SEAT BELT USE IN NORTH DAKOTA

August 2011

Thank you to North Dakota Tourism and Gerald Blank for the use
of the North Dakota picture on the cover.

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Disclaimer

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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 since then, with relatively no change in the counties and sites that make up the sample. The only major change was to update the site and county vehicle miles travelled (VMT) to the latest NDDOT estimates for the 2009 survey. This change affected the determination of sampling probabilities for some sites. All reports from 2001 through 2008 used the same VMT estimates while the 2009 through 2011 reports used the 2009 updated estimates.

The 2011 survey was based on a random probability sample of 16 North Dakota counties and 319 observation sites developed for and approved by NHTSA in 2001. Trained observers used the week of June 6-10 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 2011 statewide survey, observers tracked seat belt use for 16,390 drivers and 4,104 outboard passengers, for a total of 20,494 vehicle occupants. The estimates of seat belt use were 71.4% for drivers, 75.9% for passengers, and an overall unweighted estimate of 72.3% belted for drivers and passengers combined. This result compares to the unweighted rate of 69.8% belted in 2010. In general, the findings in the 2011 North Dakota statewide survey are consistent with the findings of previous surveys. The weighted state rate for 2011 is 76.7% compared to 74.8% for 2010.

Males were less likely than females to wear seatbelts (66.2% vs. 80.9%). 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 8%

to 31% 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 83.5% followed by SUVs (79.6%), automobiles (75.4%), and pickups (59.8%).

Although drivers outnumbered passengers four to one, passengers buckled up at a rate of 75.9% compared to drivers at 71.4%. This may be mainly due to the fact that drivers are more likely to be men than women (62.9% vs. 37.1%), and their seat belt use rates are much lower than women – 66.1% compared to 80.4% respectively. For passengers, the reverse is true. Women represented 60.6% of the passengers with a use rate of 82.0%, while men represented 39.4% of the passengers with a use rate of 66.6%.

Rates by region show those occupants in the southeast are most likely to buckle up at 80.6% followed by those in the southwest at 72.9%. Occupants in the northeast buckled up at a rate of 70.0% with occupants in the northwest exhibiting the lowest usage, 64.1%. A main reason for this difference could be the high seat belt usage on interstate highways. Seat belt use for interstate observation sites was 82.4%, compared to 71.0% for federal highways and 65.6% for state highways. Only 5.3% of the interstate observations were recorded in the northeast region, while 53.6% were recorded in the southeast and 41.1% in the southwest. The northwest region does not contain any interstate highways.

NHTSA reports a national average seat belt use rate of 85% for 2010. North Dakota falls below this average with a weighted rate of 76.7%. As previously mentioned, this year's survey reflects a modest increase in usage over 2010 of 1.9 percentage points. However, North Dakota's rate may not see sizeable improvement in the short-term without some type of sustained effort or legislative change.

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INTRODUCTION

The Upper Great Plains Transportation Institute (UGPTI), an independent research and education center at 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 2011. 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)
- Region of state (northwest, northeast, southwest, southeast)
- Population (rural, urban)
- Roadway type (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 2011 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 6 – 10, 2011
Sample Size	16,513 vehicles (includes all vehicles where either the driver or passenger or both had a known protection status)
Observation Duration Per Site	Thirty (30) minutes observation time (up to an additional half hour added if minimum 30 observations was not achieved within the first 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 12 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 because 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 16 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 the federal guidelines as "certainty" counties. The 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 2011 survey of seat belt use in North Dakota were completed at the 20 randomly chosen sites within each of the 16 counties in the North Dakota sample, with the exception of Wells County where only 19 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 unweighted rate. The formula for estimating the seat belt use for the sample sites is as follows:

$\frac{1}{\sum_k W_{ijk} VMT_{ijk}} \sum_k W_{ijk} VMT_{ijk} \left(B_{ijk}/O_{ijk}\right)$ = 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 k^{th} sample site in the j^{th} stratum within the i^{th} 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 k^{th} sample site in the j^{th} stratum within the i^{th} county.

B_{ijk} = the total number of belted drivers and passengers for the k^{th} sample site in the j^{th} stratum within the i^{th} county

O_{ijk} = the total number of observed drivers and passengers for the k^{th} sample site in the j^{th} stratum within the i^{th} county.

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

Where:

$$County\ Seat\ Belt\ Use = \frac{VMT_{iU}}{VMT_i}\ Belt\text{UseStratum}_U + \frac{VMT_{iL}}{VMT_i}\ Belt\text{UseStratum}_L$$

Where:

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

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

VMT_i = 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:

$$\text{State Seat Belt Use} = \frac{\sum W_i VMT_i P_i}{\sum W_i VMT_i}$$

Where:

i = i^{th} county

W_i = the weight for the i^{th} county, which is equal to the number of available counties in the quadrant divided by the number of counties sampled in the quadrant.

VMT_i = the total daily miles traveled in the i^{th} county

P_i = seat belt use in the i^{th} county

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 unweighted including rates by regions, vehicle types, vehicle occupants, gender, population and roadway types.

Because of limitations of direct comparisons of unweighted 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 were approved for 2010 onwards. Unfortunately, data from 2008 and earlier were not available to be recalculated.

Note that VMTs and sampling probabilities were updated for each site in the 2009 North Dakota seat belt survey. The 2010 and 2011 SBU surveys follow 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. Because 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

$$SE(\hat{p}_s) = \sqrt{V(\hat{p}_s)}$$

Where:

$SE(\hat{p}_s)$ = the estimated standard error for the state seat belt use rate

$V(\hat{p}_s)$ = the estimated variance for the state seat belt use rate

$\hat{p}_s$ = 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 $\hat{p}_s \pm 1.96 * SE(\hat{p}_s)$, 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 2011 State Seat Belt Use				
Occupants	**State Rate**	**Standard Error**	**95% CI Lower Limit**	**95% CI Upper Limit**
20,494	76.7%	0.27%	77.2%	76.2%

The 95% confidence interval means statistically there is only a 5% chance that the actual statewide seat belt percentage falls outside the range from 76.2% to 77.2%. Given the survey sample (n=20,494) is large, the standard error for all vehicle occupants is small, 0.27%, which implies that our estimate of the state seat belt use is very accurate.

Protocols

Observers

Nineteen contracted observers were used to conduct the 2011 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 based on the first site 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 12-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 a predetermined time slot, requiring a 30-minute observation period beginning at the first five-minute interval after arrival at the site, and ending exactly thirty minutes later. If a minimum of 30 observations was not achieved within the initial 30 minute timeframe, up to an additional half hour of observation time was added.

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 site accessibility issues related to road construction and flooding. In these cases, if the observer was able to move to an alternate site fitting the protocols, this was done. However, some sites with accessibility problems were terminated since alternate sites identified by the movement protocols were also inaccessible. Complete information specifying site visits is found in Appendix E

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, observer training sessions were held at two sites, with observers required to attend one of the two training sessions. 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. During field training, observers recorded data independently on separate observation forms. Each observer documented vehicle type, gender, and seat belt use of both drivers and outboard front seat passengers. Individual observations were then compared to the group to calculate the agreement rate. All agreement rates were sufficiently high based on these two sites so no additional training was required.

Data Entry

Steps were taken to ensure quality control with respect to data entry. Each site packet was checked to ensure the number of observation sheets submitted was the same as that noted by the observers. Database records were verified to match the number of observations. An accuracy check was done on a systematic sample of records by checking every ninth record. A total of 1,900 records were checked with the accuracy found to be greater than 99% for every field. Driver protection and gender, as well as passenger gender and protection had an accuracy rate of 99.99%. Vehicle type had the lowest accuracy rate of 99.63%. Errors discovered during quality assurance checks were corrected prior to all analyses being completed.

RESULTS

The overall unweighted results of the 2011 statewide survey of seat belt use on state-operated roads in North Dakota indicate that 71.4% of the drivers, 75.9% of front seat outboard passengers, and a combined 72.3% of these vehicle occupants were observed to be wearing seat belts. This compares to the unweighted rate of 69.8% belted in 2010. 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 76.7% for 2011, a 1.9 percentage point increase over the 2010 rate of 74.8%.

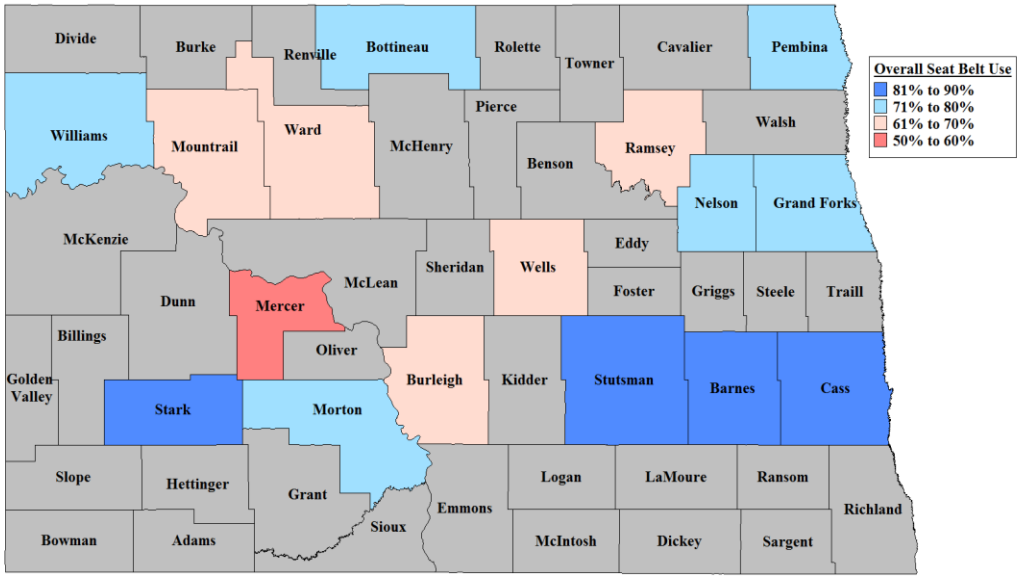


Figure 1: Total Seat Belt Use

The weighted seat belt use rates (Figure 1) range from a low of 59.8% in Mercer County to a high of 87.5% in Barnes County. Of the 16 NOPUS counties, 4 have rates above 80% - Barnes, Cass, Stark, and Stutsman. Mercer is the only county showing a usage rate lower than 60%.

One influence on the overall rate is the driver to passenger ratio. In 2010, there were 3.74 drivers for every passenger. The ratio is relatively unchanged this year at 3.99 (Table 3).

Table 3: Driver Passenger Ratio, 2010-2011

	2011	2010	Difference
Ratio			
Drivers:Passengers	3.99	3.74	+0.25
Drivers as % of Sample	80.0%	78.9%	+1.10%

In 2011, both the number of drivers and passengers in the samples increased (Figure 2).

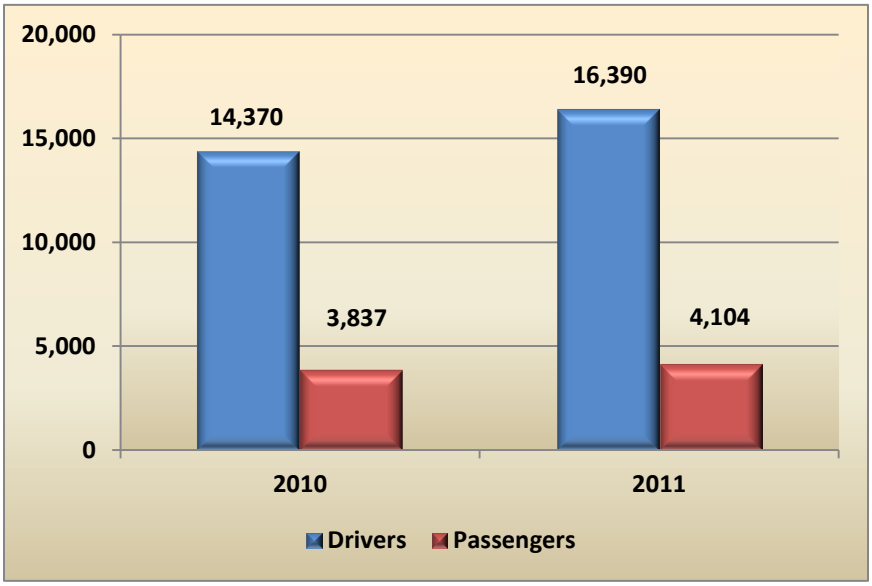


Figure 2: Driver and Passenger Observations, 2010 - 2011

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. Explanations for the reduction in the number of vehicles observed in relation to previous years would be speculation because prior surveys were conducted by a different firm. The sample size from 2010 to 2011 increased by 2,287. This increase is likely due to a time extension allowed at sites with low traffic activity when an acceptable minimum of 30 observations was not achieved within the first half hour of observation. The sample size of each annual seat belt survey from 2001 to 2011 is illustrated in Figure 3.

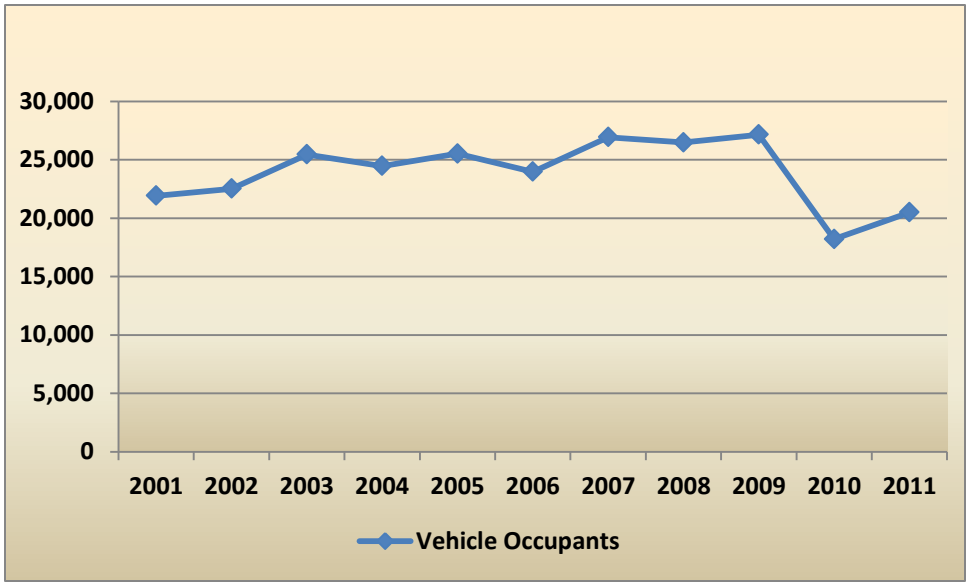


Figure 3: Observations, 2001 - 2011

Results for Vehicle Occupants

Observers collected data on 16,390 drivers and 4,104 front seat passengers for the 2011 North Dakota statewide survey. The unweighted estimates of seat belt use are 71.4% belted for drivers, 75.9% belted for passengers, with an overall estimate of the seat belt usage rate of 72.3% for drivers and passengers combined (Figure 4). Only three counties have unweighted driver rates greater than 80%: Barnes, 81.6%, Cass, 84.2%, and Stark, 83.1%. Mercer, Mountrail, Pembina and Ramsey all have driver rates less than 60% (Figure 5). For passengers, Barnes and Stark counties again rank high with rates of 91.6% and 90.1%, respectively. Mountrail lags in passenger seat belt use at 54.8% (Figure 6).

