2002 South Dakota

Statewide Seatbelt Survey

Final Report

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Summary

A statewide observational survey of seatbelt use on South Dakota (SD) roads was conducted in June of 2002. Seatbelt use and other demographic data were recorded from 11, 941 motorists traveling along a selected sample of SD roadways, which included rural and urban highways and interstates in 13 South Dakota counties. Data were recorded from all drivers, right front passengers of any age, and additional children under age 5 in the front or back seat. Results revealed that 61.1% of observed occupants were wearing a seatbelt or child restraint. When this percentage was weighted for road type and vehicle miles traveled at observation sites, the statewide estimate for seatbelt/child restraint use was 64.0%. This number compares with the statewide estimate of 63.3% in the Fall 2001 survey and 53.4% in the Fall 2000 survey.

The 2002 weighted statewide estimates for seatbelt use by road type were 60.0% for urban highways, 56.5% for rural highways, 75.7% for urban interstates, and 74.8% for rural interstates. These numbers compare with 2001 statewide estimates of 55.4%, 57.5%, 67.1%, and 75.5%, respectively.

Based on unweighted seatbelt rates, the highest use rates were found in east river counties of Davison (76.2%), Union (70.9%), and Minnehaha (68.7%). Intermediate rates were observed in the counties of Grant (65.9%), Beadle (62.5%), Hughes (61.9%), and Fall River (61.5%). Lower rates were found in Brown (56.1%), and Lawrence (54.1%). Pennington, the most populated west river county, had a rate of 63.3%. Small rural counties had the lowest rates: Charles Mix (41.2%), Tripp (46.8%) and Kingsbury (45.7%). Seatbelt use rates in 9 of the 13 counties showed increases from the 2001 survey rates.

Unweighted seatbelt use rates varied by estimated age group of vehicle occupants. Of a small sample of 82 children who appeared to be under age 5, 67.1% were in some type of safety restraint, with 31.7% in a seatbelt only and 35.4% in a child restraint. The 2002 restraint usage (seatbelt or child restraint) use rate for 116 children judged to be 5 to 13 years old was 55.2%. The rate for 429 teens who appeared to be between 14 and 17 years old was a low 48%. The seatbelt use rate for occupants who appeared to be age 18 years and older was 61.6%. Comparable rates in the 2001 survey were 77.8% for children under 5, 63.2% for children 5 – 13, 45.6% for teens, and 56.5% for adults.

More right front seat passengers (64.4%) than drivers (59.9%) were wearing safety restraints. Seatbelt use also varied by vehicle type. Occupants of sport utility vehicles (67.0%) and cars (66.1%) were more likely to wear safety restraints than were occupants of vans and pickups (52.9%). Finally, it was found that a higher percentage of occupants of out-of-state vehicles (75.1%) wore safety restraints than did occupants of vehicles with South Dakota license plates (58.2%).

Introduction

Motor vehicle injuries and fatalities are a leading cause of death and injury in the United States. Nationwide, motor vehicle accidents are the leading cause of injury-related deaths for all age groups and are the leading cause of death for persons aged 6 to 27 years (National Highway Transportation Safety Administration-NHTSA, 2001).

According to South Dakota Highway Patrol records, a total of 154 fatal accidents with 171 fatalities occurred on South Dakota roads alone during the year 2001. Since January 1st of 2002, 83 fatal accidents with 93 fatalities have occurred in SD, representing a 12% increase from 2001 records. These findings are discouraging given the steady increases in seatbelt restraint use observed in South Dakota in recent years (Struckman-Johnson, Baldwin, Struckman-Johnson, & Galinsky, 1998; Baldwin, Struckman-Johnson & Struckman-Johnson, 2000; 2001).

Rural communities face particular challenges in encouraging motorists to comply with seatbelt legislations. While nationwide, males have been found to have lower seatbelt usage rates as compared to females (Brooke et al., 2001; Wells et al., 2002) male farmers are particularly negligent in restraint usage. In a recent investigation of injury risk factors conducted in rural Iowa, restraint usage rates for male farmers were found to be significantly less than those observed for male non-farmers. Usage rates by farm women did not differ from non-farm women (Zwerling et al., 2001). Seatbelt usage rates have also been found to be significantly less among lower socioeconomic status populations (Lerner et al., 2001; Wells et al., 2002) and among persons without college degrees (Wells et al., 2002), at least in states, such as SD, without primary enforcement regulations.

