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Traffic Safety
COMMISSION

Seat Belt Use in Washington State, 2014

As Submitted to the National Highway Traffic Safety
Administration per 23 CFR Part 1340: Uniform Criteria for State
Observational Surveys of Seat Belt Use

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INTRODUCTION

Seat belts are highly effective for reducing the severity of traffic injuries. Seat belt use by all motor vehicle occupants is both a national and Washington state priority. Over the past three decades, dramatic increases in seat belt use have been achieved through the enactment of mandatory use laws, law enforcement strategies, and public education and information campaigns. Washington enacted a secondary enforcement seat belt law in 1986, and since then annual observation surveys of belt use have been conducted in order to assess changes in the rates of belt use in Washington.

Until 2013, the Washington Traffic Safety Commission (WTSC) had conducted all annual seat belt use surveys according to a methodology designed by WESTAT, Inc., which reflected the state's population and vehicle-travel patterns present in 1986. In 2010 the National Highway Traffic Safety Administration (NHTSA) proposed changes to 23 CFR Part 1340, the federal statute outlining the requirements under which all states are meant to conduct their seat belt surveys. This proposal called for a nationwide upgrade and update of survey methodologies across the states. After a public comment period on the proposal, NHTSA published a Final Rule on April 1, 2011, including detailed responses to public comments generated by the Proposed Rule.

Accordingly, through a competitive-bid process the WTSC selected and contracted with a private vendor, Resource Systems Group, Inc. (RSG), based in White River Junction, VT, to design Washington's new survey methodology according to NHTSA's specifications. In early 2013, NHTSA accepted Washington's proposal for the new seat belt observation method developed by RSG. The new method resulted in an entirely new selection of survey observation sites and a more comprehensive survey weighting approach. The result of this new methodology was a slight decline in the statewide seatbelt use rate estimate (from 96.9% in 2012 to 94.5% in 2013). This decline did not represent a decrease in statewide seatbelt use but rather is due to the change in methodology.

Due to the change in method, seat belt use estimates derived under the new method (2013 and forward) are not comparable to estimates derived under the old method (2012 and previous). The new methodology results in a more accurate estimate with greater confidence. The statistical level of accuracy with the new methodology is nearly double what it was under the old methodology.

The remainder of this report will describe the results of the 2014 seat belt survey's results.

RESULTS

A total of 85,075 front seat vehicle occupants, consisting of 66,541 drivers and 18,534 passengers, was observed in order to record shoulder seat belt use. Table 1 shows the weighted use rates for the 2014 Washington State seat belt observation survey by type of vehicle. The statewide observed rate for all vehicles and occupants was 94.5%, with a 95 percent confidence interval of +/- 0.6%. Thus, the actual statewide seat belt use rate could have been as high as 95.1% or as low as 93.9%.

Comparison of point estimate rates among vehicles types showed the highest rate for SUVs (95.7%) and the lowest rate for pickup trucks (91.2%). Thus, the difference between SUV and pickup compliance rates was 4.5 percentage points. By contrast, prior to passage of the primary seat belt law in 2002, rates for pickup trucks were generally about ten percentage points lower than rates for the other vehicle types.

**TABLE 1. SEAT BELT USE RATES, By Vehicle Type
WASHINGTON STATE, 2014**

TYPE OF VEHICLE	# OBSERVED	RATE	95% CL
Passenger Cars	38,617	95.1%	94.3% - 95.8%
Pickup Trucks	14,662	91.2%	89.1% - 93.3%
Sport Utility Vehicles	25,158	95.7%	94.9% - 96.5%
Vans	6,638	95.0%	93.4% - 96.5%
TOTAL	85,075	94.5%	93.9% - 95.1%

Analysis of belt use by type of road showed lower belt use on Non-Major roads (93.5%) than on Major roads (95.4%). Table 2 shows these figures.

