

Estimate of Reduction in Deaths, Injuries, and Societal Costs in 2015 Michigan Motorcycle Crashes with Helmet Use

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There were 3,126 police-reported motorcycle-involved traffic crashes in Michigan in 2015, in which 138 motorcyclists were killed, 546 sustained serious injuries, 1,081 sustained moderate injuries, and 813 sustained minor or possible injuries. Of crash-involved motorcyclists, 64.9% were reported to have worn a helmet, 25.7 % were reported as not wearing a helmet, and helmet use was not known for 9.4% of them (UMTRI, 2016).

The total societal cost of motorcycle crashes was estimated as \$1.8 billion, of which \$330 million were monetary costs (medical care, future earning/lost wages, public services, adjudication and sanctioning, and property damage and loss), and \$1.4 billion were quality of life costs (based on the current U.S Department of Transportation value of statistical life) (Kostyniuk et al, 2017).

A motorcyclist's helmet does not prevent a crash, but reduces the probability of death and injury to the motorcyclist, given that a crash has occurred. The National Highway Traffic Safety Administration (NHTSA) estimates that the effectiveness of helmets in preventing fatalities is 37% for riders and 41% for passengers (Deutermann, 2005). NHTSA also estimates that helmets are 8% effective in preventing minor injuries and 13% effective in preventing serious injuries, with no difference between rider and passenger (NHTSA, 1988).

Of the 138 motorcyclists killed in traffic crashes in Michigan in 2015, 56 (40.6%) were known to not be wearing helmets. Among those injured, the known non-helmet use was 34.4% for those with serious injuries, 27.6 % for those with moderate injuries, and 21.9% for those with minor or possible injuries (UMTRI, 2016). Thus, some of fatalities and injuries sustained by Michigan motorcyclists in 2015 could have been prevented, had the motorcyclists used helmets.

To estimate the preventable fatalities and injuries, we applied the rate of helmet effectiveness to the number of un-helmeted casualties in each injury severity. Helmet use or injury severity or both were not known for 9.5 % of the crash-involved motorcyclists, so these cases were not included in this estimation. If helmets were worn in some of these unknown cases, the number of preventable casualties would have been higher. However, because we did not have this information, we did not consider them in the reduction calculations, which yielded a conservative estimate.

Table 1 shows the number of preventable casualties had helmets been worn by the crash-involved motorcyclists known to be un-helmeted.

	Effectiveness of helmet in preventing injury	Number of un-helmeted casualties	Preventable casualties with helmet use
Killed- rider	37%	53	20
Killed-passenger	41%	3	1
Serious injury	13%	186	24
Moderate injury	8%	297	24
Minor or Possible Injury	8%	179	14

Helmets do not prevent a crash, but reduce the chances of a fatality or injury of a specific severity. In the best possible outcome scenario, the crash associated with the preventable casualty would become a property-damage-only crash. At the other end of the spectrum, the severity of an injury would be reduced by one level, that is, a fatal casualty would now be a severe injury, and a severe injury would be a moderate injury, and so on. We estimated the cost reduction for both scenarios, recognizing that in reality, the outcome would be somewhere in between.

Table 2 shows the victim unit costs for motorcyclists in motorcycle crashes (Kostyniuk et al) which are used in the estimation of reductions in societal costs in the two scenarios.

Unit costs	Fatal	Serious Injury	Moderate Injury	Minor or Possible Injury	Property Damage Only
Monetary Costs	1,341,410	122,717	34,959	33,008	2,940
Quality of Life Costs	7,474,513	388,170	83,850	78,966	1,046
Comprehensive (Total) Cost/casualty	8,815,923	510,887	118,809	111,974	3,986

We calculated the cost reductions by multiplying the victim casualty costs by the number of preventable casualties and subtracting the casualty cost associated with the final severity level.

Table 3 shows the current societal cost of motorcycle crashes in 2015, and the estimated reductions in these costs under the assumption of helmet use for the two bounding scenarios of final severity outcomes.

	With recorded helmet use in 2015 crashes	Scenario 1 - 100% helmet use and severity of each casualty reduced by one level		Scenario 2- 100% helmet use and severity of each crash reduced to Property-Damage-Only	
	2015 Societal Costs	Reduction	Societal Costs with helmet use	Reduction	Societal Costs with helmet use
Monetary Cost	329,895,477	28,166,521	301,728,956	32,174,866	297,720,611
Quality of Life Cost	1,430,255,359	157,324,979	1,272,930,380	169,313,005	1,260,942,354
Comprehensive (Total) Cost	1,760,155,359	185,491,500	1,574,663,859	201,487,871	1,558,667,488

If helmets had been worn by all the crash-involved motorcyclists in 2015, monetary costs of motorcycle crashes would have been reduced by \$28 million - \$32 million, quality of life costs would have been reduced by \$157 million - \$169 million, and total societal costs would have been reduced by \$185 - \$201 million. Twenty-one deaths would have been prevented, and total societal costs of motorcycle crashes would have been lower by 10.5%-11.4%.

References

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