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Seat Belt Use on North Dakota Rural Roads, 2016

Prepared by:

Kimberly Vachal, Ph.D.
Laurel Benson, Research Project Specialist

Prepared in cooperation with the:

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Seat Belt Use on North Dakota Rural Roads, 2016

Kimberly Vachal[1] and Laurel Benson[2]
Upper Great Plains Transportation Institute
North Dakota State University, Dept. 2880
P.O. Box 6050
Fargo, North Dakota 58108-6050

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[1]Research Faculty, [2]Research Project Specialist

ABSTRACT

North Dakota crash reports show that nearly 82% of fatal crashes occurred on non-interstate rural roads over the past five years. A total of 5,535 driver observations were collected at 143 sites across 24 rural counties. Seat belt use was found to be significantly different on rural highways and in rural towns. Highway seat belt use rose slightly from 67.2% in 2015 to 67.8% in 2016. Average observed highway use rates ranged from 55.5% to 82.0% on rural highways in individual counties and from 20.2% to 58.3% in rural towns between 2014 and 2016. The survey indicates a 19.5 percentage point increase in rural highway seat belt use compared to average use between 2009 and 2011. Seat belt use remains significantly higher in the eastern regions compared to the west.

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1. INTRODUCTION

North Dakota's rural roads provide vital social and commercial links for a widely dispersed population. The safety of these roadways is paramount in managing traffic assets to enhance the state's livability. Approximately two-thirds of the state's travel, in vehicle-miles, takes place on rural roads that interconnect small communities and join the rural geography to interstates, principal state corridors, and urban centers (NDDOT). This level of rural driving is relatively high considering only about a third of the nation's travel occurs on rural roads (U.S. DOT). From a safety perspective, this poses an inherent challenge because the risk for serious injury and death on rural roads is relatively high compared to the risk on urban roads and interstate highways (U.S. DOT 2005, U.S. DOT 2016). In North Dakota, crash reports from 2011 to 2015 show that nearly 82% of fatal crashes and 69% of serious injury crashes – which includes those with fatal and disabling injuries – occurred on non-interstate rural roads (NDDOT).

With an understanding that seat belts are a relatively low-cost safety device that are an easy means of primary protection for occupants in passenger vehicles, North Dakota has chosen to continue to measure seat belt use on non-interstate rural roads. Understanding tendencies and trends in seat belt use on these rural roads is essential to wise decisions regarding efforts to encourage seat belt use in the state. The U.S. Department of Transportation does work with states to measure seat belt use through the long-standing annual National Occupant Protection Use Survey (NOPUS).

Results in this survey are a supplement to the NOPUS statewide estimate. This estimate also includes urban and interstate travel that are heavily weighted in the final NOPUS seat belt use estimate. Figure 1.1 provides some insight into seat belt use based on occupant reports for crashes by road type.

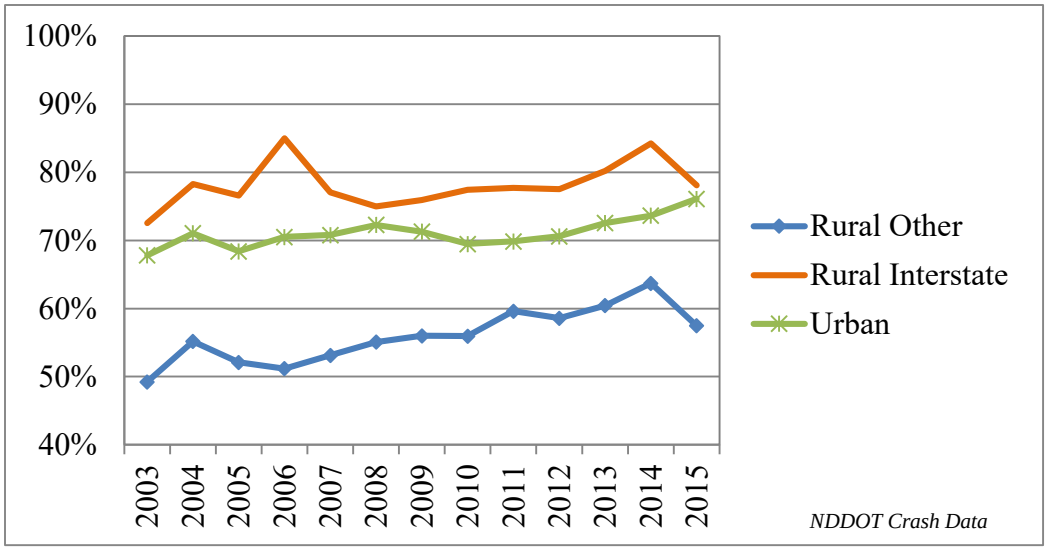

Figure 1.1 Seat Belt Use in Injury Crashes (includes Fatal Injuries), by Road Type

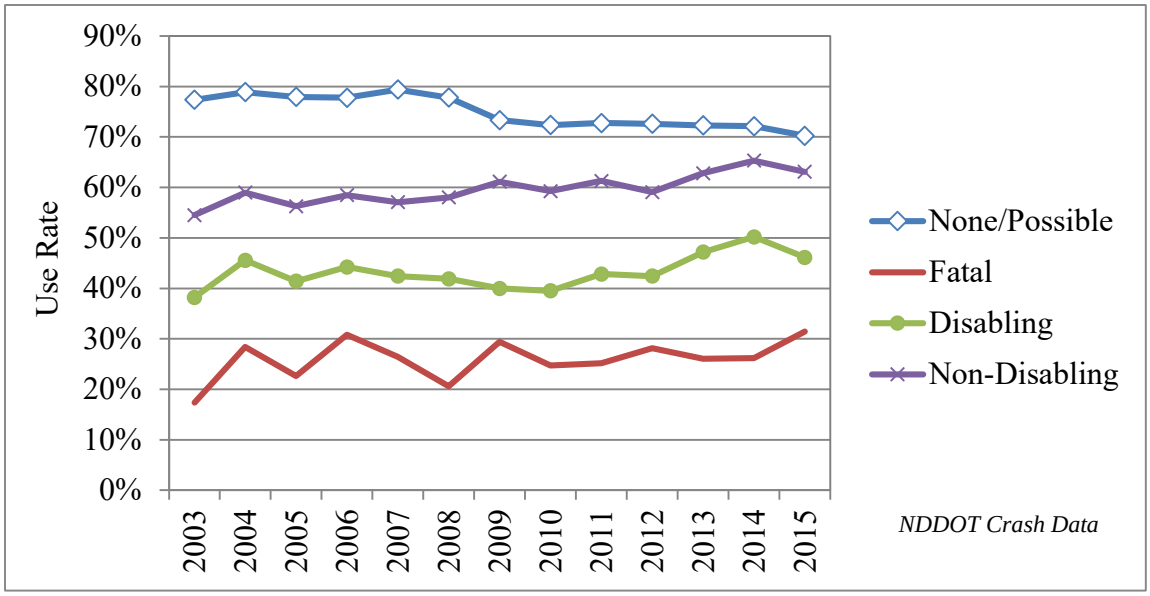

Figure 1.2 Seat Belt Use Rate in All Crashes, by Type of Injury

Although not a perfect reflection of use on the road types, trends do offer some insight for the larger population of occupants. Other perspectives on the traffic crashes are offered in the seat belt use rates by occupant injury outcome and crash incidence trends shown in Figure 1.2 and Figure 1.3. Severity of injury outcomes is negatively correlated to seat belt use considering the use rates and occupant injury outcomes. For example, use among the occupants with fatal injury outcomes was 28% compared to 72% where no injury or possible injury was reported.

In addition, crash incidence is presented to represent rates based on exposure in traffic volume on the state's roads. The crash events were each categorized by the most serious injury outcome of a crash event to develop this additional metric regarding traffic activity. The crash rate index shows a declining trend for injury crash event incidence across all crash injury outcomes as the traffic volume has declined. Gains are less pronounced for the disabling injury outcomes. The observation study of the larger population of occupants reported on in these graphs and this occupant protection study is a continuation of efforts to quantitatively monitor seat belt use for all occupants on rural roads in North Dakota as stakeholders continue efforts to increase seat belt use.

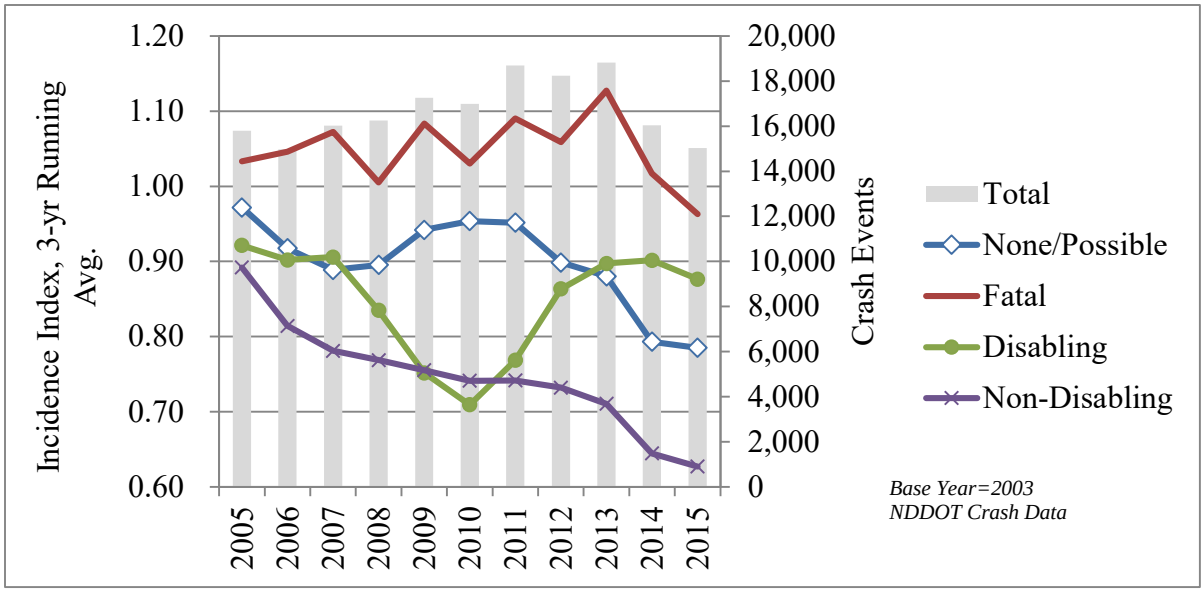

Figure 1.3 Crash Type, VMT Incidence Rate Index

2. METHODOLOGY

The method used in the 2016 survey is a continuation of a protocol initiated in 2009. Some data visualization in the results section is limited to a timeline later than 2009 to improve illustration quality. As with the previous surveys, a direct observation method was used. A first step in administering the survey was to define a representative survey sample that could be collected pragmatically, given limited resources. The sampling was based on rural county populations and geographic representation of counties across four quadrants of the state. Counties were used as the boundaries for the initial selection stratum in the sample because population and other demographic information for counties are readily available. The quadrants were defined based on the North Dakota Health Department administration regions (Figure 2.1). Initially, stratified random sampling was conducted with rural counties that are not part of the NOPUS survey. Due to changes that occurred with the NOPUS method for the 2012 survey, the counties in the rural survey were reselected to avoid duplication of counties between the surveys.

