Night Seat Belt Use in Maine

June 2023

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Introduction

There are compelling reasons for addressing nighttime seat belt use for the betterment of highway safety. Nighttime belt use rates are consistently lower than daytime belt use rates. Chaudhary and Preusser (2006) compared daytime and nighttime seat belt use in Connecticut, using the State's Section 157-compliant sites, and found that daytime belt use was about 6 percentage points higher than nighttime (83% vs. 77%). Solomon, Chaudhary, and Preusser (2007) showed a similar day to night difference (6.2 percentage points) in New Mexico using similar observation techniques.

In addition, nighttime fatalities are disproportionately frequent compared to the amount of nighttime driving that is actually done. The most recent FARS data (2021) indicates that 25 percent of all motor vehicle fatalities in the U.S. occurred between the hours of 10:00 p.m. and 3:59 a.m. but according to Hallenbeck (1997), this time period likely has less than 15 percent of daily traffic volume. Maine shows the same pattern or overrepresentation of nighttime fatalities. Figure 1 shows this effect using 2012-2021 FARS data. Belt use among fatally injured occupants (in outboard seating positions) is uniformly highest during daytime hours, with the lowest rates found from 7:00 p.m. to 5:59 a.m. In Maine over the past 10 years about 20 percent (19.6%) of the fatalities occurred between the hours of 10:00 p.m. and 3:59 a.m.

Figure 1. Percent Belt Use Among Fatally Injured Front Seat Outboard Occupants of Passenger Vehicles, By Hour, Maine, 2012-2021
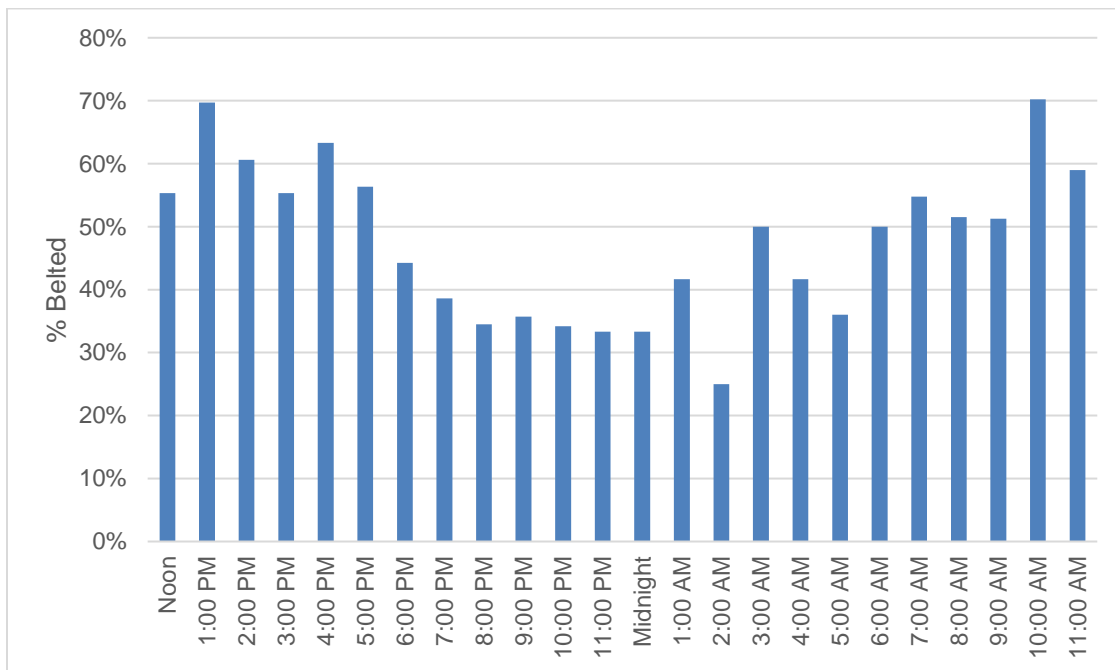
The current study continues a previously employed methodology. Nighttime sites were originally sampled from those selected for the 2012 daytime statewide survey (Chaudhary et al., 2012). It should be noted that new statewide (daytime) sites are selected every five years based on Federal Register guidelines. New night sites were selected from the resample in 2017 for use

in the 2018 night survey. New sites were selected again for the 2022 statewide daytime belt use study but, for the sake of consistency, Maine's current night belt sites were the ones selected from the 2017 daytime sample (i.e., the same sites used in the last 5-years' worth of night data).

