# 2010 South Dakota Statewide Seatbelt And Motorcycle Helmet Use Survey

# Final Report

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# 2010 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 2010. In early June, observers recorded seatbelt use, helmet use, and other demographic data for motorists and cyclists traveling along a selected sample of South Dakota rural and urban highways and interstates in 13 South Dakota counties. In late June, observers recorded supplemental helmet use data for motorcyclists traveling a sub-sample of the selected roads in the 13 counties. A total of 12,391 motorists (drivers, right front passengers of any age, and additional children under age 5 in the front or back seat) and 2,144 motorcycle drivers and passengers were observed.

### Seatbelt Use Weighted Statewide Estimates

A statewide estimate of 74.5% restraint use was observed for drivers and right front passengers, weighted for road type and vehicle miles traveled (VMT) at 205 observation sites. This number was statistically higher than the weighted statewide estimate of 72.1% obtained in 2009. The 74.5% estimate is an all-time high for seatbelt use in South Dakota measured annually since 2000.

The 2010 weighted statewide estimates for seatbelt use by road type were 74.3% for urban highways (a 9.5% increase compared to 64.8% in 2009), 71.5% for rural highways (a 4.5% increase compared to 67.0% in 2009), 75.8% for urban interstates (a 2% point increase compared to 73.8% for 2008), and 78.6% for rural interstates (a 4.6% decrease compared to 83.2% in 2009). The changes between 2009 and 2010 for all road types were statistically significant.

### Seatbelt Use Unweighted Results

**All Occupants**

Results showed that for direct or unweighted observations, 74.2% of all observed motorists were wearing a seatbelt or child restraint. This unweighted percentage is higher than the rate of 69.7% observed in the 2009 survey. Note that the 74.2% rate is unweighted for road type and VMT and is not as representative as the weighted statewide estimate of 74.5%.

**County**

The 2010 survey indicated that seatbelt rates for the two most populated counties—Minnehaha and Pennington—decreased slightly, but seatbelt rates for many less populated counties increased substantially. Considering all counties, seatbelt rates in 2010 have become moderately higher and more uniform throughout South Dakota.

The seatbelt use rates for counties by descending population size were: Minnehaha (78%), Pennington (65%), Brown (83%), Lawrence (73%), Davison (72%), Beadle (65%), Hughes (74%), Union (89%), Charles Mix (76%), Grant (77%), Fall River (62%), Tripp (74%), and Kingsbury (68%).

The counties from highest to lowest seatbelt use rates were: Union (89%), Brown (83%), Minnehaha (78%), Grant (77%), Charles Mix (76%), Hughes and Tripp (74%), Lawrence (73%), Davison (72%), Kingsbury (68%), Pennington (65%), Beadle (65%), and Fall River (62%).

Eight counties exhibited increased restraint usage rates compared to 2009 figures. These counties included Hughes with +24 (74% vs. 50% in 2009), Charles Mix with +23 (76% vs. 53% in 2009), Tripp with +15 (74% vs. 59% in 2009), Brown with +13 (83% vs. 70% in 2009), Lawrence with +13 (73% vs. 60% in 2009), Grant with +11 (77% vs. 66% in 2009), Davison with +10 (72% vs. 62% in 2009), and Beadle with +2 (65% vs. 63% in 2009). Four counties with lower rates than 2009 were: Fall River with -12 (62% vs. 74% in 2009), Union with - 8 (89% vs. 97% in 2009), Pennington with - 4 (65% vs. 69% in 2009), and Minnehaha with - 2 (78% vs. 80% in 2009). Kingsbury's rate remained unchanged (68% in 2010 and 2009).

**Age Group**

The 2010 survey indicated that children younger than five had the highest level of car seat or seatbelt protection (82%), followed by children age five to thirteen (74%), followed by adults (70%), followed by teens age fourteen to seventeen (69%). The 2010 results indicate that seatbelt use among children five to thirteen, teens, and adults are moderately higher and more uniform than in previous survey years since 2000. The greatest gains in seatbelt use have been made by the teen group, who reached a historical high of 69% since 2000. The most vulnerable population remains the 9 of 89 children (9%) under age five who were sitting or standing unrestrained as extra passengers in the front seat.

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

As found in all previous survey years, a greater percentage of right front seat passengers (72%) than drivers (69%) wore restraints. For vehicle type, occupants of vans and station wagons had the highest use rates (80%), followed by those in cars (73%) and SUVs (72%). Pickup truck occupants had the lowest usage rate of 57%. As found in previous years, a higher percentage of occupants of out-of-state vehicles (82%) wore restraints than did occupants of vehicles with SD license plates (66%).

## Motorcycle Helmet Use Statewide Estimates

A total of 2,144 motorcyclists were observed in 2010 (560 in the first survey period and 1,584 in the supplemental period.) A statewide estimate of 53.4% helmet use was

observed for motorcycle drivers and passengers, weighted for road type and VMT at observation sites. The estimate for helmet use in the 2009 survey was 36%, but this number was an unweighted average based upon 1, 034 motorcycle observations primarily from Minnehaha, Pennington, and Lawrence counties. The 53.4% weighted statewide estimate from the 2010 survey is a more representative and reliable measure of helmet use in South Dakota.

The 2010 weighted statewide estimates for helmet use by road type were 35.0% for urban highways, 59.2% for rural highways, 32.6% for urban interstates, and 59.4% for rural interstates.

## Motorcycle Helmet Use Unweighted Results

### All Riders

Results showed that for unweighted observations, 45% of all observed motorcyclists were wearing a helmet. Note that this rate is unweighted for road type and VMT and is not as representative as the weighted statewide helmet use estimate of 53%.

### County

Helmet use rates for counties were highly variable among all of the counties, regardless of population size. One pattern was that motorcyclists traveling the Black Hills roads in the counties of Lawrence and Fall River had higher helmet use rates than all other counties.

The helmet use rates for counties by descending population size were: Minnehaha (25%), Pennington (44%), Brown (60%), Lawrence (63%), Davison (39%), Beadle (42%), Hughes (29%), Union (50%), Charles Mix (21%), Grant (42%), Fall River (62%), Tripp (45%), and Kingsbury (41%).

Helmet use rates from highest to lowest for counties were: Lawrence (63%), Fall River (62%), Brown (60%), Union (50%), Tripp (45%), Pennington (44%), Beadle (42%), Kingsbury (41%), Davison (39%), Hughes (29%), Minnehaha (25%) and Charles Mix (21%).

### Age Group

Helmet use was 55% for cyclists who appeared to be age fourteen to seventeen, and 44% for cyclists who appeared to be eighteen years and older. There were too few observations of motorcyclists under age fourteen (n = 10) for a reliable percentage.

### Driver/Passenger, In/Out of State License

Helmet use was higher for passengers (55%) than for drivers (42%). More motorcyclists with out-of state license plates had on helmets (67%) than those with SD plates (37%).

## Introduction

This report is about a probability-based study of seatbelt and helmet use rates of motorists observed on South Dakota roads in June, 2010. The research, commissioned by the South Dakota Office of Highway Safety (OHS), is the 11th survey that has been conducted annually since June of 2000. This project represents a partnership between the OHS and the National Highway Traffic Safety Administration (NHTSA) created to increase the safety of travel and to save lives in South Dakota.

Motor vehicle crashes are the leading cause of death among Americans aged 1 – 34 (Beck et al., 2009). Between 1995 and 2007, over 40,000 Americans were killed each year in traffic accidents. In 2008, traffic fatalities declined by10% to a new low of 37,261 deaths. This decline was tied to high gas prices and a poor economy that kept people from driving. Other possible factors were young driver training, better road engineering, and safer vehicles. The Governors Highway Safety Association tied the decline to reduced speeds, better laws, and record high safety belt use ("Traffic deaths", 2009). Use of a safety restraint is considered to be one of the most effective ways to prevent death and injury in an accident situation (Sgarlato & deRoux, 2010; Dupont et al., 2009). In 2005, NHTSA estimated that for each percentage point increase in seat belt use, an additional 2.8 million people are buckled up, and about 270 lives are saved (Tison & Williams, 2010).

The national average seatbelt rate is documented by NHTSA annually with results from probability-based observational surveys (such as the present study) conducted by 50 States and Territories (Chen & Ye, 2010). The national rate increased in the early 1990s, "stagnated" between 66% and 69% between 1993 and 1999, then rose to a peak rate at 82% in 2005 (Tison & Williams, 2010). The rate declined to 81% in 2006, then rose to 82% in 2007, 83% in 2008, and 84% in 2009. Seatbelt use among the states varied in 2009 from lows of 68% in Wyoming and 69% in New Hampshire to highs of 98% in Michigan and 97% in Washington. Fifteen states, Washington DC, and Puerto Rico had use rates of 90% or higher. Note that the 2009 seatbelt use rate of 72.1% for South Dakota was in the mid-lower range (Chen & Ye, 2010).

