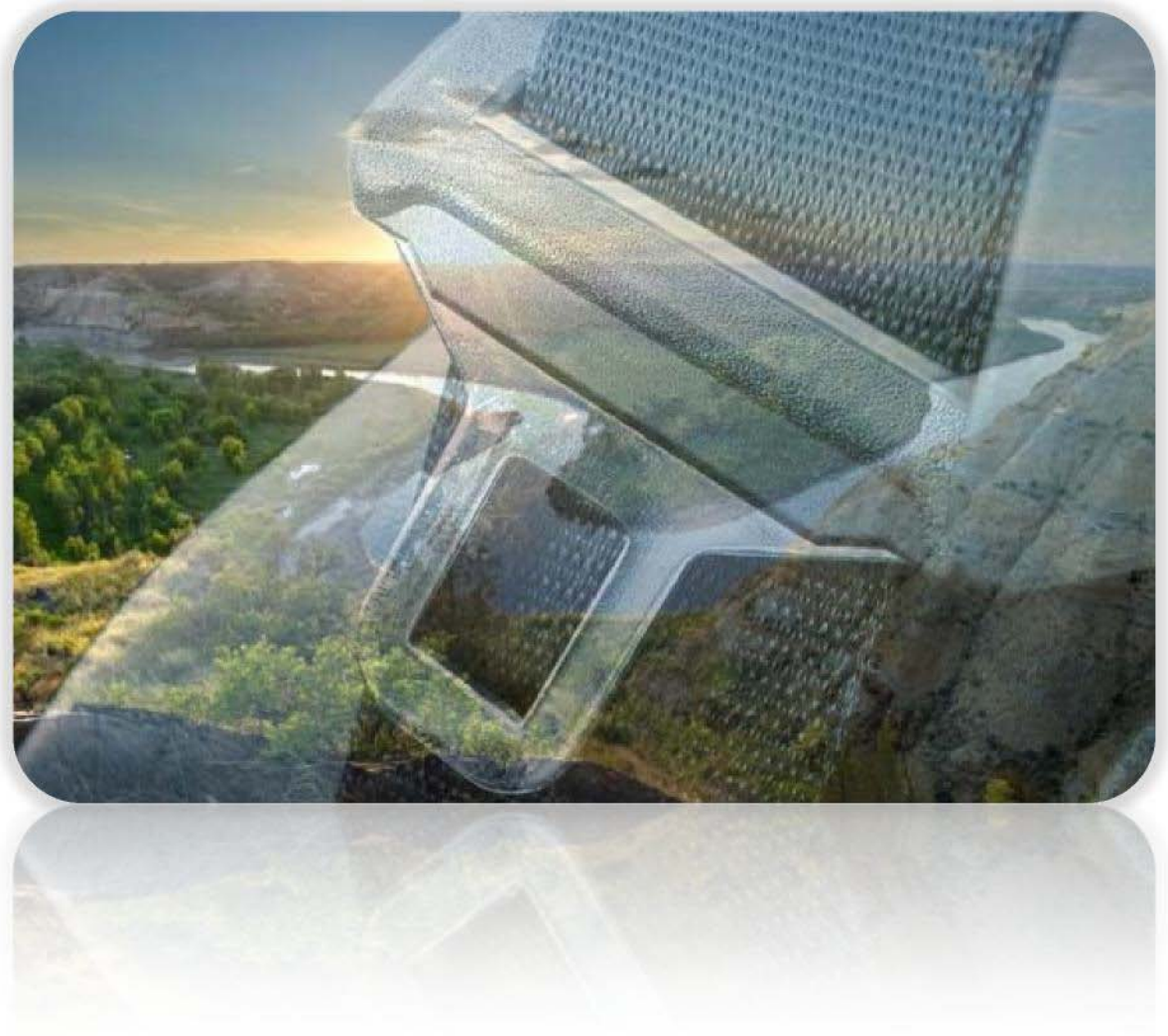
SEAT BELT USE IN NORTH DAKOTA



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EXECUTIVE SUMMARY

The purpose of North Dakota's seat belt use study is to provide statistically reliable data from which generalizations, comparative analyses and recommendations can be developed. The National Occupant Protection Use Survey (NOPUS) provides the North Dakota Department of Transportation (NDDOT) with a system that monitors the seat belt usage (SBU) rates within the state. The National Highway Traffic Safety Administration (NHTSA) funds NOPUS through the NDDOT's Traffic Safety Office.

The sampling methodology for this study was originally developed in 2001 with guidance from NHTSA and it has remained stable every year since then, with relatively no change in the counties and sites that make up the sample. The only major change, which was made to the 2009 survey, was to update the site and county vehicle miles travelled (VMT) to the latest NDDOT estimates. This change affected the determination of sampling probabilities in the case of some sites. All reports from 2001 through 2008 used the same VMT estimates while the 2009 and 2010 reports used the 2009 updated estimates.

The 2010 survey was based on a random probability sample of sixteen North Dakota counties and 319 observation sites developed for and approved by NHTSA in 2001. Trained observers used the week of June 7-11 to visit each site in their assigned county and collect the seat belt use data as prescribed in the handbook they received at training. Front seat drivers and outboard passengers in automobiles, vans, sport utility vehicles (SUVs), and pickup trucks were observed for seat belt use. Observation data forms from each site were submitted for entry and analysis.

This analysis represents a return to the NHTSA approved method of estimating seat belt use by county and state. In years since 2004, an alternative formula had been employed to estimate these rates. This alternative method of estimation was found to be inaccurate requiring the move back to the NHTSA approved method.

For the 2010 statewide survey, observers tracked seat belt use for 14,370 drivers and 3,837 outboard passengers, for a total of 18,207 vehicle occupants. The estimates of seat belt use were 68.7% for drivers, 73.6% for outboard passengers, and an overall un-weighted estimate of 69.8% belted for drivers and passengers combined. This result compares to the un-weighted rate of 70.9% belted in 2009. In general, the findings in the 2010 North Dakota statewide survey are consistent with the findings of previous surveys. The weighted state rate for 2010 is 74.8% compared to 74.9% for 2009.

Males were less likely than females to wear seatbelts (63.2% vs. 78.8%). This trend of higher female use rates holds for each vehicle type as well. Male seat belt use rates were observed to be anywhere from 10%

to 25% lower than female use rates for each county surveyed. Not controlling for gender, vehicle type exhibits similar trends to previous surveys. Van occupants had the highest seat belt use rate at 81.4% followed by SUVs (79.0%), automobiles (71.1%), and pickups (57.7%).

Although drivers outnumbered passengers four to one, passengers buckled up at a rate of 73.6% compared to drivers at 68.7%. This may be mainly due to the fact that drivers are more likely to be men than women (63.7% vs. 36.3%), and their seat belt use rates are much lower than women - 63.5% compared to 78.0% respectively. For passengers, the reverse is true. Women represented 62.2% of the passengers with a use rate of 80.7%, while men represented 37.8% of the passengers with a use rate of 61.9%.

Rates by region show those occupants in the southeast are the most likely to buckle up at 77.3% followed by those in the southwest at 71.3%. Occupants in the northeast buckled up at a rate of 64.3% with those occupants in the northwest only slightly behind at 63.3%. A main reason for this difference could be the high seat belt usage on interstate highways. Seat belt use for interstate observation sites was 81.2%, compared to 68.2% for federal highways and 61.0% for state highways. Only 4.1% of the interstate observations were recorded in the northeast region, while 46.8% were recorded in the southeast and 49.1% in the southwest. The northwest region does not contain any interstate highways.

Among the nation in 2009, North Dakota's rate ranked 41st across the fifty states and was almost 10 percentage points below the national average. With the rates appearing to plateau in the last two years, the seat belt use rate is not likely to improve in the short-term without some type of sustained effort or legislative change. In fact, in terms of relative standing to other states, North Dakota with the current rate of 74.8% may see its rank fall below 41st.

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INTRODUCTION

The Upper Great Plains Transportation Institute (UGPTI), a department of North Dakota State University (NDSU) located in Fargo, ND, was contracted by the North Dakota Department of Transportation (NDDOT) to conduct a field survey of seat belt use in 2010. The study required use of a sampling methodology approved by the National Highway Transportation Safety Administration (NHTSA) and the NDDOT. National requirements for conducting statewide seat belt surveys are located in The Federal Register, 23 CFR Part 1340, published on September 1, 1998. The methodology was designed to yield a statistically valid estimate of the current seat belt use (SBU) rate on state-operated roadways in North Dakota.

OBJECTIVE

The objective of this study was to determine the rate of seat belt use of drivers and front seat outboard passengers in the state of North Dakota.

Additional analyses determined the SBU rate in the following categories:

- Occupant (driver, passenger)
- Gender (male, female)
- Type of Vehicle (automobile, van, sport utility vehicle, pickup)
- Regions of State (northwest, northeast, southwest, southeast)
- Population (rural, urban)
- Roadway (interstate, federal highway, state highway)

A description of the various tasks involved in conducting the SBU survey is provided in this report including general information about the methods and protocols. Table 1 summarizes the 2010 NOPUS survey.

Table 1: Summary of the Seat Belt Use Survey

Methodology	Probability Based Sampling (stratified sites within sampled counties)
Source of Samples	2001 Methodology, approved by NDDOT and NHTSA
Identified Regions	Four Quadrants of the State Northwest Northeast Southwest Southeast
Selected Counties	Counties by Region Northwest: Bottineau, Mountrail, Ward, Williams Northeast: Grand Forks, Pembina, Ramsey, Nelson Southwest: Burleigh, Mercer, Morton, Stark Southeast: Barnes, Cass, Wells, Stutsman
Survey Period	June 7 – 11, 2010
Sample Size	14,464 vehicles (includes all vehicles where either the driver or passenger or both had a known protection status)
Observation Duration Per Site	Thirty (30) minutes
Number of Sites	319
Geographic Coverage	State of North Dakota

METHODOLOGY OVERVIEW

From 1998 to 2000, the methodology for the observational seat belt survey in North Dakota was based on simple random sampling of twelve counties followed by random sampling of intersections within those selected counties. As a result, the sample excluded some of the most populous counties and included mostly rural sites with low traffic density and vehicle miles traveled. This produces a strong rural bias, since each site had an equal weight and sites in the less populated counties tended to have very low seat belt usage rates. Therefore, the reported estimates based on this sampling procedure, although accurately reflecting seat belt use in those geographic areas included in the sample, were not representative of traffic density, vehicle miles traveled, and traffic patterns across North Dakota.

Following the 2000 survey, the NDDOT concluded that a new sampling methodology was needed to obtain results that were more representative of traffic patterns and the distribution of drivers and passengers in North Dakota. The NDDOT worked with research methodology experts at NHTSA to review the process.

The current methodology, in place since 2001, includes sixteen counties, representing the quadrants of the state, and 319 sites, with approximately half above and half below the mean vehicles miles traveled within each county. The current methodology can therefore be described as stratified random sampling modified by the inclusion of what are referred to in federal guidelines as “certainty” counties. Four certainty counties in North Dakota - Burleigh, Cass, Grand Forks, and Ward - represent about three-fourths of North Dakota’s population and approximately two-thirds of the vehicle miles traveled in North Dakota.

Observations for the June 2010 survey of seat belt use in North Dakota were completed at the twenty randomly chosen sites within each of the sixteen counties in the North Dakota sample, with the exception of Wells County where only nineteen sites are available. These same sites have been observed annually since 2001.