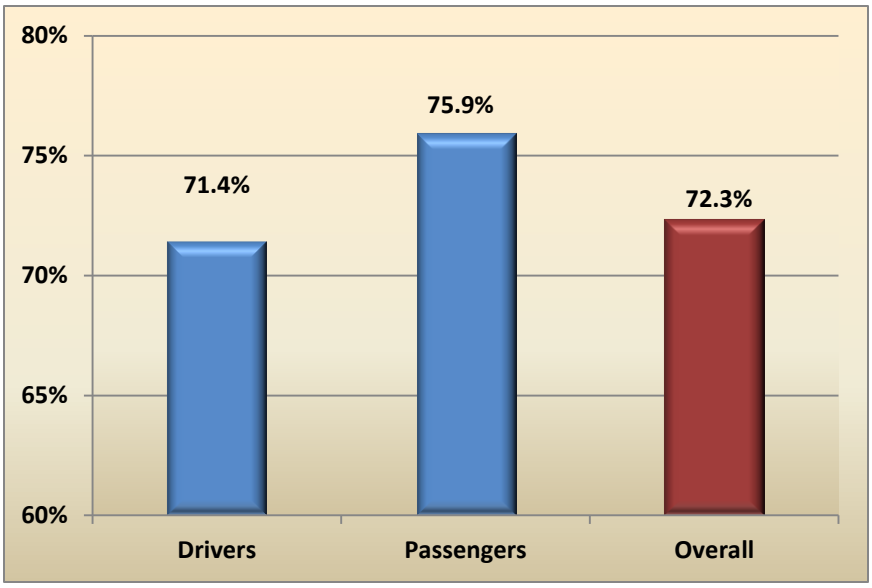


Figure 4: Percent Belted by Vehicle Occupant

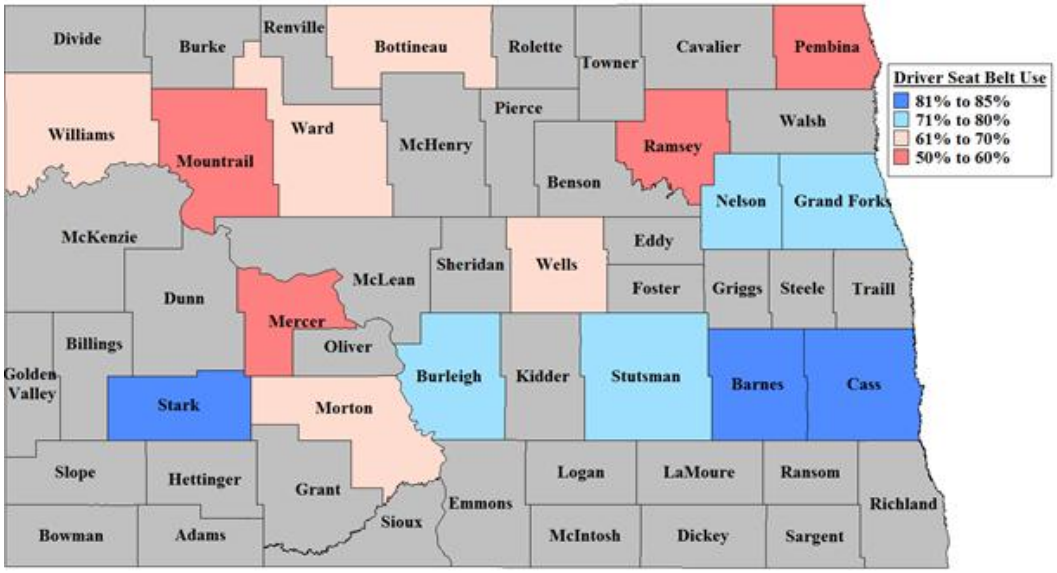


Figure 5: Driver Seat Belt Use

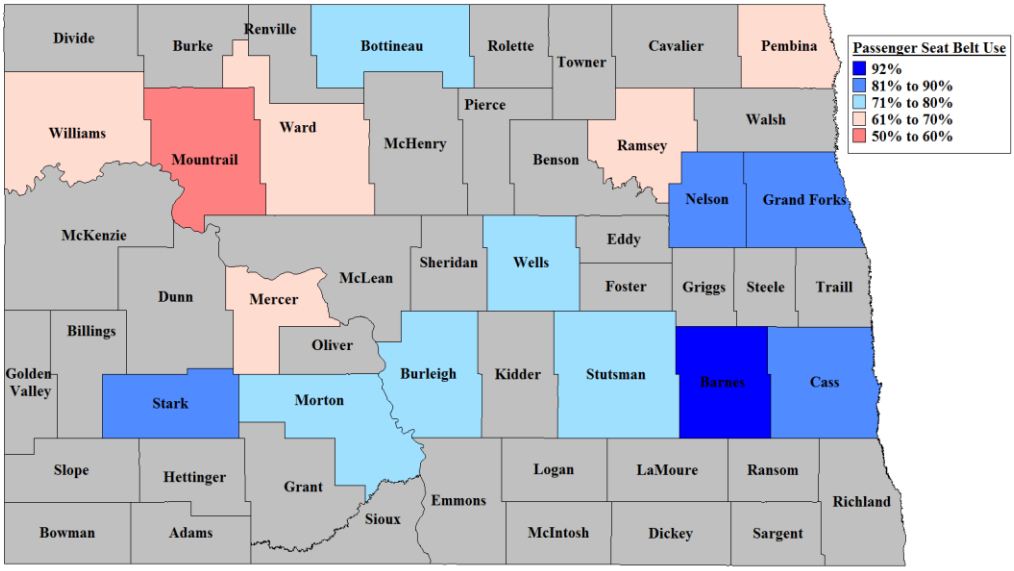


Figure 6: Passenger Seat Belt Use

Figure 7 illustrates the weighted statewide seat belt use in North Dakota for 2009 through 2011. The rates, while nearly equal for 2009 and 2010, saw an increase of 1.9 percentage points in 2011.

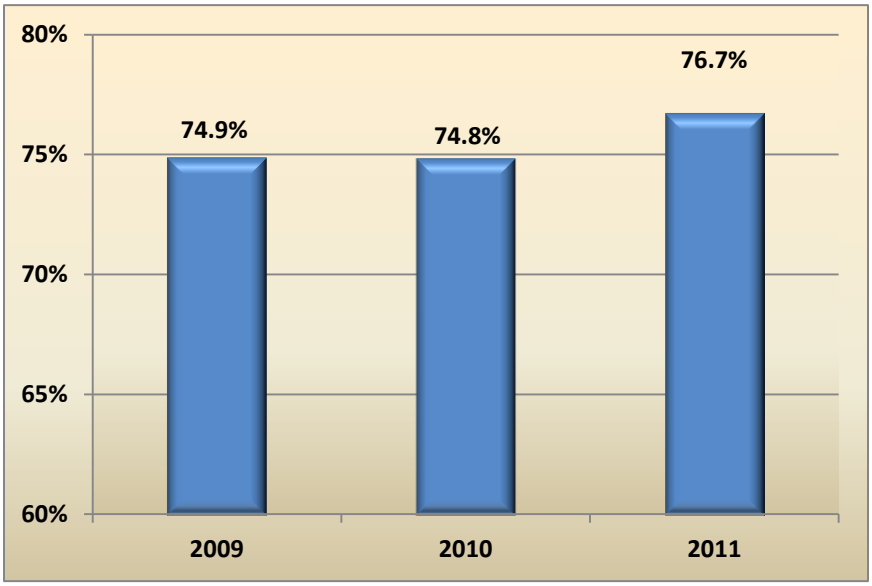


Figure 7: Percent Belted by Year, 2009 - 2011

Considerable effort has been made to address seat belt use in North Dakota. The modest increase realized this year is still considerably lower than the national average of 85% (2010) reported by NHTSA. Experiences from other states would suggest that some impetus causing 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, as well as, an examination of 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 2011 survey indicate the greatest numbers of observations were collected in the southeast and southwest quadrants with fewer observations from both the northeast and northwest. The sampling distribution by region is illustrated in Figure 8.

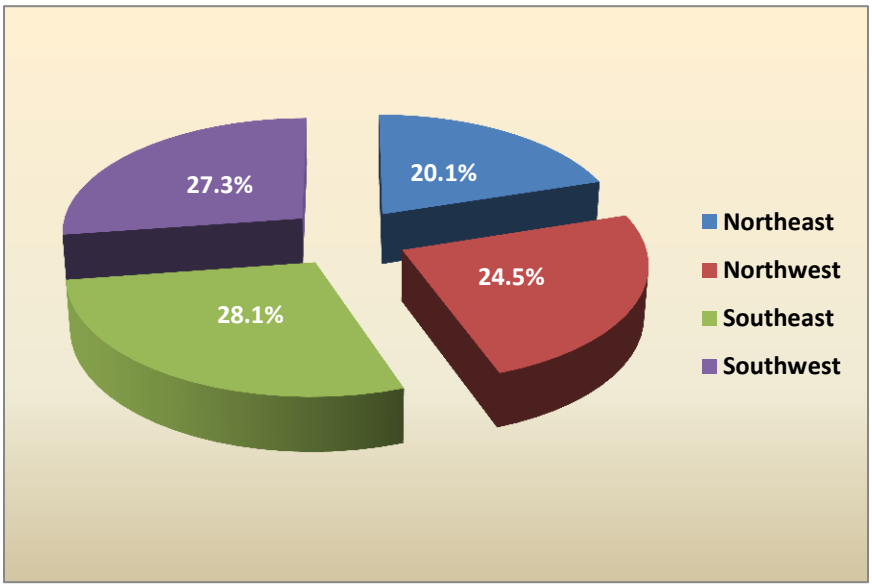
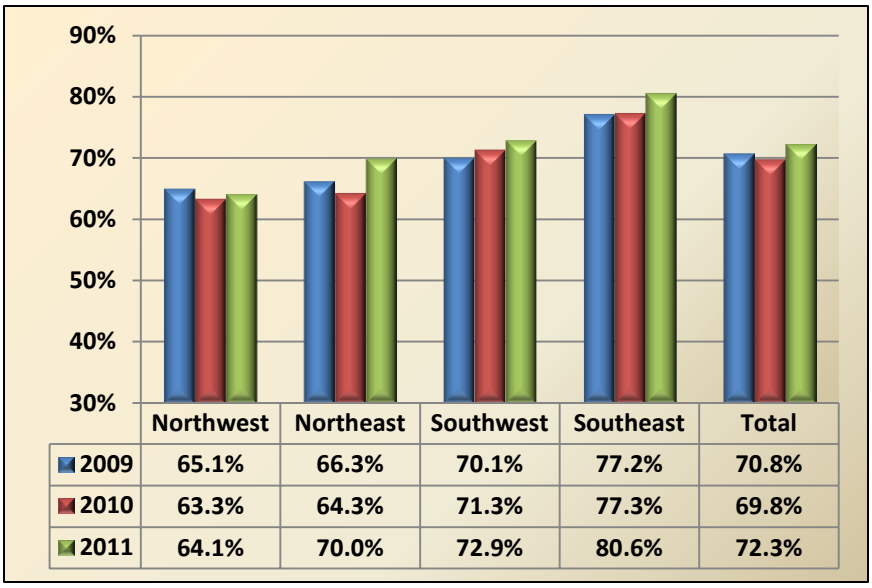


Figure 8: Sample by Region

Seat belt use (SBU) has historically been highest in the southeast and southwest regions, with lower rates in the northern quadrants. This holds true in the 2011 survey results as well. All quadrants show increased SBU rates over 2010 rates, and three of the four quadrants (southeast, southwest, northeast) have higher rates than the previous two years. The southeast region's SBU rate (80.6%) in 2011 increased by 3.3 percentage points from 2010 and the rate in the southwest (72.9%) showed an increase of 1.6 percentage points. The 2011 rates in the northern quadrants are 64.1% in the northwest, up slightly over the comparable 2010 rate. The largest rate increase was found in the northeast, 70.0%, an increase of 5.7 percentage points. Figure 9 illustrates regional SBU results for all vehicle occupants for 2011.

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



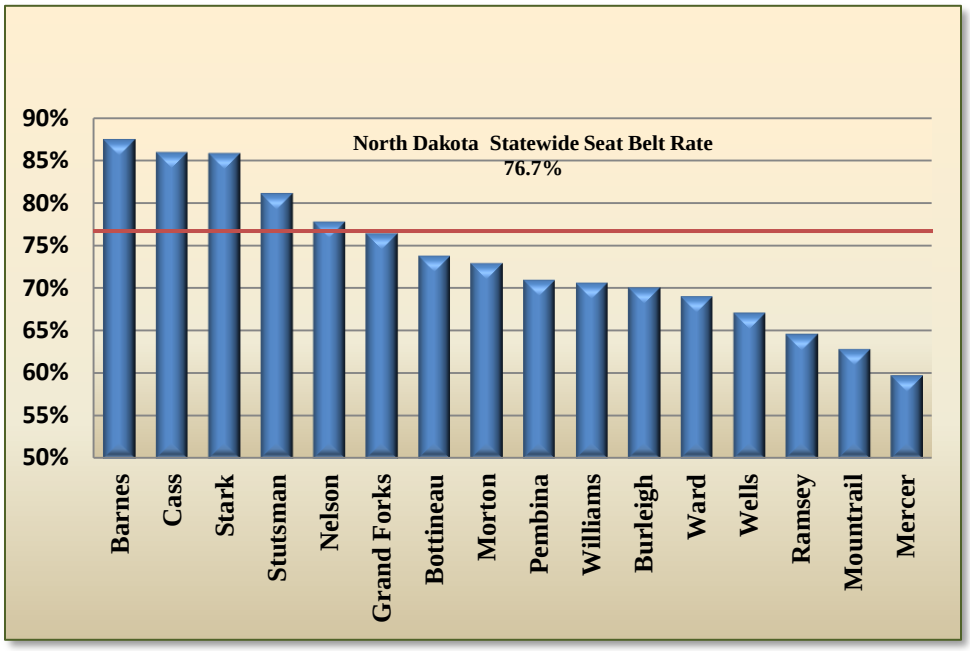
	Northwest	Northeast	Southwest	Southeast	Total
2009	65.1%	66.3%	70.1%	77.2%	70.8%
2010	63.3%	64.3%	71.3%	77.3%	69.8%
2011	64.1%	70.0%	72.9%	80.6%	72.3%

Figure 9: Percent Belted by Region & Year

Note that the relatively high rate of seat belt use in the southeast region, made up largely of Cass County and including 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. Seat belt use in the northwest has historically been the lowest and continues to lag behind the southern quadrants by a considerable margin.

