

Traffic Safety Facts

Research Note

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Passenger Vehicle Occupant Fatality Rates by Type and Size of Vehicle

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Summary

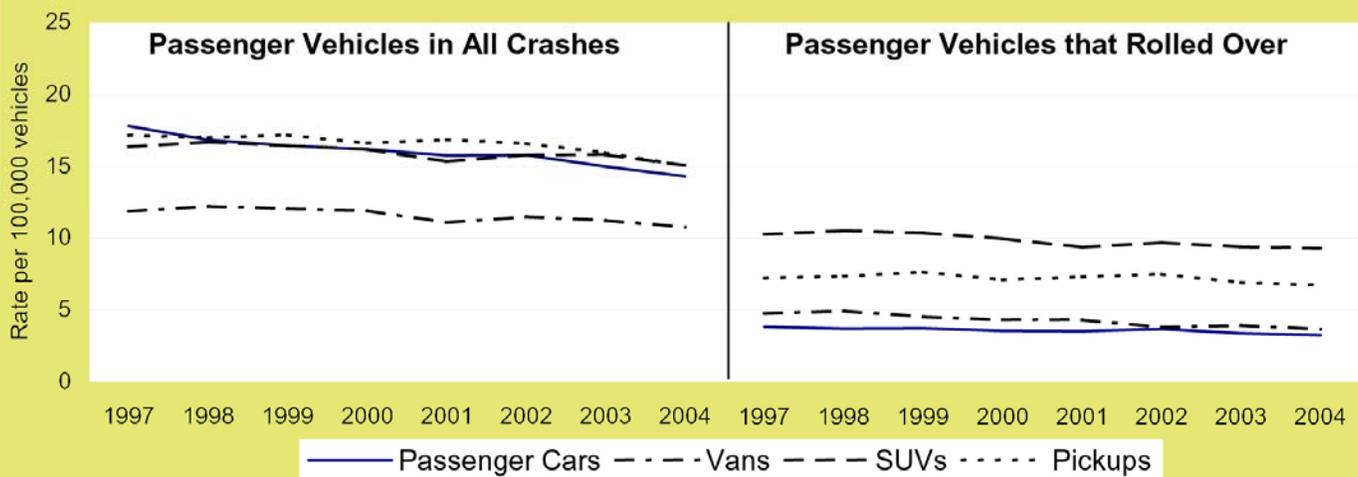
The National Highway Traffic Safety Administration (NHTSA) has routinely published (NHTSA, 2005) passenger vehicle occupant fatality rates, both overall and in vehicles that rolled over, by the type of the vehicle, such as passenger cars, SUVs, pickup trucks or vans. These categories of vehicles are broad and may mask differences in rates that might exist between vehicles of different sizes within a type. This Research Note examines the occupant fatality rates by vehicle type and size and found that in all fatal crashes, when broken down by size, compact cars have the highest occupant fatality rate while the “large vans” category has the lowest occupant fatality rate. Among vehicles that rolled over, midsize SUVs have the highest occupant fatality rate while large passenger cars have the lowest occupant fatality rate.

Background

This Research Note examines the fatality rate to occupants of passenger vehicles involved in fatal motor vehicle traffic

crashes by the type and size of the vehicle. Data from 1997 to 2004 have been presented to show trends in occupant fatality rates. One of NHTSA’s primary goals is to reduce the passenger vehicle occupant fatality rate. Reducing fatalities in vehicles that roll over is a major component of that goal. Therefore, occupant fatality rates in vehicles that rolled over are also presented in this Research Note. The rates are presented per 100,000 registered vehicles. As shown in Figure 1, the occupant fatality rates in all fatal crashes for passenger cars, SUVs, and pickup trucks are similar but higher than the rates for vans. In 2004, while the occupant fatality rates per 100,000 registered vehicle passenger cars, SUVs, and pickup trucks were around 15, the rate for vans was 10.75. Among vehicles that rolled over, the occupant fatality rates for SUVs are the highest followed by the rates for pickup trucks, vans, and passenger cars. In 2004, in fatal crashes where a rollover occurred, the occupant fatality rate per 100,000 registered vehicles for SUVs was 9.29, 6.72 for pickup trucks, 3.66 for vans, and 3.25 for passenger cars.