Using this sampling method, the state and counties are weighted by the probability of selection for each site and county and the vehicle miles traveled for each site and county. This weighting produces an estimate of the seat belt use for each county and the state that is more accurate than the raw or un-weighted rate. The formula for estimating the seat belt use for the sample sites is as follows:

_____ = belt use for the kth site in the jth stratum within the ith county.

Where:

$i = i^{th}$county

$j = j^{th}$ stratum

$k = k^{th}$ site

W_{ijk} = the weight for the kth sample site in the jth stratum within the ith county. The weight is equal to the number of sites in the sample space of each county stratum divided by the number of sites actually sampled from the county stratum.

VMT_{ijk} = the daily vehicle miles traveled for the kth individual sample site in the jth stratum within the ith county.

B_{ijk} = the total number of belted drivers and passengers for the kth sample site in the jth stratum within the ith county

O_{ijk} = the total number of observed drivers and passengers for the kth sample site in the jth stratum within the ith county.

These estimates are then used to create the county estimates using the following formulas:

Where:

Where:

VMT_{cs1} = the total daily vehicle miles traveled for the upper stratum in the county

VMT_{cs2} = the total daily vehicle miles traveled for the lower stratum in the county

VMT_c = the total daily vehicle miles traveled for the county

The county estimates are then used to calculate the overall estimates for the state as follows:

Where:

i = the county

W_i = the weight for the ith county, which is equal to the number of available counties in the quadrant divided by the number of counties sampled in the quadrant

V_i = the total daily miles traveled in county i

P_i = seat belt use in county i

These formulas were applied to produce the county and state weighted seat belt use rates. These two rates are the only weighted rates that are produced for the report. All other rates detailed in this report are un-weighted including rates by regions, vehicle types, vehicle occupants, gender, population and roadway types.

Due to limitations of direct comparisons of un-weighted seat belt use, the NDDOT was pressed to look for an alternative to the 2001 NHTSA approved formulas. In 2004, the NDDOT worked to devise a method of weighting all of the data for analysis which would allow direct comparison of rates such as gender and vehicle type. The method developed was used to calculate rates for each year from 2005 to 2009. Upon review by the National Highway Traffic Safety Administration, the results from this newly developed formula were deemed questionable and only the NHTSA formulas have been approved for this year and in the future. Unfortunately, data from 2008 and earlier were not available to be recalculated at the time this report was prepared. It should be noted that the VMTs were updated to the most recent data provided by the NDDOT for the 2009 report and that those VMTs were also used for this report. A review of the VMTs revealed several changes from previous years across the various sites within each county. As a result, the following procedures were carried out in 2009:

- All new VMTs were entered into the spreadsheets for all of the sites within each county in the sample.
- The sites were then stratified into two groups within each county: those sites within each county which were either above or below the mean VMTs for all the sites within the individual counties.
- This stratification resulted in changes to the site sample space within each stratum.
- Therefore, the sampling probabilities for each site were recalculated based on the number of sites selected from each stratum out of the sites available in the strata, just as has been done in previous North Dakota surveys.

Implementing these procedures ensured that the most up-to-date VMTs and sampling probabilities were used for each site in the 2009 North Dakota seat belt survey. The 2010 SBU survey follows these same VMTs and sampling probabilities. The county VMTs also changed, but the county sampling probabilities did not due to the fact that the sampling probabilities for the counties are not based on the average VMTs for the counties, but rather the number of counties in the region.

CONFIDENCE INTERVALS

The standard error of the state seat belt use rate measures the amount of random sampling error in the survey results. The smaller the standard error the more accurate the seat belt use rate becomes when compared to the true, but unknown, seat belt use rate for North Dakota. Assuming the design of the survey correctly measures the variable of interest, the larger the survey sample the more accurate the results.

For large populations, the variance of a stratified random sample is calculated by finding the weighted average of the strata variances. Since the survey uses two levels of stratification (i.e. county and sites within the county), we will need to employ the formula several times. The first step is to find the variance of the individual sites and then use the weighting formula to find the variance of the stratum, the counties and finally the state. Each of these formulas can be found in the appendices.

The estimated standard error for the state seat belt use rate is found by taking the square root of the variance, so

Where:

the estimated standard error for the state seat belt use rate

= the estimated variance for the state seat belt use rate

= the estimated state seat belt use rate

Using these formulas we find that the standard error for the state seat belt use is 0.30%. From this, we can build a 95% confidence interval for the state seat belt use. The 95% confidence interval formula is , where each of the terms has the meaning above and the value 1.96 is the tabled value from the standard normal distribution for a 95% confidence interval.

Table 2: Confidence Interval

95% Confidence Interval and Estimated Standard Error for the 2010 State Seat Belt Use				
Occupants	**State Rate**	**Standard Error**	**95% CI Lower Limit**	**95% CI Upper Limit**
18,207	74.8%	0.30%	74.2%	75.4%

The 95% confidence interval means statistically there is only a five percent chance that the actual statewide seat belt percentage falls outside the range from 74.2% to 75.4%. Given the survey sample (n=18,207) is large, the standard error for all vehicle occupants is small, 0.30%, which implies that our estimate of the state seat belt use is very accurate.

PROTOCOLS

Observers

Nineteen observers, a combination of UGPTI personnel and supplementary contracted staff, were used to conduct the 2010 seat belt survey. All observers participated in in-house training and accuracy testing prior to conducting the field observations. Additionally, each observer completed Institutional Review Board (IRB) training as required by North Dakota State University. Observers were required to have good driving records, to provide proof of adequate vehicle insurance if not using state fleet vehicles, and were required to wear seat belts while conducting observations.

Observational Protocols

The observational protocols used in this study were a replication of those employed in each annual seat belt survey in the state of North Dakota since 2001. The following is a review of the methodological protocols for the observations.

Order of Observation

Within clusters, the order of observation was assigned with the use of a random numbering procedure. For sites outside the clusters, the order was determined by proximity to clustered sites. To help control observation costs, minor changes were made to the prior observation order. These changes included combining sites on days with open observation times, and modifications to the order of observation times which made sense geographically. Modifications were kept to a minimum to reduce any bias effect on the rates. A complete list of county observation sites are found in Appendix A of this report.

Traffic Direction

The traffic direction of vehicles to be observed was randomly chosen in advance and was limited to one direction. In those cases where the roadway moved in only one direction, traffic was observed coming from that direction. When a site was located on or near a county line, the traffic direction was toward the county associated with the survey. In all other instances involving decisions, a randomization process was employed. Usually, this involved a random choice of direction, north or south, or east or west, and in some cases both directions.

Day of the Week

Observations were conducted Monday through Friday. The day of the week and time of day were randomly chosen for one site within each county. The remaining sites within each county were arranged

to minimize travel and costs. This predetermined order of observation sites to be visited each day was provided to each observer at their training.

Time of Day

A twelve-hour block of daylight, from 7:00 A.M. to 7:00 P.M., was identified for the parameters of the observational period. Each site observation occurred in predetermined time slots, requiring a 30-minute observation period beginning at the first five-minute interval after arrival at the site, and ending exactly thirty minutes later.

Traffic Conditions and Data Collection Problems

Observers were trained to cope with traffic problems in the following manner:

- When traffic was heavy and there were too many vehicles to count visually, recording was done as long as possible and then stopped until the observer could catch up with observations. Some vehicles were, of necessity, outside the sample. When this occurred, counting resumed after no more than a one-minute pause. Once an observer's eyes were locked on a vehicle, a count of that vehicle was required on the observation form.

- At sites with more than one lane of traffic in the predetermined direction, observations were made from the lane closest to the observer.

- Vehicles with darkened windows were excluded because visibility problems were likely to impede accuracy.

- Field observers could terminate observations at a preselected site if any of the following circumstances arose: (1) weather conditions that would hinder the accuracy of the observations; (2) heavy traffic flow that might endanger the safety of the observer; or (3) road conditions that rendered observations unfeasible, such as road construction, detoured traffic, or a crash site. If a preselected site was terminated and an alternate site could not be established, the observer notified the project coordinator immediately and recorded the cancellation details on the survey form.

Site Accessibility Problems

If a preselected site was not available during the time at which observations were scheduled to occur, the observer made the following modifications:

- On mile-posted roads, observations were to be made at the location with a mile point that was one mile higher on the same roadway in the same direction as the assigned traffic flow. If this point was not accessible, one more mile could be added. Increments up to three miles could be added with such changes noted on the observation forms.

- On non-mile posted streets and local roadways, the observer was to proceed in the same direction as the assigned traffic flow in one-quarter mile increments, not to exceed three-quarters of a mile, until an appropriate observation site was found and so noted on the observation form.

- In cases of road construction where traffic was detoured, the observer was required to select a site on the detour as close to the original site as possible, no more than two miles away on mile-posted roadways and no more than one-half mile on non-mile posted streets and local roadways. The change in site location and the reason for the change was noted on the observation form.

Observed Vehicles

All passenger vehicles were observed and classified on the observation form as automobiles, vans, pickups, and sport utility vehicles. Large trucks (semi or large box trucks), emergency vehicles, RVs/motor homes and commercial vehicles (taxi cabs, delivery vans, city vehicles, etc.) were not included in the survey.

Observations

Type of vehicle, gender characteristics and seat belt usage were recorded for both drivers and front seat outboard passengers. Observations occurred from within the observer's vehicle whenever possible. The observer was parked as close as possible to the road for accurate observation without compromising the observer's safety. If observations could not be conducted from within the vehicle, the observer was allowed to stand off the roadway and required to wear an ANSI-approved Type-2 safety vest to enhance visibility of the observer.

Problems Encountered by Observers

Some observers encountered road construction which created site accessibility issues. In these cases, if the observer was able to move to an alternate site fitting the protocols, this was done. However, observations at three sites with accessibility problems were cancelled completely since alternate sites identified by the movement protocols were also inaccessible. Two of the site cancellations occurred in Cass County and one in Grand Forks County. In addition, several site descriptions provided from previous survey protocol were vague and unclear while others did not fit the county road descriptions. For example, there were instances where the county road appeared to be misidentified in the site list as no

corresponding county road could be located when using the site maps. In other cases, the site maps did not correlate with the site description although the description appeared correct. In instances like these, judgments were made by the project staff to alter the site descriptions based on the locale and inferences drawn from the site maps provided.

QUALITY ASSURANCE

Observers

In preparation for the observation survey work, project participants completed training on protecting the rights and welfare of research participants as required under NDSU policy. Subsequent to successful completion of that training, two observer training sessions were held at two sites. All observers were required to participate in the classroom instruction and in field training observations. Each observer was tested through participation at two observation test sites to acquire an inter-observer agreement ratio.

Test sites were selected to represent the types of sites and situations observers could expect to encounter in the field. No actual sites in the sample of roadway segments were used as test sites. Observers worked in two groups, observing the same vehicles but recording data independently on separate observation forms. During the field training observers were divided into two groups. Each observer recorded the type of vehicle, gender, and seat belt use of both the driver and outboard front seat passenger. These answers were then compared to the group and a gold standard answer was derived for each vehicle type, gender and protection, which was then compared to the individual's observation to calculate the agreement rate.

The overall median agreement rate for all observers was 96.6% with the lowest being 91.8%. Looking at each of the components separately shows that vehicle type had very high agreement among the observers. The lowest agreement rate for vehicle type was 94.9%, which was mainly caused by confusion over crossover vehicles. These issues were clarified with verbal follow-up. Occupant gender had lower agreement among observers with the median agreement being 97.9% and all observers having an agreement rate of 91.7% or higher. Protection had the lowest agreement. Overall, the median agreement rate was 93.2%.

