OHIO DEPARTMENT OF PUBLIC SAFETY
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Observational Survey of Seat Belt Use in Ohio 2016

Prepared for:
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The Ohio Traffic Safety Office
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2016

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The Ohio Department of Public Safety Office and its Ohio Traffic Safety Office administration and the Applied Research Center's Director and staff are grateful to retired officers of the Ohio State Highway Patrol for their excellent field observation research.

This research endeavor is derived from a design that conforms to the requirements of the Uniform Criteria and was developed in consultation with and approved for Ohio under an agreement with the Statistical Consulting Center at Miami University. John Bailer, Chair and Distinguished Professor at Miami University, and Doug Noe, Associate Professor, provided additional statistical support through data analysis. We are grateful to the entire Statistical Consulting Center staff, which additionally includes Michael Hughes, Manager, and Dr. Jing Zhang, Assistant Professor, for their insights and support.

Robert L. Seufert
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TABLE OF CONTENTS

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EXECUTIVE SUMMARY

Overview: The 2016 baseline *Click It or Ticket* observation survey of seat belt use in Ohio contained 21,175 vehicle occupants –17,956 drivers and 3,219 passengers. After the *Click It or Ticket* media campaign and enforcement initiatives, another random sample of 23,082 occupants was observed at the same sites with 19,083 drivers and 3,999 passengers. Results of the second survey indicate that Ohio's 2016 weighted seat belt use rate is **83.8%**, nearly identical to 2015's seat belt use rate of 83.9%. Consequently, the 2016 survey results, with an overall margin of error of ± 1.0%, were derived from the second observational survey conducted in June after the combined *Click It or Ticket* media campaign and enforcement initiatives had been fully implemented. The 83.8% seat belt use rate for Ohio was formally reported to the National Highway Traffic Safety Administration (NHTSA).

In consultation with the Applied Research Center, retired officers of the Ohio State Highway Patrol (OSHP) conducted observation surveys of seat belt use at 237 randomly selected sites in 57 of Ohio's 88 counties. The surveys were conducted on randomly selected days of the week and times of day and included occupants of passenger cars, vans and minivans, sport utility vehicles (SUVs), and light and heavy trucks. Additional findings, which remain generally consistent with previous surveys, include the following:

- The seat belt use rate of light truck (mostly pickup truck) occupants (79.4%) is significantly lower than that of occupants of passenger cars (85.0%), vans (85.4%), or SUVs (87.1%).
- The Cleveland and Jackson districts have the lowest seat belt use rates, with rates of 77.4% and 78.1%, respectively. The highest rates were observed in the Wilmington and Findlay districts (both with 90.2%).
- The statewide rate for drivers was 83.7%; passengers were slightly more likely to buckle up, at 85.5%.
- Female vehicle occupants continue to have a significantly higher rate of seat belt use (87.3%) than male occupants (81.1%).
- For vehicle occupants between 15 and 25 years of age, the seat belt use rate was 84.9% and for occupants 26-64 the rate was 83.6%; 90.0% of occupants aged 65 or older were observed to be wearing seat belts, surpassing both younger age groups. While seat belt use rates among 15-to-25-year-olds have improved, due to the high number of traffic injuries and fatalities among this age group, continued targeted intervention is recommended.

Recommendations: Several populations with low belt use rates continue to warrant targeted interventions. Similar to previous years, those populations include:

- Occupants residing in rural counties
- Male occupants
- Occupants aged 15-25
- Light truck occupants

BACKGROUND

Since 1991, Ohio has conducted an annual observational survey to determine seat belt use following guidelines set by the National Highway Traffic Safety Administration (NHTSA). These guidelines have traditionally given individual states much discretion in survey design and implementation, with the stipulation that each state must generate a probability-based estimate for seat belt usage of front outboard occupants of passenger vehicles. This seat belt use estimate must have a required level of precision of less than 5% relative error and a 95% confidence coefficient. Individual states have been permitted to decide how much additional information to collect based on the resources available.

In 1998, NHTSA requested that states collect vehicle-specific information as part of the survey process. Specifically, all states were asked to collect information that would permit them to generate usage rates for occupants of four types of vehicles: passenger cars, vans/minivans, sport utility vehicles (SUVs), and pickup trucks. Since 1991, and prior to 1998, Ohio's seat belt surveys only collected data from occupants of passenger cars, minivans and SUVs, and results from each site were pooled so that observers did not record seat belt use for specific types of vehicles. Therefore, the only data available were aggregate data from each site that provided overall counts of driver and passenger seat belt use. Thus, in 1998, Ohio's survey required some modifications in the way that seat belt use data were collected in order to provide the vehicle-specific information requested by NHTSA. Also, data on license plate origins (i.e., from which state the plate was issued) have not been collected since 1999, because out-of-state vehicles were only a very small proportion of vehicles observed during previous years. In 2009 through 2011, with the exception of the addition of driver's cell phone use on the observation form, the survey methodology was identical to that used in the 2008 observation surveys. The revised methodology, implemented beginning in 2012, continues to collect the same vehicle, driver, and front-seat passenger specific data. The revised methodology is explained in greater detail in the Methodology section below.

Data were collected from vehicles stopped at randomly selected intersections and freeway off-ramps, so observers had ample opportunity to collect data from each specific vehicle observed. Traffic control devices such as traffic signals or stop signs were present at nearly all observation site locations. This method gives observers not only the opportunity to collect general seat belt use data, but to also collect demographic information pertaining to seat belt use in addition to vehicle type. Ohio and other states have found differences in seat belt use as a function of vehicle type and occupant sex, and age. Research also indicates that seat belt use varies as a function of race and ethnicity. Consequently, the race of vehicle occupants was added to the survey in 2004 and has been retained in subsequent surveys. Additionally, as noted previously, the cell phone use of the driver was added to the 2009 through 2011 surveys. Modifying the survey to collect vehicle-specific information (i.e., data on usage in various vehicle types) and demographic data vastly increases our knowledge about Ohioans who are likely to wear (or not wear) their seat belts. As previously noted, while the methodology was revised in 2012, the same types of information on vehicles, drivers, and passengers have been collected in all surveys since the revision.

Also, to provide geographical information about regional trends in seat belt use, the survey is structured to estimate seat belt use by Ohio State Highway Patrol District.

This report contains the following sections:

- **Methodology**: The methodology, approved by NHTSA, outlines the manner in which observation sites were chosen and data were collected and analyzed.
- **Results**: Descriptive results of seat belt use (e.g., percent of observations by sex, age, vehicle type, race, and OSHP district) are presented in the same manner as in past *Observational Surveys of Seat Belt Use in Ohio*.
- **Recommendations**: Recommendations are based on the data derived from the descriptive statistics and a statistical weighting and analysis.
- **References** and **Appendices:** Observation sites, forms, and other pertinent information are also included.

The following section contains a full description of the methodological procedures approved by NHTSA to estimate seat belt use.

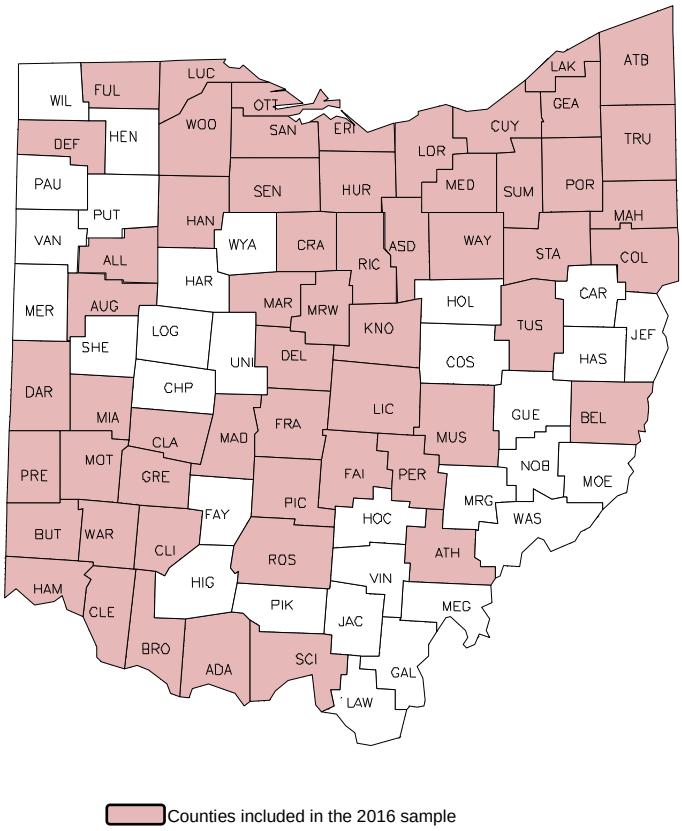
METHODOLOGY

Sample Stratification

The new methodology required a more nuanced stratification of the sample. In previous years, the sample was stratified by geographical region. Beginning in 2012, the sample was stratified by county and, within each county, by road type (primary, secondary, and municipal/rural). Observation sites were randomly selected road segments from each county depending on the road types available. For example, primary sites could only be selected in counties with at least one freeway off-ramp, while municipal roads could only be sampled in counties with a metropolitan statistical area (MSA). Appendix D details the breakdown of site types and numbers by county. The method of selection described later in this section was used to ensure that all intersections and off-ramps in a given county had *an equal probability of selection*. That is, all road segments, regardless of their location or traffic volumes, had equal likelihoods of selection as survey sites. In some cases, certain selected sites were impractical for observation, in which case a similar site (primary, secondary, or local) was selected to replace it.

As a preliminary measure to eliminate sites with relatively few consequences to policy implementation, counties with lower overall traffic-related fatalities were omitted from the sample. Federal guidelines permit the exclusion of low-fatality counties (cumulatively accounting for 15% or less of the state's highway fatalities) from the sample space so that the costs of sampling in these areas may be constrained. The present survey methodology excluded 31 low-fatality counties that cumulatively account for approximately 15% of the state's fatalities, reducing the sample of Ohio counties from 88 to 57 (see Figure 1 for counties). In all cases, excluded counties were rural with relatively small populations, few roads, and had relatively few crash-related fatalities.

Figure 1: Counties in 2016 Sample



Sample Size and Allocation to Strata

Observation sites within this sample of Ohio counties were randomly selected segments and freeway off-ramps, each vetted for safety and practicality via satellite imagery, street imagery, and direct observation. The ideal location was one which allowed for more detailed vehicle, driver, and occupant information to be recorded by observers while vehicles are stopped. Studies have shown that there is no discernible difference in the accuracy and reliability of seat belt use estimates obtained through stopped-vehicle direct observation (SVDO) compared to moving-vehicle direct observation (MVDO) (Eby, Streff, & Christoff, 1996). Although Ohio's survey previously employed the MVDO method, using the SVDO method whenever possible enables the collection of more detailed information without any loss in accuracy. Collected information includes vehicle type, driver and passenger belt use, sex, age, race, and driver cell phone use.

Aside from road type availability in each sampled county, the necessary number of intersection and off-ramp sites was determined based on two factors. Of primary consideration was the number of observations necessary to estimate seat belt use with 5% relative error and 95% confidence. Second, the number of sites had to be large enough to ensure a fairly equitable distribution of sites across days of the week and times of the day. The number of observations needed to estimate seat belt use at the alpha = .05 (95% confidence) level was determined. A power analysis was performed using data from Ohio's past observational surveys. Based on this analysis, a

minimum of 7,600 observations were required to estimate overall seat belt use with the desired amount of precision. See Appendix D for a breakdown of site allocation by strata (counties and road types).

Site Selection Procedures

Our research design conforms to the requirements of the Uniform Criteria and will generate annual estimates of occupant restraint use for adults and children using booster seats in the front seats of specified vehicles. We intend to update the sample of data collection sites every five years in order to have survey results for geographic areas in which more than 85% of crash-related fatalities occur. This sample design was developed in consultation with and approved for Ohio under an agreement with the Statistical Consulting Center at Miami University.

1. All 88 counties in Ohio were listed in descending order of the average number of motor vehicle crash-related fatalities for the period of 2006 to 2010. Ohio State Highway Patrol data, which are provided to the Fatal Accident Reporting System (FARS), were used to determine the 5-year average number of crash-related fatalities per county. It was determined that 57 counties accounted for approximately 86 percent of Ohio's total passenger vehicle crash-related fatalities. We selected road segments from each of the 57 counties. Thus, each county is considered a stratum when generating state or regional estimates of seat belt usage. See Appendix D.

2. It is expected that an *average* of 75 to 80 vehicles will be observed at each of 237 observation sites and approximately 17,775 to 18,960 vehicles overall based on past experience with Ohio's annual *Observational Survey of Seat Belt Use*. Estimates from previous surveys suggest the standard error will be well under the threshold of 2.5%. In the event there is a standard error greater than 2.5%, additional data will be collected from existing sites.

3. All 57 counties were stratified by road type (primary, secondary, and local/rural/city). Assuming that all three road types are present in a county, a random sample of road segments was selected from each county as follows: 2 primary segments, 2 secondary segments, and 1 local/rural/city segment, except for counties with 10,000,000 daily vehicle miles traveled (DVMT) or higher, in which case 2 local/rural/city segments were selected. As a result, 82 primary, 114 secondary, and 41 local/rural/city segments were selected overall. These sample sizes reflected a logistical constraint of available staffing for observation sites and the time to conduct the study. See Appendix E.

4. Additional stages of selection were used to determine the observation period, travel direction, lane, and vehicles to be observed, at random and with known probability, as appropriate under the Uniform Criteria.

Sample Size and Precision

A standard error of less than 2.5% on the seat belt use estimates is required by the Final Rule. Since 1999, Ohio has conducted the *Observational Survey of Seat Belt Use* and has historically reported standard errors below the 2.5% threshold. For instance, during the 2011 pre- and post-surveys, the standard error was .28% and .26% with 18,000-19,200 total observation surveys. These surveys have been obtained from previous sample designs using 48 counties and an *average* of 5 observation sites per county with an *average* of 75 to 80 observation surveys per site. Therefore, since the proposed design is expected to yield a minimum sample size of 17,775 observations across 57 counties and an *average* of approximately 4.16 segments per county, the precision objective should be achieved (i.e., 57 * 4.1578 * 75 = 17,775). In the event that the precision objective is not met, additional observations will be taken starting with sites having the fewest observations, and new data will be added to existing valid data until the desired precision is achieved. The latter step was unnecessary in the current survey.

County Selection

Of Ohio's 88 counties, 57 counties account for nearly 86 percent of all fatalities. In consultation with Statistical Consulting Center staff, we decided to include all 57 counties in the final sample of counties. For practical purposes, the Ohio State Highway Patrol (OSHP) assigns each of Ohio's counties to one of eight districts; although the sample of counties is not stratified by region in the analysis, seat belt use rates will be reported for districts as well as overall. See Appendix D.

Road Segment Selection

For each of the 57 counties, road segments were randomly selected within each county. Ohio employed the Census TIGER data for the selection of road segments. Also, Ohio exercised the available exclusion option and removed rural local roads in counties that are not within Metropolitan Statistical Areas (MSAs), and other non-public roads, unnamed roads, unpaved roads, vehicular trails, access ramps, cul-de-sacs, traffic circles, and service drives from the dataset. We stratified segments by road type and selected 2 primary segments, 2 secondary segments, and 1 local/rural/city segment from each county. When a county's DVMT was 10,000,000 or more, we selected 2 local/rural/city segments. As shown in Appendix D, primary and local segments were not always available for each county.

Appendix D contains the population of segments and number of segments sampled by county. Appendix E presents the selected road segments within each county and their probabilities of selection.

Reserve Sample

In the event that an original road segment is permanently unavailable, a reserve road segment was used. The reserve road segment sample consists of one additional road segment per original road segment selected, resulting in a reserve sample of 237 road segments. After data were sorted by segment length, road type, and county, the segment immediately following each selected segment was obtained as a backup sample, thus duplicating as closely as possible the segment characteristics of the original sample. Historically, Ohio has had great success using nearly all of the original site selections and one set of reserve sites was sufficient.

Data Collection and Observer Training

Road segments were mapped according to the latitude and longitude of their midpoints. Each selected road segment was identified by an intersection or interchange that occurred within or just beyond the segment. If no intersection or interchange occurred within the segment, then any suitable point on that road could be used for observation. Data collection sites were deterministically selected such that traffic could be observed with optimum accuracy. Therefore, whenever possible, sites were assigned to locations relatively close to controlled intersections (e.g., within 50 yards). Such locations allow for safe and accurate collection of detailed vehicle, driver, and occupant information of ongoing interest to the Ohio Department of Public Safety. Such detailed information has been historically used by Ohio to successfully plan, implement, evaluate, and adjust its interventions. For interstate highways, data collection will occur on a ramp carrying traffic that is exiting the highway. The observed direction of travel was randomly assigned for each road segment. The locations of the data collection sites were described on Site Assignment Sheets for each county and maps were developed to aid the Data Collectors and Quality Control (QC) Monitors in travelling to the assigned locations.

Training

Ohio has a crew of 19 data collectors with several years' experience observing seat belt use of front-seat vehicle occupants on its roadways. After consulting with Ohio Department of Transportation personnel, it was determined that increasing the survey coverage of counties to 57 from the historic 48 could still be managed by the current crew of observers. However, additional data collectors were hired when an observer was temporarily unable to collect data for various reasons. Also, when necessary, trained Applied Research Center personnel and Ohio Law Enforcement Liaisons from the Ohio State Highway Patrol served as QC Monitors.

Data Collector and QC Monitor training was conducted at the Ohio Department of Public Safety during the two weeks prior to the first data collection period. Data Collector and QC Monitor training included lecture, classroom, and field exercises. Previous training for Ohio observers does not differ significantly from new

stipulations in the Final Rule. The updated Ohio training manual included a list of any differences and highlighted those during the training session.

Quality control monitors mentioned above were given an additional half day training focusing on their specific duties. These duties include conducting unannounced site visits of data collectors at 5% of sites (a minimum of 12 randomly selected sites, i.e. 237 sites * .05 = 11.85 sites to be visited) and reviewing the field protocol during the visit. The quality control monitors were also available throughout the survey to respond to questions and offer assistance to Data Collectors as needed.

