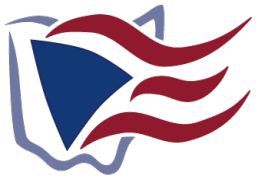

Observational Survey of Seat Belt Use in Ohio

2021

Final Report

Prepared for:

Ohio Department of Public Safety

Thomas J. Stickrath, Director

OBSERVATIONAL SURVEY OF SEAT BELT USE IN OHIO - 2021

Prepared for:

Ohio Department of Public Safety
Ohio Traffic Safety Office

Prepared by:

William H. Schneider IV, Ph.D., P.E.
and
Katie Ackerman

The University of Akron
Department of Civil Engineering

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Prepared in cooperation with the Ohio Department of Public Safety
and the U.S. Department of Transportation, National Highway Traffic Safety Administration

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The research team would like to thank the National Highway Traffic Safety Administration (NHTSA), Ohio Department of Public Safety (DPS), Ohio Traffic Safety Office (OTSO), Ohio State Highway Patrol (OSHP) and University of Akron (UA) staff and students for making this project possible and for their dedication and support in achieving Ohio's seat belt compliance goal. Additionally, the team would like to thank the retired OSHP troopers for helping collect data throughout this project.

This project is a demonstration of each agencies ongoing efforts to reduce traffic fatalities by increasing seat belt use. This work has a real, lasting impact on driver and passenger safety throughout the state of Ohio. The research team is honored to have the opportunity to work with a group of individuals that have such a passion for the work they do, and the chance to increase Ohioan safety in such a dramatic manner.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I – INTRODUCTION

The purpose of this study is to help the National Highway Traffic Safety Administration (NHTSA) and the Ohio Department of Public Safety (DPS) obtain standardized restraint use information for the state of Ohio. This study is also designed to help NHTSA and DPS determine the effectiveness of the annual national Click It or Ticket (CIOT) campaign, which was accomplished by performing seat belt surveys before and after the campaign. Furthermore, the results allow NHTSA and DPS to identify the geographic regions, vehicle types and occupant demographics related to low and high compliance rates. With this information, NHTSA and DPS may provide more targeted public information campaigns and law enforcement initiatives to increase restraint use and help save lives throughout Ohio.

The procedures outlined in this document were developed in compliance with federal requirements and in conjunction with both NHTSA and DPS to ensure state to state comparability. The success of this study is dependent on the quality of data gathered.

This report is broken into four chapters. In addition to the four chapter, appendices are included at the end of the report detailing supplementary information. The chapters are outlined below:

- Chapter I – Introduction: This chapter introduces the study scope and purpose. In additional, this chapter outlines the organization of the report.
- Chapter II – Methodology: This chapter defines the methodology and statistical analysis that was developed and used to obtain, process and present the studies data.
- Chapter III – Results: This chapter presents the data that was collected in a detailed manner.
- Chapter IV – Conclusions & Recommendations: This chapter includes a discussion on the outcomes of the study and specifies key points that may be taken away from the data collected. This chapter also includes recommendations on how Ohio may improve seat belt usage in the future.

The research team believes that the proper use of the study conclusions will ultimately result in an increased seat belt usage rate throughout Ohio. In addition, the team believes that this study is an important tool for NHTSA and DPS to use in analyzing crashes and fatalities.

CHAPTER II – METHODOLOGY

The methodology for this study was derived based upon the NHTSA's "*Uniform Criteria for State Observational Surveys of Seat Belt Use"*, previous Ohio studies, and similar studies from other states. The methodology was approved by NHTSA and is described in detail in the following sections. The research team notes that the methodology used in this year's study is consistent with previous studies conducted in Ohio, allowing for a meaningful comparison of changes in compliance rates over time.

2.1 Sample Selection

2.1.1 Study Timeline

This study was conducted in two separate phases so that NHTSA and DPS would have the ability to assess the efficiency of the national CIOT campaign on improving seat belt compliance rates in Ohio. The first phase was conducted during the two weeks immediately preceding the CIOT campaign and these data were used to estimate the baseline compliance (i.e., seat belt use) rate in 2021. The second phase was conducted during the two weeks immediately following the CIOT campaign and was used to determine the post-intervention compliance rate. The dates of the two observations may be found in Table 1.

Table 1: Study Timeline

Start Date	End Date	Task
05/03/2021	05/16/2021	Baseline Observations
05/17/2021	06/06/2021	Click It or Ticket Campaign
06/07/2021	06/20/2021	Post-Intervention Observations

As seen in Table 1, this year's study ran from May 3 to June 20, 2021.

2.1.2 Site Selection

The site locations were selected based the 2010-2014 NHTSA Fatality Analysis Reporting System (FARS). Using the FARS data, these 57 out of the 88 total counties accounted for 85% of the cumulative fatalities within the state during this five-year time frame. Following NHTSA's "*Uniform Criteria for State Observational Surveys of Seat Belt Use"*, these 57 counties represent the sample frame for selection of the survey locations. Figure 1 shows a map of the selected counties.

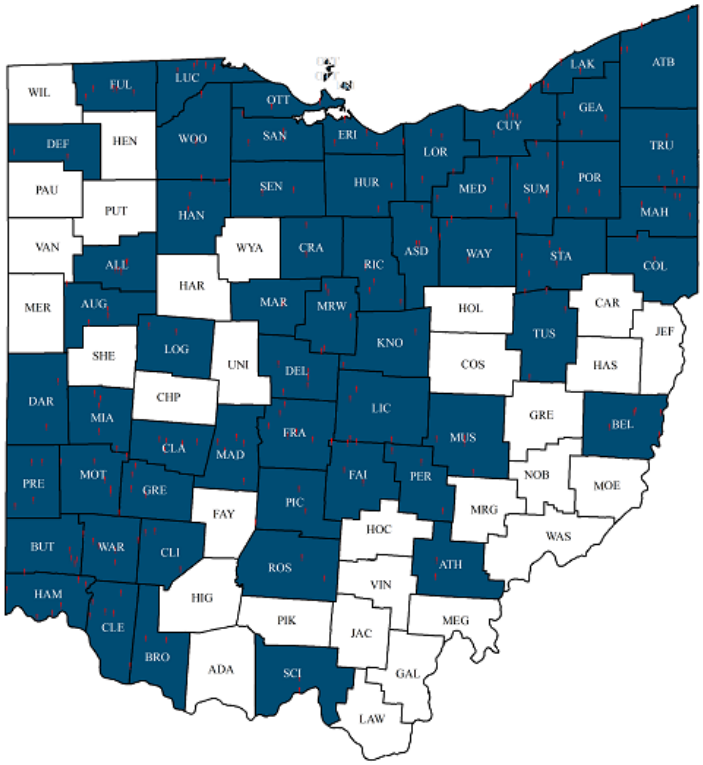
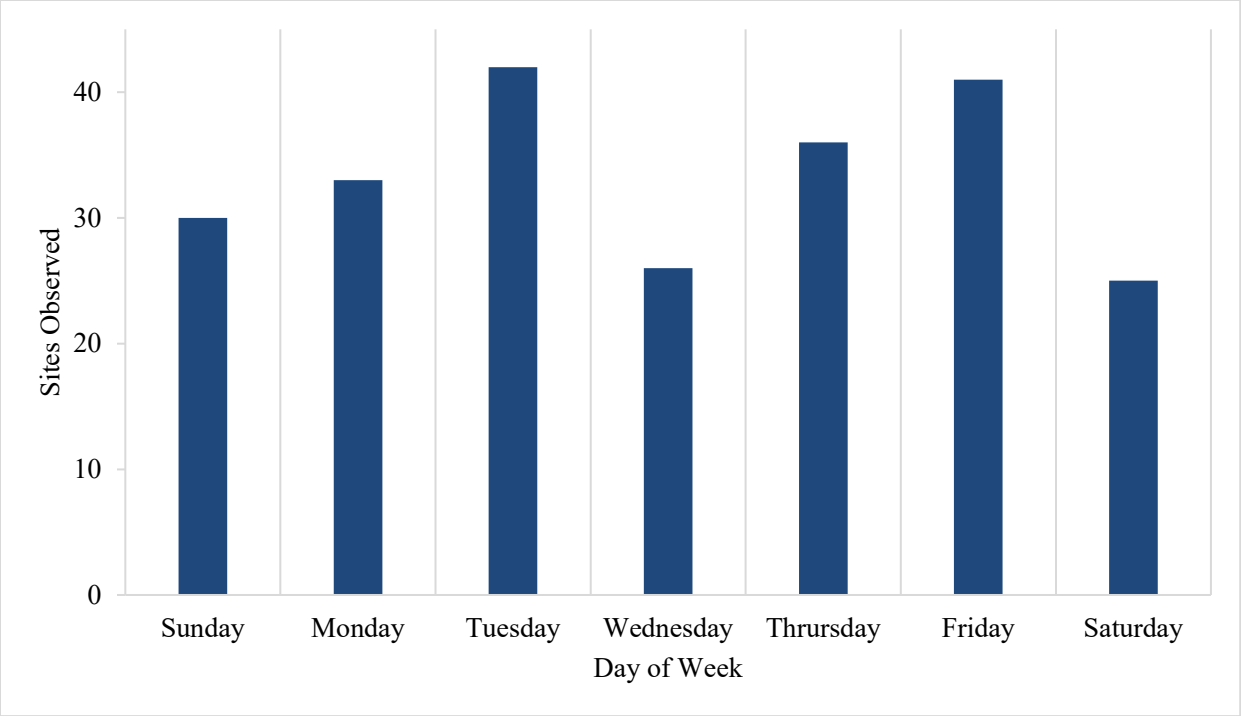


Figure 1: Observed Counties

The site locations within these counties were selected from a random sample of segments that were stratified by roadway functional class.

2.1.3 Site Distributions

To provide a representative sample of seat belt use throughout Ohio, the days of the week and times of the day for each observation location were assigned randomly. The randomized selection was produced using a random number generator in Microsoft Excel. These random numbers represented different days and start times. Sites that were geographically close to each other were clustered into groups to reduce travel and labor costs. The site groupings were then assigned a day and start time for the first site, with all other sites in the grouping following based on the next closest location. Figure 2 shows the distribution of sites observed per day of the week.

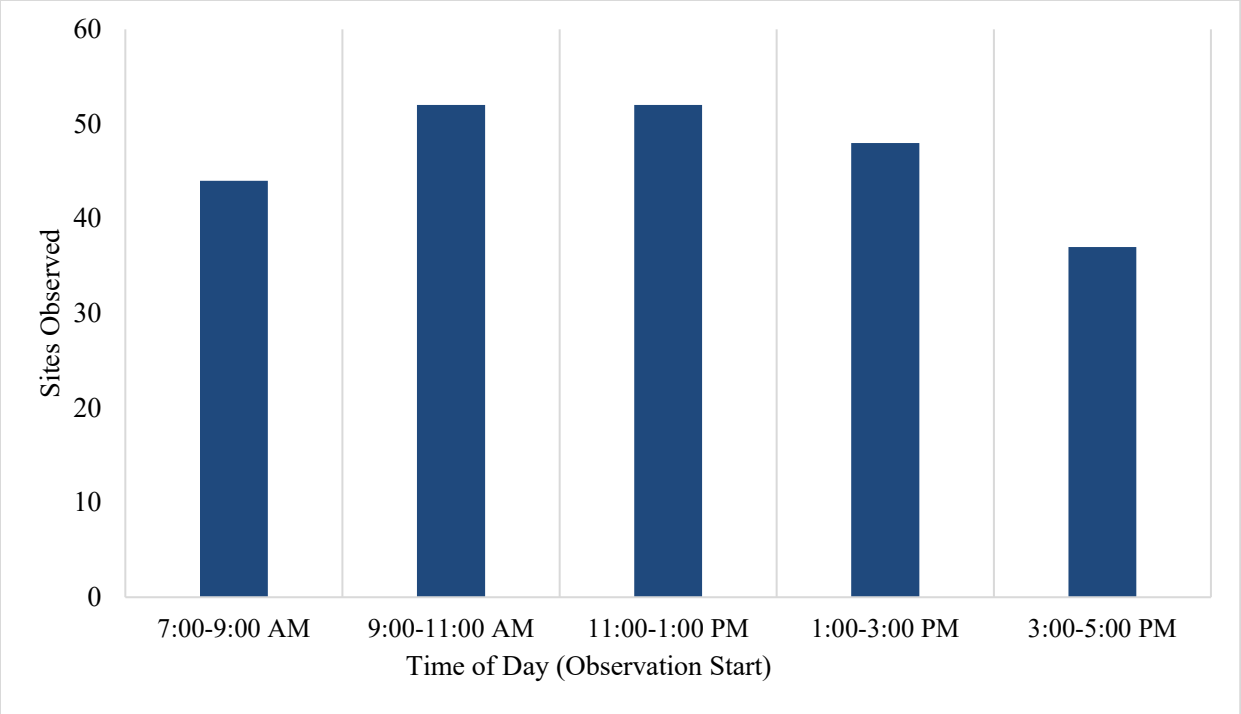


Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
30	33	42	26	36	31	25

Note: Observation days were randomly assigned.

Figure 2: Site Distribution per Day of Week

As seen in Figure 2, the sites observed per day of the week are generally uniform. Due to the aggregation of sites and random selection, there is some variability with specific days (i.e. Tuesday) including a larger number of sites. Figure 3 shows the sites observed per day.



7:00-9:00 AM	9:00-11:00 AM	11:00-1:00 PM	1:00-3:00 PM	3:00-5:00 PM
44	52	52	48	37

Note: Observation start times were randomly assigned. Observations were conducted from 7:00 am to 6:00 pm with the last observation starting at 5:00 pm.