Methods

Maine's pre-2012 statewide Section 157-compliant seat belt use survey design included 120 observation sites in 10 of the 16 counties; the design was developed in 2004. A subset of 40 of those sites in 6 counties was used for "mini" surveys from 2008 - 2010. The 40 sites were chosen to be representative of the full 120-site design in terms of urban and rural locations and road function categories. Chaudhary et al. (2010) used those 40 sites for daytime and nighttime observations in 2008 in order to be able to directly compare day and night belt usage. They found that 13 of the sites, at night, had fewer than 5 observations per 45-minute observation period in each of the three observation waves. In order to minimize the impact of these very low volume sites on the overall measures, they were dropped from nighttime belt use calculations (and day-night belt use comparisons were based only on the remaining 27 sites). Those 27 sites were used in 2009, 2010, 2011, and 2012.

Starting in 2012 the daytime statewide seatbelt survey was modified as per NHTSA regulations. Using observation data from the 2012 daytime survey a "mini" sample of 35 sites was selected from the non-local roadways to be part of the new night sample. Local roadways were excluded because late night traffic volume on local roadways is typically too low to reach a minimum number of observations. Local roadways were also not included in previous night observations, so their exclusion makes the current observation sample more comparable to previous nighttime measurements. The same criteria used for pre-2013-night observations of at least 5 vehicle observations for data to be included in the analyses was used for the 2013 observations. Six of the 35 sites were removed from the data set because of this criterion rendering the final analysis to be based on 29 sites. These 29 sites were repeated for 2015 through 2017-night belt observations.

In 2017, NHTSA required a "resample of sites" used in the 2012 design. Using the same method described above, 35 of these new sites were selected for nighttime observations. Four of these sites had fewer than 5 observations. These 4 sites were excluded from analysis. All results from the 2019 nighttime observations are based on the remaining 31 sites. There were no observations conducted in 2020 due the COVID-19 Pandemic but observations resumed in 2021. All 35 sites were observed, and all 35 sites had at least 5 observations and were included in the analyses. Another resample of the daytime sites occurred in 2022, but, for the sake of a consistent year to year comparison the night sites did not change with the most recent daytime resample.

Site information, including county name, city/town/area identifier, exact roadway location, date, day of week, time, weather condition, direction of traffic flow and roadway lane(s) was documented by observers. Each one-page data collection form had space to record information on 70 vehicles, the driver of that vehicle, and the outboard front seat passenger, if one was present. Multiple pages could be used to record belt use in any observation session as needed.

Preusser Research Group, Inc. (PRG) provided experienced observers to collect the data. All were trained to follow the procedures shown in Appendix A. Specifically, observers were trained to observe proper shoulder belt use (vs. improper or no use) of the driver and, if present, a right "outboard" (aka window-adjacent) front seat passenger. Observations were made for passenger vehicles and certain commercial vehicles. These same methods have been used in Maine since 2012 for both daytime and nighttime belt use observations and in numerous other states where PRG conducts similar work.

Observers were given descriptions of the road segment and the direction of traffic to be observed. Guidance was also provided as to the exact location from where observations should be made. Observers had the option of adjusting their location within the road segment if conditions made the recommended location unusable or unrepresentative (e.g., construction, nearby traffic rerouting, traffic crash, etc.), but they did not need to make such adjustments in 2023. Many roads had two or more lanes of traffic. In such situations, the observation period (45 minutes) was divided by the number of lanes, each lane being observed for the proportional length of time. For example, a road with three lanes would require that each lane be observed for 15 minutes.

Observations were made for 45 minutes at each location. Each observer was given a detailed schedule that included site description, mapping/location information, observation times and a structured schedule of observation times and days. The schedule was designed to maximize the opportunity to study variations in restraint use by time of day and by day of week (e.g., day/night, weekday/weekend). Nighttime observation assignments were made across a schedule beginning at 9:00 p.m. and ending at 2:45 a.m. Road segments were randomly assigned to a day of week and time of day for observations, although geographical proximity was given some consideration for travel to locations that required substantial drive times. Each day and time had an equal probability of selection.

