

2016 Standardized Crash Cost Estimates for North Carolina

Rounded to nearest thousand (with exception of PDO)

The Transportation Mobility and Safety Division periodically updates costs associated with traffic crashes for use by division personnel for cost analyses. Starting with the 2013 update, the division is now using the USDOT’s recommended Value of a Statistical Life (VSL) to calculate crash costs. The VSL used in this update was obtained from the USDOT memo “Guidance on Treatment of the Economic Value of a Statistical Life (VSL) in U.S. Department of Transportation Analyses – 2016 Adjustment” dated August 8, 2016.

Table 1a Cost per Cash – Total Crashes

Crash Type	Cost Per Crash 2016 Dollars
Fatal Crash	\$10,462,000
A Injury Crash	\$590,000
B Injury Crash	\$186,000
C Injury Crash	\$101,000
Property Damage Only Crash	\$7,000
Average Crash	\$99,000
Injury Crash (F+A+B+C)	\$300,000
Non-Fatal Injury Crash (A+B+C)	\$135,000
Severe Injury Crash (F+A)	\$4,120,000
Moderate Injury Crash (B+C)	\$122,000

The crash costs were also summarized for urban and rural areas. The crash cost for each severity category is very similar across the board for urban, rural, and combined (Total) categories. There is little change because the number of injuries per crash for each severity category changes very little when looking at rural and urban crashes. The big difference comes in the average costs. The average rural crash costs are higher because severe crashes make up a higher percentage of the total rural crashes when compared to the urban crash costs.

Table 2 Crash Costs for Urban and Rural Area

	Rural	Urban
	Cost Per Crash	Cost Per Crash
Fatal Crash	\$10,494,000	\$10,402,000
A Injury Crash	\$602,000	\$567,000
B Injury Crash	\$182,000	\$190,000
C Injury Crash	\$96,000	\$103,000
Property Damage Only Crash	\$7,000	\$7,000
Average Crash	\$150,000	\$71,000
Injury Crash (F+A+B+C)	\$436,000	\$219,000
Non-Fatal Injury Crash (A+B+C)	\$147,000	\$128,000
Severe Injury Crash (F+A)	\$4,168,000	\$4,032,000
Moderate Injury Crash (B+C)	\$123,000	\$121,000

In addition to total statewide crashes, crash costs are also calculated for seven specific crash types. The crash cost categories are:

- a) Total Crashes
- b) Frontal Impact Crashes
- c) Lane Departure Crashes
- d) Rear End Crashes
- e) Pedestrian Crashes
- f) Bicycle Crashes
- g) Train Crashes
- h) Truck Crashes

Table 1b Cost per Crash – Frontal Impact Crashes
(Angle, Left turn same road, Left turn different road, Right turn same road, Right turn different road, and Head on crashes)

Crash Type	Cost Per Crash 2016 Dollars
Fatal Crash	\$11,108,000
A Injury Crash	\$689,000
B Injury Crash	\$225,000
C Injury Crash	\$113,000
Property Damage Only Crash	\$7,000
Average Crash	\$129,000
Injury Crash (F+A+B+C)	\$314,000
Non-Fatal Injury Crash (A+B+C)	\$157,000
Severe Injury Crash (F+A)	\$4,174,000
Moderate Injury Crash (B+C)	\$141,000

Table 1c Cost per Crash – Lane Departure Crashes
(Run off road –Straight, Right, and Left, Fixed Object, Overturn/Rollover, Sideswipe opposite direction, parked motor vehicle, and Head on crashes)

Crash Type	Cost Per Crash 2016 Dollars
Fatal Crash	\$10,617,000
A Injury Crash	\$566,000
B Injury Crash	\$163,000
C Injury Crash	\$82,000
Property Damage Only Crash	\$7,000
Average Crash	\$180,000
Injury Crash (F+A+B+C)	\$473,000
Non-Fatal Injury Crash (A+B+C)	\$137,000
Severe Injury Crash (F+A)	\$4,421,000
Moderate Injury Crash (B+C)	\$112,000

