



DOT HS 812 378

October 2018 (revised)

Motorcycle Helmet Use in 2016—Overall Results

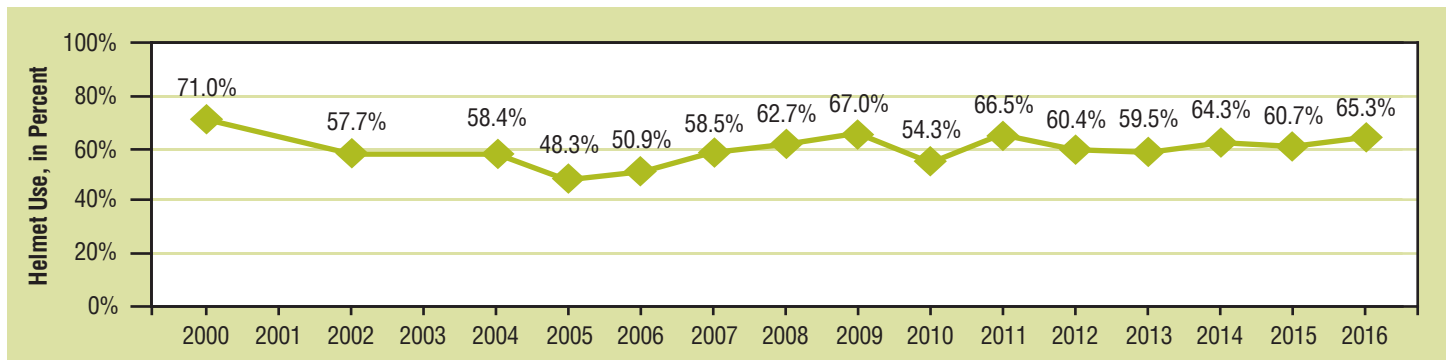
Use of DOT-compliant motorcycle helmets¹ was at 65.3 percent in 2016, not statistically different at the 0.05 level from 60.7 percent in 2015. This result is from the National Occupant Protection Use Survey (NOPUS), the only survey that provides nationwide probability-based observed data on motorcycle helmet use in the United States. The NOPUS is conducted by the National Center for Statistics and Analysis (NCSA) of the National Highway Traffic Safety Administration.

Figure 1 shows the motorcycle helmet use trend since 2000. Figure 2 shows the percentages of motorcyclists using DOT-compliant helmets, non-compliant helmets, and no helmet in 2015 and 2016.

The 2016 survey also found the following:

- Helmet use continued to be significantly higher in States that require all motorcyclists to be helmeted than in other States (Figure 3).
- Helmet use among motorcyclists in the western States increased significantly to 90.9 percent in 2016, up from 74.8 percent in 2015 (Table 1).
- Non-compliant helmet use among motorcyclists riding alone decreased significantly to 7.7 percent in 2016, down from 11.8 percent in 2015 (Table 2).
- Helmet use among motorcyclists traveling in medium speed traffic increased significantly to 68.5 percent in 2016, up from 52.3 percent in 2015 (Table 1).

Figure 1
Motorcycle Helmet Use, 2000 – 2016 (Data Source: NOPUS*)



*From 1994-2004, motorcycle helmet use data was collected every other year. Motorcycle helmet use data was not collected in 2001 and 2003.

Figure 2
Motorcyclists, by Helmet Type (NOPUS)

