Survey in Spanish, Side B 145

VII RESIDENTIAL CHOICE SURVEY 149

Table 7.1: Invites and Response Rates by Sample Source 153
Table 7.2: Completed Surveys by Region 153
Figure 7.1: Order Obtained Current Home and Job 154
Figure 7.2: Role in Choosing Current Home Location 154
Figure 7.3: Types of Parking Available 155
Figure 7.4: Housing Available within Half-Mile 155
Figure 7.5: Importance of Amenities within Walking Distance .. 156
Figure 7.6: Stated Preference Experiments Introduction 156
Figure 7.7: Example Stated Preference Experiment 156
Figure 7.8: Current Neighborhood Characteristics 158
Figure 7.9: Ideal Neighborhood Characteristics 158
Figure 7.10: Preferred Approach to Accommodating Growth ... 158
Table 7.3: Housing Tenure 160
Table 7.4: Median Home Value and Rent per Month by Region 160
Figure 7.11: Tenure by Age Group 160
Figure 7.12: Primary Reason for Choosing Current Home by Tenure 161
Table 7.5: Plan to Move within the Next Three Years 161
Figure 7.13: Plan to Move within the Next 3 Years by Age Group 161
Table 7.6: Current and Ideal Home Locations 162
Figure 7.14: Ideal Location Type by Tenure 162
Figure 7.15: Ideal Dwelling Type 163
Figure 7.16: Example Stated Preference Experiment 164
Figure 7.17: Base MNL Model with All Experiment Attributes ... 165
Figure 7.18: Selected Model Coefficients – Renters and Owners 169
Figure 7.19: Selected Model Coefficients – Commute Distance 170
Figure 7.20: Selected Model Coefficients – Household Income 171
Figure 7.21: Selected Model Coefficients – Presence of Children under 18 in Home 172

EXECUTIVE SUMMARY

1.0 INTRODUCTION

The Wasatch Front Regional Council (WFRC), the Mountainland Association of Governments (MAG), the Cache Metropolitan Planning Organization (CMPO), the Dixie Metropolitan Planning Organization (DMPO), the Utah Department of Transportation (UDOT), and the Utah Transit Authority (UTA) conducted the Utah Travel Study in 2012. The Utah Travel Study included a statewide Household Travel Diary survey as the core component of the project, as well as seven supplemental, yet complementary surveys. This suite of surveys will now serve as the basis for travel modeling activities and will inform regional and statewide transportation planning for the state of Utah. Resource Systems Group, Inc. (RSG) implemented the Utah Travel Study in conjunction with the six sponsoring agencies.

2.0 HOUSEHOLD TRAVEL DIARY SURVEY

The last household travel survey in Utah was conducted in 1993, along the Wasatch Front. Over the subsequent 18 years, the state of Utah has experienced tremendous growth, along with transportation infrastructure and socio-economic changes that impact travel behavior and travel patterns. The 2012 Household Travel Diary survey data collection will now be the basis for understanding current travel in Utah. The data will inform the plans for continued growth and development in Utah in the context of the Wasatch Choice 2040 long range development and transportation plan.

The 2012 Household Travel Diary began in March and concluded in July. Households were invited, via first-class mail, to participate in the one-day travel diary on a pre-assigned date (a Tuesday, Wednesday, or Thursday). Mailings included a pre-notification postcard, an invitation packet that included all the materials and password necessary to complete the survey, and finally a pair of reminder postcards. Households could participate using the online web survey instrument or by calling the toll-free number to complete the survey over the phone with a trained operator.

One adult member was asked a set of questions about the household, wherein they provided demographic information for both the household as a whole (number of people, number of vehicles, household income, etc.) and about each member within the household. In the travel diary section, each adult member of the household was asked to report their trips made during the pre-assigned travel day.To record travel information for the children and minors within each household, adult members were asked to fill out a simplified travel diary . As an incentive for participation, households that completed this entire survey process, which included a “debrief survey” (described later) for each adult, were awarded with a $10 Amazon.com gift card.

Household level, person level, and trip level data were processed, cleaned, and weighted to reflect the true population of the state and its regions therein. The final dataset, which included records from 9,155 households, was analyzed and compared to each agency’s current travel demand model.

3.0 ADDITIONAL SURVEYS

Although the Household Travel Diary survey (described with more detail in Chapter 1) was the primary data collection effort of the Utah Travel Study, seven additional surveys were conducted on a variety of topics. Each survey element was designed to understand different aspects of travel behavior and together form a comprehensive inventory of travel-related information for the state of Utah. The surveys are summarized in Table 1: Overview of Surveys Included in the Utah Travel Study.

The first set of surveys included travel diaries with data elements based on the main Household Travel Diary:

1. **Long Distance Survey** was a travel diary to understand the long distance trips (40+ miles) that Utahns make. Long distance travel happens more infrequently but greatly impacts a household's vehicle miles traveled. The survey was administered twice over two different seasons, once as a "debrief survey" in conjunction with the Household Travel Diary and then again to a subset of households who completed the Household Travel Diary and who had volunteered to participate in future surveys. In order to capture more infrequent trips, respondents were asked to report their "most recent" long distance trip, which may have been the day before taking the survey or six months prior. (Chapter 1)
2. **College Travel Diary** was a one-day travel diary administered to students from eight college and universities in Utah. College student travel is often underrepresented in traditional household diary surveys and so thesurvey focused on off-campus trips (one or both trip ends are off campus) made on the most recent weekday, as opposed to on a pre-assigned travel date, as was the case for the main Household Travel Diary. The College Travel Diary's survey design was otherwise very similar to the main Household Travel Diary. (Chapter 3)

The second set of surveys included surveys that largely were focused topical surveys while efficiently utilizing the same sample as that of the Household Travel Diary

3. **Bike/Pedestrian Debrief Survey** was administered in conjunction with the Household Travel Diary in that each adult who completed it was asked to report their walking and biking habits,behaviors, and opinions. (Chapter 4)
4. **Bike/Pedestrian Barriers Survey** was administered to two groups: 1) a subset of households who completed the Household Travel Diary and volunteered to participate in future surveys and 2) members of various organizations, bike clubs, neighborhood groups, etc. that were recruited. Due to the recruiting and public outreach effort, the Barriers Survey used a "convenience sample" to attract as many survey participants as possible. The questionnaire focused on identifying physical barriers to walking and bicycling. Respondents were asked to report "problem areas" (unsafe intersection, roadway with insufficient infrastructure, etc.) as a way to highlight and rank areas for possible improvement. (Chapter 4)
5. **Attitude Debrief Survey** was administered in conjunction with the Household Travel Diary in that each adult who completed it was asked their opinions on a variety of transportation, economic growth, and land use planning topics. (Chapter 5)
6. **Dixie (SunTran) OnBoard Survey** asked riders of the SunTran bus system to provide details on their trip, their satisfaction with the service, and some demographic information. It was administered as its own survey during the fall of 2012. (Chapter 6)
7. **Residential Choice Stated Preference Survey** was administered to a subset of households who completed the Household Travel Diary and volunteered to participate in future surveys. The questionnaire asked one adult in the household to describe aspects of their current housing and neighborhood characteristics, as well as what their ideal housing and neighborhood would be. Respondents also answered a series of trade-off questions, which were asked as a way to understand residents' preferences for various housing characteristics. (Chapter 7)

Table 1: Overview of Surveys Included in the Utah Travel Study

CHAPTER	SURVEY(S)	TOPICS	DATASET(S) LEVEL: NUMBER OF RECORDS	SAMPLE SIZE
1	Household Travel Diary	Household, person, and trip characteristics	Household Person Trip	9,155 households 18,171 adults, 8,875 kids 101,404 trips
2	Long Distance Debrief AND Long Distance Standalone (identical surveys)	40+ mile trips	Household Person Trip	4,386 households (631 took the survey twice) 8,652 adults 25,698 trips
3	College Travel Diary	Person and trip characteristics	Person Trip	7,923 students 32,272 trips
4	Bike/Pedestrian Debrief AND Bike/Ped Barriers	Biking and walking travel behavior; physical barriers to increased biking and walking	Person Problems/Barriers (walk and bike)	5,071 adults
5	Attitude Debrief	Opinions about and attitudes towards land-use and transportation issues	Person	5,266 adults
6	Dixie (SunTran) On-Board	Trip origin and destination; customer satisfaction	Person	558 adults
7	Residential Choice Stated Preference	Residents' preferences for housing and neighborhood attributes	Person Choices (experiments)	2,795 adults

4.0 STRUCTURE OF THIS REPORT

Each chapter describes a survey topic. In some cases, a topic included two different surveys (Bike/Pedestrian) or two different administrations of the same survey (Long Distance Travel Diary). Each chapter includes the following sections:

1. **Introduction**: a brief overview of the topic and chapter contents
2. **Administration**: a description of the methodology and approach used to collect survey data
3. **Questionnaire**: an outline of the survey questionnaire(s), including selected screen captures from the online survey instrument
4. **Data Preparation**: a summary of the steps taken to process the data, such as weighting, cleaning, merging, and recoding
5. **Data Analysis**: a series of charts, tables, and explanations of the survey results, including, in some cases, a comparison to the existing travel demand model

The appendix includes the full questionnaires for each survey as well as the screen captures from each page of the online survey. Each agency was also provided a compilation CD of the final datasets and final documentation.

The purpose of the Household Travel Diary Survey was to gather detailed information about current travel habits in Utah, to serve as the basis for the state's future travel modeling activities, and to inform the regional and statewide transportation planning. In the spring and early summer of 2012, 9,155 households across the state contributed where all members of the household answered every single question in the Household Travel Diary survey.

1. MAIN HOUSEHOLD DIARY

1.0 INTRODUCTION 2

1.1 Introduction to the Utah Travel Study Surveys 3
1.2 Structure of This Report 4

2.0 ADMINISTRATION 6

2.1 Survey Sample 6
2.2 Survey Invitation Materials 9
2.3 Survey Retrieval 13
2.4 Pre-Test Survey 14
2.5 Full Survey 15
2.6 Survey Incentives 17

3.0 QUESTIONNAIRE 18

3.1 Household Information 18
3.2 Adult Travel Diary 19
3.3 Child Travel Diary 21
3.4 Debrief Questionnaires 21

4.0 DATA PREPARATION 22

4.1 Data Checking 22
4.2 Data Weighting 23
4.3 Variables for Modeling 30

5.0 DATA ANALYSIS 33

5.1 Summary Tabulations 33

1.0 **INTRODUCTION**

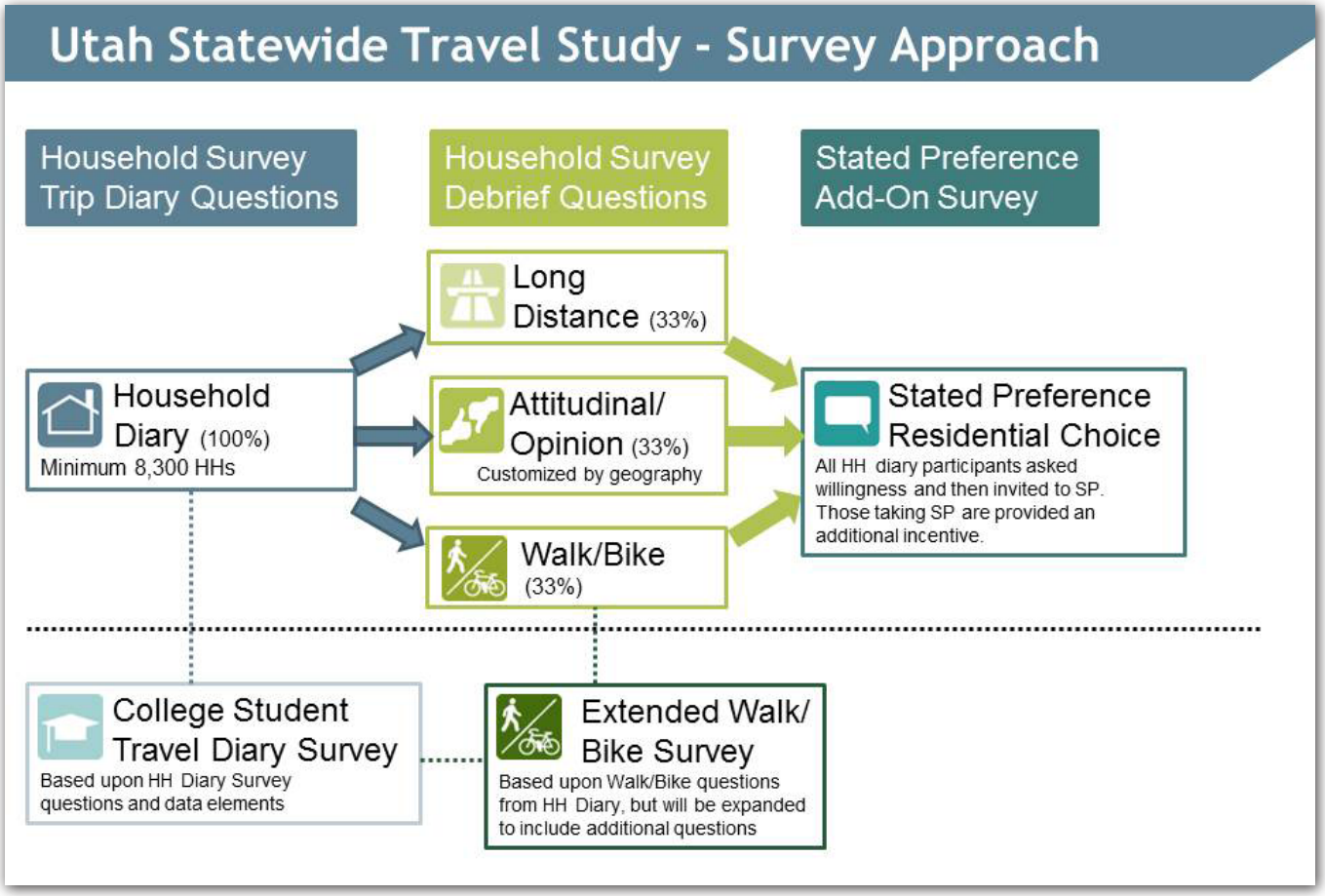
The Wasatch Front Regional Council (WFRC), in conjunction with the Mountainland Association of Governments (MAG), the Dixie Metropolitan Planning Organization (DMPO), the Cache Metropolitan Planning Organization (CMPO), the Utah Department of Transportation (UDOT), and the Utah Transit Authority (UTA) conducted the 2012 Utah Travel Study. Resource Systems Group, Inc. (RSG) served as the consultant to assist in executing the work.

The last household travel survey was conducted in 1993, along the Wasatch Front. Over the subsequent 18 years, the state of Utah has experienced tremendous growth, along with transportation infrastructure and socio-economic changes that impact travel behavior and travel patterns. The 2012 household travel diary survey data collection will be the basis for understanding current travel in Utah. The data will inform the plans for continued growth and development in Utah in the context of the Wasatch Choice 2040 long range development and transportation plan.

1.1 INTRODUCTION TO THE UTAH TRAVEL STUDY SURVEYS

In addition to the typical household travel diary, this project – called the Utah Travel Study – included six additional survey elements which are described in Figure 1.1. Each survey element was designed to understand different aspects of travel behavior and together form a comprehensive inventory of travel-related information.

Figure 1.1: Utah Travel Study Overview



1.2 STRUCTURE OF THIS REPORT

Each survey will be described in a separate chapter of this report, as outlined below. The remainder of this chapter will discuss the Household Travel Diary Survey.

1.2.1 Household Travel Diary Survey

The purpose of the Household Travel Diary Survey was to gather detailed information about current travel habits in Utah, to serve as the basis for future travel modeling activities, and to inform the regional and statewide transportation planning. 9,155 households in all regions of the state contributed by completing the three parts of the Household Travel Diary during the spring and early summer of 2012:

- The Household Information survey: A base survey that gathered information about the household and its members.
- The Travel Diary: The heart of the survey. All adult members in the household recorded and reported all their travel during one pre-assigned weekday. Adults were also responsible for recording their children(s) trips.
- The Debrief: At the end of the Household diary, participating households were assigned to take one of three debrief surveys. The purpose of the debrief surveys was to gather more information on three special topics:
  - Opinions about and attitudes towards land-use and transportation issues
  - Walk and bike habits
  - Long distance travel

1.2.2 Debrief Survey 1: Attitudes and Opinions

The Attitudinal Debrief survey, one of the three Household Travel Diary debrief surveys, was administered in the spring and early summer of 2012. The questionnaire asked respondents about their opinions on transportation and land-use planning topics, which were customized based on the household's home region.

This work is described in more detail in Chapter 5.

1.2.3 Debrief Survey 2: Long Distance Travel

The second debrief survey asked adults to report their recent long distance trips, which, for the sake of this study, were defined as trips greater than 40 miles. Given that the Household Travel Diary Survey exclusively captured typical weekday travel, the purpose of this long distance diary was to better understand the characteristics of longer, but perhaps less frequently made, trips.

This survey was conducted twice to capture long distance travel during two seasons: The first coincided with the other debrief surveys in the spring and early summer of 2012. The second was a standalone survey in the fall of 2012. These surveys, along with the combined results, are described in Chapter 2.

1.2.4 Debrief Survey 3: Walk/Bike Survey

The third debrief survey asked respondents about their walking and biking travel habits. This debrief survey was administered in the spring and early summer of 2012, but was not administered to residents of the rural region (UDOT). This work, along with the survey and results from the Walk/Bike Barriers Survey, are described in Chapter 4.

1.2.5 College Student Travel Diary Survey

Student (college or university) travel habits were examined with a College Travel Diary. The structure and content of this survey closely followed the Household Travel Diary, with a few simplifications. Unlike the Household Travel Diary, which required reporting travel for all household members on a pre-assigned travel date, the College Travel Diary only asked respondents to report on their own travel from the most recent weekday.

Eight colleges participated: Dixie State College, LDS Business College, Salt Lake Community College, Utah State University, Utah Valley University, University of Utah, Weber State University, and Westminster College.

The College Travel Diary was administered in the spring2012 prior to the conclusion of the semester. The effort is described in more detail in Chapter 3.

1.2.6 Walk/Bike Barriers Survey

Whereas the Walk/Bike Debrief Survey focused on walk/bike habits and reasons for those behaviors, the Walk/Bike Barriers Survey focused on identifying physical barriers to walking and bicycling. Respondents were asked to report "problem areas" (unsafe intersection, insufficient infrastructure, etc.) as a way to highlight areas for improvement.

The Walk/Bike Barriers Survey was administered in the fall of 2012. Its results, combined with those from the Walk/Bike Debrief Survey, are presented in Chapter 4.

1.2.7 Residential Choice Stated Preference Survey

The Residential Choice Stated Preference Survey focused on housing and neighborhood attributes, both current and ideal. Respondents described aspects of current housing and neighborhood characteristics, as well as what ideal housing and neighborhood would be. Households that had volunteered to participate in additional surveys after the Household Travel Diary were invited to the Stated Preference Residential Choice survey, along with participants in the 2011 UTA on-board survey.

The Residential Choice Stated Preference survey was administered in the spring and early summer of 2012.

1.2.8 Dixie On-Board Transit Survey

An origin-destination survey was conducted in the fall of 2012 aboard SunTran buses in the Dixie Metropolitan Planning Organization (MPO) region. This work is briefly described in Chapter 6.

2.0 ADMINISTRATION

This section describes the methods used to collect data and complete the travel diary study. RSG employed a multi-mode data collection strategy with an emphasis on the advanced web-based diary retrieval survey that includes the option of telephone retrieval.

2.1 SURVEY SAMPLE

2.1.1 Sampling Frame and Sample Size

The 1993 Household Travel Diary sampled residents from Weber, Davis, Salt Lake, and Utah counties only. The final dataset included responses from 3,100 households. By comparisons, the scope of the 2012 Household Travel Diary Survey was considerably larger, both geographically and in total number of responses.

The sampling frame was all residential addresses in the study area (Figure 1.2), which included all ZIP codes that are either partially or entirely within the state of Utah. The sample was organized in terms of regions. In addition to the pre-defined Metropolitan Planning Organization (MPO) areas, special attention was given to key regions that are experiencing significant growth. More specifically, RSG sampled a relatively larger number of households in the counties adjacent to the MPO regions rather than using a strictly population-proportional sample. This was done in order to better understand and increase statistical confidence in the high levels of commuting traffic into the MPO areas from Tooele County, Summit County, Box Elder County, Morgan County, Juab County and Wasatch County. To achieve this higher sampling rate in these edge counties and stay within the project's budget, RSG shifted (based on the plan that was originally proposed) some sample from the most rural counties into these target regions. Overall, this was a minor adjustment that struck a balance between being better able to understand longer distance travel in/out of the MPO areas, and also understand the differences in travel behavior and attitudes throughout the state.

Given this information, the sample sizes used (for the pre-test survey and the full survey) were based primarily on the following factors:

- Bench-marking of industry practices throughout the U.S;
- RSG's understanding of sample sizes suitable for statewide travel diary studies;
- RSG's ongoing work and understanding of transportation forecasting in the context of urban growth and development.
- Recognition of the need to over-sample in the smaller, rapidly growing MPO areas (Cache/Dixie) and RPO areas adjacent to the Wasatch Front (Tooele, Box Elder, Summit, etc.) to support a deeper understanding of emerging travel demand.

Figure 1.2: Sampling Frame – All Households Invited to Participate

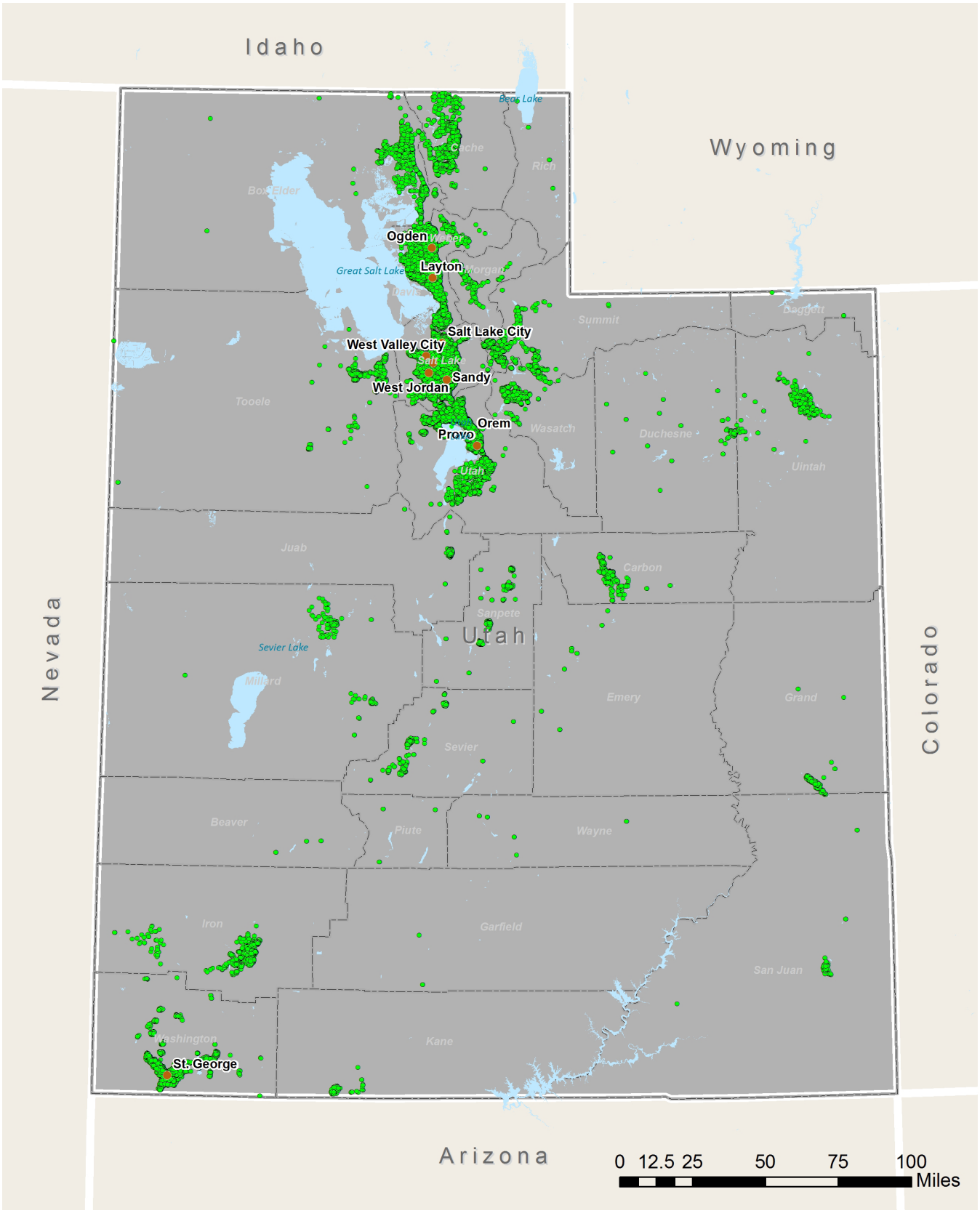


Table 1.1 summarizes the sample plan by geography.

Table 1.1: Sample Plan

REGION/GEOGRAPHY	DESIRED SAMPLE	INVITED HOUSEHOLDS	2010 HOUSEHOLDS	PERCENT OF 2010 HOUSEHOLDS
Cache	700	8,236	34,722	2.0%
Dixie	900	14,341	46,334	1.9%
MAG	1,400	17,668	140,602	1.0%
WFRC	3,800	62,764	514,915	0.7%
Iron/San Pete	300	4,473	141,119	1.1%
Tooele/Box Elder/Summit/Wasatch/Juab/Morgan	900	12,402		
UDOT: Rural Utah	300	5,004		
Total	8,300	124,888	877,692	0.9%

2.1.2 Address Based Sample

The sampling unit was an individual address. RSG used an address database from the U.S. Postal Service's Computerized Delivery Sequence (CDS) File, an electronic database that provides and continually updates all mailing addresses served by the USPS, with the exception of general delivery. The CDS File contains address information for all other varieties of addresses, including addresses that receive (or have received) mail delivery, addresses only delivered on a seasonal basis, vacant addresses, and throwback addresses (addresses not delivered to because of PO boxes). The CDS File also contains households with all types of telephone (e.g. no-telephone, landline only, cell phone mostly, cell phone only) and combinations therein. RSG used the address-based sample frame maintained by Marketing Systems Group (MSG), which is updated bimonthly and stratified based on residential land use classifications, as well as by geographic location within the state of Utah.

The invited household addresses for the pre-test and full sample were randomly selected among all existing residential addresses within each region, proportional to the number of households in that region. All counties that are either partially or entirely within the state of Utah were included in the sample. Once the set of addresses was obtained by RSG, each address was randomly assigned a travel date. Each group of travel dates was then verified for uniform spread through the study area.

Because the sample was based on residential addresses, these records can be matched to other datasets, which are commonly referred to as "ancillary data." In this case, the ancillary data were appended to the known addresses and used for the following purposes:

- Allow comparisons between respondent households' reported data and the ancillary data available for the full recruited sample to the subset of study participants;
- Demonstrate the ability to analyze non-response bias by comparing the ancillary data available for the full recruited sample to the subset of study participants;
- Adjust the sampling plan toward the end of the administration period in order to target specific types of households that may have been responding less frequently than others.

Among the ancillary data that MSG appended to the residential address were telephone number, latitude-longitude location, dwelling type, and household income. Comparisons between the final survey sample and Census data can be found in "Data Weighting".

2.2 SURVEY INVITATION MATERIALS

The Utah Travel Diary Survey invitation and outreach process included the following methods:

- Printed materials for mail-out invitation packets and postcard reminders
- Email reminders to study participants
- Outbound calls made to certain households

In addition, all outreach and survey materials included a toll-free phone number and an email address so that respondents could call/email with questions or comments.

RSG sent all printed survey materials via first-class mail. All printed materials and online graphics featured consistent visual elements, including survey titles and description, color scheme, fonts, logos and picture graphics. The intended effect of this coordination was to connect all invitations, reminders, and other notices about the project.

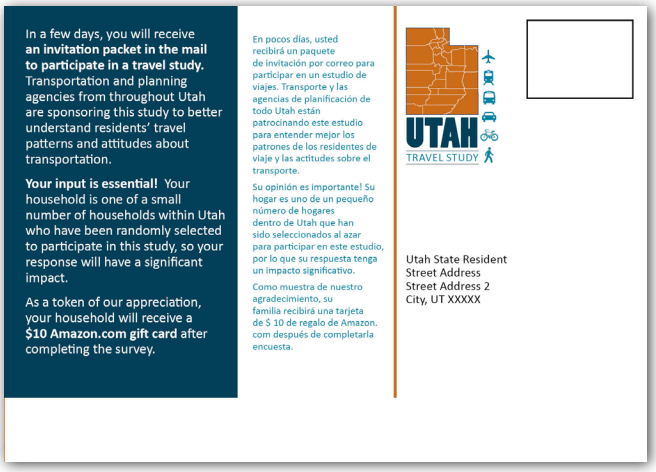
2.2.1 Postcards

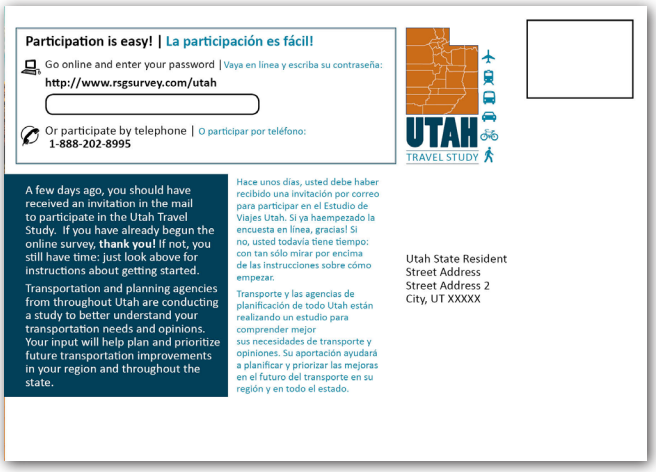
One pre-notification (advance notice) postcard was sent to arrive approximately 6-7 business days prior to the assigned travel date. The postcard announced the study and conditioned the household to expect a survey invitation in the coming days. On average, pre-notification announcements have been shown to improve the base response rate by 15%.

Two additional postcards were also mailed to each household, reminding them to complete the survey. The first reminder postcard arrived approximately on the assigned travel day and the second reminder postcard arrived approximately 2-3 days after the assigned travel day.

All information and instructions on the postcards was printed in both English and Spanish.

Figure 1.3: Pre-Notification and Reminder Postcards (front and back)





2.2.2 Survey Invitation Packet

The survey invitation packet was sent out in an envelope and scheduled to arrive approximately 3-4 days prior to the assigned travel date. The survey invitation packet included:

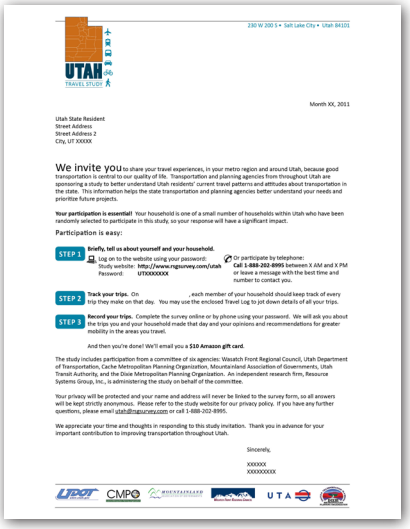
Invitation Envelope: Each invitation packet was branded on the outside with a return address P.O. Box in Utah to match the look and feel of the study website and postcards. As part of the process of determining an accurate response rate, RSG tallied any "return to sender" mailings that were undeliverable (Figure 1.4).

Invitation Letter: The invitation letter was printed on Utah Travel Study letterhead and served to explain the purpose of the study, the study sponsors, and why it was in the household's best interest to fully participate in the study. The letter also included the study website and password for the household. On average, introductory letters have been shown to improve the base response rate by 30% (Figure 1.5 and Figure 1.6)

Study FAQ document: Each invitation packet included a double-sided document with basic information and commonly asked questions and answers about the project and the survey itself.

Figure 1.4: Invitation Packet Envelope

Figure 1.5: Invitation Letter and FAQ Sheet (English, front and back)



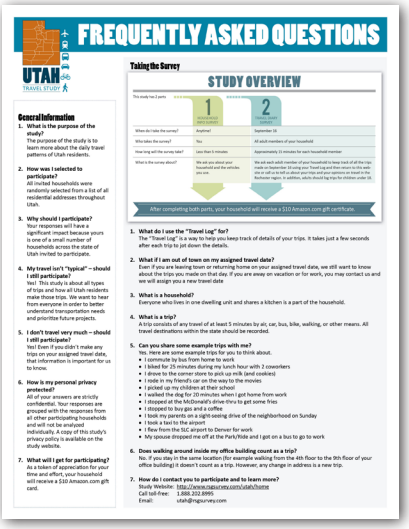
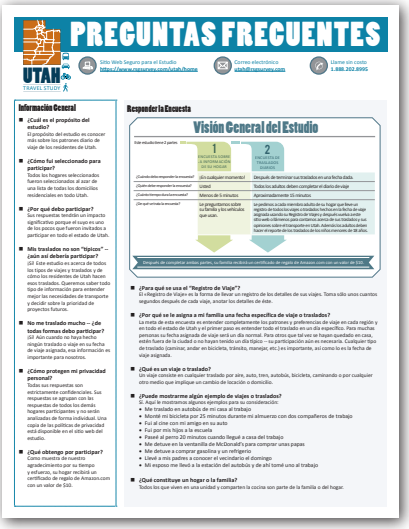


Figure 1.6: Invitation Letter and FAQ Sheet (Spanish, front and back)



Travel Log: Each invitation packet included three travel logs that served as a "worksheet" for household members to record information about their daily trips, which they could later use as a resource for completing the survey online or over the telephone. This document was also available on the study website to download and print additional copies (Figure 1.7).

Long Distance Travel insert: For those households that were randomly selected to participate in the Long Distance Travel Diary debrief section, the invitation packet included a description of long distance travel and conditioned the household to expect this debrief survey (Figure 1.8).

Figure 1.7: Travel Log (front and back)

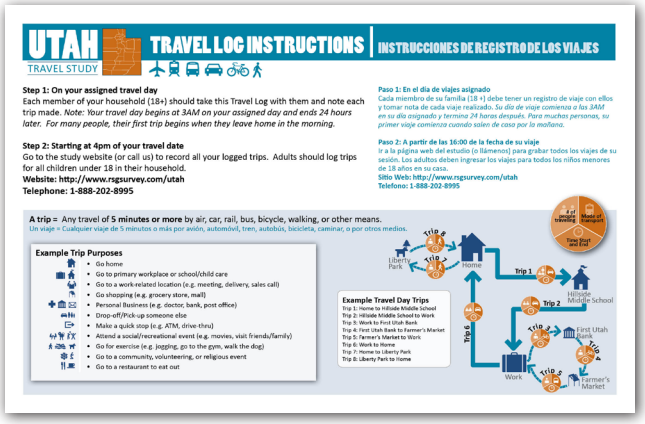
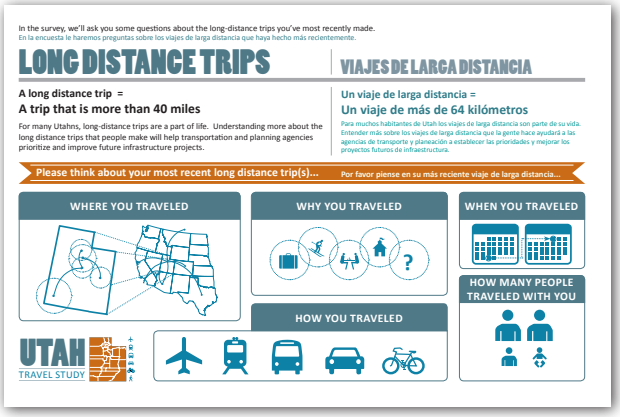


Figure 1.8: Long Distance Insert



All information in the invitation packets was printed in both English and Spanish, either on the same document in the case of the travel log, or on separate documents in the case of the invitation letter and the FAQ Sheet.

2.2.3 Email Reminders to Study Participants

Respondents were asked to provide a contact email for the household in the Household Information Survey. RSG used the email addresses to send households reminders and encourage participation, as well as send Amazon.com gift cards to those households that had completed the entire survey. A total of four possible emails were sent to households that had not completed their travel diaries. Households that preferred to be contacted by telephone were contacted by Westat, a marketing research firm. Once a household completed the entire survey, they were no longer contacted for reminders either via email or phone.

Morning of the household's assigned travel date: An email was sent to the primary contact email address for those households that had already provided an email address as part of the Household Information Survey. This message thanked the household for completing the Household Information Survey and reminded the household of their assigned travel date.

On the day immediately after the assigned travel day: Any household that had at least one adult who had not yet completed his or her travel diary was sent a follow-up email reminding them to go online and complete their travel diaries and enter their trips to qualify for the Amazon.com gift card incentive.

Third and fourth follow-up reminder email: Two additional follow-up emails—one on the Saturday following the travel date and one on the Tuesday *after* the travel date—were sent within seven days of the assigned travel date to households that still had not completed all of their assigned travel diaries.

All reminder emails provided general information about the project and the incentive for its completion. Additionally, the emails included the study website, the household's login password, and a return email address for participants with any questions or comments about the project. All email communication was sent from the project email address (utah@rsgsurvey.com). RSG has a standard of responding to emails sent from participating households within one business day.

2.3 SURVEY RETRIEVAL

The primary survey instrument for the Utah Travel Study was the RSG online survey, administered through a website produced specifically for the project. In addition to the survey, the project also used a related website to host relevant information about the Utah Travel Study, such as press releases and raffle winners.

One adult in the invited household was asked to first complete a brief Household Information Survey. On the household's assigned travel date (or a date very soon thereafter), each member completed the Travel Diary section of the survey by logging all the trips made on that particular day. Respondents could also opt to complete the survey via telephone. Calls to the projects' toll-free telephone number were fielded by Westat. In some cases, respondents may have used both methods to complete their household survey. Finally, respondents could also reach RSG by emailing utah@rsgsurvey.com with questions or requests.

Online – To participate in the online version of the Utah Travel Study, participants logged onto the survey website and entered their household-specific eight-digit password. These passwords were included in the invitation packet, as well as on each of the postcard and email reminders. At any point, respondents could exit out of the survey and later return to the survey homepage, log in using their password, and continue from where they left off.

Telephone – For respondents who preferred not to complete their survey online or lacked Internet access, members could call a toll-free number and Westat operators were available to administer the survey over the phone. Additionally, participants could choose to be contacted at a preferred date and/or time, and the operators would make an effort to reach the households at their preferred time(s). For non-English speaking households, Westat offered a foreign language service during business hours and early evenings so that respondents could complete the survey in the language of their choice.

The toll-free telephone number associated with the project was printed on all invitation materials for the survey (postcards, invitation packet, etc.). Call center operators were trained to administer the identical survey that online participants saw. Data from respondents that used the call-in option were fully integrated with all other respondents' answers. The telephone operators also had additional materials and information on hand, such as the project FAQ's and copies of all printed materials, to inform their dialogue with household members. In addition to fielding inbound calls, the call center placed targeted outbound calls to households from rural regions, where Internet access is scarcer and survey participation was expected to be lower. RSG provided Westat with a list of invited households in rural counties outside of MPO boundaries and in the Dixie MPO region to contact in order to help focus the outbound call effort.

During the full survey administration, approximately 31% of the households that completed the entire survey had at least some contact with Westat (received an inbound call and/or participated in at least some portion of the survey). Interviewers answered general questions about the survey, helped resolve technical issues with the survey, and guided respondents through the survey.

2.3.1 Spanish Translation

Due to the growing population of Spanish speakers in Utah, all parts of the survey were offered in both English and Spanish. RSG used a translation company (TranslationCzar) to perform the translations.

All written materials, including the survey invitation and the reminder postcards, were sent with both English and Spanish versions. The online survey was also offered in both English and Spanish; respondents could easily choose to switch back and forth between English and Spanish on each page of the survey. Participants who opted to take the survey by phone were provided foreign language service that as part of Westat's standard survey operation.

The structure of the survey and the questions remained the same for both English and Spanish survey versions, and the Spanish version represented a direct translation from the English version. Therefore, all responses were analyzed as one dataset, regardless of survey language.

2.4 PRE-TEST SURVEY

RSG conducted a pre-test survey in January and February 2012. The purpose of the pre-test survey was to evaluate the overall success, efficacy, and methodology of the survey before the full survey launch in March 2012. In the pre-test, 4,230 households were invited to take the Utah Travel Study, of which 203 households completed the survey where every household member answered every single survey question. The goals and objectives of the pre-test process are described in Table 1.2.

At the end of the Travel Diary portion of the pre-test survey, all adult participants were asked two open-ended questions regarding feedback for how the survey could be improved upon:

- Were there any instructions, directions, or questions that were confusing or unclear? If so, please tell us which instructions were confusing and why. We also welcome suggestions for how to improve.
- Do you have any general recommendations for how we can further improve the study? If so, please tell us your ideas and suggestions for how to improve our study.

Table 1.2: Pre-Test Goals and Tasks Performed

PRE-TEST GOALS	TASKS PERFORMED
Allow the project team to evaluate the overall survey process and to identify any areas for improvement prior to the main survey.	Reviewed question wording and response categories in terms of clarity and confusion for respondents
	Evaluated the full range of procedures associated with respondent contact, data retrieval, and data processing for the household diary and subsequent debriefing surveys
	Examined the full data-set for quality and meeting client modeling needs
Evaluate the effectiveness of the survey materials – both the survey instrument and all accompanying materials such as the memory jogger, postcards, invitation materials, etc.	Determined the time required for respondents to complete the questionnaire online and over the telephone, both the range and the average
	The pre-notice letter, instructions, and memory jogger were tested as a part of the pretest. Attention was given to question compatibility with previous travel surveys
Properly estimate and plan for reasonable response rates.	Checked and confirmed incidence and response rate assumptions
	Determined if there were any sub-populations that needed additional focus for the main study by oversampling or offering a higher incentive

2.5 FULL SURVEY

Between March and June, 2012, RSG invited a representative sample of 124,888 households within the study area to complete the Utah Travel Study. All invited households were randomly assigned one of 33 travel dates beginning on Tuesday, March 27, and ending on Thursday, June 28. To best capture a snapshot of each member's typical weekday trips, all assigned travel dates occurred on a Tuesday, Wednesday, or Thursday (Table 1.3).

On any given travel date from March through May approximately 3,500 households were invited to participate. Using the Memorial Day holiday as a break, the project team revised the schedule and sample sizes for the remaining travel dates in two ways:

1. The remaining travel dates were condensed into two consecutive weeks during late June, thus avoiding the Independence Day holiday. This meant that more households were assigned to each travel date (between 4,000 and 6,000).
2. The total number of invitations was also reduced given the higher-than-expected response rate. RSG oversampled households within the regions that were responding at a lower rate in order to achieve a balance sample.

Note that the number of completed surveys per travel date in Table 1.3 represents the household's final travel date, which, in the case of travel date reassignment (described below), was different. For example, if a household was originally invited to participate with a 4 April 2012 travel date but was later reassigned to 16 May 2012, that household would be listed as a complete for the "5/16/2012" travel date. This was the case for 84 of the 9,155 total households (0.9%).

Table 1.3: Survey Invitation Schedule

WAVE	NUMBER	TRAVEL DATE	DAY OF WEEK	INVITED HOUSEHOLDS	COMPLETES
1	1	3/27/2012	Tue	3505	206
1	2	3/28/2012	Wed	3490	218
1	3	3/29/2012	Thu	3505	233
1	4	4/3/2012	Tue	3498	241
1	5	4/4/2012	Wed	3499	216
1	6	4/5/2012	Thu	3499	252
1	7	4/10/2012	Tue	3506	297
1	8	4/11/2012	Wed	3497	254
1	9	4/12/2012	Thu	3506	236
1	10	4/17/2012	Tue	3492	323
1	11	4/18/2012	Wed	3502	248
1	12	4/19/2012	Thu	3495	237
1	13	4/24/2012	Tue	3501	260
1	14	4/25/2012	Wed	3497	272
1	15	4/26/2012	Thu	3492	270
2	16	5/1/2012	Tue	3497	249
2	17	5/2/2012	Wed	3494	242
2	18	5/3/2012	Thu	3506	277
2	19	5/8/2012	Tue	3493	287
2	20	5/9/2012	Wed	3482	230
2	21	5/10/2012	Thu	3501	277
2	22	5/15/2012	Tue	3491	289
2	23	5/16/2012	Wed	3493	285
2	24	5/17/2012	Thu	3500	279
2	25	5/22/2012	Tue	3494	306
2	26	5/23/2012	Wed	3500	286
2	27	5/24/2012	Thu	3497	249
3	28	6/19/2012	Tue	6102	384
3	29	6/20/2012	Wed	6010	422
3	30	6/21/2012	Thu	6062	417
3	31	6/26/2012	Tue	4087	305
3	32	6/27/2012	Wed	4115	294
3	33	6/28/2012	Thu	4080	314
Total				124,888	9,155

Although the travel dates organized the administrative effort, data from all travel dates were combined and used in the final analysis.

Response rate exceeded expectations in all regions (except for in rural Utah), which resulted in a final sample size of 9,155 households. The regional breakdown is summarized in Table 1.4. It should be noted here that a small number of households were invited as a part of one region but subsequently moved into the proper region during the data preparation phase of the project. This was done because the home coordinates provided by the respondent during the survey were deemed to be more accurate. The result is that the response rates shown by region are *approximate*. It is also worth noting that these seven regions were condensed down to four regions for summary and analysis processes. This is described in greater detail later in this report.

Table 1.4: Final Sample Sizes and Response Rates

REGION/ GEOGRAPHY	DESIRED SAMPLE	FINAL SAMPLE	FINAL SAMPLE/ DESIRED	FINAL RESPONSE RATE
Cache	700	808	115%	9.8%
Dixie	900	1,015	113%	7.1%
MAG	1,400	1,556	111%	8.8%
WFRC	3,800	4,236	111%	6.7%
Iron/San Pete	300	328	109%	7.3%
Tooele/Box Elder/ Summit/Wasatch/ Juab/Morgan	900	940	104%	7.6%
UDOT/Rural Utah	300	272	91%	5.4%
Total	8,300	9,155	110%	7.3%

2.5.1 Travel Date Reassignment

Throughout the survey administration, RSG compared the sample size and response rate to targets, and made efforts to maximize the survey completion rate while containing costs.

In early May, at the midpoint of the survey administration period, the response rate varied slightly by region and household income. In order to achieve the desired sample sizes by region (and household characteristics), RSG implemented two strategies for the second half of the survey:

- Increase capacity at the Westat call center to allow more time for targeted outbound reminder calls.
- Provide households that had completed the Household Information Survey but had not yet started the Travel Diary with an additional chance to participate. These 889 households were sent a follow-up email informing the household of their opportunity to still participate with their new assigned travel date.

2.6 SURVEY INCENTIVES

Survey incentives were used to encourage participation. The suite of survey invitation materials included notification of the $10 incentive (an Amazon.com gift card) that would be sent to each household upon completing the entire survey.

Near the end of the Household Information Survey, households were asked to provide a contact email address. In addition to sending email reminders, RSG used the contact email address to email $10 Amazon.com gift cards to households that completed the entire survey. A message was included with each of the gift cards that read:

> *Thank you for recently completing the Utah Travel Study. We know you could have easily ignored the invitation, but you didn't, which means your survey answers will help planners better understand and prioritize future transportation projects in your area and throughout the state.*
>
> *Here's a $10 gift card to Amazon.com as a token of our appreciation. Thank you again for participating in the study!*
>
> *Utah Travel Study*

For households that completed the survey over the phone with Westat or entered an invalid email address, RSG sent the $10 gift card via first class mail to the household's mailing address.

Part of the reassignment effort included an increased incentive to those households who had partially completed the survey. These 889 households (described above in "Travel Date Reassignment") were offered $20 Amazon.com cards to complete the survey. This approach was used to help keep survey costs down by recruiting a group of households who had already demonstrated at least some interest in participation. In the end, 84 households received the increased incentive amount.

3.0 QUESTIONNAIRE

The household travel diary survey had three primary components:

- **Household Information**: Completed by one adult in the household
- **Travel Diary:** Completed by/for all members of the household, including minors
- **Debrief:** Completed by all adults in the household, which was randomly assigned one of the three debrief surveys (Attitude, Walk/Bike, Long Distance)

3.1 HOUSEHOLD INFORMATION

This brief (approximately 5 minute) component of the diary survey was completed by one adult member of the household who was asked to provide information about the demographic characteristics of the household:

1. **Household Data**: Number of adults and children in household, home ZIP code, years lived at current residence, months of the year living full-time at residence, housing type, home location, household income, preferred way(s) of contacting household, and preferred time(s) to contact household (Figure 1.9)
2. **Person Data**: Gender, age, relationship, race, ethnicity, education, employment status, and number of jobs of household members. The name or initials of each household member were also provided for distinguishing each person during the Utah Travel Study (Figure 1.10).
3. **Vehicle Data**: Number of motor vehicles in household, year/make/model/fuel type/number of miles driven in past year for each household vehicle (Figure 1.11).

At the very end of the survey, all households were asked whether they would like to participate in future transportation surveys by the sponsoring agencies. Ninety percent (~8,000) of households answered "yes". This group became a valuable sample source for some of the subsequent surveys in the Utah Travel Study.

Figure 1.9: Household Data – Years at Residence

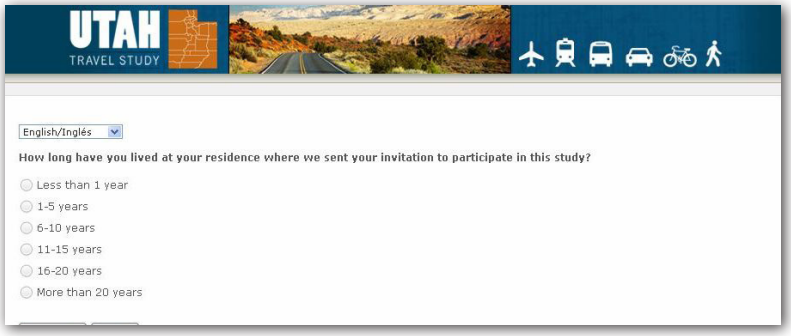


Figure 1.10: Person Data

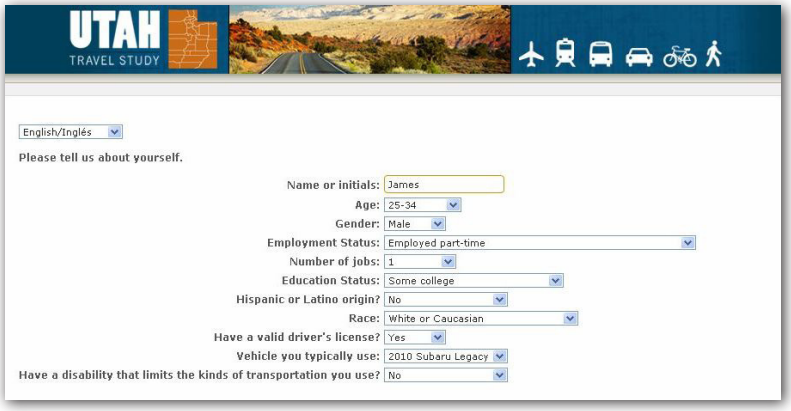
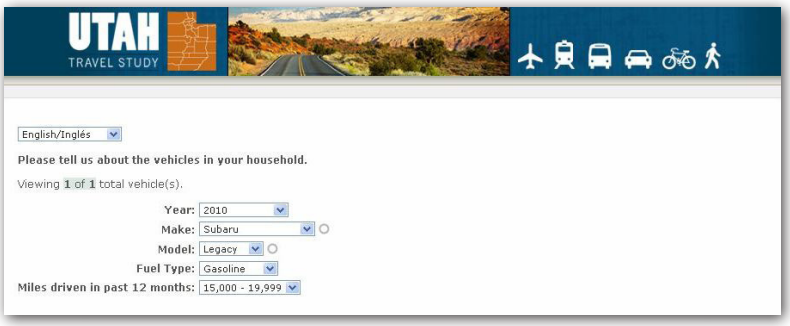


Figure 1.11: Vehicle Data



3.2 ADULT TRAVEL DIARY

Each adult in the household (age 18 or older) was asked to complete the Travel Diary survey.

The primary purpose of the Travel Diary survey was to comprehensively obtain information about the travel that occurred over a pre-assigned 24-hour weekday period for each adult member of the household. To that end, each household member was asked if they made any trips (at all) on their assigned travel date. Those who made zero trips were asked their reasons for not leaving the house.

All respondents who made at least one trip on their assigned travel date were asked to list all the locations they visited on their assigned travel date (Figure 1.12), including the address of the trips' origin and destination (Figure 1.13). Using interactive Google mapping technology, respondents could enter an address, a business name, or place a marker on the map to find each location. Once the location was selected, its latitude and longitude coordinates were automatically geocoded by the software.

Figure 1.12: Trip Roster

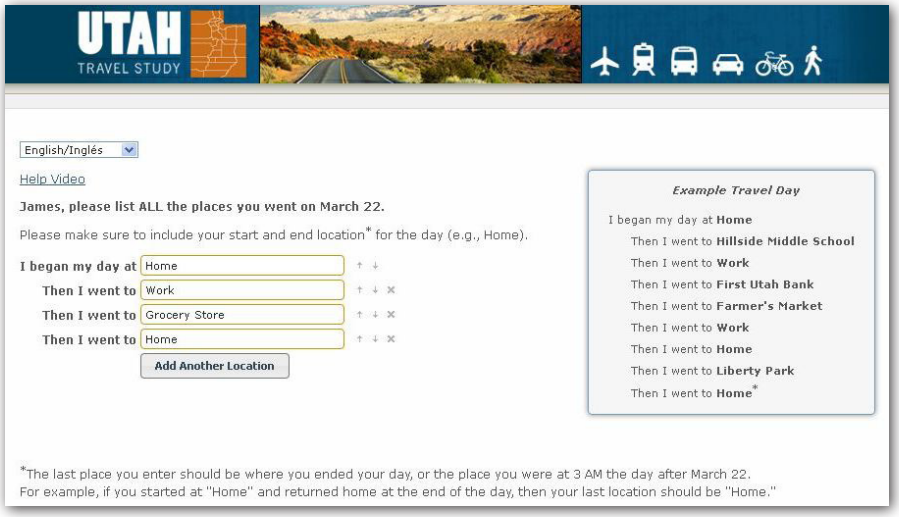
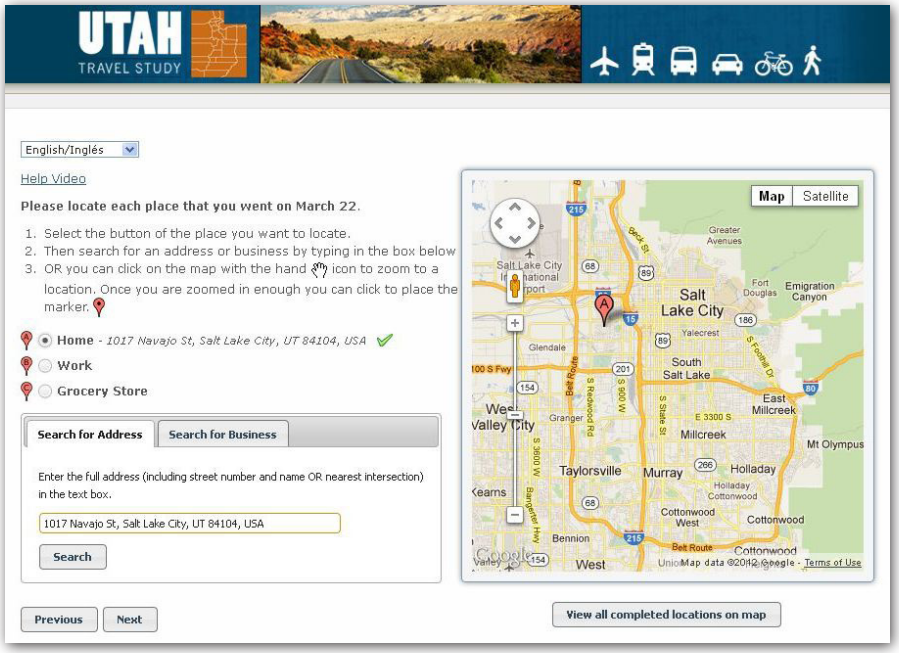


Figure 1.13: Google Map Geocoder



Having provided the roster of trips made, respondents were then asked specific details about each of their trips, including start and end times, trip purpose, and travel mode(s) used (Figure 1.14). Based on the respondents' chosen mode, the survey dynamically showed follow-up questions. Those who traveled by personal vehicle were asked to indicate:

- Which household vehicle was used on the trip
- Whether the respondent was a driver or passenger on the trip
- Any costs on the trip (toll or parking)

Those who made a walking or biking trip were asked if they used a dedicated sidewalk or bike path. All adults were asked for detailed information about the people in their travel party, including a "select all that apply" from the list of other household members and also the number of people from outside the household (Figure 1.15).

Figure 1.14: Trip Details – Automobile Trip

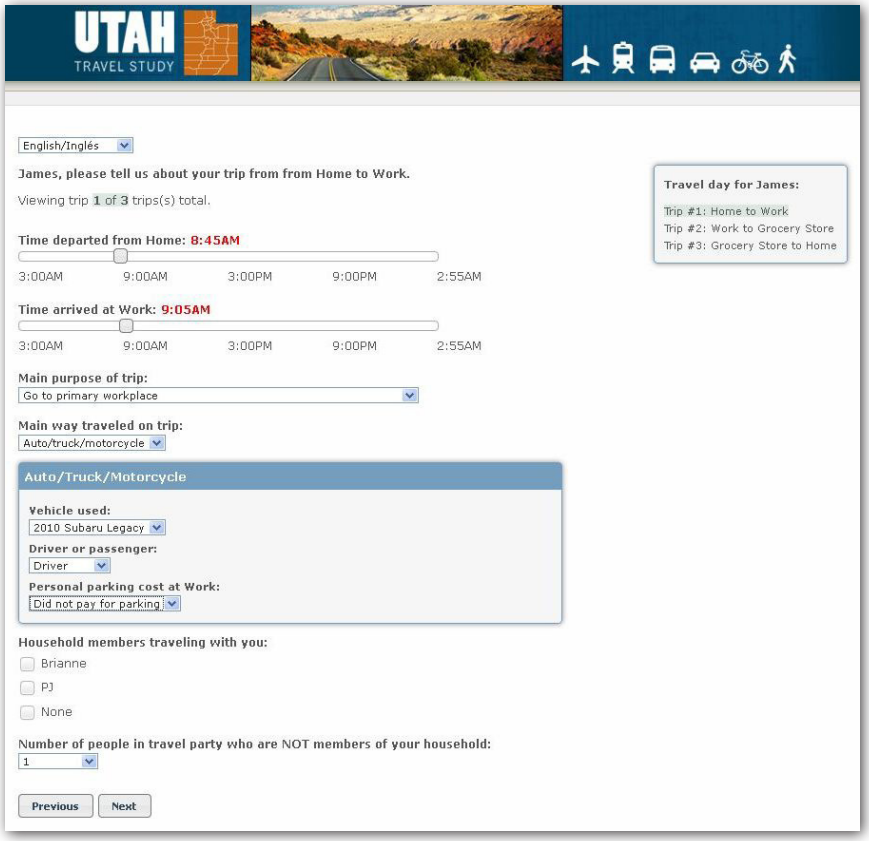
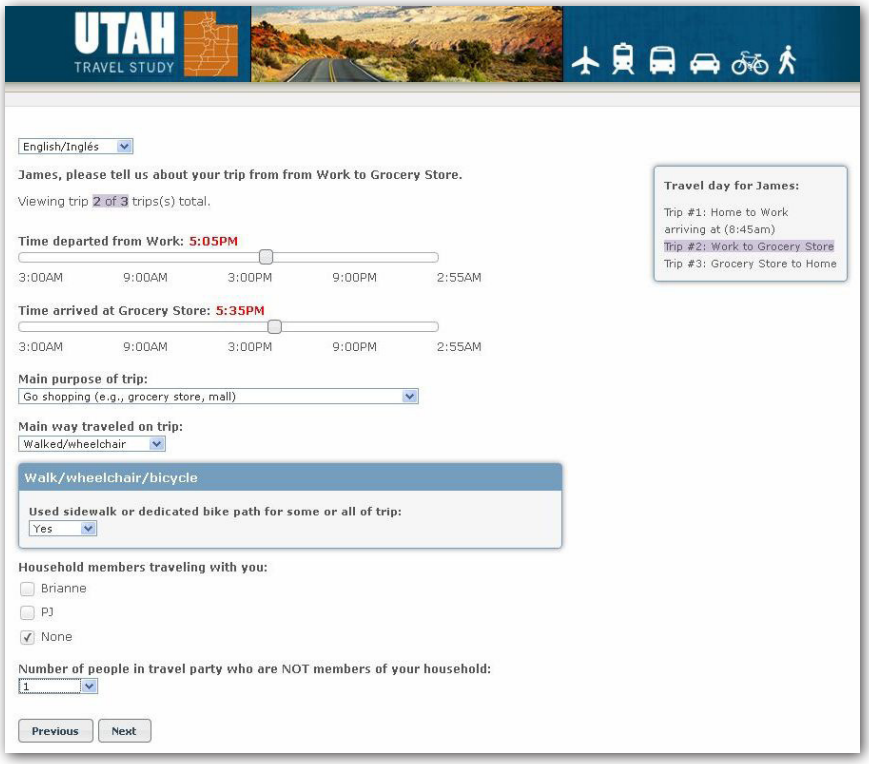


Figure 1.15: Trip Details – Walk/Bike Trip



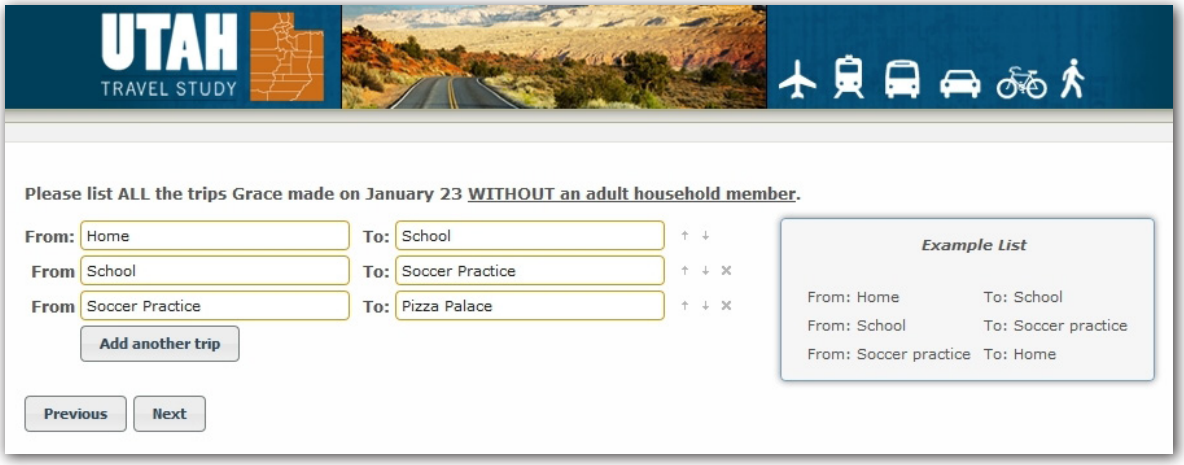
3.2.1 General Travel & Opinion Questions

After providing details for each trip, adults were asked a set of follow-up questions. Specifically, respondents who were employed were asked a few questions about their typical commute: how many days per week they commute, what time of day they typically arrive and leave work, and how they typically commute to and from work. Students attending school were asked a similar set of travel questions.

3.3 CHILD TRAVEL DIARY

To record travel information for minor members of each household, adult members were asked to fill out a simplified travel diary for those under the age of 18. Participants were first asked whether the child made any trips without an adult household member on the assigned travel date. If the child had made independent trips during the assigned travel date, the participant was asked to fill out a trip roster similar to that provided in the full Travel Diary (Figure 1.16). Respondents listed the type of locations they had visited during the day, such as "Home," "School," "Soccer Practice", along with trip times, trip purpose, and mode of transportation. To protect the privacy of minors, geographic information (indicating the locations on a map) was not collected in the Child Travel Diary.

Figure 1.16: Child Trip Roster



3.4 DEBRIEF QUESTIONNAIRES

Households were pre-assigned to take one of three debrief surveys. See separate chapters for questionnaires.

1. **Attitude:** Opinions about transportation and land use planning in the region
2. **Walk/Bike**: Respondent walk and bike habits and opinions.
3. **Long Distance**: Respondents reported on long-distance travel, defined as over 40 miles, and excluding work commute trips.

4.0 DATA PREPARATION

4.1 DATA CHECKING

RSG completed a review of the data, and during this review process identified some data cleanup tasks necessary to prepare the data for analysis. Some of this work included piecing together data from different tables into one table, and some included actual cleaning of the data. The following list describes the necessary data cleaning performed by RSG.

4.1.1 Children's Trips

To avoid children having to fill out trip details, the survey questionnaire asked adults to complete a simplified version of the travel diary for each minor in the household. That the trips were recorded in a slight different manner necessitated merging children's trip records with the adult trip records. Children's trips could have been reported in one of two ways:

1. **Dependent trips:** the child made a trip with at least one adult in the household. In this instance, the child was reported as co-travelers/passengers as part of the adults' trip records in the travel diary. Examples include a parent dropping a kid off at soccer practice and a family going out to a restaurant together.
2. **Independent trips:** the child made a trip without any household adult. In this instance, the trip was reported in the child travel diary by an adult. Examples include: a child walking from school to soccer practice and a child riding the bus to school.

Individual trip records were created for dependent kid trips by copying the household adult-accompanied trips. These were interwoven with children's independent trips. In trip records created from adult trips, the trip purposes were recoded to reflect the child's trip purpose. For example, where the adult trip purpose was 'drop-pickup', the child's purpose may have been 'school'. Finally, duplicate child trip records were removed (for example if multiple adults made the same trip involving a child).

4.1.2 Trip Destinations and Purposes

Respondents described their trip destinations in two ways:

- Typing in a destination description in a text box, e.g. "my house", and
- Selecting the destination purpose from a list of 13 trip purposes:
  - Go home
  - Go to primary workplace
  - Go shopping (e.g., grocery store, mall)
  - Conduct personal business (e.g., doctor, banking, post office)
  - Drop off/pick up someone else
  - Make a quick stop (e.g., ATM, drive-thru, fast-food, coffee)
  - Go to restaurant to eat out/get take-out
  - Go to other work-related location (e.g., meeting, sales call, delivery)
  - Attend social/recreational event (e.g., movies, visit friends/family)
  - Go to school/child care
  - Go to gym or go for exercise (e.g., go for a walk/jog)
  - Go to religious/community/volunteer activity
  - Other

The many categories allow for detailed analysis of reasons people make trips, and most purposes were worded to imply activities outside of the home. For model comparisons, however, it was necessary to represent home and work trips in a way that corresponded with the existing travel model. For example, it was possible for a respondent to describe the destination as home ("my house") and choose "make a quick stop" or "pick-up/drop-off someone else" as the purpose. In these cases, and others, RSG recoded purposes so that when the chosen location was the respondent's home, the trip purpose was also 'home', and when the chosen location was the workplace, the trip purpose was 'work. This recoding included coding trip purposes to something other than home or work in cases where the respondent had chosen 'home' or 'work' purpose but the location description indicated something else, for example 'my friend's house' or 'my husband's job'.

