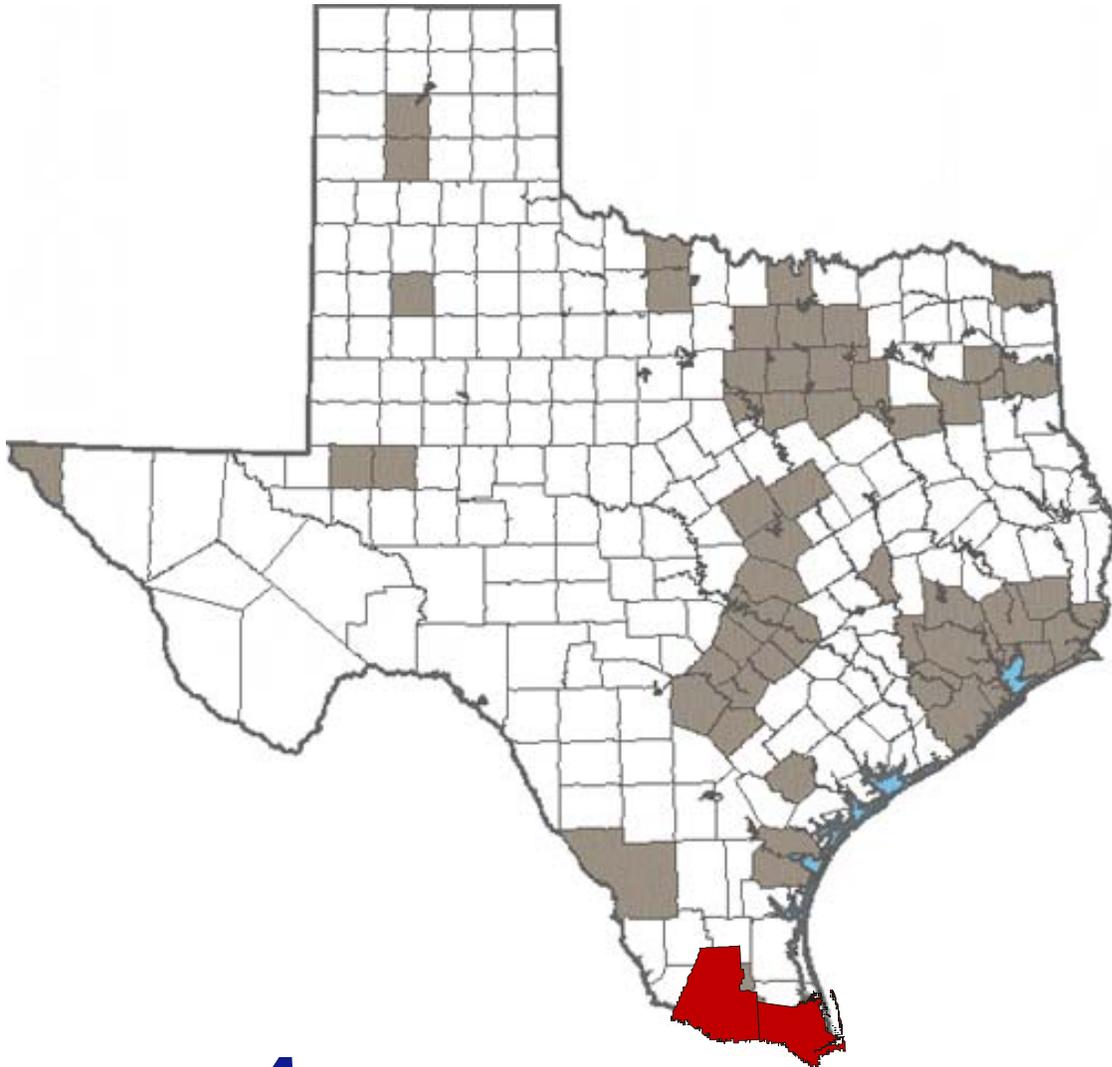


2004-2005 Rio Grande Valley Regional Household Travel Survey Technical Summary



Prepared by the
Texas Transportation Institute
November 2007

**2004-2005 Rio Grande Valley Regional Household Travel
Survey
Cameron and Hidalgo Counties, Texas
Technical Summary**

Texas Department of Transportation Travel Survey Program

by

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Performed in cooperation with the
Texas Department of Transportation
and the
Capital Area Metropolitan Planning Organization
and the
Federal Highway Administration

November 2007

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DISCLAIMER

The contents of this report reflect the views of the author who is responsible for the data, findings, and conclusions presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration, the Texas Department of Transportation (TxDOT), the Brownsville Metropolitan Planning Organization, the Harlingen-San Benito Metropolitan Planning Organization, or the Hidalgo County Metropolitan Planning Organization. This report does not constitute a standard, specification, or regulation. George B. Dresser, Ph.D. was the author of this report and David F. Pearson, Ph.D., P.E., was the study supervisor. Charlie Hall of the TxDOT Planning and Programming Division was the project director.

ACKNOWLEDGMENTS

This project was conducted in cooperation with the Texas Department of Transportation (TxDOT), the Brownsville Metropolitan Planning Organization, the Harlingen-San Benito Metropolitan Planning Organization, and the Hidalgo County Metropolitan Planning Organization. The authors provide special thanks to Mr. Charlie Hall, the TxDOT project director, for his guidance on this report and for his continuing direction of the TxDOT's Travel Survey Program. The authors also acknowledge the contributions of Mr. Gary Lobaugh, of the Texas Transportation Institute, for preparation of the graphics and for editing the report.

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INTRODUCTION

In 2004-2005, the Transportation Planning and Programming Division (TPP) of the Texas Department of Transportation (TxDOT) funded a comprehensive set of travel surveys in the cities of Brownsville and Harlingen, Texas and Hidalgo County, Texas. The purpose of these travel surveys was to provide information on the characteristics of household travel into, out of, and within the planning areas for the Brownsville Metropolitan Planning Organization (MPO), the Harlingen-San Benito MPO, and the Hidalgo County MPO. Together the surveys covered all of Cameron and Hidalgo counties. The surveys were designed to measure the amount of household travel and the characteristics of this travel for a typical Monday through Friday weekday during the school year.

The travel surveys were designed and conducted to measure household travel within this two-county area and included a Global Positioning System (GPS) component. The travel surveys also included a commercial vehicle travel survey, an external station survey, a work place survey, and a peak period and off-peak travel time and delay survey by type of roadway.

This report summarizes the results of the household survey for the two-county Rio Grande Valley region. A variety of household summary information is presented in this report. The summary information is subject to modification as the survey data are further evaluated and analyzed within the context of all the travel surveys conducted.

The travel surveys were used to calibrate separate base-year travel demand models for each of the three MPO planning areas. Additionally, the surveys are being used to calibrate a single travel demand model for the two-county Rio Grande Valley region. Previously separate household travel survey summary reports were published for each of the three MPO planning areas and the region was treated as three separate geographic areas for travel demand forecasting processes. This report treats the two-county Rio Grande Valley area as a single region.

The household travel survey sample design is based on obtaining travel information from a pre-determined number of households within certain ranges of household income and household size. The desired number of surveyed households in any household size/income range is not proportional to the estimated number of households in the cell. Rather, the number of households to be surveyed in each cell was based on the total estimated number of households in the area and the expected number of trips the households will make during a typical school-year weekday.

The survey design is based on a desired level of accuracy of +/- 10 percent with a confidence level of 90 percent for the total person trips in the survey area. Figure 1 shows the survey area. The number of households in the two-county area in 2004-2005 was estimated from the 2000 census and the Texas State Data Center (TSDC) population projections for Cameron and Hidalgo counties. Table 1 shows the estimated number of households in the study area in 2004-2005, the number of households surveyed and the distribution of the number of households surveyed stratified by household size and household income range.

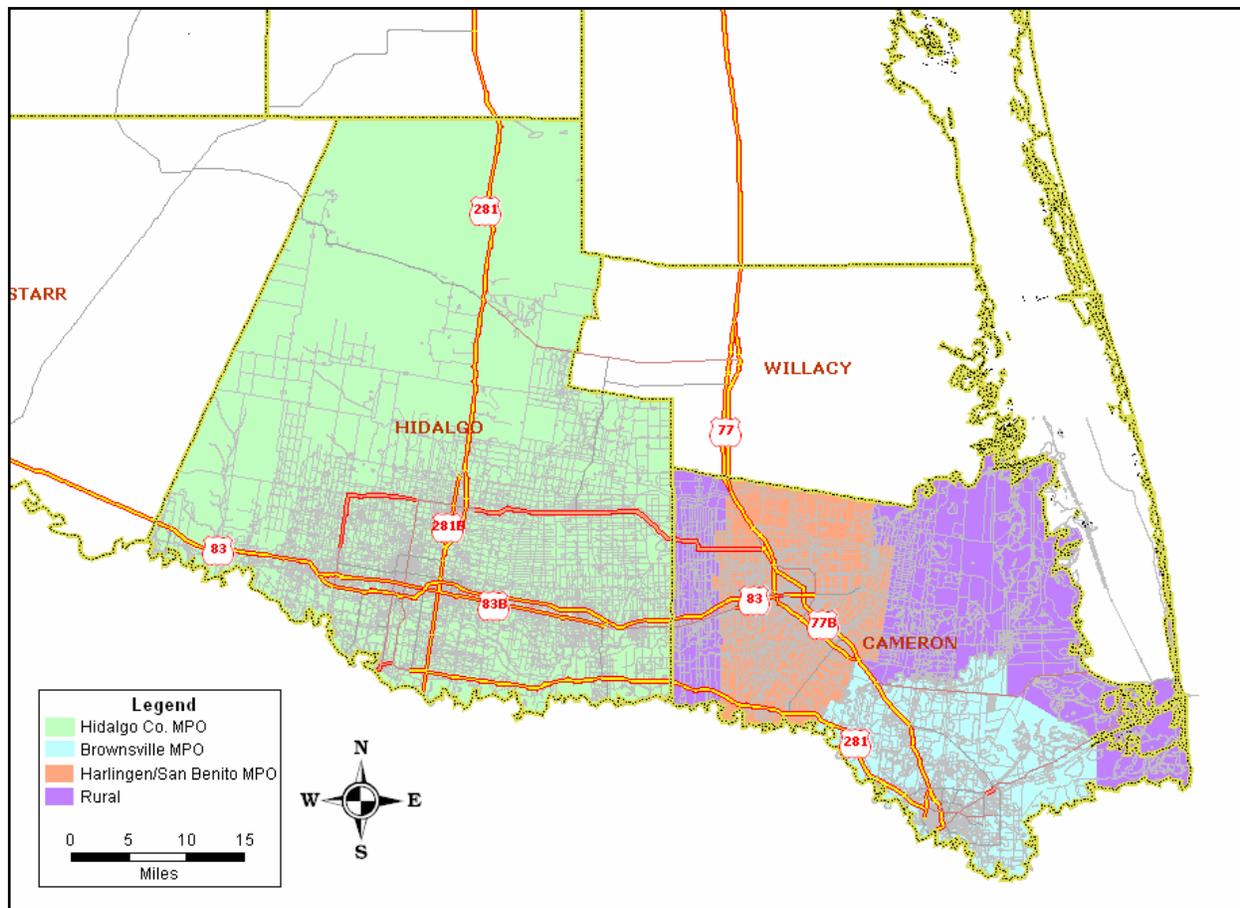


Figure 1. Household Survey Area.

A total of 2,607 households were surveyed. The minimum number of households surveyed in any household size/income range cell was 41 and the maximum number surveyed was 200. Of the estimated 294,825 households in the Rio Grande Valley region, 28 percent are households with five or more persons and 24 percent are households with two persons.

Table 1. Estimated Number of 2004-2005 Households, Number of Households Surveyed, and Percent of Surveyed Households, Stratified by Household Size and Income Range.

Income Range	Household Size					
	1	2	3	4	5+	Total
Estimated 2004-2005 Number of Households						
\$0 to \$19,999	16,304	9,346	6,781	6,987	11,026	50,444
\$20,000 to \$19,999	8,786	12,972	8,285	8,992	14,034	53,069
\$20,000 to \$34,999	7,105	14,594	10,938	12,560	19,134	64,331
\$35,000 to \$49,999	4,187	10,702	7,518	8,756	13,798	44,961
\$50,000 +	5,366	21,787	14,328	15,921	24,618	82,020
Totals	41,748	69,401	47,850	53,216	82,610	294,825
Number of Households Surveyed						
\$0 to \$9,999	74	111	122	100	121	528
\$10,000 to \$19,999	58	109	67	105	134	473
\$20,000 to \$34,999	50	132	78	109	140	509
\$35,000 to \$49,999	41	111	72	116	119	459
\$50,000 +to	45	200	115	148	130	638
Totals	268	663	454	578	644	2607
Percent of Households Surveyed						
\$0 to \$9,999	2.84	4.26	4.68	3.84	4.64	20.26
\$10,000 to \$19,999	2.22	4.18	2.57	4.03	5.14	18.14
\$20,000 to \$34,999	1.92	5.06	2.99	4.18	5.37	19.52
\$35,000 to \$49,999	1.57	4.26	2.76	4.45	4.56	17.6
\$50,000 +	1.73	7.67	4.41	5.68	4.99	24.48
Totals	10.28	25.43	17.41	22.18	24.7	100

Source: Rio Grande Valley Household Travel Survey and Texas Transportation Institute (TTI) Analysis.

HOUSEHOLD SURVEY RESULTS

This survey represents a sample of household demographic and travel characteristics for a Monday through Friday weekday during the school year in the fall of 2004 and the spring of 2005. The survey data was collected from travel diaries completed on a specified travel day for all occupants of 2,607 households located in the Rio Grande Valley region, Figure 1.

Key Points Regarding Household Survey Data

- The survey data is for an average weekday in the fall of 2004 and the spring of 2005.
- The survey data were tabulated only for persons who lived in the surveyed households. Persons living in group quarters, such as nursing homes, correctional facilities, or dormitories, or in households without telephone service were not surveyed.
- The survey data are for persons of all ages unless otherwise noted.
- The survey data do not include non-household-based travel such as commercial vehicles or tourists or persons staying in hotels.
- The estimates for population and number of households are based on the expanded survey data and may differ from population and household estimates developed by other agencies.
- The survey data is for trips that began and ended within the two-county Rio Grande Valley region. Trips that began inside the two-county region and ended outside the two-county region or vice versa are summarized in the external station survey report.