The question of why people decide to wear a seatbelt has been intensely studied. It is well established that having a primary seatbelt law (one enforced directly by a citation for failure to wear a seatbelt) motivates people to buckle up (Beck et al., 2009). Further, a primary seatbelt law has been found to be significantly more effective than having a secondary law (one enforced only if the person has already been cited for another infraction.) Seatbelt use was 85% in states that had primary enforcement laws and 74% in states that had secondary enforcement laws (Beck et al., 2009). Note that South Dakota has had a secondary seatbelt law in effect for front seat drivers and passengers since 1995. In 2001, the State mandated primary enforcement of seatbelt use for all passengers under the age of 18 years. In 2008, the penalty for a seatbelt violation increased from $20 to $25. 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 (SD Legislature, 2009).

Laws by themselves are not sufficient to get people to buckle up (Tyson & Williams, 2010.) Seatbelt enforcement programs -- usually involving intense media campaigns followed by highly visible but short enforcement periods -- have been a key factor in increasing seatbelt use rates. The best known program is the Click It or Ticket (CIT), imported from Canada to North Carolina in 1993 and now used in all States since 2003. Forty-three States and Territories using CIT showed increased belt use between 2003 and 2006. Telephone surveys in selected states indicated that CIT increased public support for seatbelt use and enforcement. The CIT remains the centerpiece of the national effort to increase seatbelt use rates (Tison & Williams, 2010) and has been an ongoing project for the South Dakota OHS since 2003.

Besides seatbelt laws and enforcement, some demographic factors have been associated with seatbelt use. One of the strongest findings is that motorists in urban locations are more likely to wear seatbelts than those in rural settings (Rakauskas, Ward, & Gerberich, 2009; Strine, et al., 2010.) For example, NHTSA reported that nationwide, urban areas had a seatbelt rate of 84% compared to 79% for rural areas (Pickrell & Ye, 2008). The lower rates in rural rates appear to be rooted in many factors including low density population, agricultural industries, tourist travel, extensive rural road systems, vehicle choice (e.g., pickups) and a perception that driving without a seatbelt is not really dangerous (Rakauskas et al., 2009; Vachal & MacGowan, 2007).

The rural factor is particularly relevant for the state of South Dakota. Vachal and MacGowan (2007) have reported in depth about the dynamics of rural traffic safety for the northern rocky mountain region (NRMR) that includes South Dakota. They note that in NRMR states, 89% of fatal traffic accidents occurred on rural roads compared to 56% for the nation overall. This statistic is likely related to lower seatbelt use in NRMR states, exhibited especially by male drivers who were 16% to 67% lower in seatbelt use rates across all age groups for the years 2001 to 2005. Despite an overall drop in rural traffic fatalities in 2008, deaths were still disproportionately higher on rural roads than urban (“Rural roads”, 2009).

Psycho-social factors such as gender have an impact in that females are more likely to buckle up than are males (Gkritza & Mannering, 2007). Young drivers, especially those in the age group of 16 - 24, are less likely to buckle up than other age groups (Vachal & MacGowan, 2007). Race is sometimes a factor, with some but not all studies showing that Blacks have lower seatbelt use than Whites or Hispanics (Gkritza & Mannering, 2007). Drivers who have been drinking, those who engage in risky behavior, and those are obese are less likely to wear seatbelts (Beck et al., 2009). Whether a driver is alone or with a passenger, and whether the passenger is wearing or not wearing a seatbelt also affects driver belt use (Gkritza & Mannering, 2007).

Other variables related to seatbelt use include road type whereby motorists on interstate highways and expressways have higher seatbelt use than those on other

roadways (Gkritza & Mannering, 2007). Night time drivers have lower seat belt use rates and are considered a particularly resistant group for seatbelt campaigns (Vachal & MacGowan, 2007). Gkritza and Mannering (2007) emphasized that complex interactions among road, vehicle, and driver and passenger factors ultimately influence seatbelt use. For example, Kim et al. (2009) found that low seat belt use in Missouri high schools was associated with teen males, Blacks, pickup trucks, accompanying occupants, weekends, inclement weather, low income SES, small size of school, and rural location.

***Motorcycle Helmet Use***

Despite declines in the fatality rates in passenger cars and light trucks, fatality rates among motorcyclists steadily increased between 1997 and 2008 (NHTSA, 2009). According to the US Department of Transportation (DOT) (2007), motorcycle fatalities increased each year from a low of 2,116 in 1997 to an all-time high of 4,810 in 2006. Although there was a 63% jump in motorcycle registration during these years, the fatalities increased disproportionately to the rise in sales. In 2007, motorcycle deaths rose 6% to 5,150 nationwide. In 2008, motorcycle fatalities accounted for 14% of all fatalities (NHTSA, 2008). However, in 2009, preliminary reports indicated that for the first time in a decade, motorcycle fatalities fell by 10% to 4,762. It is not known if this decrease is due to a recessionary cut back in motorcycle driving or to other factors ("Motorcycle deaths", 2010).

Some major characteristics of motorcycle crashes reported by the USDOT (2007) and Derrick and Faucher (2009) are:

*Forty five percent of fatally injured motorcyclists did not wear helmets.*

*Over the last ten years, 90% of motorcyclists killed were male.*

*Two thirds of motorcyclists killed on 1,001-1,500 cc engine size motorcycles were riders over age 40.*

*Twice as many motorcycle fatalities occurred on weekends as opposed to weekdays.*

*In 2005, 41% of the 1,878 motorcycle operators who died in single vehicle crashes had BAC levels of .08 g/dL or higher. Sixty-one percent of those killed in single-vehicle crashes on weekend nights had a BAC levels of .08g/dL or higher.*

*Nearly one out of four motorcycle operators (24%) involved in fatal crashes were operating their vehicles with invalid licenses.*

*It is estimated that death and disability of motorcyclists in accidents costs Americans $5 billion annually in the forms of higher insurance premiums, increased taxation, and lost taxes.*

Just as a seatbelt has protective power for occupants in motor vehicle accidents, a motorcycle helmet is a vital piece of equipment for preventing death and injury in crashes (Homer & French, 2009.) The NHTSA reports that unhelmeted riders are three times more likely to suffer serious head injuries compared with riders wearing helmets (Gkritza, 2009.) It is estimated that helmets can lower the risk of head injury by 69% and the risk of death by 42% (Homer & French, 2009.) Just as many motorists decide not to wear seatbelts, a substantial number of motorcycle riders choose not to wear helmets for personal protection. Nationwide, helmet use was 63% in 1994, rose to 71% in 2000, declined to 51% in 2006, then rose to 63% in 2008 (NHTSA, 2008).

As with seatbelt laws, helmet use laws have been very effective in motivating motorcyclists to wear helmets (Gkritza, 2009). Helmet use laws can be "universal" where all riders are required to wear a helmet or "partial" where only riders of certain age groups –usually 21 or 17 years and younger—are required to wear a helmet. As of 2009, 20 states and Washington DC had a universal helmet law and 27 states had a partial law. Three states – Illinois, Iowa and New Hampshire – had no laws. Those states with a universal helmet use law had average use rates of 97%, whereas states with partial helmet laws had rates of 54% ("Motorcycling", 2009). Iowa, with no helmet law, had use rates of 36% to 39% (Gkritza, 2009). Note that since 1984, South Dakota has a partial helmet law that mandates helmet use for riders age 17 and under.

Knowledge of other factors that influence helmet use is limited. While seatbelt use has been studied for decades, helmet use has yet to be researched so extensively. According to Gkritza, 2009, there are relatively few motorcyclists on the road to study and it is difficult and expensive to study them. There is some evidence that federally-supported efforts by the States since 1997 to offer motorcycle education programs have increased helmet use. These programs typically cover driving skills, the benefits of helmet use, dangers of drunken driving, and awareness of laws and enforcement practices (Gkritza, 2009). Since 2006, $25 million in federal motorcycle safety education grants have been made available, and some speculate that these programs may have contributed to the 2009 downtown in motorcycle fatalities ('Traffic deaths", 2010).

Road type and weather factors clearly affect helmet use. An observational study of 90,000 Iowa motorcyclists from 2000 to 2006 (Gkritza, 2009) revealed that helmet use was lower on city roads than on primary or secondary roads under similar weather conditions. Helmet use was also lower on sunny and warm days than on cloudy or rainy days. This study found that a driver's helmet use was higher if a passenger had on a helmet. As in seatbelt decisions, motorcycle driver and passenger decisions to wear a helmet appear to be interrelated. Other factors found to influence helmet use include demographics such as population density, roadway conditions, rider characteristics such as age and risk perception, and crash characteristics such as speeding and alcohol use (Houston, 2007).