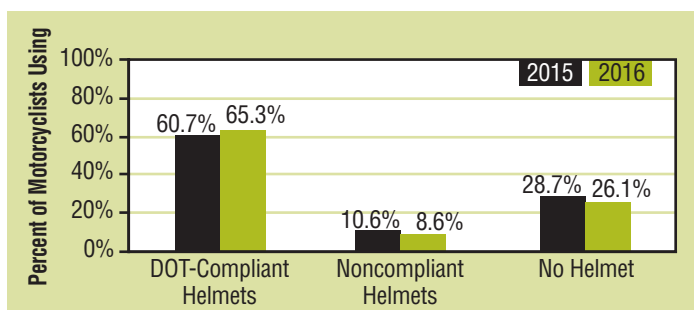
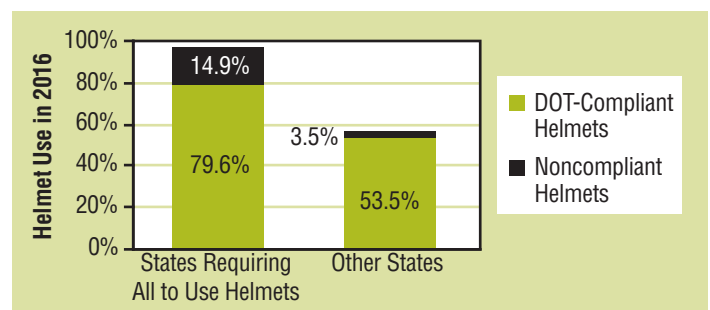


Figure 3
Motorcycle Helmet Use in 2016, by State Law and Helmet Type (NOPUS)



¹ DOT-compliant motorcycle helmets are those helmets meeting the safety requirements of Federal Motor Vehicle Safety Standard 218. Throughout this Research Note the term *helmet use* refers to the use of DOT-compliant motorcycle helmets unless otherwise stated.

Table 1
Use of Helmets Compliant With Federal Safety Regulations by Major Motorcyclist Characteristics

