

National Household Travel Survey Add-On Data Summary for the Sioux Falls, South Dakota Area

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INTRODUCTION

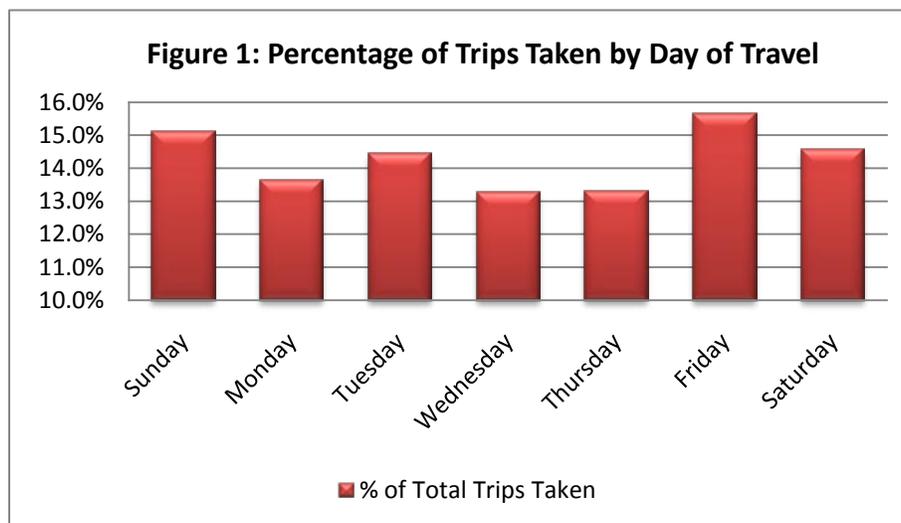
The National Household Travel Survey (NHTS) is the primary inventory of travel behavior and daily travel in the United States. The survey includes information on household demographics, drivers, vehicle age and mileage, types of trips and modes of transportation. In 2009, the Sioux Falls, South Dakota participated as an Add-on location which allowed the City of Sioux Falls Department of Transportation to collect data on a variety of variables useful for transportation planning in the area. This information was collected through a telephone survey. In order to be considered a usable household for the purposes of this study, a household must have completed the screener and at least 50% of the adults in the household must have completed an extended interview. The total number of usable households for the Sioux Falls area was 1,008.¹

This report provides a summary of key variables in this dataset that are most useful for planning purposes. The NHTS data includes variables at the household, person, vehicle and trip level. Each of the tables and graphs indicates which of these corresponding datasets was used to generate the summary.