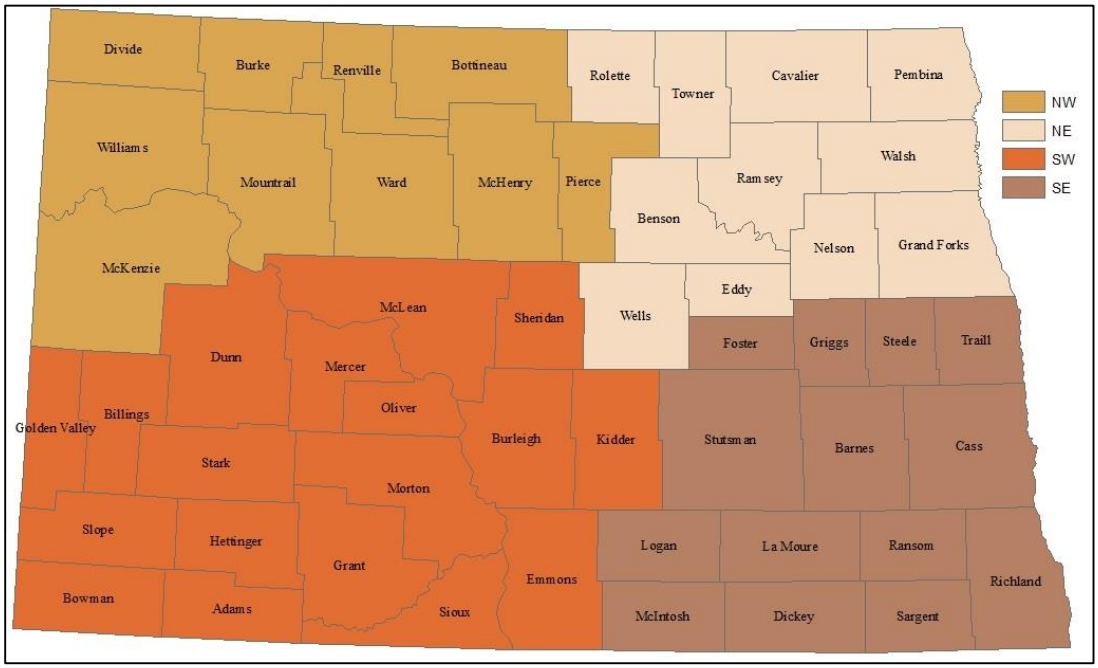

Figure 2.1 Rural Seat Belt Regions

The counties excluded from the annual statewide seat belt survey comprise the state's rural-county geography for this project. The three highest population counties in the statewide seat belt survey have approximately 65 people per square mile, compared to only 10 people per square mile for the three highest in the rural county sample. Although some counties with lower population densities are included in the statewide seat belt survey sample, the counties selected for that survey include the most populated – thus most urban – counties in the state. Of the 37 counties not surveyed in the NOPUS survey, 24 were surveyed in this project (Figure 2.2).

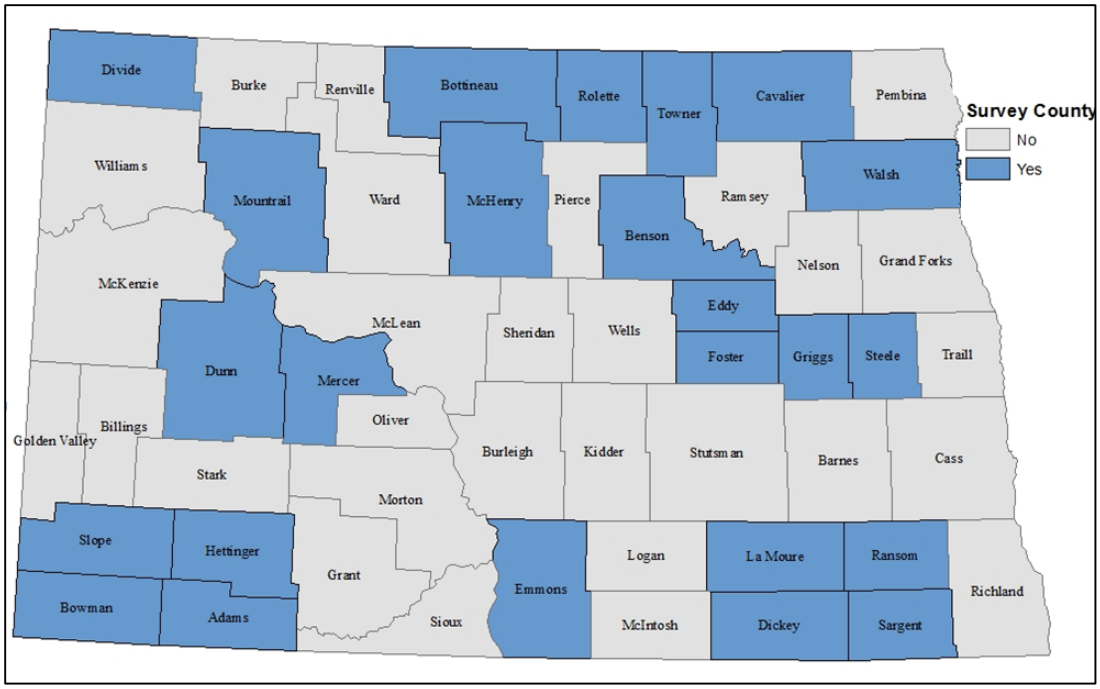

Figure 2.2 Rural Seat Belt Counties

Within the sample counties, sites selected for observation were based on local traffic knowledge because annual vehicle miles traveled, or traffic density, is not available for the local road system.

Observations were conducted in July 2016. The seat belt observations were performed by experienced seat belt survey observers. Prior to conducting county observations, observers were asked to become familiar with the "Rural Seat Belt Observation Training Guide" which outlined specific procedures recommended for conducting rural seat belt observations in North Dakota, including the data collection tool (Appendix A).

The following outlines general site selection and timeline guidance provided to observers:

1. One site per town, up to two towns per county
2. Three to four "non-town" sites to cover higher traffic intersections on non-interstate/non-urban roads in the county
3. Sites chosen had to be a minimum of 20 miles away from the interstate (to minimize bias associated with urban commuter traffic)
4. Each site had to be observed for a minimum of 30 minutes, up to one hour if extra time was needed to meet the 30-observation minimum for a site. After the additional 30 minutes, the site was considered "complete" regardless if the 30-observation minimum was met or not.
5. Hours for collection were from 7 a.m. to 7 p.m.

3. RESULTS

A total of 5,535 vehicles observations were collected during surveys conducted at 143 sites across the state. This includes 119 instances where driver seat belt use could not be determined. These observations are not included when calculating driver seat belt use in this report. Passenger seat belt use was also collected when possible. The limited information on passenger use, which includes 1,473 observations, was used primarily to assess correlation with driver use. This includes 71 instances where passenger seat belt use could not be determined. These observations are not included when calculating passenger seat belt use in this report. The non-response rates – defined as the number of cases where use could not be determined – were low for both driver and passenger at 2.5% and 4.8%, respectively. In addition to the observation distribution by county, the following table also includes the county populations used for weighted results highlighted in the following sections (Table 3.1). The number of observations is lower than the number collected in 2015, but this is reasonable as the declining traffic trend shown in Figure 3.1 is present in year-to-date figures for the rural highway traffic in monthly traffic updates from the state (NDDOT 2016).

