Occupant Restraint Use in 2017: Results From the NOPUS Controlled Intersection Study

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Abstract

This report presents results from the 2017 National Occupant Protection Use Survey (NOPUS) Controlled Intersection Study, the only nationwide probability-based occupant restraint use survey. NHTSA's National Center for Statistics and Analysis conducts this survey annually. The 2017 NOPUS found that seat belt use continued to be higher for females (91.8%) than for males (88.0%). Restraint use among children ages 4-7 in the West region increased significantly from 84.6 percent in 2016 to 95.3 percent in 2017. Seat belt use in the rear seat (75.4%) was lower than in the front seat (89.7%).

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Definitions

- Vehicle occupants observed in the NOPUS survey are counted as "belted" if they appear to have a shoulder belt across the front of the body. NOPUS does not observe the use of lap belts because these restraints cannot be reliably observed from the roadside.

- The survey classifies a child as:
  - <u>Restrained in a rear-facing car seat</u> if the child appears to be on a seat on top of the vehicle seat, facing the rear of the vehicle, with harness straps across the front of the child.
  - Restrained in a forward-facing car seat if the child appears to be on a seat on top of the vehicle seat, facing the front of the vehicle, with harness straps across the front of the child.
  - Restrained in a high-backed booster seat if the child appears to be on a seat on top of the vehicle seat with a shoulder belt across the front of the child.
  - <u>Restrained in a seat belt or backless booster seat</u> if there is a shoulder belt across the front of the child but the observers cannot see if the child is in a seat on top of the vehicle seat.
  - <u>Restrained</u> if s/he is restrained by any of the above.
  - The remaining children are classified as <u>unrestrained</u>. Note that in the survey there is no mention of being "unrestrained" in, for example, a forward-facing car seat. NOPUS does not observe the use of lap belts, and does not distinguish between seat belts and backless booster seats, because these assessments cannot be reliable if observed from the roadside.

- The racial categories "Black," "White," and "Members of other races" in NOPUS reflect subjective characterizations by roadside observers regarding the race of vehicle occupants. Likewise, observers record age groups (8 to 15 years old, 16 to 24 years old, 25 to 69 years old, and 70 and older) that best fit their visual assessment of each observed occupant.

- "Expressways" are defined as roadways with limited access, while "surface streets" comprise all other roadways.

- A roadway is defined to have "fast traffic" if, during the observation period, the average speed of passenger vehicles passing the observers exceeds 50 mph, with "medium-speed traffic" defined as 31 to 50 mph and "slow traffic" defined as 30 mph or slower. The traffic speed data in the Controlled Intersection (CI) survey is matched to the Moving Traffic (MT) survey data.

- A roadway is defined to have "heavy traffic" if the average number of vehicles on the roadway during the observation period is greater than 5 per lane per mile, with "moderately dense traffic" defined as greater than 1 but less than or equal to 5 vehicles per lane per mile, and "light traffic" as less than or equal to 1 vehicle per lane per mile. Please note that this traffic density breakdown has been revised in the 2011 NOPUS to

better capture the traffic patterns. The traffic density data in the Control Intersection survey is matched to the Moving Traffic survey data.

- Since NOPUS is not a census but a probability sample, it is impossible to produce state-by-state restraint use results. However NOPUS produces the following regional estimates:

  Northeast: Connecticut, Massachusetts, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont

  Midwest: Iowa, Kansas, Illinois, Indiana, Michigan, Minnesota, Missouri, North Dakota, Nebraska, Ohio, South Dakota, Wisconsin

  South: Alabama, Arkansas, the District of Columbia, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia

  West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, New Mexico, Nevada, Oregon, Washington, Washington, Wyoming

  These are the same regions used in the National Survey of the Use of Booster Seats (NSUBS).

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Executive Summary

The National Occupant Protection Use Survey is the only nationwide probability-based survey of seat belt use (for occupants 8 and older in both front and rear seats), motorcycle helmet use, child restraint use (for children under 8 years old), and driver electronic device use in the United States. NHTSA's National Center for Statistics and Analysis conducts this survey annually. Two sub-surveys – the Moving Traffic (MT) Survey and the Controlled Intersection (CI) Study – comprise the NOPUS.

In the Controlled Intersection Study, occupants of passenger vehicles are observed from the roadside at intersections controlled by stop signs or stoplights. Only stopped vehicles are observed to allow ample time to collect a variety of information required by the survey. NOPUS derives its estimates of seat belt use in rear seats, child restraint use, driver electronic device use, and demographic characteristics of vehicle occupants from the CI study. Details about the NOPUS sample design are in Section 5 of this report.

This report presents results of occupant restraint use from the 2017 NOPUS Controlled Intersection Study. NHTSA will publish the driver electronic device use results in a separate research note. The following are the major findings from the 2017 NOPUS Controlled Intersection Study:

Front Seat Belt Use (Among Occupants 8 and Older):
- Overall front seat belt use in 2017 was 89.7 percent, not statistically different at the 0.05 level from 90.1 percent in 2016.
- Seat belt use continued to be lower for males (88.0%) than females (91.8%) in 2017.
- Seat belt use continued to be lower among 16- to 24-year-olds (87.0%) than other age groups.

Rear Seats Belt Use (Among Occupants 8 and Older):
- Seat belt use continued to be lower in the rear seat (75.4%) than in the front seat (89.7%) in 2017.
- Rear seat belt use continued to be higher in states with seat belt laws for all seating positions (84.3%) than in states with front-seat-only belt laws (62.7%) in 2017.

Child Restraint Use (For Children From Birth to 7 Years Old):
- Restraint use for children from birth to 7 years old in 2017 was 92.8 percent, compared to 90.9 percent in 2016.
- Restraint use for children in the West region increased significantly from 90.7 percent in 2016 to 97.6 percent in 2017.

1. Introduction

The National Occupant Protection Use Survey is the only nationwide probability-based survey of seat belt use (for occupants 8 and older in both front and rear seats), motorcycle helmet use, child restraint use (for children under 8 years old), and driver electronic device use in the United States. NHTSA's National Center for Statistics and Analysis conducts the NOPUS annually. Two sub-surveys: the Moving Traffic Survey (MT) and the Controlled Intersection Study (CI) comprise the NOPUS.

In the MT survey, front-seat occupant shoulder belt use data and motorcyclist helmet use data are collected either at the roadside or by data collectors in vehicles (on expressways). NOPUS estimates of front-seat belt use and motorcycle helmet use are from the MT survey. The collective front-seat belt use estimate (also known as NHTSA's national seat belt estimate) is described in Seat Belt Use in 2017 – Overall Results [1].

In contrast, the NOPUS CI study data are collected at intersections controlled by stop signs or stoplights, where vehicle occupants are observed from the roadside. Only stopped vehicles are observed due to time constraints restricting the amount of time available to collect the variety of information required by the survey. NOPUS derives its estimates of rear-seat belt use, child restraint use, driver electronic device use, and demographic characteristics of the vehicle occupants from the CI study.

Only motorcycles and passenger vehicles (passenger cars, pickup trucks, SUVs, and vans) are observed in the NOPUS. The population of interest includes all 50 states, the District of Columbia, with the sample observation sites consisting of Federal, state, county highways, residential streets, and rural roads. Data are collected only during daylight hours when light is adequate to observe seat belt use through the vehicle windshield.

The 2017 NOPUS data collection was conducted between 7 a.m. and 6 p.m. during the period from June 5, 2017 to June 19, 2017. The 2017 NOPUS survey data are based on the results of 70,039 occupants observed in 50,577 vehicles at 1,615 data collection sites. Of those observed occupants, 2,989 were children under 8. More details on the NOPUS sampling, data collection and estimation are discussed in Section 5: NOPUS Methodology.

Please note that the terms "significant" and "statistically significant" are used interchangeably throughout this report. "Significant" always means "statistically significant," and the statistical significance level is alpha=0.05. In tables below, the data with p-values that are less than 0.05 are formatted in boldface type.

2. Demographic Results in Front Seats

The national seat belt use estimate in 2017 was 89.7 percent; not a significant change from 90.1 percent in 2016 [1]. This section presents a demographic breakdown of the occupants who used seat belts in 2017. Table 1 presents passenger vehicle occupant seat belt use in the front seats by demographic and other characteristics in 2016 and 2017. NOPUS demographics are highlighted below.

Age

There was no significant change in seat belt use among occupants for the following age groups: 8 to 15 years old, 16 to 24 years old, 25 to 69 years old, and 70 and older. Figure 1 and Table 1 show a comparison of the seat belt use rates from 2016 and 2017 across these age groups.
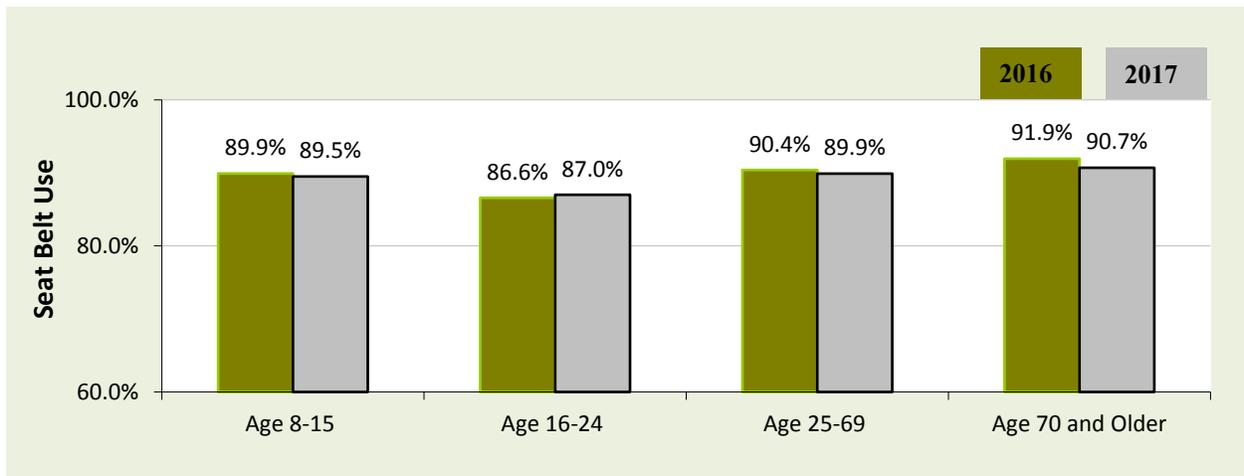
Figure 1: Seat Belt Use by Age for Occupants 8 and Older in 2016 and 2017