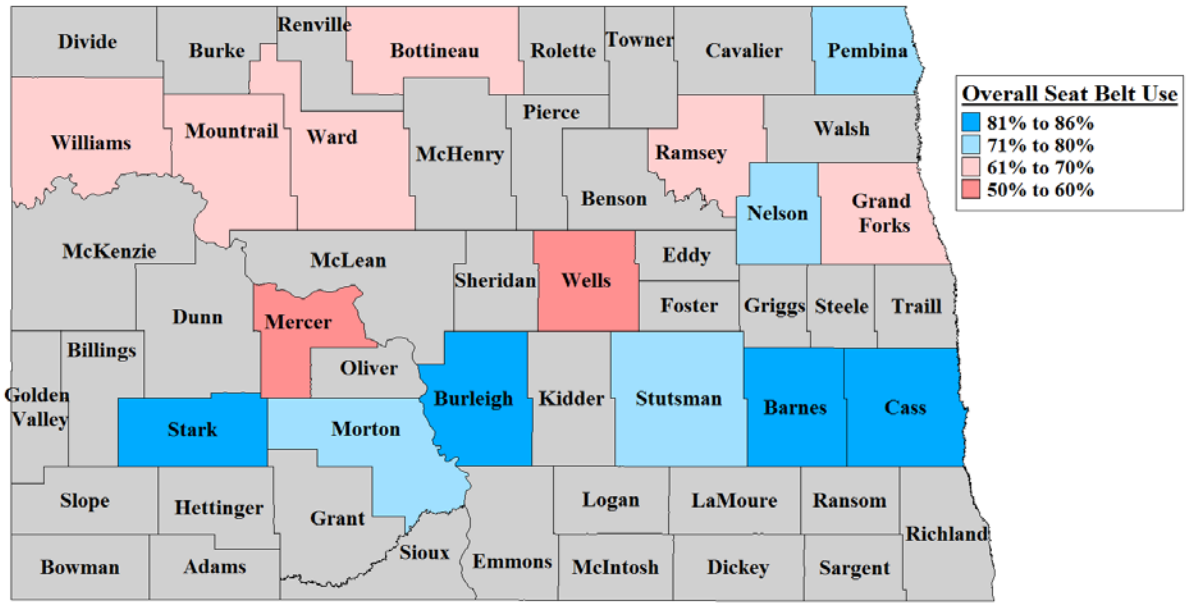
Data Entry

Steps were taken to ensure quality control with respect to data entry. Each site packet was checked to determine the actual number of sheets was the same as that noted by the observers. Database records were verified to match the number of observations. A random accuracy check was done on data entry for each site and found to be very high. All errors discovered during quality assurance checks were corrected.

RESULTS

The overall un-weighted results of the 2010 statewide survey of seat belt use on state-operated roads in North Dakota indicate that 68.7% of the drivers, 73.6% of front seat outboard passengers, and a combined 69.8% of all vehicle occupants were observed to be wearing seat belts. This compares to the un-weighted rate of 70.9% belted in 2009. Since the survey employs a two-stage stratified random sampling scheme, a more appropriate estimate of the seat belt use rate is found by weighting the unadjusted rate to account for traffic density using the formulas from the methodology section. Using those formulas, the weighted seat belt use rate is 74.8% for 2010 which is almost identical to the 2009 rate of 74.9%.

Figure 1: Total Seat Belt Use



The weighted seat belt use rates (Figure 1) range from 53.3% in Mercer County to 85.3% in Cass County. Four counties, Barnes, Stark, Burleigh and Cass, have rates above 80%, while only two have rates less than 60%, Mercer and Wells.

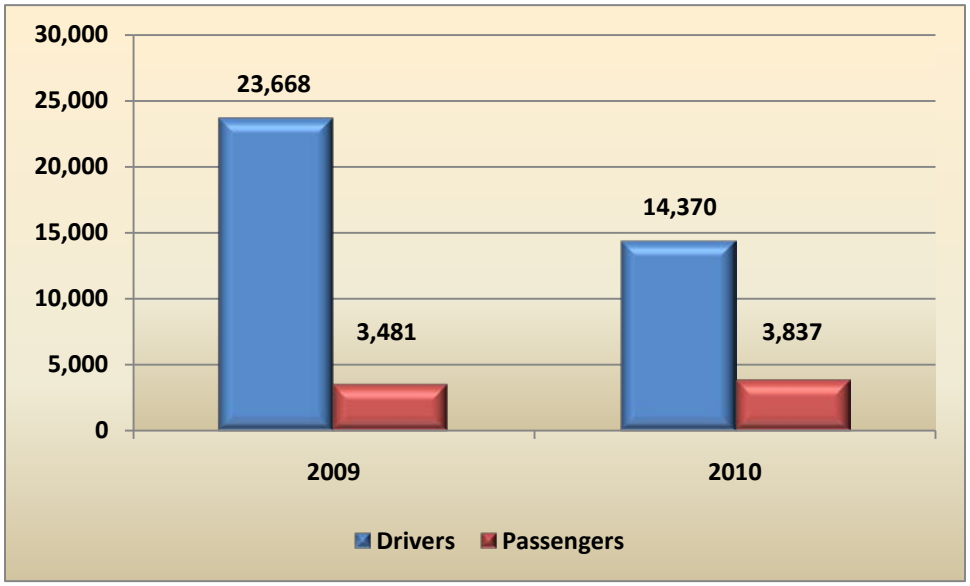
Based solely on the 2009 and 2010 survey results, it appears as though the North Dakota seat belt use rate has leveled off. As mentioned earlier, one of the issues with reverting to the NHTSA approved formula is that all of the rates from 2005 to 2008 need to be recalculated. However, the data for those years were not available at the time of the report and may not be available in the future.

This leveling off is likely due to several factors. One influence on the overall rate is the driver to passenger ratio. In 2009, there were 6.8 drivers for every passenger. The ratio dramatically declined this year to 3.7 (Table 3).

Table 3: Driver Passenger Ratio, 2009-2010

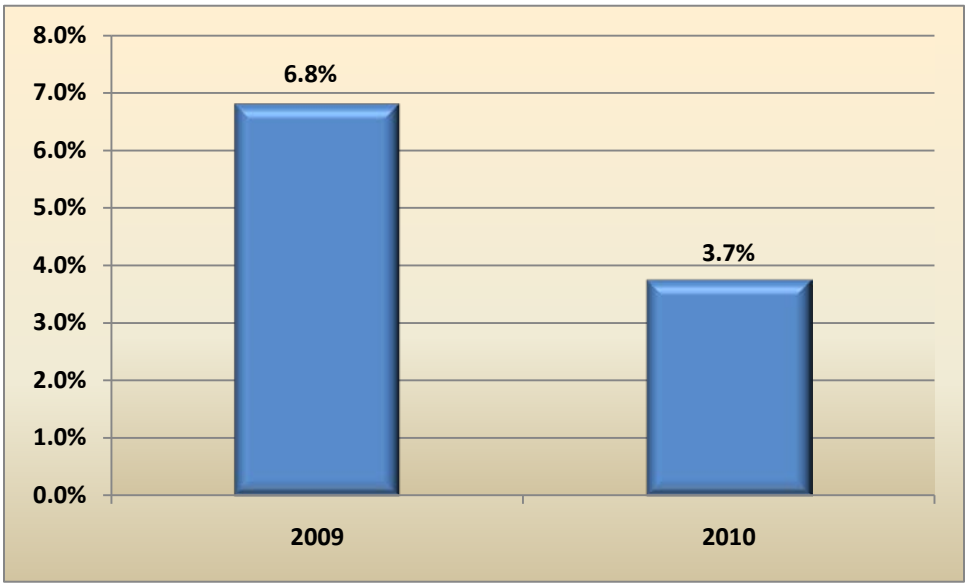
	2010	2009	Difference
Ratio			
Drivers: Passengers	3.74	6.80	-3.06
Drivers as % of Sample	78.9%	87.2%	-8.3%

Figure 2: Driver and Passenger Observations, 2009-2010



From 2008 to 2009, the relative number of drivers in the samples increased while the relative number of passengers decreased (Figure 2), and when this is expressed in ratio form, the number of drivers to passengers increased. This trend dramatically changed in 2010 (Figure 3).

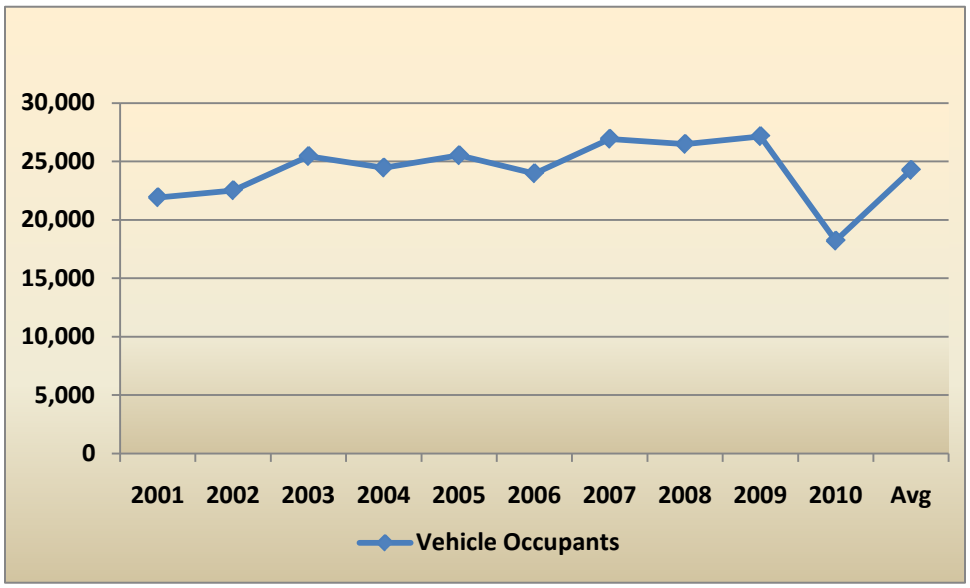
Figure 3: Driver to Passenger Ratios, 2009-2010



Sample Size by Year

Since implementation of the new sampling methodology in 2001, sample sizes have varied from year to year, with an overall modest increase of 5,229 observations from 2001 to 2009. In 2010, the sample size decreased by 8,942 over 2009. One part of the decrease is due to the three sites in Cass and Grand Forks counties that were not observed. However, overall observations in each region were lower in 2010 than 2009. Other explanations for the reduction in the number of vehicles observed in relation to previous years would be speculation since prior surveys were conducted by a different firm. The sample size of each annual seat belt survey from 2001 to 2010 is illustrated in Figure 4.

Figure 4: Observations, 2001-2010



Results for Vehicle Occupants

Observers collected data on 14,370 drivers and 3,837 outboard passengers for the 2010 North Dakota statewide survey. The un-weighted estimates of seat belt use are 68.7% belted for drivers, 73.6% belted for passengers, with an overall estimate of the seat belt usage rate of 69.8% for drivers and passengers combined (Figure 5). Only two counties have un-weighted driver rates greater than 80%. They are Cass, 82.8%, and Burleigh, 81.7%, while three counties have driver rates less than 60% Ramsey, Wells, and Mercer (Figure 6). For passengers, Cass and Burleigh counties again rank the highest with rates of 90.5% and 89.1%, respectively. Barnes County also has a rate greater than 80%, while only Mercer and Williams have passenger rates less than 60% (Figure 7).