Findings of the Survey

For the Rio Grande Valley region:

- 95 percent of the households had a vehicle available.
- 96 percent of the households had a licensed driver.
- Trip rates per household increased with household size, with household income, and with vehicle availability.
- The average vehicle occupancy was 1.59 persons per vehicle.
- 91 percent of all person trips were made in a personal-use vehicle.
- Of the household population that traveled, 56 percent drove a vehicle, 35 percent rode as a passenger in a vehicle, 5 percent rode in a school bus, 3 percent either walked or rode a bicycle, and less than 1 percent used public transportation.
- 3 percent of the total household population did not make an internal trip within the two-county Rio Grande Valley region on their survey day.
- On average, each person made 3.48 person trips per day and each household made 12.15 person trips per day.
- The average person trip length was 6.5 miles and the average person trip duration was 9.2 minutes.
- The average vehicle trip length was 7.0 miles and the average vehicle trip duration was 9.8 minutes.

- The peak hour for household travel was from 7:01 a.m. to 8:00 a.m. during which 16 percent of the trip starts occurred. The second highest hour for household trip starts was from 3:01 p.m. to 4:00 p.m. when 12 percent of the daily trip starts occurred.
- The weekday school year household travel within the two-county Rio Grande Valley region accounted for an estimated 14,245,000 vehicle miles of travel (VMT) per day.

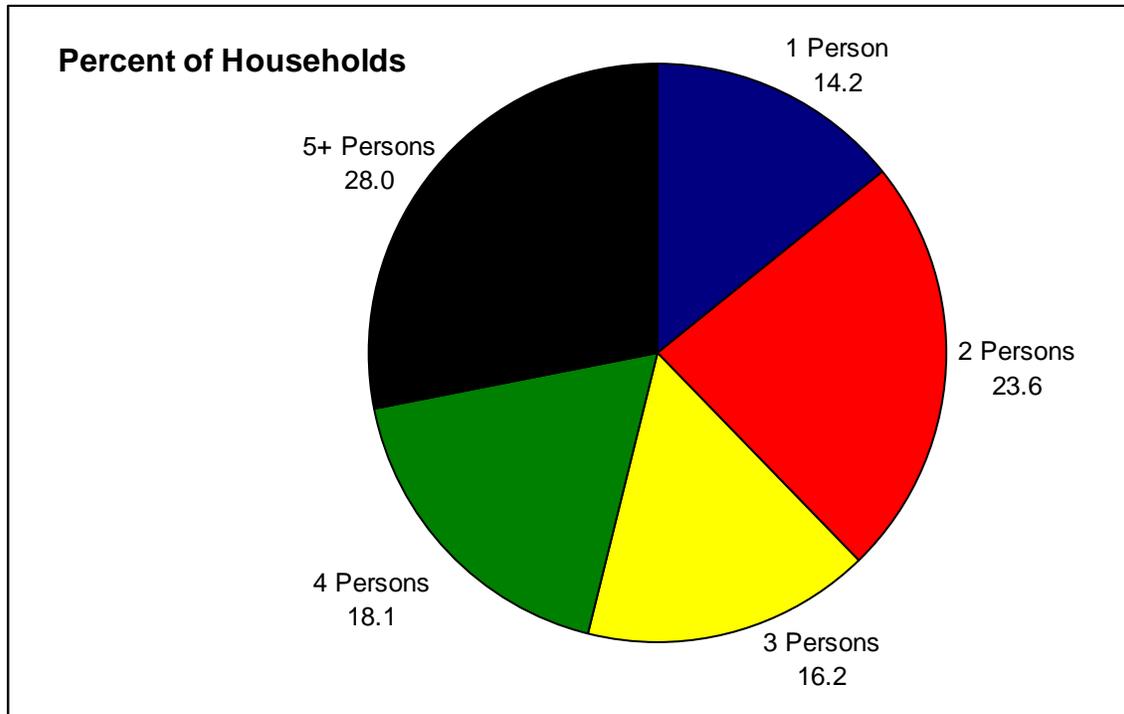
HOUSEHOLD CHARACTERISTICS

Characteristics of the household influence travel behavior. For example, household size, income, vehicles available, number of persons employed, and family life cycle affect the amount and the time-of-day that trips are made. For this survey, households include only those persons living in residences, and did not include persons living in group quarters. The data in this section are for the expanded survey data.

Household Size

Figure 2 shows the distribution of households by household size for 2004. Household size and household income range are the two household variables used to stratify the household trip rates calculated from the household travel survey. When forecasting future travel demand, the forecast population must be estimated by household size and household income range. The average household size for the two-county Rio Grande Valley region in 2004 estimated from the household travel survey was 3.49 persons per household down from 3.56 persons per household in the 2000 decennial census and 3.64 persons per household in the 1990 decennial census. The average household size for Texas was 2.80 in 1990 and 2.82 in 2000, about 21 percent lower than for the two-county Rio Grande Valley region. In the Rio Grande Valley region, as the population grows, the number of households is increasing at a slightly faster rate than the population, since there are fewer persons per household. For the two-county Rio Grande Valley region travel model, two variables, household size and household income, will be used to stratify household trip rates.

A typical household makes a certain number of trips on most days to meet household needs, for example, to purchase food and other necessities, to earn an income, to attend school, to visit friends and family, to receive medical care, to attend events, etc. For this reason, the number of households is a better predictor of future travel demand than the number of persons.

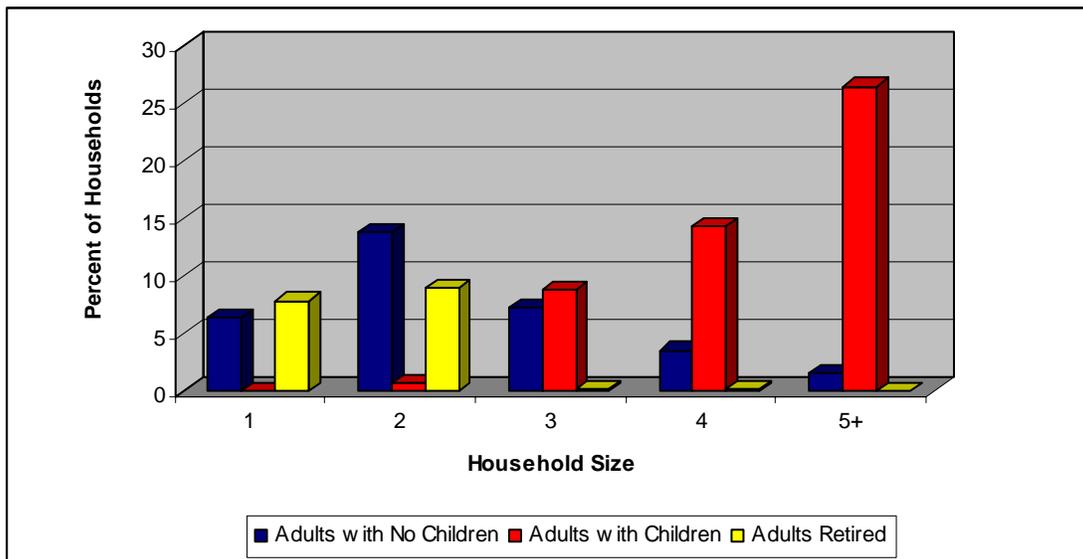


Source: Rio Grande Valley Household Travel Survey.

Figure 2. Distribution of Households by Household Size.

Household Life Cycle

Household life cycle influences the amount and time of travel. For example, households with children tend to make more trips than households without children. Households with working adults tend to make more trips than households with retired adults. There were an estimated 294,825 households in the two-county Rio Grande Valley region in 2004. Figure 3 shows the distribution of these 294,825 households by those with no children and not retired, those with children, and those with only retired persons. Just over half the households, 50 percent have children, 33 percent of the households have no children, and 17 percent of the households were only retired persons.

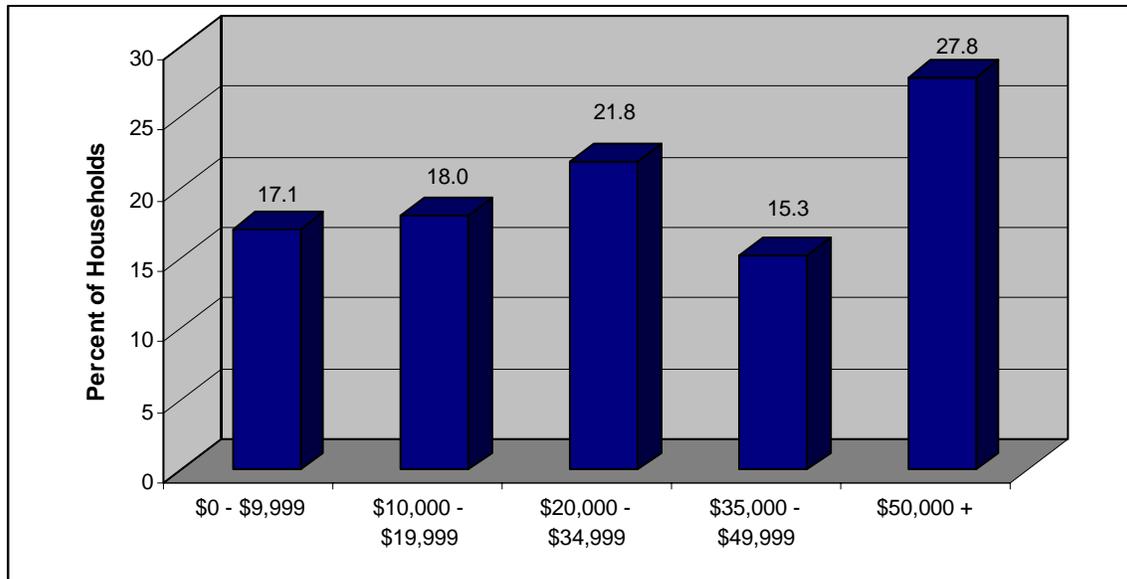


Source: Rio Grande Valley Household Travel Survey and TTI Analysis. Note: The data represents households within the two-county travel survey area. The data does not include residents who did not report age. Adults are persons 18 years of age and older. Retired households have only retired persons. If one person in the household was retired and the other adult was employed, that household was not counted as a retired household.

Figure 3. Distribution of Households by Life Cycle.

Household Income

Household income and household size are the two primary variables used to estimate household trip rates. As household income increases, the amount of household travel tends to increase. Additionally, as income increases, vehicle ownership tends to increase and additional financial resources are available to the household to support increased travel. Figure 4 shows the distribution of the 294,825 expanded households in the survey by the combined annual household income range.

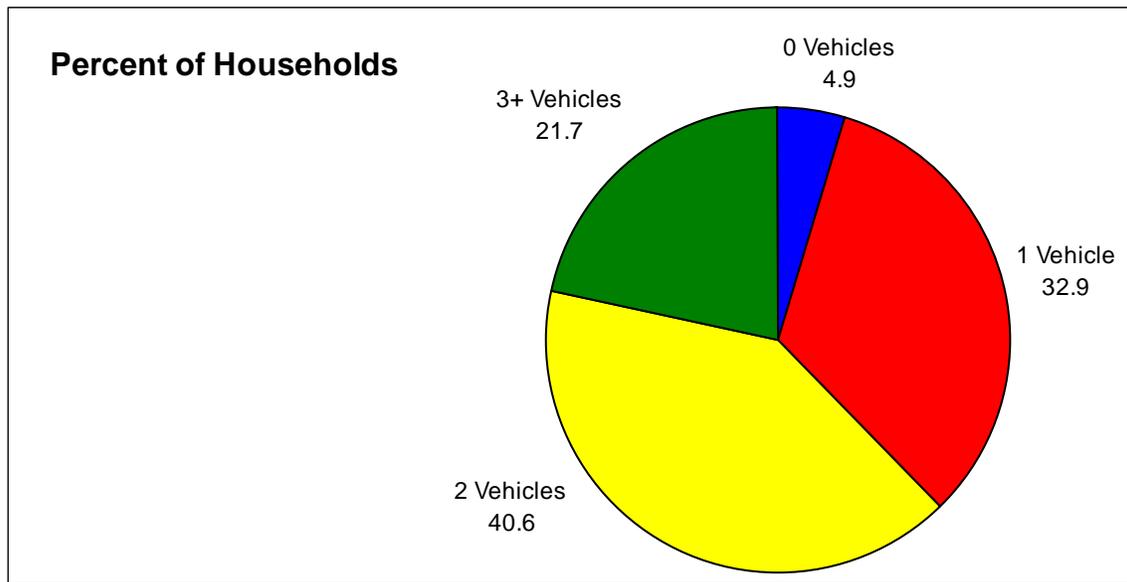


Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

Figure 4. Distribution of Households by Household Income Range.

Household Vehicle Availability and Licensed Drivers

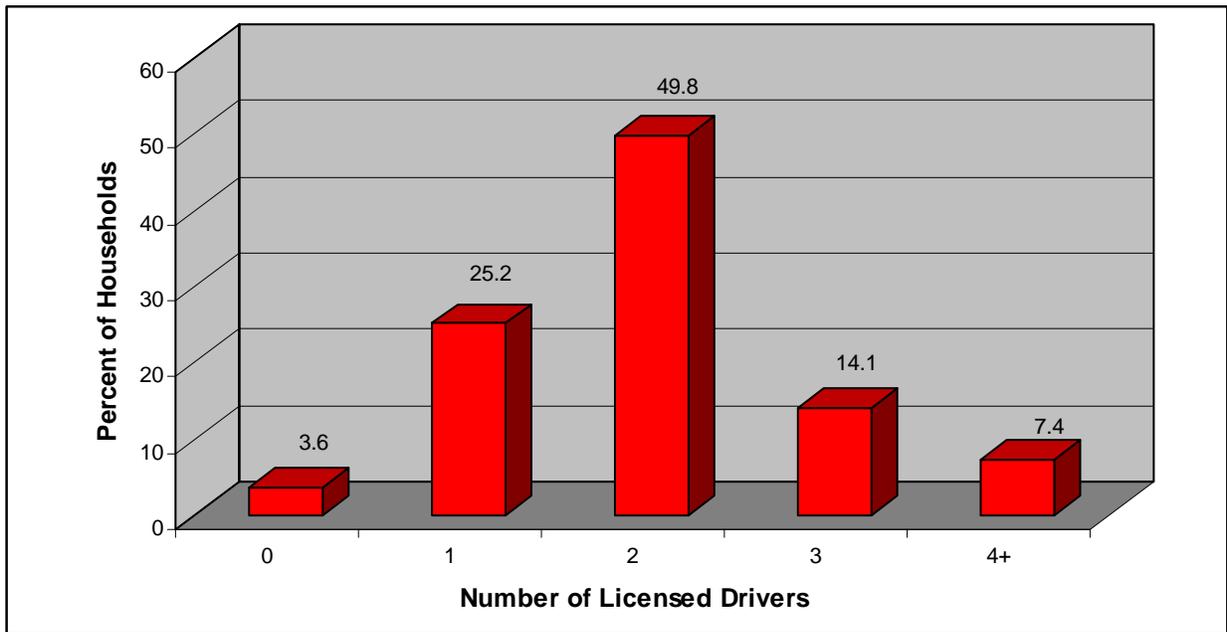
In general, as the number of vehicles available to the household increases, daily household travel increases. This household characteristic also impacts forecasting the demand for public transportation. As household vehicle availability increases, the household demand for public transportation tends to decrease. Figure 5 shows the distribution of the 294,825 expanded households in the survey by the number of vehicles available. Less than 5 percent of the households did not have a vehicle available. The average number of vehicles available per household was 1.89.