4.1.3 Transit Trip Details

The Travel Diary was designed to capture the primary travel mode used on a trip. It was not designed to gather information about transit trip legs, such as driving to a transit stop or transferring buses mid-route. Transit trips were inspected and in some cases recoded to ensure only the main transit mode was reported and to ensure that one linked trip was represented instead of multiple unlinked trips. This was important to avoid overstating the number of transit trips made. Transit trip leg reporting was found in 223 respondents, who had reported 1,585 trips (7.1 trips per person). After inspecting and consolidating the transit trip legs into a main transit trip, the number of trips was reduced to 1,171 (5.25 trips per person).

4.1.4 Removing Households Outside the Study Area

Lastly, 34 households whose home location was outside the state of Utah were removed from the final dataset. No other households were removed from the final dataset and each household in the dataset represents a complete record where every adult answered every single question in the survey and thus there are no incomplete or partial records in the final dataset.

4.2 DATA WEIGHTING

The Household Travel Diary sample covered approximately one percent of Utah's population; however, the proportions of survey households in various demographic categories were not necessarily representative of the state population. Reasons for discrepancies in demographic or geographic characteristics between the survey and actual populations include different levels of non-response. Examples of discrepancies between the demographic characteristics of households from our survey and Census data include:

- 7% more '2 Person households' in the survey than in the state.
- Higher representation of households with > $50k annual income in the survey than in the state
- More '2 Vehicle households' in the survey than in the state
- Fewer renters in the survey than in the state

In order to better represent the state's population, RSG developed weights for each household, using 2010 Census data as the basis for the actual population and their characteristics. This weighting process, described below in greater detail, sought to estimate weights for each survey household so that the characteristics of the weighted survey households match Census data in terms of both geography and demographics.

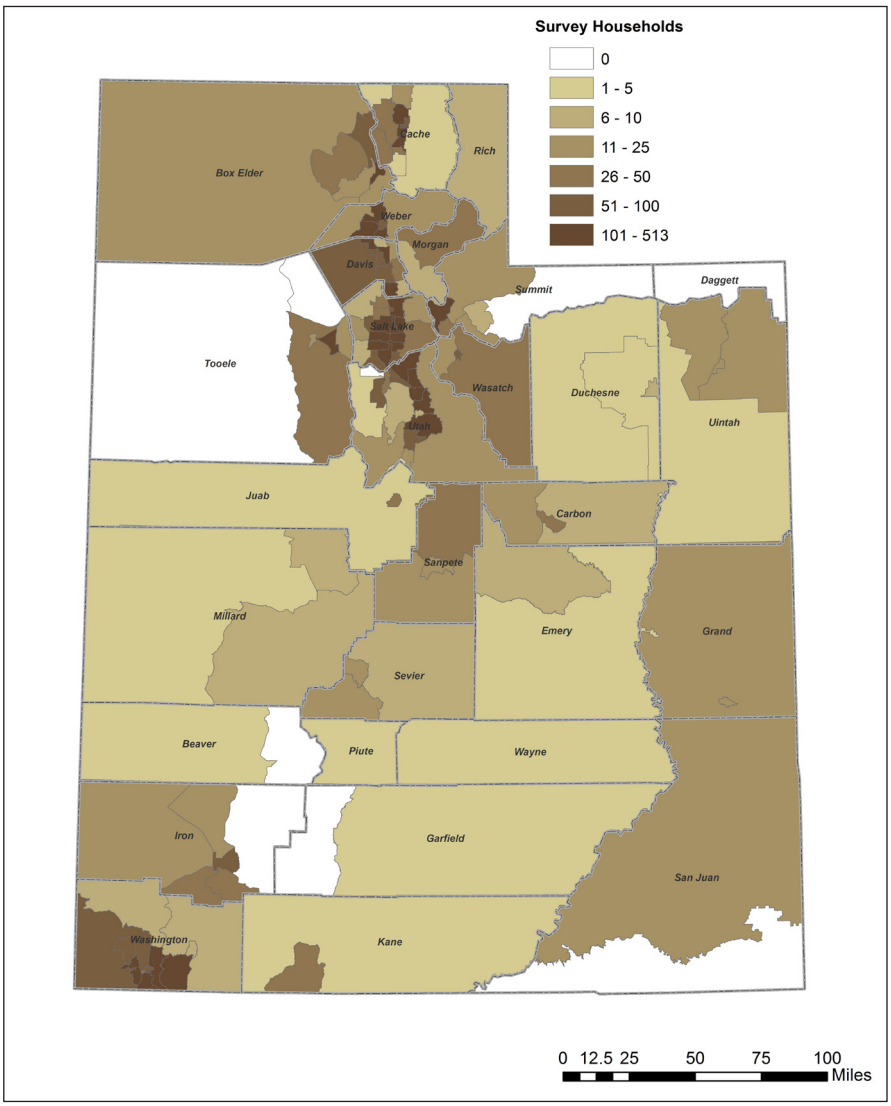
4.2.1 Defining Geographic Resolution for Survey Weighting

Before controlling the survey sample to the Census data by geography, a decision had to be made about the geographic resolution at which the survey data should be weighted to match the Census. The goal of this task was to develop a district delineation that appropriately balanced considerations related to the Census population in the district (more population translates to smaller district area, and vice versa) with the number of survey households present in the same geography. This was a judgmental exercise, where the trade-offs were the desire for geographic accuracy and the size and distribution of the weights necessary to adjust the survey sample to the population. RSG considered various established geographic resolutions used by the modelers in Utah, including Census geographies (Tracts, Block Groups), political geographies (counties), and modeling geographies ("medium" and "large" districts, as defined by the respective agencies). RSG settled on a district layer that is a "hybrid" of the existing medium and large districts used by the transportation agencies for summarizing model data. In some cases these existing districts were thought to be too coarse or too detailed for data weighting purposes, and so adjustments were made.

The data points utilized for this task were the geographic location of each survey household, a model district map with boundaries aligned with the census tract boundaries, and the number of Census households in each of these districts. Note that model districts do not cross county boundaries. Generally speaking, this hybrid district map had higher resolutions (i.e. smaller district size) in most urban areas (cities and MPOs) and lower resolution in rural areas.

A Geographic Information System (GIS) map (Figure 1.17) with the number of survey households in the existing medium districts was prepared to identify the areas that had no survey data points or too few survey records to be representative (e.g. Daggett county) and thus needed to be combined with adjoining geographic areas for weighting purposes. Consistent with the sampling plan and population densities, the number of survey records is highly concentrated within or adjacent to the MPO regions.

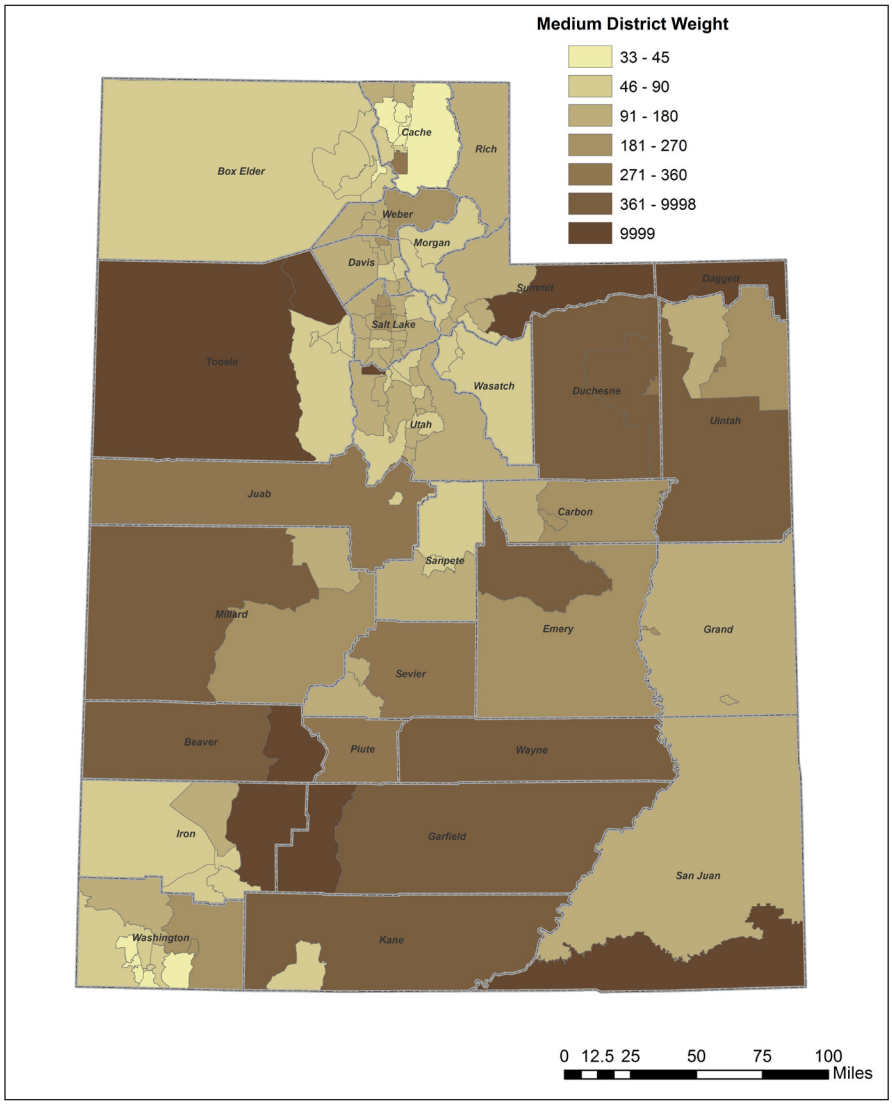
Figure 1.17: Survey Households by Existing Medium District



Though some districts had few surveyed households, the total number of Census households in many of these districts was also very low (e.g. the western portion of Box Elder County). Thus, a GIS map displaying household weights for each district was also prepared (Figure 1.18) to see if these "few" survey households were proportional to the Census households in that district, where:

$$\text{Household weight for each district} = \frac{\text{(Number of Census households)}}{\text{(Number of survey households)}}$$

Figure 1.18: Survey Household Weight by Existing Medium District



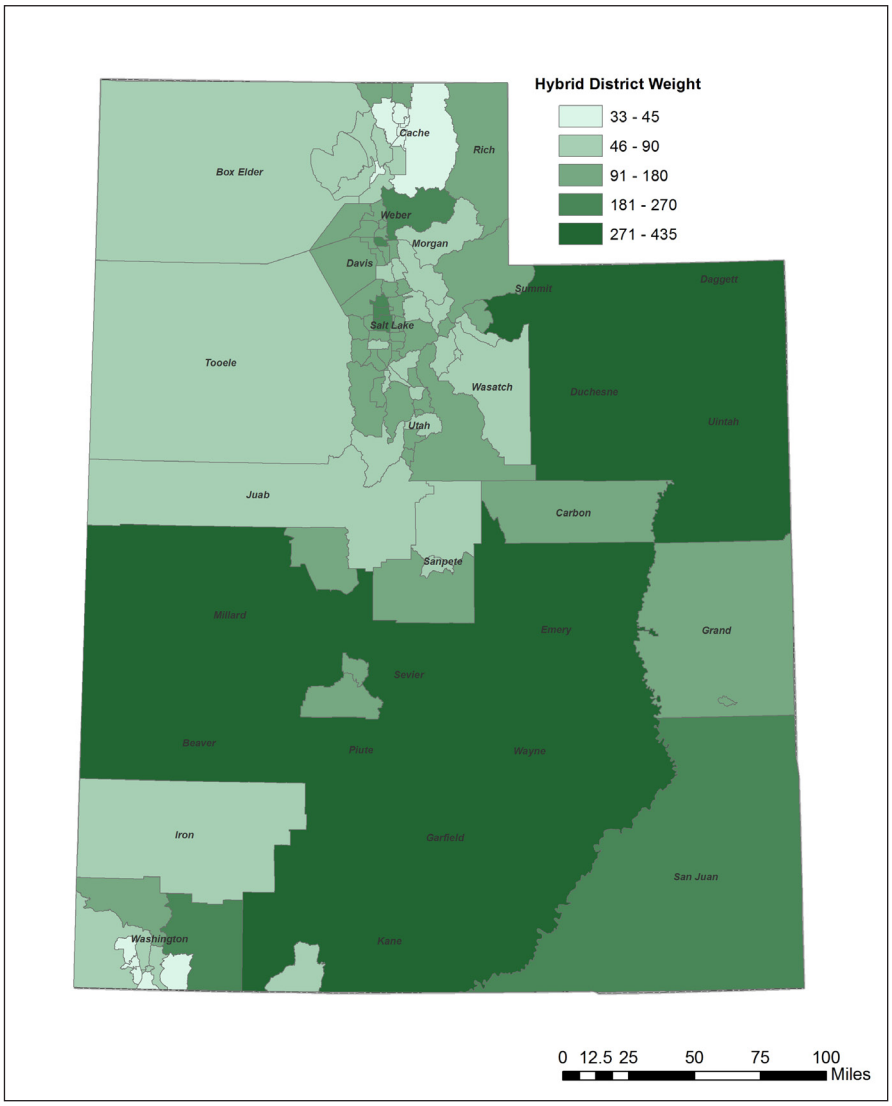
The average household weight for the entire state of Utah is approximately 95 (877,692 Census Households / 9,155 survey households), which means that each survey household represents approximately 95 Census households. With this in mind, all medium districts where the survey households carried a much larger weight than the statewide average were carefully considered as to whether they needed to be combined with another geography to lessen the likelihood that relatively few survey households would be too heavily weighted. This set of districts under consideration generally included districts that were rural and scarcely populated. On a case-by-case basis, decisions were made to combine these rural districts with either the more populated districts in the same county, or other rural districts from neighboring counties.

Specifically, RSG made the following modifications to the medium district geography:

1. Combine rural and urban districts for each of *Carbon*, *Iron*, *Juab*, *San Juan*, and *Tooele* counties (maintain separate districts by county);
2. Combine all districts within *Daggett*, *Uintah*, and *Duchesne* counties and the rural district from *Summit* County as one district crossing the county boundaries;
3. Combine rural districts in *Cache* County with adjoining urban districts in *Cache* County (some survey Households were just over the urban districts boundaries, in Logan Canyon for example);
4. Combine the rural southern and southwestern districts as one very large district crossing county boundaries (*Beaver*, *Emery*, *Garfield*, *Piute*, *Wayne*, and parts of *Kane*, *Millard*, and *Sevier*)

Figure 1.19 presents the final, 103 hybrid district geographies with weights for each region.

Figure 1.19: Hybrid Districts with Weights



4.2.2 Methodology for Survey Data Weighting

The goal of survey weighting was to assign a weight to each of the 9,155 households in the sample so that the weighted dataset closely matched the corresponding data from 2010 Census Survey along all of the following geographic and demographic dimensions:

- Geographic:
  - Hybrid districts
- Demographic
  - Household size
  - Household income
  - Auto ownership
  - Residential tenure (rent/own)

The demographic variables were controlled within each MPO area, and for the remainder of the state. The distinction here is that the demographic characteristics are not controlled for at the district level, but instead are controlled for within an MPO region (defined by counties). Specifically, for each of five areas – (1) Washington County, (2) Cache County, (3) Utah County, (4) the combination of Weber/Davis/Salt Lake County, and (5) the combination of all the other counties in the state – RSG ensured that the demographic profile of the sample was controlled to the Census data.

The household totals by geography and the distribution of households for two demographic variables (household size and residential status) were readily available from Census 2010 Summary File 1 (SF1). Data distributions for household income and auto ownership were obtained from American Community Survey (ACS) 2010 five-year estimates.

An example of the demographic profile comparisons between the raw (unweighted) survey data and Census data is provided in Figure 1.20. It shows comparisons for the state of Utah, Cache County, and Washington County across all demographic dimensions.

For example, according to the 2010 Census, 29% of the households in the state of Utah consisted of two people but in the travel diary sample the proportion was 35%. According to ACS 2010 five year estimates, 43% of households in Cache County had two vehicles, but 53% of the survey households had two vehicles. Cells with large differences between the survey data and Census data were highlighted in red.

Note that the travel diary survey gave respondents an option to *not* enter their income or residential status (respondents could select 'prefer not to say' or 'unknown'). These households had no comparable Census category and thus were assigned a weight of ***one*** for those variables. For weighting purposes the sampling distributions for the "valid" responses were rescaled to represent the percentage of valid survey responses for these two variables (income and residential status).

Figure 1.20: Raw Survey vs. Census Data

	Utah Statewide			Cache County			Washington County		
Household Size	**Census**	**Survey**	**Difference**	**Census**	**Survey**	**Difference**	**Census**	**Survey**	**Difference**
1 person HH	19%	18%	-1%	16%	12%	-4%	19%	16%	-3%
2 person HH	29%	35%	6%	30%	36%	6%	37%	49%	12%
3 person HH	16%	14%	-2%	16%	19%	3%	13%	11%	-2%
4 person HH	15%	14%	-2%	15%	14%	-2%	12%	8%	-4%
5 person HH	10%	10%	0%	11%	9%	-2%	9%	8%	0%
6+ person HH	11%	9%	-1%	11%	10%	-1%	10%	7%	-2%
Income*									
Under $10,000	5%	3%	-2%	5%	5%	0%	5%	3%	-1%
$10,000-$24,999	13%	9%	-4%	17%	15%	-3%	15%	8%	-7%
$25,000-$34,999	10%	10%	0%	13%	12%	-1%	12%	14%	2%
$35,000-$49,999	16%	16%	0%	18%	20%	2%	18%	20%	2%
$50,000-$74,999	22%	26%	4%	21%	24%	3%	24%	26%	2%
$75,000-$99,999	14%	17%	2%	12%	13%	0%	12%	16%	3%
$100,000-$149,999	13%	14%	1%	9%	9%	0%	9%	9%	0%
$150,000-$199,999	4%	3%	0%	2%	2%	-1%	2%	2%	0%
$200,000 or more	3%	3%	0%	2%	1%	-1%	2%	2%	-1%
Prefer not to answer	-	12%	-	-	8%	-	-	16%	-
Auto Ownership									
No vehicle	4%	2%	-2%	4%	2%	-2%	3%	1%	-2%
1 vehicle	25%	24%	-1%	24%	23%	-2%	29%	25%	-4%
2 vehicles	42%	47%	5%	43%	53%	10%	43%	47%	4%
3 vehicles	19%	18%	0%	19%	17%	-2%	17%	19%	3%
4+ vehicles	10%	8%	-1%	11%	6%	-5%	8%	8%	-1%
Residency Status*									
Owner	70%	83%	12%	65%	73%	8%	70%	87%	16%
Renter	30%	17%	-12%	35%	27%	-8%	30%	13%	-16%
Unknown	-	2%	-	-	2%	-	-	3%	-

Because of all these dimensions across which the survey data needed to match the census data, RSG utilized a weighting methodology known as 'Raking', which is an iterative process. Below is the step by step description of how this methodology was implemented for the Household Travel Diary Survey dataset.

1. Compute 'Hybrid District' weight (w1) and weight data by this weight
   - Generate the weighted survey frequency table for household size
2. Compute 'household size' weight (w2) and weight by w1 * w2
   - Generate weighted survey frequency table for income
3. Compute 'income' weight (w3) and weight by w1*w2*w3
   - Generate weighted survey frequency table for number of vehicles
4. Compute 'number of vehicles' weight (w4) and weight by w1*w2*w3*w4
   - Generate weighted survey frequency table for residential status
5. Compute 'residential status' weight (w5) and weight by w1*w2*w3*w4*w5
   - Generate weighted survey frequency table for household size
6. Compute a second 'household Size' weight (w2') and weight by w1*w2*w3*w4*w5*w2'
   - Generate weighted survey frequency table for income

Repeat steps 2-5 until the Census and survey household distributions are comparatively close across all geographic and demographic dimensions.

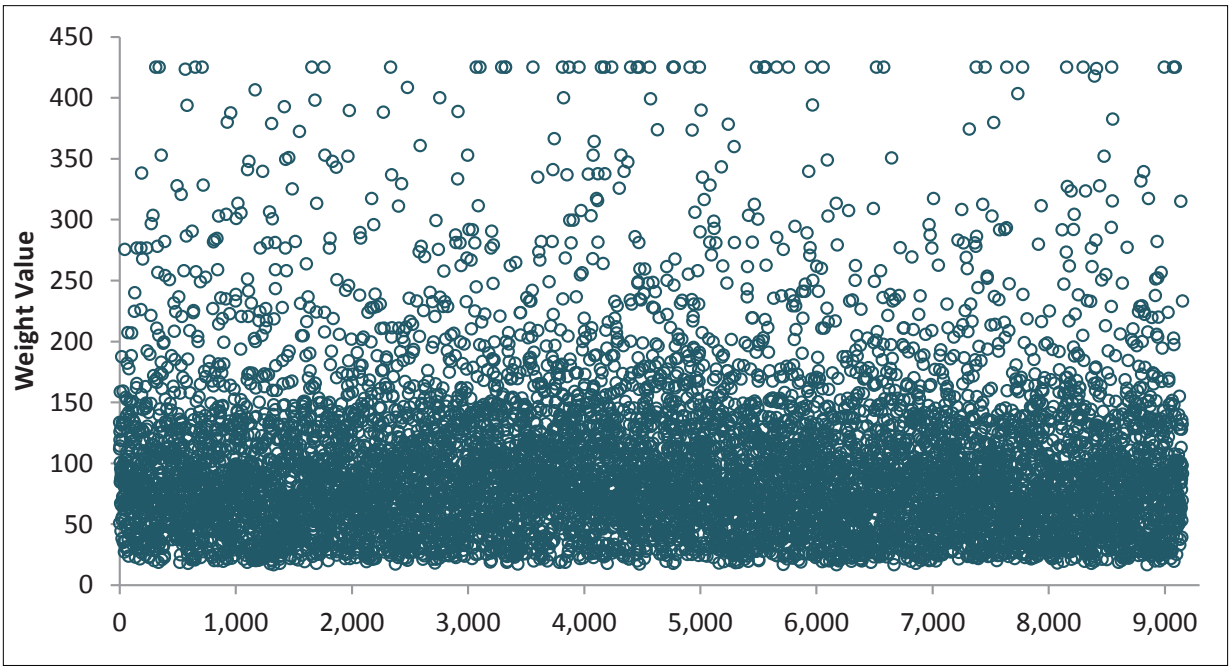
Note that the hybrid district weight used was computed and applied once, since with that step the 9,155 survey households were expanded to 877,692 Census households and the subsequent weighting by demographics did not change the location of households, only the relative number with certain demographic characteristics. For this survey the above weighting process was iterated twice and the final results are shown in Figure 1.21.

Not surprisingly, the resulting final weights are quite different across different households and counties, where some households had high weights relative to the other households (the highest weight was 794). A decision was made to set the maximum allowable weight for any household to 425, which is consistent with the maximum weight after the geographic weighting step. 425 is approximately four times the average weight of 95, and while it is a judgment call the rationale for capping the weights is to prevent a small number of households from being overly important in the sample. Figure 1.22 shows the distribution of weights for all 9,155 households in the sample after the maximum weight is applied.

Figure 1.21: Iterative Survey Weighting Result

	Utah Statewide			Cache County			Washington County		
Household Size	**Census**	**Survey**	**Difference**	**Census**	**Survey**	**Difference**	**Census**	**Survey**	**Difference**
1 person HH	19%	19%	0%	16%	16%	0%	19%	19%	0%
2 person HH	29%	29%	0%	30%	30%	0%	37%	37%	0%
3 person HH	16%	16%	0%	16%	16%	0%	13%	13%	0%
4 person HH	15%	15%	0%	15%	16%	0%	12%	12%	0%
5 person HH	10%	10%	0%	11%	11%	0%	9%	9%	0%
6+ person HH	11%	11%	0%	11%	11%	0%	10%	10%	0%
Income*									
Under $10,000	5%	5%	0%	5%	5%	0%	5%	5%	1%
$10,000-$24,999	13%	14%	1%	17%	18%	1%	15%	16%	1%
$25,000-$34,999	10%	10%	0%	13%	13%	0%	12%	12%	0%
$35,000-$49,999	16%	16%	0%	18%	18%	0%	18%	18%	0%
$50,000-$74,999	22%	22%	0%	21%	20%	-1%	24%	24%	0%
$75,000-$99,999	14%	14%	0%	12%	12%	0%	12%	12%	0%
$100,000-$149,999	13%	13%	0%	9%	9%	0%	9%	9%	0%
$150,000-$199,999	4%	4%	0%	2%	2%	0%	2%	2%	0%
$200,000 or more	3%	3%	0%	2%	2%	0%	2%	2%	0%
Prefer not to answer	-	11%	-	-	8%	-	-	14%	-
Auto Ownership									
No vehicle	4%	4%	0%	4%	4%	0%	3%	3%	0%
1 vehicle	25%	26%	1%	24%	25%	1%	29%	29%	0%
2 vehicles	42%	42%	0%	43%	42%	0%	43%	43%	0%
3 vehicles	19%	18%	0%	19%	18%	0%	17%	16%	0%
4+ vehicles	10%	9%	0%	11%	11%	0%	8%	8%	0%
						0%			0%
Residency Status*						0%			0%
Owner	70%	71%	0%	65%	65%	0%	70%	70%	0%
Renter	30%	29%	0%	35%	35%	0%	30%	30%	0%
Unknown	-	2%	-	-	2%	-	-	4%	-

Figure 1.22: Survey Weights – Capped at 425



4.3 VARIABLES FOR MODELING

In order to prepare the dataset for modeling purposes, some data manipulation was needed, such as recoding variables using travel modeling conventions (e.g. identifying productions and attractions). The following list details the variables in the dataset that RSG created for modeling purposes.

4.3.1 Geographic Variables

Several geographic variables were appended to the survey dataset for each home location and all trip locations. These variables include TAZs, districts, counties and MPO IDS. They are described in more detail below.

- **MPO and Region ID:** Counties were aggregated into MPO IDs (Cache, WFRC, MAG, Dixie, Tooele, Wasatch and UDOT) for simplicity purposes, even though each MPO's modeling or planning area does not necessarily include the most rural portions of the counties they belong to. MPOs were further aggregated into four regions (Cache, WFRC-MAG ("Wasatch Front"), Dixie, and UDOT), the most aggregate geography level (Table 1.5).
- **TAZs:** RSG developed a Traffic Analysis Zone (TAZ) system for this project by RSG by combining the TAZ systems of multiple models (listed below). The unique TAZ ID was created from: County FIPS * 10000 + TAZ ID. For TAZs within an MPO/RPO model area, the TAZ ID is the MPO/RPO model TAZID. For TAZs outside of MPO/RPO model areas, the TAZ ID is the USTM TAZ ID.
  - WFRC/MAG model
  - Cache MPO model
  - Dixie MPO model
  - Heber RPO model
  - Tooele RPO model
  - USTM model (outside the MPO and listed RPO areas)
- **Production and attraction TAZ:**
  - Home-based trips: Home TAZ is the production TAZ, the other end is the attraction TAZ.
  - Non-home based trips: Origin TAZ is the production TAZ, destination is the attraction TAZ.
- **MPO medium districts**
- **AirSage districts**: AirSage wireless carrier travel data from cell phones in 148 AirSage districts in the state were used for this project. The districts are loosely based on MPO medium districts, and emerging areas in rural Utah. Tracing trips that cross AirSage district borders at interstate locations will help validate and calibrate internal-external and external-external trips for statewide and MPO models.
- **Internal and external trips:** These four categories were based on home region, and the trip's origin and destination region(s).
  - *Internal-internal:* Respondent is resident of region, trip origin and destination are in the region
  - *Internal-external*: Respondent is resident of region, one trip end is in the region, one trip end is outside of the region.
  - *External-internal*: Respondent is not resident of region, one trip end is in region, one trip end is outside of region.
  - *External-external*: Respondent is not resident of region, both trip ends are outside of region, and the trip may or may not have passed through region.

Table 1.5: Geography Equivalence Table

COUNTY FIPS	COUNTY NAME	MPO ID	MPO	REGION ID
5	CACHE	5	Cache	1
11	DAVIS	1	WFRC	2
35	SALT LAKE	1	WFRC	2
49	UTAH	2	MAG	2
57	WEBER	1	WFRC	2
53	WASHINGTON	6	Dixie	3
1	BEAVER	0	UDOT	4
3	BOX ELDER	0	UDOT	4
7	CARBON	0	UDOT	4
9	DAGGETT	0	UDOT	4
13	DUCHESNE	0	UDOT	4
15	EMERY	0	UDOT	4
17	GARFIELD	0	UDOT	4
19	GRAND	0	UDOT	4
21	IRON	0	UDOT	4
23	JUAB	0	UDOT	4
25	KANE	0	UDOT	4
27	MILLARD	0	UDOT	4
29	MORGAN	0	UDOT	4
31	PIUTE	0	UDOT	4
33	RICH	0	UDOT	4
37	SAN JUAN	0	UDOT	4
37	SAN JUAN	0	UDOT	4
39	SANPETE	0	UDOT	4
41	SEVIER	0	UDOT	4
43	SUMMIT	0	UDOT	4
45	TOOELE	4	Tooele	4
47	UINTAH	0	UDOT	4
51	WASATCH	3	Wasatch	4
55	WAYNE	0	UDOT	4

4.3.2 Trip Variables

- **Trip purposes:** The origin and destination trip purposes were used to create the seven category and three category trip purposes used in the travel model (Table 1.6).
- **Home-based work "half-tours":** Respondents were encouraged to report all stops made during the day. RSG identified home based work half-tours as trips that began at home or work, with one or more stops in between.
- **Auto occupancy:**
  - Single occupancy vehicle (SOV)
  - High occupancy vehicle (HOV) – 2 people
  - HOV – 3+ people
- **Time of day periods:**
  - AM Peak (6 - 9 AM)
  - Midday (9 AM - 3 PM)
  - PM Peak (3 - 6 PM)
  - Night (6 PM – 6 AM)

Table 1.6: Trip Purpose Categories

7 TRIP PURPOSE CATEGORIES	3 TRIP PURPOSE CATEGORIES
Home-based work (HBW)	HBW
Home-based other (HBO)	HBO
Home-based school (HBSch)	HBO
Home-based shopping (HBShp)	HBO
Home-based personal business (HBPb)	HBO
Non-home based work (NHBW)	NHB
Non-home based non-work (NHBNW)	NHB

4.3.3 Household and Person Variables

- **Life cycle:**
  - Household with retirees (and perhaps children)
  - Household with children but no retirees
  - Household with no children, no retirees
- **Household size**
  - 1 person
  - 2 people
  - 3 people
  - 4 people
  - 5 people
  - 6 or more people
- **Auto ownership:**
  - 0 vehicles
  - 1 vehicle
  - 2 vehicles
  - 3 or more vehicles
- **Workers in the household:**
  - 0 workers
  - 1 worker
  - 2 workers
  - 3 or more workers
- **Household income:** The four categories were based on income category breakpoints in the survey data that roughly corresponded to Census quartile break-points:
  - Less than $35,000 (Census = $36,032)
  - Between $35,000 and $50,000 (Census = $61,888)
  - Between $50,000 and $100,000 (Census = $97,533)
  - Greater than $100,000

5.0 DATA ANALYSIS

RSG has completed a basic analysis of the survey data to help ensure data integrity, understand aggregate travel behavior, and make comparisons against other data sources or model output. The following section includes a quick executive summary of some basic survey data tabulations.

5.1 SUMMARY TABULATIONS

The sample size for the final dataset is 9,155 households. Each of those households participated in one of the three debrief surveys. These totals are presented, by region, in Table 1.7. The 9,155 households included 18,171 adults and 8,875 children. They own 19,148 vehicles and made a total of 101,404 trips on their assigned travel days.

Table 1.7: 2012 Household Sample Size by Region

		DEBRIEF SAMPLE		
REGION	TRAVEL DIARY (TOTAL)	WALK/BIKE DEBRIEF	ATTITUDE DEBRIEF	LONG DISTANCE DEBRIEF
Wasatch Front	5,792	1,974	1,909	1,909
Cache	808	269	267	272
Dixie	1,015	318	324	373
UDOT	1,540	1	734	805
Utah Total	9,155	2,562	3,234	3,359

As described earlier, the sample was weighted (expanded) to match the true population of Utah. The remainder of this chapter displays weighted results. The sample collected represents 1% of the State's population.

Table 1.8: 2012 Household Sample Size and Weights by Region

MPO	2012 SAMPLE	2012 WEIGHTED TO POPULATION	2012 SAMPLE PROPORTION
Wasatch Front	5792	653751	0.9%
Cache	808	34722	2.3%
Dixie	1015	46334	2.2%
UDOT	1540	139271	1.1%
Utah Total	9155	874078	1.0%

Note: Wasatch Front includes Davis, Weber, Salt Lake and Utah County. The region designated UDOT includes the non-MPO counties.

5.1.1 Trip Generation

Smaller households, and older people, tend to travel less. This trend is easily visible in the 2012 data, and when comparing data for Dixie to the other regions. Washington County is home to the largest segment of retirees in the State, and has the smallest average household size, and therefore work trip rates and overall trip rates are lower than the rest of the State.

In addition to demographic shifts that would lead to reduced travel, it is important to note that the 2012 survey data processing for this summary excluded external trips (outside the MPO boundary).

Table 1.10 presents a comparison of trip productions per household (and per person) by trip purpose. In this comparison, and others below, WFRC and MAG are combined since their model is the same. The UDOT numbers in this table and others below represent data for the remainder of the State not covered by one of the MPO models (i.e. every county except Cache, Weber, Davis, Salt Lake, Utah and Washington).

It is interesting to consider the way that demographics affect travel behavior. The following series of tables present trip generation rates for different types of household and people. The patterns are generally intuitive, and should be considered when deciding how to incorporate demographic data into demand modeling. Some interesting aspects of the data summary include the stark differences in trip rates by the type of household (life cycle), the importance of income on overall trip making, and how trip-making seems to increase and then decrease with age.

Table 1.9: Daily Trip Production Rates

MPO	WASATCH FRONT 2012	CACHE 2012	DIXIE 2012	UDOT 2012	STATEWIDE 2012
Trips per HH	11.23	11.88	10.90	11.34	11.26
Trips per Person	3.63	3.77	3.77	3.76	3.67

Table 1.10: 2012 Trip Productions per Household

	TRIPS/HOUSEHOLD				TRIPS/PERSON			
REGION/ GEOGRAPHY	HBW	HBO	NHB	TOTAL	HBW	HBO	NHB	TOTAL
Wasatch Front 2012	1.69	6.53	3.01	11.2	0.55	2.11	0.97	3.63
Cache 2012	1.84	6.55	3.49	11.9	0.58	2.08	1.11	3.77
Dixie 2012	1.30	6.34	3.27	10.9	0.45	2.19	1.13	3.77
UDOT 2012	1.63	6.23	3.48	11.3	0.54	2.07	1.16	3.76

Table 1.11: 2012 Daily Trip Rates by Household Size

HOUSEHOLD SIZE	WASATCH FRONT	CACHE	DIXIE	UDOT	STATEWIDE
1 Person	4.08	3.52	3.99	4.18	4.07
2 Person	7.60	8.32	7.47	7.57	7.62
3 Person	10.73	10.56	11.03	10.08	10.63
4 Person	14.51	14.69	13.18	14.23	14.42
5 Person	17.96	19.62	19.95	20.98	18.59
6+ Person	22.53	23.93	25.92	24.89	23.10

Table 1.12: 2012 Daily Trip Rates by Household Vehicles

NUMBER OF VEHICLES	WASATCH FRONT	CACHE	DIXIE	UDOT	UTAH
0 Vehicle	3.59	3.21	2.62	3.99	3.58
1 Vehicle	7.18	7.94	7.74	7.13	7.23
2 Vehicles	12.96	12.98	12.17	12.65	12.87
3+ Vehicles	13.90	14.84	13.59	13.34	13.82

Table 1.13: 2012 Daily Trip Rates by Household Income

INCOME CATEGORIES	WASATCH FRONT	CACHE	DIXIE	UDOT	STATEWIDE
Under $35,000	7.85	8.03	8.73	8.99	8.11
$35,000 - $49,999	10.93	12.97	9.46	11.37	11.01
$50,000 - $99,999	12.85	15.21	14.05	12.90	13.00
$100,000 or more	13.91	13.73	11.90	14.06	13.86

Table 1.14: 2012 Daily Trip Rate by Household Life Cycle

LIFECYCLE	WASATCH FRONT	CACHE	DIXIE	UDOT	STATEWIDE
HH with no children and no retirees	7.31	7.56	7.09	7.51	7.34
HH with children and no retirees	16.30	16.95	17.36	16.92	16.48
HH with retirees, and potentially children	7.01	7.62	6.78	6.59	6.92

Table 1.15: 2012 Daily Trip Rate by Number of Children in Household

NUMBER OF CHILDREN IN HOUSEHOLD	STATEWIDE RATE
0 Children	4.78
1 Child	5.79
2 Children	6.18
3+ Children	6.82

Table 1.16: 2012 Personal Daily Trip Rate by Age

AGE	STATEWIDE RATE
Under 5 years old	3.19
5 - 15	2.81
16 - 17	2.78
18 - 24	3.47
25 - 34	4.11
35 - 44	4.65
45 - 54	4.20
55 - 64	4.01
65 - 74	3.83
75 - 84	3.24
85 or older	1.97

5.1.2 Trip Distribution

Distributions of trip distance (miles) and trip duration (minutes) were reviewed and compared for trips made within each model region. For work trips in particular, trip distance and duration are largely a function of geographic characteristics of an area, such as the size of the developed area or the character of the region. Cache and Dixie have the shortest average trip distance, because they are smaller geographic areas, whereas the trip lengths are longer in the more urban WFRC/MAG region and the more rural non-MPO (UDOT) region. Travel times and distances in this analysis were compiled from Google Maps. No surprisingly, work trips are much longer than non-work trips, but non-work trips are much more prevalent, and therefore the average (total) is heavily skewed by non-work data. People living in the most rural regions (UDOT) have the longest trips on average, followed by the people living in the most urban region (WFRC/MAG).

Table 1.17: 2012 Average Trip Lengths

	TRIPS/HOUSEHOLD				TRIPS/PERSON			
REGION/GEOGRAPHY	HBW	HBO	NHB	TOTAL	HBW	HBO	NHB	TOTAL
Wasatch Front	17.7	9.2	10.1	10.8	11.0	5.0	6.0	6.2
Cache	9.9	7.3	6.2	7.4	5.0	3.6	3.2	3.7
Dixie	12.5	8.8	7.7	9.0	6.7	4.5	4.3	4.7
UDOT	18.4	11.4	12.4	12.8	13.5	7.7	9.3	9.0

Figure 1.23: Home-Based Work Trips – County to County Distribution

COUNTY	WEBER	DAVIS	SALT LAKE	UTAH	BOX ELDER	JUAB	SUMMIT	TOOELE	WASATCH	CACHE	Washington	UDOT	Out of State	Total
WEBER	69%	19%	7%	0%	3%	0%	0%	0%	0%	0%	0%	1%	0%	100%
DAVIS	16%	52%	29%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
SALT LAKE	1%	6%	87%	4%	0%	0%	1%	1%	0%	0%	0%	0%	0%	100%
UTAH	0%	0%	11%	87%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
BOX ELDER	13%	4%	3%	0%	72%	0%	0%	0%	0%	7%	0%	0%	0%	100%
JUAB	0%	0%	14%	10%	0%	69%	0%	1%	0%	0%	0%	7%	0%	100%
SUMMIT	1%	1%	38%	3%	0%	0%	45%	0%	7%	1%	1%	0%	2%	100%
TOOELE	1%	1%	29%	2%	0%	0%	0%	66%	0%	0%	0%	0%	0%	100%
WASATCH	0%	1%	10%	7%	0%	0%	14%	0%	67%	0%	0%	0%	1%	100%
CACHE	1%	0%	1%	0%	3%	0%	0%	0%	0%	94%	0%	1%	0%	100%
Washington	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	97%	2%	1%	100%
UDOT	1%	0%	1%	1%	0%	0%	0%	0%	0%	0%	1%	95%	1%	100%
Out of State	0%	12%	10%	0%	7%	0%	5%	0%	0%	12%	17%	38%	0%	100%
Total	8%	9%	42%	17%	2%	0%	1%	2%	1%	4%	4%	10%	0%	100%

Figure 1.24: All Home-Based Trips – County to County Distribution

COUNTY	WEBER	DAVIS	SALT LAKE	UTAH	BOX ELDER	JUAB	SUMMIT	TOOELE	WASATCH	CACHE	Washington	UDOT	Out of State	Total
WEBER	83%	11%	3%	0%	2%	0%	0%	0%	0%	0%	0%	1%	0%	100%
DAVIS	8%	82%	8%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
SALT LAKE	1%	2%	93%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
UTAH	0%	0%	4%	94%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
BOX ELDER	7%	2%	2%	0%	83%	0%	0%	0%	0%	5%	0%	0%	1%	100%
JUAB	1%	0%	5%	13%	0%	78%	0%	0%	0%	0%	0%	2%	1%	100%
SUMMIT	0%	0%	13%	2%	0%	0%	78%	0%	4%	0%	0%	0%	1%	100%
TOOELE	0%	1%	10%	1%	0%	0%	0%	88%	0%	0%	0%	0%	0%	100%
WASATCH	0%	0%	5%	6%	0%	0%	6%	0%	81%	0%	0%	1%	0%	100%
CACHE	0.6%	0.6%	1.4%	0.3%	2%	0%	0%	0%	0%	94%	0%	0%	1%	100%
Washington	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	97%	2%	1%	100%
UDOT	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	98%	0%	100%
Out of State	2%	2%	15%	3%	2%	0%	2%	0%	0%	3%	6%	7%	58%	100%
Total	8%	10%	36%	17%	2%	0%	1%	2%	1%	4%	5%	13%	1%	100%

5.1.3 Mode Share Summary

Mode shares were computed for each trip purpose. Table 1.18 shows the mode shares for home-based work only, since the themes are similar across all purposes. Drive alone is the dominating mode share in all regions, as expected. WFRC has the highest transit share, and Cache shows the highest share of non-motorized modes (walk and bike).

Table 1.18: 2012 Mode Shares

REGION/GEOGRAPHY	DRIVE ALONE	SHARED RIDE 2	SHARED RIDE 3+	TRANSIT	WALK	BIKE	OTHER	SCHOOL BUS
Wasatch Front 2012	78.5%	7.5%	4.2%	4.5%	3.1%	1.9%	0.3%	0.0%
Cache 2012	74.5%	7.5%	7.1%	2.1%	3.8%	4.3%	0.6%	0.0%
Dixie 2012	80.9%	9.7%	6.1%	0.1%	0.5%	2.4%	0.2%	0.0%
UDOT 2012	76.7%	9.6%	7.5%	1.1%	2.6%	1.8%	0.8%	0.0%

5.1.4 Automobile Summary

Trips to the Central Business Districts (defined as the downtown portions of Salt Lake City, Ogden, Provo, Logan and St. George) are notably less likely to involve the use of auto than overall trips as presented in the previous table. Although not surprisingly, auto travel still dominates.

Even though work trips are a small percentage of overall trips, it is highly likely that work trips by vehicle are single-occupant trips. This, combined with the highly peaked nature of work travel and long trip lengths, leads to the majority of congested situations.

Table 1.19: 2012 Automobile Mode Share

REGION	ALL TRIPS	HBW
Wasatch Front	87.1%	90.2%
Cache	84.2%	89.1%
Dixie	90.5%	96.7%
UDOT	88.3%	93.8%
Utah	87.3%	90.9%

Table 1.20: 2012 Automobile Mode Share – Trips to Central Business District (CBD)

REGION	PERCENT OF TRIPS
HBW	75%
All trips	80%

Table 1.21: 2012 Statewide Vehicle Occupancy

NUMBER OF TRAVELERS	ALL TRIPS	HBW
1	46%	86%
2	22%	9%
3	14%	3%
4	9%	1%
5+	9%	1%
Total	100%	100%

5.1.5 Transit Summary

Consistent with the earlier table on auto model shares, higher transit mode shares explain most of the decrease in auto mode shares to downtown regions. Transit shares to CBD's are much higher than the regional average, which is logical given the high concentration of activity and transit service, along with the more difficult auto access and parking conditions.

In Salt Lake County, by far the highest mode transit share is in Salt Lake City, east of I-15. In fact, transit shares throughout the rest of the county only range from 1-3% of all trips, with the relatively higher percentages just outside Salt Lake City.

Table 1.22: 2012 Transit Mode Share

REGION	ALL TRIPS	HBW
Wasatch Front	1.7%	4.5%
Cache	1.9%	2.1%
Dixie	0.2%	0.1%
UDOT	0.6%	1.1%
Utah Total	1.5%	3.7%

Table 1.23: 2012 Transit Mode Share – Trips to CBD

REGION	PERCENT OF TRIPS
HBW	17%
All trips	12%

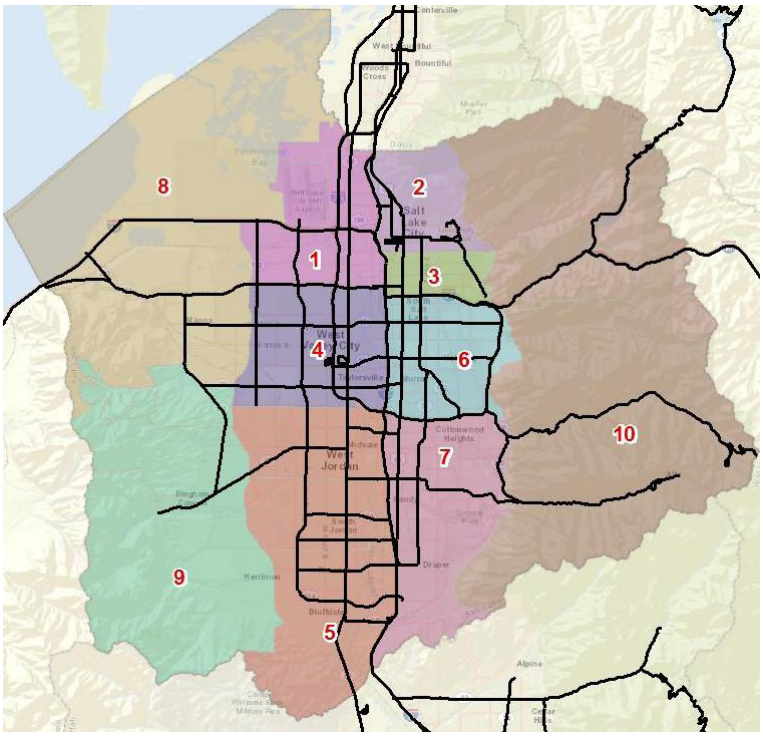
Table 1.24: 2012 Transit Mode Share by Household Auto Ownership

NUMBER OF VEHICLES	PERCENT OF TRIPS
0	19.8%
1	2.5%
2+	1.0%
Total	1.5%

Table 1.25: 2012 Transit Mode Share – Salt Lake County Areas

AREA NUMBER	AREA DESCRIPTION	TRANSIT SHARE
1	North West Salt Lake	2%
2	North East Salt Lake	9%
3	Liberty Park Residential	2%
4	West Valley, Taylorsville	3%
5	West/South Jordan to Buffdale	1%
6	Murray, Holladay	2%
7	Cottonwood Heights to Draper	1%
8	West of MVC	1%
9	Mining Area	1%
10	Mountain Forest Area	1%

Figure 1.25: Salt Lake County Area Map



5.1.6 Walk and Bike Summary

Among all households, 73% owned at least one adult bicycle.

Table 1.26: 2012 Walk/Bike Mode Share

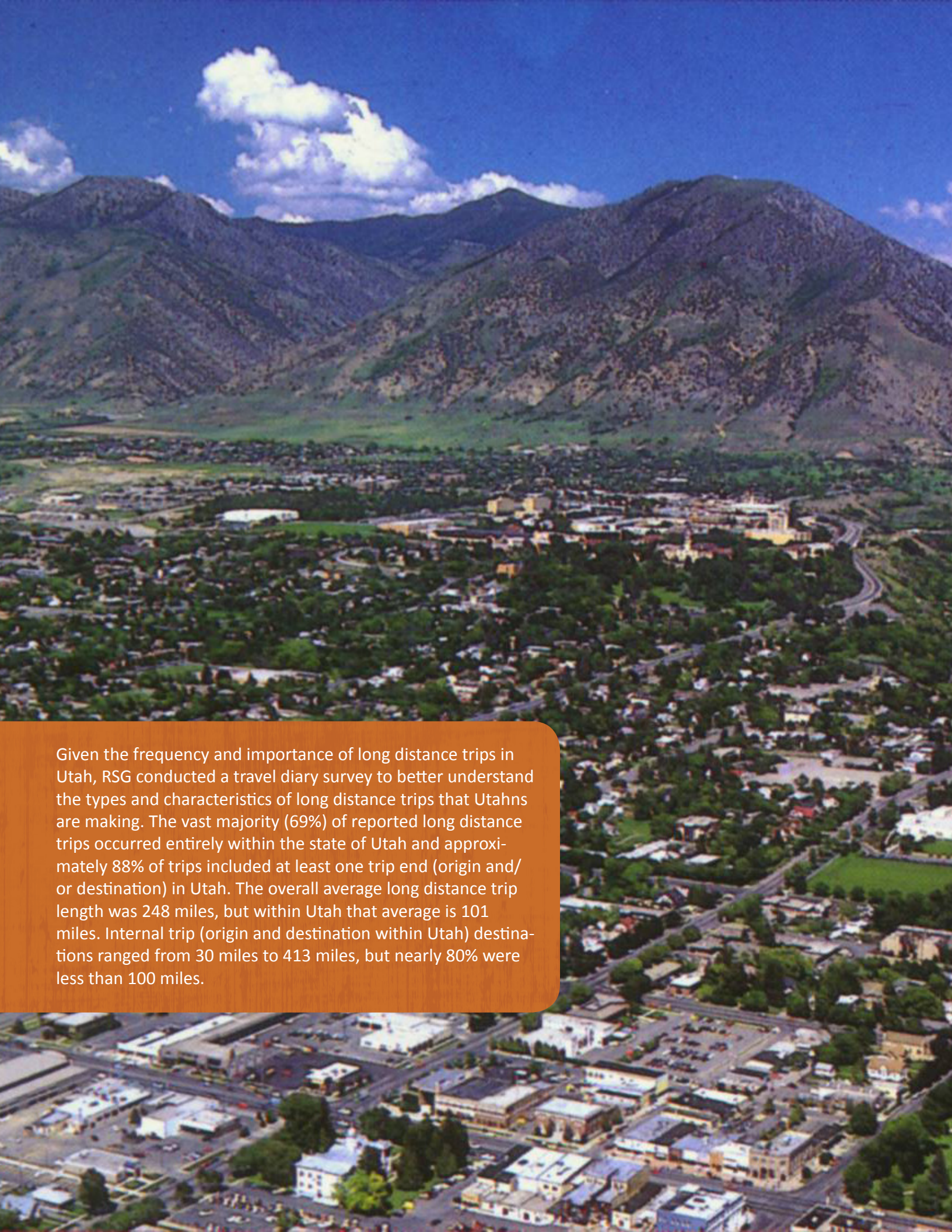
REGION	ALL TRIPS		HBW TRIPS	
	Walk	Bike	Walk	Bike
Wasatch Front	7.8%	1.7%	3.1%	1.9%
Cache	7.7%	2.7%	3.8%	4.3%
Dixie	6.0%	1.3%	0.5%	2.4%
UDOT	6.5%	1.9%	2.6%	1.8%
Utah Total	7.5%	1.8%	2.9%	2.0%

Table 1.27: 2012 Walk/Bike Mode Share – Trips Within CBD

PURPOSE	TO CBD		WITHIN CBD	
	Walk	Bike	Walk	Bike
HBW	3%	4%	59%	3%
All Trips	3%	2%	47%	6%

i. C. DiSogra, JM. Dennis, and M. Fahimi. On the Quality of Ancillary Data Available for Address-Based Sampling, JSM 2010.

ii. Hill, N., Self, B., and Roche, G. Customer Satisfaction Measurement for ISO 9000:2000. Institute of Quality Assurance, Butterworth-Heinemann Press, 2002.



Given the frequency and importance of long distance trips in Utah, RSG conducted a travel diary survey to better understand the types and characteristics of long distance trips that Utahns are making. The vast majority (69%) of reported long distance trips occurred entirely within the state of Utah and approximately 88% of trips included at least one trip end (origin and/or destination) in Utah. The overall average long distance trip length was 248 miles, but within Utah that average is 101 miles. Internal trip (origin and destination within Utah) destinations ranged from 30 miles to 413 miles, but nearly 80% were less than 100 miles.

II. LONG DISTANCE TRAVEL DIARY

1.0 INTRODUCTION 42

2.0 ADMINISTRATION 43

2.1 Survey Sample 43
2.2 Survey Invitation Materials 44
2.3 Survey Retrieval 46
2.4 Pre-Test Survey 47
2.5 Full survey 47
2.6 Survey Incentives 47

3.0 QUESTIONNAIRE 48

3.1 High Speed Rail Section 48
3.2 Long Distance Trip Diary Section 49

4.0 DATA PREPARATION 50

4.1 Data Checking 50
4.2 Data Weighting 52
4.3 variables for modeling 54

5.0 DATA ANALYSIS 55

5.1 Summary tabulations 55
5.2 Model related analysis 60

1.0 **INTRODUCTION**

Given the frequency and importance of long distance trips in Utah, a travel diary survey was conducted to better understand the types and characteristics of long distance trips that Utahns are making. For some residents, long distance trips (defined here as 40+ miles in length) are a part of their everyday routine; for others, long distance trips occur more infrequently and thus are not adequately captured in the traditional one-day, pre-assigned travel day. By asking a subset of the households in our study to complete the long distance travel diary, researchers, modelers and planners can have a more complete picture of the household's travel, including these long distance trips which may account for a larger share of the vehicle miles traveled (VMT) than is currently represented in the travel demand model.

An identical survey was administered twice – once as a part of the Household Travel Diary Survey in the spring of 2012 ("debrief"), and once as a "standalone" Long Distance Travel Diary Survey in the fall of 2012 – to households across the state of Utah. The web-based survey collected information on recent long distance trips, including: trip mode, purpose, origin, destination, and departure date. These data were cleaned, weighted, analyzed and compared with results from the Household Travel Diary Survey. This chapter of the report outlines the methodology, questionnaire design, data processing, and results from the survey effort.

2.0 ADMINISTRATION

RSG administered the long distance survey twice as a part of the Utah Statewide Travel Study. The two administrations featured the same set of questions asked of all adult members in the household; however, two different approaches – each summarized in Table 2.1 – were employed.

Table 2.1: Overview of Long Distance Survey Approach

	DEBRIEF	STANDALONE
Survey	Long distance (LD) survey	
Time period	March – July 2012	September – October 2012
Invitees	36% of all invited households (the remaining 64% of households were randomly assigned to either the Attitudinal Debrief or the Walk/Bike Debrief)	60% of the households that completed the diary survey and were willing to participate in future surveys (the remaining 40% of households were invited to the Walk/Bike Barriers Survey)
Outreach	A long distance flyer explaining the debrief survey was inserted into the invitation packet	RSG sent email invitations to selected households
Survey method	Seamless transition between the one-day diary and long distance debrief survey	Households entered the survey via a dashboard that listed each adult in the household

2.1 SURVEY SAMPLE

2.1.1 Debrief

Each of the 124,888 households that were invited to participate in the Utah Travel Study was randomly assigned to one of three debrief surveys: Attitudinal, Walk/Bike, or Long Distance. Given that the Walk/Bike Debrief survey was less likely to be relevant to households in rural regions (Utah Department of Transportation (UDOT)), these households were assigned to either the Attitudinal Debrief or the Long Distance Debrief. In total, 45,180 households (36%) from across the state were asked to participate in the long distance survey.

2.1.2 Standalone

Approximately 84% (7,715 of 9,155) of households who completed the Household Travel Diary and entered a valid email address also demonstrated a willingness to participate in future surveys. All of these households were invited to participate in one of the two additional surveys that were administered in the fall of 2012:

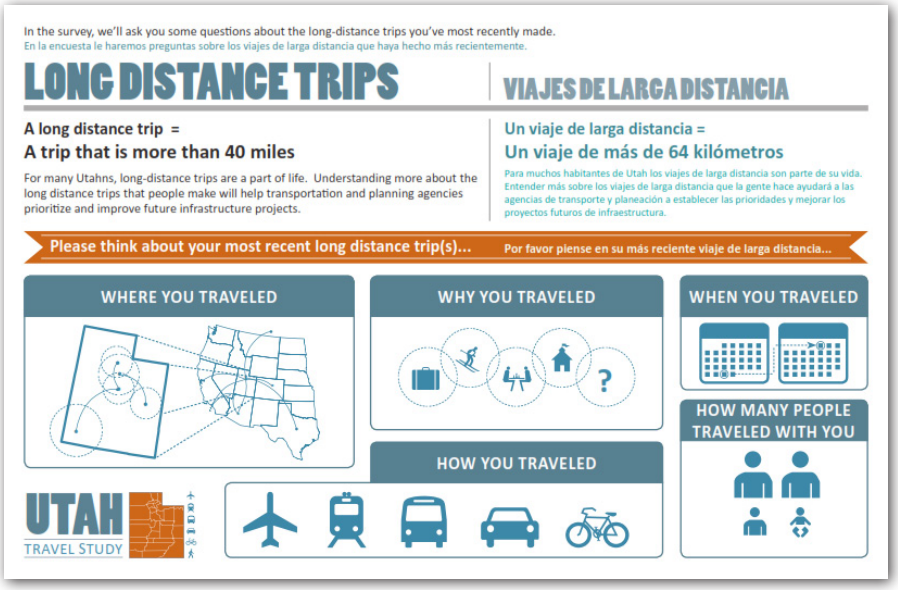
- **Standalone Long Distance Survey** (5,533 invited households):
  - All households from the UDOT region (the Long Distance survey is more relevant for rural residents than is the Walk/Bike Barriers survey)
  - Two-thirds of the households from all other regions
- **Walk/Bike Barriers Survey** (2,182 invited households):
  - All remaining households that volunteered to participate in future surveys

2.2 SURVEY INVITATION MATERIALS

2.2.1 Debrief

Invitation packets for the household invited to take the Long Distance Debrief survey included a flyer (Figure 2.1) that explained – in English and in Spanish – the definition of a long distance trip and the details they would be expected to report. In terms of additional outreach (reminder postcard, email reminders, reassignment, outbound phone calls, etc.), these households were treated identically as those who were randomly assigned to one of the other debrief surveys. See Chapter 1 for additional details on these invitation materials and outreach.

Figure 2.1: Long Distance Flyer



The Long Distance Debrief survey itself was appended to the Household Travel Diary survey in such a way that the each adult seamlessly transitioned from the one-day travel diary into the debrief survey (in this case, the long distance debrief survey). For example, in a household with two adults, the first adult completed the one-day diary then the long distance diary. Next, the second adult completed the one-day diary then the long distance diary.

2.2.2 Standalone

RSG invited all 5,533 households to the standalone survey via email (Figure 2.2) and those households that had not yet finished a week after being invited were sent a reminder email. Both emails thanked the household for earlier participation in the main household diary, introduced the standalone Long Distance survey, noted the incentive (a raffle to win a latest generation Apple iPad), and provided a survey link with an embedded password.

Each household retained their original password from the Household Travel Diary survey, thus linking data collected during the standalone long distance survey with those data collected during the main household diary survey (geographic data, household characteristics, etc.). Therefore, when a household logged on to participate in the Long Distance survey, it entered via the "progress dashboard", which listed all the adult members in their household (Figure 2.3). Whenever an adult member finished their individual survey, they would return to the dashboard until all adults had completed the survey.

Figure 2.2: Email Invitation

Greetings,

Thank you again for your participation in the Utah Travel Study this past spring, and for your interest in improving transportation in Utah.

We now invite you to complete an optional 5 minute survey about your household's recent long-distance travel. Households who complete this survey will be entered in a raffle to win a latest generation Apple iPad.

Utah's population is expected to continue to grow quickly and transportation and planning agencies want to hear from you so they can best plan for and manage that growth over the next 30 years.

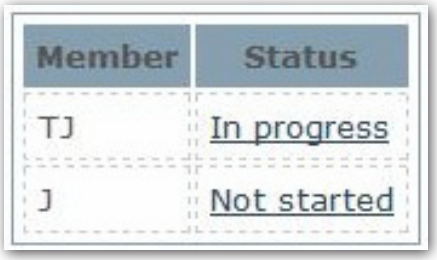
Secure Website: https://www.rsgsurvey.net/utah_ld?password=TestPassword1

Please feel free to reply to this email if you have any comments about transportation in your region.

Sincerely,

The Utah Travel Study

Figure 2.3: Progress Dashboard



Member	Status
TJ	In progress
J	Not started

2.3 SURVEY RETRIEVAL

2.3.1 Debrief

The Long Distance Debrief survey was administered in conjunction with the main Household Travel Diary survey (Table 2.2), which launched on 23 March 2012 (the first travel date was 27 March 2012) and closed on 9 July 2012. The primary survey instrument was the RSG online survey, administered through a website produced specifically for the project. Participants logged into the survey website and entered their household-specific 8-digit password. This password was included in the invitation packet as well as on each of the postcard and email reminders. At any point, respondents could exit out of the survey and later return to the survey homepage, log in using their password, and continue from where they left off. The Long Distance Debrief survey was simply the last section of the main Household Travel Diary survey for each adult to complete.

For respondents who preferred not to complete their survey online or lacked Internet access, members could call a toll-free number and Westat operators were available to administer the survey over the phone (see Chapter 1 for more information).

2.3.2 Standalone

As with other "additional" surveys (the Bike/Pedestrian Barriers Survey and the Residential Choice Stated Preference Survey), respondents were only able to complete the survey online. Households were notified about and invited to the survey via email and considering that every invited household had provided a valid email address, this was an adequate approach. On the online survey, each adult household member completed the survey on his or her own and once all adults had completed the survey, they were entered into the prize drawing.

RSG also monitored the email address to help respond to questions and provide support when needed.

Table 2.2: Overview of Survey Retrieval

	DEBRIEF	STANDALONE
Outreach	A long distance flyer explaining the debrief survey was inserted into the invitation packet	RSG sent email invitations to selected households
Completion options	Online and over the phone	Online only
Survey method	Seamless transition between the one-day diary and long distance debrief survey	Households entered the survey via a dashboard that listed each adult in the household
Pre-test	January-February 2012	21-24 September 2012
Full survey dates	March-July 2012	September-October 2012

2.4 PRE-TEST SURVEY

In order to ensure high data quality and evaluate the survey methodology, both the debrief survey and the standalone survey included a pre-test.

The debrief survey pre-test was conducted as a part of the Household Travel Diary's pre-test during January and February 2012. In the pre-test, 4,230 households were invited to take the Utah Travel Study (see Chapter 1 for more information).

Given that the standalone Long Distance survey was conducted exclusively online, the pre-test effort was smaller in scope. Two hundred and fifty households were invited to the online survey on 21 September 2012. After a successful pre-test, the full survey was launched four days later.

2.5 FULL SURVEY

2.5.1 Debrief

Between late March and early August, RSG invited a representative sample of 124,888 households within the study area to complete the Utah Travel Study. All invited households were randomly assigned one of 33 travel dates beginning on Tuesday, March 27, and ending on Thursday, June 28. To best capture a snapshot of each member's typical weekday trips, all assigned travel dates occurred on a Tuesday, Wednesday, or Thursday. As previously mentioned, the Long Distance Debrief survey was appended to the one-day travel diary for approximately 36% of all households. Adults participated in the debrief survey as a part of this full survey effort.

2.5.2 Standalone

After the standalone Long Distance survey pre-test, the full survey was launched on 25 September 2012 (1,000 invited households) and on 27 September 2012 (remaining 4,283 invited households). Reminders were sent out on 2-3 October 2012 and the survey was closed on 9 October 2012.

2.6 SURVEY INCENTIVES

Incentives were offered to encourage participation in both surveys. For the debrief survey, households received a $10 incentive (an Amazon.com gift card) for completing the main Household Travel Diary survey. Households that completed the entire standalone Long Distance survey were entered into the drawing for an Apple iPad. A winner was randomly selected after the conclusion of the survey and sent the iPad via first-class mail.

3.0 QUESTIONNAIRE

The two long distance survey administration periods – the debrief (accompanied the main Household Travel Diary) and the standalone – featured the same questionnaire, which consisted of two brief sections.

3.1 HIGH SPEED RAIL SECTION

The first section asked respondents which major cities they had visited in the past year. The city list was dynamic based on the respondents' home region; for example, those living in the Dixie region did not see "St. George, UT" on the list of options because a trip to St. George is not considered long distance.

Respondents who selected at least one of the cities listed were asked a follow-up question on the frequency of visits to each selected city; respondents who chose "None of the above" were branched over the frequency question and taken directly to the trip diary section.

The purpose of these questions was to preliminarily assess the potential demand for high speed rail by collecting data on travel to key cities in Utah as well as major regional cities that are considered a possibility for a future high speed rail connection. .

Figure 2.4: Cities Traveled

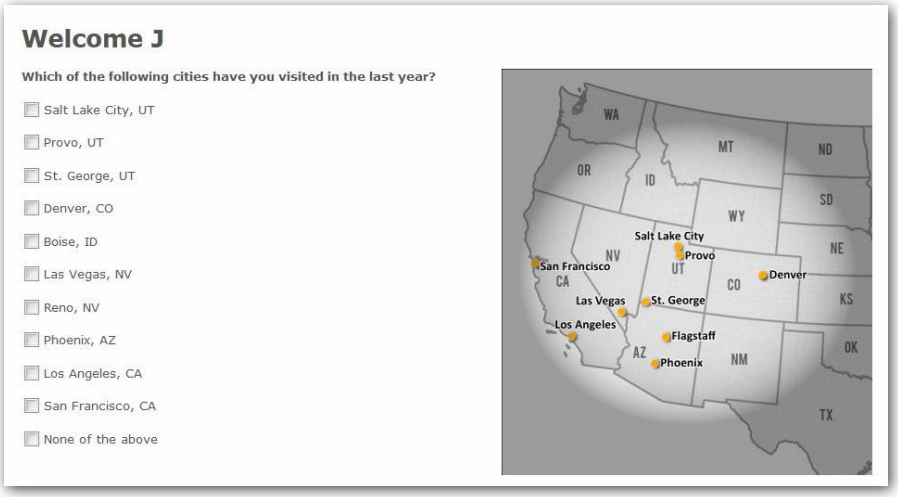


Figure 2.5: Number of Visits

3.2 LONG DISTANCE TRIP DIARY SECTION

In order to better understand why Utahns make long distance trips and where they go, the second section asked respondents to report recent trips that were over 40 miles in distance. The United States does not have a standard definition of long distance travel; however, the project team used a 40-mile trip threshold because travelers sometimes underestimate the actual distance of their trips and because both 40- and 50-mile definitions are common in long distance travel surveys.

