



U.S. Department  
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National Highway  
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# Research Note

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## Analysis of Ejection in Fatal Crashes

Data from NHTSA's Fatality Analysis Reporting System (FARS) show that the ejection rate among fatally injured passenger vehicle occupants has remained at over 20 percent since the early 1980's. Because the risk of fatality in a crash is over three times as great for an ejected occupant compared with a nonejected occupant (i.e., person retained in the vehicle), ejection remains a significant traffic safety problem.

While the safety belt use rate among fatally injured motor vehicle occupants has increased from 2.7 percent in 1982 to 35.8 percent in 1996, there has been only a slight decline in the occupant ejection rate during the same period. The fraction of totally ejected fatalities was about 23 percent in 1982, and it was about 21 percent in 1996.

For the period 1982 to 1996, the overall rate of total ejection in fatal crashes was 2.5 percent for belted occupants and 29.4 percent for unbelted occupants. Because safety belt use largely eliminates the possibility of ejection in a crash, the fact that the ejection problem does not appear to have diminished, in spite of the increase in safety belt use, must be explained by ejections in the population of motor vehicle occupants who remain unbelted.

Focusing on the unbelted individuals, the analysis finds that their ejection rate has increased from 25 percent to about 33 percent during the period 1982 to 1996. The main factor contributing to ejection among the unbelted individuals is the occurrence of rollover during the crash, which increases the

odds of ejection over five times. The average fraction ejected in rollover crashes is 51 percent compared with the ejection rate of 11 percent in fatal crashes not involving rollover.

A time trend analysis shows an increase in rollover rate among the unbelted individuals from about 28 percent in the early 1980's to over 37 percent in 1996. Thus, the increase in ejections among unbelted individuals was accompanied by an increase in rollovers, which indicates that unbelted individuals tend to be involved in more severe crashes.

Another factor that the analysis found to be strongly associated with ejection, particularly in rollover crashes, is the speed of the vehicle prior to the crash. The average police-reported speed in fatal crashes for the unbelted population has increased from about 50 mph in the early 1980's to almost 55 mph in 1996, while it has remained between 46 and 47 mph for the belted population. This provides further evidence that unbelted individuals are involved in more severe crashes.

The analysis further shows that the odds of ejection are about 1.4 times as great in a light truck (including vans and sport utility vehicles) compared with a passenger car. This estimate of the relative odds of ejection is adjusted for such factors as safety belt use and the occurrence of rollover, which leads to the conjecture that it is due to an intrinsic difference in the dynamics of being involved in a crash in a light truck compared to a crash in passenger car. Since the fraction of

light trucks involved in fatal crashes has increased from about 21 percent in the early 1980's to about 31 percent in 1996, this factor also contributes to explaining the increased prevalence of ejection.

Finally, the driver's age was found to be an important predictor of the probability of ejection. Younger drivers are more likely to be involved in ejection crashes. The average age of unbelted individuals in fatal crashes is about 35 compared with the average age of about 45 for the belted individuals. The average driver age in rollover crashes is about 33, while the average driver age in ejection crashes is about 32. In spite of the general increase in the average age of fatally injured individuals, the average driver age in rollover and ejection crashes has grown very little from 1982 to 1996.

This analysis leads to the conclusion that the increase in the prevalence of ejection among the unbelted individuals in fatal crashes during the 1980's and 1990's can be explained by the increased severity of crashes in that population, as evidenced by the increase in the rollover rate and speed, together with the increase in the presence of light trucks in those crashes and the young age of drivers involved.

The unbelted population consists of individuals who remained unbelted in spite of the enactment of safety belt use laws and public information and education campaigns. This analysis shows that they are the population more likely to be involved in the type of crashes which result in ejection when safety belts are not used compared with the population of individuals who started using safety belts during the 1980's and 1990's.

For additional copies of this research note or the technical report, *Analysis of Ejection in Fatal Crashes*, DOT-HS-808 643, November 1997, please call (202) 366-4198 or toll free 1-800-934-8517. For questions, contact John Winnicki at (202) 366-5927. This research note and other general information on highway traffic safety may be accessed by Internet users at <http://www.nhtsa.dot.gov/people/nca>.