When needed (e.g., in zero overhead lighting locations), military grade night vision goggles and 2 million candle-power handheld infrared spotlights were used. Two staff members were needed when using this specialized night vision equipment during observations. One staff member (observer) would observe belt use through the night vision goggles while shining the infrared light at the vehicle. This person would also call out the data while the other staff member (recorder) would write down information on the observation data sheet.

Results

Data were collected post-CIOT, from June 17 – June 29, 2023. The numbers of observed occupants at the sites ranged from 3 to 129. In all, there were 1,088 passenger vehicle drivers along with 260 passengers, for a total of 1,348 vehicle occupants. Weighted belt use was calculated using an average of the belt use percentages at the 35 sites, resulting in an overall nighttime statewide belt use rate of **77.5%[1]**. The standard error of measurement was calculated as the standard error of the means, which was 1.95%. The 95 percent confidence interval for the statewide night belt use value was 81.0% to 88.7%. Table 1 places these observations in context with those made in 2008 (Chaudhary et al., 2010), through 2022.

Night belt use in 2023 was 7 percentage point lower than during the comparable time period in 2022 (84.8%). The difference between 2022 and 2023 did have overlapping 95% confidence intervals suggesting that there was no significant change in use from 2022 to 2023.

Table 1. Statewide Night Belt Use, by Wave (Weighted)

	Obs. Dates	*Condition*	*Night Belt Use*
Wave 1	2/24 – 3/1/2008	Pre-enforcement	69.3%
Wave 2	4/25 – 5/3/2008	Post-enforcement	76.9%
Wave 3	5/30 – 6/12/2008	Post-CIOT	81.2%
Wave 4	5/30 – 6/13/2009	Post-CIOT	80.1%
Wave 5	6/6-6/12/2010	Post-CIOT	77.1%
Wave 6	6/3-6/11/2011	Post-CIOT	79.0%
Wave 7	6/4-6/9/2012	Post-CIOT	87.6%
Wave 8	6/1-6/9/2013	Post-CIOT	87.2%
Wave 9	5/30-6/12/2014	Post-CIOT	84.3%
Wave 10	5/29-6/1/2015	Post-CIOT	84.0%
Wave 11	6/4-6/17/2016	Post-CIOT	81.6%
Wave 12	6/8-6/15/2017	Post-CIOT	86.8%
Wave 13	6/6-6/22/2018	Post-CIOT	88.3%
Wave 14	6/7-6/20/2019	Post-CIOT	90.6%
Wave 15	6/15-6/24/2021	Post-CIOT	83.8%
Wave 16	6/15-7/13/2022	Post-CIOT	84.8%
Wave 17	**6/17-6/29/2023**	**Post-CIOT**	**77.5%**

Table 2 shows belt use rate differences (using unweighted data) by roadway type, vehicle type, sex, and person type (driver or passenger). Seat belt use did vary significantly across roadway types (χ^2 (3) = 9.49, $p < 0.05$). Use was highest on rural arterials and lowest on collectors There was a significant effect of vehicle type (χ^2 (3) = 87.47, $p < 0.0001$). The results

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[1] One site had fewer than 5 observations. The rate was 76.9% if that site's data were excluded.

mimic typical daytime patterns where pickup truck use rates (60.2%) were the lowest of all vehicle types. Car use was 78.3%, SUV use was 88.3%, and Van use was 87.0%.

Female occupants had significantly higher use rates (88.5%) than male occupants (73.9%) (χ^2 (1) = 43.05, $p < 0.0001$). The difference between Driver use (78.6%) and Passenger use (84.6%) was also significant (χ^2 (1) = 4.75, $p < 0.05$). The difference in use for female drivers (87.9%) versus female passengers (90.0%) was not significant , and neither was the difference between male drivers (73.3%) and male passengers (77.3%).