Figure 2 displays the trends of seat belt use for the four age groups over a 12-year period (2006-2017). Seat belt use among 16- to 24-year-olds has been consistently lower than other age groups.
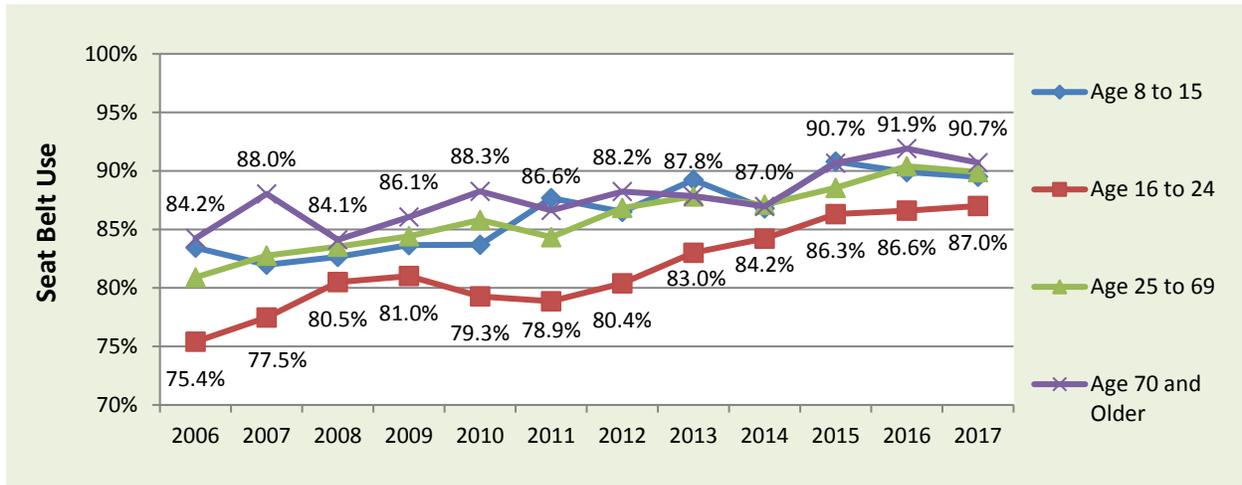
Figure 2: Seat Belt Use by Age for Occupants 8 and Older, 2006-2017

Gender

Figure 3 shows the trends of seat belt use for male and female occupants over a period of 12 years (2006 to 2017). In 2017 seat belt use continued to be lower for males (88.0%) than females (91.8%). There was no significant change in seat belt use by female or male occupants from 2016 to 2017.
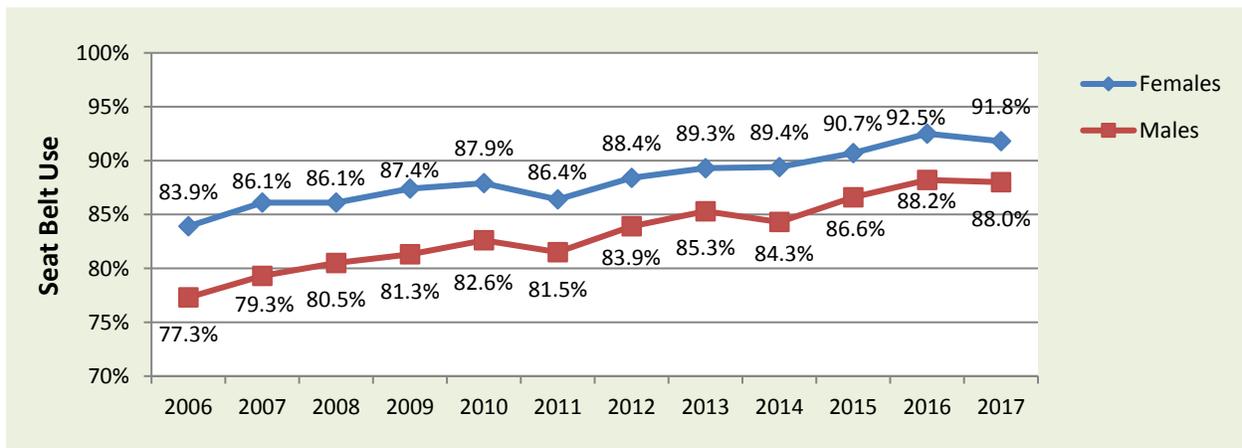
Figure 3: Seat Belt Use by Gender for Occupants 8 and Older, 2006-2017

Race

In NOPUS, observed vehicle occupant race categories are: Black, White, and members of other races. This characterization is based on the visual assessment of the data collectors who observe vehicle occupants from roadsides.

Figure 4 shows the trends of seat belt use among occupants who are White, Black, and members of other races over a period of 12 years (2006 to 2017). In 2017 seat belt use continued to be lower among Black occupants than occupants of the other racial groups. Seat belt use for members of other races continued to be higher than for the other two groups. There was no significant change in seat belt use among any of the race categories from 2016 to 2017.
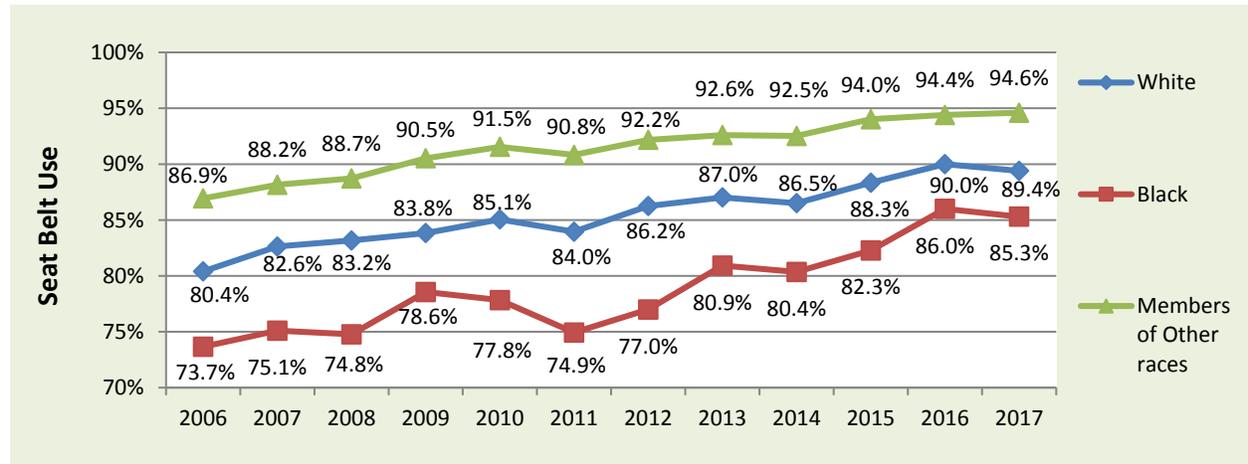
Figure 4: Seat Belt Use by Race for Occupants 8 and Older, 2006-2017

Presence of Passengers and Seat Belt Use

Figure 5 shows that seat belt use continued to be lower for drivers driving alone than for drivers driving with at least one passenger in the vehicle.

Figure 5: Passenger Effect on Seat Belt Use for Occupants 8 and Older, 2006-2017

As shown in Table 1, there was no significant change in seat belt use among any of the occupant groups from 2016 to 2017.

Table 1: Passenger Vehicle Occupant Seat Belt Use in the Front Seats by Demographic and Other Characteristics

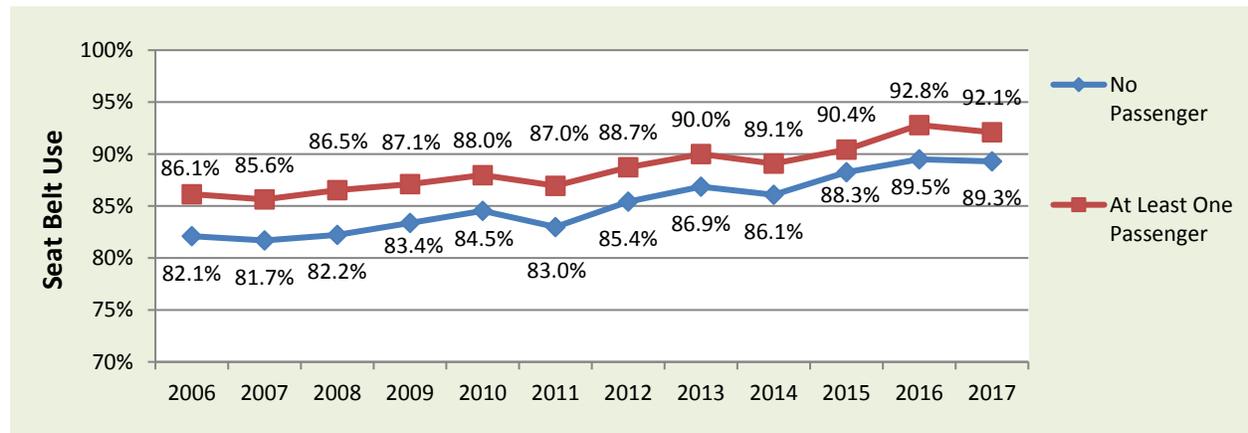| Occupant Group[1]	2016 Belt Use[2]	2016 95% Confidence Interval[3]	2017 Belt Use[2]	2017 95% Confidence Interval[3]	Change in Percentage[7]	95% Confidence Interval[4]	P-value[5]
All Occupants	90.1%	(88.5, 91.5)	89.7%	(88.2, 91.0)	-0.5	(-2.2, 1.3)	0.59
Males[6]	88.2%	(86.4, 89.7)	88.0%	(86.2, 89.5)	-0.2	(-2.1, 1.7)	0.83
Females[6]	92.5%	(90.9, 93.9)	91.8%	(90.3, 93.0)	-0.7	(-2.4, 1.0)	0.38
Occupants by Age Group[6]							
8 to 15	89.9%	(86.0, 92.8)	89.5%	(85.1, 92.7)	-0.4	(-5.9, 5.1)	0.88
16 to 24	86.6%	(82.1, 90.1)	87.0%	(85.2, 88.6)	0.4	(-3.5, 4.4)	0.83
25 to 69	90.4%	(88.8, 91.8)	89.9%	(88.3, 91.3)	-0.5	(-2.3, 1.3)	0.57
70 and Older	91.9%	(90.3, 93.3)	90.7%	(87.6, 93.0)	-1.3	(-4.4, 1.8)	0.41
Occupants by Race[6]							
White	90.0%	(88.3, 91.5)	89.4%	(87.6, 91.0)	-0.6	(-2.5, 1.4)	0.56
Black	86.0%	(80.9, 89.9)	85.3%	(81.5, 88.5)	-0.6	(-3.5, 2.2)	0.65
Members of Other Races	94.4%	(92.7, 95.8)	94.6%	(93.5, 95.6)	0.2	(-1.5, 1.9)	0.82
Drivers With							
No Passengers	89.5%	(87.7, 91.1)	89.3%	(87.7, 90.7)	-0.2	(-2.2, 1.7)	0.81
At Least One Passenger	92.8%	(91.2, 94.1)	92.1%	(90.8, 93.2)	-0.7	(-2.4, 0.9)	0.38
Drivers With							
No Passengers	89.5%	(87.7, 91.1)	89.3%	(87.7, 90.7)	-0.2	(-2.2, 1.7)	0.81
Passengers All Under 8	94.0%	(91.0, 96.1)	91.0%	(88.3, 93.1)	-3.0	(-6.4, 0.3)	0.07
Passengers All 8 and Older	92.5%	(90.9, 93.9)	92.1%	(90.8, 93.2)	-0.5	(-2.0, 1.1)	0.55
Some Passengers Under 8 and Some 8 or Older	94.5%	(91.8, 96.3)	93.7%	(91.5, 95.3)	-0.8	(-3.6, 2.0)	0.57
Drivers 16-24 With							
No Passengers	86.1%	(79.7, 90.8)	86.2%	(83.5, 88.6)	0.1	(-5.1, 5.3)	0.97
Passengers All 16-24	89.6%	(85.2, 92.8)	90.0%	(86.4, 92.7)	0.4	(-4.4, 5.2)	0.86
At Least One Passenger Not 16-24	91.5%	(84.7, 95.4)	90.3%	(86.9, 92.8)	-1.2	(-6.7, 4.3)	0.66
Occupants 16-24 When							
All Occupants Are 16-24	86.2%	(81.1, 90.1)	86.3%	(84.1, 88.3)	0.1	(-4.5, 4.6)	0.98
At Least One Occupant Is Not 16-24	87.4%	(82.8, 90.9)	88.7%	(86.4, 90.7)	1.3	(-3.6, 6.2)	0.58