Figure 1: Occupant Fatality Rate per 100,000 Registered Passenger Vehicles by Type of Vehicle in All Vehicles and Vehicles that Rolled Over, 1997-2004



While these rates by the major vehicle classifications have been routinely published by NHTSA, rates among vehicle types by the size of the vehicle have not been presented. While only a rigorous statistical model can best determine the effect of vehicle

type and size on the occurrence of fatalities and serious injuries, this note simply aims to provide occupant fatality rates by vehicle type and size along purely descriptive lines.

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Methodology

Passenger vehicle sizes can be defined by length, width, wheelbase, or the weight of the vehicle. Ideally, a classification based on a uniform criterion is desirable. However, restrictions in terms of availability of defining variables in crash data, as well as registration data, do not make such a classification feasible. However, a measure of classification has already been outlined by the American National Standards Institute (ANSI D-16, 6th ed. Section 2.2.11) which has also been adopted by the National Center for Statistics and Analysis (NCSA) Fatality Analysis Reporting System (FARS). The passenger vehicles have been classified by size as depicted in Table 1.

| Vehicle Type | Size | Criteria |
|----------------|-------------------------|--|
| Passenger Cars | Subcompact | Wheelbase: Under 100 in. |
| | Compact | Wheelbase: 100-104 in. |
| | Midsize | Wheelbase 105-109 in. |
| | Full-size | Wheelbase > 109 inches |
| Vans | Minivans | Unibody Vans |
| | Large Vans ¹ | Frame based Vans |
| SUVs | Midsize | Wheelbase > 88 inches Width: 66-75 inches |
| | Full-size | Wheelbase > 88 inches Width: 75+ inches |
| Pickup Trucks | Compact | Under 4,500 lbs. |
| | Standard | Over 4,500 lbs. |

The registration data used in this report are abstracted from R.L.Polk & Company's National Vehicle Population Profile (NVPP) – a snapshot of the passenger vehicle fleet in the United States as of July 1 of each year. NHTSA has recoded each model of the NVPP data based on the classifications outlined in Table 1.

Results

Results by Vehicle Type and Size

This section presents the fatality rates by the size of the vehicle within a vehicle type. For example, fatality rates for passenger cars have been provided for subcompact, compact, midsize, and full-size cars. In 2004, compact cars, subcompact cars, compact pickup trucks, and midsize SUVs had higher total occupant fatality rates as compared to other vehicle types, while large vans had the lowest rate. Among vehicles that rolled over, midsize SUVs as well as full-size SUVs had higher occupant fatality rates while the large passenger car category had the lowest occupant fatality rate. These results are illustrated in Tables 2 and 3.

| Vehicle Type and Size | Rate |
|-------------------------|-------|
| Compact Cars | 17.76 |
| Compact Pickups | 16.87 |
| Subcompact Cars | 16.85 |
| Midsize SUVs | 16.16 |
| Standard Pickups | 13.87 |
| Full-size SUVs | 12.34 |
| Full-size Cars | 12.16 |
| Midsize Cars | 11.49 |
| Minivans | 11.09 |
| Large Vans ² | 9.34 |

| Vehicle Type and Size | Rate |
|-----------------------|------|
| Midsize SUVs | 9.86 |
| Full-size SUVs | 7.92 |
| Compact Pickups | 7.19 |
| Standard Pickups | 6.38 |
| Compact Cars | 4.24 |
| Large Vans | 4.04 |
| Subcompact Cars | 3.62 |
| Minivans | 3.45 |
| Midsize Cars | 2.71 |
| Full-size Cars | 2.47 |