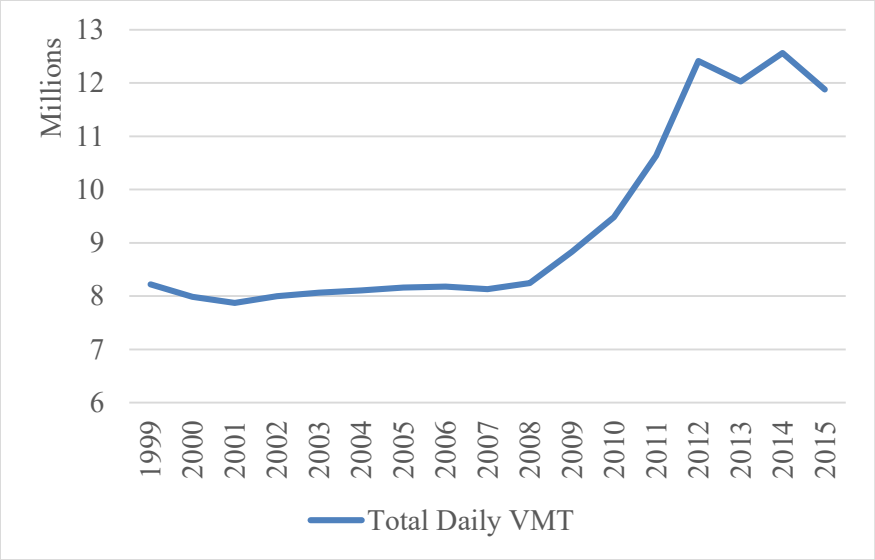

Figure 3.1 Non-Interstate Highway Traffic in North Dakota

Table 3.1 Observation Counts and Observation Site Counts by County: 2016

	Observations			Population (2014)	
County	**Count**	**% of TOTAL**	**Observation Sites Per County**	**Population**	**% of TOTAL**
Adams	370	6.7%	6	2,384	2.0%
Benson	138	2.5%	6	6,833	5.8%
Bottineau	312	5.6%	6	6,650	5.6%
Bowman	312	5.6%	6	3,247	2.8%
Cavalier	121	2.2%	6	3,855	3.3%
Dickey	203	3.7%	6	5,150	4.4%
Divide	176	3.2%	6	2,432	2.1%
Dunn	426	7.7%	6	4,399	3.7%
Eddy	104	1.9%	6	2,377	2.0%
Emmons	371	6.7%	6	3,422	2.9%
Foster	101	1.8%	6	3,362	2.9%
Griggs	115	2.1%	6	2,319	2.0%
Hettinger	239	4.3%	6	2,660	2.3%
LaMoure	189	3.4%	6	4,149	3.5%
McHenry	349	6.3%	6	5,988	5.1%
Mercer	392	7.1%	6	8,746	7.4%
Mountrail	545	9.8%	6	9,782	8.3%
Ransom	183	3.3%	6	5,446	4.6%
Rolette	176	3.2%	6	14,616	12.4%
Sargent	174	3.1%	6	3,931	3.3%
Slope	207	3.7%	5	765	0.6%
Steele	134	2.4%	6	1,955	1.7%
Towner	85	1.5%	6	2,310	2.0%
Walsh	113	2.0%	6	10,970	9.3%
TOTAL	5,535	100.0%	**143**	**117,748**	**100.0%**

3.1 Driver Rural Seat Belt Use

3.1.1 Road Type

Because the overall rural seat belt use rate may be skewed by the mix of rural highway and rural town seat belt observations – which may not truly reflect crash exposure risk – it may be more appropriate to consider the different driving environments separately. The more relevant numbers are seat belt use by road type, used here as the driving environment, because of the differing relative injury risk on the rural town and rural highway roads. The greater risk associated with travel outside of towns is evident in state crash data, which shows only about 2% of fatal crashes on rural roads occur in towns (NDDOT 2016). Therefore, rural highways are given special attention.

The observed seat belt use rate for drivers on rural highways was 67.8%. This use rate is significantly different than the use rate in rural towns at 46.6%.[1] Both use rates fall well below the NOPUS estimate of about 81%. The average use rate on highways for the most recent three years is 19.5% higher than the average rate between 2009 and 2011 (Figure 3.2). Comparing use in rural towns between 2014 and 2016 to the average use rate from 2009 to 2011, use in town increased 14.1%. The seat belt use rate on highways has ranged from 55.2% to 71.1%, peaking in 2014. The rate in towns has ranged between 35.6% and 46.0%. With regard to the year-to-year movement, the slight increase in driver use on rural highways from 2015 to 2016 is significant at the 95th percentile (χ^2=7.5292, ρ=0.003, n=6,883). The increase from 2015 to 2016 for seat belt use in towns is statistically significant at the 90th percentile (χ^2=2.9000, ρ<0.09, n=4,519).

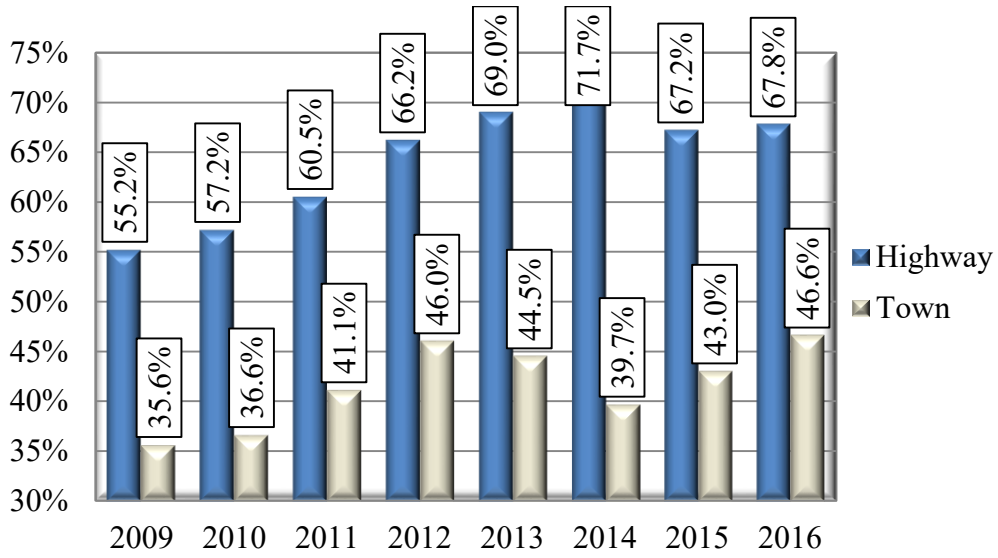

Figure 3.2 Driver Seat Belt Use by Road Type

[1]Figures reported for the seat belt use rates are observed rates weighted by county population. For regional and statewide figures, only weighted seat belt use rates are reported unless otherwise specified.

The range of highway seat belt use rates by county is large, considering an average high of 82% in Steele County and an average low of 55.5 % in Divide County over the past three years (Figure 3.3). The median use rate on highways was 67.4%. This rate has trended downward over recent years. The range in highway use among the counties was 39.1%, the largest range reported for the survey since the 44.4% range in the initial year of the survey. The large range in seat belt use suggests some potential to investigate the environment and practices in the more successful counties to determine if best practices can be transferred to other areas or if there are unique cultural or travel situations surrounding the higher rates. Average seat belt use in rural towns ranges from a high of 58.3% in Dunn County to a low of 20.5% in Hettinger County. The median use rate over the most recent three years is 39.5%. The median use rate shows a slowly declining trend since 2013, suggesting that gains have not been shared equally among the counties.