Figure 5: Belted by Vehicle Occupant

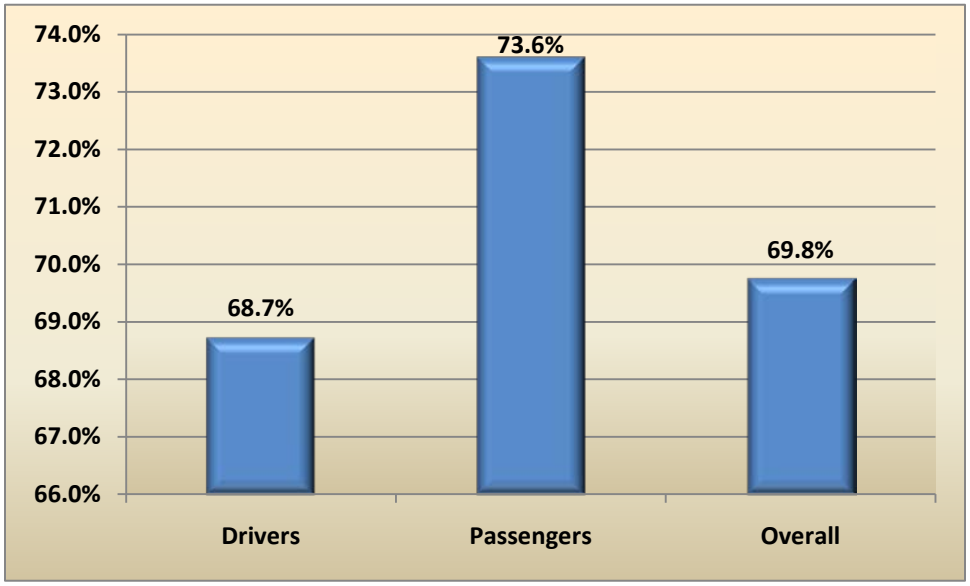


Figure 6: Driver Seat Belt Use

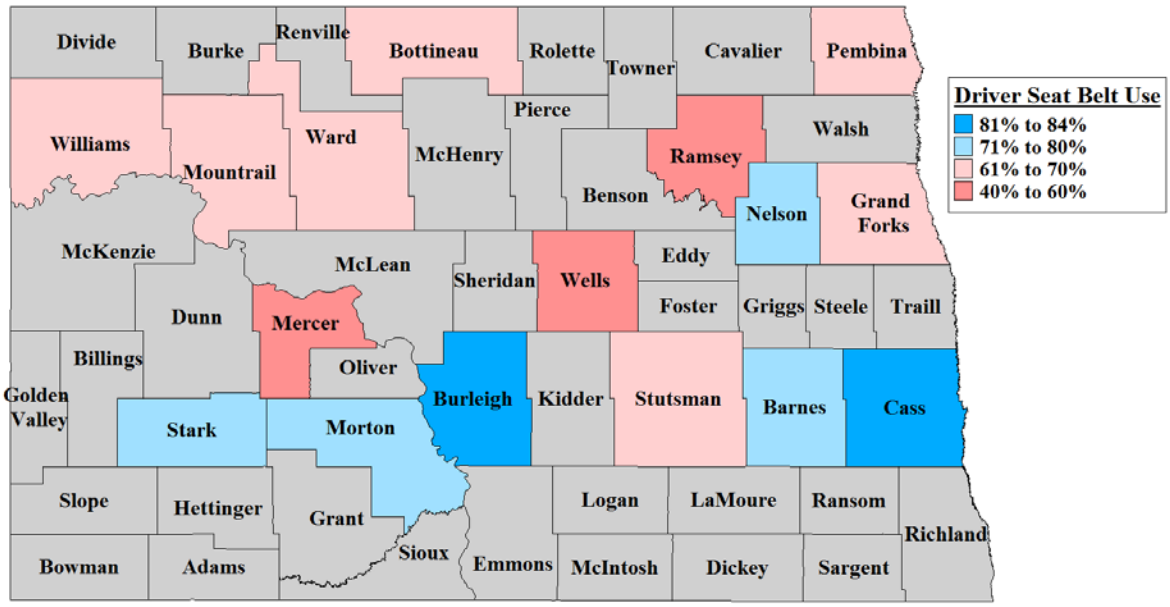


Figure 7: Passenger Seat Belt Use

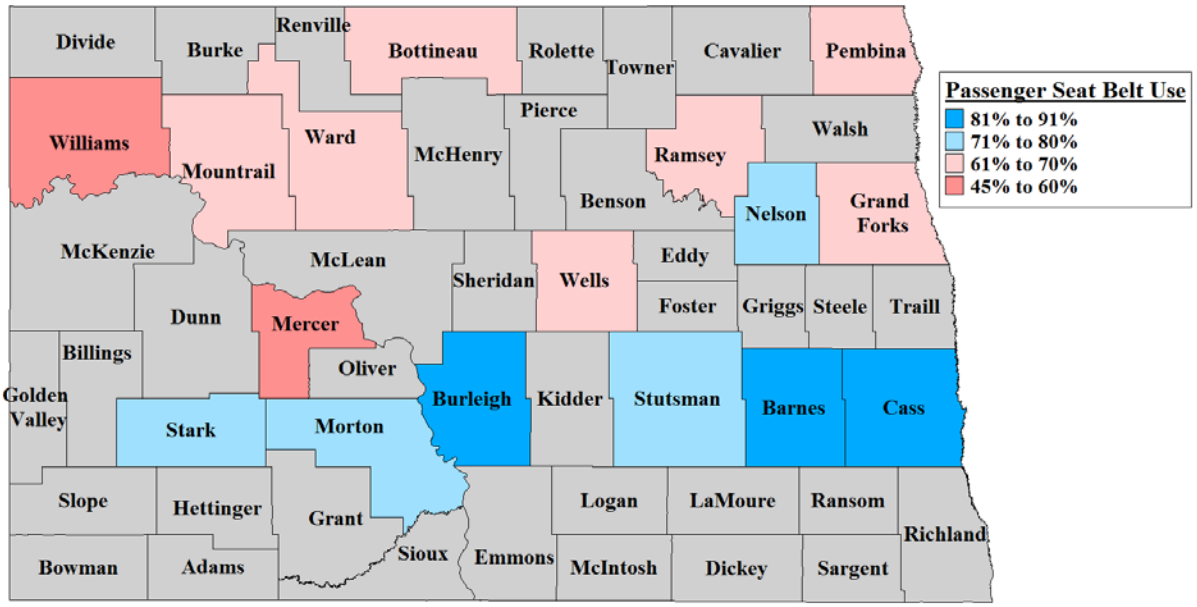
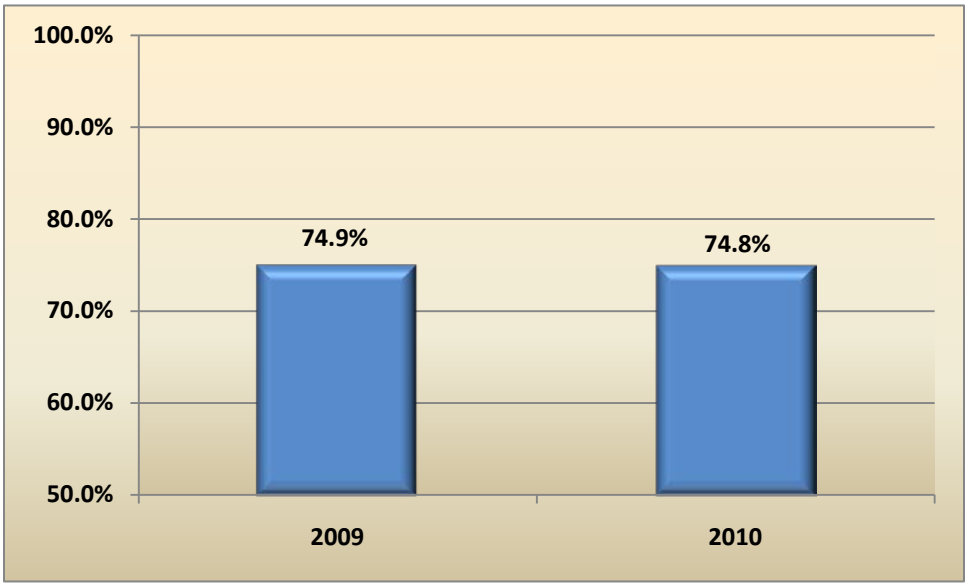


Figure 8 illustrates the weighted statewide seat belt use in North Dakota for 2009 and 2010. The rates are nearly equal for the past two years, declining by one tenth of one percent.

Figure 8: Belted by Year, 2009-2010



The slight decrease does not reflect lower seat belt use, but is instead a function of the randomness of the sampling distribution. This difference is not statistically significant. The seat belt usage rate in North

Dakota increased by 7.4 percentage points between the years 2004 and 2010. This modest increase reflects considerable effort to address seat belt use.

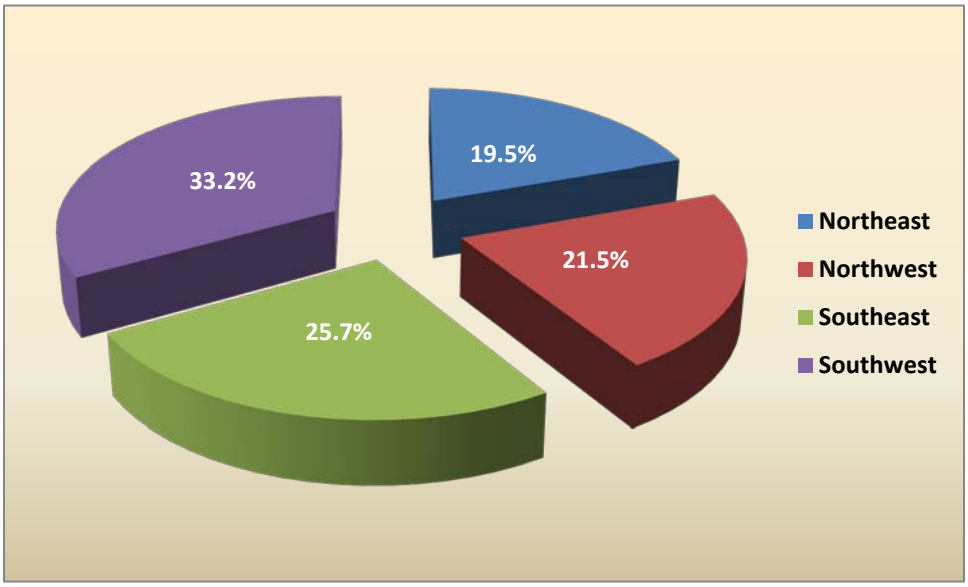
Given the lack of change in seat belt use over the past two years and the low rates compared to the other states - ND ranks 41st among the 50 states – experiences from other states would suggest that impetus that causes a major shift will be necessary to achieve significant increases in seat belt use. One possibility would be a primary seat belt law which NHTSA suggests would change seat belt usage rates by 10% to 15%. Another related possibility is heightened enforcement across the state.