### *The Present Study*

The purpose of the present study was to assess the use of seatbelt and child restraint among motorists and helmet use by motorcyclists traveling on selected South Dakota roads in June, 2010, and to compare results with previous surveys conducted since 2000. The study involved two separate surveys. In early June, observers in 13 counties recorded safety restraint use and helmet use of passing motorists and cyclists over a four day period. At the end of June, a second supplemental survey of helmet use by passing motorcyclists was conducted on a sub-sample of roads in the 13 counties. The purpose of the supplemental survey -- a new addition to the survey design -- was to increase the motorcycle sample size for more representative and reliable results. The methods and results of these two surveys are described in the remainder of this report.

## Methods

The methods used in this study were designed according to federal guidelines established by NHTSA and were originally implemented in the1998 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 to allow for collection of motorcycle helmet use data, as well as seatbelt data. A supplemental helmet use data collection period in late June was added for the two largest counties. In 2010, the supplemental observation period for motorcycles in late June was expanded to all thirteen counties.

### 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 | 9,493 |
| 10. | Grant | 8,048 |
| 11. | Fall River | 7,123 |
| 12. | Tripp | 6,883 |
| 13. | Kingsbury | 5,830 |

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 13 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 to16 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 A.M. - 9:00 A.M.
2) 9:00 A.M. - 10:30 A.M.
3) 10:30 A.M. - 12 noon
4) 12 noon - 1:30P.M.
5) 1:30P.M. - 3:00 P.M.
6) 3:00P.M. - 4:30P.M.

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 Observer was 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 2010 EMT Observers had participated in the 2005 through 2009 surveys and were expert observers. In most survey years, some Observers 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 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 individual training calls to Observers in the week before the survey period to review procedures.

## Site Selection

Observers were instructed to follow their observation schedules as closely as possible. If 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 – 2010 South Dakota Seatbelt Survey" in Appendix B.

## Supplemental Motorcycle Observation Survey

Methods for the 2009 survey produced a low number of motorcycle observations in many counties. We learned that motorcycle traffic in South Dakota is light in cool and rainy early June weather. In 2009, an "emergency" supplemental survey was arranged in late June whereby observers in Minnehaha and Pennington counties observed motorcycle traffic for five 40-minute observation periods over three days. These extra hours in the state's most populated counties raised the number of cycles from 530 to 1,034. Still, only three counties in the 2009 survey had over 100 motorcycles and five counties had only 15 or fewer motorcycles for an analysis.

Therefore, in 2010, the supplemental survey in late June was expanded to all13 counties to obtain higher frequencies of motorcycles. Observers were instructed to record motorcycle helmet use for 40 minutes at eight different sites over a four-day period when the weather was favorable. Instructions and materials for the supplemental survey were mailed to the Observers one week before the start date. A few days before the start date, investigator Cindy Struckman-Johnson made calls to individual observers to review procedures. A copy of the Observer instruction letter for the supplemental survey is in Appendix C.

## Review of Data

Data were screened using methods similar to previous years. Three graduate students in the Human Factors program at USD reviewed over 14,000 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 12,391 automobile drivers and passengers from the 13 selected counties were included in the analyses for this 2010 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 12,295 motorists for which restraint use was recorded, 9,124 or 74.2% were wearing shoulder safety restraints or were placed in a child restraint, while 3,171 or 25.8% were not wearing safety restraints. This 2010 unweighted seatbelt use rate was notably higher than the unweighted rate of 68.2% observed in 2009. 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 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.

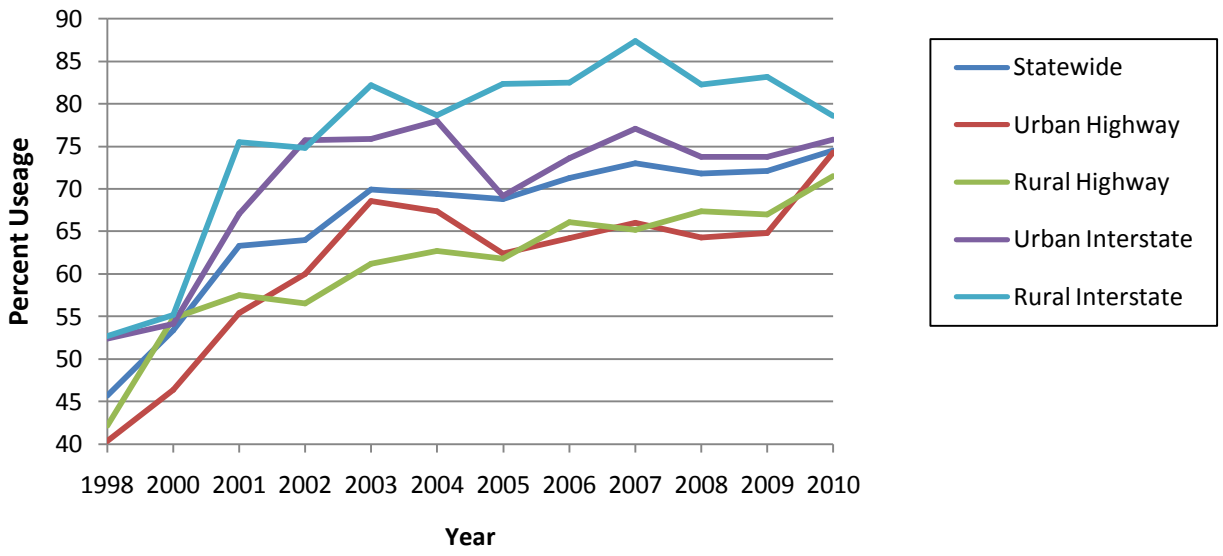
**The resulting estimate for seatbelt use on all South Dakota roads was 74.5% with a standard error of 0.4120.** Thus, it can be said that there is a 95% probability that the true rate of seatbelt use for South Dakota roads ranges between 73.7% and 75.3%. The formulas and weights for calculating the statewide estimate and standard deviation are in Appendix D.

The 2010 statewide estimate was approximately 2.4 percentage points higher than the 2009 rate. This difference is statistically significant, $t_{(60)} = 21.83$; $p < .001$. Thus, the statewide estimate for seatbelt use in South Dakota in 2010 showed a clear increase from 2009. As shown in Table 3 and Figure 1, the statewide average restraint use rate steadily increased from 2000 to 2007, and then appeared to stall in 2008. The rate slightly increased in 2009 and in 2010 broke through to a new historical high.

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

| | Year | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Road Type | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| Statewide Average | 53.4 | 63.3 | 64.0 | 69.9 | 69.4 | 68.8 | 71.3 | 73.0 | 71.8 | 72.1 | 74.5 |
| Urban Highway | 46.4 | 55.4 | 60.0 | 68.6 | 67.4 | 62.4 | 64.2 | 66.0 | 64.3 | 64.8 | 74.3 |
| Rural Highway | 54.8 | 57.5 | 56.5 | 61.2 | 62.7 | 61.8 | 66.1 | 65.2 | 67.4 | 67.0 | 71.5 |
| Urban Interstate | 54.1 | 75.7 | 75.7 | 75.9 | 78.0 | 69.6 | 73.6 | 77.1 | 73.8 | 73.8 | 75.8 |
| Rural Interstate | 55.2 | 74.8 | 74.8 | 82.2 | 78.7 | 82.4 | 82.5 | 87.4 | 82.3 | 83.2 | 78.6 |

**Figure 1: South Dakota Weighted Restraint Use by Year and Road Type**




## Estimate of Statewide Seatbelt Use by Road Type

The 2010 weighted statewide estimates for seatbelt use by road type were 74.3% for urban highways, 71.5% for rural highways, 75.8% for urban interstates, and 78.6% for rural interstates. Compared to 2009 rates (see Table 3), seatbelt use increased on urban highways by 9.5% ($p < 0.001$), increased 4.5% on rural highways ($p<.0.001$), increased 2.0% on urban interstates, ($p < 0.001$), and decreased 4.6% on rural interstates ($p < 0.001$).

## 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 11 survey periods is in Table 5 and Figures 2A and 2B. The data show a strong upward trend in nearly all counties from 1998 through 2004. Despite some stalls and dips, rates among most counties from 2005 through 2010 show a moderate upward trend.

The counties with the highest rates in 2010 were Union County (89%), Brown (83%), Minnehaha (78%), Grant (77%), Charles Mix (76%), Hughes and Tripp (74%), Lawrence (73%), and Davison (72%). Counties with midlevel rates were Kingsbury (68%), Pennington and Beadle (65%), and Fall River (62%). None of the counties exhibited extremely low usage rates in this 2010 survey.