[1] Drivers and right-front passengers of passenger vehicles.

[2] Use of shoulder belts observed between 7 a.m. and 6 p.m.

[3] The Wilson Confidence Interval is used in the estimated percentages in the occupant group (e.g., occupants who are male), which is in the form: $\left\{(2n_{EFF}p + t^2) \pm t\sqrt{(t^2 + 4n_{EFF}pq)}\right\}/(2(n_{EFF} + t^2))$, where p is the estimated percentage of Belt Use, $n_{EFF} = n/D_{EFF}$ is the effective sample size (where n is the sample size and D_{EFF} is the design effect), $t = t_{(1-\alpha/2)}(df)$, is a multiplier from the t-distribution with df degrees of freedom, and $q = 1 - p$. For percentages these endpoints are multiplied by 100.

[4] The regular symmetric interval was used for the estimated change in percentage point, which is in the form: $p \pm t_{(1-\alpha/2)}(df)\sqrt{v(p)}$, where p is the estimated change in percentage point, $v(p)$ is its estimated variance, and $t_{(1-\alpha/2)}(df)$ is a multiplier from the t-distribution with df degrees of freedom. The degrees of freedom in 2017 is different from that used in 2016.

[5] A p-value of 0.05 or less indicates that there is a statistically significant difference (at the alpha=0.05 level) between the 2016 and 2017 estimates for the group in question**; indicated with bold type**.

[6] The age, gender, and racial classifications are based on the subjective assessments of roadside observers.

[7] Belt use rate, 95% Confidence Interval, annual changes have been rounded to the nearest tenth. Annual changes have been computed based on unrounded estimates and may not equal those based on displayed values.

Source: NOPUS, 2016, 2017

3. Seat Belt Use in Rear Seats

According to Federal Motor Vehicle Safety Standard (FMVSS) 208: Occupant Crash Protection, except for convertibles and open-body vehicles, all outboard designated seating positions shall be equipped with integral lap and shoulder belts at every forward facing, outboard designated seating position. Using the 2017 vehicle registration data from the National Vehicle Population Profile (R.L. Polk & Co.), NHTSA estimated that 95.7 percent of passenger vehicles on the road have shoulder belts in the rear outboard seating positions. Of the 4.3 percent of vehicles that have only lap belts in the rear outboard seats, all observed rear-seat vehicle occupants are counted by NOPUS as *unbelted (not restrained with a shoulder belt)*, even if they are using lap belts. Consequently, NOPUS rear-seat shoulder belt use estimates reflect both the degree to which vehicle occupants use restraints and the availability of shoulder belts in these seating positions. Please note that NOPUS only observes up to two passengers in the second row of seats and none in the third row and beyond.

Table 3 on page 8 presents results of seat belt use in the rear seat of passenger vehicles in 2016 and 2017 as well as the changes between the 2 years. Some major results are highlighted below.

Seat Belt Use in Rear Seats Versus in Front Seats

Figure 6 displays the front and rear seat belt use trends from 2006 to 2017. As in previous years, seat belt use in 2017 was lower in the rear seat (75.4%) than in the front seat (89.7%).
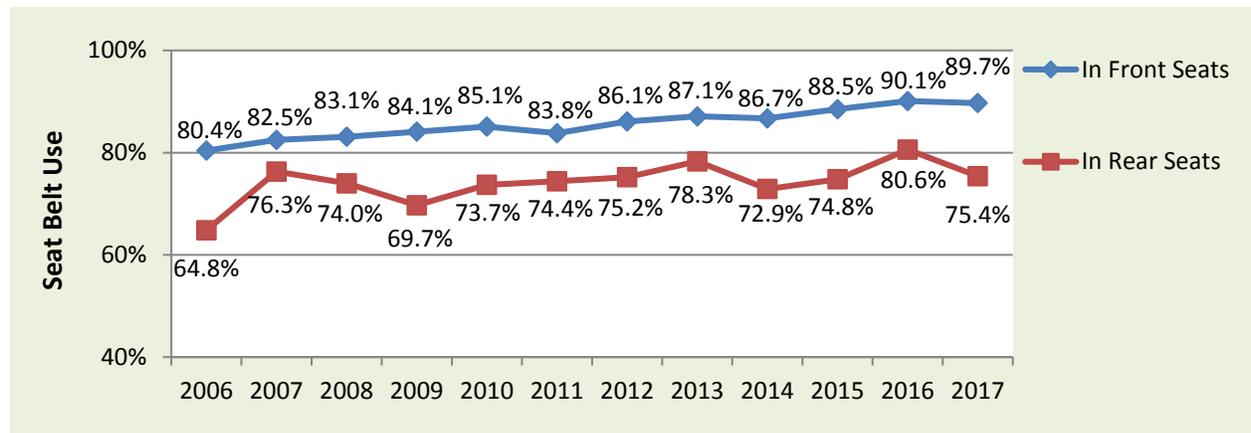
Figure 6: Seat Belt Use by Seating Position for Occupants 8 and Older, 2006-2017

Similar to the female occupants in the front seats, seat belt use among female passengers in the rear seats was higher than the seat belt use among male passengers. Seat belt use continued to be lower among black occupants than occupants of other races in both front and rear seats. There was no significant change in seat belt use among rear seats occupants.

State Laws and Rear-Seat Belt Use

At the time the 2017 NOPUS survey was conducted, 28 states and the District of Columbia required all vehicle occupants 18 and older to use seat belts when riding in the rear seats [3]. Please note that rear-seat belt use laws are secondary in Arizona, Colorado, Idaho, Massachusetts, Missouri, Montana, Nebraska, Nevada, New Jersey, North Carolina, North Dakota, Ohio, Pennsylvania, South Dakota, Vermont, Virginia, and Wyoming. Secondary seat belt laws state that law enforcement officers may issue a ticket for not wearing a seat belt only when there is another citable traffic infraction. New Hampshire is the only state that does not have mandatory seat belt laws.

Table 2 provides a list of states requiring seat belts be used in all seating positions.

Table 2: States With Laws Requiring Seat Belts Be Used in All Seating Positions [3]

Alaska	California	Delaware
District of Columbia	Hawaii	Idaho
Illinois	Indiana	Kansas
Kentucky	Louisiana	Maine
Maryland	Massachusetts	Minnesota
Montana	Nevada	New Jersey
New Mexico	North Carolina	Oregon
Rhode Island	South Carolina	Texas
Utah	Vermont	Washington
Wisconsin	Wyoming	

States with laws in effect as of June 2017, requiring people 18 and older to use seat belts in all seating positions. Also includes the District of Columbia.

Figure 7 shows the trends of rear-seat belt use among passengers in the states with or without laws requiring belt use in all seating positions over the period 2006—2017.As in previous years, seat belt use in rear seats in 2017 was higher in the states with laws requiring belt use in all seating positions (84.3%) than in the states requiring belt use only in the front seat (62.7%).