Observation Periods and Quality Control

All seat belt and booster seat use observations were conducted during weekdays and weekends between 7:00 a.m. and 6:00 p.m. The schedule included rush hour (before 9:30 a.m. and after 3:30 p.m.) and non-rush hour observations. Data collection was conducted for 50 minutes immediately following a 5-minute traffic count; a second 5-minute traffic count immediately followed the observation. Observers recorded seat belt use and demographic information of interest to Ohio, both while vehicles were stopped in the designated lane at the traffic control device (if present) and while traffic was moving through the intersection, ramp, or road segment whenever possible. When traffic was moving, observers recorded data for as many vehicles as possible. Approximately 8 counties were covered per day with an average of four or five sites scheduled for each county. Start times were organized to ensure that a representative number of weekday versus weekend and rush hour versus non-rush hour sites were included.

Maps showing the location of all observation sites and Site Assignment Sheets were provided to the Data Collectors and QC Monitors. These indicated the observed road name, the crossroad included within the road segment (or nearest crossroad), assigned date, assigned time, and assigned direction of travel. Sites within relatively close geographic proximity were assigned as data collection clusters. The first site within each cluster was assigned a random day and time for completion. Next, all other sites within a cluster were assigned to the same day by geographic proximity in order to minimize travel costs.

Data Collection

All passenger vehicles, including commercial vehicles with a gross vehicle weight rating (GVWR) of less than 10,000 pounds, were eligible for observation. The Seat Belt Survey Site Description Form and the Observation Form are shown in Appendix F. The Site Description Form obtains descriptive information for each site, including: date, site location, site number, alternate site data, assigned traffic flow, number of lanes available and observed, start and end times for observations, and weather conditions. This form was completed by the Data Collector at each observation site.

The Seat Belt Survey Observation Form was used to record seat belt use by drivers and front seat passengers. Additional forms were provided for each observer since some sites had a significantly higher traffic volume than average. After being reviewed by QC Monitors, the forms were scanned and the data were imported directly into a database for analysis.

The data collectors observed as many lanes of traffic as they could accurately monitor while obtaining data on 99% of the vehicles. Only one direction of traffic was observed at any given site.

Observations were made of all drivers and right front seat occupants, including children riding in booster seats. The only right front seat occupants excluded from the analysis were child passengers who were traveling in child seats with harness straps.

Alternate Sites and Rescheduling

When a site was temporarily unavailable due to a crash or inclement weather, data collection was rescheduled for a corresponding time of day and day of week. In the event that the site was permanently unusable an alternate site, selected as part of the reserve sample, was used as a permanent replacement. The alternate for each site was clearly identified and listed on the Site Assignment Sheet and additional site selection support was provided by the staff member responsible for site selection.

Quality Control Procedures

The Quality Control (QC) Monitors made unannounced visits to at least twelve data collection sites throughout the state. During these visits, the QC Monitor first evaluated the Data Collector's performance from a nonintrusive distance (if possible), and then observed alongside the Data Collector. This procedure helped ensure that the Data Collector followed survey protocol including: being on time at assigned sites, completing the Site Description Form and observation forms, and making accurate observations of seat belt use. In the event it is discovered that a Data Collector falsified data, the Data Collector will be replaced by a back-up Data Collector and the back-up Data Collector will revisit all sites proven to be, or suspected, to be falsified and recollect all data. However, no Data Collector has ever been found to be untrustworthy. At the end of each observation period, the Data Collector shipped the forms by overnight service to Miami University's Applied Research Center (ARC) in Middletown, Ohio. The QC monitors and Applied Research Center Staff reviewed the forms. If the rate of unknowns exceeded 10% for any site (potentially leading to an overall nonresponse rate of 10% or more), then the Data Collector was sent back to that site for an additional observation period. These same procedures were successfully completed in 2016. The ARC reviewed all data submitted by observers and the data were rigorously collected and were found to be statistically consistent and complete.

Statistical Analysis

The Site Description Forms and Data Collection Forms were returned directly to the Miami University Applied Research Center and a cursory review of the forms and data from each observer and site was performed. Site and vehicle-specific information were linked in the final dataset used for statistical analysis. All analyses were performed using a combination of Microsoft Excel, Access, and SPSS.

Estimation and Variance Estimation

Imputation

Imputation on missing data was unnecessary, per the protocol and Ohio's past experience with observational surveys.

Sampling Weights

We selected a stratified random sample within road type strata in each county. In addition, the number of segments selected was small relative to the number of possible road segments. As a consequence, finite population correction factors were not used. Initial sampling weights were defined as the reciprocal of the proportion of segments sampled within a stratum.

Nonresponse Adjustment

The data collection protocol in this plan includes a provision for the use of alternate observation sites and road segments with non-zero eligible traffic volume; consequently, zero observations at a site will be unlikely. However, if no vehicles pass a site during the 50 minute observation period or if the site is closed for some other reason, an alternate site that is paired with the selected site will be used. Consequently, a nonresponse adjustment in these cases will be unnecessary, since the alternative observation site is already associated with the selected observation site. If the alternate site is also unavailable, the site's sampling weight will be redistributed over the other segments of the same road type in its county. Let p_{isj} be the road segment selection probability for observation site j of segment s in county i, and

$$w_{isj} = \frac{1}{p_{isj}}$$

be the road segment weight. Weights for non-missing road segments of the same road type within the same county will be multiplied by the adjustment factor for a nonresponding site,

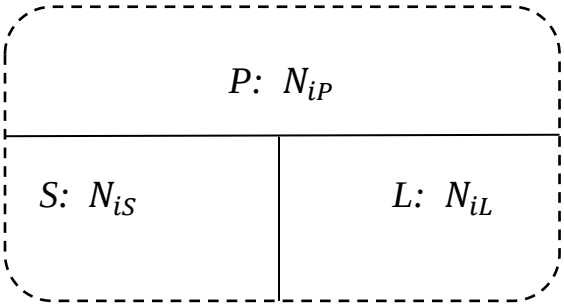
$$f_{is} = \frac{\sum_{all\ j} w_{isj}}{\sum_{responding\ j} w_{isj}}$$

and the missing road segments will be dropped from the analysis file. Moreover, since we will be left with fewer than two observed sites of segment type s within county i, we adjust our estimates by combining strata within the county. In other cases of nonresponse (e.g. cars with unobservable seat belt status), each site's initial sampling weight will be adjusted by multiplying by the reciprocal of its observed response rate. These adjustments are described in Section 5.4.

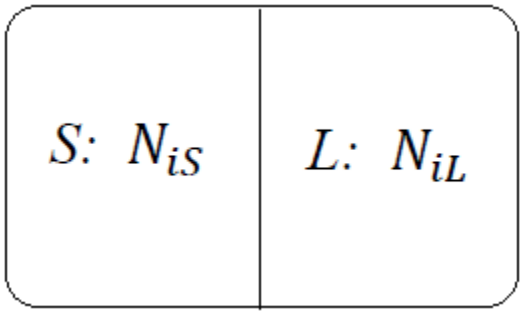
Estimators

5.4.1: Stratification and Allocation

County "i" can be considered a population comprised of 3 strata (i=1, …, 57): "P" = primary; "S" = secondary; and "L" = local segments. The numbers of segments in each stratum are N_{iP}, N_{iS} and N_{iL}, respectively. A county is represented as:



When a county does not have any primary road segments, it is represented as:



The size of the sample from each stratum is n_{iP}=2, n_{iS}=2 and n_{iL}=1, except for counties with 10,000,000 or higher DMVT, in which case n_{iL}=2.

5.4.2: Estimators

Within an observation site, the estimated seat belt use rate $\hat{\pi}_{isj}$ is calculated as:

$$\hat{\pi}_{isj} = \sum \frac{u_{dlv|isj} y_{dlv|isj}}{u_{dlv|isj}},$$

where $u_{dlv|isj}$ is the sampling weight of vehicle v in lane l travelling in direction d, and $y_{dlv|isj} = 1$ if a seat belt is in use and 0 if not. The vehicle sampling weight is defined as $u_{dlv|isj} = \frac{1}{p_{dlv|isj}} = \frac{1}{p_{d|isj} p_{l|isjd} p_{v|isjdl}}$, where, $p_{d|isj}$ represents the probability of traffic direction selection, $p_{l|isjd}$ is the probability of lane selection within direction, and $p_{v|isjdl}$ is the probability of vehicle selection within the lane.

County estimate (stratified estimator, adjusted for nonresponse)

The initial sampling weight for observation site j in stratum s within county i is the reciprocal, $\frac{N_{is}}{n_{is}}$, of the proportion of segments sampled within the stratum. If the response rate at the site is denoted r_{isj}, the nonresponse-adjusted weight, w_{isj}, is obtained by multiplying the initial sample weight by r_{isj}^{-1}; hence, $w_{isj} = \frac{N_{is}}{n_{is} r_{isj}}$. The county estimate for the rate of seat-belt use is then

$$\hat{\pi}_{C_i} = \frac{\sum_{s \in \{P,S,L\}} \sum_{j=1}^{n_{is}} w_{isj} \hat{\pi}_{isj}}{\sum_{s \in \{P,S,L\}} \sum_{j=1}^{n_{is}} w_{isj}}.$$

Region estimate

Suppose counties C_1, ... , C_R comprise a region. Then the region seat belt use estimate is given by

$$\hat{\pi}_{region} = \sum_{i=1}^{R} \left(\frac{N_{C_i}^*}{N_{region}^*} \right) \hat{\pi}_{C_i},$$

where $N_{region}^* = \sum_{i \in region} N_i^*$.

State estimate

The Ohio seat belt use estimate and its variance are similarly defined:

$$\hat{\pi}_{state} = \sum_{i=1}^{57} \left(\frac{N_i^*}{N_{state}^*} \right) \hat{\pi}_{C_i},$$

where $N_{state}^* = \sum_{i=1}^{57} N_i^*$.

5.4.3: Variance Estimation

To derive an estimate for the variance of $\hat{\pi}_{C_i}$, we first note that the county seat-belt use estimate above can be re-expressed as the algebraically-equivalent weighted-average of stratum-specific estimates:

$$\hat{\pi}^*_{C_i} = \sum_{s\in\{P,S,L\}} W^*_{is}\hat{\pi}_{is} = \frac{1}{N^*_i}\sum_{s\in\{P,S,L\}} N^*_{is}\hat{\pi}_{is}\,.$$

In addition to suggesting that counties are strata in the state, we are suggesting the use of stratified sampling of segment type {P, S, L} within each county. Thus, the county estimate is constructed as a weighting of estimates from each segment strata in a county. Here W_{is}* is the (non-response adjusted) proportion of road segments in county "i" that are of types. Note that this differs from the N_i*/N_{state}* weights that are used to combine county estimates into a state or region estimate.

In defining the component quantities, of $\hat{\pi}_{C_i}$ above, we take advantage of the fact that any stratum will have at most two observation sites (that is, $n_{is} \le 2$). For a stratum with two observation sites, we define the nonresponse-adjusted effective stratum size as $N^*_{is} = \frac{N_{is}}{2}\left(\frac{1}{r_{is1}} + \frac{1}{r_{is2}}\right)$ and the nonresponse-adjusted stratum seat belt use estimate as $\hat{\pi}_{is} = \hat{\pi}_{is1}\left(\frac{r_{is2}}{r_{is1}+r_{is2}}\right) + \hat{\pi}_{is2}\left(\frac{r_{is1}}{r_{is1}+r_{is2}}\right)$. For a stratum with only one observation site, these quantities are defined as $N^*_{is} = \frac{N_{is}}{r_{is1}}$ and $\hat{\pi}_{is} = \hat{\pi}_{is1}$. The overall effective county size is $N^*_i = N^*_{iP} + N^*_{iS} + N^*_{iL}$, and the final weights for in the formula above are given by $W^*_{iP} = \frac{N^*_{iP}}{N^*_i}$, $W^*_{iS} = \frac{N^*_{iS}}{N^*_i}$, and $W^*_{iL} = \frac{N^*_{iL}}{N^*_i}$, the nonresponse-adjusted effective proportion of each segment type sampled in county i.

When $n_{iL} = 1$, we combine the local and secondary sites together into a new strata (denoted with a subscript "N") to obtain the estimated variance of $\hat{\pi}^*_{C_i}$,, i.e., there are two stratum considered in the variance estimation, primary and secondary/local. Then estimated variance of $\hat{\pi}^*_{C_i}$ can then be expressed as

$$\hat{V}\left(\hat{\pi}^*_{C_i}\right) = \sum_{s\in\{P,N\}}\left[\frac{W^{*2}_{is}}{n_{is}}\sum_{j=1}^{n_{is}}\frac{\left(\hat{\pi}_{isj} - \hat{\pi}_{is}\right)^2}{n_{is}-1}\right].$$

- assuming the secondary and local sites are homogeneous
- $W^*_{iP} = \frac{N^*_{iP}}{N^*_i}$, $W^*_{iN} = \frac{N^*_{iS}+N^*_{iL}}{N^*_i}$
- ignoring FPC since $N_{iS} >> n_{iS}$

If $n_{iL} = 0$ because of nonresponse, i.e., neither the initially sampled site nor the reserve sample site is available, cells will be collapsed across strata within county in a similar manner.

Bound on error of estimate = $2\sqrt{\hat{V}\left(\hat{\pi}^*_{C_i}\right)}$

Confidence interval: $\hat{\pi}^*_{C_i} \pm 2\sqrt{\hat{V}\left(\hat{\pi}^*_{C_i}\right)}$

The variance of the region estimate is given by

$$\hat{V}\left(\hat{\pi}_{region}\right) = \sum_{i=1}^{R}\left(\frac{N^*_{C_i}}{N^*_{region}}\right)^2 \hat{V}\left(\hat{\pi}^*_{C_i}\right).$$

Error bounds and confidence intervals for the regional estimates are defined similarly to those for county estimates.

The variance of the state estimate is given by

$$\hat{V}(\hat{\pi}_{state}) = \sum_{i=1}^{57}\left(\frac{N^*_i}{N^*_{state}}\right)^2 \hat{V}\left(\hat{\pi}^*_{C_i}\right).$$

The error bound and confidence interval for the state estimate is defined similarly to those for county estimates.

All computations were performed using standard statistical software, such as SPSS, proc surveyreg in SAS, or the survey package in R.

RESULTS

Statewide Seat Belt Use

The official 2016 overall seat belt use rate for vehicle occupants from Ohio is 83.8% (Table 3), nearly identical to the 2015 rate of 83.9%. Due to the large sample size of 23,082 occupant observations (19,083 drivers plus 3,999 passengers), the survey has a confidence interval of approximately plus or minus 1.0%. An average of 81 vehicles and 97 occupants were observed per site.

Alone, the 2016 rate is a point estimate of seat belt use. Applying a confidence interval determines a range of values that allows seat belt use to be estimated with a desired amount of certainty. NHTSA guidelines specify a 95% confidence level and a confidence interval of plus or minus 5%. Using the statistical weighting procedures outlined in the methodology, we can be **95% certain** that Ohio's seat belt usage for all vehicle occupants is within approximately ± **1.0% of 83.8%**.

95% Confidence Interval: **82.8% - 84.8%**

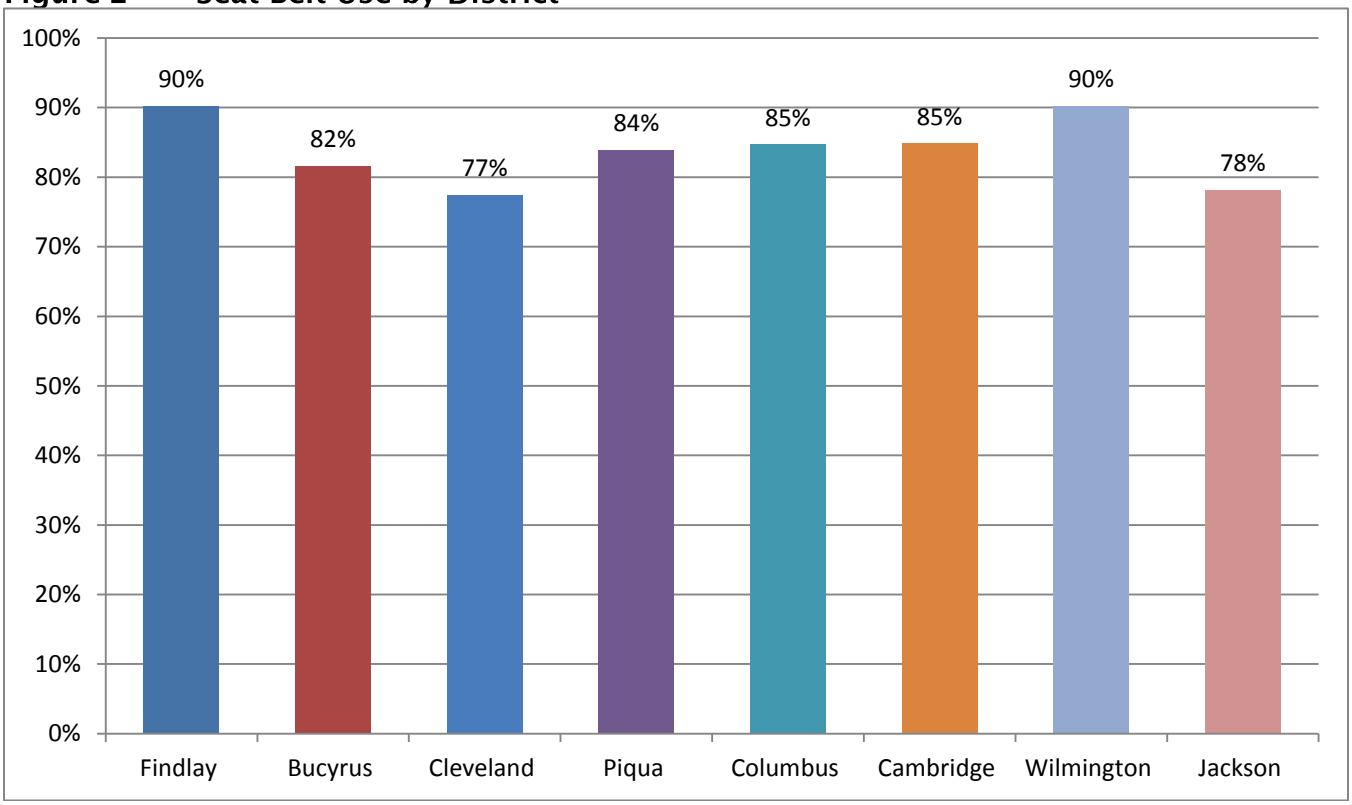
OSHP District Seat Belt Use

As illustrated in Table1 and Figure 2, Cleveland and Jackson Ohio State Highway Patrol (OSHP) Districts have lower seat belt use rates than other districts.