Table 1d Cost per Crash – Rear End Crashes
(Rear end slow or stop and Rear end turn crashes)

Crash Type	Cost Per Crash 2016 Dollars
Fatal Crash	\$10,521,000
A Injury Crash	\$618,000
B Injury Crash	\$207,000
C Injury Crash	\$105,000
Property Damage Only Crash	\$7,000
Average Crash	\$55,000
Injury Crash (F+A+B+C)	\$156,000
Non-Fatal Injury Crash (A+B+C)	\$123,000
Severe Injury Crash (F+A)	\$2,970,000
Moderate Injury Crash (B+C)	\$118,000

Table 1e Cost per Crash – Pedestrian Crashes

Crash Type	Cost Per Crash 2016 Dollars
Fatal Crash	\$9,829,000
A Injury Crash	\$491,000
B Injury Crash	\$137,000
C Injury Crash	\$69,000
Property Damage Only Crash	\$7,000
Average Crash	\$972,000
Injury Crash (F+A+B+C)	\$993,000
Non-Fatal Injury Crash (A+B+C)	\$138,000
Severe Injury Crash (F+A)	\$5,303,000
Moderate Injury Crash (B+C)	\$103,000

Note: Due to having a relatively small yearly sample size, the costs for pedestrian crashes were calculated based on five years of crash data (2012-2016)

Table 1f Cost per Crash – Bicycle Crashes

Crash Type	Cost Per Crash 2016 Dollars
Fatal Crash	\$9,708,000
A Injury Crash	\$476,000
B Injury Crash	\$131,000
C Injury Crash	\$67,000
Property Damage Only Crash	\$7,000
Average Crash	\$374,000
Injury Crash (F+A+B+C)	\$387,000
Non-Fatal Injury Crash (A+B+C)	\$119,000
Severe Injury Crash (F+A)	\$3,788,000
Moderate Injury Crash (B+C)	\$99,000

Note: Due to having a relatively small yearly sample size, the costs for bicycle crashes were calculated based on five years of crash data (2012-2016)

Table 1g Cost per Crash – Train Crashes

Crash Type	Cost Per Crash 2016 Dollars
Fatal Crash	\$10,425,000
A Injury Crash	\$482,000
B Injury Crash	\$180,000
C Injury Crash	\$79,000
Property Damage Only Crash	\$60,000
Average Crash	\$748,000
Injury Crash (F+A+B+C)	\$1,846,000
Non-Fatal Injury Crash (A+B+C)	\$156,000
Severe Injury Crash (F+A)	\$7,285,000
Moderate Injury Crash (B+C)	\$123,000

Note: Due to having a relatively small yearly sample size, the costs for train crashes were calculated based on five years of crash data (2012-2016)

Table 1h Cost per Crash – Truck Crashes

Crash Type	Cost Per Crash 2016 Dollars
Fatal Crash	\$10,433,000
A Injury Crash	\$557,000
B Injury Crash	\$176,000
C Injury Crash	\$97,000
Property Damage Only Crash	\$7,000
Average Crash	\$171,000
Injury Crash (F+A+B+C)	\$592,000
Non-Fatal Injury Crash (A+B+C)	\$146,000
Severe Injury Crash (F+A)	\$4,751,000
Moderate Injury Crash (B+C)	\$119,000

Appendix

How crash costs are calculated (using 2014 numbers as an example):

- The cost per injury data was obtained by using the Value of a Statistical Life (VSL) guidelines found in the USDOT memo “Guidance on Treatment of the Economic Value of a Statistical Life (VSL) in U.S. Department of Transportation Analyses.” The example in this appendix uses the 2014 Adjustment. This memo gives the VSL as \$9.2 million. Other injury costs are given as a fraction of the VSL cost and are shown in Table 3.