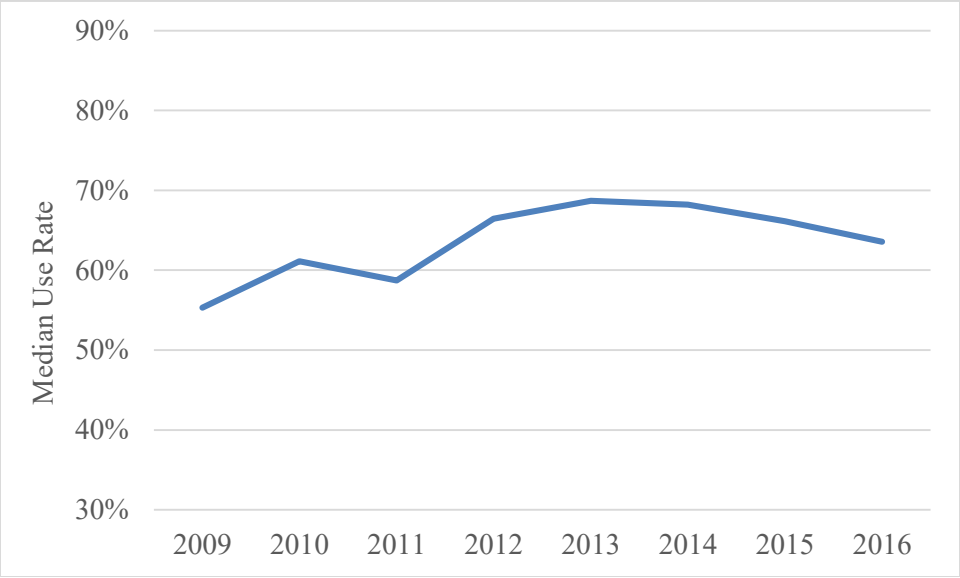

Figure 3.3 Median Highway Use Rate Among Counties

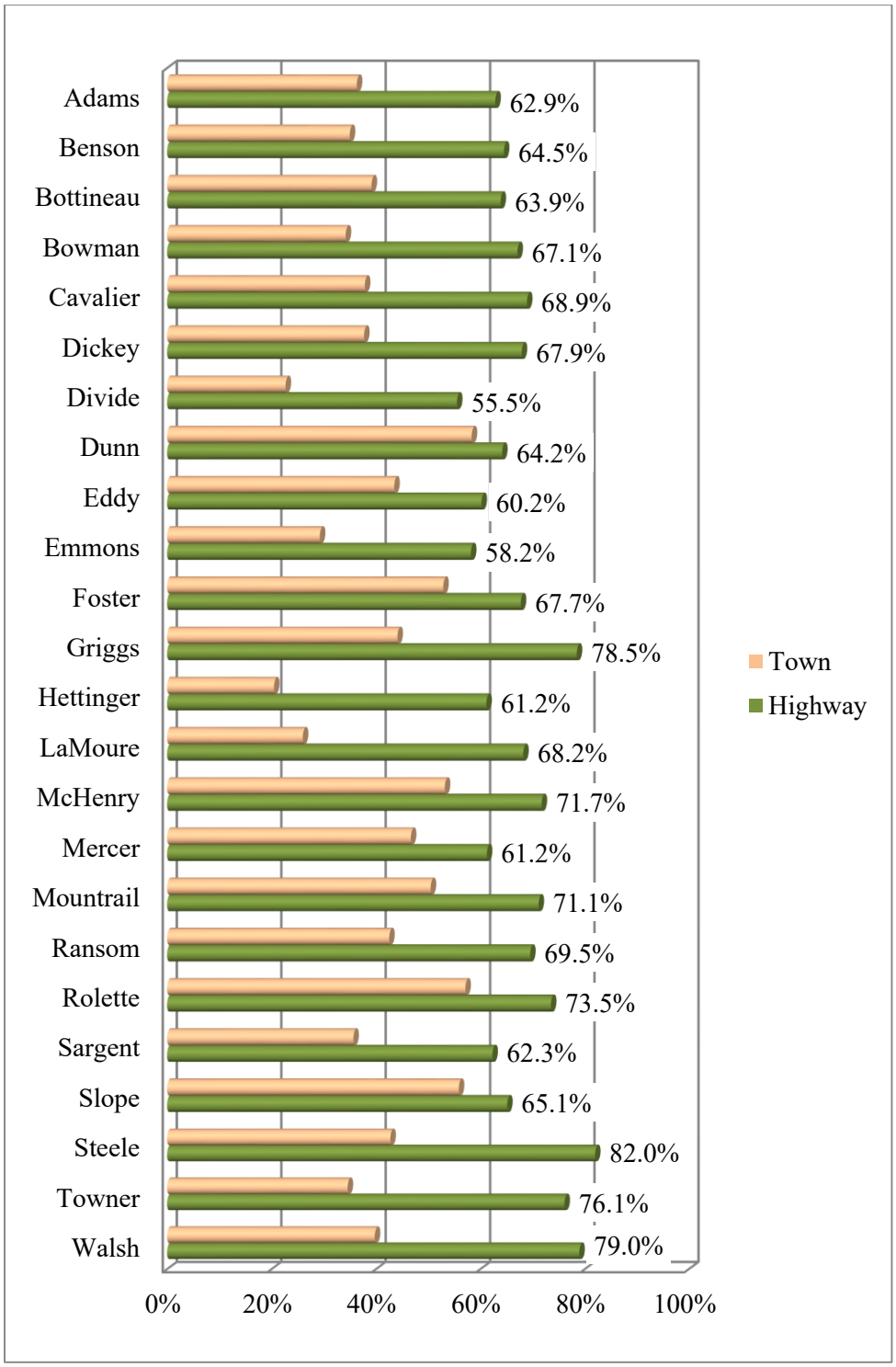

Figure 3.4 Driver Seat Belt Use by Road Type and County, Average 2014-2016

Clusters and corridors of counties can be identified in the map of seat belt use by looking at the distribution of counties by use rates by quartile (Figure 3.5). Bottineau, Benson and Eddy were among counties in the lower quartiles in seat belt use rates. McHenry and Mountrail remain in the upper quartile. Other counties with the lowest highway seat belt use rates are grouped in two areas: Sargent along the southern tier, along with Emmons and a cluster of Slope, Bowman, Hettinger and Adams in the southwest. These counties had less than 65% of observed vehicle drivers using seat belts. In the northcentral region, Rolette, Towner, Griggs, Steele and Walsh form an eastern cluster with high use reported of more than 80%. Towner moved from the lower to upper use rate strata from 2015 to 2016. With the counties in the high-use quadrant, commuter traffic and close proximity to an interstate highway may be an influence. Although attempts are made to minimize interstate traffic influences, it is likely that some counties still have some interstate traffic effects. White counties were not surveyed in this study.

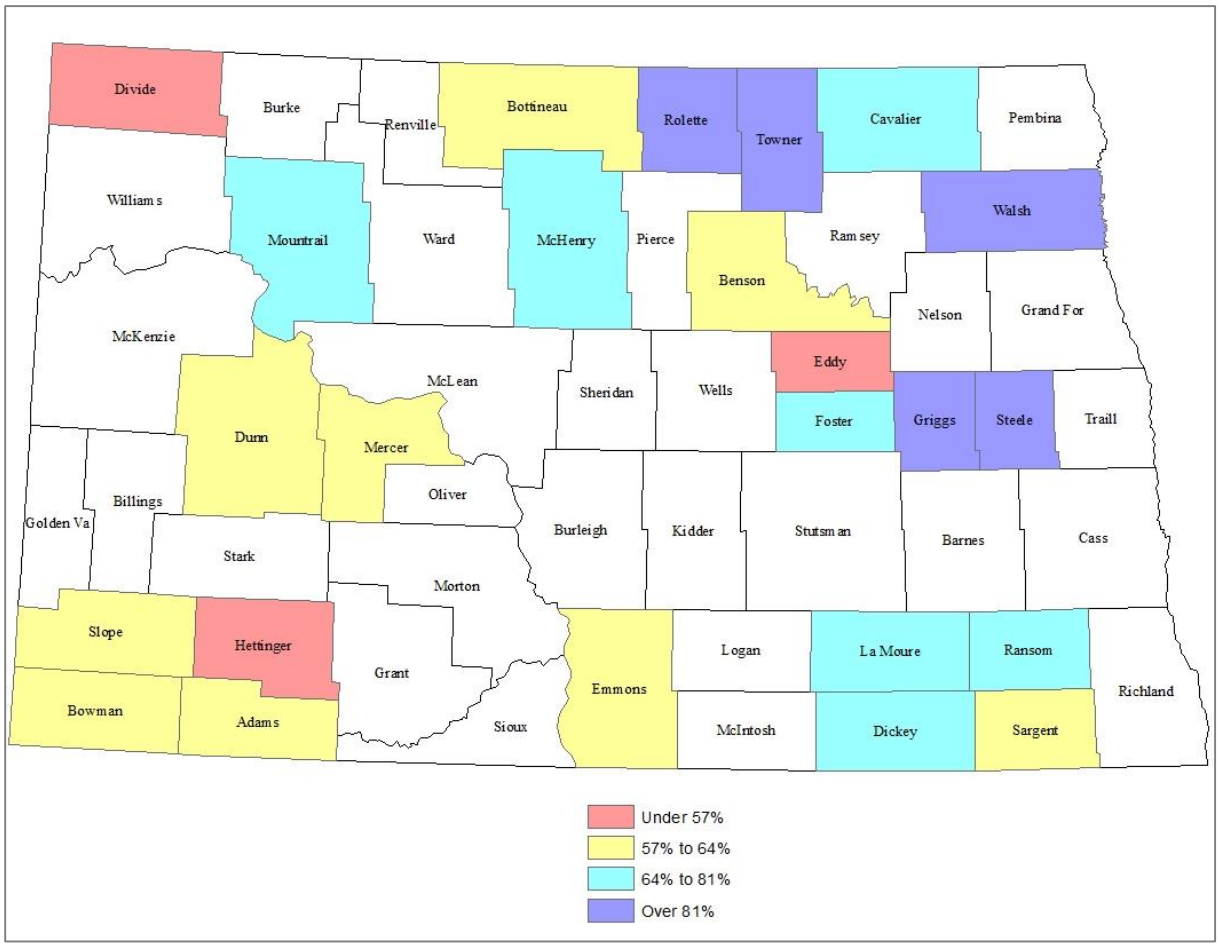

Figure 3.5 Highway Seat Belt Use by County, Average 2014-2016

Of the counties that have been observed in recent years, Rolette and Towner had the largest increases in highway seat belt use compared to the county average for the previous three years' observation rates (Table 3.2). Counties with the largest declines in highway seat belt use were Divide and Dunn. Once again, it is possible that the fluctuations in seat belt use identified here

are attributable to driver behavior, but changes in driver characteristics or environmental factors may have been an influence.

Table 3.2 Annual Observation of Highway Seat Belt Use by County

County	2012	2013	2014	2015	2016	Percentage Point Change from Avg. Previous 3-yr Observations
Adams	66.0%	61.4%	63.7%	66.9%	58.0%	-6%
Benson	73.0%	60.4%	66.9%	65.3%	61.3%	-3%
Bottineau		67.7%	66.2%	65.4%	60.0%	-6%
Bowman	66.9%	59.1%	64.1%	75.0%	62.2%	-4%
Cavalier	70.2%	76.0%	63.0%	78.9%	64.9%	-8%
Dickey	65.7%	53.2%	64.4%	73.0%	66.4%	3%
Divide	53.6%	71.4%	60.1%	58.5%	48.0%	-15%
Dunn	61.0%	77.0%	74.2%	61.3%	57.0%	-14%
Eddy	65.6%	57.6%	64.3%	64.3%	52.0%	-10%
Emmons		53.2%	57.2%	56.6%	60.8%	5%
Foster	67.9%	69.7%	73.5%	62.0%	67.7%	-1%
Griggs	71.2%	74.8%	81.7%	72.0%	81.7%	6%
Hettinger	67.9%	51.3%	71.1%	63.4%	49.0%	-13%
LaMoure	66.9%	54.9%	70.8%	64.2%	69.6%	6%
McHenry	63.4%	81.6%	77.2%	71.1%	66.9%	-10%
Mercer		70.6%	67.1%	58.5%	58.1%	-7%
Mountrail		74.1%	78.7%	68.2%	66.5%	-7%
Ransom	67.4%	65.1%	68.0%	71.2%	69.4%	1%
Rolette	62.2%	73.6%	76.5%	62.6%	81.4%	10%
Sargent	61.9%	60.7%	65.4%	62.5%	59.0%	-4%
Slope	78.2%	72.1%	68.4%	67.0%	60.0%	-9%
Steele	63.5%	84.5%	81.3%	80.2%	84.4%	2%
Towner	52.7%	58.9%	71.4%	69.8%	87.1%	20%
Walsh	81.8%	82.7%	74.4%	77.7%	84.8%	7%

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3.1.2 Region

Based on the regions defined in the methodology section, seat belt use among drivers in the four quadrants are presented as trend lines in Figure 3.6. Seat belt use by drivers in the Northwest and Southwest regions decline in 2016, compared to the previous year. The eastern regions remain above the western in seat belt use. The Northwest seat belt use rate does remain above the Southwest rate, although the west continues to trend downward. The slowdown in the oil industry in the west may be influencing these rates as commuter, industry traffic and economic activity associated with the oil industry has been reportedly down those regions. The eastern regions had a similar rate of about 77%. The southwest again had the largest percentage decline in seat belt use, 9.2%, among all regions. Use in the northwest also declined again in 2016 with a 5.6% decline in use. These declines may be related to a change in the traffic and driver group composition associated with diminished oil industry activity.

The Southwest, at 67.2%, remains below all other regions in seat belt use on rural highways. The Northeast rate of 73.6% is a slight increase after leveling off in previous years. The western regions experienced decreases in highway seat belt use from 2015 to 2016. The eastern region has higher use rates in comparing the two years. The decline in the seat belt use rate was statistically significant compared to last year for the southwest (χ^2=10.3315, ρ=0.03, n=2,739) region at the 95th percentile.