Safety restraint usage by front seat motor vehicle occupants became mandatory in SD on January 11995 (DOT, 2002) and by 1996, 49 out of 50 states had some type of statewide legislation mandating safety restraint usage (Derrig, Segui-Gomez, Abtahi, & Liu, 2002). Yet, despite these mandates a surprisingly large number of motor vehicle occupants continue to travel unrestrained, particularly in select population groups. Additionally alarming is the observation that the driver population most likely to be non-users of safety belts are also more likely to engage in other high risk driving behaviors such as driving after drinking, tailgating, running red lights, and driving at excessive speeds (Wells, Williams, & Framer, 2002).

Seatbelt use has consistently been shown to significantly reduce fatality rates for victims of motor vehicle accidents (Derrig et al., 2002). Seatbelt use has also been shown to significantly decrease the severity of injuries in a motor vehicle crash and in particular decreases both the incidence and severity of potentially fatal closed head injuries (Norris, Matthews, Riad, 2000). According to the NHTSA, deaths and serious disabilities caused by motor vehicle crashes could be reduced by approximately 50% with the use of safety

belts and child restraint devices. Seatbelts are estimated to save 9,500 lives in America each year. Research has found that lap/shoulder belts, when used properly, reduce the risk of fatal injury to front seat passenger car occupants by 45% and the risk of moderate-to-critical injury by 50%. Yet, NHTSA records indicate that fewer than 40 percent of both adults and children who die in traffic crashes are properly restrained.

These facts and figures emphasize the importance of safety restraint usage at the local level. In response to a national initiative by the NHTSA, the South Dakota Office of Highway Safety commissioned associates of the Human Factors Laboratory (HFL) at the University of South Dakota to conduct a probability-based survey of seatbelt use in the state in 1998, 2000, 2001, and currently during the summer of 2002. The purpose of these studies was to document the level of seatbelt use in a sample of drivers and front seat passengers traveling in noncommercial vehicles on South Dakota roads during the last quarter of 1998, 2000, and 2001 and during the third quarter of 2002. The methods and procedures developed and implemented in the1998 study resulted in a systematic procedure that: a) could be replicated in future investigations; and, b) would establish a base rate of current seat belt use that could be compared to future investigations as a means of evaluating programmatic efforts aimed at increasing usage rates.

This report presents the methods, procedures and results of the 2002 Statewide Seatbelt Survey. As indicated, the methods used in the 2002 study were based in large part on those established in the 1998 survey and used subsequently in the 2000 and 2001 surveys. Modifications were made to the 1998 survey design for data collection in the 2000 survey. These modifications were again implemented in the 2001 and 2002 survey design and are indicated along with a rationale for their inclusion. Results of the 2002 survey are presented followed by a discussion of the general trends observed in usage rates and implications for future surveys and public safety programming.

Methods

The methods used in this study were designed and conducted according to federal guidelines established by NHTSA and as implemented in the previous 1998 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). One modification to the design of this survey was implemented in an effort to increase the observational rate for children under the age of 5 years.

Survey Design: Stage 1

This study utilized the geographic sampling techniques and road segment sites established in the 1998 survey. These road segment sites were established in 1998 based on the following process. 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	5,668	0.77%	15.21%
35	McCook	5,686	0.77%	15.98%
36	Kingsbury	5,830	0.79%	16.77%
37	Day	6.421	0.87%	17.64%
38	Moody	6,538	0.89%	18.53%
39	Tripp	6,883	0.93%	19.46%
40	Custer	6,966	0.94%	20.40%
41	Fall River	7,123	0.97%	21.37%
42	Bon Homme	7,677	1.04%	22.41%
43	Spink	7,700	1.04%	23.45%
44	Grant	8,048	1.09%	24.54%
45	Hutchinson	8,102	1.10%	25.64%
46	Turner	8,633	1.17%	26.81%
47	Butte	8,926	1.21%	28.02%
48	Todd	9,296	1.26%	29.28%
49	Charles Mix	9,493	1.29%	30.57%
50	Roberts	9,973	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	7,379,733	100.00%	

Following 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. Table 2 lists the counties that were selected and their corresponding populations.