**TABLE 2. SEAT BELT USE RATES, By Road Type
WASHINGTON STATE, 2014**

TYPE OF ROAD	# OBSERVED	RATE	95% CL
Major Road	77,433	95.4%	95.2% - 95.7%
Non-Major Road	7,642	93.5%	92.3% - 94.7%
TOTAL	85,075	94.5%	93.9% - 95.1%

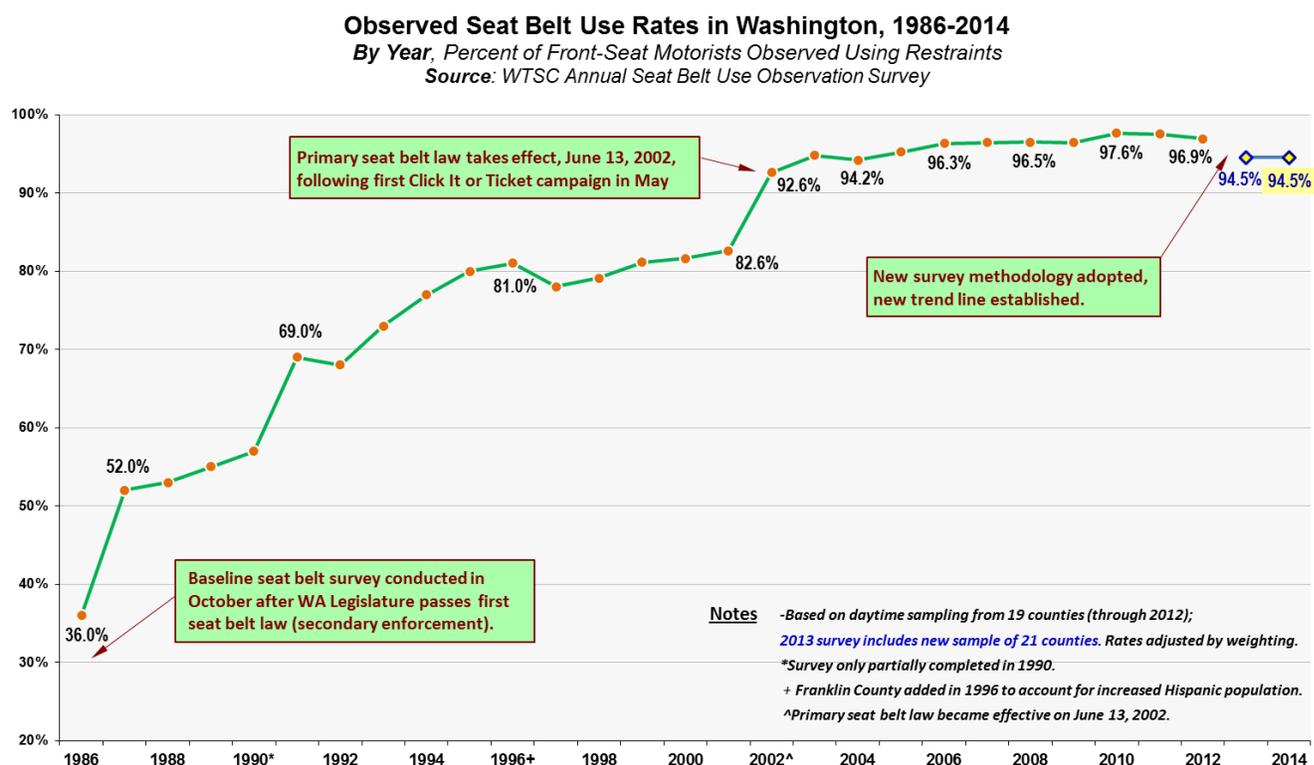
Table 3 show belt use rates for all counties in the sample. Variability in seat belt use among the counties is evident in these rates, which range from point estimates of 99.1% in Thurston County to 91.2% in Whatcom County. County level results should be interpreted with caution. The seatbelt use survey was designed for a statewide estimate, and therefore the selection of major and minor road segments in each county sampled reflected the statewide proportion of these road segments. In reality, though, the proportion of major and minor road segments in each county varies. In order to produce more accurate county-level estimates, the proportion of major and minor road segments observed should match each county's unique proportion. This issue will be addressed in 2018 when the site sample is reselected.