Results by County

The 2011 weighted seat belt usage for all vehicle occupants in the 16 counties included in the sample are illustrated in Figure 10 by descending order of usage. The 2011 data indicates that four counties, Barnes, Cass, Stark and Stutsman, have rates that are above 80%. The lowest usage is found in Mercer County at 59.8% which is 22% lower than the statewide rate of 76.7%. Wells, Ramsey and Mercer have all ranked in the bottom five counties for SBU over the last three survey years.



Barnes	87.5%
Cass	86.0%
Stark	85.8%
Stutsman	81.1%
Nelson	77.8%
Grand Forks	76.5%
Bottineau	73.8%
Morton	72.9%
Pembina	71.0%
Williams	70.7%
Burleigh	70.1%
Ward	69.1%
Wells	67.1%
Ramsey	64.6%
Mountrail	62.9%
Mercer	59.8%

Figure 10: Seat Belt Use by County

Table 4 outlines changes in weighted seat belt rates by county between the 2010 and 2011 surveys. A majority of the counties saw relatively small changes in seat belt use rates. Four counties had changes of more than 7 percentage points. They are Burleigh with a decline of 14.5 percentage points, and Bottineau, Stutsman, and Wells with increases of 7.3, 8.0, and 8.3 percentage points respectively. Overall, five counties had decreases from 2010 rates, while most counties saw increases ranging from 0.7 to 8.3 percentage points.

Table 4: Counties, 2010-2011

Weighted Percent Belted by County			
	2010	2011	Percentage Point Difference (+/-)
Burleigh	84.60%	70.09%	-14.51
Morton	77.60%	72.95%	-4.65
Mountrail	66.50%	62.90%	-3.60
Pembina	74.10%	70.99%	-3.11
Ramsey	64.90%	64.62%	-0.28
Cass	85.30%	85.97%	0.67
Nelson	76.20%	77.84%	1.64
Stark	83.00%	85.85%	2.85
Ward	64.30%	69.07%	4.77
Williams	64.80%	70.68%	5.88
Barnes	81.50%	87.47%	5.97
Mercer	53.30%	59.78%	6.48
Grand Forks	69.90%	76.46%	6.56
Bottineau	66.50%	73.81%	7.31
Stutsman	73.10%	81.13%	8.03
Wells	58.80%	67.11%	8.31
TOTAL	74.80%	76.73%	1.93

Note that it is best to be cautious in interpreting usage rates from one year to the next at the county level. 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

The 2011 North Dakota survey shows the distribution of vehicle occupants to be similar to previous years. Sample size varied by less than 1 percentage point from 2010 for all vehicle types. Automobiles held the largest share of the sample with 40.0%, pickup trucks - 30.0%, SUVs - 21.0% and vans - 9.0% (Figure 11).

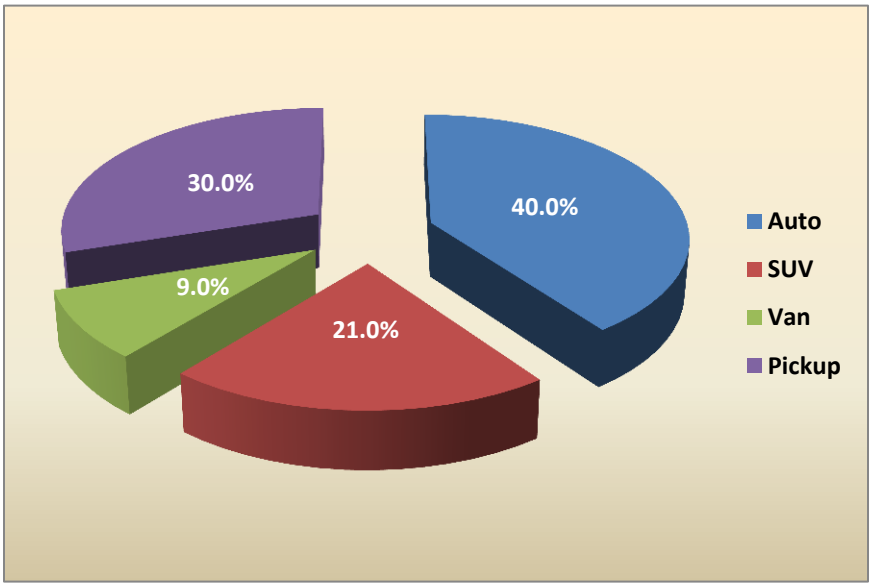


Figure 11: Distribution of Sample by Vehicle Type

Unweighted seat belt usage rates are higher than the unweighted statewide average for every vehicle type except pickups again this survey. This demographic represents 30.0% of the sample and 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 2011 is 59.8% which is a slight increase over 2010 rates (57.7%). However, occupants of pickups still have observed seat belt use rates 20% to 28% lower than the rates in other vehicle types. Finally, the pickup usage rate is 17% lower than the overall unweighted state rate of 72.3%. These results in 2011 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 overall seat belt use by vehicle type are presented in Figure 12. Detailed seat belt use by individual county and vehicle type is represented in Figures 13 through 16.

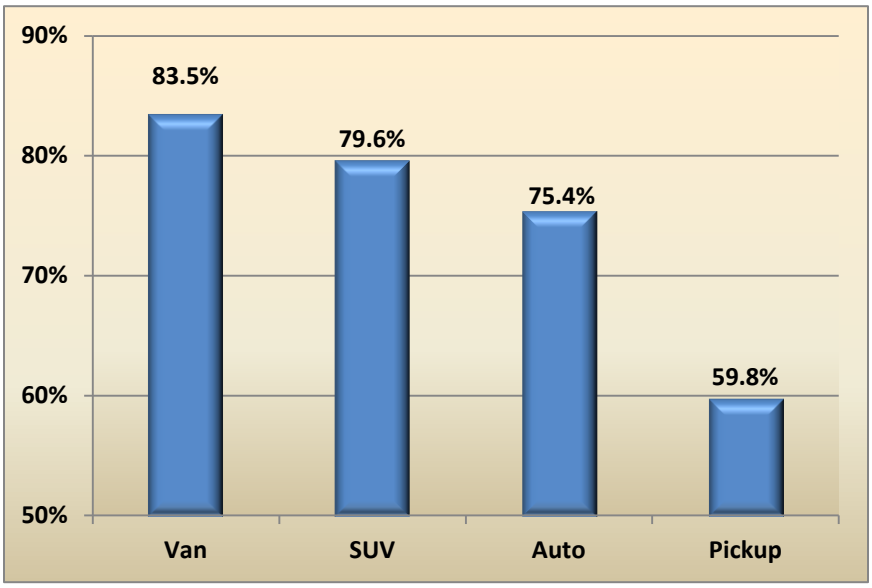


Figure 12: Percent Belted by Vehicle Type, All Occupants

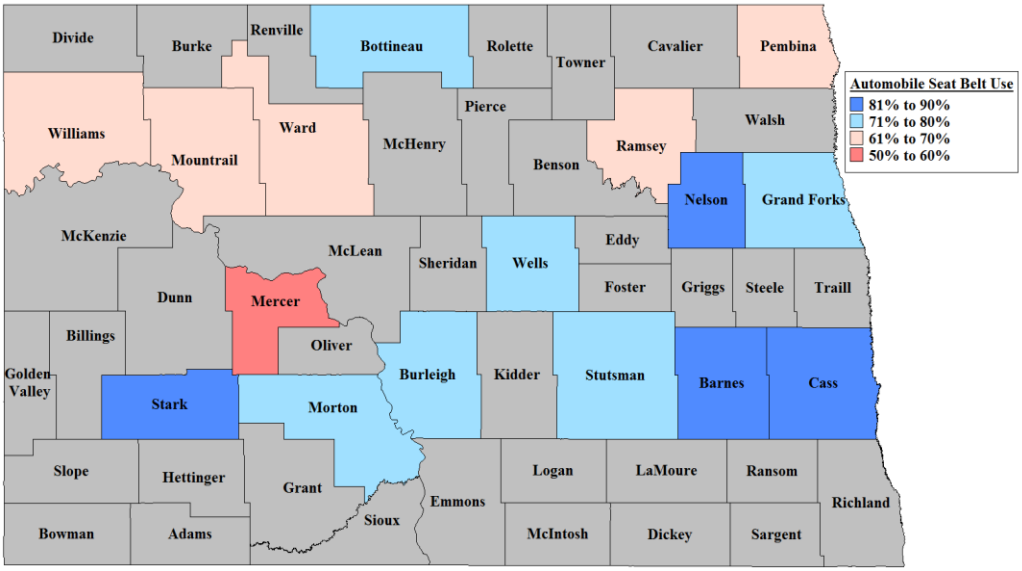


Figure 13: Automobile Seat Belt Use

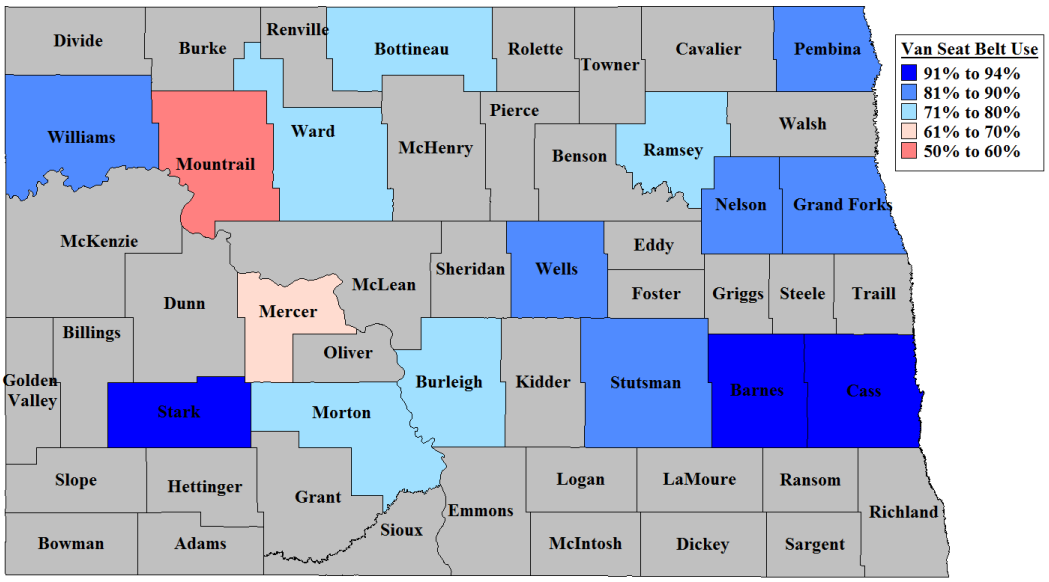


Figure 14: Van Seat Belt Use

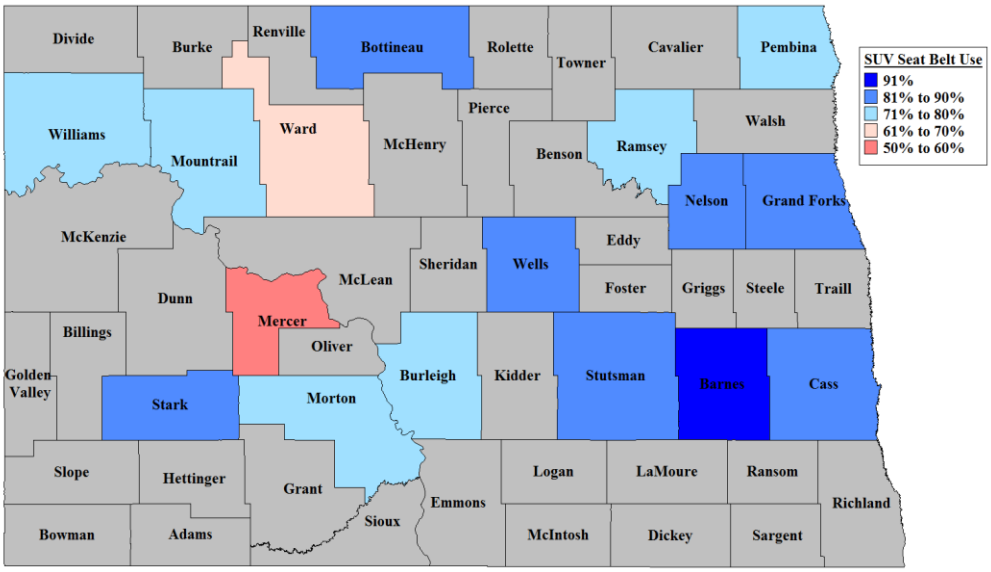


Figure 15: SUV Seat Belt Use

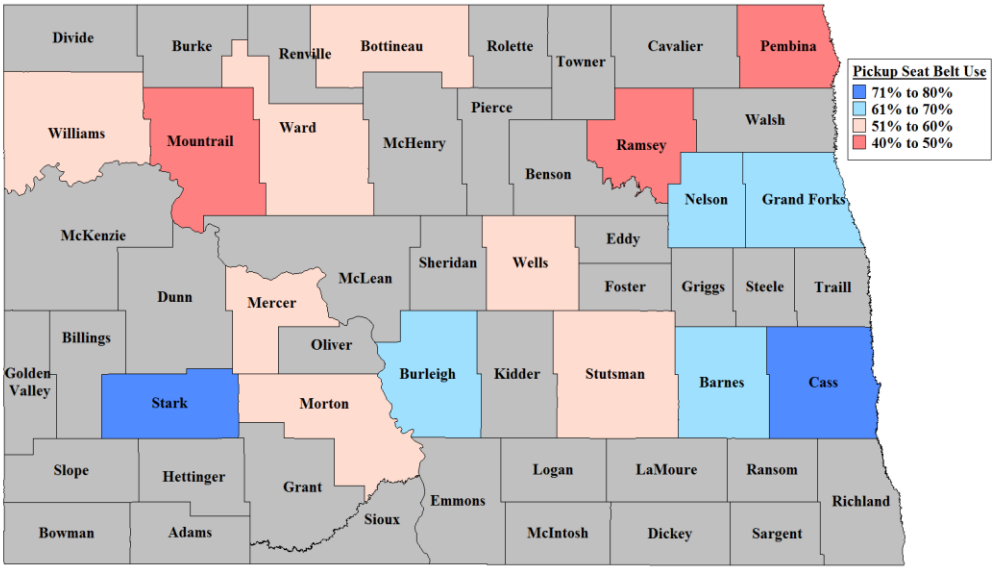


Figure 16: Pickup Seat Belt Use

Gender and Seat Belt Use

The results for gender and seat belt use in 2011 are consistent with the results of prior surveys. Males made up more of the drivers, females more of the passengers, with females having higher rates of seat belt use in every circumstance. The statewide male seat belt use rate was 66.2% compared to 80.9% for females representing 58.2% and 41.8% of the sample respectively. Sample distribution of vehicle occupants by gender is illustrated in Figure 17.