Table 1: OSHP District Usage Rates

OSHP	Usage Rate	Standard Error	Lower Bound	Upper Bound	Unweighted N
Findlay	90.2%	0.0122	0.8782	0.9262	2,338
Bucyrus	81.7%	0.0162	0.7848	0.8482	2,307
Cleveland	77.4%	0.0131	0.7481	0.7995	4,712
Warren	81.8%	0.0206	0.7773	0.8579	3,738
Piqua	84.8%	0.0054	0.8278	0.8490	2,399
Columbus	84.7%	0.0253	0.7970	0.8963	3,445
Cambridge	84.8%	0.0256	0.7979	0.8983	1,331
Wilmington	90.2%	0.0148	0.8733	0.9312	2,151
Jackson	78.1%	0.0283	0.7259	0.8367	661
Statewide	**83.8%**	**0.0070**	**0.8237**	**0.8513**	**23,082**

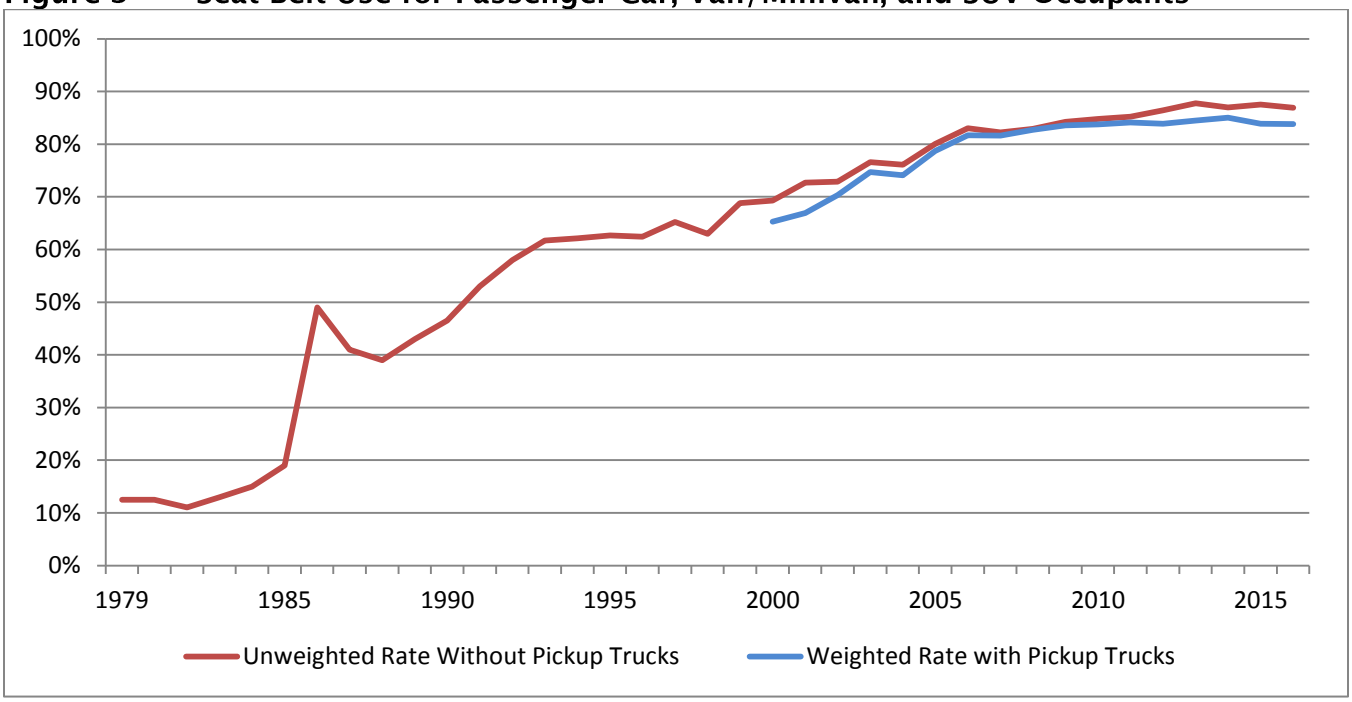
Figure 2 Seat Belt Use by District



It is important to note that the overall seat belt use estimate is based on all front outboard occupants observed in five vehicle types.[1] Because pickup trucks were excluded from the survey until 1998, the 2016 rate is only comparable to rates since 1998. Calculating the unweighted 2016 rate without trucks indicates a usage rate of approximately 86.9%, highlighting the detrimental effect of low seat belt use rates among truck occupants on the overall seat belt use rate. Figure 3 represents un-weighted seat belt usage excluding pickup trucks (in red). In comparison, the weighted rate including pickup trucks (in blue) shows that while the rate without pickup trucks is higher than when they are included, the rates converged until 2012, when the new methodology was implemented.

Commercial vehicles were excluded from these historically comparable rates as specified by NHTSA.

Figure 3 Seat Belt Use for Passenger Car, Van/Minivan, and SUV Occupants



[1] Data on four vehicle types—passenger cars, vans/minivans, sport utility vehicles, and pickup/light trucks—have been collected since the 1998 survey. The 2012 methodology update subdivided trucks into "light" and "heavy" classes; both are excluded from the unweighted rate in Figure 3.

Vehicle Type and Seat Belt Use

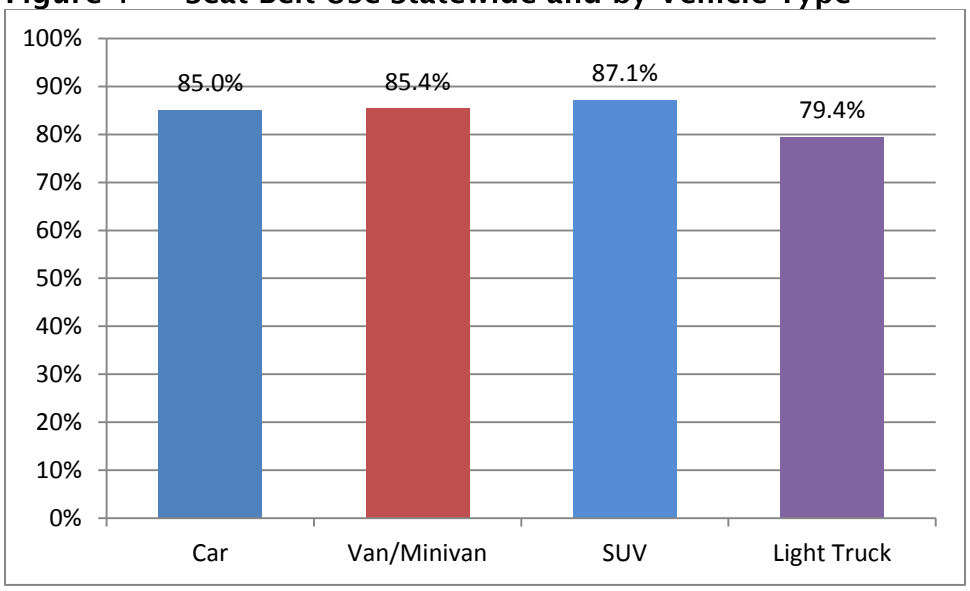
Following the pattern of previous surveys and expectations, light truck occupants had a significantly lower seat belt use rate than occupants of other vehicles types during 2016, presenting an opportunity to increase overall seat belt use in the future (see Table 2).

Table 2: Seat Belt Use by Vehicle Type[2]

			95% Confidence Interval		
Vehicle Type	**Usage Rate**	**Standard Error**	**Lower Bound**	**Upper Bound**	**Unweighted n**
Passenger Car	85.0%	0.0081	0.8341	0.8659	10,515
Van/Minivan	85.4%	0.0096	0.8349	0.8728	2,294
SUV	87.1%	0.0134	0.8445	0.8971	6,162
Light Truck	79.4%	0.0184	0.7581	0.8301	3,404
Statewide	**83.8%**	**0.0070**	**0.8237**	**0.8513**	**23,057**

Figure 4 illustrates the extent to which van/minivan and SUV occupant seat belt use exceeds the passenger car occupant use rate and, especially, the light truck occupant use rate.

Figure 4 Seat Belt Use Statewide and by Vehicle Type



The results for each vehicle type by OSHP district are presented in Table 3. As shown, occupants of light trucks had a significantly lower rate of seat belt use than occupants in all other vehicle types in every district. Seat belt use was lowest among light truck occupants in the Warren, Cleveland and Jackson districts.

[2] Insufficient heavy truck observations for accurate weighting. Unweighted rate is 79.8% of 678 occupants.

Table 3: Vehicle Type Usage Rates by OSHP District

Region	Passenger Car	Unweighted N	Van / Minivan	Unweighted N	SUV	Unweighted N	Light Truck	Unweighted N
Findlay	92.5%	1,112	84.8%	254	93.7%	605	83.2%	365
Bucyrus	80.7%	962	82.7%	219	86.8%	724	78.0%	309
Cleveland	78.4%	2,168	81.1%	370	82.1%	1,426	73.5%	571
Warren	83.7%	1,718	89.7%	469	82.2%	861	70.8%	567
Piqua	87.7%	1,146	85.1%	318	88.2%	472	77.8%	425
Columbus	87.0%	1,404	83.3%	311	85.5%	1,045	79.4%	523
Cambridge	87.3%	535	89.7%	126	85.3%	346	81.1%	222
Wilmington	88.4%	1,173	95.6%	175	93.4%	513	86.9%	280
Jackson	76.8%	297	83.5%	52	82.3%	170	73.8%	142
Statewide	**85.0%**	**10,515**	**85.4%**	**2,294**	**87.1%**	**6,162**	**79.4%**	**3,404**

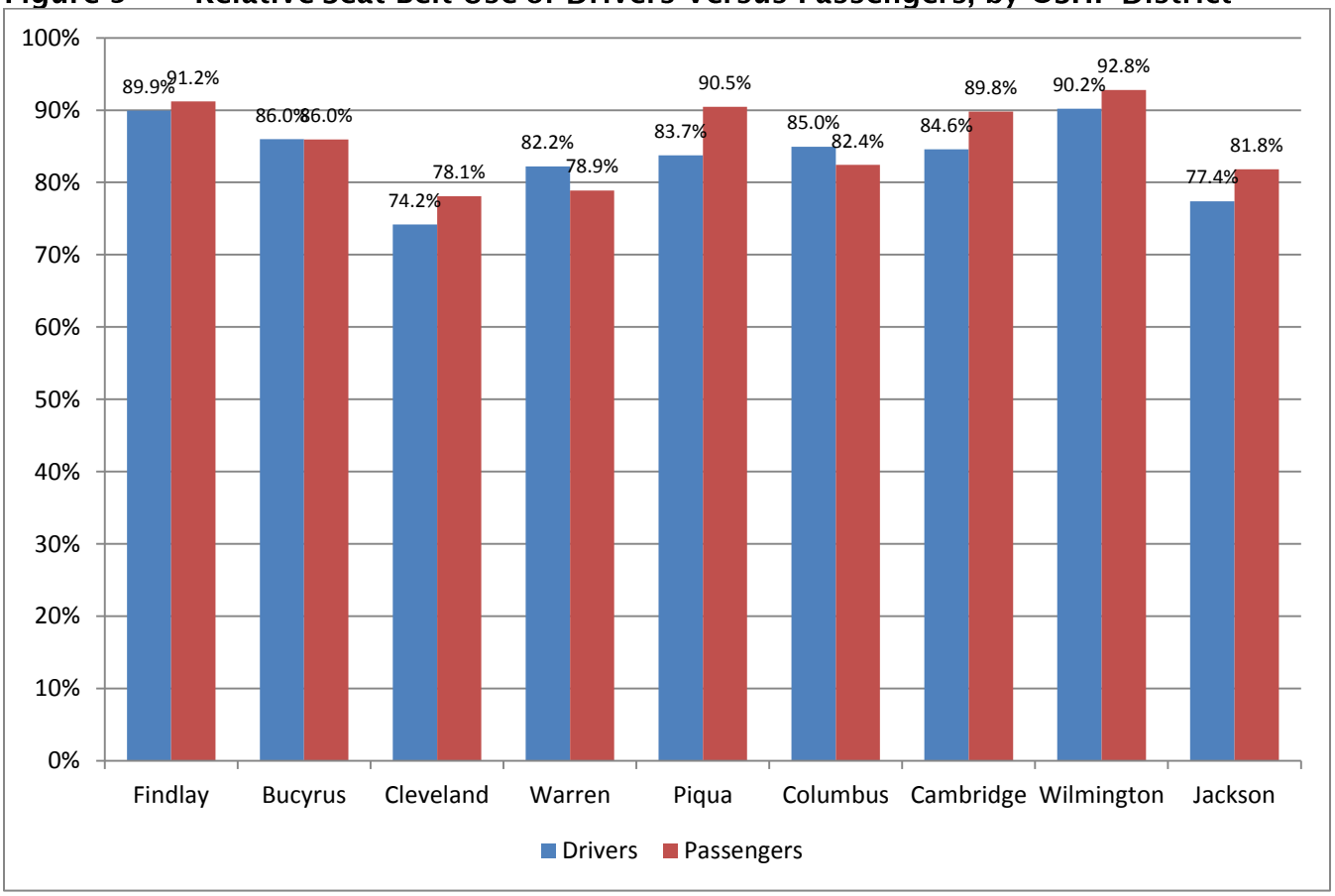
Driver and Passenger Seat Belt Use

Ohio's seat belt observation survey has traditionally found differences between drivers and passengers in their rates of seat belt use, although the two rates are strongly correlated and reciprocal. Table 4 depicts the results for drivers and passengers, respectively, by OSHP district. Meanwhile, Figure 5 illustrates the relative differences by OSHP districts.

Table 4: Driver and Passenger Usage Rates by OSHP District

Region	Drivers	Unweighted N	Passengers	Unweighted N
Findlay	89.9%	1,873	91.2%	465
Bucyrus	81.3%	1,751	83.7%	556
Cleveland	77.7%	4,012	78.1%	700
Warren	82.2%	3,026	78.9%	712
Piqua	83.7%	1,992	90.5%	407
Columbus	85.0%	2,925	82.4%	520
Cambridge	83.4%	1,085	89.1%	246
Wilmington	90.2%	1,860	92.8%	291
Jackson	77.4%	559	81.8%	102
Statewide	**83.7%**	**19,083**	**85.5%**	**3,999**

Figure 5 Relative Seat Belt Use of Drivers Versus Passengers, by OSHP District



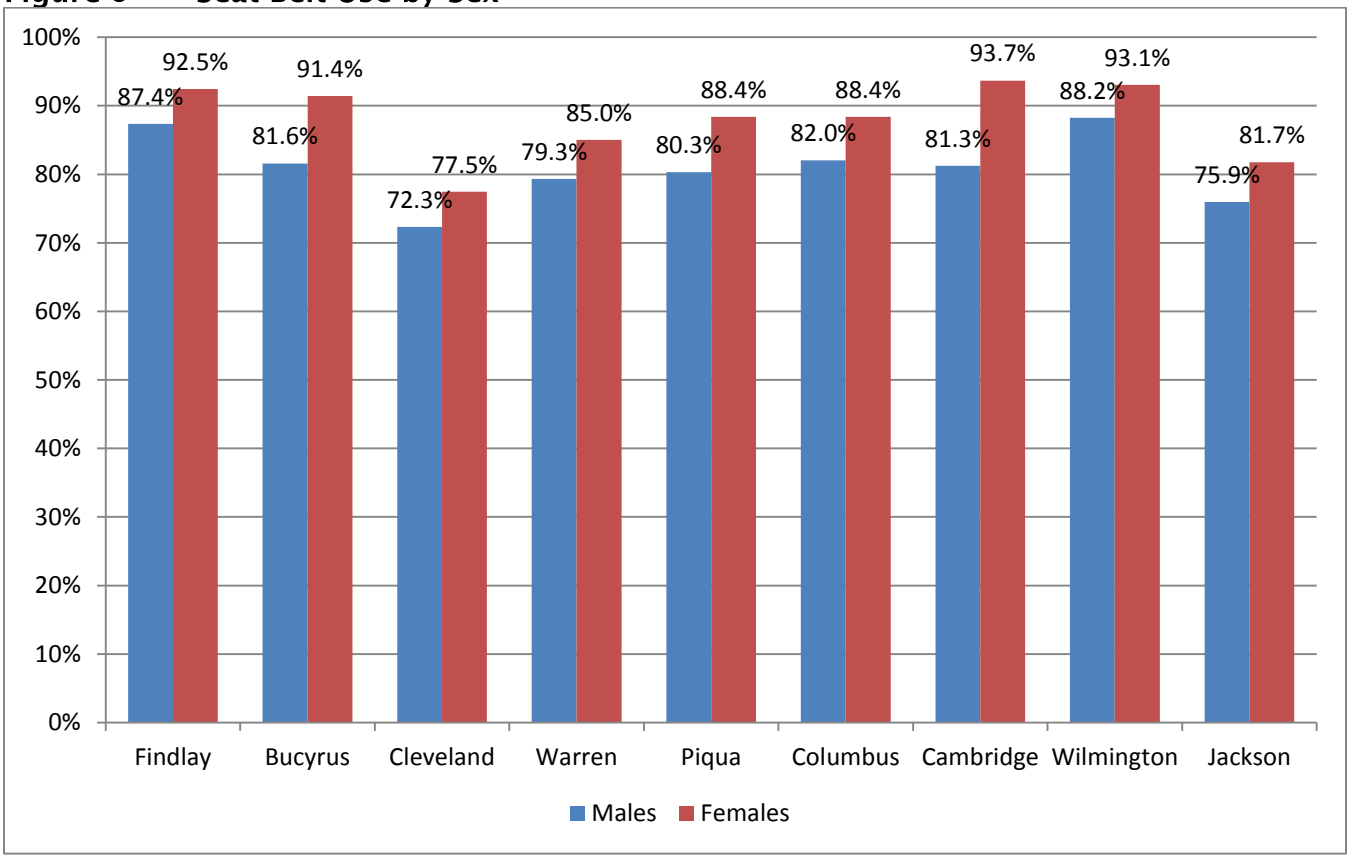
Sex of Vehicle Occupants and Seat Belt Use

Separate estimates were generated for male and female front outboard occupants. Consistent with past Ohio survey results, female occupants had higher rates of seat belt use than did male occupants. The disparity was greatest in the Cambridge district and least in the Wilmington district. (Table 5). Figure 6 illustrates a comparison of the results by district.

