

2009 South Dakota Statewide Seatbelt And Motorcycle Helmet Use Survey

Final Report

Prepared for and funded by the
South Dakota Office of Highway Safety

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August 2009

2009 SOUTH DAKOTA STATEWIDE SEATBELT AND MOTORCYCLE HELMET USE SURVEY

SUMMARY

A statewide observational survey of seatbelt and motorcycle helmet use on South Dakota roads was conducted in June of 2009. Seatbelt use, helmet use, and other demographic data were recorded for motorists and cyclists traveling along a selected sample of South Dakota rural and urban highways and interstates in 13 South Dakota counties. A total of 10,284 motorists (drivers, right front passengers of any age, and additional children under age 5 in the front or back seat) and 1,034 motorcycle drivers and passengers were observed.

Seatbelt Use Weighted Statewide Estimates

A statewide estimate of 72.1% restraint use was observed for drivers and right front passengers, weighted for road type and vehicle miles traveled at observation sites. This number was statistically higher than the weighted statewide estimate of 71.8% obtained in 2008.

The 2009 weighted statewide estimates for seatbelt use by road type were 64.8% for urban highways (compared to 64.3% in 2008), 67.0% for rural highways (compared to 67.4% in 2008), 73.8% for urban interstates (compared to 73.8% for 2008), and 83.2% for rural interstates (compared to 82.3% in 2008). The increases from 2008 to 2009 for rural interstate and urban highways were statistically significant. The decrease on rural highways was not statistically significant.

Seatbelt Use Unweighted Results

All Occupants

Results showed that for direct or unweighted observations, 68.2% of all observed motorists were wearing a seatbelt or child restraint. This unweighted percentage is lower than a rate of 70.5% for last year's survey. However, the weighted rate comparisons showing a slight increase in rates from the past year take precedence over the unweighted observations showing a slight decrease.

County

The seatbelt use rates for counties by descending population size were: Minnehaha - 79.7%; Pennington - 68.8%, Brown - 69.6%, Lawrence - 60.2%, Davison - 62.4%, Beadle - 62.7%, Hughes - 50.1%, Union - 97.3%, Charles Mix - 52.9%, Grant - 65.6%, Fall River- 73.9%, Tripp - 59.4%, and Kingsbury - 67.8%.

The counties from highest to lowest seatbelt use rates were: Union (97.3%), Minnehaha (79.7%), Fall River (73.9%), Brown (69.6%) Pennington (68.8%),

Kingsbury (67.8%), Beadle (62.7%), Davison (62.4%), Tripp (59.4%), Charles Mix (52.9%), and Hughes (50.1%).

Three counties' rates were within one to one one-half percentage points of last year's rates: Minnehaha (79.7 % vs. 80.3% in 2008), Pennington (68.8% vs. 70.0% in 2008), and Union ((97.3% vs. 96.6% in 2008). Three counties' rates were higher than last year's rates: Brown (69.6% vs. 58.5% in 2008), Charles Mix (52.9% vs. 48.0% in 2008), and Fall River (73.9% vs. 64.1% in 2008). Seven counties had lower rates than in the previous year: Lawrence (60.2% vs. 62.8% in 2008), Davison (62.4% vs. 65.4% in 2008), Beadle (62.7% vs. 76.8% in 2008), Hughes (50.1% vs. 57.6% in 2008), Grant (65.6% vs. 82.8% in 2008), Tripp (59.4% vs. 66.4% in 2008), and Kingsbury (67.8% vs. 76.5% in 2008).

Age Group

Of a sample of 92 children who appeared to be under age five, 81.5% were protected in either a child safety seat or a seatbelt. This rate is similar to last year's rate of 80.5%. Of 89 children judged to be age five to thirteen, 65.2% were wearing seatbelts. This rate is lower than last year's rate of 73.9%. Of 741 children judged to be age fourteen to seventeen, 61.9% were wearing seatbelts. This rate is lower than last year's rate of 67.8%. The rate for motorists who were judged to be age eighteen and older was 67.6%. This rate was lower than last year's rate of 70.5%.

Driver/Passenger, Vehicle Type, In-Out of State License

As found in all previous survey years, a greater percentage of right front seat passengers (70.6%) than drivers (67.2%) wore restraints. For vehicle type, occupants of vans and station wagons had the highest use rates (76.6%), followed by those in cars (71.4%) and SUVs (70.8%). Pickup truck occupants had the lowest usage rate of 55.2%. As also found in previous years, a higher percentage of occupants of out-of-state vehicles (80.0%) wore restraints than did occupants of vehicles with South Dakota license plates (64.7%).

Motorcycle Helmet Use Unweighted Results

Observations of helmet use by cyclists were collected for the first time in the 2009 survey. Motorcycles were observed during the 13 county seatbelt survey period (n = 530) and during a supplemental two-day survey period in the Sioux Falls area of Minnehaha County and the Rapid City area of Pennington County (n = 504). A total of 1,034 motorcycle drivers and passengers were observed--844 from Minnehaha, Pennington and Lawrence and 190 from the other counties. The unweighted statewide rate helmet use by all cyclists was 35.6%--33.7% for drivers and 42.5% for passengers.

Introduction

Accidents and Safety Device Use. Motor vehicle crashes are a major source of injury and death, especially among young adult populations (Ginsburg et. al., 2008). Yet, the potential for injury in a motor vehicle crash does not compare to the risk of injury or death in a motorcycle crash. In 2005, the fatality rate for motorcyclists was more than five to one when compared with other vehicle types (Peters, 2007). A 2007 National Highway Safety Administration (NHTSA) report found that motorcycle fatalities accounted for 13% of all motor vehicle deaths that year, and 14% of all occupant fatalities.

It is an undisputed fact that the use of restraint devices such as child seats, shoulder and lap belts, and the use of motorcycle helmets tends to lessen the severity of injuries and to increase the survival rates in all manner of motor vehicle collisions and accidents (Houston & Richardson, 2007; 2008). Wearing a seatbelt can increase the chance of surviving a potentially fatal crash by 45% to 73% (Blincoe et al., 2002). Non-helmeted motorcyclists are 40 times more likely to suffer a fatal head injury than helmeted motorcyclists (NHTSA, 2008). Studies of states that have recently implemented primary helmet laws showed large increases in helmet use and, in turn, decreases in motorcycle crash-related head injuries (Mertz & Weiss, 2008; NHTSA, 2008). However, knowledge of such risks does not appear to strongly influence the use of these simple safety devices.

Seatbelt use in the USA has been on the rise since NHTSA began collecting data in 1994, with passenger vehicle occupant fatalities steadily decreasing in a similar manner (NHTSA, 2008). In recent years, the nationwide seatbelt use is estimated to be in the 80% to 82% range (NOPUS, 2006; Pickrell & Ye, 2008). In contrast, nationwide helmet use showed a declining trend from around 71% in 2000 to 51% in 2006 (NHTSA, 2008); yet last year helmet use again rose to 63% (Pickrell & Ye, 2008). Nevertheless, the national figures for seatbelt and helmet use do not translate to regional or state use. Seatbelt and helmet use are highest in the West and lowest in the Northeast (Glassbrenner & Ye, 2007; Pickrell & Ye, 2008).

Safety Device Laws. Why such dramatic differences in seat belt and helmet use across the nation? It has been found that the greatest contributing factor as to whether or not one chooses to buckle or helmet up is the law in each state (NHTSA, 2008). Presently, there exist two major types of seatbelt laws—a primary and a secondary. Where a primary law allows officers to issue a citation solely for not wearing a seatbelt, the secondary law only allows a citation for not wearing a seatbelt as an auxiliary to a primary citation (e. g., speeding, failure to stop, etc.). In 2008, 26 states upheld primary seatbelt laws and 23 states upheld secondary seat belt laws, while only one state had no law what so ever (NHTSA, 2008).

How does South Dakota stand regarding safety device laws? Since 1984, the State has required that all child motor vehicle passengers under the age of five or weighing less than 40 pounds be in a safety seat. As of January, 1995, a secondary seatbelt law

has been in effect for individuals driving and riding in the front seat of any vehicle. In 2001, the State mandated primary enforcement of seatbelt use for all passengers under the age of 18 years. In 2008, the mandated penalty for a seatbelt violation increased from \$20 to \$25.

The laws for helmet use are quite different from seatbelt laws in that they are dependent on age. Age-related helmet laws stipulate that if you are under a certain age (17 – 21 years of age depending on the state) you must wear a helmet; those over this age have the choice of whether or not to wear a helmet. A universal helmet law requires all motorcyclists to wear helmets. As of 2008, three states have no helmet law what so ever, over half—27 of the states—have an age-related law, and only 20 states have universal helmet laws (NHTSA, 2008). However, a number of states have actually repealed the stricter universal helmet laws in exchange for the more lax age restricted helmet laws. In South Dakota, the current age-related helmet law has not been changed since January, 1984. It mandates helmet use for riders age 17 and under.

Other Compliance Factors. Beyond legal pressures to buckle up, for years programs of varying complexity and depth, such as the NHTSA's "Click it or ticket" advertisement campaign (2009) and the Socorro, Texas bi-lingual classroom based awareness program (2002), have worked to increase seatbelt awareness and use. Yet, a recent study by Ginsburg and colleagues (2008) concluded that many teenaged individuals are not receiving the message. They found that only 70% of teens in their study reported wearing a seat belt--substantially below the national average.

The interrelatedness of drivers and passengers has been found to affect seatbelt use. Gkritza and Mannering, 2008, found that those driving alone were less likely to be wearing seatbelts than those driving with others in the vehicle. These authors further explored seatbelt use via factor analysis and found that for single occupant vehicles, male drivers of trucks or passenger vans were significantly less likely to be using their safety belts. Those driving sport-utility vehicles or other passenger cars were more likely to be using their safety belts. A new factor in the literature found to affect seatbelt use is obesity. A recent study found that obese persons are less likely than lower BMI persons to wear safety restraints during daily driving (Schlundt et al., 2007).

Compared to seatbelt use, there is considerably less research on factors that influence helmet use. One reason is that there are far fewer motorcycles riders to study than there are motorists (Gkritza, 2009). Factors found to influence helmet use include demographics such as population density, weather conditions, roadway conditions, rider characteristics such as age and risk perception, and crash characteristics such as speeding and alcohol use (Gkritza, 2009; Houston, 2007). Gkritza examined motorcycle helmet use in Iowa--where helmet use is not mandated--and found that only 36% of motorcyclists and 39% of their passengers wore helmets on average. Factor analysis for helmet use found that people were less likely to wear a helmet on warm/sunny days, on city roads, and if they were alone.

The Present Study. The data collected for this report are focused on the use of seat belts, child restraints, and motorcycle helmets on South Dakota roadways. Since 1998, the SD Office of Highway Safety has commissioned an annual survey of motorist restraint use on state highways using procedures that comply with federal standards. These surveys have found that restraint use has risen from 63% in 2001 to an all time high of 73% in 2007 (Chen & Ye, 2009).

Motorcycle helmet use in the state, however, has not been closely studied. In 1980, Struckman-Johnson and Ellingstad found that motorcycle helmet rates in 1976 before the repeal of a universal helmet law were nearly 100% for drivers and passengers. In post-repeal 1977, helmet use dropped to 57% for drivers and 61% for passengers. By 1978, use had further fallen to 48% for drivers and 56% for passengers. The current report will be the first to include data on helmet use for an update on these 30-year-old statistics.

Methods

The methods used in this study were designed according to federal guidelines established by NHTSA and were originally implemented in the 1998 South Dakota Statewide Seatbelt Survey. The methods and procedures described below are in compliance with the “Uniform Criteria for State Observational Surveys of Seat Belt Use”, published in the Federal Register on September 1, 1998 (63 F.R. 463389). The design was modified in the 2000 survey in an effort to increase the observations for children under the age of five years. In 2007, a separate vehicle type code was added for pickup trucks. In 2009, the design was changed again to allow for collection of motorcycle helmet use data.

Survey Design: Stage 1

This study used the geographic sampling techniques and road segment sites established in the 1998 survey. The first step was to select geographic areas for sampling of traffic. South Dakota is a state with less than 800,000 citizens residing in 66 counties. The population is not evenly distributed throughout the state, as 50% of the citizens live in eight counties with urban centers. Many of the remaining 58 counties have low populations residing in largely rural areas.