Figure 7: Seat Belt Use in Rear Seats by State Law Type for Occupants 8 and Older, 2006-2017

Table 3: Seat Belt Use in the Rear Seat of Passenger Vehicles, by Major Characteristics
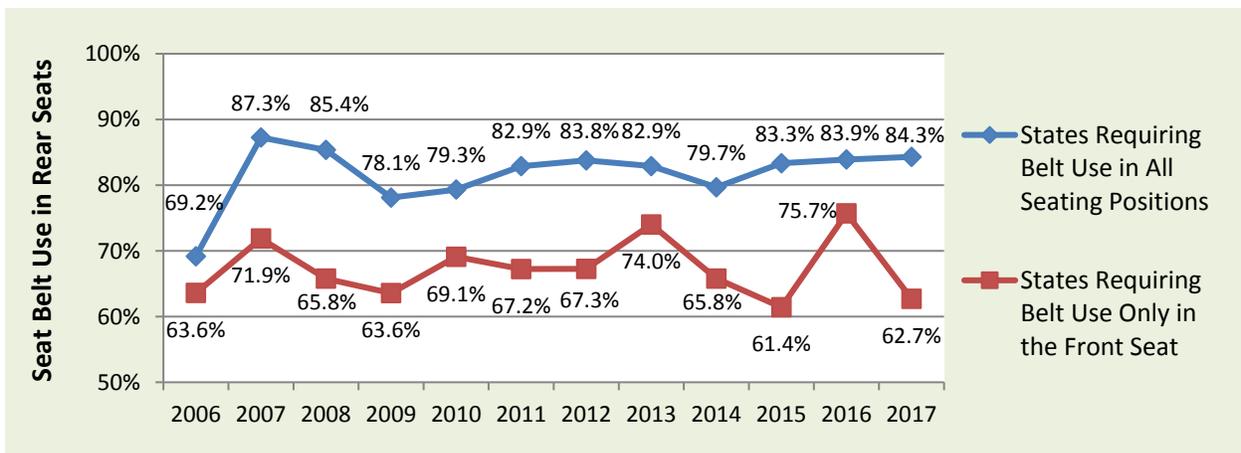
Passenger Group[1]	2016		2017		2016 – 2017 Change		
	Belt Use[2]	95% Confidence Interval[3]	Belt Use[2]	95% Confidence Interval[3]	Change in Percentage[7]	95% Confidence Interval[4]	P-value[5]
All Passengers	80.6%	(75.9, 84.5)	75.4%	(68.9, 80.9)	-5.2	(-13.1, 2.8)	0.19
Males[6]	79.4%	(74.0, 83.9)	73.6%	(67.3, 79.1)	-5.8	(-13.9, 2.3)	0.15
Females[6]	81.7%	(76.9, 85.7)	77.2%	(69.5, 83.4)	-4.6	(-13.1, 4.0)	0.28
Passengers by Age Group[6]							
8 to 15	86.0%	(81.6, 89.5)	83.0%	(75.9, 88.3)	-3.0	(-10.0, 3.9)	0.38
16 to 24	78.2%	(70.7, 84.3)	71.8%	(63.3, 78.9)	-6.5	(-16.5, 3.5)	0.20
25 to 69	76.8%	(68.8, 83.2)	70.0%	(62.4, 76.7)	-6.8	(-18.7, 5.2)	0.26
70 and Older	74.9%	(56.8, 87.2)	72.1%	(55.6, 84.3)	-2.8	(-24.5, 19.0)	0.80
Passengers by Race[6]							
White	81.6%	(77.0, 85.4)	78.8%	(73.8, 83.1)	-2.7	(-9.5, 4.0)	0.41
Black	71.4%	(61.5, 79.7)	52.9%	(34.1, 70.8)	-18.6	(-45.1, 8.0)	0.16
Members of Other Races	83.9%	(77.6, 88.6)	78.9%	(72.2, 84.3)	-5.0	(-13.7, 3.8)	0.25
Passengers in States With Laws Requiring Belts Be Used							
In All Seating Positions	83.9%	(79.1, 87.8)	84.3%	(78.8, 88.5)	0.4	(-5.5, 6.2)	0.89
In the Front Seat Only	75.7%	(66.0, 83.3)	62.7%	(52.6, 71.9)	-12.9	(-28.3, 2.5)	0.10

[1] Up to two passengers observed in the second row of seats in passenger vehicles.

[2] Use of shoulder belts observed between 7 a.m. and 6 p.m.

[3] The Wilson Confidence Interval is used in the estimated percentages in the occupant group (e.g., occupants who are male), which is in the form: $\left\{(2n_{EFF}p + t^2) \pm t\sqrt{(t^2 + 4n_{EFF}pq)}\right\}/\left(2(n_{EFF} + t^2)\right)$, where p is the estimated percentage of Belt Use, $n_{EFF} = n/D_{EFF}$ is the effective sample size (where n is the sample size and D_{EFF} is the design effect), $t = t_{(1-\alpha/2)}(df)$, is a multiplier from the t-distribution with df degrees of freedom, and $q = 1 - p$. For percentages these endpoints are multiplied by 100.

[4] The regular symmetric interval was used for the estimated change in percentage point, which is in the form: $p \pm t_{(1-\alpha/2)}(df)\sqrt{v(p)}$, where p is the estimated change in percentage point, $v(p)$ is its estimated variance, and $t_{(1-\alpha/2)}(df)$ is a multiplier from the t-distribution with df degrees of freedom. The degrees of freedom in 2017 is different from that used in 2016.

[5] A p-value of 0.05 or less indicates that there is a statistically significant difference (at the alpha=0.05 level) between the 2016 and 2017 estimates for the group in question, **indicated with bold type**.

[6] The age, gender, and racial classifications are based on the subjective assessments of roadside observers.

[7] Belt use rate, 95% Confidence Interval, annual changes have been rounded to the nearest tenth. Annual changes have been computed based on unrounded estimates and may not equal those based on displayed values.

Source: NOPUS, 2016, 2017

4. Child Restraint Use

In 2017, NOPUS continued to collect roadside observational data on child restraint use for all children under 8 years old. Detailed results of child restraint use are presented in Tables 5, 6, and 7. Table 5 presents the results of child restraint use in passenger motor vehicles by major characteristics in 2016 and 2017 as well as the changes between the two years. Table 6 presents results on child rear placement by major characteristics in 2016 and 2017 as well as the changes between the two years. Table 7 divides the child occupants into three age groups and reports restraint use by some other characteristics among these groups. Some of the major results of child restraint use are discussed below.

Child Restraint Use Among All Children Under 8

Restraint use for children under 8 in 2017 is 92.8 percent, up from 90.9 percent in 2016. Figure 8 shows the child restraint use trend since 2006.
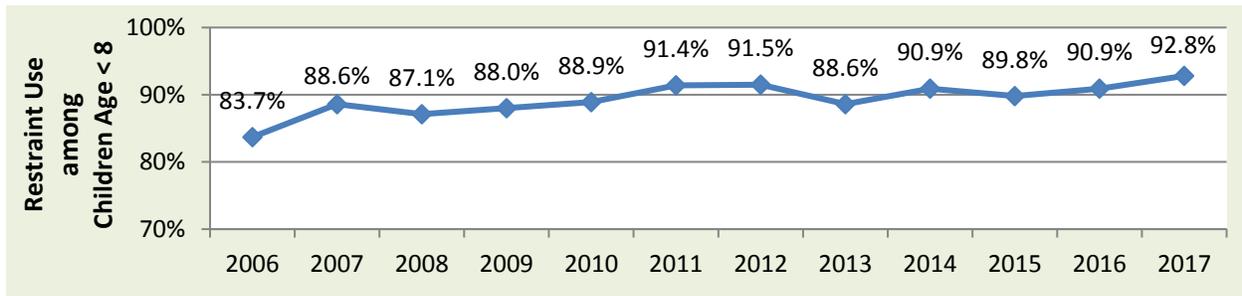
Figure 8: Child Restraint Use Among Children Under 8, 2006-2017

Child Rear Seat Placement

Figure 9 shows the trends (for each age group) of rear seat placement of children under age 8 between 2006 and 2017. The 2017 NOPUS found that 93.8 percent of children under 8 rode in the rear seats of vehicles. In the infant group (from birth to 12 months), 98.2 percent rode in the rear seat. 98.3 percent of 1- to 3-year-olds and 89.6 percent of 4- to 7-year-olds were in the rear seats in 2017.

Note that the child restraint use in the rear seats increased to 93.2 percent in 2017 from 91.8 percent in 2016 (Table 5).
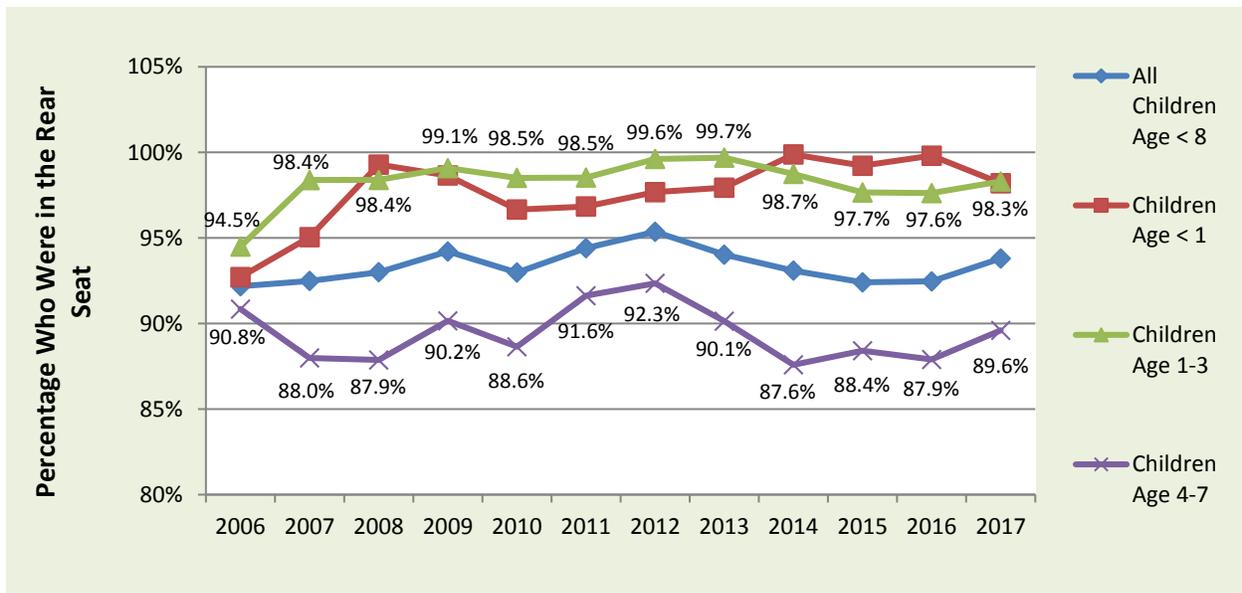
Figure 9: Child Rear Seat Placement, 2006 - 2017

At the time the 2017 survey was conducted, 9 states required children 5 and younger who weighed less than 80 pounds and were less than 54 inches tall to ride in the rear seats of vehicles. Table 4 lists the states with child rear placement laws.

Table 4: States With Laws Requiring Children 5 and Younger To Be in the Rear Seat*

California	Georgia	Maine
New Jersey	Rhode Island	South Carolina
Tennessee	Washington	Wyoming

* Among children less than 80 pounds and less than 54" tall. States with laws in effect as of June 27, 2017. In no other states did such laws take effect during the period June 27, 2015, to June 27, 2016. In Delaware, children 11 and younger and 65 inches or less must be the rear seat if passenger air bag is active.