Figure 3: Site Distribution per Time of Day

As seen in Figure 3, the mid-day hours received the most sites while the morning and evening hours received the least. Due to the mid-day hours having a higher likelihood of being observed, this time slot has a higher number of sites observed.

2.2 Statistical Analysis

Rates for seat belt use were estimated for each survey individual site, as well as at the county and statewide levels. In addition, 95-percent confidence intervals for each use rate estimate were calculated. The methods applied in estimating these quantities are based on the approved protocol and are consistent with NHTSA's "*Uniform Criteria for State Observational Surveys of Seat Belt Use"*. Details of the methods used to estimate seat belt use rate and variance are provided in this section.

2.2.1 Imputation

No imputation was done on missing data.

2.2.2 Sampling Weights

The following is a summary of the notation used in this section:

- g – Subscript for county
- h – Subscript for road segment type
- i – Subscript for road segment
- j – Subscript for directional of travel
- k – Subscript for lane of travel
- l – Subscript for vehicle

Under this stratified multistage sample design, the inclusion probability for each vehicle at a particular site is the product of the selection probabilities at each stage. The overall vehicle inclusion probability at a given site is shown in Equation 1.

$$\pi_{jkl} = \pi_j \, \pi_{k|j} \, \pi_{l|k} \qquad \text{Equation 1}$$

where:

π_j = direction,
$\pi_{k|j}$ = lane of travel, and
$\pi_{l|jk}$ = vehicle.

The sampling weight (design weight) for each vehicle at a particular site shown in Equation 2.

$$w_{jkl} = \frac{1}{\pi_{jkl}} \qquad \text{Equation 2}$$

where:

w_{jkl} = sampling weight.

At the site-level, the number of segments sampled was small relative to the number of segments in the population for each county-road segment type stratum. Consequently, no finite population correction factors were applied. The sampling weights for each segment are simply equal to the reciprocal of the proportion of segments sampled in each county-road type stratum as displayed in Equation 3.

$$w_{ghi} = \frac{N_{gh}}{n_{gh}} \qquad \text{Equation 3}$$

where:

w_{ghi}= sampling weight for segment *i* of road segment type *h* in county *g*,
n_{gh}= number of segments sampled from road segment type stratum *h* of county *g*; and
N_{ghi} = total number of segments among road segment type stratum *h* of county *g*.

Thus, the overall inclusion probability of an individual vehicle is $\pi_{ghijkl} = \pi_{ghi}\pi_{jkl|ghi}$ and the sampling weight is $w_{ghijkl} = w_{ghi}w_{jkl|ghi}$.

2.2.3 Non-Response Adjustment

There are two instances by which non-response may arise with respect to data collection for the seat belt use survey. First, a site may be unobservable due to issues such as the presence of a construction work zone. In most instances, an alternative site is provided, and this site may be included without needing to adjust the sampling weights. The data collection protocol in the approved plan also includes provisions for instances where both the primary and alternative observation site are unavailable for observation. This scenario was encountered twice and there was no close alternative due to extensive construction. Therefore two sites were removed from this survey.

Secondly, non-response may arise at the vehicle level in instances where the belt use of vehicle occupants was unobservable due to issues such as glare, tinted windows, etc. In these instances, the sampling weight for that site is increased by multiplying by the reciprocal of the response rate at that site, r_{ghi}. Thus, the sampling weight for each individual site is now defined as shown in Equation 4.

$$w_{ghi} = \frac{N_{gh}}{n_{gh}r_{ghi}} \qquad \text{Equation 4}$$

2.2.4 Estimators

For each front-seat occupant observed, their seat belt use status was defined as seen in Equation 5.

$$y_{jkl|ghi} = \begin{cases} 1, if\ belt\ used \\ 0, otherwise \end{cases} \qquad \text{Equation 5}$$

As such, within an individual observation site *i* of road segment type *h* in county *g*, the seat belt use rate (proportion) is estimated as presented in Equation 6.

$$\hat{p}_{ghi} = \frac{\sum w_{jkl|ghi} y_{jkl|ghi}}{\sum w_{jkl|ghi}} \quad \text{Equation 6}$$

The use rate ($\hat{p}_{gh}$) for road segment type *h* in county *g* is then determined using Equation 7.

$$\hat{p}_{gh} = \frac{\sum w_{ghi} \hat{p}_{ghi}}{\sum w_{ghi}} \quad \text{Equation 7}$$

At the county level, use rates ($\hat{p}_g$) for each road segment type are weighted by stratum-level VMT. Equation 8 demonstrations this calculation.

$$\hat{p}_g = \frac{\sum_{\forall h} VMT_{gh} \hat{p}_{gh}}{\sum_{\forall h} VMT_{gh} \hat{p}_{gh}} \quad \text{Equation 8}$$

where:

VMT_{gh}= total vehicle miles traveled for road segment type *h* in county *g*.

The use of the VMT-based estimator reduces a bias towards local road segments that is due to their relatively short length and low VMT as compared to primary and secondary roads. Similarly, the statewide use rates ($\hat{p}_{statewide}$) is simply an average of the county-level use rates, weighted by total county-level VMT among the three road segment classes as found in Equation 9.

$$\hat{p}_{statewide} = \frac{\sum_{\forall g} \sum_{\forall h} VMT_{gh} \hat{p}_{gh}}{\sum_{\forall g} \sum_{\forall h} VMT_{gh} \hat{p}_{gh}} \quad \text{Equation 9}$$

2.2.5 Variance Estimation

The variance and standard error for each estimator was determined as detailed in this section. First, at the county-road segment class, the variance is calculated as displayed in Equation 10.

$$V(\hat{p}_{gh}) = \sum_{\forall h}\left[\frac{\left(N_{gh}/N_g\right)^2}{n_{gh}}\sum_{i=1}^{n_{gh}}\frac{(\hat{p}_{ghi}-\hat{p}_{gh})^2}{n_{gh}-1}\right] \quad \text{Equation 10}$$

where:

$V(\hat{p}_{gh})$ = Estimated variance within road segment class *h* of county *g*,
N_{gh}= Total number of road segments of type *h* in county *g,*
N_g= Total number of road segments of all types in county *g,*
n_{gh}= Number of locations sampled among road segment type *h* in county *g,*
$\hat{p}_{ghi}$ = Estimated belt use rate at location *i* in road segment type *h* in belt use group *g, and*
$\hat{p}_g$ = Estimated belt use rate in road segment type *h* in belt use group *g.*

When a road segment stratum includes less than two sites, it is aggregated with the adjacent stratum. For the purposes of this study, all counties included at least two secondary sites. Consequently, this aggregation involved either the local segments being combined with the secondary segments or the primary segments being combined with the secondary segments. From here, the county-level variance is given by Equation 11.

$$V(\hat{p}_g) = \frac{\sum_{\forall h} VMT_{gh}^2 \times V(\hat{p}_{gh})}{\left(\sum_{\forall h} VMT_{gh}\right)^2} \quad \text{Equation 11}$$

Finally, the state-level variance is calculated similarly using Equation 12.

$$V(\hat{p}_{statewide}) = \frac{\sum_{\forall g\forall h} VMT_{gh}^2 \times V(\hat{p}_{gh})}{\left(\sum_{\forall g\forall h} VMT_{gh}\right)^2} \quad \text{Equation 12}$$

For each estimate, the standard error of use rate is found by simply taking the square root of the estimated variance. The 95-percent confidence interval of each use rate is equal to the weighted seat belt use rate plus/minus 1.96 (for the Z-test at alpha = 0.05) multiplied by the standard error.

2.2.6 Non-Response Rate

According to NHTSA's guidelines, the non-response rate for the annual seat belt survey cannot exceed 10%. Within the context of this study, a non-response occurs when the observer was not able to determine the safety belt use of a front seat vehicle occupant. This may occur due to a variety of reasons such as tinted windows, sun glare, high speeds of the vehicle in question, etc. Observers in the field marked 'unknown belt use' to keep a record of these non-responses. There was a total of 20 non-response observations for pre-ciot and 39 non-response for post-ciot which represents less than 0.05% of the total

number of observations. This non-response rate was below the allowable maximum of 10% established by NHTSA.

2.3 Data Collection

The nature of this study requires a large amount of data to be collected in a very short period. Due to this, NHTSA, DPS, University of Akron (UA) and the observers must operate and communicate clearly. Much of the work for this study is completed before any observations even begin, preparing, organizing and distributing material need for the study.

2.3.1 Observer Training

The success of this study is completely dependent on the quality of data that is recorded. Due to this, it is critical that the observers are trained in a thorough and complete manner on how to properly record the data. A mandatory training session was organized and led by the UA principal investigator at DPS headquarters in Columbus, Ohio the week before the first phase of observations were to start. Any observers that were not able to attend the training meeting were trained separately with UA. It is important to note that the observers in this study are retired state patrol officers and not students. This added training by helps improve the overall quality of the data.

2.3.2 Vehicle Classification

This study is built to differentiate seat belt use between five different vehicle classes. These include passenger car (PC), sport utility vehicle (SUV), van/minivan (V), light truck (LT) and heavy truck (HT) up to a gross vehicle weight rating (GVWR) of 10,000 pounds or less. Light trucks include vehicles with an estimated GVWR less and 6,000 pounds and include light-duty pickup trucks. Heavy trucks include vehicles with an estimated GVWR of 6,001-10,000 pounds and include full-size pickup trucks, utility vans and step vans; however, does not include walk-in trucks or delivery trucks.

2.3.3 Field Procedure

The field data collection procedure was communicated to the observers through the mandatory training session and a set of printed instructions. For each site, the observer prepared him/herself by reviewing the imagery provided for each site. Once at the site, the observer found a safe place to setup and began to collect data. Traffic counts were collected throughout the hour-long observation. Seat belt compliance observations were observed in the lane closest to the observer. The forms used to collect data may be found in Appendix A. The observers conducted site observations in a safe area near the study site.

CHAPTER III – RESULTS

This chapter includes the results of the 2021 Ohio Seat Belt Study. Each type of dataset that was collected is broken into an individual section. Each section typically contains a chart and table to visualize the data. There are thirteen sections in this chapter as follows:

- Section 3.1: Statewide Compliance
- Section 3.2: Historical Compliance
- Section 3.3: Compliance per District
- Section 3.4: Compliance per County
- Section 3.5: Compliance per Day of Week
- Section 3.6: Compliance per Time of Day
- Section 3.7: Compliance per Road Class
- Section 3.8: Compliance per Vehicle Type
- Section 3.9: Compliance per Gender
- Section 3.10: Compliance per Age
- Section 3.11: Compliance per Race
- Section 3.12: Compliance per Demographics
- Section 3.13: Cell Phone Usage

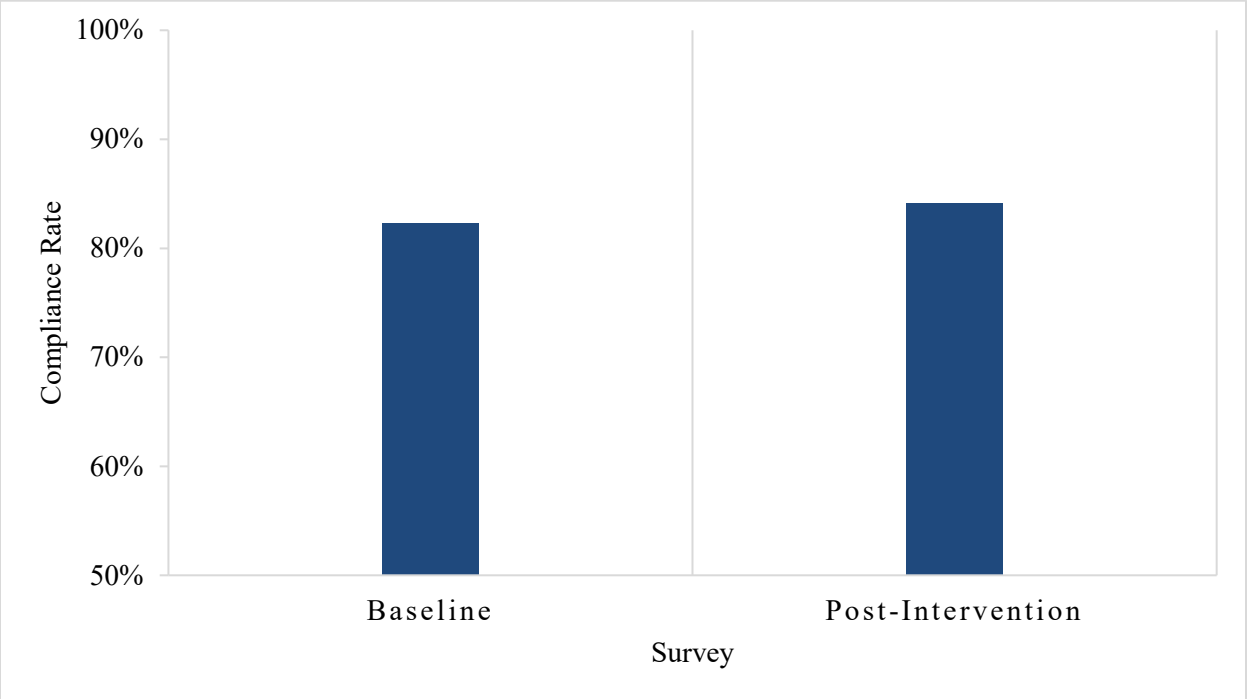
There are a few key terms that the research team would like to define that will be used throughout this chapter. These key terms include:

- Compliance: The compliance refers to the percentage of observable occupants that were wearing a seat belt.
- Standard Error: The standard error refers to the standard deviation of the compliance rate. A 95-percent confidence interval for each compliance rate can be determined by adding (subtracting) 1.96 times the standard error to (from) the compliance rate.
- Count: The count refers to the total number of observable occupants that data was collected on.