Because it is difficult to sample traffic in all areas of a state with a low population, a “multi-stage cluster approach” was utilized. In this plan recommended by NHTSA guidelines, sampling can be restricted to the counties that account for 85% of the state’s population. Therefore, the sampling pool was comprised of the 33 largest counties in South Dakota that account for 85% of South Dakota’s population. Table 1 shows the eligible counties in ascending order according to population size.

**Table 1: Largest South Dakota Counties Accounting
for 85% of the State Population**

County	Population	% of State	Cumulative %
1-33			14.44%
34 Dewey	5668	0.77%	15.21%
35 McCook	5686	0.77%	15.98%
36 Kingsbury	5830	0.79%	16.77%
37 Day	6421	0.87%	17.64%
38 Moody	6538	0.89%	18.53%
39 Tripp	6883	0.93%	19.46%
40 Custer	6966	0.94%	20.40%
41 Fall River	7123	0.97%	21.37%
42 Bon Homme	7677	1.04%	22.41%
43 Spink	7700	1.04%	23.45%
44 Grant	8048	1.09%	24.54%
45 Hutchinson	8102	1.10%	25.64%
46 Turner	8633	1.17%	26.81%
47 Butte	8926	1.21%	28.02%
48 Todd	9296	1.26%	29.28%
49 Charles Mix	9493	1.29%	30.57%
50 Roberts	9973	1.35%	31.92%
51 Lake	10,647	1.44%	33.36%
52 Union	11,959	1.62%	34.98%
53 Shannon	12,010	1.63%	36.61%
54 Clay	15,370	2.08%	38.69%
55 Hughes	15,404	2.09%	40.78%
56 Beadle	17,976	2.44%	43.22%
57 Davison	18,807	2.55%	45.77%
58 Lincoln	20,152	2.73%	48.50%
59 Yankton	21,013	2.85%	51.35%
60 Meade	21,999	2.98%	54.33%
61 Lawrence	22,131	3.00%	57.33%
62 Codington	25,452	3.45%	60.78%
63 Brookings	26,186	3.55%	64.33%
64 Brown	35,701	4.84%	69.17%
65 Pennington	87,190	11.81%	80.98%
66 Minnehaha	140,518	19.04%	100.00%
TOTAL	737,973		

Table 2: Selected South Dakota Counties and Their Populations

	County	Population
1.	Minnehaha	140,518
2.	Pennington	87,190
3.	Brown	35,701
4.	Lawrence	22,131
5.	Davison	18,807
6.	Beadle	17,976
7.	Hughes	15,404
8.	Union	11,959
9.	Charles Mix	9493
10.	Grant	8048
11.	Fall River	7123
12.	Tripp	6883
13.	Kingsbury	5830

According to NHTSA guidelines, a sample of 13 counties could be drawn for a state with at least 85% of the population residing in 30 – 39 counties. The two largest counties in the state were selected and the remaining 11 counties were randomly drawn. Although Hutchinson County was initially drawn for the sample, it was learned that the county would be undergoing a local seatbelt survey in the fall of 1998. Therefore, Tripp County was substituted. Table 2 lists the counties that were selected and their corresponding populations.

Survey Design: Stage 2

The second stage of the study was to select the sample of road segments to be surveyed within the thirteen counties. According to NHTSA guidelines, road segments must be drawn from roads that have an adequate level of traffic based upon Vehicle Miles Traveled (VMT) estimates. Initially, it was estimated that there were an average number of 50 road segments available for sampling in the South Dakota counties. According to the NHTSA guidelines, 19 road segments can be sampled from a base of 50 road segments per county.

However, assessment of 1998 VMT estimates for South Dakota roadways revealed that only an average number of 27 road segments were available for sampling in the 13 counties. (Relative to other states, South Dakota has a limited number of roadways for which VMT estimates are recorded.) Therefore, permission was received from the NHTSA regional survey design advisor to sample 17 or fewer road segments per county.

In order to select the road segments, maps of roadways and VMT estimates per roadway segments for the 13 counties were obtained from the South Dakota Department of Transportation, Division of Planning and Engineering. Roadways were divided into four classifications:

Urban Interstate

Urban Highway -- principal and minor highways within designated urban areas (5,000 + population)

Rural Interstate

Rural Highway -- principal and minor highways outside of urban areas.

Following recommendations from the NHTSA regional survey design advisor, road segments for urban interstate and urban highways were measured in one mile units, whereas road segments for rural interstate and rural highways were measured in ten mile units. VMT estimates were calculated for each road segment chosen. Road segments with unacceptably low VMT estimates were excluded. Once all of the roadways in a county were divided into eligible segments, a random numbers program was used to select 17 segments for sampling.

The random selection procedure was restricted by the roadway classification of a segment so that the number of segments chosen would be proportionate to the total VMT traveled on a roadway type for that county. For example, in Minnehaha County, the proportions of total vehicle miles traveled by roadway type were:

23% for Urban Interstate
43% for Urban Highways
25% for Rural Interstate
10% for Rural Highways.

Therefore, the drawing of selected road segments was restricted to:

4 Urban Interstate sites (about 23% of 17 sites)
7 Urban Highway sites (about 43% of 17 sites)
4 Rural Interstate sites (about 25% of 17 sites)
2 Rural Highway sites (about 10% of 17 sites).

The procedure described above was applied individually to the 13 counties for final selection of the 17 road segments. Five counties (Brown, Davison, Grant, Kingsbury, and Tripp) had only 13 to 16 road segments chosen because of a limited number of roadways with VMT data available.

The last step in the road segment selection process was to designate a seatbelt observation site within each of the 205 selected road segments. Whenever possible, the observation site was placed at an intersection in which vehicles slowed or stopped for a traffic signal or sign. This allowed for accurate and safe viewing of seatbelt and helmet use by the Observers. See Appendix A for a list of the observation sites by mile marker and probability of selection in counties by the four roadway types.

Sampling Time Periods

Six 90-minute blocks of daylight time were scheduled for seatbelt observations. The actual observation time per period was 40 minutes. Including travel time, six sites could be observed in a single day. A county could therefore be surveyed in a four-day period. To minimize travel time and distance required to conduct the survey, some sample sites were grouped into geographic clusters. A day of the week to begin data collection was assigned to a cluster. Within a cluster, each road segment was randomly assigned to the available time slots. The time blocks were:

- 1) 7:30 AM - 9:00 AM
- 2) 9:00 AM - 10:30 AM
- 3) 10:30 AM - 12 noon
- 4) 12 noon - 1:30PM
- 5) 1:30PM - 3:00 PM
- 6) 3:00PM - 4:30PM

Sample time periods were scheduled for two week days and for Saturday and Sunday.

Sample Size

Based on previous observational surveys in South Dakota, it was estimated that approximately 10,000 vehicle observations would be collected from the 205 sites. This sample size allows one to be 95% confident that the numbers reported would be within 1% of the actual values -- an acceptable margin of error according to NHTSA guidelines.

Data Collection

The original 1998 data collection form was designed for recording seatbelt use (yes or no) by front seat drivers and right-side passengers of each vehicle observed in the survey. For the 2000 survey, the data collection form was modified to measure seatbelt and child restraint use of all child passengers between 0-4 years of age, front or back seat. This change was implemented in all subsequent surveys.

The form allowed collection of other information of interest to the SD Office of Highway Safety, including estimated age of drivers and passengers, in- or out-of-state vehicle license plate, and type of vehicle such as car, van or SUV. In 2007, the form was modified to provide a separate category for pickup trucks. Demographic data were also collected for each vehicle observation period including county, site number, time of day, date, observer initials, and roadway type.

In 2009, the form was modified to include motorcycles as a vehicle type. Observers were instructed to record all information about motorcycle drivers and passengers in the same manner as for four-wheeled vehicles except that helmet use – yes or no—was recorded in the same column used for seatbelt use. A copy of the 2009 modified form is on the last page of the Observer Manual in Appendix B.

Observer Selection and Training

One or two Observers are typically assigned to a county. In the 1998 through 2004 surveys, Observers were primarily members of a retired senior citizens group with a background in driver education. Since the 2005 survey, Emergency Medical Technicians (EMT's) were contracted by the SD Office of Highway Safety to be Observers. A majority of the 2008 EMT Observers had participated in the 2005, 2006, and 2007 surveys and were expert observers. Adding further to this expertise, all Observers in the 2009 survey had participated in the 2008 survey. Some Observers occasionally had another person (usually a family member) assist them in the data collection process.

Observers received: 1) a descriptive list and maps of the site locations in their respective counties; 2) a four-day schedule during the first week of June for completing one observation period at each site in their county; 3) an instruction manual explaining how to conduct roadside observations, including the new procedures for observing motorcycles; and 4) coding sheets for recording data. Observers were instructed to read the manual and engage in a practice period with local traffic. Investigator Cindy Struckman-Johnson arranged a training call to all individual Observers in the week before the survey period to discuss procedures and the changes for motorcycle observations.

Site Selection

Observers were instructed to follow their observation schedules as closely as possible. In the event that Observers could not complete a scheduled site due to weather or other problems, they were instructed to use alternative times presented on their observation schedule. Upon arrival at a site, Observers were asked to find a safe viewing place. They were to station themselves so that they could view traffic traveling in a pre-designated direction on the pre-designated roadway.

Sampling Procedures

Observers were instructed to observe *every* four-wheeled vehicle if the traffic flow was regular or light, and *every other* vehicle if the traffic flow was heavy. Because motorcycles were expected to appear infrequently, Observers were told to select *every* motorcycle that appeared in their stream of traffic during the survey period. They were instructed also to survey passing motorcycles that were not in their stream of traffic if helmet use of the riders could be clearly determined. This over-sampling was done to increase the number of motorcycles for more reliable data analyses.

Observers monitored traffic for 40 minutes of the 90-minute observation period, and used the remaining minutes to travel to the next observation point. The data collection procedures are explained in the "Observer Manual – 2009 South Dakota Seatbelt Survey" in Appendix B.

Supplemental Motorcycle Observation Hours

The weather during the official survey period in the first weeks of June in 2009 was unusually cold and rainy, which limited motorcycle riding. Several Observers confirmed that they saw few motorcyclists during their survey hours (only 20 in Minnehaha and 31 in Pennington.) A supplemental plan was made to increase the motorcycle sample size. In the last week of June, Observers in Minnehaha and Pennington counties--the two largest population centers in the state--were sent out to observe only motorcycles at five survey sites where motorcycle traffic could be expected. Observers were to observe for 40 minutes at each site on two different days with good weather.

Review of Data

Data were screened using methods similar to previous years. Two graduate students in the Human Factors program at USD reviewed over 11,000 lines of raw data for unreadable writing, obvious errors, and logical inconsistencies in the coding (e.g., two drivers in a vehicle with the same ID number; a driver with an infant age). When possible, the coding was corrected. If questions remained about the validity of the coding, the observation was discarded. Data were encoded into EXCEL spreadsheets and checked for accuracy by Investigator Dave Struckman-Johnson. Investigator Carryl Baldwin then used additional computer analyses to detect logical errors in coding before conducting final data analyses. Analyses of data for four-wheeled vehicles were conducted separately from motorcycle data.

Results

Seatbelt and Child Restraint Use

A total of 10,284 automobile drivers and passengers from the 13 selected counties were included in the analyses for this 2009 survey. Motorcycle observations were excluded from this data set. The automobile sample size varied by a small number of observations in some analyses due to missing data. Of the total motorists observed, 7,015 or 68.2% were wearing shoulder safety restraints or were placed in a child restraint, while 3,269 or 31.8% were not wearing safety restraints. This 2009 unweighted seatbelt use rate was slightly less than the unweighted rate of 70.5% observed in 2008, but slightly higher than the unweighted rates observed in the 2007 and 2006 surveys, which were 67.7% both years. Note that these percentages do not accurately reflect seatbelt use across South Dakota as the numbers have not been adjusted or "weighted" for road type and vehicle miles traveled (VMT) at the observation sites in the 13 counties.

Estimate of Statewide Seatbelt Use

NHTSA guidelines require that a statewide seatbelt use be estimated by adjusting seatbelt use rates observed at every individual county site for road type and VMT. Essentially, the adjusting process gives more weight to seatbelt use rates observed on

roads that are more heavily traveled. The statewide estimate of seatbelt use was obtained by finding the percentage of seatbelt use for each of the 205 sites, and then computing a weighted mean for each road type for each county. Then, a weighted average for each road type across counties was found where the weights were the VMT for that county on that road type and the sampling weight for the county based on the probability of its selection to be included in the survey. Finally, the estimates for the four road type averages were weighted by the VMT for each road type for the entire state.