Before being asked about specific trips, respondents were informed that "understanding why people travel far from home and where they go on those trips helps us plan infrastructure improvements." Next, respondents were asked when they made their most recent long distance trip. Given the high likelihood that respondents made (and reported) a regular work commute trip in the main household travel diary, the survey instructed respondents to exclude those trips from this long distance section.

The response to this question provided a temporal frame of reference for the respondent because their answer was dynamically inserted into the question that asked them to report all the trips made during that period. For example, if an adult indicated that they made their most recent trip in the past two weeks, the survey would then prompt them to describe all of their long distance trips within the past two weeks. Respondents used the open-end text boxes in their trip roster to report the origins and destinations for each trip.

Finally, respondents reported the details for each trip reported, including: purpose, mode, departure date (using a calendar "date picker"), and the number of people who were traveling. Just as in the main Household Travel Diary, the survey system looped through each trip to collect the details in a clear and efficient manner.

Figure 2.6: When the Most Recent Long Distance Trip Occurred

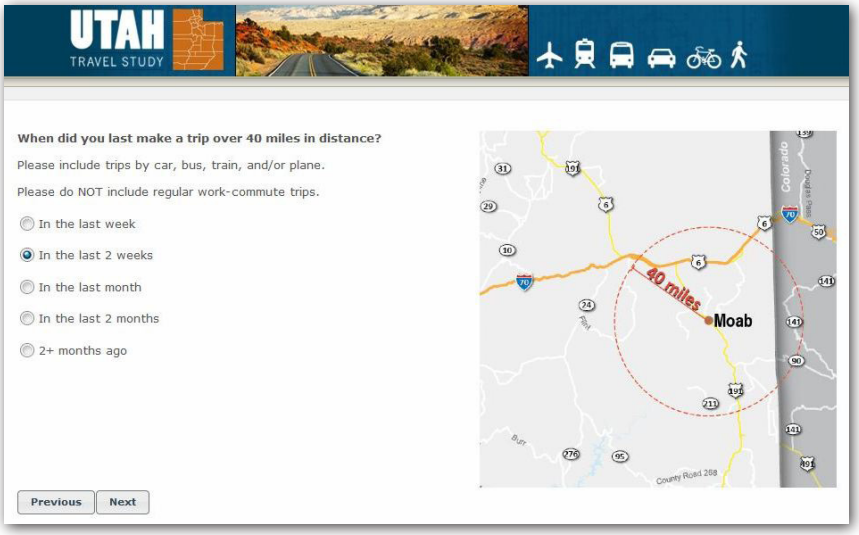
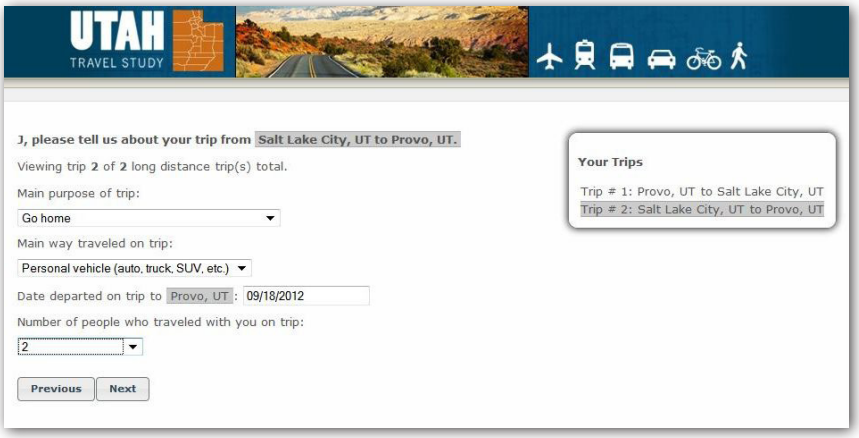


Figure 2.7: Long Distance Trip Roster

Figure 2.8: Long Distance Trip Details



4.0 DATA PREPARATION

4.1 DATA CHECKING

4.1.1 Merge Debrief Data with Standalone Data

Data from the Long Distance Debrief were merged with data from the standalone Long Distance survey to create a final dataset, which included 4,386 households (after cleaning). Each of these households took *at least* one of the long distance surveys (debrief and/or standalone); 14% (631) took the survey during both administrations and the remaining 86% participated in exactly one of the long distance surveys (Figure 2.9). At the household level, each record in the final dataset represents a unique household that belongs to one of the distinct participation categories: "Debrief only", "Standalone only", or "Both". In the person-level and trip-level datasets, each row represents a survey participant or a unique trip, respectively. For example, a single-person household that participated in both surveys has two rows at the person level (distinguished by a "survey" variable). Likewise, if that person reported two trips during the debrief survey and four trips during the standalone survey, the dataset includes six trip records associated with that particular household.

4.1.2 Clean Trip Ends

Once the set of households was finalized, the data themselves were cleaned; this exercise focused particularly on the "trip ends" that were entered by respondents. As previously mentioned, respondents could enter any text string in the open-ended origin and destination text boxes. These trip ends were cleaned in order to:

- Correct inconsistencies across trips and/or respondents (i.e. typos or "SLC" vs. "Salt Lake City, UT")
- Assign a city and state to general locations (e.g. "Zion National Park" or "84010")
  - Entries such as "home" or "my house" were assigned to that household's home city and state
- Remove undecipherable trip ends (e.g. "Mom's house" or "Cabin")
  - Any household that had at least one trip with an undecipherable trip end was removed from the dataset because that trip could not accurately be geocoded or categorized.

Some examples of the above are displayed in Table 2.3.

Once each trip had a valid city and state, those trip ends were geocoded to a latitude/longitude and a series of geographic identifiers (MPO region, TAZ, county, etc.). International origins and destinations were excluded from the geocoding exercise. In addition, RSG used the trip end coordinates and Google's mapping technology to estimate a distance for each trip. This distance represents the miles associated with the fastest driving route available between the origin and destination.

Figure 2.9: Survey(s) Completed

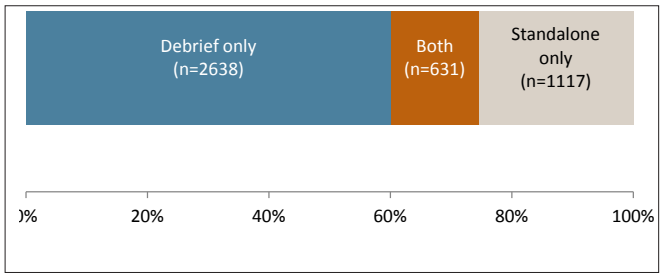


Table 2.3: Trip Ends Cleaning

ORIGINAL	CLEANED		
Origin (or destination)	City	State	Place (other)
SLC	Salt Lake City	UT	
Salt Lake City, UT	Salt Lake City	UT	
Denver	Denver	CO	
Zion National Park	Springdale	UT	
84010	Bountiful	UT	
My house	St. George	UT	
Calgary, Albert			Canada
Uinta Mountains	Kamas	UT	
Mom's house	Removed from dataset		
Cabin	Removed from dataset		

4.1.3 Impute "Return" Trips

It is assumed that all trips are either tours (e.g. Salt Lake City to Denver to Boulder to Salt Lake City) or round-trips (e.g. Salt Lake City to Denver to Salt Lake City); however, many respondents reported exactly one trip or a series of one-way trips. With the exception of a person moving cities (an unlikely phenomenon in our sample), these reported one-way trips necessarily have a "return" trip, even though it was not explicitly reported in the survey. These unreported return trips became the imputed trips that were added to the final dataset.

Rather than speculate as to the precise details of that return trip, the imputed trip inherited the details from the reported trip, with the exception of the origin and destination which were reversed. Table 2.4 displays the result.

Table 2.4: Imputed Trips

	TRIP 1 (REPORTED)	TRIP 1A (IMPUTED)
Origin	Provo	St. George
Destination	St. George	Provo
Purpose	Business	Business
Mode	Auto	Auto
Occupancy	1 passenger	1 passenger
Date	9/17/2012	9/17/2012

4.1.4 Define Trip Purpose Segments

Respondents were specifically instructed *not* to include regular work commute trips in the long distance travel diary because if that trip is indeed a regular trip, then it would have been captured during the main Household Travel Diary. Therefore, the long distance survey offered respondents with the following trip purposes from which to choose:

- Company business (meeting, sales call, etc.)
- Social (visit family/friends)
- Recreational (hiking, sporting event, etc.)
- Go to/from school
- Go home
- Other

These categories allow for detailed analysis of reasons people make trips, and most purposes were worded to imply activities outside of the home. For model comparisons, however, it was necessary to represent home and work trips in a way that corresponded with the existing travel model. First, RSG identified trips as "home-based" if the origin or destination city and county matched the respondent's home city and county. Next, RSG calculated trip purpose segments for each trip based on whether or not the trip was home-based and the reported trip purpose. The following trip purpose segments are included in the final dataset:

- Home-Based Work: these are regular work commute trips that were reported during the main household travel diary survey and were at least 40 miles in length. These 320 trips were added to the final long distance dataset.
- Home-Based Work-Related: the trip was home-based and had a purpose of "Company business".
- Home-Based Other: the trip was home-based and had a purpose *other than* "Company business".
- Non-Home-Based: all remaining trips.

4.2 DATA WEIGHTING

4.2.1 Household Weight

In order to more closely reflect the true population of those living in Utah, the collected survey data were weighted by several key household characteristics: geography, household size, number of available vehicles, household income, and residency type. This process for improving the sample's representativeness was identical to the process used to weight the main household travel diary sample:

- Expand the sample to the full population (collected an approximately 0.5% sample for the Long Distance survey)
- Control for differences in sampling/response rates by sub-population
  - Geographic weighting ("hybrid" districts were used because existing boundaries (e.g. counties or census blocks) were thought to be too coarse or too detailed for weighting purposes
  - Demographic weighting (household characteristics)
- Iterate until there is a nearly perfect match between the sample and target ("control") datasets

The maximum value of the final household weight was capped at 850 (twice the maximum for the main Household Travel Diary sample because the Long Distance survey sample was approximately half the size) to minimize the impact of any single household. This maximum weight was applied to 27 households (0.6% of the sample).

4.2.2 Trip Weights

Four trip weights were calculated to account for various nuances in the dataset.

Temporal Weight

Given the relative infrequency of long distance trips, this survey provided residents with an opportunity to report trips that occurred recently, rather than only trips that occurred on a pre-assigned day. For example, the main Household Travel Diary survey is unlikely to capture the monthly trip that an employee makes to his or her client's office. In order to account for this fact that most of the trips did not occur "yesterday" or on a pre-assigned day, trips were weighted based on *how long ago* the trip occurred. The goal of this approach is to arrive at the daily average, by discounting trips that occur infrequently. Figure 2.10 displays how long ago, relative to the survey completion day, that the given trip occurred. For example, if an adult participated in the survey on 24 October and reported a long distance trip from 17 October, that trip occurred seven days ago.

RSG accounted for this temporal aspect using the survey completion date and the trip departure date as follows (example included):

$$Trip\ Weight\ (Temporal) = \frac{1}{SurveyCompletionDate - TripDepartureDate}$$

$$Trip\ Weight\ (Temporal) = \frac{1}{October\ 24,2012 - October\ 17,2012} = \frac{1}{7} = 0.14$$

A weight from 0 (trip occurred 365 days ago or more) to 1 (trip occurred on same day as the respondent participated) was applied to all trips. As a final step, trips made by households that participated in both survey administrations were halved to account for the fact that they are, in theory, reporting twice as many trips. This final temporal weight distribution is displayed in Figure 2.11.

Every adult in the household reported all of their long distance trips within a certain time frame (e.g. past week, past month, etc.). In many cases, multiple adults in a given household reported the same trip. For example, if a husband and wife both traveled from Salt Lake City to Denver, CO on 17 April, that particular trip would appear in the dataset twice, and for both trip records, the reported occupancy would be at least two (it could be higher if kids or non-household members were also with them). In an effort to account for these duplicate trips, RSG applied a trip weight based on the number of times a particular trip was reported by a given household:

$$Trip\ Weight\ (Duplicate) = \frac{1}{Number\ of\ household\ members\ who\ reported\ the\ same\ trip}$$

Figure 2.10: How Long Ago (in Days) That the Trip Occurred

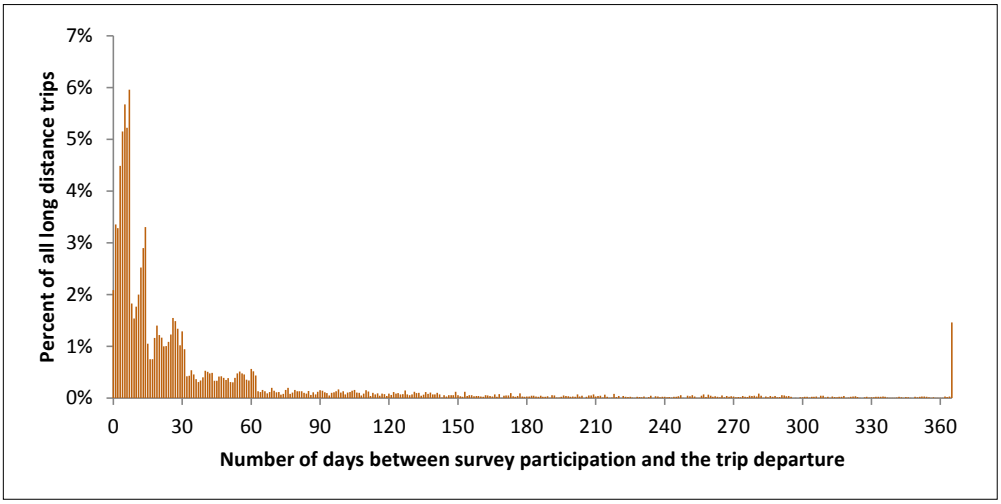


Figure 2.11: Temporal Weight Distribution - Duplicate Trip Weight

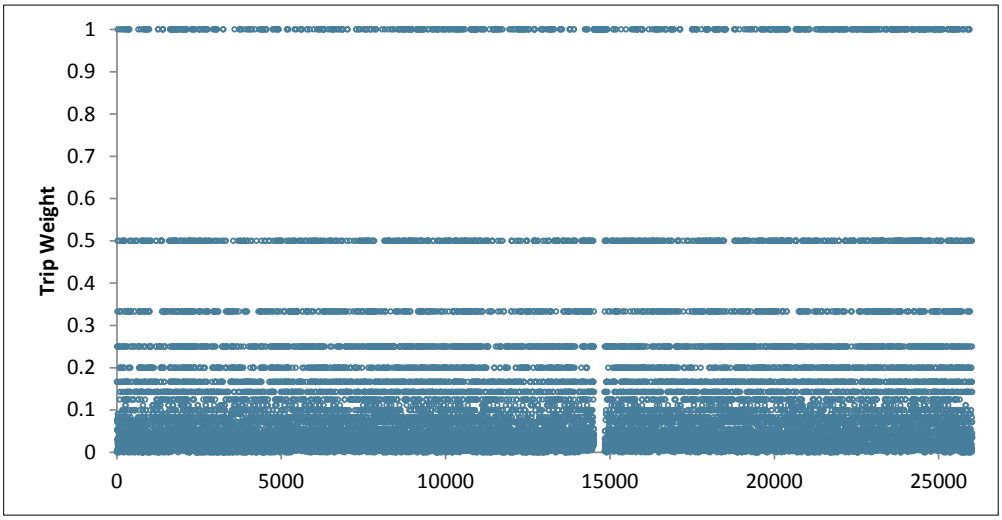


Table 2.5: Duplicate Trip Weights

NUMBER OF HH MEMBERS WHO REPORTED THE SAME TRIP	WEIGHT APPLIED	NUMBER OF TRIPS	PERCENT OF TRIPS
1	1	15033	58%
2	0.5	10128	39%
3	0.3333	699	3%
4	0.25	120	0%
5	0.2	30	0%
7	0.1429	8	0%
Total		26,018	100%

Reported Occupancy Weight

The third trip weight accounted for the number of travelers on the trip, as reported by the trip maker. The weight itself is equal to the number of total travelers, e.g. a trip with three people (one driver, two passengers) received an occupancy weight of three. A distribution of these occupancy weights is displayed in Figure 2.12.

Trip Distance Weight

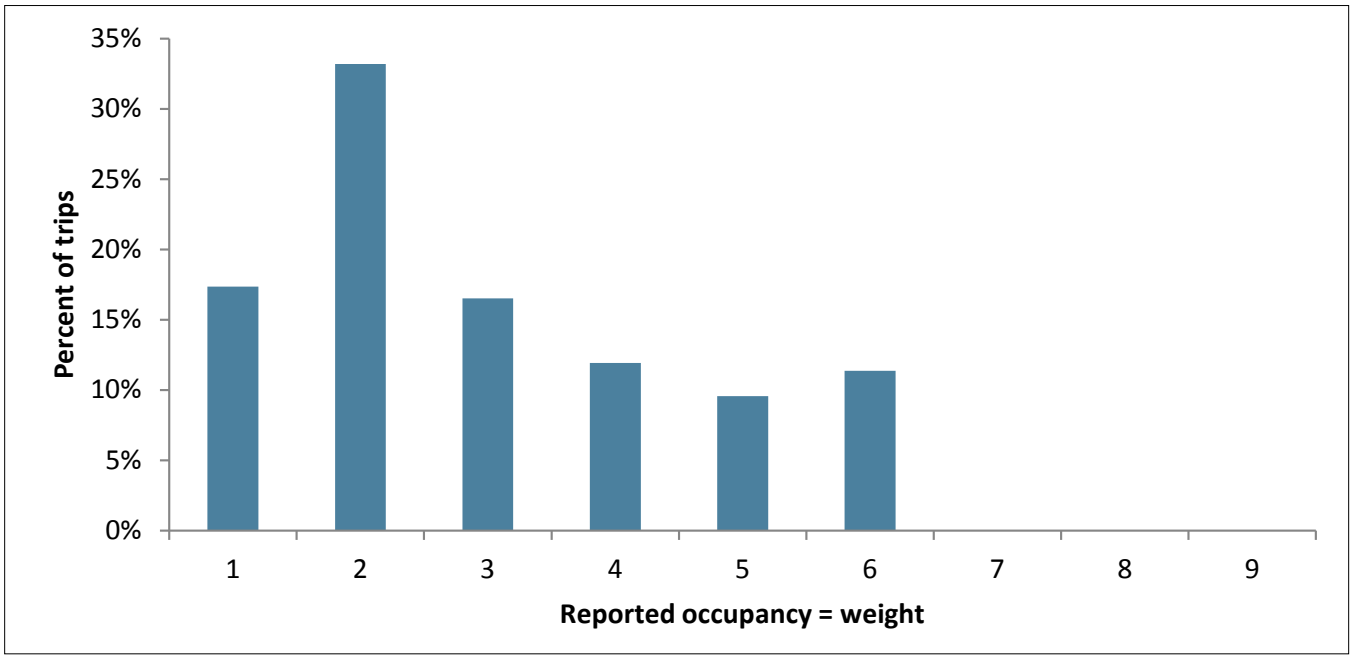
Finally, RSG assigned a trip weight of zero to all trips with a Google estimated trip distance less than 30 miles. Although long-distance trips were defined as 40+ miles in the survey, RSG selected 30 miles as the cut-off point because the estimated trip distances were calculated based on city-to-city combinations, which may have obscured some of the extra distance for those trips.

The final trip weight used for analysis was a product of all the aforementioned trip weights: Temporal Weight * Duplicate Trip Weight * Reported Occupancy Weight * Trip Distance Weight.

4.3 VARIABLES FOR MODELING

Please refer to Chapter 1, Household Travel Diary Survey, for more detailed information on the inclusion of geographic variables (TAZ, MPO ID, Region ID, etc.) and household characteristics (size, income, vehicles available, etc.).

Figure 2.12: Reported Occupancy Trip Weight Distribution



5.0 DATA ANALYSIS

RSG has completed a basic analysis of the survey data to help ensure data integrity, understand long distance travel behavior, and prepare to integrate the long distance survey data into the travel demand modeling effort. This section includes these basic analyses. All numbers and percentages represent weighted results, unless otherwise noted.

5.1 SUMMARY TABULATIONS

5.1.1 Person Level Results

Each adult who completed the Long Distance survey was asked which major cities they have visited in the past year. In order to avoid overstating the likelihood of travel to a particular city, the list of cities shown was dynamic based on what region the household was from: residents of the MAG region did not see Provo; residents of the WFRC region did not see Salt Lake City, and residents of the Dixie region did not see St. George. The rational was that if someone from the Dixie region was reporting a trip to St. George, it was not representing a long distance trip because St. George is located nearby that individual's home. For example, the WFRC and MAG regions were combined for Figure 2.13, but only residents of MAG had Salt Lake City as an option, which is why only about 20% of the combined population selected it as an answer option. Of all the cities listed outside of the state, Utahns were most likely to travel to Las Vegas; in fact, 76% of adults from the Dixie region had visited Las Vegas in the past year.

Provo and Salt Lake City were the most frequented cities from among those that visited. For example, two-thirds of residents who had visited Salt Lake City in the past year did so at least five times (Figure 2.14). The cities outside of Utah were visited less frequently.

In order to frame the long distance trip roster section, respondents first indicated how recently they made a long distance trip over 40 miles. Nearly one-third of respondents in the standalone survey reported a long distance trip from the past week compared at 26% from the debrief survey (Figure 2.15). This suggests that there may be seasonal differences in long distance travel, since the stand alone survey was conducted in the summer.

Figure 2.13: Cities Visited in Past Year (by Region)

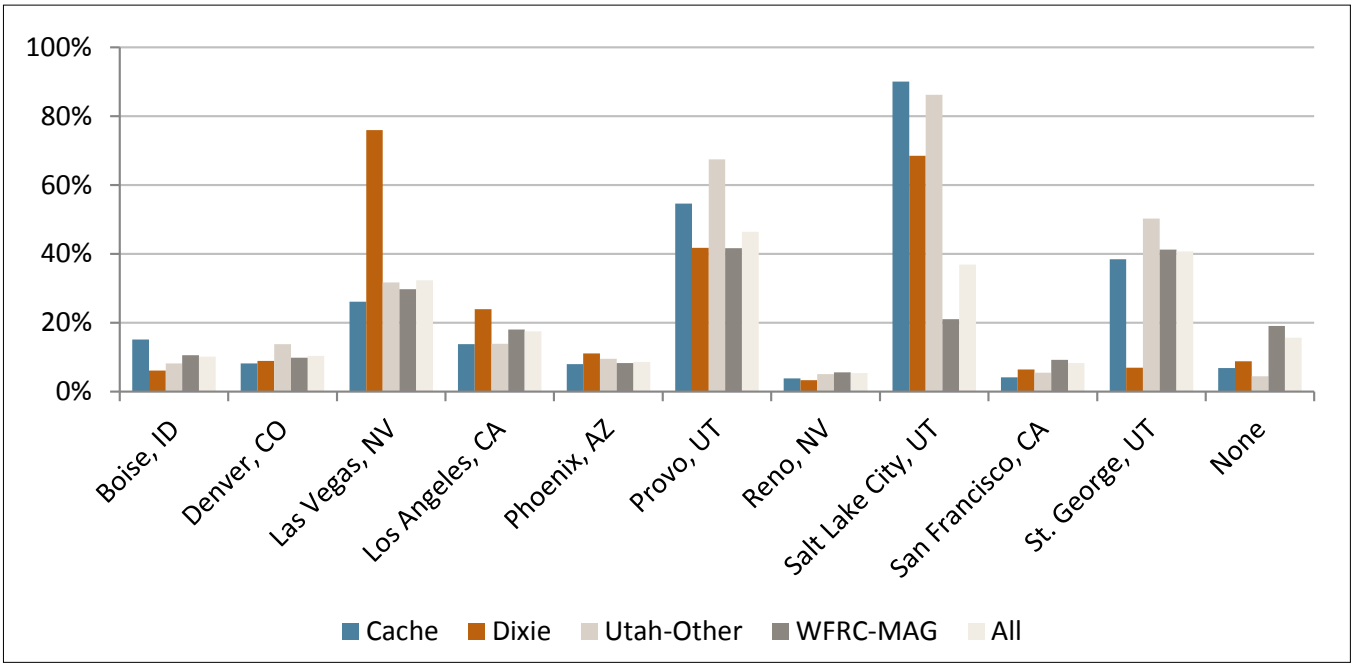


Figure 2.14: Number of Visits Per Year

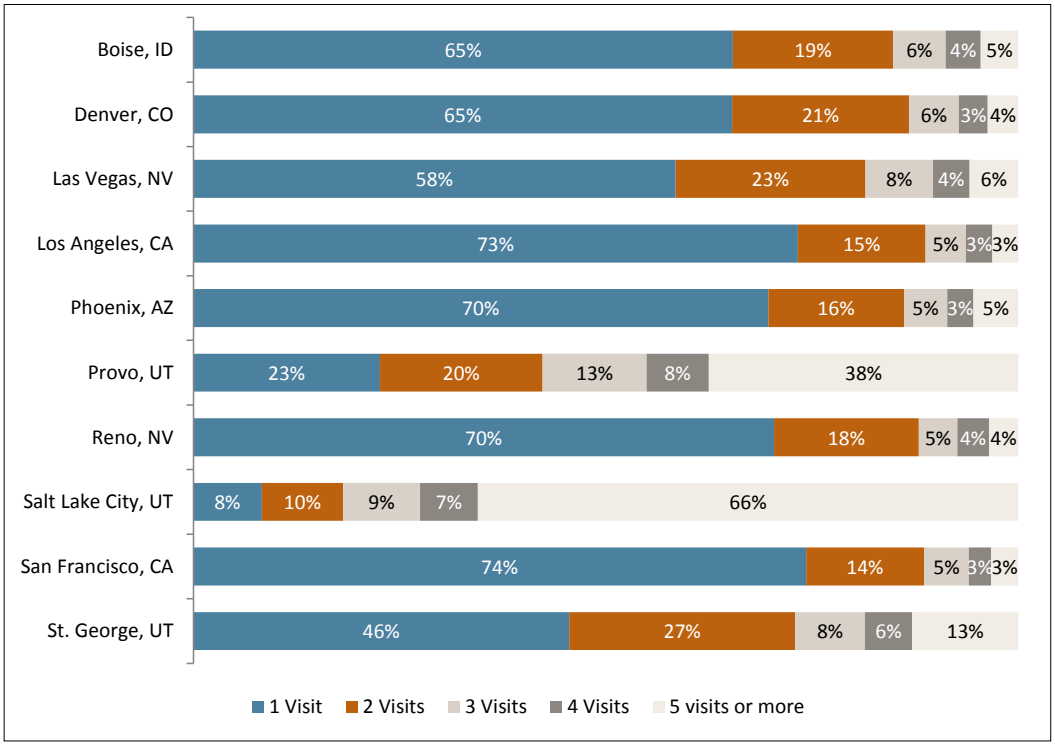
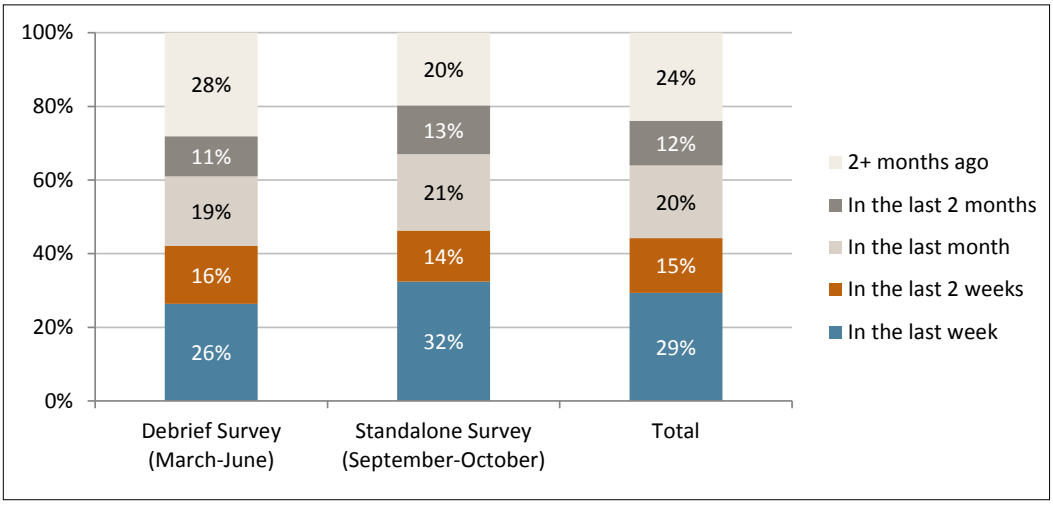


Figure 2.15: When the Most Recent Long Distance Trip Occurred



5.1.2 Trip Level Results

The vast majority (69%) of reported long distance trips occurred entirely within the state of Utah (Table 2.6) and approximately 88% of trips included at least one trip end (origin and/or destination) in Utah.

Figure 2.16 and Figure 2.17 display the origins and destinations of trips the occurred entirely within Utah and trips that occurred at least partially outside of Utah, respectively.

Table 2.6: Trip End Locations

		DESTINATION		
		UTAH	EXTERNAL	TOTAL
ORIGIN	UTAH	69%	9%	78%
	EXTERNAL	10%	12%	22%
	TOTAL	79%	21%	100%

Figure 2.16: Trip Destinations (Internal Trips Only)

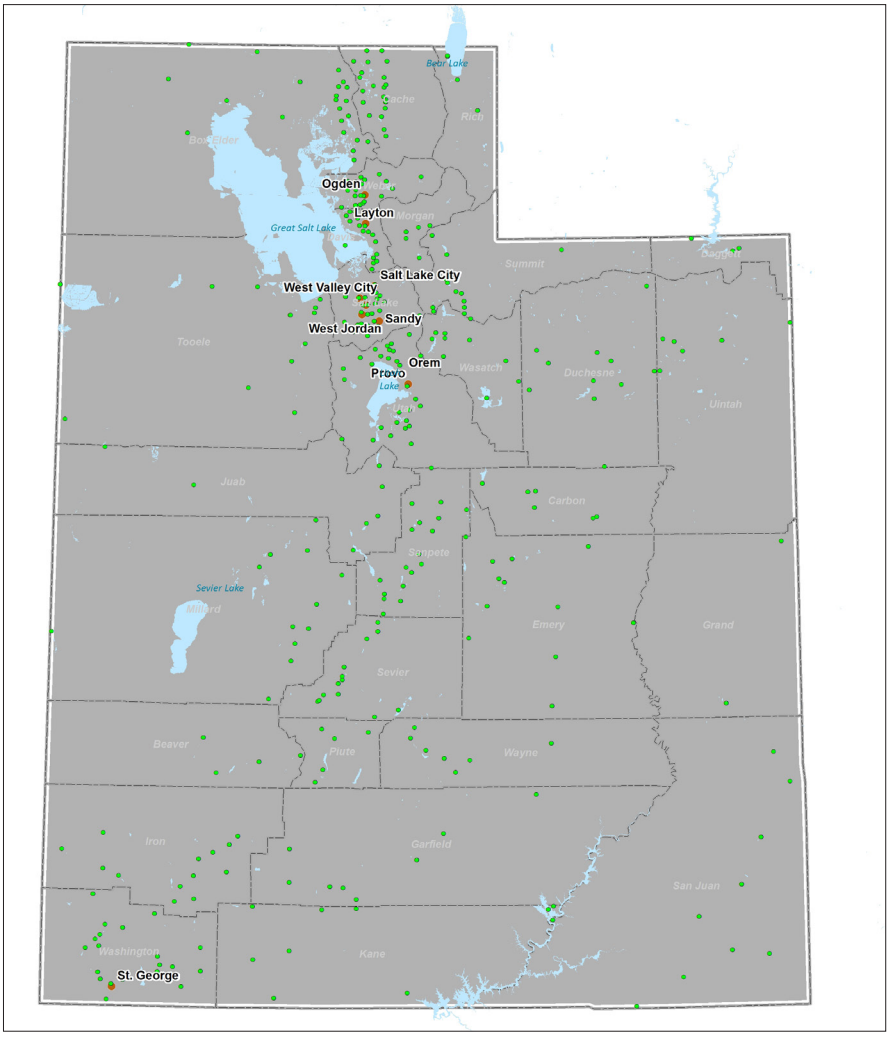
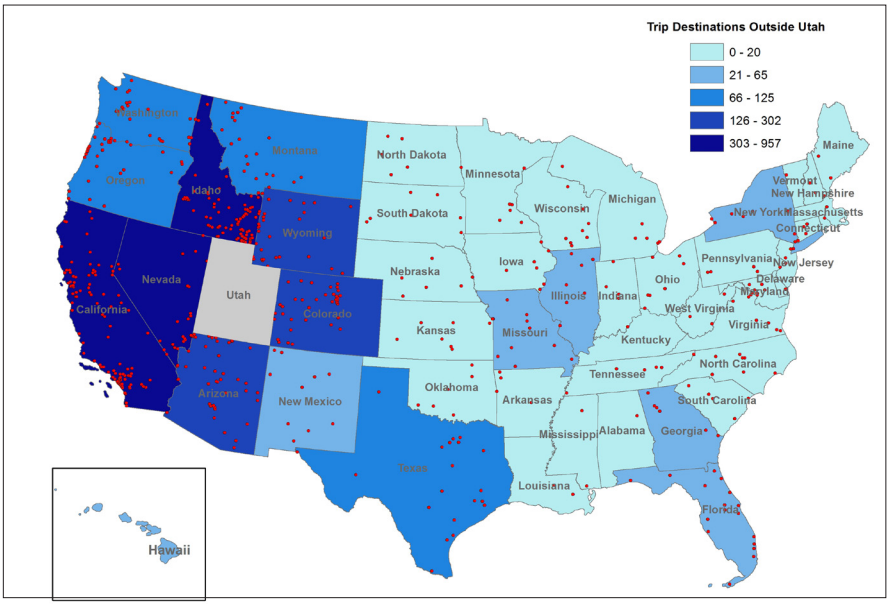


Figure 2.17: Trip Destinations (External Trips Only)



Trips with at least one international end were not geocoded and, therefore, do not have an associated trip distance. Ignoring those records, the overall average trip length was 248 miles, but within Utah that average is 101 miles. Internal trip (origin and destination within Utah) destinations ranged from 30 miles to 413 miles, but nearly 80% were less than 100 miles (Figure 2.18). For trips that included at least one external trip end, 37% were less than 100 miles, while 8% were at least 1,000 miles in length. Figure 2.19 shows the overall trip distribution, highlighting the concentration of trips that were between 30-100 miles. The "spikes" in data represent frequent trip end combinations; for example, nearly 6% of all long distance trips were 44 miles, which is the distance between Salt Lake City and Provo.

Figure 2.18: Trip Distances (by Trip Location)

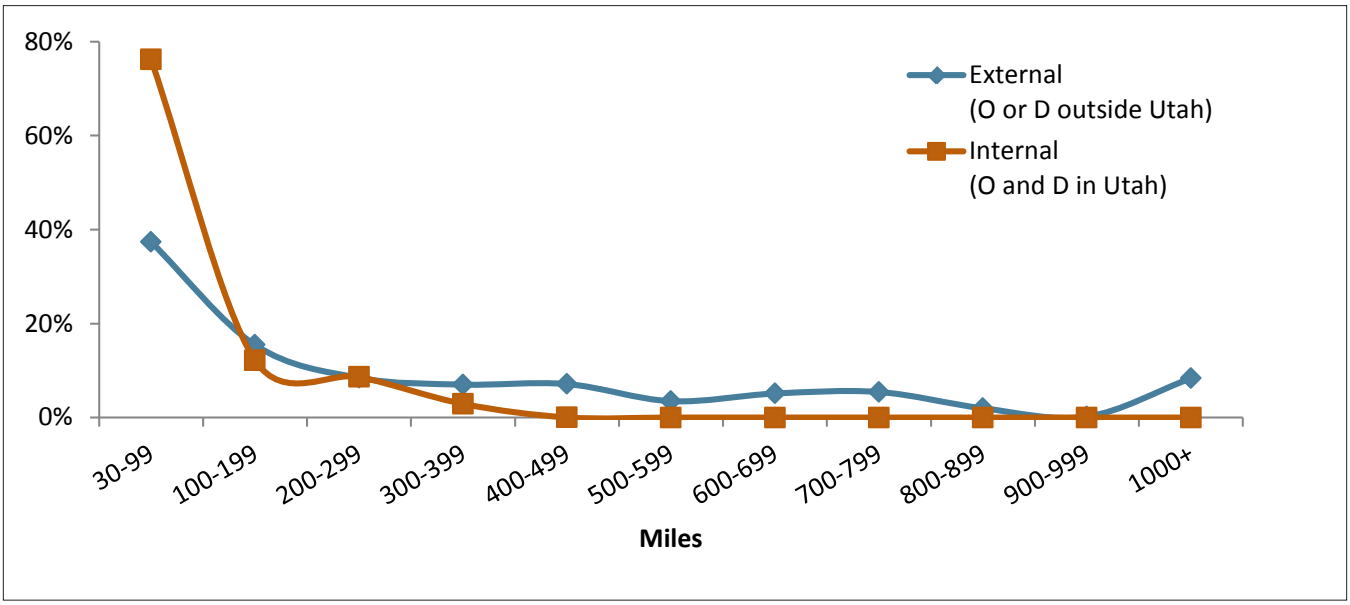


Figure 2.19: Trip Distance Distribution (All Trips)

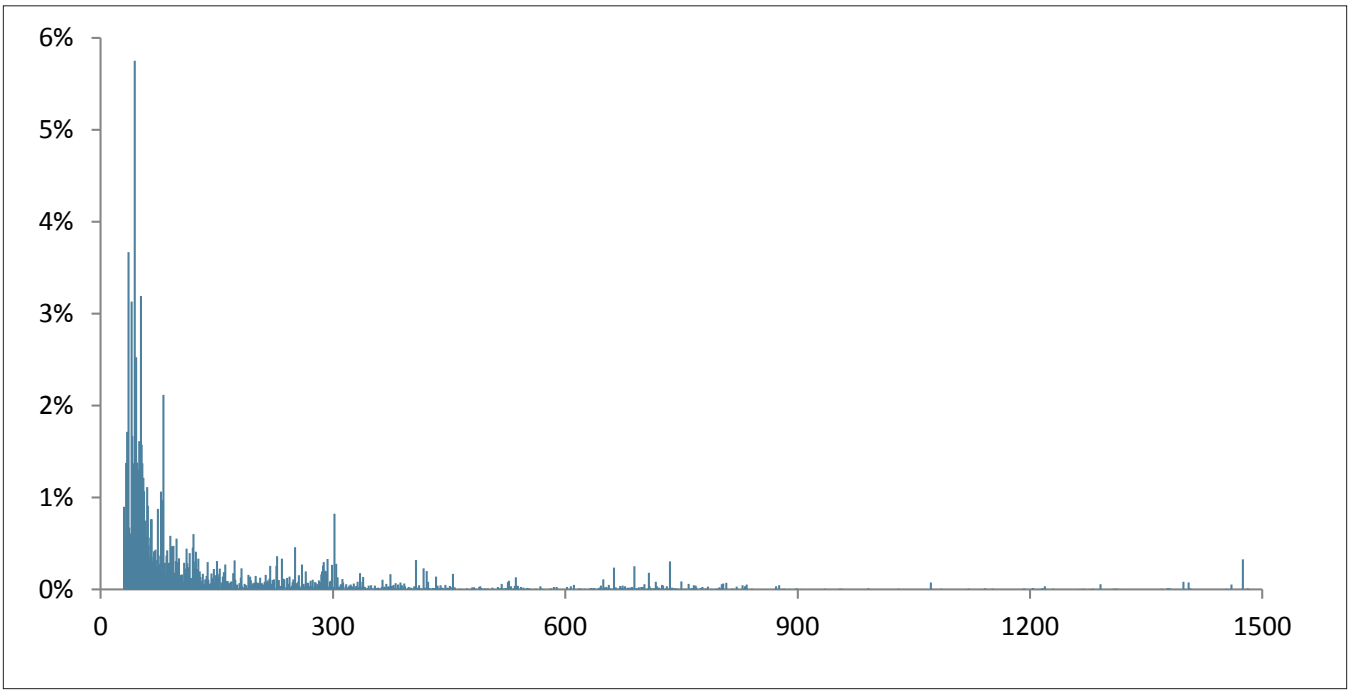


Figure 2.20, Figure 2.21, and Figure 2.22 display the distributions for trip mode, purpose, and segment, respectively.

Figure 2.20: Primary Mode

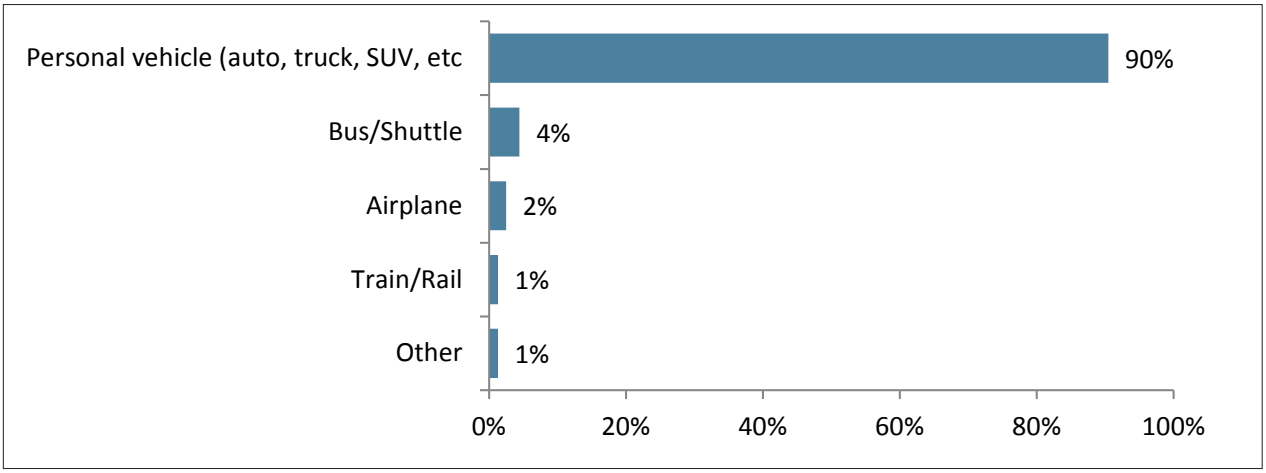


Figure 2.21: Primary Purpose

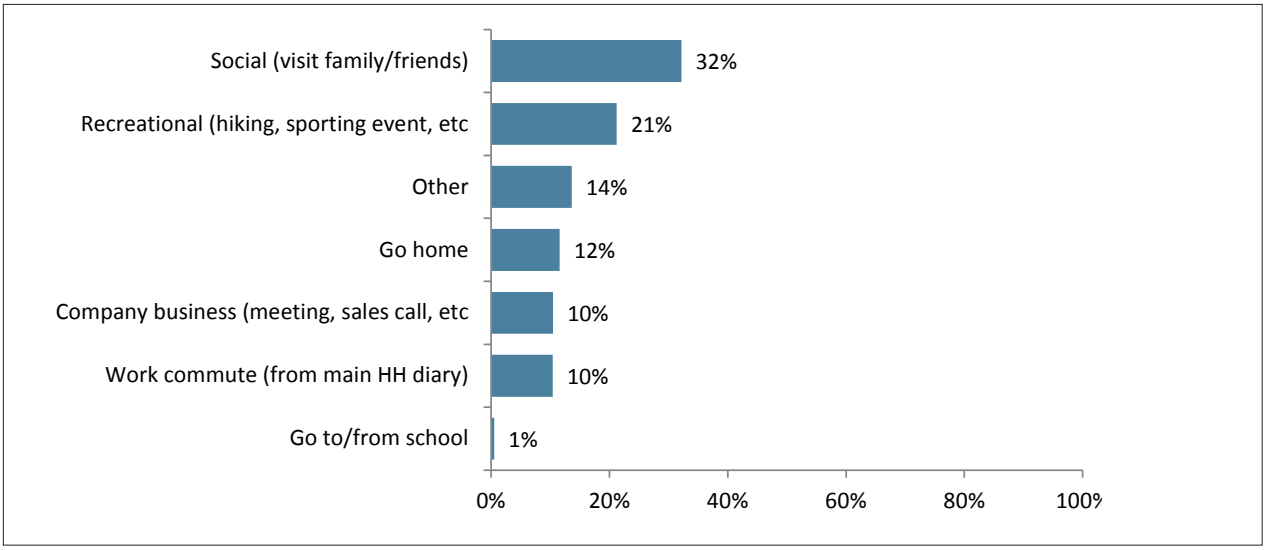
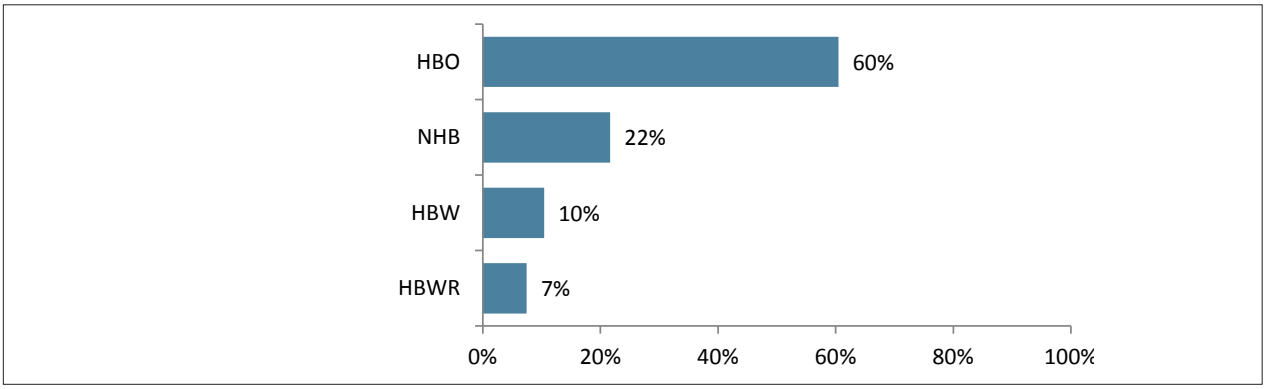


Figure 2.22: Trip Purpose Segment



5.2 MODEL RELATED ANALYSIS

5.2.1 Trip Rates

Household trip rates, stratified by various household characteristics, are displayed in Figure 2.23, Figure 2.24, and Figure 2.25. Given the limitations of the dataset (neither children's dependent nor independent trips were reported), RSG applied a series of trip-level weights to allow for an approximation of a household long distance trip rate. The resulting overall trip rate is 1.39 long distance trips per household and from among the breakdowns by household characteristics, several logical patterns do emerge:

- Households in more rural regions are making more long distance trips, especially for regular commuting purposes
- Larger households typically make more long distance trips
- Higher income households are making slightly more long distance trips

Figure 2.23: Trips Per Household (by Region)

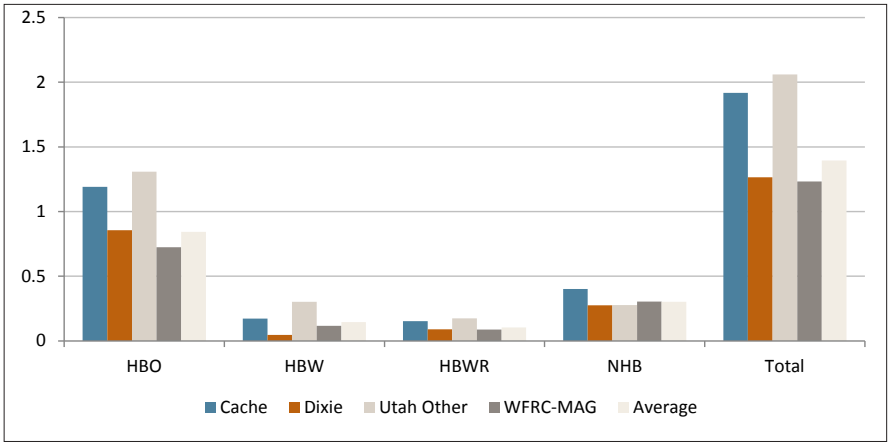


Figure 2.24: Trips Per Household (by Household Size)

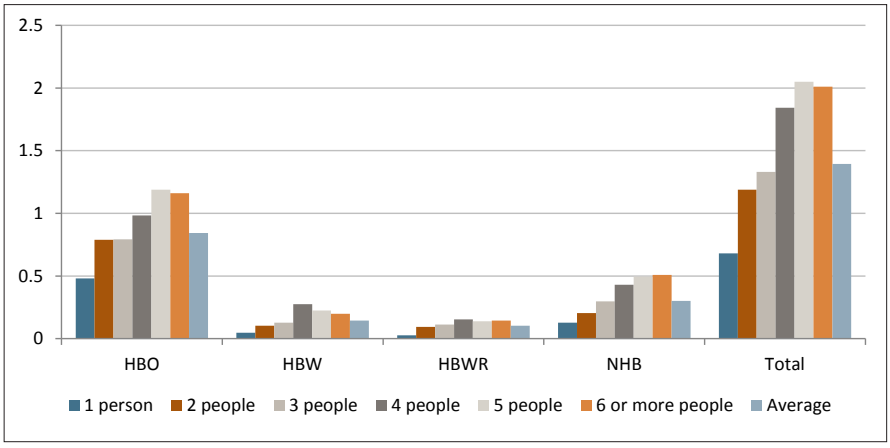
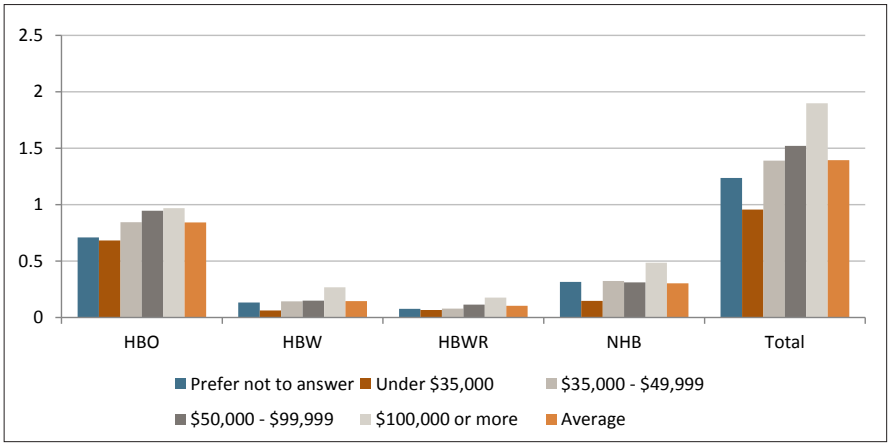


Figure 2.25: Trips Per Household (by Household Income)



5.2.2 Seasonality

Evaluating the seasonal differences in trip making can be done in two ways: first by looking at how recently respondents reported making a long distance trip (Figure 2.26) and second by comparing the trip rates between the spring (debrief survey) and the fall (standalone survey) (Figure 2.27). To adequately compare results, these two figures include only the 14% of households that took both surveys. Results from both figures indicate that more (frequent) long distance travel occurred during the early fall months than during the spring months. In fact, the trip rate was approximately 15% higher in the standalone survey than in the debrief survey. Note that the household trip rates in Figure 2.27 are lower than the overall household trip rates (1.39) in large part because trip weights were halved for those households that participated twice.

Figure 2.26: When the Most Recent Long Distance Trip Occurred (Adults Who Took Both Surveys Only)

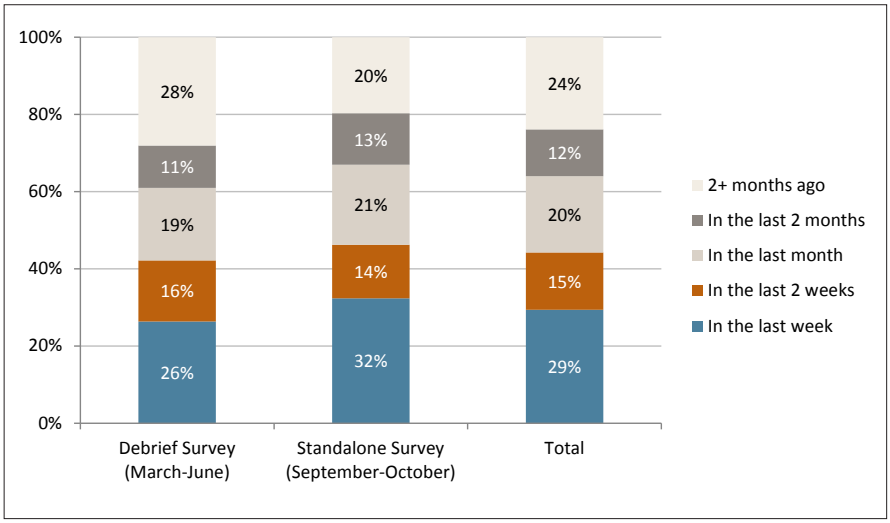
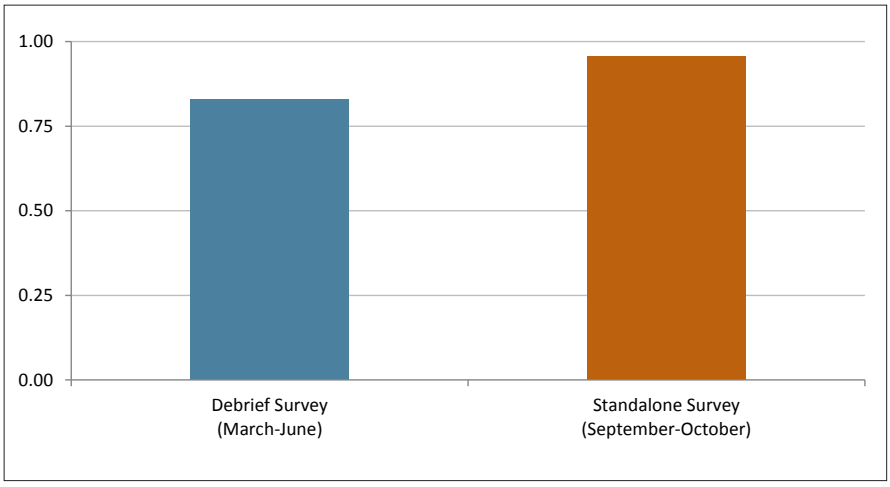


Figure 2.27: Trips Per Household (by Survey Period)



College students can be major contributors to regional and intra-urban travel demand. There are approximately 200,000 students enrolled at a college or university in Utah today. Over 20% of UTA's total transit market is the college student population commuting to campuses along the Wasatch Front. In total, 7,923 students completed the college travel diary. This data helps shed light on how college students travel and how their travel differs from the average regional person trip rate in order to improve future travel demand models.

III. COLLEGE DIARY

1.0 INTRODUCTION 64

2.0 ADMINISTRATION 65

2.1 Survey Sample 66
2.2 Survey Invitation Materials 68
2.3 Survey Retrieval 68
2.4 Pre-Test Survey 69
2.5 Full Survey 69
2.6 Survey Incentives 69

3.0 QUESTIONNAIRE 70

3.1 College Affiliation 70
3.2 Demographic Characteristics 70
3.3 Travel Diary 72
3.4 Travel Habits & Attitudes 74

4.0 DATA PREPARATION 76

4.1 Data Checking 76
4.2 Data Weighting 77
4.3 Variables for Modeling 79

5.0 DATA ANALYSIS 81

5.1 Summary Tabulations 81
5.2 Model Related Analysis 83

1.0 INTRODUCTION

College populations are often under-represented in travel diary surveys because younger, more transient populations are harder to reach. However, college students can be major contributors to regional and intra-urban travel demand. For example, over 20% of UTA's total transit market is the college student population commuting to campuses along the Wasatch Front. There are currently approximately 200,000 students enrolled at a college or university in the state and several of these institutions are major regional attractions and employers.

Further, college students are mobile, have travel habits that are different from the general population, and are not well captured in the travel demand model because it stratifies trip rates by demographic variables that do not represent the college population well, such as household size, income, and automobile ownership.

The Utah College Travel Diary closely followed the Household Travel Diary in structure and content, which was important to allow for comparison between the two datasets. However, a few important modifications were made to the College Travel Diary to better encourage participation. The most notable difference is that the College Travel Diary asked students to report their own travel (and not the travel for any other household members or roommates) from the most recent weekday (as opposed to a pre-assigned travel date).

Eight colleges/universities agreed to participate in the College Travel Diary:

- Dixie State College
- LDS Business College
- Salt Lake Community College
- Utah State University
- Utah Valley University
- University of Utah
- Weber State University
- Westminster College

After administering the College Travel Diary survey to students for approximately one month (April 2012), the survey data were cleaned and processed. In total, 7,923 students completed the entire survey. These data were then compared to the existing travel demand model and to results from the Household Travel Diary in order to better understand how college students travel and how their travel should be incorporated into future travel demand models.

2.0 ADMINISTRATION

While the College Travel Diary survey questionnaire and structure were similar to the Household Travel Diary, the College Travel Diary survey administration process differed in a few ways.

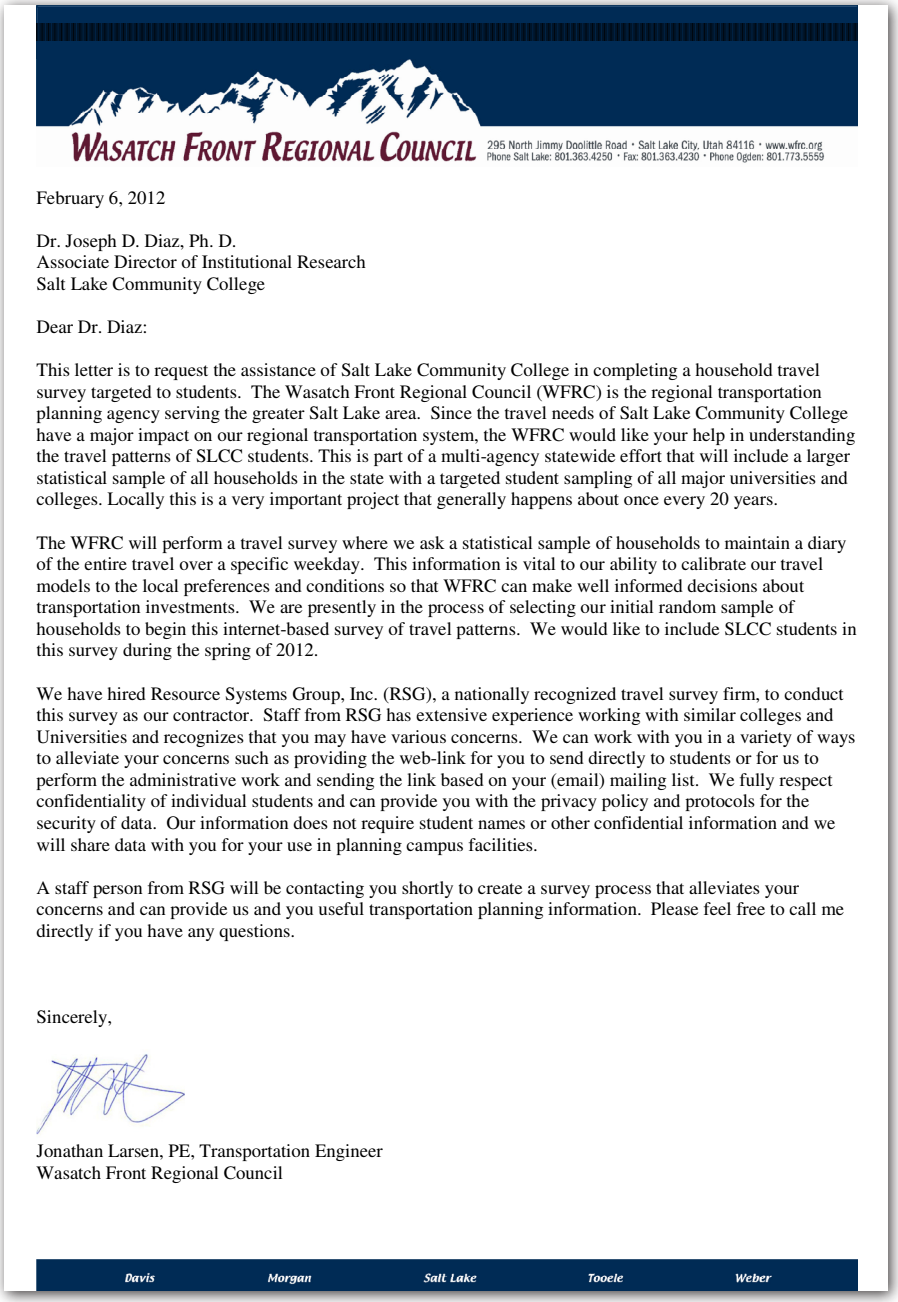
WFRC, the other agencies, and RSG developed a list of ten academic institutions around Utah to contact. This list of academic institutions included both public and private schools and focused on the institutions within MPO boundaries within the state.

In particular, Deans, Vice Presidents, Provosts and other high-ranking officials at each institution were contacted and, in many cases, WFRC, MAG, Cache, and Dixie MPO each identified contacts or personally communicated with an institution. In some instances, agencies drafted letters themselves in an effort to communicate the importance of the survey and the details of the overall project effort (Figure 3.1).

RSG worked directly with the lead contact at each college to provide the necessary recruitment materials, including draft invitation language,FAQ information, schedule, and email invitation logistics. The colleges then handled most of the direct communication with the students, including emailing the survey invitation to students. This was an important factor in colleges' willingness to participate, and allowed them to work within the technological, privacy, and schedule constraints of their institution.

A key difference between the College Travel Diary and the Household Travel Diary is that, as described above, the level of participation among college students depends greatly on the actions of a third party (the college or university administration). In general, seemingly small factors such as the timing (hour and day) of invitation emails, the number of invitation emails, the title/stature of the person sending the invitation email, and the brevity of the email can greatly influence the response among college students. On all of these factors, RSG made recommendations to the institution regarding best practices and then the institution implemented as they deemed appropriate.

Figure 3.1: Agency Outreach Letter Example



WASATCH FRONT REGIONAL COUNCIL
295 North Jimmy Doolittle Road • Salt Lake City, Utah 84116 • www.wfrc.org
Phone Salt Lake: 801.363.4250 • Fax: 801.363.4230 • Phone Ogden: 801.773.5559

February 6, 2012

Dr. Joseph D. Diaz, Ph. D.
Associate Director of Institutional Research
Salt Lake Community College

Dear Dr. Diaz:

This letter is to request the assistance of Salt Lake Community College in completing a household travel survey targeted to students. The Wasatch Front Regional Council (WFRC) is the regional transportation planning agency serving the greater Salt Lake area. Since the travel needs of Salt Lake Community College have a major impact on our regional transportation system, the WFRC would like your help in understanding the travel patterns of SLCC students. This is part of a multi-agency statewide effort that will include a larger statistical sample of all households in the state with a targeted student sampling of all major universities and colleges. Locally this is a very important project that generally happens about once every 20 years.

The WFRC will perform a travel survey where we ask a statistical sample of households to maintain a diary of the entire travel over a specific weekday. This information is vital to our ability to calibrate our travel models to the local preferences and conditions so that WFRC can make well informed decisions about transportation investments. We are presently in the process of selecting our initial random sample of households to begin this internet-based survey of travel patterns. We would like to include SLCC students in this survey during the spring of 2012.

We have hired Resource Systems Group, Inc. (RSG), a nationally recognized travel survey firm, to conduct this survey as our contractor. Staff from RSG has extensive experience working with similar colleges and Universities and recognizes that you may have various concerns. We can work with you in a variety of ways to alleviate your concerns such as providing the web-link for you to send directly to students or for us to perform the administrative work and sending the link based on your (email) mailing list. We fully respect confidentiality of individual students and can provide you with the privacy policy and protocols for the security of data. Our information does not require student names or other confidential information and we will share data with you for your use in planning campus facilities.

A staff person from RSG will be contacting you shortly to create a survey process that alleviates your concerns and can provide us and you useful transportation planning information. Please feel free to call me directly if you have any questions.

Sincerely,

Jonathan Larsen, PE, Transportation Engineer
Wasatch Front Regional Council

Davis Morgan Salt Lake Tooele Weber

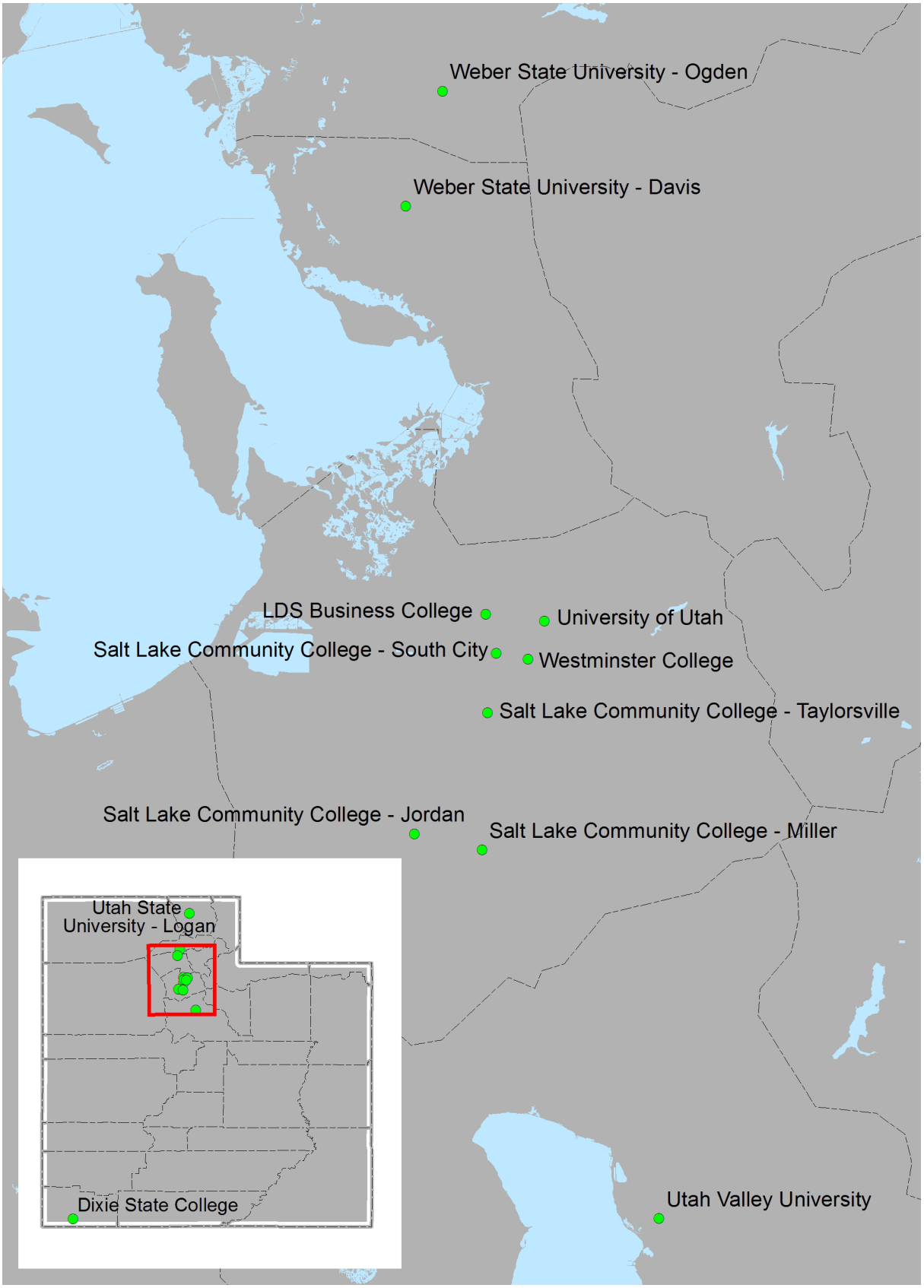
2.1 SURVEY SAMPLE

The eight schools listed in Table 3.1 and mapped in Figure 3.3.2 agreed to participate in the survey. Brigham Young University and Southern Utah University chose not to participate.