Table 3 Relative Disutility Factors by Injury Severity Level (AIS)

AIS Level	Severity	Fraction of VSL	Cost Per Injury
AIS 1	Minor	.003	\$27,600
AIS 2	Moderate	.047	\$432,400
AIS 3	Serious	.105	\$966,000
AIS 4	Severe	.266	\$2,447,200
AIS 5	Critical	.593	\$5,455,600
AIS 6	Unsurvivable	1.000	\$9,200,000

Source: USDOT Memorandum “Guidance on Treatment of the Economic Value of a Statistical Life (VSL) in U.S. Department of Transportation Analyses – 2014 Adjustment” (June 13, 2014)

- As shown in the table above, the VSL guidance lists injuries in terms of the Abbreviated Injury Scale (AIS). Law enforcement officers in North Carolina report injuries using the KABCO Scale. In order to accurately apply the costs in Table 3 to the North Carolina data, a conversion matrix provided by the National Highway Traffic Safety Administration (NHTSA) was applied to the data.

Table 4 KABCO–AIS Data Conversion Matrix

	0 No Injury	C Possible Injury	B Non- Incapacitating	A Incapacitating	K Killed	
AIS	0	0.92534	0.23437	0.08347	0.03437	0.00000
	1	0.07257	0.68946	0.76843	0.55449	0.00000
	2	0.00198	0.06391	0.10898	0.20908	0.00000
	3	0.00008	0.01071	0.03191	0.14437	0.00000
	4	0.00000	0.00142	0.00620	0.03986	0.00000
	5	0.00003	0.00013	0.00101	0.01783	0.00000
Fatality	0.00000	0.00000	0.00000	0.00000	1.00000	
Sum(Prob)	1.00	1.00	1.00	1.00	1.00	

Source: National Highway Traffic Safety Administration, July 2011

The matrix is based on probability and the reality that an injury report made by an observation at a crash site does not always end up being accurate. For example, based on the matrix, if a crash report indicates that a driver had an injury of 0 (no injury) there is

actually a 7.26% chance that it was an AIS 1 injury (Minor), a 0.198% chance that it was an AIS 2 injury (Moderate), a 0.008% chance that it was an AIS 3 injury (Serious), and a 0.003% chance that it will turn out to be a AIS 5 injury (Critical).

- The probabilities from Table 4 are applied to the costs per AIS injury in Table 3 in order to calculate the costs per injury on the KABCO Scale, which are presented in Table 5.

Table 5 2014 Cost Per Injury

Severity (AIS Level)	Cost Per Injury
K	\$9,200,000
A	\$439,990
B	\$119,839
C	\$61,194
O	\$3,100

- The North Carolina Database is then used to determine the average number of each type of injury in each severity category. Table 6 shows the results of this for the 2014 crash data (Total Crashes).

Table 6 Average Number of Injuries by Severity Category – Total Crashes

Crash Type	Average Number of Fatal Injuries	Average Number of A Injuries	Average Number of B Injuries	Average Number of C Injuries	Average Number of O Injuries
Fatal Crash	1.08	0.14	0.34	0.27	0.41
A Injury Crash	0	1.15	0.34	0.31	0.62
B Injury Crash	0	0	1.23	0.43	0.75
C Injury Crash	0	0	0	1.49	1.37

In this example, in 2014 a fatal crash averaged 1.08 fatalities, 0.14 A injuries, 0.34 B injuries, 0.27 C injuries, and 0.41 O injuries.

- The final cost for each severity category includes the costs associated with the average number of injuries in each crash type. Table 7 shows an example computation of the cost of an average fatal crash in 2014.

Table 7 Computation of Cost Per Fatal Crash

Injury	Number of Injuries (1)	Cost Per Injury (2)	Crash Cost (1) X (2)
Fatal Injury	1.08	\$9,200,000	\$9,944,061
A Injury	0.14	\$449,555	\$63,385
B Injury	0.34	\$122,445	\$40,182
C Injury	0.27	\$62,524	\$16,342
O Injury	0.41	\$3,167	\$1,285
TOTAL (rounded to nearest thousand)			\$10,065,000