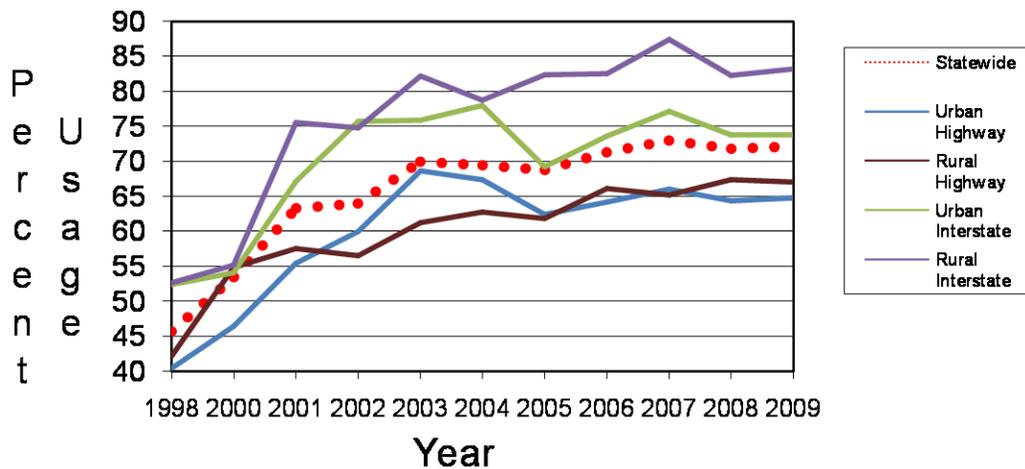
The resulting estimate for seatbelt use on all South Dakota roads was 72.05% with a standard error of 0.576. Thus, it can be said that there is a 95% probability that the true rate of seatbelt use for South Dakota roads ranges between 70.92% and 73.18%. The formulas and weights for calculating the statewide estimate and standard deviation are in Appendix C.

The 2009 statewide estimate was approximately 0.3 percentage points higher than the 2008 rate. This difference is statistically significant, $t_{(60)} = 2.07$, $p < .001$. Thus, the statewide estimate for seatbelt use in South Dakota in 2009 showed a slight increase, returning to an upward trend established by the 2006 and 2007 surveys. This outcome is shown in Table 3 and Figure 1.

Table 3: South Dakota Weighted Percent Restraint Use by Year and Road Type

Road Type	Year									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Statewide Average	53.4	63.3	64.0	69.9	69.4	68.8	71.3	73.0	71.8	72.1
Urban Highway	46.4	55.4	60.0	68.6	67.4	62.4	64.2	66.0	64.3	64.8
Rural Highway	54.8	57.5	56.5	61.2	62.7	61.8	66.1	65.2	67.4	67.0
Urban Interstate	54.1	75.7	75.7	75.9	78.0	69.6	73.6	77.1	73.8	73.8
Rural Interstate	55.2	74.8	74.8	82.2	78.7	82.4	82.5	87.4	82.3	83.2

Figure 1: South Dakota Weighted Restraint Use by Year and Roadtype



Estimate of Statewide Seatbelt Use by Road Type

The 2009 weighted statewide estimates for seatbelt use by road type were 64.75% for urban highways, 67.01% for rural highways, 73.82% for urban interstates, and 83.21% for rural interstates. Compared to 2008 rates (see Table 3), seatbelt use increased on urban highways by 0.5% (p < 0.05), decreased 0.4% on rural highways (not a statistically significant change), remained the same on urban interstates, and increased 0.9% on rural interstates (p < 0.01).

Seatbelt Use by County

The unweighted seatbelt use rates for the 13 South Dakota counties are in Table 4. A summary of seatbelt use rates for the 13 counties over ten survey periods is in Table 5 and Figures 2A and 2B. The data show an upward trend in nearly all counties from 1998 through 2003 and 2004. Since 2005, rates among most of the counties are showing moderate fluctuations

Comparing 2009 rates with 2008 survey results, three counties--Minnehaha, Pennington, and Union--had nearly the same rate (within 1 to 1 ½ percentage points). Three counties showed an increase from 2008: Brown by 11%, Charles Mix by nearly 5%, and Fall River by almost 10%. Seven counties showed slight to moderate decreases in rates from the prior year. Lawrence showed a decrease of 2%, Davison decreased by 3%, Beadle by nearly 6%, Hughes by 7%, Tripp by nearly 7%, and Kingsbury by 3%. The largest decrease (17%) was observed in Grant County.

The counties with the highest rates in 2009 were Union County with 97%, Minnehaha with 80%, Fall River with 74%, Brown with 70%, Pennington with 69% and Kingsbury with 68%. Counties with midlevel rates were Grant with 66%, Beadle with 63%, Davison with 62%, and Lawrence with 60%. In the lowest tier were Tripp with 59%, Charles Mix with 53%, and Hughes with 50%.

Table 4: South Dakota 2009 Unweighted Restraint Use by County

County	Restraint Used		Totals
	Yes	No	
Minnehaha	1163 79.7%	297 20.3%	1460
Pennington	924 68.8%	419 31.2%	1343
Brown	197 69.6%	86 30.4%	283
Lawrence	716 60.2%	474 39.8%	1190
Davison	439 62.4%	264 37.6%	703
Beadle	360 62.7%	214 37.3%	574
Hughes	427 50.1%	425 49.9%	852
Union	905 97.3%	25 2.7%	930
Charles Mix	356 52.9%	317 47.1%	673
Grant	719 65.6%	377 34.4%	1096
Fall River	283 73.9%	100 26.1%	383
Tripp	104 59.4%	71 40.6%	175
Kingsbury	422 67.8%	200 32.2%	622
% of Total	7015 68.2%	3269 31.8%	10284

Table 5: South Dakota Unweighted Percent Restraint Use by County by Year

County	Year									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Minnehaha	57	69	69	80	82	73	73	77	80	80
Pennington	43	51	63	67	70	70	77	72	70	69
Brown	60	64	56	65	62	58	61	62	59	70
Lawrence	73	62	54	73	68	69	65	65	63	60
Davison	52	67	76	60	70	69	76	76	65	62
Beadle	56	57	63	55	63	68	67	65	77	63
Hughes	36	54	62	76	77	55	54	53	58	50
Union	61	71	71	77	79	76	87	98	97	97
Charles Mix	24	28	41	48	50	48	59	36	48	53
Grant	46	53	66	45	53	55	78	77	83	66
Fall River	52	58	62	60	63	60	72	69	64	74
Tripp	30	39	47	37	33	50	66	56	66	59
Kingsbury	38	44	46	49	43	55	57	70	76	68

Figure 2A: South Dakota Weighted Restraint Use by Year for Higher Population Counties

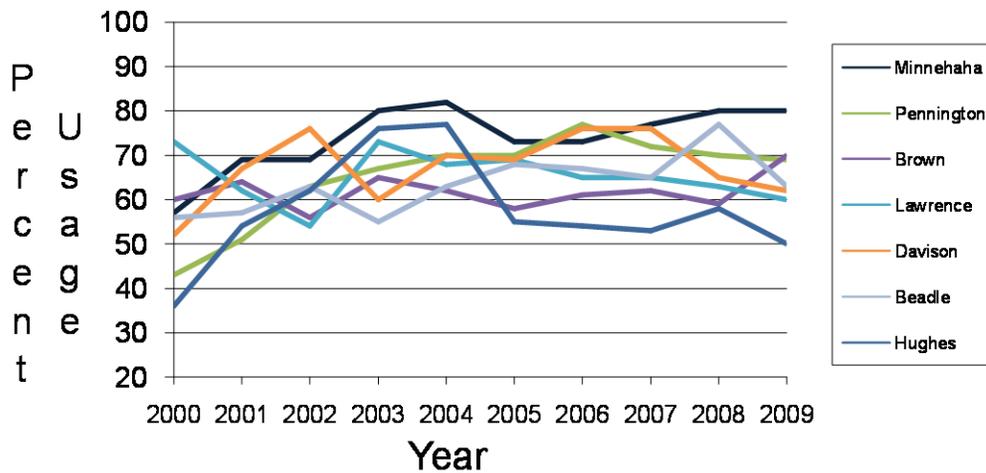
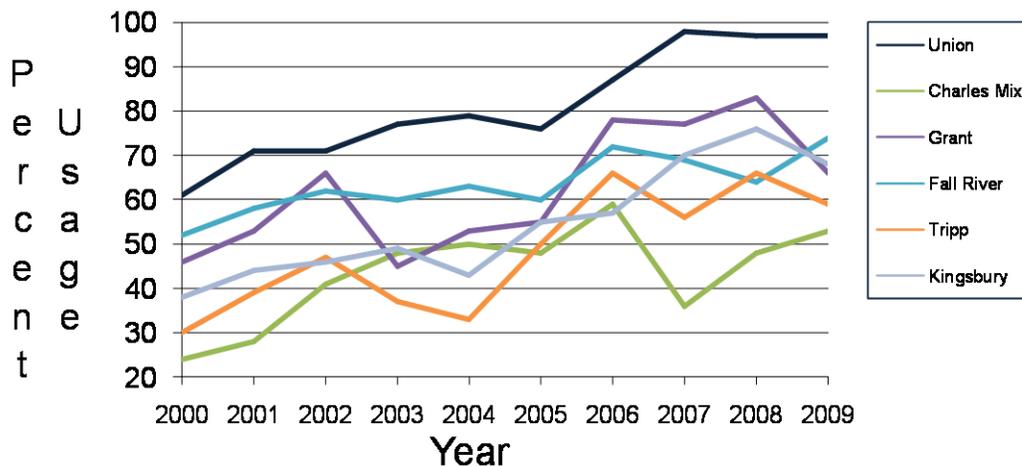


Figure 2B: South Dakota Weighted Restraint Use by Year for Lower Population Counties



Seatbelt Use by Age of Motorist

Observers estimated the age of drivers and passengers to the best of their ability. In approximately 16 or .2% instances, the Observer was unable to determine age. These instances were excluded from the age by restraint use analyses. As in all previous surveys since 1998, Observers always recorded data for the driver and a right front passenger, irrespective of age. In subsequent survey years (2000 – 2009), data were also recorded for additional passengers between 0 - 4 years of age in the front seat

Table 6: South Dakota 2009 Unweighted Restraint Use by Age

Age	Restraint Use			Total
	Belt	Child Restraint	None	
0 - 4 years	9 9.8%	66 71.7%	17 18.5%	92
5 -13 years	58 65.2%	0 .0%	31 34.8%	89
14 - 17 years	459 61.9%	0 .0%	282 38.1%	741
18 & over	6413 68.6%	0 .0%	2933 31.4%	9346
Total	6939 67.6%	66 .6%	3263 31.8%	10268

(e.g., on the right front passenger's lap or in the middle of the seat) and in the back seat. This new protocol was adopted in order to increase the sample size of child passengers aged 0 - 4 years for better estimates of child restraint use.

Child restraint use was defined as a passenger restrained by a child safety seat or carrier. If children who appeared to be under the age of five years were observed riding anywhere in the vehicle in a child safety seat, they were given a code of "yes—child restraint in use". If children under five were observed wearing a shoulder restraint but were not seated in a child safety seat, they received a code of "yes—seatbelt in use". Children under five years who were not in a carrier or a seatbelt were coded as "no – restraint not in use." Note however, that according to South Dakota law, all children under the age of five years should be restrained in an approved child safety restraint unless they weigh more than 40 pounds. Table 6 illustrates the total number of observations and restraint use by each age group including the use of child restraints.

The total number of children judged to be between 0 - 4 years of age observed in the 2009 survey was 92. Of these, 75 or 81.5% were observed in some type of safety restraint. In accordance with South Dakota law, 66 or 71.7% were placed in a child safety seat, while another 9 (9.8%) were wearing a shoulder restraint, but were not seated in a child safety seat. This total restraint use rate of 81.5% is up slightly from last year's rate of 80.5%.