**Table 4: South Dakota 2010 Unweighted Restraint Use by County**

| County | Restraint Used | | Totals |
|---|---|---|---|
| | Yes | No | |
| Minnehaha | 1114<br>77.5% | 323<br>22.5% | 1437 |
| Pennington | 1082<br>64.9% | 585<br>35.1% | 1667 |
| Brown | 950<br>83.0% | 195<br>17.0% | 1145 |
| Lawrence | 1014<br>73.0% | 375<br>27.0% | 1389 |
| Davison | 559<br>72.0% | 217<br>28% | 776 |
| Beadle | 478<br>64.7% | 261<br>35.3% | 739 |
| Hughes | 547<br>73.6% | 196<br>26.4% | 743 |
| Union | 1045<br>89.4% | 124<br>10.6% | 1169 |
| Charles Mix | 473<br>76.3% | 147<br>23.7% | 620 |
| Grant | 902<br>77.0% | 269<br>23.0% | 1171 |
| Fall River | 232<br>61.5% | 145<br>38.5% | 377 |
| Tripp | 95<br>74.4% | 33<br>25.5% | 128 |
| Kingsbury | 633<br>67.8% | 301<br>32.2% | 934 |
| % of Total | 9124<br>74.2% | 3171<br>25.8% | 12295 |

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

| County | Year | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| Minnehaha | 57 | 69 | 69 | 80 | 82 | 73 | 73 | 77 | 80 | 80 | 78 |
| Pennington | 43 | 51 | 63 | 67 | 70 | 70 | 77 | 72 | 70 | 69 | 65 |
| Brown | 60 | 64 | 56 | 65 | 62 | 58 | 61 | 62 | 59 | 70 | 83 |
| Lawrence | 73 | 62 | 54 | 73 | 68 | 69 | 65 | 65 | 63 | 60 | 73 |
| Davison | 52 | 67 | 76 | 60 | 70 | 69 | 76 | 76 | 65 | 62 | 72 |
| Beadle | 56 | 57 | 63 | 55 | 63 | 68 | 67 | 65 | 77 | 63 | 65 |
| Hughes | 36 | 54 | 62 | 76 | 77 | 55 | 54 | 53 | 58 | 50 | 74 |
| Union | 61 | 71 | 71 | 77 | 79 | 76 | 87 | 98 | 97 | 97 | 89 |
| Charles Mix | 24 | 28 | 41 | 48 | 50 | 48 | 59 | 36 | 48 | 53 | 76 |
| Grant | 46 | 53 | 66 | 45 | 53 | 55 | 78 | 77 | 83 | 66 | 77 |
| Fall River | 52 | 58 | 62 | 60 | 63 | 60 | 72 | 69 | 64 | 74 | 62 |
| Tripp | 30 | 39 | 47 | 37 | 33 | 50 | 66 | 56 | 66 | 59 | 74 |
| Kingsbury | 38 | 44 | 46 | 49 | 43 | 55 | 57 | 70 | 76 | 68 | 68 |

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

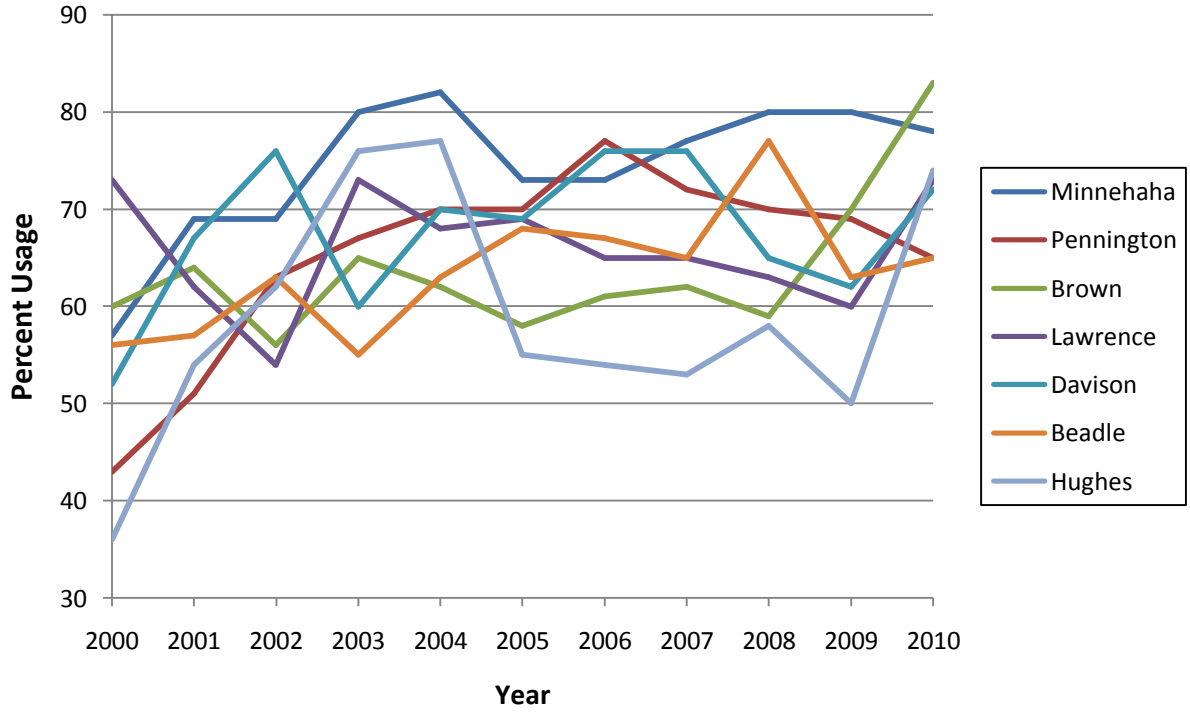
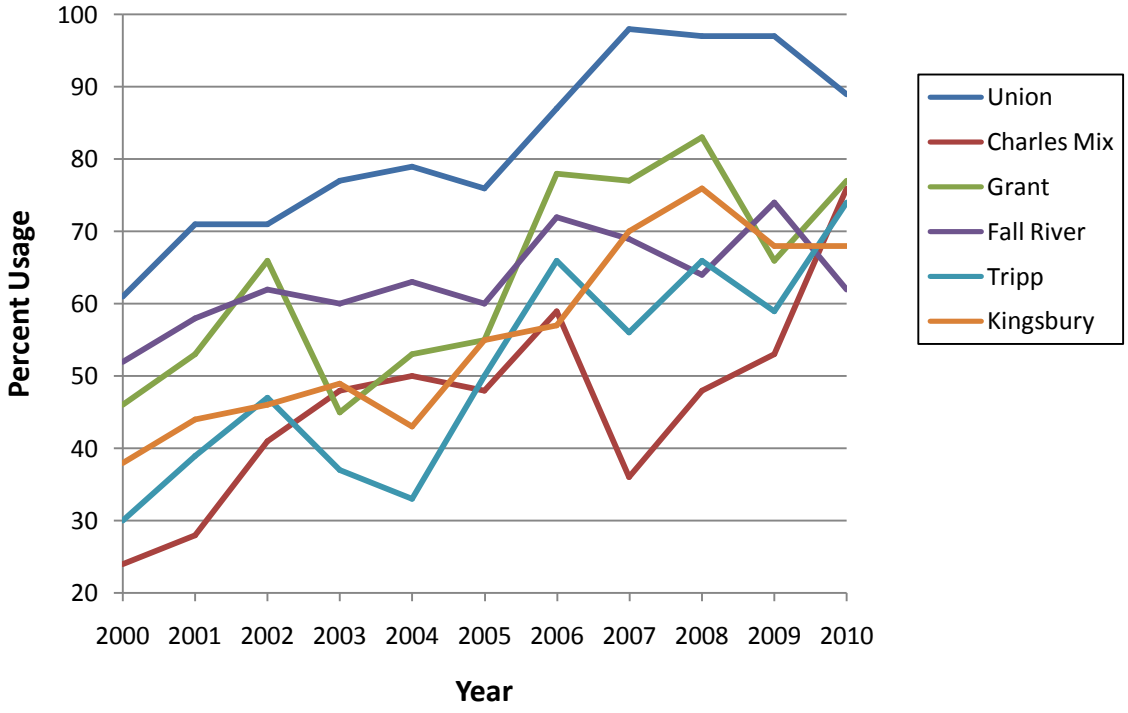


**Figure 2B: South Dakota Unweighted Restraint Use by Year for Lower Population Counties**




## Seatbelt Use by Age of Motorist

Observers estimated the age of drivers and passengers to the best of their ability. In approximately 39 or .3% instances, the Observer was unable to determine age. These

**Table 6: South Dakota 2010 Unweighted Restraint Use by Age**

| Age | Restraint Use | | | |
|---|---|---|---|---|
| | Belt | Child Restraint | None | Total |
| 0 - 4 years | 14<br>15.7% | 59<br>66.3% | 16<br>18.0% | 89 |
| 5 -13 years | 52<br>72.2% | 1<br>1.4% | 19<br>26.4% | 72 |
| 14 - 17 years | 699<br>68.7% | 0<br>.0% | 318<br>31.3% | 1017 |
| 18 & over | 7775<br>69.8% | 0<br>.0% | 3351<br>30.2% | 11126 |
| Total | 8540<br>69.4% | 60<br>.5% | 3704<br>30.1% | 12304 |

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 – 2010), data were also recorded for additional passengers between 0 - 4 years of age in the front seat (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 2010 survey was 89. Of these, 73 or 82% were observed in some type of safety restraint. In accordance with South Dakota law, 59 or 66% were placed in a child safety seat. Another 14 (16%) were wearing a shoulder restraint, but were not seated in a child safety seat. This total restraint use rate of 82% was the same as last year's rate.