Source: Rio Grande Valley Household Travel Survey and TTI Analysis. Note: A household vehicle is any motorized vehicle available to a household for travel including motorcycles, trucks, vans, automobiles, sport utility vehicles, etc.

Figure 5. Distribution of Households by Number of Vehicle Available.

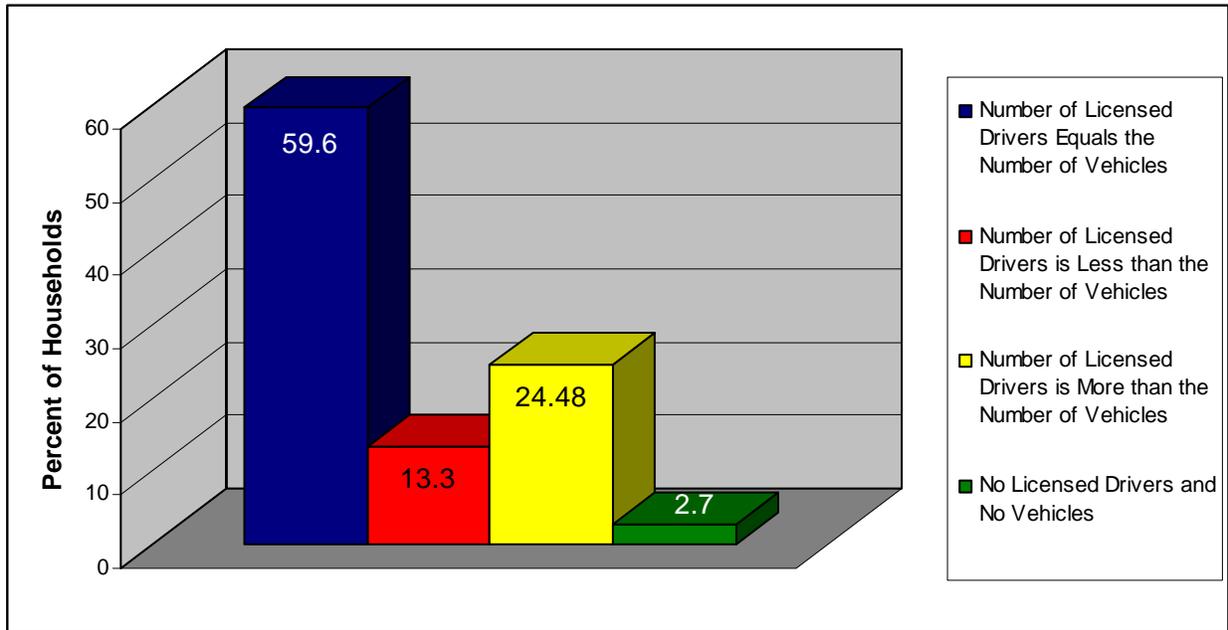
Figure 6 shows the distribution of the 294,825 expanded households by the number of licensed drivers per household. Less than 4 percent of the households did not have a licensed driver.



Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

Figure 6. Distribution of Households by Number of Licensed Drivers.

Figure 7 shows the distribution of the 294,825 expanded households by the number of licensed drivers and the number of vehicles available. For the majority of households, 60 percent, the number of licensed drivers and the number of vehicles available is equal. For 13 percent of the households, the number of licensed drivers is less than the number of vehicles available. Less than 3 percent of the households have neither a licensed drivers nor a vehicle available.

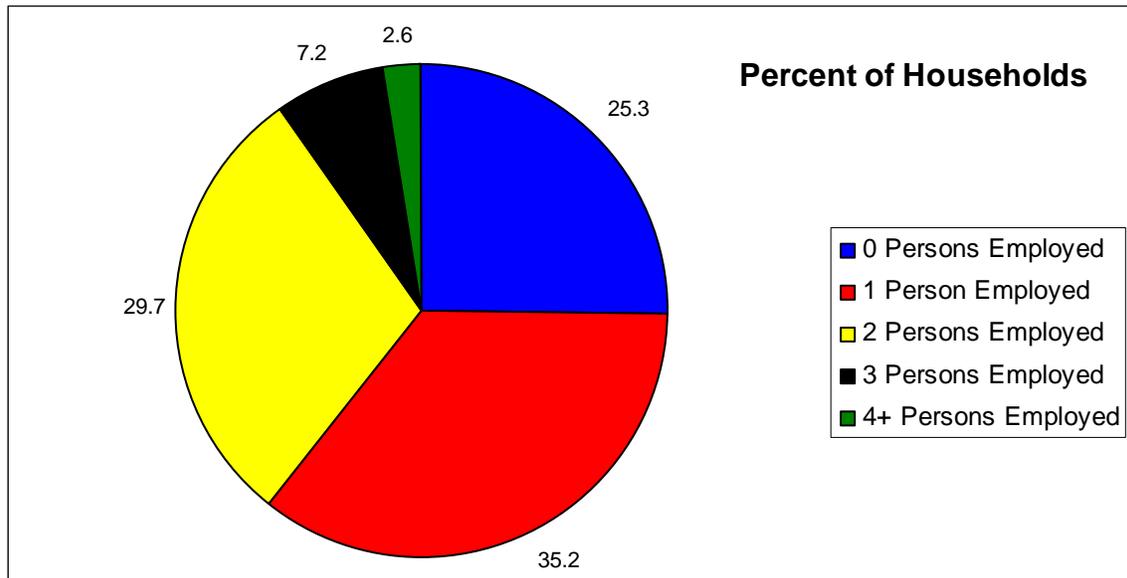


Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

Figure 7. Distribution of Households by Licensed Drivers and Vehicle Availability.

Household Employment

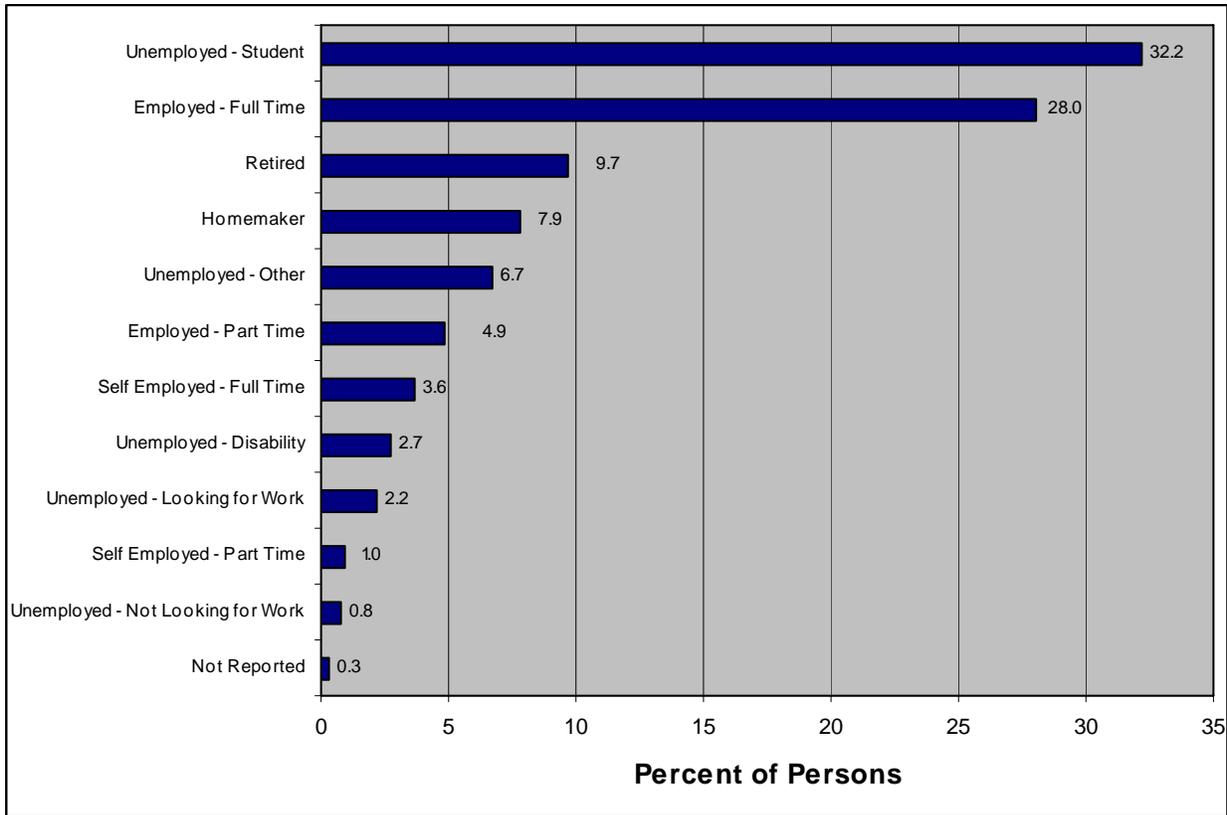
The 294,825 expanded households included 1,030,139 persons for an average of 3.49 persons per household. Figure 8 shows the distribution of the 294,825 expanded households by the number of persons employed.



Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

Figure 8. Distribution of Households by Number of Persons Employed.

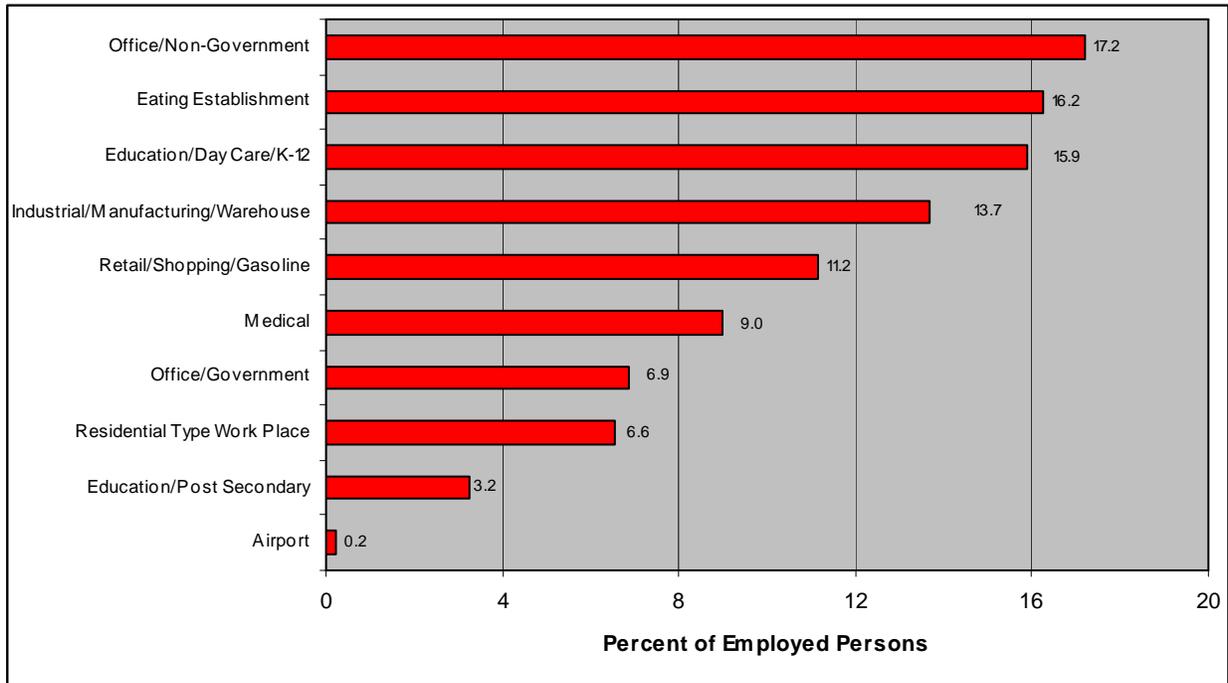
Figure 9 shows the distribution of the 1,030,139 persons regardless of age by employment status. Just over 28 percent of the population is employed full time and over 32 percent of the population is students. Of those employed, 5 percent had more than one job.



Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

Figure 9. Distributions of Persons by Employment Status.

Figure 10 shows the distribution of the employed persons by the type of employer. The 294,825 households had 386,623 employed persons for an average of 1.31 employed persons per household. The office non-government employer type accounted for 17 percent of the employed persons. The eating establishment employer type provided for 16 percent of the employed persons.

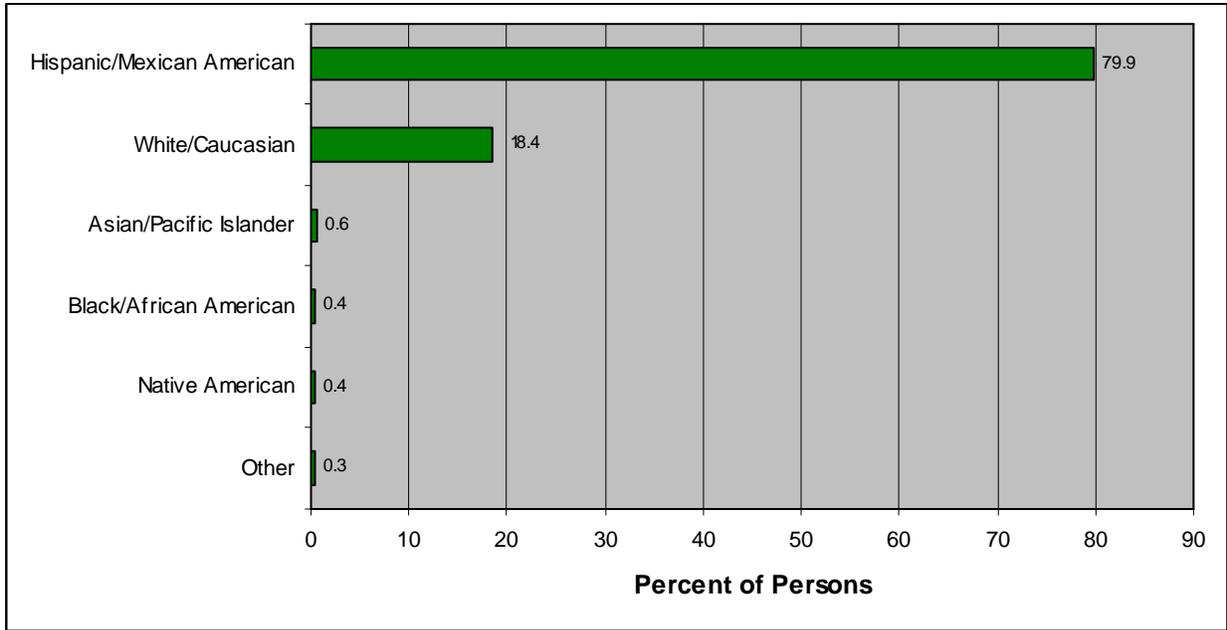


Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

Figure 10. Distribution of Employed Persons by Employer Type.