The number of children in a child safety seat in 2009--71.7%--increased relative to the 2008 rate of 67.3%. As shown in Table 7 and Figure 3, the percentage of children under age five in any kind of safety restraint has steadily risen every year since the 2000 survey, with the exception of a spike in usage observed in 2006.

In the 2009 survey, a total of 89 children judged to be age 5 - 13 were observed. Of these, 58 or 65.2% were wearing a seatbelt. No children in this age group were observed in a child safety seat, and the remaining 31 (34.8%) were unrestrained. The restraint usage rate for this age group is down considerably considering the rate of 73.9% observed in the 2008 survey.

Table 7 and Figure 3 show the restraint use for children 5 - 13 each year since the 2000 survey. Note that restraint use observed in 2009 is within the range of fluctuation relative to prior years though it is considerably below the rate observed in the 2008 survey.

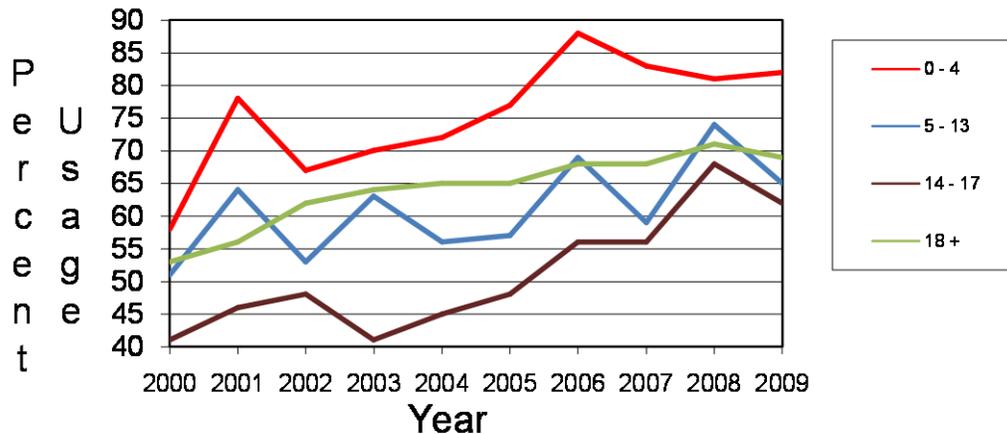
A total of 741 motorists were judged to be in the teenage category of 14 - 17 years. Of these teens, 459 or 61.9% were wearing a seatbelt while the remaining 282 or 38.1% were not. This compares to a rate of 67.8% observed for this teenage group in the 2008 survey. Though the 2009 rate represents a decline from the 2008 rate, it is still substantially higher than the rate of 55.5% observed in the 2007 survey. Table 7 and Figure 3 show the restraint usage rates for teens in South Dakota over the last several survey years.

The majority of observed motorists (a total of 9,346) were estimated to be in the age group of 18 years and older. Of these, 6,413 (68.6%) were wearing a restraint. The adult restraint usage rate in 2008 and 2007 was 70.5% and 68.5%, respectively. Table 7 and Figure 3 demonstrate that, in general, adult seatbelt use rates have steadily increased since 2000.

Table 7: South Dakota Unweighted Percent Restraint Use by Age by Year

Age	Year									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
0 – 4	58	78	67	70	72	77	88	83	81	82
5 – 13	51	64	53	63	56	57	69	59	74	65
14 – 17	41	46	48	41	45	48	56	56	68	62
18+	53	56	62	64	66	65	68	68	71	69

Figure 3: South Dakota Unweighted Restraint Use by Year and Age Group



Seatbelt Use for Drivers versus Passengers

In accordance with national guidelines, data were recorded for all drivers and right front seat passengers of any age. For the SD Office of Highway Safety purposes, data were also recorded for additional children under the age of five sitting in the middle front seat, on laps of right front passengers, and in the back seat. Unweighted data for restraint use by occupant position in the vehicle are presented in Table 8.

Restraint use was somewhat higher for passengers than for drivers. Of the 7,568 drivers observed, 5085 or 67.2% were wearing a safety restraint. This rate is slightly lower than the rate of 69.1% observed in the 2008 survey. Of the 2,638 right front passengers observed, 1,862 or 70.6% were wearing shoulder restraints. This compares to a 2008 rate of 73.1% for right front passengers.

According to federal and state guidelines, children 0 - 4 years of age should be placed in a child safety restraint in the back seat, where possible. Recall from the previous section that a total of 92 children in this age group were observed. Of these 92 children, 70 or 77% were riding in the back seat. Of these 70 children riding the backseat, 64 or 91.4% were restrained in the mandated child safety seat. Two children (2.9%) were wearing a seatbelt only and four children (5.7%) were not wearing a restraint.

Data were recorded for eight additional child front seat passengers who were sitting in the middle of the front seat or on laps of right front passengers. As in previous years, restraint usage for these child passengers was extremely low. In this 2009 survey, only two (25%) of these eight children were seated in a child safety seat. The remaining six children (75%) in this front seat passenger condition were unrestrained. In the 2008 survey, only one of 11 children in this passenger position were wearing any type of safety restraint and none of the 2008 front seat children were in a child safety seat. Although the number of observations is low, these data indicate that young children riding as extra passengers in the front seat are a high risk population.

Table 8: SD Unweighted Restraint Use for Drivers vs. Passengers.

Occupant Type	Restraint Use			Total
	Seatbelt	Child Restraint	None	
Drivers	5085 67.2%	0 .0%	2483 32.8%	7568
Right-Front Passengers	1862 70.6%	0 .0%	776 29.4%	2638
Additional Child Front Passenger	0 .0%	2 25.0%	6 75%	8
Child Passenger Back Seat	2 2.9%	64 91.4%	4 5.7%	70
Total	6949 67.6%	66 .6%	3269 31.8%	10284

Seatbelt Use for Vehicle Type

Only non-commercial vehicles were observed. In 2006 surveys and all previous years, vehicles had been categorized into three classifications: 1) cars; 2) vans, mini-vans, pickups and station wagons; and 3) Sport Utility Vehicles (SUVs). Starting with the 2007 survey, pickup trucks were coded in a separate category. This change was to allow tracking patterns of seatbelt use by drivers and passengers in pickups, a popular vehicle in this rural state of South Dakota.

Table 9 presents a summary of data regarding restraint use by vehicle type. Combining seatbelt and child safety seats, restraint usage was highest (76.6%) for vans and minivans and station wagons. The next highest usage rate (71.4%) was observed for cars, followed closely by 70.8% for SUVs. As in previous years, the lowest usage rate of all categories was observed for pickup trucks -- 55.2% (similar to the 2008 rate of 54.3%)

Table 9: SD 2009 Unweighted Restraint Use by Vehicle Type

Vehicle Type	Restraint Use			Total
	Yes	Child Restraint	None	
Cars	2949 71.4%	31 .8%	1149 27.8%	4129
Vans	1040 76.6%	15 1.1%	302 22.3%	1357
SUVs	1414 70.8%	13 .7%	570 28.5%	1997
Pickups	1546 55.2%	7 .2%	1248 44.6%	2801
Total	6949 67.6%	66 .6%	3269 31.8%	10284

Seatbelt Use for In-State versus Out-of-State Vehicles

Observers recorded whether or not the vehicles included in the observation had in- or out-of-state license plates. Consistent with previous years, the majority of observations were of vehicles with in-state license plates (81.0% or 8,259 out of 10,200 vehicles whose plate status could be identified). As illustrated in Table 10, vehicles with out-of-state license plates had higher rates of restraint use (80.7%) for seatbelts and child safety restraints combined than did motorists traveling in vehicles with in-state license plates (65.3%). The rates in 2008 were 79.3% for out-of-state and 68.9% for in-state.

Table 10: South Dakota 2009 Unweighted Restraint Use by In- and Out-of-State License Plates

License Plates	Restraint Use			Total
	Yes	Child Restraint	None	
In-State	5347 64.7%	52 .6%	2860 34.6%	8259
Out-of-State	1553 80.0%	13 .7%	375 19.3%	1941
Total	6900 67.6%	65 .6%	3235 31.7%	10200

Motorcycle Helmet Use

Motorcycle Helmet Use Unweighted Estimate for Drivers and Passengers

For the first time in this 2009 survey, observations of helmet usage by motorcycle drivers and passengers were recorded. A total of 530 motorcyclists were observed during the regular survey period in the first weeks of June. Due to cold, rainy weather that limited motorcycle traffic during these days, supplemental motorcycle-only observation hours were conducted in Minnehaha and Pennington counties. These counties were selected because they have the largest populations in South Dakota.

The Observers for these two counties each selected five survey sites with probable motorcycle traffic and observed each for one 40-minute period during two good weather days in the last week of June. In Minnehaha, the Observer chose four urban highway and one urban interstate site, all within the city of Sioux Falls. Observations at these sites yielded 247 motorcyclist observations. The Observer in Pennington observed 257 riders at two rural highway sites and three urban highways in the Rapid City area. A total number of 504 riders were observed in the supplemental survey.

The investigators made a decision to combine the observations of the regular and the supplemental motorcycle surveys because similar helmet use rates were obtained from the two survey periods. For example, the helmet use rate obtained in Lawrence County during the regular survey period was 39.8% for 289 motorcyclists. The rate obtained for neighboring Pennington County in the supplemental survey period was 38.9% for 257 motorcyclists. The total number of observations for the combined regular and supplemental survey periods was 1,034.

Of the 1,034 motorcyclists observed, 368 or 35.6% were wearing helmets. This percentage stands as an unweighted statewide estimate of motorcycle helmet use for 2009. As illustrated in Table 11, helmet use was higher among

passengers than drivers. Of the 219 passengers observed, 93 or 42.5% were wearing helmets. For the 815 drivers observed, helmets were worn by only 275 or 33.7%.

Table 11: South Dakota 2009 Unweighted Statewide Helmet Use

Motorcycle Riders	Helmet Use		Total
	Yes	No	
Driver	275 33.7%	540 66.3%	815
Passenger	93 42.5%	126 57.5%	219
Total	368 35.6%	666 64.4%	1034

Motorcycle Helmet Use Unweighted Estimate by County

Helmet usage by county is illustrated in Table 12. The greatest number of motorcyclists was observed in Pennington (n = 288) and Minnehaha (n = 267) counties where the supplemental survey took place. However, Lawrence County, a prime motorcycle riding region in the Black Hills, had 289 motorcyclists observed in the regular survey. Most of the other counties observed in the regular survey had very small samples of motorcycles, due in part to low population and bad weather conditions. Helmet use rates based upon 20 or fewer observations are most likely not reliable.

With this caution in mind, the highest helmet usage rate was observed in Davison County where 9 of the 10 (90%) motorcyclists were wearing helmets. Fall River also had a high helmet usage rate of 83.3% or 5 of 6. Three counties had intermediate rates of helmet usage: Kingsbury with 9 of 15 or 60%, Grant with 7 of 11 or 63.6%, and Charles Mix with 5 of 8 or 62.5%. Despite its high rate of seatbelt usage, only 5% or 1 of 20 motorcyclists in Union county was observed wearing a helmet. This was the lowest rate observed of all 13 counties. Beadle county had a helmet usage rate of 44.4% or 12 of 27, which was identical to the rate observed in Tripp where 8 of 18 (44.4%) wore helmets. Hughes and Brown counties had helmet usage rates of 29.5% (13 of 44) and 29% (9 of 31), respectively.

In Minnehaha, Pennington, and Lawrence counties significantly more motorcyclists were observed, making these unweighted estimates more reliable than the lower counts observed in the other counties. Of these relatively large motorcycle rider county samples, Lawrence and Pennington counties had the highest rates. In Lawrence, 115 of 289 or 39.8% of riders were wearing helmets. In Pennington County, 112 of 288

(38.9%) motorcyclists were wearing helmets. This compares to only 63 of 267 or 23.6% in Minnehaha County.