The following sections include more information regarding the results of this year's study.

3.1 Statewide Compliance

The *"Observational Survey of Seat Belt Use in Ohio – 2021"* collected a total of 43,689 occupant observations. This number is broken down further to include 36,514 drivers and 7,175 passengers. The reported pre-intervention results include 20,307 observations comprising 17,065 drivers and 3,242 passengers. The reported post-intervention results include 23,382 observations comprising 19,449 drivers and 3,933 passengers. A total of 231 sites across 57 counties were included. Figure 5 shows the statewide compliance results for Ohio in 2021.



Survey	Compliance (%)	Standard Error (%)	Count
Baseline	82.30%	1.03%	20,307
Post-Intervention	84.10%	0.76%	23,382
Difference	1.8%	N/A	3,075

Note: Reported numbers are weighted.

Figure 4: Statewide Compliance Rate

As seen in Figure 4, Ohio observed a statewide compliance rate of 84.10%. Additionally, the CIOT campaign showed a positive impact on statewide compliance amounting as evidenced by a 1.8% increase. The statewide results were weighted using the methodology described in Chapter II of this report. The statewide compliance results include all observations that were made during the post-intervention survey.

The data presented in the statewide compliance rate is the only data for the remainder of this report that includes the baseline (pre-CIOT) data. All data reported after this point are that of the post-intervention

survey (post-CIOT). Additionally, only the statewide and historical compliance results are weighted, all other reported numbers are unweighted.

3.2 Historical Compliance

In previous studies, Ohio has traditional trailed behind the national average compliance rate. Since 1998, Ohio has averaged a compliance rate that is 3.23% lower than the national average. The 2021 compliance rate in Ohio (84.10%) is 6.2% lower than the national average (90.3%) in 2020 (the most recent year for which national data are available). Figure 5 shows the comparison between the Ohio and national compliance rates.

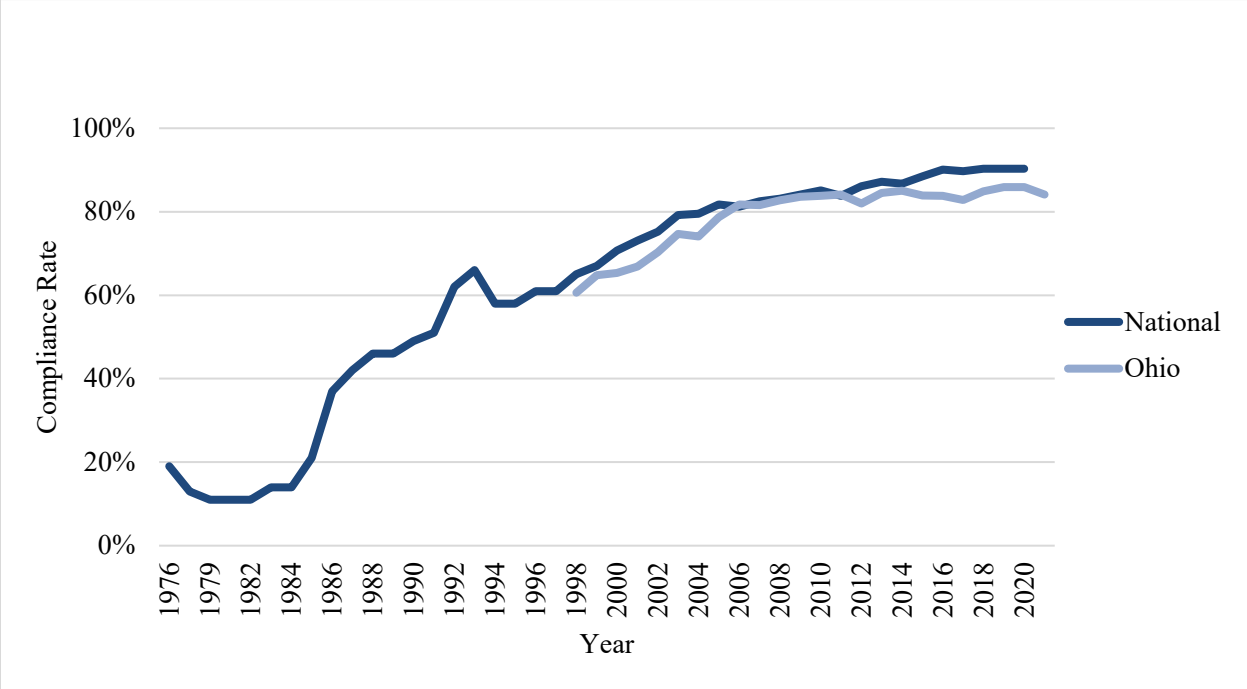
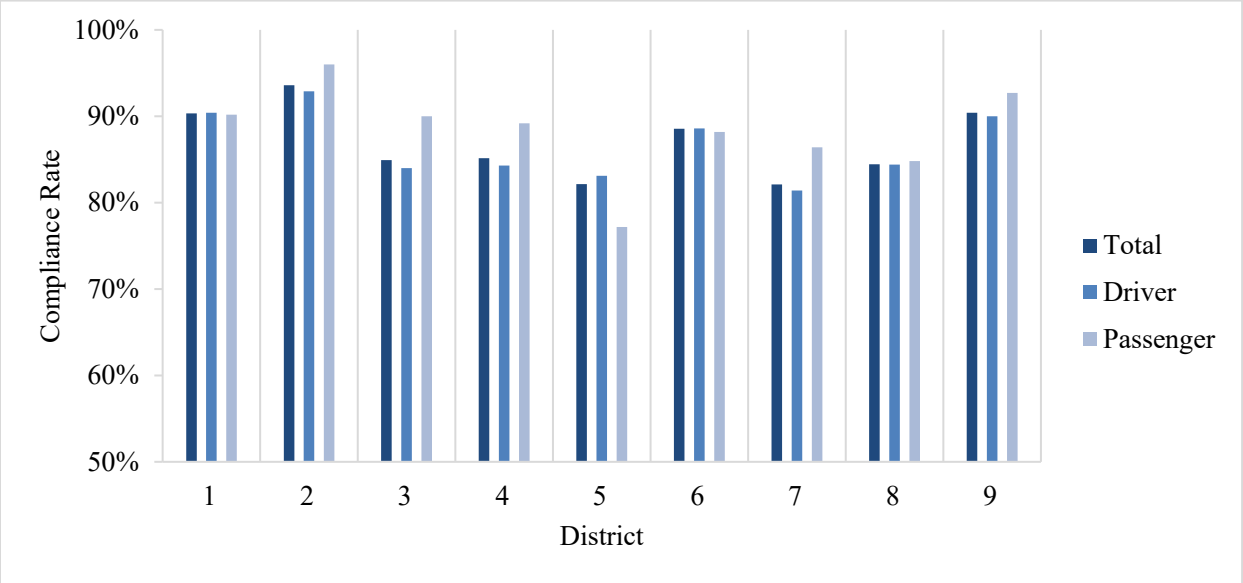


Figure 5: Historical Compliance Rate

While national data for 2021 has not been released at the time of this report, data from 1976 through 2018 was included. Data from Ohio from 1998 through 2021 has also been included. Results from the 2021 Ohio study have been consistent with previous year's studies. For the past decade, the compliance rate in Ohio has varied between 82.0% and 86.0%.

3.3 Compliance per District

The observations were grouped into each of the nine OSHP districts in which they were located. This allowed for the data to be viewed on a broad level to determine if certain geographical regions presented low or high compliance. Districts 5, 82.2%, 7, 82.1%, and 8, 84.4%, had the lowest compliance rates. District 5 includes the cities Dayton and Springfield, along with Interstates I-75 and I-70. District 7 includes mid-east Ohio, along with the cities New Philadelphia, Cambridge, and Marietta. Interstates I-70 and I-77 run through District 7 as well. District 8 is Southwestern Ohio including Cincinnati, Hamilton, and Maysville. The major interstates that run through this district are I-275, I-71, and I-75. Figure 6 provides a detailed breakdown of the District compliance Rates.



District	Occupant	Compliance	Sample Size
1	All	90.3%	2703
	Driver	90.4%	2274
	Passenger	90.2%	429
2	All	93.6%	3150
	Driver	92.9%	2472
	Passenger	96.0%	678
3	All	84.9%	4206
	Driver	84.0%	3553
	Passenger	90.0%	653
4	All	85.2%	3780
	Driver	84.3%	3123
	Passenger	89.2%	657
5	All	82.2%	1497
	Driver	83.1%	1265
	Passenger	77.2%	232
6	All	88.5%	4645
	Driver	88.6%	3866
	Passenger	88.2%	779
7	All	82.1%	984
	Driver	81.4%	837
	Passenger	86.4%	147
8	All	84.4%	1895
	Driver	84.4%	1619
	Passenger	84.8%	276
9	All	90.4%	522
	Driver	90.0%	440
	Passenger	92.7%	82

Note: District refers to OSHP, refer to Figure 7 for locations. Reported numbers are unweighted.

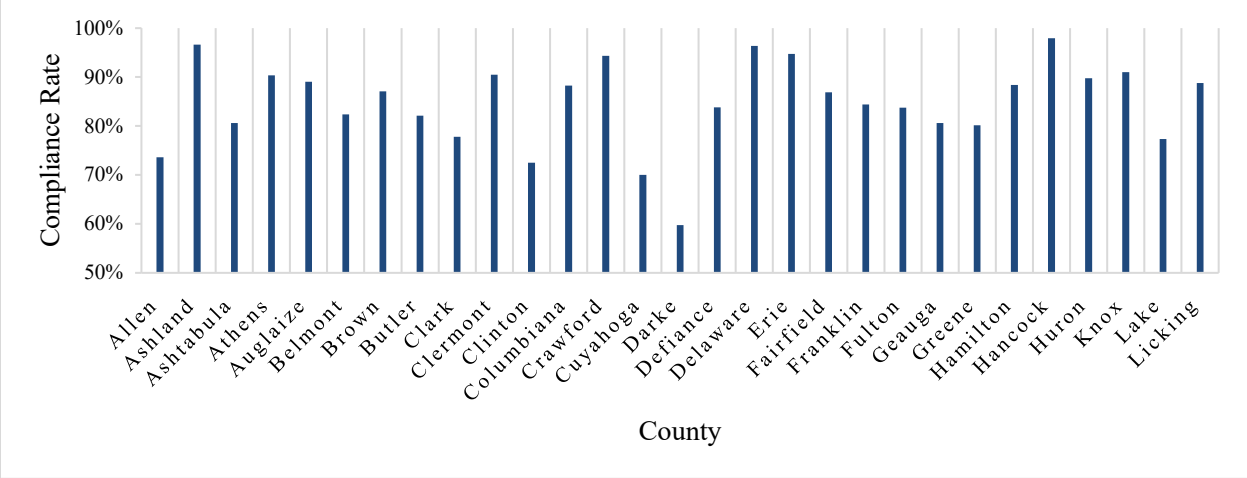
Figure 6: Compliance Rate per District

As seen in Figure 6, District 9, 522, had significantly fewer observations than the other districts, for which between 984 and 4,645 observations were obtained. The greatest number of observations occurred in District 6, 5,054.

3.4 Compliance per County

The observations were further broken down by the county in which they were located. A total of 57 out of the 88 Ohio counties were observed in this study. As mentioned in Chapter II, these 57 counties were selected as they accounted for 85% of traffic fatalities in Ohio. Figure 9 displays the county level compliance rates in 2018.

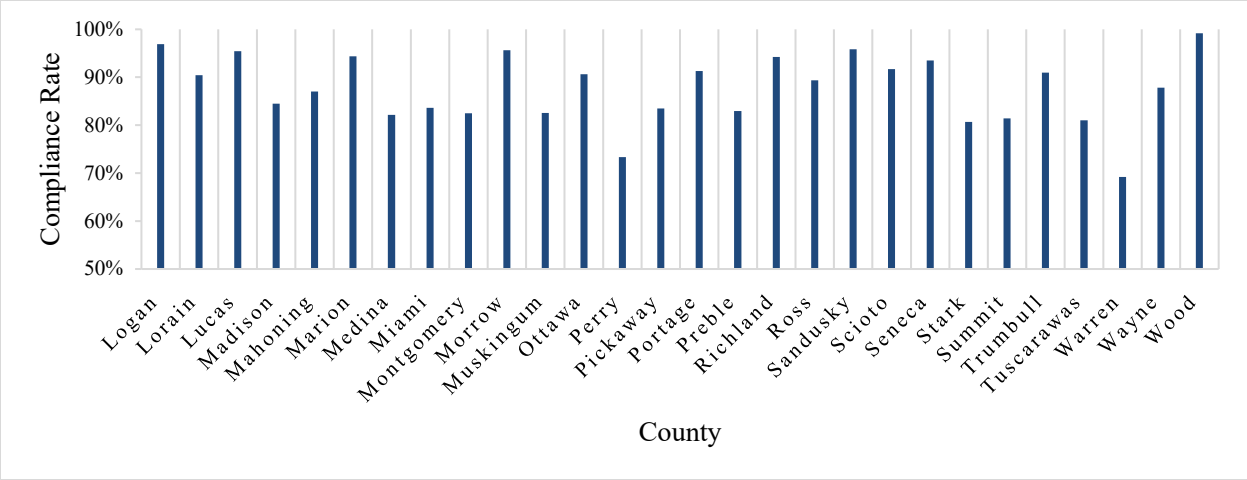
As seen in Figures 7 and 8, six counties had a compliance rate lower than 75%, Allen, Clinton, Cuyahoga, Darke, Perry, and Warren. These counties are located in District 1, 3, 5, 6 and 8. Cuyahoga County, home to Cleveland has historically had a very low compliance rate. In contrast, the other two major metropolitan areas in Ohio, Franklin County, Columbus, had a compliance rate of 84.4% and Hamilton County, Cincinnati, had a compliance rate of 88.4%.