ANALYSIS

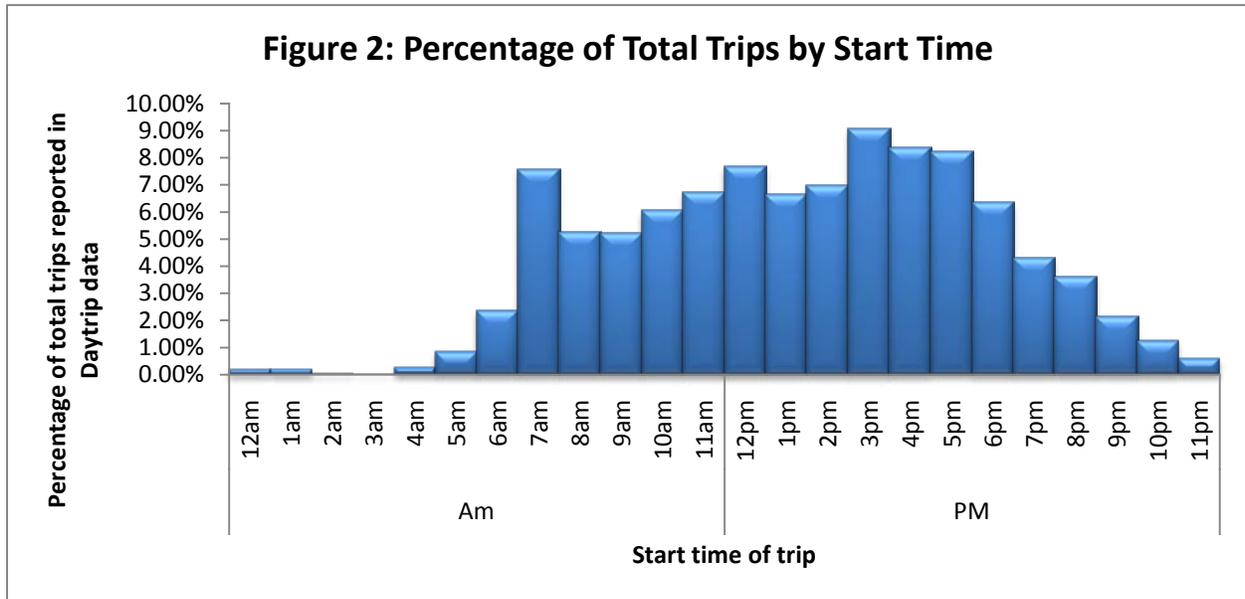
Peak Travel Times

An important part of planning for transportation needs is being able to understand when most travel occurs. It is important to not only know during which hour of the day most travel occurs but also during which day of the week. Figure 1 below provides the percentage of number of trips reported by the day of the week. Friday is the busiest day of travel. This may be due to weekend travel plans as trips for the weekend are likely to begin on Friday. It would be useful to analyze travel patterns in terms of time of year or seasonal differences as well, but the 2009 dataset does not provide the information for that type of comparison.



¹ Documented in "Rapid City and Sioux Falls, South Dakota Final Sample Design Report." January 27, 2010, prepared by Westat.

It is also important to understand which times of the day most travel tends to occur. Understanding which hours of the day are likely to be busier can help planners to predict likely time periods of congestion and increased traffic risk. As Figure 2 and Table 1 demonstrate the hour between 3pm and 4pm is the time of day in which the highest percentage of trips originate. This also is typically the time of day in which most school days end. Between 4pm and 6pm is also a busy travel time, most likely because of the traffic returning from work, as is the hour between 7 and 8am, when most people will be commuting to work or returning home from night shift.



AM		PM	
12am	0.19%	12pm	7.68%
1am	0.20%	1pm	6.64%
2am	0.05%	2pm	6.96%
3am	0.03%	3pm	9.06%
4am	0.29%	4pm	8.35%
5am	0.84%	5pm	8.23%
6am	2.36%	6pm	6.33%
7am	7.58%	7pm	4.31%
8am	5.25%	8pm	3.62%
9am	5.24%	9pm	2.12%
10am	6.06%	10pm	1.26%
11am	6.74%	11pm	0.60%

Vehicle Count Data

The 2009 NHTS Add-on data for the Sioux Falls area reported approximately 2.5 persons per household. Of those, about 1.9 are drivers aged 15 years or older. There are, on average, 2.3 vehicles per household, although there is some variation based on household size, life cycle and family income. These data indicate that there are more vehicles per household than there are drivers in the Sioux Falls area.

Predictably, the average number of vehicles per household varies based on household size. Table 2 provides the average number of vehicles per household size category as well a breakdown of the count and percentage of number of vehicles for each household size. The percentages reported are percentages by row, for example of all households that have only one household member, about 68% of them have just one vehicle. Households with 3 or more members have on average almost 3 vehicles per household, whereas households with only one member average much closer to one vehicle per household. While analyzing the number of vehicles per household by number of household members is helpful, it may also be important to understand how life cycle phase may affect the number of vehicles per household.