Table 12: South Dakota 2009 Helmet Use by County

County	Helmet Usage		Total
	Yes	No	
Minnehaha	63 23.6%	204 76.4%	267
Pennington	112 38.9%	176 61.1%	288
Brown	9 29.0%	22 71.0%	31
Lawrence	115 39.8%	174 60.2%	289
Davison	9 90.0%	1 10.0%	10
Beadle	12 44.4%	15 55.6%	27
Hughes	13 29.5%	31 70.5%	44
Union	1 5.0%	19 95.0%	20
Charles Mix	5 62.5%	3 37.5%	8
Grant	7 63.6%	4 36.4%	11
Fall River	5 83.3%	1 16.7%	6
Tripp	8 44.4%	10 55.6%	18
Kingsbury	9 60.0%	6 40.0%	15
Total	368 35.6%	666 64.4%	1034

Motorcycle Helmet Use Unweighted Estimate by Age of Rider

The overwhelming majority of motorcyclists observed were adults and all appeared to be at least five years of age. Of the 1,028 for whom age could be estimated, 1,011 (98.3%) were estimated to be 18 years of age or older. Of the remaining, 11 or 1.1% were teens aged 14 - 17 and 6 or .6% were aged 5 - 13 years. As illustrated in Table 12, 100% or 6 of 6 children aged 5 - 13 observed riding on motorcycles were wearing helmets. Helmet usage was also high among teens aged 14 - 17 with 10 of 11 or 90.9%

wearing helmets. Helmet usage among adults was considerably lower with only 348 of 1,011 or 34.4% wearing helmets.

Table 13: South Dakota 2009 Helmet Use by Age

Age	Helmet Usage		Total
	Yes	No	
5-13 years	6 100.0%	0 .0%	6
14-17 years	10 90.9%	1 9.1%	11
18+ years	348 34.4%	663 65.6%	1011
Total	364 35.4%	664 64.6%	1028

Motorcycle Helmet Use Unweighted Estimate by Road Type

Road type comparisons for motorcycle helmet use (Table 14) were problematic

Table 14: SD 2009 Helmet Use by Road Type

Road Type	Helmet Usage		Total
	Yes	No	
Urban Highway	128 28.6%	320 71.4%	448
Rural Highway	211 41.7%	295 58.3%	506
Urban Interstate	14 38.9%	22 61.9%	36
Rural Interstate	15 34.1%	29 65.9%	44
Total	368 35.6%	666 64.4%	1034

because there were low numbers of observations on interstate roads. This occurred because only one of eight sites for the supplemental survey was an interstate road. However, the comparisons for urban and rural highway are legitimate. They show that helmet use on rural highways (41.7%) was over 10% higher than on urban highways (28.6%).

Motorcycle Helmet Use Unweighted Estimate by License State

Most of the motorcyclists observed had South Dakota license plates--791 or 76.5%. Similar to the finding for seatbelt data, a lower percentage of in-state riders wore helmets (32.9%) than did riders with out-of-state license plates (46.4%).

Table 15: South Dakota 2009 Helmet Use by License State

License State	Helmet Use		Total
	Yes	No	
In State	260 32.9%	531 67.1%	791
Out of State	97 46.4%	112 53.6%	209
Unknown State	11 32.4	23 67.6	34
Total	368 35.6%	666 64.4%	1034

Discussion

Seatbelt Use

Results of the current survey established that the weighted statewide estimate of restraint use for South Dakota in year 2009 was 72.1%. This estimated rate was higher than the rate of 71.8% observed in the 2008 survey. The statistically significant increase in the 2009 statewide estimate was due in part to a small but statistically significant increase of seatbelt use on rural interstates (83.2% vs. the 2008 rate of 82.3%) and a very small but statistically significant increase on urban highways (64.8% vs. the 2008 rate of 64.3%). However, the 2009 estimate was still lower than the rate of 73% observed in 2007--an apparently peak year for seatbelt use in South Dakota.

The slight increase in the statewide rate in 2009 indicates that overall seatbelt use on South Dakota roadways is possibly on the upswing but definitely holding at a high level. The 2009 rate indicates that the move downward observed in 2008 is not a trend for declining seatbelt use. Another positive finding is that the historic high level of seatbelt use on rural highways observed in 2008 (67.4%), is holding this year at 67.0% - within the range of normal statistical fluctuation and not a statistically significant change.

Looking at unweighted rates, seatbelt use in Minnehaha (80%) and Pennington (69%) counties--the two largest population centers in South Dakota-- and Union County (97%) are holding at high levels. These three counties had rates very close (within 1 to 1 ½ percentage points) to their 2008 rate. Three counties showed increases in seatbelt use – Brown and Fall River with ten percent increases and Charles Mix with a five percent increase. In fact, historic high levels of seatbelt use were obtained by Brown County (70%) and Fall River (74%). However, the remaining seven counties showed declines in seatbelt use. These declines could reflect typical fluctuations in seatbelt rates based upon lower sample sizes in low population counties. Or, the declines could indicate that seatbelt use in the more rural counties of South Dakota is not keeping pace with the gains in the urban areas. Future surveys will shed light on this finding.

Positive news from the 2009 survey was that use restraint use (including both car seats and seatbelts) for the 92 observed children judged to be under age five remained at a high level--82%. Restraint use for children under age five has been in the 80% level now for the past four years. In addition, 72% of young children were in a child restraint device, continuing an upward trend from 67% in 2008 and 61% in 2007.

Another positive finding was that 70 or 77% of the 92 children under age five were placed in the backseat where greater protection is offered. Of those in the backseat, 91% were in a child safety seat and 3% had on a seatbelt—resulting in a total protection rate of 94%. This compares closely to the 93% rear-seat child protection rate observed in 2008. On the down side, the study confirmed again that there is a small, vulnerable population of children under five who are placed on laps or in the middle front seat without restraint protection (six or 75% of eight children observed).

The 2009 survey revealed that seatbelt use by children judged to be age 5 - 13 was down to 65% from a historic high of 74% in 2008. The rate for teens judged to be age 14 - 17 also declined to 62% from another historic high of 68% in 2008. However, these rates are still substantially higher than some rates in the 40% and 50% range observed for older children in the 2000--2005 surveys. Despite these improvements over time, the 2009 survey confirmed again that a higher percentage of adult-age motorists were wearing seatbelts (69%) than the mid-age children and teens riding with them. The SD Office of Highway Safety is currently working to educate the teen population with a program called “Alive at 25” aimed at good decision-making for drivers age 14 – 24 (Woster, 2008).

Confirming the findings from surveys in 2007 and 2008, seatbelt use of riders in pickup trucks (55%) was substantially lower than for all other kinds of vehicles (71% – 77%). This low rate continues to offer a challenge for public safety advocates in a rural farm and ranching state like South Dakota where pickup trucks remain popular. Over one fourth (2,801 or 27%) of all motorists observed in the 2009 survey were in pickups.

As found in all prior surveys, the 2009 survey revealed that seatbelt use rates were higher for right-front passengers (71%) than for drivers (67%). Confirming another finding from all previous surveys, seatbelt use was higher for out-of-state motorists

(80%) than for motorists with South Dakota plates (65%). This could be because out-of-state travelers tend to be on interstate roads, or that they are affected by seatbelt laws in their home states, or a combination thereof.

Motorcycle Helmet Use

The 2009 survey was historic in that observations of helmet use by motorcyclists were included for the first time. To our knowledge, helmet use has not been systematically measured in South Dakota since 1978--over thirty years ago. The data collection for helmet use involved two procedures. First, motorcycles were added as a vehicle type to the regular survey and were observed with the same procedures as were four-wheeled vehicles. When rainy early June weather limited motorcycle traffic, a supplemental plan was devised. The Observers in the two most populated counties in the state--Minnehaha and Pennington--did five additional survey hours on good weather days at sites expected to have motorcycle traffic. Each survey procedure yielded over 500 motorcyclist observations, giving a total sample of 1,034.

This sample was not sufficiently large to find a weighted statewide estimate for helmet use. Too many counties had too few motorcycle observations to generate reliable weights for each of the 205 observation sites. For example, sample sizes ranged from 6 to 44 in ten of the counties. However, an unweighted statewide estimate was possible because sample sizes of over 200 cycles were obtained in the largest population counties of Minnehaha and Pennington. In addition, Lawrence County, located in the prime motorcycle touring area of the Black Hills, yielded over 200 cycle observations.

The unweighted statewide estimate for motorcycle helmet use in the 2009 survey was 34% for drivers and 42% for passengers. Although this rate reflects data from all 13 counties, the rate is most representative of cycle traffic in "East River" Minnehaha county and "West River" counties of Pennington and Lawrence. The rate in Minnehaha County (24%) was substantially lower than rates in Pennington (39%) and Lawrence (40%) counties. The difference is partly but not entirely accounted for by road type differences in helmet use: 35% for urban highway and 40% for rural highway. Obviously, variables related to touring the winding highways of the Black Hills promote helmet use more so than do variables in the Sioux Falls area.

South Dakota's 2009 helmet use rate of 36% for drivers and passengers is lower than a recent nation-wide rate of 63% cited by Pickrell and Ye, 2008. The 34% South Dakota driver helmet use rate is dramatically lower than levels observed in the state several decades ago. In 1976, when a universal helmet law was in effect, nearly 100% of cycle drivers wore helmets. After repeal of the law, driver rates dropped to 57% in 1977 and further to 48% in 1978 (Struckman-Johnson & Ellingstad, 1980). However, the current South Dakota helmet use rates of 34% for drivers and 42% for passengers are very similar to those found in a recent survey in Iowa--36% for drivers and 39% for passengers (Gkritza, 2009).

One final but very positive finding from the 2009 helmet use survey was that 100% of the six child passengers appearing to be between ages 5 - 13 wore helmets, and 91% of 11 teen riders wore helmets. Although few children were observed on motorcycles, nearly all young riders had head protection.

Retrospective on Survey Influences

Each year that the South Dakota seatbelt (and now motorcycle helmet use) survey takes place, external factors are at work on the survey results. Despite all attempts to use the same survey procedures every year, there are variations that may affect the outcome. One factor that did not vary this year was Observer expertise. All 2009 Observers had participated in the 2008 survey for their counties. In addition, most Observers had participated in the survey for the past four years. Having expert Observers contributed to the reliability and validity of the 2009 survey.

The biggest change in the survey this year was adding motorcycle observations to the survey. Observers generally reported that the addition did not overcomplicate the survey. If the motorcycle survey is repeated, a method should be found to increase sample sizes in the less populated counties. This could be done by either adding survey hours to the official survey and/or by expanding a supplementary motorcycle-only survey.

This year there was unexpectedly low traffic in Brown County and higher traffic in Grant County. Observers speculated that road construction and local centennial celebrations affected traffic patterns. Cold and rainy weather in the first weeks of June most likely affected automobile traffic and certainly limited motorcycle traffic. Because of the weather, a supplemental survey period for motorcycles traffic was added. Gas prices in 2009 were lower than in 2008, a factor that most likely increased automobile traffic. It is possible that the 2009 economic recession has affected traffic and seatbelt and helmet use in unknown ways. Safety programs and policing may be less affordable in certain areas of the state. However, having a good survey design and thousands of automobile observations and hundreds of motorcycle observations helps control for the effects of these unexpected and uncontrollable events.

One important factor under human control is legislation for seatbelt and helmet use. A change this year was an increase in the fine for a secondary seatbelt violation from \$20 to \$25. It is questionable that this small change affected state seatbelt use in the 2009 survey. Despite strong educational and policing efforts by the SD Office of Highway Safety, and despite lower fatality rates on state highways, the State is under pressure to put in place stronger traffic safety laws (Woster, 2008). Private groups, such as Advocates for Highway and Auto Safety are making attempts to change the current laws in favor of stricter regulation all around. As a state that lacks universal helmet laws, vehicular child endangerment laws and several others, South Dakota may face lobbying and political pressure until changes are made.