In the 2010 survey, a total of 72 children judged to be age 5 - 13 were observed. Of these, 52 or 72% were wearing a seatbelt, and 1 child or 1.4% in this age group was observed in a child safety seat for a total of 74%. The remaining 19 (26%) were unrestrained. The restraint usage rate for this age group is up from the 65% rate observed in the 2009 survey.

A total of 1,017 motorists were judged to be in the teenage category of 14 - 17 years. Of these teens, 699 or 69% were wearing a seatbelt while the remaining 318 or 31% were not. This represents an increase from the rate of 62% observed for this age group in the 2009 survey.

The majority of observed motorists (a total of 11,126) were estimated to be in the age group of 18 years and older. Of these, 7,775 (70%) were wearing a restraint. The 2010 rate is slightly higher than the 2009 rate of 69%.

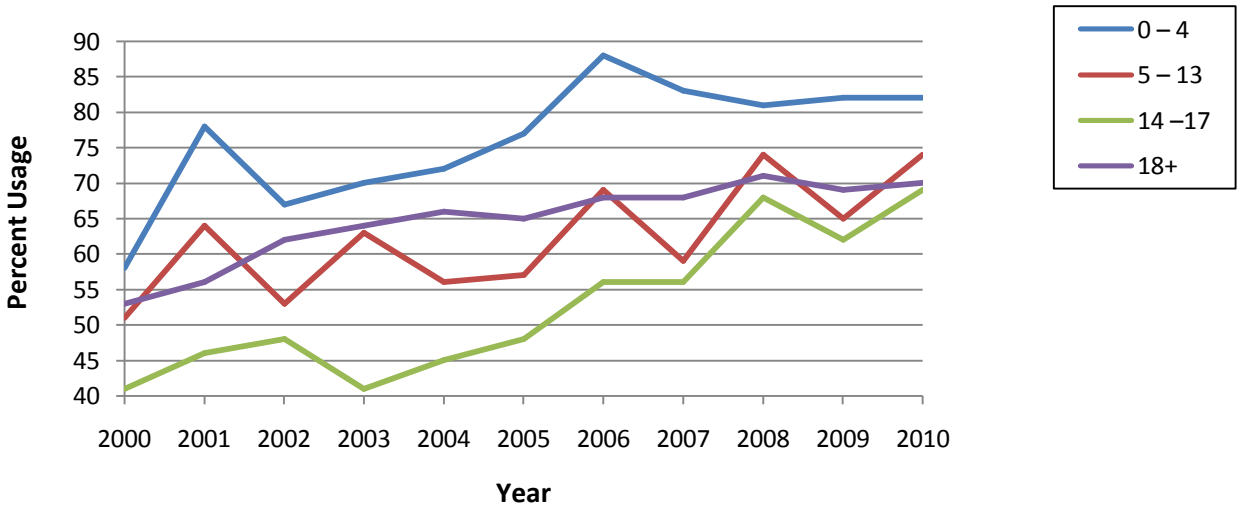
Table 7 and Figure 3 show the restraint use for age groups for each year since the 2000 survey. All age groups show a fluctuating upward trend over the 11-year period. Restraint use is highest for the youngest and most vulnerable age group of children appearing to be under five years of age. A historical high of 88% was reached for this group in 2006 and rates have since been maintained in the low 80% range. Low sample sizes for this age group (usually less than 100) may contribute to the variability of observed rates. The next highest rates are shown for adults 18 years and older

whose rates have been maintained in the 70% range since 2007. Children age 5 to 13 show the third highest rates, fluctuating from a low of 50% in 2000 to a high of 74% in 2010. Low sample sizes for this age group (usually less than 100) may contribute to the spikes shown in rates. Youth who appear to be 14 – 17 years show the lowest restraint use, starting with a historical low of 40% in 2000. Rates have climbed steadily since 2003 and reached a historical high this year of 69%.

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

| Age | Year | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| 0 – 4 | 58 | 78 | 67 | 70 | 72 | 77 | 88 | 83 | 81 | 82 | 82 |
| 5 – 13 | 51 | 64 | 53 | 63 | 56 | 57 | 69 | 59 | 74 | 65 | 74 |
| 14 –17 | 41 | 46 | 48 | 41 | 45 | 48 | 56 | 56 | 68 | 62 | 69 |
| 18+ | 53 | 56 | 62 | 64 | 66 | 65 | 68 | 68 | 71 | 69 | 70 |

**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 SDOHS 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 9,100 drivers observed, 6,284 or 69% were wearing a safety restraint. This rate is slightly higher than the rate of 67% observed in the 2009 survey. Of the 3,170 right front passengers observed, 2,268 or 72% were wearing shoulder restraints. This compares to a 2009 rate of 71% 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. Recall from the previous section that a total of 89 children in this age group were observed. Of these 89 children, 65 or 73% were riding in the back seat. Of these 65 children riding in the backseat, 56 or 86% were restrained in the mandated child safety seat. Seven children (11%) were wearing a seatbelt only and two children (3%) were not wearing a restraint.

Data were recorded for eight “extra” child front seat passengers who were sitting or standing 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 2010 survey, none (0%) of these eight children were seated in a child safety seat or restrained with a seatbelt. In the 2009 survey, only two of eight children in this passenger position were in a child safety seat and the remaining six children wore no restraint. Although the number of observations is low, these data continue to 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 | 6284<br>69.0% | 0<br>.0% | 2816<br>30.9% | 9100 |
| Right–Front Passengers | 2268<br>71.5% | 0<br>.0% | 898<br>28.3% | 3170 |
| Additional Child Front Passenger | 0<br>.0% | 0<br>.0% | 8<br>100.0% | 8 |
| Child Passenger Back Seat | 7<br>10.8% | 56<br>86.2% | 2<br>3.1% | 65 |
| Total | 8559<br>69.3% | 60<br>.5% | 3724<br>30.2% | 12374 |

## 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 as research indicated that restraint use is lower in pickup trucks.

Table 9 presents a summary of data regarding restraint use by vehicle type. Combining seatbelt and child safety seats, restraint usage was highest (80%) for vans, minivans and station wagons. The next highest usage rate (74%) was observed for cars, followed closely by SUVs (72%). As in previous years, the lowest usage rate of all categories was observed for pickup trucks – 57%. Although this remains the lowest usage rate among vehicle categories, the current rate reflects a slight increase over the 2009 rate of 55% and the 2008 rate of 54%.

**Table 9: SD 2010 Unweighted Restraint Use by Vehicle Type**

| | Restraint Use | | | |
|---|---|---|---|---|
| Vehicle Type | Yes | Child Restraint | None | Total |
| Cars | 3526<br>73.0% | 35<br>.7% | 1271<br>26.3% | 4832 |
| Vans | 1457<br>79.5% | 13<br>.7% | 362<br>19.8% | 1832 |
| SUVs | 1658<br>72.1% | 8<br>.3% | 633<br>27.5% | 2299 |
| Pickups | 1918<br>56.7% | 4<br>.1% | 1458<br>43.1% | 3380 |
| Total | 8559<br>69.3% | 60<br>.5% | 3724<br>30.2% | 12343 |

## 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% or 9,932 out of 12,304 vehicles). As illustrated in Table 10, vehicles with out-of-state license plates had higher rates of restraint use (82%) for seatbelts and child safety restraints combined than did motorists traveling in vehicles with in-state license plates (67%). The rates in 2009 were 81% for out-of-state and 65% for in-state.