Table 5: Male and Female Usage Rates by OSHP District

Region	Male	Unweighted N	Female	Unweighted N
Findlay	87.4%	1,165	92.5%	1,165
Bucyrus	78.2%	1,240	85.9%	1,064
Cleveland	75.2%	2,706	80.7%	1,978
Warren	79.3%	2,029	85.0%	1,701
Piqua	80.3%	1,303	88.4%	1,093
Columbus	82.0%	1,943	88.4%	1,502
Cambridge	80.2%	775	92.1%	555
Wilmington	88.2%	1,189	93.1%	959
Jackson	75.9%	374	81.7%	286
Statewide	**81.1%**	**12,724**	**87.3%**	**10,303**

Figure 6 Seat Belt Use by Sex



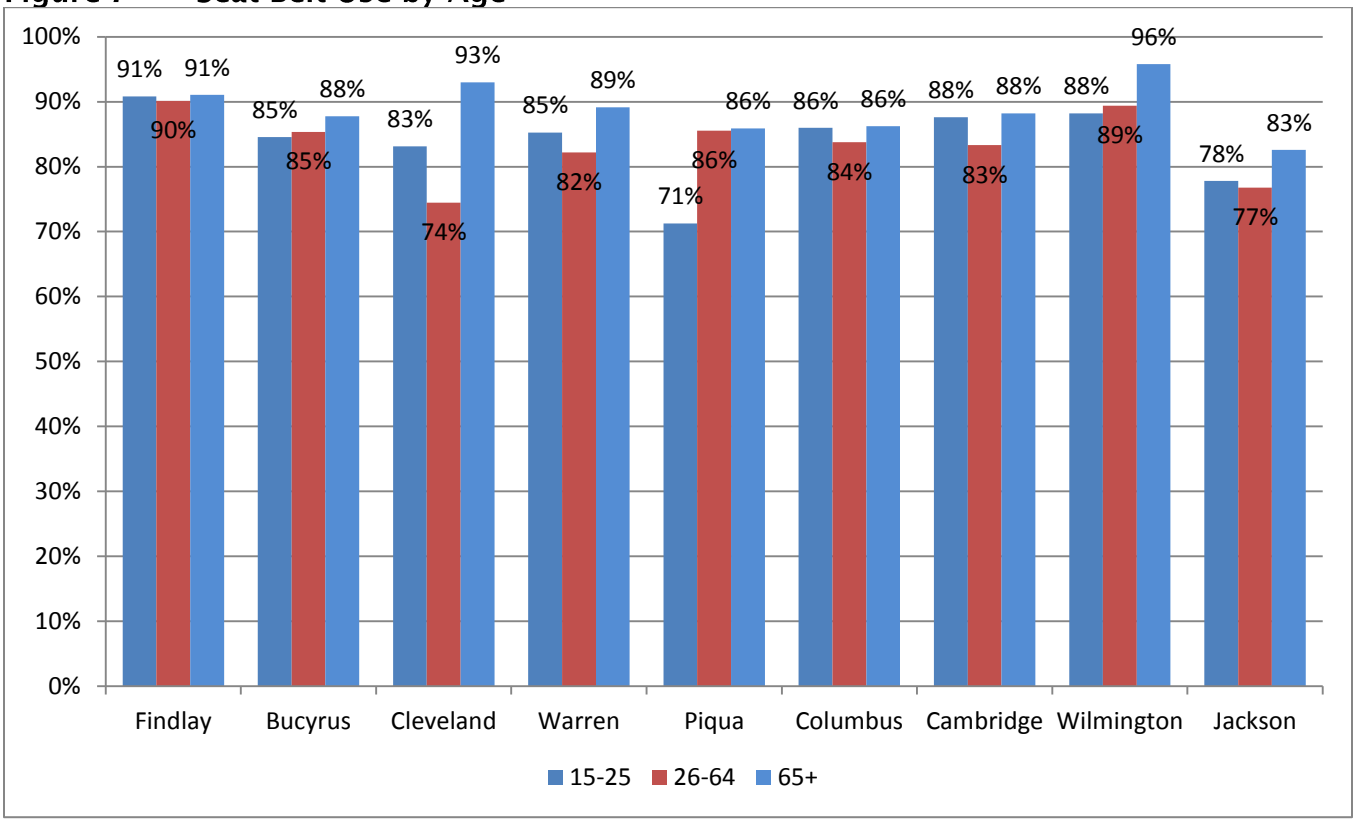
Age of Vehicle Occupants and Seat Belt Use

Compared to other age groups, seat belt use was lowest (83.6%) among vehicle occupants age 26-64. However, seat belt use increases among older occupants, reaching 90.0% among occupants age 65 and older. Table 6 summarizes the results for each age group by OSHP district. A comparison of these results by district is contained in Figure 7.

Table 6: Age Group Usage Rates by OSHP District

Region	15-25	Unweighted N	26-64	Unweighted N	65+	Unweighted N
Findlay	90.8%	415	90.1%	1,550	91.1%	331
Bucyrus	79.2%	241	80.8%	1,648	86.2%	381
Cleveland	86.0%	229	77.9%	4,170	92.8%	253
Warren	85.3%	1,094	82.2%	2,045	89.2%	523
Piqua	71.2%	295	85.5%	1,707	85.9%	359
Columbus	86.0%	502	83.8%	2,284	86.3%	610
Cambridge	86.8%	232	82.2%	890	86.9%	182
Wilmington	88.2%	434	89.4%	1,297	95.8%	399
Jackson	77.8%	124	76.8%	438	82.6%	94
Statewide	**84.9%**	**3,566**	**83.6%**	**16,029**	**90.0%**	**3,132**

Figure 7 Seat Belt Use by Age



There were too few occupants younger than 15 to accurately estimate seat belt use for children. Historically, however, children's restraint use has been relatively low and may be hampered by parents' misunderstanding of, or simply not owning, booster and/or safety seats for the youngest passengers.

Race of Vehicle Occupants and Seat Belt Use

Beginning in 2004, the observation survey assessed seat belt use by race: Caucasian, African-American, and individuals of other races ("other"). The present observation methodology precluded the collection of more detailed race information; therefore, these surveys provide data on seat belt use primarily by Caucasians and African-Americans. Also, due to the demographic characteristics of Ohio and the difficulty of clearly determining race with the current methodology, the number of vehicle occupants identified as African-American was relatively small (n = 1,339) and is probably an underrepresentation of the number of African-American drivers and front-seat passengers using Ohio roads. Due to the low number of African-Americans in the survey, an accurate weighted estimate of their seat belt use rate was unable to be determined with accuracy. The Cleveland OSHP district has more than four times as many observations of African-Americans as the next closest district of Columbus, so rates in that district may be more representative than others. Table 7 shows unweighted rates for both African-Americans and Caucasians, but these results should be interpreted with caution. The weighted rates for Caucasians are included in the final column for comparison.

The lack of observed data for African-Americans presents both a challenge and opportunity for increasing overall seat belt use in Ohio, and reducing the number of fatalities and serious injuries suffered by African-Americans.

Table 7: Racial/Ethnic Group Usage Rates by OSHP District

Region	African-American	Unweighted N	Caucasian	Unweighted N	Caucasian (Weighted Rates)
Findlay	84.1%	69	89.3%	2,255	90.2%
Bucyrus	80.0%	65	89.6%	2,183	86.4%
Cleveland	70.2%	574	78.9%	3,982	76.6%
Warren	75.1%	197	82.3%	3,486	82.2%
Piqua	77.0%	87	86.4%	2,296	84.0%
Columbus	81.5%	173	87.5%	3,188	85.4%
Cambridge	71.4%	21	88.4%	1,305	86.1%
Wilmington	88.0%	125	93.6%	1,998	91.8%
Jackson	67.9%	28	76.2%	630	78.3%
Statewide	**75.7%**	**1,339**	**85.6%**	**21,323**	**84.6%**

Observation Site Type and Seat Belt Use

Table 8 summarizes the results for usage by observation site type and by OSHP district.

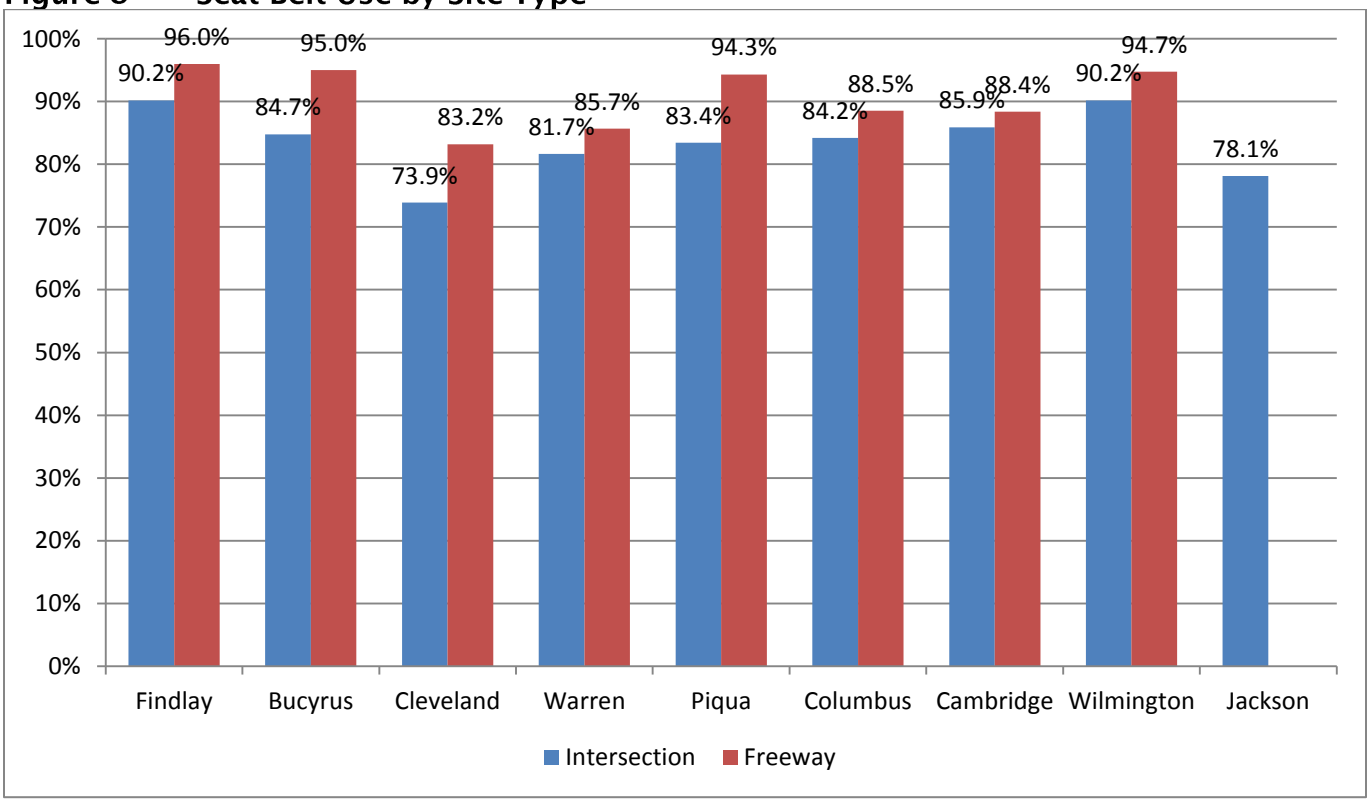
Table 8: Seat Belt Use by Site Type and OSHP District

Region	Intersection	Unweighted N	Freeway	Unweighted N
Findlay	90.2%	1,465	96.0%	305
Bucyrus	80.0%	1,220	94.3%	531
Cleveland	77.3%	2,176	81.0%	1,836
Warren	81.7%	2,196	85.7%	830
Piqua	83.4%	1,228	94.3%	764
Columbus	84.2%	1,535	88.5%	1,390
Cambridge	84.7%	541	88.4%	544
Wilmington	90.2%	1,003	94.7%	857
Jackson	78.1%	559	-	0
Statewide	**83.5%**	**11,923**	**89.6%**	**7,057**

As seen in previous years, seat belt use is higher on limited access roadways (i.e., interstates and expressways). This is most likely due to the greater perceived risk and subsequent behavior associated with travel at higher speeds on limited access roadways and, on average, with traveling relatively longer distances on such roadways.

A comparison of weighted seat belt use rates by site designation and OSHP district is illustrated in Figure 8.

Figure 8 Seat Belt Use by Site Type



Observation Road Designation and Seat Belt Use

Table 9 and Figure 9 summarize the results for usage by observation site designation.

Starting in 2012, the analysis also included a separate road type category, distinguishing "primary" routes (interstate highways) and "secondary" routes (U.S. and state routes) from municipal/rural routes. Since there are fewer municipal roads in the survey and comparatively fewer observations for municipal routes, the weighted estimate for such roads was unable to be accurately determined.

Table 9: Seat Belt Use by Road Type and OSHP District (Weighted)

Region	Primary	Unweighted N	Secondary	Unweighted N
Findlay	94.3%	680	84.4%	920
Bucyrus	95.1%	508	80.5%	1,046
Cleveland	80.1%	1,675	84.7%	1,656
Warren	81.8%	1,017	82%	1,571
Piqua	88.3%	696	84.5%	1,037
Columbus	81.8%	1,150	88.0%	1,215
Cambridge	88.4%	544	82.3%	471
Wilmington	94.7%	857	92.9%	788
Jackson[3]	-	-	78.1%	559
Statewide	**84.5%**	**7,127**	**85.7%**	**9,263**

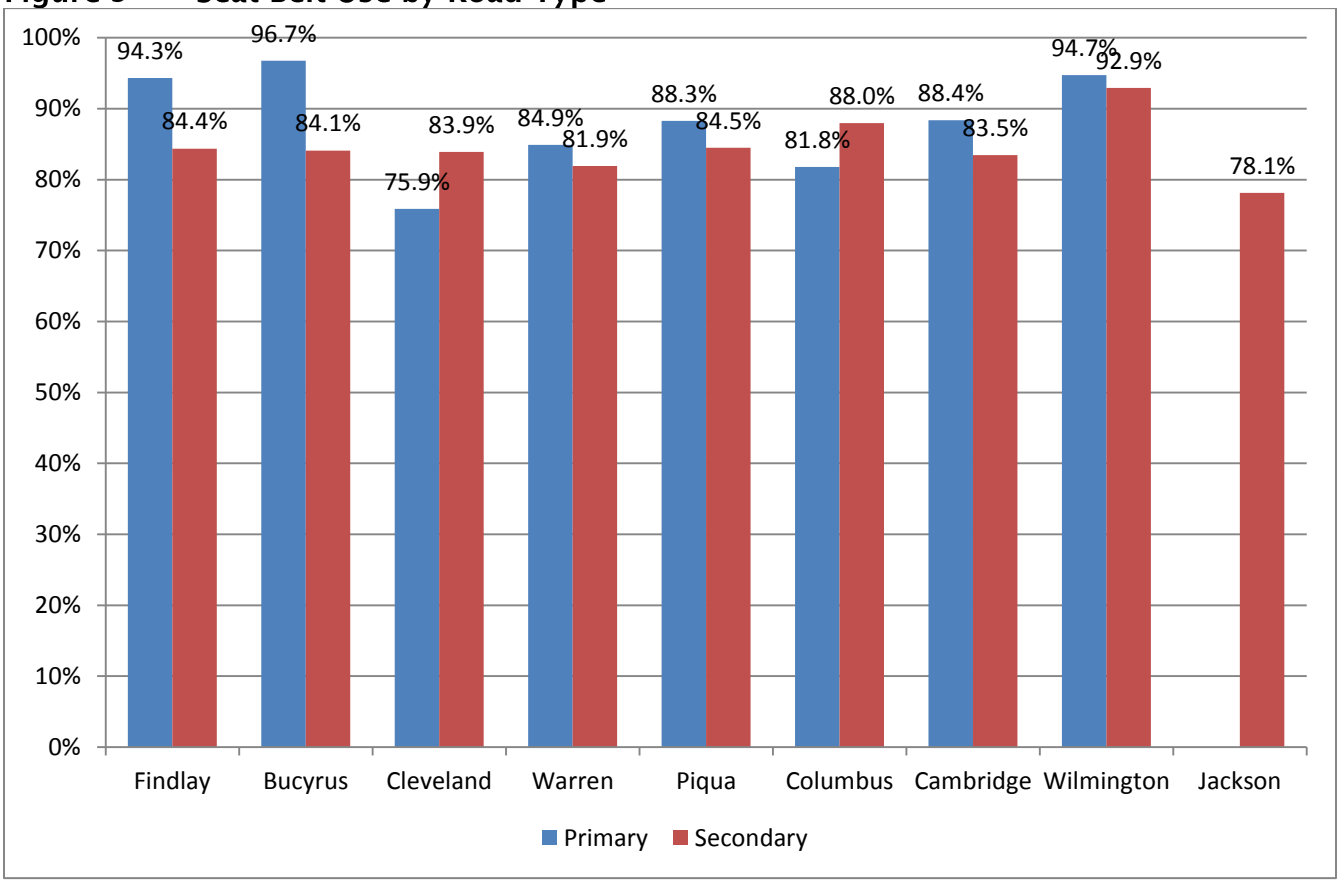
The unweighted rates for primary, secondary, and local roads are contained in Table 10. Figure 9 illustrates the weighted results by road type and region.