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Appendix A

List of Observation Sites by Roadway Type

Urban Interstate

County	Road	Mile	Site #	Probability of Selection for County
Minnehaha	29N	77	2	.31
Minnehaha	29N	98	3	.31
Minnehaha	229	3	4	.31
Minnehaha	229	5	5	.31
Minnehaha	229	7	6	.31
Pennington	90E	56	11	.18
Pennington	90E	60	12	.18
Lawrence	90	13	2	1.00
Davison	90	330	8	1.00
Davison	90	333	10	1.00
Union	29S	.98	1	1.00

Rural Interstate

Minnehaha	90	379	13	.19
Minnehaha	90	390	14	.19
Minnehaha	90	412	15	.19
Pennington	90E	66	13	.31
Pennington	90E	90	14	.31
Pennington	90E	98	15	.31
Pennington	90W	55	16	.31
Pennington	90W	62	17	.31
Lawrence	90	12	1	1.00
Lawrence	90E	15	3	1.00
Lawrence	90E	27	4	1.00
Lawrence	90W	12	5	1.00
Lawrence	90W	15	6	1.00
Lawrence	90W	24	7	1.00
Davison	90	319	6	1.00
Davison	90	325	7	1.00
Davison	90	332	9	1.00
Union	29N	1	2	1.00
Union	29N	18	3	1.00
Union	29N	27	4	1.00
Union	29S	42	5	1.00
Grant	29	201	16	1.00

Urban Highway

Minnehaha	115	84	7	.70
Minnehaha	115	87	8	.70
Minnehaha	115	88	9	.70
Minnehaha	11	79	10	.70
Minnehaha	42	363	11	.70
Minnehaha	42	367	12	.70
Minnehaha	38	365	17	.70
Pennington	16	69	2	.18
Pennington	16B	68	3	.18
Pennington	16B	70	4	.18
Pennington	79	80	6	.18
Pennington	44	40	7	.18
Pennington	44	49	8	.18
Brown	12	289	4	1.00
Brown	12	290	5	1.00
Brown	12	292	6	1.00
Brown	12E	289	8	1.00
Brown	281	193	9	1.00
Brown	281N	197	14	1.00
Lawrence	14A	9	14	.13
Lawrence	14A	10	15	.13
Davison	37	74	3	.60
Davison	37	76	4	.60
Davison	38	300	12	.60
Beadle	37	125	13	1.00
Beadle	37	127	14	1.00
Beadle	37	128	15	1.00
Hughes	14E	230	3	1.00
Hughes	14W	232	5	1.00
Hughes	14	229	6	1.00
Hughes	14	230	7	1.00
Hughes	14B	95	11	1.00
Hughes	14B	96	12	1.00
Hughes	34	209	13	1.00
Hughes	34	210	14	1.00

Rural Highway

Minnehaha	19	64	1	.07
Minnehaha	38	349	16	.07
Pennington	16	45	1	.10
Pennington	16A	59	5	.10

Pennington	44	87	9	.10
Pennington	44	107	10	.10
Lawrence	385	122	8	.66
Lawrence	85	28	9	.66
Lawrence	14A	29	10	.66
Lawrence	14A	35	11	.66
Lawrence	14A	37	12	.66
Lawrence	14A	41	13	.66
Lawrence	14A	41	16	.66
Lawrence	14A	50	17	.66
Brown	10	279	1	.55
Brown	10	282	2	.55
Brown	10	297	3	.55
Brown	12	309	7	.55
Brown	281	214	10	.55
Brown	281	214	11	.55
Brown	281S	185	12	.55
Brown	281N	185	13	.55
Brown	37	207	15	.55
Brown	37	208	16	.55
Brown	37	208	17	.55
Hughes	83	138	1	.69
Hughes	1804	256	2	.69
Hughes	14	139	4	.69
Hughes	14	246	8	.69
Hughes	14	251	9	.69
Hughes	14	263	10	.69
Hughes	34	212	15	.69
Hughes	34	232	16	.69
Hughes	34	245	17	.69
Davison	37	62	1	.83
Davison	37	72	2	.83
Davison	37	76	5	.83
Davison	42	302	11	.83
Davison	38	302	13	.83
Beadle	14	333	1	.83
Beadle	14	354	2	.83
Beadle	14	354	3	.83
Beadle	14	363	4	.83
Beadle	14	316	5	.83
Beadle	14	326	6	.83
Beadle	14	326	7	.83
Beadle	14	331	8	.83
Beadle	28	269	9	.83
Beadle	28	283	10	.83
Beadle	28	298	11	.83

Beadle	281	117	12	.83
Beadle	37	133	16	.83
Beadle	37	145	17	.83
Union	46	365	6	.88
Union	46	366	7	.88
Union	46	380	8	.88
Union	46	371	9	.88
Union	11	9	10	.88
Union	11	23	11	.88
Union	11	35	12	.88
Union	11	35	13	.88
Union	50	423	14	.88
Charles Mix	50	337	1	.88
Charles Mix	50	329	2	.88
Charles Mix	50	314	3	.88
Charles Mix	50S	299	4	.88
Charles Mix	50N	299	5	.88
Charles Mix	50	273	6	.88
Charles Mix	1804	90	7	.88
Charles Mix	1804	120	8	.88
Charles Mix	44	298	9	.88
Charles Mix	44	305	10	.88
Charles Mix	44	306	11	.88
Charles Mix	45	27	12	.88
Charles Mix	46	277	13	.88
Charles Mix	46	288	14	.88
Charles Mix	46	290	15	.88
Grant	20	439	1	1.00
Grant	20	439	2	1.00
Grant	20	446	3	1.00
Grant	158	439	4	1.00
Grant	12	377	5	1.00
Grant	12	388	6	1.00
Grant	12	390	7	1.00
Grant	12	390	8	1.00
Grant	12	399	9	1.00
Grant	123	172	10	1.00
Grant	15	160	11	1.00
Grant	15	167	12	1.00
Grant	15	174	13	1.00
Grant	15	174	14	1.00
Grant	15	175	15	1.00
Fall River	18	62	1	.65
Fall River	18	11	2	.65
Fall River	18	12	3	.65
Fall River	18	24	4	.65

Fall River	471	7	5	.65
Fall River	471	21	6	.65
Fall River	471	27	7	.65
Fall River	89	29	8	.65
Fall River	71	1	9	.65
Fall River	71	2	10	.65
Fall River	71	7	11	.65
Fall River	71	27	12	.65
Fall River	71	35	13	.65
Fall River	385	39	14	.65
Fall River	79	26	15	.65
Fall River	385	12	16	.65
Fall River	385	13	17	.65
Tripp	53	26	1	1.00
Tripp	183S	5	2	1.00
Tripp	183S	19	3	1.00
Tripp	183N	43	4	1.00
Tripp	183N	61	5	1.00
Tripp	49	18	6	1.00
Tripp	49	27	7	1.00
Tripp	49	42	8	1.00
Tripp	18	242	9	1.00
Tripp	18	252	10	1.00
Tripp	18	252	11	1.00
Tripp	18	273	12	1.00
Tripp	44	237	13	1.00
Tripp	44	270	14	1.00
Kingsbury	25	114	1	1.00
Kingsbury	25	120	2	1.00
Kingsbury	81	116	3	1.00
Kingsbury	81	119	4	1.00
Kingsbury	81	125	5	1.00
Kingsbury	14	363	6	1.00
Kingsbury	14	365	7	1.00
Kingsbury	14	378	8	1.00
Kingsbury	14	378	9	1.00
Kingsbury	14	383	10	1.00
Kingsbury	14	387	11	1.00
Kingsbury	14	390	12	1.00
Kingsbury	14	400	13	1.00
Kingsbury	25	113	14	1.00

APPENDIX B: OBSERVER INSTRUCTIONS FOR COMPLETING THE SEATBELT / MOTORCYCLE HELMET USE SURVEY FORM

South Dakota Statewide Seatbelt and Motorcycle Helmet Use Survey

June, 2009

OVERVIEW

The South Dakota Seatbelt and Motorcycle Helmet Use Survey Form has been designed so that a large amount of information can be quickly collected about seatbelt and motorcycle helmet use on our state roads. The form allows for collection of seatbelt use data for all drivers and right front passengers in non-commercial vehicles, as well as children age four and under **anywhere** in the car. Beginning this year the form also allows for collection of helmet use data for motorcycle drivers and passengers. The form is constructed so that every person to be surveyed in or on a vehicle (including motorcycles) receives one full line of data -- 22 columns across the page.

The first three columns are used to record an identification number given to the occupant's vehicle, starting with 001 for the observation period. The type of vehicle is recorded in the fourth column. In the fifth column, the occupant is recorded as being a driver, a right front seat passenger, an additional child 0-4 years in the front, a child 0-4 years in the back seat, a motorcycle driver, or a motorcycle passenger of any age. **The occupant's seatbelt, child restraint use, or helmet use is recorded in the sixth column – the most important information for the survey!** In the 7th column, the occupant's age is estimated. In the 8th column, the occupant's vehicle is recorded as having either an in-state or out-of-state license plate.

The remaining 14 columns are used for recording "demographic" information about the observation such as county, site number, time of day, and road type. While the vehicle and occupant information must be recorded immediately as the vehicle passes, the demographic information only has to be written **once** on the first line of the first coding form used for a 40-minute observation period. When the coding sheets are processed, the demographic information will be automatically duplicated for all persons recorded during that observation session.

Here are some common mistakes made in past surveys:

- **Remember to start with Vehicle ID Number "001" for every new observation period. In past surveys, some Observers incorrectly started with the number from the previous survey period. For example, if they ended up with 45 vehicles during the first period, they started with number "046" for the second period and continued upwards for every new period. This is wrong.**

- Remember to give an “extra” child passenger (0 – 4 years of age) who is sitting or standing in the middle of the front seat, on the lap of the driver, on the lap of the right front seat passenger, or on the lap of a center front seat passenger the special Driver/Passenger/Extra code of “3”. Give any child 0 – 4 years sitting in the back seat the special Driver/Passenger/Extra code of “4”.
- Remember that we are only interested in “extra” child passengers (those described above) who appear to be less than 5 years old. If an “extra” child appears older than four, don’t record any data for this child.
- In past surveys, some vehicles were assigned two drivers – code “1”. We are not sure if the Observers coded a passenger as “1” instead of “2”, or if there were two vehicles with different drivers who were accidentally assigned the same vehicle ID number. Please check your work to correct for this.
- In the past surveys, there were some drivers who were assigned the age category of 1 (0 – 4 years) making them too young to be driving!
- Remember to use the Road Type code number for a site that appears in the description in the site list. These are the correct codes according to definitions used by the Department of Transportation. Even though a highway runs through an intersection in town, it is still considered a “rural highway” if the town has less than 5,000 people.
- Do not “double sample” any site by having two Observers recording data on two different streams of vehicles at or near the same site. It is acceptable for Observers to share recording duties or to take turns recording data on one stream of vehicles during a 40-minute period. But, do not split up and watch two streams of vehicles that are going different directions or are at slightly different locations at the same site.
- Remember to stop observing vehicles at the end of the 40 minute period, no matter if you have 0 vehicles or over a 100!

1) Materials

Observers will be observing from 13 - 17 sites for 40 minutes each over a period of 4 days (officially Thursday – Sunday.) They will be mailed a packet of materials containing all necessary materials for these observations. Observers will receive an Observer Site Schedule that will show the time and place to observe traffic over the 4-day period. Some extra days are listed as alternative dates. Observers will receive an Observation Site List that contains the numbers and descriptions of the observation sites located along urban and rural highways

and interstates. Maps of the approximate location of the observation sites will also be provided.

2) Preparation for the Observation Session:

Observers should wear an orange safety vest issued by the SD Office of Highway Safety to increase their visibility to passing traffic. Observers should carry their observation sheets on a clipboard and use a number 2 pencil for recording information. Do not use ink or flair pens. It is very important that Observers write numbers clearly so that they can be entered-correctly into the computer. Cross "7"s so that they can be distinguished from "1"s.

3) Arrival on Site and selection of an Observation Area:

Observers should reach their observation site a few minutes before they plan to begin the observation session. Note that scheduled time periods are 1½ hour periods and the observation session is only for 40 minutes. This gives Observers some leeway in start and stop times. Make sure you allow enough time to finish and get to the next site.

Before the observation session begins, the Observer should record the demographic information in columns 9 - 22 on the first row of the observation sheet. Most of the codes for the demographic information are on the top of the observation form. Information about "Road Type" is on the Site List. This information only has to be coded once for each 40-minute observation session.

Observers will then choose a position at the site that provides the best view of occupants in vehicles. For urban road sites, choose sites that allow observation of vehicles that have stopped for a red light or stop sign, or slowed for a yield sign. The best position is usually on the curb next to a right-hand turn lane on urban sites. For rural segments, intersections or junctions provide the best observation position.

Observers should stand at the safest possible position either on the curb or well to the side of the road which allows them a good view inside the front seat of cars/vans/trucks and sport utility vehicles which will be stopping or slowing at the site. Observers must be careful not to step into the roadway and endanger themselves as they attempt to look inside passing vehicles. It is better to be safe and guess about some information than it is to put oneself at risk for a closer look. Do not observe in weather with lightning.