Some factors that may be useful in discussions about increasing seat belt use in North Dakota are found in the remainder of this report which focuses on differences in seat belt use among regions of the state and across counties. In addition, there is an examination of the seat belt use rates by gender, vehicle type, population density, and roadway type.

Results by North Dakota Regions

The sampling methodology divides the state into quadrants: northwest, northeast, southwest and southeast. Each region contains a "certainty" county and three additional randomly selected counties from all the remaining counties in each quadrant.[1] The results for the 2010 survey indicate that 33.2% of the observations were collected in the southwest quadrant, 25.7% in the southeast quadrant, 21.5% in the northwest quadrant and 19.5% in the northeast quadrant. The sampling distribution by region is illustrated by Figure 9.

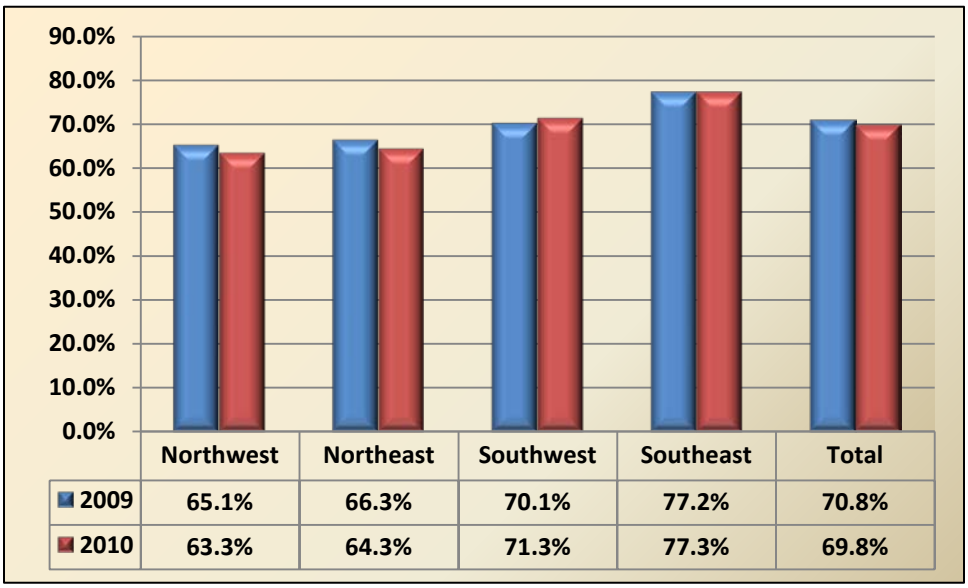
Figure 9: Sample by Region



Seat belt use has historically been highest in the southeast and southwest regions, with substantially lower rates in the northern quadrants. This holds true in the 2010 survey results as well. The southeast region's SBU rate (77.3%) in 2010 is identical to that of 2009 while the rate in the southwest (71.3%) showed a slight increase. The 2010 rates in the northern quadrants are at 64.3% in the northeast, down 2.0 percentage points over the comparable 2009 rate, and 63.3% in the northwest, 1.8 percentage points from the 2009 rate. Figure 10 illustrates regional SBU results for all vehicle occupants for 2010.

[1] See the discussion of the sampling methodology for details on certainty counties and the selection processes.

Figure 10: Percent Belted by Region & Year



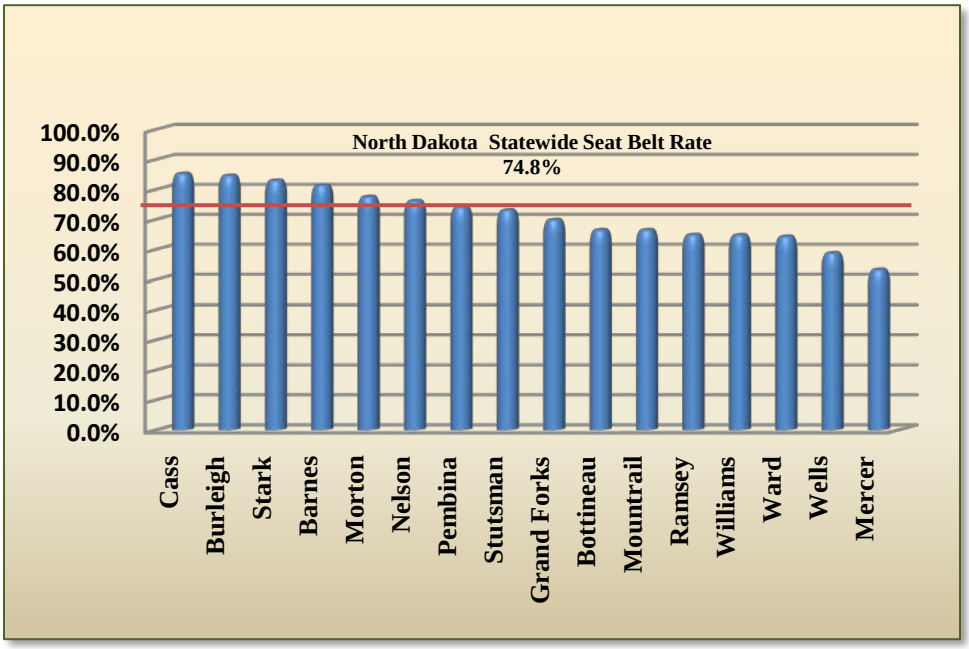
	Northwest	Northeast	Southwest	Southeast	Total
2009	65.1%	66.3%	70.1%	77.2%	70.8%
2010	63.3%	64.3%	71.3%	77.3%	69.8%

It should be noted that the relatively high rate of seat belt use in the southeast region, made up largely of Cass County and inclusive of Fargo - the state's largest city - has a major influence on the statewide rate. This is partly due to the large number of observations that come from the southeast, and also because of the relatively large number of vehicle miles travelled in the southeast. Over the last several years, the southeast region consistently has had the highest rate of seat belt use in the state, typically in the high seventy percent range. The rate of seat belt use in the southwest region, 71.3%, increased over the 2009 rate of 70.1%. Seat belt use in the northeast still lags behind the southern quadrants by a considerable margin, as does SBU in the northwest, which has historically exhibited a pattern of the lowest rates of seat belt use.

Results by County

The 2010 weighted seat belt usage for all vehicle occupants in the sixteen counties included in the sample are illustrated in Figure 11 by descending order of usage. The 2010 data indicates that four counties, Cass, Barnes, Burleigh and Stark, have rates that are above 80%. The lowest usage is found in Mercer County at 53.3% which is over 20% lower than the statewide rate of 74.8%.

Figure 11: Belted by County



Cass	85.3
Burleigh	84.6
Stark	83.0
Barnes	81.5
Morton	77.6
Nelson	76.2
Pembina	74.1
Stutsman	73.1
Grand Forks	69.9
Bottineau	66.5
Mountrail	66.5
Ramsey	64.9
Williams	64.8
Ward	64.3
Wells	58.8
Mercer	53.3

Table 4 illustrates changes in seat belt rates by county between the 2009 and 2010 surveys. A majority of the counties saw relatively small changes in seat belt use rates. Only three counties had changes of more than 7 percentage points. They are Wells with a decline of 11.4 percentage points, Pembina with an increase of 20.3 percentage points, and Stark with an increase of 8.9 percentage points. Overall, eleven counties saw decreases from 2009 rates, while only five counties saw increases.

Table 4: Counties, 2009-2010

Weighted Percent Belted by County			
	2009	2010	Percentage Point Change
Wells	70.2%	58.8%	-11.4
Grand Forks	76.5%	69.9%	-6.6
Williams	71.2%	64.8%	-6.4
Mountrail	72.5%	66.5%	-6.0
Nelson	81.7%	76.2%	-5.5
Ward	68.9%	64.3%	-4.6
Mercer	57.3%	53.3%	-4.0
Bottineau	70.1%	66.5%	-3.6
Cass	88.0%	85.3%	-2.7
Morton	80.1%	77.6%	-2.5
Ramsey	67.3%	64.9%	-2.4
Burleigh	82.3%	84.6%	2.3
Barnes	76.4%	81.5%	5.1
Stutsman	66.7%	73.1%	6.4
Stark	74.1%	83.0%	8.9
Pembina	53.8%	74.1%	20.3
Total	74.9%	74.8%	-0.1

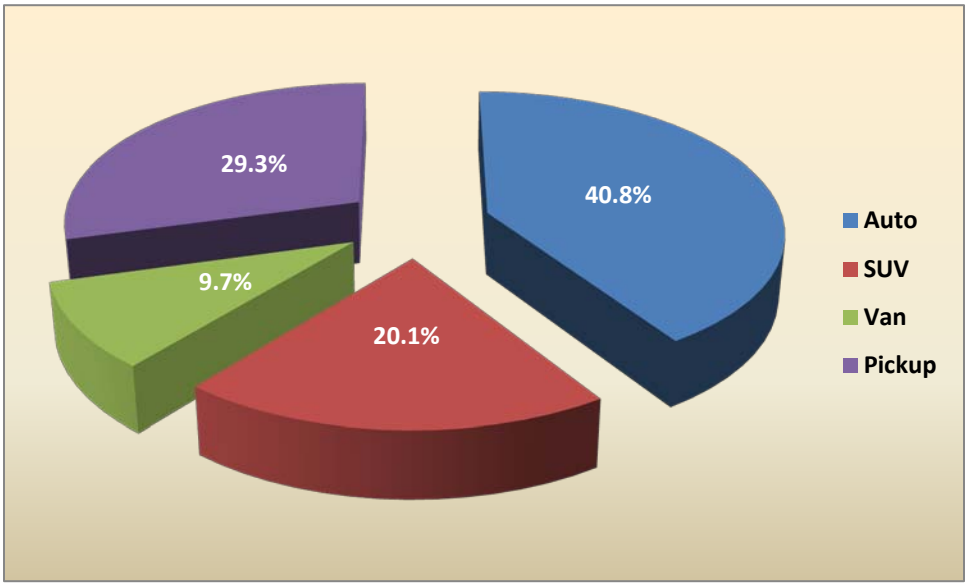
It should be noted that it is best to be cautious in interpreting usage rates from one year to the next at the county level. The reader should focus more on trends over several years when available. The changes from one year to the next often represent sampling difference and are not likely to be statistically significant, especially for counties where the total observations is small.[2] However, even the rates for the larger counties may be volatile over time.

[2] The frequencies of observations by county are presented in the appendix to the report.

Results by Vehicle Type

For the 2010 North Dakota survey, 40.8% of vehicle occupants were in automobiles, 29.3% were in pickup trucks, 20.1% were observed in SUVs and 9.7% were in vans (Figure 12).

Figure 12: Distribution of Sample by Vehicle Type



An interesting result for 2010 is that the un-weighted seat belt usage rates are higher than the statewide average for every type of vehicle except for occupants of pickups. Although this demographic represents only 29.3% of the sample, the low rate of seat belt use in these vehicles has a substantially depressing effect on the overall rate. The usage rate in pickups for 2010 is 57.7% belted, which is 23.7 percentage points lower than the rate in vans, 21.3 percentage points lower than the rate in SUVs, 13.4 percentage points lower than the rate in automobiles, and 12.1percentage points lower than the un-weighted state rate of 69.8%. These results in 2010 are consistent with the long-term trends for seat belt use in North Dakota and other states that are largely rural and have a high frequency of pickup trucks.

The results for seat belt use by vehicle type are presented in Figure 13 and maps of county seat belt use by individual vehicle type are included in Figures 14 through 17.