Count of Household Members	Average Vehicles per HH	Count of Household Vehicles				Total (Count) (% of row)
		0 (Count) (% of row)	1 (Count) (% of row)	2 (Count) (% of row)	3+ (Count) (% of row)	
1	1.17	26 11.66%	149 66.82%	37 16.59%	11 4.93%	223 100%
2	2.45	3 0.63%	54 11.3%	241 50.42%	180 37.66%	478 100%
3	2.81	0 0%	10 7.04%	53 37.32%	79 55.63%	142 100%
4+	2.79	0 0%	8 3.54%	108 47.79%	110 48.67%	226 100%
Total	2.31	29 2.71%	221 20.67%	439 41.07%	380 35.55%	1,069 100%

Table 3 provides the average number of vehicles per household for 11 distinct categories of what the NHTS classifies as Life Phases. This variable provides useful information about whether or not the household has young school aged children, or children of driving age within the household. The table provides evidence that as both the number of adults in the house and the age of the youngest child increase, the number of vehicles per household increases as well.

Table 3: Average Household Vehicle Count by Life Cycle Phase from Vehicle Data	
Life Cycle Phase	Average Household Vehicle Count
One adult, no children	1.16
2+ adults, no children	2.45
One adult, youngest child 0-5	1.44
2+ adults, youngest child 0-5	2.30
One adult, youngest child 6-15	1.67
2+ adults, youngest child 6-15	2.56
One adult, youngest child 0-5	2.00
2+ adults, youngest child 0-5	2.90
One adult, retired, no children	1.14
2+ adults, retired, no children	2.12

Finally, the number of household vehicles is also varies by family income of the household. Predictably, the number of household vehicles also varies by household income and the relationship is fairly linear. As income increases so does the average number of vehicles per household. As is displayed in Table 4 on the next page, the lowest number of vehicles per household, the only category averaging less than one vehicle per household, is for those making between \$5,000 and \$9,999. The highest number of vehicles per household is reported for those making over \$100,000 a year, with 2.89 vehicles per household.

Table 4: Average Household Vehicle Count by Family Income	
Household Family Income	Average Household Vehicle Count
< \$5000	1.08
\$5,000 - \$9,999	0.74
\$10,000 - \$14,999	1.12
\$15,000 - \$19,999	1.53
\$20,000 - \$24,999	1.61
\$25,000 - \$29,999	1.79
\$30,000 - \$34,999	2.24
\$35,000 - \$39,999	2.12
\$40,000 - \$44,999	2.54
\$45,000 - \$49,999	2.46
\$50,000 - \$54,999	2.38
\$55,000 - \$59,999	2.43
\$60,000 - \$64,999	2.50
\$65,000 - \$69,999	2.54
\$70,000 - \$74,999	2.76
\$75,000 - \$79,999	2.67
\$80,000 - \$99,999	2.84
> =\$100,000	2.89
Total	2.33

Vehicle Age and Type

In addition to the number of vehicles per household, the data also provides useful information on vehicle age and type. Figure 3 provides the distribution of vehicles in the data by vehicle type. Almost half of the vehicles reported in the survey are automobiles such as cars or station wagons. About 17% are SUVs and another 20% are pickup trucks. Understanding the types of vehicles on the road can help in estimating average miles per gallon, in planning for traffic as well as expected road maintenance and for predicting potential harm associated with vehicle crashes.