4) Selection and Coding of the First Vehicle:

When the Observer is ready to record data, he/she will observe the first non-commercial car, mini-van, van, SUV, pickup truck, or motorcycle to stop at the site. **IMPORTANT: Commercial vehicles of any type (cars, station wagons, mini-vans, vans, pickup trucks, and large trucks) will not be included in the**

survey. Commercial vehicles are those with commercial license plates and/or commercial signing or lettering of any kind on the vehicle. **Four-wheel or three-wheel ATVs are also not included in the survey. They do not count as motorcycles!**

The first vehicle is assigned the sequence number "001" and marked as a car, van/mini-van/station wagon, SUV, pickup truck or motorcycle. Next, the person driving the vehicle is marked for being in the driver position. Then the driver's seatbelt or motorcycle helmet use and age group is recorded, followed by a code for in-state or out-of-state vehicle license plate.

If there is a right front vehicle passenger or a motorcycle passenger, use the next line of the form to code passenger information. This line also begins with the ID number of "001". If there is a child 0-4 years of age in addition to the right seat passenger, (e.g., one who is sitting or standing on a driver or front seat passenger's lap or in the center front seat), record information about the child on the next line starting with the same vehicle number "001". If there are any children 0-4 years in the back seat, code information about each child on a separate line starting with the same vehicle number.

Observers may not always be able to record accurately all information about the vehicle. The best strategy is to record the most important information first: **drive/pass, seatbelt or helmet use and age.** Then, move to other categories such as vehicle type (car, van, SUV, pickup, motorcycle). Record the state of license plate last, skipping it if you must.

5) Selection of Vehicles Throughout the Observation Session:

If traffic flow is **heavy** (an average of more than 1 vehicle per minute including motorcycles), observe **every other** vehicle (including motorcycles) that stops or slows down. For example, after the first vehicle has been coded as Vehicle ID "001", the Observer should let one vehicle stop and leave and then code data on the **next** vehicle that stops as Vehicle ID Number "002". Repeat the pattern throughout the 40-minute period.

If the traffic flow is lighter such that less than one vehicle stops every minute, Observers should record data on **every vehicle** (including motorcycles) that stops or slows down. If a vehicle containing several children takes a lot of time to code, skip the next one or two vehicles until you are ready to code again.

6) Completing the Observation Session:

At the end of the 40-minute observation session, Observers should go to the box in the lower right corner of the first survey form used for the session and check whether every vehicle or every other vehicle was observed. Then, Observers should record the total number of vehicles observed for the session. **Note that the total number should match the highest Vehicle ID Number for the**

session - be careful not to count vehicles with passengers more than once. Scan handwriting and correct unreadable numbers. The survey forms should be clipped together in correct order, and stored in a safe, dry place until they are mailed back to Cindy Struckman-Johnson.

7) Starting the Next Observation Session:

At the Observer's next 40-minute session, he/she should begin with a **new survey form** and the **Vehicle ID numbers should begin again with "001"**. Demographic information for this site should be recorded on the first line of the coding sheet.

DESCRIPTIONS OF CATEGORIES AND CODES

Vehicle ID Number

During each observation session, the Observer will assign a sequential "Vehicle ID number" to each vehicle that is sampled (selected for observation). The sequential ID's should start with "001" each session. ID numbers for an observation session in heavy traffic will probably run from 001 to over 100. **The same Vehicle ID Number is assigned to the driver and passengers in the same vehicle.** In other words, if a vehicle has only a driver, only one line of the coding form will be used for the vehicle. If the vehicle has a driver and passengers, **two or more** lines of the coding form will be used for the vehicle and **all will have the same Vehicle ID Number.**

Vehicle Type

Non-commercial passenger cars are coded as "1". Vans, mini-vans and station wagons are coded as "2". Sport utility vehicles of all types are coded as "3". Pickup trucks are coded as "4". Two wheeled motor vehicles of any type (motorcycles, scooters, mopeds, or three wheelers) are recorded as motorcycles. Motorcycles with side cars and three wheeled tricycle type motorcycles should also be recorded as motorcycles. **Four- or three-wheel ATV's should not be counted as motorcycles.**

Driver/Passenger/Extra Children Age 0-4

Drivers of standard motor vehicles (car, van, minivan, sport utility, or pickup) are coded as "1". Standard motor vehicle passengers of any age, child or adult, in the right front seat are recorded as "2". **IMPORTANT: Extra children (0-4 years) in the front of standard motor vehicles who are sitting or standing on the lap of the driver, right front passenger or are sitting or standing in the center are recorded as "3". Children (0-4 years) anywhere in the back seat are recorded as "4".**

Drivers of motorcycles (two or three wheeled) are coded as 5. All passengers on motorcycles are coded 6 regardless of age.

To clarify, driver-passenger codes “1” through “4” are used for standard motor vehicles. Codes “5” and “6” are used only for motorcycles.

Seatbelt /Helmet Use ** The Most Important Part of the Survey! **

Cars, Vans, SUVs and Pickups

As soon as a standard motor vehicle stops or slows, observers should immediately determine whether the driver and right front passenger or any children 0–4 years of age are wearing a safety restraint. A "1" means a seatbelt is being used. A "2" means it was not in use. A "3" is used for the special case when a child passenger is sitting in a child restraint device or car seat.

Seatbelt use is determined by the **shoulder strap of the seatbelt or by the use of a child restraint** for standard motor vehicles. Using a shoulder strap as an indicator is a procedure that the National Highway Traffic Safety Administration has standardized for seatbelt surveys across the country. It has been determined to be more accurate than trying to see inside of cars to check for lap belts.

For the driver of a standard motor vehicle, code "1" if a shoulder strap is in use. Code "2" if the shoulder strap is not in use.

If there is a right front passenger of any age, start a new line of code with the same vehicle sequence number used for the driver on the previous line. For the right front passenger code "1" if a shoulder strap is in use. Code "3" if a child restraint (car safety seat, infant carrier, special harness to supplement the standard lap/shoulder belt, etc.) is in use. Code "2" if NEITHER the shoulder strap nor a child restraint is in use.

If there is a child 0-4 years of age in the front seat **in addition** to the right front seat passenger (Driver/Passenger/Extra Child code “3”), give a Seatbelt Use code of “3” if a child restraint is in use. Code “1” if the child 0-4 years of age is restrained by only a shoulder belt, but not a child restraint. Code “2” if NEITHER a child restraint or shoulder belt is in use. Use the same Seatbelt Use codes for children 0-4 years of age in the backseat (Driver/Passenger/Extra Child code “4”).

Motorcycles

When a two or three wheeled motorcycle stops, helmet use should be recorded in **column 6 – the same column used for seatbelt use**. For the driver of a motorcycle, code “4” if a helmet is in use. Code “5” if a helmet is not in use. A helmet must actually be worn it be considered in use. A helmet hanging from or

sitting on a motorcycle is considered **not** in use. If there are one or more passengers on the motorcycle (including side cars), record their helmet use in the same way.

To clarify, seatbelt/helmet use codes 1, 2, and 3 are only used for drivers and passengers of standard four wheeled vehicles and codes 4 and 5 are only used for drivers and passengers on motorcycles.

Age

Observers should pay special attention to judging the age of child occupants / riders.

If the occupant or rider is an "infant" to 4 years old, code "1".

If the occupant or rider appears to be 5 to 13 years old, code "2".

If the occupant or rider appears to be 14 to 17 years old, code "3".

If the occupant or rider appears to be 18 years old or older, code "4".

If you are uncertain about the exact age of an occupant such as you are not sure if a child is 13 or 14 years old, make your best guess. If you cannot see the occupant well enough to even guess at their age, then code "5" for unknown. The unknown category is used only for cases when you can not determine age at all, e.g., large hat obscuring face of vehicle occupant or a full face helmet on a motorcycle rider.

Lic State

This column is used to indicate whether or not the license plate on the observed vehicle is from South Dakota or another state. Code "1" for a South Dakota plate (regardless of county of origin). Code "2" for any out of state plate. Code "3" if you absolutely cannot determine whether or not the plate is in-state or out of state.

THE REMAINING CODES ARE RECORDED ONLY ONCE ON THE FIRST LINE OF THE FIRST FORM USED AT A SITE.

County

Code the appropriate number for the thirteen counties listed on the Observer Form.

Site

Observers will be given an "Observation Site List" which will list all observation sites in the county and a two-digit Site Number for each site. Observers should code the appropriate Site Number for each 40-minute observation session.

Time

The Time category refers to the time of day that the observation session is scheduled.

- 1 = 7:30 to 9:00 A.M.
- 2 = 9:00 to 10:30 A.M.
- 3 = 10:30 to 12 noon
- 4 = 12 noon to 1:30 P.M.
- 5 = 1:30 to 3:00 P.M.
- 6 = 3:00 to 4:30 P.M.

Month/Day/Year

Record the full date of the observation day --including "0"s --in these six spaces. For example, June 9, 2009 would be recorded as "060909".

Observer

Each Observer will enter his or her first and last initial initials on the coding sheet for identification purposes.

Road Type

The Observation Site List provided to all observers will have a "Road Type" code for each site. **REMEMBER TO USE THE ROAD TYPE NUMBER ASSIGNED IN THE SITE LIST. The sites have been assigned the codes of 1 (Urban Highway), 2 (Rural Highway), 3 (Urban Interstate) and 4(Rural Interstate) based on Department of Transportation definitions.**

Returning Data

When you are finished observing all of your sites, put the completed survey forms in the return-addressed envelope in your supplies packet and mail it back to Cindy Struckman-Johnson. Use the enclosed money to send the package PRIORITY rate with a green DELIVERY CONFIRMATION sticker. Cindy will reimburse you if the cash is not enough!

Please send the orange vests and any expense information to your group coordinator, not to Cindy.

If you have any questions about this manual or any of the survey procedures, call Cindy Struckman-Johnson in the Human Factors Lab at the University of South Dakota at (605) 677-5295 or (605) 677-5098 in the afternoon or 605-624-8858 in the mornings and evenings. Her cell phone number is 605-670-2657. If Cindy is not available, please leave a message with a number and a good time to call you and she will return your call. Cindy's e-mail is cindysj@usd.edu.

OBSERVER MANUAL APPENDIX A

SEATBELT SURVEY FORM EXAMPLES

The last page of this appendix contains an example of a partially completed survey form. It contains coding for 5 vehicles at a hypothetical observation site in Brown County. What follows is an explanation of why the codes shown on the sample form have been used. These examples have been selected to demonstrate many of the things you will commonly encounter while observing as well as some things you need to be careful about.

Vehicle 001 – Driver Only

There is only a single line with the vehicle ID 001, so this vehicle did not have a passenger. Note that vehicle 1 is coded "001" not "1". The vehicle type is coded as "1" so this vehicle must have been a non-commercial car. The third thing that is coded is "1" for Drive/Pass/Extra. This line of entries describes a driver. The next column indicates the driver's belt use. Because this is coded as "1", a shoulder belt was in use. Age is coded "4" meaning that the driver is 18 years of age or older. The "1" in the Lic State column means the vehicle plate was from South Dakota.

The remaining columns of information apply to all the vehicles coded on this sheet, so only one line of data needs to be entered for the entire sheet. County is coded "03" because this example takes place in Brown County. The next 2 columns are the code for the particular site within Brown County. Each observer will be provided with a list of codes for all sites at which he/she will be observing. Time is coded as "2" meaning that the observation is taking place between 9:00 and 10:30 A.M. The next six columns code the month, day and year of the observation. Note that the 7 is crossed so the data entry person will have no difficulty telling the difference between 1's and sloppy 7's.

The next two columns are for the first and last initials of the observer. In this example, Donna Smith was observing so "D" and "S" are recorded in these two columns. The last column indicates the type of road on which the observation is taking place. Because the observation site is a highway that runs through a city, the correct road type is urban highway and code "1" is entered. Please do not guess at the road type. Instead, use the road type code that appears on the site list. The definitions of road type were determined by the Department of Transportation.

Vehicle 002 – Driver /Right front passenger (Child 0-4 years)

Vehicle 002 is a car and has two lines of code and a "3" in the Veh Type column indicating an SUV with a driver and passenger. The driver line indicates a shoulder belt was used (Seat belt use code = "1") and that driver was at least 18 years old (Age code = 4). The car has South Dakota plates.