Figures 2 through 5 depict the occupant fatality rates for passenger vehicles by the type and size of the vehicles in all crashes as well as crashes in which a rollover occurred. In recent years, the occupant fatality rates in all crashes seem to be trending flat or downwards for all vehicle types and sizes. Among vehicles that rolled over, the rates are also flat or trending downward except for full-size SUVs, where there is a recent upward trend. In terms of relative differences between vehicle types, subcompact cars, compact cars and compact pickup trucks have the highest overall occupant fatality rate while large vans and minivans have the lowest occupant fatality rate. Among vehicles that rolled over, midsize and full-size cars had the lowest occupant fatality rate while midsize SUVs had the highest occupant fatality rate.

¹ Includes vans that are used to transport cargo as well as vans used to transport passengers, i.e., 12/15-Passenger Vans, Conversion Vans, etc..

² Because the largest proportion included in this rate are cargo and other commercial vans, this or any other rate for large vans in the Research Note should not be used to make assessments of the fatality rate to the occupants of 15-Passenger Vans. While large vans have the lowest occupant fatality rate, past NHTSA research has shown that for 15-Passenger Vans, the risk of rollover increases with occupancy.

Figure 2: Occupant Fatality Rate per 100,000 Registered Passenger Cars by Size in All Vehicles and Vehicles that Rolled Over, 1997-2004

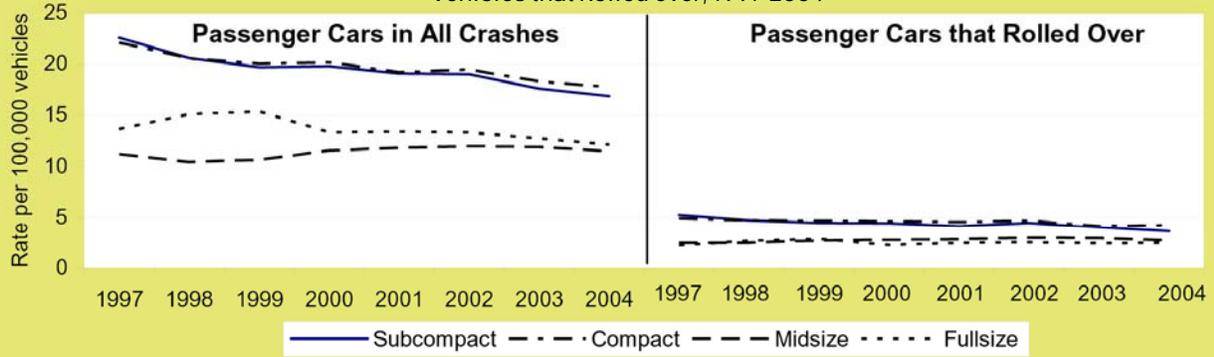


Figure 3: Occupant Fatality Rate per 100,000 Registered Vans by Size in All Vehicles and Vehicles that Rolled Over, 1997-2004