Ethnicity

Figure 11 shows the distribution of the 1,030,139 persons by ethnicity.



Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

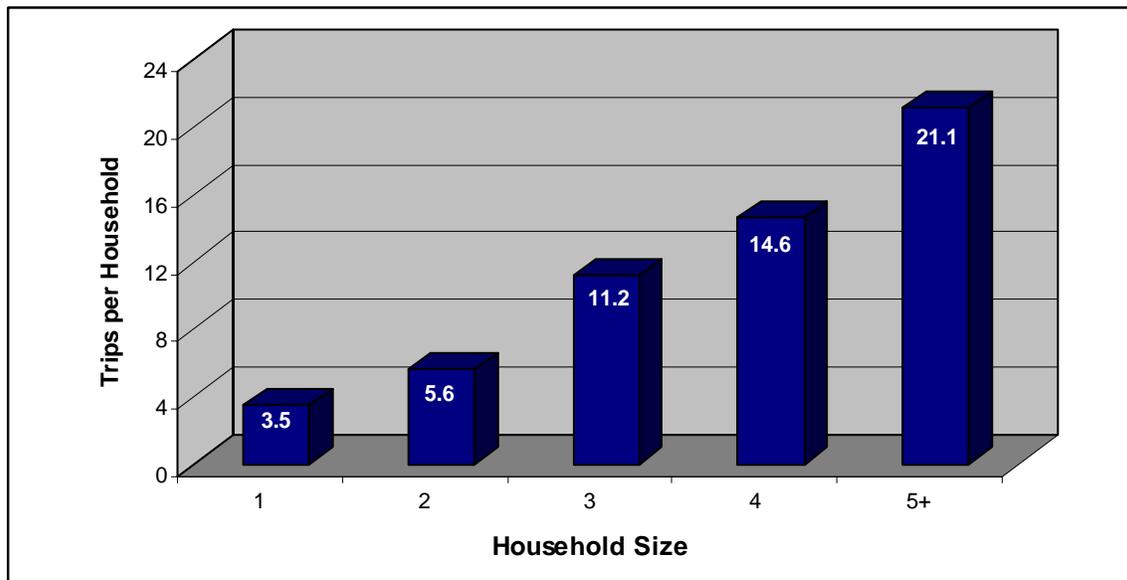
Figure 11. Distribution of Persons by Ethnicity.

TRAVELER CHARACTERISTICS

The previous section reported on a variety of household and person characteristics obtained from the household travel survey. In this section, these household and person characteristics are related to household travel characteristics. Household size, household income, household life cycle, household vehicle availability, household licensed drivers, and household employment all affect the amount of household travel.

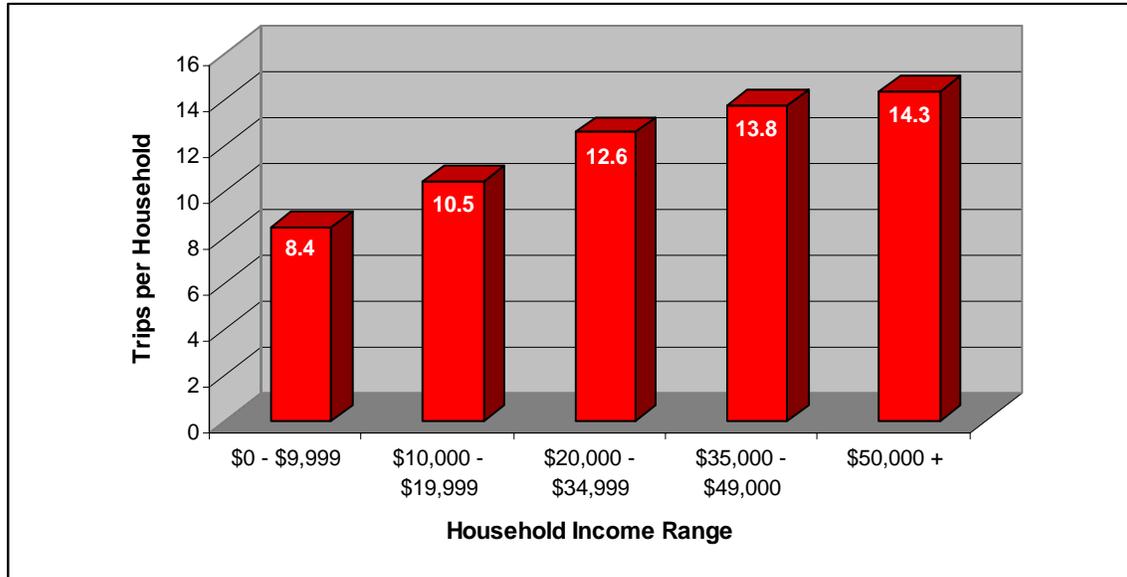
Household Trip Rates and Vehicle Occupancy

The household trip rates in this section are for person trips made in a vehicle either as the driver or as a passenger. Figure 12 shows household trip rates as a function of household size. As the household size increases, household trip rates increase and become large for large household sizes. For travel demand forecasting applications, households with five or more household members are grouped and an average trip rate is used for the group. Figure 13 shows the household trip rates as a function of the household income range. As expected, as household income increases, the household trip rates increase.



Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

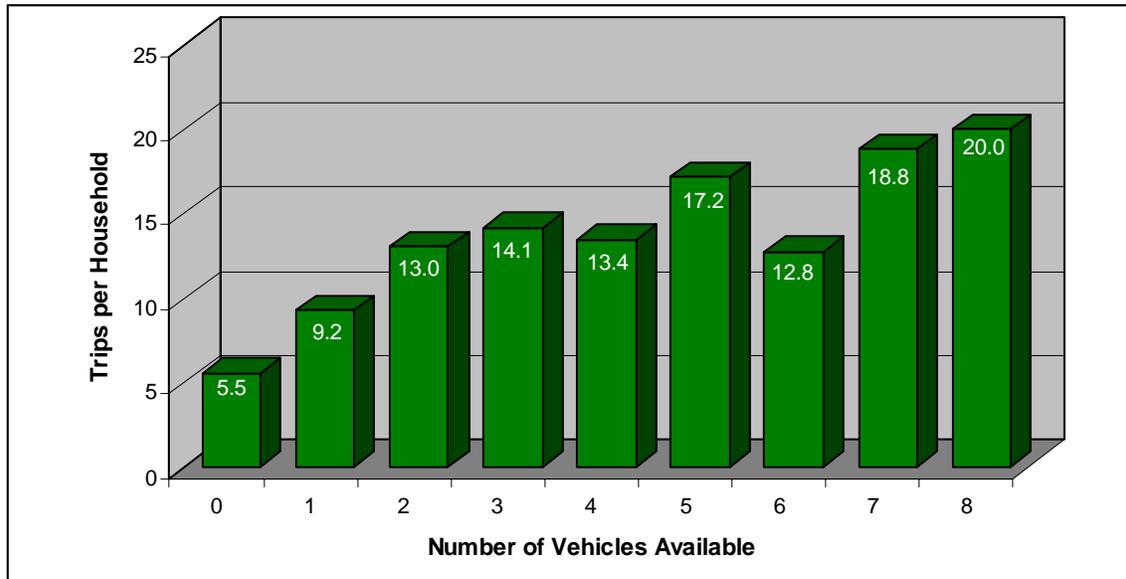
Figure 12. Household Trip Rates by Household Size.



Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

Figure 13. Household Trip Rates by Household Income Range.

Figure 14 shows the household trip rates as a function of the number of vehicles available to household members for travel. Again, as expected, as the number of vehicles available to the household increase, the household trip rates increase, but the rate increases very little after two vehicles. Notice that households with no vehicle available do make a meaningful number of trips. The trip rates for households with 6, 7, and 8 vehicles available are interesting but not reliable due to the very small sample sizes for these households. The average number of vehicles per household was 1.9.



Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

Figure 14. Household Trip Rates by Number of Vehicles Available.

Table 2 shows the person trip rates cross classified by household size and household income for all internal trip purposes combined, that is, trips that begin and end inside the two-county Rio Grande Valley Region. These trip rates are for all trips by all modes including transit, bicycle, and walk trips. For travel demand forecasting applications, the cross-classified trip rates are disaggregated by trip purpose into home-based work (HBW) trips, home-based non-work (HBNW) trips, and non-home-based (NHB) trips. (See the terminology section for the definitions of these terms.) As a part of the travel demand forecasting process, the person trips are divided among the modes during the mode split step. The average household person trip rate for internal trips was 12.16.

Table 2. Person Trip Rates by Household Size and Household Income.

Household Income Range	Household Size				
	1	2	3	4	5 +
\$0 - \$9,999	2.65	3.91	9.10	12.07	18.11
\$10,000 - \$19,999	3.03	5.51	9.61	13.06	18.26
\$20,000 - \$34,999	4.37	5.49	10.62	13.72	21.10
\$35,000 - \$49,999	3.36	5.72	12.80	16.87	21.84
\$50,000 plus	4.24	6.42	12.54	15.75	23.68

Source: Rio Grande Household Travel Survey and TTI Analysis.

Table 3 shows the average vehicle occupancy for person trips made in private vehicles by household size and by household income range. The average vehicle occupancy for all households was 1.59 persons per vehicle.

Table 3. Average Vehicle Occupancy by Household Size and Household Income.

Household Income Range	Household Size				
	1	2	3	4	5 +
\$0 - \$9,999	1.27	1.38	1.56	1.72	2.17
\$10,000 - \$19,999	1.10	1.56	1.73	1.69	1.83
\$20,000 - \$34,999	1.119	1.39	1.45	1.52	1.80
\$35,000 - \$49,999	1.09	1.35	1.42	1.61	1.84
\$50,000 plus	1.06	1.28	1.32	1.51	1.74

Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

Travel by Age Cohort

A total of 1,030,139 persons were represented in the expanded household survey. Table 4 shows the number of persons and distribution of persons by age cohort that did not make any internal trips on their survey day. As expected, older persons are less likely to travel than are younger persons, but the older population is mobile and contribute significantly to the amount of household travel. The rather high percentage of persons making zero internal trips in the 20-24 age cohort probably is due to under reporting or not reporting of trips by this age cohort.

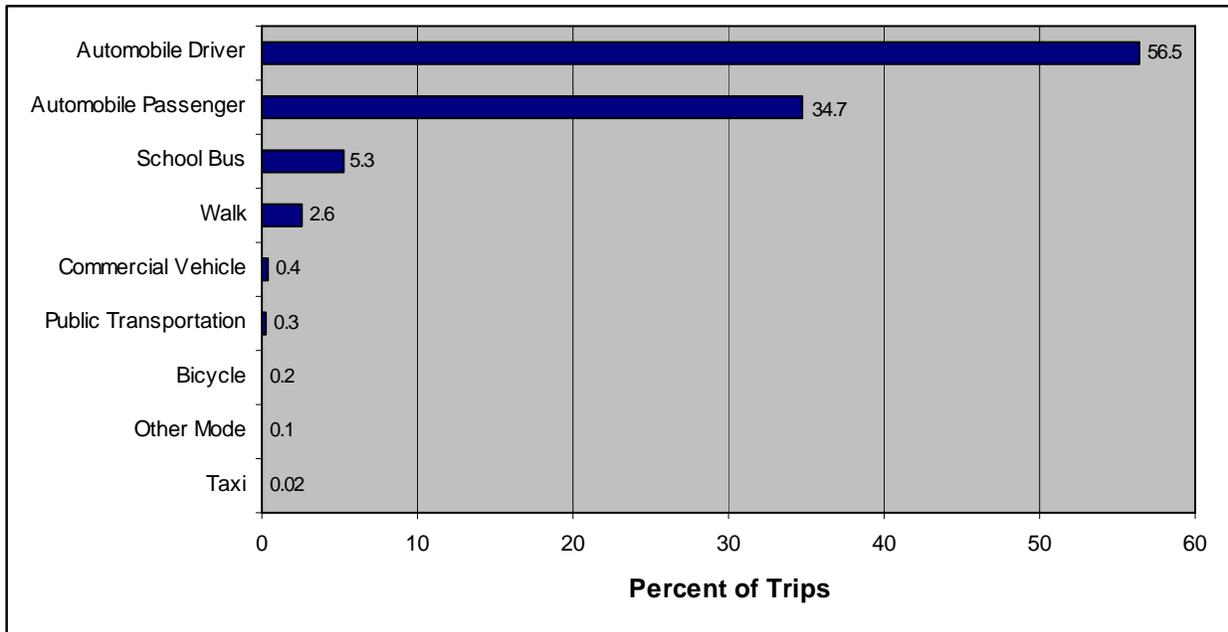
Table 4. Number of Persons, Percent of Persons and Percent of Persons Making Zero Trips by Age Cohort.

Age Cohort	Number of Persons	Percent of Persons	Number of Person Making Trips	Number of Persons Making Zero Internal Trips	Percent of Persons Making Zero Internal Trips
0-15	301,356	29.26	273,738	27,617	9.16
16-19	92,673	9.00	87,881	4,792	5.17
20-24	77,591	7.53	65,793	11,798	15.20
25-29	77,369	7.51	67,773	9,596	12.40
30-34	71,914	6.98	64,033	7,881	10.96
35-39	68,708	6.67	60,446	8,262	12.02
40-44	63,404	6.16	56,484	6,920	10.91
45-49	56,260	5.46	48,444	7,815	13.89
50-54	47,974	4.66	40,656	7,319	15.27
55-59	35,613	3.46	29,786	5,827	16.36
60-64	31,830	3.09	25,496	6,334	19.90
65-69	30,708	2.98	23,010	7,698	25.07
70-74	28,789	2.79	21,808	6,981	24.25
75-79	22,784	2.21	17,179	5,605	24.60
80 +	23,060	2.24	14,022	9,037	39.19
Total	1,030,033	100	896,549	133,482	12.96

Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

MODE OF TRAVEL

The modes of travel were household automobile-driver, household automobile-passenger, school bus, walk, commercial vehicle, public transportation, bicycle, other, and taxi. Figure 15 shows the distribution of the 3,583,479 person trips by mode of travel. Automobile travel accounted for 91 percent of the person trips. School bus trips accounted for 5 percent of the person trips and walk accounted for almost 3 percent of the person trips. The surveyed households made little use of public transportation, less than 1 percent of the person trips.



Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

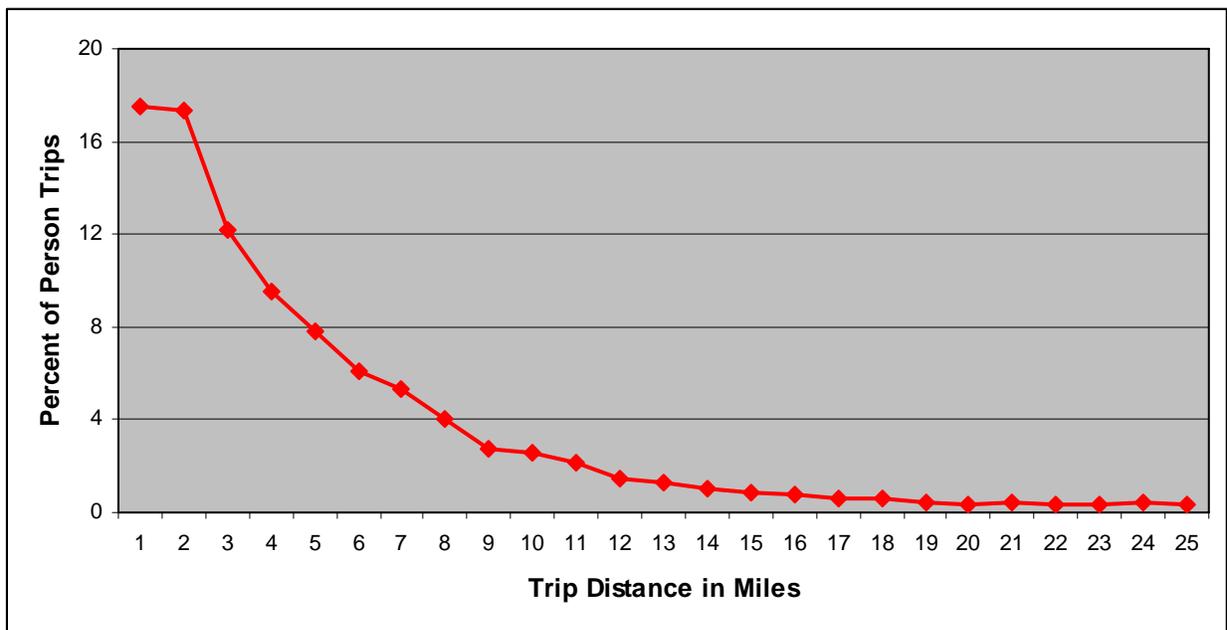
Figure 15. Distribution of Person Trips by Mode of Travel.

AMOUNT OF TRAVEL

Several measures are used to record the amount of travel — the number of person trips, the number of vehicle trips, the trip distances in miles, the trip durations or travel times in minutes, and the VMT.

Trip Distance

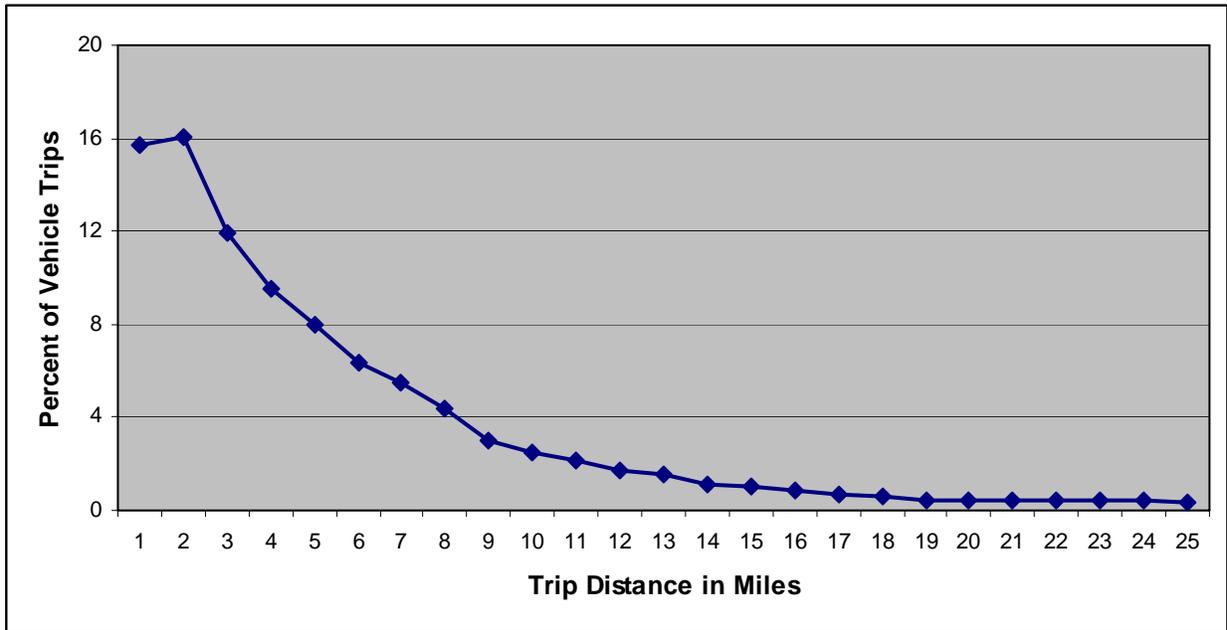
Figure 16 shows the distribution of person trips by the length of the trip in miles. The distribution is for internal person trips, trips beginning and ending inside the two-county Rio Grande Valley region. The average person trip length was 6.5 miles.



Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

Figure 16. Distribution of Person Trips by Trip Distance in Miles.

Figure 17 shows the distribution of vehicle trips by the length of the trip in miles. The average vehicle trip length was 7.0 miles. For travel demand modeling, the travel modeler needs data about the distribution of vehicle trips in miles and the average vehicle trip length in miles for each internal trip purpose. Distributions similar to Figure 17 are prepared for each internal trip purpose.

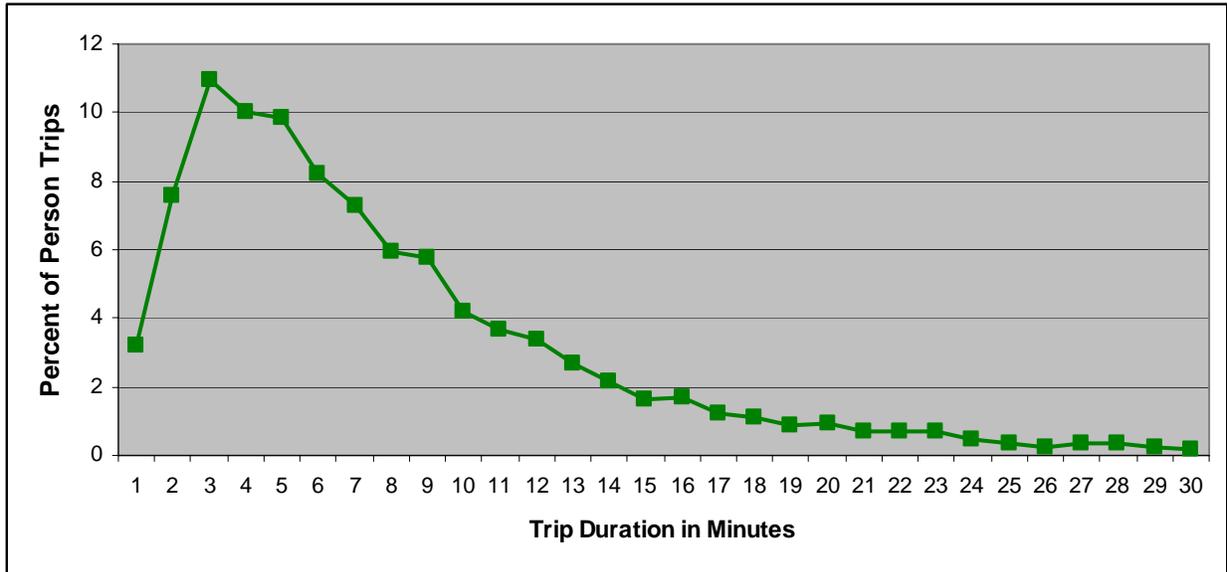


Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

Figure 17. Distribution of Vehicle Trips by Trip Distance in Miles.

Trip Duration

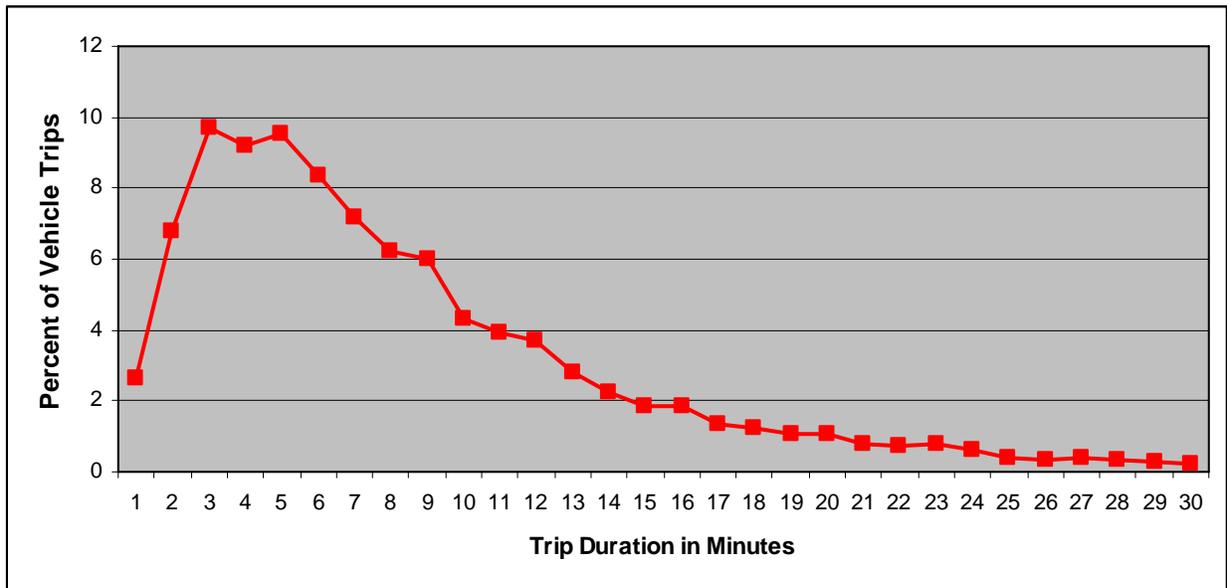
Figure 18 shows the distribution of person trips by the duration of the trip in minutes. The distribution is for internal person trips, trips beginning and ending inside the two-county Rio Grande Valley region. The average person trip length was 9.2 minutes.



Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

Figure 18. Distribution of Person Trips by Trip Duration in Minutes.

Figure 19 shows the distribution of vehicle trips by the duration of the trip in minutes. The average vehicle trip duration was 9.8 minutes.



Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

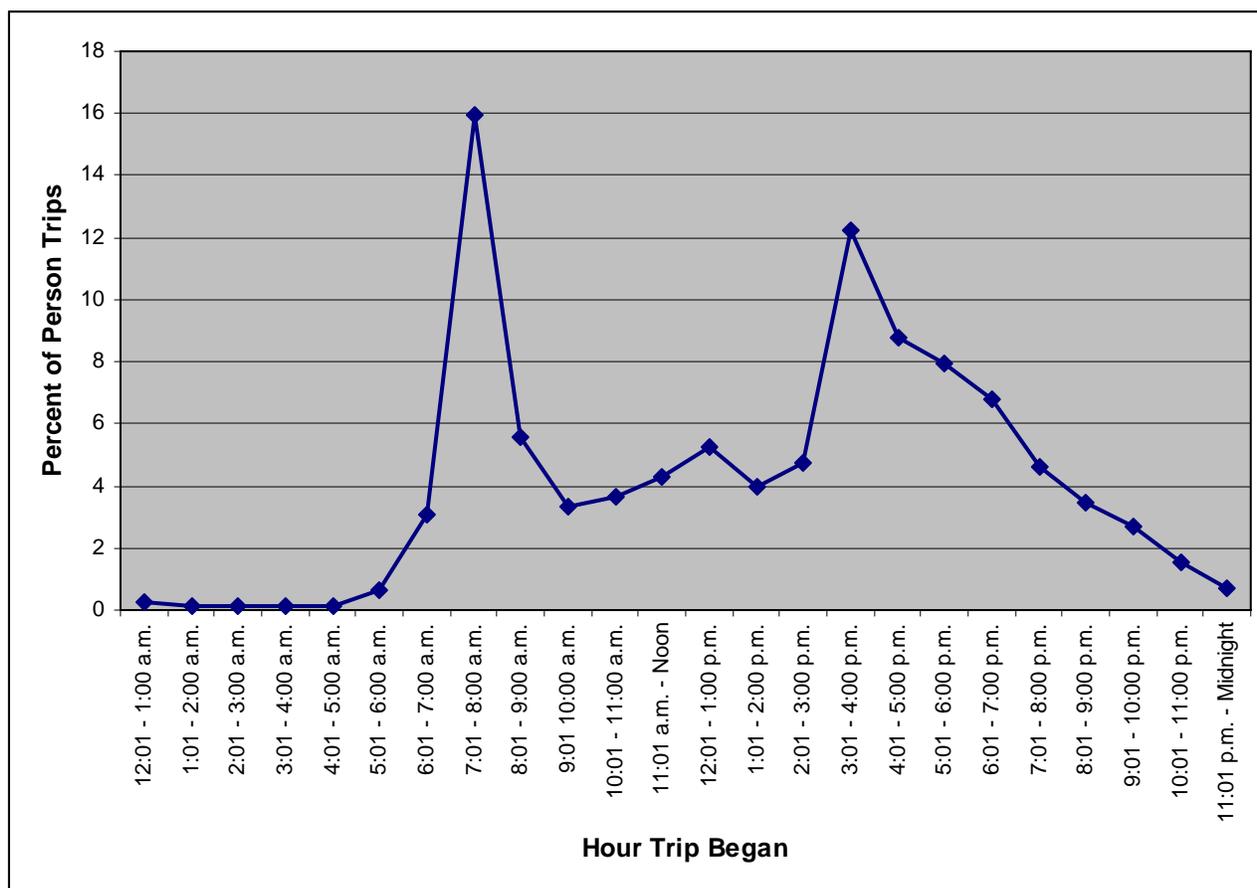
Figure 19. Distribution of Vehicle Trips by Trip Duration in Minutes.

Vehicle Miles of Travel (VMT)

VMT is calculated as the product of the average vehicle trip length in miles and the number of vehicle trips. For household trips internal to the two-county Rio Grande Valley region, the estimated VMT is 14,245,000 miles per school-year weekday. This is not the total VMT for the region, as the VMT associated with external-local, external-through, commercial vehicle, visitor travel, and intrazonal trips is not included in the estimate.