The passenger line for Vehicle 002 indicates that the passenger was a child 0-4 years of age in the right front seat (Drive/Pass/Extra = "2") in a child restraint (Seat belt use = "3"). It is extremely important to the survey that child restraint use be coded correctly. If a passenger is **USING** a child restraint, "3" is the correct code for the Belt use column. Do **NOT** code "1" (shoulder belt used) even if a shoulder belt is being used to hold the child restraint in place. Finally, do NOT use code "3" if an empty child restraint is present in the front seat. The age is coded as "1" indicating that the passenger was between 0 and 4 years of age. The final column for the Vehicle 002 passenger line repeats the South Dakota license plate code "1".

Vehicle 003 – Driver /Right front passenger/ Child 0-4 in front/ Non-recorded older child

Vehicle 003 has three lines of code indicating a driver and more than one passenger. The Veh Type column for vehicle 003 is coded as "2" indicating that the vehicle was a van, mini-van or station wagon. The driver line (code "1" in Drive/Pass/Extra) has an entry for Belt Use indicating that the driver was not wearing a seat belt (code = "2"). Note that the same code value is used to indicate a vehicle occupant **is not** wearing a shoulder harness or using a child restraint for all standard vehicle types, but not for motorcycle helmet use. The remaining codes for the driver of Vehicle 003 indicate that the driver is 18 years old or older and that the vehicle had out-of-state license plates, coded "2".

The next line of information for the first passenger of vehicle 003 duplicates the Vehicle ID Number and Veh Type codes. The Drive/Pass column is coded "2" to indicate a right front seat passenger. The Belt Use column is coded "1" indicating that the passenger was wearing a seat belt. The next column of the passenger information records age. Code "5" is entered in this example. Code "5" stands for "Unknown". In this example, the age is unknown because the child on her lap blocked the passenger's face from view. This is one of the few situations in which code "5" is appropriate. Code "5" should **not** be used in cases when you are not sure whether a person is 4 or 5, 13 or 14, or 17 or 18. If you are not sure about age category, make your best guess. **Use code "5" only in those cases when you can't tell age at all.** The final column of the first passenger data duplicates the out-of-state license code from the previous line for this vehicle.

The third line of information for vehicle 003 again duplicates the Vehicle ID Number and the Veh Type codes. The Drive/Pass column is coded as "3" indicating that there was a child 0-4 years of age in the front seat in addition to the right front passenger coded on the previous line. (In this case the child 0-4 years of age had been seated on the right front passengers' lap.) The Belt Use column is coded as "2" indicating the child was not in a child restraint device. The Age column indicates that the child was 0-4 years of age. The Lic State

code duplicates the “2” indicating an out of state license plate as recorded on the previous two lines for Vehicle 003.

A fourth child was present in the center of the seat. However, no information was recorded for this child because the child was estimated to be in the age category of 5-13 years.

Vehicle 004 – Driver /Two backseat passengers (0-4 years)

Vehicle 004 is a car with three lines of code and a “1” in the Veh Type column indicating a car with a driver and at least two passengers. The driver line indicates a shoulder belt was used (code “1”) and that driver was at least 18 years old. The car has South Dakota plates.

The second line for Vehicle 004 indicates that a child 0-4 years of age was seated in the back seat (passenger code 4) in a child restraint (code = “3”). The age is coded as “1” indicating that the passenger was 0-4 years of age. The final column for the Vehicle 004 passenger line repeats the South Dakota license plate code “1”.

The third line for Vehicle 004 indicates that a second child (0-4 years of age) was present in the back seat (Drive/Pass/Extra is coded as “4”). This child 0-4 years old was not in a child restraint as indicated by the Seat Belt Use code “2”. Age is coded as “1” and the License plate information is repeated as “1” indicating a vehicle with SD license plates as recorded on the previous two lines.

Vehicle 005 – Driver / Backseat passenger (0-4 years)

Vehicle 005 has two lines of code. A “1” in the Vehicle Type column indicates this was a car. The driver was wearing a seat belt (Seat belt use code = “1”) and was between 14 and 17 years of age (Age code = “3”). The vehicle had South Dakota license plates.

The second line of code for Vehicle 005 repeats the vehicle type information. The Drive/Pass/Extra code of “4” indicates that there was a child 0-4 years of age in the back seat. The Seat belt use code is “1” for this passenger indicating that the child 0-4 years was wearing a shoulder belt but was not in a child restraint device.

Vehicle 006 – Motorcycle driver and passenger.

Vehicle 006 has two lines of code. A vehicle type “5” indicates a motorcycle. The first line corresponds to the motorcycle driver as indicated by the “5” coded in the Drive/Pass or Extra column. A “5” is coded in the next column indicating no helmet use. The driver’s age is estimated to be over 18 as indicated by the “4” coded in the next column. The vehicle has an SD plate.

The second line of code for vehicle 006 repeats the vehicle information. A “6” is coded in the next column to indicate a motorcycle passenger. A “4” indicates that the passenger was using a helmet and the 2 in the next column indicates that the passenger was between 5 and 13. This estimation was possible because the helmet used did not obscure the passenger’s face. With full face helmet use, the age category may have to be coded as “5” – unknown.

Observation Session Summary Boxes

The observation session summary box in the lower right hand corner of the sample form would be completed if this were the **first** page of information collected at a site. Because this example starts with Vehicle ID Number 001, this is a first sheet.

The upper half of the box indicates whether every vehicle was observed (normal traffic conditions) or every other vehicle was observed (heavy traffic conditions). The "Every Car Observed" line is checked because traffic was obviously light enough for this strategy.

A lower box indicates the total number of vehicles including motorcycles observed during the 40-minute observation session. There were a total of 6 vehicles. At the end of an observation session, you will need to count vehicles on ALL forms used during that session, but **you should only enter the totals on the first sheet.**

The lowest box is used for recording a description of the actual location used for observation. Terminology similar to that used on the site list is expected. For this example the Observer was located at the interchange of Highway 281 and Highway 12 observing all traffic turning onto Highway 281.

Remember: Use a number 2 pencil so that you may erase and clarify coding information written unclearly when the observation period is over.

South Dakota Seatbelt and Motorcycle Helmet Survey Form

Vehicle Type

Car = 1
 Van, Minivan, or
 Station Wagon = 2
 Sport Utility = 3
 Pickup = 4
 Motorcycle = 5

Driver / Passenger/Extra

Driver = 1
 Right Front Passenger = 2
 Extra Child Front = 3
 Child Rear = 4
 Motorcycle driver = 5
 Motorcycle passenger = 6

Seatbelt/Helmet Use

Seatbelt Used = 1
 Seatbelt Not Used = 2
 Child Restraint Used = 3
 Helmet Used = 4
 Helmet Not Used = 5

Age

Infant to 4 = 1
 5 to 13 = 2
 14 to 17 = 3
 18 or over = 4
 Unknown = 5

License State

South Dakota = 1
 Other State = 2
 Unknown = 3

County

Minnehaha = 01
 Pennington = 02
 Brown = 03
 Lawrence = 04
 Davison = 05
 Beadle = 06
 Hughes = 07
 Union = 08
 Charles Mix = 09
 Grant = 10
 Fall River = 11
 Tripp = 12
 Kingsbury = 13

Site Number

Check County
 Site List

Time

7:30 – 9:00 am = 1
 9:00 – 10:30 am = 2
 10:30 – noon = 3
 noon – 1:30 pm = 4
 1:30 – 3:00 pm = 5
 3:00 – 4:30 pm = 6

Road Type

Urban Highway = 1
 Rural Highway = 2
 Urban Interstate = 3
 Rural Interstate = 4
 (Check County Site
 List)

Revised May 2009

Vehicle ID Number	Veh Type	Drive Pass or Extra	Seat Belt/ Helm Use	Age	Lic State	County	Site Number	Time	Month	Day	Year	Observer	Road Type
001	1	1	1	4	1	03	03	2	07	09	09	D.S.	1
002	3	1	1	4	1								
002	3	2	3	1	1								
003	2	1	2	4	2								
003	2	2	1	5	2								
003	2	3	2	1	2								
004	1	1	1	4	1								
004	1	4	3	1	1								
004	1	4	2	1	1								
005	1	1	1	3	1								
005	1	4	1	1	1								
006	5	5	5	4	1								
006	5	6	4	2	1								

Check One

Every vehicle observed

Every other vehicle observed

Total vehicles observed in 40 minutes 6

Describe your observing location at this site:

Intersection of 281 & 12. Stood on North corner by the Stop sign - watched traffic turning onto 281

Appendix C

Computation of Mean Seat Belt Use for South Dakota

The computation of the mean seatbelt use for in South Dakota was a three-stage process. Stage 1 consisted of computing mean seat belt use for each road type in each county. For purposes of this calculation, only drivers and right front seat passengers were considered to retain compatibility to prior year values and Federal reporting requirements. In this computation, the vehicle miles traveled value (VMT) for a particular site was computed by averaging the VMT values for each of the sub-segments in the road segment the selected site represented. These VMT values were then used to compute a weighted average for all sites for a particular road type in a particular county. This weighted mean seatbelt use rate for a particular road type in a particular county is designated

\hat{P}_{ij} where i denotes road type (from 1 to 4) and j denotes county (from 1 to 13).

The second stage of the computation consisted of computing weighted means for each road type across counties based on the vehicle miles traveled (VMT) on that road type in each county and on the sampling weight for the county based on probability of selection for surveying for that county. The mean seatbelt use for a road type is

$$\hat{P}_i = \frac{\sum_{j=1}^{13} W_{.j} V_{ij} \hat{P}_{ij}}{\sum_{j=1}^{13} W_{.j} V_{ij}}$$

Where \hat{P}_i = the seat belt use estimate for road type i

$W_{.j}$ is the county weight for county j (1 for Minnehaha and Pennington, 31/11 for the remaining 11 counties)

V_{ij} is the VMT for road type i in county j

\hat{P}_{ij} is the seatbelt use rate estimated for road type i and county j in stage 1.

The final stage of the estimate consisted of computing the weighted average of the across county road type estimates for a statewide estimate. Weights were based on the proportion of the state's VMT on each road type.

The formula for computing the statewide estimate is

$$\hat{P} = \frac{\sum_{i=1}^4 V_i \hat{P}_i}{\sum_{i=1}^4 V_i}$$

Where \hat{P} = the statewide seat belt use estimate

V_i is the proportion of VMT for road type i in the state

\hat{P}_i is the rate estimated for road type i in the state stage 2.

In the 2009 South Dakota Survey, the following values were obtained

Urban Highway:	$w_1 = 0.18324$	$\hat{P}_1 = 64.75$
Rural Highway:	$w_2 = 0.44819$	$\hat{P}_2 = 67.01$
Urban interstate:	$w_3 = 0.05521$	$\hat{P}_3 = 73.82$
Rural interstate:	$w_4 = 0.31336$	$\hat{P}_4 = 83.21$

Thus, statewide seat belt use is estimated as 72.05% for 2009.

Computation of Variance and Confidence Bounds for Mean Seat Belt Use for South Dakota

Computational formula for the variance of \hat{P} , using the terms as defined in the computation of the weighted use estimate above, is

$$Var(\hat{P}) = \frac{\sum_{i=1}^4 \sum_{j=1}^{13} (W'_{ij})^2 * (\hat{P}_{ij} - \hat{P})^2}{n^* - 1}$$

where n^* = the number of county-road type groups

The W'_{ij} in the formula are weights applied to the deviations based on the formula below

$$W'_{ij} = \frac{W_{.j} * V_{ij}}{\sum_{i=1}^4 \sum_{j=1}^{13} W_{.j} W_{ij}}$$

where the W 's and V in the formula are as define previously in discussion of the second stage of the analysis.

Using these formulas, the variance of \hat{P} is 0.3315. The sampling error is then 0.5757%.

Now, the 95% confidence bounds can be computed as the:

$$(\text{statewide mean}) \pm (1.96)(0.5757).$$

Thus, the 95% confidence bounds on our mean estimate are:

$$72.05\% \pm (1.96)(0.5757) \text{ or } p(70.92\% < \text{Statewide Use} < 73.18) = .95$$

In non-statistical terms, there is a 95% chance that the true statewide seatbelt use rate in South Dakota is between 70.9 and 73.2 with our best estimate being that it is 72.05%