**Table 10: South Dakota 2010 Unweighted Restraint Use by In- and Out-of-State License Plates**

| License Plates | Restraint Use | | | Total |
|---|---|---|---|---|
| | Yes | Child Restraint | None | |
| In-State | 6598<br>66.4% | 54<br>.5% | 3280<br>33.0% | 9932 |
| Out-of-State | 1942<br>81.9% | 6<br>.3% | 424<br>17.9% | 2372 |
| Total | 8540<br>69.4% | 60<br>.5% | 3704<br>30.1% | 12304 |

## Motorcycle Helmet Use

In the first 2010 survey period for automobiles and motorcycles in early June, 560 motorcycles were observed. The supplemental survey in later June yielded another 1,584 motorcycle observations. The two samples were combined for a total of 2,144 motorcyclists. Of these, 959 or 45.2% were wearing helmets. Note that this percentage is unweighted for road type and VMT and is not a statewide estimate. The difference between the unweighted rate of 45% in 2010 and 36% in 2009 should not be considered an “increase” in helmet use. The 2009 rate was based upon a much smaller sample of 1,034 motorcycles mostly observed in three counties. Minnehaha, the county with large, reliable sample sizes each year, had helmet use rates of 25% for 2010 and 24% for 2009. This similarity in rates suggests that there was likely no substantial change in helmet use between the two years.

### Statewide Estimate for Helmet Use

The same procedures for calculating the statewide estimate for seatbelt use were applied to the motorcycle observations. See page16 for a description of the process and Appendix E for a copy of the calculations. The weighting formula was modified to account for sites with missing data.

**The resulting estimate for helmet use on all South Dakota roads was 53.37% with a standard error of 0.8889.** Thus, it can be said that there is a 95% probability that the true rate of helmet use for South Dakota roads ranges between 51.63 and 55.11. While this percentage is currently the best possible estimate of helmet use for South Dakota, increasing the sample size of motorcycles in a future survey would improve the reliability of a statewide estimate.

## Estimate of Statewide Helmet Use by Road Type

The 2010 weighted statewide estimates for seatbelt use by road type was 35.0% for urban highways, 59.2% for rural highways, 32.6% for urban interstates, and 59.4% for rural interstates.

## Motorcycle Helmet Use Unweighted Estimate for Drivers and Passengers

As illustrated in Table 11, helmet use was higher among passengers than drivers. Of the 495 passengers observed, 272 or 55% were wearing helmets. For the 1,649 drivers observed, helmets were worn by 697 or 42%.

**Table 11: South Dakota 2010 Unweighted Statewide Helmet Use**

| Motorcycle Riders | Helmet Use | | |
|---|---|---|---|
| | Yes | No | Total |
| Driver | 697<br>42.3% | 952<br>57.7% | 1649 |
| Passenger | 272<br>54.9% | 223<br>45.1% | 495 |
| Total | 969<br>45.2% | 1175<br>54.8% | 2144 |

## Motorcycle Helmet Use Unweighted Estimate by County

Helmet usage by county is illustrated in Table 12. The greatest overall number of motorcyclists were observed in Lawrence (n = 350), Minnehaha (n = 342), and Union (n=315) counties.

The highest helmet usage rate was observed in Lawrence County where 63% of motorcyclists were wearing helmets. This was a substantial increase over the rate of 40% observed during the 2009 survey. Fall River also had a high helmet usage rate of 62% , as did Brown County with 60% wearing helmets. Six counties had intermediate rates of helmet usage: Union (50%) Tripp (45%), Pennington (44%), Beadle (42%), Grant (42%), and Kingsbury (41%.) The four remaining counties had low helmet usage rates: Charles Mix (21%), Minnehaha (25%), Hughes (29%), and Davison (39%). Minnehaha County at only 25% was perhaps the most surprising, considering the popularity of motorcycle riding (n=342), and the relatively high proportion of non-motorcycle drivers that use seatbelts or other restraint (78%). This low helmet usage rate by motorcyclists in Minnehaha is comparable to the rate of 24% observed in the 2009 survey.

**Table 12: South Dakota 2010 Helmet Use by County**

| | Helmet Usage | | Total |
|---|---|---|---|
| County | Yes | No | |
| Minnehaha | 84<br>24.6% | 258<br>75.4% | 342 |
| Pennington | 96<br>44.0% | 122<br>56.0% | 218 |
| Brown | 130<br>60.5% | 85<br>39.5% | 215 |
| Lawrence | 219<br>62.6% | 131<br>37.4% | 350 |
| Davison | 49<br>38.9% | 77<br>61.1% | 126 |
| Beadle | 50<br>42.4% | 68<br>57.6% | 118 |
| Hughes | 28<br>28.9% | 69<br>71.1% | 97 |
| Union | 156<br>49.5% | 159<br>50.5% | 315 |
| Charles Mix | 7<br>20.6% | 27<br>79.4% | 34 |
| Grant | 49<br>42.2% | 67<br>57.8% | 116 |
| Fall River | 33<br>62.3% | 20<br>37.7% | 53 |
| Tripp | 22<br>44.9% | 27<br>55.1% | 49 |
| Kingsbury | 46<br>41.4% | 65<br>58.6% | 111 |
| Total | 969<br>45.2% | 1175<br>54.8% | 2144 |

**Motorcycle Helmet Use Unweighted Estimate by Age of Rider**

The overwhelming majority of motorcyclists observed were adults and all but one appeared to be at least five years of age. Of the 2,125 motorcyclists observed, 2,040 (96%) were estimated to be 18 years of age or older. Of the remaining, 75 or 4% were teens aged 14 – 17, 9 or .4% were aged 5 - 13 years, and 1 or <.1% were aged 0 – 4 years. As illustrated in Table 13, 100% or 1 of 1 children aged 0 - 4 years, and 78% or 7 of 9 children aged 5 - 13 observed riding on motorcycles were wearing helmets. Helmet usage among teens aged 14 - 17 was observed in 41 of 75 or 55% of riders, which is lower than younger children but higher than adults. Helmet usage among adults was 906 of 2,040 or 44%.

**Table 13: South Dakota 2010 Helmet Use by Age**

| Age | Helmet Usage | | Total |
|---|---|---|---|
| | Yes | No | |
| 0-4 years | 1<br>100.0% | 0<br>.0% | 1 |
| 5-13 years | 7<br>77.8% | 2<br>22.2% | 9 |
| 14-17 years | 41<br>54.7% | 34<br>45.3% | 75 |
| 18+ years | 906<br>44.4% | 1134<br>55.6% | 2040 |
| Total | 955<br>44.9% | 1170<br>55.1% | 2125 |

## Motorcycle Helmet Use Unweighted Estimate by License State

Most of the motorcyclists observed had South Dakota license plates—1,485 or 76%. Similar to the finding for seatbelt data, a lower percentage of in-state riders wore helmets (37%) than did riders with out-of-state license plates (67%).

**Table 14: South Dakota 2010 Helmet Use by License State**

| License State | Helmet Use | | |
|---|---|---|---|
| | Yes | No | Total |
| In State | 550<br>37.0% | 935<br>63.0% | 1485 |
| Out of State | 309<br>67.2% | 151<br>32.8% | 460 |
| Total | 859<br>44.2% | 1086<br>55.8% | 1945 |

## Discussion

### Seatbelt Use

Results of the 2010 survey established that the weighted statewide estimate of restraint use was 74.5% -- a historical high for the State of South Dakota. The 2010 statewide South Dakota rate was 2.4 points higher than the rate of 72.1% observed in the 2009 survey. This upward shift was statistically significant. The change was due in large part to a dramatic 9.5% increase in seatbelt use on urban highways (74.3% in 2010 from 64.8% in 2009). Also contributing was a 4.5% increase in seatbelt use on rural highways (71.5% in 2010 from 67.0% in 2009) and a 2% increase on urban interstates (75.8% in 2010 from 73.8% in 2009). The only negative news was that seatbelt use on rural interstates declined by 4.6% (78.6% in 2010 from 83.2% in 2009.) All changes in seatbelt rates between 2010 and 2009 for road types were statistically significant.

The strong increase in the statewide rate in 2010 following the slight increase in rate between 2008 and 2009 (71.8% to 72.1%) indicates that overall seatbelt use on South Dakota roadways is on the upswing. The statewide seatbelt rate has not stalled or declined, as suggested by a slight decrease in rates between 2007 and 2008 (73.0% to 71.8%). More positive news is that seatbelt use rates for urban and rural highways have for the first time broken into the 70% range. It can be said in 2010 that seatbelt use is moving toward uniformity on the four major road types.

There were some interesting outcomes for unweighted county rates for the 2010 survey. Rates for the two largest counties in the state actually decreased from the previous year: Minnehaha declined from 80% in 2009 to 78% in 2010; Pennington dipped from 69% in 2009 to 65% in 2010. The pattern across survey years for these two counties suggests that they may have reached a plateau or flat phase in seatbelt use. Minnehaha County is hovering in the high 70% to 80% range, whereas Pennington is fluctuating in the high 60% to 70% range. National rates show a plateau phase from 2005 to 2007 when rates hovered between 82% and 81%. However, the national rate eventually moved upward to 84% in 2009. It remains to be seen if Minnehaha and Pennington rates will break into higher ranges of seatbelt use.