Figure 13: Belted by Vehicle Type, All Occupants

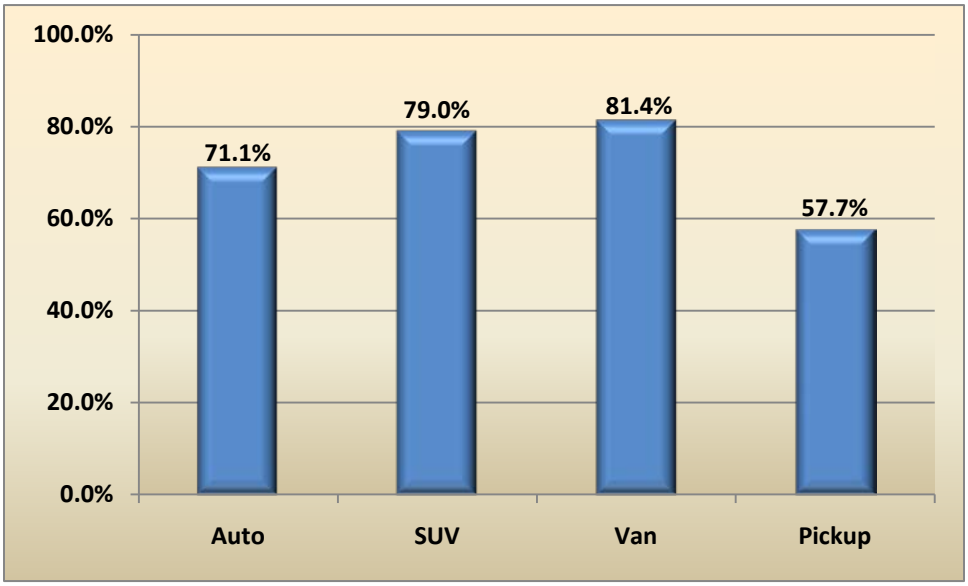


Figure 14: Automobile Seat Belt Use

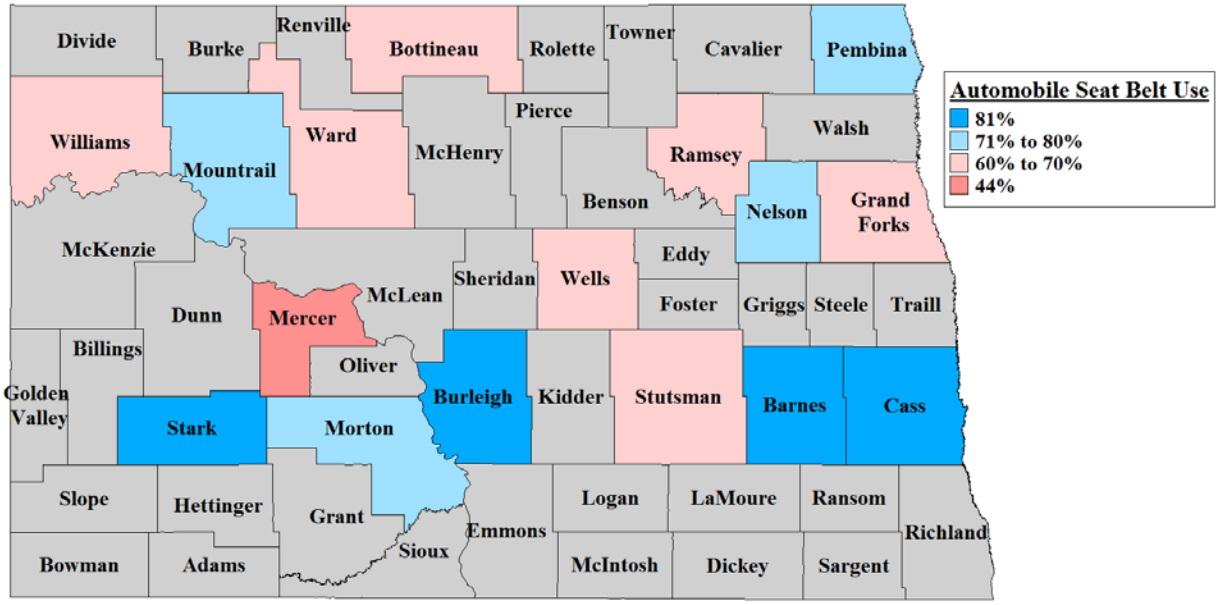


Figure 15: Van Seat Belt Use

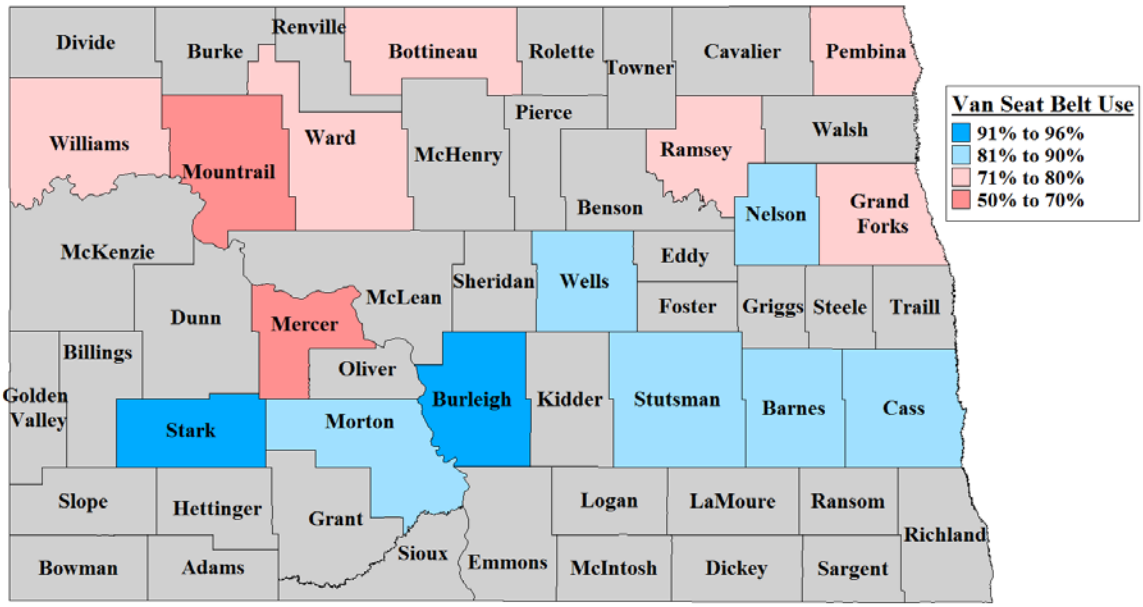


Figure 16: SUV Seat Belt Use

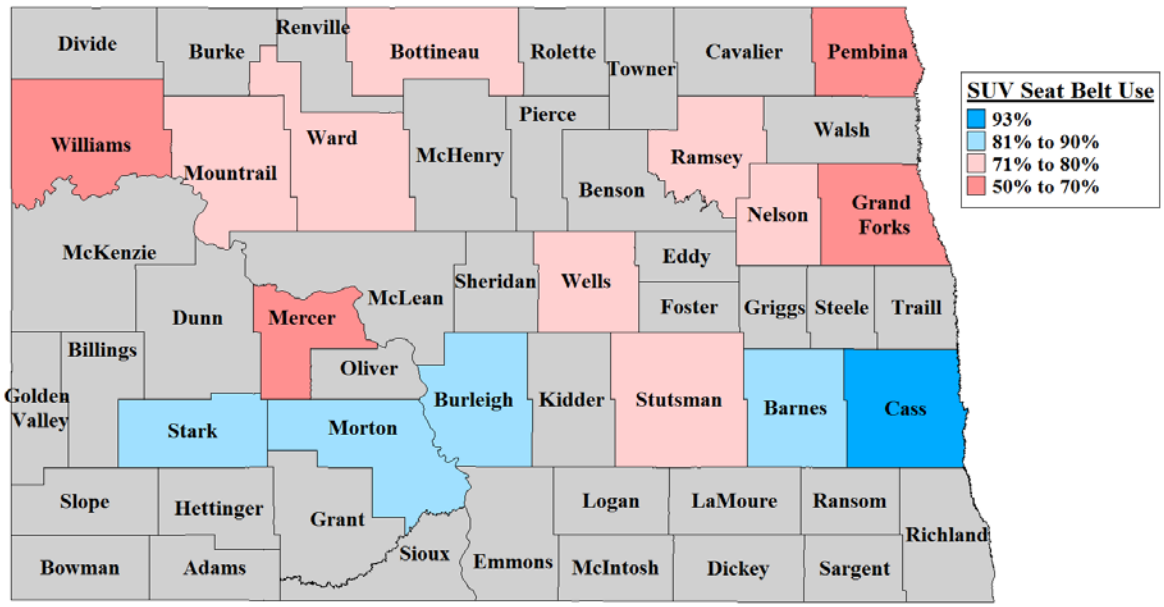
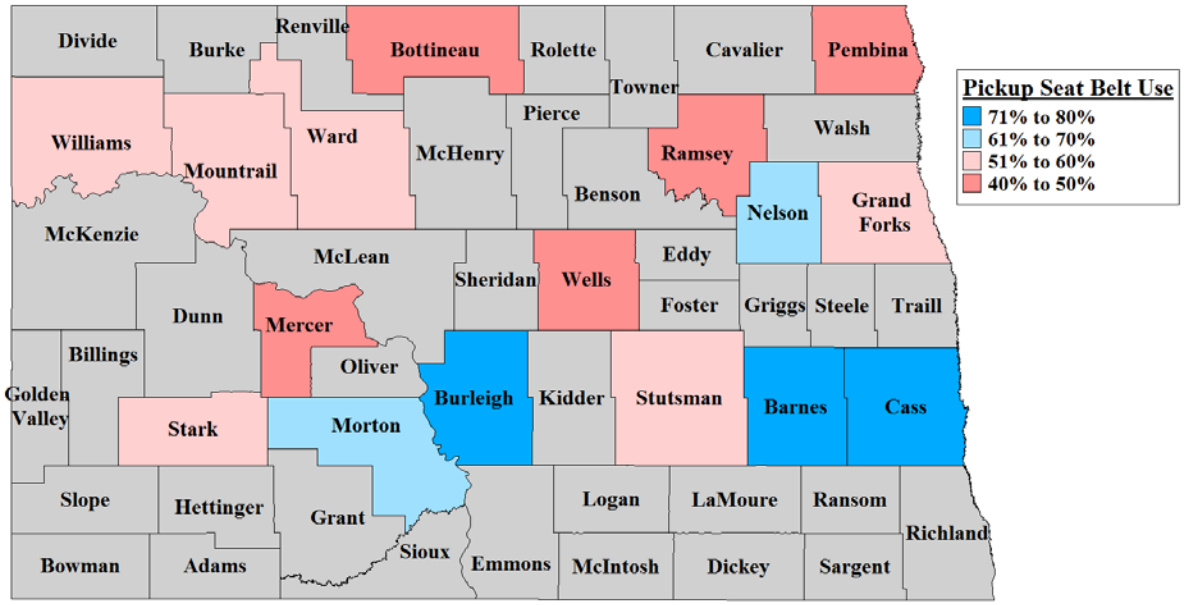