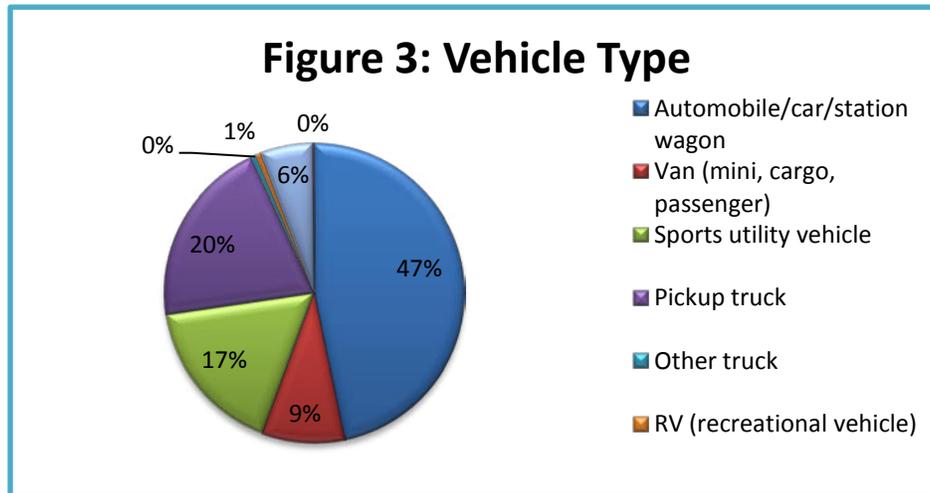


Table 5 provides a summary overview of the average vehicle age by vehicle type. It also shows the minimum and maximum for vehicle age by each vehicle type to illustrate the distribution of age for each type. As Table 5 indicates, in Sioux Falls, the average age for all vehicles is just under 10 years and the average age for a standard automobile, the most frequent type, is just over 10 years.

Vehicle Type	Vehicle Age		
	Mean	Min	Max
Automobile	10.17	1	74
Van (mini, cargo, passenger)	8.18	1	25
SUV	8.02	1	52
Pickup truck	11.07	1	43
Other truck	19.92	4	48
RV (recreational)	18.07	1	40
Motorcycle	11.31	1	39
Golf Cart	5	5	5
Other	17.67	1	43
Total	9.98	1	74

Table 6 also provides information about vehicle age by vehicle type, but offers a more detailed breakdown of the count and percentage of vehicles in each age category. Each cell in the table provides a count for the two categories, the percentage by row, and the total percentage. This allows the table to be interpreted by row, for example in just evaluating pick-up trucks in the sample, just over 50% are ten years or older. The total percentages make it possible to see which categories are the most common out of all possible combinations. For each type of vehicle the most frequent response for age has been highlighted. In almost all cases this is the 10 or more years category. The largest percentage

of vehicles in Sioux Falls which is also highlighted and is about one fifth of all vehicles reported, are Automobiles that are 10 years are older.

Vehicle Type	Vehicle Age					Total
	Missing	1 - 2 yrs old	3-5 yrs old	6-9 yrs old	10 yrs or more	
Automobile/car/station wagon/SUV	26 2.3% 1.1%	134 11.6% 5.4%	235 20.4% 9.5%	260 22.5% 10.5%	499 43.2% 20.2%	1,154 100% 46.7%
Van (mini, cargo, passenger)	9 4.1% 0.4%	25 11.4% 1.0%	57 25.9% 2.3%	60 27.3% 2.4%	69 31.4% 2.8%	220 100% 8.9%
Sports utility vehicle	9 2.1% 0.4%	48 11.4% 1.9%	106 25.2% 4.3%	133 31.7% 5.4%	124 29.5% 5.0%	420 100% 17.0%
Pickup truck	19 3.8% 0.8%	31 6.1% 1.3%	89 17.6% 3.6%	112 22.2% 4.5%	254 50.3% 10.3%	505 100% 20.5%
Other truck	1 7.1% 0.04%	0 0% 0%	3 21.4% 0.1%	1 7.1% 0.04%	9 64.3% 0.4%	14 100% 0.6%
RV (recreational vehicle)	0 0% 0%	1 7.1% 0.04%	1 7.1% 0.04%	3 21.4% 0.1%	9 64.3% 0.4%	14 100% 0.6%
Motorcycle	9 6.5% 0.4%	26 18.8% 1.1%	30 21.7% 1.2%	26 18.8% 1.1%	47 34.1% 1.9%	138 100% 5.6%
Golf Cart	0 0% 0%	0 0% 0%	1 100% 0.04%	0 0% 0%	0 0% 0%	1 100% 0.04%
Other	0 0% 0%	1 33.3% 0.4%	0 0% 0%	1 33.3% 0.2%	1 33.3% 0.1%	3 100% 0.1%
Total	73 3.0%	266 10.8%	522 21.1%	596 24.1%	1,012 41.0%	2,469 100%