TIME OF TRAVEL

The time of travel is a function of the activity to be accomplished. The start times for trips to work and to school are dictated by the time that work and school begin. For other activities, such as trips to shop or for recreation, the trip start times are flexible. As travel during peak periods becomes more congested, some drivers choose to make trips earlier or later to avoid the most congested travel time. Figure 20 shows the distribution of trip start times for a 24-hour weekday during the school year. The morning peak period, 7:01 a.m.-to-8:00 a.m., has the highest percentage of daily trip starts with 16 percent of the trips starting during this hour. During the morning peak period, trips from home to work and from home to school are the primary destinations. The second highest hour for trip starts is 3:01 p.m.-to-4:00 p.m. with 12 percent of the trip starting during this hour. During this hour, trips from home to school and back to home are the primary destinations. The afternoon peak period is spread out with most of the trip starts occurring between the hours of 4:01 p.m.-to-7:00 p.m.

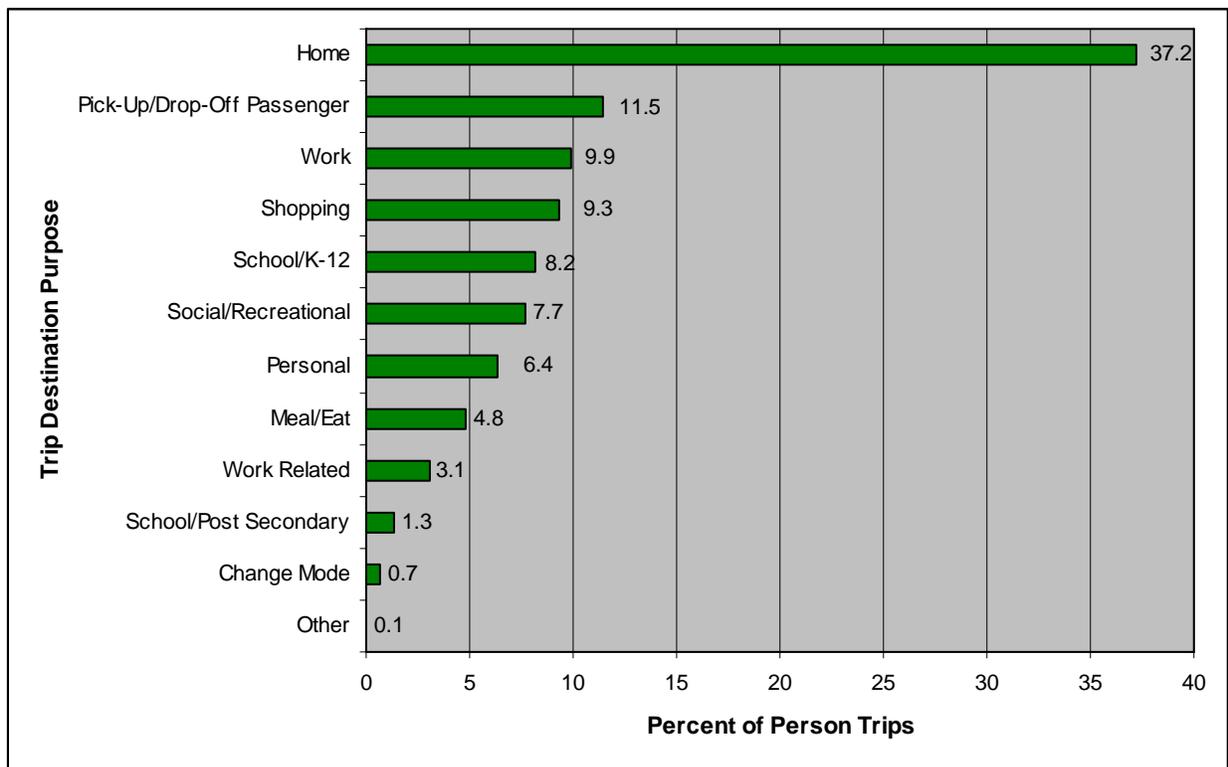


Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

Figure 20. Distribution of Person Trip Start Times by Hour of the Day.

TRAVEL PURPOSE

As a part of their travel diary, each household member was asked to identify from a list of choices what they did at each trip destination. The information about the trip destination was used to categorize the trip by trip purpose. In travel demand modeling typically there are three internal trip purposes, HBNW, HBW, and NHB. Figure 21 shows the distribution of person trips by the trip destination purpose. As would be expected, the most frequent trip destination was the return home trip.



Source: Rio Grande Valley Household Travel Survey and TTI Analysis.

Figure 21. Distribution of Person Trips by Trip Destination Purpose.

Type of Place at Trip Destination

Closely related to the travel purpose and what the traveler did at the destination end of the trip is information on the type of place or business that was at the destination end of the trip. The travel demand modeler uses this information to develop trip attraction rates for various types of land use. For travel demand modeling, attractions are typically grouped into three categories — basic, retail, and service. Table 5 shows the distribution of person trips by the types of places identified in the survey for the destination end of the trip.

Table 5. Number of Person Trips and Distribution of Person Trips by Type of Place at Trip Destination.

Type of Place	Person Trips	Percent of Person Trips
Residential	362,714	10.12
Residential Type Work Place	31,237	0.87
Construction Site	24,709	0.69
Transportation Stop	29,502	0.82
Automotive Dealer/Repair	38,357	1.07
Bank/Financial Institution	62,685	1.75
Barber/Beauty/Nail Salon	13,563	0.38
Bookstore/Newsstand	2,522	0.07
Convenience/Drug Store	56,768	1.58
Government Offices	110,127	3.07
Offices Non-Government	166,955	4.66
Grocery	224,785	6.27
Health Club	26,304	0.73
Medical Facility/Hospital	191,094	5.33
Movie Theater/Cinema	17,023	0.48
Restaurant/Fast food, Bar and Grill	298,822	8.34
Educational – 12 th Grade or Lower	1,092,201	30.48
Educational – College, Trade, Etc.	120,645	3.37
Shopping Mall/Department Store	282,241	7.88
Gas Station	41,121	1.15
Airport	6,315	0.18
Other	383,830	10.71
Total	3,583,520	100

Source: Rio Grande Valley Travel Survey and TTI Analysis.

WHERE PEOPLE TRAVELED

Figures 22-32 show the geographic distribution of internal person trips within the two-county Rio Grande Valley region. Figure 22 shows the two-county area and the nine sub-regions. Figure 23 shows the number of person trip interchanges between Area 1 and Areas 2-9. Figure 24 shows the number of person trip interchanges between Area 2 and Area 1 and Areas 3-9. Figure 25 shows the number of person trip interchanges between Area 3 and Areas 1-2 and Areas 4-6. Figure 26 shows the number of person trip interchanges between Area 4 and Areas 1-3 and Areas 5-9. Figure 27 shows the number of person trip interchanges between Area 5 and Areas 1-4 and Area 6-9. Figure 28 shows the number of person trip interchanges between Area 6 and Areas 1-5 and Areas 7-9. Figure 29 shows the number of person trips between Area 7 and Areas 1-6 and Areas 8-9. Figure 30 shows the number of trips between Area 8 and Areas 1-7 and Area 9. Figure 31 shows the number of trips between Area 9 and Areas 1-8. Figure 32 shows the percent of person trips that remain within each sub-area.

The two-county Rio Grande Valley region was divided into the following nine sub-areas.

- Area 1 – Central Brownsville: All zones located southeast and south of FM-3248, southwest of FM-511, and west of FM-511 and FM- 3068.
- Area 2: All other Cameron County zones not located in Area 1.
- Area 3 – Central Harlingen and San Benito: All zones south and west of Loop 499 and east of US-77, and all zones comprising San Benito.
- Area 4 – Southwest Cameron County: All zones north of the Rio Grande river, south of US-83, southwest of US-77/83, west of FM-732, and east of the Hidalgo County line.
- Area 5 – Northwest Cameron County: All zones north of US-83, east of the Hidalgo County line, and south of the Willacy County line.
- Area 6 – North Hidalgo County: All zones north of US-83, east of FM-364, north of FM-681, north of SH-107, east of the county lines of Cameron, Kenedy, and Willacy counties, and south of the Brooks County line.
- Area 7 – South-Central Hidalgo County: All zones north of US-83, east of FM-364, south of SH-107 and west of US-281.
- Area 8 – East Central Hidalgo County: All zones north of US-83, east of the Cameron County line, east of US-281, south of SH-107, and west of the Cameron County line.
- Area 9 – South Hidalgo County: All zones north of the Rio Grande river, east of the Starr County line, south of US-83, and west of the Cameron County line.

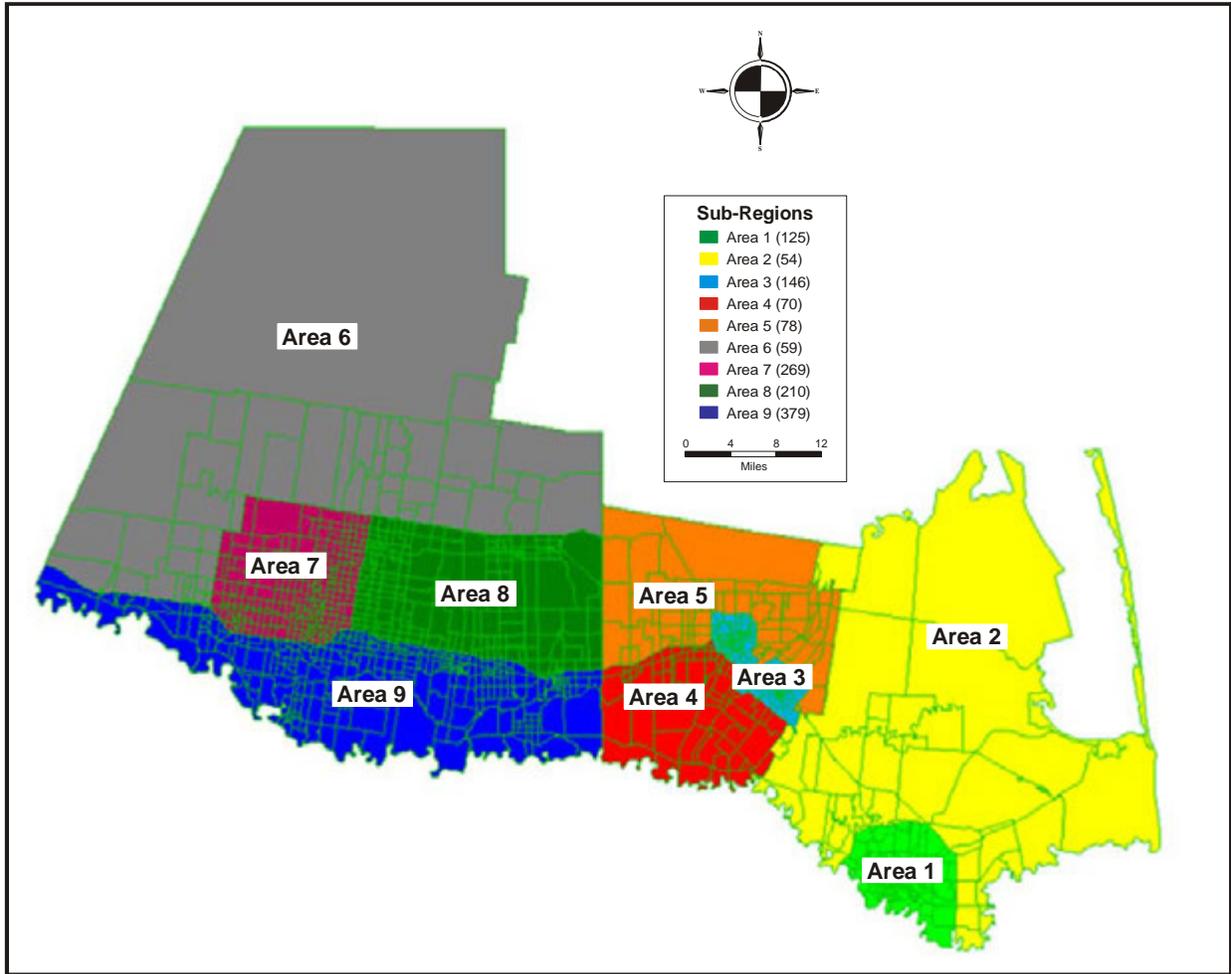


Figure 22. Two-County Rio Grand Valley Study Area and the Nine Sub-Regions within the Study Area.

