



Motorcycle Rider Safety

The Issue:

Motorcycles are the most hazardous form of motor vehicle transportation.¹ A lack of physical barriers around motorcyclists compared to the occupants of cars and trucks, combined with less stability and less visibility all contribute to the risk of crashes, injuries and fatalities.² When crashes occur, motorcyclists need adequate head protection to prevent one of the leading causes of death and disability in the U.S. -- head injuries.³

The Impact:

- In 2021, 6,101 motorcycle riders were killed, a 9 percent increase from the previous year.⁴ This is the highest fatality total in a single year since data collection began in 1975.
- The number of motorcycle crash fatalities in 2021 is nearly three times the historic low of 2,116 motorcycle crash deaths in 1997.⁵
- Motorcycle riders represented 14 percent of the total traffic fatalities in 2021, despite representing only three percent of all registered vehicles annually.⁶
- 82,528 motorcyclists were injured in 2020, the most recent year for which data was available.⁷
- Per vehicle mile traveled in 2020, motorcycle riders were nearly 28 times more frequently killed in a traffic crash than occupants of passenger cars in traffic crashes.⁸
- Motorcycle rider fatalities of older adults (aged 65 and older) increased by 75 percent over the ten-year period from 2011 to 2020.⁹

The Facts:

Motorcycle Helmets Save Lives, Prevent and Mitigate Injuries and Reduce Costs

- In 2020, when helmet use was known, 40 percent of motorcyclists killed were not wearing a helmet.¹⁰
- Motorcycle helmets reduce the risk of head injury by 69 percent and reduce the risk of death by 42 percent.¹¹
- The National Highway Traffic Safety Administration (NHTSA) estimates that helmets saved the lives of 1,872 motorcycle riders in 2017 (the latest year for which data is available) and that 749 more lives in all states could have been saved if all motorcycle riders had worn helmets. For every 100 motorcycle riders who are killed in crashes while not wearing helmets, 37 riders could have been saved if helmets had been worn.¹²
- A study of motorcycle crash victims in Wisconsin from 2010 to 2015 by researchers at the University of Wisconsin in Madison found that unhelmeted riders in the state sustained cervical spine injuries twice as often as riders who wore helmets.¹³
- Annually, motorcycle crashes cost \$13 billion in economic impacts and \$66 billion in societal harm as measured by comprehensive costs based on 2010 data.¹⁴ When adjusted only for inflation, these amounts increase to \$17 billion and \$86 billion, respectively.¹⁵ Serious injuries and fatalities accounted for 87 percent of total comprehensive costs of motorcycle crashes, compared to 57 percent of the total comprehensive costs of all motor vehicle crashes.¹⁶
- In 2010, motorcycle helmets were preventing \$17 billion in societal harm costs annually, but another \$8 billion in harm costs could have been prevented if all motorcycle riders had worn helmets.¹⁷ When adjusted only for inflation, these amounts increase to \$22 billion and \$10 billion, respectively.¹⁸
- In 2010, helmets were saving \$2.7 billion in economic costs annually which amounts to \$3.5 billion when adjusted for inflation.¹⁹

The Solutions: Laws, Technology and Roadway Safety Infrastructure

All-Rider Helmet Requirements Are Effective, Reduce Costs and the Public Supports Them

- According to a 2012 Government Accountability Office (GAO) report, “laws requiring all motorcyclists to wear helmets are the only strategy proved to be effective in reducing motorcyclist fatalities.”²⁰
- According to NHTSA, in 2020, there were 7.7 times as many unhelmeted fatalities (1,897 fatalities) in states without a universal helmet law compared to states with a universal helmet law (246 fatalities). These states were similar with respect to total resident populations.²¹
- In states without all-rider helmet laws, 57 percent of motorcyclists killed in 2020 were not wearing helmets, compared to 11 percent in states with such laws.²²
- The observed use rate of U.S. Department of Transportation (DOT)-compliant helmets among motorcycle riders was just over 86 percent in states with all-rider helmet laws, compared to only 53 percent in other states in 2021.²³
- In Michigan, which repealed its all-rider law in 2012, there would have been 26 fewer motorcycle crash deaths (a 21 percent reduction) that year if the helmet mandate was still in place, according to the University of Michigan Transportation Research Institute.²⁴ Additionally, in the remainder of the year after the helmet repeal was enacted, only 74 percent of motorcycle riders involved in crashes were helmeted, compared to 98 percent in the same time period of the previous four years.²⁵
- A study of motorcycle rider crash injuries before and after Michigan partially repealed its motorcycle helmet use law found that following the repeal, the percentage of hospitalized trauma patients with a head injury rose 14 and the percentage of skull fracture-related injuries rose 38 percent. The study also found that trauma patients with head injuries were more likely to need costly hospital services, such as intensive care unit stays, ventilation, and neurosurgical interventions than patients without head injuries.²⁶
- In states with an all-rider helmet law, use of a helmet resulted in economic costs saved to society of \$725 per registered motorcycle, compared with \$198 per registered motorcycle in states without such a law.²⁷
- By an overwhelming majority (more than 82 percent), Americans favor state laws requiring all motorcycle riders to wear helmets.²⁸
- According to the American Academy of Pediatrics (AAP), in states with only youth-specific helmet laws, helmet use has decreased and youth mortality has increased. Serious traumatic brain injury among young riders was 38 percent higher in states with only age-specific laws compared to states with all-rider helmet laws.²⁹
- All-rider motorcycle helmet law repeal efforts which include motorcycle education and training requirements fail to meet the safety benefit provided by a universal helmet law. There is no scientific evidence that motorcycle rider training reduces crash risk.