Motorcyclist Group	2015		2016		2015–2016 Change		
	Helmet Use ¹	95% Confidence Interval ²	Helmet Use ¹	95% Confidence Interval ²	Change in Percentage Points	95% Confidence Interval ³	P-Value ⁴
All Motorcyclists	60.7%	(51.1, 69.6)	65.3%	(57.6, 72.2)	4.5	(-6.7, 15.8)	0.42
Riders	63.9%	(54.1, 72.6)	67.8%	(59.2, 75.4)	4.0	(-7.4, 15.3)	0.48
Passengers	46.3%	(34.7, 58.4)	52.5%	(38.5, 66.1)	6.2	(-10.9, 23.2)	0.47
Motorcyclists in States Where ⁵							
Use Is Required for All Motorcyclists	79.8%	(71.8, 85.9)	79.6%	(67.4, 88.0)	-0.2	(-7.6, 7.3)	0.96
Other States	42.9%	(34.7, 51.4)	53.5%	(43.3, 63.4)	10.7	(-4.2, 25.5)	0.15
Motorcyclists on							
Expressways	71.3%	(62.7, 78.6)	69.8%	(54.2, 81.9)	-1.5	(-15.5, 12.6)	0.83
Surface Streets	57.0%	(45.8, 67.6)	63.5%	(55.3, 70.9)	6.5	(-6.6, 19.5)	0.32
Motorcyclists Traveling in							
Fast Traffic	68.1%	(60.9, 74.7)	66.7%	(54.3, 77.2)	-1.4	(-13.2, 10.5)	0.81
Medium-Speed Traffic	52.3%	(38.5, 65.9)	68.5%	(58.4, 77.1)	16.2	(0.0, 32.3)	0.05
Slow Traffic	62.2%	(43.3, 78.0)	58.6%	(46.6, 69.7)	-3.6	(-19.4, 12.2)	0.65
Motorcyclists Traveling in							
Heavy Traffic	68.9%	(59.8, 76.8)	64.0%	(53.9, 73.0)	-4.9	(-14.7, 4.8)	0.31
Moderately Dense Traffic	53.6%	(39.3, 67.2)	64.8%	(55.8, 72.9)	11.3	(-7.7, 30.2)	0.23
Light Traffic	54.7%	(37.1, 71.1)	69.9%	(54.1, 82.1)	15.3	(-0.8, 31.4)	0.06
Motorcyclists in							
Light Precipitation	71.8%	(49.5, 86.9)	74.2%	(21.3, 96.8)	2.4	(-58.3, 63.2)	0.94
Light Fog	NA	NA	NA	NA	98.4	NA	NA
Clear Weather Conditions	60.6%	(50.5, 69.9)	64.7%	(57.6, 71.3)	4.1	(-8.1, 16.3)	0.49
Motorcycle Riders When							
They Are the Sole Rider	65.7%	(56.8, 73.6)	70.1%	(61.1, 77.7)	4.4	(-4.7, 13.5)	0.33
They Have a Passenger	57.4%	(40.8, 72.4)	58.9%	(46.3, 70.5)	1.6	(-22.3, 25.4)	0.89
Motorcyclists in the							
Northeast	77.2%	(53.5, 90.9)	70.7%	(46.8, 86.9)	-6.4	(-10.3, -2.6)	0.00
Midwest	44.3%	(31.9, 57.5)	53.8%	(44.8, 62.6)	9.5	(-7.8, 26.7)	0.27
South	60.0%	(47.4, 71.3)	67.5%	(50.7, 80.7)	7.5	(-7.4, 22.4)	0.31
West	74.8%	(60.4, 85.3)	90.9%	(81.1, 95.8)	16.0	(1.5, 30.5)	0.03
Motorcyclists in							
Urban Areas	60.6%	(52.8, 68.0)	56.7%	(48.9, 64.1)	-4.0	(-12.3, 4.4)	0.34
Rural Areas	60.8%	(44.6, 75.0)	72.4%	(61.2, 81.4)	11.6	(-9.2, 32.4)	0.26
Motorcyclists Traveling During							
Weekdays	62.1%	(53.5, 70.0)	69.6%	(60.1, 77.7)	7.5	(-3.8, 18.9)	0.18
Weekday Rush Hours	63.6%	(54.0, 72.3)	71.1%	(62.6, 78.3)	7.4	(-4.8, 19.7)	0.22
Weekday Non-Rush Hours	60.4%	(48.6, 71.2)	68.6%	(55.4, 79.4)	8.2	(-9.2, 25.5)	0.34
Weekends	59.4%	(45.1, 72.2)	60.4%	(49.5, 70.3)	1.0	(-14.7, 16.7)	0.90
Motorcycle Riders Who							
Are Riding Alone	65.7%	(56.8, 73.6)	70.1%	(61.1, 77.7)	4.4	(-4.7, 13.5)	0.33
Have a Passenger Using a DOT-Compliant Helmet	86.9%	(73.5, 94.1)	83.9%	(58.4, 95.1)	-2.9	(-27.8, 21.9)	0.81
Have a Passenger Using a Noncompliant Helmet	NA	NA	NA	NA	-26.8	(-62.9, 9.3)	0.14
Have an Unhelmeted Passenger	24.3%	(9.4, 50.0)	29.2%	(10.5, 59.1)	4.9	(-19.5, 29.2)	0.69
Passengers on Motorcycles on Which							
The Rider Is Using a DOT-Compliant Helmet	70.2%	(53.1, 83.1)	74.8%	(52.4, 88.9)	4.6	(-12.8, 21.9)	0.60
The Rider Is Using a Noncompliant Helmet	NA	NA	NA	NA	-12.3	(-58.5, 33.8)	0.59
The Rider Is Unhelmeted	12.8%	(7.1, 21.8)	22.5%	(6.5, 54.9)	9.7	(-17.8, 37.2)	0.47

¹ Use of helmets meeting the safety requirements of Federal Motor Vehicle Safety Standard 218, observed between 7 a.m. and 6 p.m. among motorcycle riders and passengers.

² The Wilson Confidence Interval is used in the estimated percentages in the motorcyclist group (e.g., motorcyclists in urban areas), 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 Helmet Use, $n_{EFF} = n/DEFF$ is the effective sample size (where n is the sample size and $DEFF$ 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.

³ 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 used in 2016 is different from that used in 2015.

⁴ A p-value of 0.05 or less indicates that there is a statistically significant difference (at the alpha=0.05 level) between the 2015 and 2016 estimates for the group in question, indicated with bold type.

⁵ Use rates reflect the laws in effect at the time data was collected.

NA: Data not sufficient to produce a reliable estimate.