**TABLE 3. SEAT BELT USE RATES BY COUNTY
WASHINGTON STATE, 2013**

COUNTY	# Observed	RATE	95% CL
BENTON	1,326	96.0%	93.9% - 98.2%
CLARK	4,825	96.8%	94.8% - 94.8%
COWLITZ	2,715	95.6%	91.3% - 99.9%
FRANKLIN	1,412	92.7%	83.4% - 100.0%
GRANT	1,111	96.6%	95.2% - 98.0%
GRAYS HARBOR	3,055	94.3%	93.1% - 95.5%
KING	28,334	94.1%	92.9% - 95.4%
KITSAP	2,787	94.6%	92.9% - 96.3%
KITTITAS	1,297	96.0%	93.8% - 98.2%
LEWIS	2,840	98.9%	98.3% - 99.5%
MASON	1,894	98.9%	98.4% - 99.4%
OKANOGAN	1,295	93.0%	91.4% - 94.6%
PIERCE	8,289	93.5%	91.8% - 95.2%
SKAGIT	2,397	91.8%	89.2% - 94.4%
SNOHOMISH	5,635	96.6%	96.1% - 97.1%
SPOKANE	3,325	93.8%	91.6% - 96.0%
STEVENS	1,899	92.3%	90.7% - 93.9%
THURSTON	5,966	99.1%	98.8% - 99.3%
WHATCOM	1,883	91.2%	88.2% - 94.3%
WHITMAN	7,43	95.2%	93.6% - 96.9%
YAKIMA	2,047	97.4%	94.5% - 100.0%
TOTAL	85,075	94.5%	93.9% - 95.1%

DISCUSSION

The chart below shows belt use rates for all state surveys from 1986 through 2014. Seat belt use in Washington State has shown a fairly consistent upward trend during that period. Use more than doubled in the ten years following implementation of the secondary enforcement law, from 36% in 1986 to 80% in 1995. The rates in Washington under the secondary law were among the highest reported by secondary-law states. However, little change in belt use was seen between 1995 and 2001.



In 2002, changes implemented in laws, policies, and programs had a dramatic influence on seat belt use rates. These changes included the following:

- The primary enforcement law was enacted in June 2002;
- The Chief of the Washington State Patrol made seat belt enforcement one of the core missions of the agency; and
- Washington State participated in the national Memorial Day “Click it or Ticket” program during May/June 2002.

Consequently, observed belt use increased from 82.6% in 2001 to 92.6% in 2002.

Washington has been able to maintain a high rate of seat belt use (93% to 98%) in the years since 2002 by continuing to support enhanced enforcement programs in conjunction with public information and education efforts. These programs include the following:

- Regular waves of Click it or Ticket mobilizations – two waves per year through 2009, and one per year from 2010 through 2014;
- Road signs (650 throughout the state) that constantly remind the public that the seat belt law is enforced and that the fine is expensive (currently \$124);
- Incentive programs for local law enforcement agencies to foster sustained enforcement of the seat belt law (only through 2008); and
- High school-based seat belt education projects (called Click it And Ticket) have been conducted in over 60 schools since 2007.

A paper by Salzberg and Moffat (2004) describes these programs in detail.

Washington's 97.6% rate in 2010 was both the highest in state history as well as one of the highest seat belt use rates ever reported by a state. The increase of nearly 1.2 percentage points (from 2009) meant that roughly one-third of occupants not using seat belts in the 2009 survey 'converted' to using seat belts in 2010. Washington's 2012 observed seat belt use rate was statistically unchanged from the 2010 and 2011 rates. Beginning in 2013, the seat belt use rate is the beginning of a new trend generated by means of a different survey sampling method.