Table 10: Seat Belt Use by Road Type and OSHP District (Unweighted)

Region	Primary	Unweighted N	Secondary	Unweighted N	Local	Unweighted N
Findlay	93.7%	680	84.1%	920	91.2%	273
Bucyrus	98.1%	508	84.3%	1,046	88.9%	197
Cleveland	78.3%	1,675	78.3%	1,656	73.6%	681
Warren	86.1%	1,017	79.3%	1,571	81.7%	438
Piqua	88.3%	696	85.1%	1,037	83.4%	259
Columbus	88.5%	1,150	87.2%	1,215	84.4%	560
Cambridge	89.2%	544	86.4%	471	92.6%	70
Wilmington	95.6%	857	92.3%	788	86.9%	215
Jackson	-	-	75.8%	559		0
Statewide	**88.0%**	**7,127**	**83.1%**	**9,263**	**82.7%**	**2,693**

[3] There are no primary segments in Jackson OSHP district.

Figure 9 Seat Belt Use by Road Type



Cross-tabulations of Observation Characteristics and Seat Belt Use

The seat belt use rates in Tables 11 through 13 and Figures 10 through 12 are based on several demographic, occupant, and vehicle characteristics. As indicated and consistent with previous survey results, male light truck drivers age 15-25 had the lowest seat belt usage rate of all drivers, while female van/minivan occupants aged 65 years or older had higher rates than other drivers. Many of the passenger seat belt use rates are based on relatively few observations and thus have a larger sampling error. That caveat should be kept in mind when interpreting data in those categories. However, these rates do indicate that passengers of light trucks had relatively low usage rates.

Table 11: Driver and Passenger Usage Rates by Age and Sex

		Drivers	Unweighted N	Passengers	Unweighted N
Ages 15-25	Males	81.4%	1,410	65.2%	336
	Females	88.3%	1,428	87.1%	388
Ages 26-64	Males	82.5%	8,189	74.1%	796
	Females	87.6%	5,603	90.1%	1,418
Ages 65+	Males	87.0%	1,618	85.4%	185
	Females	92.2%	765	92.5%	558

Table 12: Driver and Passenger Usage Rates by Age and Vehicle Type

		Drivers	Unweighted N	Passengers	Unweighted N
Ages 15-25	Passenger Car	86.1%	1,679	81.6%	375
	Van / Minivan	85.4%	171	66.1%	62
	SUV	87.7%	625	84.3%	153
	Light Truck	73.3%	329	63.0%	119
Ages 26-64	Passenger Car	85.5%	5,940	85.1%	864
	Van / Minivan	87.4%	1,347	90.5%	294
	SUV	87.3%	3,848	88.6%	639
	Light Truck	76.0%	2,165	73.6%	341
Ages 65+	Passenger Car	89.1%	1,184	90.5%	335
	Van / Minivan	87.8%	254	92.5%	106
	SUV	91.2%	578	93.4%	213
	Light Truck	83.1%	331	82.7%	75

Table 13: Driver and Passenger Usage Rates by Sex and Vehicle Type

		Drivers	Unweighted N	Passengers	Unweighted N
Males	Passenger Car	84.5%	4,847	78.9%	568
	Van / Minivan	85.3%	948	79.2%	173
	SUV	86.7%	2,339	84.0%	344
	Light Truck	76.1%	2,572	60.5%	304
Females	Passenger Car	88.0%	3,970	89.0%	1,103
	Van / Minivan	89.6%	826	92.4%	341
	SUV	88.9%	2,712	91.4%	752
	Light Truck	82.1%	257	86.8%	265

Figure 10 Seat Belt Use by Age and Sex

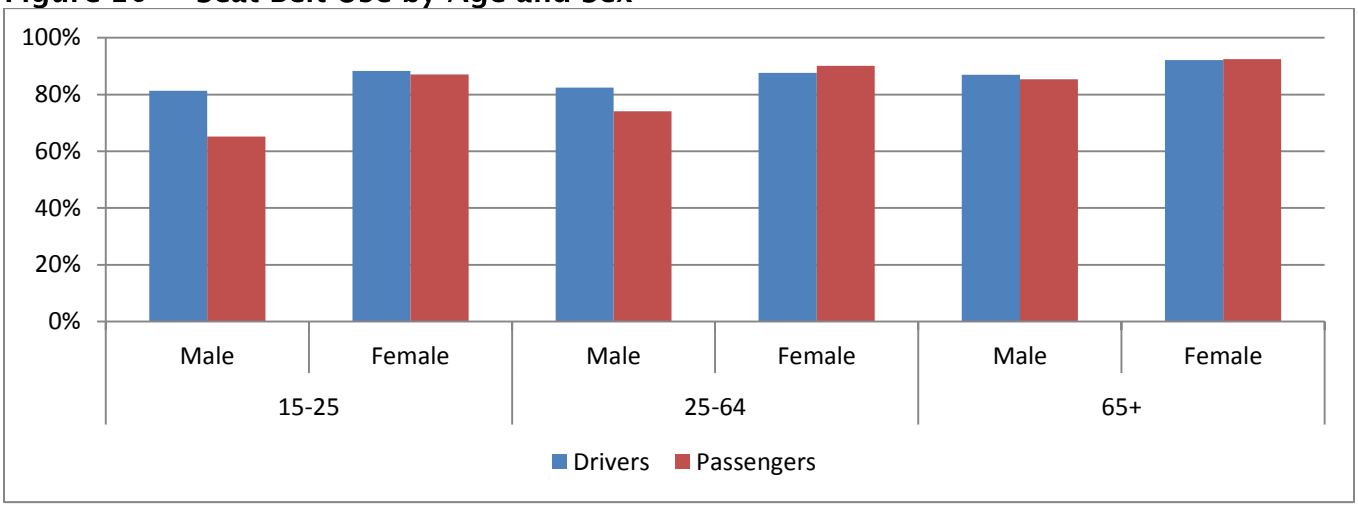


Figure 11 Seat Belt Use by Age and Vehicle Type

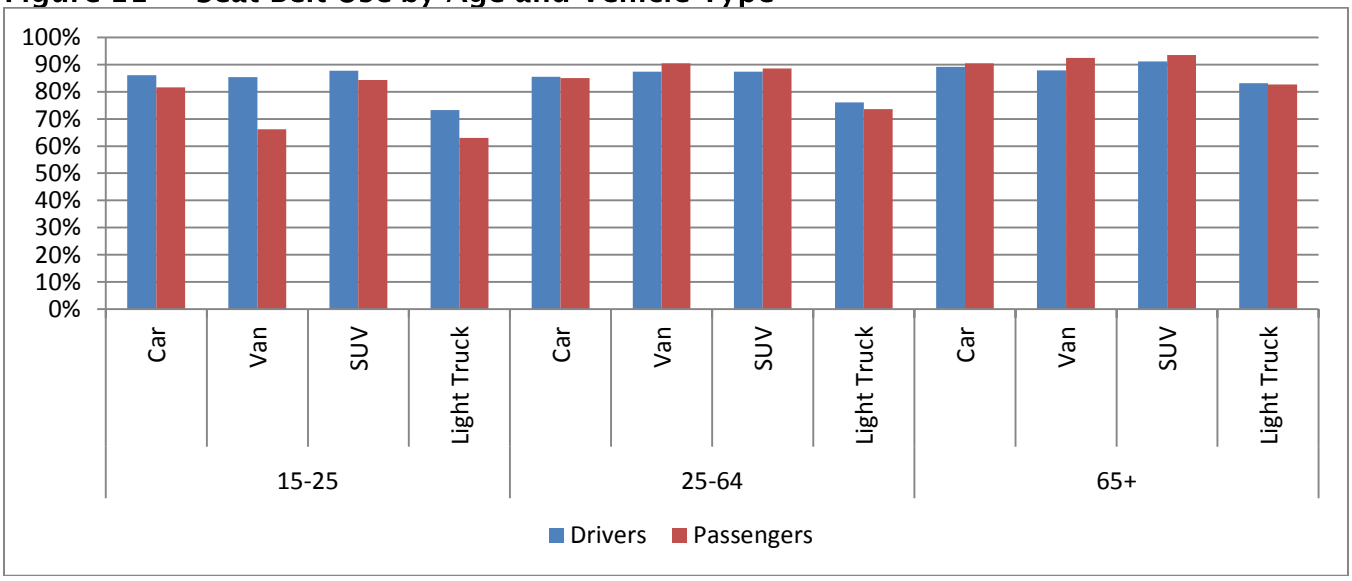
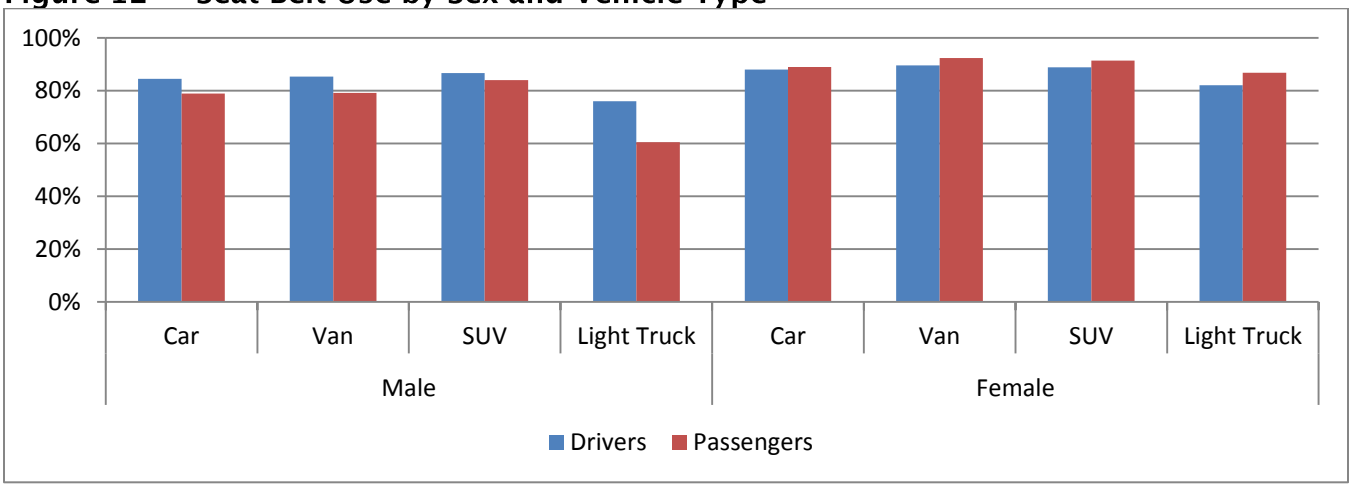


Figure 12 Seat Belt Use by Sex and Vehicle Type



Media and Enforcement Interventions

The 2016 Observational Seat Belt Study reports only results from the second observational survey which occurred in June, after multiple interventions, including media campaigns and enforcement initiatives such as *Click It or Ticket*. Therefore, it is useful to compare usage rates between both surveys, shown in Figure 13. The increase in seat belt use between surveys is consistent with data from prior years. This increase may at least partially be attributed to the efforts by federal and state agencies to encourage seat belt use by Ohio vehicle occupants. However, as shown in Figure 14, not all districts experienced increases in seat belt use rates; Piqua and Jackson districts saw a slight drop-off in use rates during the June survey. In contrast, the rural Findlay district showed relatively better post-intervention rates than districts with traditionally high seat belt use rates.

Figure 13 2015 Seat Belt Use by Survey Number

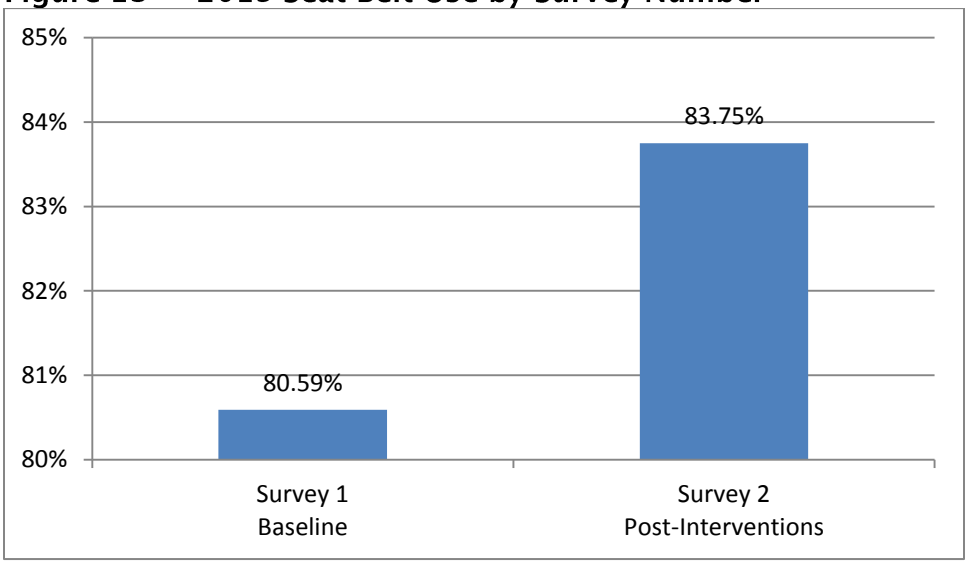
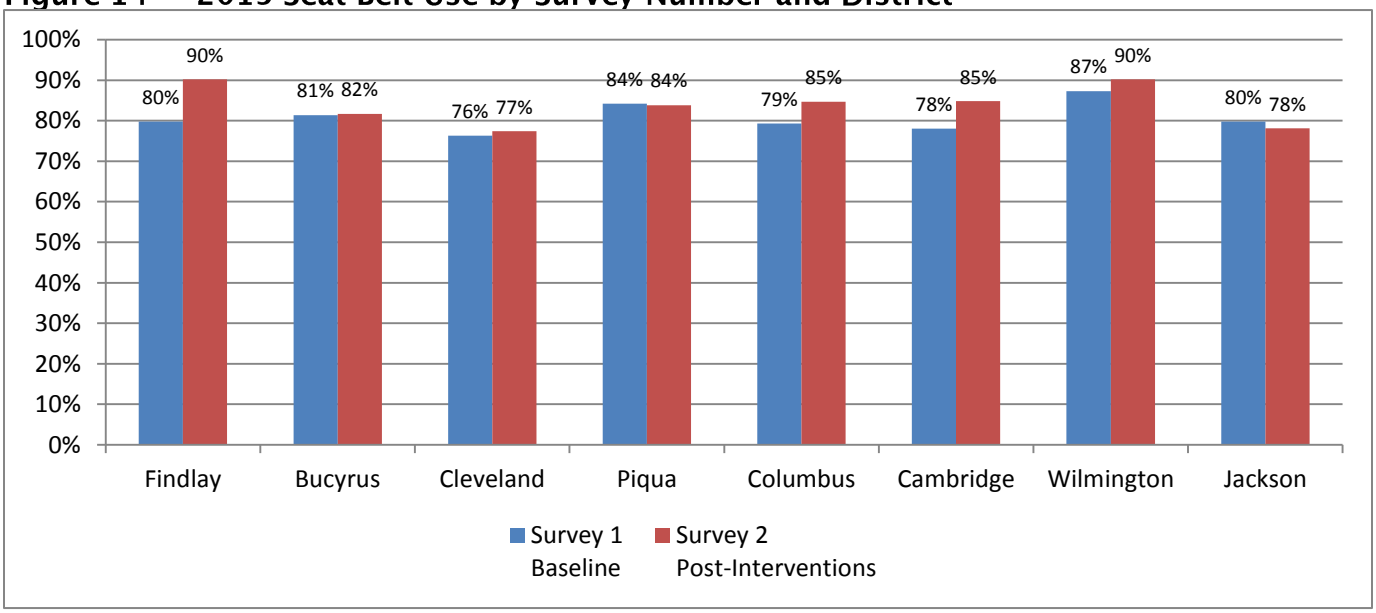


Figure 14 2015 Seat Belt Use by Survey Number and District



CONCLUSIONS

As reported, the 2016 overall Ohio seat belt use rate is 83.8%, nearly identical to the 2015 rate of 83.9%. Without a primary seat belt law in Ohio, greater compliance with the present secondary seat belt law must occur among those populations that consistently have relatively low rates of seat belt use. Hence, media and enforcement initiatives; which promote greater seat belt use, must be strengthened; become ongoing, rather than periodic; and be directed disproportionately at the following populations:

- Vehicle occupants in rural counties/districts
- Vehicle occupants age 15-25
- Male vehicle occupants
- Light truck occupants

One approach to increasing seat belt use is cited by Williams and Wells (2004: 179). They maintain that what is necessary in the United States to achieve seat belt use rates of 90% or greater is widespread, methodical, and sustained application of enforcement programs, augmented by the use of creative publicity campaigns. Another approach is the passage of a primary seat belt law, which could initially increase overall use rates by as much as 6%. A primary law could continue to increase seat belt use in diminishing increments thereafter, until a state maximum level is reached. The passage of a primary seat belt law could give Ohioans the "push" they need to comply with seat belt laws. A policy white paper by the Applied Research Center outlined Ohioans' support for a primary law and their intent to obey it, based on statewide telephone surveys conducted yearly (Seufert, Kubilius, & Walton, 2007). Public support for a primary law is very promising. However, in absence of a primary seat belt law, Ohio can only strive to achieve a seat belt use rate of 85% or greater through widespread, methodical, and sustained enforcement programs and creative media campaigns directed disproportionately at the above groups who are least compliant with Ohio's existing seat belt law.