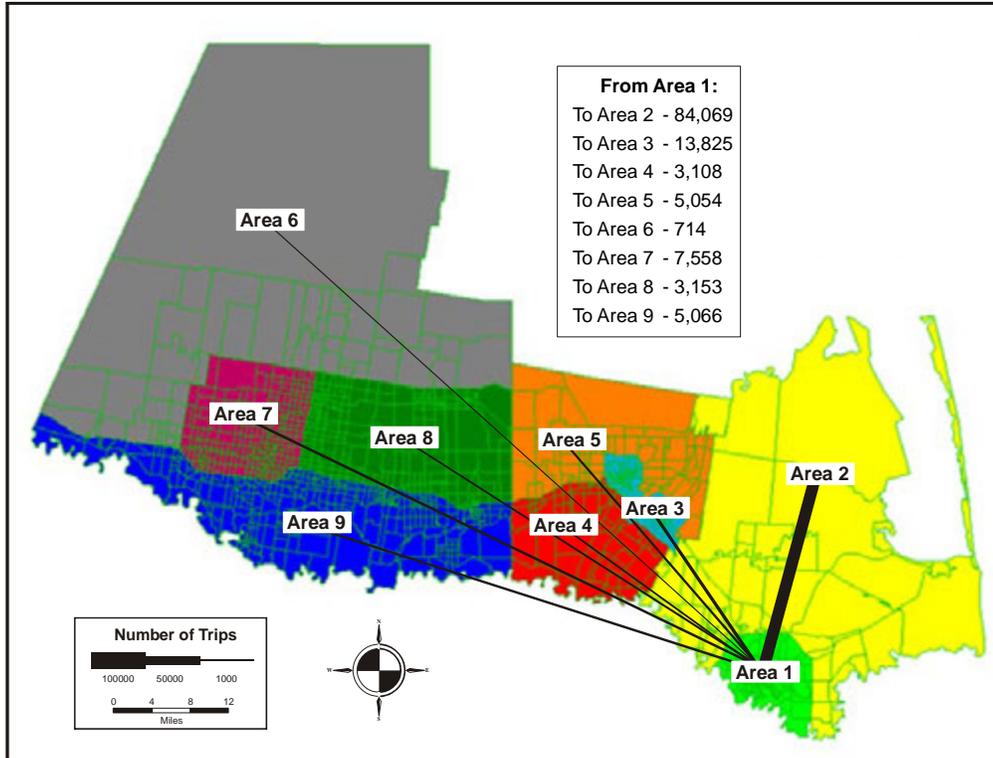


Figure 23. Person Trip Interchanges between Area 1 and Areas 2 through 9

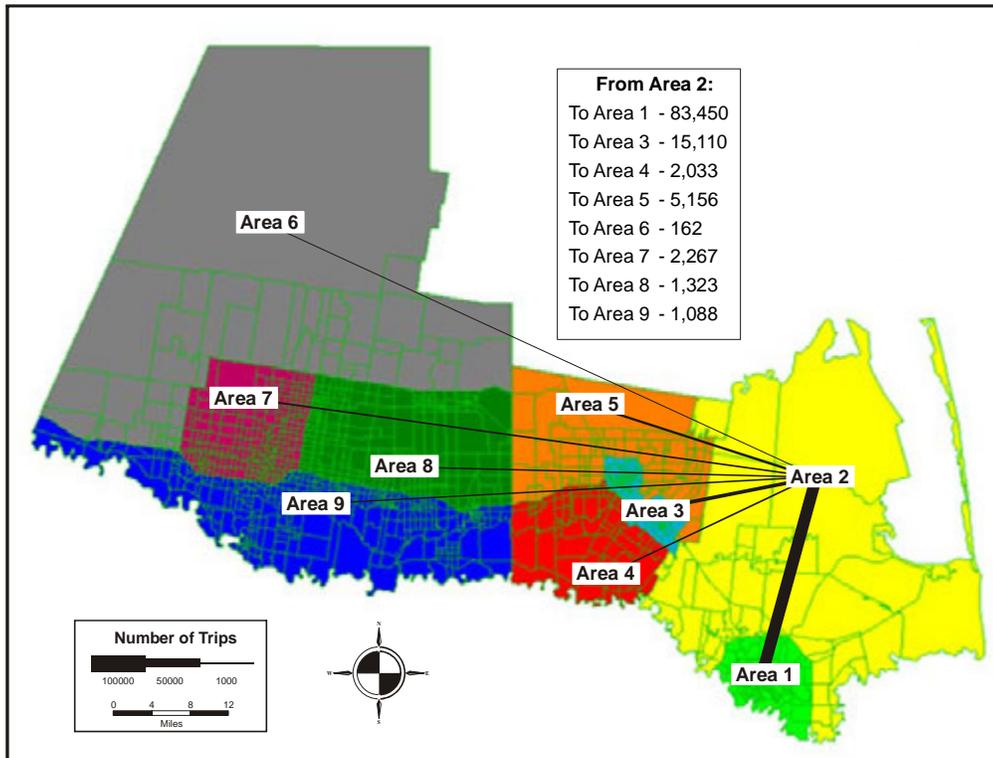


Figure 24. Person Trip Interchanges between Area 2 and Area 1 and Areas 3 through 9.

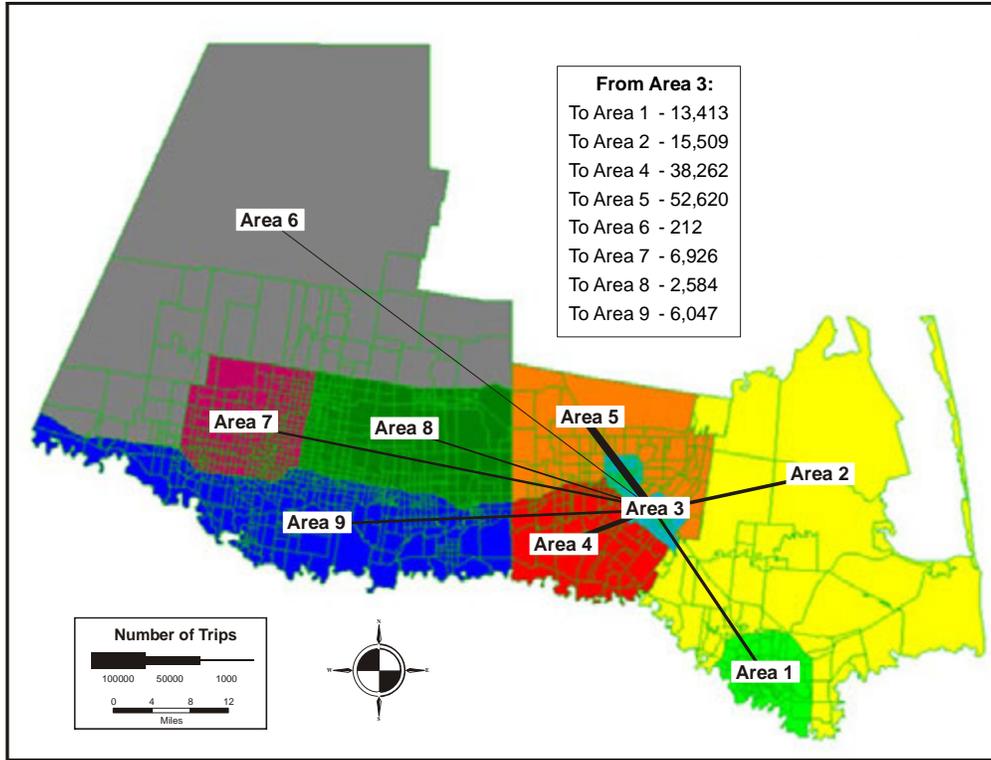


Figure 25. Person Trip Interchanges between Area 3 and Areas 1 and 2 and Areas 4 through 9.

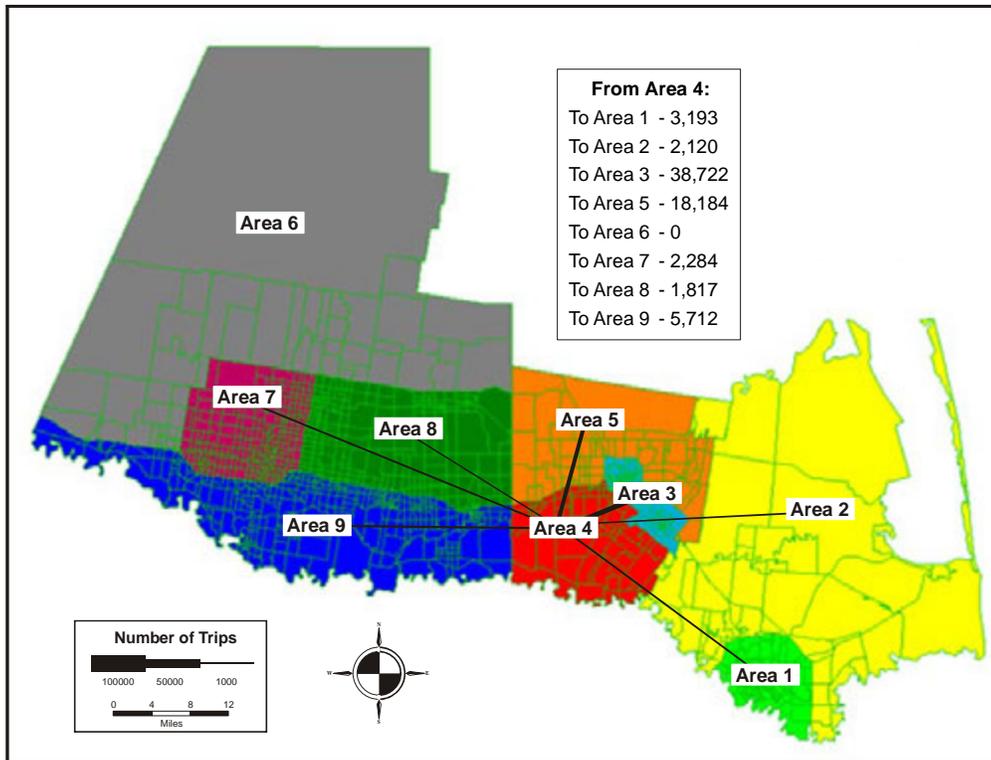


Figure 26. Person Trip Interchanges between Area 4 and Areas 1 through 3 and Areas 5 through 9.

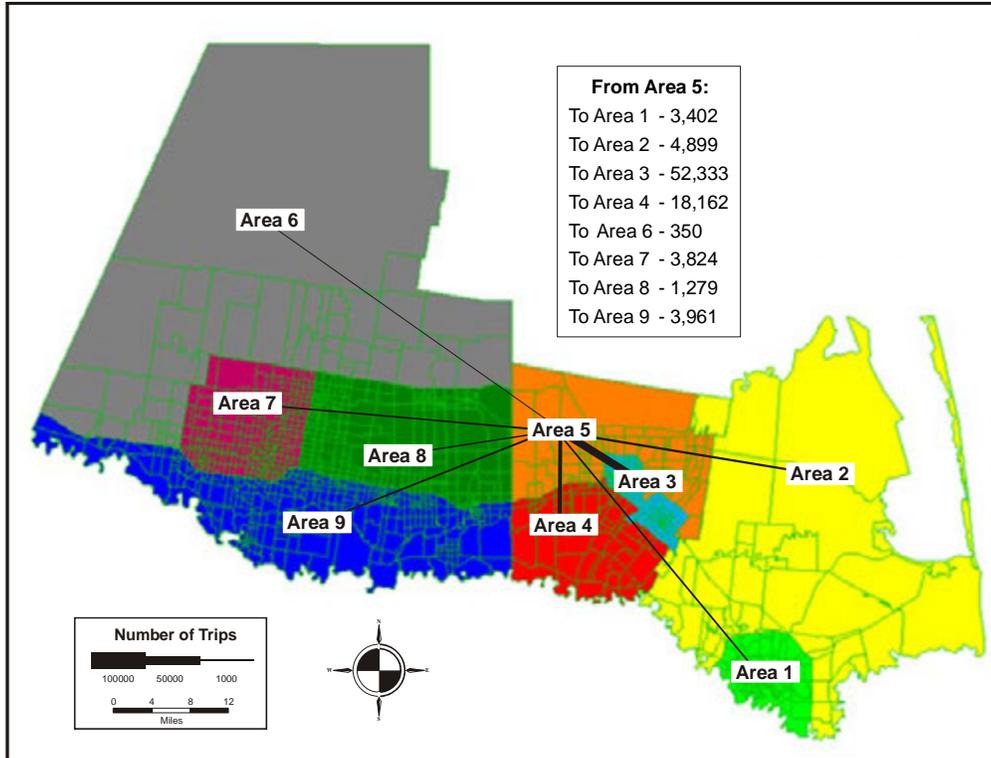


Figure 27. Person Trip Interchanges between Area 5 and Areas 1 through 4 and Areas 6 through 9.

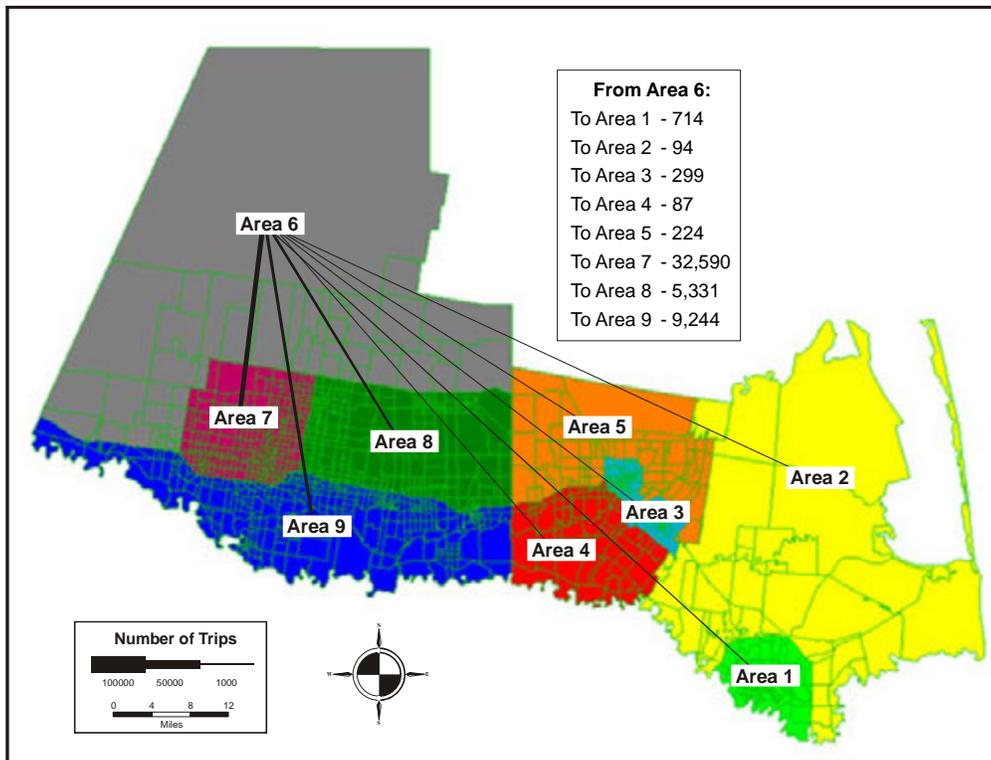


Figure 28. Person Trip Interchanges between Area 6 and Areas 1 through 5 and Areas 7 through 9.

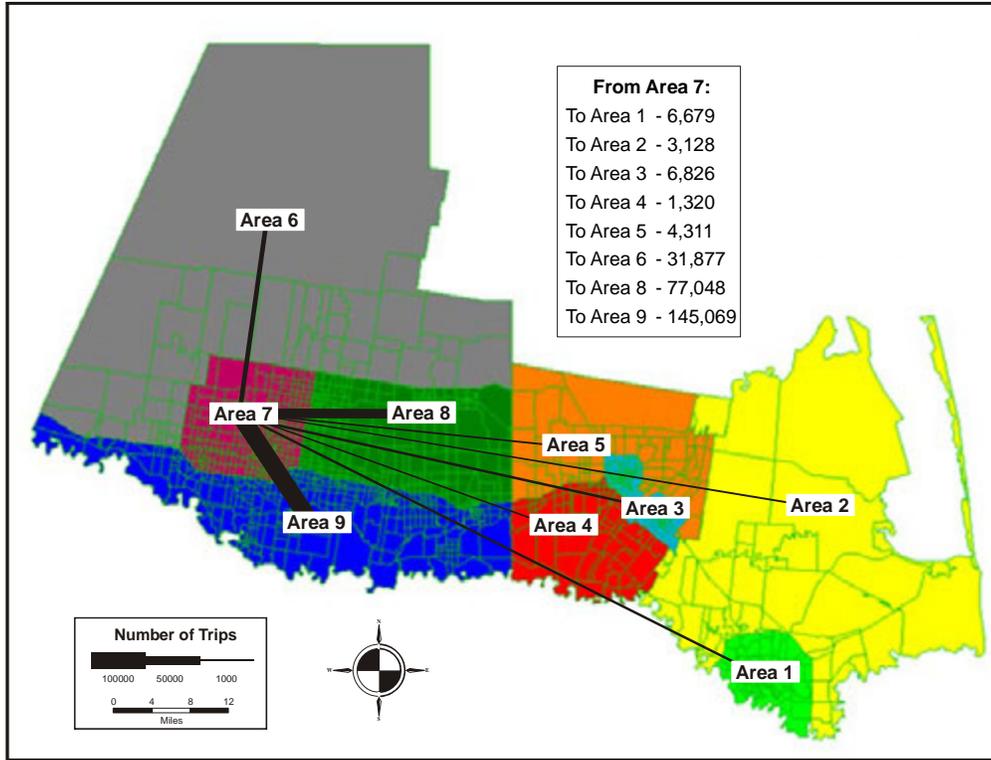


Figure 29. Person Trip Interchanges between Area 7 and Areas 1 through 6 and Areas 8 and 9.