Table 3.1: Participating Colleges Student Population

COLLEGE	MAIN CAMPUS(ES)	STUDENT POPULATION SPRING 2012 (APPROXIMATE)	PERCENT FULL-TIME STUDENTS (APPROXIMATE)
Dixie State College	St. George	9,000	60%
LDS Business College	Salt Lake City	1,800	70%
Salt Lake Community College	Taylorsville, Miller, Jordan, South City	34,000	35%
University of Utah	Salt Lake City	31,000	70%
Utah State University	Logan	29,000	85%
Utah Valley University	Orem	33,000	50%
Weber State University	Ogden, Davis	25,000	50%
Westminster College	Salt Lake City	3,200	95%
Total		166,000	

Figure 3.2: Participating Colleges



2.2 SURVEY INVITATION MATERIALS

The College Travel Diary communications and materials were primarily electronic, consisting of a pre-notice, the survey invitation, and a reminder.

2.2.1 Pre-notice

Dixie State College, Salt Lake Community College, University of Utah, and Weber State University notified students by email of the upcoming survey in advance of the survey launch. Just as with the Household Travel Diary, the purpose of this pre-notification email was increase response rate by announcing the study and conditioning the student to expect a survey invitation in the coming days.

2.2.2 Invitation

RSG coordinated with each college on both the content and timing of the email invitations, which included a brief description of the project and survey, a note that an iPad would be offered as an incentive for completion, and a hyperlink to the online survey. The colleges themselves sent out the survey invitations to their respective student populations. Figure 3.3 is the survey invitation sent out by University of Utah.

In addition to the email invitation, Dixie State College also advertised the survey on television monitors in the student center. These monitors continuously scroll through news, events, and announcements (Figure 3.4).

2.2.3 Reminder

In an effort to boost response rate, Salt Lake City Community College and Utah Valley University both sent reminder emails to their student bodies approximately one week after sending out the initial invitation.

2.3 SURVEY RETRIEVAL

The survey instrument for the College Travel Diary survey was the RSG online survey, administered through a website produced specifically for the Utah Travel Study. Given the prominence of English on all campuses in our study, the survey was administered in English, which also helped reduce the total cost of developing the survey.

To participate, students simply navigated to the website and clicked to start the survey. Because the College Travel Diary was an open invitation to all students, respondents did not have to enter a password to take the survey.

As with the Household Travel Diary, RSG monitored the email inbox and responded to students who had questions about or problems with the survey instrument.

Figure 3.3: Utah Valley University Survey Invite

Dear students,

You are invited to participate in a 10-minute survey about transportation planning across our region and all of Utah. By participating, you will be able to enter a prize drawing to win the latest iPad!

Utah's six major transportation planning agencies are inviting students at ten universities across the state to participate in the Utah Travel Study. The results will be used to better plan for students' travel needs, as well as to obtain your suggestions for improving area roads, transit, and biking/walking.

Please help weigh in on important regional transportation planning decisions and ensure that Utah Valley has a higher participation rate than Utah's nine other universities! Participation is of course voluntary. No personal info is required and your answers will be kept confidential.

Click the link below to get started and to learn more:

https://www.rsgsurvey.com/utahcollege/entry

Thank you in advance for your participation in this important study.

Utah Travel Study sponsors:
Utah Dept. of Transportation (UDOT)
Utah Transit Authority (UTA)
Wasatch Front Regional Council
Dixie Metropolitan Planning Organization (DMPO) Cache Metropolitan Planning Organization (CMPO)
Mountainland Association of Governments Study Conducted by: Resource Systems Group, Inc (RSG)

To confirm the validity of this email go to www.uvu.edu/oit/survey.

Figure 3.4. Dixie State College Special Advertisement

2.4 PRE-TEST SURVEY

RSG gathered input from the Stakeholder Committee and colleges during the development of the College Travel Diary questionnaire and online survey. Results from the pre-test version of the Household Travel Diary also helped guide the format of the College Diary. In addition, RSG sought to reduce the colleges' communication burden and also minimize the amount of coordination that would be required to conduct a pre-test at each college. As such, there was no formal pre-test for the College Travel Diary.

2.5 FULL SURVEY

The College Travel Diary survey launch was staggered during a period around the first two weeks of April 2012. Invitations were staggered in order to accommodate the vacation schedule(s) at each college and also to reduce the number of students participating simultaneously, allowing RSG to better respond to questions as they arose.

Survey administration began on March 28, when Weber State University invited their students. The final invite was sent on April 16, by Westminster College. Westminster College did not send out an explicit survey invitation but rather included the survey invitation on the last page of their own parking survey. The survey closed for all schools on April 26, 2012 at 5 pm EST. To maximize participation, the administration period was completed before the end of the spring term (end of April 2012).

Table 3.2 shows survey administration details and response rates. Response rates varied from 2 – 10 percent, with an average of 5 percent. The final sample size was 7,923 students.

2.6 SURVEY INCENTIVES

Students who completed the survey were offered the opportunity to enter into a drawing to win a latest generation Apple iPad. Those willing to enter the drawing provided an email address for notification. The eight winners – one from each college/university – were randomly selected from among the full populations of willing participants. These were notified during the first week of June 2012.

Table 3.2: Survey Administration Details from Each College

COLLEGE	NUMBER OF STUDENTS INVITED*	PRE-INVITATION NOTICE SENT	SURVEY EMAIL INVITATION DATE	REMINDER EMAIL	NUMBER OF COMPLETED SURVEYS	RESPONSE RATE
Dixie State College	7,800	Yes	10-Apr	-	421	5%
LDS Business College	1,800	-	30-Mar	-	205	11%
Salt Lake Community College	34,000	Yes	4-Apr	Yes	634	2%
University of Utah	21,300	Yes	5-Apr	-	2,035	10%
Utah State University	25,800	-	6-Apr	-	2,036	8%
Utah Valley University	29,000	-	4-Apr	Yes	1,527	5%
Weber State University	21,500	Yes	28-Mar	-	1,007	5%
Westminster College	3,300	-	16-Apr	-	58	2%
Total	144,500				7,923	5%

** As reported by colleges. For example, the University of Utah only invited a subset of their student population.*

3.0 QUESTIONNAIRE

The questionnaire was developed in collaboration with participating colleges and the survey stakeholders.

As described, the College Travel Diary questionnaire was identical to the Household Travel Diary questionnaire where possible to allow for comparisons during analysis, with the following important differences to fit students:

- **No household-level reporting:** Students reported on their travel only and not that of their household or roommmates'.
- **No pre-assigned travel date**: Participants were asked to report on travel made on the most recent weekday. For example, students filling out the survey form on Saturday, Sunday, or Monday were asked about their travel from Friday.
- **Participants were asked to describe off-campus trips only:** This includes trips to or from campus and trips that occurred entirely off-campus. Whereas in the household diary survey walking seven minutes from home to the corner store is considered a trip, in the college diary survey, if that same activity were to take place entirely within the boundaries of campus (from the dorm to the college cafeteria), it was not to be reported. The primary advantage of this approach was that it reduced the number of trips respondents have to report, and thereby reduced respondent burden.

The questionnaire itself had four sections, which are described in more detail below. The survey began by introducing respondents to the purpose of the survey, a link to privacy policy for the information gathered, and estimated time required for completing the survey. A project email address was provided as a resource for addressing any technical questions about the survey.

3.1 COLLEGE AFFILIATION

Because the College Travel Diary was administered to eight colleges, the first question asked students to provide information about their affiliations:

- College/university (Dixie State College, Utah State University, etc.)
- School/college (school of medicine, college of arts and sciences, etc.)
- Primary campus
- Secondary campus, if applicable

The question logic and answer choices shown were dynamic based on the students' answers.

3.2 DEMOGRAPHIC CHARACTERISTICS

The next section asked students to provide demographic information (Figure 3.5). A list of dropdown questions asked for year in school, whether the student lived on or off campus, full or part-time status, number of on- and off-campus jobs. These variables determined what questions respondents would see later in the survey, and were important for segmenting data in weighting, analysis and modeling.

Respondents were also asked to report age, gender, race and whether they were of Hispanic or Latino origin. Household income was not asked in the College Travel Diary. Finally, respondents answered whether they had a driver's license and a smartphone.

Students who live off campus were asked a series of questions about their household, which, given the variety of living situations near college campuses, was defined in this survey as everyone living in the same dwelling unit that shares a kitchen. Students were asked to describe their household, including the number of adults, the number of children (under 18 years old), and if they lived with a partner, spouse, family members, and/or roommates.

Students living on campus were asked how many motor vehicles they had with them on campus. Students living off-campus were asked how many motor vehicles in working order were in their household. Respondents were informed that motor vehicles could include cars, trucks, SUVs, vans, RVs and motorcycles. Respondents in households with at least one motor vehicle were then asked to provide vehicle(s) year, make and model. Those living off-campus were asked how often they use the vehicle to travel to and from campus, and whether they had a permit to park on campus (Figure 3.6).

Students living off-campus reported their home location on an interactive map (Figure 3.7) and selected a description for their off-campus residence (single family house, townhouse, apartment building etc.).

Figure 3.5: Demographic Information

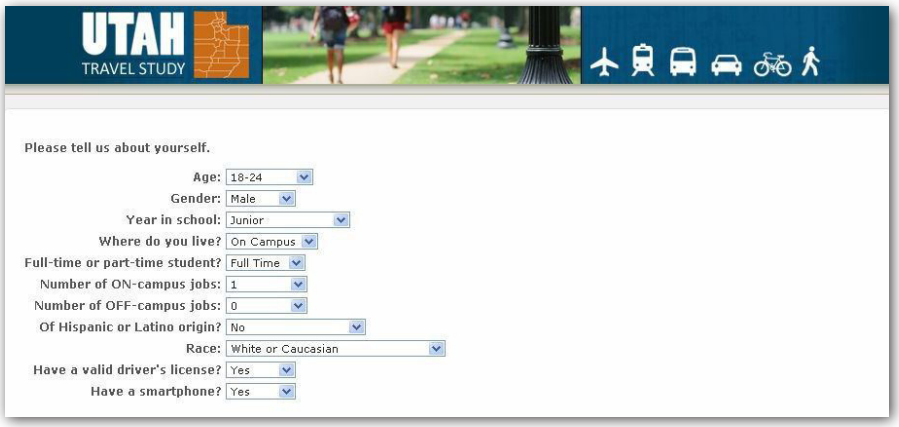
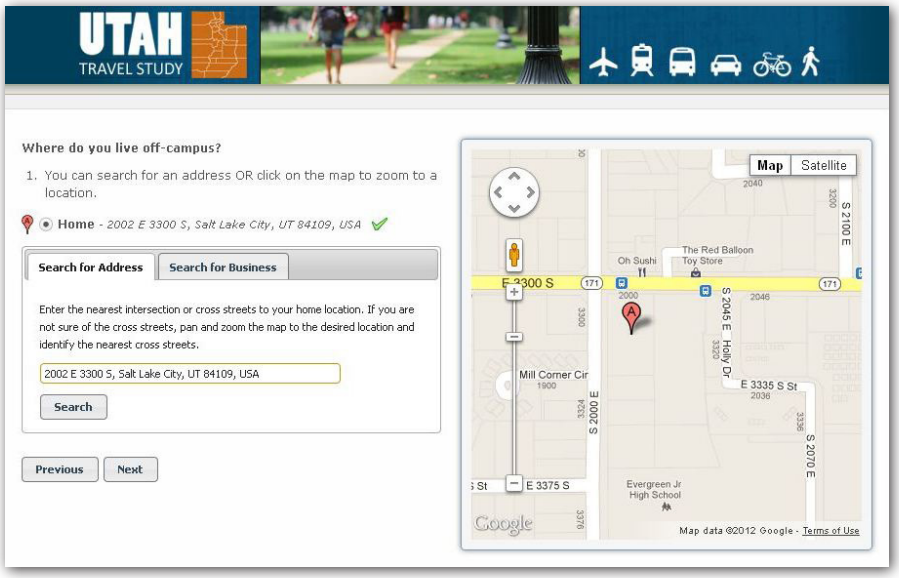


Figure 3.6: Vehicle Information for Off-Campus Respondents

Figure 3.7: Google Map Geocoder



3.3 TRAVEL DIARY

The travel diary began by asking students to report their trips from the most recent weekday (students living on campus were asked to only include the trips they made off-campus). To help respondents understand what constitutes a trip, the survey included a graphic with trip examples (Figure 3.8).

Students who had not made any (off-campus) trips were asked to select from a list all reasons why they had not made any trips. Those saying they were traveling outside Utah were asked to report which city and state they were in.

Students who had made (off-campus) trips were asked to list all their trips (Figure 3.9), and indicate each location on an interactive map (Figure 3.10). After completing this, a summary list with all reported trips and approximated distances was shown, giving respondents a chance to go back and edit their locations, or proceed to the next question.

Figure 3.8: Travel Diary Introduction with Trip Example

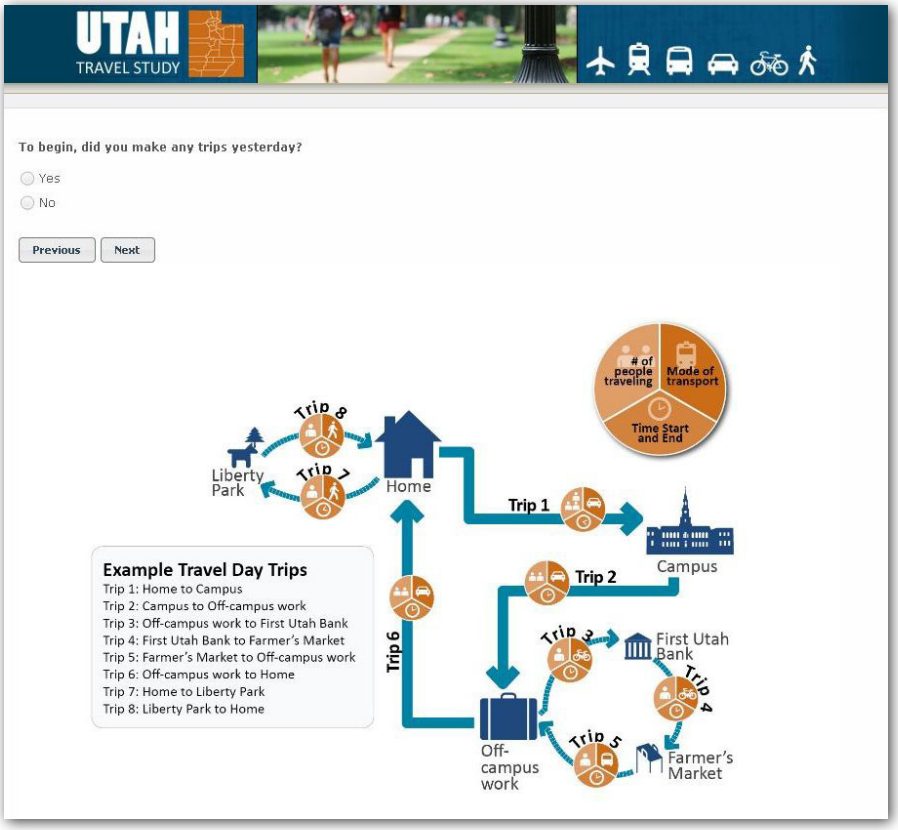
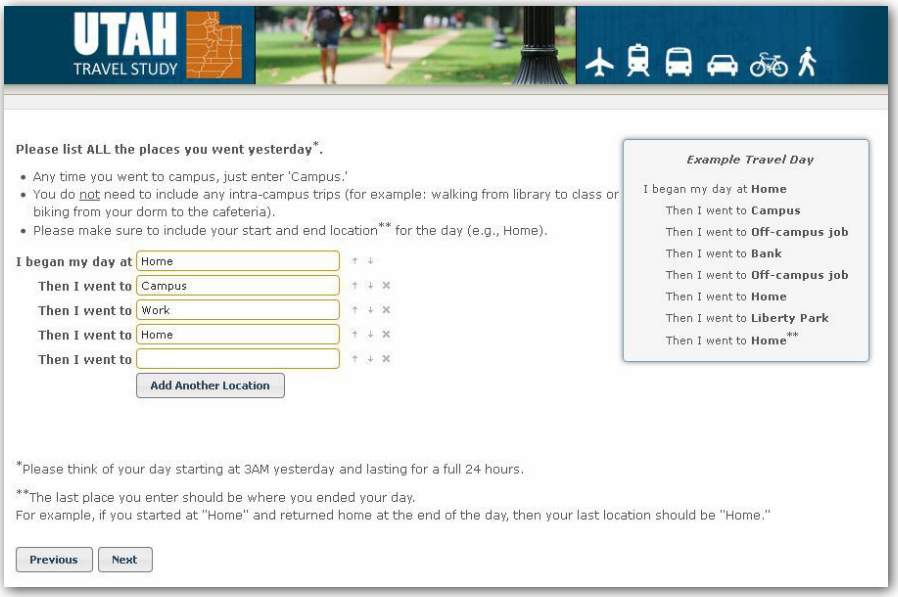


Figure 3.9: Trip Roster



For each reported trip, a screen followed asking for trip start and end time, the main purpose of the trip, and "main way traveled" (mode used). Respondents saying they traveled by auto/truck/motorcycle and who had earlier provided information about household motor vehicles could choose their vehicle from a list. Those with driver's licenses were asked if they were the driver or passenger.

Respondents indicated whether they traveled alone or with others. Those reporting bike or walk trips were asked if they used a sidewalk or bike path for some part of the trip (Figure 3.11). Before the travel diary section ended, respondents had a chance to report total duration of any additional off-campus walks or bike rides they may have made but forgotten to report in the diary.

Figure 3.10: Mapping Trip Roster Locations

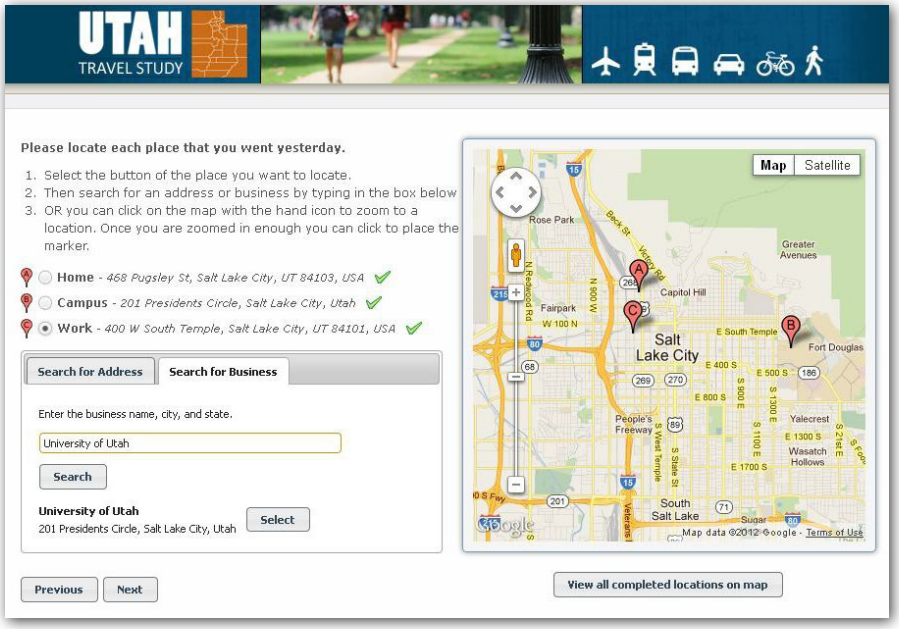
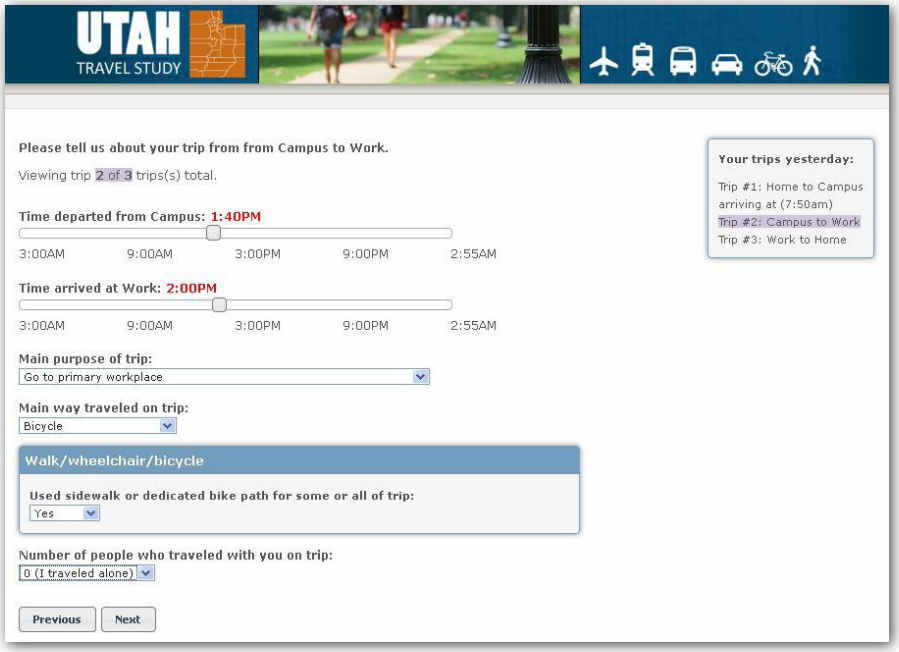


Figure 3.11: Trip Details Walk or Bike



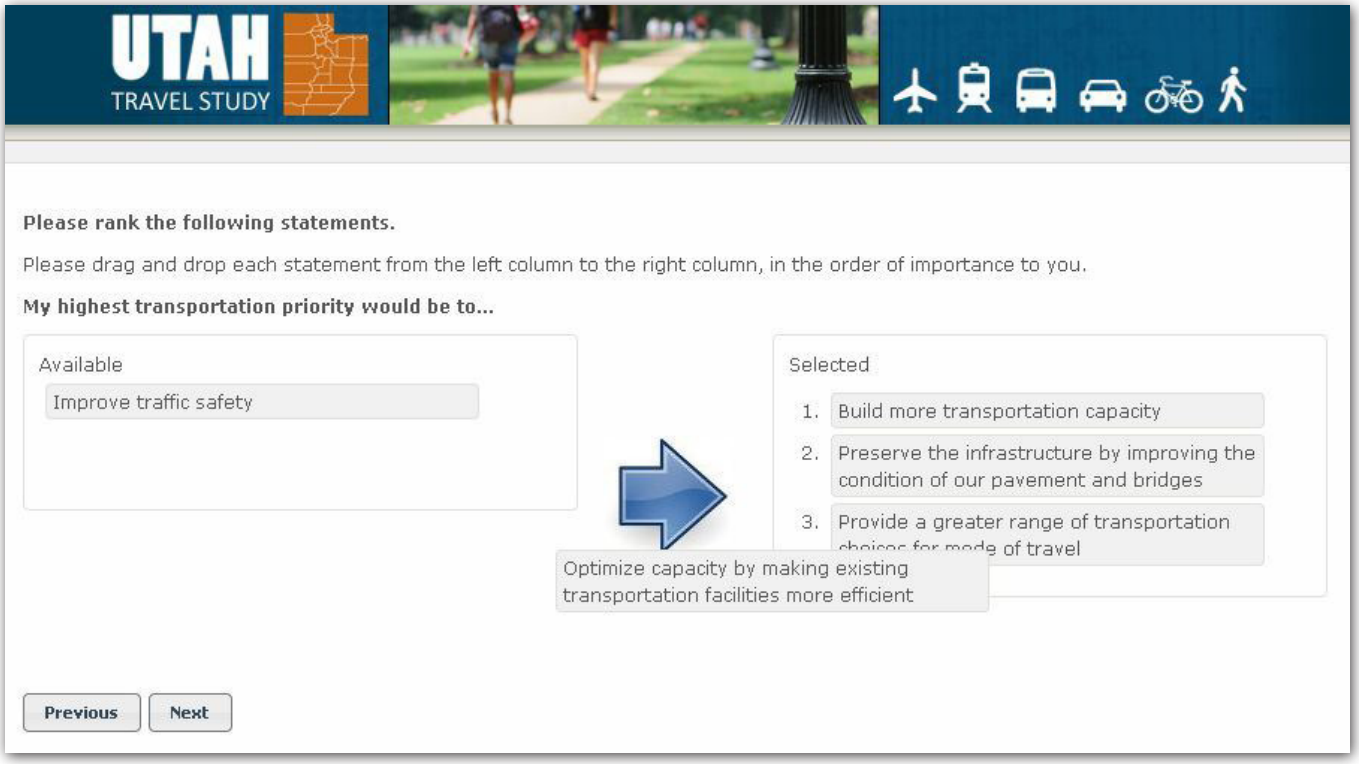
3.4 TRAVEL HABITS & ATTITUDES

The next section focused on students' travel habits in general, and opinions about transportation in their respective regions. First, respondents were asked for their agreement level with five statements about transportation funding priorities (Figure 3.12). Next, five statements about transportation planning priorities were listed in a box on the left, and respondents were asked to rank the statements in a box on the right by clicking on them with a mouse and dragging them over to the box. The benefit of ranking is that respondents have to choose order of importance, and cannot indicate that everything is a top priority/most important. These statements were identical to the statements shown in the Household Travel Diary:

- Improve traffic safety
- Build more transportation capacity
- Preserve the infrastructure by improving the condition of our pavement and bridges
- Provide a greater range of transportation choices for mode of travel
- Optimize capacity by making existing transportation facilities more important

A series of questions about travel habits followed. These questions were tailored to each student based on their college affiliation and key demographic characteristics. Respondents were asked whether they ever travel between campuses, and if so, how they typically travel (what transportation mode). Students with off-campus jobs were asked how many hours they work per week, and how (what transportation mode) they typically get to work. They were also asked to report where they work by using an interactive map. Students living off-campus reported how often and how they travel to and from campus. Students living off-campus in households with motor vehicles reported how often they use a household vehicle in the middle of the work or school day. All students were asked how often they ride transit (bus or rail).

Figure 3.12: Transportation Funding Priorities



Students at Utah State University, Utah Valley University and University of Utah were asked if they have a transit pass, and if so, to specify what type of pass they have. Students at these three universities were also asked how often they ride the campus shuttle.

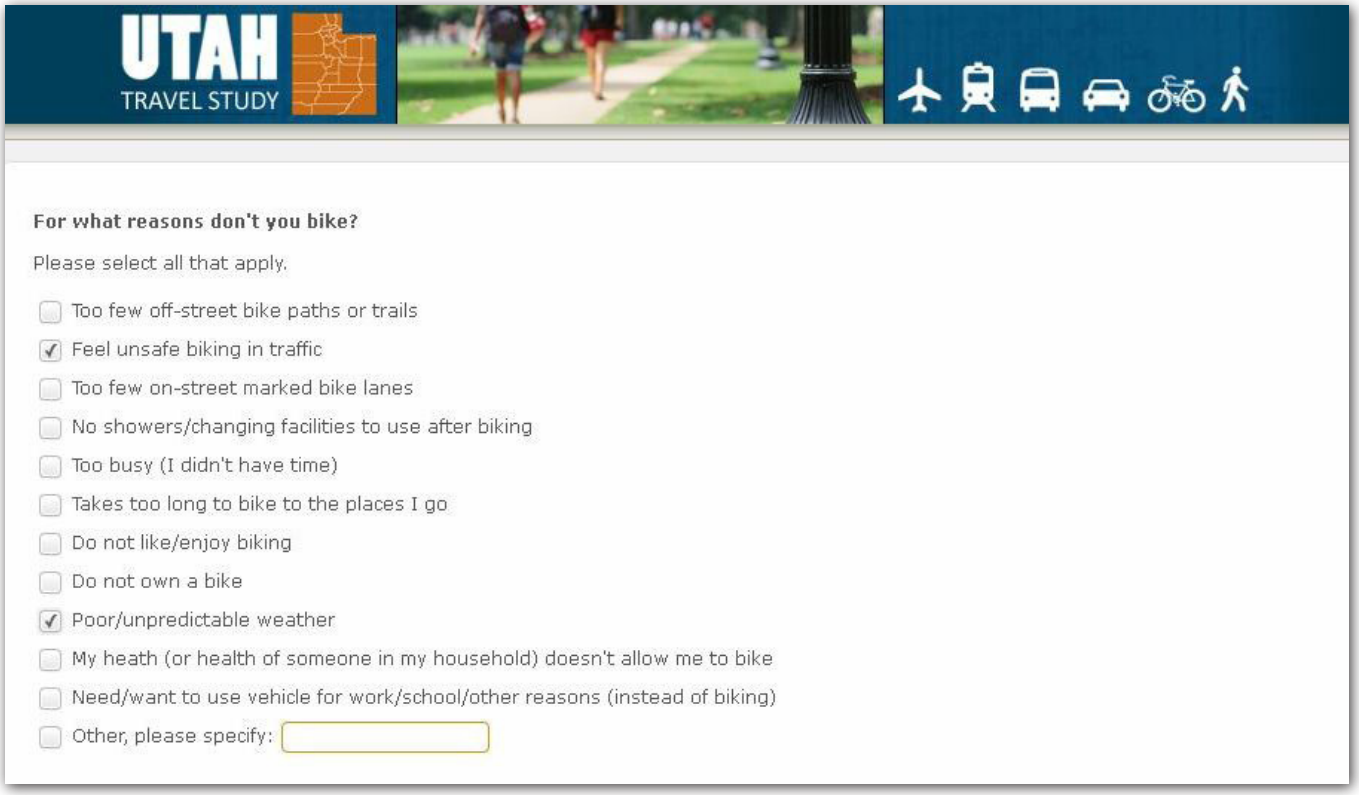
In addition to motorized modes, the questionnaire included questions about biking which were identical to the questions asked in the bicycle and pedestrian debrief of the Household Travel Survey. Respondents reported how many days they had gone for a bike ride in the last two weeks, and if they bike more or less often now than at the same time last year. Students who said they never bike were asked to select all reasons why from a list (Figure 3.13).

Similarly, students who had gone for bike rides in the last two weeks selected all reasons for why they bike. Both questions included fields for open ended answers.

Utah State University students were asked to list the most important transportation challenges and safety issues at the university. All students were given the opportunity to provide additional comments or suggestions about how to improve transportation to and from their campus or transportation in their region overall.

Finally, students were asked whether they were interested in being entered into the iPad raffle, and whether they would be willing to participate in future transportation surveys conducted by local transportation planning agencies. Students had the option of providing their email address for being contacted about the raffle and/or future surveys.

Figure 3.13: Reasons for Not Biking



4.0 DATA PREPARATION

After the survey administration was completed, RSG reviewed and prepared the data for agency analysis and travel demand modeling. Work completed included data cleaning, appending geographic data, weighting to 2010 college enrollment data, and making comparisons to current travel demand models.

4.1 DATA CHECKING

RSG completed a review of the data, and during this review process identified some data cleanup tasks necessary to prepare the data for analysis. Some of this work included piecing together data from different tables into one table, and some included actual cleaning of the data. The following describes the necessary data cleaning performed by RSG.

First, RSG ensured that the correct destination trip purposes for home and college were recorded. In the survey, respondents described their trip destinations in two ways:

1. Typing in a destination description in a text box, e.g. "my house"
2. Selecting the destination purpose from a list of 16 trip purposes:
   - Go home (or to dorm)
   - Go to primary workplace
   - Go to other work-related location
   - Attend class
   - School-related activity
   - Go to cafeteria
   - Go shopping (e.g., grocery store, mall)
   - Personal business (e.g., doctor, bank, etc.)
   - Pick-up/Drop-off someone else
   - Make a quick stop (e.g., ATM, drive-thru, etc.)
   - Go to restaurant to eat out/get take out
   - Attend social/recreational event (e.g., movies, visit friends/family)
   - Go to child's school/child care
   - Go to gym or go for exercise (e.g., go for a walk, jog, etc.)
   - Go to religious/community/volunteer activity
   - Other

The many categories allow for detailed analysis of reasons students make trips, and most purposes were worded to imply activities outside of the home. For model comparisons, however, it was necessary to represent home and work trips in a way that corresponded with the existing travel model. For example, it was possible for a respondent to describe the destination as home "my house", but choose "make a quick stop" or "pick-up/drop-off someone else" as the purpose. In these cases, and others, RSG recoded purposes so that when the chosen location was the student's home, the trip purpose was also 'home', and when the chosen location was the campus, the trip purpose was 'campus/class'. This recoding included coding trip purposes to something

other than home or campus in cases where the respondent had chosen 'home' or 'campus' purpose but the location description indicated something else, for example 'my friend's house' or 'my children's school'.

In addition, RSG recoded the housing variable to off-campus for students who said they live on-campus but attend colleges that do not offer on-campus housing. Last, respondents who concurrently enrolled in high school (e.g. a high school senior taking a class at the local college) were flagged.

4.2 DATA WEIGHTING

As described, the goal of the College Travel Diary administration was to achieve as many completed surveys as possible per participating college. As such, no efforts were made during data collection to match the composition of college student populations and the resulting differences in travel patterns.

First, the following student types were excluded from the weighting scheme (but retained in the dataset, with a weight of zero):

1. Part-time students reporting on-campus residence
2. Students only taking classes online (no regular trips to campus)
3. Students only attending extension centers
4. Students concurrently enrolled in high-school

Next, RSG identified two variables (full-time vs. part-time status and on-campus vs. off-campus resident) that could be used to weight the collected survey data to the full population of the college. These two demographic variables were combined to create three categories. Students were then assigned to one of those categories based on their survey answers (Table 3.3).

5. Full-time student living off campus
6. Full-time student living on campus
7. Part-time student living off campus (as noted above, part-time students living on-campus were excluded from the weighting scheme)

Table 3.3: Full- and Part-Time, On- and Off-Campus Students

	FULL-TIME		PART-TIME	
COLLEGE	ON CAMPUS	OFF-CAMPUS	OFF-CAMPUS	TOTAL
Dixie State College	19	311	73	403
LDS Business College	0	184	21	205
Salt Lake Community College	0	321	235	556
University of Utah	213	1,446	363	2,022
Utah State University	335	1,207	201	1,743
Utah Valley University	0	1,107	298	1,405
Weber State University -Ogden	53	624	168	845
Weber State University – Davis	0	63	38	101
Westminster College	10	43	5	58
Total	630	5,306	1,402	7,338

RSG contacted college budget offices to get full- and part-time student enrollment and the number of students living in dormitories. To match in time with the 2010 Census data used in the Household Diary weighting, fall 2010 headcount enrollment was used for the college control totals (Table 3.4).

Finally, RSG calculated a weight that was applied to each student based on their college and demographic category. For example, 213 full-time University of Utah students living on campus participated in the College Travel Diary survey. At the university itself, there are a total of 2,400 students who fall into this same category. Therefore, RSG applied a weight of 11.3 (2,400/213) to every full-time student at the University of Utah who lives on campus. In practice, this means that every survey record represents 11.3 students in that same category at the University of Utah (Table 3.5). Note that the four main campuses of Salt Lake Community College; Taylorsville, Miller, Jordan and South City, were treated as one group because of the small sample size. A total of 7,338 students were assigned weights. The other 585 students remain in the dataset, with a weight of zero.

Table 3.4: 2010 Enrollment

	FULL-TIME		PART-TIME	
COLLEGE	ON CAMPUS	OFF-CAMPUS	OFF-CAMPUS	TOTAL
Dixie State College	266	4,917	2,899	8,082
LDS Business College	0	962	837	1,799
Salt Lake Community College	0	8,751	16,514	25,265
University of Utah	2,400	19,630	8,789	30,819
Utah State University	3,477	9,848	3,147	16,472
Utah Valley University	0	14,619	8,553	23,172
Weber State University -Ogden	825	9,433	4,933	15,191
Weber State University –Davis	0	1,952	1,605	3,557
Westminster College	550	2,064	549	3,163
Total	7,518	72,176	47,826	127,520

Table 3.5: Person Weights

	FULL-TIME		PART-TIME	
COLLEGE	ON CAMPUS	OFF-CAMPUS	OFF-CAMPUS	TOTAL
Dixie State College	14.0	15.8	39.7	20.0
LDS Business College	0.0	5.2	39.9	8.8
Salt Lake Community College	0.0	27.3	70.3	45.4
University of Utah	11.3	13.6	24.1	15.1
Utah State University	10.4	8.1	15.4	9.3
Utah Valley University	0.0	13.2	28.4	16.5
Weber State University -Ogden	15.6	15.1	29.2	17.8
Weber State University –Davis	0.0	31.0	42.2	35.2
Westminster College	55.0	48.0	109.8	54.5

Zero-weight students: Dixie State College (18), Salt Lake Community College (78), University of Utah (13), Utah State University (293), Utah Valley University (122), Weber State University (61).

4.3 VARIABLES FOR MODELING

In order to prepare the dataset for modeling, some data manipulation was needed, such as recoding variables using travel modeling conventions (e.g. identifying productions and attractions). The following list details the variables in the dataset that RSG created for modeling purposes. Note that the processes used for College Travel Diary data preparation were, where possible, consistent with those used for the Household Travel Diary.

4.3.1 Geographic Variables

- **MPO and Region ID:** Counties were aggregated into MPO IDs (Cache, WFRC, MAG, Dixie, Tooele, Wasatch and UDOT) for simplicity purposes, even though each MPO's modeling or planning area does not necessarily include the most rural portions of the counties they belong to. MPOs were further aggregated into four regions (Cache, WFRC-MAG ("Wasatch Front"), Dixie, and UDOT), the most aggregate geography level (Table 3.6).
- **TAZs:** RSG developed a Traffic Analysis Zone (TAZ) system for this project by combining the TAZ systems of multiple models (listed below). The unique TAZ ID was created from: County FIPS * 10000 + TAZ ID. For TAZs within an MPO/RPO model area, the TAZ ID is the MPO/RPO model TAZID. For TAZs outside of MPO/RPO model areas, the TAZ ID is the USTM TAZ ID.
  - WFRC/MAG model
  - Cache MPO model
  - Dixie MPO model
  - Heber RPO model
  - Tooele RPO model
  - USTM model (outside the MPO and listed RPO areas)
- **Production and attraction TAZ:**
  - Home-based trips: Home TAZ is the production TAZ, the other end is the attraction TAZ.
  - Non-home based trips: Origin TAZ is the production TAZ, destination is the attraction TAZ.
- **MPO medium districts**

Table 3.6. Geography Equivalence Table

COUNTY FIPS	COUNTY NAME	MPO ID	MPO	REGION ID
5	CACHE	5	Cache	1
11	DAVIS	1	WFRC	2
35	SALT LAKE	1	WFRC	2
49	UTAH	2	MAG	2
57	WEBER	1	WFRC	2
53	WASHINGTON	6	Dixie	3
1	BEAVER	0	UDOT	4
3	BOX ELDER	0	UDOT	4
7	CARBON	0	UDOT	4
9	DAGGETT	0	UDOT	4
13	DUCHESNE	0	UDOT	4
15	EMERY	0	UDOT	4
17	GARFIELD	0	UDOT	4
19	GRAND	0	UDOT	4
21	IRON	0	UDOT	4
23	JUAB	0	UDOT	4
25	KANE	0	UDOT	4
27	MILLARD	0	UDOT	4
29	MORGAN	0	UDOT	4
31	PIUTE	0	UDOT	4
33	RICH	0	UDOT	4
37	SAN JUAN	0	UDOT	4
37	SAN JUAN	0	UDOT	4
39	SANPETE	0	UDOT	4
41	SEVIER	0	UDOT	4
43	SUMMIT	0	UDOT	4
45	TOOELE	4	Tooele	4
47	UINTAH	0	UDOT	4
51	WASATCH	3	Wasatch	4
55	WAYNE	0	UDOT	4

4.3.2 Trip Variables

- **Trip purposes:** The trip purposes were used to create a four-category trip purpose variable:
  - Non-home based
  - Home-based college
  - Home-based work
  - Home-based other
- **Time of day periods:**
  - AM Peak (6 - 9 AM)
  - Midday (9 AM - 3 PM)
  - PM Peak (3 - 6 PM)
  - Night (6 PM – 6 AM)
- **Model trip distance and model travel time**: Based on the reported origin and destination TAZs, travel times and trip distances were added to the survey dataset from the MPO travel models, which vary depending on the location of the specific institution.

5.0 DATA ANALYSIS

5.1 SUMMARY TABULATIONS

Selected demographic variables that are relevant to travel are summarized in Table 3.7, Table 3.8, Table 3.9, and Table 3.10.

Table 3.7: College Demographics – Student Category

COLLEGE/UNIVERSITY	NUMBER OF STUDENTS	FULL TIME, LIVE ON CAMPUS	FULL TIME, LIVE OFF CAMPUS	PART TIME, LIVE ON CAMPUS	PART TIME, LIVE OFF CAMPUS
Dixie State College	421	5%	77%	0%	18%
LDS Business College	205	0%	90%	0%	10%
Salt Lake Community College	634	0%	57%	0%	43%
Utah State University	2036	17%	65%	1%	16%
Utah Valley University	1527	0%	78%	0%	22%
University of Utah	2035	11%	71%	1%	18%
Weber State University	1007	5%	71%	1%	23%
Westminster College	58	17%	74%	0%	9%
Total	7923	8%	71%	1%	21%

Table 3.8: College Demographics - Gender

COLLEGE/UNIVERSITY	NUMBER OF STUDENTS	MALE	FEMALE
Dixie State College	421	44%	56%
LDS Business College	205	53%	47%
Salt Lake Community College	634	45%	55%
Utah State University	2036	51%	49%
Utah Valley University	1527	59%	41%
University of Utah	2035	51%	49%
Weber State University	1007	44%	56%
Westminster College	58	40%	60%
Total	7923	51%	49%

Table 3.9: College Demographics – Off-Campus Job

COLLEGE/UNIVERSITY	NUMBER OF STUDENTS	WORKS OFF CAMPUS	DOES NOT WORK OFF CAMPUS
Dixie State College	421	58%	42%
LDS Business College	205	59%	41%
Salt Lake Community College	634	71%	29%
Utah State University	2036	49%	51%
Utah Valley University	1527	70%	30%
University of Utah	2035	55%	45%
Weber State University	1007	72%	28%
Westminster College	58	60%	40%
Total	7923	60%	40%

Table 3.10: College Demographics - Smart Phone Ownership

COLLEGE/UNIVERSITY	NUMBER OF STUDENTS	OWNS A SMART PHONE	DOES NOT OWN A SMART PHONE
Dixie State College	421	45%	55%
LDS Business College	205	52%	48%
Salt Lake Community College	634	63%	37%
Utah State University	2036	41%	59%
Utah Valley University	1527	57%	43%
University of Utah	2035	60%	40%
Weber State University	1007	58%	42%
Westminster College	58	69%	31%
Total	7923	54%	46%

Figure 3.14: Household Member Types (Live Off-Campus and Not Alone)

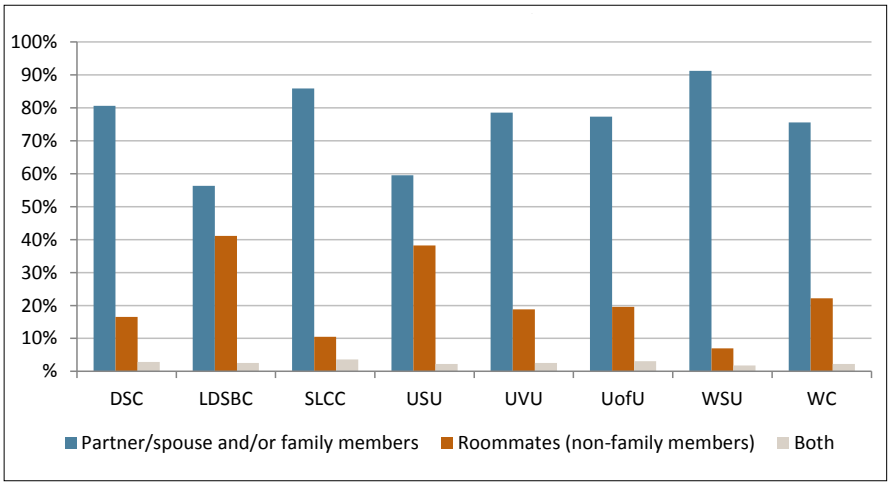


Figure 3.14 shows differences in household member type among students living off-campus and not alone. At LDS Business College, 41% of these students have roommates, (56 percent live with family), compared to Salt Lake Community College, where only 10% of these students have roommates (86% live with family).

5.2 MODEL RELATED ANALYSIS

The survey data collected in this study will be used to enhance existing travel models in Utah. RSG has taken the initial step of evaluating several aspects of the existing models and underlying data compared to these new data. Note the *weighted* College Travel Diary data were used in these comparisons. Key findings for trip generation, trip distribution, mode choice and auto travel are presented here.

The trips reported in the College Travel Diary excluded short, intra-campus trips (e.g. lecture hall to cafeteria). Therefore, the dataset consists of trips made on publicly maintained roadways and transit systems, and this is sufficient when the data are to be used in supporting a four-step travel demand model.

Note that Weber State University's Davis campus is included in the survey data and therefore in the following comparisons, but it is not currently included in existing models.

5.2.1 Trip Rates

The current travel demand model assumes the home-based college trip rate to be 1.5 daily trips per full-time equivalent (FTE). RSG's comparisons used headcount instead of FTE. Figure 3.15 shows survey person trip-rates for students living off-campus. At 1.49, Utah State University has the highest home-based college trip rate; clearly, the average survey home-based college trip rate is substantially lower than the rate of 1.5 currently used in the model. Dixie State College (Dixie region) has the highest overall trip rate (4.53), with Utah State University (Cache region) second (4.39). University of Utah has the lowest overall trip rate (3.83). Students at colleges with higher trip rates have shorter distances between home and college, allowing for more trips between home and college in a day (see "Trip Distributions").

In addition to model comparison, the College Travel Diary trip data were compared to the Household Travel Diary data for each region. Figure 3.16 shows the comparison between college trip rates and household trip rates for the universe which includes the WFRC, Cache, and Dixie regions combined. The relationship was the same across these individual regions. The student person trip rate is higher than the regional average person trip rate, even though intra-campus trips are excluded from the dataset. Students make fewer home-based other trips, but instead make more non-home-based trips.

Figure 3.15: Trip Rate by Purpose

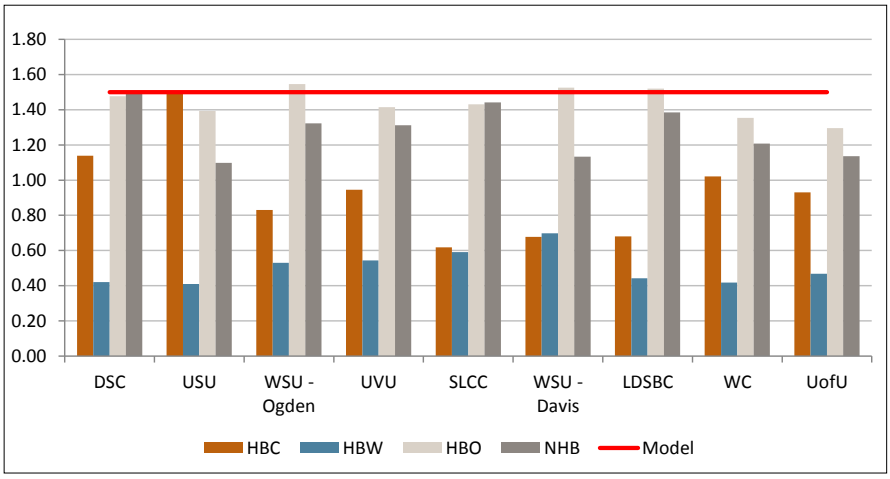
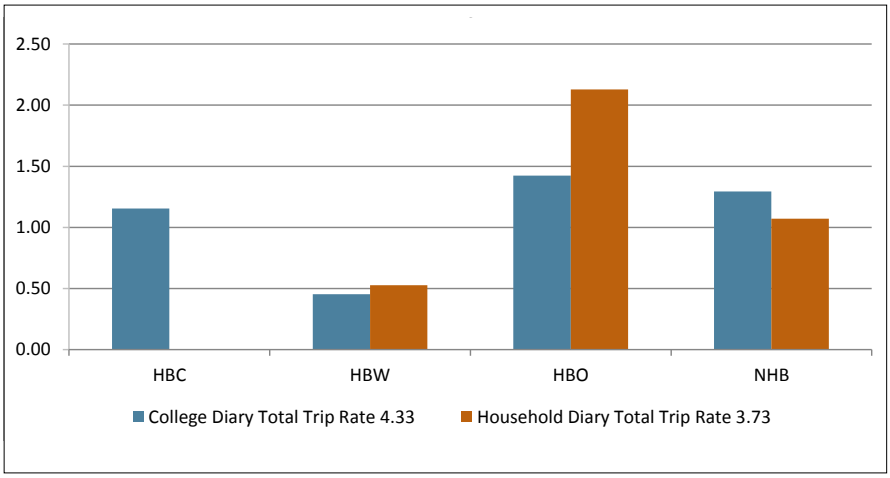


Figure 3.16: Person Trip Rate - College Diary vs. Household Diary



5.2.2 Trip Distributions

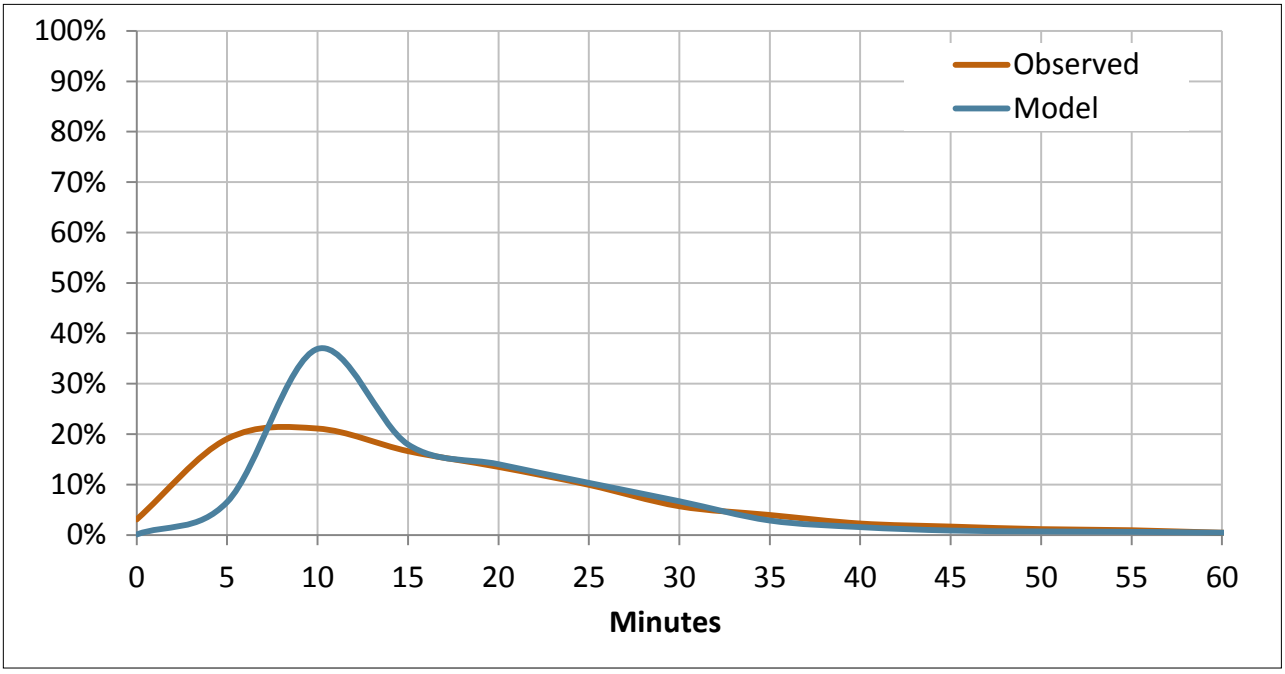
Table 3.11 shows the average home-based college network trip distances and travel times (assumes auto transportation). How far off-campus students live relative to campus differs substantially between colleges (and regions), ranging from an average distance of two miles for Utah State University students, to an average of almost nine miles for Weber State University - Ogden. Distributions of home-based college trip distance and travel time were compared to the model in each region. Two minutes of terminal time were added to survey time. The models generally follow the survey data, with some exceptions, like the higher frequency of shorter (around 5 minute) travel times in the WFRC region (Figure 3.17).

Table 3.11: Trip Distance and Travel Time - HBC

COLLEGE	CAMPUS	AVERAGE DISTANCE (MILES)	AVERAGE TIME (MINUTES)
Utah State University		2.0	7.2
Dixie State College		3.3	11.0
Westminster College		3.5	9.8
Utah Valley University		5.9	15.3
Weber State University	Davis	6.1	16.1
Salt Lake Community College	Miller	6.9	18.1
Salt Lake Community College	Taylorsville	7.7	17.4
Salt Lake Community College	South City	7.7	16.1
University of Utah		8.0	18.9
Salt Lake Community College	Jordan	8.1	18.1
LDS Business College		8.5	16.0
Weber State University	Ogden	8.9	20.0

Note: Off-campus students only

Figure 3.17: Trip Length Frequency - WFRC



5.2.3 Mode Shares

Home-base college mode shares (Figure 3.18) were compared to the model (Figure 3.19). Overall, the model overestimates the share of auto trips for home-based college travel. The model assumes an average non-auto mode share of 7%, while the survey data show a non-motorized mode share of 13%. Non-auto mode shares are especially large for University of Southern Utah (41%), Westminster College (39%) and LDS Business College (24%).

Figure 3.18: HBC Mode Shares – College Diary

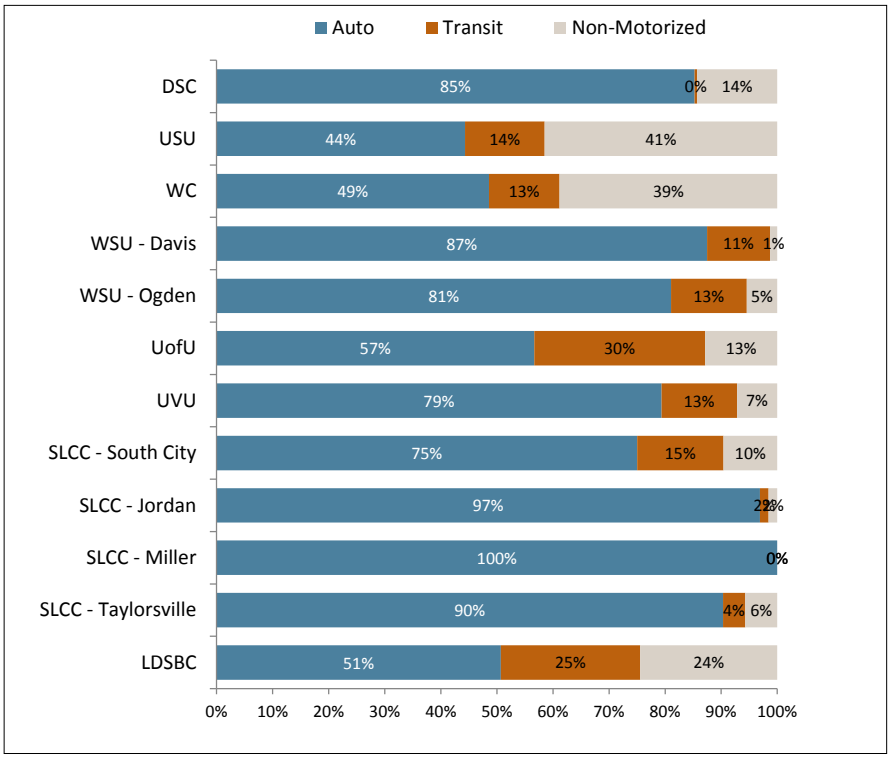
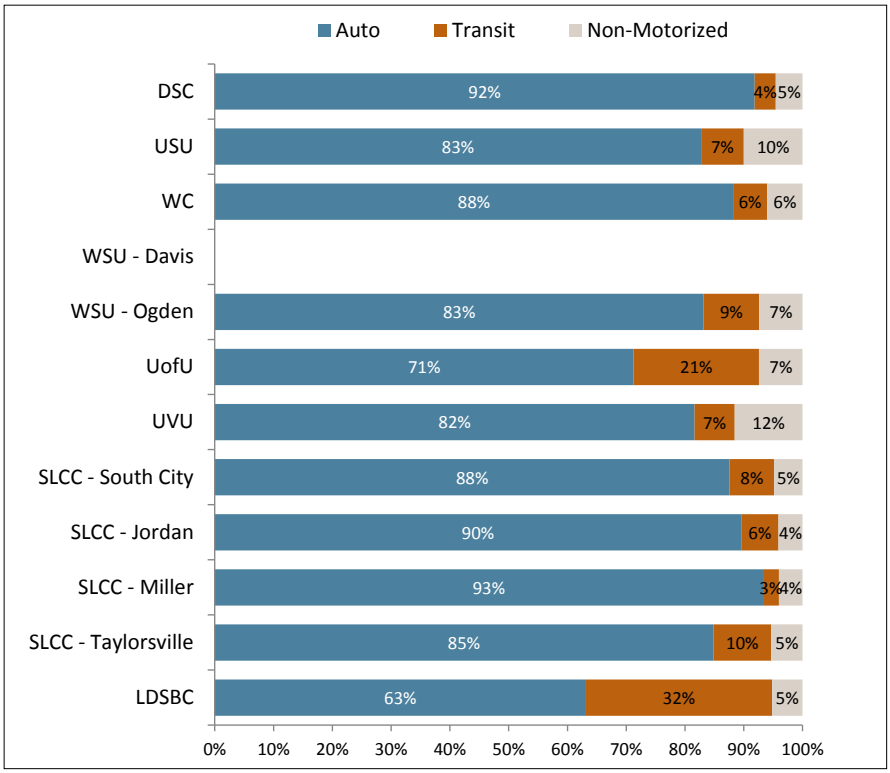


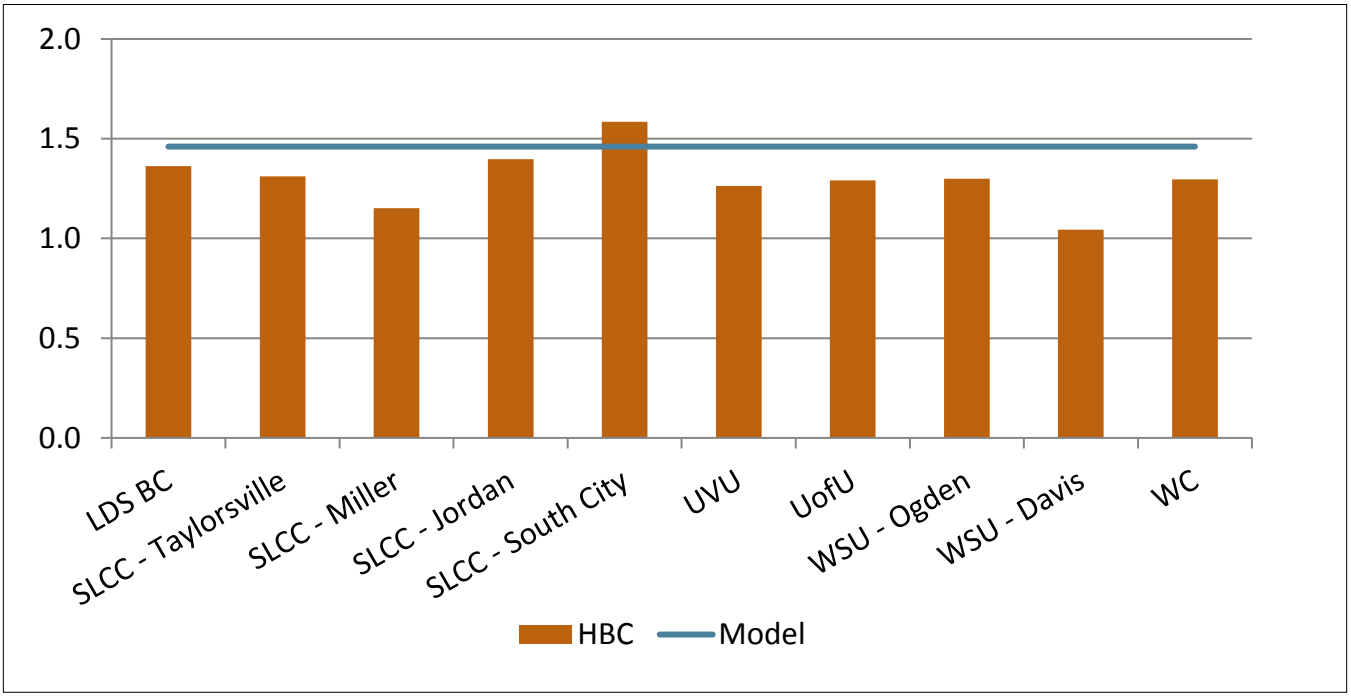
Figure 3.19: HBC Mode Shares - Model



5.2.4 Auto Occupancies

Auto occupancies were compared to the model. The model over-predicts home-based college auto occupancy (1.46), and under-predicts auto occupancy for other home-based trips (1.63).

Figure 3.20: Auto Occupancy – Home-Based College



5.2.5 Time of Day / Diurnal Distributions

Time of day distributions were created from survey trip departure times, and compared the models. Current models assume the time of day distribution for home-based college travel closely follows the distribution for home-based work. The comparison to survey data (Figure 3.21) shows the college time of day distribution differs considerably from the home-based work model assumption. Home-based college travel has a distinct AM peak, similar to, but not as pronounced, as home-based work (the dashed line). Unlike home-based work, college travel has no PM peak. Overall, college travel is more spread out during the day.

Figure 3.21: Auto Occupancy - Home-Based Other

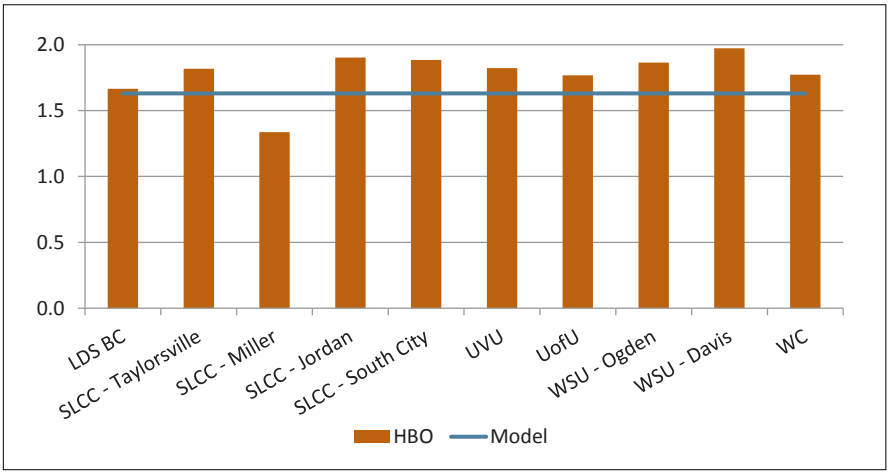
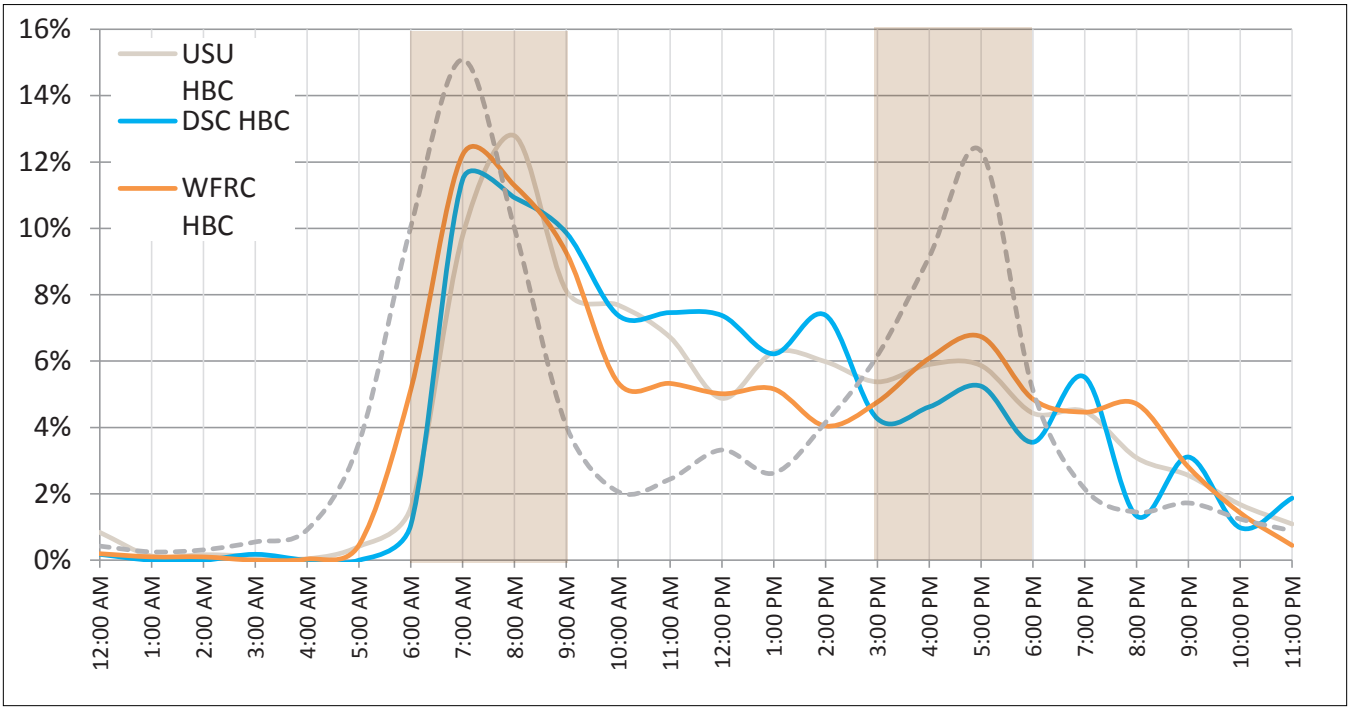


Figure 3.22: Diurnal Distribution - HBC vs. WFRC HBW



A better understanding of preferred bicycling and walking environments allows cities to more effectively meet demands for non-motorized infrastructure. The Bicycle and Pedestrian Survey contains travel behavior data from over 5,000 adults from over 2,500 households throughout the state. Of those surveyed, 71% of all adults reported making at least one walking trip of 10 minutes or more in the week prior to being surveyed and 44% of respondents in all regions reported they have biked before. The vast majority indicated inadequate, incomplete, or missing infrastructure as the largest barrier to walking and bicycling.