A decrease in rates in Minnehaha and Pennington counties would normally result in a lower statewide estimate because results for these two populated counties are weighted heavily in the formula. However, rates for 8 of the 13 other less populated counties increased sufficiently to raise the statewide estimate. Counties showing increases were Hughes (+24 points), Charles Mix (+23 points), Tripp (+15 points), Brown (+13 points), Lawrence (+13 points), Grant (+11 points), Davison (+10 points), and Beadle (+2 points). Union County declined by 8 points, but still had a very high rate of 89%. Fall River, a county with a record of fluctuations, declined by 12 points. The positive news is that higher seatbelt use rates in South Dakota are becoming more uniform throughout the different regions of the State. For the first time in the history of the surveys, no county fell below the 60% use rate.

Another positive finding is that restraint use (car seat or seat belt) for children who appeared to be under age 5 remained at a high rate of 82% (73 of 89 children). This is the fifth consecutive year that restraint use for children under five has been in the 80% range. The all-time-high rate of 88% for this age group in 2006, however, has yet to be matched. The survey also showed that 66% (59 of 89 children) had the mandated protection of a car seat. In addition, 63% (56 of 89 children) had the added protection of being placed in a car seat in the backseat. However, 9% (8 of 89 children) under age 5 were observed standing or sitting in the middle of the front seat or on laps of front seat passengers without any restraint protection. Note that Observers had to guess at children's ages, but their age judgments of infants and very young children in car seats were likely to be accurate.

The seatbelt use for young children who appeared to be 5 to 13 years matched an all-time-high of 74% measured in 2008. The youth group that is traditionally the most resistant to seatbelt use – teens age 14 to 17 – was found to have an all-time high rate of 69%. This rate is a dramatic improvement over the 41% rate measured for this age group a decade ago. The 2010 survey is notable in that for the first time the rate for adults (70%) was nearly matched by the teen age group (69%), and the rates for both of these groups were reasonably close to the rate for children age 5 to 13 (74%). There has been an upward and converging trend for seatbelt use for these three age groups.

The 2010 survey revealed that seatbelt use of occupants of pickup trucks (57%) was substantially lower than for cars (71%), SUV's (71%) and for vans and station wagons (77%). The low rate for pickups has been found every survey year since 2007 when pickup trucks were placed in a separate observation category. This low rate of seatbelt use in pickup trucks occurs in all parts of the country (Pickrell & Ye, 2008.) The resistance of pickup occupants to seatbelt use presents a traffic safety challenge for South Dakota where pickups remain a popular vehicle of choice. In the 2010 survey, 27% of all occupants were in a pickup truck.

The 2010 survey found that seatbelt use rates were higher for right-front passengers (72%) than for drivers (69%), a result consistently found in past surveys. Another consistent finding is that seatbelt use was higher for out-of-state motorists (82%) than for motorists with South Dakota plates (66%).

***Motorcycle Helmet Use***

The 2010 survey was the second one to include observations of helmet use by motorcyclists. In 2009, the first year to include motorcycles, we had Observers add motorcycles as a vehicle type to the regular automobile survey conducted in early June. This method produced a sample of only 530 motorcycles. We were able to add 504 motorcycles in a supplemental mini-survey in Minnehaha and Pennington counties in late June. Combined results showed that only 36% of observed cyclists wore helmets (34% for drivers and 42% for passengers). We reported the 36% rate as an unweighted average largely reflecting helmet use in Minnehaha, Pennington, and Lawrence

counties. We were unable to conduct a statewide estimate due to missing data from many sites throughout the 13 counties.

In 2010 survey we expanded the supplemental motorcycle survey to all 13 counties. Combining the two surveys, we were successful in obtaining data on 2,122 motorcycles, (over 1,000 more than in 2009.) The sample sizes by county were large enough to compute a statewide estimate of motorcycle helmet use of 53%. Thus, it is estimated that slightly over half of motorcyclists traveling South Dakota roads in June wore helmet protection. The only comparison figures for South Dakota are from a series of studies conducted in the 1970s just before and after repeal of a universal helmet law. In 1976, before repeal, helmet use rate approached 100%. Post repeal rates were 57% in 1977 and 48% in 1978 (Struckman-Johnson & Ellingstad, 1980). Thus, it appears that current helmet use in South Dakota is similar to levels observed in the late 1970's following the repeal of a universal helmet law.

Statewide estimates by road type showed that motorcyclists had the lower rates of helmet use on urban highways (35%) and urban interstates (32%). Most likely, motorcyclists are like motorists who perceive less risk of accidents if they are traveling short distances on roads close to home. In contrast, statewide estimates revealed that higher percentages of motorcyclists riding on rural highways (59%) and rural interstates (59%) wore helmets. Motorcyclists and motorists are probably alike in that they increase their use of protective devices when traveling long distances at high speeds.

Only one child under the age of five was observed riding on a motorcycle, and this child had a helmet on. Of the 9 riders who appeared to be 5 – 13 years of age, 7 or 78% wore helmets. Of 75 riders appearing to be 14 – 17, only 55% were helmeted, despite the presence of a South Dakota law that mandates helmets for those under age 18.

***Retrospective on Survey Influences***

Each year we review factors that potentially influenced the outcome of the South Dakota seatbelt and motorcycle helmet use survey. Considering survey factors, we had another good year for observer reliability. Most of the Observers for the 2010 survey were experts who had participated in one or more previous surveys. Another strength of the 2010 survey was that the motorcycle sample was increased to over 2,100 observations, thus improving the representativeness and the reliability of the results. With this larger sample, we were able to calculate the first-ever weighted statewide estimate for helmet use. However, there is still room to increase the motorcycle sample size for a future survey. Problems this year were with the stormy weather, which hampered observations and reduced sample sizes particularly in Tripp and Charles Mix counties. Ongoing construction prevented observations at numerous sites throughout the state, including three sites in Minnehaha county.

Every survey year there are extraneous factors that affect traffic dynamics and indirectly influence the survey results. In 2010, the rain, wind storms, and flooding in

June most certainly affected traffic dynamics. Cloudy, rainy weather is known to decrease motorcycle riding and increase helmet use. The ongoing recession is said to be affecting traffic dynamics throughout the nation, most obviously with decreased miles being traveled. For South Dakota, one likely effect is that tourist travel on interstates and highways is down. Gas prices this June were not as high as two years ago, a factor that may have boosted traffic on all roadways. Some speculate that the recession and cost of gas has boosted the number of motorcycles on the road. These factors and others that may reveal themselves in the future likely had some unknown imprint on the survey results.

**The Future**

Seatbelt use is at an historically high level of 74.5% for the state, but yet this rate is still below the 2009 national level of 84%. Will South Dakota be able to break through to a higher level of seatbelt use in the years to come or will rates stabilize? From our reading of the literature and trends, the highest seatbelt rates are found in states with primary enforcement laws (Beck et al., 2007). The latest trend is for states to add enforcement of seatbelts for backseat passengers ("Seatbelt laws", 2010). Whether South Dakota follows this path or maintains its secondary enforcement law will most likely be debated in the future meetings of the State legislature.

We discovered two recent studies relevant to this debate. One was a survey that found that rural Minnesotans, compared to urban Minnesotans, were less accepting of the "utility" of traffic safety interventions that involve law enforcement. The authors recommended that traffic safety be improved by using local mechanisms that reflect rural culture, rather than imposing laws by State or National authorities (Rakauskas et al., 2009). In another study, however, adults in Montana were polled about having a primary enforcement law for seatbelt use. Despite Montana being a rural state with a secondary seatbelt law, 61% of respondents supported having such as law. Support was highest among women, older persons, American Indians, persons with health insurance, and those who wear their seatbelts (Perkins, et. al., 2009.)

With helmet use at a level of 53%, South Dakota is below the national level of 63%. One way for South Dakota to increase helmet rate would be to reinstate a universal helmet law which was repealed in 1977. States with universal helmet laws show helmet rates as high as 100% (Derrick & Faucher, 2009.) Our review of the literature suggests that any effort to strengthen helmet laws will be opposed by those who support personal freedoms of motorcycle riders and supported by those who perceive helmetless riders are a danger to themselves, a drain on public health resources, and a burden to tax payers (Homer & French, 2009). While this controversy is sorted out in State legislatures, an alternative approach recommended by the United States DOT (2007) and many traffic experts is to continue to support educational programs to teach skills and helmet use behavior to new and young motorcycle riders.