Figure 17: Pickup Seat Belt Use

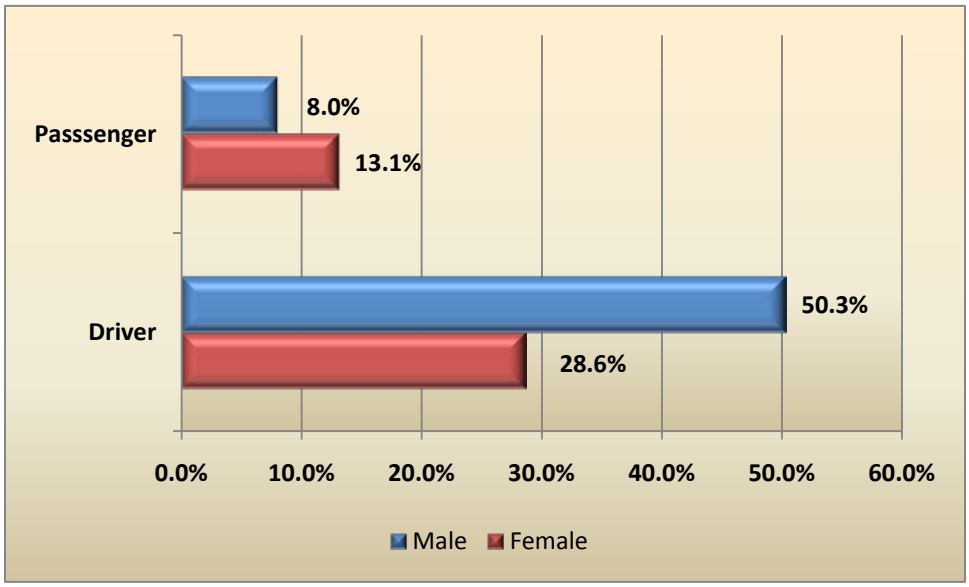


Gender and Seat Belt Use

The results for gender and seat belt use in 2010 are consistent with the results of prior surveys. Males made up more of the drivers, females most of the passengers, with females having higher rates of seat belt use in every circumstance. The statewide male seat belt use rate was 63.2% compared to 78.8% for females representing 58.3% and 41.7% of the sample respectively.

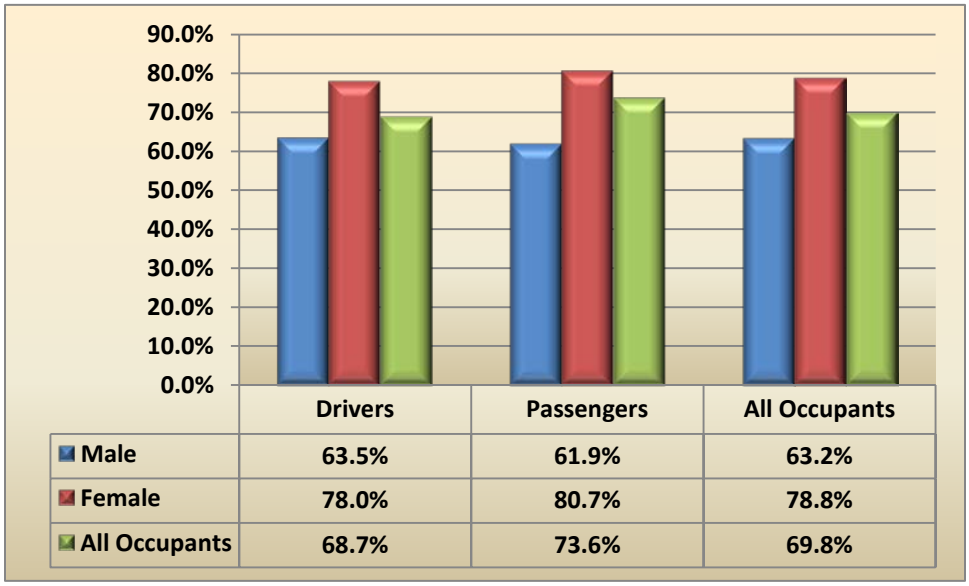
In ten cases, occupant gender was unable to be determined, however, occupant protection was recorded. These ten cases are included in all of the analyses except where gender is one of the variables of interest. Of the ten occupants, eight were belted, eight were drivers with six being belted, and two were passengers with both being belted. Removing these ten cases for these parts of the analyses has no effect on the overall numbers, but is mentioned here for completeness of reporting.

Figure 18: Percent of Sample by Gender & Vehicle Occupant



Sample distribution of vehicle occupants by gender is illustrated in Figure 18. Females are consistently using their seat belts at a higher frequency than males whether driver or passenger (Figure 19). The seat belt use rate for female drivers was 78.0%, compared to a rate of 63.5% for male drivers, a difference of 14.5 percentage points. Female passengers SBU was 80.7%, 18.8 percentage points higher than male passengers (61.9%). The overall rate for female vehicle occupants was 78.8%, compared to a rate of 63.2% for male occupants, reflecting a difference of 15.6 percentage points.

Figure 19: Belted by Gender & Vehicle Occupant



	Drivers	Passengers	All Occupants
Male	63.5%	61.9%	63.2%
Female	78.0%	80.7%	78.8%
All Occupants	68.7%	73.6%	69.8%

As can be seen in the following maps (Figures 20 and 21), both males and females are more likely to use their seatbelts in the south and the east.

Figure 20: Female Seat Belt Use

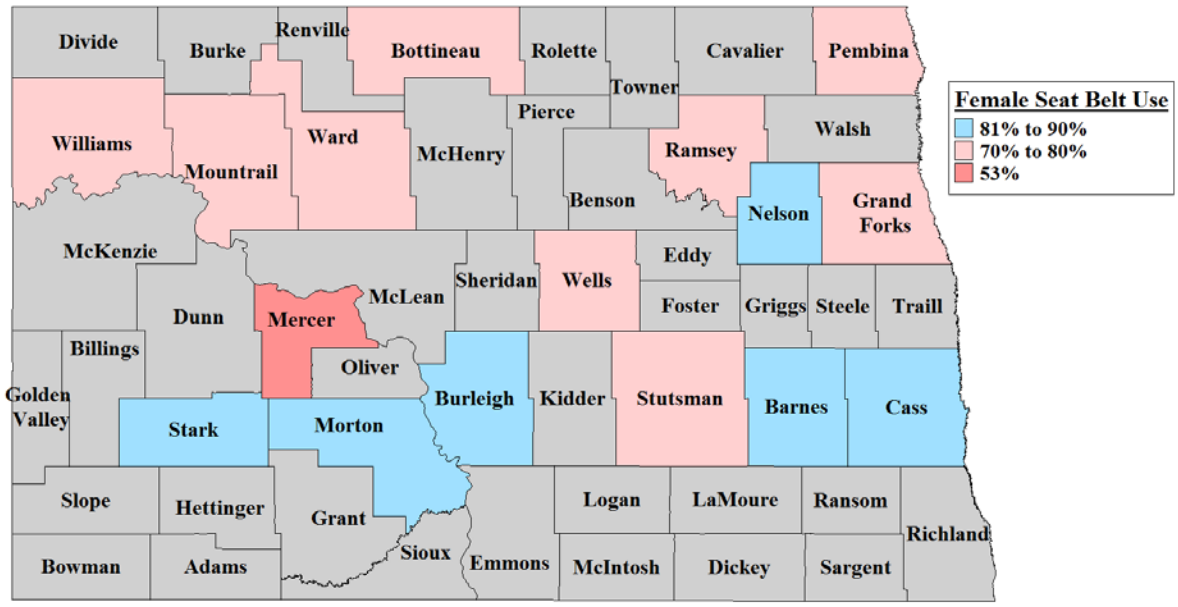
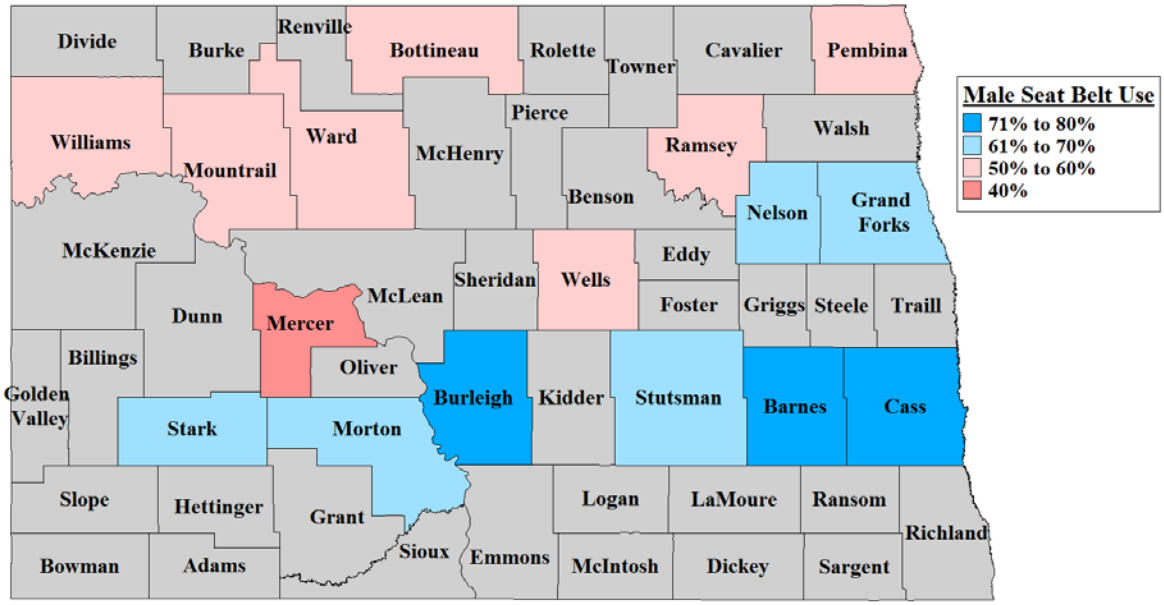


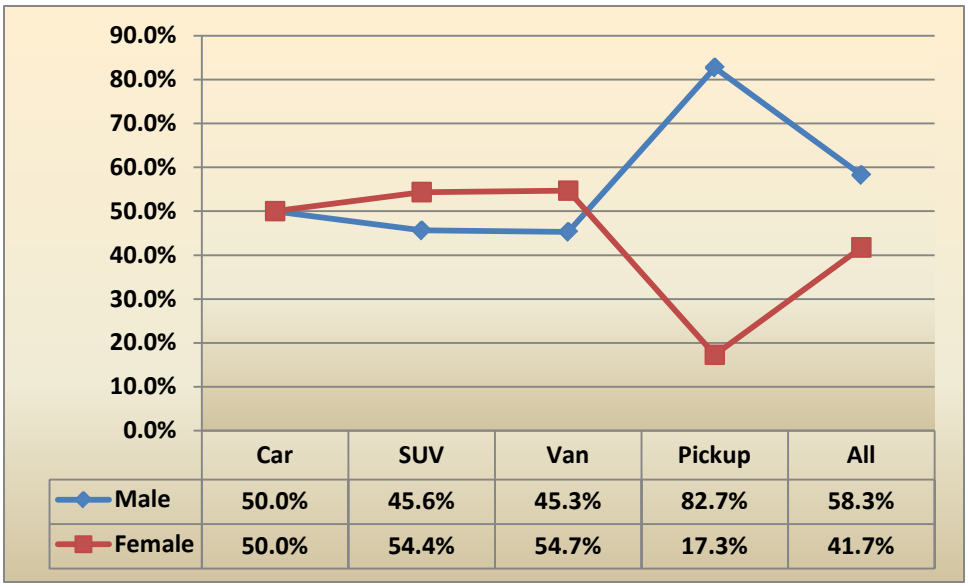
Figure 21: Male Seat Belt Use



Gender and Vehicle Type

The gender breakdown of the sample by vehicle type is approximately uniform with the exception of pickups. Male pickup drivers outnumber female pickup drivers by 4,416 to 923 or a 4.8 to 1 ratio. Males represent 82.7% of the pickup occupants in the sample, which represents the difference in favor of males in the driver population. When considering the data without respect to the driver/passenger demographic, female occupants exceed male occupants in vans and SUVs. The distribution of vehicle occupants by gender, expressed as percentages of the sample, are illustrated in Figure 22.