Safety Technology to Prevent Motorcycle Crashes

- The Insurance Institute for Highway Safety (IIHS) evaluated on-road data and found that motorcycle anti-lock braking systems were associated with a 22 percent reduction in the rate of fatal crash involvements.³⁰ This proven technology should be required as standard equipment (i.e., via a federal motor vehicle safety standard (FMVSS)) in new motorcycles to prevent and mitigate crashes.
- Proven collision avoidance systems in vehicles including automatic emergency braking (AEB), lane departure warning (LDW), blind spot detection (BSD), rear AEB and rear cross-traffic alert should be required to detect and safely respond, as appropriate, to vulnerable road users (VRUs) including motorcycle riders. These systems should be standard equipment in new vehicles. Similarly, automated driving systems (ADS) should be required to detect and safely respond to VRUs

Road Safety Infrastructure Improvements and the Safe System Approach³¹

The Safe System Approach (SSA) assumes that humans will make mistakes and that we must anticipate this and make accommodations to account for limited human injury tolerances through five elements: Safe Vehicles,

Safe Road Users, Safe Roads, Safe Speed and Post Crash Care. By improving the design and operation of roadways to accommodate all road users safely, the SSA seeks to avoid conflicts between road users (drivers of vehicles, motorcycle riders, pedestrians, bicyclists, micromobility riders, wheelchair users and others) and minimize impact forces when they do occur to prevent fatalities and serious injuries.

Infrastructure improvements consistent with the SSA to limit conflicts include:

- Curbing speed - This can be accomplished by reducing speed limits, properly employing automated enforcement to augment traditional enforcement, adding speed humps, using real-time speed feedback signs, performing road diets and installing roundabouts, as appropriate.
- Prioritizing infrastructure to promote safety - This includes changes such as adding lighting and sight lines, leading intervals, pedestrian hybrid beacons, curb extensions, accessible sidewalks, rumble strips, protected intersections, separated bike lanes, and road separations that take into account all users, as appropriate.

Localities can advance these and other infrastructure improvements systemically by requiring their adoption as appropriate in road design and maintenance projects.

The Infrastructure Investment and Jobs Act, Pub. L. 117-58, includes multiple provisions that advance the SSA including expanded funding for safety infrastructure upgrades. It also provides support and guidance for localities planning to apply for such, permits use of certain federal funds for automated enforcement programs in school and work zones, directs requirements for vehicle safety improvements including crash avoidance technologies, and ensures funds are used to improve vulnerable road user safety.