Table 2: Selected 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

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.

Survey Design: Stage 2

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

However, assessment of 1998 VMT estimates for South Dakota roadways revealed that only an average number of 27 road segments were available for sampling in the 13 counties. (Relative to other states, South Dakota has a limited number of roadways for which VMT estimates are recorded.) Therefore, permission was received from the 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 Highways -- principal and minor highways outside of urban areas.

Following recommendations from the 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 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. One observation time 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, 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) 7:30AM - 9:00AM
2) 9:00AM - 10:30AM
3) 10:30AM - 12 noon
4) 12 noon - 1:30PM
5) 1:30PM - 3:00 PM
6) 3:00PM - 4:30PM

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

For the 2000 survey, the 1998 data collection form was modified to reflect the inclusion of additional child passengers between 0-4 years of age. This modification was also implemented in the 2001 survey. A copy of this modified form is included on the last page of the Observer Manual in Appendix B. The 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. The modified form also included instructions for recording additional front seat passengers and back seat passengers who were under the age of five years.

The form allowed collection of other information of interest to the South Dakota Office of Highway Safety, including child restraint use for all passengers who appeared to be under age five, estimated age of drivers and passengers, vehicle type, and in- or out-of-state license plate of the vehicle. Demographic data were also collected for each vehicular observation period including county, site number, time of day, date, observer initials, and roadway type. Data were collected for all passenger cars, pickups, vans, and sport utility vehicles observed. Commercial trucks and motor homes were excluded.

Observers, Observation Procedures, and Observer Training

Two Observers were assigned to a county. The Observers were members of a retired citizen group who have a background in driver education. Members of this group have been found to be accurate and motivated observers of seatbelt use in previous surveys. Observers received (1) a list of observation sites and a description and maps of the site locations for their respective counties, (2) a four-day schedule for completing a 40-minute observation period of each site in their county, and (3) an instruction manual explaining how to conduct roadside observations. In addition, the Office of Highway Safety issued Observers safety vests and clipboards. Observers received training through a series of telephone conference calls with the HFL investigators. They were instructed to read the manual and engage in a practice period using local traffic. After the practice period, Observers received a final call from the investigators to review procedures.

Observers were instructed to follow their observation schedules as closely as possible. In the event that Observers could not complete a scheduled site due to weather or complications, they were instructed to call the HFL investigators for reassignment of that site. Observers were asked to stand or park in a safe viewing place when they reached an observation site. They were to station themselves so that they could view traffic traveling in a pre-designated direction on the pre-designated roadway. Observers were instructed to monitor every vehicle if the traffic flow was regular or light, and every other vehicle if the traffic flow was heavy. Observers monitored traffic for 40 minutes of the 90 minute observation period, and used the remaining minutes for travel time and location of a safe observation point.

The data collection procedures are explained in detail in the "Observer Manual – 2002 South Dakota Seatbelt Survey" in Appendix B.

Results

A total of 11,941 observations from the 13 selected counties are included in the analyses. A small percentage of observations could not be included in individual analyses due to actual missing data. Table 3 presents a summary of unweighted data regarding overall seatbelt restraint use in each county as well as the total number of observations per county. Of the 11,941 motorists, 7294 or 61.1% were wearing shoulder safety restraints or were placed in a child restraint, while 4647 or 38.9% were not wearing safety restraints. Restraint use was coded "yes" if there was an observed presence of a shoulder harness. Using the presence of a shoulder strap to indicate seatbelt restraint usage has been demonstrated in previous research to result in the highest accuracy rate as compared to other existing methods. Child restraint use was coded "yes" if a child was seated in a restrained child safety seat regardless of whether or not a shoulder restraint securing the child safety seat was in view.