Finally, it is worth noting that seat belt use among passenger vehicle occupant fatalities has improved dramatically over the years in response to Washington's changes in seat belt laws, policies, and practices. In 1986, only 21% of passenger vehicle occupant fatalities were wearing a seat belt at the time of the crash. By 2013, the percentage of vehicle occupant fatalities wearing a seat belt increased to 65% (Fatality Analysis Reporting System).

SURVEY METHODS

Survey Design and Observation Sites

NHTSA's Final Rule to 23 CFR Part 1340 included a number of new requirements for state seat belt surveys. The following are some of the highlights:

1. The sampling frame now includes counties that "account for at least 85 percent of the state's passenger vehicle occupant fatalities" (§1340.5). One result of this change is that the number of counties in our sample increased from 19 to 21, with four counties leaving the survey and six different counties joining it.
2. With some specific exceptions, all roads within the 21 Washington counties selected were included in the sampling frame. From that sample, based on an approximate 60%-40% vehicle miles-traveled (VMT) distribution between Major (i.e., highway) and Non-Major (i.e., city, county, or other local) roads in Washington, 271 Major and 181 Non-Major segments (a total of 452 separate road segments) were selected probabilistically from road segment data provided by NHTSA and the Washington State Department of Transportation.
3. Following probabilistic selection of road segments, the specific observation site to be used in the survey was selected within each selected road segment deterministically through in-person inspections meant to optimize both observer safety and observer viewing ease.
4. The direction of traffic and the time period to be observed at each site were chosen independently and randomly, although for practical scheduling purposes the ordering of sites visited in a given county on a given day was chosen deterministically. That is, sites were grouped in clusters based on geographic proximity in order to minimize observer travel time.

The new survey sample includes 452 roadway sites. For all sites chosen by the survey coordinator and his team, hand-held Global Positioning System (GPS) devices were used to record specific latitudes and longitudes, as well as written and photographic records to further identify each site. Upon arrival at the site, observers used the device to "check-in", assuring that every observer was at the right location and remained there for the right amount of time. This documentation also ensures that every site remains consistent until the survey sample is refreshed, i.e., every five years according to CFR §1340.12(a).

The observation and data collection processes comply with NHTSA survey guidelines specified in CFR §1340.7. Four different types of vehicles – passenger cars (including station wagons), pickup trucks, sport utility vehicles (SUVs), and passenger vans – were observed during two separate 20-minute data collection periods at each of the road-side observation sites. Since

passenger cars have consistently accounted for about 50% of all vehicles observed in the WTSC's annual seat belt surveys, one period was devoted to passenger cars alone; during a second 20-minute period, occupants in the other passenger vehicles were observed. Seat belt use was observed and tallied separately for drivers and outboard passengers at each site.

Observation Procedures

A team of experienced observers, many of whom are retired or off-duty police officers accustomed to enforcing seat belt laws, underwent survey training (updated and conducted annually) and then collected the survey data as scheduled and as outlined in the training. The survey coordinator, also a retired police officer, trained the survey observers as well as quality-control monitors (QCMs) on all requirements outlined in CFR §1340.8(a). In Washington, QCMs are required to visit two sites in every county. In 2014, QCMs visited 38 sites out of 450 total sites sampled, or 8.4%, which exceeds the 5%-threshold required in CFR §1340.8(a). However, due to unforeseen circumstances, QCMs did not visit sites in Grant or Spokane counties and only one site was visited in Skagit county.

Each roadway site was observed for 40 minutes, 20 minutes for passenger cars alone and 20 minutes for pickup trucks, SUVs, and vans combined; passenger cars alone constitute nearly half (47%) of all vehicles included in the survey. Survey personnel typically observed roughly 8 sites per day during the hours between 7 AM and 6 PM. Thus, the survey results should be generalized to represent daytime hours only. The roadways were observed from the shoulder or a sidewalk adjacent to the road or, if possible, from an overpass.