November 2022

-
- ¹ The Economic and Societal Impact of Motor Vehicle Crashes, 2010 (Revised), NHTSA, May 2015 (Revised), DOT HS 812 013, available at <http://www-nrd.nhtsa.dot.gov/Pubs/812013.pdf>.
 - ² Facts + Statistics: motorcycle crashes; Insurance Information Institute, available at <https://www.iii.org/fact-statistic/facts-statistics-motorcycle-crashes>, last accessed Oct. 27, 2022.
 - ³ Coronado VG, Xu L., Basavaraju SV, McGuire LC, Wald MM, Faul MD, Guzman BR, JD Hemphill, *Surveillance for Traumatic Brain Injury--Related Deaths --- United States, 1997--2007*, MMWR Morb Mortal Wkly Rep. 60(05), 1-32, 2011, available at <http://www.cdc.gov/mmwr/pdf/ss/ss6005.pdf>
 - ⁴ Traffic Safety Facts: Early Estimates of Motor Vehicle Traffic Fatalities and Fatality Rate by Sub-Categories in 2021, NHTSA, May 2022, DOT HS 813 298, available at: <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813298>
 - ⁵ Traffic Safety Facts 2019: A Compilation of Motor Vehicle Crash Data, NHTSA, Aug. 2021, DOT HS 813 141 available at <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813141> & Overview of Motor Vehicle Crashes in 2020, NHTSA, Mar. 2022, DOT HS 813 266, available at <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813266>.
 - ⁶ Traffic Safety Facts. 2020 Data: Motorcycles, NHTSA, May 2022, DOT HS 813 306, available at <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813306>; Traffic Safety Facts 2019: A Compilation of Motor Vehicle Crash Data, NHTSA, Aug. 2021, DOT HS 813 141 available at <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813141>
 - ⁷ Traffic Safety Facts. 2020 Data: Motorcycles, NHTSA, May 2022, DOT HS 813 306, available at <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813306>
 - ⁸ Traffic Safety Facts. 2020 Data: Motorcycles, NHTSA, May 2022, DOT HS 813 306.
 - ⁹ Traffic Safety Facts. 2020 Data: Motorcycles, NHTSA, May 2022, DOT HS 813 306.
 - ¹⁰ Traffic Safety Facts. 2020 Data: Motorcycles, NHTSA, May 2022, DOT HS 813 306.
 - ¹¹ Liu BC, Ivers R, Norton R, Boufous S, Blows S, Lo SK, *Helmets for preventing injury in motorcycle riders (Review)*, The Cochrane Library, Issue 1, 2009. Available online at: <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD004333.pub3/abstract> (Accessed Nov. 11, 2013).
 - ¹² Traffic Safety Facts. 2020 Data: Motorcycles, NHTSA, May 2022, DOT HS 813 306.
 - ¹³ Page PS, Wei Z, Brooks NP, *Motorcycle helmets and cervical spine injuries: a 5-year experience at a Level 1 trauma center*, Journal of Neurosurgery: Spine, Vol. 28, No. 6, June 2018. Available online at: <http://thejns.org/doi/full/10.3171/2017.7.SPINE17540>.
 - ¹⁴ The Economic and Societal Impact of Motor Vehicle Crashes, 2010 (Revised), NHTSA, May 2015 (revised), DOT HS 812 013.
 - ¹⁵ CPI Inflation Calculator, U.S. Bureau of labor Statistics, available at https://www.bls.gov/data/inflation_calculator.htm.
 - ¹⁶ The Economic and Societal Impact of Motor Vehicle Crashes, 2010 (Revised), NHTSA, May 2015 (revised), DOT HS 812 013.
 - ¹⁷ The Economic and Societal Impact of Motor Vehicle Crashes, 2010 (Revised), NHTSA, May 2015 (revised), DOT HS 812 013.
 - ¹⁸ CPI Inflation Calculator, U.S. Bureau of labor Statistics, available at https://www.bls.gov/data/inflation_calculator.htm.
 - ¹⁹ The Economic and Societal Impact of Motor Vehicle Crashes, 2010 (Revised), NHTSA, Nov. 2020, DOT HS 812 981.
 - ²⁰ Motorcycle Safety: Increasing Federal Flexibility and Identifying Research Priorities Would Help Support States' Safety Efforts, GAO, 2012, GAO-13-42, available at <http://www.gao.gov/assets/660/650037.pdf>.
 - ²¹ Traffic Safety Facts. 2019 Data: Motorcycles, NHTSA, Sept. 2021, DOT HS 813 112; 2019 National and State Population Estimates, United States Census Bureau, available at <https://www.census.gov/newsroom/press-kits/2019/national-state-estimates.html>.
 - ²² Traffic Safety Facts. 2020 Data: Motorcycles, NHTSA, May 2022, DOT HS 813 306, available at <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813306>.
 - ²³ Traffic Safety Facts, Research Note: Motorcycle Helmet Use in 2021 – Overall Results, NHTSA, Mar. 2022, DOT HS 813 270, available at <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813270>.
 - ²⁴ Flannagan CA, Analysis of Motorcycle Crashes: Comparison of 2012 to Previous Years, 18th Michigan Traffic Safety Summit, 2013.
 - ²⁵ Flannagan CA, Analysis of Motorcycle Crashes: Comparison of 2012 to Previous Years, 18th Michigan Traffic Safety Summit, 2013.

-
- ²⁶ Status Report, Vol. 51, No. 7, “Head injuries rise as riders ditch helmets in Michigan”, IIHS, September 1, 2016; available at <https://www.iihs.org/iihs/sr/statusreport/article/51/7/2>.
- ²⁷ Centers for Disease Control and Prevention (CDC), Helmet use Among Motorcyclists Who Died in Crashes and Economic Cost Savings Associated With State Motorcycle Helmet Laws – United States, 2008-2010, MMWR Morb Mortal Wkly Rep, 61(23), 425-430, 2012.
- ²⁸ Foundation for Traffic Safety, *2017 Traffic Safety Culture Index, March 2018*. Available at: <https://bit.ly/2GesYcS>.
- ²⁹ Weiss, H., Ph.D., MPH, MS, Agimi, Y.L., MPH, and Steiner, C., MD, MPH, “Youth Motorcycle-Related Brain Injury by State Helmet Law Type: United States 2005-2007,” *Pediatrics*, November 2010, available at <https://pubmed.ncbi.nlm.nih.gov/21078726/>.
- ³⁰ Motorcycle Antilock braking Systems and Fata Crash Rates: Updated Results, Aug., 2021, IIHS, available at <https://www.iihs.org/topics/bibliography/ref/2236>.
- ³¹ “Recommendations of the Safe System Consortium,” Johns Hopkins University Center for Injury Research and Prevention, May 2021. Available here: <https://www.jhsph.edu/research/centers-and-institutes/johns-hopkins-center-for-injury-research-and-policy/our-impact/documents/recommendations-of-the-safe-system-consortium.pdf>.