RECOMMENDATIONS

The 2016 Observation Survey of Seat Belt Use increases and reaffirms knowledge about Ohioans who are and are not using seat belts. While the survey results show incremental gains in seat belt use overall and in many subpopulations, the following groups have again been identified as meriting special attention due to relatively low usage rates: Vehicle occupants in the Jackson and Cleveland districts; young drivers and their passengers; male drivers and their passengers; and light truck drivers and passengers. For the most part, these groups are identical to those identified during previous surveys. Furthermore, without a state primary seat belt law, increasing compliance with existing law by occupants with these characteristics is necessary to achieve a statewide seat belt use rate of 85% or greater.

1. **Rural OSHP District Vehicle Occupants:** During 2016, compared to other Ohio districts, the Jackson and Cleveland OSHP districts had the lowest seat belt use rates (78% and 77%, respectively). The Jackson district comprises mainly rural counties, only three of which are part of the statewide sample. As a result, most of those observation sites are intersections, which typically have lower usage rates than freeway ramps. Also, a higher proportion of occupants were observed in light trucks in rural districts than in other areas of the state. Once again, light truck drivers and their passengers are a high risk subpopulation. Due to changes in Ohio State Highway Patrol District designations over the years, it is harder to determine why the Cleveland district has low seat belt use in 2016; this could be a statistical anomaly, but close observation going forward is warranted.

2. **Vehicle Occupants Age 15 -25:** Vehicle occupants age 15-25 has improved somewhat to nearly 85%. It is much lower in rural districts; for example, the Piqua district seat belt usage rate of 71% for occupants age 15-25 is lowest of the eight districts. Since motor vehicle crashes are the leading cause of death among people age 15-20 (NHTSA, 2005), increasing seat belt use among young drivers and passengers is especially imperative. Therefore, increased statewide and targeted law enforcement and education initiatives should be directed toward this population. The life-saving rationale for greater seat belt use should be clearly emphasized. Also, innovative drivers' education programs and other initiatives aimed at increasing driving skill, knowledge, judgment, and personal responsibility among novice drivers would be highly beneficial.

3. **Male Vehicle Occupants:** Overall, male drivers and passengers are significantly less likely to wear seat belts in comparison with female drivers and passengers. For instance, during 2016 and previous years, male driver and passenger seat belt usage rates were significantly lower than rates for female passengers regardless of vehicle type. Thus, messages designed to promote belt use should be directed specifically to males and their "significant others." By appealing to their sense of responsibility toward their families, children, and friends, as well as emphasizing the tangible safety benefits, male seat belt use should increase. Coupled with strict law enforcement, this multi-faceted effort would increase seat belt use among males both while driving and riding as passengers.

4. **Light Truck Occupants:** The 2016 light truck occupant seat belt use rate is 79.4%. As in previous years, light truck occupants (formerly designated as pickup truck occupants) are one of the most important groups on which to focus media and enforcement initiatives. These individuals, and especially male pick-up truck drivers and their passengers of all ages, generally have significantly lower seat belt usage rates than occupants of other vehicles. The exception in 2016 are light truck occupants in the Wilmington and Findlay OSHP districts, with seat belt use rates of 87% and 83%, respectively. Among male occupants of light trucks, 76% of drivers and 61% of passengers wore seat belts. In contrast, usage rates are 82% for female light truck drivers and 87% for female light truck passengers. The usage rate is also low for light truck drivers and passengers ages 15 to 25, at 73% and 63%, respectively. Overall, 15% of drivers and passengers occupied light trucks during the 2016 survey. Based on the percentage of all registered vehicles in Ohio that are light trucks, the percent that are involved in fatal crashes, and the low compliance with seat belt law among light truck occupants, this group is at higher risk for death or serious injury from crashes. Therefore, increasing seat belt use among light truck drivers and passengers, especially males, is very important to reduce Ohio's traffic-related fatalities and serious injuries.

In summary, innovative and sustained actions by the ODPS and the OJCS on the above four recommendations should be directed disproportionately at the above "high risk" groups in order to achieve significantly higher seat belt use in Ohio. In addition, concerned Ohioans should continue to pursue the passage of a primary seatbelt law. For instance, surveys of a representative sample of Ohioans with valid driver's licenses illustrate that a majority would favor a primary seat belt law for the state, would obey such a law, and believe a primary law would have a significant positive impact on highway safety in Ohio (Seufert et. al., 2003-2009). Furthermore, a state can expect to experience a marked increase in seat belt use—perhaps 5% or more—with the passage of a primary seat belt use law. This may be particularly important in light of the fact that seat belt use has increased only incrementally during the last decade. Therefore, positive outcomes on seat belt use resulting from ODPS and OJCS actions on the above four recommendations would be further enhanced and sustained by passage of a primary seatbelt law.

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APPENDIX A: SITE LOCATIONS

Site Number	OHSP Region	Geographical Region	County	Road to be Observed
1	Columbus	CN	Delaware	I-71
2	Columbus	CN	Delaware	I-71
3	Columbus	CN	Delaware	US Hwy 42
4	Columbus	CN	Delaware	S Old State Rd (County Rd 10)
5	Columbus	CN	Delaware	SR 37 / E Cherry St
6	Columbus	CN	Fairfield	I- 70
7	Columbus	CN	Fairfield	I- 70
8	Columbus	CN	Fairfield	N Memorial Dr
9	Columbus	CN	Fairfield	SR-256
10	Columbus	CN	Fairfield	Fairfield Beach Rd NE
11	Columbus	CN	Franklin	I-71
12	Columbus	CN	Franklin	I- 270
13	Columbus	CN	Franklin	Southeast Expressway
14	Columbus	CN	Franklin	W Innerbelt (OH 315)
15	Columbus	CN	Franklin	Farmers Dr
16	Columbus	CN	Franklin	Foster Ave
17	Columbus	CN	Knox	Martinsburg Rd (Market St in Martinsburg) / OH-586
18	Columbus	CN	Knox	SR-3
19	Columbus	CN	Licking	I-70
20	Columbus	CN	Licking	I-70
21	Columbus	CN	Licking	Marion Rd NW
22	Columbus	CN	Licking	Worthington Rd
23	Columbus	CN	Licking	N 21st St
24	Columbus	CN	Madison	I- 71
25	Columbus	CN	Madison	I- 70
26	Columbus	CN	Madison	State Rte 323
27	Columbus	CN	Madison	OH-29 / Urbana-West Jefferson Rd
28	Columbus	CN	Madison	W Jefferson-Kiousville Rd
29	Bucyrus	CN	Marion	SR -47 (W Water St)
30	Bucyrus	CN	Marion	SR-423
31	Columbus	CN	Morrow	I- 71
32	Columbus	CN	Morrow	I- 71
33	Columbus	CN	Morrow	State Rte 288
34	Columbus	CN	Morrow	SR-95
35	Columbus	CN	Morrow	S Cherry St
36	Columbus	CN	Pickaway	Harrisburg Pike / Brownfield Hwy / US-62
37	Columbus	CN	Pickaway	State Rte 752
38	Columbus	CN	Pickaway	W Mill St
39	Bucyrus	NE	Ashland	I- 71
40	Bucyrus	NE	Ashland	I- 71
41	Bucyrus	NE	Ashland	State Rte 58
42	Bucyrus	NE	Ashland	US Rte 30
43	Cleveland	NE	Ashtabula	I- 90
44	Cleveland	NE	Ashtabula	US-322
45	Cleveland	NE	Ashtabula	SR-531
46	Cleveland	NE	Ashtabula	S Ridge Rd E
47	Cambridge	NE	Columbiana	Lisbon St
48	Cambridge	NE	Columbiana	Jerome St
49	Cleveland	NE	Cuyahoga	I- 71
50	Cleveland	NE	Cuyahoga	I- 77

Site Number	OHSP Region	Geographical Region	County	Road to be Observed
51	Cleveland	NE	Cuyahoga	Chester Ave
52	Cleveland	NE	Cuyahoga	Lorain Ave
53	Cleveland	NE	Cuyahoga	Crestine Ave
54	Cleveland	NE	Cuyahoga	E 39th St
55	Bucyrus	NE	Erie	I- 80
56	Bucyrus	NE	Erie	I- 80
57	Bucyrus	NE	Erie	State St / OH-60 N
58	Bucyrus	NE	Erie	State Rte 2
59	Bucyrus	NE	Erie	Mason Rd
60	Cleveland	NE	Geauga	US Hwy 422
61	Cleveland	NE	Geauga	US Hwy 422
62	Cleveland	NE	Geauga	Tavern Rd
63	Cleveland	NE	Geauga	Kinsman Rd
64	Cleveland	NE	Geauga	Sherman Rd
65	Bucyrus	NE	Huron	Conwell Ave
66	Bucyrus	NE	Huron	OH-103
67	Cleveland	NE	Lake	I- 271 (I-90)
68	Cleveland	NE	Lake	I- 90
69	Cleveland	NE	Lake	Reynolds Rd
70	Cleveland	NE	Lake	S State St
71	Cleveland	NE	Lake	Bayridge Blvd
72	Bucyrus	NE	Lorain	I- 80
73	Bucyrus	NE	Lorain	I- 80
74	Bucyrus	NE	Lorain	N Ashland-Oberlin Rd
75	Bucyrus	NE	Lorain	W Erie Ave
76	Bucyrus	NE	Lorain	Whitman Blvd
77	Cleveland	NE	Mahoning	I-680
78	Cleveland	NE	Mahoning	I- 680
79	Cleveland	NE	Mahoning	Market St
80	Cleveland	NE	Mahoning	N Main St
81	Cleveland	NE	Mahoning	Sheridan St
82	Cleveland	NE	Medina	I- 71
83	Cleveland	NE	Medina	I- 76
84	Cleveland	NE	Medina	N Court St
85	Cleveland	NE	Medina	Center Rd / OH-303
86	Cleveland	NE	Medina	West St
87	Cleveland	NE	Portage	I- 76
88	Cleveland	NE	Portage	I- 76
89	Cleveland	NE	Portage	Church St
90	Cleveland	NE	Portage	E Main St
91	Cleveland	NE	Portage	Tallmadge Rd
92	Bucyrus	NE	Richland	I- 71
93	Bucyrus	NE	Richland	I- 71
94	Bucyrus	NE	Richland	State Rte 181
95	Bucyrus	NE	Richland	Park Ave W
96	Bucyrus	NE	Richland	Poorman Rd
97	Cleveland	NE	Stark	I- 77
98	Cleveland	NE	Stark	I- 77
99	Cleveland	NE	Stark	Waynesburg Dr SE
100	Cleveland	NE	Stark	Market Ave N
101	Cleveland	NE	Stark	Main St
102	Cleveland	NE	Summit	I-271
103	Cleveland	NE	Summit	I- 77
104	Cleveland	NE	Summit	Manchester Rd
105	Cleveland	NE	Summit	State Rte 8

Site Number	OHSP Region	Geographical Region	County	Road to be Observed
106	Cleveland	NE	Summit	Co Hwy 2
107	Cleveland	NE	Summit	Main St
108	Cleveland	NE	Trumbull	State Rte 11
109	Cleveland	NE	Trumbull	State Rte 11
110	Cleveland	NE	Trumbull	SR-46
111	Cleveland	NE	Trumbull	Belmont Ave
112	Cleveland	NE	Trumbull	Warren-Sharon Rd
113	Bucyrus	NE	Wayne	I- 71
114	Bucyrus	NE	Wayne	I- 71
115	Bucyrus	NE	Wayne	Congress Rd
116	Bucyrus	NE	Wayne	Massillon Rd / OH 241
117	Findlay	NW	Allen	I- 75
118	Findlay	NW	Allen	I- 75
119	Findlay	NW	Allen	E Suthoff St
120	Findlay	NW	Allen	Harding Hwy
121	Findlay	NW	Allen	Augsburger Rd
122	Piqua	NW	Auglaize	I- 75
123	Piqua	NW	Auglaize	I- 75
124	Piqua	NW	Auglaize	State Rte 66
125	Piqua	NW	Auglaize	US Hwy 33
126	Bucyrus	NW	Crawford	E Main St (SR 103)
127	Bucyrus	NW	Crawford	Bucyrus Bypass / US-30
128	Findlay	NW	Defiance	US Hwy 24
129	Findlay	NW	Defiance	Defiance Ave
130	Findlay	NW	Fulton	I- 80
131	Findlay	NW	Fulton	I- 80
132	Findlay	NW	Fulton	State Rte 120 (Morenci St)
133	Findlay	NW	Fulton	SR 2
134	Findlay	NW	Fulton	Co Rd F
135	Findlay	NW	Hancock	I- 75
136	Findlay	NW	Hancock	I- 75
137	Findlay	NW	Hancock	W Main Cross St
138	Findlay	NW	Hancock	E Main St
139	Piqua	NW	Logan	US Hwy 33
140	Piqua	NW	Logan	State Rte 273
141	Findlay	NW	Lucas	I-75
142	Findlay	NW	Lucas	I- 280
143	Findlay	NW	Lucas	Airport Hwy
144	Findlay	NW	Lucas	W Central Ave / US 20
145	Findlay	NW	Lucas	Birchwood Ave
146	Findlay	NW	Lucas	Spring Meadow Dr
147	Bucyrus	NW	Ottawa	I- 80
148	Bucyrus	NW	Ottawa	SR 19 (S Locust St)
149	Bucyrus	NW	Ottawa	W Harbor Rd
150	Bucyrus	NW	Ottawa	N Crogan St
151	Bucyrus	NW	Sandusky	I- 80
153	Bucyrus	NW	Sandusky	Dunwald Dr
154	Bucyrus	NW	Sandusky	Pemberville Rd
155	Bucyrus	NW	Seneca	S Washington St / SR 231
156	Bucyrus	NW	Seneca	N Countyline St
157	Findlay	NW	Wood	I- 75
158	Findlay	NW	Wood	I- 75
159	Findlay	NW	Wood	Haskins Rd
160	Findlay	NW	Wood	SR-25 / Dixie Hwy
161	Findlay	NW	Wood	Fort Meigs Rd

Site Number	OHSP Region	Geographical Region	County	Road to be Observed
162	Jackson	SE	Athens	SR-682 / S Plains Rd
163	Jackson	SE	Athens	US Hwy 33
164	Cambridge	SE	Belmont	I- 70
165	Cambridge	SE	Belmont	I- 70
166	Cambridge	SE	Belmont	Sunset Hts / US-250 / Cadiz Rd
167	Cambridge	SE	Belmont	SR-148 / E Captina Hwy
168	Cambridge	SE	Belmont	Woodrow Ave
169	Cambridge	SE	Muskingum	I- 70
170	Cambridge	SE	Muskingum	I- 70
171	Cambridge	SE	Muskingum	Adair Ave (SR 60 N)
172	Cambridge	SE	Muskingum	SR-284
173	Columbus	SE	Perry	State Rte 204
174	Columbus	SE	Perry	SR-668
175	Cambridge	SE	Tuscarawas	I- 77
176	Cambridge	SE	Tuscarawas	I- 77
177	Cambridge	SE	Tuscarawas	State Rte 39
178	Cambridge	SE	Tuscarawas	State Rte 93
179	Wilmington	SW	Brown	State Rte 763
180	Wilmington	SW	Brown	US Hwy 52
181	Wilmington	SW	Brown	Old State Rte 68
182	Wilmington	SW	Butler	I- 75
183	Wilmington	SW	Butler	I- 75
184	Wilmington	SW	Butler	Reinartz Blvd
185	Wilmington	SW	Butler	High St
186	Wilmington	SW	Butler	Church St
187	Piqua	SW	Clark	I-70
188	Piqua	SW	Clark	I- 70
189	Piqua	SW	Clark	N Limestone St
190	Piqua	SW	Clark	Mechanicsburg Rd
191	Piqua	SW	Clark	N Western Ave
192	Wilmington	SW	Clermont	I- 275
193	Wilmington	SW	Clermont	I- 275
194	Wilmington	SW	Clermont	US Hwy 52
195	Wilmington	SW	Clermont	State Rte 132
196	Wilmington	SW	Clermont	Woodville Pike
197	Wilmington	SW	Clinton	I- 71
198	Wilmington	SW	Clinton	I- 71
199	Wilmington	SW	Clinton	W Main St / US 22
200	Wilmington	SW	Clinton	Wayne Rd
201	Piqua	SW	Darke	SR-722
202	Piqua	SW	Darke	State Rte 118
203	Piqua	SW	Greene	I-675
204	Piqua	SW	Greene	I- 675
205	Piqua	SW	Greene	N Central Ave
206	Piqua	SW	Greene	E Xenia Dr
207	Piqua	SW	Greene	Indian Ripple Rd
208	Wilmington	SW	Hamilton	I- 75
209	Wilmington	SW	Hamilton	I- 71
210	Wilmington	SW	Hamilton	Wooster Pike
211	Wilmington	SW	Hamilton	E Mehring Way
212	Wilmington	SW	Hamilton	Kenwood Rd
213	Wilmington	SW	Hamilton	Winchell Ave
214	Piqua	SW	Miami	I- 75
215	Piqua	SW	Miami	I- 75
216	Piqua	SW	Miami	N Miami St

Site Number	OHSP Region	Geographical Region	County	Road to be Observed
217	Piqua	SW	Miami	E US Rte 36
218	Piqua	SW	Miami	Peters Rd
219	Piqua	SW	Montgomery	I-70
220	Piqua	SW	Montgomery	I- 75
221	Piqua	SW	Montgomery	S Ludlow St / OH-48
222	Piqua	SW	Montgomery	National Rd
223	Piqua	SW	Montgomery	Sycamore St (SR 725)
224	Piqua	SW	Montgomery	Meadowcreek Dr
225	Piqua	SW	Preble	I- 70
226	Piqua	SW	Preble	I- 70
227	Piqua	SW	Preble	State Rte 732 W
228	Piqua	SW	Preble	US-127 N (N Barron St)
229	Piqua	SW	Preble	E Main St
230	Jackson	SW	Ross	Western Ave
231	Jackson	SW	Ross	N Bridge St
232	Jackson	SW	Scioto	US Hwy 52
233	Jackson	SW	Scioto	SR 104
234	Wilmington	SW	Warren	I- 75
235	Wilmington	SW	Warren	I- 75
236	Wilmington	SW	Warren	S Main St
237	Wilmington	SW	Warren	US Hwy 42 Byp
238	Wilmington	SW	Warren	Harold St