Table 3: Restraint Use by County

County	Restraint Used Yes	Restraint Used No	Total
Minnehaha	904 68.7%	411 31.3%	1315
Pennington	643 63.3%	373 36.7%	1016
Brown	732 56.1%	573 43.9%	1305
Lawrence	497 54.1%	421 45.9%	918
Davison	987 76.2%	308 23.8%	1295
Beadle	679 62.5%	408 37.5%	1087
Hughes	913 61.9%	562 38.1%	1475
Union	371 70.9%	152 29.1%	523
Charles Mix	248 41.2%	354 58.8%	602
Grant	460 65.9%	238 34.1%	698
Fall River	289 61.5%	181 38.5%	470
Tripp	256 46.8%	291 53.2%	547
Kingsbury	315 45.7%	375 54.3%	690
Total	7294	4647	11941
% of Total	61.1%	38.9%	

Estimate of Statewide Seatbelt Use

The statewide estimate of seatbelt use was obtained by finding the percentage of seatbelt use for each site, 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 (vehicle miles traveled) 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 64.0% with a standard error of 0.387. Thus, it can be said that there is a 95% probability that the true rate of seatbelt use for South Dakota

roads ranges between 63.2% and 64.7%. The formulas and weights for calculating the statewide estimate and standard deviation are in Appendix C.

Although the 2002 statewide estimate is approximately 0.7% higher that the 2001 rate, the confidence intervals for the two estimates overlap significantly. It would be prudent to say that the 2001 and 2002 seatbelt use rates were statistically the same.

Estimate of Statewide Seatbelt Use by Road Type

The 2002 weighted statewide estimate for seatbelt use on urban highways was 60.0%, which was statistically higher than the estimate of 55.4% for the 2001 survey. The 2002 estimate of 56.5% for rural highways was statistically similar to the rate of 57.5% for the 2001 survey. The 2002 weighted statewide rate for urban interstates was 75.7% which was statistically higher than the estimate of 67.1% for 2001. The 2002 weighted estimate for rural interstates was 74.8%, which was statistically similar to the 2001 rate of 75.5%. The increases observed in urban highways and urban interstates may indicate that seatbelt use by South Dakota motorists has increased on these types of roads. However, the differences could also reflect increased travel by out-of-state motorists who are more likely to be wearing seatbelts. The increases could also be due to the seasons when the two surveys were conducted—summer for the 2002 survey and fall for the 2001 survey. In any case, the increases were on the road types that together represent only slightly over one fifth of the roads in South Dakota. Thus, the changes were not substantial enough to increase the weighted statewide estimate of seatbelt use between the 2001 and 2002 survey periods.

Seatbelt Restraint Use by County

As illustrated in Table 3, unweighted seatbelt use was highest in Davison where 76.2% or 987 of the 1295 motorists observed were wearing safety restraints. This rate represents a substantial increase over the rate of 66.8% observed in the 2001 survey. The next highest rate of seatbelt usage was observed in Union County where 70.9% or 371 of 523 of the motorists observed were wearing restraints. This rate is consistent with the rate of 70.7% observed in Union County in the 2001 survey. In the 2002 survey, Minnehaha County had the next highest rate of seatbelt use with 68.7% or 904 of the 1315 motorists observed wearing a safety restraint. This rate was also very consistent with the rate of 69% observed in Minnehaha County in the 2001 survey. The 2002 rate observed in Grant County was 65.9% or 460 out of 698 motorists wearing a safety restraint. In comparison, the 2001 seatbelt use rate for Grant County was 53.3%.

Seatbelt use was lowest in Charles Mix County where 41.2% or 248 of 602 motorists observed were wearing a safety restraint. This usage rate, though modest, represents a substantial increase over the rate of 28.4% observed in Charles Mix County in the 2001 survey. The next lowest rate of restraint use in the 2002 survey was in Kingsbury County where only 45.7% of 690 motorists observed wore seatbelts. This rate is slightly higher than the 44.4%% rate observed in 2001. Tripp County's low rate of 46.8% (256 of 547 motorists) in the 2002 survey was nonetheless higher than its rate of 38.5% observed in 2001.