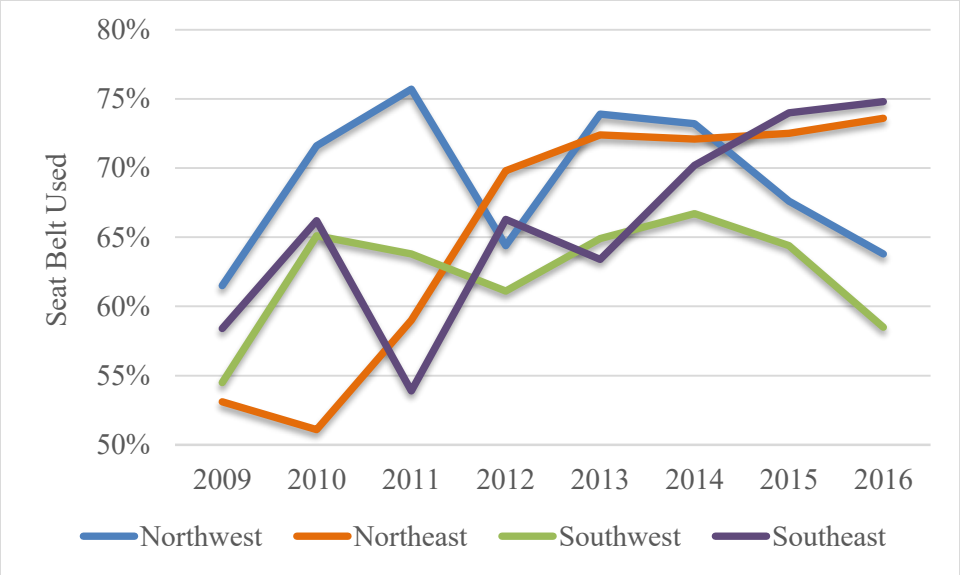

Figure 3.6 Highway Driver Seat Belt Use by Region

3.1.3 Driver Gender

Males were present at a ratio of about 2.3 to 1 in the driver population for the rural road seat belt observations. Of the 5,419 drivers observed where gender could be determined, 3,816 were male. Females made up a smaller share of the driver population both on highways and in towns, with the share higher in town at 36.1% compared to 26.4% on the highways. Females were the minority driver group in gender on all roads, similar to previous years. Gender is a common topic in seat belt use research because of the relatively low-cost and ease with which the information can be collected. The lower propensity for males to use seat belts found in this study is consistent with other research (Groetzke and Islam 2015, Strinea et al. 2010, U.S. DOT 2008, Gross et al. 2007, Vivida et al 2007, McCartt and Northrup 2004). Driver seat belt use does vary significantly between the genders (χ^2=57.9433, p=<0.001, n=5,419).

With regard to driver use rates by gender for road type, female use on rural highways was 77.1% compared to 63.3% for males (Figure 3.7). In rural towns, the use rates are 58.4% for female drivers and 39.8% for males. Seat belt use increased for female and male drivers on both highways and in towns compared to 2015. The increase in seat belt use by females (χ^2=5.89, p=0.02, n=1,616) in towns is significant at the 95th percentile compared to the previous year. Changes in the other road type and driver categories were not statistically significant.

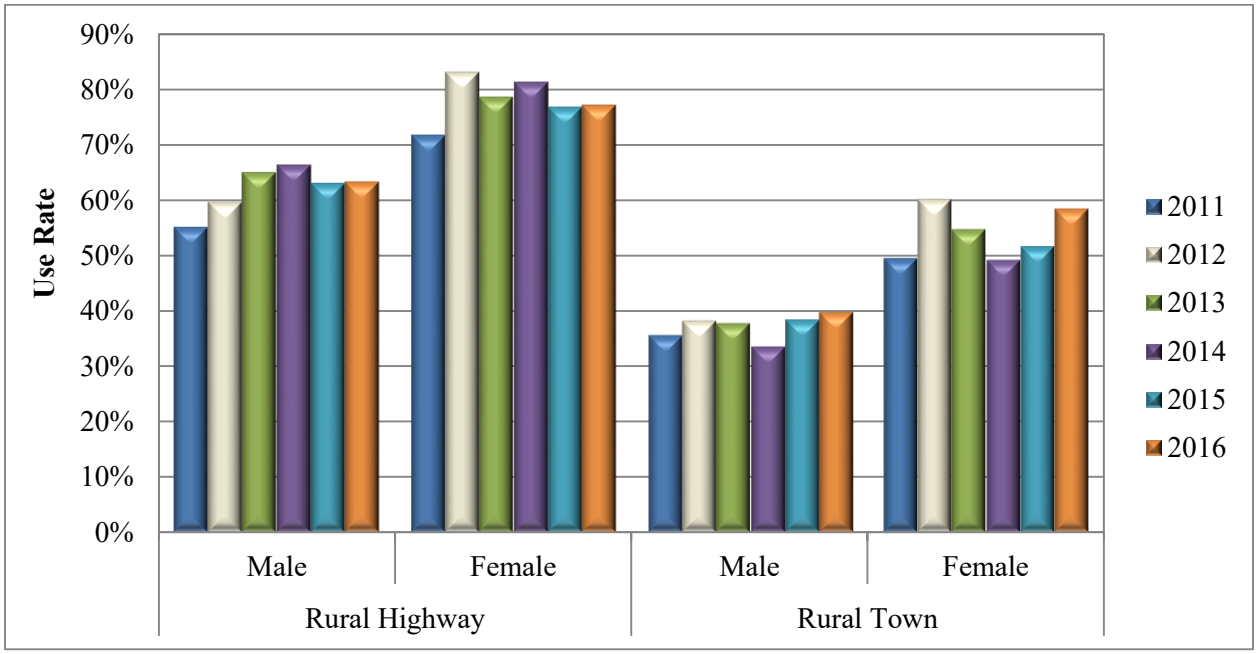

Figure 3.7 Driver Seat Belt Use by Gender and Road Type

Table 3.3 shows county-level seat belt use rates on rural highways and in rural towns by gender. The figures should be used with caution since several seat belt rates for females on both road types and males in town are estimated with fewer than 30 driver observations. In addition, county-level seat belt use may have environmental or event factors that affect the figures relative to other counties and year-to-year changes. These factors may include commuter traffic, observation site proximity to highways, community events, local economic activity, and

observation counts. The information is offered as additional insight, but should be used sparingly as the sole factor in resource decisions. Used in conjunction with expanded information from this survey or other seat belt use studies, the additional information may be useful in targeting education and enforcement activities.

Table 3.3 County Driver Seat Belt Use, by Road Type and Gender

	Average 2013-2015				2016			
	Rural Highway		Rural Town		Rural Highway		Rural Town	
County	Male	Female	Male	Female	Male	Female	Male	Female
Adams	59%	77%	25%	42%	53%	68%	39%	67%
Benson	61%	72%	32%	42%	50%	87%	22%	75%
Bottineau	62%	78%	34%	56%	58%	67%	32%	53%
Bowman	62%	81%	32%	50%	59%	75%	32%	50%
Cavalier	69%	82%	32%	45%	61%	76%	7%	57%
Dickey	61%	69%	34%	53%	63%	90%	21%	48%
Divide	61%	85%	26%	24%	43%	70%	20%	30%
Dunn	70%	78%	56%	67%	58%	53%	59%	60%
Eddy	58%	73%	37%	44%	38%	88%	37%	83%
Emmons	48%	79%	18%	38%	54%	79%	26%	47%
Foster	64%	78%	30%	55%	57%	90%	60%	100%
Griggs	70%	87%	29%	59%	76%	96%	33%	57%
Hettinger	45%	77%	17%	35%	48%	51%	29%	32%
LaMoure	59%	71%	25%	33%	68%	93%	22%	34%
McHenry	73%	86%	43%	66%	65%	84%	42%	88%
Mercer	61%	77%	41%	58%	54%	74%	30%	53%
Mountrail	73%	80%	46%	59%	68%	63%	49%	66%
Ransom	61%	79%	32%	56%	67%	86%	40%	51%
Rolette	67%	77%	47%	60%	83%	86%	78%	57%
Sargent	61%	69%	28%	48%	56%	76%	42%	55%
Slope	66%	81%	64%	63%	57%	74%	36%	70%
Steele	78%	92%	43%	39%	81%	95%	48%	29%
Towner	61%	79%	33%	38%	87%	92%	36%	57%
Walsh	71%	83%	35%	50%	85%	88%	35%	63%

3.1.4 Vehicle Type

As with gender, vehicle type is also commonly considered in seat belt surveys. Both offer potentially useful information for greater efficacy in directing education and enforcement outlays toward a driver group (U.S. DOT 2016). For example, a nationwide study of fatal crashes showed that pickup truck occupants had the highest percent of unrestrained fatalities among all passenger vehicle types (U.S. DOT 2016). Similar use patterns for this vehicle type were found here, with male pickup truck drivers having the lowest use rates among the gender-fleet mix.

The rural seat belt observations included more pickup trucks, with 2,457, than SUVs, cars or vans with 1,281, 1,262, and 336 respectively (Figure 3.8). The motorcycle driver figure varies substantially year-to-year based on weather conditions. For example, the count in 2016 was midrange with 80 observations; 2015 was relatively high at 106 compared to 57 in 2014. The fleet composition for the seat belt observation, by vehicle type, is similar to 2015 with a slight increase in the share of SUVs.