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

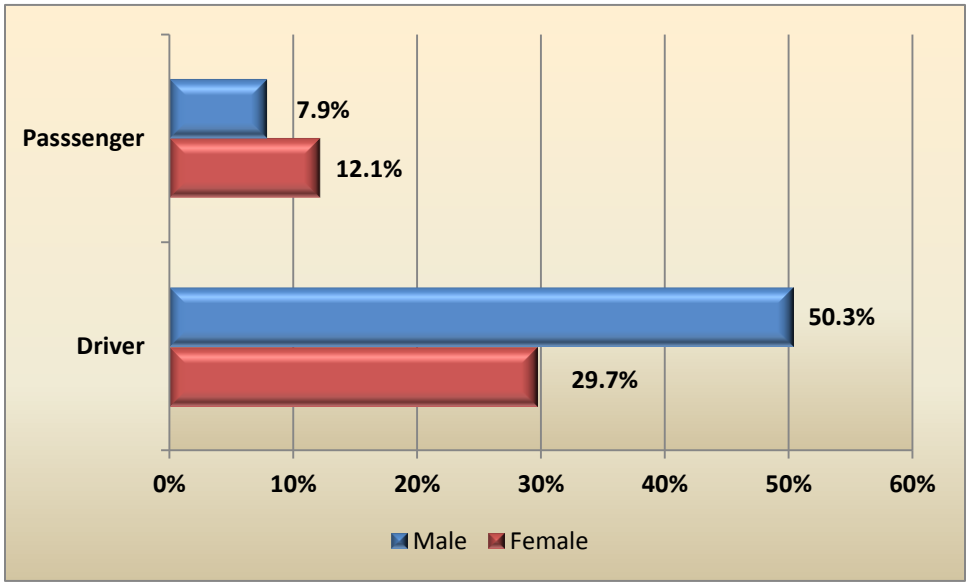
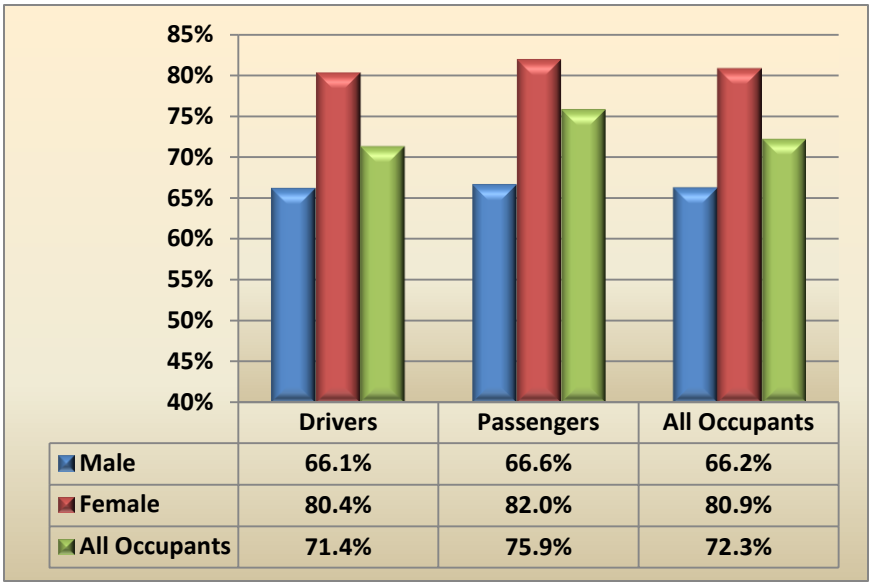


Figure 17: Percent of Sample by Gender & Vehicle Occupant

Females, both drivers and passengers, consistently use their seat belts more frequently than males (Figure 18). The seat belt use rate for female drivers was 80.4%, compared to a rate of 66.1% for male drivers, a difference of 14.3 percentage points. Female passengers seat belt use was 82.0%, 15.4 percentage points higher than male passengers (66.6%). The overall rate for female vehicle occupants was 80.9%, compared to a rate of 66.2% for male occupants, reflecting a difference of 14.7 percentage points.



	Drivers	Passengers	All Occupants
Male	66.1%	66.6%	66.2%
Female	80.4%	82.0%	80.9%
All Occupants	71.4%	75.9%	72.3%

Figure 18: Belted by Gender & Vehicle Occupant

As can be seen in the following maps (Figures 19 and 20), both males and females are more likely to use their seatbelts in the south and the east.

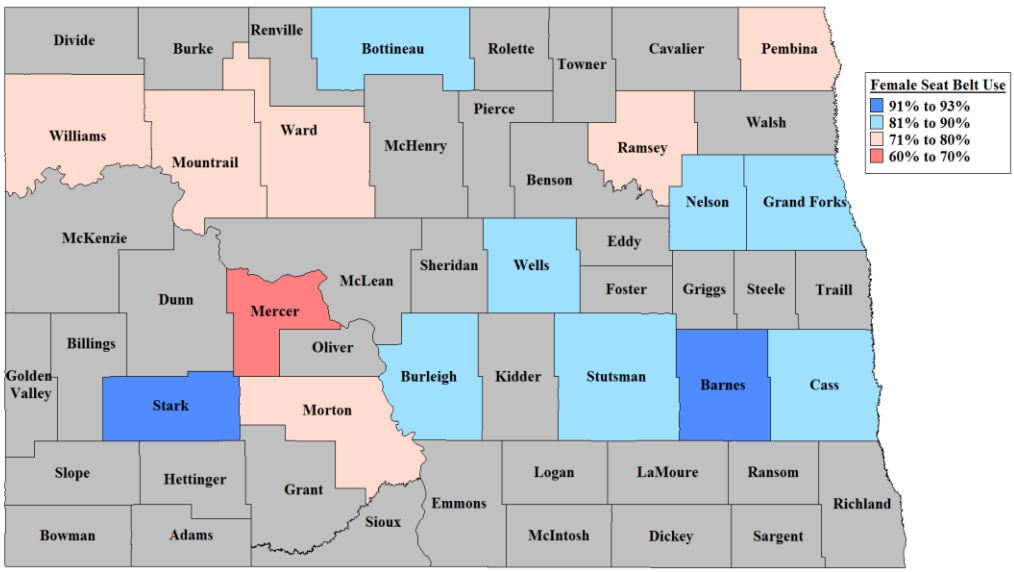


Figure 19: Female Seat Belt Use

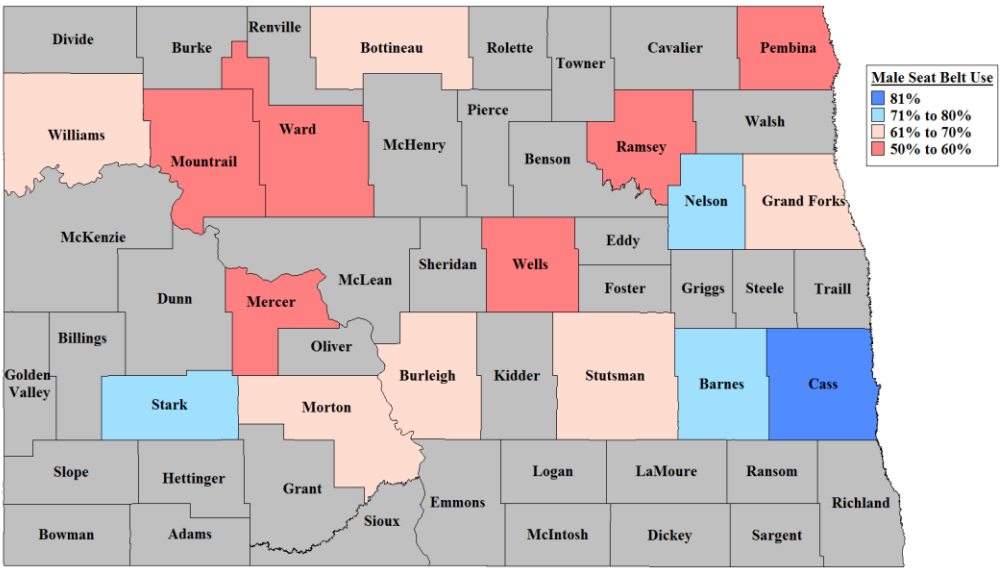
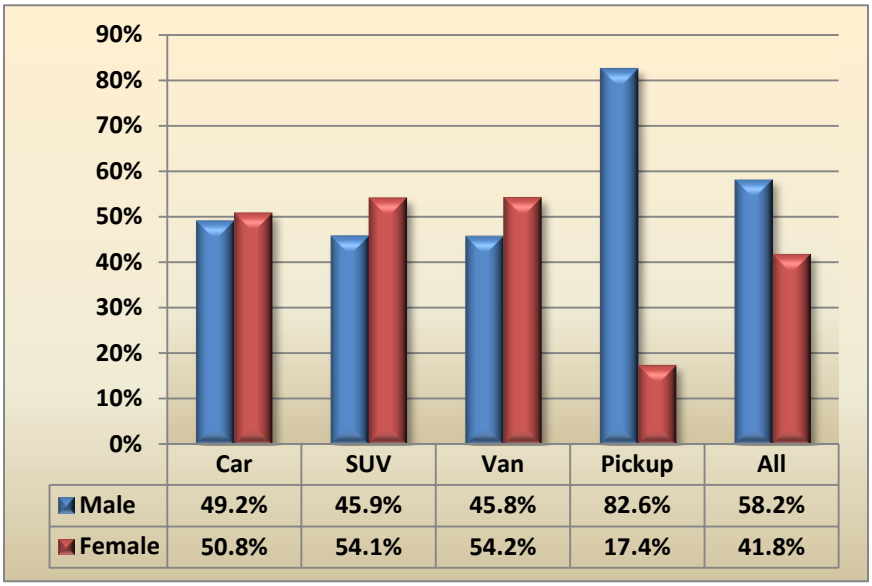


Figure 20: Male Seat Belt Use

Gender and Vehicle Type

The gender breakdown of the sample by vehicle type is approximately uniform with the exception of pickups. Male occupants outnumber female occupants in pickups by a ratio of 4.7 to 1. Males represent 82.6% of the pickup occupants in the sample. When considering the data without respect to the driver/passenger demographic, female occupants exceed male occupants in vans, SUVs, and automobiles. The distribution of vehicle occupants by gender, expressed as percentages of the sample, are illustrated in Figure 21.



	Car	SUV	Van	Pickup	All
Male	49.2%	45.9%	45.8%	82.6%	58.2%
Female	50.8%	54.1%	54.2%	17.4%	41.8%

Figure 21: Percent of Sample by Vehicle Type, All Occupants

Females have higher rates of seat belt use than males for every type of vehicle, although the size of the gender difference in seat belt use varies by type of vehicle (Figure 22). The female rates, compared to male rates, were 8.9 percentage points higher in automobiles, 8.4 percentage points higher in vans, 8.3 percentage points higher in SUVs, and 16.6 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 56.9% belted in pickup trucks. The lowest observed rates for females were also in pickup trucks at 73.5%. Female seat belt use is higher than the unweighted state SBU rate across all vehicle types, whereas, male seat belt use outpaces the state rate in vans and SUVs only.

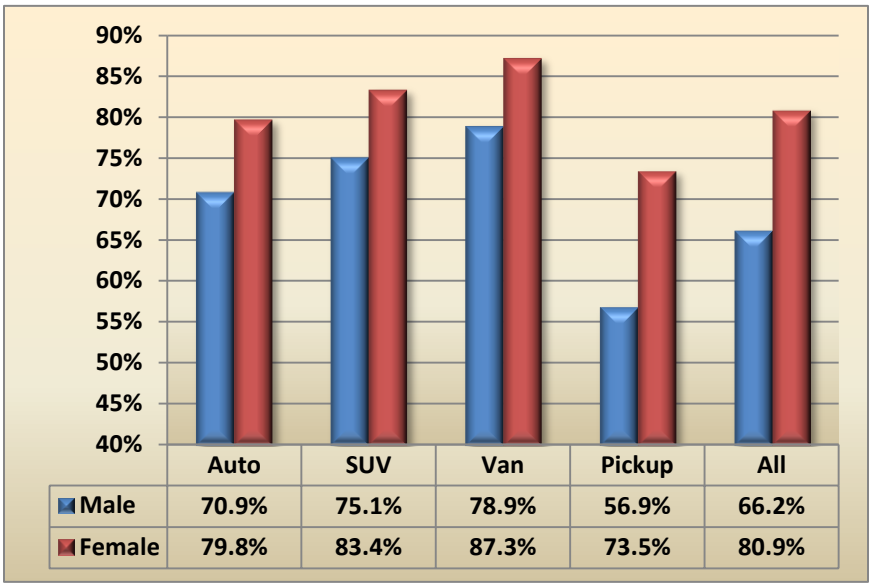


Figure 22: Belted by Gender & Vehicle Type

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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 2011 sample, more observations (n=11,242, 54.9%) came from the rural sites than the urban sites (n=9,252, 45.1%).

For 2011, 71.3% of vehicle occupants in urban sites and 73.2% of vehicle occupants in rural sites were observed wearing seat belts. This 1.9 percentage point gap can mainly be attributed to the differences in road types and whether the site lies within a city or town. Also, seat belt use on interstates in North Dakota is higher than other types of roadways surveyed, and because many of the sites along interstates are classified as rural this also inflates the rural seat belt use rate.

The relationship between seat belt use and population density are presented in Figure 23.

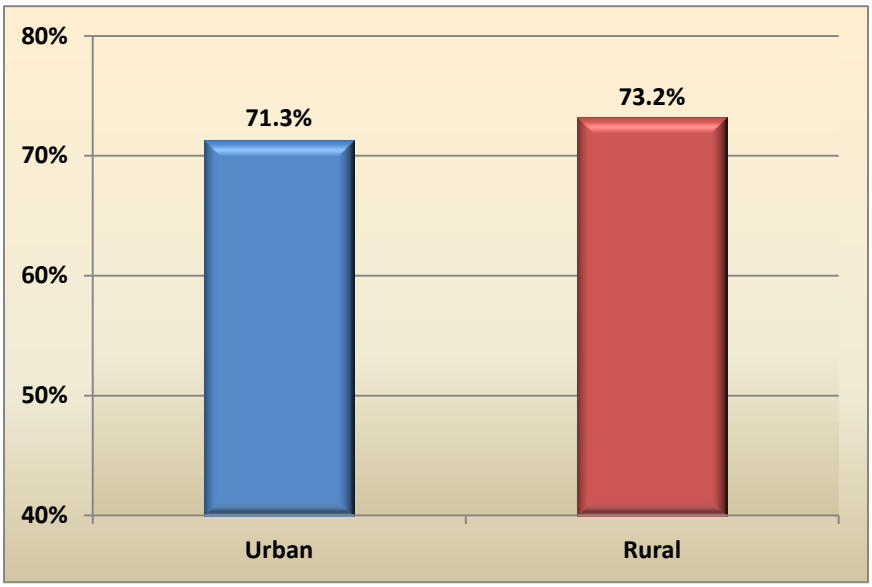

Figure 23: Seat Belt Use by Population

Results by Roadway Type

Roadway type is classified as state-designated, federally-designated, and interstate roadways. A large difference in seat belt use rates is found across the three types. In the 2011 survey, state, federal and interstate roadways accounted for 36.2%, 34.9%, and 28.9% of the vehicles respectively. 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 again evident in 2011. Vehicle occupants on interstates were belted at a rate 16.8 percentage points higher than the rate for state roadways, and 11.4 percentage points higher than vehicle occupants observed on federal roadways (Figure 24).