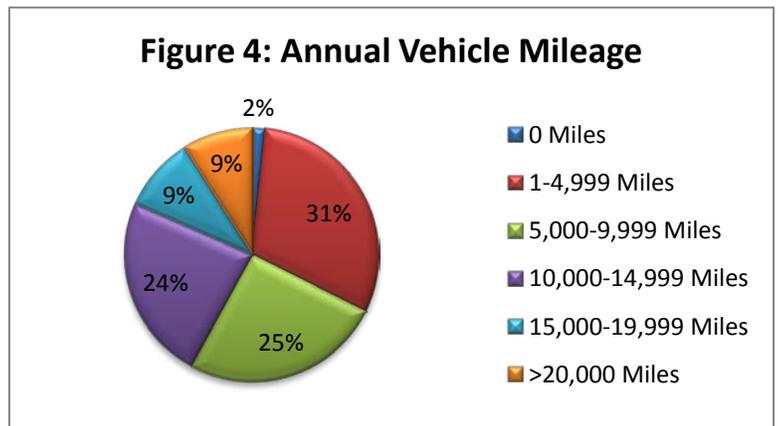
Household family income is also an important predictor of vehicle age. Table 7 provides the average age of household vehicles for each family income bracket. The relationship between income and age of vehicle is negative and fairly linear. The average age of vehicles for households with a family income between \$5,000 and \$9,999 is 17.2 years, while the average age for those making more than

\$100,000 a year is 7.9 years old. While there is some variation in the middle income brackets, the relationship is fairly uniform.

Table 7: Age of Vehicle by Family income	
Household Family Income	Age of Vehicle in Years
< \$5,000	16.3
\$5,000 -9,999.00	17.2
\$10,000 -14,999.00	13.9
\$15,000 -19,999.00	13.1
\$20,000 -24,999.00	12.5
\$25,000 -29,999.00	10.9
\$30,000 -34,999.00	12.0
\$35,000 -39,999.00	9.0
\$40,000 -44,999.00	12.0
\$45,000 -49,999.00	11.6
\$50,000 -54,999.00	10.8
\$55,000 -59,999.00	9.2
\$60,000 -64,999.00	10.9
\$65,000 -69,999.00	8.4
\$70,000 -74,999.00	9.3
\$75,000 -79,999.00	9.3
\$80,000 -99,999.00	8.9
> =100,000.00	7.9
Total	9.9

In addition to the age of the vehicle, it is also useful to understand annual vehicle mileage. There were 1833 vehicles reported in the survey for which the respondent was able to provide exact mileage estimates. The average annual mileage for all vehicles reported was just over 9,000 miles. There was a substantial range to the data though with a minimum reported value of 0 miles and a maximum reported value of 140,000. The extreme values introduce some concern about the accuracy of the mean, but eliminating the outliers provides similar means. Also, the distribution of vehicles in terms of annual vehicle miles, displayed in Table 8 and illustrated in Figure 4, provide a similar picture. Of the majority of vehicles for which there was actual mileage reported, approximately 58%, travelled less than 10,000 miles annually.