Several counties had restraint usage rates in the 50%-60% range. Brown had an observed restraint usage rate of 56.1% or 732 of 1305 observed motorists in the 2002 survey. This rate was lower than the rate of 64.1% observed for Brown County in the 2001 survey. In the 2002 survey, Lawrence County had a rate of 54.1% or 497 of 918 occupants, which was also lower than the 2001 rate of 62.3% and lower than the 2000 observed rate of 72.6%. Beadle had a 2002 rate of 62.5% or 679 of 1087 observed motorists wearing a seatbelt. This rate represents a moderate increase from the 2001 rate of 56.8% for Beadle County.

Fall River's 2002 rate of 61.5% (289 of 470 motorists) was slightly higher than the 2001 rate of 57.8% of observed motorists wearing safety restraints. Pennington County's 63.3% rate for the 2002 survey (643 of 1016 occupants) was substantially higher than the 2001 rate of 50.9%, which had shown a substantial increase from the 2000 rate of 42.1%. Finally, Hughes County's 2002 rate increased considerably to a usage rate of 61.9% (913 of 1475 occupants) as compared to a 2001 rate of 53.9% and a 2000 rate of 36.2%. In summary, 9 out of 13 counties showed an increase in seatbelt use rates from the 2001 to the 2002 survey periods.

Age of Motorist

Observers estimated the age of drivers and front seat passengers to the best of their ability. If the observer was unable to determine age, these few 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 years (2000, 2001, and the present 2002 surveys), if an additional passenger between 0-4 years of age was present in the front seat (e.g., on the right front passenger's lap or in the middle of the seat), data for this passenger were recorded. Data were also recorded for any child between 0-4 years of age riding in the back seat. This new protocol was adopted to increase the sample size of child passengers age 0–4 years for better estimates of child restraint use.

Child restraint use was defined as a passenger restrained by a child carrier. If children under the age of 5 years were observed riding in the front seat of a vehicle unrestrained, this was recorded as no restraint used. If a child under five years of age was observed riding in the front passenger seat wearing a shoulder restraint but not seated in a child carrier, then restraint use was recorded as a "yes". Note however, that according to South Dakota law, all children under the age of 5 years should be restrained in an approved child safety restraint unless they weigh more than 40 pounds. Table 4 illustrates the total number of observations and restraint use by each age group including the use of child restraints.

Table 4: Restraint Use by Age

Age	Restraint Use: Belt	Restraint Use: Child Restraint	Restraint Use: None	Total
0 - 4 years	26 31.7%	29 35.4%	27 32.9%	82
5 -13 years	62 53.4%	2 1.7%	52 44.8%	116
14 - 17 years	206 48.0%		223 52.0%	429
18 & over	6955 61.6%		4341 38.4%	11296
Total	7249 60.8%	31 0.3%	4643 38.9%	11923

A total of 82 children between 0-4 years of age were observed. Of these, a total of 67.1% were observed in some type of safety restraint: 35.4% (29/82) were buckled in a child safety restraint and another 31.7% (26/82) were wearing a shoulder restraint, but not seated in a child safety seat. The remaining 32.9% (27/82) were not wearing any type of safety restraint. Disturbingly, the 67.1% restraint use rate for children 0-4 years in the 2002 survey was substantially lower than the rate of 77.8% observed in the 2001 survey. However, the 2002 rate remains higher than the rate of 58% observed for children 0-4 years in the 2000 survey.

A total of 116 children between 5-13 years of age were observed. Of these, 64 or 55.2% were wearing some type of safety restraint, with 2 children observed in a child safety seat and another 62 wearing a standard safety belt type restraint. The remaining 52 or 44.8% of children aged 5-13 were not wearing a restraint of any type. This rate is lower than the 64.5% usage rate for 5-13 year olds observed in the 2001 survey, but is still higher than the rate of 51.3% for this age group in the 2000 survey.