County	Compliance	Sample Size
Allen	73.6%	390
Ashland	96.6%	954
Ashtabula	80.6%	618
Athens	90.4%	208
Auglaize	89.1%	247
Belmont	82.4%	358
Brown	87.1%	155
Butler	82.1%	274
Clark	77.8%	306
Clermont	90.5%	461
Clinton	72.5%	142
Columbiana	88.3%	366
Crawford	94.4%	142
Cuyahoga	70.0%	667
Darke	59.8%	82
Defiance	83.8%	185
Delaware	96.4%	908
Erie	94.7%	512
Fairfield	86.9%	474
Franklin	84.4%	712
Fulton	83.7%	486
Geauga	80.6%	340
Greene	80.2%	227
Hamilton	88.4%	639
Hancock	98.0%	489
Huron	89.8%	245
Knox	91.0%	267
Lake	77.4%	654
Licking	88.8%	579

Note: 29 of 57 observed counties presented in Figure 7, remaining 28 counties presented in Figure 8. Reported numbers are unweighted.

Figure 7: Compliance Rate per County (Allen – Licking)



County	Compliance	Sample Size
Logan	96.9%	97
Lorain	90.4%	647
Lucas	95.4%	787
Madison	84.5%	206
Mahoning	87.0%	594
Marion	94.3%	407
Medina	82.1%	420
Miami	83.6%	238
Montgomery	82.5%	177
Morrow	95.7%	621
Muskingum	82.6%	384
Ottawa	90.6%	416
Perry	73.3%	326
Pickaway	83.5%	552
Portage	91.3%	643
Preble	82.9%	123
Richland	94.2%	919
Ross	89.3%	169
Sandusky	95.8%	264
Scioto	91.7%	145
Seneca	93.5%	245
Stark	80.7%	518
Summit	81.4%	672
Trumbull	91.0%	565
Tuscarawas	81.0%	242
Warren	69.2%	224
Wayne	87.8%	328
Wood	99.2%	366

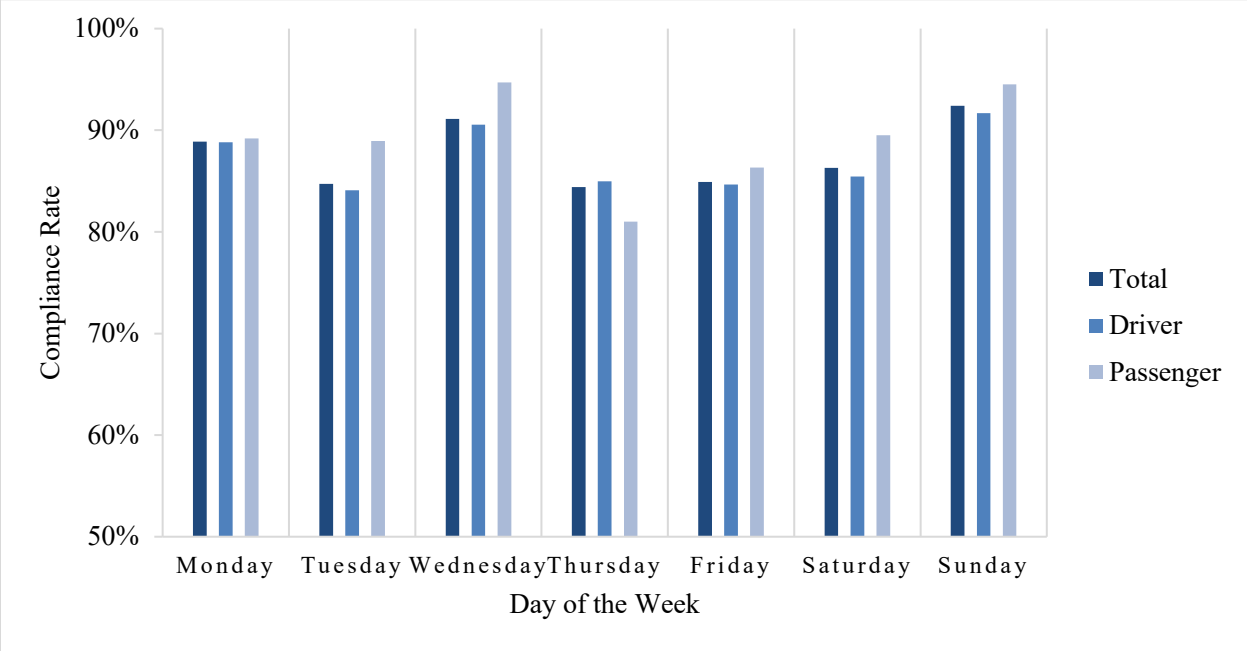
Note: 28 of 57 observed counties presented in Figure 12, remaining 29 counties presented in Figure 11. Reported numbers are unweighted.

Figure 8: Compliance Rate per County (Logan – Wood)

As seen in Figures 7 and 8, county sample sizes ranged from 82 to 954 observations. On average, each county accounted for approximately 410 observations.

3.5 Compliance per Day of Week

The compliance rate was also calculated by day of week to determine if there was any difference based on day, weekday or weekend. The study was conducted during every day of the week. The results of the compliance rate per day of week may be found in Figure 9.



Day	Occupant	Compliance	Sample Size
Monday	All	88.9%	3407
	Driver	88.8%	2917
	Passenger	89.2%	490
Tuesday	All	84.7%	4368
	Driver	84.1%	3790
	Passenger	88.9%	578
Wednesday	All	91.1%	2034
	Driver	90.6%	1769
	Passenger	94.7%	265
Thursday	All	84.4%	3162
	Driver	85.0%	2704
	Passenger	81.0%	458
Friday	All	84.9%	4385
	Driver	84.7%	3669
	Passenger	86.3%	716
Saturday	All	86.3%	2285
	Driver	85.5%	1808
	Passenger	89.5%	477
Sunday	All	92.4%	3741
	Driver	91.7%	2792
	Passenger	94.5%	949

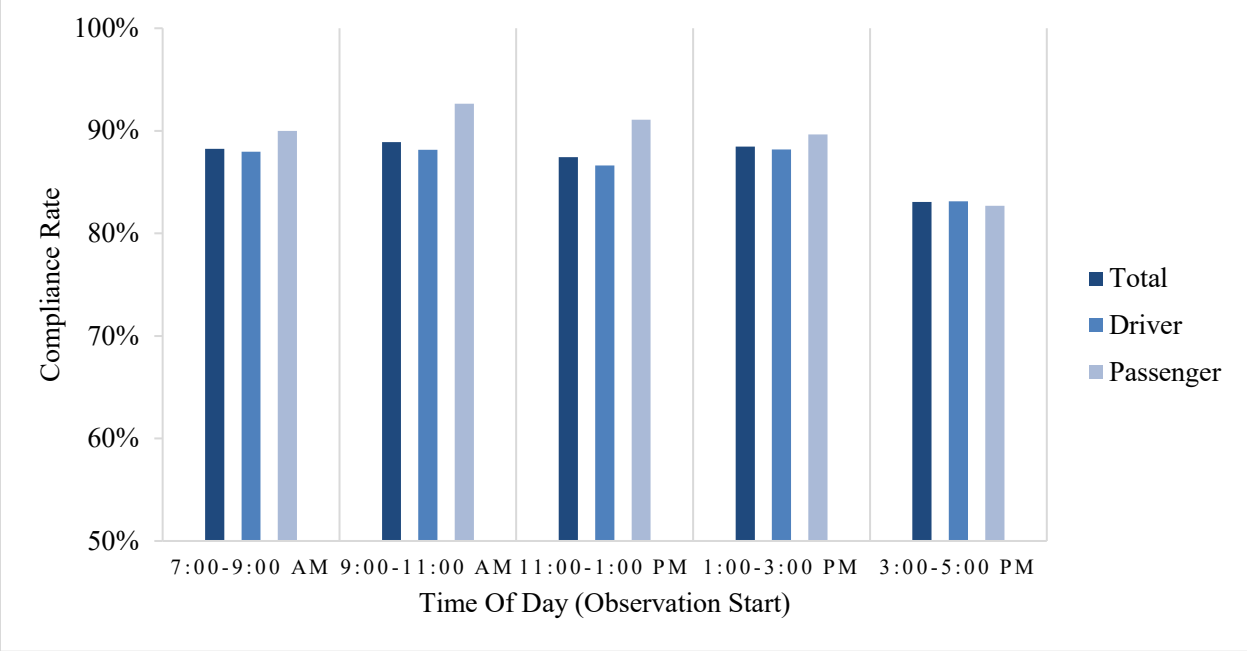
Note: Reported numbers are unweighted.

Figure 9: Compliance Rate per Day of Week

As seen in Figure 9, the day of week has a slight impact on the compliance rate. The day with the highest compliance, Sunday, 92.4%, was 8.0% higher than that of the lowest, Thursday, 84.4%. Additionally, each day of the week had roughly the same number of observations ranging from 4,407 on Monday to 4,375 on Friday.

3.6 Compliance per Time of Day

The compliance rate per time of day was considered to conclude if peak travel times had an impact on the compliance rate. The study was conducted from 7:00 AM to 6:00 PM with 5:00 PM being that last time observations would begin. The results of the compliance rate per time of day may be found in Figure 10.



Time (Observation Start)	Occupant	Compliance	Sample Size
7:00-9:00 AM	All	88.2%	3579
	Driver	88.0%	3089
	Passenger	90.0%	490
9:00-11:00 AM	All	88.9%	4975
	Driver	88.2%	4172
	Passenger	92.7%	803
11:00-1:00 PM	All	87.4%	5124
	Driver	86.6%	4194
	Passenger	91.1%	930
1:00-3:00 PM	All	88.5%	5258
	Driver	88.2%	4264
	Passenger	89.6%	994
3:00-5:00 PM	All	83.1%	4446
	Driver	83.1%	3730
	Passenger	82.7%	716

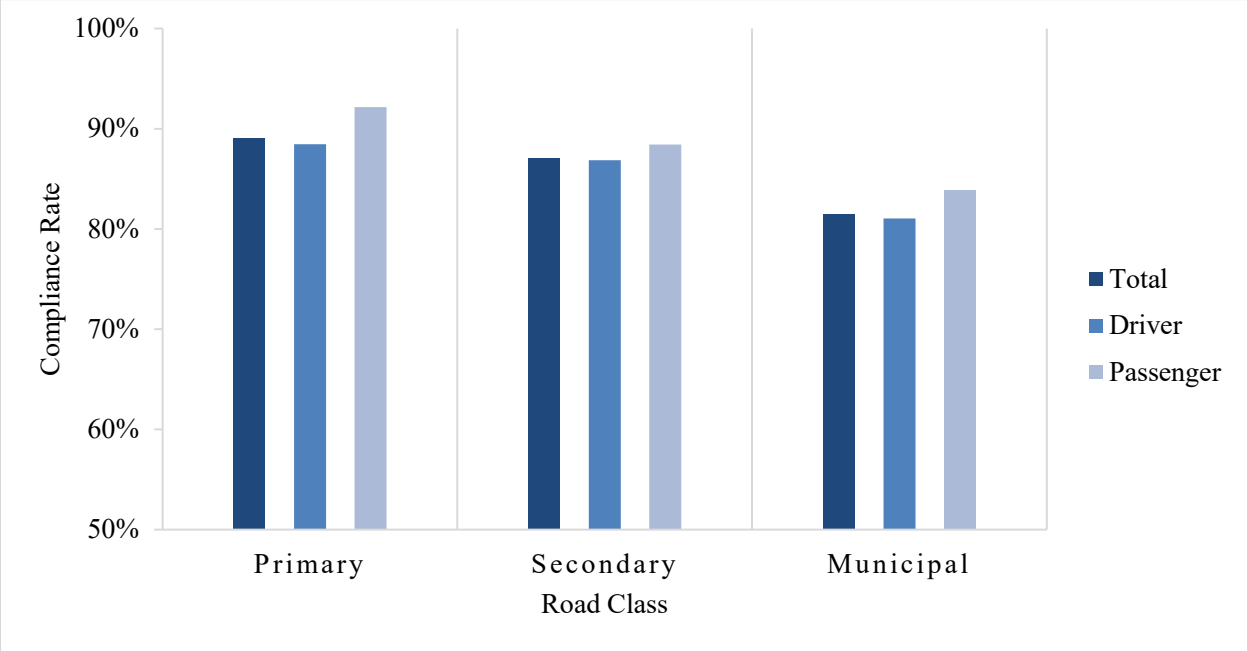
Note: Times refer to time that site observations began, 3:00-5:00 PM includes observations that start at 5:00 PM and are completed at 6:00 PM. Reported numbers are unweighted.

Figure 10: Compliance Rate per Time of Day

As seen in Figure 10, the time of day that the observations were made had little to no impact on the compliance rate of the vehicle occupants. The sample size observed shows that the hours between 1:00 PM and 3:00 PM had the most observations. This time period has the second highest number of sites assigned to it.

3.7 Compliance per Road Class

The compliance rate per road class was determined to see if there was any correlation between type of road and seat belt use. There are three types of road classes based on MAF/TIGER Feature Class Code Definitions (MTFCC), primary, secondary and local. Figure 11 shows the results of the compliance rate per road class.