Appendix B: Ohio Average Passenger Vehicle Crash-Related Fatalities by County 2006-2010

County	Average Fatalities	Percent of State Fatalities Within County	Cumulative Percent
Franklin	79.0	6.82%	6.82%
Cuyahoga	70.2	6.06%	12.88%
Hamilton	53.8	4.65%	17.53%
Montgomery	46.2	3.99%	21.52%
Lucas	42.8	3.70%	25.21%
Summit	35.6	3.07%	28.29%
Butler	31.0	2.68%	30.96%
Stark	30.6	2.64%	33.60%
Lorain	28.0	2.42%	36.02%
Trumbull	25.8	2.23%	38.25%
Mahoning	20.8	1.80%	40.04%
Clark	20.0	1.73%	41.77%
Licking	19.2	1.66%	43.43%
Wood	18.6	1.61%	45.04%
Medina	18.4	1.59%	46.62%
Portage	17.8	1.54%	48.16%
Ashtabula	17.4	1.50%	49.66%
Delaware	16.8	1.45%	51.11%
Clermont	15.6	1.35%	52.46%
Ross	14.6	1.26%	53.72%
Wayne	14.0	1.21%	54.93%
Muskingum	13.8	1.19%	56.12%
Lake	13.4	1.16%	57.28%
Warren	13.2	1.14%	58.42%
Columbiana	13.0	1.12%	59.54%
Fairfield	12.6	1.09%	60.63%
Pickaway	11.6	1.00%	61.63%
Richland	11.6	1.00%	62.63%
Geauga	11.4	0.98%	63.62%
Greene	11.2	0.97%	64.58%
Miami	11.2	0.97%	65.55%
Allen	10.8	0.93%	66.48%
Scioto	10.6	0.92%	67.40%
Tuscarawas	10.4	0.90%	68.30%
Preble	10.4	0.90%	69.19%
Seneca	9.8	0.85%	70.04%
Logan	9.8	0.85%	70.89%
Knox	9.6	0.83%	71.71%
Ashland	9.2	0.79%	72.51%
Fulton	9.2	0.79%	73.30%
Sandusky	9.0	0.78%	74.08%
Belmont	9.0	0.78%	74.86%
Perry	9.0	0.78%	75.63%
Brown	8.8	0.76%	76.39%
Athens	8.8	0.76%	77.15%
Marion	8.8	0.76%	77.91%
Huron	8.4	0.73%	78.64%
Hancock	8.4	0.73%	79.36%
Defiance	8.0	0.69%	80.06%
Crawford	8.0	0.69%	80.75%
Clinton	8.0	0.69%	81.44%

County	Average Fatalities	Percent of State Fatalities Within County	Cumulative Percent
Erie	8.0	0.69%	82.13%
Darke	8.0	0.69%	82.82%
Ottawa	8.0	0.69%	83.51%
Morrow	7.8	0.67%	84.18%
Madison	7.8	0.67%	84.86%
Auglaize	7.6	0.66%	85.51%
Highland	7.6	0.66%	86.17%
Jefferson	7.2	0.62%	86.79%
Washington	7.0	0.60%	87.39%
Pike	7.0	0.60%	88.00%
Coshocton	7.0	0.60%	88.60%
Lawrence	7.0	0.60%	89.21%
Williams	6.8	0.59%	89.79%
Henry	6.6	0.57%	90.36%
Champaign	6.6	0.57%	90.93%
Mercer	6.4	0.55%	91.49%
Shelby	6.4	0.55%	92.04%
Holmes	6.4	0.55%	92.59%
Fayette	6.2	0.54%	93.13%
Wyandot	6.2	0.54%	93.66%
Paulding	6.2	0.54%	94.20%
Jackson	6.2	0.54%	94.73%
Guernsey	5.8	0.50%	95.23%
Hardin	5.6	0.48%	95.72%
Adams	5.6	0.48%	96.20%
Union	5.2	0.45%	96.65%
Putnam	5.0	0.43%	97.08%
Carroll	4.6	0.40%	97.48%
Hocking	4.6	0.40%	97.88%
Meigs	4.2	0.36%	98.24%
Gallia	4.2	0.36%	98.60%
Vinton	3.2	0.28%	98.88%
Van Wert	3.2	0.28%	99.15%
Harrison	2.8	0.24%	99.40%
Monroe	2.8	0.24%	99.64%
Noble	2.2	0.19%	99.83%
Morgan	2.0	0.17%	100.00%

APPENDIX C: OHIO REGIONS, COUNTIES, AND DVMT

Region	County	2010 DVMT	Regional DVMT Total
Central	Franklin	30,468,040	
	Licking	5,018,660	
	Delaware	4,413,660	
	Fairfield	3,144,130	
	Madison	2,111,160	
	Pickaway	1,882,050	
	Marion	1,802,010	
	Morrow	1,794,240	
	Knox	1,138,670	51,772,620
Northeast	Cuyahoga	28,966,690	
	Summit	15,782,120	
	Stark	8,547,820	
	Lorain	6,681,770	
	Mahoning	6,509,030	
	Trumbull	6,186,980	
	Lake	6,016,920	
	Portage	4,762,580	
	Medina	4,578,630	
	Richland	3,593,350	
	Wayne	3,093,620	
	Erie	2,973,120	
	Ashtabula	2,956,900	
	Columbiana	2,563,780	
	Geauga	2,148,870	
	Ashland	1,895,360	
	Huron	1,296,540	108,554,080
Northwest	Lucas	11,744,210	
	Wood	4,982,630	
	Allen	3,172,480	
	Hancock	2,864,660	
	Sandusky	2,684,720	
	Fulton	1,658,090	
	Auglaize	1,576,620	
	Logan	1,333,800	
	Ottawa	1,258,160	
	Seneca	1,257,920	
	Crawford	1,075,800	
	Defiance	1,018,130	34,627,220
Southeast	Tuscarawas	2,908,920	
	Muskingum	2,888,180	
	Belmont	2,576,240	
	Athens	1,540,820	
	Perry	747,110	10,661,270
Southwest	Hamilton	21,244,430	
	Montgomery	14,265,500	
	Butler	7,078,190	
	Warren	4,711,380	
	Clark	4,451,950	
	Greene	4,374,730	
	Clermont	4,180,210	

	Miami	3,055,230	
	Ross	2,277,130	
	Clinton	1,918,680	
	Scioto	1,681,730	
	Preble	1,486,790	
	Darke	1,316,990	
	Brown	1,195,240	73,238,180

APPENDIX D: POPULATION OF ROAD TYPES BY COUNTY AND NUMBER SELECTED

Due to errors in the road designation variable in the segment database obtained from NHTSA, three (3) counties (Athens, Columbiana, and Darke) each had one (1) local segment mislabeled as a primary segments. Marion County had ten (10) local segments mislabeled as primary segments. Each of these mislabeled segments was checked on a map to ensure they were actually local segments. Because Athens, Columbiana, Darke, and Marion County were each counties without an MSA, these local roads were discarded from selection process. Additionally, while two (2) counties (Ottawa and Sandusky) had multiple primary segments, due to the rural nature of the counties, in each there was only one legal place (i.e., exit ramp) for observers to safely observe the primary traffic. Finally, Pickaway County had primary segments, but no exit ramps. Therefore, although our sampling program drew primary segments from Ottawa, Sandusky, and Pickaway, some were unusable, so the number of primary sites (and the total number of sites to be observed) is four (4) fewer than the sampling program selected. See the "Totals" and "Actual Number to be Observed" lines at the end of the following table.

County	Population of Primary Segments	Number of Primary Segments Sampled	Population of Secondary Segments	Number of Secondary Segments Sampled	Population of Local Segments	Number of Local Segments Sampled	Total Population of Segments	Total Number of Segments Sampled
Allen	166	2	1731	2	10869	1	12766	5
Ashland	120	2	2324	2	0	0	2444	4
Ashtabula	392	2	1797	2	0	0	2189	4
Athens	0	0	1836	2	0	0	1836	2
Auglaize	87	2	1686	2	0	0	1773	4
Belmont	237	2	2654	2	11184	1	14075	5
Brown	0	0	1577	2	7382	1	8959	3
Butler	88	2	1782	2	18288	1	20158	5
Clark	240	2	1253	2	9028	1	10521	5
Clermont	72	2	1507	2	9915	1	11494	5
Clinton	75	2	1090	2	0	0	1165	4
Columbiana	0	0	2920	2	0	0	2920	2
Crawford	0	0	1969	2	0	0	1969	2
Cuyahoga	1071	2	4109	2	43018	2	48198	6
Darke	0	0	2506	2	0	0	2506	2
Defiance	0	0	1581	2	0	0	1581	2
Delaware	86	2	1388	2	10167	1	11641	5
Erie	132	2	1388	2	6316	1	7836	5
Fairfield	34	2	1439	2	10985	1	12458	5
Franklin	1799	2	3333	2	58672	2	63804	6
Fulton	146	2	1311	2	6279	1	7736	5
Geauga	14	2	723	2	4271	1	5008	5
Greene	209	2	1108	2	11412	1	12729	5
Hamilton	752	2	2393	2	33334	2	36479	6
Hancock	179	2	1174	2	0	0	1353	4
Huron	0	0	2251	2	0	0	2251	2
Knox	0	0	2799	2	0	0	2799	2
Lake	379	2	1683	2	9723	1	11785	5
Licking	221	2	3320	2	17268	1	20809	5
Logan	0	0	1543	2	0	0	1543	2
Lorain	302	2	1976	2	15148	1	17426	5
Lucas	592	2	1647	2	22312	2	24551	6
Madison	106	2	945	2	2904	1	3955	5

Mahoning	581	2	2125	2	14952	1	17658	5
Marion	0	0	918	2	0	0	918	2
Medina	153	2	1135	2	7776	1	9064	5
Miami	163	2	1463	2	8273	1	9899	5
Montgomery	414	2	1817	2	32557	2	34788	6
Morrow	101	2	717	2	3281	1	4099	5
Muskingum	127	2	1393	2	0	0	1520	4
Ottawa	35	2	952	2	5647	1	6634	5
Perry	0	0	1235	2	0	0	1235	2
Pickaway	11	2	810	2	3674	1	4495	5
Portage	251	2	2586	2	12107	1	14944	5
Preble	88	2	1567	2	5540	1	7195	5
Richland	163	2	2856	2	12447	1	15466	5
Ross	0	0	1322	2	0	0	1322	2
Sandusky	174	2	1318	2	0	0	1492	4
Scioto	0	0	1669	2	0	0	1669	2
Seneca	0	0	1249	2	0	0	1249	2
Stark	190	2	3079	2	30770	1	34039	5
Summit	922	2	2270	2	29232	2	32424	6
Trumbull	502	2	1899	2	12157	1	14558	5
Tuscarawas	139	2	1759	2	0	0	1898	4
Warren	315	2	1486	2	12694	1	14495	5
Wayne	42	2	2080	2	0	0	2122	4
Wood	496	2	1808	2	11082	1	13386	5
Totals	12366	86	102256	114	520664	41	635286	241
Actual Number to be Observed		82		114		41		237

Appendix E: Sampled Road Segments

Site No.	County	Road Types	Latitude	Longitude	Segment length in miles	Probability of Selection
	Central Region					
1	Delaware	Primary Roads	40.14745	-82.97041	0.089	0.0233
2	Delaware	Primary Roads	40.1849	-82.9462	0.502	0.0233
3	Delaware	Secondary Roads	40.2803	-83.0684	0.023	0.0014
4	Delaware	Secondary Roads	40.1546	-82.996	0.122	0.0014
5	Delaware	Local, Rural, and City Roads	40.3017	-83.1145	0.031	0.0001
6	Fairfield	Primary Roads	39.9323	-82.7955	0.040	0.0588
7	Fairfield	Primary Roads	39.9381	-82.7707	0.254	0.0588
8	Fairfield	Secondary Roads	39.717	-82.607	0.087	0.0014
9	Fairfield	Secondary Roads	39.8679	-82.6825	0.088	0.0014
10	Fairfield	Local, Rural, and City Roads	39.9108	-82.4711	0.039	0.0001
11	Franklin	Primary Roads	39.8585	-83.0717	0.018	0.0011
12	Franklin	Primary Roads	40.0327	-83.1235	0.074	0.0011
13	Franklin	Secondary Roads	39.8584	-82.8287	0.085	0.0006
14	Franklin	Secondary Roads	39.9592	-83.0187	0.112	0.0006
15	Franklin	Local, Rural, and City Roads	39.9349	-83.1349	0.080	0.0000
16	Franklin	Local, Rural, and City Roads	40.0737	-83.0121	0.087	0.0000
17	Knox	Secondary Roads	40.2721	-82.3553	0.018	0.0007
18	Knox	Secondary Roads	40.4832	-82.3595	0.073	0.0007
19	Licking	Primary Roads	39.9459	-82.6162	0.192	0.0090
20	Licking	Primary Roads	39.9488	-82.6847	0.215	0.0090
21	Licking	Secondary Roads	40.2117	-82.5429	0.057	0.0006
22	Licking	Secondary Roads	40.0724	-82.5797	0.151	0.0006
23	Licking	Local, Rural, and City Roads	40.0769	-82.4283	0.033	0.0001
24	Madison	Primary Roads	39.7571	-83.3054	0.227	0.0189
25	Madison	Primary Roads	39.9802	-83.2524	0.305	0.0189
26	Madison	Secondary Roads	39.7305	-83.3337	0.063	0.0021
27	Madison	Secondary Roads	40.0433	-83.5111	0.096	0.0021
28	Madison	Local, Rural, and City Roads	39.8878	-83.2811	0.015	0.0003
29	Marion	Secondary Roads	40.4553	-83.1898	0.024	0.0022
30	Marion	Secondary Roads	40.6808	-83.1506	1.044	0.0022
31	Morrow	Primary Roads	40.3746	-82.8286	0.115	0.0198
32	Morrow	Primary Roads	40.4187	-82.8206	0.943	0.0198
33	Morrow	Secondary Roads	40.6806	-82.8112	0.176	0.0028
34	Morrow	Secondary Roads	40.3812	-82.8286	0.602	0.0028
35	Morrow	Local, Rural, and City Roads	40.6013	-82.8941	0.078	0.0003
36	Pickaway	Secondary Roads	39.8056	-83.1751	0.353	0.0025
37	Pickaway	Secondary Roads	39.7233	-82.8809	0.989	0.0025
38	Pickaway	Local, Rural, and City Roads	39.5984	-82.9492	0.073	0.0003
	Northeast Region					
39	Ashland	Primary Roads	40.8571	-82.2577	0.053	0.0167
40	Ashland	Primary Roads	40.8543	-82.2606	0.180	0.0167

Site No.	County	Road Types	Latitude	Longitude	Segment length in miles	Probability of Selection
41	Ashland	Secondary Roads	40.994	-82.2229	0.162	0.0009
42	Ashland	Secondary Roads	40.7849	-82.2386	0.240	0.0009
43	Ashtabula	Primary Roads	41.8501	-80.7031	0.124	0.0051
44	Ashtabula	Primary Roads	41.529	-80.7132	0.188	0.0051
45	Ashtabula	Secondary Roads	41.9003	-80.7935	0.027	0.0011
46	Ashtabula	Secondary Roads	41.8616	-80.7675	0.282	0.0011
47	Columbiana	Secondary Roads	40.627	-80.5909	0.021	0.0007
48	Columbiana	Secondary Roads	40.7778	-80.7668	0.042	0.0007
49	Cuyahoga	Primary Roads	41.4467	-81.7399	0.052	0.0019
50	Cuyahoga	Primary Roads	41.3106	-81.6479	0.399	0.0019
51	Cuyahoga	Secondary Roads	41.5036	-81.6776	0.045	0.0005
52	Cuyahoga	Secondary Roads	41.4175	-81.92	0.167	0.0005
53	Cuyahoga	Local, Rural, and City Roads	41.4451	-81.6874	0.048	0.0000
54	Cuyahoga	Local, Rural, and City Roads	41.4947	-81.6583	0.251	0.0000
55	Erie	Primary Roads	41.3396	-82.7538	0.546	0.0152
56	Erie	Primary Roads	41.3239	-82.624	0.757	0.0152
57	Erie	Secondary Roads	41.4149	-82.3655	0.086	0.0014
58	Erie	Secondary Roads	41.4102	-82.7457	0.113	0.0014
59	Erie	Local, Rural, and City Roads	41.3617	-82.7815	0.416	0.0002
60	Geauga	Primary Roads	41.3841	-81.2316	1.435	0.1429
61	Geauga	Primary Roads	41.3893	-81.3666	1.743	0.1429
62	Geauga	Secondary Roads	41.3817	-81.0753	0.101	0.0028
63	Geauga	Secondary Roads	41.4589	-81.0127	0.914	0.0028
64	Geauga	Local, Rural, and City Roads	41.537	-81.2275	0.253	0.0002
65	Huron	Secondary Roads	41.0437	-82.7157	0.154	0.0009
66	Huron	Secondary Roads	41.1793	-82.6409	0.179	0.0009
67	Lake	Primary Roads	41.5852	-81.4482	0.036	0.0053
68	Lake	Primary Roads	41.6436	-81.3613	0.786	0.0053
69	Lake	Secondary Roads	41.699	-81.3776	0.030	0.0012
70	Lake	Secondary Roads	41.7151	-81.2327	0.043	0.0012
71	Lake	Local, Rural, and City Roads	41.636	-81.4566	0.076	0.0001
72	Lorain	Primary Roads	41.3602	-82.2841	0.005	0.0066
73	Lorain	Primary Roads	41.3815	-82.2067	0.350	0.0066
74	Lorain	Secondary Roads	41.2077	-82.2186	0.313	0.0010
75	Lorain	Secondary Roads	41.4327	-82.2588	0.708	0.0010
76	Lorain	Local, Rural, and City Roads	41.396	-82.0842	0.018	0.0001
77	Mahoning	Primary Roads	41.1117	-80.6916	0.078	0.0034
78	Mahoning	Primary Roads	41.0282	-80.6279	0.179	0.0034
79	Mahoning	Secondary Roads	41.0946	-80.6534	0.010	0.0009
80	Mahoning	Secondary Roads	40.924	-80.9937	0.030	0.0009
81	Mahoning	Local, Rural, and City Roads	41.0839	-80.6508	0.065	0.0001
82	Medina	Primary Roads	41.009	-81.9461	0.570	0.0131
83	Medina	Primary Roads	41.0448	-81.7355	0.587	0.0131
84	Medina	Secondary Roads	41.154	-81.8628	0.217	0.0018
85	Medina	Secondary Roads	41.2376	-81.912	0.853	0.0018
86	Medina	Local, Rural, and City Roads	41.0334	-81.737	0.023	0.0001