IV. BICYCLE & PEDESTRIAN SURVEY

1.0 INTRODUCTION 90

2.0 ADMINISTRATION 91

2.1 Survey Sample 91
2.2 Survey Invitation Materials..... 93
2.3 Survey Retrieval..... 94
2.4 Pre-Test Survey 94
2.5 Full Survey 94
2.6 Survey Incentives..... 96

3.0 QUESTIONNAIRE 97

3.1 Debrief Survey 97
3.2 Barriers Survey 98

4.0 DATA PREPARATION 104

4.1 Data Checking..... 104
4.2 Data Weighting..... 104

5.0 DATA ANALYSIS.....105

5.1 Summary Tabulations – Debrief Survey..... 105
5.2 SUmmary taBULATIONS – Barriers Survey 108

1.0 **INTRODUCTION**

Two bicycle and pedestrian surveys were conducted as part of the Utah Travel Study: the Bicycle and Pedestrian Debrief Survey ("debrief survey" or "walk/bike debrief survey"), which was conducted in conjunction with the Household Travel Diary survey, and the Bicycle and Pedestrian Barriers Survey ("barriers survey" or "walk/bike barriers survey"), which was conducted in the fall of 2012 and open to any Utah resident.

Non-motorized transportation plays an important role in transportation systems. Bicycling and walking support and connect other modes as well as offer an alternative; and for some, non-motorized transportation is the only alternative available. Additionally, many cities are increasingly interested in making bicycling and walking a more attractive alternative for a variety of reasons, including concerns about air quality, infrastructure costs, and public health issues. Collecting more information about non-motorized transportation behaviors and why people choose to walk and bike (or not) helps shape policy. A better understanding of preferred bicycling and walking environments allows cities to more effectively meet current and latent demands for non-motorized infrastructure.

The purpose of the Debrief Survey was to record current bicycling and walking habits. The primary purpose of the Barriers Survey was to identify the needs of bicyclists and pedestrians. In particular the survey sought to identify and locate physical barriers where specific infrastructure changes could improve the traveling environment for people who already bike or walk, as well as potentially encouraging more biking and walking. The Barriers Survey also recorded current non-motorized travel habits and attitudes.

2.0 ADMINISTRATION

RSG administered the two bicycle and pedestrian surveys separately during the course of the Utah Travel Study. The Bicycle and Pedestrian Debrief Survey was administered to a portion of the adults who completed the Household Travel Diary. The Bicycle and Pedestrian Barriers Survey was broadly advertised and was open to any Utah resident who wished to participate.

The administration approaches for each survey are summarized in Table 4.1.

Table 4.1: Overview of the Administration of the Debrief and Barriers Bicycle and Pedestrian Surveys

	DEBRIEF SURVEY	BARRIERS SURVEY
Time period	March – July 2012	September – November 2012
Invitees	28% of all invited households (the remaining 72% of households were randomly assigned to either the Attitudinal Debrief or the Long Distance Debrief). Rural residents were not invited to the Walk/Bike Debrief Survey.	40% of the households that completed the diary survey and were willing to participate in future surveys (the remaining 60% of households were invited to the Standalone Long Distance survey). The general public was also invited.
Outreach	Nothing specific to the walk/bike survey beyond the overall invitation packet and postcards	RSG sent email invitations to selected households from the Household Travel Diary; RSG and partner agencies also sent an open invitation to a variety of community organizations.
Survey method	Seamless transition between the one-day diary and Walk/Bike Debrief survey	Any interested resident could access the survey via an open website link
Final sample size	5,071 individual completes	1,987 individual completes (some data from partial-completes were used for analysis)

2.1 SURVEY SAMPLE

2.1.1 Debrief Survey

Each household that was invited to participate in the Utah Travel Study was randomly assigned to one of three debrief surveys: Attitudinal, Walk/Bike, or Long Distance. The respondents selected for invitation to the Bicycle and Pedestrian Debrief Survey all resided in urbanized areas (including the four MPO regions – Wasatch Front Regional Council (WFRC), Mountainland Association of Governments (MAG), Cache MPO, and Dixie MPO). Urban residents were emphasized for the Bicycle and Pedestrian Debrief sample because rural residents are typically less impacted by non-motorized transportation issues, and therefore would be more able and likely to respond to the other debrief surveys. 2,562 of the 34,412 households that were invited to the Bicycle and Pedestrian Debrief Survey went on to complete the entire survey. This response rate (7.5%) was consistent across all three debrief surveys.

2.1.2 Barriers Survey

The first of two groups invited to the Barriers Survey came from the Household Travel Diary sample. Approximately 84% (7,715 of 9,155) of households who completed the Household Travel Diary and entered a valid email address also demonstrated a willingness to participate in future surveys. All of these households were invited to participate in one of the two additional surveys that were administered in the fall of 2012:

- Standalone Long Distance Survey (5,533 invited households):
  - All households from the UDOT (or rural) region (the Long Distance survey is more relevant for rural residents than is the Walk/Bike Barriers survey)
  - Two-thirds of the households from all other regions
- Walk/Bike Barriers Survey (2,182 invited households):
  - All remaining households

The second group was a convenience-based sample. WFRC, the other agencies, and RSG collaborated to develop a list of Utah businesses and community organizations that were identified as potential partners for advertising the survey to their respective communities. In addition, the agencies sent the invitation to their own email distribution lists. The list included organizations that were likely to have an interest in biking or walking issues, such as bicycle shops, biking and running teams, parent organizations, and neighborhood groups. The organizations were contacted and asked to forward the survey information to their constituents. RSG and the stakeholder committee worked with these organizations by providing information, invitation language, and instructions about the survey. Also, as the survey link was an open link (and no passwords were required for participation), participants were encouraged to forward the link to their friends and neighbors.

2.2 SURVEY INVITATION MATERIALS

2.2.1 Debrief Survey

There was no special mention of the Walk/Bike Debrief survey in the invitation materials that were distributed to invitees of the Utah Travel Study.

2.2.2 Barriers Survey

All communications and materials for the Bicycle and Pedestrian Barriers Survey were electronic. An invitation email and a reminder email were sent directly to the first group of people invited to the Walk/Bike Barriers survey – those households that participated in the Household Travel Diary survey. This email introduced the survey, asked for their participation, and provided the survey web-link.

To recruit the convenience sample,RSG sent emails to businesses and organizations to recruit them for advertisement assistance. These emails introduced the survey, explained how the results would be used, asked for the organization's help in publicizing the survey, and provided information for the organization to ask RSG questions and take the necessary next steps. Overall, 152 businesses and organizations were identified for this recruitment effort, including the University of Utah's Commuter Services which self-identified their interest. Figure 4.1 summarizes the numbers and types of organizations identified, and a complete list is included in the Appendix to this report.

Additionally, RSG provided organizations with a flyer (Figure 4.2) that could be printed and displayed in a physical location or used electronically either on their website or as an attachment to the invitation email.

Figure 4.1: Organizations Recruited for Survey Distribution

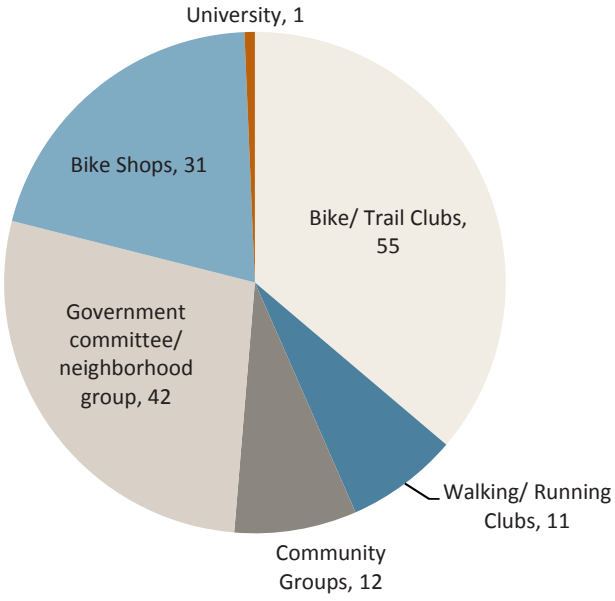


Figure 4.2: Flyer for the Bicycle and Pedestrian Barriers Survey

2.3 SURVEY RETRIEVAL

2.3.1 Debrief Survey

The Walk/Bike Debrief survey was administered in conjunction with the main Household Travel Diary survey, which launched on 23 March 2012 (the first travel date was 27 March 2012) and closed on 9 July 2012. The primary survey instrument was the RSG online survey, administered through a website produced specifically for the project. Participants logged into the survey website and entered their household-specific 8-digit password. This password was included in the invitation packet as well as on each of the postcard and email reminders. At any point, respondents could exit out of the survey and later return to the survey homepage, log in using their password, and continue from where they left off. The Walk/Bike Debrief survey was simply the last section of the main Household Travel Diary survey for each adult to complete.

For respondents who preferred not to complete their survey online or lacked Internet access, members could call a toll-free number and Westat operators were available to administer the survey over the phone (see Chapter 1 for more information).

The online survey was also offered in both English and Spanish; respondents could easily choose to switch back and forth between English and Spanish on each page of the survey. Participants who opted to take the survey by phone were provided foreign language service that as part of Westat's standard survey operation.

The structure of the survey and the questions remained the same for both English and Spanish survey versions, and the Spanish version represented a direct translation from the English version. Therefore, all responses were analyzed as one dataset, regardless of survey language.

2.3.2 Barriers Survey

As with other "additional" surveys (the Standalone Long Distance Survey and the Residential Choice Stated Preference Survey), respondents were only able to complete the survey online. Respondents were notified about and invited to the survey via email. RSG also monitored the email address to help respond to questions and provide support when needed. This survey was programmed exclusively in English.

2.4 PRE-TEST SURVEY

2.4.1 Debrief Survey

In order to ensure high data quality and evaluate the survey methodology, both the Walk/Bike Debrief survey and Walk/Bike Barriers survey included a pre-test.

The Debrief Survey pre-test was conducted as a part of the Household Travel Diary's pre-test during January and February 2012. In the pre-test, 4,230 households were invited to take the Utah Travel Study (see Chapter 1 for more information).

RSG pre-tested the Bicycle and Pedestrian Barriers Survey with Utah's regional and state transportation agencies and selected bicycle and pedestrian planning consultants during the development of the survey. Additionally, the survey began with a soft launch on 26 September 2012 to identify potential issues. For this soft launch, the initial invitation was emailed to 151 individuals (about 7% of the sample from the Household Travel Diary group). At the end of the first five days, 12% of the soft launch group had responded, and no substantial issues were identified with the website from these responses.

2.5 FULL SURVEY

2.5.1 Debrief Survey

All invited households were randomly assigned one of 33 travel dates beginning on Tuesday, March 27, 2012 and ending on Thursday, June 28, 2012. To best capture a snapshot of each member's typical weekday trips, all assigned travel dates occurred on a Tuesday, Wednesday, or Thursday. As previously mentioned, the Walk/Bike Debrief survey was appended to the one-day travel diary for approximately 28% of all households. Adults participated in the Debrief Survey as a part of this full survey effort.

2.5.2 Barriers

After the soft launch, the invitation with the survey link was emailed to the remainder of the sample from the Household Travel Diary (2,031 individuals) and to the businesses and organizations recruited for advertisement assistance. The full survey was launched on 1 October 2012. A reminder email was sent to the Household Travel Diary group on 10 October (excluding 48 participants who had unsubscribed or who had invalid email addresses). Three reminder emails were sent to the businesses and organizations throughout the month of October to encourage more participation.

In both the invitation emails and on the survey website, an email address was provided so that participants could contact RSG with questions or comments. RSG has a standard of replying to emails within one business day. Several people emailed with comments about bicycling and walking in Utah, the content of which are provided in the Appendix.

The survey website was closed on 20 November 2012.

In total, 1,987 completed, valid responses were recorded by the end of the survey. Responses for an additional 199 incomplete respondents are included in the final dataset. . Incomplete responses were included from any respondents who were able to provide at least one mapped bike or walk problem location. Throughout this chapter, all tables, charts, and other data summaries only refer to complete responses unless otherwise noted. Figure 4.3 shows the total completed responses by respondents' home region, and Figure 4.4 shows the number of reported bike and walk problem locations by home region (including locations reported by respondents who did not complete the entire survey).

Because the survey was a broadly advertised open link and because membership numbers for each organization are not known, it is not possible to identify response rates from each invitation source. However, the survey included an open ended question asking respondents to report where they had heard about the survey. Some respondents said they heard about the survey from multiple sources, while others described a more general source (such as "in an email" or "on Facebook"). Approximately 93% of respondents provided a response. Figure 4.5 shows the responses categorized by the primary type of survey invitation or information source reported.

Figure 4.3: Completed Surveys by Home Region

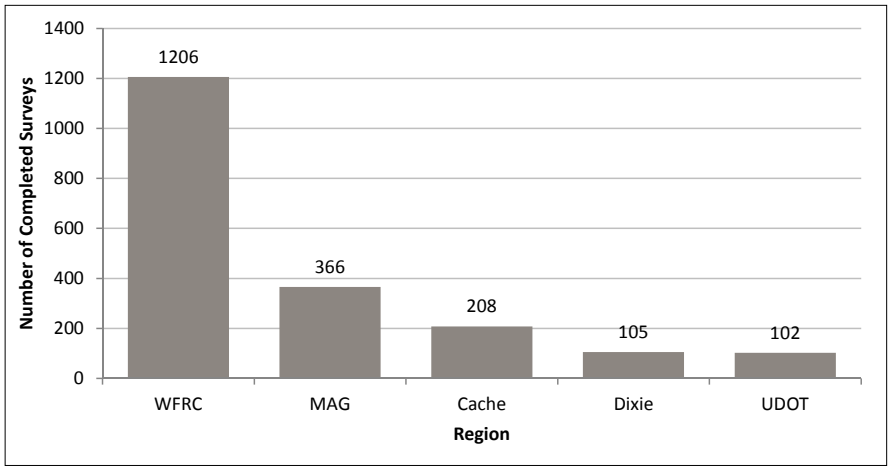


Figure 4.4: Number of Reported Bike and Walk Problems by Home Region

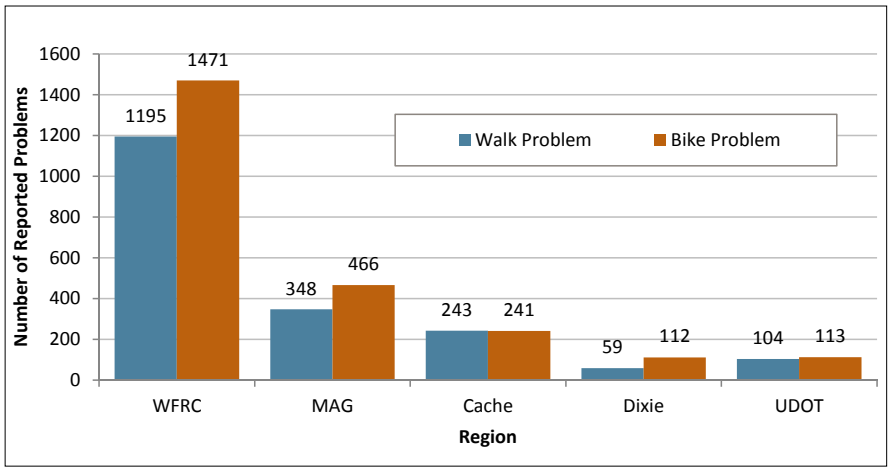
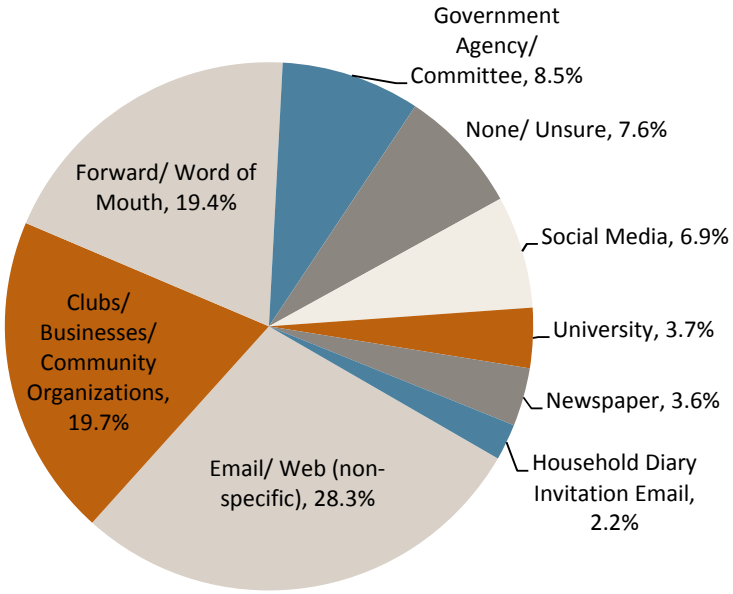


Figure 4.5: Completed Surveys by Invitation Source



2.6 SURVEY INCENTIVES

Incentives were offered to encourage participation in both surveys. For the Walk/Bike Debrief survey, households received a $10 incentive (an Amazon.com gift card) for completing the main Household Travel Diary survey. Participants who completed the Bicycle and Pedestrian Barriers Survey were invited to enter a raffle for an Apple iPad. The survey invitation materials all advertised this raffle. The raffle drawing was conducted after the survey closed, and the winner was randomly drawn from the respondents who provided their email address for the raffle.

3.0 QUESTIONNAIRE

3.1 DEBRIEF SURVEY

The Bicycle and Pedestrian Debrief Survey consisted of three sections:

- Pedestrian habits
- Bicycle habits
- Attitudes

Because this was connected to the Household Travel Diary, which included demographic questions, no individual or household demographic questions were required. Also, because it immediately followed the Household Travel Diary, the Debrief Survey was intentionally kept short, including 12 questions in total.

The questionnaire and screenshots of the online survey are included in the Appendix.

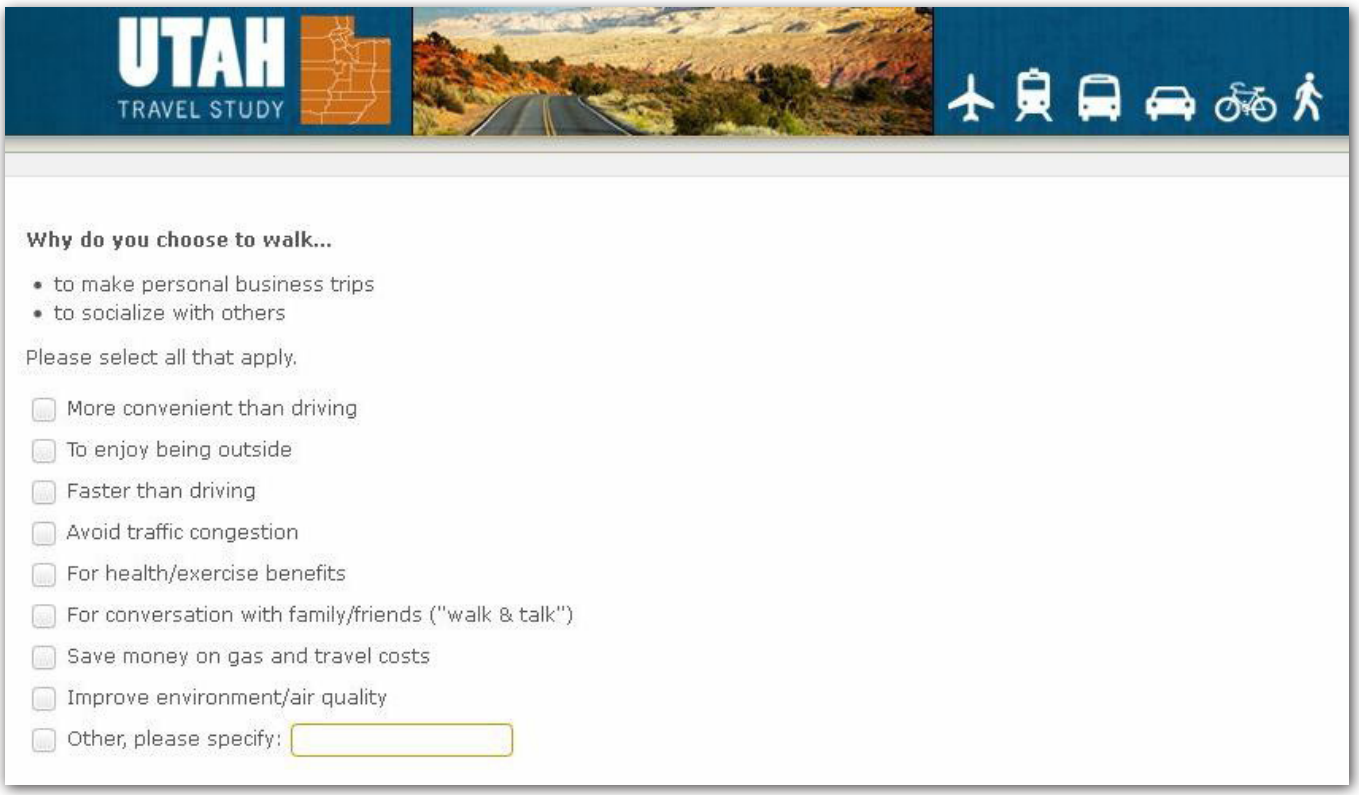
3.1.1 Pedestrian Habits

The pedestrian section of the Debrief Survey asked respondents to report their typical walking habits, types of destinations, and the reasons that they chose to walk or not.

First, respondents were asked how frequently they had gone for a walk (of more than ten minutes) in the past week. A follow up question asked how their current walking frequency compared to their typical walking frequency the previous year.

If the respondent reported not walking at all in the past week, they were then asked to identify one or more reasons that they did not walk from a list, while respondents who reported walking at least once were instead asked to identify one or more typical purposes for their walk trips. If those respondents chose any purpose that was not "exercise", they were then also asked why they chose to walk for that purpose (Figure 4.6).

Figure 4.6: Debrief Survey – Reasons for Walking for Transportation



3.1.2 Bicycle Habits

The bicycle section of the Debrief Survey asked respondents to report their typical bicycling habits, types of destinations, and the reasons that they chose to bike or not. The questions were identical in format to the walking questions. The primary differences were that respondents were asked about the frequency of biking trips in the past *two* weeks, and the answer choices varied slightly in the questions about why a respondent did not bike, the purposes of the bike trips they did make, and the reasons they bicycled for transportation.

3.1.3 Attitudes

The last two questions in the survey asked respondents about their perceptions of the existing bicycling and walking environments and their opinion about the importance of bicycling and walking. The first question asked respondents to agree or disagree with various statements about bicycling and walking (Figure 4.7), and the last question, an open-ended text box, allowed respondents to comment on or suggest improvements to the bicycling and walking environments in their town.

3.2 BARRIERS SURVEY

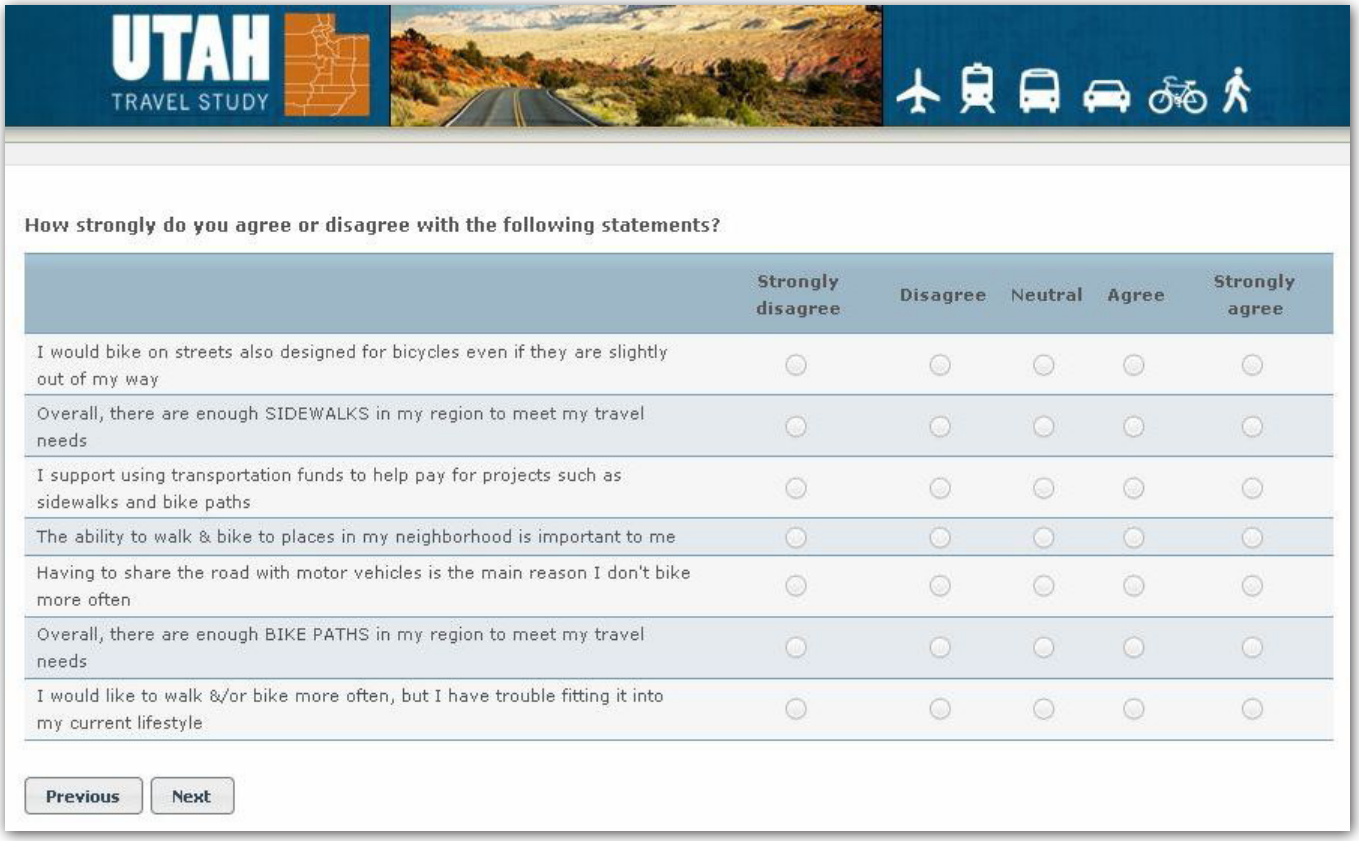
The Bicycle and Pedestrian Barriers Survey was also developed in collaboration with the stakeholder committee. Many of the questions drew on recent research and examples of surveys from other cities, including, among others, a 2006 survey from New York City, a 2011 survey from Portland, Oregon, and an Environmental Barriers Assessment survey from Wasatch Rides and the Disability Law Center.

The Barriers Survey included demographic questions, questions about typical bicycling and walking behavior (similar to those in the Debrief Survey), more extensive attitude questions, and questions asking for detailed infrastructure problems at specific locations. The survey included five main sections:

1. Household Details and Screening
2. Pedestrian Habits and Barriers
3. Bicycle Habits and Barriers
4. Attitudes
5. Demographic Details and Closure

The questionnaire script and screenshots of the online survey are included in the Appendix.

Figure 4.7: Debrief Survey – Bicycle and Pedestrian Attitudes



3.2.1 Household Details and Screening

The first four questions collected basic information about the respondents' household size, bicycle ownership, and employment status. Household size (including number of adults and number of children) is a valuable baseline variable for any survey as it can easily be compared with other data, but it also may correlate with a household's ability or desire to use non-motorized transportation. Similarly, the number of bicycles a household owns is an important factor for interpreting responses to questions about bicycling behavior and attitudes.

These demographic questions, as well as the employment status question, were asked at the beginning of the survey as the responses could be used to filter out irrelevant questions or answer choices later in the survey. The last question in this section allowed respondents to choose whether they wanted to respond to walking questions, biking questions, or both (Figure 4.8).

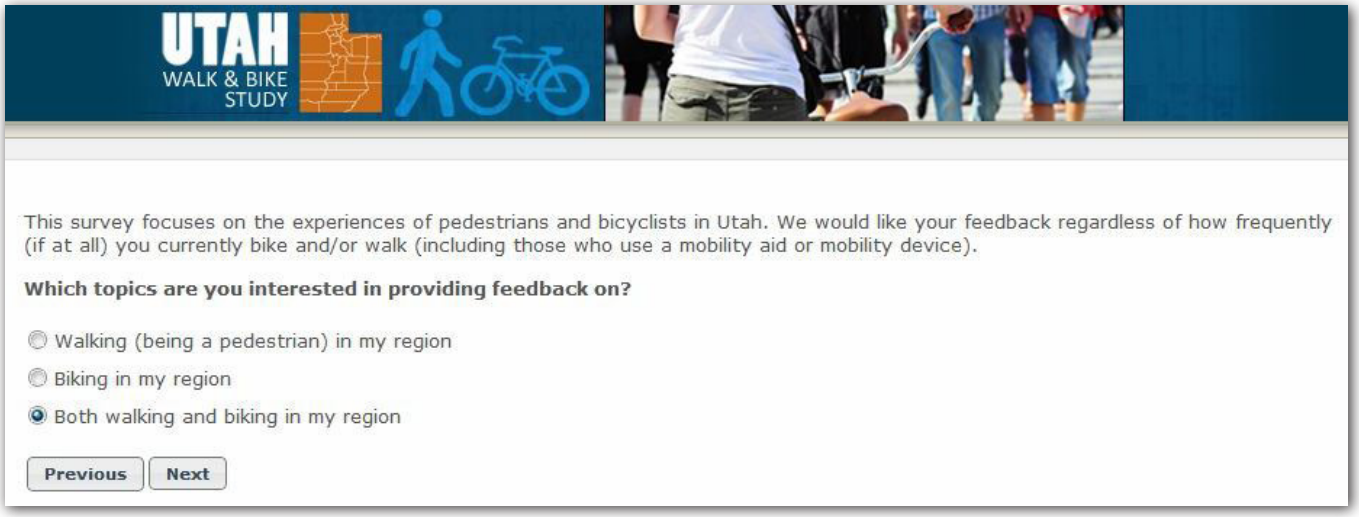
3.2.2 Pedestrian Habits and Barriers

Respondents who were interested in completing the pedestrian section of the Barriers Survey began with questions similar to those in the Debrief Survey:

- Current walk frequency: The answer set included the option "I walk, but did not go for a walk of 10 or more minutes in the last week" so that the survey could distinguish between those who walk infrequently and those who never walk
- Walk frequency compared to the same time last year
- Typical reasons for walking (if respondent ever walks)
- Typical reasons for not walking

All respondents were asked this question as it is possible that a person who walks for some of their trips may still have concerns that prevent them from walking in other locations or for other purposes.

Figure 4.8: Barriers Survey – Topic Screening



The next set of questions asked respondents about specific locations that they thought needed pedestrian improvements. First respondents were asked if they knew of locations that could be improved. If respondents said yes, they were asked to list the all locations they wanted to be improved (Figure 4.9). The survey interface included an "Add another location" button, which allowed respondents to list as many locations as they desired. Once the list of problem locations was established by the respondent, the survey "looped" through each location and asked respondents to:

- Describe the problem in more detail (Figure 4.10)
- Type of problem
- Type of area
- Description of problem (open-end text box)
- Severity of the problem
- Locate the problem (Figure 4.11).

The last question in the pedestrian section asked respondents to rate their comfort with different types of infrastructure (Figure 4.12). This was asked to identify the types of infrastructure improvements that different types of residents would be most comfortable using.

Figure 4.9: Barriers Survey – Walk Problem Location Roster

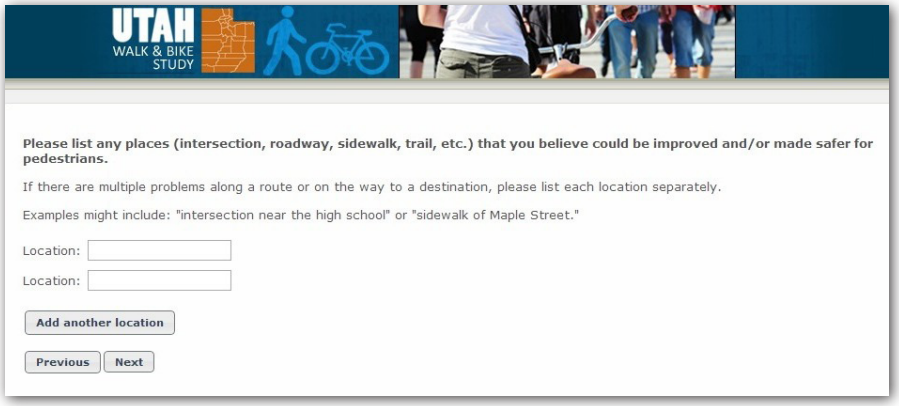


Figure 4.10 Barriers Survey – Walk Problem Details

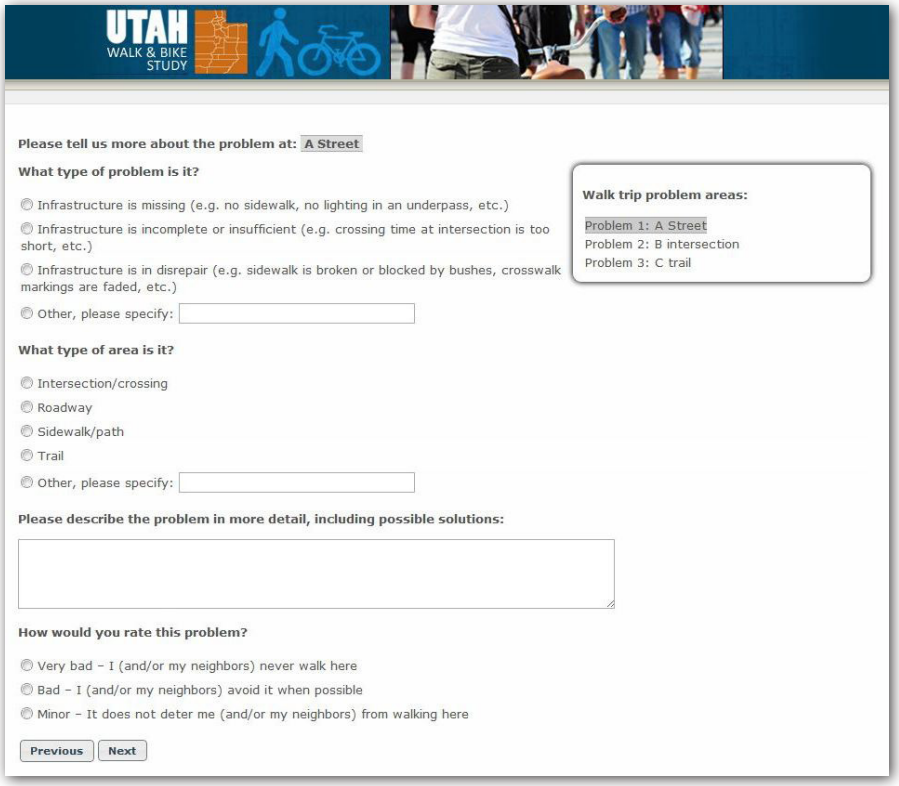


Figure 4.11 Barriers Survey – Walk Problem Geocoder

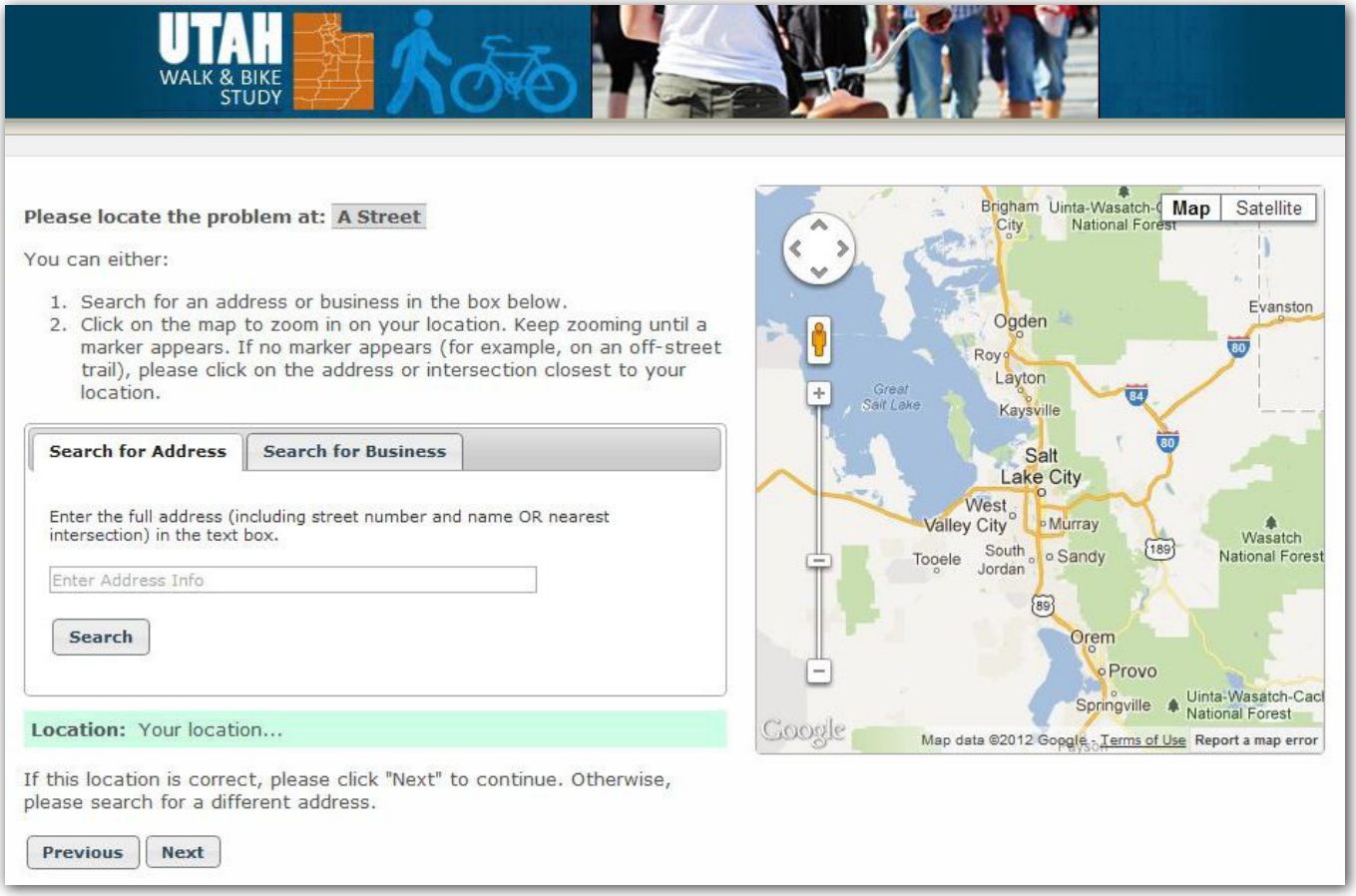
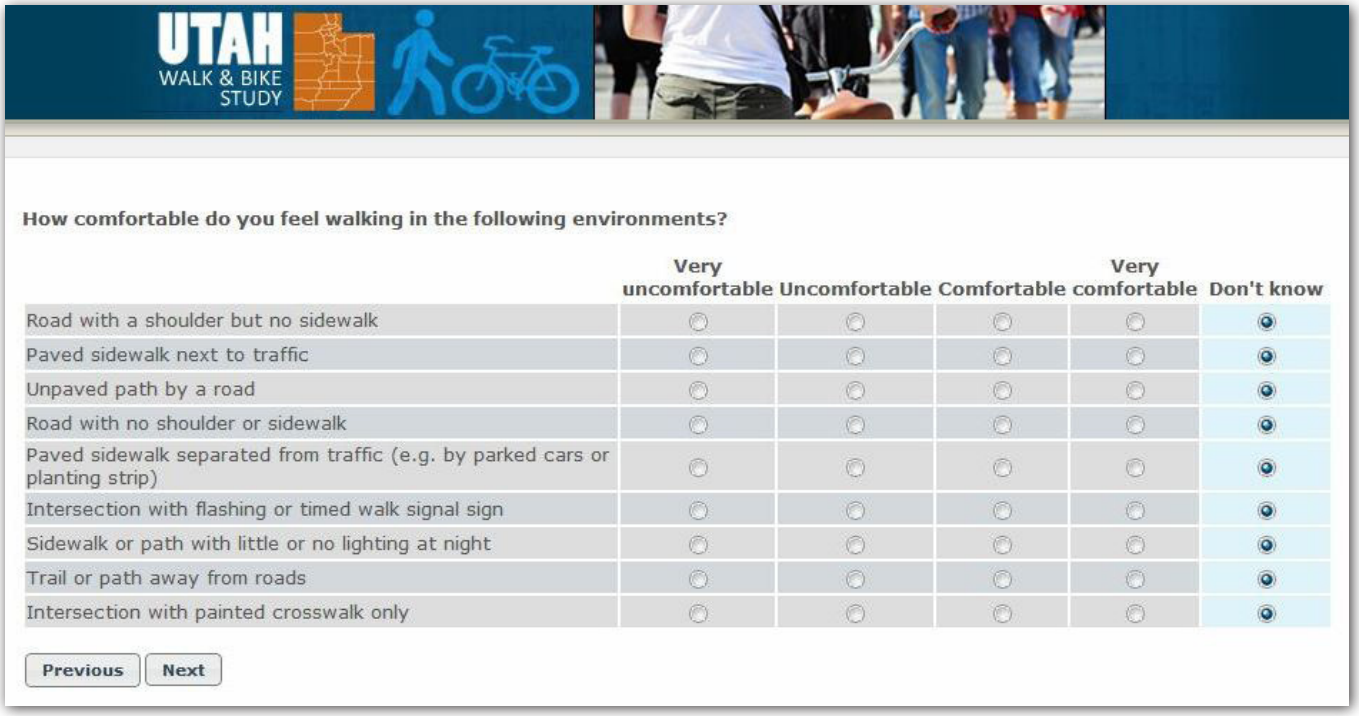


Figure 4.12 Barriers Survey – Walking Environment Preferences



3.2.3 Bicycle Habits and Barriers

The bicycle habits and barriers section mirrored the walking habits and barriers section. The only differences were:

- Added question: respondents were asked the number of miles and trips made per week by the following purposes (Figure 4.13):
  - Exercise/training/recreation
  - Commuting (if student or employed)
  - Shopping/errands
  - Bike rides with children (if household included children)
- Added question: respondents were asked how often they ride in groups (as compared to making trips alone).
- Modified question: the answer options for biking environment preferences included:
  - Low-traffic road shared with motor vehicles
  - Shoulder of a low-traffic road
  - Shoulder of a high-traffic road
  - Bike lane next to traffic
  - Bike lane separated from traffic (e.g. by parked cars or a planting strip)
  - Multi-use path/trail (e.g. shared with pedestrians)
  - Bike lane or path with little or no lighting at night
  - Intersection of a high-traffic road with no bike lanes
  - Intersection of a high-traffic road with bike lanes

These additions were made in order to include additional interpretations of attitudes and concerns. For example, a person who bicycles long distances for exercise or commutes by bike daily may have a different experience and comfort level than someone who typically only bikes around their neighborhood on weekends.

3.2.4 Attitudes

After responding to specific questions about bicycling and/or walking, all respondents were asked to rate the importance of different transportation funding priorities (Figure 4.14) and enforcement or encouragement programs for increasing the safety of non-motorized transportation (Figure 4.15).

Respondents were then given the opportunity to provide additional open-ended comments and suggestions about bicycling and walking in their town.

3.2.5 Demographic Details and Closure

The final section of the Bicycle and Pedestrian Barriers Survey asked a few additional demographic questions. These questions were included at the end of the survey because while they were important for analysis purposes, they did not explicitly impact branching during the survey. Questions included:

- Home ZIP code
- Number of vehicles available to the household
- Age
- Gender
- If the respondent (or any others in their household) had physical disabilities that limited their mobility
- Household income

Following these demographic questions, respondents were asked how they received the invitation for the survey and whether they belonged to any groups, clubs or mailing lists related to bicycling or walking. The survey then closed after collecting optional contact information that was only used to enter respondents in the raffle.

Figure 4.13 Barriers Survey – Typical Weekly Biking Distances by Purpose

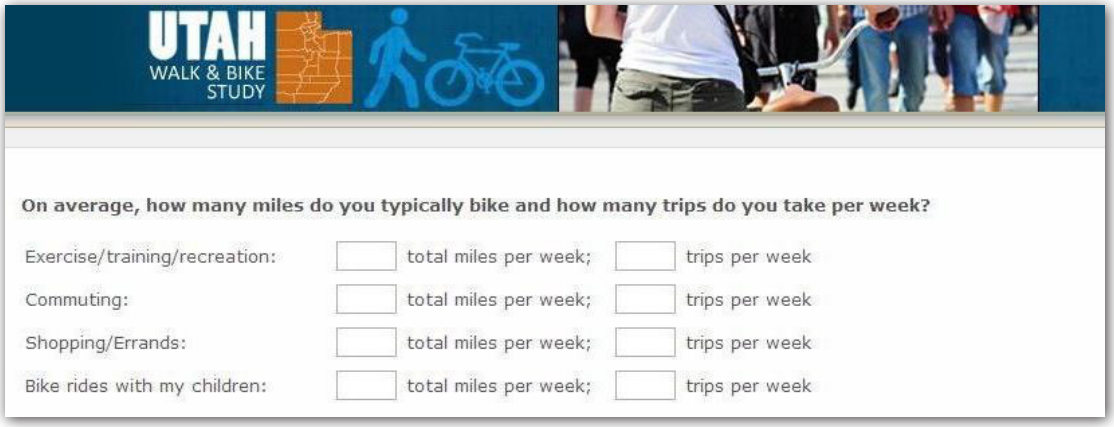


Figure 4.14 Barriers Survey – Infrastructure Funding Priorities

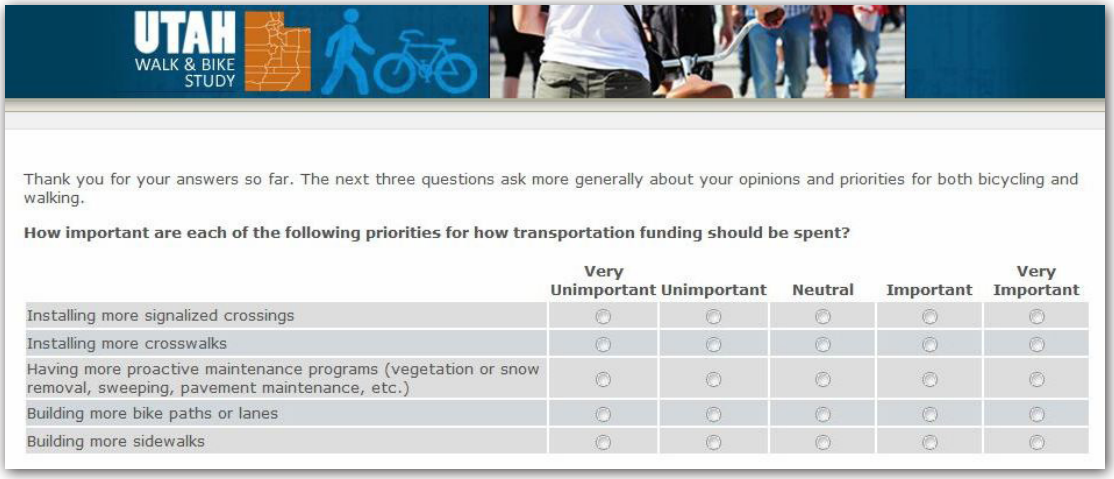


Figure 4.15 Barriers Survey – Encouragement and Enforcement Priorities

4.0 DATA PREPARATION

4.1 DATA CHECKING

4.1.1 Debrief

Besides the data checking described in Chapter 1 about the Household Travel Diary, no additional data checks were performed on the Walk and Bike Debrief Survey.

4.1.2 Barriers

After the Barriers Survey was closed, RSG reviewed the data to identify data cleaning tasks necessary to prepare the dataset for analysis. The final data for the Barriers Survey is contained in two datasets – one is the baseline details at the individual respondent level (recording the demographic details and the typical biking and walking behaviors and attitudes), and the other contains all the details about the reported pedestrian and bicycle problem locations. For that dataset, multiple records may exist for each individual.

While incomplete records are generally discarded, RSG determined that several respondents provided valid problem location responses but did not finish the entire survey. Therefore incomplete responses were included where the respondent provided complete, mapped information for *at least one pedestrian or bicycle problem*.

Finally, the responses were categorized by region using the respondents' home ZIP codes. Nine people who reported either an invalid or out-of-state ZIP code were removed from the final dataset.

4.2 DATA WEIGHTING

4.2.1 Debrief

No weights were applied to the Debrief Survey data for the purposes of this analysis.

4.2.2 Barriers

The Barriers Survey was a "convenience" sample and the administration approach sought to maximize response. As such, no data weights were developed or applied for the responses from the Barriers Survey, nor are they recommended. This is because participants were able to self-select into the survey based on their interest, and no information was collected about the individuals who did not take the survey. While it could be possible to make some general comparisons between the survey respondents and the general population (for example, with Census data), there are numerous factors that influence a respondent's perceptions of and use of non-motorized transportation that are not be possible to determine.

5.0 DATA ANALYSIS

Results from each survey (Debrief and Barriers) are presented separately in this section, starting with the Debrief Survey.

5.1 SUMMARY TABULATIONS – DEBRIEF SURVEY

This section presents results from the Bicycle and Pedestrian Debrief Survey. 2,562 households completed the Bicycle and Pedestrian Debrief portion of the Household Travel Diary. Data from all 5,071 adults in these household were included in the final dataset.

5.1.1 Walking and Biking Behaviors and Preferences

The Debrief Survey included several questions specifically about walking behaviors and preferences. 71% of all adults reported making at least one walking trip of 10 minutes or more in the week prior to being surveyed. This figure was similar across regions, although Cache residents were the most likely to report not walking at all in the past week (34%). These results are presented in Figure 4.16.

Respondents also reported their bicycling behavior in the past *two weeks*. The majority of respondents in all regions said that they never biked (56%, overall) or that they had not biked in the past two weeks (24-31%) (Figure 4.17). This varied slightly among the regions – in the Cache and MAG regions, slightly fewer people said the *never* biked, and slightly more said they had not biked in the past two weeks. Less than 20% of respondents said they had biked at all in the two weeks prior to the survey.

Figure 4.16: Walk Frequency (Trips Last Week) by Region

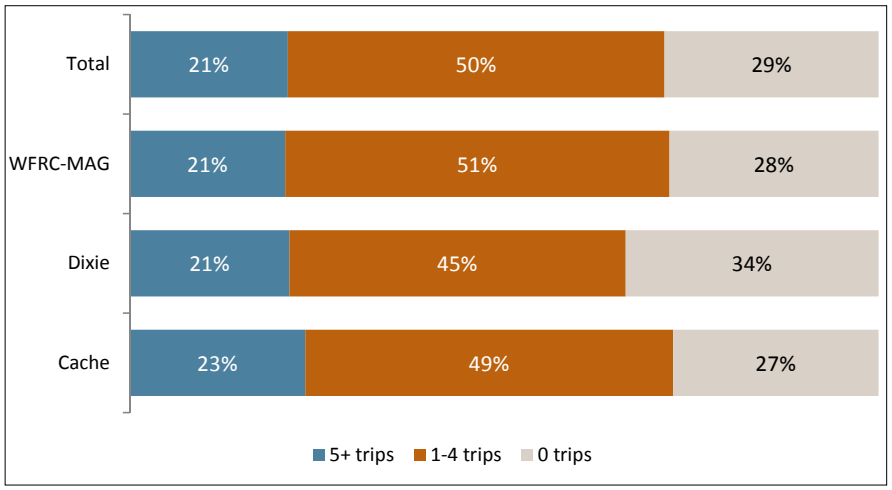
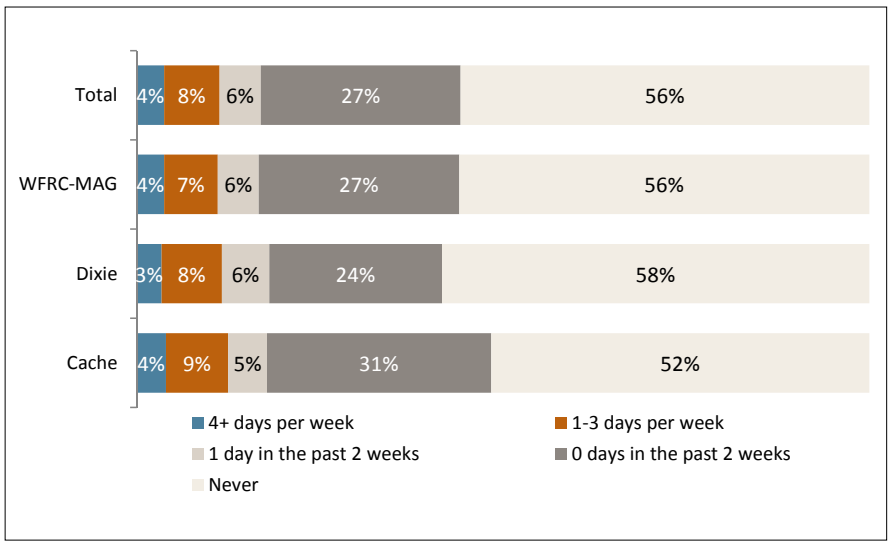


Figure 4.17: Bike Frequency (Days Last Two Weeks) by Region



Of the respondents who did make at least one walking trip, an overwhelming majority said they typically walked for exercise (Figure 4.18). In this question, respondents could choose multiple reasons for walking. In addition to exercise, a little over 20% of question respondents also said they walked to accompany their children, to socialize with others (such as in a walking group), or to walk the dog. Fewer people reported making walk trips for more utilitarian purposes, such as commuting to school or work, running personal errands, or connecting to other modes of transportation.

The respondents who said they sometimes biked (even if they had not biked in the past two weeks) were also asked their typical reasons or purposes for bike trips. As with walking purposes, the overwhelming majority chose exercise as a typical purpose. All other purposes were chosen much less often. Compared to walking, however, biking to work was chosen slightly more often (10% compared to 7%). Other than this, utilitarian trips tended to be less common reasons for biking than for walking.

People who said they walked or biked were also asked why they chose to walk or bike for their various trip purposes (Figure 4.19). The most common responses for walkers were that they enjoyed being outside and wanted to get exercise. Less than a quarter of walk question respondents chose to walk to save money, time, or avoid traffic. This suggests that most people's trips may be too long for walking to be a competitive mode.

About twice as many bikers as walkers said they rode a bike to enjoy being outside and to get exercise. People who rode bikes also consistently reported other motivations for making bike trips more often than walkers did. Overall, it suggests that people who ride bikes tend to have a variety of reasons for doing so, which makes sense as choosing to ride a bike is often a more conscious decision than walking, involving more effort and equipment.

Figure 4.18: Walk and Bike Purposes

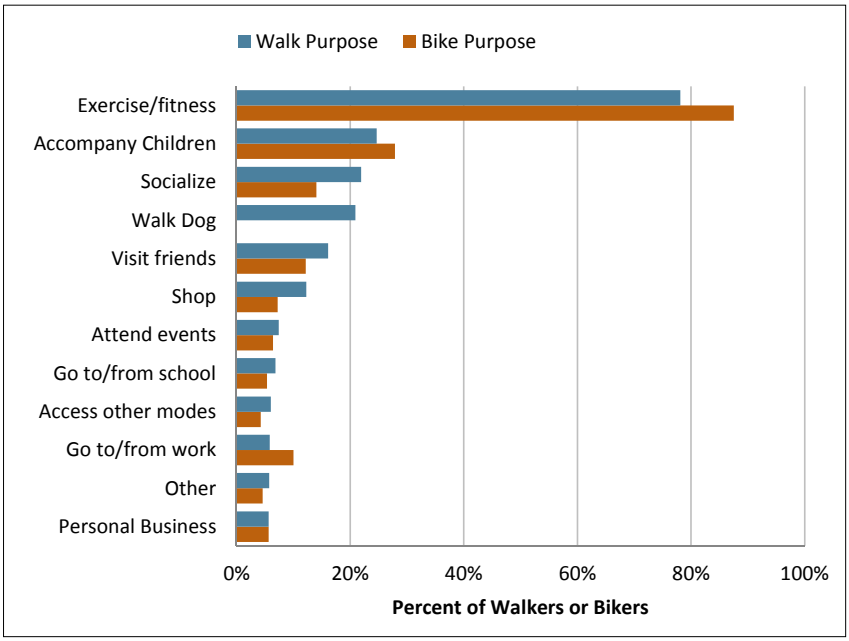
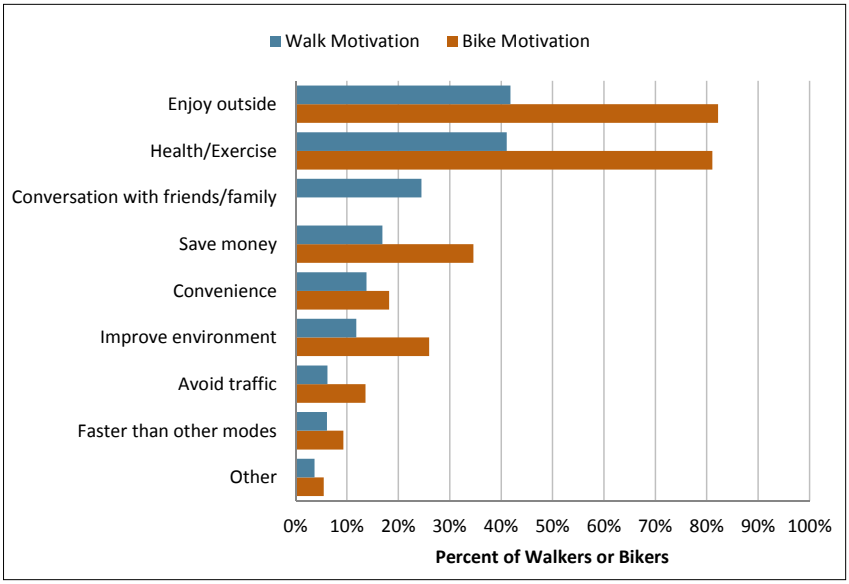


Figure 4.19: Walk and Bike Motivations



Survey respondents who said they did not make any walking trips were asked about the reasons they did not walk (Figure 4.20). Again, respondents could choose multiple barriers or reasons why they did not walk. The most common response (about 45% of question respondents) was that the person was too busy or did not have time to walk the previous week. About another 20% of question respondents reported that their trip distances were too far to walk. Taken together, these results suggest that travel time is an important factor in people's decision to walk. Very few people (about 2%) reported a lack of trails or safety concerns as barriers to walking.

Of the respondents who said they never bike, the majority said that one reason was that they did not own a bike. Caution should be used in interpreting this, however. The lack of bicycle ownership is not necessarily the only barrier that prevents or discourages these respondents from biking. Many of them also simply have no any interest in biking (about 20%). Other barriers including factors of travel time, weather, and inadequate bicycle infrastructure were only rarely noted as reasons people did not bike, though again, this should be cautiously interpreted as some of these concerns may be correlated with a general lack of interest in biking. More people (about 15%) said they did not bike because they felt unsafe in traffic, compared to about 2% who did not walk due to safety concerns.

After reporting on specific walking and bicycling behaviors, all Debrief Survey respondents were asked whether they agreed or disagreed with a variety of statements. Two-thirds of respondents said they agreed or strongly agreed that transportation funds should help pay for biking and walking facilities (Figure 4.21). The majority also agreed that biking and walking in their neighborhoods was important and that there were enough sidewalks in their region. Fewer people (about 38%) agreed that there were enough bike paths, and few people (about a third) agreed that they would bike on streets designed for bicycles – these statements taken together suggest a general preference for off-street or separated bicycle facilities. However, a majority of respondents did not agree that they would bike more often if they did not have to share the road with motor vehicles, suggesting that for some, off-street or separated bicycle facilities alone would not induce them to bike more.

Figure 4.20: Walk and Bike Barriers

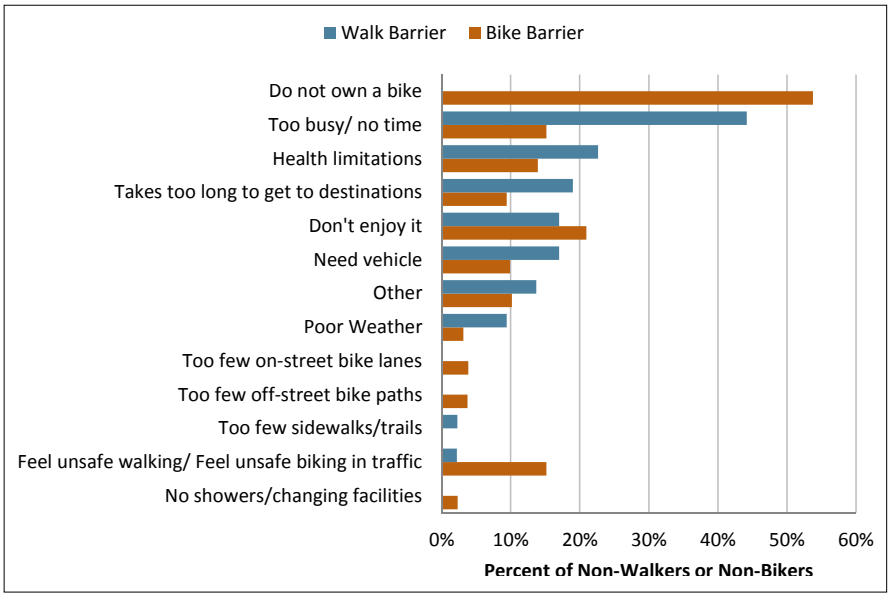
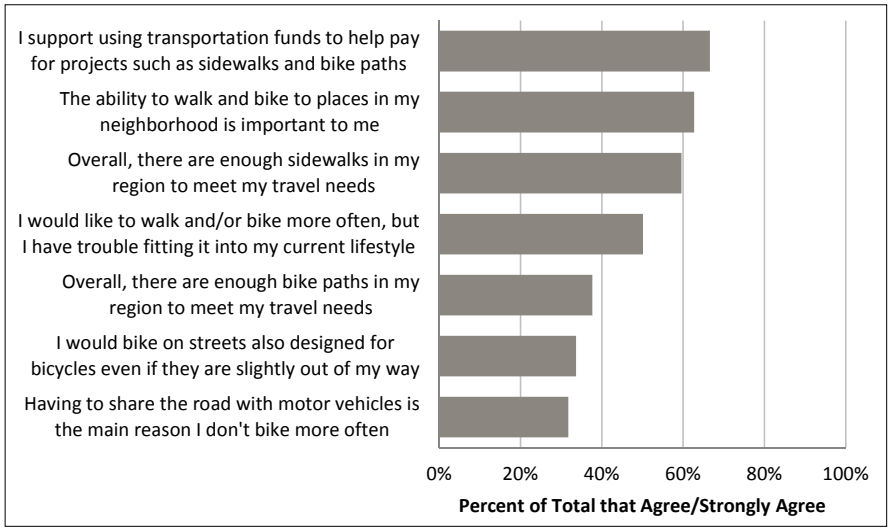


Figure 4.21: Attitudes



5.2 SUMMARY TABULATIONS – BARRIERS SURVEY

As previously noted, the Bicycle and Pedestrian Barriers Survey was administered as an open link that any Utah resident was able to access. Because of this, and because many of the advertising and invitation sources were associated with bicycle or pedestrian interests, there is a high likelihood that the respondents who self-selected to participate in the survey also have stronger interests in bicycling and walking. This should be kept in mind when reviewing or using the results from this survey.

The majority of responses came from the MPO regions (Figure 4.22), with a higher concentration in and around the larger cities. This is particular helpful for analysis because those urban environments tend to have greater density (in both population and destinations) and tighter street grids, both of which can be associated with higher amounts of bicycling and walking. Larger cities also tend to be associated with higher levels of traffic congestion, which can prompt some people to choose alternative transportation modes.

1,987 adults completed the entire barriers survey. All person-level tables and figures in this section present results based on those 1,987 adults. However, several more respondents completed a portion of the survey. Barrier-level table and figures in this section of the report include those reported by the 1,987 adults as well as those who reported at least one walk or bike barrier, but did not completed the entire survey. These numbers are summarized in Table 4.2.

Figure 4.22: Completed Surveys by ZIP Code

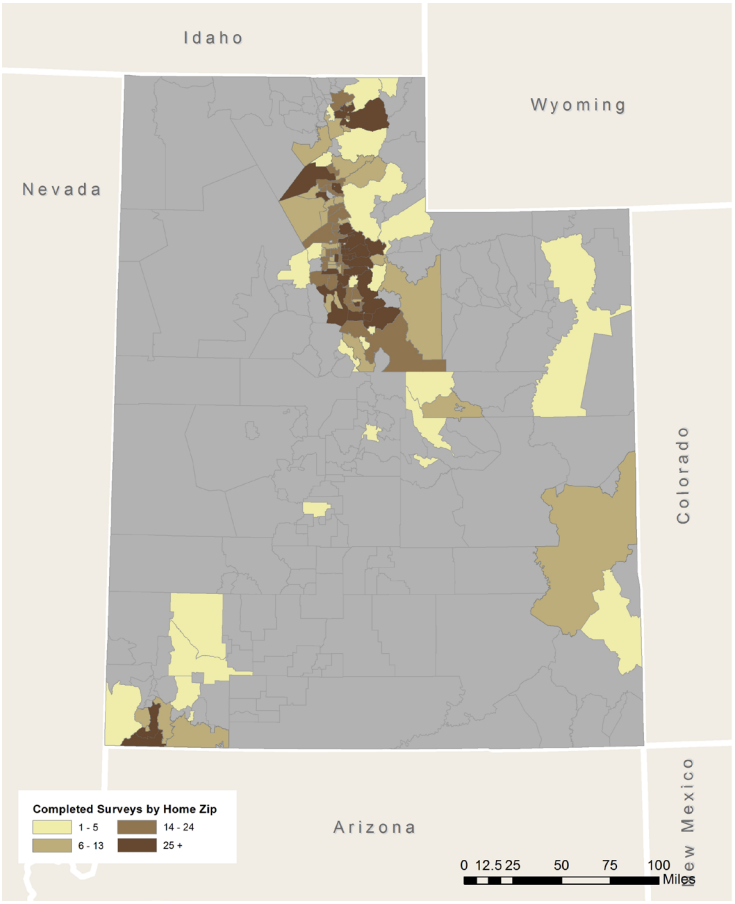


Table 4.2: Sample Size and Number of Barriers (Problems) Reported

SURVEY TOPIC	NUM OF RESPONDENTS (COMPLETED ENTIRE SURVEY)	PROBLEMS	NUM OF PROBLEMS	AVERAGE PROBLEMS PER RESPONDENT	ADDITIONAL PROBLEMS (FROM PARTIALLY COMPLETED SURVEYS)
Walk Only	279	Walk problems	277	1.0	14
Both (Walk AND Bike)	1,198	Walk problems	1,657	1.4	238
		Bike problems	1,337	1.1	56
Bike only	510	Bike problems	1,049	2.1	47
Total	1,987		4,320	2.2	355

5.2.1 Respondent Overview and Demographics

Half of the adults who completed the entire survey were between the ages of 25 and 44 (Figure 4.23). The distributions of household size and income are also presented here (Figure 4.24 and Figure 4.25, respectively).