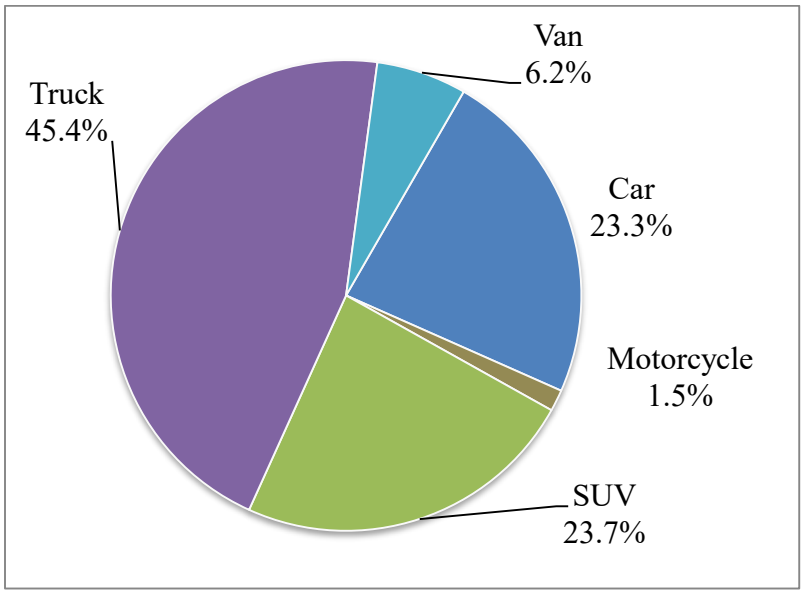

Figure 3.8 Observed Rural Road Passenger Vehicle Fleet, by Vehicle Type

A significant variation in seat belt use is found across passenger vehicle types on rural roads by vehicle (null -2LL=7340.994, final -2LL=6939.65, χ^2=401.35, ρ <.0001, n=5,372). After controlling for road type and gender effects where female drivers were 1.7 times more likely to be using seat belts and drivers were 2.5 times more likely to be belted on highways than in town, pickup truck drivers were found to have a significantly lower likelihood for seat belt use. Van drivers were the comparison group among the vehicles showing high-use. Van drivers were 1.8 times more likely to be belted than their pickup truck driving cohorts (OR=0.566, 95% CI 0.441, 0.727). Driver seat belt use in pickup truck on rural roads was 52.0% compared to 69.2% for van drivers (Figure 3.9). Use by pickup truck drivers on rural roads increased slightly compared to 2015 while use by car drivers increased by 5.1 percentage points. Sport utility vehicle drivers had a slightly lower observed use rate in 2016 at 66.7% compared to 67.2% in 2016. Seat belt use by van drivers remained above the other vehicle types despite a 3.1 percentage point decline in use for 2016 compared to 2015. The changes between 2015 and 2016 for car and truck drivers was statistically significant (χ^2=2.8541, p=0.09, n=2,599; χ^2=3.3040, p=0.07, n=5,271) at the 90th percentile.

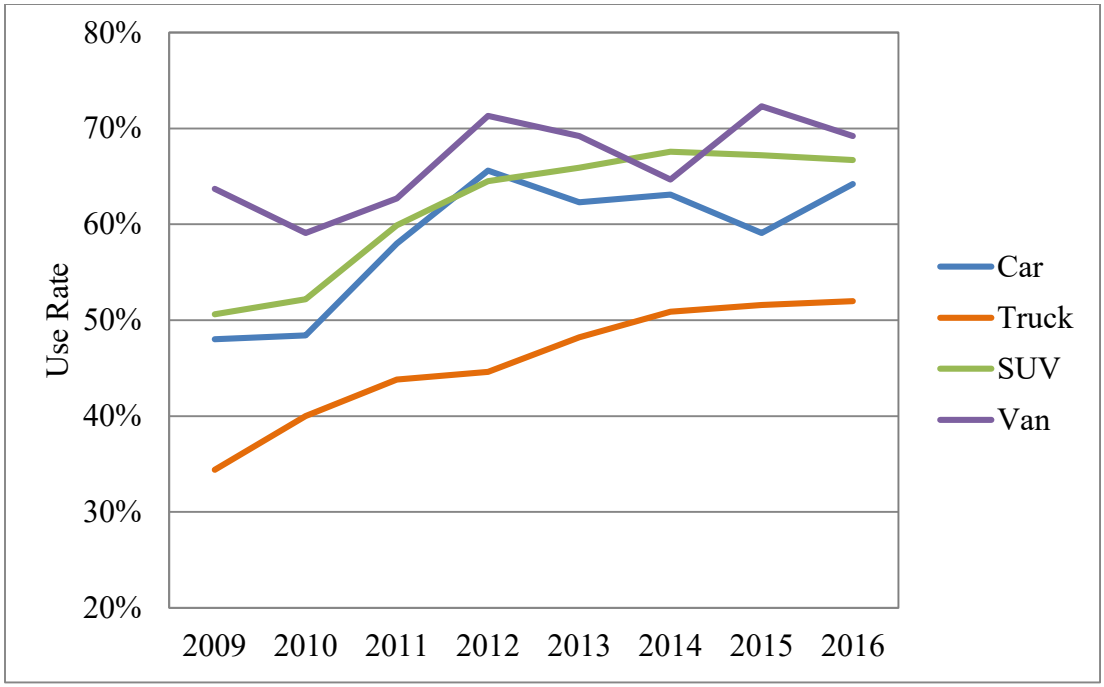

Figure 3.9 Driver Seat Belt Use by Vehicle Type

Further stratification for gender shows that female drivers have higher seat belt use rates among all vehicle classes on all roads in 2016, ranging from 72.4% for cars to 93.5% for vans (Table 3.4). Males, in comparison, used seat belts only 59.7% of the time in pickup trucks and 77.2% of the time in vans. Seat belt use in pickup trucks increased for both genders when comparing rates in 2016 to the previous three-year average. An increase is statistically significant at the 95th percentile for male pickup drivers, compared to last year (χ^2=6.7235, ρ=0.01, n=4,726).

Table 3.4 Driver Seat Belt Use by Vehicle Type and Gender

	Average 2013-2015		2016	
	Male	**Female**	**Male**	**Female**
Car	58.9%	64.5%	61.8%	72.4%
SUV	64.0%	69.3%	72.0%	81.6%
Pickup	47.6%	59.1%	59.7%	73.2%
Van	65.0%	75.8%	77.2%	93.5%

When coupling the road environment with gender, the highest use rate was among females driving vans on rural highways. Seat belts were in use for 81.2% of drivers observed in this group in the 2016 survey (Table 3.5). The lowest use rate, 30.9%, was again among males driving pickups in rural towns. Use rates for male pickup truck drivers increased while female use decreased. Use by car drivers increased in 2016 compared to the previous three-year average with the exception of a small decline for male drivers on highways. Seat belt use decreased for males and females driving vans, with the exception of males in town, when comparing 2016 to the previous three-year average. The largest decrease in use rates, considering gender, road and vehicle mix, was for female van drivers on highways in comparing 2016 to the previous three-year average. The largest gain was for male SUV drivers in town.

Table 3.5 Driver Seat Belt Use by Vehicle Type, Gender, and Road Type

	Average 2012-2015				2016			
	Rural Highway		Rural Town		Rural Highway		Rural Town	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
Car	69.8%	75.7%	47.2%	51.2%	69.4%	76.3%	48.9%	53.2%
SUV	75.5%	82.9%	42.7%	53.4%	66.5%	77.9%	56.1%	60.2%
Pickup	58.4%	70.5%	33.3%	44.7%	60.0%	69.3%	30.9%	69.4%
Van	75.0%	91.6%	45.7%	60.3%	71.9%	81.2%	64.4%	53.4%

3.2 Passenger Rural Seat Belt Use

As previously mentioned, passenger observations were collected when traffic flow and field of vision allowed observers to collect information in addition to the driver seat belt use (Figure 3.10). Passenger seat belt use was 81.6% on rural highways and 63.1% in rural towns. Both the highway and town use rate were reported at their highest level since the survey was initiated in 2009. Neither change is statistically significant compared to 2015. Unlike the driver population, a majority of passengers were female, comprising 57.1% of the group.

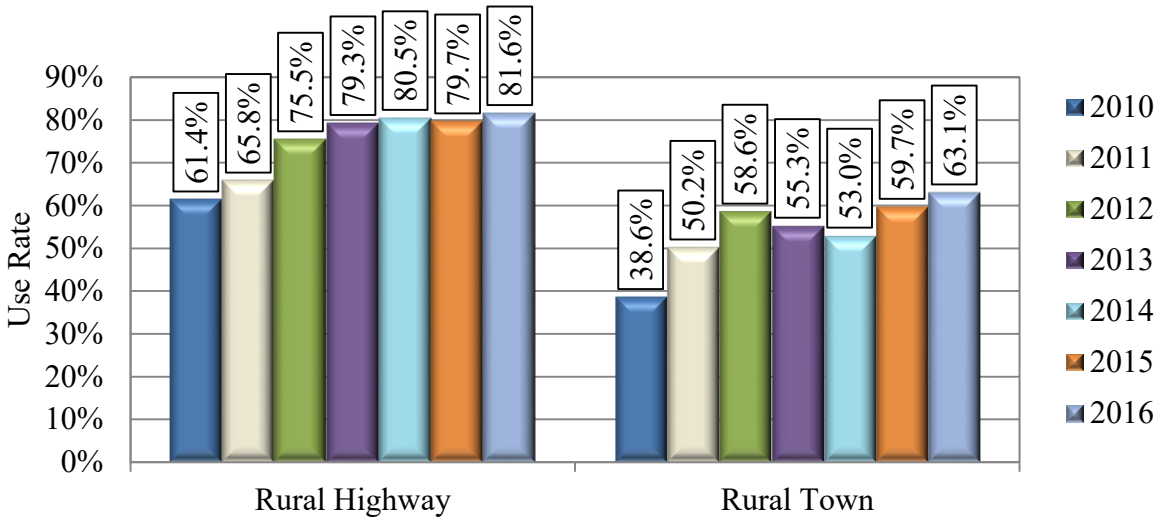

Figure 3.10 Seat Belt Use in Passenger Observation Cases

As with driver observations, gender was a significant characteristic in passenger seat belt use (χ^2=80.4299, p<0.001, n=1,388). Recall that the effects of the road type mix in the passenger gender trends may skew these overall figures considering the stark difference between highway and town use. Consequently, use rates are presented in the context of the road type (Figure 3.11). Figures by gender and road type show an increase for female passengers on rural highways. Both male and female passenger use decreased slightly in highways compared to the previous three-year average. None of the changes in passenger use rates for the gender/road combinations changed significantly compared to 2015.

