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Research Note

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Estimating Lives Saved by Restraint Use in Potentially Fatal Crashes

For the past decade, NHTSA has used a method of calculating the number of lives saved by safety belts based on analyses conducted during the mid-1980's. Using a single effectiveness estimate of 45 percent and employing first the 19-city survey data and, more recently, state survey information from states with and without belt laws, this method formed the basis for the annual estimates of the number of front-outboard passenger vehicle occupants, age five and older, saved by safety belts. NHTSA also calculates estimates of the number of lives saved by other restraint types, such as child safety seats, but in a different manner. Using a formula that takes into account the age of the child (infant or toddler) to identify the type of seat most likely used, the number of *potential fatalities* is computed. This represents how many fatalities would have occurred if no one were restrained. The actual number of fatalities is subtracted from this value to determine the number of lives that were saved. This method relies on restraint use in potentially fatal crashes (UPFC), and is basically the method that will now also be used to calculate the number lives saved by safety belts.

The main reason for having used an alternative approach with safety belts was to overcome what is believed to be an overreporting of belt use on police accident reports. This overreporting may be associated with the presence of mandatory use laws, as well as insurance incentives for using restraints. The calculation, applied to the aggregate nationwide fatal crash data, yields a conservative estimate of the number of lives saved by restraints.

Unfortunately, this method has not “kept up with” the dramatic increases in safety belt use experienced during the past few years. In addition, recent NHTSA analyses demonstrate that safety belt use for fatally injured occupants appears more reasonable than originally assumed. However, safety belt use for crash survivors continues to appear unreliably high.

The new method to determine lives saved by safety belts uses a more detailed approach, incorporating police-reported belt use for each individual fatality, and specific restraint effectiveness estimates for the different restraint types, vehicle types, and seating positions. It also makes NHTSA's method of determining lives saved consistent with the approach used for child safety seats and motorcycle helmets. That is, now all estimates of lives saved by restraints will be calculated using the formula:

$$\text{Lives Saved} = FE/(1-E)$$

where F = the number of restrained fatalities
and E = the effectiveness of the restraint.

The number of potential fatalities is derived by dividing the number of restrained fatalities (F) by 1 minus the effectiveness ($1-E$). The number of lives saved is then these potential fatalities minus the actual fatalities, or potential fatalities times the system effectiveness. The formula above combines these two steps to directly calculate the number of lives saved by a particular restraint type.

This newer method is preferable to the older

approach for several reasons. It does not rely on survey data of unknown quality, since all calculations are derived from the count of restrained fatalities. The reported restraint use is believed to be accurate for fatalities, and therefore the overreporting problem is minimized. In addition, the number of lives saved can be calculated separately for each type of vehicle, each type of restraint (manual or automatic safety belt, air bag, child seat, or motorcycle helmet), and even the seating position of the occupant. Thus, an estimate of the total number of lives saved by the restraint type(s) under study can be determined, rather than being limited to front outboard occupants in passenger vehicles, and assuming a single standard effectiveness rate for everyone.

The following table presents estimates of lives saved, using both the previous approach and the new method based on potential fatalities. The comparison between the "Previous Method" and the "New Method" is limited to front-outboard passenger vehicle occupants, age five and older, since this is what was calculated by the previous method. The last column provides the new estimates of lives saved by safety belts for all passenger vehicle occupants, age 5 and older, in ALL seating positions, and accounting for the differing estimates of effectiveness for the various available restraint systems.

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| Estimates of Lives Saved | | | |
|---------------------------------|------------------------------------------------------------|-------------------|-----------------------------------------------------------|
| Year | Front Outboard Passenger Vehicle Occupants, Age 5 + | | New Method, All Passenger Vehicle Occupants Age 5+ |
| | Previous Method | New Method | |
| 1982 | | | 678 |
| 1983 | 725 | 784 | 809 |
| 1984 | 1,053 | 1,155 | 1,197 |
| 1985 | 1,810 | 2,361 | 2,435 |
| 1986 | 3,329 | 3,984 | 4,094 |
| 1987 | 4,021 | 5,000 | 5,171 |
| 1988 | 4,573 | 5,801 | 5,983 |
| 1989 | 4,575 | 6,160 | 6,353 |
| 1990 | 4,800 | 6,416 | 6,596 |
| 1991 | 4,682 | 6,802 | 7,022 |
| 1992 | 5,226 | 7,203 | 7,403 |
| 1993 | 5,344 | 8,148 | 8,372 |
| 1994 | 5,998 | 8,918 | 9,175 |
| TOT | 46,136 | 62,732 | 65,288 |