Figure 4.23: Age Distribution

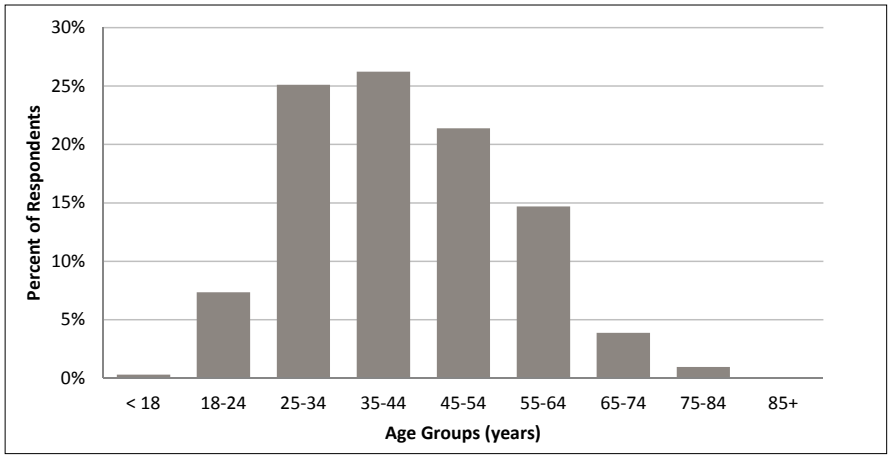


Figure 4.24 Household Size Distribution (Children and Adults)

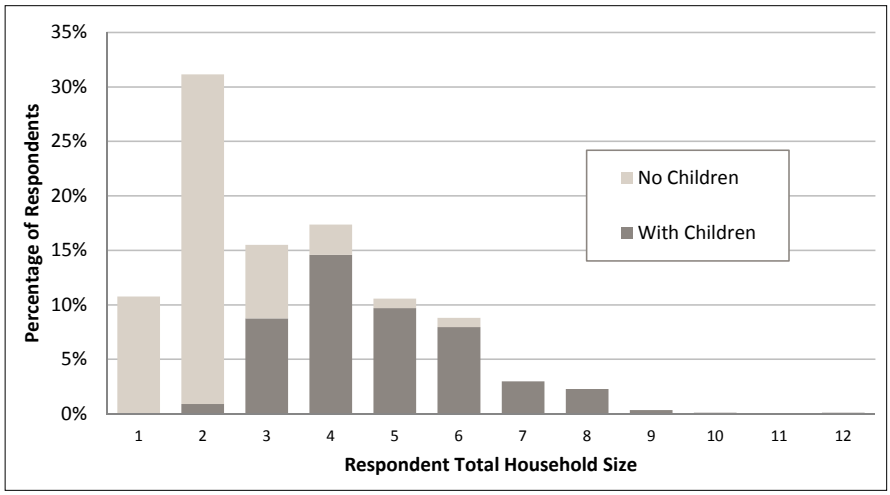
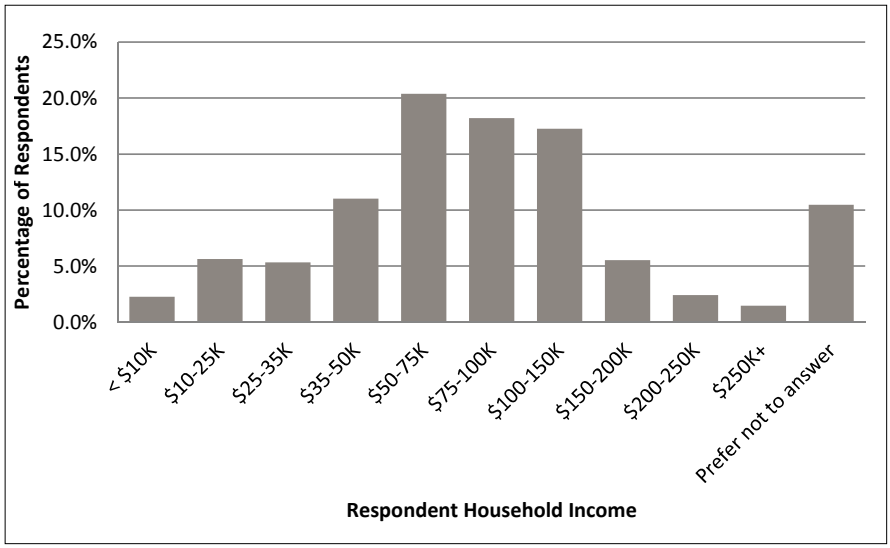


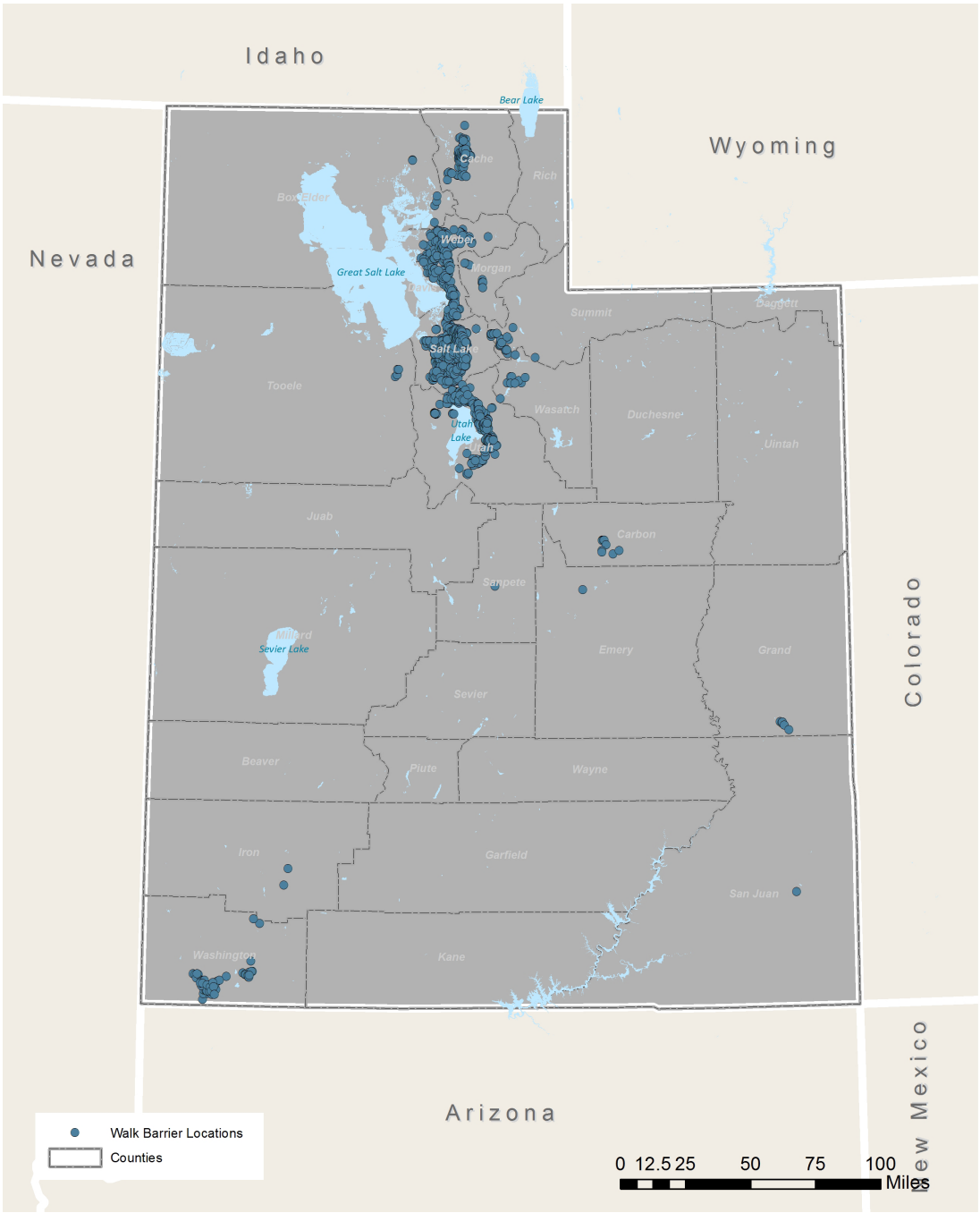
Figure 4.25 Household Income



5.2.2 Reported Walking and Biking Barrier Locations

Over the course of the survey, respondents described and located 2,186 pedestrian problem locations and 2,489 bicycle problem locations. (This includes locations reported by respondents who were unable to complete the entire survey – see the previous note in the Administration section for more details.)

Figure 4.26: Walk Barrier Locations, Statewide



These locations were largely concentrated in the urban regions, though a few locations were identified in smaller towns or rural areas. Many of these locations outside of the main cities tend to be more oriented towards recreational bicycling or walking, as compared to problem locations identified in the cities. The maps on the following pages show where the reported barriers are located, and also highlight intersections and roadways that were marked most frequently.

Figure 4.27: Bike Barrier Locations, Statewide

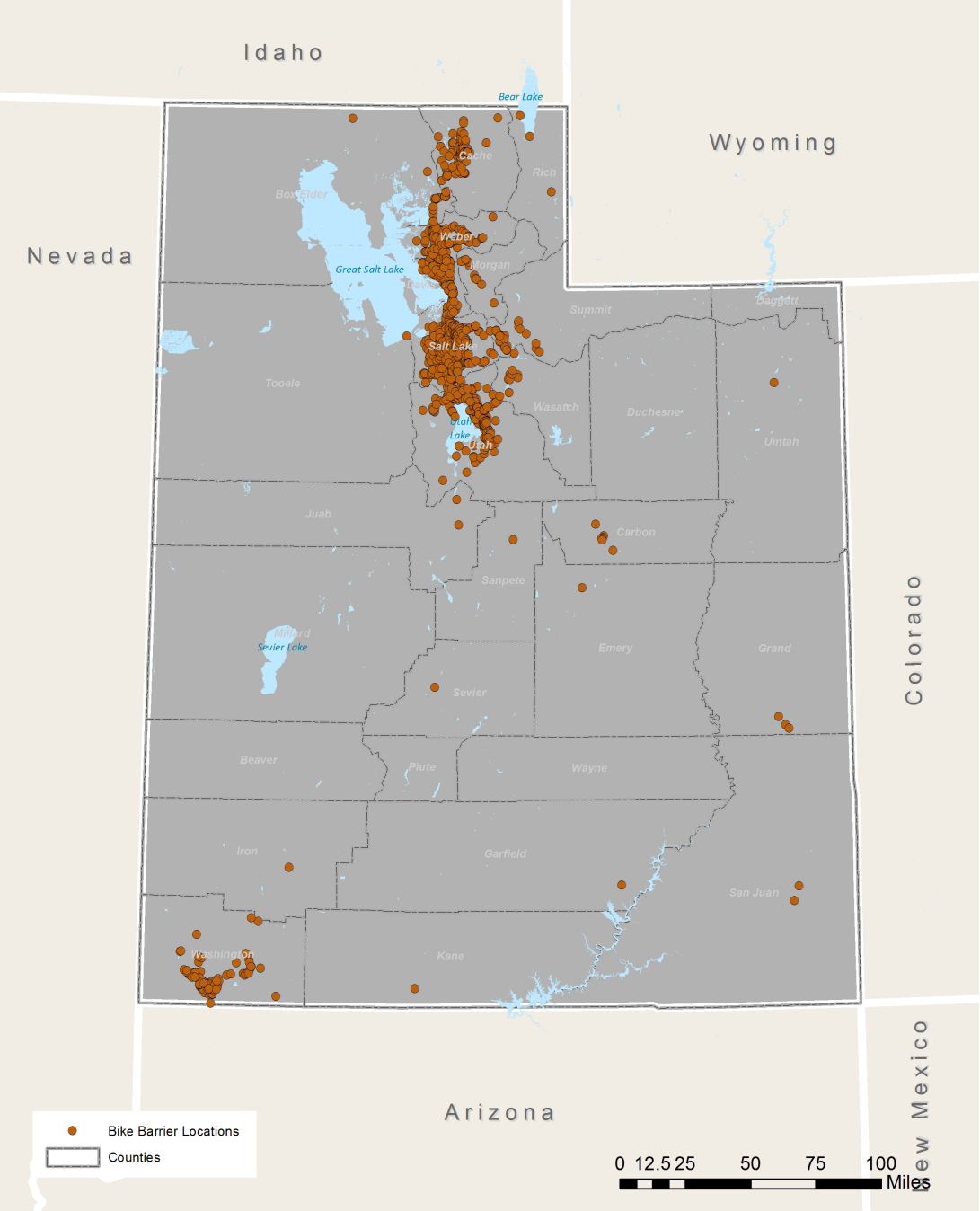


Figure 4.28: Walk Barrier Locations, WFRC/MAG Region

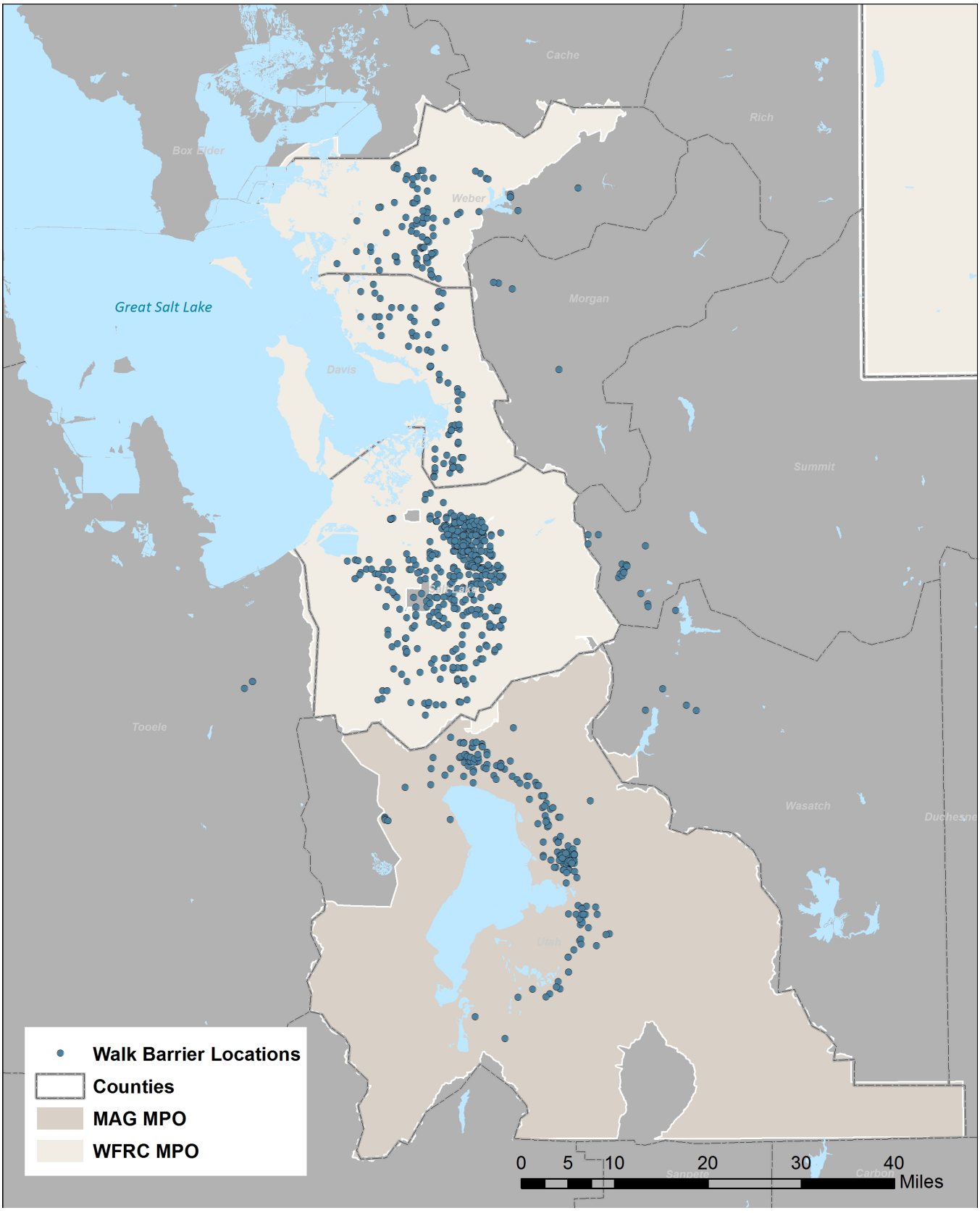


Figure 4.29: Bike Barrier Locations, WFRC/MAG Region

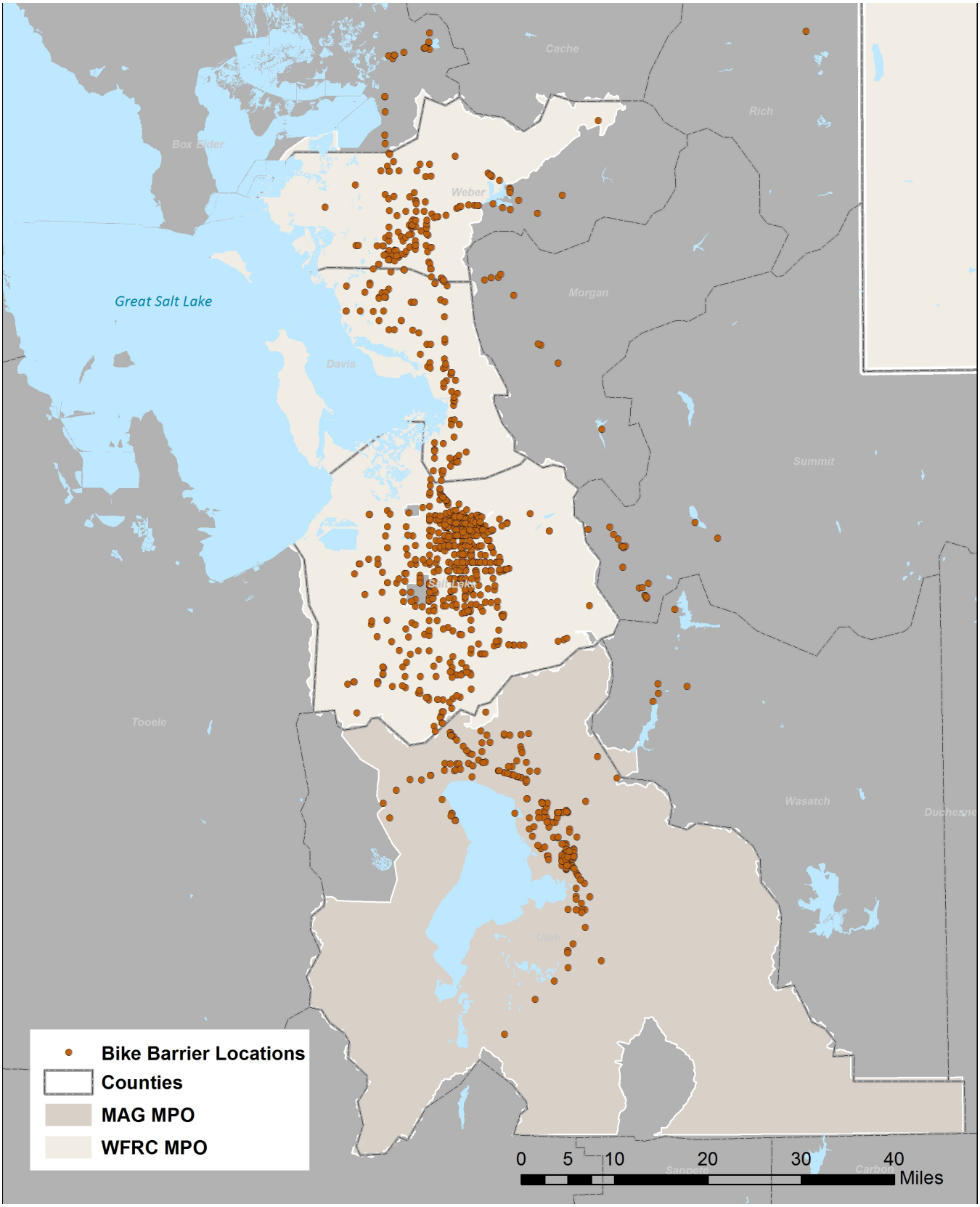


Figure 4.30: Walk and Bike Barrier Hot Spots, WFRC/

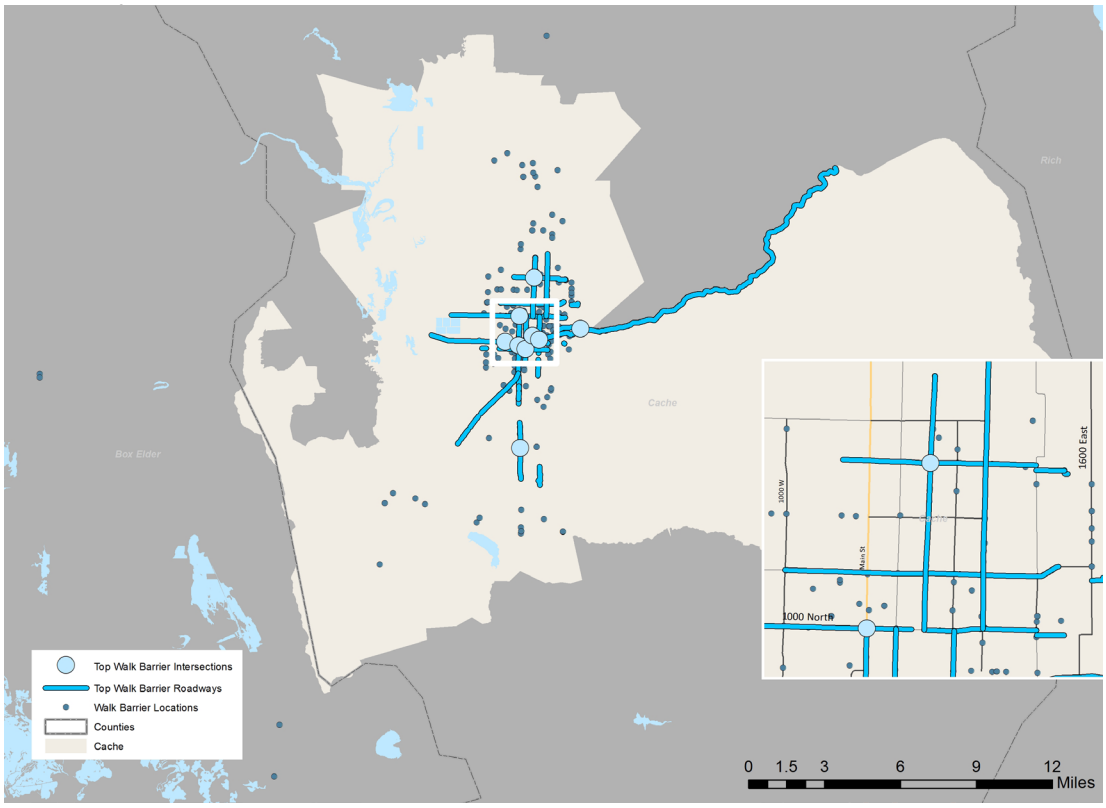


Figure 4.31: Walk Barrier Locations, Cache Region

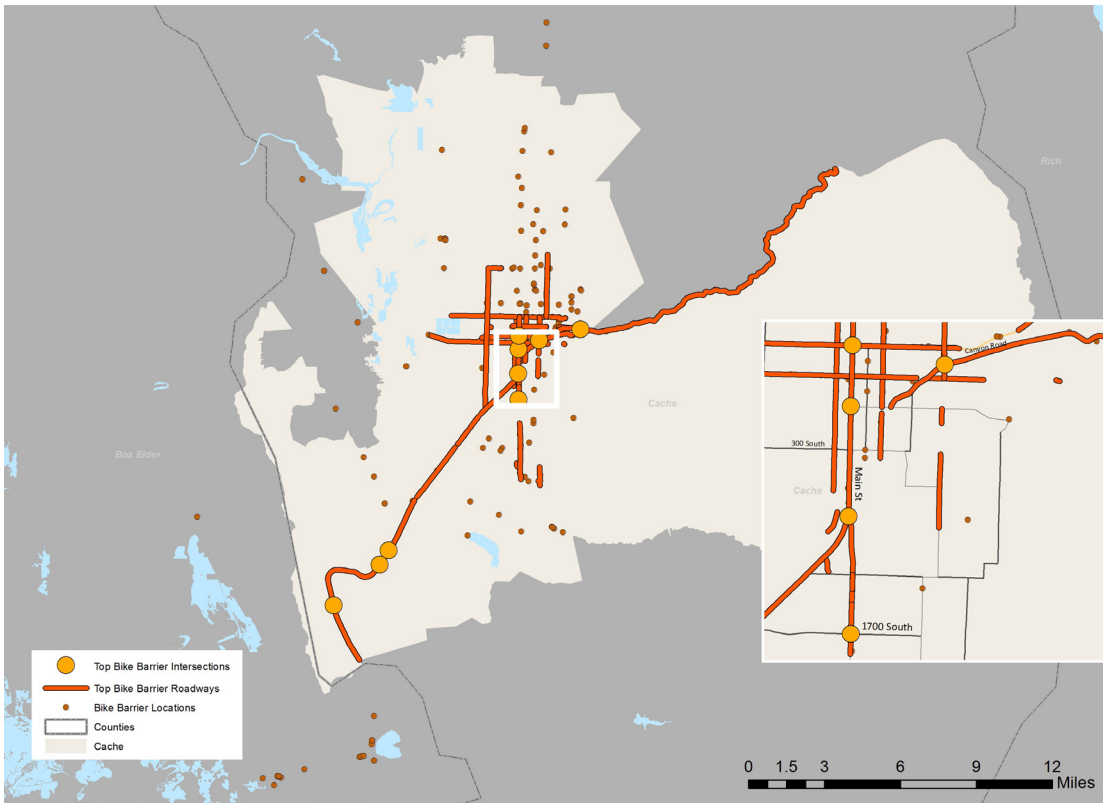


Figure 4.32: Bike Barrier Locations, Cache Region

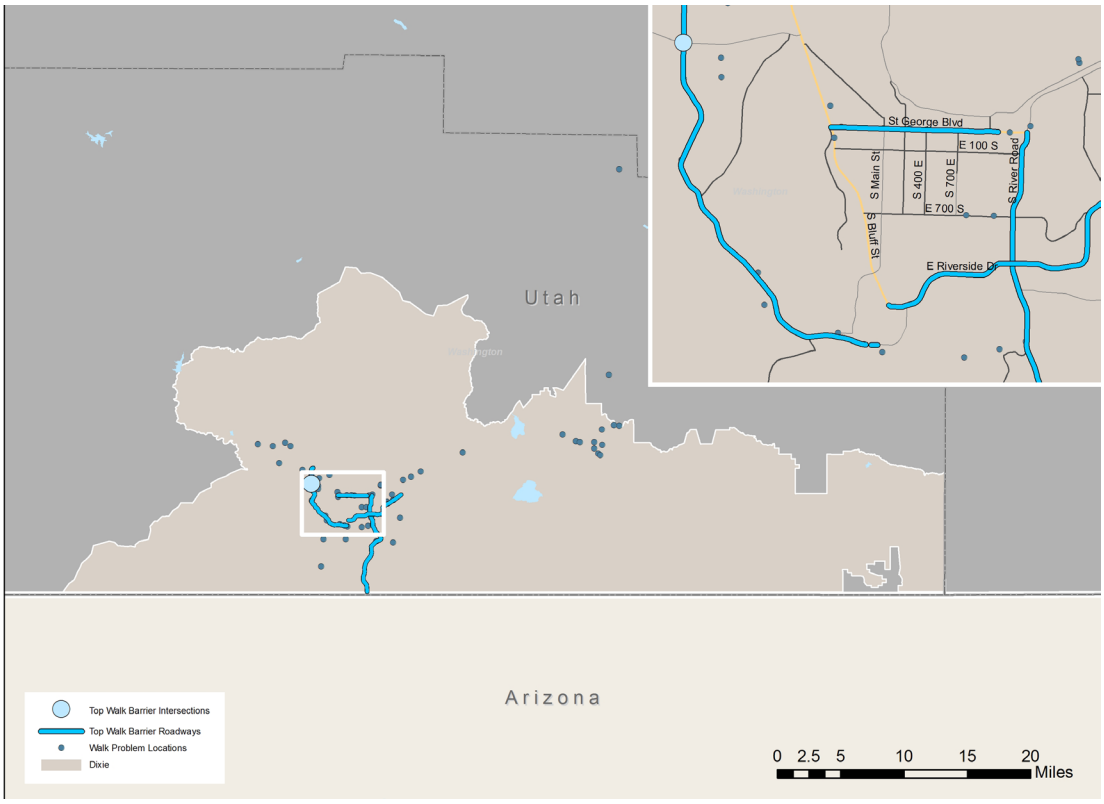


Figure 4.33: Walk and Bike Barrier Hot Spots, Cache Region

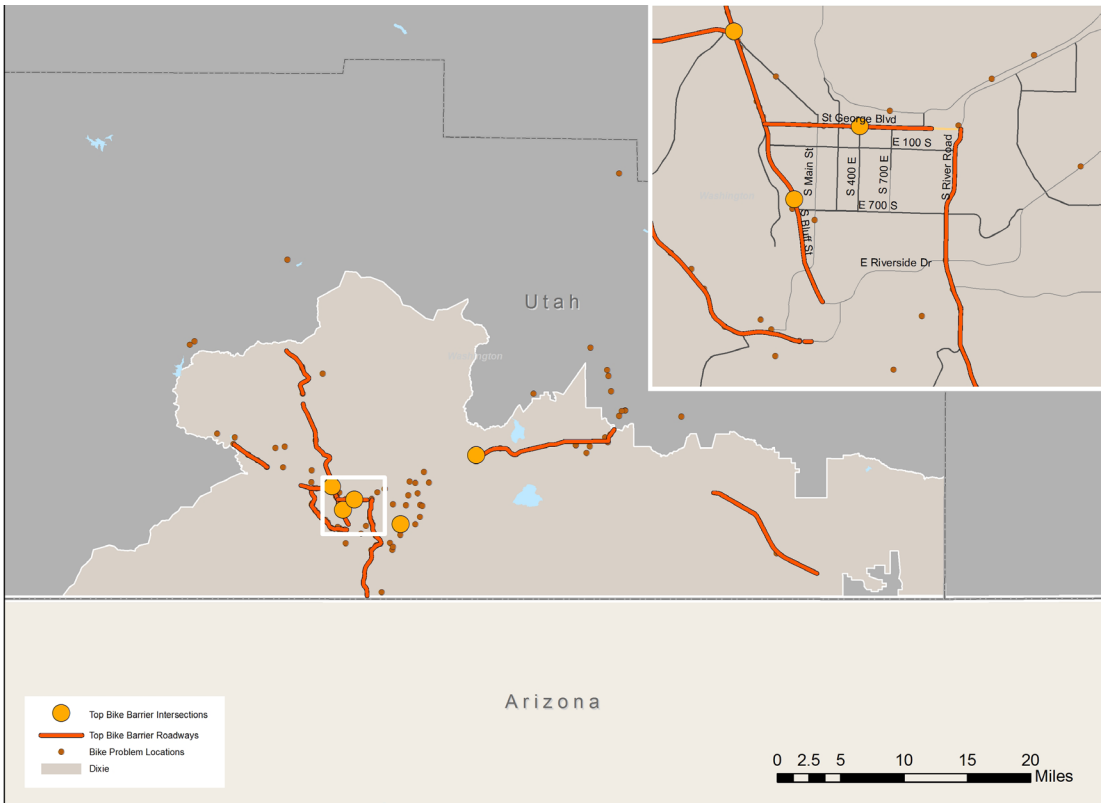


Figure 4.34: Walk Barrier Locations, Dixie Region

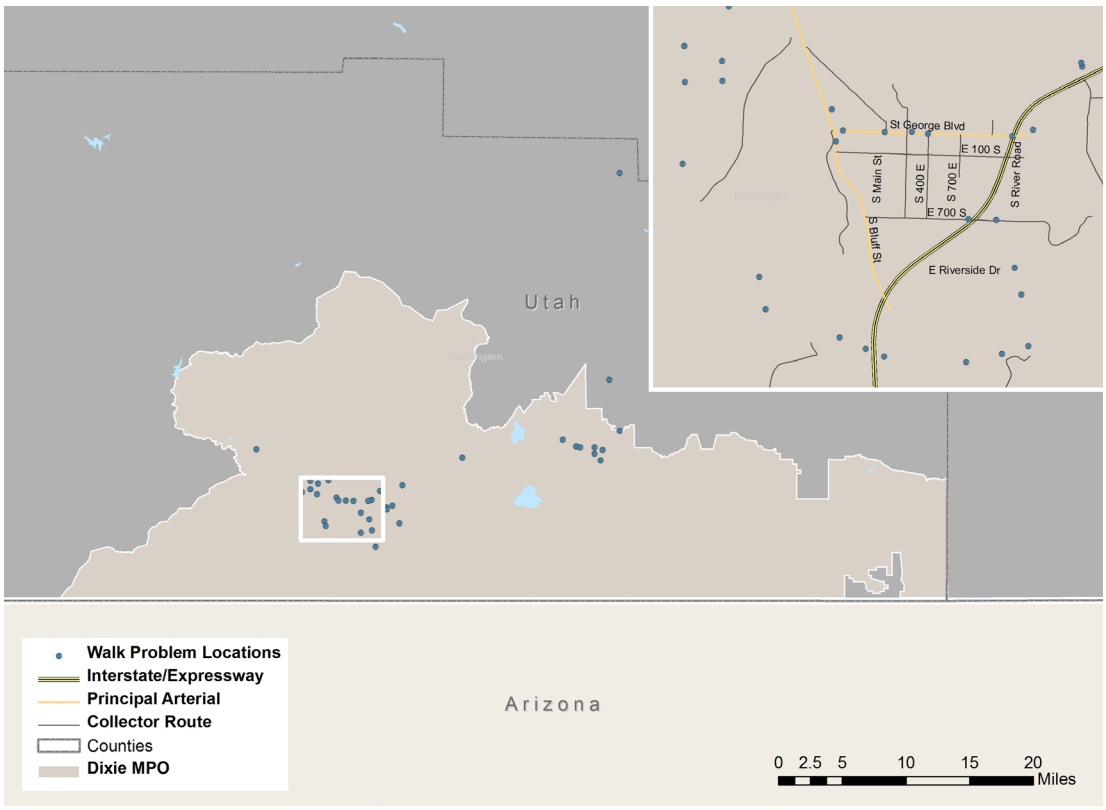


Figure 4.35: Bike Barrier Locations, Dixie Region

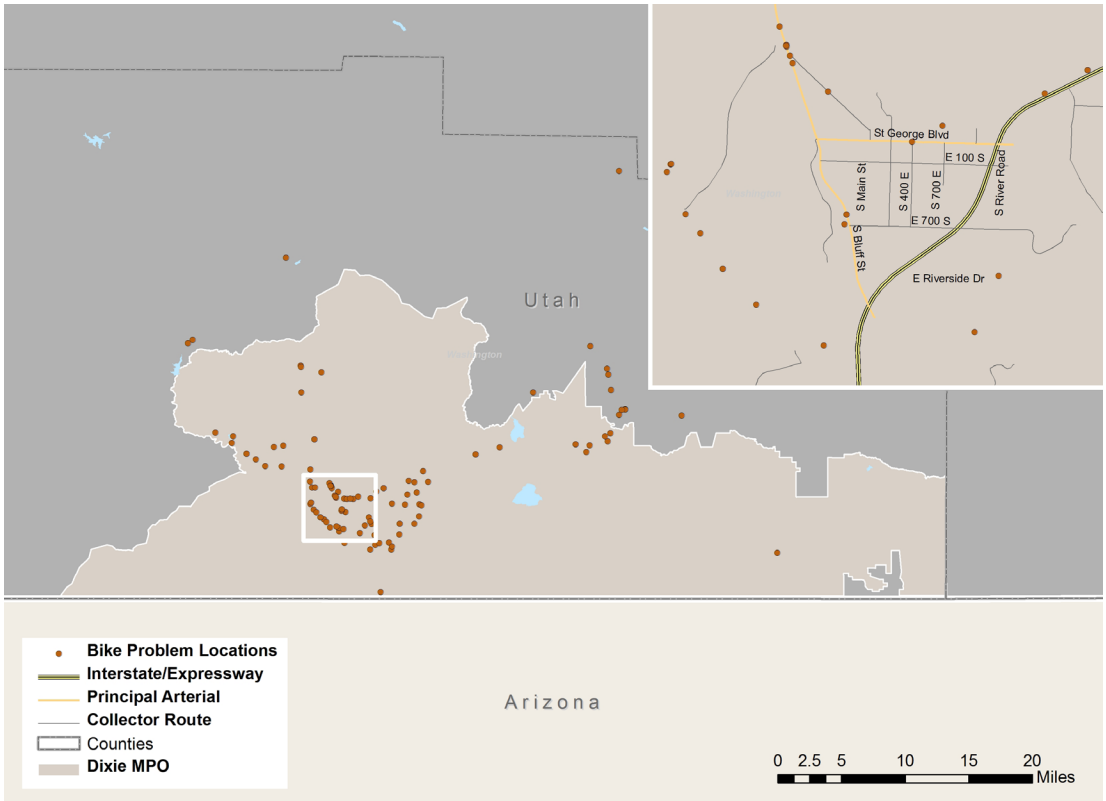
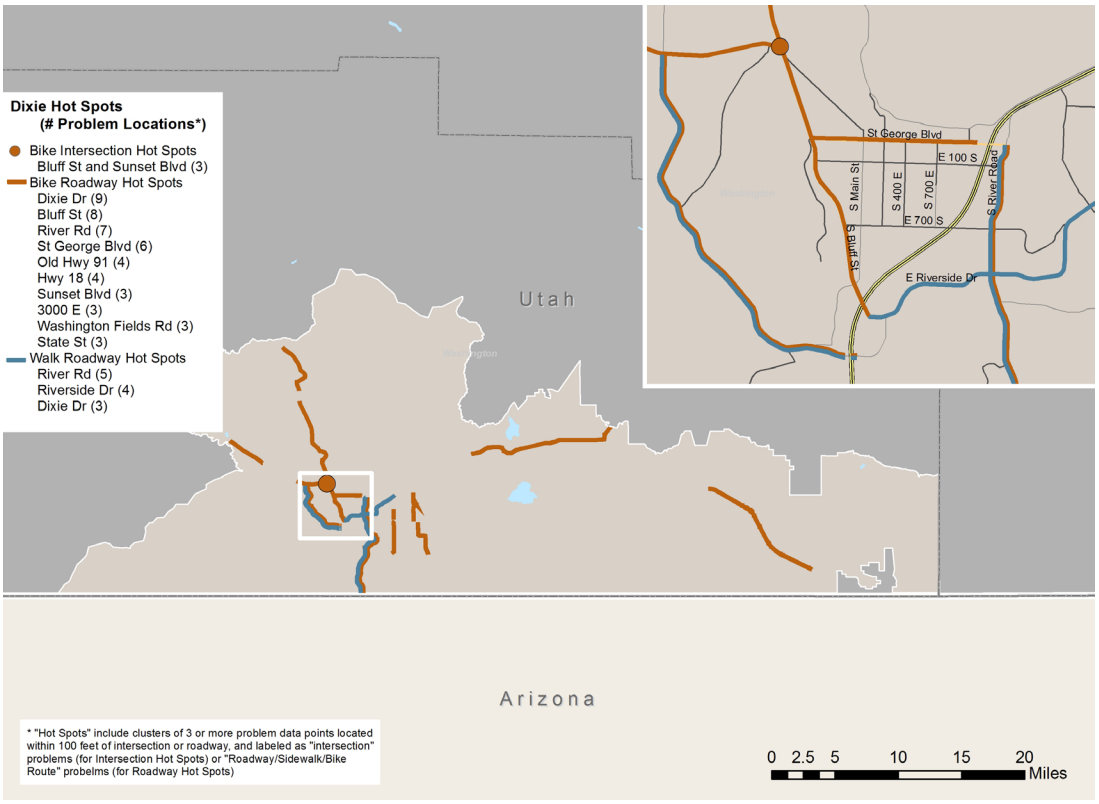


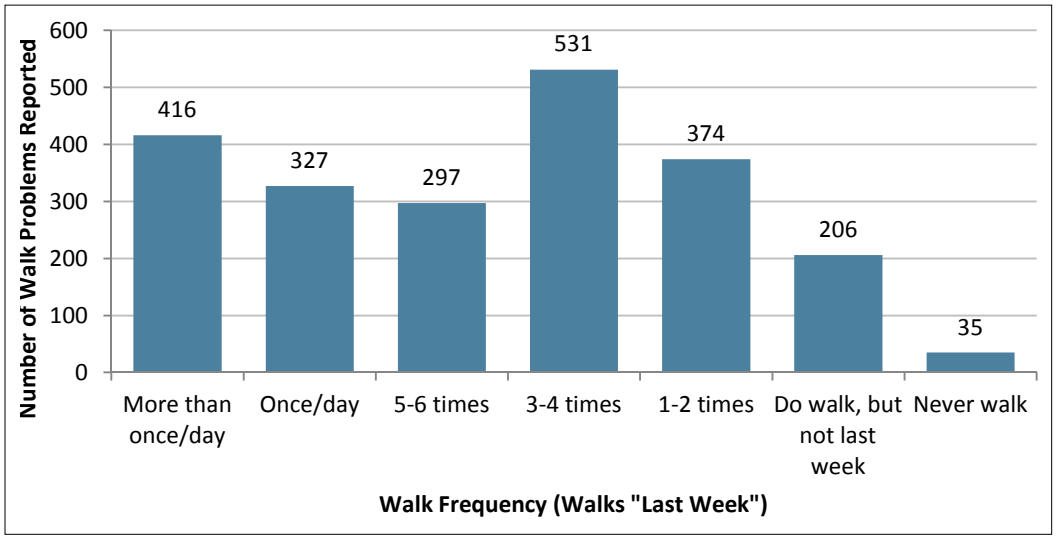
Figure 4.36: Walk and Bike Barrier Hot Spots, Dixie Region



The large majority (almost 90%) of pedestrian barrier locations were identified by respondents who had walked more than once in the week before the survey (Figure 4.37). This corresponds to the general walking frequency. Only a very few respondents who never walked reported problem locations. Most of these were related to their observations and concerns about pedestrian safety on roads where they drive, including places near schools or places where they saw people walking or jogging on a shoulder.

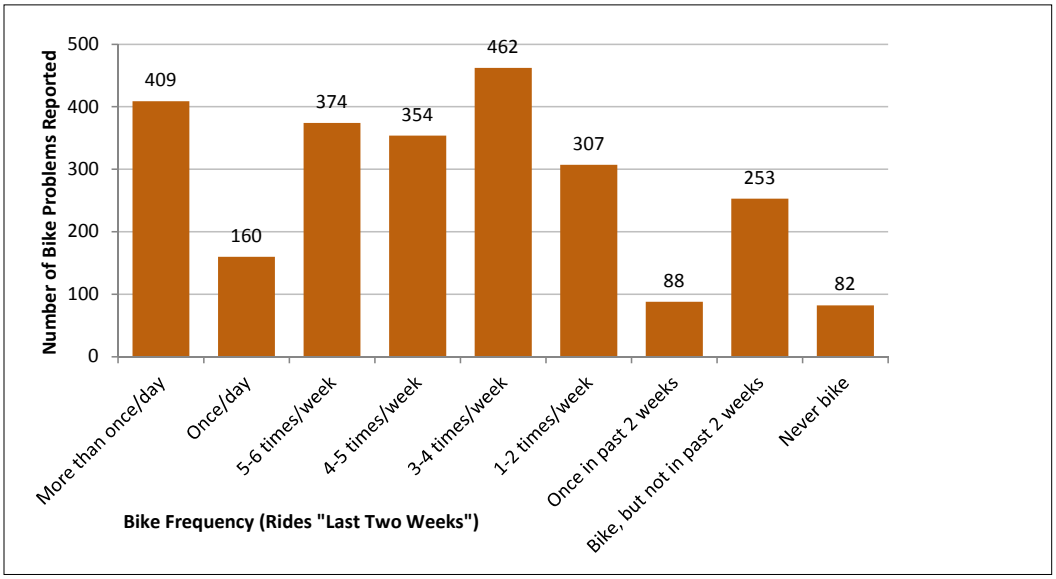
The majority of bicycle barrier locations were also identified by people who rode a bike multiple times in the two weeks before the survey (Figure 4.38). More than half were reported by respondents who cycled 4-5 times per week. Like the walk problems, only a small number of bike problem locations were described by people who said they never ride a bike. These bike problems included many that reflected a concern for safety, but also included expressions of frustration at bicyclists who are perceived as law breakers or riders who do not share the road.

Figure 4.37: Number of Walk Barriers Reported by Walk Frequency



Includes problems reported by respondents who were not able to complete the baseline

Figure 4.38: Number of Bike Barriers Reported by Bike Frequency



The vast majority of bicycle and walk problems were classified as having inadequate, incomplete, or missing infrastructure (Figure 4.39). This includes locations where bike lanes, sidewalks or crossing facilities are needed. "Other" problem types included a range of concerns from general comments about excessive traffic to visibility concerns, as well as more specific descriptions of inadequate infrastructure (such as narrow sidewalks) or maintenance issues (such as bike lanes full of debris).

The majority of bicycling and walking barriers were also classified as route problems – located along roadways, sidewalks, bike lanes, and paths (Figure 4.40). However, more walking barriers were identified at intersections. This is not surprising as individual large intersections may be a more noticeable barrier to pedestrians, as bicyclists that ride with traffic may be more concerned about their space on the roadway in general, and less concerned about riding through specific intersections.

Figure 4.39: Types of Walk and Bike Problems

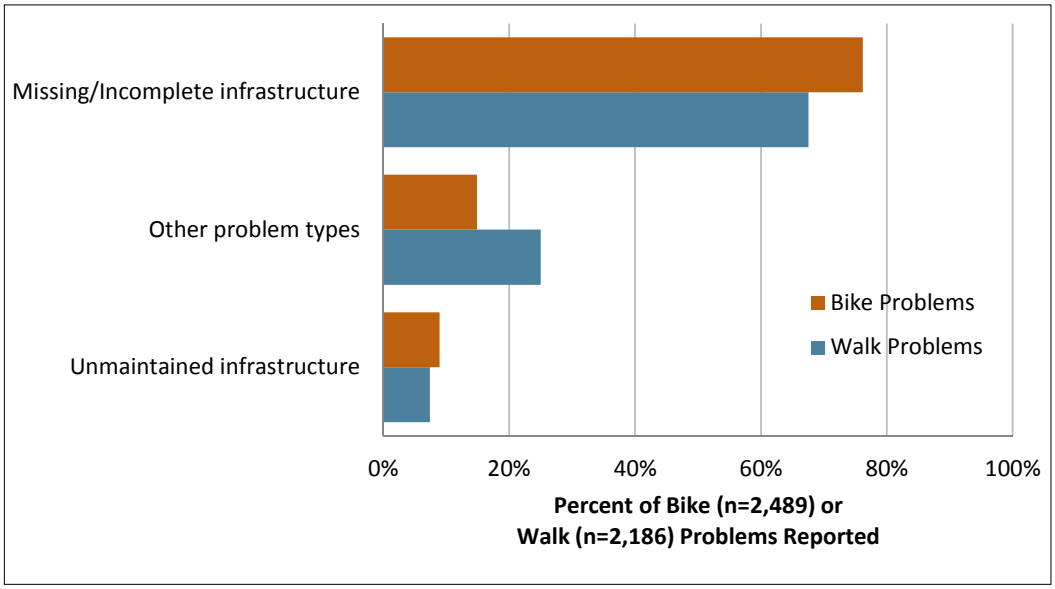
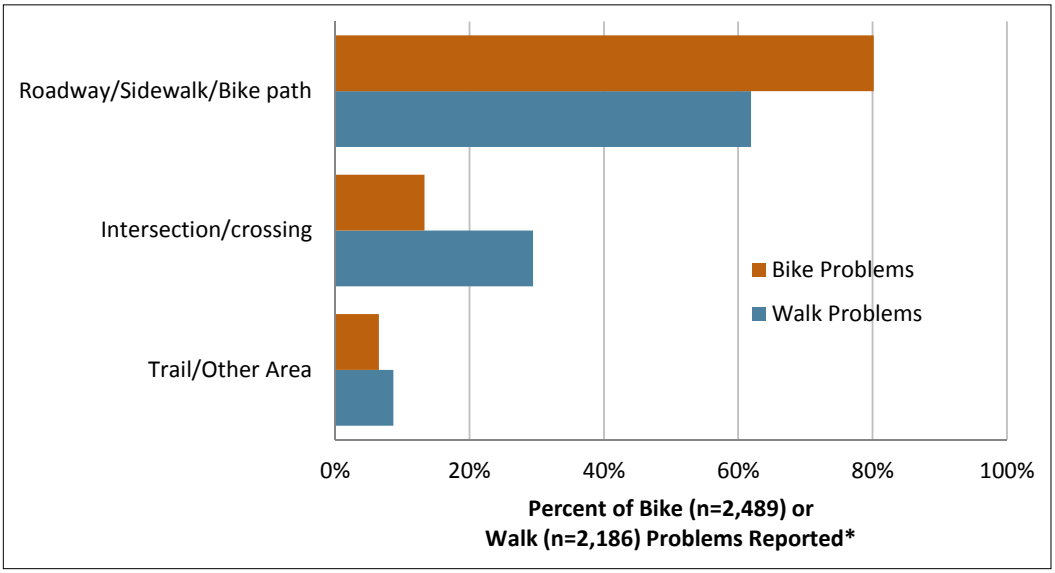


Figure 4.40: Location of Walk and Bike Problems



5.2.3 Walking and Biking Behaviors and Preferences

In addition to the bicycle and pedestrian barrier location descriptions, the Barriers Survey included questions about respondents' typical bicycling and walking behaviors and attitudes. Some participants chose to only complete the biking or walking portion, but many completed both portions. For example, respondents who selected "bike only" were not asked about their walking behavior or preferences and vice versa.

Similar to the Debrief Survey, the majority of Barriers Survey respondents typically walk for exercise (Figure 4.41). A greater proportion of Barriers Survey walk respondents reported walking for utilitarian purposes, including about 27% walking to shops, 19% running personal errands, and 15% walking to work. This in part supports the assumption that more people who walk frequently and have a greater personal interest in walking self-selected to take the survey.

Respondents to the bicycle portion of the Barriers Survey also overwhelmingly indicated exercise as a typical bicycling purpose. However, they also reported bicycling for utilitarian purposes much more commonly than walkers. Notably, more than a third of bicycle survey respondents reported that their work commute was a typical bike trip purpose. This suggests that the self-selected participants overall may bike more frequently and for more types of trips than the average Utah resident.

Figure 4.41: Typical Walk and Bike Trip Purposes

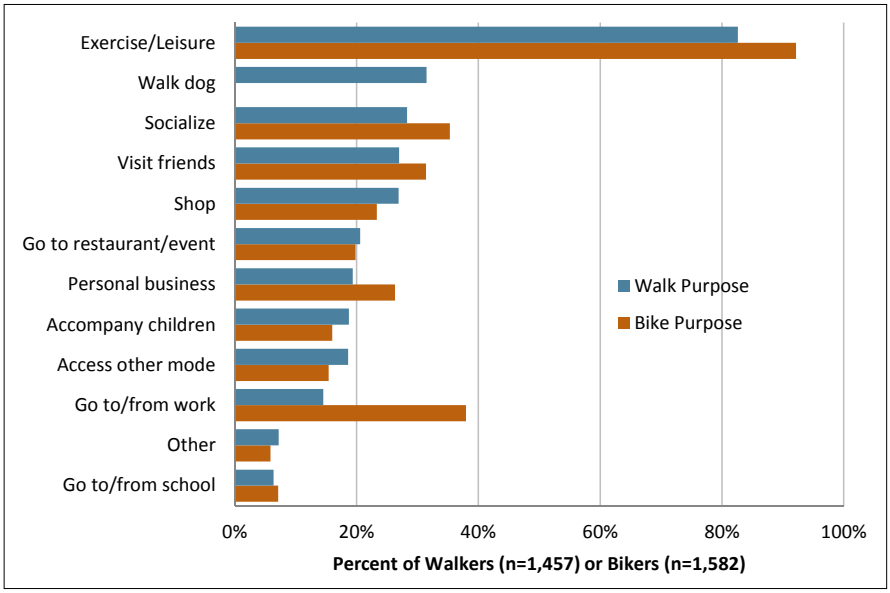
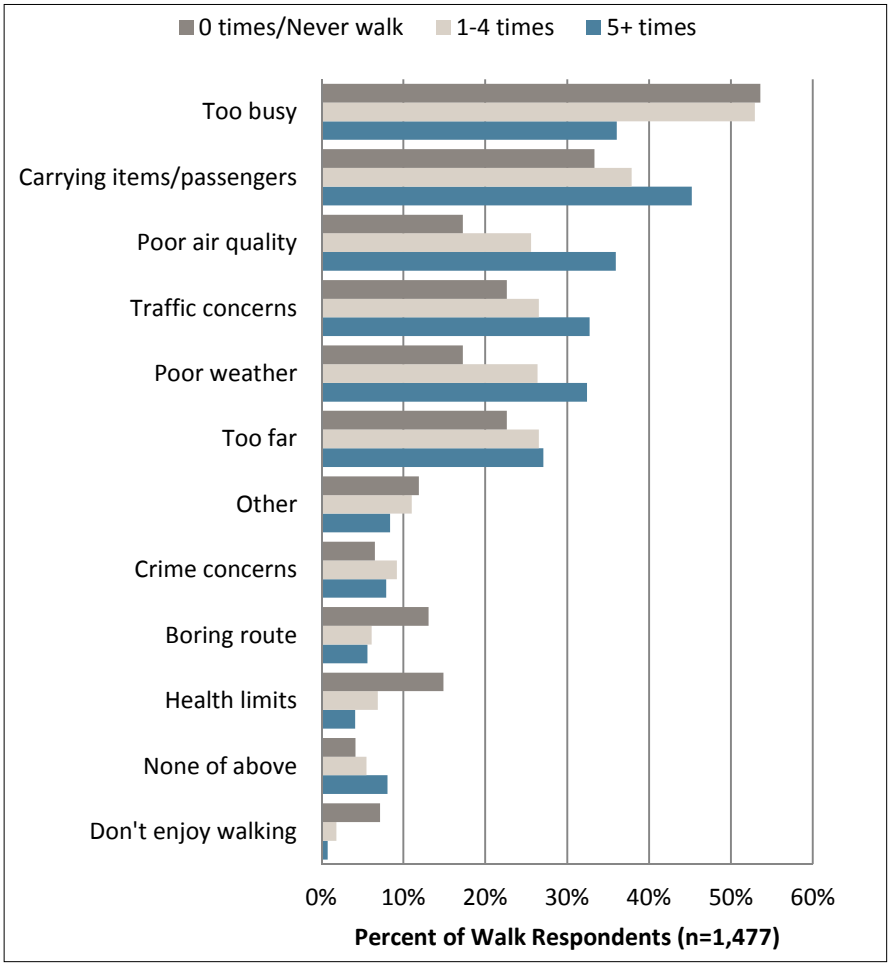


Figure 4.42: Typical Walking Barriers by Walking Frequency



In addition to asking respondents to identify the locations of specific physical barriers, the Barriers Survey also asked about pedestrian and bicycle barriers in general (Figure 4.42). While the overall majority of walk respondents reported a lack of time as a barrier, this was more common for non-walkers or less frequent walkers. More frequent walkers (those who walked 5 or more times the previous week) tended to report a greater variety of reasons. The need to carry passengers or items was their most common barrier, and the frequent walkers were also more discouraged by poor air quality, traffic issues, and poor weather. Respondents who rarely or never walk said that health limitations or a boring route were barriers somewhat more often than more frequent walkers.

Bicycle survey respondents reported a similar range of general barriers (Figure 4.43), in addition to the specific location barriers. The most common barrier for all respondents was related to traffic safety. Similar to the walking barriers, frequent bicyclists also commonly noted poor weather, a lack of carrying capacity, and poor air quality as reasons they did not bike more often, while people who rarely or never biked were more discouraged by hilly terrain and health limitations than frequent bicyclists.

Another question in the walking survey asked respondents to rate their comfort on a variety of types of pedestrian infrastructure, ranging from an off-street trail to the side of a roadway with no shoulder (Figure 4.44). Not surprisingly, few respondents are comfortable in less accommodating pedestrian environments (such as roadways with or without shoulders), and most are comfortable on facilities designed to separate pedestrians from traffic.

Figure 4.43: Typical Biking Barriers by Biking Frequency

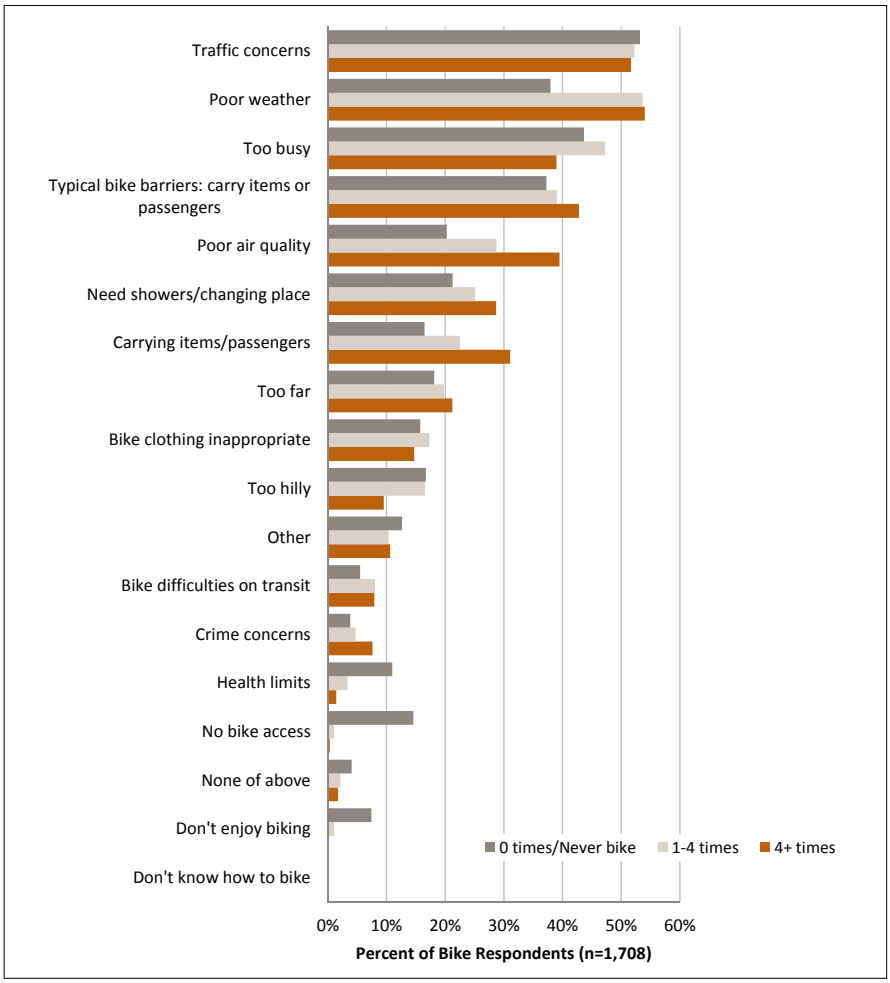
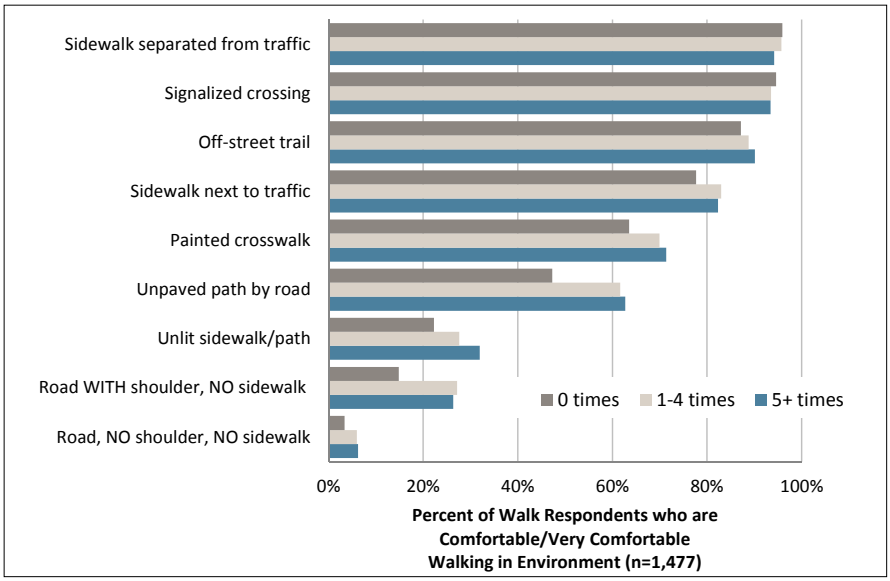


Figure 4.44: Walking Environment Comfort by Walking Frequency



Unlike walk respondents' comfort in various pedestrian environments, there were noticeable differences in comfort levels by biking frequency (Figure 4.45). Infrequent bicyclists were less often comfortable than frequent bicyclists on all facility types. The difference is particularly notable for all on-street facilities. There is less difference between infrequent and frequent cyclists on separated bike lanes or multi-use trails.

The last section of the Barriers Survey asked all respondents to rate their priorities on a variety of bicycling and walking facilities and programs. First, they rated the importance of funding different bicycling and walking infrastructure projects (Figure 4.46); second, they rated safety priorities (Figure 4.47). These ratings generally corresponded with the frequency of problem types mentioned earlier in the survey during the walking and biking

Figure 4.45: Biking Environment Comfort by Biking Frequency

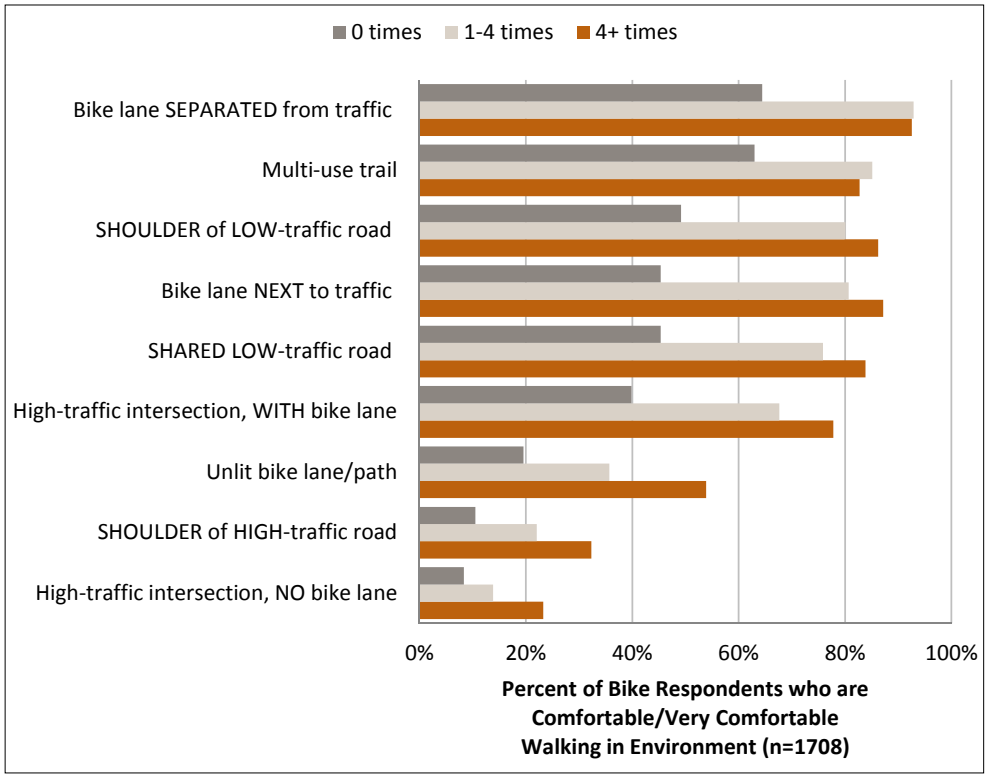
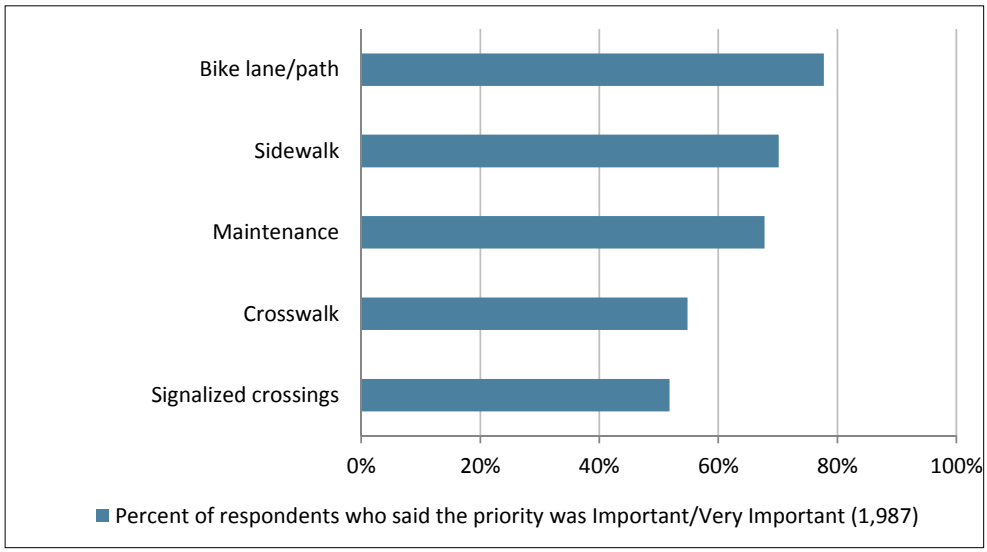


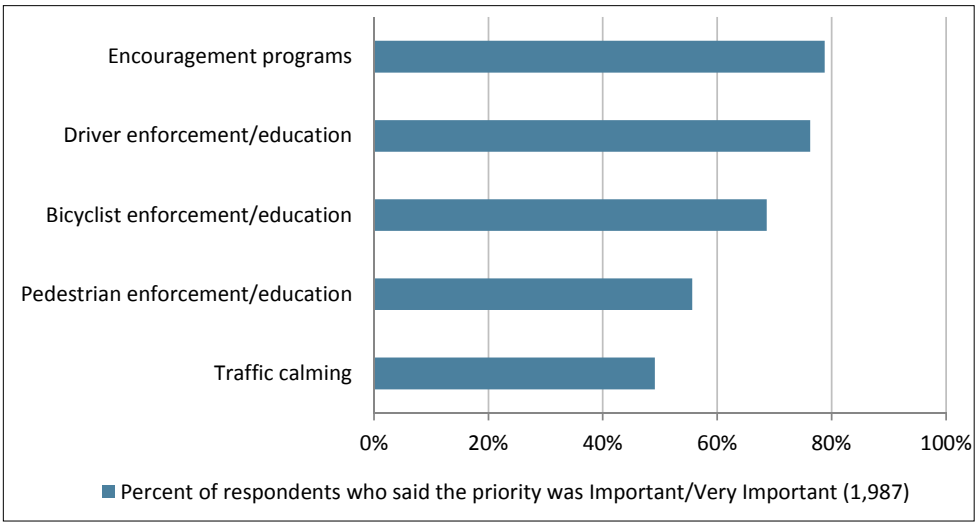
Figure 4.46: Important Funding Priorities



barriers sections (missing/incomplete infrastructure on roadways, sidewalks, and bike paths). For safety priorities, encouragement programs and driver education and enforcement were most commonly rated as important or very important priorities among all respondents.