Road Type	Occupant	Compliance	Sample Size
Primary	All	89.1%	8415
	Driver	88.4%	6977
	Passenger	92.1%	1438
Secondary	All	87.1%	12667
	Driver	86.8%	10526
	Passenger	88.4%	2141
Municipal	All	81.5%	2300
	Driver	81.0%	1946
	Passenger	83.9%	354

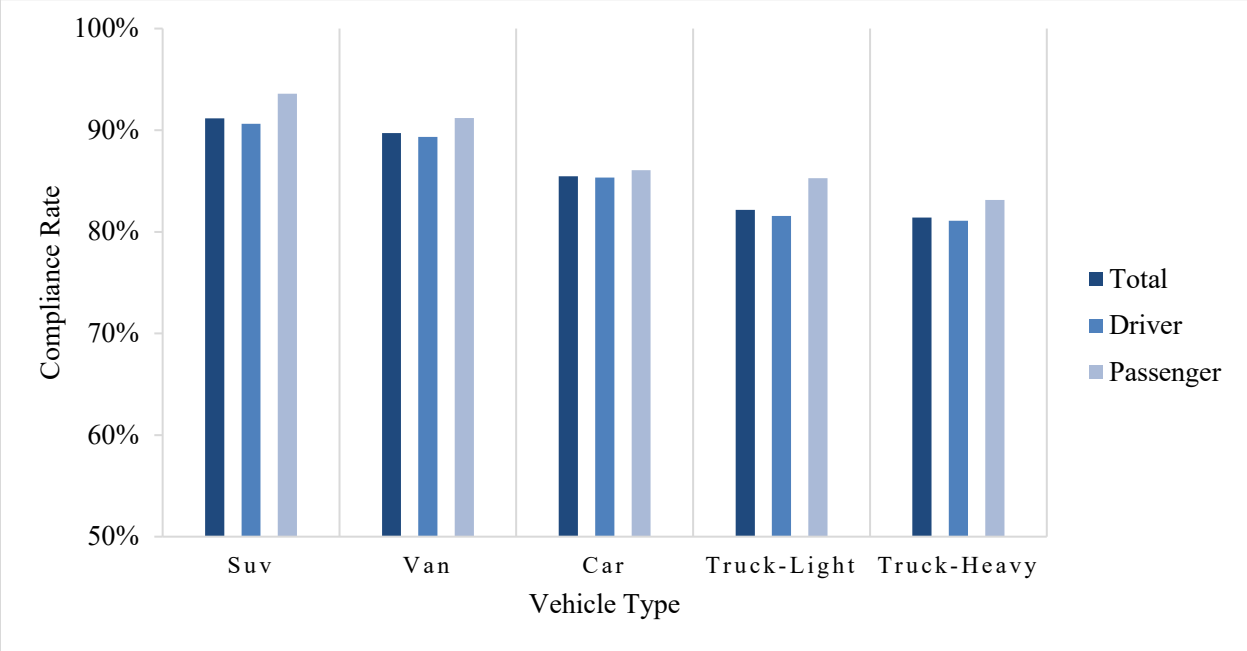
Note: Road classifications were procured using the MAF/TIGER Feature Class Code Definitions. Reported numbers are unweighted. Reported numbers are unweighted.

Figure 11: Compliance Rate per Road Class

As seen in Figure 11, local roads had the lowest compliance rate of any road class at a total of 81.5%. Next, secondary roads, which consist mainly of state and local highways were observed to have a compliance rate of 87.1%. Finally, primary roads, which consist mainly of interstate and limited access highways had the highest compliance rates at 89.1%.

3.8 Compliance per Vehicle Type

The compliance rate per vehicle type was observed to identify if the type of vehicle had an impact on the occupant compliance rate. There were five types of vehicles observed; SUV, Van, Car, Truck-Light and Truck-Heavy. More information on the types of vehicles observe red may be found in Chapter II of this report. The results of the compliance rate per vehicle type may be found in Figure 12.



Vehicle Type	Occupant	Compliance	Sample Size
SUV	All	91.2%	8777
	Driver	90.6%	7170
	Passenger	93.6%	1607
Van	All	89.7%	1886
	Driver	89.3%	1489
	Passenger	91.2%	397
Car	All	85.4%	8302
	Driver	85.3%	7068
	Passenger	86.1%	1234
Truck-Light	All	82.2%	2706
	Driver	81.6%	2278
	Passenger	85.3%	428
Truck-Heavy	All	81.4%	1711
	Driver	81.1%	1444
	Passenger	83.1%	267

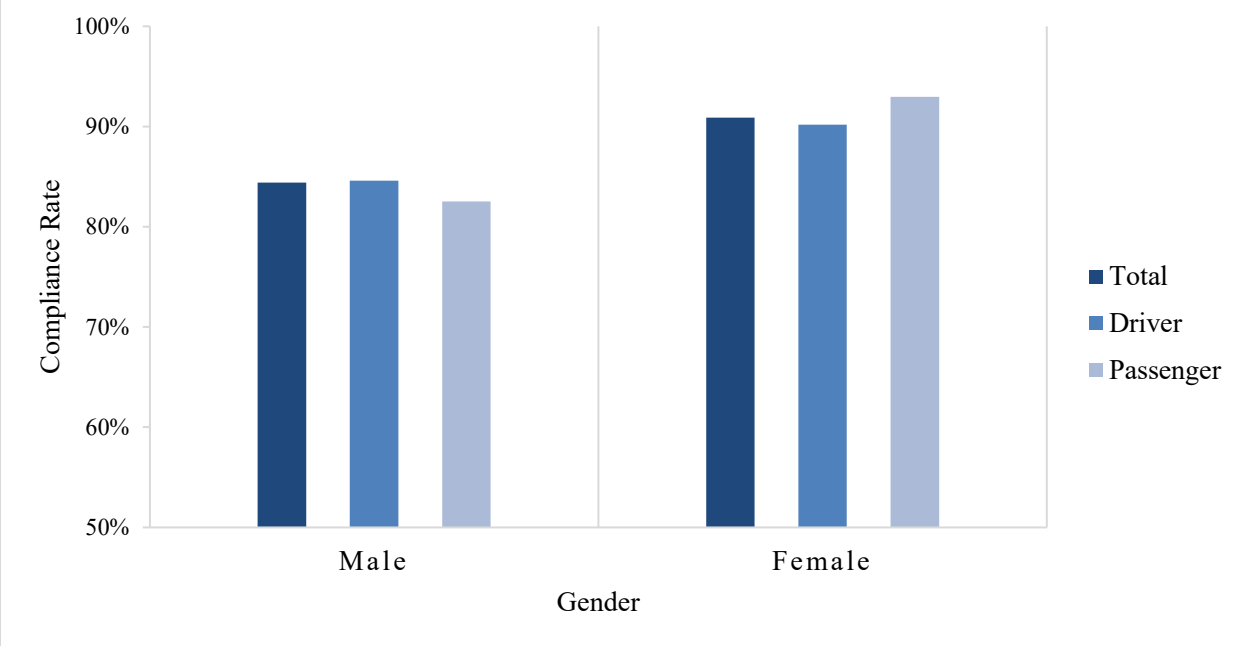
Note: Vehicle information was obtained from the U.S. Department of Energy and Federal Highway Administration. Reported numbers are unweighted.

Figure 12: Compliance Rate per Vehicle Type

As seen in Figure 12, both types of trucks had the lowest compliance rates seen with truck-heavy at 81.4% and truck-light at 82.2%. Next, cars had a compliance rate of 85.4.1% and vans at 89.7%. The most compliant vehicle type observed was the SUV at 91.2%.

3.9 Compliance per Gender

The compliance rate per gender was obtained to determine if there was a difference in compliance between male and female occupants. Figure 13 shows the results of the compliance rate per gender.



Sex	Occupant	Compliance	Sample Size
Female	All	90.9%	10468
	Driver	90.2%	7814
	Passenger	93.0%	2654
Male	All	84.4%	12899
	Driver	84.6%	11635
	Passenger	82.5%	1264

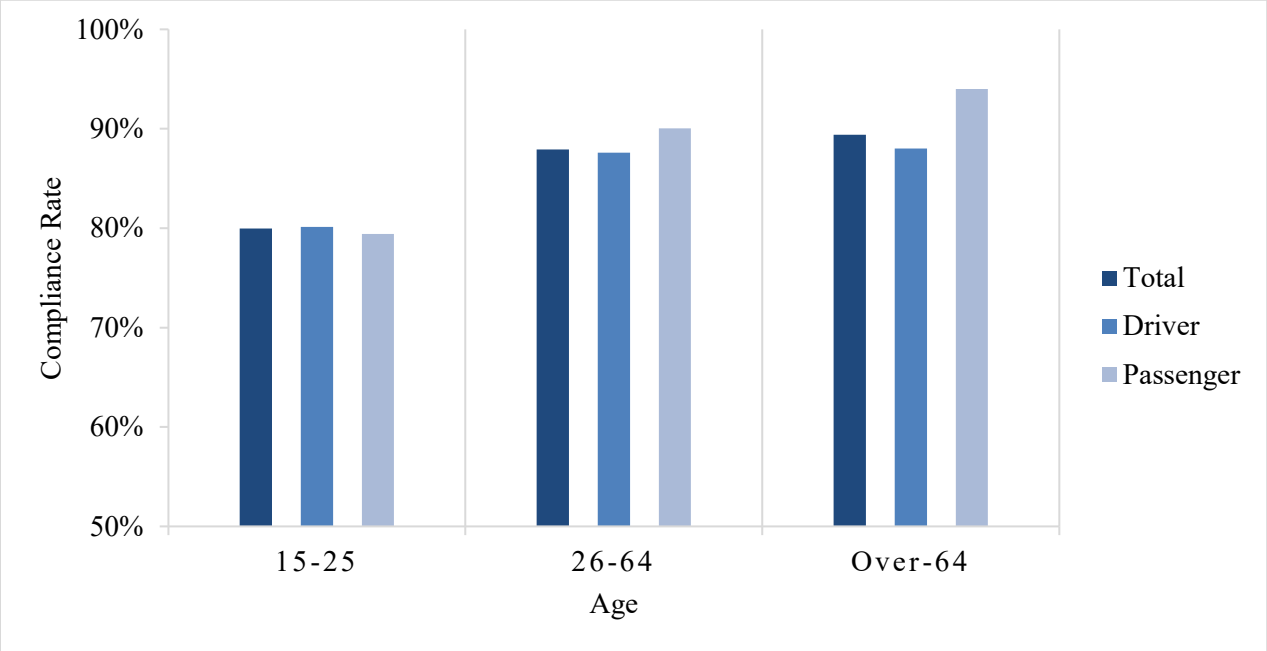
Note: Reported numbers are unweighted. There are 15 values that had an undefined gender. These unknown values present a 50% compliance rate.

Figure 13: Compliance Rate per Gender

As seen in Figure 13, the compliance of female occupants is significantly higher than that of males. Female occupants had a compliance rate of 90.9% while males were over 6.5% less compliant at 84.4%. In addition, it was seen that there were more male than female drivers while there were more female than male passengers.

3.10 Compliance per Age

The compliance rate per age was considered to understand if there is a relationship between occupant age and compliance. Drivers were divided into three age categories; 15-25 years, 26-64 years and over-64 years of age. Additionally, passengers had two additional age groups; 0-4 years and 5-14 years of age. Figure 14 displays the results of the compliance rate per age group.



Age	Occupant	Compliance	Sample Size
0-4	All	33.3%	3
	Driver	N/A	0
	Passenger	33.3%	3
5-14	All	95.3%	255
	Driver	N/A	0
	Passenger	95.3%	255
15-25	All	80.0%	2750
	Driver	80.1%	2152
	Passenger	79.4%	598
26-64	All	87.9%	16606
	Driver	87.6%	14409
	Passenger	90.0%	2197
Over-64	All	89.4%	3754
	Driver	88.0%	2888
	Passenger	94.0%	866

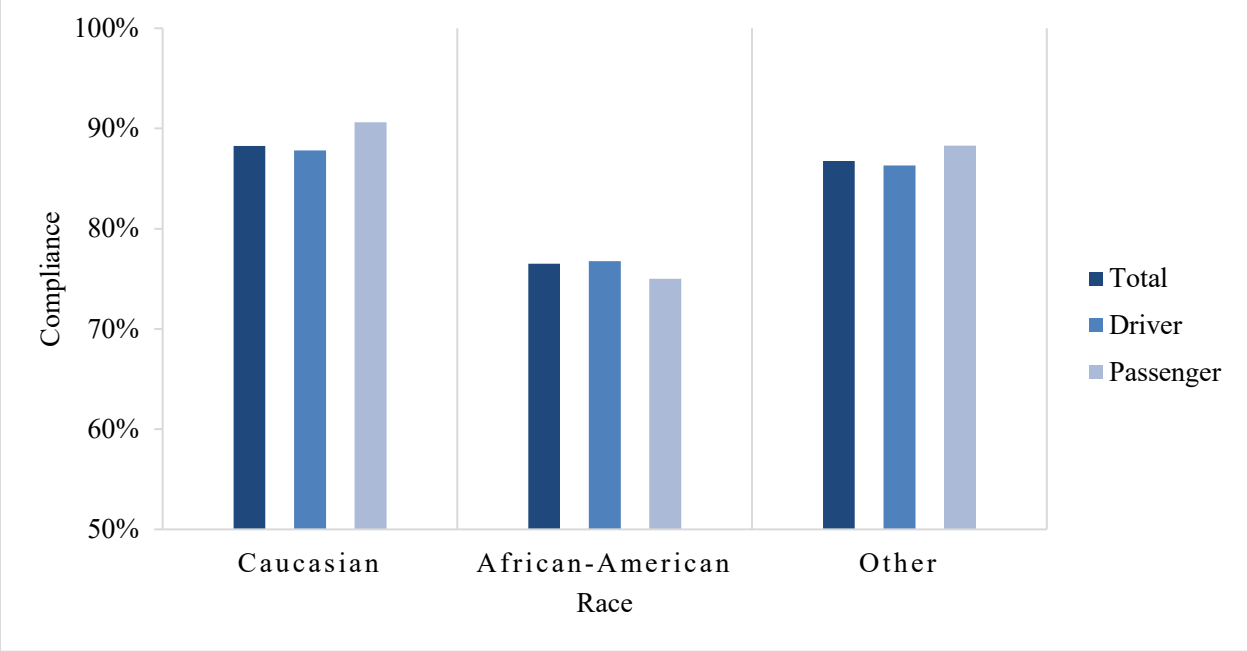
Note: Passengers younger than the age of 15 omitted from graph. Reported numbers are unweighted. There are 14 values that had an undefined age. These unknown values present a 40% compliance rate.