Site No.	County	Road Types	Latitude	Longitude	Segment length in miles	Probability of Selection
87	Portage	Primary Roads	41.1057	-81.1562	0.011	0.0080
88	Portage	Primary Roads	41.1059	-81.0798	0.938	0.0080
89	Portage	Secondary Roads	41.2053	-81.1475	0.014	0.0008
90	Portage	Secondary Roads	41.1546	-81.3308	0.025	0.0008
91	Portage	Local, Rural, and City Roads	41.0996	-81.1384	0.081	0.0001
92	Richland	Primary Roads	40.7887	-82.4076	0.106	0.0123
93	Richland	Primary Roads	40.7454	-82.4491	0.327	0.0123
94	Richland	Secondary Roads	40.7694	-82.71	0.021	0.0007
95	Richland	Secondary Roads	40.7589	-82.5306	0.045	0.0007
96	Richland	Local, Rural, and City Roads	40.6165	-82.5196	0.031	0.0001
97	Stark	Primary Roads	40.7821	-81.3821	0.147	0.0105
98	Stark	Primary Roads	40.7979	-81.3917	0.199	0.0105
99	Stark	Secondary Roads	40.7865	-81.3486	0.055	0.0006
100	Stark	Secondary Roads	40.8711	-81.364	0.074	0.0006
101	Stark	Local, Rural, and City Roads	40.88	-81.4196	0.081	0.0000
102	Summit	Primary Roads	41.3357	-81.5145	0.014	0.0022
103	Summit	Primary Roads	40.9595	-81.4602	0.294	0.0022
104	Summit	Secondary Roads	41.0536	-81.549	0.005	0.0009
105	Summit	Secondary Roads	41.2127	-81.4875	0.435	0.0009
106	Summit	Local, Rural, and City Roads	41.0157	-81.6879	0.028	0.0001
107	Summit	Local, Rural, and City Roads	40.9672	-81.5692	0.367	0.0001
108	Trumbull	Primary Roads	41.2046	-80.7078	0.150	0.0040
109	Trumbull	Primary Roads	41.3466	-80.7013	0.168	0.0040
110	Trumbull	Secondary Roads	41.3124	-80.7311	0.027	0.0011
111	Trumbull	Secondary Roads	41.1813	-80.6644	0.054	0.0011
112	Trumbull	Local, Rural, and City Roads	41.2173	-80.5839	0.496	0.0001
113	Wayne	Primary Roads	40.9315	-82.1167	0.407	0.0476
114	Wayne	Primary Roads	40.9598	-82.0627	1.363	0.0476
115	Wayne	Secondary Roads	40.9173	-82.0518	0.028	0.0010
116	Wayne	Secondary Roads	40.6996	-81.6919	0.384	0.0010
	Northwest Region					
117	Allen	Primary Roads	40.8569	-83.9372	0.090	0.0120
118	Allen	Primary Roads	40.8228	-83.9917	0.388	0.0120
119	Allen	Secondary Roads	40.8367	-84.3393	0.033	0.0012
120	Allen	Secondary Roads	40.7307	-84.0779	0.071	0.0012
121	Allen	Local, Rural, and City Roads	40.8994	-83.9118	0.091	0.0001
122	Auglaize	Primary Roads	40.5544	-84.1697	0.038	0.0230
123	Auglaize	Primary Roads	40.6502	-84.1315	0.303	0.0230
124	Auglaize	Secondary Roads	40.4775	-84.3771	0.070	0.0012
125	Auglaize	Secondary Roads	40.5587	-84.2106	0.316	0.0012
126	Crawford	Secondary Roads	40.9605	-82.8437	0.006	0.0010
127	Crawford	Secondary Roads	40.8179	-82.9402	0.321	0.0010
128	Defiance	Secondary Roads	41.3078	-84.3653	0.055	0.0013
129	Defiance	Secondary Roads	41.2963	-84.5522	0.119	0.0013
130	Fulton	Primary Roads	41.5908	-84.2538	0.455	0.0137
131	Fulton	Primary Roads	41.5906	-84.1077	0.703	0.0137

Site No.	County	Road Types	Latitude	Longitude	Segment length in miles	Probability of Selection
132	Fulton	Secondary Roads	41.6991	-84.085	0.044	0.0015
133	Fulton	Secondary Roads	41.5434	-84.2415	0.236	0.0015
134	Fulton	Local, Rural, and City Roads	41.558	-84.2491	0.012	0.0002
135	Hancock	Primary Roads	41.0899	-83.6597	0.278	0.0112
136	Hancock	Primary Roads	41.0681	-83.664	0.326	0.0112
137	Hancock	Secondary Roads	40.8921	-83.656	0.010	0.0017
138	Hancock	Secondary Roads	41.1077	-83.7907	0.030	0.0017
139	Logan	Secondary Roads	40.3787	-83.7508	0.086	0.0013
140	Logan	Secondary Roads	40.5086	-83.6479	0.808	0.0013
141	Lucas	Primary Roads	41.6937	-83.5031	0.037	0.0034
142	Lucas	Primary Roads	41.6376	-83.4923	0.157	0.0034
143	Lucas	Secondary Roads	41.63	-83.6017	0.054	0.0012
144	Lucas	Secondary Roads	41.6749	-83.7054	0.227	0.0012
145	Lucas	Local, Rural, and City Roads	41.6075	-83.6196	0.055	0.0001
146	Lucas	Local, Rural, and City Roads	41.6231	-83.7107	0.066	0.0001
147	Ottawa	Primary Roads	41.4722	-83.3272	0.147	0.0571
148	Ottawa	Secondary Roads	41.4997	-83.1453	0.054	0.0021
149	Ottawa	Secondary Roads	41.5202	-82.9927	0.095	0.0021
150	Ottawa	Local, Rural, and City Roads	41.5832	-82.8364	0.066	0.0002
151	Sandusky	Primary Roads	41.3813	-83.0146	0.253	0.0115
152	Sandusky	Secondary Roads	41.3055	-82.959	0.048	0.0015
153	Sandusky	Secondary Roads	41.4532	-83.3712	0.083	0.0015
154	Seneca	Secondary Roads	41.0918	-83.1748	0.116	0.0016
155	Seneca	Secondary Roads	41.2162	-83.4204	0.182	0.0016
156	Wood	Primary Roads	41.2123	-83.6497	0.136	0.0040
157	Wood	Primary Roads	41.2851	-83.638	0.347	0.0040
158	Wood	Secondary Roads	41.3941	-83.674	0.096	0.0011
159	Wood	Secondary Roads	41.4816	-83.646	0.514	0.0011
160	Wood	Local, Rural, and City Roads	41.532	-83.6555	0.070	0.0001
	Southeast Region					
161	Athens	Secondary Roads	39.331	-82.1288	0.012	0.0011
162	Athens	Secondary Roads	39.3315	-82.0824	0.029	0.0011
163	Belmont	Primary Roads	40.0715	-80.7418	0.021	0.0084
164	Belmont	Primary Roads	40.0725	-80.9694	0.075	0.0084
165	Belmont	Secondary Roads	40.0826	-80.7469	0.024	0.0008
166	Belmont	Secondary Roads	39.8674	-80.8225	0.074	0.0008
167	Belmont	Local, Rural, and City Roads	40.1545	-80.9545	0.053	0.0001
168	Muskingum	Primary Roads	39.9757	-81.8478	0.062	0.0157
169	Muskingum	Primary Roads	39.9557	-81.9438	0.371	0.0157
170	Muskingum	Secondary Roads	39.953	-82.0068	0.055	0.0014
171	Muskingum	Secondary Roads	39.8599	-81.8049	0.478	0.0014
172	Perry	Secondary Roads	39.9073	-82.3609	0.388	0.0016
173	Perry	Secondary Roads	39.7433	-82.3056	0.425	0.0016
174	Tuscarawas	Primary Roads	40.5082	-81.4833	0.025	0.0144
175	Tuscarawas	Primary Roads	40.2726	-81.5443	0.100	0.0144
176	Tuscarawas	Secondary Roads	40.4781	-81.3576	0.004	0.0011

Site No.	County	Road Types	Latitude	Longitude	Segment length in miles	Probability of Selection
177	Tuscarawas	Secondary Roads	40.5818	-81.6164	0.067	0.0011
	Southwest Region					
178	Brown	Secondary Roads	38.8035	-83.723	0.017	0.0013
179	Brown	Secondary Roads	38.6557	-83.762	0.043	0.0013
180	Brown	Local, Rural, and City Roads	38.7847	-83.8623	0.057	0.0001
181	Butler	Primary Roads	39.363	-84.3683	0.100	0.0227
182	Butler	Primary Roads	39.351	-84.3778	0.154	0.0227
183	Butler	Secondary Roads	39.5205	-84.4014	0.044	0.0011
184	Butler	Secondary Roads	39.3913	-84.538	0.103	0.0011
185	Butler	Local, Rural, and City Roads	39.5613	-84.6389	0.039	0.0001
186	Clark	Primary Roads	39.93396	-83.63198	1.009	0.0083
187	Clark	Primary Roads	39.8933	-83.8228	0.109	0.0083
188	Clark	Secondary Roads	39.9307	-83.8066	0.066	0.0016
189	Clark	Secondary Roads	40.0037	-83.7186	0.582	0.0016
190	Clark	Local, Rural, and City Roads	39.9275	-83.8273	0.003	0.0001
191	Clermont	Primary Roads	39.0616	-84.3131	0.095	0.0278
192	Clermont	Primary Roads	39.1809	-84.2656	0.161	0.0278
193	Clermont	Secondary Roads	38.8955	-84.2342	0.015	0.0013
194	Clermont	Secondary Roads	39.0305	-84.1981	0.067	0.0013
195	Clermont	Local, Rural, and City Roads	39.2018	-84.2162	0.081	0.0001
196	Clinton	Primary Roads	39.4629	-83.9848	0.275	0.0267
197	Clinton	Primary Roads	39.4947	-83.915	0.836	0.0267
198	Clinton	Secondary Roads	39.4454	-83.8457	0.042	0.0018
199	Clinton	Secondary Roads	39.4489	-83.8506	0.205	0.0018
200	Darke	Secondary Roads	40.0498	-84.7565	0.050	0.0008
201	Darke	Secondary Roads	40.3244	-84.6369	0.140	0.0008
202	Greene	Primary Roads	39.7761	-84.0327	0.047	0.0096
203	Greene	Primary Roads	39.818	-84.0003	0.228	0.0096
204	Greene	Secondary Roads	39.8291	-84.0198	0.059	0.0018
205	Greene	Secondary Roads	39.8182	-84.0048	0.086	0.0018
206	Greene	Local, Rural, and City Roads	39.695	-84.082	0.062	0.0001
207	Hamilton	Primary Roads	39.1227	-84.5354	0.020	0.0027
208	Hamilton	Primary Roads	39.1623	-84.4356	0.058	0.0027
209	Hamilton	Secondary Roads	39.1427	-84.3894	0.055	0.0008
210	Hamilton	Secondary Roads	39.0987	-84.5028	0.118	0.0008
211	Hamilton	Local, Rural, and City Roads	39.1774	-84.3831	0.100	0.0001
212	Hamilton	Local, Rural, and City Roads	39.1212	-84.5348	0.201	0.0001
213	Miami	Primary Roads	40.0171	-84.2303	0.036	0.0123
214	Miami	Primary Roads	40.1333	-84.2157	0.425	0.0123
215	Miami	Secondary Roads	39.9721	-84.33	0.022	0.0014
216	Miami	Secondary Roads	40.147	-84.1491	0.839	0.0014
217	Miami	Local, Rural, and City Roads	39.9219	-84.2672	0.149	0.0001
218	Montgomery	Primary Roads	39.8489	-84.4247	0.060	0.0048
219	Montgomery	Primary Roads	39.8121	-84.189	0.132	0.0048
220	Montgomery	Secondary Roads	39.7551	-84.1925	0.015	0.0011
221	Montgomery	Secondary Roads	39.8901	-84.2075	0.098	0.0011

Site No.	County	Road Types	Latitude	Longitude	Segment length in miles	Probability of Selection
222	Montgomery	Local, Rural, and City Roads	39.6453	-84.2875	0.065	0.0001
223	Montgomery	Local, Rural, and City Roads	39.6149	-84.1749	0.171	0.0001
224	Preble	Primary Roads	39.8372	-84.5341	0.079	0.0227
225	Preble	Primary Roads	39.8361	-84.5712	0.911	0.0227
226	Preble	Secondary Roads	39.6927	-84.7098	0.099	0.0013
227	Preble	Secondary Roads	39.7631	-84.6365	0.118	0.0013
228	Preble	Local, Rural, and City Roads	39.8389	-84.7944	0.097	0.0002
229	Ross	Secondary Roads	39.3348	-83.0008	0.062	0.0015
230	Ross	Secondary Roads	39.3597	-82.9763	0.066	0.0015
231	Scioto	Secondary Roads	38.7394	-83.0028	0.006	0.0012
232	Scioto	Secondary Roads	38.9302	-83.0432	0.284	0.0012
233	Warren	Primary Roads	39.4926	-84.3244	0.011	0.0063
234	Warren	Primary Roads	39.4375	-84.3377	0.351	0.0063
235	Warren	Secondary Roads	39.2793	-84.1126	0.040	0.0013
236	Warren	Secondary Roads	39.4137	-84.2032	0.232	0.0013
237	Warren	Local, Rural, and City Roads	39.5656	-84.2883	0.147	0.0001

Appendix F: Ohio Seat Belt Survey – Site Description Form

Statewide Seat Belt Survey - Site Description Form 2015
Observer Name

Road to be Observed: _____

Direction of Observation: _____

Cross Street: _____

County:	Nearest City:	OSP District:
Site:	Day:	Date:
Start Time:	End Time:	Interuptions:
1st Traffic Count:	2nd Traffic Count:	Total Lanes:

Weather	Visibility	Site	Site Type
___ Sunny/Mostly Sunny	___ Poor	___ Primary	___ Intersection
___ Cloudy/Mostly Cloudy	___ Satisfactory	___ Alternate	___ Freeway Ramp
___ Light Rain	___ Excellent	___ Other	___ Toll
___ Heavy Rain			
___ Snow			

Observer Comments: _____

Ohio Seat Belt Survey – Observation Form

Site # ☐

Vehicle
Car ☐ Truck - Light ☐
Van ☐ Truck - Heavy ☐
SUV ☐

Driver Belted
Yes ☐ Unknown ☐
No ☐

Driver Sex
Male ☐ Female ☐

Driver Age
15-25 ☐ 65+ ☐
26-64 ☐

Driver Race
Caucasian ☐
African American ☐
Other ☐

Driver Cell Phone
Yes ☐ No ☐

Passenger Belted
Yes ☐ Unknown ☐
No ☐ No Passenger ☐

Passenger Sex
Male ☐ Female ☐

Passenger Age
0-4 ☐ 26-64 ☐
5-14 ☐ 65+ ☐
15-25 ☐

Passenger Race
Caucasian ☐
African American ☐
Other ☐

Vehicle
Car ☐ Truck - Light ☐
Van ☐ Truck - Heavy ☐
SUV ☐

Driver Belted
Yes ☐ Unknown ☐
No ☐

Driver Sex
Male ☐ Female ☐

Driver Age
15-25 ☐ 65+ ☐
26-64 ☐

Driver Race
Caucasian ☐
African American ☐
Other ☐

Driver Cell Phone
Yes ☐ No ☐

Passenger Belted
Yes ☐ Unknown ☐
No ☐ No Passenger ☐

Passenger Sex
Male ☐ Female ☐

Passenger Age
0-4 ☐ 26-64 ☐
5-14 ☐ 65+ ☐
15-25 ☐

Passenger Race
Caucasian ☐
African American ☐
Other ☐

Vehicle
Car ☐ Truck - Light ☐
Van ☐ Truck - Heavy ☐
SUV ☐

Driver Belted
Yes ☐ Unknown ☐
No ☐

Driver Sex
Male ☐ Female ☐

Driver Age
15-25 ☐ 65+ ☐
26-64 ☐

Driver Race
Caucasian ☐
African American ☐
Other ☐

Driver Cell Phone
Yes ☐ No ☐

Passenger Belted
Yes ☐ Unknown ☐
No ☐ No Passenger ☐

Passenger Sex
Male ☐ Female ☐

Passenger Age
0-4 ☐ 26-64 ☐
5-14 ☐ 65+ ☐
15-25 ☐

Passenger Race
Caucasian ☐
African American ☐
Other ☐

Vehicle
Car ☐ Truck - Light ☐
Van ☐ Truck - Heavy ☐
SUV ☐

Driver Belted
Yes ☐ Unknown ☐
No ☐

Driver Sex
Male ☐ Female ☐

Driver Age
15-25 ☐ 65+ ☐
26-64 ☐

Driver Race
Caucasian ☐
African American ☐
Other ☐

Driver Cell Phone
Yes ☐ No ☐

Passenger Belted
Yes ☐ Unknown ☐
No ☐ No Passenger ☐

Passenger Sex
Male ☐ Female ☐

Passenger Age
0-4 ☐ 26-64 ☐
5-14 ☐ 65+ ☐
15-25 ☐

Passenger Race
Caucasian ☐
African American ☐
Other ☐

Applied Research Center
Miami University

ODPS 2012
Data Collection Form