Table 2. Night Belt Use, June 2023, by Road Type, Vehicle Type, Person Type, and Role[1]

Road Functional Class Category*	N	Night Belt Use
Expressways	233	83.3%
Urban Other Arterials	542	77.1%
Rural Other Arterials	346	83.8%
Collectors	226	76.1%
Vehicle Type**		
Passenger Cars	451	78.3%
Pickups	246	60.2%
SUVs	596	88.3%
Vans	54	87.0%
Sex Driver – Passenger		
Male Drivers	697	73.3%
Male Passengers	110	77.3%
Female Drivers	390	87.9%
Female Passengers	150	90.0%
Sex**		
Male	807	73.9%
Female	540	88.5%
Driver-Passenger*		
Driver	1087	78.6%
Passenger	260	84.6%

[1] Raw (unweighted) percentage

* Significance level p< .05

** Significance level p< .01

Discussion

The observed nighttime seat belt use rate in 2023 was the lowest in twelve years. The rate observed in 2019 was the highest yet recorded so there could have been some regression to the mean in the years following. However, the decrease measured in 2023 was the lowest in several years and was 7 percentage points lower than the 2022 rate. Nighttime non-belt use has been associated with alcohol use while driving and could be indicative of a change in this behavior. Nighttime crashes resulting in fatalities are overrepresented (i.e., higher than the traffic volume would account for compared to daytime crashes). These factors make a decreasing nighttime seatbelt use an important value to watch.

The reason for this drastic decrease is unclear. Anecdotal reports from data collected in 2020 indicate an increase in risky driving behavior in general. Whether this increase is real, whether it continued through 2023, and whether it accounted for decreased use at night is unknown. There was no parallel decrease in daytime belt use – in fact, daytime belt use increased by 1.1 percentage point between 2022 and 2023.

The use rates since 2012 have failed to show any consistent pattern. It could be useful to increase the time spent during observation periods to boost the Ns (e.g., observe sites for 1-hour or 1.5-hours instead of 45 minutes) or to increase the number of sites included. The 2024 survey, if it occurs, may use sites selected from the resampled daytime sites that occurred in 2022. Alternatively, the current sites may be maintained to keep consistency (or some hybrid of site selection may be beneficial).

Typically, we do not see much difference in nighttime use rates by roadway functional classes, but this year was different. Similar to what is seen in daytime observations, belt use rates were higher on interstates, but unlike daytime, the rural arterials showed an unexpectedly high use rate at night (half a percentage point higher than the interstates rate). There was also a similar pattern of use at night and day based on sex and vehicle type. Both daytime and nighttime observations in 2023 showed lower use among men and pickup truck drivers. Another similarity between daytime and nighttime is the higher use among passengers than drivers.

Nighttime seat belt use in Maine was much lower (17 percentage points) than the daytime rate in 2023 and also lower than the 2022 nighttime rate (7 percentage points). There was an unusually high nighttime rate observed in 2019 (that was higher than the 2019 daytime rate) but the recent nighttime surveys suggest that the 2019 nighttime rate may have been artificially (e.g., due to chance) high. There are relatively few night observations (i.e., low N) overall so some variability in the year-to-year rate could be expected.

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Appendix A. Maine Seat Belt Observation Instructions

Qualifying vehicles include passenger automobiles, pickup trucks, recreational vehicles, jeeps, and vans (private, public, and commercial). Pickup trucks should be coded as "trucks". Jeeps, Broncos, Blazers, and other vehicles of that type should be coded as sport utility vehicles (SUVs). Recreational vehicles that are pickup or van "conversions" should be coded as a pickup or van. Do not include large trucks or buses. Eligible vehicles should be observed regardless of the state in which they are registered. Emergency vehicles such as police, fire and ambulance, vehicles with mounted colored lights, government vehicles and taxis are to be recorded as long as they qualify as one of the above listed eligible vehicles. Ex. Fire department or Police SUV=SUV; Police cruiser=car.

Belt use will be observed for front seat occupants only. Observe and record data for the driver and passenger in the right front seat. If there is more than one front seat passenger, observe only the "outside" passenger. Do not record data for passengers in the back seat or for a passenger riding in the middle of the front seat.