Figure 14: Compliance Rate per Age

As seen in Figure 14, younger occupants had a much lower compliance rate than that of middle-age and older occupants. Occupants aged 15-25 years had the lowest compliance rate at of 80.0%. Occupants aged 26-64 years had a compliance rate of 87.9% and those aged over-64 of 89.4%. Note that occupants under the age of 15 had the highest compliance rate but smallest sample size and may not have control of whether they are belted or not.

3.11 Compliance per Race

The compliance rate per race was observed to see if there was a difference in compliance between races. Occupant race was broken into three categories; Caucasian, African American and Other. The results of the compliance rate per race may be found in Figure 19.



Race	Occupant	Compliance	Sample Size
Caucasian	All	88.3%	21039
	Driver	87.8%	17481
	Passenger	90.6%	3558
African American	All	76.5%	1891
	Driver	76.8%	1639
	Passenger	75.0%	252
Other	All	86.8%	423
	Driver	86.3%	329
	Passenger	88.3%	94

Note: Reported numbers are unweighted. There are 29 values that had an undefined race. These unknown values present a 65.5% compliance rate.

Figure 15: Compliance Rate per Race

As seen in Figure 19, Caucasian compliance was 88.3%, Other was 86.8%, while African American occupants was the lowest at 76.5%.

3.12 Compliance per Demographics

The compliance rate per demographic characteristics for drivers was compiled into a single table to determine which subgroups were most at risk of being noncompliant. In order to keep the sample sizes

large enough to be statistically relevant only three demographic factors were looked at; gender, age and vehicle type. Table 2 shows the results of at-risk subgroups.

Table 2: Compliance Rate per Demographics

Gender	Age	Vehicle	Compliance	Sample Size
Male	15-25	Car	72.1%	603
		SUV	77.8%	221
		Truck-Light	72.7%	33
		Truck-Heavy	63.0%	100
		Van	78.8%	33
	26-64	Car	85.0%	2757
		SUV	90.8%	2578
		Truck-Light	80.3%	1081
		Truck-Heavy	82.6%	1671
		Van	84.9%	647
	Over-64	Car	85.3%	625
		SUV	90.4%	647
		Truck-Light	83.2%	196
		Truck-Heavy	76.1%	293
		Van	91.3%	150
Female	15-25	Car	84.6%	661
		SUV	89.0%	444
		Truck-Light	85.7%	7
		Truck-Heavy	75.0%	20
		Van	96.7%	30
	26-64	Car	88.9%	2024
		SUV	91.4%	2805
		Truck-Light	85.5%	117
		Truck-Heavy	91.0%	178
		Van	93.5%	551
	Over-64	Car	91.0%	398
		SUV	92.8%	475
		Truck-Light	100.0%	10
		Truck-Heavy	87.5%	16
		Van	94.9%	78

Note: Reported numbers are unweighted.

As seen in Table 2, the subgroups that are most at-risk of being noncompliant include most occupants of trucks, especially young and middle-age males. Additionally, young males in cars also were observed to have a low compliance rate. The trends were consistent with those from seat belt surveys conducted in other states, including Michigan. Note that some sample sizes are too small to have statistical relevance.

3.13 Cell Phone Usage

In addition to observing seat belt compliance, data regarding cell phone usage was also collected. An overall statewide estimate of phone use by drivers was determined. Observers were instructed to consider

drivers to be using a cell phone if they could clearly be seen talking on it. Table 3 presents the statewide phone usage.

Table 3: Statewide Phone Usage

Phone Use	Sample Size
5.8%	18,591

Note: Phone usage applies only to drivers. Reported number is unweighted.

As seen in Table 3, Ohio had a statewide driver phone use rate of 6.4%. Previous studies of seat belt use in Ohio did not report a statewide phone use so there is no historical data to compare to. However, national estimates show a use rate of 5.9% in 2016 (Pickrell & Li, 2017). Consequently, it appears cell phone use by drivers is more prevalent in Ohio as compared to other states. In addition to the statewide phone use, the compliance rate per phone usage was also determined to see if phone users were likely to wear a seat belt. Table 4 shows the compliance rate per phone usage.

Table 4: Compliance Rate per Phone Usage

Phone	Baseline		Post-Intervention	
	Compliance	Sample Size	Compliance	Sample Size
No	85.4%	16,001	87.1%	18,373
Yes	82.4%	1,054	83.1%	1,072

Note: Compliance refers to only drivers.

As seen in Table 4, the baseline study saw almost no difference in the compliance rate between phone users and non-phone users. However, in the post-intervention survey, there was a 1.2% increase in compliance for drivers who did not use a phone. Additional investigation is necessary to better understand the relationship between cell phone usage and seat belt compliance.

CHAPTER IV – RECOMMENDATIONS & CONCLUSIONS

The "*Observational Survey of Seat Belt Use in Ohio – 2021"* study provides important insights as to seat belt use among Ohioans. As shown in Chapter III, the CIOT campaign and enforcement successfully increased seat belt usage throughout the state. The compliance rate rose from 82.3% to 84.1% for a net increase of 1.8%. The post-intervention, post-CIOT, seat belt compliance rate increase of 1.8% is also similar to what Ohio has seen over the past decade, 2.50% average increase. Overall, the team notes a few trends that were observed in this year's study.

- Local roads have a lower compliance rate compared to primary and secondary roads,
- Heavy and light trucks have a lower compliance rate compared to any other vehicle type,
- Male occupants have a lower compliance rate compared to female occupants,
- Young occupants have a lower compliance rate compared to older occupants, and
- Subgroup of young males in trucks, heavy trucks, showed the lowest compliance rates of all demographic subgroups with an adequate sample size.

When compared to previous studies conducted in Ohio, the conclusions of this year's study are very similar to what has been seen historically throughout the state.

4.1 Recommendations

This year's study provided some additional insights that may be helpful for NHTSA and DPS to recognize as key areas for improvement. These recommendations mirror the trends that were observed in the previous section:

4.1.1 Local Roads

Local roads had by far the lowest rate of compliance in the state. When compared to secondary, 87.1%, and primary, 89.1%, roads, local roads, 81.5%, had on average a 6.6% lower compliance rate. Local roads also service a disproportionately large number of heavy and light trucks, a group in which compliance is also particularly low.

4.1.2 Heavy & Light Trucks

As is consistent with previous studies, heavy trucks, 81.4%, and light trucks, 82.2%, have a significantly lower compliance rate than each; cars, 85.4%, vans, 89.7%, and SUV's, 91.2%. As mentioned in the preceding point, trucks typically are seen in greater numbers on local roads compared to secondary and primary roads. These two groups combine to create a situation that limits the ability to raise the compliance rate for either group significantly.

4.1.3 Male Occupants

When compared to female occupants, 90.9%, male occupants, 84.4%, have historically had a lower compliance rate. Again, as seen in how trucks and local roads combine to depress compliance, so does the male occupants and truck groups. Truck occupants are typically male which creates another grouping that limits the ability to raise the compliance rate.

4.1.2 Young Occupants

Traditionally, young occupants, 80.1% have a lower compliance rate than both mid-age, 87.9%, and older, 89.4%, occupants. The 2021 study saw no change in this being the case. This group is a prime target for campaigns that attempt to increase seat belt compliance since they may be reached in large numbers during driving training and school. The group also could increase the compliance rate in the future has they will be on the road for the longest amount of time out of any age group.

4.2 Conclusions

Using the information contained in this report, especially the recommendations, both NHTSA and DPS may develop new techniques to increase the seat belt compliance rate in Ohio and nationwide. The use of both enforcement and media campaigns is crucial to maintain the success that Ohio has had and further increase the statewide compliance rate. Each occupant that NHTSA and DPS may reach and convince to wear a seat belt has the potential to save a life. Increasing seat belt compliance is one of the easiest ways to decrease the number of annual fatalities that occur on Ohio roads. To that end, the results and recommendations from this study play an important role in helping to achieve this shared goal.

CHAPTER V – REFERENCES

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APPENDIX

Appendix A Data Collection Forms

PHASE I
SITE NUMBER: SITE DESCRIPTION FORM

Observer Information			
1a) Scheduled Observer:		1b) Actual Observer:	
Schedule Information			
2a) Scheduled Day:		2b) Observed Day:	
3a) Scheduled Date:		3b) Observed Date:	
4a) Scheduled Time:		4b) Observed Time:	
Site Information			
5) Site Choice: If "Alternate" or "Other" complete 6b, 7b, 8b & 9b.	Primary	Alternate	Other
6a) Primary Site Type:		6b) Alternate Site Type:	
7a) Primary Site:		7b) Alternate Site:	
8a) Primary Direction:		8b) Alternate Direction:	
9a) Primary Cross Street:		9b) Alternate Cross Street:	
10) OSHP District:			
11) County:			
12) Nearest City:			
Traffic Information			
13a) Directions Available:		13b) Directions Observed:	
14a) Lanes Available:		14b) Lanes Counted:	
15) Traffic Count:			
Weather Information			
16) Precipitation:	Sunny	Cloudy	Light Rain	Heavy Rain	Snow
17) Visibility:	Excellent	Satisfactory	Poor
Additional Information			
18) Interruptions:	_____ minutes; caused by:		
19) Total SSF pages:			
20) Notes:			

Figure 16: Site Description Form

PAGE NUMBER:
SITE NUMBER:

SITE SURVEY FORM

VEHICLE	CAR VAN SUV TRUCK-LIGHT TRUCK-HEAVY	CAR VAN SUV TRUCK-LIGHT TRUCK-HEAVY	CAR VAN SUV TRUCK-LIGHT TRUCK-HEAVY	CAR VAN SUV TRUCK-LIGHT TRUCK-HEAVY	CAR VAN SUV TRUCK-LIGHT TRUCK-HEAVY
DRIVER BELT	YES NO UNKNOWN	YES NO UNKNOWN	YES NO UNKNOWN	YES NO UNKNOWN	YES NO UNKNOWN
DRIVER SEX	MALE FEMALE	MALE FEMALE	MALE FEMALE	MALE FEMALE	MALE FEMALE
DRIVER AGE	15-25 26-64 OVER-64	15-25 26-64 OVER-64	15-25 26-64 OVER-64	15-25 26-64 OVER-64	15-25 26-64 OVER-64
DRIVER RACE	CAUCASIAN AFRICAN-AMERICAN OTHER.	CAUCASIAN AFRICAN-AMERICAN OTHER	CAUCASIAN AFRICAN-AMERICAN OTHER	CAUCASIAN AFRICAN-AMERICAN OTHER	CAUCASIAN AFRICAN-AMERICAN OTHER
DRIVER PHONE	YES NO	YES NO	YES NO	YES NO	YES NO
PASSENGER BELT	YES NO UNKNOWN NO-PASSENGER	YES NO UNKNOWN NO-PASSENGER	YES NO UNKNOWN NO-PASSENGER	YES NO UNKNOWN NO-PASSENGER	YES NO UNKNOWN NO-PASSENGER
PASSENGER SEX	MALE FEMALE	MALE FEMALE	MALE FEMALE	MALE FEMALE	MALE FEMALE
PASSENGER AGE	0-4 5-14 15-25 26-64 OVER-64	0-4 5-14 15-25 26-64 OVER-64	0-4 5-14 15-25 26-64 OVER-64	0-4 5-14 15-25 26-64 OVER-64	0-4 5-14 15-25 26-64 OVER-64
PASSENGER RACE	CAUCASIAN AFRICAN-AMERICAN OTHER	CAUCASIAN AFRICAN-AMERICAN OTHER	CAUCASIAN AFRICAN-AMERICAN OTHER	CAUCASIAN AFRICAN-AMERICAN OTHER	CAUCASIAN AFRICAN-AMERICAN OTHER

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OHIO DEPARTMENT OF PUBLIC SAFETY