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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

### OBSERVER INSTRUCTIONS FOR COMPLETING THE SEATBELT / MOTORCYCLE HELMET USE SURVEY FORM

**South Dakota Statewide Seatbelt and Motorcycle Helmet Use Surveys**

**June, 2010**

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. Since 2009, 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 7$^{th}$ column, the occupant's age is estimated. In the 8$^{th}$ 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 40 minute observation period. In the past, some Observers incorrectly started with the last 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.**

- **Since 2009, remember that motorcycles are recorded as Vehicle Type 5. For motorcycles, the Driver code is 5 and the passenger code is 6. A motorcycle rider wearing a helmet is coded 4 and a rider without a helmet is coded 5.**

- **Remember to give an "extra" child passenger (0 – 4 years of age) who is sitting or standing in the <u>middle</u> of the front seat or on <u>the lap</u> of any person in the front seat the *Driver/Passenger/Extra code of "3"*. Give any child 0 – 4 years in the <u>back seat</u> the 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.**

- **Remember to use the Road Type code number for a site that appears in the description in the <u>site list</u>. 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 <u>one</u> 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 any person's lap or in the center of the 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 one 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 selected for observation. Sequential means that the next vehicle gets the next higher number. 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 “5”. 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 seat who are sitting or standing on a person’s lap or in the middle of the seat 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, 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 an "extra" child 0-4 years old in the front seat **in addition** to the right front seat passenger, give a Seatbelt Use code of "3" if a child restraint is in use (e. g., a safety seat is placed in the middle of the seat.) Code "1" if the child 0-4 years 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.

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. 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 cannot determine age at all, e.g., large hat obscuring face of vehicle occupant or a full face helmet on a motorcycle rider.

License State

This column is used to indicate whether or not the license plate on the observed vehicle is from South Dakota of 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 5, 2010 would be recorded as "060510".

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!

## SURVEY 2 OF MOTORCYCLES

This year the Office of Highway Safety is funding a second survey of motorcycle drivers and passengers to take place from Friday, June 25 through Sunday, June 28. The purpose of this survey is to increase the sample size of motorcycles observed in the first survey in early June. In 2009, the first year when motorcycles were added to the four-wheeled vehicle survey, there were too few motorcycles observed in most counties for a reliable analysis. The weather was too wet and cool for motorcycle riding. As an experiment, two Observers from Pennington and Minnehaha counties went out at the end of June for four observation hours and observed enough motorcycles for a better analysis.

This year we are asking Observers for all 13 counties to go out for a total of eight observation hours during a late June weekend. Each Observer will choose the **eight sites** from their county's original seatbelt site list where they expect to have the **highest motorcycle traffic**. Observers will then **make up their own schedule** for their eight observation hours at these sites Friday through Monday using the 7:30am – 4:30 pm time periods. The one restriction is that four of the hours must be on a weekday (Friday or Monday), and four must be on a weekend (Saturday or.Sunday). It is expected that Observers will watch the weather and pick the hours and days when the weather is sunny and the motorcyclists are out. The procedures for conducting Survey 2 are identical to those used in the first survey in June, with the exception that only **motorcycles are observed.** In mid-June, Cindy Struckman Johnson will call each Observer and confirm which eight sites are being chosen and answer any questions. After Observers have completed their observations for Survey 2, they are to return the data in an envelope that will be provided in a second mailing from Cindy that will take place mid-June.

**After the two surveys are completed, 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.**

## 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 motor vehicles and one motorcycle 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/ Extra 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.

**<u>Vehicle 004</u> – 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.

**<u>Vehicle 005</u> – 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.

**<u>Vehicle 006</u> – 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 light for this sample!

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. 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.

**STAY SAFE AND GOOD LUCK!**

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 1 | 1 | 1 | 1 | 4 | 1 | 0 | 3 | 0 | 3 | 2 | 06 | 7 | 09 | 59 | 10 | 09 | D. | S. | 1 |
| 0 | 0 | 2 | 3 | 1 | 1 | 4 | 1 | | | | | | | | | | | | | | |
| 0 | 0 | 2 | 3 | 2 | 3 | 1 | 1 | | | | | | | | | | | | | | |
| 0 | 0 | 3 | 2 | 1 | 2 | 4 | 2 | | | | | | | | | | | | | | |
| 0 | 0 | 3 | 2 | 2 | 1 | 5 | 2 | | | | | | | | | | | | | | |
| 0 | 0 | 3 | 2 | 3 | 2 | 1 | 2 | | | | | | | | | | | | | | |
| 0 | 0 | 4 | 1 | 1 | 1 | 4 | 1 | | | | | | | | | | | | | | |
| 0 | 0 | 4 | 1 | 4 | 3 | 1 | 1 | | | | | | | | | | | | | | |
| 0 | 0 | 4 | 1 | 4 | 2 | 1 | 1 | | | | | | | | | | | | | | |
| 0 | 0 | 5 | 1 | 11 | 1 | 3 | 1 | | | | | | | | | | | | | | |
| 0 | 0 | 5 | 1 | 4 | 1 | 1 | 1 | | | | | | | | | | | | | | |
| 0 | 0 | 6 | 5 | 5 | 5 | 4 | 1 | | | | | | | | | | | | | | |
| 0 | 0 | 6 | 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

## Supplemental Survey Instructions

June 17, 2010

Dear Observers,

We are getting close to the time to start the Motorcycle-Only Survey scheduled for Friday, June 25, through Monday, June 28. The purpose of this survey is to add to the number of motorcycle observations from the early June survey.

Your task is to go out and observe for a 40-minute period at eight of the sites from the site list that you use for the regular seatbelt/motorcycle survey. You get to choose the eight sites where you think motorcycle traffic will most likely be. You also get to choose the day and time to observe over the four days. Try to get half of the hours on a weekday and half on a weekend, if you can. Aim for days and times where the weather is good for motorcycle riding. You may choose a time that is past 4:30 pm and into the evening hours. If so, write the time on the data sheets as a new code of "7".

Motorcycle traffic in some counties may be low, even in good weather. Don't worry about how many cycles you observe -- Just send in the data on what you find!

I am sending a blank schedule for you to write down what sites you observe and the day and time. Please return this schedule when you send back the data sheets in the enclosed priority mail envelope. I have enclosed $6 and a delivery confirmation sticker for this second mailing. Please get the data back ASAP as the deadline for the report is tight!

Thanks again for your help!

Sincerely,

Cindy Struckman-Johnson
Project Co-Director

## Appendix D

## Computatation 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 2010 South Dakota Survey, the following values were obtained

| | | |
|---|---|---|
| Urban Highway: | $w_1 = 0.18324$ | $\hat{P}_1 = 74.33$ |
| Rural Highway: | $w_2 = 0.44819$ | $\hat{P}_2 = 71.48$ |
| Urban interstate: | $w_3 = 0.05521$ | $\hat{P}_3 = 75.85$ |
| Rural interstate: | $w_4 = 0.31336$ | $\hat{P}_4 = 78.64$ |

Thus, statewide seat belt use is estimated as 74.48% for 2010.

**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 0.1698. The sampling error is then 0.4121.

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

(statewide mean) +/- (1.96)(0.4121).

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

73.68% +/- (1.96)(0.4121) or p(73.68% < Statewide Use < 75.29) = .95

In non-statistical terms, there is a 95% chance that the true statewide seatbelt use rate in South Dakota is between 73.68% and 75.29% with our best estimate being that it is 74.48%.

## Appendix E

### Computatation of Mean Helmet Use for South Dakota

The computation of the mean helmet use for in South Dakota was a three-stage process. Stage 1 consisted of computing mean helmet use for each road type in each county. 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 helmet 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 helmet 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 helmet 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 helmet 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 helmet 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 2010 South Dakota Survey, the following values were obtained

| | | |
|---|---|---|
| Urban Highway: | $w_1$ = 0.18324 | $\hat{P}_1$ = 35.04 |
| Rural Highway: | $w_2$ = 0.44819 | $\hat{P}_2$ = 59.20 |
| Urban interstate: | $w_3$ = 0.05521 | $\hat{P}_3$ = 32.65 |
| Rural interstate: | $w_4$ = 0.31336 | $\hat{P}_4$ = 59.40 |

Thus, statewide seat belt use is estimated as 53.37% for 2010.

**Computation of Variance and Confidence Bounds for Mean Seat Belt Use for South Dakota - 2010**

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 0.791986. The sampling error is then 0.889936%.

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

(statewide mean) +/- (1.96)(0.889936).

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

53.37% +/- (1.96)( 0.889936) or p(51.63% < Statewide Use < 55.11) = .95

In non-statistical terms, there is a 95% chance that the true statewide helmet use rate in South Dakota is between 51.6% and 55.1% with our best estimate being that it is 53.37%