If a child is present in the front seat in a child restraint seat, do not record anything. However, children riding in the right front seat, regardless of age, who are not in child restraint seats should be observed as any other right front seat passenger. Children in booster seats should be observed. Each observation period will last for exactly 45 minutes.

The following procedures will be used in conducting observations of seat belt use:

As you observe a qualifying vehicle, record the type of vehicle (car, truck, SUV, van), the occupants' sex (male, female, unknown), and shoulder restraint use (yes, no, unknown) of the front seat occupants (driver and front seat "outside" passenger only). If there is no qualified passenger, leave the passenger fields blank. If you cannot tell whether there is a qualified right front seat passenger, code "U" in the passenger gender box.

Code restrained if you observe the shoulder belt properly positioned over the shoulder. If you notice a lap belt in use without a shoulder belt, it should be recorded as not restrained. Only shoulder belts are to be counted. Even if the vehicle likely has no shoulder belts, code the occupant(s) as not restrained.

If the person is using the shoulder belt improperly, e.g., has the shoulder strap under his/her arm or behind the back, this should be recorded as not restrained. If you can't tell shoulder belt use at all, code unknown.

If there are multiple lanes in the "observed direction" and traffic is too dense to code all lanes at once, observe traffic in each lane for an equal amount of time, and in the direction specified, throughout the 45-minute observation time period.

In many situations, it will be possible to observe every vehicle in the designated lane(s). However, if there is too much traffic for you to observe every vehicle, you should determine a reference point up the road in the appropriate lane. Observe the next vehicle to pass the reference point after the last vehicle has been coded.

Do not observe if rain, fog, or other inclement weather makes it impossible to do so safely or accurately. If you arrive at a site and it begins to rain, do not collect data in the rain. Find a dry place and wait up to 15 minutes to see if the rain stops. If the rain does stop, begin observing again and extend the observation period to make up for the time missed. Otherwise, you will have to contact your supervisor to reschedule the site. (Note: You may continue observations in light fog, drizzle, or mist).
If more than one data sheet is used, staple the sheets together at the end of the observation period and note the number of sheets used at the top of the first data page.

It may happen that the site you are assigned is seriously compromised due to construction or special activity. If this occurs, you may move one block in either direction on the same street such that you are observing the same stream of traffic that would have normally been observed had there been no obstruction. If moving one block will not solve the problem, then do not conduct the observation. Notify your supervisor; an alternate site will be selected and observed at a future time.

The following procedures will be used in rescheduling observations of seat belt use.

If the site is temporarily unusable, e.g., due to bad weather or temporary traffic congestion or blockage:

- Inform your supervisor of the problem as soon as practical.

- With your supervisor's assistance, reschedule the same site to be observed at the same time of day/day of week.

If the site cannot be used during this observation schedule, e.g., due to construction:

- Inform your supervisor of the problem as soon as practical.

- With your supervisor's assistance, schedule an equivalent alternate site to be observed at the same time of day and day of the week. The alternate site must be in the same county and of the same roadway type. Your supervisor will provide a specific alternate site to be observed; you may not simply pick any other roadway to observe.

Appendix B. Maine Seat Belt Observation Form

SITE NUMBER:_____   **SITE:**_____ _____

NOTES:_____ _____

WEATHER CONDITIONS
1 Clear / Sunny   4 Fog
2 Light Rain   5 Clear but Wet
3 Cloudy

DATE: _____ - _____ - _____   **DAY OF WEEK:** _____

DIRECTION OF TRAFFIC FLOW (Circle one): N   S   E   W

START TIME:_____ **(Observation period will last exactly 45 minutes)**

	DRIVER			PASSENGER			DRIVER			PASSENGER	
Veh. #	**Vehicle** C = car T = truck S = suv V = van	**Sex** M = male F = female U = unsure	**Use** + = yes - = no U = unsure	**Sex** M = male F = female U = unsure	**Use** + = yes - = no U = unsure	**Veh. #**	**Vehicle** C = car T = truck S = suv V = van	**Sex** M = male F = female U = unsure	**Use** + = yes - = no U = unsure	**Sex** M = male F = female U = unsure	**Use** + = yes - = no U = unsure
1						36					
2						37					
3						38					
4						39					
5						40					
6						41					
7						42					
8						43					
9						44					
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