Source: National Occupant Protection Use Survey, NCSA

Table 2
Use of Noncompliant Helmets by Major Motorcyclist Characteristics

Motorcyclist Group	2015		2016		2015–2016 Change		
	Helmet Use ¹	95% Confidence Interval ²	Helmet Use ¹	95% Confidence Interval ²	Change in Percentage Points	95% Confidence Interval ³	P-Value ⁴
All Motorcyclists	10.6%	(7.6, 14.7)	8.6%	(4.8, 14.9)	-2.0	(-6.0, 2.0)	0.31
Riders	10.7%	(7.4, 15.3)	7.4%	(4.0, 13.4)	-3.2	(-7.2, 0.7)	0.10
Passengers	10.4%	(6.3, 16.8)	14.5%	(7.8, 25.3)	4.0	(-5.5, 13.6)	0.39
Motorcyclists in States Where ⁵							
Use Is Required for All Motorcyclists	14.7%	(9.1, 23.0)	14.9%	(7.0, 28.8)	0.2	(-7.1, 7.5)	0.97
Other States	6.8%	(3.7, 12.0)	3.5%	(1.8, 6.4)	-3.3	(-8.5, 1.9)	0.20
Motorcyclists on							
Expressways	10.8%	(6.3, 17.8)	8.5%	(4.5, 15.2)	-2.3	(-10.3, 5.7)	0.56
Surface Streets	10.6%	(7.3, 15.2)	8.7%	(4.3, 16.6)	-1.9	(-7.0, 3.2)	0.45
Motorcyclists Traveling in							
Heavy Traffic	10.0%	(6.7, 14.6)	9.0%	(5.2, 15.1)	-1.0	(-7.2, 5.1)	0.73
Moderately-Dense Traffic	11.3%	(6.5, 19.0)	6.6%	(2.6, 15.6)	-4.7	(-10.8, 1.4)	0.12
Slow Traffic	10.6%	(4.8, 21.5)	10.5%	(4.3, 23.3)	-0.1	(-8.9, 8.7)	0.99
Motorcyclists Traveling in							
Heavy Traffic	11.6%	(7.0, 18.6)	12.3%	(5.9, 24.0)	0.8	(-7.5, 9.1)	0.85
Moderately Dense Traffic	8.7%	(4.6, 15.7)	4.9%	(2.7, 8.8)	-3.7	(-9.8, 2.3)	0.21
Light Traffic	13.5%	(6.9, 24.7)	7.2%	(2.9, 16.8)	-6.3	(-15.3, 2.6)	0.16
Motorcyclists in							
Light Precipitation	NA	NA	NA	NA	NA	NA	NA
Light Fog	NA	NA	NA	NA	NA	NA	NA
Clear Weather Conditions	10.3%	(7.0, 14.8)	9.1%	(5.1, 15.7)	-1.2	(-5.7, 3.2)	0.58
Motorcycle Riders When							
They Are the Sole Motorcyclist	11.8%	(8.2, 16.6)	7.7%	(4.5, 12.9)	-4.1	(-7.8, -0.3)	0.03
They Have a Passenger	6.7%	(3.4, 13.0)	6.3%	(1.8, 19.7)	-0.4	(-8.3, 7.5)	0.92
Motorcyclists in the							
Northeast	9.5%	(3.5, 23.3)	12.7%	(5.0, 28.9)	3.2	(-5.1, 11.6)	0.43
Midwest	4.0%	(2.5, 6.1)	3.3%	(1.6, 7.0)	-0.6	(-3.2, 1.9)	0.62
South	15.3%	(8.5, 26.2)	14.3%	(5.2, 33.8)	-1.0	(-10.6, 8.6)	0.83
West	16.1%	(10.7, 23.6)	5.9%	(2.5, 13.3)	-10.3	(-20.9, 0.3)	0.06
Motorcyclists in							
Urban Areas	11.0%	(7.7, 15.5)	11.4%	(6.7, 18.8)	0.4	(-4.4, 5.3)	0.86
Rural Areas	10.3%	(6.3, 16.4)	6.3%	(2.9, 13.2)	-4.0	(-9.6, 1.7)	0.16
Motorcyclists Traveling During							
Weekdays	10.5%	(7.6, 14.4)	8.0%	(4.9, 13.0)	-2.5	(-7.7, 2.8)	0.34
Weekday Rush Hours	10.3%	(5.8, 17.5)	9.7%	(5.3, 17.1)	-0.5	(-7.6, 6.5)	0.88
Weekday Non-Rush Hours	10.8%	(7.8, 14.6)	6.9%	(3.8, 12.1)	-3.9	(-10.0, 2.2)	0.20
Weekends	10.8%	(6.1, 18.4)	9.3%	(4.3, 18.7)	-1.5	(-7.0, 4.0)	0.58
Motorcycle Riders Who							
Are Riding Alone	11.8%	(8.2, 16.6)	7.7%	(4.5, 12.9)	-4.1	(-7.8, -0.3)	0.03
Have a Passenger Using a DOT-Compliant Helmet	3.2%	(0.9, 10.6)	1.2%	(0.4, 3.8)	-2.0	(-6.7, 2.6)	0.38
Have a Passenger Using a Noncompliant Helmet	NA	NA	NA	NA	NA	NA	NA
Have an Unhelmeted Passenger	NA	NA	NA	NA	NA	NA	NA
Passengers on Motorcycles on Which							
The Rider Is Using a DOT-Compliant Helmet	11.5%	(5.3, 22.9)	8.9%	(4.5, 16.9)	-2.6	(-11.5, 6.4)	0.56
The Rider Is Using a Noncompliant Helmet	NA	NA	NA	NA	NA	NA	NA
The Rider Is Unhelmeted	NA	NA	NA	NA	NA	NA	NA