Child Restraint Use by Region

Restraint use among children in the West region of the U.S. increased significantly to 97.6 percent in 2017 from 90.7 percent in 2016. There were no significant changes in child restraint use from 2016 to 2017 in the other three regions (Northeast, Midwest, and South), as shown in Figure 10.
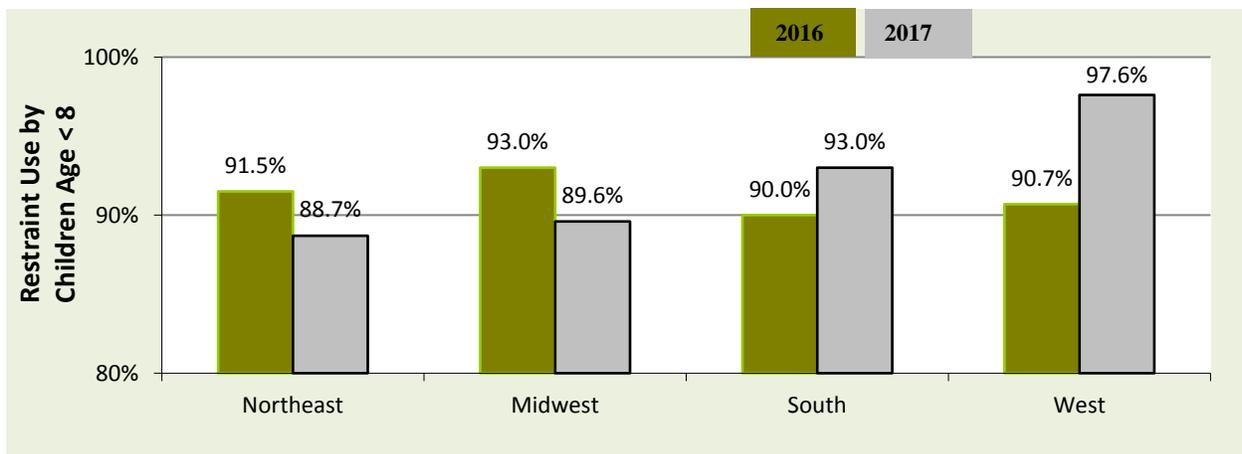
Figure 10: Child Restraint Use by Region in 2016 and 2017

Figure 11 shows that child restraint use in the West region increased significantly in 2017 after experiencing a dip in 2016. Except for a few years, child restraint use in the West region has consistently exceeded that in the other regions.
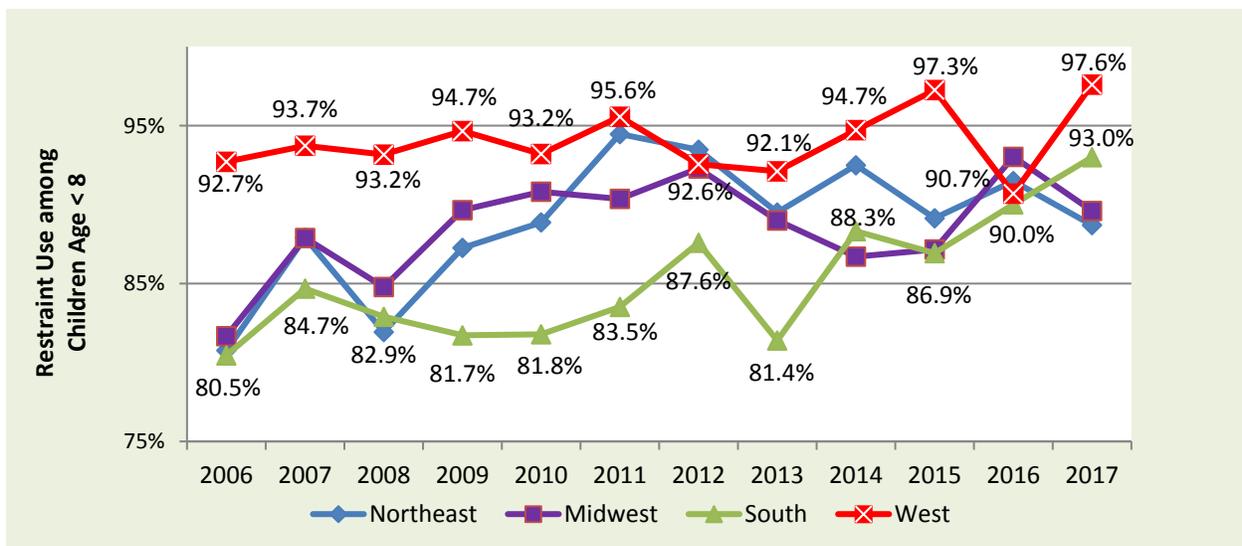
Figure 11: Child Restraint Use by Region, 2006-2017

Child Restraint Use by Time of Week

Child restraint use among child passengers increased from 90.7 percent in 2016 to 93.0 percent in 2017 during weekdays, however this was not a significant change. There were also no significant changes in child restraint use from 2016 to 2017 during any time periods of the week, as shown in Figure 12.
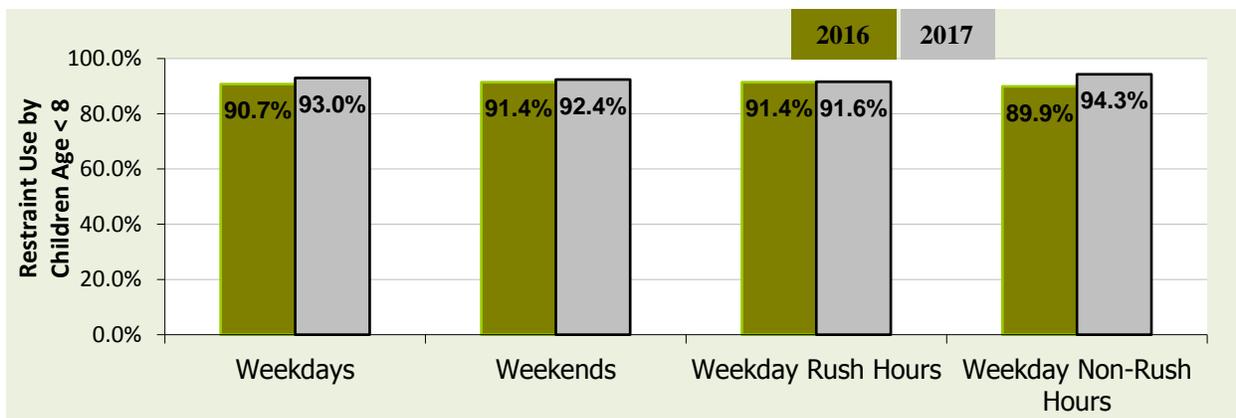
Figure 12: Child Restraint Use by Time of Week in 2016 and 2017

Child Restraint Use by Vehicle Type

As shown in Figure 13, restraint use for children traveling in passenger cars increased from 86.8 percent in 2016 to 89.9 percent in 2017; this was not a statistically significant increase.
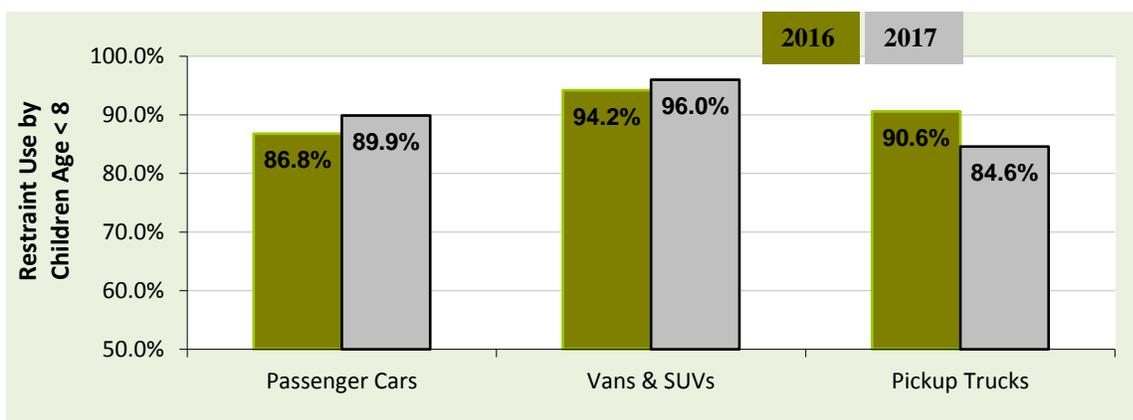
Figure 13: Child Restraint Use by Vehicle Type in 2016 and 2017

Child Restraint Use by Driver Type and Belt Use Status

Table 5 shows that the restraint use for children driven by drivers of "Other Races" bounced back up to 94.5 percent in 2017 after an unusual dip in 2016 to 85.2 percent. This was a statistically significant increase.

As shown in Figure 14, restraint use for children driven by belted drivers continued to be significantly higher than for those driven by unbelted drivers.

Figure 14: Child Restraint Use by Driver Belt Status, 2006-2017

Table 5: Child Restraint Use in Passenger Motor Vehicles, by Major Characteristics