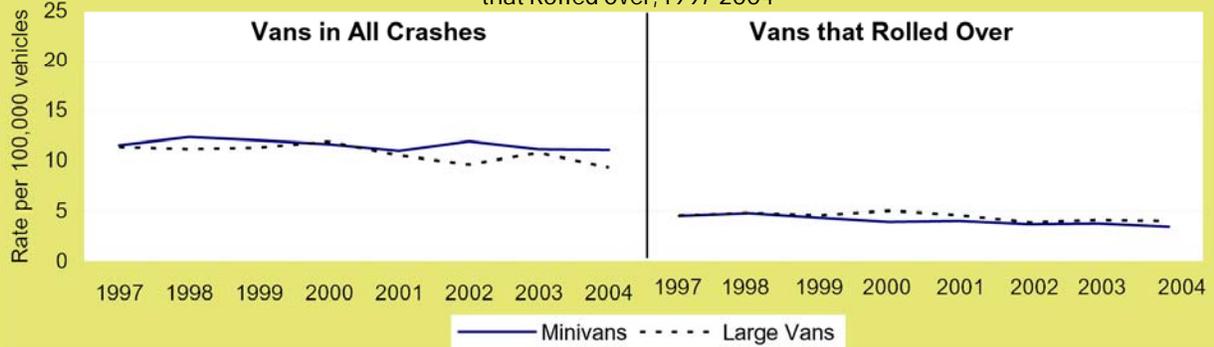


Figure 4: Occupant Fatality Rate per 100,000 Registered SUVs by Size in All Vehicles and Vehicles that Rolled Over, 1997-2004

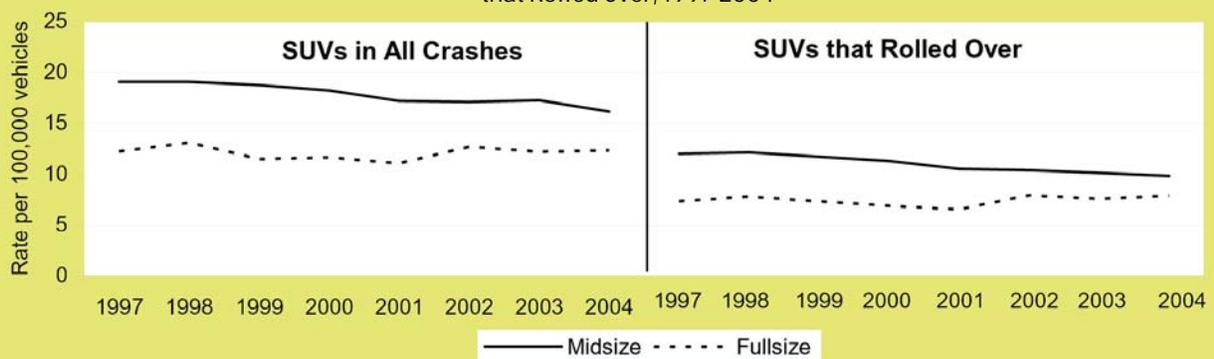


Figure 5: Occupant Fatality Rate per 100,000 Registered Pickup Trucks by Size in All Vehicles and Vehicles that Rolled Over, 1997-2004

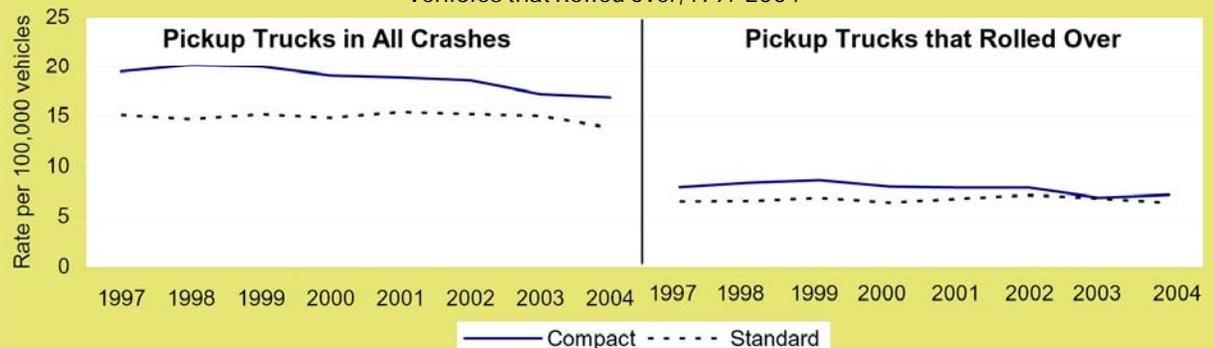


Table 4 depicts the registration data and the number of fatalities from 1997 to 2004 by the type and the size of the vehicle.