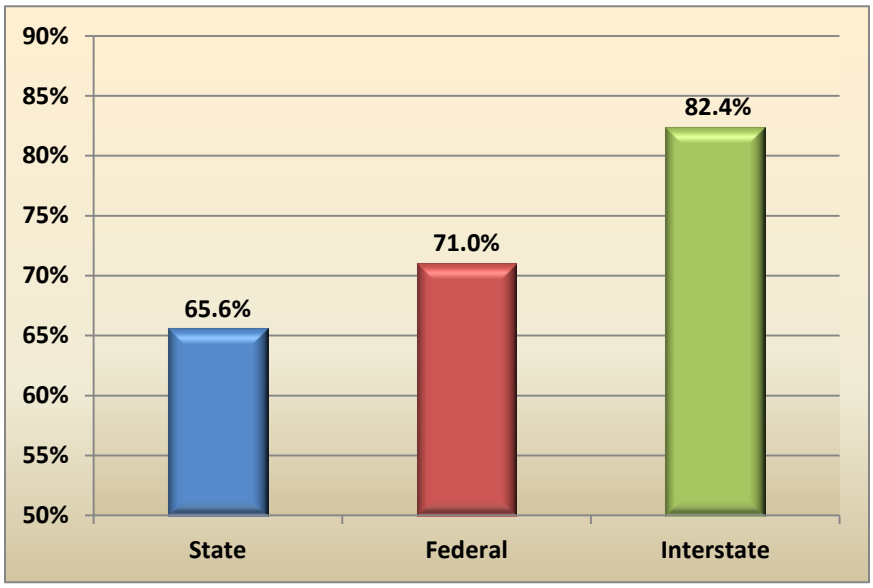

Figure 24: Seat Belt Use by Roadway Type

SUMMARY

Fifteen observers collected data on seat belt use for 16,390 drivers and 4,104 outboard passengers, for a total of 20,494 observations. The observations were collected at 319 sites across state-operated roadways in 16 counties. Based on the sampling methodology weighting procedures, the final estimate for the statewide seat belt use was 76.7% belted. This estimate is 1.9 percentage points higher than the 2010 overall estimate - an improvement over the 2009 to 2010 surveys where rates were essentially equal. Continued 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 2011 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 declines in the northeast. The northwest continues to have the lowest rate of seat belt use.

- **County.** Barnes had the highest rate of seat belt use at 87.5% with Cass and Stark close behind at 86.0% and 85.8% respectively. Mercer (59.8%) is the only county with a rate less than 60% - a pattern that replicates the surveys of 2009 and 2010 as well. While most counties showed little change in seat belt use from 2010 to 2011, four had rates that changed by more than 7 percentage points: Burleigh with a decline of 14.5 percentage points, and Bottineau, Stutsman, and Wells with increases ranging from 7.3 to 8.3 percentage points. Overall five counties saw decreases from 2010 rates, while eleven counties saw increases.

- **Vehicle Type.** The results of the 2011 statewide survey indicate that rates of seat belt use were above the unweighted statewide average in every vehicle type except pickup trucks. Seat belt use among pickup occupants continues to depress the overall rate in North Dakota due to the fact pickup truck occupants made up 30% of the sample and the usage was extremely low – 59.8% overall with male occupants at 56.9%.

- **Gender.** Female occupants had much higher rates of seat belt use than male occupants. This is true whether females are drivers or passengers. Only one county has female seat belt use rates less than 70% compared to six counties with male seat belt use less than 70% and another six counties with rates less than 60%. 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, 78.9%, and the lowest in pickup trucks, 56.9%. By comparison, female rates were more consistent across vehicle types, ranging from 87.3% in vans to 73.5% in pickup trucks.

APPENDICES

Appendix A: Site Locations

BARNES COUNTY

1	I-94	Urbana Exit 272	E	2-2
2	I-94	4 mi East of Site 1 at Eckelson Exit 276	W	2-2
3	94 Bus Lp	Westbound ramp to I-94	W	Valley City 2-2
4	I-94	South Hwy 1 Exit 288 2 miles west of Valley City	E	2-2
5	1	Southeast limits of Dazey Hwy 1 & 26	N&S	2-2
6	1	Southeast limits of Rogers	N&S	Rogers 2-2
7	I-94	6 miles east of Site 2 Exit 283	W	2-2
8	I-94	West Exit of Valley City Exit 290 Park on eastbound on ramp	E	Valley City 2-2
9	94 Bus Lp	Main St & 12th Ave E	E&W	Valley City 2-2
10	I-94	4 1/2 mi east of Valley City Exit 298	W	2-2
11	I-94	County Line exit 307 at Tower City	W	2-2
12	32	Camp Arnold Historic Site 3 1/2 mi. North of Oriska (Watch Mileage).	N&S	2-2
13	32	Southeast limits of Oriska	N&S	Oriska 2-2
14	I-94	Oriska Exit 302	W	2-2
15	32	Northeast limits of Nome	N&S	Nome 2-1
16	46	Intersection with Hwy 1	E&W	2-1
17	1	2 mi north of Hwy 46 County Road 38 and Hwy 1	N&S	2-1
18	94 Bus Lp	Service road to I-94 east edge of Valley City Exit 294	E	2-2
19	I-94	2 mi east of Valley City Exit 296	E	2-2
20	I-94	East exit to Valley City Exit 294	W	Valley City 2-2

BOTTINEAU COUNTY

1	5	Intersection with Main street	W	Bottineau 5-1
2	5	Intersection with Co Rd 57	E&W	5-1
3	60	Southeast limits of Willow City	N	Willow City 5-1
4	60	Northwest limits of Willow City	S	Willow City 5-1
5	60	Intersection with Co Rd 22	N&S	5-1
6	60	Y Intersection (see map)	S	5-1
7	5	Intersection with 13th ave NE east of Bottineau	W	5-1
8	5	Intersection with Co Rd One mile West of Site 21	E	5-1
9	14	1 mile south of Hwy 5 intersection	N&S	5-1
10	14	Intersection with 2nd Ave at Kramer	N	Kramer 5-1
11	14	3 mi south of Kramer	N	5-1
12	5	Intersection with Hwy 83	W	5-2
13	83	Westhope (see map)	N	Westhope 5-2
14	83	Half mi north of Westhope	N&S	5-2
15	83	Intersection with Hwy 5	N	5-2
16	5	3 mi north of Maxbass	N	5-2
17	5	Intersection with Co Rd 3	E&W	5-2
18	83	Intersection with Hwy 5	S	5-2
19	256	Intersection with Co Rd 6 four mi south of Antler	S	5-2
20	256	Antler	S	5-2

BURLEIGH COUNTY

1	83N	*Two mi south of Wilton	S	8-1
2	83N	9 mi north of Bismarck	N	8-2
3	83N	Northwood Estates 6 1/2 mi north of I-94 exit	N	8-2
4	I-94	Divide Ave Exit	E	Bismarck 8-2
5	1804	Junction River Road and 1804 (At Eagles Park)	S	8-2
6	94 Bus Lp	Intersection with Memorial Highway and Fraine Barracks Road east entrance memorial bridge	W	Bismarck 8-2
7	94 Bus Lp	Intersection with Divide near Oasis Truck Stop	N	Bismarck 8-2
8	I-94	*East Exit 161 at Bismarck	W	Bismarck 8-2
9	I-94	*2 mi east of East Bismarck exit 161	E	8-2
10	I-94	7 mi east of Sterling exit (at the Driscole exit)	W	8-2
11	83S	2 mi south of I-94 at Sterling	N&S	8-2
12	36	East limits of Wing	W	Wing 8-1
13	14	West limits of Wing	S	Wing 8-1
14	94 Bus Lp	Bismarck Expressway & 26th St	W	Bismarck 8-2
15	83 Bus Lp	7th St S and Bismarck Expressway	S	Bismarck 8-2
16	94 Bus Lp	Broadway and Washington	E	Bismarck 8-2
17	83 Bus Lp	9th St S and Bismarck Expressway	N	Bismarck 8-2
18	83 Bus Lp	7th St N and Broadway	S	Bismarck 8-2
19	83 Bus Lp	7th St N and Main	S	Bismarck 8-2
20	I-94	Intersection with Hwy 83 at Bismarck Went 1 block East so could count traffic coming on to I-94 from Bismarck going East	E	Bismarck 8-2

* alternate site or site description clarification

CASS COUNTY

1	I-29	6 mi north of Gardner exit 92 at County Line	S	9-1
2	I-29	**Argusville exit mile marker 78	N	9-1
3	I-29	Gardner exit 86	S	9-1
4	I-29	Argusville exit 79	S	9-1
5	I-29	**Median Mile Marker 83 Argusville	N	9-1
6	I-29	19th Ave N (exit 67) Fargo	S	Fargo 9-1
7	I-29	Rest area north of Harwood	N	9-1
8	I-29	Harwood exit	S	9-1
9	81 Bus Lp	19th Ave N and University Fargo	S	Fargo 9-1
10	81 Bus Lp	University and Dakota Dr (8th Ave N) Fargo	S	Fargo 9-1
11	I-29	Main Street Exit Fargo	S	Fargo 9-1
12	294	12th Ave N and Dakota Drive Fargo	E	Fargo 9-1
13	I-29	Hickson exit 50	N	9-2
14	46	South of Leonard Intersection of Hwy 18	E	9-2
15	I-94	Leonard and Hwy 18 Exit 331 at Casselton	E	9-2
16	10 Bus Lp	University and Main Avenue Fargo	W	Fargo 9-1
17	I-94	Intersection with Hwy 81 (University) exit 351 Fargo	W	Fargo 9-1
18	I-29	Horace and Wild Rice exit 56	N	9-2
19	10 Bus Lp	Main Avenue and 45th St Fargo	W	Fargo 9-2
20	10 Bus Lp	Main Avenue and 42nd St Fargo	E	Fargo 9-2

**site cancellation

GRAND FORKS COUNTY

1	15	North limits of Northwood	E	Northwood 18-2
2	18	Intersection with Hwy 15 five mi east of Northwood	S	18-2
3	15	7 mi east of Site 82 at curve	E	18-2
4	15	Intersection with Legion Baseball Field Road at Thompson	E&W	Thompson 18-2
5	15	Intersection with I-29	W	18-2
6	I-29	**5 and a third mi north of Hwy 15	N	18-2
7	81 bus 1p	Columbia Rd and 32nd Ave Grand Forks	N	Gr. Forks 18-2
8	297	DeMers and 12th St at Hardees	E	Gr. Forks 18-2
9	81 bus 1p	Washington St and 8th Ave S Grand Forks	S	Gr. Forks 18-2
10	I-29	Intersection with DeMers and Hwy 297	S	Gr. Forks 18-2
11	2	Gateway Drive and 42nd St N Grand Forks	W	Gr. Forks 18-2
12	2	Gateway Drive and 20th St N Grand Forks	E	Gr. Forks 18-2
13	81 bus 1p	81 (Wash) and 10th Ave N Grand Forks	N	Gr. Forks 18-2
14	2	Gateway and 3rd St N (from SE), Grand Forks Pay attention to the map	W	Gr. Forks 18-2
15	2	Gateway and Columbia Rd Grand Forks	E	Gr. Forks 18-2
16	2	4 mi west of Emerado	E	18-2
17	2	Northwest limits of Emerado East of AFB exit (Use Median Crossing east of Exit)	E&W	Emerado 18-2
18	I-29	Manvel Exit (exiting Manvel by I-29 south)	S	18-1
19	I-29	4 mi north of Manvel Exit 157	N	18-1
20	81	Intersection with Co Rd 8 at Manvel	E&W	Manvel 18-1

** site cancellation

MERCER COUNTY

1	49	Intersection with Co Rd 34 nine mi south of Beulah (Hannover Exit)	N	29-2
2	200	Golden Valley	E	29-2
3	49	Intersection with Hwy 200	S	29-2
4	1806	Curve near Hille Wildlife Management Area (see map)	E	29-1
5	200	Main St and 2nd Ave E Pick City	W	Pick City 29-1
6	200	1 mi west of Pick City	E	29-1
7	200	Intersection with 200A	W	29-2
8	200A	3 mi east of Intersection with Hwy 200 at Hwy 31 S intersection	E	29-2
9	200A	Intersection with Hwy 31 to Stanton About 2 miles East of Site 108	W	29-2
10	200A	4 mi east of Stanton Rd	W	29-2
11	31	Intersection with South Ave Stanton	S	Stanton 29-2
12	200	Intersection with 6th Ave NE Hazen	E	Hazen 29-2
13	200	Intersection with 9th Ave NW (on S side of 200) and with Antelope Dr (on N side of 200) Hazen	W	Hazen 29-2
14	200	Intersection with 3rd Ave NW Hazen Jct Mercer Co Rd 27	E	Hazen 29-2
15	200	2 mi west of Hazen	E	29-2
16	49	Intersection with Main St Beulah	N	Beulah 29-2
17	49	Intersection with 7th St NW Beulah	S	Beulah 29-2
18	200	2 mi east of intersection with Hwy 49	W	29-2
19	49	Intersection with Co Rd 20 North of river on the south side of Beulah	N	Beulah 29-2
20	49	Intersection with subdivision road south of Beulah (see map)	S	Beulah 29-2

MORTON COUNTY

1	6	Intersection with 19th St SW Mandan	N	Mandan 30-1
2	94 bus 1p	Memorial Hwy and 3rd St SE Mandan	W	Mandan 30-1
3	1806	Intersection with 19th St SE Mandan (HWY 1806 is labeled 6th Ave SE at this point)	N	Mandan 30-1
4	1806	Fort Rice	N	30-2
5	94 bus 1p	Memorial Hwy at exit from I-94 Mandan	W	Mandan 30-1
6	94 bus 1p	Memorial Hwy at Redwing Dr Mandan (park at Auto dealership and Jakes Glass)	E	Mandan 30-1
7	6	Intersection with 3rd St SW Mandan	S	Mandan 30-1
8	94 bus 1p	Intersection of Hwy 1806 and Old Red Trail Mandan	E	Mandan 30-1
9	I-94	Mandan Ave Exit 153 Mandan	E	Mandan 30-1
10	94 bus 1p	Old Red Trail and 8th Ave NE Mandan	W	Mandan 30-1
11	I-94	Intersection with Hwy 25 at Truck Stop west of Mandan Exit 147	W	30-1
12	I-94	Sweet Briar Lake and Judson Exit 134	E	30-1
13	6	Intersection with Co Rd 136	N&S	30-2
14	6	Bridge to Selfridge at county line	N&S	30-2
15	6	Intersection with Hwy 21	E (N)	30-2
16	21	Main and Hwy 21 Flasher	E&W	Flasher 30-2
17	I-94	Rest area east of Glen Ullin mile 120	W	30-3
18	49	Intersection with I-94 north of Glen Ullin (North of interstate)	S	30-3
19	49	Intersection with Co Rd 6 at the west edge of Glen Ullin (Corner where 49 turns South)	N (E)	30-3
20	I-94	Hebron exit 97	E	30-3