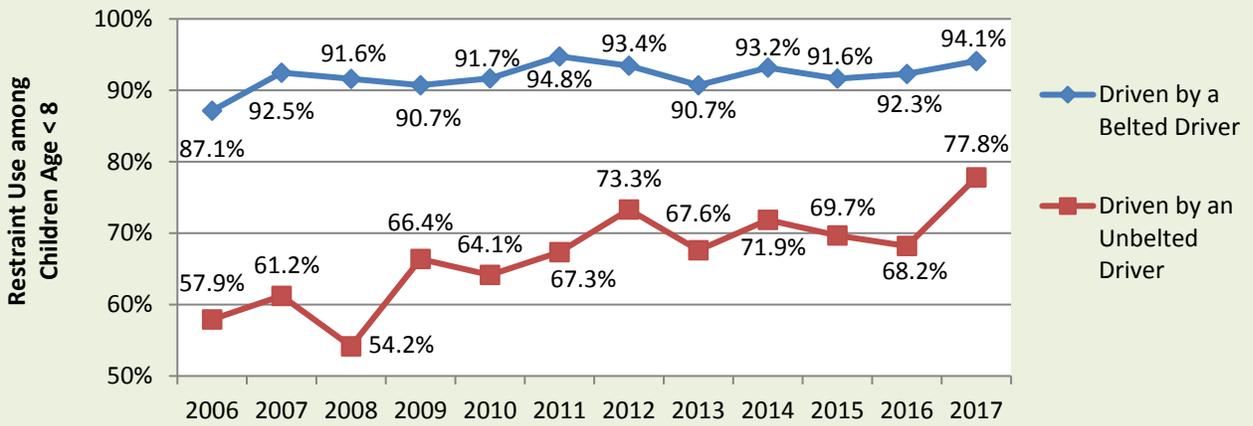| Child Passenger Group[1]	2016		2017		2016-2017 Change		
	Restraint Use[2]	95% Confidence Interval[3]	Restraint Use[2]	95% Confidence Interval[3]	Change in Percentage Points[6]	Confidence in a Change in Use[4]	P-value[5]
All Child Passengers (From Birth to 7 Years)	90.9%	(87.3, 93.6)	92.8%	(90.4, 94.6)	1.9	(-1.9, 5.6)	0.32
Children Driven by							
a Belted Driver	92.3%	(89.3, 94.5)	94.1%	(92.3, 95.6)	1.8	(-1.4, 5.1)	0.26
an Unbelted Driver	68.2%	(51.6, 81.2)	77.8%	(66.2, 86.3)	9.6	(-8.9, 28.1)	0.30
a Male Driver	92.5%	(89.9, 94.5)	90.1%	(85.9, 93.1)	-2.5	(-7.0, 2.1)	0.28
a Female Driver	90.0%	(84.9, 93.5)	94.5%	(91.8, 96.3)	4.5	(-0.3, 9.2)	0.07
a Driver 16 to 24	95.1%	(87.9, 98.1)	92.8%	(84.7, 96.8)	-2.3	(-9.6, 5.0)	0.52
a Driver 25 to 69	90.5%	(86.9, 93.2)	92.8%	(90.3, 94.6)	2.3	(-1.6, 6.2)	0.25
a Driver 70 and Older	91.6%	(77.1, 97.2)	94.6%	(72.6, 99.1)	3.0	(-11.5, 17.5)	0.68
a White Driver	94.0%	(91.2, 96.0)	94.0%	(91.8, 95.6)	0.0	(-3.4, 3.3)	0.98
a Black Driver	77.8%	(67.9, 85.3)	83.3%	(74.6, 89.5)	5.5	(-7.0, 18.0)	0.38
a Driver who is a Member of Other Races	**85.2%**	**(79.1, 89.7)**	**94.5%**	**(91.1, 96.6)**	**9.3**	**(3.1, 15.5)**	**0.00**
Children in							
the Front Seat	80.2%	(68.2, 88.4)	86.3%	(77.9, 91.9)	6.1	(-7.1, 19.4)	0.35
the Rear Seat	91.8%	(88.4, 94.3)	93.2%	(90.7, 95.1)	1.4	(-2.3, 5.1)	0.44
Child Passengers on							
Expressways	90.4%	(84.8, 94.2)	94.8%	(91.8, 96.7)	4.4	(-0.6, 9.3)	0.08
Surface Streets	91.3%	(88.1, 93.7)	91.4%	(87.5, 94.2)	0.1	(-4.0, 4.2)	0.96
Child Passengers Traveling in							
Fast Traffic	89.6%	(84.2, 93.3)	94.2%	(91.4, 96.1)	4.6	(-0.2, 9.5)	0.06
Medium-Speed Traffic	92.2%	(89.2, 94.4)	93.6%	(88.4, 96.5)	1.4	(-2.7, 5.4)	0.49
Slow Traffic	92.2%	(87.0, 95.4)	88.9%	(82.3, 93.3)	-3.2	(-10.4, 4.0)	0.37
Child Passengers in							
Passenger Cars	86.8%	(81.8, 90.7)	89.9%	(86.1, 92.8)	3.1	(-2.9, 9.1)	0.30
Vans and SUVs	94.2%	(90.5, 96.5)	96.0%	(94.0, 97.3)	1.8	(-1.1, 4.7)	0.20
Pickup Trucks	90.6%	(82.8, 95.1)	84.6%	(73.6, 91.6)	-6.0	(-17.2, 5.2)	0.28
Child Passengers in the							
Northeast	91.5%	(88.4, 93.8)	88.7%	(74.6, 95.5)	-2.7	(-13.8, 8.3)	0.61
Midwest	93.0%	(83.5, 97.2)	89.6%	(86.7, 92.0)	-3.4	(-11.0, 4.2)	0.36
South	90.0%	(83.8, 94.0)	93.0%	(89.0, 95.7)	3.0	(-2.6, 8.7)	0.28
West	**90.7%**	**(84.0, 94.8)**	**97.6%**	**(96.4, 98.5)**	**6.9**	**(0.9, 12.9)**	**0.03**
Child Passengers in							
Urban Areas	91.2%	(87.3, 93.9)	93.6%	(90.5, 95.7)	2.4	(-2.1, 7.0)	0.29
Rural Areas	90.4%	(86.0, 93.6)	91.0%	(86.1, 94.3)	0.6	(-4.8, 5.9)	0.83
Child Passengers Traveling During							
Weekdays	90.7%	(86.4, 93.7)	93.0%	(91.0, 94.7)	2.4	(-1.7, 6.4)	0.24
Rush Hours	91.4%	(86.6, 94.6)	91.6%	(87.4, 94.5)	0.2	(-4.6, 5.1)	0.92
Non-Rush Hours	89.9%	(84.5, 93.5)	94.3%	(92.0, 95.9)	4.4	(-0.5, 9.4)	0.08
Weekends	91.4%	(87.0, 94.4)	92.4%	(87.9, 95.3)	0.9	(-4.4, 6.2)	0.72

[1] Passengers under age 8 observed between 7 a.m. and 6 p.m. in the right-front seat or the second row of seats in passenger vehicles that are stopped at a stop sign or stoplight. Age, gender, and racial classifications are based on the subjective assessments of roadside observers.
[2] Use of child car seats (forward- or rear-facing), booster seats, and seat belts.

[3] The Wilson Confidence Interval is used in the estimated percentages in the occupant group (e.g., occupants who are male), which is in the form: $\left\{(2n_{EFF}p + t^2) \pm t\sqrt{(t^2 + 4n_{EFF}pq)}\right\}/\left(2(n_{EFF} + t^2)\right)$, where p is the estimated percentage of Belt Use, $n_{EFF} = n/D_{EFF}$ is the effective sample size (where n is the sample size and D_{EFF} is the design effect), $t = t_{(1-\alpha/2)}(df)$, is a multiplier from the t-distribution with df degrees of freedom, and $q = 1 - p$. For percentages these endpoints are multiplied by 100.

[4] The regular symmetric interval was used for the estimated change in percentage point, which is in the form: $p \pm t_{(1-\alpha/2)}(df)\sqrt{v(p)}$, where p is the estimated change in percentage point, $v(p)$ is its estimated variance, and $t_{(1-\alpha/2)}(df)$ is a multiplier from the t-distribution with df degrees of freedom. The degrees of freedom in 2017 is different from that used in 2016.

[5] A p-value of 0.05 or less indicates that there is a statistically significant difference (at the alpha=0.05 level) between the 2016 and 2017 estimates for the group in question, **indicated with bold type**.

[6] Belt use rate, 95% Confidence Interval, annual changes have been rounded to the nearest tenth. Annual changes have been computed based on unrounded estimates and may not equal those based on displayed values.

Source: NOPUS, 2016, 2017

Table 6: The Percent of Children Who Rode in the Rear Seat, by Major Characteristics