Figure 17: Site Survey Form

Appendix B Site List

Table 5: 2021 Site List

Site	District	County	Class	Address
101	1	Allen	Primary	I-75 SB Exit 127 @ SR 81/Findlay Road
102	1	Allen	Primary	I-75 NB Exit 130 @ E Bluelick Road
103	1	Allen	Secondary	SR 309/N Jameson Avenue SB @ Rice Avenue
104	1	Allen	Secondary	SR 117/Bellfontaine Avenue SEB @ S Shawnee Avenue
105	1	Allen	Local	N Main Street NB @ W North Street
106	1	Defiance	Secondary	US 24 SB Exit 22 @ SR 424/Baltimore Street
107	1	Defiance	Secondary	SR 2/SR 49/E High Street NEB @ S Maple Street
108	1	Fulton	Primary	I-80 Exit 25 @ SR 66 (both directions/toll exit)
109	1	Fulton	Primary	I-80 Exit 34 @ SR 108 (both directions/toll exit)
110	1	Fulton	Secondary	SR 2/Main Street EB @ Wood Street
111	1	Fulton	Secondary	SR 66 NB @ US 20A
112	1	Fulton	Local	CR H WB @ CR 13
113	1	Hancock	Primary	I-75 NB Exit 157 @ SR 12
114	1	Hancock	Primary	I-75 SB Exit 161 @ Township Highway 99
115	1	Hancock	Secondary	US 23/N Countyline Street SB @ W North Street
116	1	Hancock	Secondary	SR 18/Van Buren Street EB @ N Vine Street
117	1	Lucas	Primary	I-280 NB Exit 12 @ E Manhattan Boulevard
118	1	Lucas	Primary	I-75 Exit 208 WB @ E Manhattan Boulevard
119	1	Lucas	Secondary	SR 51/Monroe Street SEB @ Franklin Park Mall entrance 350 NW of Royer Road
120	1	Lucas	Secondary	US 20/SR 120/W Central Avenue WB @ Centennial Road
121	1	Lucas	Local	Sandra Drive SB @ W Laskey Road
122	1	Lucas	Local	Lewis Avenus SB @ Eleanor Avenue
123	1	Wood	Primary	I-75 SB Exit 179 @ US 6
124	1	Wood	Primary	I-75 NB Exit 179 @ US 6
125	1	Wood	Secondary	SR 18/Deshler Road EB @ N Main Street
126	1	Wood	Secondary	SR 795/Avenue Road WB @ Wyandot Place/Ramp to I-75 SB
127	1	Wood	Local	E Gypsy Lane Road/CR 324 EB @ County Home Road/S Dunbridge Road
201	2	Crawford	Secondary	SR 4/Sandusky Avenue SB @ SR 103
202	2	Crawford	Secondary	US 30/Bucyrus Bypass NB @ Exit to SR 98/Plymouth Street
203	2	Erie	Primary	I-80 Exit 110 (both directions/toll exit) @ SR 4/Hayes Avenue
204	2	Erie	Primary	I-80 Exit 118 (both directions/toll exit) @ US 250
205	2	Erie	Secondary	US 6/Warren Street SB @ Scott Street
206	2	Erie	Secondary	SR 13/Main Street NEB @ US 6/Cleveland Road E
207	2	Huron	Secondary	US 224 EB @ SR 13
208	2	Huron	Secondary	SR 60 SB @ SR 162
209	2	Marion	Secondary	SR 95/Mt Vernon Avenue WB @ SR 529/University Drive

210	2	Marion	Secondary	US 23 SB Exit @ SR 95
211	2	Ottawa	Primary	I-80 Exit 81 Both directions @ SR 51
212	2	Ottawa	Secondary	SR 105/Water Street WB @ Benton Street/W Main Street
213	2	Ottawa	Secondary	SR 53/NE Catawba Road SB @ SR 163/East Harbor Road
214	2	Richland	Primary	I-71 NB Exit 165 @ SR 97
215	2	Richland	Primary	I-71 SB Exit 169 @ SR 13
216	2	Richland	Secondary	SR 93/Cleveland Street NB @ SR 95/Newville Street
217	2	Richland	Secondary	SR 430/Park Avenue W EB @ Home Road
218	2	Richland	Local	W 6th Street WB @ Bowman Street
219	2	Sandusky	Primary	I-80 Exit 91 (both directions/toll exit)
220	2	Sandusky	Secondary	US 6/Main Street WB @ US 23
221	2	Sandusky	Secondary	US 20 Bypass Highway SEB @ SR 412/Castalia Street
222	2	Seneca	Secondary	SR 67/S Kilbourne Street NEB @ SR 162/W Jefferson Street
223	2	Seneca	Secondary	US 224 EB @ SR 18/US 224/Tiffin-Fostoria Road
301	3	Ashland	Primary	I-71 SB Exit 186 @ US 250
302	3	Ashland	Primary	I-71 NB Exit 186 @ US 250
303	3	Ashland	Secondary	US 42 SB @ Middle Rewsburg Road/CR 1302
304	3	Ashland	Secondary	SR 58 SB @ US 224
305	3	Cuyahoga	Primary	I-71 NB Exit 245 @ Fulton Rd
306	3	Cuyahoga	Primary	I-490 SB Exit 1B @ W 7th St
307	3	Cuyahoga	Secondary	US 42/Pearl Rd EB @ Greenleaf Ave
308	3	Cuyahoga	Secondary	SR 283/Lakeshore Blvd SWB @ S Lake Shore/E 189th St
309	3	Cuyahoga	Local	E 80th St NB @ Union Ave
310	3	Cuyahoga	Local	E 49th St NB @ Barkwill Ave
311	3	Lorain	Primary	I-80 Exit 135 @ Baumhart Road [both directions – toll exit]
312	3	Lorain	Primary	I-90 Exit 140 @ SR 58/Leavitt Road [both directions – toll exit]
313	3	Lorain	Secondary	OH 83/Avon Belden Road NB @ SR 57/Grafton-Eastern Road
314	3	Lorain	Secondary	SR 18/W Herrick Avenue EB @ SR 58/N Main Street
315	3	Lorain	Local	E River Street SB @ Broad Street
316	3	Medina	Primary	I-76 Exit 2 WB @ SR 3/Wooster Pike
317	3	Medina	Primary	I -271 Exit 3 NB @ SR 94/Ridge Road
318	3	Medina	Secondary	SR 301/Spencer Road NB @ SR 162/E Main Street
319	3	Medina	Secondary	SR 261/Akron Road WB @ Hartman Road/Co Rd 127
320	3	Medina	Local	Crystalbrooke Drive NB @ Mattingly Road/Township Rd 62
321	3	Stark	Primary	I-77 NB Exit 103 @ SR 800/Cleveland Avenue SW
322	3	Stark	Primary	I-77 SB Exit 109 @ Everhard Road NW
323	3	Stark	Secondary	SR 43/Market Avenue N SB @ 30th Street
324	3	Stark	Secondary	SR 93/Manchester Avenue NW SB @ SR 172/Richard Avenue
325	3	Stark	Local	Elton Street SW WB @ Pigeon Run Avenue
326	3	Summit	Primary	I-271 Exit 12 SB @ SR 303/W Streetsboro Road

327	3	Summit	Primary	I-271 Exit 19 SB @ SR 82/E Aurora Road
328	3	Summit	Secondary	SR 91/Darrow Road NB @ Twinsburg Road
329	3	Summit	Secondary	SR 261/West Avenue WB @ Nottingham Street
330	3	Summit	Local	Belleflower Road NB @ Bisson Avenue
331	3	Summit	Local	Stratford Street WB @ 31st Street SW
332	3	Wayne	Primary	I-71 NB Exit 198 @ SR 539/Congress Road
333	3	Wayne	Primary	I-71 NB Exit 196 @ SR 301/Elyria Road
334	3	Wayne	Secondary	SR 301/Elyria Road SB @ SR 302/Lattasburg Road
335	3	Wayne	Secondary	US 30/Lincoln Way WB @ Exit onto SR 3/Columbus Avenue
401	4	Ashtabula	Primary	I-90 EB Exit 241 @ SR 7
402	4	Ashtabula	Primary	I-90 EB Exit 218 @ SR 534
403	4	Ashtabula	Secondary	SR 531/9th Street EB @ Ohio Avenue
404	4	Ashtabula	Secondary	SR 534/S Broadway Street NB @ I-90 EB Exit 218 onramp
405	4	Columbiana	Secondary	SR 45 SB @ SR 9
406	4	Columbiana	Secondary	SR 45 SB @ Saltwell Road/CR 867
407	4	Geauga	Secondary	US 422 WB Exit 29 @ SR 44/Ravenna Road
408	4	Geauga	Secondary	SR 306/Chillicothe Road SB @ SR 87
409	4	Geauga	Local	Lake Avenue NB @ Springdale Avenue
410	4	Lake	Primary	I-90 WB Exit 189 @ Som Center Road
411	4	Lake	Primary	I-90 EB Exit 200 @ SR 44/Ravenna Road
412	4	Lake	Secondary	SR 91/Som Center Road NB @ Maplegrove Road
413	4	Lake	Secondary	US 20/Euclid Avenue NEB @ E 300th Street
414	4	Lake	Local	Driftwood Drive WB @ SR 283/Andrews Road
415	4	Mahoning	Primary	I-680 EB Exit 2 @ N Meridian Road
416	4	Mahoning	Primary	I-680 SB Exit 7 @ South Avenue
417	4	Mahoning	Secondary	SR 45/S Salem Warren Road SB @ US 224/W Akron-Canfield Road
418	4	Mahoning	Secondary	SR 289/Wilson Avenue NWB @ Rigby Street
419	4	Mahoning	Local	Struthers Road NB @ Arrel Road/CR 34
420	4	Portage	Primary	I-76 Exit 48 EB @ SR 225
421	4	Portage	Primary	I-76 Exit 38A EB @ SR 44/Ravenna Road
422	4	Portage	Secondary	US 224/Akron Canfield Road WB @ SR 43
423	4	Portage	Secondary	SR 43/Cleveland Canton Road SB @ SR 14/Cleveland-East Liverpool Road
424	4	Portage	Local	Eberly Road EB @ Industry Road and Waterloo Road
425	4	Trumbull	Primary	I-80 EB Exit 234A @ US 62
426	4	Trumbull	Primary	I-80 WB Exit 229 @ SR 193/Belmont Avenue
427	4	Trumbull	Secondary	SR 193/Belmont Avenue SB @ Tibbetts Wick Road
428	4	Trumbull	Secondary	SR 11 SB Exit 61 @ SR 5/Warren Road
429	4	Trumbull	Local	Belmont Avenue NB @ Fenton Street
501	5	Auglaize	Primary	I-75 NB Exit 110 @ US 33
502	5	Auglaize	Primary	I-75 SB Exit 111 @ SR 501
503	5	Auglaize	Secondary	SR 116 SB @ Deep Cut Road/SR 116
504	5	Auglaize	Secondary	SR 219/E Spring Street WB @ SR 29/N Main Street
505	5	Clark	Primary	I-70 WB Exit 66 @ SR 54
506	5	Clark	Primary	I-70 WB Exit 54 @ SR 72/S Limestone Street

507	5	Clark	Secondary	SR 41/Troy Road/W 1st Street WB @ Upper Valley Pike
508	5	Clark	Secondary	E National Road WB @ N Bird Road
509	5	Clark	Local	W Cassilly Street WB @ N Fountain Avenue
510	5	Darke	Secondary	SR 49A SB @ W South Street/SR 49
511	5	Darke	Secondary	SR 121/S Center Street NB @ Ward Street
512	5	Greene	Primary	I-675 NB Exit 22 @ SR 235/E Xenia Drive
513	5	Greene	Primary	I-675 SB Exit 16 @ Grange Hall Road
514	5	Greene	Secondary	US 42/S Church Street NB @ W 2nd Street
515	5	Greene	Secondary	US 35 WB @ Factory Road
516	5	Greene	Local	Wilmington-Dayton Pike SB @ SR 725/Centerville Road
517	5	Logan	Secondary	SR 366 WB @ SR 235
518	5	Logan	Secondary	SR 274 EB @ SR 638
519	5	Miami	Primary	I-75 NB Exit 82 @ US 36
520	5	Miami	Primary	I-75 SB Exit 78 @ N CR 25A
521	5	Miami	Secondary	SR 66/Broadway Street/Riverside Drive EB @ N CR 25A
522	5	Miami	Secondary	US 40/W National Road EB @ SR 202/Old Troy Pike
523	5	Miami	Local	W Kessler-Cowlesville Road EB @ Peters Road
524	5	Montgomery	Primary	I-70 WB Exit 38 @ SR 201
525	5	Montgomery	Primary	I-70 EB Exit 21 @ Arlington Road
526	5	Montgomery	Secondary	US 35 WB @ Exit onto Steve Whalen Boulevard
527	5	Montgomery	Secondary	SR 48/Main Street SEB @ Westbrook Road
528	5	Montgomery	Local	Kenosha Road WB @ Ackerman Boulevard
529	5	Montgomery	Local	Orchard Drive WB @ Shroyer Road
530	5	Preble	Primary	I-70 WB Exit 10 @ US 127
531	5	Preble	Primary	I-70 EB Exit 14 @ SR 503
532	5	Preble	Secondary	SR 725 WB @ SR 177
533	5	Preble	Secondary	US 127 SB @ SR 725/Central Avenue
601	6	Delaware	Primary	I-71 NB Exit 131 @ US 36
602	6	Delaware	Primary	I-71 NB Exit 121 @ SR 750/Polaris Parkway
603	6	Delaware	Secondary	US 36 EB @ S Houck Road
604	6	Delaware	Secondary	US 36 WB @ Access road to fast food and hotels 800 feet west of I-71 SB exit #131
605	6	Delaware	Local	Seldom Seen Road/CR 121 WB @ Sawmill Parkway
606	6	Fairfield	Primary	I-70 WB Exit 112 @ SR 256/Baltimore Reynoldsburg Road
607	6	Fairfield	Primary	I-70 EB Exit 112B @ SR 256/Baltimore Reynoldsburg Road
608	6	Fairfield	Secondary	SR 204/Blacklick Eastern Road NW SB @ Refugee Road/SR 204 EB
609	6	Fairfield	Secondary	SR 37/Granville Pike NB @ College Avenue
610	6	Fairfield	Local	Market Street SEB @ Center Street
611	6	Franklin	Primary	I-270 WB Exit 23 @ US 23
612	6	Franklin	Primary	I-70 WB Exit 94 @ Wilson Road
613	6	Franklin	Secondary	US 33/Riverside Drive NB @ Cranston Drive
614	6	Franklin	Secondary	US 23/Summit Street SB @ Warren Street
615	6	Franklin	Local	Westrock Drive SB @ Roberts Road E