MOUNTRAIL COUNTY

1	8	5 mi north of Stanley	S	31-1
2	2	Intersection of Hwy 8 & 6th Ave SE Stanley	N	Stanley 31-1
3	2	Intersection with Hwy 8 Stanley	E&W	Stanley 31-1
4	2	1 mi east of Stanley	E	31-1
5	2	Southwest limits of Palermo	W	31-1
6	2	Intersection with Co Rd 37 to Blaisdell	E	31-1
7	2	Intersection with Co Rd 5 to White Earth	E	31-1
8	2	1/2 mi east of Ross	W	31-1
9	8	Corner of 6th Ave SW and Main St Stanley	N&E	Stanley 31-1
10	8	Intersection with 1st Ave N Stanley	N&S	Stanley 31-1
11	8	2 1/2 mi south of Stanley	S	31-1
12	8	5 1/2 mi south of Stanley at curve	N	31-1
13	8	4 mi north of Intersection with Hwy 23	S	31-2
14	23	Intersection with Hwy 8	E&W	31-2
15	23	Intersection with Hwy 37	E&W	31-2
16	37	Intersection of 3rd St East and 3rd Ave South Parshall	N	Parshall 31-2
17	37	Intersection of 3rd St E and Railroad Ave Parshall	N&S	Parshall 31-2
18	23	Intersection with Hwy 1804 New Town	E&W	N.Town 31-2
19	1804	4 mi northwest of New Town	E	31-2
20	1804	10 mi northwest of New Town	N&S	31-2

NELSON COUNTY

1	15	Intersection with Co Rd 5 one mi south of Tolna	E	32-1
2	15	Intersection of Railroad Ave and First St Pekin	E&W	Pekin 32-1
3	1	Intersection with Hwy 15 one half mi east of Pekin	N	32-1
4	15	Intersection with Hwy 1 one half mi east of Pekin	E&W	32-1
5	1	6 mi north of intersection with Hwy 15 at Old Settlers Park	N&S	32-1
6	1	Intersection with Hwy 2 at Lakota	N	Lakota 32-1
7	1	Northeast limits of Lakota	S	Lakota 32-1
8	1	Intersection with Co Rd 4 seven mi north of Lakota (Site 167)	S	32-1
9	35	Intersection at South 3rd St and Jeanette Ave Michigan	N	Michigan 32-1
10	2	Intersection with Hwy 35 Michigan	E&W	Michigan 32-1
11	35	Intersection with Hwy 2 Michigan (Hwy 2 is split by a median)	N&S	Michigan 32-1
12	2	1 mi west of Petersburg	E&W	32-1
13	2	Intersection with 5th St Petersburg	W	Petersburg 32-1
14	2	Intersection with Hwy 32 Petersburg	E	Petersburg 32-1
15	32	Intersection with Co Rd 20 seven mi south of Petersburg	N&S	32-1
16	32	Intersection with Hwy 15	N&S	32-1
17	15	Intersection with Co Rd 21 four mi west of Hwy 32	E&W	32-1
18	15	Intersection with Co Rd 15 at southeast limits of McVille	W	McVille 32-1
19	15	Southwest limits of McVille	E	McVille 32-1
20	1	Intersection with Co Rd 36 seven mi south of Pekin	N	32-1

PEMBINA COUNTY

1	32	*Intersection with Co Rd 1 Walhalla	N&S	Wallhalla 34-1
2	18	Northwest limits of Neche	S	Neche 34-1
3	18	*Intersection with Co Rd 1 four mi west of Bathgate	N&S	34-1
4	5	3 mi west of intersection with Hwy 18 (Co Rd 15)	E&W	34-1
5	32	I mi north of intersection with Hwy 5 near Oak Lawn Cemetery Historical Site	N&S	34-2
6	32	*Intersection with Co Rd 3 Mountain	N&S	Mountain 34-2
7	5	Intersection with Hwy 32 five mi north of Mountain	E	34-2
8	5	*Intersection with Co Rd 12 near Icelandic State Park	E&W	34-2
9	5	Intersection with Bedrock Lake Rd west limits of Cavalier	E&W	Cavalier 34-2
10	18	Southern limits of Cavalier	N&S	Cavalier 34-2
11	18	Intersection with Hwy 66 two mi east of Crystal	N&S	34-2
12	91	Intersection with Hwy 81 St Thomas	N	St.Thomas 34-2
13	81	*2 mi north of St Thomas	N&S	34-2
14	I-29	*Exit 193	S	34-2
15	66	At I-29 exit Drayton	E	Drayton 34-2
16	66	Intersection with Main St (Hwy 44) Drayton	W	Drayton 34-2
17	44	Main St and Divide St Drayton	N&S	Drayton 34-2
18	44	Main St and Scribner St Drayton	N&S	Drayton 34-2
19	66	Intersection with Co Rd 4 five mi west of Drayton	E&W	34-2
20	66	Intersection with Hwy 81 three mi south of St. Thomas	E&W	34-2

* alternate site or site description clarification

RAMSEY COUNTY

1	2	Intersection with Co Rd 20 at Penn	E	36-2
2	2	Grand Harbor and Darby No Marker	W	36-2
3	2	Highway 2 intersecting with Frontage Road at Davis Hotel	E	D. Lake 36-2
4	19	Intersection with Hwy 2 Devils Lake Park North of stoplights. Park at the entrance of Roosevelt Park. Observe southbound traffic. Road is designated West.	W	D. Lake 36-2
5	19	Corner of Devils Lake city limits	E	D. Lake 36-2
6	20	Intersection with 22nd St	N	D. Lake 36-2
7	20	Webster	N&S	36-1
8	17	Intersection with Co Rd 27 (Ram Co sign number 3)	E&W	36-1
9	17	Eastern limits Edmore	E&W	Edmore 36-1
10	2	Intersection with Co Rd 27 Crary exit	W	36-2
11	2	Intersection with Co Rd 27 at Crary Wildlife Management Area (this is a rest stop)	E	36-2
12	2	Intersection With southeast city limits Devils Lake US2 and Elks Drive	W	D. Lake 36-2
13	20	Directly across from Lake Region State College highway sign facing East Devils Lake	S	D. Lake 36-2
14	20	Intersection with Hwy 19 Devils Lake	N	D. Lake 36-2
15	20	Intersection with southern limits Devils Lake	N	D. Lake 36-2
16	19	Southeast boundary of Airport Devils Lake	E	D. Lake 36-2
17	2	Intersection with Hwy 20 Devils Lake	E	D. Lake 36-2
18	2	Intersection with 14th Ave Devils Lake	W	D. Lake 36-2
19	20	Intersection with Shamrock Lane Devils Lake	S	D. Lake 36-2
20	20	Intersection with Hwy 57 By Casino	N	36-2

STARK COUNTY

1	22	2 mi north of Dickinson (32 St SW by Jay R's Auto Body)	S	45-2
2	I-94	Intersection with Hwy 22 exit Dickinson	W	Dix 45-2
3	22	3rd Ave W and 12th St W or Museum Drive Dickinson	S	Dix 45-2
4	I-94	Exit 59 west of Dickinson	E	Dix 45-2
5	85	Intersection with Co Rd 22 thirteen mi south of Belfield thirteen mi So of old Hwy 10 twenty-five mi off eastside of school	N&S	45-2
6	85	Intersection with I-94 south side of interstate Belfield	N&S	Belfield 45-2
7	I-94	Intersection with 85 at Belfield	E	Belfield 45-2
8	I-94	Exit at South Heart	W	45-2
9	22	3rd Ave W and 8th St S (Loaf N Jug) Dickinson	N	Dix 45-2
10	94 bus 1p	State Ave & 2nd St W Dickinson	N	Dix 45-2
11	22	Prairie Hills Mall entrance Dickinson	S	Dix 45-2
12	22	3rd Ave W and 21st St W Dickinson	N	Dix 45-2
13	I-94	Old Green River Rest Area	E	45-2
14	I-94	Taylor Exit 78	W	45-1
15	8	Intersection with Co Rd 24 thirteen mi south of Richardton	N&S	45-1
16	8	Intersection with Hwy 10 west of Richardton	S&E	45-1
17	94 bus 1p	Villard and 10th Ave E (Kum and Go) Dickinson	W	Dix 45-2
18	I-94	Exit 64 east of Dickinson	E	Dix 45-2
19	94 bus 1p	States Ave and Villard Dickinson	E	Dix 45-2
20	22	3rd Ave W and 4th St W Dickinson	S	Dix 45-2

STUTSMAN COUNTY

1	I-94	Intersection with Hwy 30 one mi west of Medina Exit 228	E	47-2
2	I-94	Medina Exit	E	47-2
3	I-94	Windsor Exit 242	E	47-2
4	94 bus 1p	Bus Loop and 14th Ave SW Jamestown	W	J.town 47-2
5	281	Intersection of 94 Bus Loop and 281 Jamestown	N	J.town 47-2
6	52	2 mi north of Jamestown at Pipestem Lake	S	47-2
7	36	West of Woodworth at curve	E	47-1
8	36	Intersection with Hwy 52 at Pingree	W	Pingree 47-1
9	46	Intersection with Hwy 281	N	47-2
10	281	Intersection with Co Rd to Sydney ten mi south of Jamestown	N&S	47-2
11	281	3 mi south of Jamestown	N&S	47-2
12	281	Last intersection in south Jamestown	N	J.town 47-2
13	52	12th Ave SE and the road intersecting between 12th and 13th street Jamestown	E	J.town 47-2
14	281	Intersection with 4th Ave SW Jamestown	N	J.town 47-2
15	9	Intersection with Hwy 20 Courtenay	W	Courtenay 47-2
16	9	Kensal city limits	S	47-1
17	281	Buffalo Mall entrance (25th St SW) Jamestown	N&S	J.town 47-2
18	I-94	5 mi east of Jamestown Bloom exit 262	W	47-2
19	I-94	East Jamestown exit	W	J.town 47-2
20	281	Intersection immediately south of Buffalo Mall Jamestown	N	J.town 47-2

WARD COUNTY

1	52	Intersection with Hwy 50	N&S	51-1
2	50	Intersection with Hwy 52	W	51-1
3	52	Northwest limits of Donnybrook	N&S	D.Brook 51-1
4	28	Northern limits of Carpio	N&S	Carpio 51-2
5	52	Intersection Co Rd 11 and Co Rd 8 at Foxholm 184 St NW	N&S	51-2
6	2	1 mi east of Berthold	E&W	51-2
7	52	Intersection with Hwy 2	N&S	51-2
8	2	At Burlington exit	E&W	51-2
9	2	Intersection with Hwy 83 Bypass at Minot	E	Minot 51-2
10	52 bus loop	Intersection with Hwy 2 Minot	N&E	Minot 51-2
11	83	4 mi north of Ruthville	S	51-2
12	83	Intersection with Co Rd 8 at Ruthville	N	51-2
13	83	Intersection with 20th Ave SE Minot	N	Minot 51-2
14	83	Intersection with Hwy 2	S	Minot 51-2
15	83	Intersection with Hwy 23	N	51-3
16	83	Intersection with Co Rd 24 to Douglas 345th Ave SW	S	51-3
17	23	Intersection with Hwy 28 to Ryder	W	51-3
18	52 Bus loop	Intersection with 8th Ave SE Minot	E	Minot 51-2
19	52 Bus loop	Intersection with Hiawatha Minot	W	Minot 51-2
20	2	Intersection with 6th St SE Minot	W	Minot 51-2

WELLS COUNTY

1	3	1 mi north of North St in Harvey	S	Harvey 52-1
2	3	Intersection with Hwy 91 at Harvey	S	Harvey 52-1
3	52 Bus Loop	Intersection with Hwy 3 at Harvey	E&W	Harvey 52-1
4	52	Intersection with Hwy 52 Bus Loop south of Harvey	E&W	52-1
5	30	3 mi north of Hamburg	N&S	52-1
6	30	Intersection with Railroad Ave Hamburg	N&S	Hamburg 52-1
7	52	Manfred	E&W	52-1
8	15	Intersection with Hwy 30 five mi east of Fessenden	W	52-1
9	15	Half mi east of Fessenden	E	52-1
10	15	Intersection with Vine Ave Fessenden	E	Fessenden 52-1
11	15	Intersection with Hwy 52 at Fessenden	W	Fessenden 52-1
12	52	1 mi south of Fessenden	N	52-1
13	52	3 mi south of Fessenden	S	52-1
14	200	Intersection with Hwy 3 one and a half mi west of Hurdsfield	E	52-2
15	3	Half mi north of Hurdsfield	N&S	52-2
16	3	Northern city limits of Hurdsfield	N&S	Hurdsfield 52-2
17	200	Intersection with Bowdon exit	E&W	52-2
18	52	Intersection with Hwy 200	S/E	52-2
19	52	Intersection at Sykeston exit	E&W	52-2

WILLIAMS COUNTY

1	50	Intersection with Main St Grenora	E&W	Grenora 53-2
2	50	1 mi west of Zahl at junction with Co Rd 3A	E&W	53-2
3	50	Intersection with Hwy 42 six and a half mi east of Alamo	W	53-2
4	50	3 'A mi south of Wildrose (Hwy 50 & Wildrose)	E	53-2
5	40	Intersection with Hwy 2 ten mi east of Ray	N&S	53-1
6	2	6 mi east of Ray or 4 mi west of Site 304	E&W	53-1
7	2	Intersection with Co Rd 41 at Ray	W	Ray 53-1
8	2	Intersection with Co Rd 33 four mi north of Epping	E&W	53-1
9	2	Intersection with Hwy 85 north of Williston	S	53-3
10	2/85	At Hi-Land Heights north of Williston	S	53-3
11	2 Bus Loop	Intersection with 22nd St W Williston	N	Williston 53-3
12	1804	Intersection with Main St Williston	W	Williston 53-3
13	1804	Intersection with 9th Ave E Williston	E	Williston 53-3
14	1804	Intersection with East Dakota Parkway Williston	W	Williston 53-3
15	1804	Intersection with 20th Ave E Williston	E	Williston 53-3
16	1804	Intersection with 27th Ave E Williston	W	Williston 53-3
17	1804	Intersection with Co Rd 33 to Lewis and Clark State Park east of Williston	E&W	53-1
18	1804	Intersection with Co Rd 51 sixteen mi east of Lewis and Clark State Park	E&W	53-1
19	2	Intersection with Hwy 85 South west of Williston	W	53-3
20	2	Intersection with Hwy 1804 west of Williston	E	53-3