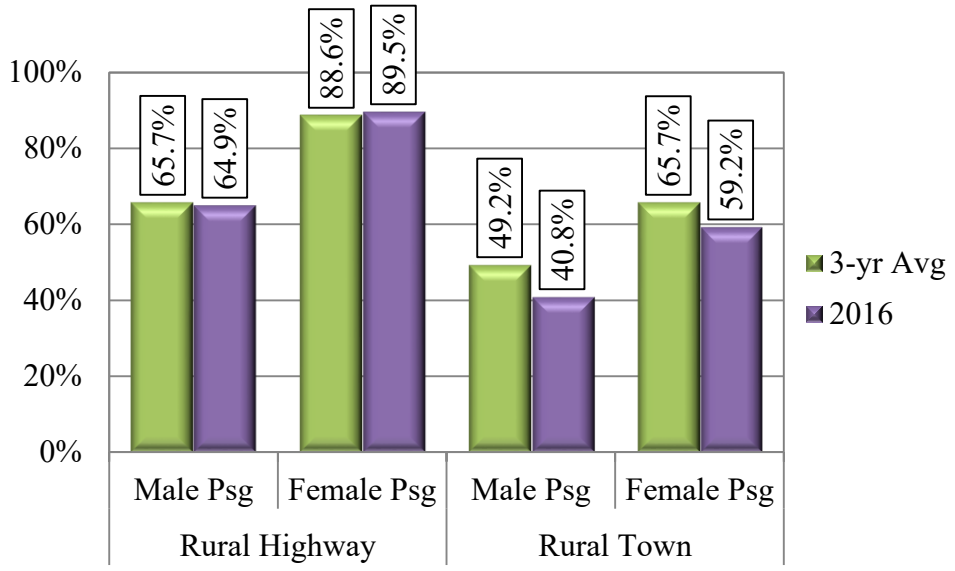

Figure 3.11 Passenger Seat Belt Use by Road Type and Gender, Previous 3-Year Average and Current Year

Driver and passenger seat belt use rates were correlated in cases where passenger use could be recorded (Pearson's Corr.=0.61, p<.0001, n=1,403). This relationship is slightly weaker than in 2015. The findings are consistent with earlier research (Nambisan and Vasudevan 2007). In 64.8% of observations, both the driver and passenger were belted (Figure 3.12). Neither passenger nor driver was belted in 16.4% of the observations. This share is smallest since the survey was initiated in 2009. The driver was belted and passenger unbelted in 4.4% of observations, while the passenger was belted and the driver unbelted 11.7% of the time. The share of observations where only the passenger is belted is also the highest use level reported among the eight years the survey has been conducted. The share with neither belted has been stable over recent years, at the lowest in the survey history. Males were driving in a majority of the cases where passenger gender and belt use was recorded, representing 71.6% of the drivers. Passenger seat belt use was significantly related to driver gender in 2016 with 77.5% of female driver passengers belted compared to 70.2% of male driver passengers (χ^2=7.5140, p=0.01, n=1,394).

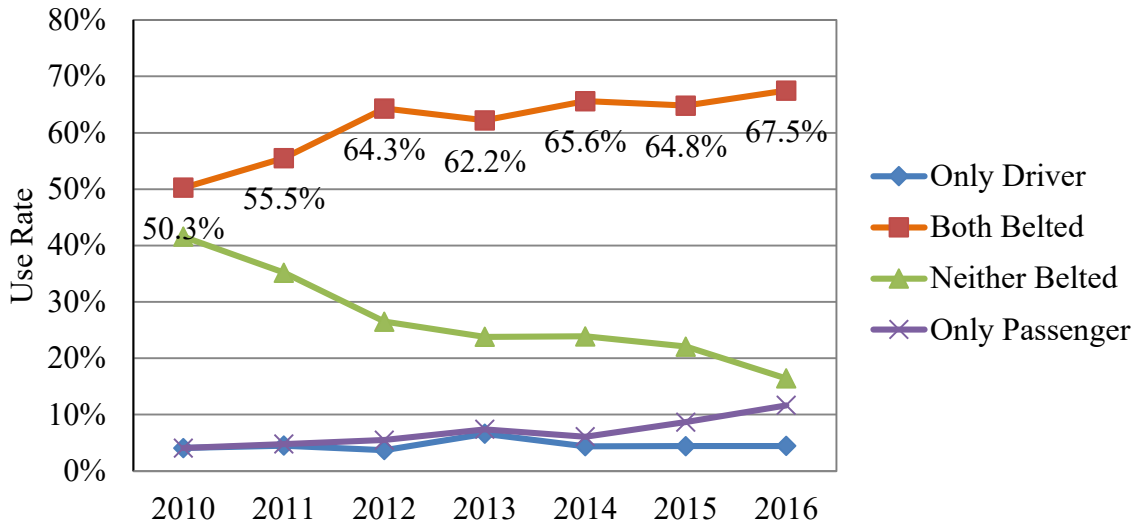

Figure 3.12 Passenger Seat Belt Use

Stratifying the passenger seat belt cases by road type shows that passengers were consistently more likely to be belted on rural highways than in rural towns over the past seven years (Figure 3.13). Unbelted passengers were found most frequently in rural towns, with use on these roads slipping between 2013 and 2014 before increasing slightly in 2015 and 2016. The continued positive trend by passengers observed on rural highways is a key gain in traffic safety as the likelihood for serious injury crash outcomes is greater on these roads because of factors such as higher speeds and greater distance to emergency services. Neither the slight decline in use on rural highways nor the increase in towns, from 2015 to 2016, is statistically significant.

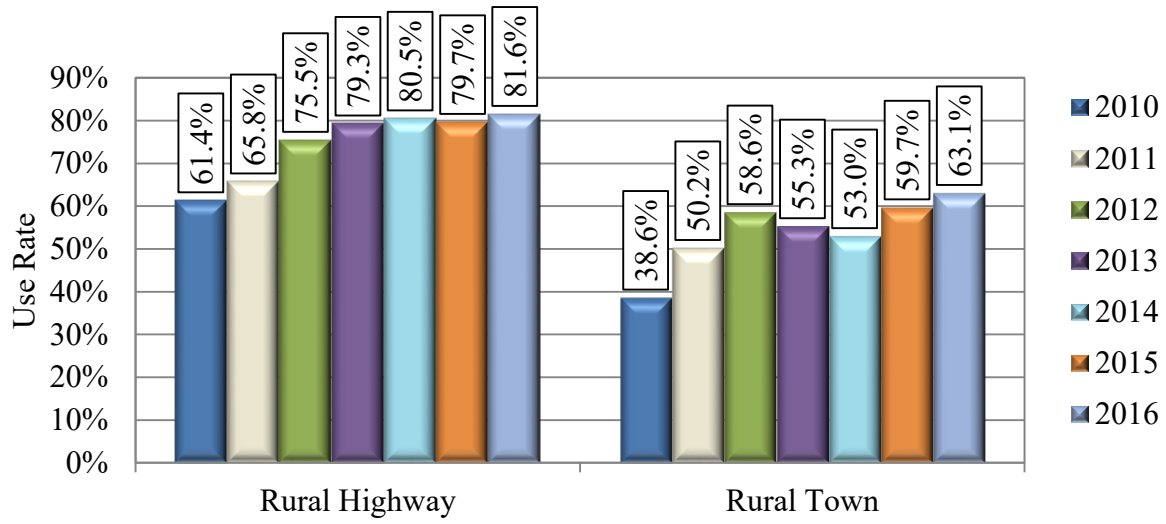

Figure 3.13 Passenger Seat Belt Use Rates by Road Type

3.3 Motorcycle Helmet Use

Although the primary target for this occupant use survey is drivers of passenger vehicles, observers were also asked to collect information about motorcycle driver helmet use when traffic allowed. During the 2016 survey, 80 motorcycle observations were collected. Statistics are reported, but because of the very small number of observations, caution should be used in making generalizations about the larger motorcycle driver population.

Males were drivers in 73 of the 80 cases. Helmet use on rural highways was estimated at 39.3% and 60.0% in towns (Figure 3.14). Rural highway helmet use is substantially lower than rates observed in 2014 and 2015, but there is a large variation across time likely related to limited observations. Only 26 observations were collected for rural towns, so the figure is not statistically robust.

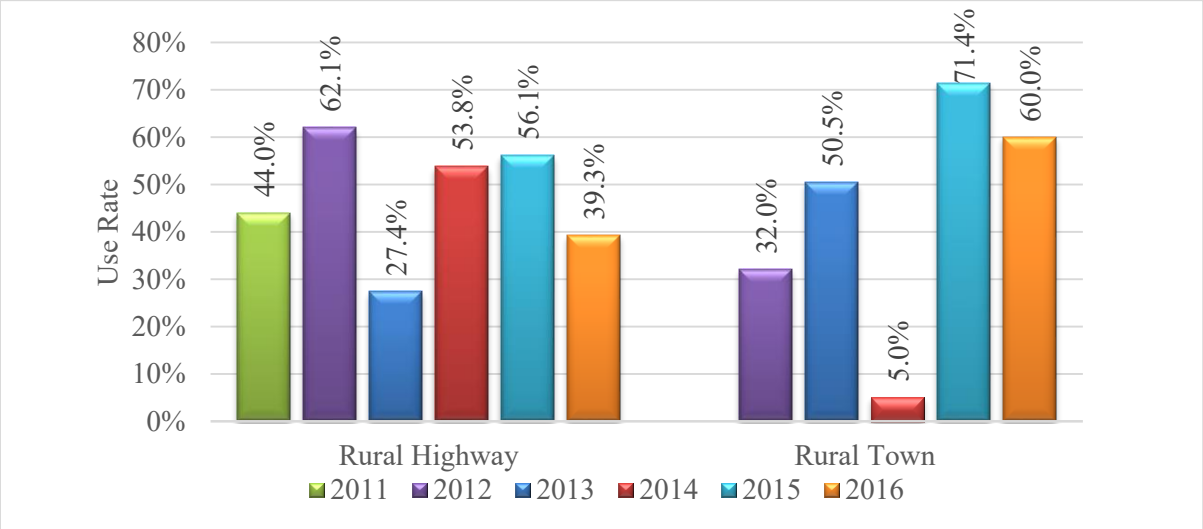

Figure 3.14 Driver Helmet Use by Road Type

The largest gender-road driver group for motorcycles has been males on rural highways. Limited observations show a substantial decline in helmet use by male motorcycle drivers on rural highways (Figure 3.15). The rate has averaged about 49% since 2012. The 2013 figures are not included in the average due to a small number of observations in that year.