| Table 4: Registered Passenger Vehicles by Vehicle Type and Size, 1997-2004 | | | | | | | | |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Type and Size | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
| Passenger Vehicles | 191,960,390 | 195,749,209 | 200,012,521 | 203,913,482 | 207,719,870 | 211,992,662 | 216,729,606 | 223,213,958 |
| Cars | 124,672,920 | 125,965,709 | 126,868,744 | 127,740,420 | 128,874,299 | 130,196,812 | 131,549,941 | 133,275,377 |
| Subcompact | 30,275,524 | 29,180,185 | 27,979,452 | 26,760,764 | 25,619,810 | 24,571,274 | 23,148,380 | 21,851,909 |
| Compact | 36,139,144 | 36,913,085 | 37,094,457 | 37,323,021 | 37,554,060 | 37,781,267 | 38,297,173 | 38,318,494 |
| Midsize | 29,531,161 | 31,369,741 | 33,390,540 | 35,580,282 | 37,470,777 | 39,229,025 | 40,793,931 | 42,654,513 |
| Full-size | 28,727,091 | 28,502,698 | 28,404,295 | 28,056,742 | 28,069,375 | 28,325,231 | 28,832,982 | 29,642,017 |
| Vans | 16,159,473 | 16,718,727 | 17,323,154 | 17,890,186 | 18,226,000 | 18,382,607 | 18,555,362 | 18,931,753 |
| Minivans | 10,312,124 | 10,992,409 | 11,723,593 | 12,431,565 | 12,882,988 | 13,221,220 | 13,491,379 | 13,856,151 |
| Large Vans | 5,844,175 | 5,723,193 | 5,596,603 | 5,455,819 | 5,340,375 | 5,158,902 | 5,061,582 | 5,072,354 |
| SUVs | 14,531,850 | 16,247,573 | 18,401,488 | 20,726,979 | 22,995,533 | 25,521,939 | 28,354,796 | 31,415,143 |
| Midsize | 10,128,214 | 11,369,629 | 13,265,658 | 14,991,841 | 16,726,433 | 18,736,041 | 20,871,314 | 23,246,926 |
| Full-size | 3,601,079 | 4,092,926 | 4,655,935 | 5,298,616 | 5,880,436 | 6,438,417 | 7,168,909 | 7,875,001 |
| Pickup Trucks | 34,314,455 | 34,819,388 | 35,653,344 | 36,118,236 | 36,389,196 | 36,792,345 | 37,288,653 | 38,557,291 |
| Compact | 13,679,034 | 13,675,186 | 13,826,540 | 13,766,295 | 13,550,444 | 13,248,588 | 13,245,677 | 13,426,656 |
| Standard | 20,635,421 | 21,144,202 | 21,826,804 | 22,351,941 | 22,838,752 | 23,543,757 | 24,042,976 | 25,124,684 |
| Fatalities in All Crashes by Vehicle Type and Size, 1997-2004 | | | | | | | | |
| Passenger Vehicles | 32,448 | 31,899 | 32,127 | 32,225 | 32,043 | 32,843 | 32,271 | 31,693 |
| Cars | 22,199 | 21,194 | 20,862 | 20,699 | 20,320 | 20,569 | 19,725 | 19,091 |
| Subcompact | 6,838 | 6,012 | 5,504 | 5,291 | 4,886 | 4,674 | 4,073 | 3,681 |