A total of 429 motorists were estimated to be the teen-age category of 14 to17 years. Of these, 206 or 48.0% were wearing a safety restraint. This rate is slightly higher than the rate of 45.6% observed in the 2001 survey for this age group. The majority of observed motorists (a total of 11296) were estimated to be in the age group of 18 years and older. Of these, 6955 (61.6%) were wearing a restraint. This rate represents an increase from the adult usage rate of 56.5% observed in the 2001 survey and a rate of 53.2% observed in the 2000 survey for the adult age group.

<u>Drivers versus Passengers</u>

According to guidelines, data were recorded for all drivers and right front seat passengers. Data for additional passengers were only recorded if the additional passenger was under the age of 5 years (0-4 years).

Unweighted data for restraint use by occupant position in the vehicle is presented in Table 5. Restraint use was somewhat higher for passengers than for drivers. Of the 9,134 drivers observed, 5473 or 59.9% were observed wearing safety restraints. Of the 2759 right front seat passengers observed, 1777 or 64.4%% were wearing shoulder restraints, with an additional 11 or .4% in a child safety seat.

According to federal and state guidelines, children 0-4 years of age should be placed in a child safety restraint in the back seat, where possible. As indicated in Table 5, 78.6% (22 of 28) of the 0-4 year age children seated in the back seat were in fact observed in some type of safety restraint. However, only 14 of 28 or 50.0% were in a child restraint.

Data from 20 additional child front seat passengers were recorded. Of these 20, 11 (55%) were wearing some type of safety restraint, with 6 (30%) observed to be in a child safety seat and the remaining 5 (25%) in only a seatbelt.

Table 5: Restraint Use for Drivers versus Passengers.

	Restraint Use			
Occupant Type	Yes	Child Restraint	None	Total
Drivers	5473 59.9%		3661 40.1%	9134
Right –Front Passengers	1777 64.4%	11 .4%	971 35.2%	2759
Additional Child Front Passenger	5 25.0%	6 30.0%	9 45.0%	20
Child Passenger Back Seat	8 28.6%	14 50.0%	6 21.4%	28
Total	7263 60.8%	31 .3%	4647 38.9%	11941

Vehicle Type

Only non-commercial vehicles were observed. Vehicles were categorized into three classifications: cars; vans, mini-vans, pickups and station wagons; and Sport Utility Vehicles (SUVs). Table 6 presents a summary of data regarding restraint use in each vehicle category. The ratio of restraints worn per motorist is considerably higher in categories of cars (66.1%) and Sport Utility Vehicles (67.0%) than the rate observed for

vans/pickups (52.9%). This pattern of rates is consistent with the rates observed in previous surveys, including the 1998, 2000, and 2001 surveys.

Table 6: Restraint Use by Vehicle Type

Vehicle Type	Restraint Use			Total
	Yes	Child Restraint	None	
Cars	3804 66.1%	24 .4%	1931 33.5%	5759
Vans/Pickups	2553 52.9%	5 .1%	2271 47.0%	4829
Sport Utility Vehicles	906 67.0%	2 .1%	444 32.9%	1351
Total	7263 60.8%	31 .3%	4646 38.9%	11941

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. The overwhelming majority of observations were of vehicles with in-state license plates (86.4% or 10,292 out of 11916). As illustrated in Table 7, vehicles with out-of-state license plates tended to have higher rates of seatbelt restraint use (75.2%) than did motorists traveling in vehicles with in-state license plates (58.8%).

Table 7: Restraint Usage Observed for In-and Out-of State License Plates

License Plates	Restraint Use			Total
	Yes	Child Restraint	None	
In-State	6023 58.5%	28 .3%	4241 41.2%	10292
Out-of-State	1219 75.1%	3 .2%	402 24.8%	1624
Total	7242 60.8%	31 .3%	4643 39.0%	11916

Validity Check

As previously indicated, seatbelt use was lowest in Charles Mix County in the 2002 survey with a rate of 41.2% (248/602). A low usage rate was also observed in the 2001 survey in which only 28.4% or 186 of 655 motorists observed were wearing a safety restraint. Despite the modest usage rate observed in this county, the rate was slightly higher than the 2000 survey rate of 23.6% for Charles Mix.