Annual Vehicle Miles	Freq.	Percent
0 Miles	30	1.64%
1-4,999 Miles	563	30.71%
5,000-9,999 Miles	469	25.59%
10,000-14,999 Miles	434	23.68%
15,000-19,999 Miles	173	9.44%
>20,000 Miles	164	8.95%
Total	1,833	100%



Trip Information

The NHTS survey also provides information about to evaluate the nature of trips, including average number of trips per day, average length of trip, mode of transportation used, and trip purpose. The average number of trips per day per person in Sioux Falls was 3.9. Gender and age were both related to the number of trips taken per day. On average males made 3.76 trips per day while females made 3.94 trips per day. As Table 9 demonstrates, age also had an effect on the amount of trips made per day. Only the youngest and oldest cohorts average less than four (4) trips per day, while those between 35-45 years old average almost five (5) trips per day. Life Style Phase also had an effect on the number of daily trips made per person as is illustrated in Table 10. Predictably, households with children and two or more adults made the most number of trips per day. The group with the highest number of trips per day, at almost 16 daily trips per person, was households with two or more adults and children between the ages of 16 and 21. Single retired adults with no children had the lowest average daily trips per person, at just over 3 trips per day.

Age Cohort	Average Number of Daily Trips per Person
<15	2.45
15 to 24	4.01
25 to 34	4.35
35 to 44	4.93
45 to 54	4.68
55 to 64	4.29
65 and older	3.41

Table 10: Number of Daily Household Trips by Life Cycle from Household Data	
Life Cycle Phase	Household Trips per Day
One adult, no children	4.15
2+ adults, no children	7.96
One adult, youngest child 0-5	7.89
2+ adults, youngest child 0-5	13.03
One adult, youngest child 6-15	11.08
2+ adults, youngest child 6-15	15.77
One adult, youngest child 16-21	7.50
2+ adults, youngest child 16-21	15.55
One adult, retired, no children	3.29
2+ adults, retired, no children	7.39

The survey results also provide information on the mode of transportation for these trips. Of the 9,475 trips recorded, reported in Table 11, the vast majority, 89.5%, were made in a personal vehicle. The second most frequent mode of transportation in terms of number of trips was walking at 6.7%. These data indicate that driving a personal vehicle is the primary mode of transportation in Sioux Falls by far. To the extent that public and alternative forms of transportation are available, they are not being widely used.

Table 11: Percentage of Trips by Mode of Transportation	
Mode of Transportation	Percent
Private Vehicle (Car, truck, motorcycle, etc)	89.5%
Public Transportation (Bus, Train, etc)	1.6%
Taxi	0.1%
Bicycle	1.0%
Walk	6.7%
Other	1.1%
Total	100%

The distance of the trip is one obvious determinant of the mode of transportation chosen. The average distance for all 9407 trips for which trip length was reported in the survey was 8.2 miles, but there was significant variance in this variable. The minimum reported distance was only one-tenth of a mile and the maximum is 1200 miles. While these outliers have some effect on the reported mean, eliminating these observations had minimal effect on the reported averages due to the large number of observations. Table 12 indicates that the average trip length in a private vehicle or on public transportation is just over eight (8) miles. The average trip length for a bicycle trip is almost three (3) miles, and for a walking trip, just under one mile.

Mode of Transportation	Average trip length in miles
Private Vehicle	8.30
Public Transportation	8.34
Taxi	6.05
Bicycle	2.82
Walk	0.71
Other	53.9
Total	8.19

The length of trip in miles can also be evaluated according to the purpose of the trip. This provides useful information for planning about average distances that individuals commute or travel for shopping and other purposes. Table 13 provides the average trip distance in miles as well as the median distance in miles by the reported purpose of the trip. The average reported trip length for work trips is just under nine (9) miles, while the average reported shopping trip is between five (5) and six (6) miles. Respondents are also likely to attend school and church relatively close to home with the average reported trip length for those trips being less than five (5) miles. The Median shows slightly less variance. The median for work trips is just over five (5) miles, while the median distance for shopping, school/church and other personal or social trips are all three (3) miles or less.