Survey personnel were instructed to observe shoulder belt use of drivers and right-front seat passengers. Traffic was observed in one direction of travel only, which was specified in the sampling plan. On multiple-lane roads, survey personnel were instructed to observe only as many lanes of traffic as was feasible based on traffic flow and vehicle speeds. For example, on exceptionally busy 4-lane interstate highways, typically only 1 or 2 lanes were observed at a time but were rotated so as to adequately sample travel lanes in the designated direction. Both the total number of travel lanes and the number of lanes actually observed were recorded and considered in weighting.

Beginning in 2014, the WTSC purchased iPads for the observers to use during data collection. An observation survey data collection application was developed including a summary screen, followed by the observation data collection screen equipped with a timer. At each site, the observer completed the site summary screen, then initiated the timer and collected data for each 20 minute observation period. Prior to data collection via iPads, the observers used a manual 'ticker' device that consisted of four counters. The use of iPads vastly improved data collection and accuracy, as is evident when comparing the 2013 nonresponse rate at 2.65% to the 2014 nonresponse rate at only 0.7%.

The data collection application allowed observers to assign each front seat occupant as 'Belted', 'Not belted', or 'Can't tell', with an additional option for passengers 'No Passenger'. Observers counted misuse of shoulder belts, such as passengers wearing the shoulder portion under the arm, as 'Not belted'. Cases where the observer was unsure about belt use were designated 'Can't tell'; such cases typically resulted from sun glare or tinted windows on a vehicle. For 1999 and in all subsequent surveys, the WTSC modified the procedure for counting cases where the observer was unsure about belt use. In previous years, 'unsure' observations had been counted as 'not using' belts.

Rate Estimation Procedure

The belt use rates computed from the survey data are weighted estimates derived from the number of belted occupants divided by the total number of occupants observed. The ratio of belted occupants to total occupants was adjusted by an estimate of vehicle time on the road for each road segment site. Time on the road was computed by the length of the road segment divided by the approximate speed of the vehicles observed. The estimates were also adjusted by a ratio of the actual number of lanes observed divided by the total number of lanes in that direction of travel.

The seat belt use rate estimates were calculated using the sampling probability weighting factor generated for each site. The sampling weights for all sites are defined as the "inverse of the probability that a particular vehicle is observed during the study" at each stage (i.e., the "joint probabilities") of the sampling procedure. The formula used to estimate belt usage is described in detail in the *Revised Sampling, Data Collection and Estimation Plan*.

Standard error estimates were generated using a weighted bootstrapping method. The method was developed in R statistical software by RSG. In 2013, the first year the new method was deployed, RSG provided all weight calculations and estimates in order to fully test the methodologies they had developed on behalf of the WTSC. In 2014, all rate estimation calculations were conducted by WTSC's Research Director using SAS statistical software and R. Standard error estimates were generated in R using the syntax provided by RSG. The WTSC Research Director, Staci Hoff, PhD, meets the standard for statistical review as described in §1340.8(c).

In July of 2014, Washington experienced the worst summer wild fires in state history, resulting in the Governor declaring a state of emergency. Okanogan county was severely affected by the fires. As a result, two observation sites in Okanogan were treated as 'non-responding sites', or sites with eligible volume and yet no usable observations. Visibility was severely compromised and safety was a priority concern. The observers shared several photos with WTSC to provide insight into the conditions the wild fires created, provided on the following page. These two sites were excluded from analysis, and all other weights for non major sites in Okanogan were adjusted by the calculated non-responsive site factor.

Okanogan County Wild Fires – July 2014



REFERENCES

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Salzberg P & Moffat J, 2004. Ninety Five Percent: An Evaluation of Law, Policy, and Programs to Promote Seat Belt Use in Washington State. *Journal of Safety Research* 35: 215-222.