The last section of the Barriers Survey allowed respondents to provide general comments or additional observations about bicycling and walking. The text of each comment is included in the Appendix. Topics discussed in these comments included concerns about air quality and maintenance issues, design suggestions and preferences, and types of destinations to consider for improved non-motorized access. Other comments mentioned the importance of providing or improving non-motorized access to transit. Additionally, several comments indicated a general concern about road user awareness, both from a driver's perspective, observing unsafe or unaware pedestrian or bicyclist behavior as well as from bicyclist and pedestrian perspectives of unaware drivers.

Figure 4.47: Important Safety Priorities



i. Throughout this report, "walk", "pedestrian", and other similar terms also refer to individuals who use mobility aids or devices to get around, such as walkers, wheelchairs, and scooters.

ii. http://www.nyc.gov/html/dcp/pdf/transportation/bike_survey.pdf

iii. http://www.portlandoregon.gov/transportation/article/372609

A subset of survey participants completed an Attitude Survey, where respondents answered questions regarding their opinions on transportation and land use planning. The survey was specifically tailored to each respondents' home regions and focused on relevant topics and developments in their area. The data from the Attitude Survey helps inform outreach and advocacy efforts as part of the Wasatch Choice 2040 long range development and transportation plan.

V. ATTITUDE SURVEY

1.0 INTRODUCTION 126

2.0 ADMINISTRATION 127

2.1 Survey Sample 127
2.2 Survey Invitation Materials 127
2.3 Survey Retrieval 127
2.4 Pre-Test Survey 127
2.5 Full Survey 127
2.6 Survey Incentives 128

3.0 QUESTIONNAIRE 129

3.1 Agreement Questions 129
3.2 Ranking Question 132
3.3 Dixie Add-on 132

4.0 DATA PREPARATION 133

4.1 Data Checking 133
4.2 Data Weighting 133

5.0 DATA ANALYSIS 134

5.1 Statewide Results 134
5.2 Regional Results 136

1.0 INTRODUCTION

The Attitude Survey was one of three special topic surveys administered to a random sample of households completing the Household Travel Diary. The purpose of the Attitude Survey was to learn more about opinions on transportation and land use planning, focusing specifically on relevant topics and developments in respondents' home regions. The data can be used as a complement to the Household Travel Diary and to help inform outreach and advocacy efforts as part of the Wasatch Choice 2040 long range development and transportation plan.

2.0 ADMINISTRATION

2.1 SURVEY SAMPLE

Each household invited to participate in the Utah Travel Study was randomly assigned to one of three debrief surveys: Attitudinal, Walk/Bike, or Long Distance. Given that the Walk/Bike Debrief survey was less likely to be relevant to households in rural regions outside of the MPO regions, these rural households were only invited to either the Attitudinal Debrief or the Long Distance Debrief. In total, 45,296 households (36%) from across the state were asked to participate in the Attitude Survey. 3,224 of the 45,296 households that were invited to the Attitude Survey went on to complete the entire survey. This response rate (7.1%) was approximately consistent across all three debrief surveys.

2.2 SURVEY INVITATION MATERIALS

The invitation materials included generic language that indicated the sponsoring agencies wanted to obtain responding households opinions on various transportation topics, but no more specific language was provided in advance to invitees of the Utah Travel Study in order to try to minimize bias or pre-planning from respondents regarding the attitudinal questions.

2.3 SURVEY RETRIEVAL

The Attitude Survey was administered in conjunction with the main Household Travel Diary survey, which launched on 23 March 2012 (the first travel date was 27 March 2012) and closed on 9 July 2012. The primary survey instrument was the RSG online survey, administered through a website produced specifically for the project. Participants logged into the survey website and entered their household-specific 8-digit password. This password was included in the invitation packet as well as on each of the postcard and email reminders. At any point, respondents could exit out of the survey and later return to the survey homepage, log in using their password, and continue from where they left off. The Attitude Survey was simply the last section of the main Household Travel Diary survey for each adult to complete.

For respondents who preferred not to complete their survey online or lacked Internet access, members could call a toll-free number and Westat operators were available to administer the survey over the phone (see Chapter 1 for more information).

The online survey was also offered in both English and Spanish; respondents could easily choose to switch back and forth between English and Spanish on each page of the survey. Participants who opted to take the survey by phone were provided foreign language service that as part of Westat's standard survey operation.

The structure of the survey and the questions remained the same for both English and Spanish survey versions, and the Spanish version represented a direct translation from the English version. Therefore, all responses were analyzed as one dataset, regardless of survey language.

2.4 PRE-TEST SURVEY

The Attitude survey pre-test was conducted as a part of the Household Travel Diary's pre-test during January and February 2012. In the pre-test, 203 households completed the Utah Travel Study whereby every household member completed every question of the survey (see Chapter 1 for more information). As part of the review of pre-test data, wording modifications were made to a few of the question statements in the Attitude survey. Similarly, the review of the pre-test data confirmed the decision not to ask the attitude survey to households in the rural regions of Utah. Lastly, upon reviewing the pre-test data, the decision was made to add one new question at the start of the attitude survey to confirm the identity of the household member. This new proxy question is discussed below.

2.5 FULL SURVEY

Each invited household were randomly assigned one of 33 travel dates beginning on Tuesday, March 27, 2012 and ending on Thursday, June 28, 2012. To best capture a snapshot of each member's typical weekday trips, all assigned travel dates occurred on a Tuesday, Wednesday, or Thursday. As previously mentioned, the Attitude Debrief Survey was appended to the one-day travel diary for approximately 36% of all households. Adults participated in this debrief survey as a part of this full survey effort.

5,266 adults from 3,224 households completed the Attitude Survey on their own. The first question of the Attitude Survey (and therefore the last question of the Household Travel Diary survey) asked the participant to confirm if they had been completing the Household Travel Diary for themself, for someone who was sitting with them (and present), or for a family member who wasn't present (but had provided their travel log information). Proxy responses to the Attitude Survey were not allowed,

meaning if a respondent completed the Household Travel Diary survey for a family member who was not present then the Attitude Survey questions were not shown or asked for the household member who was not present. This decision was made because the household member was able to take the Attitude Survey themselves and did not need to answer those questions again for the household member who was not present. Answering the attitude questions more than once (for themselves and for a household member who was not present) would also potentially bias the results. The impact on the Attitude Survey data is that the sample is comprised of households where all adults completed the Attitude Survey and households where only a subset of adults completed the Attitude Survey. The regional breakdown of complete surveys is presented in Table 5.1.

Table 5.1: Sample Size by Region

	ADULTS (COUNT)	PERCENT
Cache	442	8%
Dixie	514	10%
WFRC-MAG	3,114	59%
Utah Other	1,196	23%
Total	5,266	

2.6 SURVEY INCENTIVES

A $10 Amazon.com gift card was offered as an incentive to encourage participation in the Utah Travel Study. Households who completed the entire Utah Travel Study, including both the Household Travel Diary and their assigned debrief survey (in this case the Attitude Survey) were sent their gift card.

3.0 QUESTIONNAIRE

3.1 AGREEMENT QUESTIONS

The Attitude Debrief Survey consisted primarily of a series of "agreement" questions. In this question format, respondents were presented with a series of statements and were asked to select how strongly they agreed or disagreed with each of those statements (Figure 5.1). Some statements were shown to all respondents while other statements varied by home region so as to be more specific and relevant to respondents. During the questionnaire design process, RSG worked with the stakeholder committee to identify regionally-specific topics and statements that were important to each agency or MPO to include in the final survey.

A total of 32 statements were used in the survey. Respondents saw, on average, about half of all of those statements with the specific statements varying by region. Table 5.2 shows which statements were asked of residents from each region. RSG made an effort to group the statements by theme for the online survey while also keeping the number of statements (rows) on each topic (screen) to approximately six or fewer.

Figure 5.1: Example Agreement Question

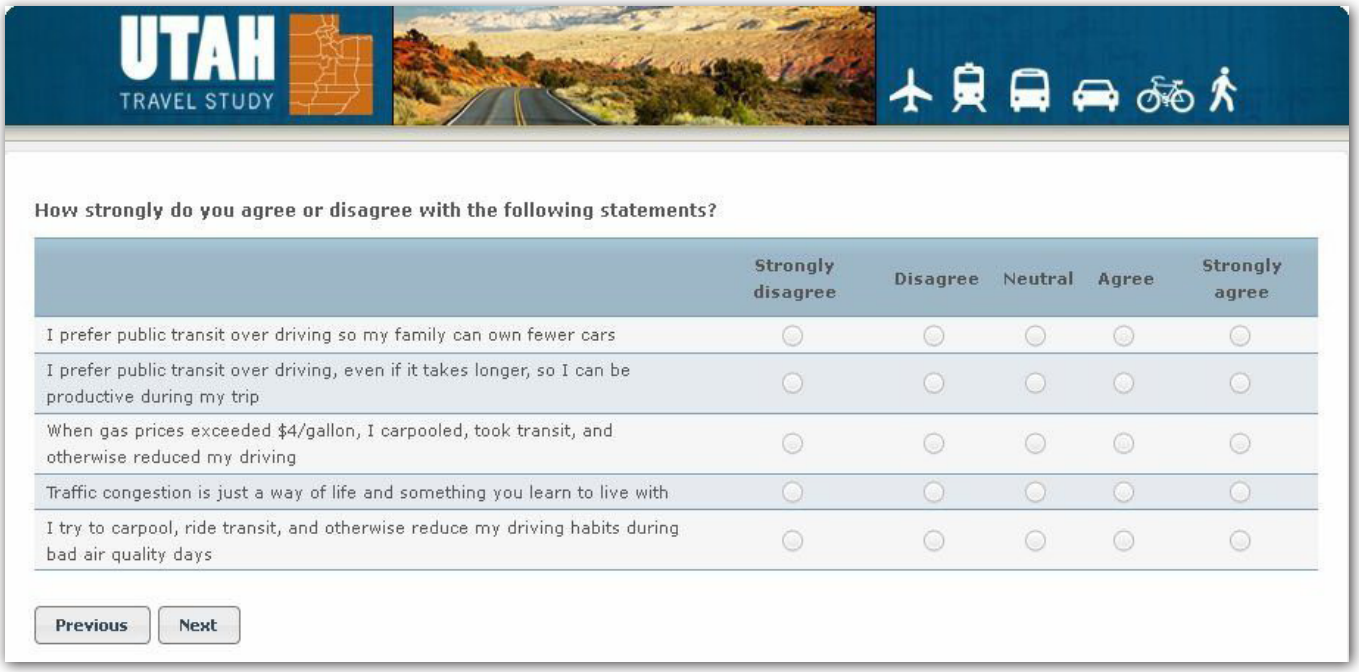


Table 5.2: Statements Included for Each Region

TOPIC	STATEMENT	DIXIE	MAG	WFRC	CACHE	UDOT
Transit/Travel Mode	The transportation system is well planned/ designed in Washington County	X				
Transit/Travel Mode	Traffic congestion is just a way of life and something you learn to live with			X		
Transit/Travel Mode	Traffic congestion is NOT a major problem for me	X	X			
Transit/Travel Mode	I have to drive to get to transit anyway, so I may as well just drive my car the whole way	X	X			X
Transit/Travel Mode	When gas prices exceeded $4/gallon, I carpooled, took transit, and otherwise reduced my driving		X	X		
Transit/Travel Mode	I try to carpool, ride transit, and otherwise reduce my driving habits during bad air quality days		X	X	X	
Transit/Travel Mode	I have carpooled more since the Utah Department of Transportation (UDOT) implemented Express Lanes on I-15		X			
Transit/Travel Mode	For me, car is king! Nothing will replace my car as my main mode of transportation				X	X
Transit/Travel Mode	If available, I would use express bus service to connect the Cache Valley with the Utah Transit Authority's (UTA) bus and train system on the Wasatch Front				X	
Transit/Travel Mode	I would be willing to drive less if I had better transit choices	X				X
Transit/Travel Mode	I would be willing to drive less if I had more advanced notice to plan my schedule differently on those days					X
Transit/Travel Mode	I would be willing to drive less if there were more sidewalks and bicycle lanes for me to use					X
Transit/Travel Mode	Public transit is my only transportation option	X	X		X	
Transit/Travel Mode	I currently make an effort to take public transit whenever I can	X			X	
Transit/Travel Mode	Overall, public transit in my region meets my needs		X		X	
Transit/Travel Mode	I can take transit to most locations in my region quickly and easily	X				
Transit/Travel Mode	I prefer public transit over driving, even if it takes longer, so I can be productive during my trip			X		
Transit/Travel Mode	I prefer public transit over driving so my family can own fewer cars			X		
Transit/Travel Mode	The Cache Valley Transit District (CVTD) bus system should begin to charge a fare				X	
Land Use	Transportation and land use planning should be more coordinated, even if it meant limiting land use choices	X	X	X	X	X
Land Use	A top transportation priority should be to promote infill land development and redevelopment	X	X	X	X	X

TOPIC	STATEMENT	DIXIE	MAG	WFRC	CACHE	UDOT
Land Use	A top transportation priority should be to provide improved access to new areas for development	X	X	X	X	X
Land Use	A top transportation priority should be to improve the connectivity of streets and sidewalks for shorter distance trips	X	X	X	X	X
Taxes	I support a road or a bridge across Utah Lake to connect our growing population (west of Utah Lake) to the city centers (east of Utah Lake)		X			
Taxes	Some residential streets will need to be widened or otherwise improved in order to meet the future travel demand for Cache Valley				X	
Taxes	A five lane arterial road is needed on the west side of Cache Valley (west of 10th West) from south of Logan to Smithfield or beyond				X	
Taxes	I am in favor of building more round-about intersections (like the one at 200 East and 1800 North)				X	
Taxes	A top transportation priority should be to maintain efficient traffic flow on our most heavily travelled roadways	X	X	X		X
Taxes	Improving the transportation system would improve the economy	X	X	X	X	X
Taxes	I would be willing to pay higher taxes in order to build a transportation system that resulted in less traffic congestion	X	X	X	X	X
Taxes	I would be willing to pay higher taxes in order to build more sidewalks, trails, and bicycle lanes			X	X	
Taxes	I would be willing to pay higher taxes in order to improve or expand mass transit	X			X	
Total		15	15	13	18	12

3.2 RANKING QUESTION

After answering the series of agreement questions, all respondents regardless of region were asked to prioritize five transportation priorities. These priorities and the wording for the priorities were provided by Utah DOT based on the published priorities for the agency itself:

1. Improve traffic safety
2. Make existing transportation facilities more efficient
3. Provide a greater range of transportation choices for mode of travel
4. Build more transportation capacity
5. Improve the condition of our pavement and bridges

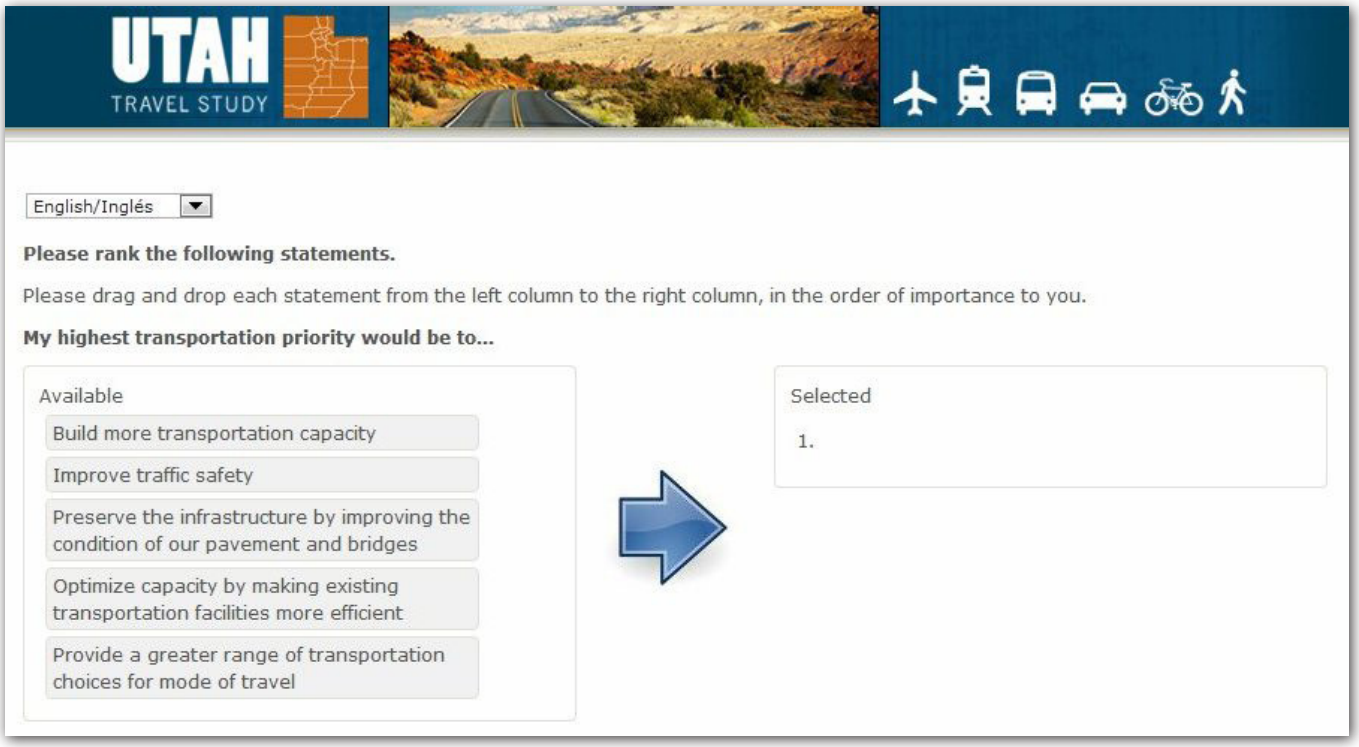
Respondents used the interactive "drag-and-drop" to rank the statements. The statements were shown on screen to respondents in a randomized order in order to minimize order bias. The end result is an ordered list of priorities for each respondent and overall (Figure 5.2). This identical ranking question was also asked of all college students who completed the Utah College Travel Diary survey (see separate chapter).

3.3 DIXIE ADD-ON

Residents of the Dixie MPO region were asked two additional questions:

1. What is your opinion of the transit service in the St. George region?
   - The service is adequate
   - The service should be expanded in the city of St. George
   - The service should be expanded in St. George and extended to other nearby communities
   - The service should be reduced or eliminated
2. Which of the following would encourage you to make greater use of transit service? Please select all that apply.
   - More frequent service
   - Faster service
   - Service to the new Airport
   - Service extended to nearby communities (e.g. Washington, Ivins)
   - Service to Zion National Park
   - Gas prices increase (by $1 or more)
   - Free transit service
   - None of the above

Figure 5.2: Drag-and-Drop Ranking Question



4.0 DATA PREPARATION

4.1 DATA CHECKING

Besides the data checking described in Chapter 1 about the Household Travel Diary, no additional data checks were performed on the Attitude Survey data.

4.2 DATA WEIGHTING

No weights were applied to the Attitude Survey data for the purposes of this analysis.

5.0 DATA ANALYSIS

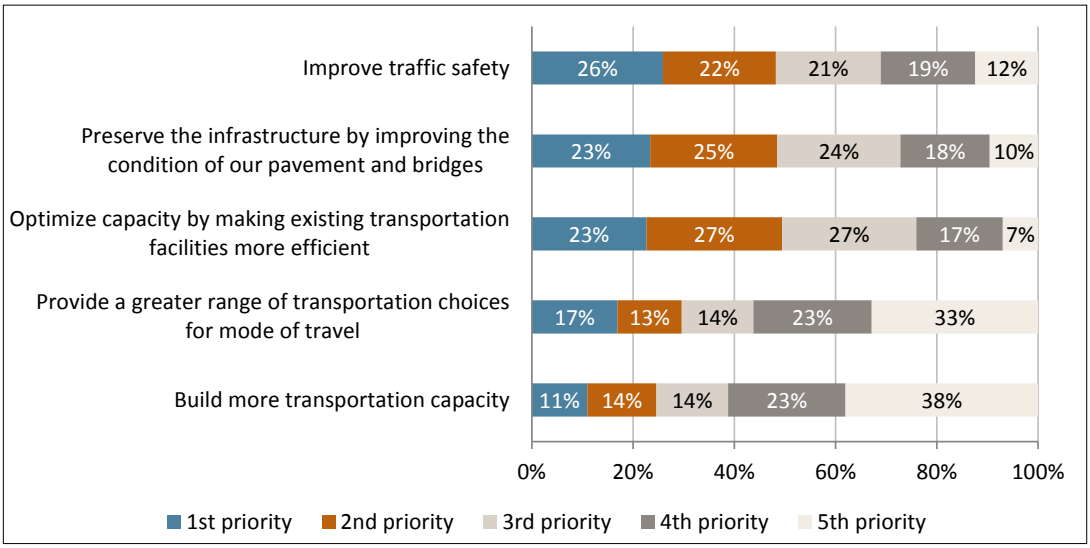
5.1 STATEWIDE RESULTS

5.1.1 Priority Ranking

Near the end of the Attitude Survey, respondents were instructed to rearrange five transportation priorities in order of importance to them. By forcing them to rank all five statements, analysts can identify the relative importance of each. Without this feature, many respondents would have likely ranked all five of these statements as a "high priority". Overall, the three statements involving the preservation/improvement of existing conditions ("improve traffic safety", "preserve the infrastructure by improving the condition of our pavement and bridges", and "optimize capacity by making existing transportation facilities more efficient") received the most high rankings (1st, 2nd, or 3rd, priority). These three statements received a "top two" ranking from nearly half of the sample. For example, 26% of the sample selected "improve traffic safety" as their top overall priority while 22% more selected it as their second overall priority (Figure 5.3).

In general, priorities did not vary significantly between regions, especially among those with shared characteristics (e.g. WFRC and MAG). "Making existing transportation facilities more efficient", "improving the condition of our pavement and bridges," and "improving traffic safety" all were given the highest rank by at least one region (Figure 5.4). For example, 23% of the overall sample selected "optimizing capacity by making existing transportation facilities more efficient" as the top priority, but that same figure was 27% for the WFRC-MAG region. Meanwhile, "providing a greater range of transportation choices for mode of travel" and "building more transportation capacity" were consistently ranked at the "bottom" of the list. These findings were largely true across the state.

Figure 5.3: Priority Rankings for Entire Sample



5.1.2 Land Use Attitudes

Respondents from all regions were asked to evaluate a set of statements about land use planning. Unlike the ordered ranking described above, this question involved respondents selecting their agreement with each statement on a five-point scale (strongly disagree to strongly agree). The WFRC-MAG region and the rest of the state placed the statements in the same general order ("a top transportation priority should be to improve the connectivity of streets and sidewalks for shorter distance trips" was highest); however, some regional differences did emerge. The biggest difference between WFRC-MAG region and the rest of the state was in "Transportation and land use planning should be more coordinated, even if it meant limiting land use choices": the Wasatch Front tended to agree with that statement significantly more than residents from the rest of the state.

Figure 5.4: Top Priority by Region

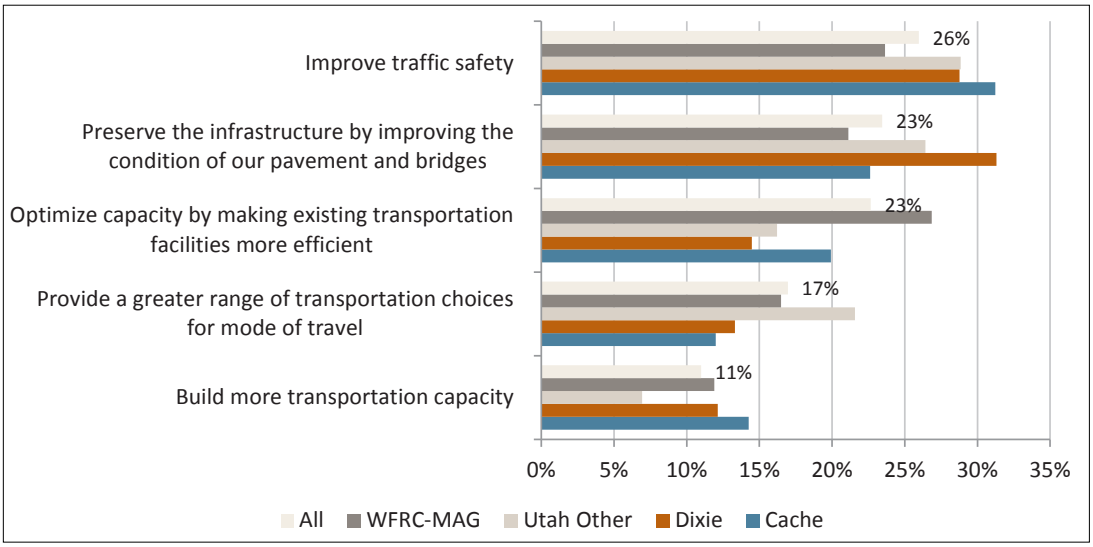
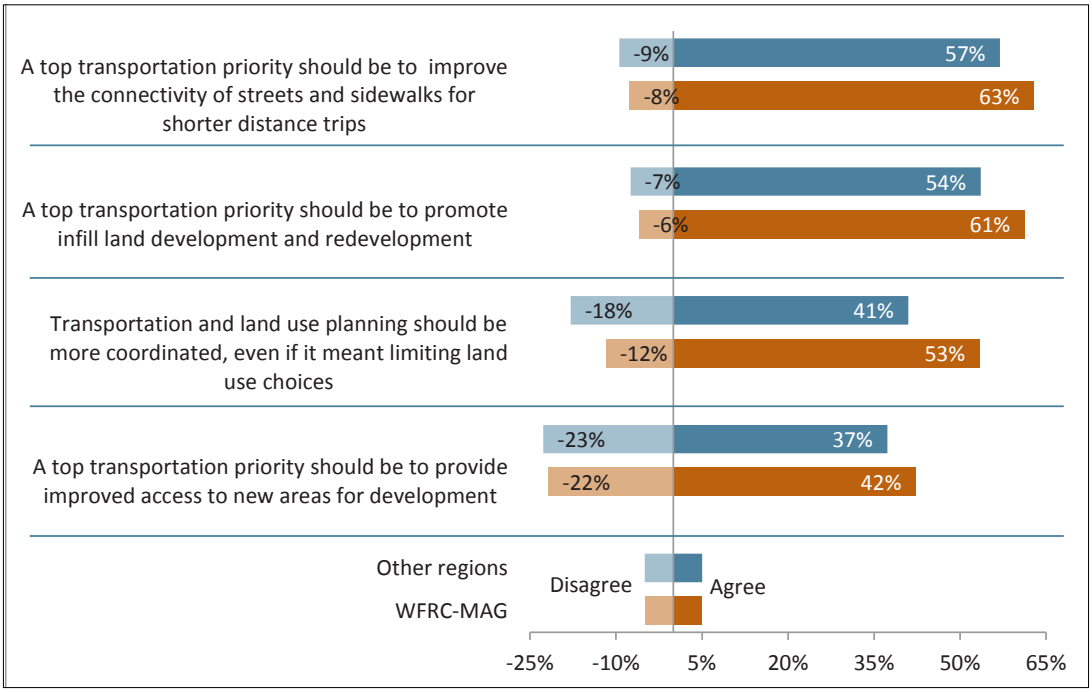


Figure 5.5: Land Use Attitudes by Region



5.2 REGIONAL RESULTS

This section provides an overview of the Attitude Survey results for each region. All "agreement" levels represent the percent who selected "strongly agree" or "agree", unless otherwise noted. In addition, if WFRC residents were not asked a particular question but MAG residents were, that is noted with the text "(no WFRC data)" in the WFRC-MAG region.

5.2.1 WFRC-MAG

Below are some selected findings for the WFRC-MAG region:

Taxes

- Wasatch Front residents (along with those from Cache) are more interested in using tax revenue to build a transportation system that resulted in less traffic congestion than residents from the other parts of the state (Figure 5.6)
- 87% agree that "A top transportation priority should be to maintain efficient traffic flow on our most heavily travelled roadways" (Figure 5.6)

Driving, Transit, and Mode Choice

- Approximately 41% of Wasatch Front residents think that congestion is NOT a major problem. In Dixie, this number is closer to 70% (Figure 5.7)
- There appears to be an opportunity to education more on existing non-auto mode options (carpooling for I-15, regional transit) to try and change the mindsets of travelers and have them consider a mode switch (Figure 5.8 and Figure 5.9)
- Satisfaction with the public transit system in MAG is meeting the needs of less than 20% of residents (Figure 5.8)
- High gas prices impacted behavior (mode) for approximately 38% of Wasatch Front residents

5.2.2 Cache

Below are some selected findings for the Cache region:

Taxes

- 27% of residents would be willing to pay higher taxes in order to improve or expand mass transit, while more than 42% would be willing to pay higher taxes in order to build more sidewalks, trails, and bicycle lanes (Figure 5.6)

Driving, Transit, and Mode Choice

- Cache residents are largely open to transit: 40% agree with the statement "If available, I would use express bus service to connect the Cache Valley with the Utah Transit Authority's (UTA) bus and train system on the Wasatch Front" (Figure 5.9)
- Although most residents consider their "car to be king", they are also fairly willing to switch modes if they had advance notice to plan their schedule differently (Figure 5.6)
- 36% of Cache residents think that the transit system meets their needs (Figure 5.7)

5.2.3 Dixie

Below are some selected findings for the Dixie region:

Transportation System

- Although 51% of Dixie residents are neutral on whether or not "The transportation system is well planned/designed in Washington County", more adults disagree with that statement (30%) than agree (19%).

Taxes

- 44% of Dixie residents agree that "Improving the transportation system would improve the economy". Agreement is significantly higher in WFRC-MAG (59%) and the UDOT region (57%).

Driving, Transit, and Mode Choice

- Most residents (67%) don't think traffic congestion is a problem (Figure 5.7)
- Transit use (4%) and willingness to use transit are both quite low (Figure 5.8). Note the findings from the SunTran OnBoard Survey (Chapter 6), which show that most users of the system use it frequently and rely on it.
- "I have to drive to get to transit anyway, so I may as well drive the whole way" – agreement in Dixie is 46% compared with approximately 35% in both the MAG region and UDOT.

5.2.4 UDOT

Taxes

- "I would be willing to pay higher taxes in order to build a transportation system that resulted in less traffic congestion": 30% of residents from the UDOT region agree with that statement, a figure that is significantly lower than the WFRC region (43%) and significantly higher than the Dixie region (25%)
- Rural residents are more likely to agree that improving the transportation system improves the economy (57%) than Dixie residents (44%) or Cache residents (48%)

Driving, Transit, and Mode Choice

- Rural residents appear to be more likely to drive less under certain conditions. Although most of these statement were asked only of UDOT and Cache residents, rural residents were more likely to drive less:
  - If there were more sidewalk sand bicycle lanes (28% to 10%)
  - If residents had more better transit choices (50% to 36% in Dixie and 20% in Cache)

Figure 5.6: Taxes – Percent Agreement by Region

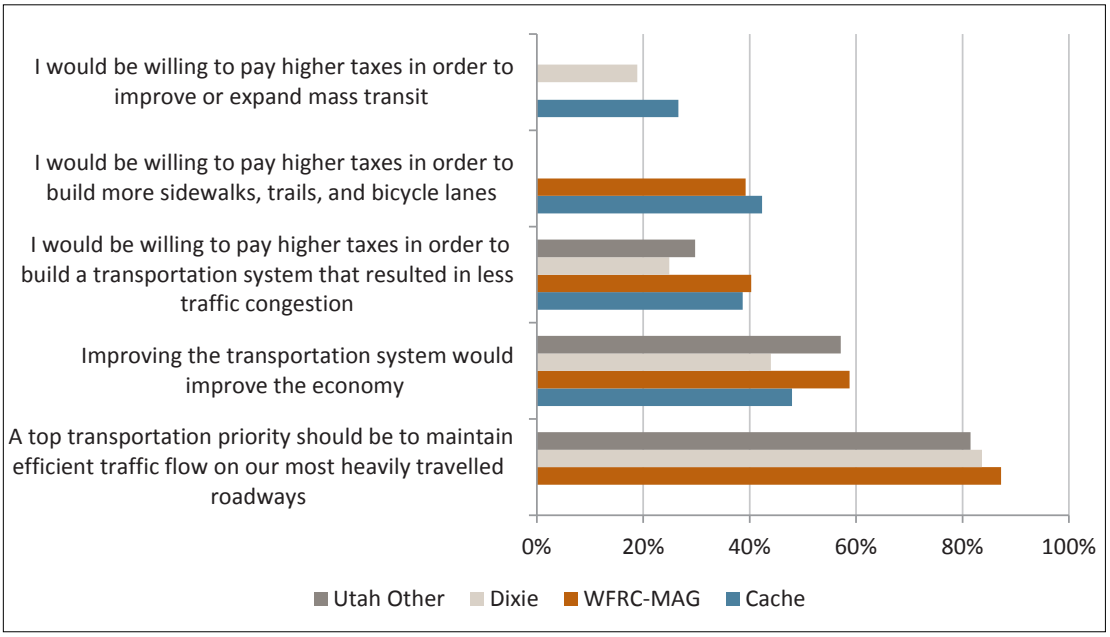


Figure 5.7: Driving Habits – Percent Agreement by Region

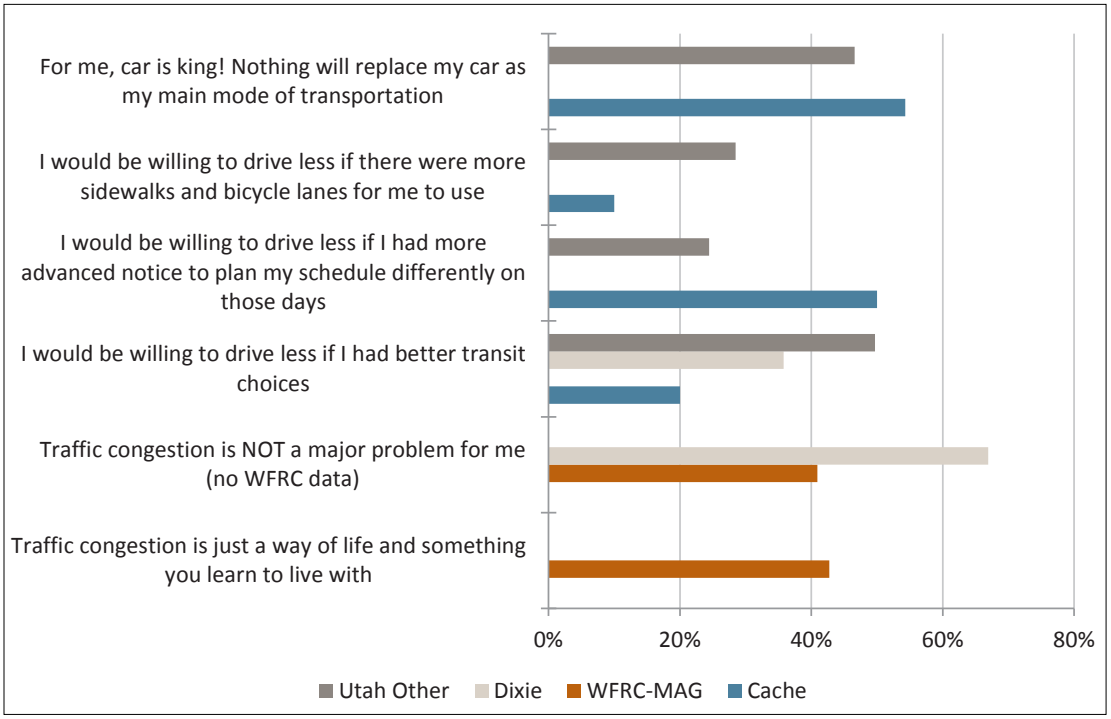


Figure 5.8: Transit Use – Percent Agreement by Region

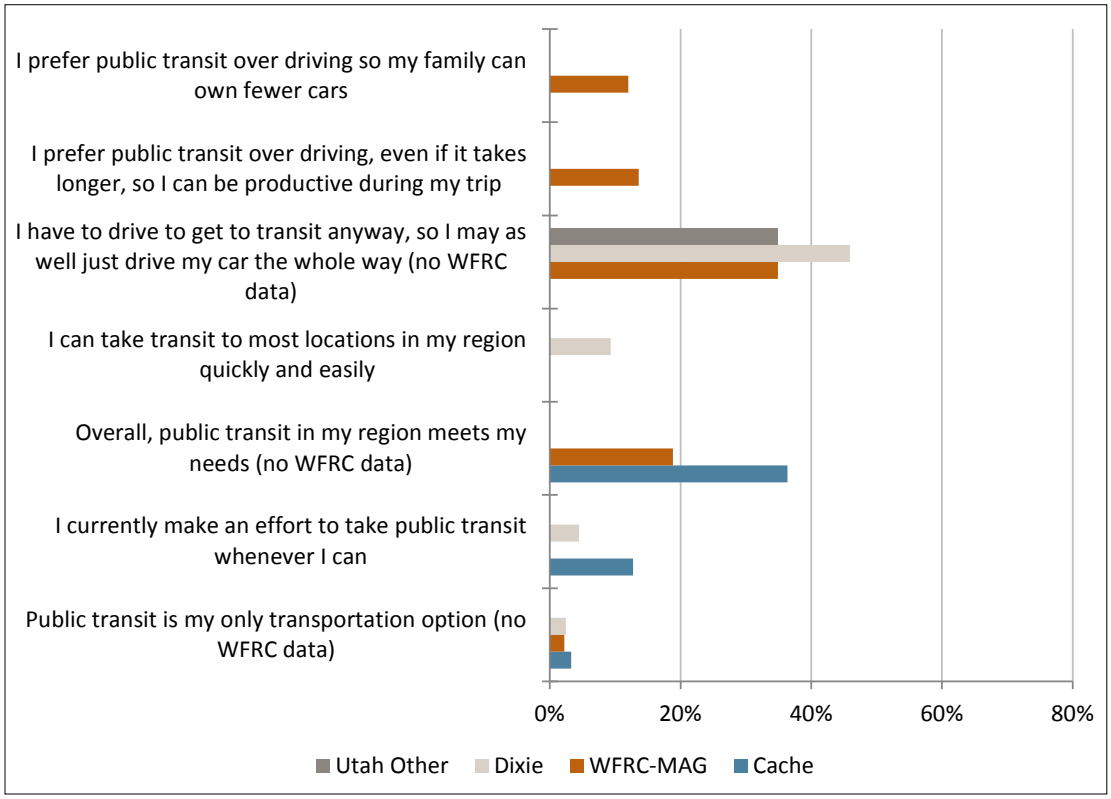
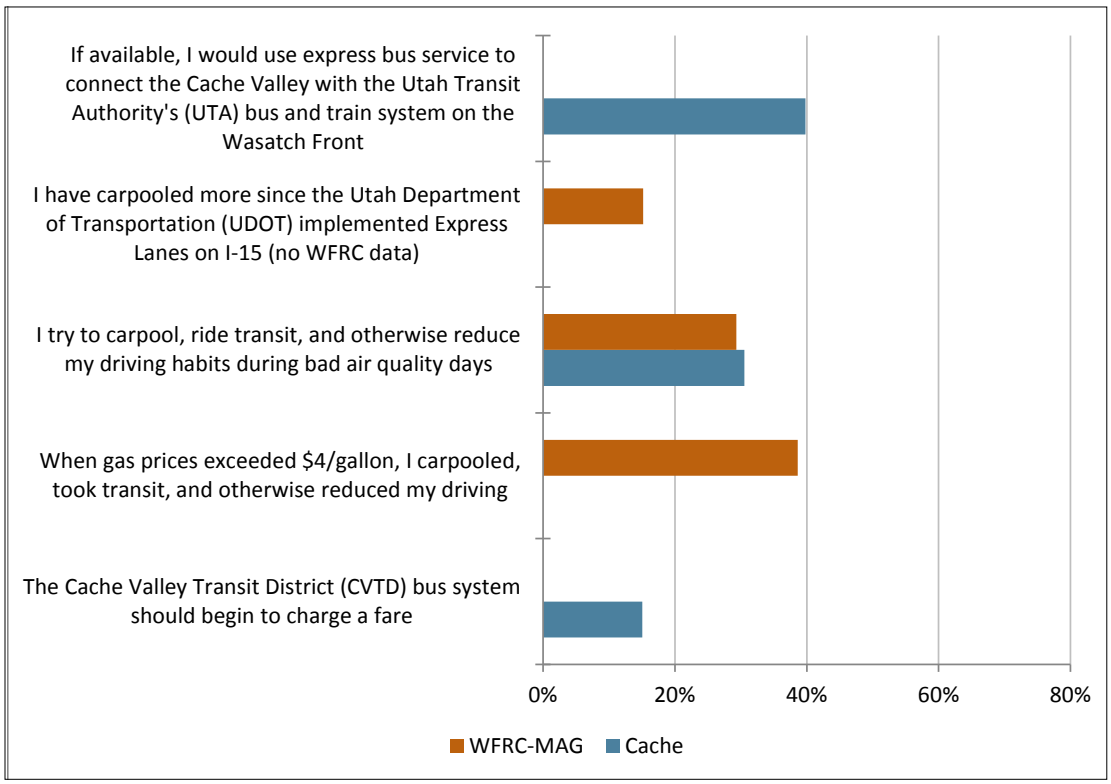


Figure 5.9: Mode Choice – Percent Agreement by Region



The demand for public transit in St. George has grown steadily over the past few years to a ridership of over 37,000 in 2012. To better understand the demographics and use of SunTran buses in the larger context of the Utah Travel Study project, RSG conducted a preliminary transit onboard survey in the St. George region. Among the 558 respondents, it is clear that SunTran is serving an important population that is reliant on transit service. More than three-quarters (76%) of respondents said that they did not have another transportation option other than SunTran, and 76% of respondents reported that they ride SunTran four or more days per week.

VI. DIXIE SUN TRANSIT ON-BOARD SURVEY

1.0 INTRODUCTION 142

2.0 ADMINISTRATION 144

2.1 Survey Sample 144
2.2 Survey Materials 144
2.3 Survey Incentive 144

3.0 QUESTIONNAIRE 146

4.0 DATA PREPARATION 146

5.0 DATA ANALYSIS 147

5.1 Summary Results 147
5.2 Trip Detail Results 147
5.3 Attitudinal Results 147
5.4 Demographic Results 147

1.0 INTRODUCTION

Need for a SunTran OnBoard Survey

SunTran is the city of St. George's public transit system in Washington County, Utah and operates as a division of the City of St. George Public Works Department. SunTran has four routes that run in the downtown St. George area and connect at the city's Transit Center at Dixie State College (100 South 1000 East). Currently, buses run every 40 minutes from Monday through Saturday from 6:00AM to 8:00PM. SunTran does not operate on the following days: Sundays, New Year's Day, Memorial Day, 4th of July, Pioneer Day, Labor Day, Thanksgiving Day, and Christmas Day. In total, SunTran buses pick up and drop off passengers at more than 60 bus stops across the St. George area.

The SunTran bus fare can be paid using cash or by purchasing a pass. To ride SunTran a cash fare costs $1.00 or $0.50 for a discount fare for seniors, persons with disabilities, or Medicare cardholders. SunTran also offers several pass options; a one-day pass, a monthly pass, a 10-ride pass, and a semester pass for college students.

The SunTran system was formed in 2003 and provided 65,935 rides that year. By 2011, SunTran provided 442,000 rides, with ridership increasing steadily at a pace of close to 20% annually. In 2010, the SunTran operating budget was $0.9 million dollars. Given that the demand for public transit in St. George has grown steadily, it was determined that a preliminary transit onboard survey to understand more about the demographics and use of SunTran buses would be a valuable component of the larger Utah Travel Study project.

Known SunTran Ridership Data

In preparation for conducting the Dixie (SunTran) On-Board Survey, the Dixie MPO and RSG reviewed available ridership data for the SunTran system. In this planning stage, the following ridership information was known (Table 6.1). Over the past few years, the SunTran year-to-year ridership has continued to grow steadily. For example, ridership in the month of January has increased from 26,721 in 2009 to 37,626 in 2012.

Table 6.1: SunTran Annual Ridership

MONTH	2009	2010	2011	2012
January	26,721	25,303	36,770	37,626
February	24,743	27,931	36,003	36,931
March	26,790	31,637	39,174	38,292
April	27,231	30,456	37,673	36,318
May	25,496	29,000	35,059	35,505
June	27,100	31,315	35,724	34,821
July	26,616	29,458	33,601	Not available
August	28,979	32,721	39,562	Not available
September	28,324	35,566	38,242	Not available
October	29,609	35,851	38,415	Not available
November	26,403	34,679	36,094	Not available
December	26,281	30,981	35,909	Not available

The Dixie MPO and RSG were also able to obtain more detailed ridership information from SunTran for the month of June 2012. This information is provided in the table below and is only provided for weekdays (Table 6.2). For the 21 weekdays in June 2012, SunTran had an average daily ridership of 1,386. Routes 1, 2, and 4 averaged between 300 and 350 passengers on weekdays, while Route 3 averaged about 400 passengers each weekday in June 2012.

Table 6.2: SunTran June 2012 Weekday Ridership

DATE	ROUTE 1 RED CLIFFS	ROUTE 2 RIVERSIDE	ROUTE 3 WEST SIDE	ROUTE 4 SUNSET	TOTAL
1-June	300	318	380	269	1267
4-June	357	352	470	314	1493
5-June	400	314	460	376	1550
6-June	329	307	410	332	1378
7-June	329	315	391	300	1335
8-June	347	363	349	343	1402
11-June	293	292	420	37	1382
12-June	318	311	413	360	1402
13-June	343	365	379	307	1394
14-June	324	256	385	305	1270
15-June	397	358	365	288	1408
18-June	328	344	438	363	1473
19-June	326	363	452	384	1524
20-June	341	343	440	322	1446
21-June	334	349	346	289	1318
22-June	345	302	415	311	1373
25-June	291	335	443	366	1435
26-June	357	295	411	331	1394
27-June	315	317	380	328	1340
28-June	298	313	366	293	1270
29-June	299	282	361	319	1261

2.0 ADMINISTRATION

2.1 SURVEY SAMPLE

The Dixie MPO and RSG worked together to create a plan for the Dixie MPO to administer the SunTran onboard survey. An overview of the sampling plan is as follows:

- On 8-9 November 2012, Dixie MPO staff distributed paper surveys on-board buses
- Because the SunTran system is small, Dixie MPO staff attempted to hand-out surveys for every trip, for each of the four routes, on the 8-9th of November.
- Surveys were not distributed on a Saturday (weekend), but were only distributed for the two weekdays
- Each bus runs from 6AM-8PM, with new round-trips every 40 minutes. Round-trips are approximately 35 minutes in duration. Therefore, in total, there are approximately 20 round-trips per day, across 14 hours, for each route
- Each route was divided into two 7-hour blocks of time or shifts for staff to distribute surveys.

At this time, RSG does not know the details of exactly how many Dixie MPO staff worked to distribute survey or exactly how many surveys were distributed by Dixie MPO staff. This information can be requested from the Dixie MPO.

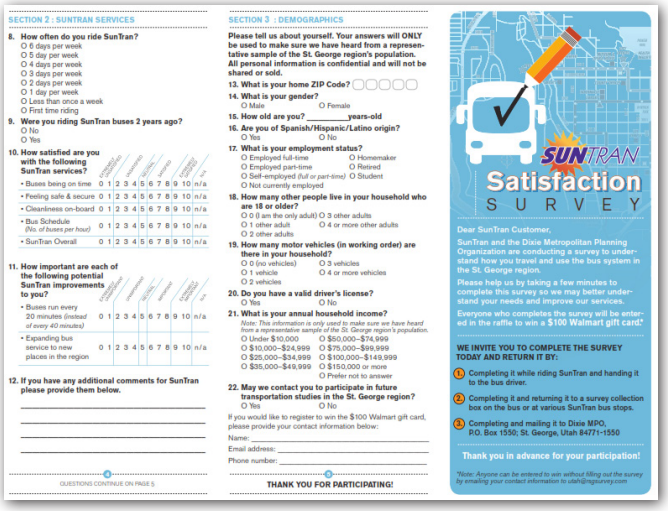
2.2 SURVEY MATERIALS

Because the SunTran average daily ridership in June 2012 was approximately 1,386 riders, RSG designed, printed, and provided the Dixie MPO with 2,000 paper surveys in English (Figure 6.1 and Figure 6.2) and 1,000 paper surveys in Spanish (Figure 6.3 and Figure 6.4) in order to ensure there would be an adequate number of surveys to distribute for the two weekdays in November.

2.3 SURVEY INCENTIVE

A raffle prize for one winning respondent of a $100 gift card to Walmart was offered. This text was printed on the front of the survey and then respondents were asked to provide their name and contact information if they wanted to be entered into the raffle.

Figure 6.1: Paper Survey in English, Side A



SECTION 2 : SUNTRAN SERVICES

8. How often do you ride SunTran?
O 6 days per week
O 5 day per week
O 4 days per week
O 3 days per week
O 2 days per week
O 1 day per week
O Less than once a week
O First time riding

9. Were you riding SunTran buses 2 years ago?
O No
O Yes

10. How satisfied are you with the following SunTran services?
• Buses being on time 0 1 2 3 4 5 6 7 8 9 10 n/a
• Feeling safe & secure 0 1 2 3 4 5 6 7 8 9 10 n/a
• Cleanliness on-board 0 1 2 3 4 5 6 7 8 9 10 n/a
• Bus Schedule (No. of buses per hour) 0 1 2 3 4 5 6 7 8 9 10 n/a
• SunTran Overall 0 1 2 3 4 5 6 7 8 9 10 n/a

11. How important are each of the following potential SunTran improvements to you?
• Buses run every 20 minutes (instead of every 40 minutes) 0 1 2 3 4 5 6 7 8 9 10 n/a
• Expanding bus service to new places in the region 0 1 2 3 4 5 6 7 8 9 10 n/a

12. If you have any additional comments for SunTran please provide them below.

QUESTIONS CONTINUE ON PAGE 5

SECTION 3 : DEMOGRAPHICS

Please tell us about yourself. Your answers will ONLY be used to make sure we have heard from a representative sample of the St. George region's population. All personal information is confidential and will not be shared or sold.

13. What is your home ZIP Code? ☐☐☐☐☐
14. What is your gender?
O Male O Female
15. How old are you? _____years-old
16. Are you of Spanish/Hispanic/Latino origin?
O Yes O No
17. What is your employment status?
O Employed full-time O Homemaker
O Employed part-time O Retired
O Self-employed (full or part-time) O Student
O Not currently employed
18. How many other people live in your household who are 18 or older?
O 0 (I am the only adult) O 3 other adults
O 1 other adult O 4 or more other adults
O 2 other adults
19. How many motor vehicles (in working order) are there in your household?
O 0 (no vehicles) O 3 vehicles
O 1 vehicle O 4 or more vehicles
O 2 vehicles
20. Do you have a valid driver's license?
O Yes O No
21. What is your annual household income?
Note: This information is only used to make sure we have heard from a representative sample of the St. George region's population.
O Under $10,000 O $50,000–$74,999
O $10,000–$24,999 O $75,000–$99,999
O $25,000–$34,999 O $100,000–$149,999
O $35,000–$49,999 O $150,000 or more
O Prefer not to answer
22. May we contact you to participate in future transportation studies in the St. George region?
O Yes O No

If you would like to register to win the $100 Walmart gift card, please provide your contact information below:
Name: _____
Email address: _____
Phone number: _____

THANK YOU FOR PARTICIPATING!

SUNTRAN Satisfaction SURVEY

Dear SunTran Customer,

SunTran and the Dixie Metropolitan Planning Organization are conducting a survey to understand how you travel and use the bus system in the St. George region.

Please help us by taking a few minutes to complete this survey so we may better understand your needs and improve our services.

Everyone who completes the survey will be entered in the raffle to win a $100 Walmart gift card.*

WE INVITE YOU TO COMPLETE THE SURVEY TODAY AND RETURN IT BY:

1. Completing it while riding SunTran and handing it to the bus driver.
2. Completing it and returning it to a survey collection box on the bus or at various SunTran bus stops.
3. Completing and mailing it to Dixie MPO, P.O. Box 1550; St. George, Utah 84771-1550

Thank you in advance for your participation!

*Note: Anyone can be entered to win without filling out the survey by emailing your contact information to utah@rsgsurvey.com

Figure 6.2: Paper Survey in English, Side B

SECTION 1 : TRIP QUESTIONS

Please tell us about the trip you were making today when you received this survey.
Please only tell us about the ONE-WAY portion of your trip (e.g., if you made a round-trip, please only describe the half of the trip you were making when you received this survey).

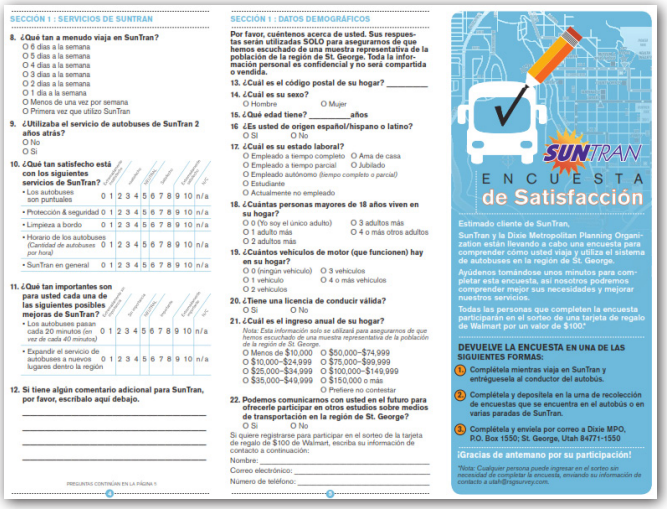
1. Where did you START your trip?
O Home
O Work
O College/University/Tech School
O Shopping
O Social Visit/Church/Personal
O Recreation/Sightseeing/Restaurant
O Medical Appointment/Hospital Visit
O Other
2. Where did you first get ON the SunTran bus for your trip?
On the map, please write "START" where you first got on the bus.
3. Where did you last get OFF the SunTran bus?
On the map, please write "END" where you last got off (or will get off) the bus.
4. Where are you ENDING your trip?
O Home
O Work
O College/University/Tech School
O Shopping
O Social Visit/Church/Personal
O Recreation/Sightseeing/Restaurant
O Medical Appointment/Hospital Visit
O Other
5. How did you pay for your trip?
O Cash
O One-Day Pass
O Month Pass
O 10-Ride Pass
O Semester Pass
6. What type of fare/pass did you use?
O Regular
O Discounted (persons who are 65+, Medicare Card holders, or have a qualifying disability)
7. Did you have another option to make this trip today?
O Yes - I could have driven, carpooled, biked, etc. today
O No - Riding SunTran was my only option

QUESTIONS CONTINUE ON PAGE 4

SUNTRAN Service That Shines

START & END EXAMPLES:

Figure 6.3: Paper Survey in Spanish, Side A



SECCION 1 : SERVICIOS DE SUNTRAN

8. ¿Qué tan a menudo viaja en SunTran?
O 6 días a la semana
O 5 días a la semana
O 4 días a la semana
O 3 días a la semana
O 2 días a la semana
O 1 día a la semana
O Menos de una vez por semana
O Primera vez que utiliza SunTran
9. ¿Utilizaba el servicio de autobuses de SunTran 2 años atrás?
O No
O Si
10. ¿Qué tan satisfecho está con los siguientes servicios de SunTran?
• Los autobuses son puntuales 0 1 2 3 4 5 6 7 8 9 10 n/a
• Protección & seguridad 0 1 2 3 4 5 6 7 8 9 10 n/a
• Limpieza a bordo 0 1 2 3 4 5 6 7 8 9 10 n/a
• Horario de los autobuses (Cantidad de autobuses por hora) 0 1 2 3 4 5 6 7 8 9 10 n/a
• SunTran en general 0 1 2 3 4 5 6 7 8 9 10 n/a
11. ¿Qué tan importantes son para usted cada una de las siguientes posibles mejoras de SunTran?
• Los autobuses pasan cada 20 minutos (en vez de cada 40 minutos) 0 1 2 3 4 5 6 7 8 9 10 n/a
• Expandir el servicio de autobuses a nuevos lugares dentro la región 0 1 2 3 4 5 6 7 8 9 10 n/a
12. Si tiene algún comentario adicional para SunTran, por favor, escríbalo aquí debajo.

PREGUNTAS CONTINÚAN EN LA PÁGINA 5

SECCION 1 : DATOS DEMOGRÁFICOS

Por favor, cuéntenos acerca de usted. Sus respuestas serán utilizadas SOLO para asegurarnos de que hemos escuchado de una muestra representativa de la población de la región de St. George. Toda la información personal es confidencial y no será compartida o vendida.

13. ¿Cuál es el código postal de su hogar? _____
14. ¿Cuál es su sexo?
O Hombre O Mujer
15. ¿Qué edad tiene? _____años
16. ¿Es usted de origen español/hispano o latino?
O Si O No
17. ¿Cuál es su estado laboral?
O Empleado a tiempo completo O Ama de casa
O Empleado a tiempo parcial O Jubilado
O Empleado autónomo (tiempo completo o parcial)
O Estudiante
O Actualmente no empleado
18. ¿Cuántas personas mayores de 18 años viven en su hogar?
O 0 (Yo soy el único adulto) O 3 adultos más
O 1 adulto más O 4 o más otros adultos
O 2 adultos más
19. ¿Cuántos vehículos de motor (que funcionen) hay en su hogar?
O 0 (ningún vehículo) O 3 vehículos
O 1 vehículo O 4 o más vehículos
O 2 vehículos
20. ¿Tiene una licencia de conducir válida?
O Si O No
21. ¿Cuál es el ingreso anual de su hogar?
Nota: Esta información solo se utilizará para asegurarnos de que hemos escuchado de una muestra representativa de la población de la región de St. George.
O Menos de $10,000 O $50,000–$74,999
O $10,000–$24,999 O $75,000–$99,999
O $25,000–$34,999 O $100,000–$149,999
O $35,000–$49,999 O $150,000 o más
O Prefiere no contestar
22. Podemos comunicarnos con usted en el futuro para ofrecerle participar en otros estudios sobre medios de transportación en la región de St. George?
O Si O No

Si quiere registrarse para participar en el sorteo de la tarjeta de regalo de $100 de Walmart, escriba su información de contacto a continuación:
Nombre: _____
Correo electrónico: _____
Número de teléfono: _____

SUNTRAN ENCUESTA de Satisfacción

Estimado cliente de SunTran,

SunTran y la Dixie Metropolitan Planning Organization están llevando a cabo una encuesta para comprender cómo usted viaja y utiliza el sistema de autobuses en la región de St. George.

Ayúdenos tomándose unos minutos para completar esta encuesta, así nosotros podremos comprender mejor sus necesidades y mejorar nuestros servicios.

Todas las personas que completen la encuesta participarán en el sorteo de una tarjeta de regalo de Walmart por un valor de $100.*

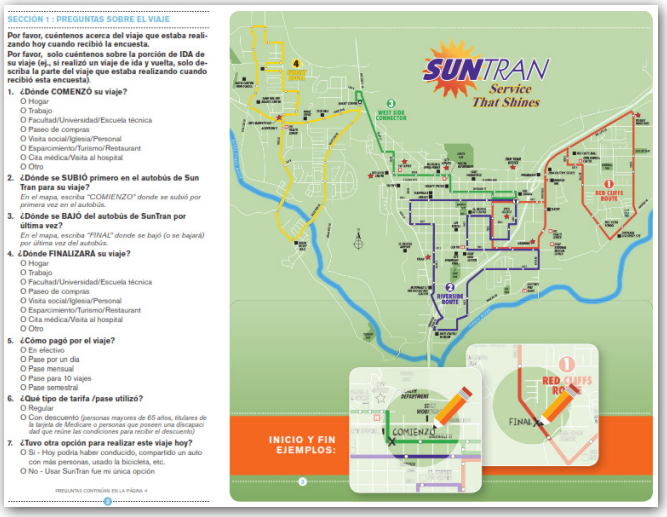
DEVUELVE LA ENCUESTA EN UNA DE LAS SIGUIENTES FORMAS:

1. Complétela mientras viaja en SunTran y entréguesela al conductor del autobús.
2. Complétela y deposítela en la urna de recolección de encuestas que se encuentra en el autobús o en varias paradas de SunTran.
3. Complétela y envíela por correo a Dixie MPO, P.O. Box 1550; St. George, Utah 84771-1550

¡Gracias de antemano por su participación!

*Nota: Cualquier persona puede ingresar en el sorteo sin necesidad de completar la encuesta, enviando su información de contacto a utah@rsgsurvey.com.

Figure 6.4: Paper Survey in Spanish, Side B



SECCION 1 : PREGUNTAS SOBRE EL VIAJE

Por favor, cuéntenos acerca del viaje que estaba realizando hoy cuando recibió la encuesta.
Por favor, solo cuéntenos sobre la porción de IDA de su viaje (ej., si realizó un viaje de ida y vuelta, solo describa la parte del viaje que estaba realizando cuando recibió esta encuesta).

1. ¿Dónde COMENZÓ su viaje?
O Hogar
O Trabajo
O Facultad/Universidad/Escuela técnica
O Paseo de compras
O Visita social/Iglesia/Personal
O Esparcimiento/Turismo/Restaurant
O Cita médica/Visita al hospital
O Otro
2. ¿Dónde se SUBIÓ primero en el autobús de Sun Tran para su viaje?
En el mapa, escriba "COMIENZO" donde se subió por primera vez en el autobús.
3. ¿Dónde se BAJÓ del autobús de SunTran por última vez?
En el mapa, escriba "FINAL" donde se bajó (o se bajará) por última vez del autobús.
4. ¿Dónde FINALIZARÁ su viaje?
O Hogar
O Trabajo
O Facultad/Universidad/Escuela técnica
O Paseo de compras
O Visita social/Iglesia/Personal
O Esparcimiento/Turismo/Restaurant
O Cita médica/Visita al hospital
O Otro
5. ¿Cómo pagó por el viaje?
O En efectivo
O Pase por un día
O Pase mensual
O Pase para 10 viajes
O Pase semestral
6. ¿Qué tipo de tarifa /pase utilizó?
O Regular
O Con descuento (personas mayores de 65 años, titulares de la tarjeta de Medicare o personas que poseen una discapacidad que reúne las condiciones para recibir el descuento)
7. ¿Tuvo otra opción para realizar este viaje hoy?
O Si - Hoy podría haber conducido, compartido un auto con más personas, usado la bicicleta, etc.
O No - Usar SunTran fue mi única opción

PREGUNTAS CONTINÚAN EN LA PÁGINA 4

SUNTRAN Service That Shines

INICIO Y FIN EJEMPLOS:

3.0 QUESTIONNAIRE

In 2011, the Utah Transit Authority (UTA) conducted a transit onboard survey along the Wasatch Front. The design of the SunTran onboard survey was conducted by RSG based on three factors:

1. To allow as much comparability as possible of survey questions to those used in the UTA survey
2. To be a short and manageable paper survey for respondents that fit on one piece of paper
3. To include a few questions regarding potential SunTran system expansion that were requested by Dixie MPO and SunTran.

The decision to conduct the survey on paper, while recognizing it would mean respondents may elect to only answer a portion of questions on the printed survey, was made to try to ensure the maximum ability to reach all riders of the system. For this same reason, the survey was printed in both English and Spanish.

The questionnaire itself consisted of three sections:

4. Trip details: origin information, destination information, and fare payment
5. SunTran services (attitudinal): trip frequency, satisfaction, importance rating
6. Demographics: ZIP code, age, gender, income, etc.

4.0 DATA PREPARATION

RSG conducted data entry on all surveys. This data entry included both standard data entry for all questions, as well as geocoding the trip origin and destination information that all respondents. The data entry also included all other standard information for a survey dataset such as including a unique ID for each respondent and an ID to indicate if the survey was completed in English or Spanish. After data-entry was completed, RSG also conducted quality control to review each record and code all missing variables (for questions that respondents elected not to answer).

5.0 DATA ANALYSIS

5.1 SUMMARY RESULTS

A total of 558 people completed the SunTran onboard survey. Among these respondents 85% (474 people) completed the English version of the survey, while 15% (84 people) completed the Spanish version of the survey. Again, because the survey was conducted on paper, there is "missing" data for any given question where a subset of respondents decided not to answer that specific question.

5.2 TRIP DETAIL RESULTS

The 558 survey respondents provided basic information about their trip using SunTran on the day that they received their survey on the bus. Among those who completed the question, 77% paid a regular fare and 23% rode SunTran using a discounted fare. The most common way of paying for the SunTran fare was cash (55%) and a monthly pass (28%) among those who answered the question.

It is clear from the data that SunTran is serving an important population that relies on the transit service in the St. George region. More than three-quarters (76%) of respondents said that they did not have another option (besides riding SunTran) for making their trip. Similarly, 76% of respondents reported that they ride SunTran four or more days per week. Only 8% of respondents reported that they ride SunTran one day a week or less frequently.