Appendix B: Code Book

Variable Information

Variable	Type	Label
CASENO	Number	Overall Case Number
CNTYPOP	Number	County Population - 2009
CoVMT	Number	Annual Vehicle Miles Traveled for this County
CTYIDNBR	Number	County ID Number
CTYNAME	Text	County Name
DAILY_CO_VMT	Number	Daily Vehicle Miles Traveled for this County
DAILY_STRATUM_VMT	Number	Daily Vehicle Miles Traveled for this Stratum
DESCRIP	Text	Description
DIR	Text	Direction of Traffic
DRGENDER	Text	Driver Gender
DRPROT	Text	Driver Protection
ENDTIME	Date/Time	End of Observations at this Site
FIRSTNAME	Text	Observer First Name
HWYNBR	Text	Highway Number
ID	Number	Overall Site ID
LASTNAME	Text	Observer Last Name
LATITUDE	Number	Latitude
LONGITUDE	Number	Longitude
MAPID	Text	MAP ID
NOPUS_Year	Number	Year of NOPUS Data
OBSDATE	Date/Time	Date of Observations at this Site
OBSID	Number	Observer ID
OBSNBR	Number	Site Observation Number
PASSGENDER	Text	Passenger Gender
PASSPROT	Text	Passenger Protection
POP	Number	Rural Urban Indicator
RDTYPE	Text	Road Type
REGION	Text	Region of the State
SITEDESCNBR	Number	County Site Decsription Number
SiteVMT	Number	Daily Vehicle Miles Traveled for this Site
STATEPOP	Number	State Population - 2009
STRATUM	Text	Statum ID
STTIME	Date/Time	Start of Obsverations at this Site
Variable	Data Type	Description
VEHTYPE	Text	Vehicle Type
WC	Number	Weight for this County
WS	Number	Weight for this Site

Variable Values

County		
Value	**Label**	**Region**
1	Barnes	4
2	Bottineau	1
3	Burleigh	3
4	Cass	4
5	Grand Forks	2
6	Mercer	3
7	Morton	3
8	Mountrail	1
9	Nelson	2
10	Pembina	2
11	Ramsey	2
12	Stark	3
13	Stutsman	4
14	Ward	1
15	Wells	4
16	Williams	1

2011 Observers	
Value	**Label**
3	Danika Carpenter
5	Elliot Gunderson
8	Brittany Jacobsen
13	Laura Malchose
15	Carol Mock
16	Kelly Mogen
17	Sherri Olsen
22	Jeanine Bitzan
23	Daniel Bitzan
24	Josh Zosel
25	Ashley Kvamme
26	Alyssa Miller
27	Lisa Robinson
28	Feliciana Anaya
29	Tanner Carpenter

	Value	**Label**
Region	1	Northwest
	2	Northeast
	3	Southwest
	4	Southeast
Population	1	Urban
	2	Rural
Roadway	1	State Highway
	2	Federal Highway
	3	Interstate Highway
Weekday	1	Sunday
	2	Monday
	3	Tuesday
	4	Wednesday
	5	Thursday
	6	Friday
	7	Saturday

Appendix C: Frequencies

North Dakota Statewide Survey, June 2011

Estimated Seat Belt Use (Percent) and Unweighted Frequencies for Vehicle Occupants

Occupant	Status	Estimate Percent	Unweighted Frequency		
Driver	Belted	71.4%			
	Not Belted	28.6%			
	Total	100.0%	16390		
				Ratio	4.0
Passenger	Belted	75.9%			
	Not Belted	24.1%			
	Total	100.0%	4104		
All Occupants	Belted	72.3%			
	Not Belted	27.7%			
	Total	100.0%	20494		

North Dakota Statewide Survey, June 2011

Seat Belt Use by Region

Region of State						
Occupant	**Status**	**Northwest**	**Northeast**	**Southwest**	**Southeast**	**Total**
Drivers	Belted	64.0%	68.3%	71.8%	79.7%	71.4%
	Not Belted	36.0%	31.7%	28.2%	20.3%	28.6%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
	Count	3,939	3,336	4,518	4,597	16,390
Passengers	Belted	64.6%	77.3%	77.6%	83.9%	75.9%
	Not Belted	35.4%	22.7%	22.4%	16.1%	24.1%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
	Count	1076	781	1,075	1,172	4,104
All Occupants	Belted	64.1%	70.0%	72.9%	80.6%	72.3%
	Not Belted	35.9%	30.0%	27.1%	19.4%	27.7%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
	Count	5,015	4,117	5,593	5,769	20,494

North Dakota Statewide Survey, June 2011

Seat Belt Use by County

		County																
Occupants	Status	Barnes	Bottineau	Burleigh	Cass	Grand Forks	Mercer	Morton	Mountrail	Nelson	Pembina	Ramsey	Stark	Stutsman	Ward	Wells	Williams	Total
Drivers	Belted	81.6%	67.6%	72.1%	84.2%	73.5%	53.8%	68.3%	59.8%	76.4%	58.6%	59.9%	83.1%	73.2%	63.9%	64.5%	66.1%	71.4%
	Not Belted	18.4%	32.4%	27.9%	15.8%	26.5%	46.2%	31.7%	40.2%	23.6%	41.4%	40.1%	16.9%	26.8%	36.1%	35.5%	33.9%	28.6%
	Count	847	445	1,294	2,416	1,524	756	981	913	479	568	765	1,487	894	1,439	440	1,142	16,390
	% of Sample	4.1%	2.2%	6.3%	11.8%	7.4%	3.7%	4.8%	4.5%	2.3%	2.8%	3.7%	7.3%	4.4%	7.0%	2.1%	5.6%	80.0%
Passengers	Belted	91.7%	78.8%	75.8%	84.3%	83.5%	68.2%	71.3%	54.8%	83.7%	68.2%	69.4%	90.1%	78.4%	68.8%	78.2%	62.6%	75.9%
	Not Belted	8.3%	21.2%	24.2%	15.7%	16.5%	31.8%	28.7%	45.2%	16.3%	31.8%	30.6%	9.9%	21.6%	31.2%	21.8%	37.4%	24.1%
	Count	252	104	285	527	357	129	349	270	92	110	222	312	283	416	110	286	4,104
	% of Sample	1.2%	0.5%	1.4%	2.6%	1.7%	0.6%	1.7%	1.3%	0.4%	0.5%	1.1%	1.5%	1.4%	2.0%	0.5%	1.4%	20.0%
All Occupants	Belted	83.9%	69.8%	72.8%	84.2%	75.4%	55.9%	69.1%	58.7%	77.6%	60.2%	62.0%	84.3%	74.4%	65.0%	67.3%	65.4%	72.3%
	Not Belted	16.1%	30.2%	27.2%	15.8%	24.6%	44.1%	30.9%	41.3%	22.4%	39.8%	38.0%	15.7%	25.6%	35.0%	32.7%	34.6%	27.7%
	Count	1,099	549	1,579	2,943	1,881	885	1,330	1,183	571	678	987	1,799	1,177	1,855	550	1,428	20,494
	% of Sample	5.4%	2.7%	7.7%	14.4%	9.2%	4.3%	6.5%	5.8%	2.8%	3.3%	4.8%	8.8%	5.7%	9.1%	2.7%	7.0%	100.0%

Note: Based on unweighted percentages

North Dakota Statewide Survey, June 2011

Comparison of Seat Belt Use by County Usage

	2010	2011	Percentage Point (+/-)
Barnes	81.5%	87.5%	6.0%
Cass	85.3%	86.0%	0.7%
Stark	83.0%	85.8%	2.8%
Stutsman	73.1%	81.1%	8.0%
Nelson	76.2%	77.8%	1.6%
Grand Forks	69.9%	76.5%	6.6%
Bottineau	66.5%	73.8%	7.3%
Morton	77.6%	72.9%	-4.7%
Pembina	74.1%	71.0%	-3.1%
Williams	64.8%	70.7%	5.9%
Burleigh	84.6%	70.1%	-14.5%
Ward	64.3%	69.1%	4.8%
Wells	58.8%	67.1%	8.3%
Ramsey	64.9%	64.6%	-0.3%
Mountrail	66.5%	62.9%	-3.6%
Mercer	53.3%	59.8%	6.5%
Total	74.8%	76.7%	1.9%

Note: Based on weighted percentages

North Dakota Statewide Survey, June 2011

Seat Belt Use by Gender

Occupant	Status	Gender			Total
		Male	Female	Unknown	
Drivers	Belted	66.1%	80.4%	60.0%	71.4%
	Not Belted	33.9%	19.6%	40.0%	28.6%
	Count	10,308	6,077	5	16,390
Passengers	Belted	66.6%	82.0%	100.0%	75.9%
	Not Belted	33.4%	18.0%	0.0%	24.1%
	Count	1,616	2,486	2	4,104
All Occupants	Belted	66.2%	80.9%	71.4%	72.3%
	Not Belted	33.8%	19.1%	28.6%	27.7%
	Count	11,924	8,563	7	20,494

North Dakota Statewide Survey, June 2011

Male Seat Belt Use

Vehicle Type						
Occupant	**Status**	**Auto**	**SUV**	**Van**	**Pickup**	**Total**
Male Drivers	Belted	71.4%	74.5%	77.8%	57.2%	66.1%
	Not Belted	28.6%	25.5%	22.2%	42.8%	33.9%
	Count	3,510	1,653	667	4,478	10,308
Male Passengers	Belted	67.1%	78.2%	82.9%	55.1%	66.6%
	Not Belted	32.9%	21.8%	17.1%	44.9%	33.4%
	Count	523	321	175	597	1,616
All Male Occupants	Belted	70.9%	75.1%	78.9%	56.9%	66.2%
	Not Belted	29.1%	24.9%	21.1%	43.1%	33.8%
	Count	4,033	1,974	842	5,075	11,924

North Dakota Statewide Survey, June 2011

Female Seat Belt Use Rate

Vehicle Type						
Occupant	**Status**	**Auto**	**SUV**	**Van**	**Pickup**	**Total**
Female Drivers	Belted	78.6%	83.1%	87.5%	74.6%	80.4%
	Not Belted	21.4%	16.9%	12.5%	25.4%	19.6%
	Count	3,127	1,729	647	574	6,077
Female Passengers	Belted	83.5%	84.4%	87.1%	72.3%	82.0%
	Not Belted	16.5%	15.6%	12.9%	27.7%	18.0%
	Count	1,038	602	348	498	2,486
All Female Occupants	Belted	79.8%	83.4%	87.3%	73.5%	80.9%
	Not Belted	20.2%	16.6%	12.7%	26.5%	19.1%
	Count	4,165	2,331	995	1,072	8,563

Appendix D: Survey Instrument

Seat Belt Survey Form **Page # _____ of_____**

Date _____ **Start Time:** _____ **AM/PM** **End Time** _____**AM/PM**

County_____ **Observer Name:**_____

Site Location Description (including city/town where applicable): _____

Site ID Number: _____ **(if applicable)**

Traffic Type Being Observed: ❑ Town/City ❑ Highway/County Road (outside of town/city) ❑ Interstate

Obs	Vehicle Type					Driver					Passenger				
						Gender		Protection			Gender		Protection		
1	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
2	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
3	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
4	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
5	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
6	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
7	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
8	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
9	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
10	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
11	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
12	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
13	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
14	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
15	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
16	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
17	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
18	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
19	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
20	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
21	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
22	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
23	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
24	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
25	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
26	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
27	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
28	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
29	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK
30	Car	Trck	SUV	Van	Mcycl	M	F	Y	N	DK	M	F	Y	N	DK

M=Male; F=Female; DK = Do Not Know

Appendix E: Site Seat Belt Use Rates with Site and County Weights for 2011

Barnes County

June, 2011

Site Rates with Weights					
Site	Site Weight	County Weight	Total Belted	Total Occupants	Seat Belt Rate
1	1.2	2.67	58	64	90.6%
2	1.2	2.67	53	59	89.8%
3	3.7	2.67	23	33	69.7%
4	1.2	2.67	68	75	90.7%
5	3.7	2.67	24	35	68.6%
6	3.7	2.67	26	35	74.3%
7	1.2	2.67	49	56	87.5%
8	3.7	2.67	65	74	87.8%
9	3.7	2.67	92	143	64.3%
10	1.2	2.67	81	85	95.3%
11	1.2	2.67	56	59	94.9%
12	3.7	2.67	26	34	76.5%
13	3.7	2.67	39	47	83.0%
14	1.2	2.67	55	58	94.8%
15	3.7	2.67	20	29	69.0%
16	3.7	2.67	17	30	56.7%
17	1.2	2.67	29	33	87.9%
18	1.2	2.67	40	43	93.0%
19	1.2	2.67	48	50	96.0%
20	3.7	2.67	53	57	93.0%

Bottineau County

June, 2011

Site Rates with Weights					
Site	Site Weight	County Weight	Total Belted	Total Occupants	Seat Belt Rate
1	1.45	1.67	45	96	46.9%
2	1.22	1.67	24	32	75.0%
3	1.45	1.67	10	12	83.3%
4	1.45	1.67	8	9	88.9%
5	1.45	1.67	33	40	82.5%
6	1.45	1.67	20	23	87.0%
7	1.22	1.67	28	48	58.3%
8	1.22	1.67	26	42	61.9%
9	1.45	1.67	6	9	66.7%
10	1.45	1.67	n/a	n/a	n/a
11	1.45	1.67	n/a	n/a	n/a
12	1.22	1.67	24	28	85.7%
13	1.45	1.67	16	29	55.2%
14	1.45	1.67	14	18	77.8%
15	1.22	1.67	19	24	79.2%
16	1.22	1.67	11	13	84.6%
17	1.22	1.67	34	45	75.6%
18	1.22	1.67	36	42	85.7%
19	1.45	1.67	22	29	75.9%
20	1.22	1.67	7	10	70.0%

Burleigh County

June, 2011

Site Rates with Weights					
Site	Site Weight	County Weight	Total Belted	Total Occupants	Seat Belt Rate
1	2.2	1	51	64	79.7%
2	2.2	1	44	50	88.0%
3	2.2	1	55	74	74.3%
4	2.2	1	73	103	70.9%
5	2.2	1	23	30	76.7%
6	6.3	1	84	110	76.4%
7	2.2	1	64	92	69.6%
8	2.2	1	48	65	73.8%
9	6.3	1	35	44	79.5%
10	2.2	1	56	72	77.8%
11	2.2	1	25	35	71.4%
12	6.3	1	n/a	n/a	n/a
13	6.3	1	13	15	86.7%
14	6.3	1	59	91	64.8%
15	6.3	1	63	87	72.4%
16	6.3	1	80	111	72.1%
17	6.3	1	69	113	61.1%
18	6.3	1	124	174	71.3%
19	6.3	1	112	154	72.7%
20	2.2	1	71	95	74.7%

