
INSURANCE INSTITUTE FOR HIGHWAY SAFETY

NEWS RELEASE

Tuesday, February 10, 1998

NEW STUDY OF RELATIONSHIPS BETWEEN VEHICLE WEIGHT AND OCCUPANT DEATH RATES HELPS PUT IN PERSPECTIVE ISSUE OF CRASH COMPATIBILITY

ARLINGTON, VA — As bigger and heavier utility vehicles get ever more popular, is incompatibility between vehicles in crashes becoming a big safety problem on U.S. roads? A comprehensive new study by the Insurance Institute for Highway Safety addresses this issue. The study focuses on fatal crashes involving 1990-95 model cars (including minivans), pickups, and utility vehicles. Researchers examined occupant deaths in these vehicles as well as deaths in other vehicles with which these vehicles collided.

For each vehicle type and crash configuration, relationships between vehicle weights and death rates were reviewed to explore the role of incompatibility in passenger vehicle occupant deaths. Examined were deaths inside the study vehicles in two-vehicle and single-vehicle crashes, deaths inside any other vehicles that crashed with the study vehicles, and the relative death risk when study vehicles collided with each other in front-to-front and front-to-side crashes.

Occupant deaths inside 1990-95 vehicles

The basic findings reinforce what's long been known about vehicle size and occupant death rates. As vehicle weight decreases, the number of occupants killed in crashes increases. There also are differences among vehicle types. The lightest utility vehicles have by far the highest death rates, but in the other weight classes, pickups have the highest occupant death rates, and cars have the lowest (figure 1, attached *Status Report*). These results reflect both single- and two-vehicle crashes, and the latter account for 48 percent of all car occupant deaths, 35 percent of all pickup occupant deaths, and 29 percent of all utility vehicle deaths.

Deaths inside study vehicles in two-vehicle crashes

Lighter vehicles have higher occupant death rates in two-vehicle crashes, and within each weight class, cars and pickups have similar occupant death rates. Utility vehicles

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have somewhat lower death rates (figure 3, *Status Report*). Incompatibility can play a role in two-vehicle crashes because the characteristics of both vehicles – especially their weights, crush zone stiffnesses, and geometric designs – influence crash outcomes.

Other vehicles in two-vehicle crashes with deaths in the study vehicles

In two-vehicle crashes with deaths in 1990-95 model cars, just under 50 percent of the other vehicles also are cars. This percentage ranges from 48 percent for the lightest cars to 40 percent for the heaviest. Pickups are 20-21 percent and utility vehicles 7-8 percent of the other vehicles, regardless of the weight class of the cars with occupant deaths. Medium and heavy trucks are the other vehicles in 17 percent of the deaths in the lightest cars and 26 percent in the heaviest ones. For pickups and utility vehicles with occupant deaths, the other vehicles are less likely to be cars and more likely to be medium and heavy trucks (figure 4, *Status Report*).

Deaths inside other vehicles that collide with the study vehicles

Heavier passenger vehicles have the highest rates of occupant deaths occurring in the other vehicles they collide with. Here, however, there are large differences among vehicle types. In every weight class, pickups have the highest other-vehicle death rates and cars the lowest. Even the heaviest cars have lower other-vehicle death rates than the lightest pickups or utility vehicles (figure 5, *Status Report*).

Deaths in the study vehicles vs. deaths in the other vehicles

In two-vehicle crashes involving cars, there are more deaths inside the cars than in the other vehicles they collide with. Only when the two heaviest classes of cars are involved are there slightly more deaths in the other vehicles. In contrast, in crashes involving pickups or utility vehicles there are many more deaths in the other vehicles. This excess of deaths in other vehicles is most pronounced for crashes with the heaviest pickups (see table).

"These results have particular importance for occupant protection priorities," says Institute President Brian O'Neill. "More people die inside cars than in the other vehicles they collide with, and not all of the other vehicles involved are cars. This means the highest priority for car designs should continue to be improving protection for their own occupants. Designing cars to improve *car-to-car* crash compatibility

should only be considered if it doesn't conflict with this priority. On the other hand, the very high death rates for occupants of other vehicles colliding with pickups or utility vehicles suggest that making future model pickups and utility vehicles more crash compatible, especially in crashes with cars, should be a priority."

Deaths in car-to-pickup and car-to-utility vehicle crashes

The results summarizing the relative risks for occupants when pairs of the study vehicles collided identify particularly high-risk configurations. For all crashes between cars and pickups or cars and utility vehicles, people in cars are about four times more likely to die than people inside pickups or utility vehicles. When pickups or utility vehicles strike cars in the side, the risk of death for car occupants relative to the risk of the pickup or utility vehicle occupants dying is 27-to-1. This compares with about 6-to-1 for people in cars struck in the side by another car and 20-to-1 when the striking car is heavy. People in small cars weighing less than 2,500 pounds struck in the side by pickups or utility vehicles have a relative death risk of 47-to-1 (figures 8, 9, 10, *Status Report*).

"These relative risk results highlight some of the severe crash incompatibility problems between cars and light trucks and should help establish priorities for future vehicle design improvements," says O'Neill. "At the same time, it's important to understand that about 10 percent of all car occupant deaths occur in crashes with pickups, and about 4 percent occur in crashes with utility vehicles. Virtually all of the remaining car occupant deaths occur in crashes with other cars, big trucks, or in single-vehicle crashes. Thus, compatibility improvements, even though they're important, are not panaceas."

1-page table follows this 3-page release; see also Status Report, Vol. 33, No. 1 February 14, 1998

Related information on Internet: www.highwaysafety.org.

**Occupant death rates in two-vehicle crashes,
deaths in 1990-95 model passenger vehicles and other vehicles**
deaths per million vehicles per year

Vehicle weight class (pounds)	Vehicle crash pairs					
	1990-95 cars	Other vehicles	1990-95 pickups	Other vehicles	1990-95 utility vehicles	Other vehicles
<2,500	109	35			105	58
2,500-	83	43	89	88	54	75
3,000-	60	48	56	116	53	75
3,500-	53	57	52	115	37	92
4,000-	49	58	44	144	29	91
4,500-			45	169	29	110
5,000+			38	181	25	112