Trip Purpose	Average	Median
To/From Work	8.8	5.3
Work Related Business	16.1	5.0
Shopping	5.5	2.0
Other Family/Personal	6.2	2.1
School/Church	4.5	3.0
Medical/Dental	6.1	4.0
Vacation	26.5	6.8
Visit Friends/Relatives	15.7	4.0
Other Social/Recreation	7.5	3.0

We can also evaluate purpose by travel day to understand the extent that these type of trips vary throughout the week. As one might expect, Table 14 shows that Saturday and Sunday seem to be the busiest days for shopping, and the least travelled days for work purposes.

Travel Day	Work	Shopping	School/Church	Other
Sunday	3.1%	19.5%	31.4%	14.6%
Monday	20.5%	10.2%	11.3%	12.9%
Tuesday	19.2%	10.1%	15.8%	14.2%
Wednesday	20.1%	9.4%	17.6%	11.4%
Thursday	17.9%	11.0%	10.8%	13.0%
Friday	14.7%	16.3%	9.3%	17.0%
Saturday	4.5%	23.4%	3.9%	16.9%
Total	100%	100%	100%	100%

The purpose of the trip is also related to the mode of transportation used. Table 15 provides a breakdown of respondents' choices for mode of transportation by the purpose of their trip for three primary purposes. The data indicates that trips taken for the purpose of getting to and from school are have a higher percentage of respondents walking or using public transportation, this may be in part because of the close proximity of schools, as noted below, and shopping centers to residential areas.

Mode of Transportation	Work	School/Church	Shopping
Private Vehicle (Car, truck, motorcycle)	95.4%	81.0%	96.5%
Public Transportation (Bus, Train, etc)	0.1%	10.7%	0.1%
Taxi	0.0%	0.1%	0.1%
Bicycle	0.3%	2.3%	0.0%
Walk	2.9%	5.6%	2.9%
Other	1.3%	0.3%	0.4%

The type of transportation used also varies by household family income. As is demonstrated in Table 16, for individuals reporting a household family income of less than \$10,000 a year, 27.2% of their reported trips are travelled by walking. This is compared to less than 7% of trips for any of the groups earning over \$15,000. The group having the highest percentage of trips taken on public transportation earns an average household family income of \$15,000 to \$24,999.

Household Family Income	Private Vehicle	Public Transportation	Taxi	Bicycle	Walk	Other	Total
< \$10,000	70.5%	2.2%	0.0%	0.0%	27.3%	0.0%	100.0%
\$10,000 - \$14,999	86.6%	0.0%	0.0%	2.7%	8.1%	2.7%	100.0%
\$15,000 - \$24,999	87.8%	3.7%	0.0%	0.7%	6.9%	0.9%	100.0%
\$25,000 - \$34,999	89.8%	0.9%	0.0%	1.1%	6.3%	1.8%	100.0%
\$35,000 - \$49,999	91.9%	0.8%	0.4%	0.8%	6.2%	0.1%	100.0%
\$50,000 - \$74,999	89.5%	1.9%	0.0%	1.3%	6.9%	0.4%	100.0%
\$75,000 - \$99,999	89.7%	2.3%	0.0%	0.7%	6.2%	1.0%	100.0%
> \$100,000	89.2%	0.9%	0.1%	1.4%	6.6%	1.8%	100.0%

Travel to School Information

The NHTS Add-on for 2009 also included a section in the interview related to travel to schools. In particular the survey addressed the age at which individuals felt comfortable allowing their children to walk without an adult to school, how far individuals lived away from their school, and potential concerns that parents have about allowing their children to walk to and from school. Not all of the survey respondents were selected to provide information for this section; only 215 total respondents were included. Of those 79% attended public school, 18% attended private school, and approximately 3% had children that were either home schooled or not in school. The majority of respondents lived less than two (2) miles away from their school, as is reported in Table 17.