¹ Use of helmets that do not meet the safety requirements of Federal Motor Vehicle Safety Standard 218, observed between 7 a.m. and 6 p.m. among motorcycle riders and passengers.

² The Wilson Confidence Interval is used in the estimated percentages in the motorcyclist group (e.g., motorcyclists in urban areas), 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 Helmet Use, $n_{EFF} = n/DEFF$ is the effective sample size (where n is the sample size and $DEFF$ 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.

³ 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 used in 2016 is different from that used in 2015.

⁴ A p-value of 0.05 or less indicates that there is a statistically significant difference (at the alpha=0.05 level) between the 2015 and 2016 estimates for the group in question, indicated with bold type.

⁵ Use rates reflect the laws in effect at the time data was collected.

NA: Data not sufficient to produce a reliable estimate.

Source: National Occupant Protection Use Survey, NCSA

Survey Methodology

The NOPUS is the only survey that provides nationwide probability-based observed data on motorcycle helmet use in the United States. The survey observes helmet use as it actually occurs at randomly selected roadway sites, and thus provides the best tracking of helmet use in this country.

The survey data is collected by sending observers to probabilistically sampled roadways, who observe motorcyclists between 7 a.m. and 6 p.m. Observations are made either while standing at the roadside or, in the case of expressways, while riding in a vehicle in traffic. In order to capture the true behavior of motorcyclists, NOPUS observers do not stop motorcycles or interview motorcyclists. The 2016 NOPUS data was collected from June 6 to June 25, 2016, while the 2015 data was collected from June 1 to June 27, 2015.

The NOPUS uses a complex multistage probability sample, statistical data editing, imputation of unknown values, and complex estimation procedures. The sample sites for the 2016 NOPUS were entirely from the 2015 NOPUS sample redesign. Table 3 shows the observed sample sizes of the 2016 NOPUS Moving Traffic Survey. A total of 939 motorcyclists were observed on the 797 motorcycles at the 1,893 data collection sites.

Table 3
Sites, Motorcycles, and Motorcyclists Observed

Numbers of	2015	2016	Percentage Change
Sites Observed*	1,901	1,893	-0.42%
Motorcycles Observed	851	797	-6.35%
Motorcyclists Observed	1,019	939	-7.85%

*The number of sites observed reflects the number of sites in the sample frame minus those sites unavailable due to restricted access, traffic problems, or safety issues.

Because the NOPUS sites are selected probabilistically, we can analyze the statistical significance of its results. Statistically significant changes in helmet use between 2015 and 2016 are identified in Table 1 and Table 2 by a P-Value that is 0.05 or less in the table's far-right column.