5.3 ATTITUDINAL RESULTS

Respondents were asked a short set of questions in order to understand overall sentiment and satisfaction with SunTran service. Overall, riders were very positively inclined toward SunTran with 87% of respondents satisfied or extremely satisfied with SunTran. Given respondents' reliance on the SunTran system, survey participants were also strongly in support of improvements to the system. Overall, 81% of respondents stated it was important to have buses run every 20 minutes (instead of every 40 minutes), and 90% of respondents stated it was important to expand SunTran service to new places in the area. Participants were also given an opportunity to provide open-end comments and from among these there was a strong sentiment for expanding SunTran service to the local Walmart.

5.4 DEMOGRAPHIC RESULTS

A short set of demographic questions was asked of each respondent. The gender split among respondents was close to even as 48% of respondents were women and 52% were men. In all, 30% of respondents who answered the question indicated that they were of Spanish, Hispanic, or Latino origin. Overall, 42% of respondents reported living in a household that did not have a working motor vehicle and 55% of respondents reported that they did not have a valid driver's license. Among those who answered the question, 61% reported that their annual household income was less than $25,000. Again, these survey results indicate the importance of and reliance on the SunTran system among current riders.

As a complementary piece to the Household Travel Diary, a subset of respondents answered questions about their housing preferences in Utah. The in-depth understanding of the drivers for where and how people live helps regions better plan for future land-use patterns and transportation systems.

A large majority of respondents (72%) own their home, with price being the single most important factor for their decision on where to live. For renters, commute distance was nearly as important as the price of rent. Three times more renters than owners prefer downtown city neighborhoods, but nearly equal proportions in both groups identified mixed use suburban as the ideal home location type.

VII. RESIDENTIAL CHOICE SURVEY

1.0 INTRODUCTION 150

2.0 ADMINISTRATION 151

2.1 Survey Sample 151
2.2 Survey Invitation Materials 151
2.3 Survey Retrieval 152
2.4 Pre-Test Survey 152
2.5 Full Survey 152
2.6 Survey Incentives 153

3.0 QUESTIONNAIRE 154

3.1 Current Home Location 155
3.2 Ideal Home Location 156
3.3 Stated Preference Experiments 156
3.4 Attitude/Debrief Questions 158
3.5 Demographic Questions, UTA sample only 158

4.0 DATA PREPARATION 159

4.1 Data Weighting 159

5.0 DATA ANALYSIS 160

5.1 Summary Tabulations 160
5.2 Basic Choice Models 164

6.0 CONCLUDING REMARKS 173

1.0 INTRODUCTION

The Utah Stated Preference Residential Choice survey (referred to as the Residential Choice survey in this chapter) asked Utah residents about their current housing and neighborhood characteristics (revealed preferences), and their ideal or future preferences for housing and neighborhoods (stated preferences).

The purpose of this survey was to be a complement to the Household Travel Diary data, providing in-depth information about housing preferences in Utah. Housing preferences, including where and how people live and where and how they want to live, are important drivers of land-use patterns and transportation. When studying residential choice, however, it is important to bear in mind that the relation between current conditions and ideal conditions is far more complex than can be expressed in a survey. Whether one can afford to rent or buy in the location of choice, current work locations of adults in the household and the possibility to find work in a desired area of residence are examples of factors that may largely be outside of the household's control. In addition, housing preferences are constrained to some degree by the housing supply. Nonetheless, MPOs play a key role in facilitating regional planning discussions and developing a better understanding of housing preferences is important for long-range land-use and transportation planning, as they may be in line with current plans, or trending in a different direction. These data can be used as a foundation for outreach and discussions about how cities and towns in Utah want to grow, such as occurred with the development of Wasatch Choices 2040 Vision.

A few of the many questions that can be investigated with the Residential Choice data include:

- When deciding where to live, what is more important: House size or neighborhood characteristics? Commute distance or home/rent price?
- How do preferences differ between groups of people? What about if you live in a rural area versus downtown Salt Lake City? If you have children? What about age, gender, income?
- How do ideal housing preferences compare to where respondents live now?

2.0 ADMINISTRATION

The Residential Choice survey was administered separately from the Utah Statewide Household Travel Diary Survey, but benefitted from the pool of Household Travel Diary respondents as a sample source.

2.1 SURVEY SAMPLE

The Residential Choice survey had two sample sources:

1. Household diary completes with email addresses who volunteered to participate in future surveys by the sponsoring agencies.
2. Respondents from the 2011 UTA On-Board Survey (WFRC and MAG regions) with email addresses who had volunteered to participate in future surveys. In the spring of 2011, RSG conducted an on-board origin-destination survey on behalf of the Utah Transit Authority (UTA). The 4,650 respondents who provided email addresses and who indicated willingness to participate in future transportation related surveys were invited to take the Residential Choice survey.

2.2 SURVEY INVITATION MATERIALS

RSG used respondent-provided email addresses from the Household Travel Diary or the UTA survey to communicate with respondents. A total of three possible emails were sent:

- Survey invite: The invite introduced the project and the incentive (iPad raffle) for completing the survey. The invite included the survey website, the household's login password, and a return email address for participants with any questions or comments about the project. All email communication was sent from the project email address. RSG has a standard of responding to emails sent from participating households within one business day.
- Survey reminder: One reminder was sent to households that had not completed the survey one week after being invited.
- Raffle winner notification. (See "Survey Incentives").

2.3 SURVEY RETRIEVAL

The survey instrument for the Residential Choice survey was the RSG online survey, administered through a website produced specifically for the Utah Travel Study. The survey was administered in English.

To participate, participants logged onto the survey website and entered the password provided to them in the invitation email. Household diary participants had the same password as in the household diary. At any point, respondents could exit out of the survey and later return to the survey homepage, log in using their password, and continue from where they left off.

One adult per household was asked to complete the survey. The decision was made to only ask one adult rather than all adults because the frame of reference for this survey is the household (not the individual) and there was no need to collect person level information.

2.4 PRE-TEST SURVEY

89% (183 households) of the households who participated in the pre-test of the Utah Statewide Travel Diary Survey volunteered to participate in future survey research conducted by the study sponsors. These 183 households were invited to complete the Residential Choice pre-test survey. In order to reduce respondent burden and facilitate linking the Residential Choice dataset to the household diary data for analysis, information from the diary was used in the Residential Choice, such as a list of household member names.

Pilot administration began on Friday March 9, 2012, with RSG sending out the first email invitation. A reminder was sent out on Thursday March 15, 2012 to households that had not yet started the survey, and administration ended on Monday March 19, 2012. At the conclusion of the pilot, a total of 85 individuals had completed the survey, a response rate of 46%.

Based on the results and respondent comments from the pilot, RSG made modifications to the Stated Preference experiments layout on screen, questionnaire wording, and order of questions.

2.5 FULL SURVEY

Survey invitations were sent out in two batches, the first in May and the second in June 2012. Household Travel Diary respondents were invited approximately two weeks after the Household Travel Diary incentive had been mailed out, to ensure they had received the incentive before getting invited to take another survey.

- Batch 1: Survey administration began on May 11, 2012, with RSG sending out the first email invitation. A reminder was sent to households that had not yet started the survey on May 17. A total of 3,896 households were invited; 2,295 from the Household Travel Diary, 1,601 from the UTA group). Batch 1 included households from the diary survey that had travel dates between March 27 and April 19.
- Batch 2: On June 6, an additional 5,347 households were invited; 2,303 households from the Utah Household Travel Diary and 3,044 from the UTA group. The reminder email was sent out on June 14. Batch 2 included household diary travel dates between March 27 and May 15.

The overall response rate was 30% (Table 7.1). The Household Travel Diary group's response rate was twice as high as the UTA group. This difference in response rates was anticipated, given that the Household Travel Diary group had recently (a few weeks or, at most, a couple of months) completed the Household Travel Diary, and received the Amazon incentive, and also verified their current email addresses, whereas it had been approximately a year since the UTA onboard survey

Table 7.1: Invites and Response Rates by Sample Source

SAMPLE SOURCE	NUMBER INVITED	COMPLETED SURVEYS	RESPONSE RATE
Household Travel Diary	4,598	1,891	41%
UTA	4,645	904	19%
Total	9,243	2,795	30%

Among the Household Travel Diary sample, the proportion of completed Residential Choice surveys by region was similar to the Household Travel Diary survey (Table 7.2). The UTA sample, however, was almost exclusively residents of the WFRC-MAG region. Therefore, the Residential Choice sample in its entirety has a larger proportion of WFRC-MAG residents than other Utah Travel Study surveys.

Table 7.2: Completed Surveys by Region

	RESIDENTIAL CHOICE COMPLETES FROM THE HOUSEHOLD TRAVEL DIARY		RESIDENTIAL CHOICE COMPLETES INCLUDING UTA SAMPLE		HOUSEHOLD TRAVEL DIARY	
	Count	Percent	Count	Percent	Count	Percent
WFRC-MAG	1,226	65%	2,109	75%	5,792	63%
Cache	232	12%	233	8%	808	9%
Dixie	156	8%	156	6%	1,015	11%
UDOT	277	15%	297	11%	1,540	17%
Total	1,891	100%	2,795	100%	9,155	100%

2.6 SURVEY INCENTIVES

Those completing the Residential Choice survey were entered into a raffle to win a latest generation iPad. One winner was drawn from the pre-test survey, and one from the full survey. Winners were contacted by email in May and June, 2012, with a message that notified them of the raffle results and instructed them to confirm their mailing address within 14 days. It also reminded the winner of why they were included in the drawing and who was sponsoring the study.

3.0 QUESTIONNAIRE

The Residential Choice survey questionnaire included questions also used in the 2011 Community Preference Survey by the National Association of Realtors,the 2007 Growth & Transportation Survey for the National Association of Realtors, and RSG's previous research work for various TCRP projects for the National Academies of Science. The design of the questionnaire benefited from input from Dr. Reid Ewing and Dr. Arthur C. Nelson of the University of Utah. The questionnaire had four sections of questions:

1. Current home location questions
2. Ideal home location questions
3. Stated preference experiments
4. Attitude/debrief questions

At the beginning of the survey, respondents were presented with an introductory page describing the purpose of the survey, privacy policy for the information gathered, time expected for completing the survey, and instructions for how to navigate through the survey. A project email address was provided to respond to any technical questions about the survey.

A PDF of the survey questionnaire and screen captures for all survey questions from the online survey are included separately in the Appendix. An overview with examples of questions is presented next.

Figure 7.1: Order Obtained Current Home and Job

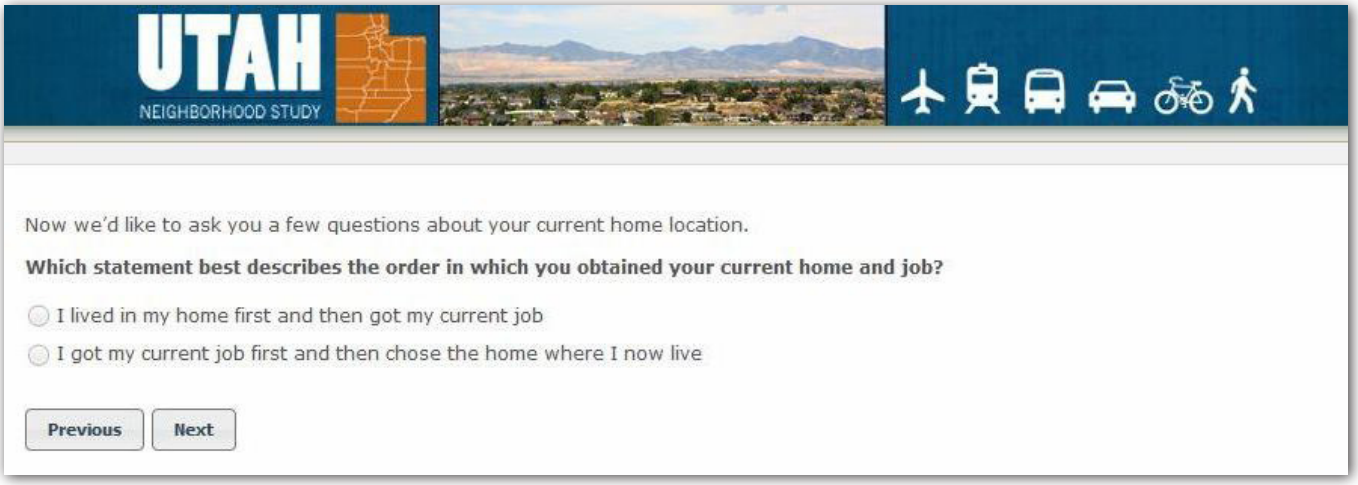


Figure 7.2: Role in Choosing Current Home Location

3.1 CURRENT HOME LOCATION

First, respondents from the Household Travel Diary were asked to identify themselves from a list of initials or names of their household's adult household members who had participated in the Household Travel Diary survey. This allowed the demographic information for the respondent to be included in this survey's dataset without re-asking it of each respondent. Secondly, all respondents were asked to indicate their employment status. Respondents with a job were asked in which order they obtained their current home and job (Figure 7.1). All respondents were asked to indicate what role they played in the decision to live in their current residence (Figure 7.2).

Those who had an active role in the choosing their current home provided the primary reason why they chose this home.

Next, all respondents saw two lists of factors that influence where to live, and selected how important each factor was to them, on a five point scale ranging from very unimportant to very important. The statement order was randomized to avoid reading bias.

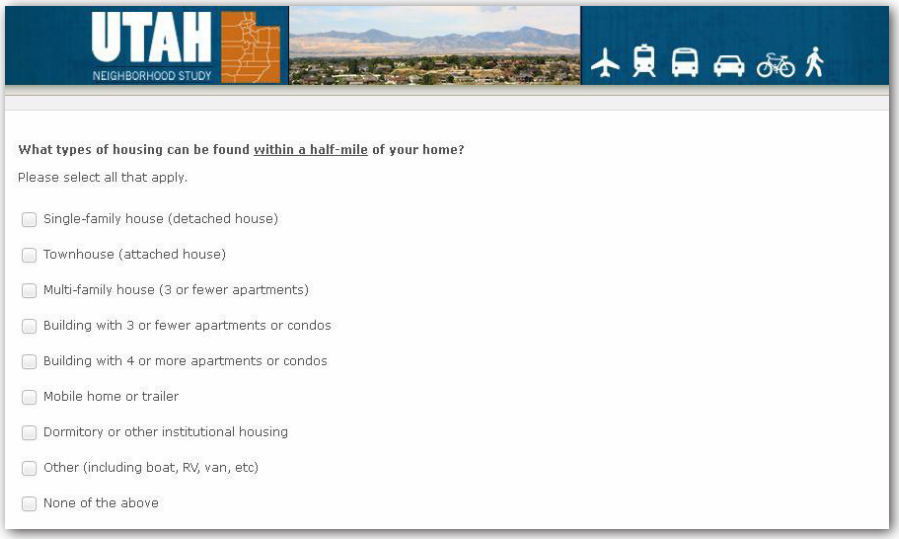
Respondents could indicate whether they rent or own (pay mortgage on) their current home. A question asked about current home lot size and whether the respondent felt their current lot is too small, about right, or too big. Respondents were asked what types of parking are available to them and what parking they use (Figure 7.3). The parking answer was later used as input to the stated preference experiments.

To gather more information about the respondent's neighborhood, a series of questions were asked about their neighborhood and distances to various types of places. Respondents first characterized the housing mix within a half-mile of their home by choosing from a list (Figure 7.4). They were then asked to provide the approximate distance from their home to nearest bus stop, train stop, commercial district, green space or recreational amenities. Respondents with a job were asked their approximate commute distance to work.

The questions about current housing concluded with asking home-owners and renters to provide the approximate value of their home or monthly rent.

Figure 7.3: Types of Parking Available

Figure 7.4: Housing Available within Half-Mile



3.2 IDEAL HOME LOCATION

After the questions about current home location, respondents were instructed to consider their ideal home location, which may or may not have different characteristics from where they live now. First, respondents were asked to choose whether the size of a house or the neighborhood is more important when deciding where to live, and then to indicate the importance of having certain amenities within an easy walk from their home (Figure 7.5). Next, respondents were asked from a list of options which type of home they would most prefer to live in.

Before the stated preference experiments, respondents answered whether they were planning to move within the next three years. Those who thought they might move were asked whether they were planning on renting or owning (paying mortgage on) their next home. Reported tenure was later used as input to the stated preference experiments.

Figure 7.5: Importance of Amenities within Walking Distance

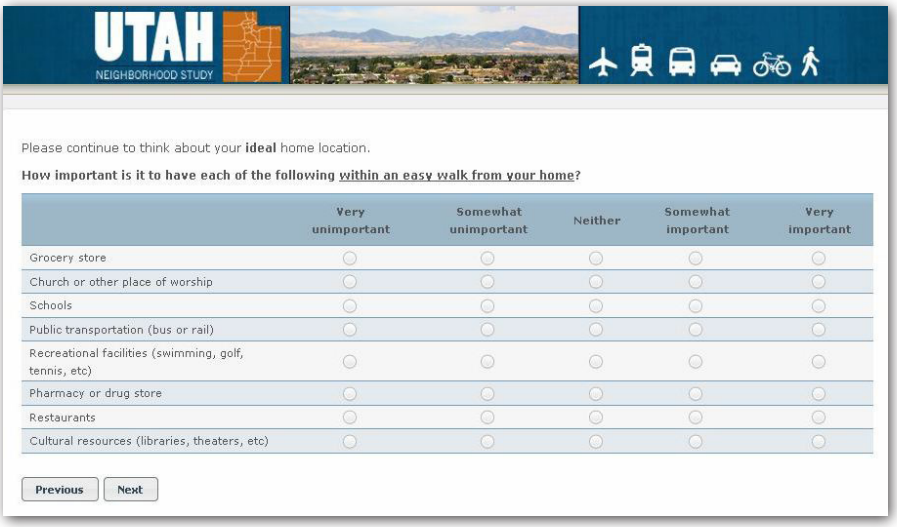


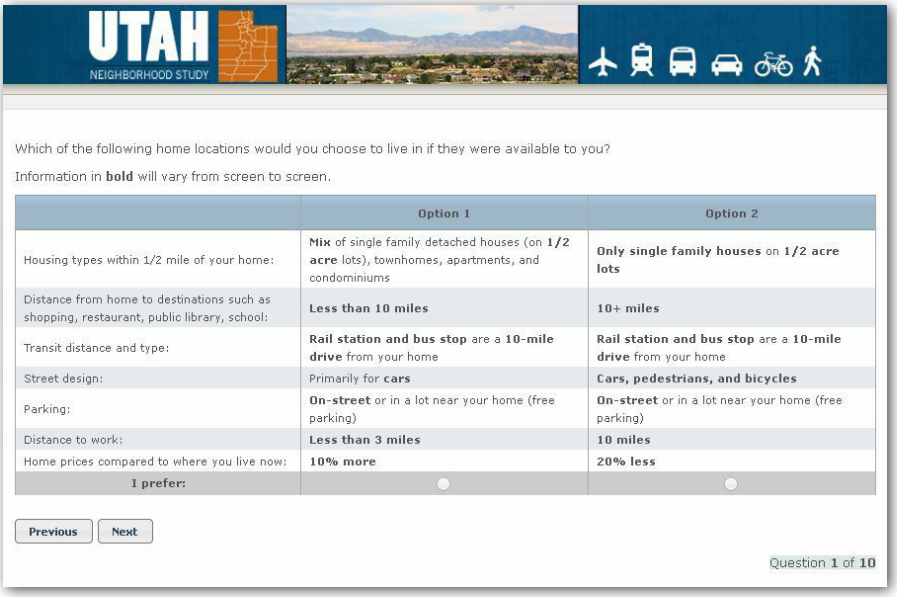
Figure 7.6: Stated Preference Experiments Introduction

3.3 STATED PREFERENCE EXPERIMENTS

At the start of this section, respondents were given instructions on how to complete the stated preference portion of the survey (Figure 7.6).

Respondents were then shown a series of ten choice experiments asking them to make a residential location choice between two hypothetical housing options per experiment. Each experiment included variations on the following seven attributes (Figure 7.7):

Figure 7.7: Example Stated Preference Experiment



The order in which the seven attributes (i.e. parking, distance to work, street design etc.) was shown was randomized across respondents, meaning some respondents saw housing attributes on the first row, destinations on the second row, pricing last, while others saw transit first, followed by pricing and then destinations, etc.

The experimental design ensured that some of the seven attributes were the same across alternatives within one experiment. This is to encourage respondents to trade off on specific attributes other than those that were held constant.

The full list of possible attribute levels shown in the ten experiments is listed below:

- Housing composition:
  - There is a mix of single family detached houses (on ¼ acre lots), townhomes, apartments, and condominiums within a half-mile of your home
  - There is a MIX of single family detached houses (on ½ acre lots), townhomes, apartments, and condominiums within a half-mile of your home
  - There are only single family houses on ½ acre lots within a half-mile of your home
  - There are only single family houses on 1+ acre lots within a half-mile of your home
- Destinations:
  - Local destinations (such as shopping, a restaurant, a public library, and a school) are within walking distance of your home. (Excluded with housing level 4).
  - Local destinations (such as shopping, a restaurant, a public library, and a school) are within 3 miles of your home
  - Local destinations (such as shopping, a restaurant, a public library, and a school) are within 10 miles of your home
  - Local destinations (such as shopping, a restaurant, a public library, and a school) are 10+ miles away from your home
- Parking availability and cost:
  - Parking in your own driveway and/or garage
  - Parking on-street or in a lot near your home (free parking)
  - Parking is off-street (lot and/or garage) near your house (monthly rental). (Excluded with housing levels 3 and 4).
- Proximity to transit:
  - RAIL STATION AND BUS STOP are within walking distance of your home
  - BUS STOP is within walking distance and rail station is a 5 mile drive from your home
  - RAIL STATION AND BUS STOP are a 5 mile drive from your home
  - RAIL STATION AND BUS STOP are a 10 mile drive from your home
- Street design/Accessibility for pedestrians and bicycles:
  - The streets are designed primarily for cars
  - The streets are designed to accommodate cars, pedestrians, and bicycles
- Proximity to work:
  - Your one-way commute to work is less than 3 miles
  - Your one-way commute to work is 5 miles
  - Your one-way commute to work is 10 miles
  - Your one-way commute to work is 20 miles
- Home/Rent prices:
  - Home prices/rent in this neighborhood are/is 20% less compared to your current neighborhood
  - Home prices/rent in this neighborhood are/is 10% less compared to your current neighborhood
  - Home prices/rent in this neighborhood are/is the same compared to your current neighborhood
  - Home prices/rent in this neighborhood are/is 10% more compared to your current neighborhood
  - Home prices/rent in this neighborhood are/is 20% more compared to your current neighborhood

3.4 ATTITUDE/ DEBRIEF QUESTIONS

After the stated preference experiments, respondents were asked to share more information about their current neighborhood and provide thoughts on what makes a good neighborhood.

First, they were asked to indicate the degree to which they agreed or disagreed with statements about their current neighborhood (Figure 7.8).

Using the same scale, respondents were asked to agree or disagree with statements about a future/ideal neighborhood, if they were to move (Figure 7.9).

Lastly, respondents were asked to choose which statements are closest to their views on transportation and land use planning, given Utah's anticipated population growth over the next few decades (Figure 7.10).

Some additional demographic questions were asked of UTA respondents that were not asked of the respondents from the Household Travel Diary Survey (see below).

Figure 7.8: Current Neighborhood Characteristics

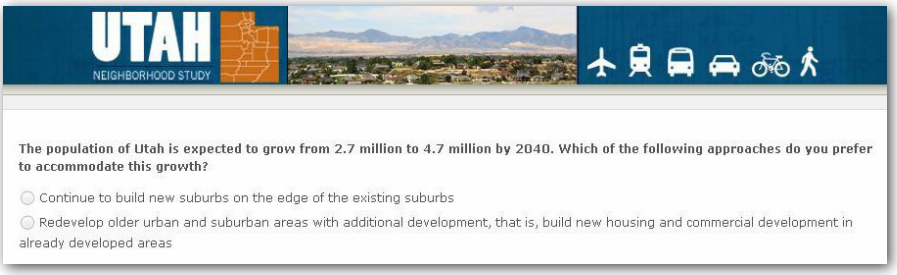


Figure 7.9: Ideal Neighborhood Characteristics

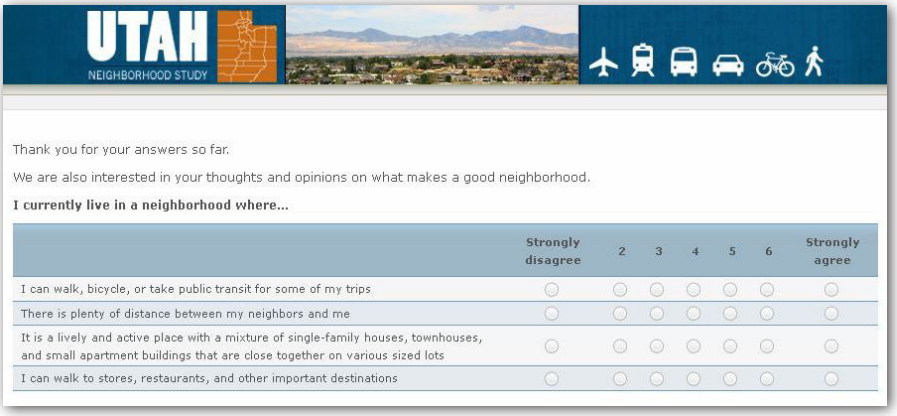
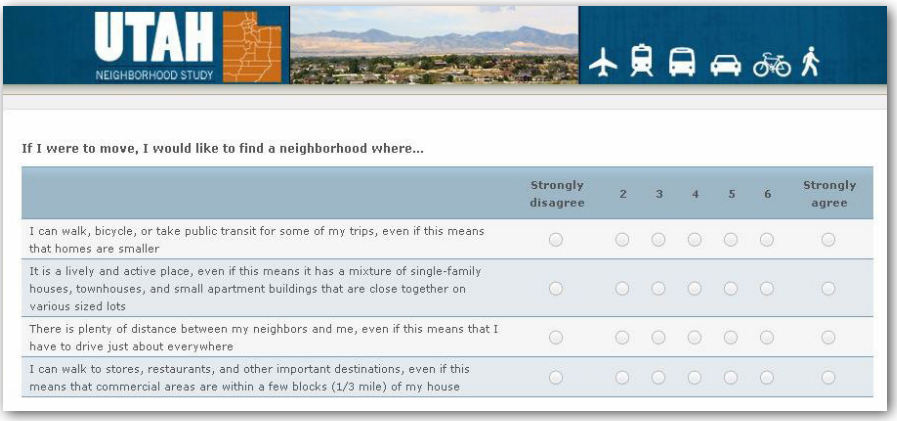


Figure 7.10: Preferred Approach to Accommodating Growth



3.5 DEMOGRAPHIC QUESTIONS, UTA SAMPLE ONLY

At the end of the survey, respondents from the UTA sample were asked a few additional housing and demographic questions, to allow for comparison with the household diary group for which these data had already been collected.

Housing questions included the number of years living at the current residence, as well as details regarding the current residence and neighborhood. Person demographics collected were age, gender, number of jobs, education status, race/ethnicity, driver's license and whether they have a disability that limits the transportation they use. Household demographic questions asked for number of adults and children in the household, number of vehicles and adult and child bicycles, and income group.

At the end of the survey, all respondents were thanked for their participation and provided an opportunity to provide any additional comments.

4.0 DATA PREPARATION

After the survey administration was completed, RSG reviewed and prepared the data for analysis and use by the agencies and the University of Utah. Data preparation work completed included data cleaning, appending geographic data, and appending demographic data from the Household Travel Diary.

The pre-test survey completes were not included in the final dataset from the full survey, because of the changes made between the two surveys.

Demographic variables were added to the Residential Choice dataset from the Household Travel Diary dataset.

A few housing variables, only asked in the Household Travel Diary, were also added to the Residential Choice dataset. These variables were:

- Number of months per year lived at residence, and which months.
- If lived less than 10 years in current residence: Importance (on a seven point scale) of the following factors when choosing current residence: Change in family, affordability, proximity to job or school, quality of schools, area walkability, privacy, proximity to family and friends, proximity to transit, proximity to highway.

Home latitude and longitude, TAZ, county and region were added to the Household Travel Diary group. Home latitude and longitude were added to the UTA sample from the UTA dataset for the 85% of respondents where the data were available. For 15% of the UTA sample, home county was the finest resolution available (exact home location was not asked in the Residential Choice survey).

The Residential Choice survey included many opinion/attitude questions, using five or seven-point scales to indicate level of agreement or importance. In data analysis, the five or seven categories are often collapsed into three (e.g. "strongly agree or agree", "neutral" and "disagree or strongly disagree"), to highlight overall trends in the data. For convenience, three-category versions were created of all such questions.

4.1 DATA WEIGHTING

Household weights were not developed for the Residential Choice survey dataset during the Utah Travel Study. If weights are to be developed in future use of this dataset, the process would differ from the weighting scheme developed for the Household Travel Diary. Key differences are:

- The UTA sample represented a convenient sample, whereas the Household Travel Diary sub-sample is essentially proportional, but regardless, there was no explicit effort to cover certain geographies or demographics.
- The sample size for the Residential Choice survey is smaller (2,795) than the Household Travel Diary sample, which means that the geographic and demographic resolution used to weight the household diary may be too refined for the Residential Choice survey and the weights are not transferable given the different sample.

5.0 DATA ANALYSIS

RSG created and reviewed summary tabulations of survey variables. The data from the residential stated preference experiments were also used to develop a set of initial statistical choice models, using multinomial logit modeling (MNL). The model results are presented following the summary tabulations.

5.1 SUMMARY TABULATIONS

A few key findings by demographic segment and region are presented in this section. A large majority of respondents (72%) own their home, while 24% rent (Table 7.3). Note that rounding shows the total to be 99%, when in fact the true total is 100%.

Table 7.4 displays median home value and rent price per month, as reported by respondents. The median home value for all regions was $200,000. The WFRC-MAG region had the highest median home value, and Cache County had the lowest. Median rents were $610 per month for all regions, and followed the same regional pattern as home ownership values.

Factors determining tenure status were examined. Age (and therefore typically income) is a major determinant of whether respondents rent or own their home, which is not surprising (Figure 7.11).

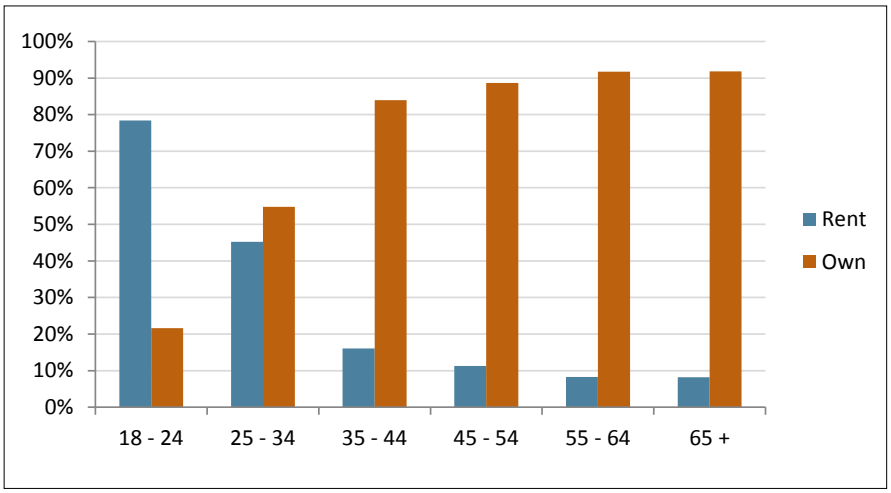
Table 7.3: Housing Tenure

HOUSING TENURE	COUNT	PERCENT
Own (Paying Mortgage)	2,018	72%
Rent	676	24%
Other	62	2%
Prefer not to answer	39	1%
Total	2,795	100%

Table 7.4: Median Home Value and Rent per Month by Region

	HOME OWNERS	MEDIAN HOME VALUE	RENTERS	MEDIAN RENT PER MONTH
WFRC-MAG	1,490	$210,000	538	$698
Cache	142	$171,000	88	$500
Dixie	133	$200,000	15	$675
Utah Other	254	$190,000	35	$673
Median All Regions		$200,000		$610

Figure 7.11: Tenure by Age Group



The 94% of respondents who said they had a significant role in choosing their current home were asked to provide the primary reason they chose their home. Notable differences exist between owners and renters. Figure 7.12 shows the price of the home was the single most important reason among owners, with commute distances and 'other reasons' more distant second and third. For renters, on the other hand, commute distance was nearly as important as the rent price. The open-ended reasons provided by home-owners were typically combinations of the attributes, indicating the many factors that weigh into the commitment of buying a home.

Survey respondents were asked whether they plan to move within the next three years. Table 7.5 splits the answers by tenure status. Not surprisingly, more than four times as many renters as home owners were planning to move within the next three years. Interestingly, almost 20% in both groups were 'unsure'.

People tend to be more mobile in the housing market at certain stages in life. Figure 7.13 looks at the same question by age group. Clearly, younger people are more likely to move than older people.

Figure 7.12: Primary Reason for Choosing Current Home by Tenure

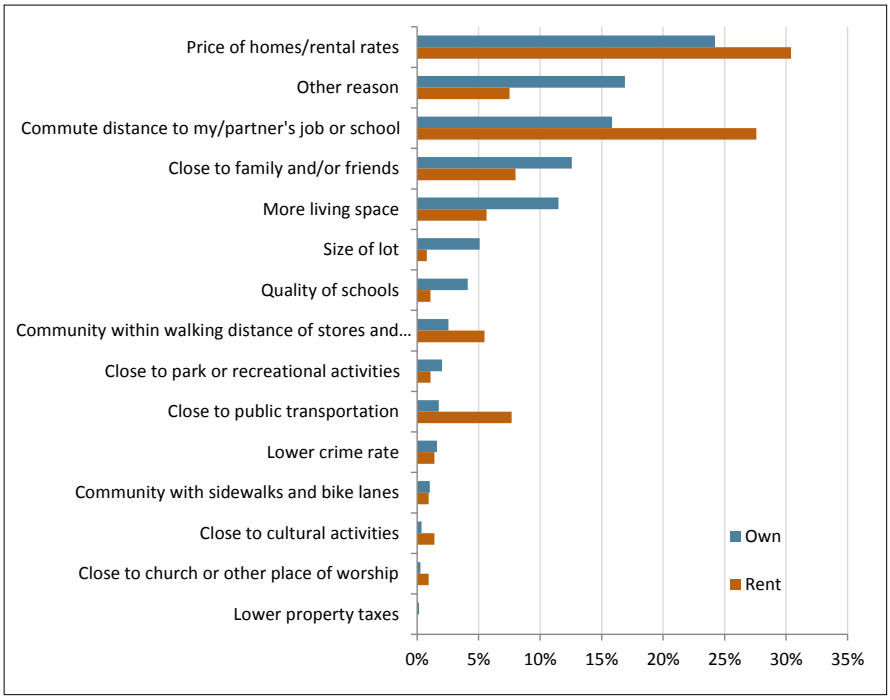


Table 7.5: Plan to Move within the Next Three Years

	OWNERS	RENTERS
Yes	15%	71%
No	67%	10%
Unsure	19%	19%

Figure 7.13: Plan to Move within the Next 3 Years by Age Group

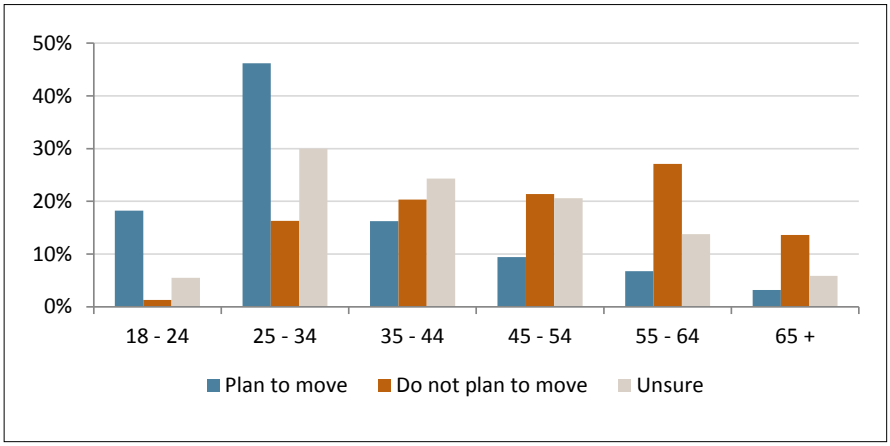


Table 7.6: Current and Ideal Home Locations

CURRENT LOCATION	IDEAL LOCATION: City downtown	City residential	Suburban mixed	Suburban residential	Small town	Rural area	Row Sum	Column Percent of Total	Count
City downtown	43%	16%	17%	7%*	8%*	9%	100%	5%	152
City residential	9%	30%	25%	14%	14%	8%	100%	26%	723
Suburban mixed	6%	9%	49%	16%	13%	7%	100%	21%	588
Suburban residential	5%	5%	32%	33%	15%	10%	100%	33%	933
Small town	3%*	2%*	16%	10%	47%	22%	100%	10%	283
Rural area	0%	3%*	16%*	5%*	14%*	62%	100%	4%	116
Row Percent of Total	8%	13%	30%	20%	17%	12%	100%	100%	152
Count	221	355	852	546	477	344	221	355	2,795

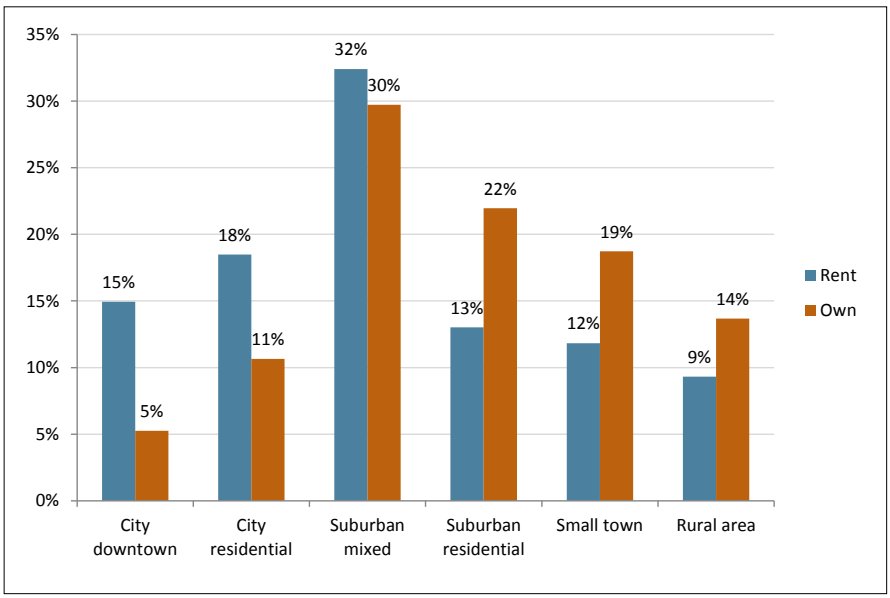
*= Respondent Count < 20

Table 7.6 contrasts respondents' self-reported current home area with the type of area they would ideally want to live in. The row and column totals give the big picture. The column percent of total shows the majority of respondents live in residential suburbs (33%) and residential city neighborhoods (26%). At the same time, there appears to be an aversion to these predominately residential locations; The row percent of total show only 20% of all respondents identified residential suburbs as the ideal, and only 13% identified residential city neighborhoods as ideal. Mixed use suburbs emerged as the most popular location type, chosen by 30% of respondents as the ideal type of home location.

The cells in Table 7.6 provide more detail about what location types are ideal depending on where the respondent lives now. The bolded percentage in each row is the most popular location type by current location type. For example, only 30% of those currently living in residential city neighborhoods feel that this type of location is the ideal place for them to live; 39% of them wish for a more suburban location (suburban mixed or suburban residential). In contrast, 43% of respondents in city downtowns feel that this is the ideal location, and only 24%of them would prefer a suburban location (note the small sample size). Sixty-two percent of those living in rural areas feel that rural living is their ideal (note the small sample size).

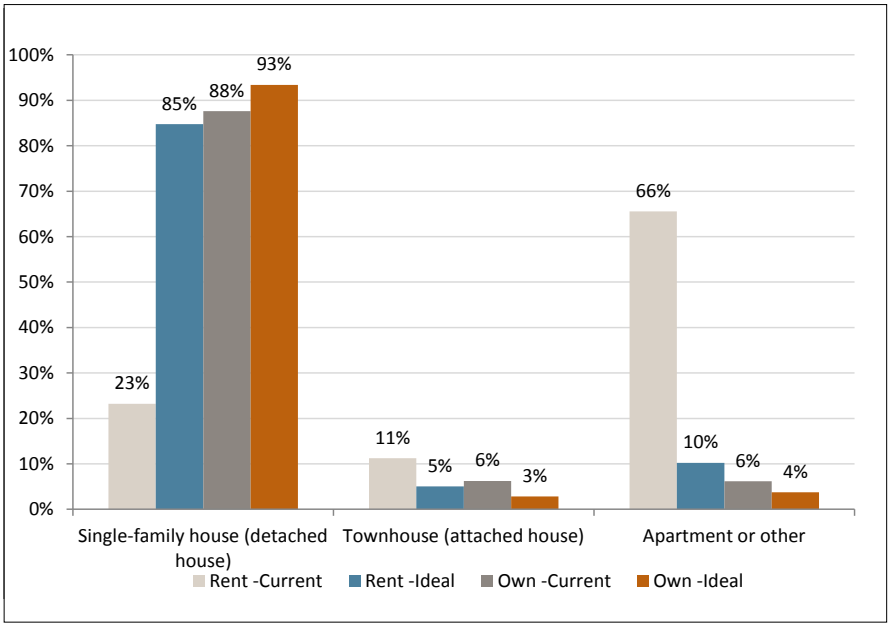
What is considered an ideal location type to some extent depends on current tenure status. Figure 7.14 shows ideal location types chosen by renters and owners. For example, three times more renters than owners prefer downtown city neighborhoods, while owners prefer residential suburbs, small towns and rural areas more than renters. Interestingly, nearly equal proportions in both groups identify mixed use suburban as the ideal home location type.

Figure 7.14: Ideal Location Type by Tenure



The tabulations presented thus far show there is considerable variation in location type preferences, from rural locations to city downtowns. Figure 7.15 shows a lack of variation when it comes to the actual dwelling (residence) type. The single-family detached house dominates completely among both owners and renters. Not surprisingly, most home-owners live in the type of dwelling they want: 93% of home-owners prefer a single-family detached house, and 88% already live in one. Among renters, on the other hand, 85% would like to live in a single-family detached house, but only 23% do (rent a single-family detached house). The overwhelming preference for single-family detached housing appears to be contradictory to the types of locations people want to live in.

Figure 7.15: Ideal Dwelling Type



5.1.1 Open-Ended Respondent Comments

At the end of the survey, over 400 respondents (about 15%) provided additional comments about housing, transportation and land-use in Utah. All comments are enclosed in the Appendix.

Emerging themes among the comments included a desire to increase public transit provisions and concern over the reduction of bus lines in favor of light rail. Some expressed these concerns particularly with regards to being able to age in place and get around by transit in old age. Another topic was concern about Utah's population growth and implications for traffic congestion, air quality and quality of life in currently rural areas. A number of respondents took the opportunity to comment on the survey experience. Respondents found the survey interesting and the topics important, but expressed difficulty choosing between attributes in the survey or pick just one answer because of the complexity of housing location decisions.

5.2 BASIC CHOICE MODELS

The ten stated preference choice experiments in the Residential Choice survey were specifically designed to make respondents reveal their housing preferences by trading off between combinations of the seven housing attributes and their levels. See Figure 7.16 for an example of one of the ten choice experiments.

The experimental design used to generate the choice experiments allows for statistical choice modeling of the data. Preliminary multinomial logit (MNL) choice models were developed using the stated preference data.

Model estimation was performed using the statistical program BIOGEME, and began with a base model including all respondents, to reveal average preferences for the entire survey population. Coefficients were estimated on the levels of the seven attributes included in the experiments (Figure 7.17). For each housing attribute (e.g. commute distance), one level is fixed at zero and is the 'base case' against which coefficients for all other levels of that attribute are estimated (e.g. 'distance less than 3 miles'). Positive model coefficients indicate positive utility with the increase of an attribute level relative to the base case. Somewhat simplified, positive utility can be thought of as "more attractive". Negative model coefficients indicate negative utility with the increase of an attribute level, and can be thought of as "less attractive".

Figure 7.16: Example Stated Preference Experiment

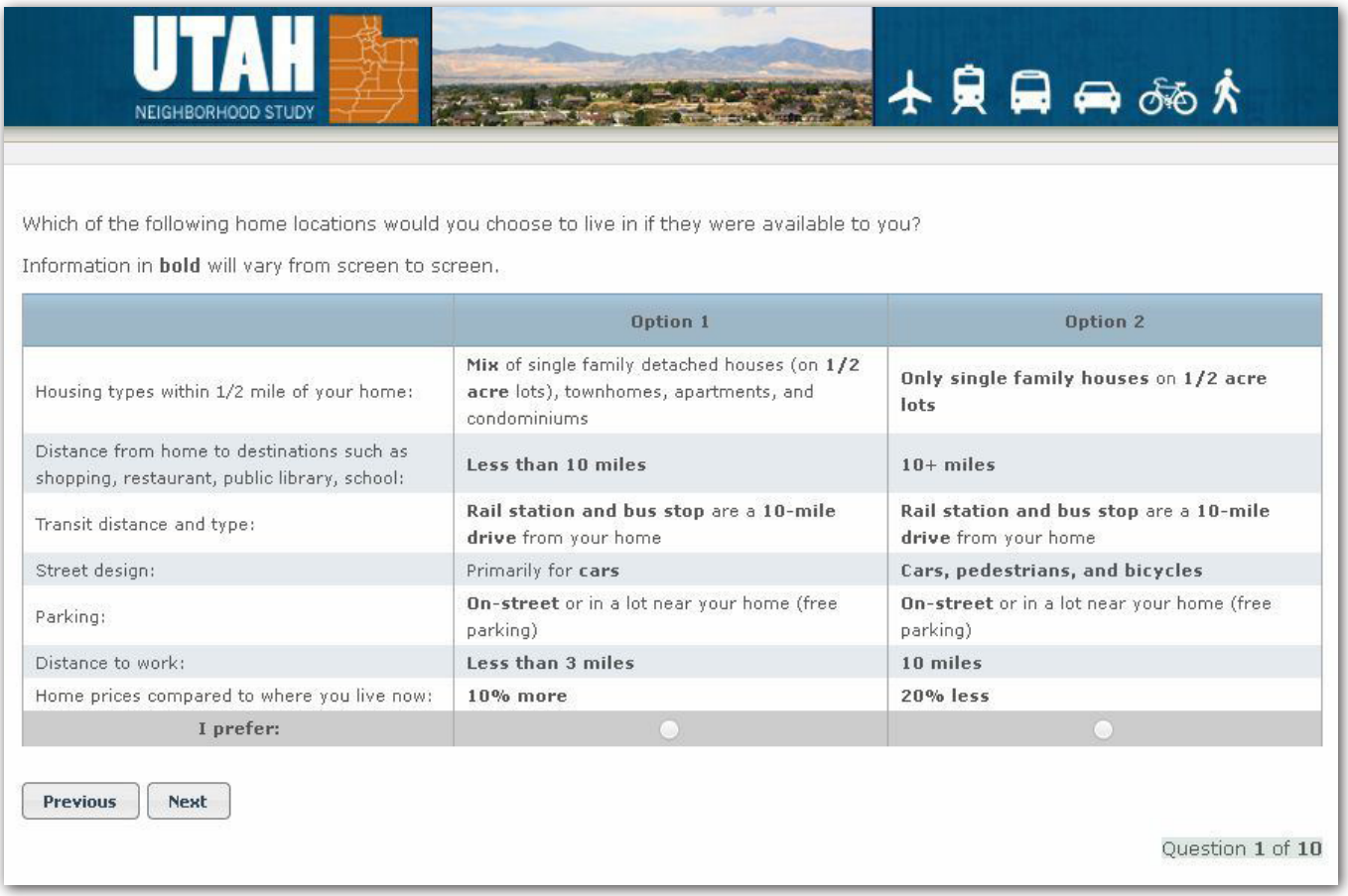


Figure 7.17: Base MNL Model with All Experiment Attributes

Base MNL Model with All Experiment Attributes - All Respondents

Model Statistics	
Number of estimated parameters	19
Number of observations	27950
Number of individuals	2795
Null log-likelihood	-19421.984
Init log-likelihood	-19421.984
Final log-likelihood	-15827.627
Likelihood ratio test	7188.714
Rho-square	0.185
Adjusted rho-square	0.184

Model Coefficients	**Coefficient Value (0 = base case)**	**Robust Standard Error**	**Robust T-test**	
Distance to work				
Less than 3 miles	0			
5 miles	-0.052	0.028	*-1.86*	*
10 miles	-0.228	0.029	*-7.91*	**
20 miles	-0.633	0.031	*-20.33*	**
Distance from home to destinations such as shopping, restaurant, public library, school				
Walking distance	0			
Less than 3 miles	-0.063	0.030	*-2.11*	**
3-10 miles	-0.293	0.030	*-9.82*	**
10 miles or more	-0.645	0.030	*-21.2*	**
Housing types within 1/2 mile of your home				
Mix of single family detached houses (on 1/4 acre lots), townhomes, apartments, and condominiums	0			
Mix of single family detached houses (on 1/2 acre lots), townhomes, apartments, and condominiums	0.215	0.025	*8.47*	**
Only single family houses on 1/2 acre lots	0.452	0.031	*14.75*	**
Only single family houses on 1+ acre lots	0.44	0.035	*12.54*	**
Home/Rent Prices compared to where you live now				
20% less	0.020	0.030	*0.67*	
10% less	0.089	0.029	*3.05*	**
Same	0			
10% more	-0.251	0.030	*-8.26*	**
20% more	-0.402	0.033	*-12.09*	**
Parking				
In your own driveway and/or garage	0			
On-street or in a lot near your home (free parking)	-0.949	0.026	*-37.28*	**
Off-street (lot and/or garage) near your house (monthly rental)	-1.16	0.032	*-36.36*	**
Street design				
Primarily for cars (base)	0			
For cars, pedestrians, and bicycles	0.353	0.021	*16.56*	**
Distance to transit and type of transit				
Rail station and bus stop are within walking distance of your home	0			
Bus stop is within walking distance and rail station is 5-mile drive from your home	-0.109	0.030	*-3.66*	**
Rail station and bus stop are 5-mile drive from your home	-0.298	0.032	*-9.31*	**
Rail station and bus stop are a 10-mile drive from your home	-0.467	0.033	*-14.07*	**

** Coefficient is statistically significant at the 90% confidence level*

In addition to knowing whether the coefficient has a positive or negative value, it is also necessary to know whether the difference from the base case is large enough to say there is a real difference, in other words, whether the difference is statistically different from the base case. To this end, each coefficient has a t-statistic (labeled 'Robust T-test' in the model results), which tells us whether the coefficient is statistically significantly different from the base case.

Though the cutoff for determining a coefficient as significant is somewhat arbitrary, a t-statistic of 1.96 (or -1.96) is often used. A t-statistic of 1.96 is equivalent to a 95% confidence (probability) that the difference from the base case is truly significant (and not a result of statistical randomness). The model results in this report considers coefficients as significant above the 90% confidence level (t >= 1.64). The base model findings are summarized below:

- Distance to work:
  - Longer commutes are less attractive than the base case commute of less than 3 miles; the negative coefficients grow in magnitude as distance increases (-0.052, -0.228, -0.633) and are significant. In the context of the choice experiments, another way to express this finding is that respondents were less likely to choose housing alternatives that featured a longer commute.
- Distance to non-work destinations:
  - Longer distances to destinations such as shopping, restaurant, public libraries and schools were less attractive than the base case walking distance. The coefficients are very similar in magnitude and significance to the commute coefficients, which implies commute and non-commute distances are of similar importance in choosing housing.
- Housing types within half-mile of home:
  - The base case was a mix of dwelling types, with higher density, and coefficients were estimated on three neighborhood types of decreasing density (predominately single-family housing). The coefficients are positive and significant, meaning lower density development (on larger lots) is more attractive than high-density or a mix of housing types. Note that there is no relevant difference in magnitude between single family houses on half-acre lots and 1+ acre lots.
- Home/rent prices compared to where respondent lives now:
  - On average, respondents were more likely to choose housing that was somewhat less expensive (10%) than where they currently live (positive and significant coefficient). But there is a limit; the coefficient on houses that were 20% less expensive was not significant, meaning respondents seek to stay in a somewhat narrow price range.
- Parking availability and cost:
  - Parking in one's own driveway and/or garage is strongly preferred; the coefficients on on-street and off-street monthly rental in a garage/lot were strongly negative (with very large t-statistics of -37.28 and -36.36). The strong magnitude of the parking coefficients relative to all other coefficients in the model means parking had the largest influence in whether an alternative would be chosen or not: if an alternative did not have private parking it was unlikely to be chosen.
- Street design - Pedestrian and bicycle access:
  - Multi-use streets were clearly preferred over streets designed for cars. While the magnitude of the coefficient was not as strong as the parking coefficients, this attribute was considered a 'no-brainer' by respondents.
- Proximity to transit:
  - Living within walking distance to bus and rail (the base case) is preferred over having to drive to transit; the negative coefficients grow in magnitude as distance increases (-0.109, -0.298, -0.467) and are significant

The base model findings are intuitive, meaning they mostly confirm what one would expect. What is often more interesting and revealing is estimating choice models by segments of the population. As the summary tabulations suggested, housing preferences vary between segments of the survey sample, often based on demographic attributes. To examine a range of possible segments, separate base models were estimated for the following segmentations: Home region (WFRC, MAG, Cache, Dixie, UDOT), housing tenure status, current distance to work (categorical), household income (categorical), and children under age 18 living at home. Note that the chosen segmentations were not an exhaustive list of possible model segmentations, but rather a start. The remainder of this section highlights findings from these segmentations.

5.2.1 Models by Home Region

Segmenting by region can suggest high-level differences between regions with different characteristics, such as more urban versus rural regions. In this high-level model, respondents in more urban regions, such as WFRC, showed stronger preference for destinations within walking distance. Perhaps surprisingly, UDOT (rural areas) showed the strongest sensitivity to transit distance, which might be worth investigating further. Overall, home region is a too general segmentation variable, and for more meaningful results, segmentation by smaller geographies, or demographics, is recommended.

5.2.2 Models by Housing Tenure Status

The base model was estimated separately for renters and owners. Figure 7.18 presents model statistics and coefficients with differences or notable similarities between tenure segments. As expected, when choosing between housing alternatives, renters are seeking to minimize rent cost, while home owners are looking for prices more similar to where they live now; the coefficients on both 10% and 20% lower rent levels were positive and significant for renters, but not for owners. Renters were also somewhat more sensitive to commute distances than owners were; the coefficient on the 5 mile commute was negative for renters and owners alike, but only statistically significant (t = -1.64) for renters. These two differences were also seen in Figure 7.12 in the summary tabulations, where rent price and commute distance were top reasons for deciding to live in current home. The choice models also confirmed dwelling type preferences seen in the summary tabulations; relative to the base case (higher density), the coefficients on housing types of decreasing density are positive and significant for both segments. It is worth noting that the magnitude of the coefficient increases with decreasing housing density in the renter model (the preference for single family houses on lots of 1 acre (0.432) is stronger than for single family houses on half-acre lots (0.303)), whereas in the owner model the preference for 1+ acre lots is not stronger (rather slightly weaker, though not significantly) than the preference for half-acre lots.

Note also that the variables with no differences between segments were parking, street design and distance to transit.

Figure 7.18: Selected Model Coefficients – Renters and Owners

Selected MNL Model Coefficients - Renters and Owners

Model Statistics	Renters	Owners
Number of estimated parameters	19	19
Number of observations	6760	20180
Number of individuals	676	2018
Null log-likelihood	-4692.606	-14029.299
Init log-likelihood	-4692.606	-14029.299
Final log-likelihood	-3873.164	-11221.631
Likelihood ratio test	1638.885	5615.336
Rho-square	0.175	0.2
Adjusted rho-square	0.171	0.199

	Renters			Owners		
Model Coefficients	**Coefficient Value**	**Robust T-test**		**Coefficient Value**	**Robust T-test**	
Distance to work						
Less than 3 miles	0			0		
5 miles	-0.094	*-1.64*	*	-0.042	*-1.3*	
10 miles	-0.362	*-5.93*	**	-0.179	*-5.38*	**
20 miles	-0.897	*-13.55*	**	-0.554	*-15.45*	**
Distance from home to destinations such as shopping, restaurant, public library, school						
Walking distance	0			0		
Less than 3 miles	-0.105	*-1.78*	*	-0.039	*-1.09*	
3-10 miles	-0.368	*-6.03*	**	-0.272	*-7.7*	**
10 miles or more	-0.795	*-12.92*	**	-0.596	*-16.51*	**
Housing types within 1/2 mile of your home						
Mix of single family detached houses (on 1/4 acre lots), townhomes, apartments, and condominiums	0			0		
Mix of single family detached houses (on 1/2 acre lots), townhomes, apartments, and condominiums	0.292	*5.68*	**	0.201	*6.71*	**
Only single family houses on 1/2 acre lots	0.303	*5.14*	**	0.520	*14.01*	**
Only single family houses on 1+ acre lots	0.432	*6.32*	**	0.479	*11.34*	**
Home/Rent Prices compared to where you live now						
20% less	0.186	*3.06*	**	-0.051	*-1.4*	
10% less	0.170	*3.04*	**	0.054	*1.54*	
Same	0			0		
10% more	-0.394	*-6.49*	**	-0.209	*-5.72*	**
20% more	-0.520	*-7.75*	**	-0.368	*-9.29*	**

*** Coefficient is statistically significant at the 95% confidence level*

** Coefficient is statistically significant at the 90% confidence*

5.2.3 Models by Current Distance to Work

The base model was estimated separately for the four commute distance groups in the survey: Under 5 miles, 5 – 10 miles, 10 – 20 miles and over 20 miles. Figure 7.19 Figure 7.18 presents model statistics and coefficients with differences or notable similarities between commute distance segments.

There are notable differences in preferences based on respondents' current commute distances, and preferences tend to correspond with current commute. For example, respondents with the shortest commutes (less than 5 miles), expressed aversion to any work *and* non-work distances exceeding the base case distance of 'less than 3 miles' (all coefficients negative and significant at the 95% confidence level). In contrast, the coefficients on the 5 mile commute and 'less than 3 mile' non-work distances were not significant for respondents with current commutes of 5 – 10 miles or longer. Those currently commuting over 20 miles (one-way) showed a preference for shorter commutes.

Note also that the variables with no differences between segments were home prices, housing types, parking, street design and distance to transit.

Figure 7.19: Selected Model Coefficients – Commute Distance

Selected MNL Model Coefficients - Commute Distance

Model Statistics	< 5 miles	5-10 miles	10-20 miles	> 20 miles
Number of estimated parameters	19	19	19	19
Number of observations	7970	4000	4850	5680
Number of individuals	797	400	485	568
Null log-likelihood	-5524.383	-2772.589	-3361.764	-3937.076
Init log-likelihood	-5524.383	-2772.589	-3361.764	-3937.076
Final log-likelihood	-4557.959	-2166.567	-2656.156	-3065.924
Likelihood ratio test	1932.849	1212.044	1411.216	1742.304
Rho-square	0.175	0.219	0.21	0.221
Adjusted rho-square	0.171	0.212	0.204	0.216

	< 5 miles		5-10 miles		10-20 miles		> 20 miles	
Model Coefficients	Coefficient Value	Robust T-test	Coefficient Value	Robust T-test	Coefficient Value	Robust T-test	Coefficient Value	Robust T-test
Distance to work								
Less than 3 miles	0		0		0		0	
5 miles	-0.117	*-2.3* **	-0.089	*-1.15*	0.029	*0.42*	-0.110	*-1.72* *
10 miles	-0.404	*-7.35* **	-0.221	*-2.81* **	-0.128	*-1.85* *	-0.170	*-2.64* **
20 miles	-1.020	*-16.61* **	-0.873	*-10.42* **	-0.445	*-5.92* **	-0.338	*-5.16* **
Distance from home to destinations such as shopping, restaurant, public library, school								
Walking distance	0		0		0		0	
Less than 3 miles	-0.124	*-2.26* **	-0.043	*-0.54*	-0.049	*-0.66*	-0.039	*-0.54*
3-10 miles	-0.380	*-6.79* **	-0.296	*-3.58* **	-0.401	*-5.47* **	-0.119	*-1.75* *
10 miles or more	-0.727	*-12.53* **	-0.669	*-8.19* **	-0.704	*-9.15* **	-0.418	*-6.44* **

*** Coefficient is statistically significant at the 95% confidence level*
** Coefficient is statistically significant at the 90% confidence level*

5.2.4 Models by Household Income

The base model was estimated separately for three income categories: Less than $35,000, $35,000 - $75,000 and over $75,000.

Figure 7.20 presents model statistics and coefficients with differences or notable similarities between income segments. Intuitively, the lowest income segment is more sensitive to housing prices; this is the only group with positive and significant coefficients on housing prices 10% and 20% lower than the base case. Like the lowest income category, the two higher income groups indicate they would not want to pay 10% or 20% more than they do now, but unlike the lowest income category, lower than current prices had no positive effect.

An unexpected model result concerns distance to transit. Relative to having rail and bus within walking distance (the base case), the low and high income segments were less likely to choose a housing alternative where the rail station was a five mile drive away (and a bus stop within walking distance), whereas the middle income group showed no sensitivity until both bus and rail were a five mile drive away. This suggests there may be a preference for easy train transit access in the low and high income groups. This is an example of the benefit of segmenting models; the base model with all respondents as one group did not reveal this difference. Nonetheless, it is plausible that this difference in rail preference may be better explained by current commute distances or urban/rural home location, rather than income.

Note also that the variables with no differences between segments were housing types, parking, street design and distance to transit.

Figure 7.20: Selected Model Coefficients – Household Income

Selected MNL Model Coefficients - Household Income

Model Statistics	**< $35,000**	**$35,000 - $75,000**	**> $75,000**
Number of estimated parameters	19	19	19
Number of observations	5580	10200	9680
Number of individuals	558	1020	968
Null log-likelihood	-3867.761	-7070.101	-6709.665
Init log-likelihood	-3867.761	-7070.101	-6709.665
Final log-likelihood	-3262.724	-5710.339	-5310.338
Likelihood ratio test	1210.075	2719.525	2798.653
Rho-square	0.156	0.192	0.209
Adjusted rho-square	0.152	0.19	0.206

	< $35,000		**$35,000 - $75,000**		**> $75,000**	
Model Coefficients	**Coefficient Value**	**Robust T-test**	**Coefficient Value**	**Robust T-test**	**Coefficient Value**	**Robust T-test**
Home/Rent Prices compared to where you live now						
20% less	0.155	*2.29* **	0.0005	*0.01*	-0.026	*-0.5*
10% less	0.195	*3.03* **	0.073	*1.45*	0.061	*1.23*
Same	0		0		0	
10% more	-0.356	*-5.39* **	-0.28	*-5.5* **	-0.158	*-3.06* **
20% more	-0.451	*-6.13* **	-0.478	*-8.89* **	-0.283	*-5.03* **
Distance to transit and type of transit						
Rail station and bus stop are within walking distance of your home	0		0		0	
Bus stop is within walking distance and rail station is 5-mile drive from your home	-0.195	*-2.99* **	-0.027	*-0.54*	-0.14	*-2.63* **
Rail station and bus stop are 5-mile drive from your home	-0.397	*-5.61* **	-0.263	*-4.93* **	-0.278	*-4.95* **
Rail station and bus stop are a 10-mile drive from your home	-0.553	*-7.41* **	-0.385	*-7.11* **	-0.542	*-9.24* **

*** Coefficient is statistically significant at the 95% confidence level*

** Coefficient is statistically significant at the 90% confidence level*

5.2.5 Models by Presence of Children under 18 in Home

To explore the possible impact of children on housing choice, the base model was estimated separately for two household types: Households with children under 18 years of age, and households without. Figure 7.21 shows coefficients for commute distance and distance to other destinations, including schools. These simple models did not reveal many differences between these two types of households. Sensitivity to commute distance does not appear to differ between households with and without children, but households with children showed a preference for housing with non-work destinations, perhaps especially schools, within walking distance (negative coefficient on 'less than 3 miles').

Figure 7.21: Selected Model Coefficients – Presence of Children under 18 in Home

Selected MNL Model Coefficients - Presence of Children Under 18 in Home

Model Statistics	With Children Under 18		Without Children Under 18	
Number of estimated parameters	19		19	
Number of observations	12280		15670	
Number of individuals	1228		1567	
Null log-likelihood	-8518.779		-10903.205	
Init log-likelihood	-8518.779		-10903.205	
Final log-likelihood	-6592.75		-9118.343	
Likelihood ratio test	3852.057		3569.725	
Rho-square	0.226		0.164	
Adjusted rho-square	0.224		0.162	
Model Coefficients	**Coefficient Value**	**Robust T-test**	**Coefficient Value**	**Robust T-test**
Distance to work				
Less than 3 miles	0		0	
5 miles	-0.038	*-0.9*	-0.059	*-1.6*
10 miles	-0.236	*-5.07* **	-0.217	*-5.88* **
20 miles	-0.637	*-13.28* **	-0.635	*-15.39* **
Distance from home to destinations such as shopping, restaurant, public library, school				
Walking distance	0		0	
Less than 3 miles	-0.088	*-1.9* **	-0.04	*-1.01*
3-10 miles	-0.31	*-7.01* **	-0.283	*-6.96* **
10 miles or more	-0.673	*-14.33* **	-0.632	*-15.74* **

*** Coefficient is statistically significant at the 95% confidence level*

** Coefficient is statistically significant at the 90% confidence level*

6.0 CONCLUDING REMARKS

After initial model estimation where each segment of interest is estimated in a separate model, models can be refined by estimating the segments in the same model, with separate coefficients, which allows for a better understanding of the extent to which the segments differ. Further segmentation into more combinations of attributes can also help identify what characteristics most influence housing choice, for example whether housing tenure or income best explains transit preferences.

As mentioned in the introduction and demonstrated throughout this chapter, studying and modeling residential choice is complicated because the relation between current conditions and ideal conditions is far more complex than can be expressed in a survey. Whether one can afford to rent or buy in the location of choice, current work locations of adults in the household and the possibility to find work in a desired area of residence are examples of factors that may largely be outside of the household's control. For example, even though minimizing the commute distance (and thereby time spent away from the home) may be desirable for workers in households with children, this is not easy or necessarily realistic to accomplish, and the models indeed suggested workers in households with children do not show a stronger preference for shorter commutes than the group without children.

Nonetheless, MPOs play a key role in facilitating regional planning discussions, and developing a better understanding of housing preferences is important for long-range land-use and transportation planning, as they may be in line with current plans, or trending in a different direction. These data can be used as a foundation for outreach and discussions about how cities and towns in Utah want to grow.