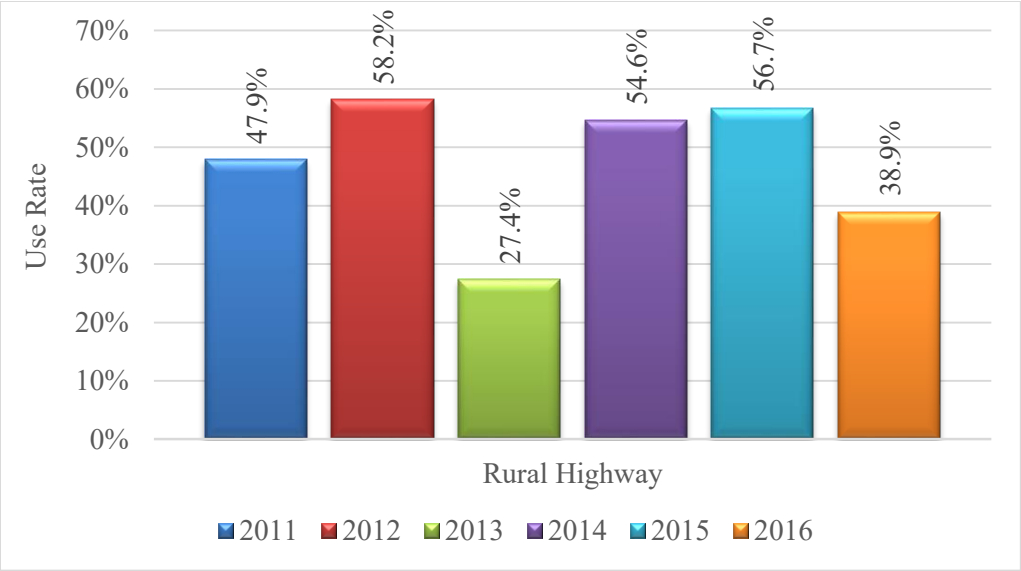

Figure 3.15 Male Driver Helmet Use, Males on Rural Highways

Only 22 observations were collected for males in rural towns during the 2016 survey with 54.5% wearing helmets. Three of the four female motorcycle driver observed in town were wearing helmets. Three female riders were observed on rural highways – two were wearing helmets. The use rate among female passengers on rural highways was 55.6% for the nine observed. No male passenger observations were reported for motorcycles on any roads. All motorcycle helmet use figures should be used with caution because of the limited observations.

4. DISCUSSION

North Dakota's roads provide vital economic and social connections for residents and visitors. These roads are a relatively high-risk travel environment. Rural roads account for 75% of annual travel and nearly 82% of fatal crashes and 89% of serious injury crashes. While there are many important aspects of road safety, the focus here is in measuring seat belt use for managing it as a safety priority.

A total of 5,535 driver observations were collected at 143 sites across 24 rural counties. Highway seat belt use rose slightly from 67.2% in 2015 to 67.8% in 2016. The survey indicates a 19.5 percentage point increase in rural highway seat belt use compared to average use between 2009 and 2011. Similar to previous findings, seat belt use was found to be significantly different on rural highways and in rural towns. Seat belt use remains significantly higher in the eastern regions compared to the west. Average observed highway use rates ranged from 55.5% to 82.0% on rural highways in individual counties and from 20.2% to 58.3% in rural towns between 2014 and 2016. The median use rate shows a slowly declining trend since 2013. In addition to statewide media efforts, local programs focusing on education and high visibility seat belt enforcement (such as the *Click It or Ticket* campaign), individual agency campaigns, and multi-agency enforcement efforts, have contributed to the increase.

With regard to gender, seat belt use increased for female and male drivers on highways and in towns compared to last year. The increase in seat belt use by females in towns is significant. Female driver seat belt use on rural highways at 77.1% remained higher than the male driver use rate of 63.3%. Based on year-to-year movements in the trend, it appears that a specific education or enforcement campaign triggered a larger than "normal" increase in this user group in 2012. It appears the large gain was not sustained in 2013. The rate was up again in 2014, but fell below the 2013 use rate in 2015. The seat belt use rates, by gender, have shown little change in the past couple years.

Seat belt use rates on highways were also found to vary significantly by vehicle type. While pickup truck drivers had the lowest propensity to use seat belts, at 52.0%, this rate was slightly higher than in 2015. Van driver use declined slightly, to 69.2%, but remained highest among the vehicle types. Stratification for gender and vehicle shows that female drivers have higher seat belt use rates among all vehicle classes. As with previous surveys, comparable town seat belt use rates were lower than highway use rates across all gender and vehicle strata.

Results also continued to show a correlation between driver and passenger seat belt use. Where observations were collected for driver and passenger shared seat belt behavior, both were belted in 67.5% of cases – the highest level since the survey was initiated in 2009. Cases where neither driver or passenger was belted accounted for 16.4% of observations, the smallest share in the seven-year survey history.

The limited number of motorcycle helmet use observations that were collected shows a substantial decrease in use on rural highways. A few observations were collected in towns, but figures were not statistically useful. Any findings regarding motorcycle helmet use should be used with extreme caution because of the limited number of observations. While the figures do offer some insight, generalizations cannot be made about the larger population of motorcycle riders from the small sample.

The seat belt use rate on the state's rural roads was found to be lower than the commonly reported NOPUS use rate collected in the annual statewide seat belt survey. The relative risk and significant difference in use rates between rural highways and towns should continue to be considered in research related to rural seat belt use. In addition, results indicate a need for continued assessment of programs to increase local seat belt enforcement or awareness on rural roads.

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6. APPENDIX: SEAT BELT OBSERVATION TRAINING GUIDE

SEAT BELT OBSERVATION TRAINING GUIDE

Purpose

The purpose of this training guide is to outline procedures recommended for conducting rural seat belt observations in North Dakota.

Site Selection

- Please observe at 1-2 sites WITHIN towns and 3-4 sites OUTSIDE of towns. This will result in 4-6 total observation sites.
- Select sites which are a minimum of 20 miles away from any interstate (I-29, I-94).

Collection Form

Observers will document seat belt use of drivers and front seat **outboard** passengers on a seat belt survey form. A sample form is found in Appendix A. Helmet use is recorded for motorcycle drivers and passengers on the same form.

- On each form observers will record the date, county, observer name, page number, start time, end time, site location description, vehicle type, driver gender, driver protection, passenger gender, and passenger protection.
- Eligible vehicles include cars, pickup trucks, SUVs (including crossover vehicles), vans, and motorcycles.

  DO NOT count large trucks (semi or large box trucks), commercial vehicles (taxi cabs, delivery vans, city vehicles), emergency vehicles (police/fire vehicles), or RVs/motor homes.

QUICK REFERENCE

- *Eligible vehicles include:*
  - *Cars*
  - *Pickups*
  - *SUVs (including crossover vehicles)*
  - *Vans*
  - *Motorcycles (helmet use)*

- Children riding in the front seat (NOT in a child car seat) are counted the same as other front seat passengers.
- Your observations should include all eligible vehicles regardless of state of origin, i.e. count both in-state and out-of-state vehicles.

Time

- Observers will observe between 7am and 7pm.

Observation Methods

Observers will record seat belt use for eligible occupants in cars, pickups, SUVs, and vans, as well as helmet use for motorcycle occupants. Eligible occupants are the driver of the vehicle and the outboard front seat passenger. (Example: If there are three passengers in the front seat of the vehicle, only count the driver and outermost passenger.)

QUICK REFERENCE

- *Observers must attempt to record all vehicles they view. If observers cannot determine SB use, the vehicle must still be recorded on the observation survey form. If traffic is too busy to record all vehicles, observers should stop to catch up then resume as soon as possible, waiting no longer than 1 minute to continue. Once an observer's eyes are locked on a vehicle, a count of that vehicle must be recorded.*

- Observers will be supplied with observation forms, and site descriptions from the previous year.
- There will be 1 observer per site. If traffic is too heavy to observe all vehicles, stop/catch up, and resume recording seat belt observations as soon as possible; waiting no longer than 1 minute to resume.
- Position vehicle so observations can be conducted safely and without distraction to other vehicle drivers. Where possible, observers should remain in their vehicles to record seat belt use. If it is not possible to observe from a vehicle vantage point, the observer may leave the vehicle but must remain off the roadside.
- **Each observer will observe for a minimum of 30 minutes. If a minimum of 30 observations cannot be recorded in 30 minutes, the observer will continue observing up to an hour. If 30 observations still cannot be recorded after an hour of observing, the observation should be considered complete.**
- Do not record observations of vehicles with windows that are excessively tinted because accuracy may be compromised.
- Only properly worn seat belts are recorded as using protection. Incorrect seat belt use is recorded as no seat belt (Example: shoulder strap under arm, behind the back, lap belt only).
- If observations at a site are terminated due to inclement weather or observer safety issues etc., record the time and reason that observations halted, and move to an alternate location.

Safety

Safety of the observers and vehicle occupants is paramount in conducting the seat belt use survey.

- Observations can be made from the observer's vehicle. To ensure the safety of the observers and other vehicle occupants, observers' vehicles must not hinder traffic flow. Park off the road away from the pavement's edge.
- When observations from inside a vehicle are not possible, observers should ensure they do not stand on the roadway when recording seat belt use. Always practice safety when crossing roads.
- Observers must not distract drivers of vehicles they are observing.
- When in their vehicle, observers must always wear seat belts.
- Observers must stay alert at all times. Do not work while under the influence of alcohol, drugs, or prescription medications.
- Dress appropriately for the weather.
- Do not bring children or pets with you to the observation sites.

Conclusion

Dress for the work. A hat, sunscreen and sun glasses are essential.

Be thoroughly familiar with all the procedures in this manual. Accurate information is of paramount importance.

Each observer is ultimately responsible for his/her work, as well as safety. Remember, observation requires that are within close proximity to traffic. Stay alert and be ready to react.

Any questions or concerns should be reported to Andrea Huseth: 701-231-6427.

Seat Belt Survey Form

Page # _____ of_____

Start Time: _____ AM/PM

Date_____

End Time: _____ AM/PM

County:_____

Observer Name:_____

Site Location Description:

_____

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
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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