Data collection, estimation, and variance estimation for the NOPUS are conducted by Westat, Inc., under the direction of NHTSA's NCSA under Federal contract number DTNH22-13-D-00284.

Definitions

In Federal Motor Vehicle Safety Standard 218 (Code of Federal Register, Title 49, Volume 5, Part 571, Section 218, October 2003), NHTSA established standards for motorcycle helmets to ensure a certain degree of protection in a crash. *DOT-compliant helmets* are helmets that meet this safety standard, while noncompliant helmets are helmets that do not.

DOT-compliant helmets are marked with an identifying sticker on the back of the helmets. However, because of the prevalence of counterfeit stickers, NOPUS data collectors categorize DOT-compliant helmets as helmets that cover the motorcyclists' ears or are at least 1 inch thick.

NHTSA defines helmet use as the use of DOT-compliant helmets.

At the time the 2016 survey was conducted, 19 States and the District of Columbia required all motorcyclists to be helmeted. Table 4 provides a list of States with laws requiring helmet use for all motorcyclists. Twenty-eight States required only a subset of riders or motorcycle passengers to use helmets (such as those under age 17, 18, or 20). Three States—Illinois, Iowa, and New Hampshire—had no motorcycle helmet requirement.

Table 4
States With Laws* Requiring Helmet Use for All Motorcyclists

Alabama	Mississippi	Oregon
California	Missouri	Tennessee
District of Columbia	Nebraska	Vermont
Georgia	Nevada	Virginia
Louisiana	New Jersey	Washington
Maryland	New York	West Virginia
Massachusetts	North Carolina	

*States and the District of Columbia with laws in effect as of May 31, 2016

"Expressways" are defined to be roadways with limited access, while "surface streets" comprise all other roadways. "Rush hour" is defined as 7 to 9:30 a.m. and 3:30 to 6 p.m.

A roadway is defined to have "fast traffic" if during the observation period the average speed of passenger vehicles that pass the observer exceeds 50 mph, with "medium-speed traffic" defined as 31 to 50 mph, and "slow traffic" defined as 30 mph or slower.

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.

The survey uses the following definitions of geographic regions, which are defined in terms of the States contained in the region below:

Northeast: CT, MA, ME, NH, NJ, NY, PA, RI, VT

Midwest: IA, KS, IL, IN, MI, MN, MO, ND, NE, OH, SD, WI

South: AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV

West: AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA, WY

Please note that NHTSA employs the following data reporting guidelines for NOPUS publications:

Estimates whose numerator is based on fewer than five observations in the sample, and/or whose denominator is based on fewer than 30 observations in the sample, or that are not statistically different from zero percent are reported as “NA” in publications, including any related estimates.

For More Information

This Research Note was written by Hongying (Ruby) Li and Timothy M. Pickrell, mathematical statisticians in the Mathematical Analysis Division, NCSA, NHTSA. For questions regarding the information presented in this document, please contact timothy.pickrell@dot.gov.

Additional data and information on the survey design and analysis procedures will be available in upcoming publications to be posted at <https://crashstats.nhtsa.dot.gov/#/>

Helmets are estimated to be 37-percent effective in preventing fatal injuries to motorcycle riders and 41 percent for motorcycle passengers. NHTSA estimates that helmets saved the lives of 1,772 motorcyclists in 2015. For more information on the campaign by NHTSA and the States to raise helmet use, see <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/>.

The NOPUS also observes other types of restraints, such as seat belts and child restraints, and observes driver electronic device use. This publication is part of a series that presents overall results from the survey on these topics. Please see publications in the series, such as “Seat Belt Use in 2016 – Overall Results,” for the latest data on these topics.

The suggested APA format citation for this document is:

Li, R., & Pickrell, T. M. (2018, October, Revised). *Motorcycle helmet use in 2016 – Overall results*. (Traffic Safety Facts Research Note. Report No. DOT HS 812 378). Washington, DC: National Highway Traffic Safety Administration.



U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

This research note and other general information on highway traffic safety may be accessed by Internet users at: www-nrd.nhtsa.dot.gov/CATS/index.aspx