| Compact | 7,992 | 7,589 | 7,432 | 7,525 | 7,211 | 7,348 | 7,013 | 6,807 |
| Midsize | 3,308 | 3,273 | 3,556 | 4,115 | 4,426 | 4,709 | 4,857 | 4,900 |
| Full-size | 3,924 | 4,303 | 4,365 | 3,744 | 3,765 | 3,775 | 3,682 | 3,603 |
| Vans | 1,914 | 2,042 | 2,088 | 2,129 | 2,019 | 2,109 | 2,080 | 2,036 |
| Minivans | 1,191 | 1,360 | 1,412 | 1,448 | 1,416 | 1,577 | 1,504 | 1,536 |
| Large Vans | 665 | 638 | 634 | 650 | 563 | 497 | 547 | 474 |
| SUVs | 2,380 | 2,713 | 3,026 | 3,358 | 3,530 | 4,031 | 4,483 | 4,735 |
| Midsize | 1,932 | 2,171 | 2,489 | 2,736 | 2,878 | 3,205 | 3,606 | 3,757 |
| Full-size | 442 | 537 | 536 | 619 | 652 | 818 | 875 | 972 |
| Pickup Trucks | 5,887 | 5,921 | 6,127 | 6,003 | 6,139 | 6,100 | 5,957 | 5,801 |
| Compact | 2,665 | 2,753 | 2,761 | 2,627 | 2,561 | 2,463 | 2,281 | 2,265 |
| Standard | 3,123 | 3,114 | 3,319 | 3,320 | 3,524 | 3,588 | 3,622 | 3,486 |
| Fatalities in Vehicles That Rolled Over by Vehicle Type and Size, 1997-2004 | | | | | | | | |
| Passenger Vehicles | 9,527 | 9,773 | 10,140 | 9,959 | 10,157 | 10,729 | 10,442 | 10,553 |
| Cars | 4,765 | 4,672 | 4,718 | 4,548 | 4,559 | 4,794 | 4,464 | 4,334 |
| Subcompact | 1,587 | 1,381 | 1,252 | 1,189 | 1,066 | 1,103 | 922 | 790 |
| Compact | 1,782 | 1,747 | 1,743 | 1,734 | 1,721 | 1,776 | 1,597 | 1,624 |
| Midsize | 730 | 778 | 907 | 982 | 1,067 | 1,173 | 1,206 | 1,157 |
| Full-size | 636 | 763 | 816 | 631 | 697 | 719 | 708 | 731 |
| Vans | 768 | 823 | 784 | 771 | 786 | 699 | 728 | 692 |
| Minivans | 471 | 529 | 510 | 488 | 522 | 489 | 508 | 478 |
| Large Vans | 269 | 277 | 259 | 275 | 247 | 202 | 209 | 205 |
| SUVs | 1,489 | 1,705 | 1,902 | 2,064 | 2,149 | 2,471 | 2,661 | 2,920 |
| Midsize | 1,218 | 1,381 | 1,559 | 1,695 | 1,762 | 1,954 | 2,117 | 2,293 |
| Full-size | 266 | 320 | 342 | 366 | 387 | 512 | 544 | 624 |
| Pickup Trucks | 2,479 | 2,560 | 2,724 | 2,558 | 2,651 | 2,755 | 2,580 | 2,591 |
| Compact | 1,088 | 1,151 | 1,197 | 1,106 | 1,073 | 1,049 | 912 | 965 |
| Standard | 1,351 | 1,391 | 1,506 | 1,429 | 1,554 | 1,683 | 1,644 | 1,603 |
| Source: NCSA FARS 1997-2003 (Final) and 2004 (ARF) Files R.L.Polk & Company National Vehicle Population Profile (NVPP) Data. Note: Totals for vehicle type include counts for vehicles whose size could not be determined using available information. Counts by vehicle size will not add up to vehicle type totals. | | | | | | | | |