Cass County

June, 2011

Site Rates with Weights					
Site	Site Weight	County Weight	Total Belted	Total Occupants	Seat Belt Rate
1	3.56	1	107	113	94.7%
2	3.56	1	64	73	87.7%
3	3.56	1	105	123	85.4%
4	8	1	102	113	90.3%
5	3.56	1	71	78	91.0%
6	8	1	203	232	87.5%
7	8	1	97	108	89.8%
8	8	1	96	114	84.2%
9	8	1	199	247	80.6%
10	3.56	1	148	186	79.6%
11	3.56	1	245	293	83.6%
12	8	1	7	9	77.8%
13	3.56	1	92	111	82.9%
14	8	1	21	25	84.0%
15	3.56	1	105	122	86.1%
16	8	1	203	239	84.9%
17	3.56	1	214	256	83.6%
18	8	1	102	125	81.6%
19	8	1	136	180	75.6%
20	8	1	162	196	82.7%

Grand Forks County

June, 2011

Site Rates with Weights					
Site	Site Weight	County Weight	Total Belted	Total Occupants	Seat Belt Rate
1	6.1	1	30	39	76.9%
2	6.1	1	22	35	62.9%
3	3.1	1	32	40	80.0%
4	6.1	1	98	125	78.4%
5	6.1	1	20	35	57.1%
6	3.1	1	34	44	77.3%
7	3.1	1	134	178	75.3%
8	6.1	1	104	133	78.2%
9	3.1	1	97	145	66.9%
10	3.1	1	29	31	93.5%
11	6.1	1	85	109	78.0%
12	6.1	1	51	79	64.6%
13	6.1	1	92	121	76.0%
14	6.1	1	85	118	72.0%
15	3.1	1	94	127	74.0%
16	3.1	1	39	60	65.0%
17	3.1	1	99	134	73.9%
18	3.1	1	67	78	85.9%
19	3.1	1	106	121	87.6%
20	6.1	1	100	129	77.5%

Mercer County

June, 2011

Site Rates with Weights					
Site	Site Weight	County Weight	Total Belted	Total Occupants	Seat Belt Rate
1	1.3	1.33	29	37	78.4%
2	1.3	1.33	17	27	63.0%
3	2	1.33	52	94	55.3%
4	1.3	1.33	6	10	60.0%
5	1.3	1.33	16	31	51.6%
6	2	1.33	32	39	82.1%
7	1.3	1.33	23	30	76.7%
8	1.3	1.33	25	37	67.6%
9	2	1.33	12	17	70.6%
10	1.3	1.33	20	31	64.5%
11	2	1.33	13	18	72.2%
12	2	1.33	38	71	53.5%
13	2	1.33	23	49	46.9%
14	2	1.33	17	34	50.0%
15	1.3	1.33	18	32	56.3%
16	2	1.33	42	82	51.2%
17	2	1.33	63	129	48.8%
18	1.3	1.33	24	52	46.2%
19	2	1.33	9	34	26.5%
20	1.3	1.33	16	31	51.6%

Morton County

June, 2011

Site Rates with Weights					
Site	Site Weight	County Weight	Total Belted	Total Occupants	Seat Belt Rate
1	4.64	1.33	36	61	59.0%
2	4.64	1.33	50	88	56.8%
3	4.64	1.33	32	45	71.1%
4	4.64	1.33	30	43	69.8%
5	4.64	1.33	38	74	51.4%
6	3.11	1.33	77	122	63.1%
7	4.64	1.33	108	153	70.6%
8	4.64	1.33	40	57	70.2%
9	3.11	1.33	38	51	74.5%
10	3.11	1.33	80	116	69.0%
11	3.11	1.33	52	63	82.5%
12	3.11	1.33	51	67	76.1%
13	3.11	1.33	34	43	79.1%
14	4.64	1.33	12	19	63.2%
15	3.11	1.33	39	49	79.6%
16	4.64	1.33	15	37	40.5%
17	3.11	1.33	72	85	84.7%
18	4.64	1.33	35	41	85.4%
19	4.64	1.33	15	30	50.0%
20	3.11	1.33	65	86	75.6%

Mountrail County

June, 2011

Site Rates with Weights					
Site	Site Weight	County Weight	Total Belted	Total Occupants	Seat Belt Rate
1	1.18	1.67	10	18	55.6%
2	2.89	1.67	7	9	77.8%
3	2.89	1.67	70	107	65.4%
4	2.89	1.67	55	71	77.5%
5	1.18	1.67	63	78	80.8%
6	1.18	1.67	37	47	78.7%
7	1.18	1.67	40	53	75.5%
8	1.18	1.67	44	53	83.0%
9	2.89	1.67	26	70	37.1%
10	2.89	1.67	34	90	37.8%
11	2.89	1.67	26	38	68.4%
12	1.18	1.67	14	31	45.2%
13	1.18	1.67	19	37	51.4%
14	1.18	1.67	76	121	62.8%
15	1.18	1.67	23	41	56.1%
16	2.89	1.67	20	31	64.5%
17	2.89	1.67	13	39	33.3%
18	1.18	1.67	69	174	39.7%
19	1.18	1.67	25	37	67.6%
20	2.89	1.67	23	38	60.5%

Nelson County

June, 2011

Site Rates with Weights					
Site	Site Weight	County Weight	Total Belted	Total Occupants	Seat Belt Rate
1	1.62	2	16	22	72.7%
2	1.62	2	25	36	69.4%
3	1.62	2	12	14	85.7%
4	1.62	2	31	38	81.6%
5	1.29	2	26	35	74.3%
6	1.62	2	25	31	80.6%
7	1.62	2	18	29	62.1%
8	1.29	2	9	14	64.3%
9	1.62	2	14	25	56.0%
10	1.29	2	36	50	72.0%
11	1.62	2	6	11	54.5%
12	1.29	2	47	56	83.9%
13	1.62	2	37	41	90.2%
14	1.29	2	44	53	83.0%
15	1.29	2	12	14	85.7%
16	1.62	2	28	34	82.4%
17	1.29	2	16	19	84.2%
18	1.62	2	16	20	80.0%
19	1.62	2	16	20	80.0%
20	1.62	2	9	9	100.0%

Pembina County

June, 2011

Site Rates with Weights					
Site	Site Weight	County Weight	Total Belted	Total Occupants	Seat Belt Rate
1	3.25	2	16	44	36.4%
2	3.25	2	7	9	77.8%
3	2.13	2	18	24	75.0%
4	2.13	2	31	48	64.6%
5	2.13	2	34	37	91.9%
6	2.13	2	14	21	66.7%
7	2.13	2	15	26	57.7%
8	2.13	2	19	27	70.4%
9	3.25	2	30	68	44.1%
10	3.25	2	20	43	46.5%
11	2.13	2	21	35	60.0%
12	3.25	2	14	35	40.0%
13	3.25	2	13	19	68.4%
14	2.13	2	37	41	90.2%
15	3.25	2	12	14	85.7%
16	3.25	2	35	41	85.4%
17	3.25	2	19	35	54.3%
18	3.25	2	17	51	33.3%
19	3.25	2	17	31	54.8%
20	3.25	2	19	29	65.5%

Ramsey County

June, 2011

Site Rates with Weights					
Site	Site Weight	County Weight	Total Belted	Total Occupants	Seat Belt Rate
1	1.22	2	30	43	69.8%
2	1.22	2	25	40	62.5%
3	2.64	2	35	50	70.0%
4	2.64	2	18	36	50.0%
5	1.22	2	24	42	57.1%
6	2.64	2	42	69	60.9%
7	1.22	2	24	39	61.5%
8	1.22	2	9	17	52.9%
9	2.64	2	9	17	52.9%
10	1.22	2	34	45	75.6%
11	1.22	2	27	40	67.5%
12	2.64	2	33	52	63.5%
13	2.64	2	41	66	62.1%
14	2.64	2	50	91	54.9%
15	1.22	2	59	99	59.6%
16	2.64	2	37	56	66.1%
17	2.64	2	26	42	61.9%
18	2.64	2	23	38	60.5%
19	2.64	2	39	58	67.2%
20	1.22	2	27	47	57.4%

Stark County

June, 2011

Site Rates with Weights					
Site	Site Weight	County Weight	Total Belted	Total Occupants	Seat Belt Rate
1	1.9	1.33	71	96	74.0%
2	4.3	1.33	62	71	87.3%
3	4.3	1.33	131	154	85.1%
4	1.9	1.33	61	63	96.8%
5	1.9	1.33	37	42	88.1%
6	1.9	1.33	113	158	71.5%
7	1.9	1.33	79	89	88.8%
8	1.9	1.33	59	64	92.2%
9	4.3	1.33	84	105	80.0%
10	4.3	1.33	75	90	83.3%
11	4.3	1.33	130	154	84.4%
12	4.3	1.33	54	62	87.1%
13	1.9	1.33	53	59	89.8%
14	1.9	1.33	108	118	91.5%
15	1.9	1.33	22	31	71.0%
16	4.3	1.33	26	34	76.5%
17	4.3	1.33	85	100	85.0%
18	1.9	1.33	103	114	90.4%
19	4.3	1.33	58	73	79.5%
20	4.3	1.33	106	122	86.9%

Stutsman County

June, 2011

Site Rates with Weights					
Site	Site Weight	County Weight	Total Belted	Total Occupants	Seat Belt Rate
1	2.5	2.67	90	103	87.4%
2	2.5	2.67	65	73	89.0%
3	2.5	2.67	82	93	88.2%
4	5.5	2.67	42	72	58.3%
5	2.5	2.67	108	154	70.1%
6	2.5	2.67	35	42	83.3%
7	5.5	2.67	6	10	60.0%
8	5.5	2.67	4	8	50.0%
9	2.5	2.67	7	11	63.6%
10	2.5	2.67	42	55	76.4%
11	2.5	2.67	49	67	73.1%
12	5.5	2.67	31	52	59.6%
13	5.5	2.67	26	42	61.9%
14	5.5	2.67	84	120	70.0%
15	5.5	2.67	5	19	26.3%
16	5.5	2.67	8	12	66.7%
17	5.5	2.67	56	81	69.1%
18	2.5	2.67	49	51	96.1%
19	2.5	2.67	57	62	91.9%
20	5.5	2.67	30	50	60.0%

Ward County

June, 2011

Site Rates with Weights					
Site	Site Weight	County Weight	Total Belted	Total Occupants	Seat Belt Rate
1	3.5	1	40	63	63.5%
2	7.6	1	2	6	33.3%
3	7.6	1	45	74	60.8%
4	7.6	1	12	31	38.7%
5	3.5	1	65	90	72.2%
6	3.5	1	75	109	68.8%
7	3.5	1	56	78	71.8%
8	7.6	1	65	127	51.2%
9	3.5	1	51	65	78.5%
10	3.5	1	48	62	77.4%
11	3.5	1	46	66	69.7%
12	3.5	1	89	113	78.8%
13	7.6	1	87	163	53.4%
14	7.6	1	178	251	70.9%
15	3.5	1	55	85	64.7%
16	3.5	1	64	80	80.0%
17	7.6	1	23	33	69.7%
18	7.6	1	60	99	60.6%
19	7.6	1	54	92	58.7%
20	7.6	1	91	168	54.2%

Wells County

June, 2011

Site Rates with Weights					
Site	Site Weight	County Weight	Total Belted	Total Occupants	Seat Belt Rate
1	2.9	2.67	15	33	45.5%
2	1.11	2.67	6	22	27.3%
3	2.9	2.67	28	39	71.8%
4	1.11	2.67	23	34	67.6%
5	2.9	2.67	4	9	44.4%
6	2.9	2.67	11	12	91.7%
7	1.11	2.67	29	37	78.4%
8	2.9	2.67	14	16	87.5%
9	2.9	2.67	15	19	78.9%
10	2.9	2.67	6	22	27.3%
11	1.11	2.67	19	31	61.3%
12	1.11	2.67	25	30	83.3%
13	2.9	2.67	27	32	84.4%
14	2.9	2.67	12	14	85.7%
15	1.11	2.67	11	23	47.8%
16	2.9	2.67	25	43	58.1%
17	1.11	2.67	24	32	75.0%
18	1.11	2.67	25	35	71.4%
19	1.11	2.67	51	67	76.1%

Williams County

June, 2011

Site Rates with Weights					
Site	Site Weight	County Weight	Total Belted	Total Occupants	Seat Belt Rate
1	4.18	1.67	18	35	51.4%
2	4.18	1.67	20	27	74.1%
3	4.18	1.67	5	14	35.7%
4	4.18	1.67	1	1	100.0%
5	4.18	1.67	64	98	65.3%
6	2.89	1.67	101	132	76.5%
7	2.89	1.67	59	82	72.0%
8	2.89	1.67	76	101	75.2%
9	2.89	1.67	38	47	80.9%
10	4.18	1.67	61	102	59.8%
11	2.89	1.67	106	165	64.2%
12	4.18	1.67	20	33	60.6%
13	4.18	1.67	54	101	53.5%
14	4.18	1.67	36	70	51.4%
15	4.18	1.67	53	97	54.6%
16	4.18	1.67	22	42	52.4%
17	2.89	1.67	33	47	70.2%
18	2.89	1.67	23	41	56.1%
19	2.89	1.67	66	94	70.2%
20	2.89	1.67	78	99	78.8%

Appendix F: Standard Error Formulas

The variance for the kth site in the jth stratum within the ith county can be found from the following formula:

$$\hat{V}(\hat{p}_{ijk}) = \left(\frac{\hat{p}_{ijk}\hat{q}_{ijk}}{n_{ijk}-1}\right)$$

Where:

i= ith county

j=jth stratum

k=kth site

$\hat{V}(\hat{p}_{ijk})$ = the estimated variance for the kth site in the jth stratum within the ith county

$\hat{p}_{ijk}$ = percent of belted occupants at the kth site in the jth stratum within the ith county

$\hat{q}_{ijk}$ = 1 - $\hat{p}_{ijk}$

Once the individual site variances have been found, the variances are weighted by the stratum weights as follows:

$$\hat{V}(\hat{p}_{ij}) = \frac{1}{(\sum_k W_{ijk})^2} \sum_{k=1}^{20} W_{ijk}^2 \hat{V}(\hat{p}_{ijk})$$

Where:

$\hat{V}(\hat{p}_{ij})$= the estimated variance for the jth stratum within the ith county

W_{ijk} = the weight for the kth site in the jth stratum within the ith county

Similarly the variance for the county is found by weighting the stratum variances.

$$\hat{V}(\hat{p}_i) = \frac{1}{(\sum_j W_{ij})^2} \sum_{j=1}^{2} W_{ij}^2 \hat{V}(\hat{p}_{ij})$$

The state variance is then found by weighting the county variances.

$$\hat{V}(\hat{p}_s) = \frac{1}{(\sum_i W_i)^2} \sum_{i=1}^{16} W_i^2 \hat{V}(\hat{p}_i)$$