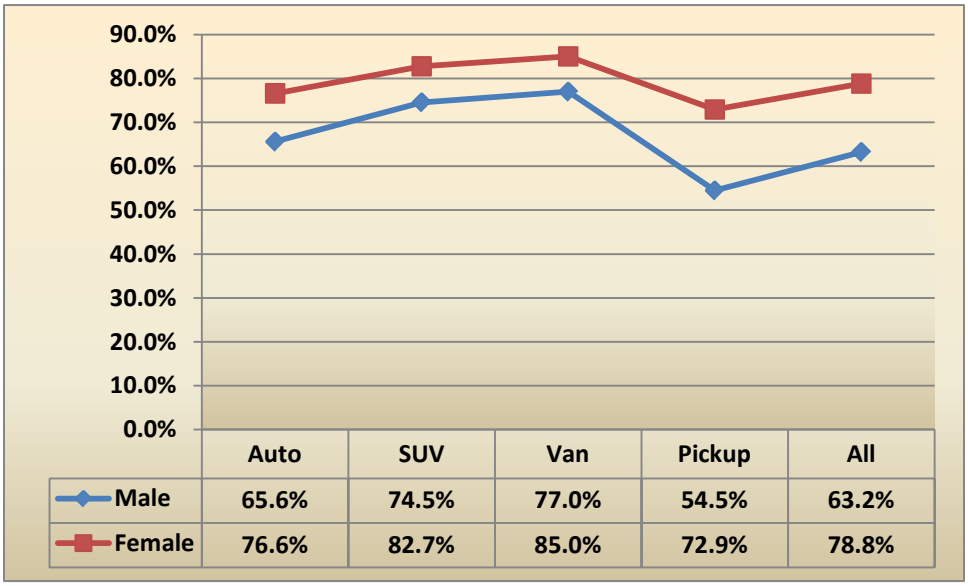
Figure 22: Percent of Sample by Vehicle Type, All Occupants



	Car	SUV	Van	Pickup	All
Male	50.0%	45.6%	45.3%	82.7%	58.3%
Female	50.0%	54.4%	54.7%	17.3%	41.7%

Females had higher rates of seat belt use than males in every type of vehicle, although the size of the gender difference in seat belt use varies by type of vehicle (Figure 23). The female rates, compared to male rates, were 11.0 percentage points higher in automobiles, 8.0 percentage points higher in vans, 8.2 percentage points higher in SUVs, and 18.4 percentage points higher in pickup trucks. In general, the female seat belt usage rates were consistently high across all type of vehicles, including pickups. The male rates were more varied, but the most significant finding was that the male rate dropped off precipitously to 54.5% belted in pickup trucks. The lowest observed rates for females were also in pickup trucks at 72.9%.

Figure 23: Belted by Gender & Vehicle Type



	Auto	SUV	Van	Pickup	All
Male	65.6%	74.5%	77.0%	54.5%	63.2%
Female	76.6%	82.7%	85.0%	72.9%	78.8%

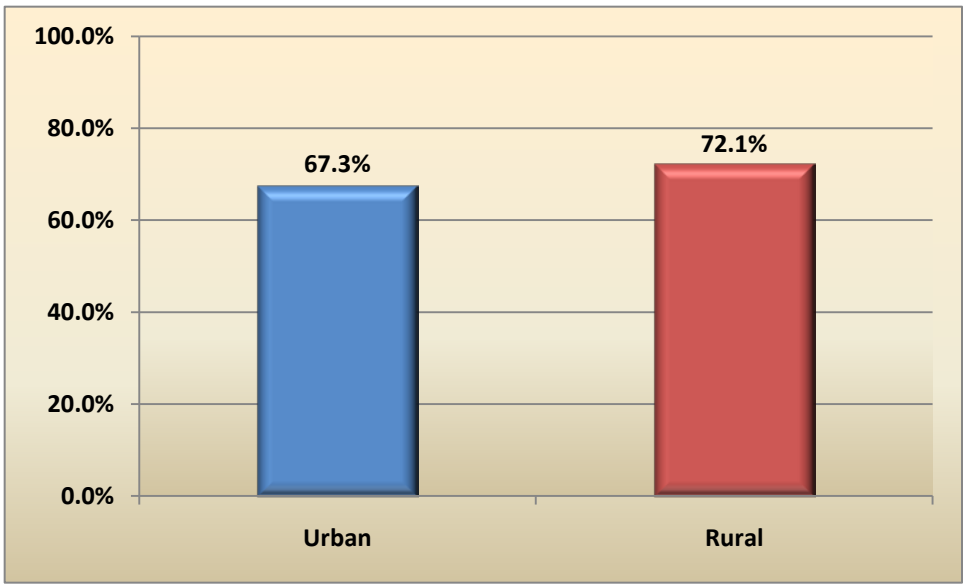
Results by Population Density

For this report, urban areas are defined as areas with a population of 2,500 or more residents, while rural areas are defined as having fewer than 2,500 residents. As a result, many of the "urban" areas of North Dakota actually have a very small town or rural character. In addition, many of the sites designated as "rural" may be part of the interstate or federal roadway system, where rates tend to be higher. In the 2010 sample, more observations (n=9,376, 51.5%) come from the rural sites than the urban sites (n=8,831, 48.5%).

For 2010, 67.3% of vehicle occupants in urban sites and 72.1% of vehicle occupants in rural sites were observed wearing seat belts. This 4.8 percentage point gap can mainly be attributed to the differences in road types and whether the site lies within a city or town. Occupants traveling within city or town limits are less likely to be belted than those traveling outside of city or town limits.

The results of the relationship between seat belt use and population density are presented in Figure 24.

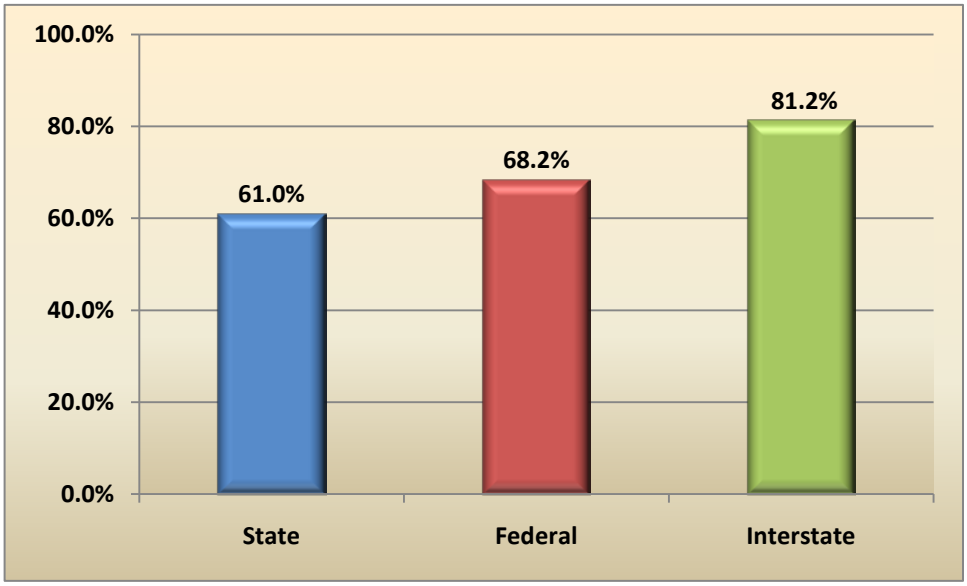
Figure 24: SBU by Population



Results by Roadway Type

Breaking down seat belt use by roadway type - classified as state-designated, federally-designated, and interstate - shows a large difference in seat belt use rates across the three types. For 2010, each roadway type accounted for about a third of the observations. Overall, state roadways accounted for 33.7% of the occupants, federal roadways accounted for 35.6% and interstate roadways accounted for 30.6%. It is typical for North Dakota to find that vehicle occupants on interstate roadways have, by far, the highest rates of seat belt use, and this was true for 2010. Vehicle occupants on interstates were belted at a rate of 81.2%, which is 20.2 percentage points higher than the rate of 61.0% for state roadways, and 13.0 percentage points higher than the rate of 68.2% for vehicle occupants observed on federal roadways (Figure 25).

Figure 25: SBU by Roadway Type



SUMMARY

Seventeen observers collected data on seat belt use for 14,370 drivers and 3,837 outboard passengers, for a total of 18,207 observations. The observations were collected at 316 sites across state-operated roadways in sixteen counties. Based on the sampling methodology weighting procedures, the final estimate for the statewide seat belt use was 74.8% belted. This estimate is 0.1 percentage point lower than the 2009 overall estimate. The actual seat belt use did not change in any significant sense from the 2009 estimates which ranked North Dakota 41st out of 50 in the nation among state seat belt use. Major improvement in seat belt use will likely only occur through some type of significant change either from implementation of a primary seat belt law, additional enforcement through increased funding, or possibly higher fines based on experiences from other states (NHTSA).

A summary of major findings regarding seat belt use in North Dakota for 2010 are:

- **Region.** Rates of seat belt use continue to be highest in the southeast region. The southwest had the next highest rate of seat belt use, but the rate falls off considerably in the northeast. The northwest continues to have the lowest rate of seat belt use.

- **County.** Cass had the highest rate of SBU at 85.3% with Burleigh close behind at 84.6%. Only two counties had rates of less than 60% - Wells at 58.8% and Mercer at 53.3%. Mercer's 2009 rate was also below 60% and ranked it next to last among the sixteen counties. While most counties showed little change in seat belt use from 2009 to 2010, three had rates that changed by more than 7 percentage points: Wells with a decline of 11.4 percentage points, Pembina with an increase of 20.3 percentage points, and Stark with an increase of 8.9 percentage points. Overall eleven counties saw decreases from 2009 rates, while only five counties saw increases.

- **Vehicle Type.** The results of the 2010 statewide survey indicated that rates of seat belt use were above the un-weighted statewide average in every type of vehicle except pickup trucks. The fact that pickup truck occupants made up almost 30% of the sample and the usage was extremely low - 57.7% overall with male occupants at 54.5% - combined to depress the overall rate of seat belt use in North Dakota.

- **Gender.** Female occupants had much higher rates of seat belt use than male occupants. This is true whether females are drivers or passengers. Females consistently have higher rates when compared to males not only in North Dakota, but across the nation.

- **Gender and Vehicle Type.** Females had higher rates of seat belt use than males for every vehicle type. Female rates were relatively high even in pickup trucks. The highest rate for males was found in vans, 77.0%, and the lowest in pickup trucks, 54.5%. By comparison, female rates were more consistent across vehicle types, ranging from 85.0% in vans to 72.9% in pickup trucks.