As part of a new procedural methodology designed to ensure the validity of observational data recording, a validity check was conducted in Charles Mix County. This validity check involved separate trained observers independently collecting and recording observational data at a sub-sample of the previously documented county sites. Data obtained from the separate observations were then compared to the original recorded data. Independent sample t-tests indicated that restraint usage rates did not differ significantly between the original observational recordings and the validity check recordings. All statistical tests yielded two-tailed significance levels of greater than .05. In other words, the validity check confirmed the accuracy of the original observations.

Discussion

Results of the current survey established that the weighted statewide estimate of restraint use for South Dakota in year 2002 was 64.0%. This weighted statewide estimate is statistically similar to the 2001 statewide estimate of 63.3%. Although there was no change between 2001 and 2002, restraint use in South Dakota roadways is significantly higher than weighted statewide estimates of 45% in 1998 and 53.4% in 2000.

Despite the demonstrated positive upward trend in South Dakota seat belt usage, overall statewide rates still fall below the national average. Nationwide seatbelt use rates were 68% in 1996, 68.9% in 1998, 71% in 2000, and 73% in 2001 according to NHTSA records. Rates of safety restraint use for children in South Dakota also continue to be low relative to many other states. South Dakota's lower usage rates may, at least in part reflect the particular challenges faced in rural areas where usage rates among males involved in agricultural production remain low and where income and educational levels (also associated with low safety restraint usage) also fall below national averages.

Child Restraint Use

Nationwide, the leading cause of death and disability for children over the age of one year is motor vehicle accidents (Winston, Durbin, Kallan, & Moll, 2000). According to NHTSA figures, most children killed in automobile accidents are not restrained. It is estimated that in an automobile accident, rear-facing infant seats reduce the risk of fatal injury for young children by as much as 71%, while seatbelts reduce the risk of fatal injury for young children by only 45% (NHTSA, 2001). Despite these figures, many children continue to travel in motor vehicles without adequate safety restraints. Although rates observed in this 2002 survey were higher than rates observed in both the 1998 and 2000 surveys, a slight decrease in usage rates was observed in the 2002 survey as compared to the 2001 survey.

Previous surveys, 1998, 2000, and 2001 were conducted during the last quarter and therefore rates were established during the fall months. The 2002 survey was carried out during the start of the third quarter and therefore represents summer motorist activities. The impact of this change is unknown. However, it can be speculated that the decrease in usage rates among children 0-4 years of age may possibly represent seasonal changes in motorist activities (i.e., more travel for recreational purposes rather than while parents are in route to and from work or school). Future surveys conducted during similar times will provide an indication of whether or not the current usage rates represent seasonal trends or overall changes in usage rates.

Recommendations for Future Surveys

Child Restraint Observations. The revised sampling protocol initiated in the 2000, 2001 survey and continued in the 2002 survey substantially increased the overall observed rate for children as compared to the 1998 survey. However, observation rates remain low for persons under the age of 18 years. Future survey designers might consider planning additional observation sites at places where children are likely to be observed in residential or other slow moving traffic areas such as near day cares, schools and public libraries.

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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 Manual – 2001 South Dakota Seatbelt Survey

Place holder for manual

Appendix C

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 1998 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 subsegments 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 2001South Dakota Survey, the following values were obtained

Urban Highway:	$w_1 = 0.18323$	$\hat{P}_1 = 60.04$
Rural Highway:	$w_2 = 0.44819$	$\hat{P}_2 = 56.53$
Urban interstate:	$w_3 = 0.05521$	$\hat{P}_3 = 75.67$
Rural interstate:	$w_4 = 0.31336$	$\hat{P}_4 = 74.79$

Thus, statewide seat belt use is estimated as **64.0%**.

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 0.150. The sampling error is then 0.387%.

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

(statewide mean) +/- (1.96)(0.387).

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

64.0 +/- (1.96)(0.387) or **p(63.19% < Statewide Use < 64.71%) = .95**