Child Passenger Group[1]	2016		2017		2016-2017 Change		
	Percentage Who Were in Rear Seat[2]	95% Confidence Interval[3]	Percentage Who Were in Rear Seat[2]	95% Confidence Interval[3]	Change in Percentage Points[6]	Confidence in a Change in Use[4]	P-value[5]
All Child Passengers (From Birth to 7 Years)	92.5%	(89.4, 94.7)	93.8%	(91.6, 95.4)	1.3	(-1.9, 4.6)	0.41
0 (Infants)	99.8%	(98.8, 100.0)	98.2%	(92.4, 99.6)	-1.6	(-4.5, 1.4)	0.28
1-3	97.6%	(95.5, 98.8)	98.3%	(97.3, 98.9)	0.7	(-1.0, 2.3)	0.40
4-7	87.9%	(83.2, 91.4)	89.6%	(85.8, 92.5)	1.7	(-3.7, 7.1)	0.51
Child Passengers in States With[6]							
Law Requiring Children From Birth of 5 Years Be in the Rear Seat	95.0%	(92.6, 96.6)	93.3%	(89.8, 95.6)	-1.7	(-4.4, 1.1)	0.22
No Such Law	91.6%	(87.7, 94.3)	93.9%	(91.1, 95.9)	2.3	(-1.8, 6.4)	0.26
Children Driven by							
a Belted Driver	93.0%	(89.9, 95.2)	94.1%	(92.0, 95.7)	1.2	(-2.1, 4.4)	0.46
an Unbelted Driver	84.3%	(78.1, 89.0)	89.9%	(83.0, 94.1)	5.5	(-2.5, 13.6)	0.17
a Male Driver	91.7%	(88.1, 94.3)	92.2%	(89.3, 94.3)	0.5	(-3.5, 4.5)	0.80
a Female Driver	92.9%	(89.8, 95.2)	94.7%	(91.9, 96.6)	1.8	(-1.7, 5.3)	0.30
a Driver 16 to 24	99.6%	(97.9, 99.9)	98.7%	(95.8, 99.6)	-0.8	(-2.6, 0.9)	0.35
a Driver 25 to 69	92.1%	(88.8, 94.4)	93.6%	(91.4, 95.3)	1.6	(-1.8, 5.0)	0.36
a Driver 70 and Older	74.6%	(46.2, 90.9)	77.6%	(53.3, 91.3)	3.0	(-31.6, 37.6)	0.86
a White Driver	92.4%	(88.4, 95.1)	93.4%	(90.8, 95.3)	1.1	(-3.3, 5.4)	0.62
a Black Driver	92.3%	(87.7, 95.2)	93.9%	(86.3, 97.4)	1.6	(-3.0, 6.2)	0.48
a Driver who is a Member of Other Races	93.1%	(88.8, 95.8)	95.3%	(92.8, 97.0)	2.3	(-2.3, 6.9)	0.32
Child Passengers on							
Expressways	95.2%	(91.0, 97.5)	95.9%	(93.4, 97.5)	0.7	(-3.0, 4.3)	0.70
Surface Streets	90.3%	(86.4, 93.2)	92.3%	(89.5, 94.4)	2.0	(-1.8, 5.8)	0.30
Child Passengers Traveling in							
Fast Traffic	93.5%	(89.5, 96.0)	95.3%	(93.3, 96.8)	1.9	(-1.5, 5.2)	0.26
Medium-Speed Traffic	93.0%	(89.1, 95.5)	92.8%	(89.0, 95.3)	-0.2	(-4.9, 4.6)	0.94
Slow Traffic	89.5%	(84.0, 93.2)	91.9%	(86.2, 95.4)	2.4	(-2.6, 7.4)	0.33
Child Passengers in							
Passenger Cars	92.5%	(87.9, 95.4)	94.6%	(92.5, 96.2)	2.2	(-1.7, 6.0)	0.26
Vans and SUVs	94.5%	(91.9, 96.3)	95.4%	(92.7, 97.1)	0.9	(-2.0, 3.7)	0.54
Pickup Trucks	79.9%	(72.8, 85.6)	76.5%	(67.5, 83.7)	-3.4	(-15.2, 8.4)	0.56
Child Passengers in the							
Northeast	97.3%	(95.1, 98.5)	95.3%	(91.7, 97.4)	-2.0	(-5.8, 1.9)	0.31
Midwest	89.4%	(81.6, 94.1)	93.2%	(87.3, 96.4)	3.8	(-3.9, 11.5)	0.32
South	91.7%	(85.5, 95.4)	93.3%	(89.9, 95.6)	1.6	(-4.5, 7.7)	0.60
West	94.1%	(91.3, 96.0)	94.2%	(88.2, 97.3)	0.1	(-3.4, 3.7)	0.93
Child Passengers in							
Urban Areas	93.4%	(90.6, 95.4)	94.0%	(91.3, 95.9)	0.6	(-2.7, 3.9)	0.70
Rural Areas	90.4%	(84.6, 94.1)	93.3%	(90.3, 95.4)	2.9	(-2.2, 8.0)	0.25
Child Passengers Traveling During							
Weekdays	92.1%	(88.7, 94.6)	93.6%	(91.1, 95.5)	1.5	(-2.1, 5.1)	0.40
Rush Hours	93.1%	(89.1, 95.7)	94.7%	(92.0, 96.6)	1.6	(-2.1, 5.4)	0.38
Non-Rush Hours	91.0%	(87.6, 93.6)	92.7%	(87.2, 95.9)	1.6	(-3.8, 7.0)	0.55
Weekends	93.1%	(89.3, 95.6)	94.0%	(90.0, 96.5)	1.0	(-3.7, 5.6)	0.68
Child Passengers in a							
Rear-Facing Car Seat	99.9%	(99.4, 100.0)	98.7%	(92.2, 99.8)	-1.2	(-3.9, 1.6)	0.38
Forward-Facing Car Seat	98.8%	(97.3, 99.5)	99.4%	(98.6, 99.7)	0.6	(-0.6, 1.7)	0.32
High-Backed Booster Seat	99.4%	(98.0, 99.8)	100.0%	(100.0, 100.0)	0.6	(-0.2, 1.4)	0.13
Seat belt or Backless Booster Seat	85.5%	(78.5, 90.5)	85.6%	(80.9, 89.3)	0.1	(-8.3, 8.6)	0.97
No Restraint Observed	83.5%	(78.1, 87.9)	88.2%	(79.8, 93.4)	4.7	(-3.8, 13.2)	0.27

[1]Passengers under 8 observed between 7 a.m. and 6 p.m. in the right-front seat or the second row of seats in passenger vehicles that are stopped at a stop sign or stoplight. Age, gender, and racial classifications are based on the subjective assessments of roadside observers.

[2] The percentage of the child passenger group who were in the second row of seats at the time of observation.

[3] The Wilson Confidence Interval is used in the estimated percentages in the occupant group (e.g., occupants who are male), which is in the form: $\left\{(2n_{EFF}p + t^2) \pm t\sqrt{(t^2 + 4n_{EFF}pq)}\right\}/(2(n_{EFF} + t^2))$, where p is the estimated percentage of Belt Use, $n_{EFF} = n/D_{EFF}$ is the effective sample size (where n is the sample size and D_{EFF} is the design effect), $t = t_{(1-\alpha/2)}(df)$, is a multiplier from the t-distribution with df degrees of freedom, and $q = 1 - p$. For percentages these endpoints are multiplied by 100.

[4] The regular symmetric interval was used for the estimated change in percentage point, which is in the form: $p \pm t_{(1-\alpha/2)}(df)\sqrt{v(p)}$, where p is the estimated change in percentage point, $v(p)$ is its estimated variance, and $t_{(1-\alpha/2)}(df)$ is a multiplier from the t-distribution with df degrees of freedom. The degrees of freedom in 2017 is different from that used in 2016.

[5] A p-value of 0.05 or less indicates that there is a statistically significant difference (at the alpha=0.05 level) between the 2016 and 2017 estimates for the group in question, **indicated with bold type**.

[6] Belt use rate, 95% Confidence Interval, annual changes have been rounded to the nearest tenth. Annual changes have been computed based on unrounded estimates and may not equal those based on displayed values.

Source: NOPUS, 2016, 2017

Table 7: Child Restraint Use in Passenger Motor Vehicles, by Age and Other Characteristics

Child Passenger Group[1]	2016		2017		2016-2017 Change		
	Restraint Use[2]	95% Confidence Interval[3]	Restraint Use[2]	95% Confidence Interval[3]	Change in Percentage Points[6]	Confidence in a Change in Use[4]	P-value[5]
Infants (From Birth to 12 Months)							
Infants Driven by							
a Belted Driver	98.6%	(96.6, 99.4)	99.5%	(98.6, 99.8)	0.9	(-0.6, 2.4)	0.22
an Unbelted Driver	NA	NA	NA	NA	NA	NA	NA
a Male Driver	98.6%	(95.9, 99.5)	98.8%	(96.3, 99.6)	0.2	(-2.2, 2.7)	0.84
a Female Driver	98.5%	(95.3, 99.5)	99.7%	(98.9, 99.9)	1.2	(-0.6, 3.1)	0.18
Infants in							
Passenger Cars	97.3%	(92.0, 99.1)	98.6%	(96.4, 99.5)	1.4	(-2.2, 4.9)	0.44
Vans and SUVs	99.4%	(97.7, 99.9)	99.9%	(99.4, 100.0)	0.5	(-0.4, 1.3)	0.30
Pickup Trucks	NA	NA	NA	NA	NA	NA	NA
Infants in the							
Northeast	99.1%	(94.4, 99.9)	99.0%	(94.4, 99.8)	0.0	(-2.6, 2.5)	0.98
Midwest	100.0%	(100.0, 100.0)	100.0%	(100.0, 100.0)	0.0	(0.0, 0.0)	1.00
South	98.7%	(96.3, 99.5)	99.4%	(97.9, 99.9)	0.7	(-1.2, 2.7)	0.45
West	96.2%	(85.7, 99.1)	99.1%	(94.8, 99.9)	2.9	(-3.0, 8.7)	0.32
Infants in							
Urban Areas	98.0%	(95.2, 99.2)	99.3%	(98.0, 99.8)	1.4	(-0.7, 3.4)	0.18
Rural Areas	100.0%	(100.0, 100.0)	99.6%	(97.5, 99.9)	-0.4	(-1.3, 0.5)	0.33
Children 1 to 3							
Children 1-3 Driven by							
a Belted Driver	95.6%	(92.5, 97.4)	98.0%	(96.0, 99.0)	2.4	(-0.4, 5.2)	0.09
an Unbelted Driver	86.6%	(68.4, 95.1)	85.8%	(73.7, 92.9)	-0.8	(-16.5, 14.9)	0.91
a Male Driver	96.2%	(93.2, 97.9)	95.3%	(90.1, 97.8)	-0.9	(-5.0, 3.1)	0.64
a Female Driver	94.5%	(90.3, 96.9)	97.9%	(96.3, 98.8)	3.4	(-0.1, 6.9)	0.06
Children 1-3 in							
Passenger Cars	93.6%	(89.0, 96.3)	96.4%	(92.5, 98.3)	2.9	(-1.7, 7.4)	0.21
Vans and SUVs	96.7%	(92.8, 98.5)	97.3%	(94.8, 98.6)	0.6	(-2.7, 3.9)	0.71
Pickup Trucks	90.1%	(71.0, 97.2)	98.5%	(91.4, 99.8)	8.4	(-4.6, 21.3)	0.20
Children 1-3 in the							
Northeast	91.5%	(75.2, 97.4)	94.7%	(88.4, 97.7)	3.3	(-10.2, 16.8)	0.62
Midwest	96.7%	(91.0, 98.8)	96.9%	(92.9, 98.7)	0.2	(-3.1, 3.6)	0.88
South	93.2%	(86.9, 96.6)	95.3%	(91.3, 97.6)	2.1	(-2.9, 7.1)	0.40
West	98.4%	(94.7, 99.5)	100.0%	(100.0, 100.0)	1.6	(-0.4, 3.7)	0.11
Children 1-3 in							
Urban Areas	95.0%	(91.1, 97.3)	97.9%	(95.8, 98.9)	2.9	(-0.6, 6.3)	0.10
Rural Areas	95.3%	(91.7, 97.3)	94.3%	(87.2, 97.6)	-1.0	(-7.0, 5.0)	0.74
Children 4 to 7							
Children 4-7 Driven by							
a Belted Driver	89.1%	(85.0, 92.2)	90.2%	(87.1, 92.6)	1.0	(-3.7, 5.8)	0.66
an Unbelted Driver	49.2%	(28.3, 70.3)	67.8%	(54.3, 78.8)	18.6	(-8.5, 45.6)	0.17
a Male Driver	89.7%	(85.8, 92.6)	85.0%	(79.1, 89.5)	-4.7	(-11.1, 1.7)	0.14
a Female Driver	85.0%	(77.4, 90.4)	90.5%	(85.4, 94.0)	5.5	(-2.6, 13.6)	0.17
Children 4-7 in							
Passenger Cars	80.4%	(72.9, 86.2)	83.0%	(76.4, 88.1)	2.7	(-6.8, 12.2)	0.57
Vans and SUVs	91.5%	(86.7, 94.7)	94.0%	(90.5, 96.3)	2.5	(-1.4, 6.3)	0.20
Pickup Trucks	89.4%	(78.4, 95.1)	77.9%	(62.8, 88.1)	-11.5	(-28.2, 5.3)	0.17
Children 4-7 in the							
Northeast	89.5%	(79.3, 95.0)	79.5%	(56.1, 92.2)	-10.0	(-30.7, 10.8)	0.33
Midwest	88.8%	(72.9, 95.9)	82.9%	(77.6, 87.1)	-5.9	(-18.8, 7.0)	0.36
South	86.9%	(78.0, 92.5)	90.3%	(84.3, 94.1)	3.4	(-4.1, 10.9)	0.36

West	**84.6%**	**(76.6, 90.3)**	**95.3%**	**(91.9, 97.2)**	**10.6**	**(1.9, 19.4)**	**0.02**
Children 4-7 in							
Urban Areas	86.8%	(81.3, 90.9)	88.6%	(83.1, 92.5)	1.8	(-5.6, 9.1)	0.63
Rural Areas	87.1%	(79.6, 92.2)	87.7%	(81.2, 92.2)	0.6	(-6.6, 7.7)	0.87

[1] Passengers under 8 observed between 7 a.m. and 6 p.m. in the right-front seat or the second row of seats in passenger vehicles that are stopped at a stop sign or stoplight. Age, gender, and racial classifications are based on the subjective assessments of roadside observers.