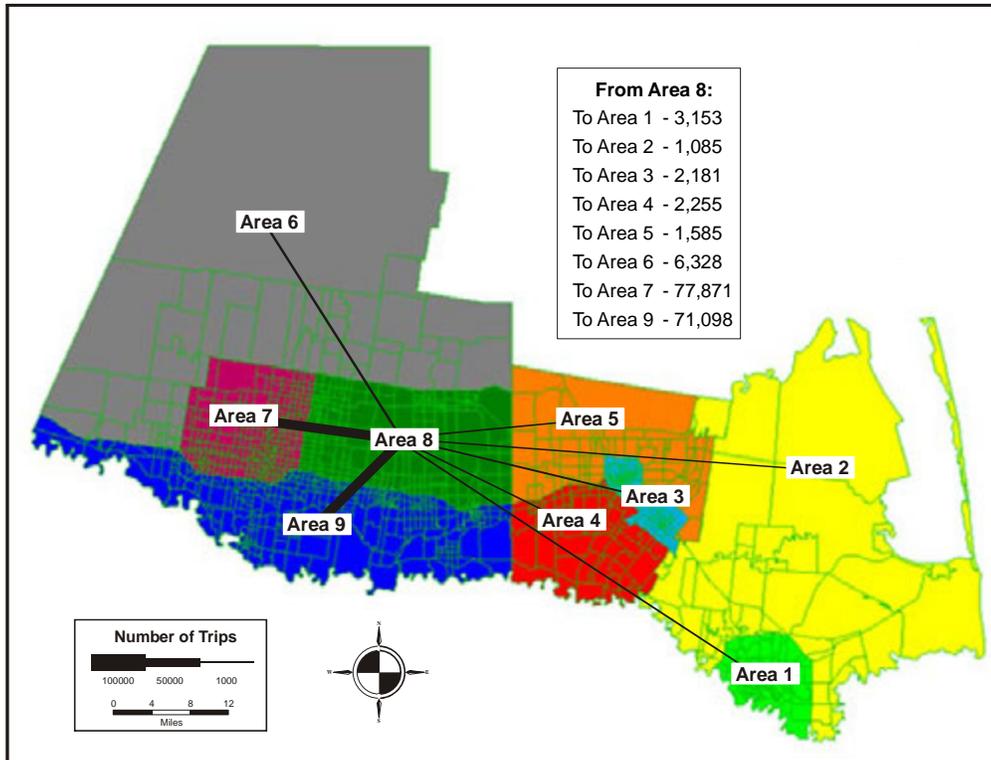


Figure 30. Person Trip Interchanges between Area 8 and Areas 1 through 7 and Area 9.

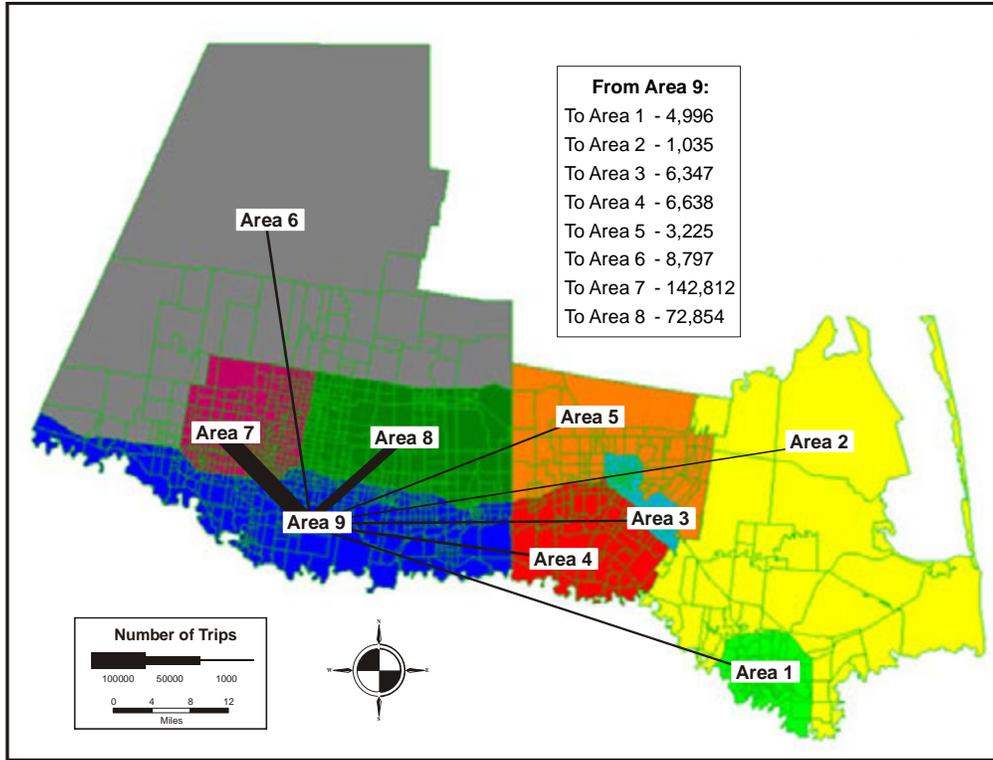


Figure 31. Person Trip Interchanges between Area 9 and Areas 1 through 8.

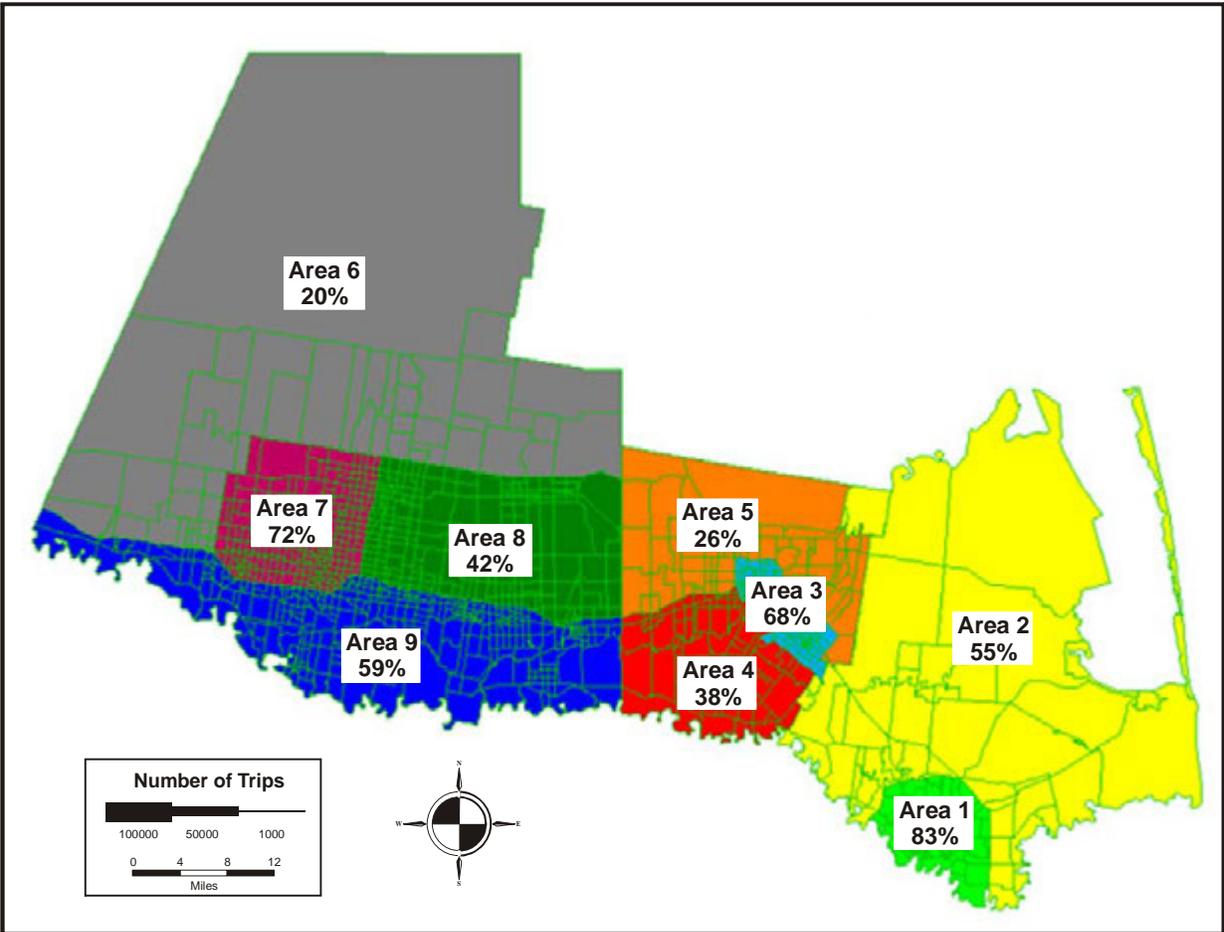


Figure 32. Percent of Person Trips that Remain within Each Sub-Region.

Table 6 provides household survey summary data for the two-county region and for each of the household travel surveys conducted in the City of Brownsville, the Cities of Harlingen and San Benito, and Hidalgo County, Texas. Data, more detailed than that provided in this report, has been provided to TxDOT's Transportation and Programming Division for their use in preparing a single travel demand model for the two-county Rio Grande Valley region.

Table 6. Comparative Travel Survey Data for Selected Texas Urban Areas.

Urban Area	Brownsville	Harlingen - San Benito	Hidalgo County	Rio Grande Valley Region
Demographics				
Household Population	203,290	168,752	658,115	1,030,139
Licensed Drivers	109,436	103,196	359,823	585,035
Number of Households	55,015	53,090	181,473	294,825
Average Household Size	3.70	3.18	3.63	3.49
Number of Motor Vehicles	105,849	98,163	338,810	555,443
Motor Vehicles per Household	1.92	1.85	1.87	1.88
Number of Daily Trips by Mode				
Total Person Trips	553,822	434,659	2,273,841	3,583,480
Automobile-Driver Trips	306,352	246,010	1,296,718	2,023,295
Motor Vehicle Passenger Trips	170,949	159,191	791,678	1,243,681
School Bus Trips	40,489	16,977	106,426	188,781
Walk Trips	21,296	10,576	58,328	93,337
Public Transit Trips	3,826	97	3,156	9,889
Bicycle Trips	1,298	589	4,209	6,571
Commercial Vehicle Trips	462	692	11,425	14,250
Other Modes/Taxi	150	527	1,901	3,709
Number of Daily Trips by Destination/Purpose				
Trips to Home	220,692	157,146	847,808	1,322,199
Trips to Work	55,775	39,102	210,803	353,105
Trips Work Related	9,854	6,838	70,349	109,126
Trips to Shop	52,419	41,299	210,919	333,674
Trips to Pick-Up/Drop Off Passenger	55,835	55,115	283,180	410,936
Trips for Personal Business	32,226	30,750	142,555	228,654
Trips for Social/Recreation	35,571	39,613	174,919	276,680
Trips for School K-12	52,908	36,842	181,741	292,203
Trips for School Post Secondary	9,902	3,292	31,211	46,762
Trips for Meal/Eat	23,972	20,732	107,369	171,603
Trips to Change Mode	4,306	3,350	10,938	24,622
Other Trips	362	580	2,050	3,596
Daily Trip Rates				
Person Trips per Person	2.72	2.58	3.45	3.48
Person Trips per Household	10.07	8.19	12.53	12.15
Trip Lengths and Durations				
Average Person Trip Length in Miles	4.2	3.5	4.9	6.5
Average Vehicle Trip Length in Miles	4.4	3.6	5.3	7.0
Average Person Trip Duration in Minutes	7.0	6.0	7.5	9.2
Average Vehicle Trip Duration in Minutes	7.3	6.3	8.0	9.8
Vehicle Miles of Travel (VMT)				
Household Internal VMT	1,346,000	895,000	6,856,000	14,245,000

Source: Selected Travel Surveys and TTI Analysis.

TERMINOLOGY

Within the context of the household travel survey, a number of terms are used. These terms are defined in this section.

Person Trip – A person trip is the movement of an individual from one location to another location. In the household survey, trips were recorded for all persons in a surveyed household.

Automobile Driver Trip – An automobile driver trip is the movement of a vehicle from one location to another location. These trips are recorded for the person driving the vehicle. These are also referred to as vehicle trips.

Trip Purpose – The trip purpose is stated in terms of the purpose at the location the trip began and the purpose at the location the trip ended. For example, a trip that began at home and ended at work would be referred to as a home-based work (HBW) trip. There were 11 trip purposes used in the household survey.

Trip Activity – The trip activity is stated in terms of the activity at the location the trip began and/or the location the trip ended. There were 22 activities used in household survey. The activities were recorded in the survey and post processed to identify the trip purpose associated with each trip activity.

Vehicle Availability – Vehicle availability is the number of vehicles available to members of a household for making trips.

Vehicle Occupancy – Vehicle occupancy is the number of occupants in a vehicle during a vehicle trip including the driver of the vehicle.

Mode of Travel – Mode of travel is the physical means used by the household member to make a trip. The modes are walk, vehicle driver, vehicle passenger, carpool driver, carpool passenger, vanpool driver, vanpool passenger, commercial vehicle driver, commercial vehicle passenger, public transportation, school bus, taxi/paid limousine, bicycle, motorcycle/moped, and other.

Home-Based Work (HBW) Trip – An HBW trip is a trip that has one end of the trip at home and the other end of the trip at work. An HBW trip is non-directional in terms of the trip activity/trip purpose, i.e., a trip from home to work or from work to home is defined as an HBW trip.

Home-Based Non-Work (HBNW) Trip – An HBNW is a trip with one end of the trip at home and the other of the trip at a location other than the work location. An HBNW trip is non-directional in terms of the trip activity/trip purpose.

Non-Home-Based (NHB) Trip – An NHB trip is a trip with neither end of the trip at home.

Trip Productions – Trip productions are the number of trips produced by members of a household. Trip productions are computed by trip purpose and mode of travel. Production rates are the number of trip productions divided by the number of households that produced those trips.

Trip Attractions – Trip attractions are the number of trips attracted to a particular category of land use. Trip attractions are computed by trip purpose and mode of travel for different land use categories.