Distance	% of Respondents
Less than 1/4 mile	8.7%
Between 1/4 and 1/2 mile	11.1%
Between 1/2 and 1 mile	16.9%
Between 1 mile and 2 miles	18.8%
More than 2 miles	44.4%
Total	100%

The selected respondents reported separately about how their child gets to and from school on most school days because given the difference between the end of school and work days in it is likely that children may take an alternate mode of transportation home from school than that which they took to school. Table 18 reports the percentage of respondents which use each mode of transportation to school and the percentage that use each from school. Over half of the respondents reported that on most school days they used a private vehicle to get both to and from school.

Mode of transportation	% to school	% from school
Private vehicle	58.3%	53.7%
Local Public Transit	0.5%	0.5%
Commuter Bus	0.5%	0%
School Bus	28.2%	30.2%
Charter Bus	0%	0.5%
Shuttle Bus	0.0%	0.5%
Bicycle	1.9%	1.0%
Walk	10.7%	13.7%

Respondents were also asked at what grade level they would allow their child to walk or bike to school without at an adult. Fifth grade was the mean response, and together with sixth grade had the most frequent number of responses (each had 21% of responses). Ten (10) percent of respondents indicated that they would feel comfortable with their child walking unaccompanied to school as young as first grade and Eight (8) said that they would never allow it. To better understand why parents might have reservations about children walking or biking to school, the survey also asked respondents to indicate how much of an issue five potential concerns were in their decision to allow their child to walk or bike to and from school. The question specifically addressed:

- The distance between home and school (Distance)
- Violence or crime along the route (Crime)
- The amount of traffic along the route (Traffic)
- The speed of traffic along the route (Speed)
- Poor weather or climate in the area (Weather)

Table 19 provides a breakdown of the respondents' level of concern about each of these topics. The percentages are provided by column, for example 57.4% of all respondents asked about crime along the route to school indicated that it was not an issue. The largest areas of concern for parents appear to be the distance to the school and the amount of traffic along the route. The majority of parents also indicated that speed and weather were at least somewhat of an issue. Figures 5-9 provide an illustration of each response by each question.

	Distance	Crime	Traffic	Speed	Weather
Not an issue	19.8%	57.4%	10.4%	15.4%	6.0%
A little bit of an issue	11.9%	21.3%	11.9%	11.4%	6.0%
Somewhat of an issue	12.4%	5.9%	15.4%	20.3%	31.8%
Very much an issue	16.8%	5.0%	25.3%	20.3%	27.4%
A serious issue	39.1%	10.4%	37.1%	32.7%	28.9%

Conclusion

This report has provided a brief overview of the information contained for the Sioux Falls area in the 2009 NHTS data. The report has focused on the variables identified by the Sioux Falls Department of Transportation and the Consultant as being the most useful or immediately relevant for transportation planning. The findings illustrate important patterns about transportation in the Sioux Falls area.

- The busiest travel day in terms of the number of trips taken and miles driven is Friday.
- The most heavily travelled time of the day is between 3pm and 4pm.
- There are on average, 2.3 vehicles per household in the Sioux Falls area, but there is substantial variation based on household size, life cycle phase, and household family income.
- The average age of vehicles in Sioux Falls varies by type but in collectively is about ten years old.
- The majority of vehicles reported in the survey are driven less than 10,000 miles annually.
- On average each person in Sioux Falls makes approximately four (4) daily trips; however, there is substantial variation based on age and life cycle phase.
- The vast majority, almost 90%, of trips in Sioux Falls are made in a private vehicle, though those that make less than \$10,000 a year are more likely to walk than higher income groups.
- The average distance travelled to work is just under nine (9) miles, to school between four (4) and (5) miles, and to shop between five (5) and six (6) miles.
- The majority of respondents live within two miles of their school district and about half indicate that their child gets to and from school in a private vehicle.
- The distance and traffic along the route to school were the largest issues for parents in considering whether to allow their child to walk or bike to school without an adult.

This report is not intended to be an exhaustive account of all the information available about travel in Sioux Falls. Further analysis based on specific questions or areas of concern will likely yield even greater benefit to the Sioux Falls Department of Transportation.