[2] Use of child car seats (forward- or rear-facing), booster seats, and seat belts.

[3] The Wilson Confidence Interval is used in the estimated percentages in the occupant group (e.g., occupants who are male), which is in the form: $\{(2n_{EFF}p + t^2) \pm t\sqrt{(t^2 + 4n_{EFF}pq)}\}/(2(n_{EFF} + t^2))$, where p is the estimated percentage of Belt Use, $n_{EFF} = n/D_{EFF}$ is the effective sample size (where n is the sample size and D_{EFF} is the design effect), $t = t_{(1-\alpha/2)}(df)$, is a multiplier from the t-distribution with df degrees of freedom, and $q = 1 - p$. For percentages these endpoints are multiplied by 100.

[4] The regular symmetric interval was used for the estimated change in percentage point, which is in the form: $p \pm t_{(1-\alpha/2)}(df)\sqrt{v(p)}$, where p is the estimated change in percentage point, $v(p)$ is its estimated variance, and $t_{(1-\alpha/2)}(df)$ is a multiplier from the t-distribution with df degrees of freedom. The degrees of freedom in 2017 is different from that used in 2016.

[5] A p-value of 0.05 or less indicates that there is a statistically significant difference (at the alpha=0.05 level) between the 2016 and 2017 estimates for the group in question, **indicated with bold type**.

[6] Belt use rate, 95% Confidence Interval, annual changes have been rounded to the nearest tenth. Annual changes have been computed based on unrounded estimates and may not equal those based on displayed values.

NA: Data was not sufficient to produce a reliable estimate.

Source: NOPUS, 2016, 2017

5. NOPUS Methodology

The NOPUS sample was redesigned in 2015 and that design has since been used to conduct the survey. This section discusses the sample design, data collection, and estimation used in the 2017 NOPUS Controlled Intersection Study. Data collection, estimation, and variance estimation for NOPUS are conducted by Westat, Inc., under the direction of the National Center for Statistics and Analysis (NCSA) under Federal contract number DTNH22-13-D-00284.

Sample Design

The NOPUS uses a complex multistage probability sample, statistical data editing, imputation for unknown values and complex estimation procedures. The sample sites for the 2017 NOPUS were entirely from the 2015 NOPUS sample redesign.

The redesigned NOPUS sample was selected using a stratified two-stage design. The first stage of selection was the individual county or set of adjacent counties, referred to as the primary sampling unit (PSU) within the design framework. The PSUs were targeted for selection based on their measure of size (MOS). A sample of 57 primary sampling units (PSUs) were selected from a frame of 1,588 PSUs.

The second stage of selection or secondary sampling unit (SSU), within the selected PSUs, is the road segment. At the road segment level, the NOPUS data collectors are then positioned so that they can efficiently observe seat belt use, motorcycle helmet use, and driver electronic device use.

The NOPUS sample frame of PSUs excluded Puerto Rico and the U.S. Territories. All other counties in the U.S. were included in the sampling frame with the exception of 37 counties and three areas in Alaska; these locations were excluded on the basis of low traffic volume measured in terms of vehicle miles traveled (VMT) or because they were geographically isolated. The sample frame of SSUs excluded segments along unnamed roads, cul-de-sacs, private roads, and a variety of other road types that have traditionally had very low traffic volume measured by VMT.

One PSU was sampled with certainty because of its large VMT, and the remaining PSUs were then grouped into the eight major strata based on the four Census region (Northeast, Midwest, South, and West) and two urbanicity classes (Urban and Rural).

A sample of 57 PSUs was selected using a Sequential Poisson method [4] with probability approximately proportional to the VMT as the MOS. The new NOPUS sample was selected to maximize PSU overlap with the old sample, thus maintaining comparability of the estimates from the current and previous samples. A SSU sample of road segments within each PSU is selected based upon the types of roads and urban/rural status with specified sampling rates.

Table 8 shows the observed sample sizes of the 2017 NOPUS Controlled Intersection Study. A total of 70,039 occupants were observed in 50,577 vehicles at 1,615 data collection sites. Of these observed occupants, 2,989 were children under 8. Please note that due to ineligibility,

construction, danger in the area, or road closure, observations could not be completed at some of the sampled observation sites.

Table 8: Sites, Vehicles, and Occupants in the 2017 NOPUS Controlled Intersection Study

Numbers of	2016	2017	Percentage Change
Sites Observed	1,600	1,615	0.94%
Vehicles Observed	48,177	50,577	4.98%
Total Occupants	66,993	70,039	4.55%
Occupants 8 and Older	64,144	67,050	4.53%
In Front Seat	61,114	63,779	4.36%
In Rear Seat	3,030	3,271	7.95%
Occupants Under 8	2,849	2,989	4.91%
Children Under 1	322	390	21.12%
Children 1 to 3	931	996	6.98%
Children 4 to 7	1,596	1,603	0.44%

Data Collection

The 2017 NOPUS data collection was conducted during the period from June 6, 2017, to June 19, 2017.

Data collection protocols remain largely the same in the redesigned NOPUS; however, NHTSA has made some minor adjustments to streamline data collection. In order to provide an estimate based on all vehicles affected by seat belt laws in relevant jurisdictions, data collectors observe and record seat belt use for all passenger vehicles observed at the data collection sites.

In NOPUS Controlled Intersection Study, trained data collectors observe restraint use of drivers and other occupants of passenger vehicles (passenger cars, pickup trucks, SUVs, and vans) which have stopped at a stop sign or stoplight during daylight hours between 7 a.m. and 6 p.m. Observations are made both on the surface streets and at the ends of the expressway exit ramps (where there are controlled intersections). Only stopped vehicles are observed based on the time required to collect the variety of information required by the survey, including subjective assessments of the vehicle occupants' age and race. Observers collect data on the driver, right-front passenger, and up to two passengers in the second row of seats. Observers do not interview vehicle occupants intentionally, allowing NOPUS to capture the uninfluenced behavior of the occupants.

The NOPUS Controlled Intersection Study is conducted annually following the NOPUS Moving Traffic Survey and is usually scheduled for all surface streets and limited access highway ramps, where NOPUS data from previous years indicates that a controlled intersection exists. If the data collectors arrive at an assigned surface street site and the site is not controlled, they are instructed to search for an alternate data collection site further along the same road segment. After the data collectors have located a controlled intersection, they position

themselves at the traffic signal or stop sign, facing the oncoming traffic from the side of the road. The data collectors walk in the direction of the oncoming traffic, away from the intersection to make their observations. When the traffic light turns green or they finish observing all vehicles, the data collectors return to the intersection to wait for the next traffic light cycle or next vehicle. They observe vehicles in the lane closest to their observational position, even if the closest lane is an exclusive turn lane (which is often the case at the controlled intersections.) When possible and if visibility allows, the data collectors also observe the other lanes of traffic. The data collectors are instructed to record the first behavior of the driver in which they observe.

Estimation

NOPUS estimates the proportion of occupants restrained in restraint type (R) among the occupants having characteristic (C) using the formula,

$$\text{Restraint Use}_{CR} = \frac{\sum\limits_{i,j,k} w_{ijk} F_{ijk} CR_{ijk}}{\sum\limits_{i,j,k} w_{ijk} F_{ijk} C_{ijk}},$$

where w_{ijk} and F_{ijk}, respectively, denote the base weight and the product of various weight adjustment factors at the site k in the stratum j of the PSU i. CR_{ijk} stands for the number of observed occupants having characteristic C and restrained in restraint type R and C_{ijk} denotes the number of observed occupants having characteristic C at the site k in the stratum j of the PSU i. For example, the seat belt use by vehicle type is estimated using the above formula, where CR_{ijk} is the number of observed belted occupants in certain type of vehicles (such as passenger cars, vans & SUVs, or pickup trucks) and C_{ijk} is the number of ALL (belted and unbelted) occupants observed in that type of vehicles at the site k in the stratum j of the PSU i.

Prior to 2015, NHTSA's NOPUS publications reported integer percentage values for seat belt use point estimates. Along with updating the survey design, NHTSA has revised its NOPUS reporting format to be consistent with statistical best practices across the Federal Government. The new reporting format presents percentage point estimates with one decimal place. Along with this change, 95 percent confidence intervals and p-values accompany the point estimates.

In certain instances, NHTSA does not provide estimates. These are typically restraint use estimates whose numerator is based on fewer than five persons observed, or whose denominator is based on fewer than 30 people observed. These are reported as "NA" in publications. Any related estimate (i.e., change in use and confidence estimates) is not reported as well. The same criteria are used in reporting estimates from the National Survey of Use of Booster Seats (NSUBS).

6. References

[1] Li, R., Pickrell, T. M. (2017, December). *Seat belt use in 2017 – Overall results* (Traffic Safety Facts Research Note. Report No. DOT HS 812 465). Washington, DC: National Highway Traffic Safety Administration. Available at https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812465

[2] Li, R., Pickrell, T. M. (2018, January). *Occupant restraint use in 2016: Results from the NOPUS controlled intersection study* (Traffic Safety Facts Research Note. Report No. DOT HS 812 463). Washington, DC: National Highway Traffic Safety Administration. Available at https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812463

[3] Highway Loss Data Institute. (2017, March). Safety belts (Web page). Arlington, VA: Insurance Institute for Highway Safety. Available at www.iihs.org/iihs/topics/laws/safetybeltuse?topicName=safety-belts

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