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

TRAFFIC TECH
Technology Transfer Series

NHTSA

DOT HS 813 076 May 2021

Pilot Test of a Methodology for an Observation Survey of Motorcycle Personal Protective Equipment

Motorcycle Personal Protective Equipment

A motorcycle helmet is an effective type of personal protective equipment (PPE), with potential to reduce the risk of head injury by around 69% and death by around 42% (Liu et al., 2008). Other elements of PPE that protect the body from severe injury include impact and skid resistant jackets and pants, gloves, and sturdy over-ankle boots. The National Highway Traffic Safety Administration, State Highway Safety Offices, and motorcycle safety groups conduct safety programs to encourage the use of PPE. These programs support NHTSA's mission to save lives and reduce injuries from traffic crashes. However, their impact is not easily determined, partly due to the lack of data on the use rate of PPE. This issue is of concern, especially considering that motorcyclist fatalities occur 27 times more frequently than passenger vehicle occupant fatalities, on a per vehicle miles traveled basis.

A valuable source of PPE use data is direct observations of motorcyclists. Observation surveys reveal use rates of PPE, by location and operator characteristics, including type of motorcycle. Although of high value, observation survey data are costly to obtain, and many States do not conduct observation surveys. This project sought to ease the burdens of conducting an observation survey of motorcycle PPE by establishing a valid but efficient methodology of use in any jurisdiction. The project effort included preparing a sampling frame, selecting a sample of road segments and observation sites, developing data collection protocols, training and deploying field staff, and collecting, weighting, and analyzing the data.

Methodology

The survey methodology followed design considerations used in previous State helmet use surveys, NHTSA's Uniform Criteria for State Observational Surveys of Seat Belt Use (23 CFR Part 1340) and the National Occupant Protection Use Survey.[1] The design was for a probability-based sample of road segments. The population of inference was all motorcyclists (operators and passengers) riding on public roadways in Florida, during the day. A main concern of data collection was that motorcycles are rare compared to passenger vehicles, so to improve efficiency, roads preferred by motorcyclists, including "Best Roads" were oversampled. In addition, data collection locations were restricted to counties that accounted for at least 85% of motorcycle fatalities across a 5-year period (from 2011 to 2015), and very low-volume roads such as rural local roads were excluded.

The sample consisted of road segments from all limited access highways, arterials, and local roads, selected from the U.S. Census Bureau's Topologically Integrated Geographic Encoding and Referencing (TIGER) as the source of the road segments. The sample was stratified by four State regions and road type. There were two rounds of data collection. The sample in the first round had road segments selected per probability proportional to size (PPS), in which the length of road was the measure of size (MOS).[2] The second round of data collection took place one year later. In the second round, the sample of road segments were not selected per PPS, but with equal probability. Table 1 shows the sample characteristics for each round of data collection.

Table 1. Population and Sample by Road Type

Road Type	Population of Road Segments	Round One Sample of Roads	Round Two Sample of Roads
Best rides	9,858	40	60
Limited Access Highways	7,950	33	24
Arterials	69,188	131	145
Local Roads	941,376	84	59
Total	1,028,372	288	288

[1] The National Occupant Protection Use Survey (NOPUS) obtains nationwide probability-based observed data on seat belts and motorcycle helmet use.

[2] Probability proportional to size is a sampling procedure in which the probability of selection is proportional to a measure of size; in this case, the size was the length of the road segment.

There were two protocols for observations, one for motorcyclists in moving traffic on highways, and one for motorcyclists stopped at intersections. Observations at intersections allowed more time and proximity to observe the use of boots, jackets and pants, and gloves, and high-visibility or retroreflective materials.

Results

Round One resulted in 841 motorcyclists observed with a 43% use rate of DOT-certified helmets, and a standard error of 17%. The standard error in Round One was deemed too large, so in Round Two, road segments were selected not per PPS, but per equal probability. Round Two resulted in 873 motorcyclists observed, a 61% use rate of DOT-certified helmets, and a standard error of 7.7%. See Table 2 for results.

Table 2. Percentage of Motorcyclists Observed Using PPE, in Rounds One and Two of Data Collection

PPE Item	Round One			Round Two		
	Use Rate	Standard Error	N	Use Rate	Standard Error	N
DOT-Compliant Helmet	43.03%	17.45%	841	60.90%	7.73%	873
Boots	7.13%	3.82%	618	15.15%	4.93%	674
Gloves	6.20%	2.33%	617	7.42%	2.34%	673
Jacket	1.74%	0.91%	617	2.89%	0.77%	674
Pants	0.79%	0.49%	617	1.81%	0.57%	674

Conclusions

The results suggest that in an observation survey involving motorcycles, it is crucial to oversample road segments that are likely to have higher rates of motorcycle traffic (such as in the "Best Rides" stratum). In addition, a design that oversamples arterial road segments may increase sample yields. Results suggest that selecting road segments per probability proportional to size (PPS), when the measure of size is road segment length, was not efficient for motorcycle observations. It may be more efficient to use a measure of size relevant to motorcycle traffic, such as motorcycle volume at the road segment level. Otherwise, selecting road segments per equal probability, as opposed to PPS, may increase sample yield.

References

Benedick, A., De Leonardis, D., Green, J., & Petraglia, E. (2021, February). *Pilot test of a methodology for an observation survey of motorcycle personal protective equipment* (Report No. DOT HS 813 062). National Highway Traffic Safety Administration.

Liu, B. C., Ivers, R., Norton, R., Boufous, S., Blows, S., & Lo, S. K. Helmets for preventing injury in motorcycle riders (Art. No. CD004333.). *Cochrane Database of Systematic Reviews 2008, Issue 1.* DOI: 10.1002/14651858.CD004333.pub3

National Center for Statistics and Analysis. (2019, August). *Motorcycles: 2017 data* (Updated, Traffic Safety Facts. Report No. DOT HS 812 785). Washington, DC: National Highway Traffic Safety Administration. Available at https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812785

23 CFR Part 1340 [Docket No. NHTSA–2010–0002], RIN 2127–AK41, Uniform Criteria for State Observational Surveys of Seat Belt Use. www.govinfo.gov/content/pkg/FR-2011-04-01/pdf/2011-7632.pdf

How to Order

To order the full report, *Pilot Test of a Methodology for an Observation Survey of Motorcycle Personal Protective Equipment*, prepared by Westat, Inc., write to the Office of Behavioral Safety Research, NHTSA, NTI-130, 1200 New Jersey Avenue SE, Washington, DC 20590, fax 202-366-7394, or download from www.nhtsa.gov. Kathryn Wochinger was the manager for this project.

Suggested APA Format Citation:

National Highway Traffic Safety Administration. (2021, May). *Pilot test of a methodology for an observation survey of motorcycle personal protective equipment* (Traffic Tech, Technology Transfer Series. Report No. DOT HS 813 076).

U.S. Department of Transportation

National Highway Traffic Safety Administration

1200 New Jersey Avenue SE, NPD-320
Washington, DC 20590