616	6	Franklin	Local	Cunard Road NB @ Livingston Avenue
617	6	Knox	Secondary	SR 205/Danville Jelloway Road SB @ Main Street
618	6	Knox	Secondary	US 36/Columbus Road/Main Street NEB @ S Preston Street
619	6	Licking	Primary	I-70 EB Exit 132 @ SR 13
620	6	Licking	Primary	I-70 EB Exit 118 @ SR 310
621	6	Licking	Secondary	SR 37/Main Street/Johnstown-Alexandria Road NWB @ W Jersey Street
622	6	Licking	Secondary	US 62/Johnstown-Utica Road NW SWB @ SR 37/S Main Street/Johnstown-Alexandria Road
623	6	Licking	Local	York Road SW NB @ US 40
624	6	Madison	Primary	I-70 EB Exit 80 @ SR 29
625	6	Madison	Primary	I-71 NB Exit 84 @ SR 56
626	6	Madison	Secondary	US 40/National Pike WB @ SR 56/W Urbana-London Road
627	6	Madison	Secondary	SR 142/Columbus Cincinnati Road NEB @ US 40
628	6	Madison	Local	E 5th Street SWB @ N Main Street
629	6	Morrow	Primary	I-71 NB Exit 140 @ SR 61
630	6	Morrow	Primary	I-71 NB Exit 151 @ SR 95
631	6	Morrow	Secondary	SR 61 NB @ SR 288
632	6	Morrow	Secondary	SR 314/Chesterville Shelby SB @ SR 95/E Sandusky Street
633	6	Morrow	Local	West Point-Bellville Road WB @ SR 61
634	6	Perry	Secondary	SR 155/Main Street WB @ SR 13
635	6	Perry	Secondary	SR 13 NB @ SR 204
636	6	Perry	Local	Town Highway 54 NB @ US 22
637	6	Pickaway	Secondary	US 23/Walnut Street NB @ SR 316/Ashville Road
638	6	Pickaway	Secondary	SR 56/E Main Street EB @ N Pickaway Street
639	6	Pickaway	Local	S Main Street NB @ US 22/W Front Street
701	7	Belmont	Primary	I-70 EB Exit 216 @ SR 9/S Marietta Street
702	7	Belmont	Primary	I-70 EB Exit 225 @ Marion Street
703	7	Belmont	Secondary	US 40/E Main Street WB @ S Sugar Street
704	7	Belmont	Secondary	SR 7 WB Exit to Shadyside @ Central Avenue/Scenic OH 7
705	7	Belmont	Local	E South Street WB @ SR 147/Chestnut Street
706	7	Muskingum	Primary	I-70 WB Exit 157 @ SR 93
707	7	Muskingum	Primary	I-70 WB Exit 152 @ US 40
708	7	Muskingum	Secondary	SR 146/Marietta Street WB @ 9th Street/Wayne Avenue
709	7	Muskingum	Secondary	SR 60/S River Road NWB @ Bridge Street
710	7	Tuscarawas	Primary	I-77 NB Exit 93 @ SR 212
711	7	Tuscarawas	Primary	I-77 SB Exit 65 @ US 36
712	7	Tuscarawas	Secondary	SR 212 WB @ SR 800
713	7	Tuscarawas	Secondary	US RT 250 EB @ SR 93
801	8	Brown	Secondary	SR 756 NB @ SR 125
802	8	Brown	Secondary	SR 774 EB @ US 68/S High Street
803	8	Brown	Local	Purdy Road/S Main Street NB @ Winchester Street
804	8	Butler	Primary	I-75 NB Exit 22 @ Tylersville Road
805	8	Butler	Primary	I-75 SB Exit 24 @ Liberty Way

806	8	Butler	Secondary	SR 129/Michael A Fox Highway EB Exit 24 @ Cincinnati Dayton Road
807	8	Butler	Secondary	SR 126/Cincinnati Brookville Road EB @ Hamilton Cleves Road
808	8	Butler	Local	Kyles Station Road WB @ SR 4/Hamilton Middletown Road
809	8	Clermont	Primary	I-275 NB Exit 59A @ SR 450
810	8	Clermont	Primary	I-275 SB Exit 65 @ SR 125
811	8	Clermont	Secondary	US 50 WB @ SR 222
812	8	Clermont	Secondary	SR 276 NB @ US 50/E Main Street
813	8	Clermont	Local	SR 727 SB @ SR 131
814	8	Clinton	Primary	I-71 SB Exit 50 @ US 68
815	8	Clinton	Primary	I-71 NB Exit 45 @ SR 73
816	8	Clinton	Secondary	SR 28 EB @ SR 73/N South Street
817	8	Clinton	Secondary	SR 380 SB @ SR 73
818	8	Hamilton	Primary	I-275 WB Exit 47 @ Reed Hartman Highway
819	8	Hamilton	Primary	I-275 EB Exit 52 @ E Loveland Madeira Road
820	8	Hamilton	Secondary	US 22/SR 3/Montgomery Road NB @ Williams Avenue
821	8	Hamilton	Secondary	US 127/Central Parkway SB @ W 14th Street
822	8	Hamilton	Local	Delhi Avenue EB @ Glen Oaks Drive
823	8	Hamilton	Local	US 50/Lawrenceburg Road SB @ Louisville Pike
824	8	Warren	Primary	I-75 NB Exit 32 @ SR 122
825	8	Warren	Primary	I-71 NB Exit 36 @ Wilmington Road
826	8	Warren	Secondary	SR 123/Mill Street SB @ E Pike Street
827	8	Warren	Secondary	SR 63/W Main Street EB @ SR 123/Glosser Road/Neil Armstrong Way
828	8	Warren	Local	Greentree Road/CR 20 WB @ SR 741
901	9	Athens	Secondary	US 50/SR 32/E Bentbrook Drive EB @ Old Route 33
902	9	Athens	Secondary	SR 682/S Plains Road SB @ Connett Road
903	9	Ross	Secondary	US 23 NB @ SR 159/N Bridge Street
904	9	Ross	Secondary	US 50 WB @ Jones Road
905	9	Scioto	Secondary	US 23 SB @ CR 159
906	9	Scioto	Secondary	US 52/12th Street WB @ Lincoln Street

Appendix C Ohio Fatality Data

Table 6: Ohio Fatality Data (2010-2014)

County	Average Fatalities	Percent of State Fatalities	Cumulative Percent
Franklin	79.2	7.6	7.6
Cuyahoga	54.8	5.2	12.8
Montgomery	47.8	4.6	17.4
Hamilton	45.0	4.3	21.7
Lucas	36.6	3.5	25.2
Stark	33.8	3.2	28.4
Summit	31.0	3.0	31.4
Butler	25.2	2.4	33.8
Trumbull	24.0	2.3	36.1
Mahoning	22.8	2.2	38.3
Clermont	21.4	2.0	40.3
Lorain	20.2	1.9	42.2
Licking	18.4	1.8	44.0
Wood	17.0	1.6	45.6
Ashtabula	15.4	1.5	50.2
Warren	16.0	1.5	48.7
Clark	16.0	1.5	47.2
Columbiana	13.2	1.3	54.0
Wayne	13.4	1.3	52.7
Ross	13.4	1.3	51.4
Medina	12.4	1.2	60.0
Lake	12.4	1.2	58.8
Delaware	12.6	1.2	57.7
Fairfield	12.8	1.2	56.5
Portage	13.0	1.2	55.2
Richland	11.0	1.1	64.5
Pickaway	11.6	1.1	63.4
Scioto	12.0	1.1	62.3
Muskingum	12.0	1.1	61.2
Marion	10.0	1.0	65.4
Greene	9.2	0.9	69.1
Miami	9.4	0.9	68.2
Logan	9.4	0.9	67.3
Fulton	9.8	0.9	66.4
Sandusky	8.0	0.8	77.9
Athens	8.0	0.8	76.4
Seneca	8.4	0.8	75.6
Erie	8.4	0.8	74.8
Ashland	8.4	0.8	74.0
Tuscarawas	8.6	0.8	73.2
Ottawa	8.6	0.8	72.4
Darke	8.6	0.8	71.6
Geauga	8.8	0.8	70.7
Belmont	8.8	0.8	69.9

Mercer	8.0	0.8	77.1
Madison	7.2	0.7	84.3
Huron	7.2	0.7	83.6
Hancock	7.2	0.7	82.9
Auglaize	7.2	0.7	81.5
Preble	7.4	0.7	80.8
Allen	7.6	0.7	80.1
Clinton	7.8	0.7	78.7
Guernsey	7.2	0.7	82.2
Pike	7.8	0.7	79.4
Crawford	6.0	0.6	88.5
Knox	6.2	0.6	87.3
Morrow	6.6	0.6	84.9
Union	5.8	0.6	89.6
Williams	6.0	0.6	89.1
Lawrence	6.2	0.6	87.9
Coshocton	6.2	0.6	86.7
Washington	6.4	0.6	86.2
Shelby	6.6	0.6	85.5
Brown	4.8	0.5	94.1
Defiance	5.4	0.5	91.7
Holmes	4.8	0.5	94.6
Adams	4.8	0.5	93.7
Harrison	5.0	0.5	93.2
Fayette	5.0	0.5	92.7
Jackson	5.4	0.5	92.3
Wyandot	5.5	0.5	91.2
Highland	5.6	0.5	90.7
Hardin	5.6	0.5	90.2
Perry	4.6	0.4	95.9
Vinton	3.8	0.4	98.6
Paulding	3.8	0.4	98.2
Meigs	3.8	0.4	97.8
Van wert	4.0	0.4	97.5
Jefferson	4.0	0.4	97.1
Carroll	4.0	0.4	96.7
Putnam	4.3	0.4	96.3
Henry	4.6	0.4	95.5
Champaign	4.6	0.4	95.0
Noble	3.2	0.3	99.8
Hocking	3.2	0.3	99.5
Morgan	3.3	0.3	99.2
Monroe	3.3	0.3	98.9
Gallia	2.2	0.2	100.0

Note: Information obtained from NHTSA FARS data.

Appendix D Ohio Road Population Data

Table 7: Ohio Road Population Data

	Primary		Secondary		Local		Total	
County	Count	Sampled	Count	Sampled	Count	Sampled	Count	Sampled
Allen	157	2	1689	2	18829	1	20675	5
Ashland	114	2	2138	2	0	0	2252	4
Ashtabula	163	2	1940	2	0	0	2103	4
Athens	0	0	1720	2	0	0	1720	2
Auglaize	78	2	1655	2	0	0	1733	4
Belmont	294	2	2132	2	16905	1	19331	5
Brown	0	0	1602	2	10068	1	11670	3
Butler	87	2	1733	2	19470	1	21290	5
Clark	217	2	1235	2	9563	1	11015	5
Clermont	120	2	1563	2	10563	1	12246	5
Clinton	65	2	1141	2	0	0	1206	4
Columbiana	0	0	2430	2	0	0	2430	2
Crawford	0	0	1196	2	0	0	1196	2
Cuyahoga	1808	2	5068	2	46547	2	53423	6
Darke	0	0	2387	2	0	0	2387	2
Defiance	0	0	1655	2	0	0	1655	2
Delaware	84	2	1227	2	10479	1	11790	5
Erie	130	2	1446	2	0	0	1576	4
Fairfield	30	2	1317	2	12602	1	13949	5
Franklin	1778	2	3442	2	60020	2	65240	6
Fulton	142	2	1293	2	11161	1	12596	5
Geauga	0	0	714	2	4272	1	4986	3
Greene	184	2	1122	2	13475	1	14781	5
Hamilton	1175	2	2386	2	33483	2	37044	6
Hancock	167	2	1174	2	0	0	1341	4
Huron	0	0	2238	2	0	0	2238	2
Knox	0	0	2668	2	0	0	2668	2
Lake	275	2	1762	2	10750	1	12787	5
Licking	217	2	2919	2	33467	1	36603	5
Logan	0	0	1321	2	0	0	1321	2
Lorain	278	2	1996	2	16268	1	18542	5
Lucas	608	2	1846	2	22158	2	24612	6
Madison	105	2	882	2	3338	1	4325	5
Mahoning	544	2	2049	2	15202	1	17795	5
Marion	0	0	1022	2	0	0	1022	2
Medina	259	2	1166	2	7666	1	9091	5
Miami	156	2	1374	2	8765	1	10295	5
Montgomery	600	2	1788	2	35058	2	37446	6
Morrow	99	2	677	2	3619	1	4395	5
Muskingum	203	2	1459	2	0	0	1662	4
Ottawa	33	1	948	2	0	0	981	3
Perry	0	0	1123	2	5198	1	6321	3
Pickaway	0	0	818	2	3687	1	4505	3

Portage	243	2	2211	2	19995	1	22449	5
Preble	85	2	1449	2	0	0	1534	4
Richland	156	2	2615	2	21902	1	24673	5
Ross	0	0	1516	2	0	0	1516	2
Sandusky	166	1	1275	2	0	0	1441	3
Scioto	0	0	1540	2	0	0	1540	2
Seneca	0	0	1276	2	0	0	1276	2
Stark	191	2	2828	2	31684	1	34703	5
Summit	906	2	2215	2	30966	2	34087	6
Trumbull	206	2	2149	2	13859	1	16214	5
Tuscarawas	252	2	1956	2	0	0	2208	4
Warren	293	2	1293	2	13217	1	14803	5
Wayne	39	2	1950	2	0	0	1989	4
Wood	436	2	1767	2	11532	1	13735	5