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Guidelines to Observe and Estimate Statewide Seat Belt Use at Night

Previous research has found an overrepresentation of fatal crashes at night, as well as substantially lower seat belt use among occupants of passenger vehicles at night compared to seat belt use during the day. An estimate of statewide nighttime seat belt use would be beneficial for understanding the problem of nighttime driving risk, and for evaluating the impact of nighttime seat belt enforcement programs. The *Guidelines to Observe and Estimate Statewide Seat Belt Use at Night* provides States with options for estimating statewide seat belt use at night. This report also provides a detailed description of how to conduct night observations.

Background

The National Highway Traffic Safety Administration standardized the way States measure seat belt use by introducing probability-based procedures and guidelines for selecting observation locations and weighting data collected at those sites. The weighting served to make the observations representative of statewide seatbelt use based on both traffic volume and population. The sampling and weighting with regard to traffic volume primarily used 24-hour traffic information. The fact that volume information is based on all the hours of the day, though observations were done only in daylight, was not an issue given that the large majority of traffic occurs during the daytime hours. The estimates generated by these surveys provide a good measure of belt use during the day.

Some recent studies have attempted to provide an estimate of statewide nighttime seat belt use. Generally, however, they failed to properly account for certain aspects of changes in traffic from night to day. There are fewer motor vehicles on the roadways at night as compared to the day. However, the drop-off in volume is not consistent between different functional classes of roadways. Higher volume roadways (e.g., interstates and freeways) tend to retain more of their volume at night than lower volume roadways (e.g., local roads and collectors). The problem with applying the daytime weighting to the nighttime observation data is that the distribution of the traffic across functional class at night is unlikely to be the same as it is during the day. Therefore, the weighting will overrepresent the influence of some functional classes and underestimate the influence of others.

The guidelines in this report are based on taking the existing design for estimating (daytime) belt use and adjusting the weighting to accommodate differences in nighttime traffic volumes. For States having comprehensive hour-by-hour traffic volumes, there are also guidelines to draw an entirely new sample of observation sites, based on nighttime traffic data, to use in estimating nighttime seat belt use.

Re-Sampling Based on Night Data

States may opt to draw an entirely new sample on which to conduct night observations. This new sample would be independent from the day survey. States should consider drawing a new sample of road segments for their nighttime survey only if the appropriate data are available. Specifically, a State would need to have a measure of hourly traffic volume by vehicle type for all roadways eligible to be sampled. If such data are available, a State may opt to then follow the same procedures used in drawing the sample for the daytime survey, but base selection probabilities on the nighttime passenger vehicle volumes (i.e., exclude buses and heavy trucks) rather than the 24-hour traffic volumes used for daytime sample selection. Details are available for the guidelines from NHTSA. For convenience and comparability the nighttime sample would follow the daytime design in terms of how many road segments, of what types, and in what counties.

Re-Weighting Daytime Plan for Nighttime Observations

Most States will not have the data necessary to draw a completely new sample for night observations. Therefore, they will need to start with their existing daytime sample. The formulas that are used to combine all data into a statewide daytime belt use figure will need to be adjusted for nighttime belt use computation. The adjustment is simple: replace the 24-hour weights with new weights based on nighttime passenger vehicle traffic. The report describes how to reweight the existing daytime weighting spreadsheet to estimate statewide nighttime belt use from nighttime observation data.

Data weighting methods differ greatly from State to State. The report provides general guidelines for weighting night-

time observation data to produce an unbiased estimate with minimal variance. The main issues are:

- change in proportion of traffic occurring on individual functional classes from day to night, and
- overrepresentation of large truck traffic at night compared to day.

The new weighting will start from the existing weighting spreadsheet for a State's daytime survey. The traffic volume data used to make the daytime data representative of statewide (daytime) belt use is inappropriate for weighting nighttime observation data and producing an estimate of statewide nighttime seat belt use. Vehicle miles traveled (VMT) data will need to be adjusted to make the weights representative of night traffic in terms of passenger vehicle distribution across functional classes. This should be the only necessary adjustment, since population, the other variable typically used in weighting, is constant across time of day.

The adjustments can be made in one of two ways depending on what data are available to the State. If the State can access hourly traffic volume data (i.e., vehicle counts from each road segment for each hour of the day) then the weighting will be performed slightly differently than if the State only has access to total 24-hour (i.e., daily) volume for each segment. Note that the segments described here are not just the observation sites but the complete sample of all roadways in the State used to calculate State VMT.

Both methods will require "clicker counts," that is, actual counts of traffic volume, to estimate the volume of passenger vehicles at night. The hourly data will likely result in more reliable estimates of night traffic volume, and therefore some effort should be invested into obtaining this data if available.

The report describes the steps for reweighting under each situation (hourly versus daily data availability) and provides examples from two States, Pennsylvania and Connecticut. The general purpose of the steps is the same for all States, but the steps may need to be adjusted to achieve their goals depending on the weighting scheme for any individual State.

Summary

The general steps used to perform a statewide estimate of nighttime seat belt use are to (1) keep everything the same as the daytime estimate except for the few things required to make it possible to conduct the observations, and (2) make the observations representative of nighttime traffic.

Some enhanced procedures need to be implemented during nighttime observations primarily because it is usually dark and difficult to see at night. Judicious adjusting of site locations, special equipment, observer/recorder teams, and enhanced safety measures will overcome most of the obstacles posed for seat belt observations at night.

Strategies to make the observations representative of night traffic include drawing an entirely new sample based on night traffic volume data, and making the volume data already included in the standard weighting spreadsheet represent night passenger vehicle volume.

How to Order

To order ***Guidelines to Observe and Estimate Statewide Seat Belt Use at Night*** (32 pages), prepared by Preusser Research Group, write to the Office of Behavioral Safety Research, NHTSA, NTI-130, 1200 New Jersey Avenue SE., Washington, DC 20590, fax 202-366-7394, or download from www.nhtsa.gov. Angela Eichelberger, Ph.D., was the project manager.

U.S. Department of Transportation
National Highway Traffic Safety Administration
1200 New Jersey Avenue SE., NTI-130
Washington, DC 20590

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