Table 5 depicts the occupant fatality rate per 100,000 registered vehicles from 1997 to 2004 by the type and the size of the vehicle in all crashes and crashes in which a rollover occurred.

| Table 5: Occupant Fatality Rate per 100,000 Registered Vehicles by Vehicle Type and Size, 1997-2004 | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|
| Type and Size | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
| Occupant Fatality Rates in All Crashes by Vehicle Type and Size, 1997-2004 | | | | | | | | |
| Passenger Vehicles | 16.90 | 16.30 | 16.06 | 15.80 | 15.43 | 15.49 | 14.89 | 14.20 |
| Cars | 17.81 | 16.83 | 16.44 | 16.20 | 15.77 | 15.8 | 14.99 | 14.32 |
| Subcompact | 22.59 | 20.60 | 19.67 | 19.77 | 19.07 | 19.02 | 17.60 | 16.85 |
| Compact | 22.11 | 20.56 | 20.04 | 20.16 | 19.20 | 19.45 | 18.31 | 17.76 |
| Midsize | 11.20 | 10.43 | 10.65 | 11.57 | 11.81 | 12.00 | 11.91 | 11.49 |
| Full-size | 13.66 | 15.10 | 15.37 | 13.34 | 13.41 | 13.33 | 12.77 | 12.16 |
| Vans | 11.84 | 12.21 | 12.05 | 11.90 | 11.08 | 11.47 | 11.21 | 10.75 |
| Minivans | 11.55 | 12.37 | 12.04 | 11.65 | 10.99 | 11.93 | 11.15 | 11.09 |
| Large Vans | 11.38 | 11.15 | 11.33 | 11.91 | 10.54 | 9.63 | 10.81 | 9.34 |
| SUVs | 16.38 | 16.70 | 16.44 | 16.20 | 15.35 | 15.79 | 15.81 | 15.07 |
| Midsize | 19.08 | 19.09 | 18.76 | 18.25 | 17.21 | 17.11 | 17.28 | 16.16 |
| Full-size | 12.27 | 13.12 | 11.51 | 11.68 | 11.09 | 12.70 | 12.21 | 12.34 |
| Pickup Trucks | 17.16 | 17.00 | 17.18 | 16.62 | 16.87 | 16.58 | 15.98 | 15.05 |
| Compact | 19.48 | 20.13 | 19.97 | 19.08 | 18.90 | 18.59 | 17.22 | 16.87 |
| Standard | 15.13 | 14.73 | 15.21 | 14.85 | 15.43 | 15.24 | 15.06 | 13.87 |
| Occupant Fatality Rates in Vehicles That Rollover by Vehicle Type and Size, 1997-2004 | | | | | | | | |
| Passenger Vehicles | 4.96 | 4.99 | 5.07 | 4.88 | 4.89 | 5.06 | 4.82 | 4.73 |
| Cars | 3.82 | 3.71 | 3.72 | 3.56 | 3.54 | 3.68 | 3.39 | 3.25 |
| Subcompact | 5.24 | 4.73 | 4.47 | 4.44 | 4.16 | 4.49 | 3.98 | 3.62 |
| Compact | 4.93 | 4.73 | 4.70 | 4.65 | 4.58 | 4.70 | 4.17 | 4.24 |
| Midsize | 2.47 | 2.48 | 2.72 | 2.76 | 2.85 | 2.99 | 2.96 | 2.71 |
| Full-size | 2.21 | 2.68 | 2.87 | 2.25 | 2.48 | 2.54 | 2.46 | 2.47 |
| Vans | 4.75 | 4.92 | 4.53 | 4.31 | 4.31 | 3.80 | 3.92 | 3.66 |
| Minivans | 4.57 | 4.81 | 4.35 | 3.93 | 4.05 | 3.70 | 3.77 | 3.45 |
| Large Vans | 4.60 | 4.84 | 4.63 | 5.04 | 4.63 | 3.92 | 4.13 | 4.04 |
| SUVs | 10.25 | 10.49 | 10.34 | 9.96 | 9.35 | 9.68 | 9.38 | 9.29 |
| Midsize | 12.03 | 12.15 | 11.75 | 11.31 | 10.53 | 10.43 | 10.14 | 9.86 |
| Full-size | 7.39 | 7.82 | 7.35 | 6.91 | 6.58 | 7.95 | 7.59 | 7.92 |
| Pickup Trucks | 7.22 | 7.35 | 7.64 | 7.08 | 7.29 | 7.49 | 6.92 | 6.72 |
| Compact | 7.95 | 8.42 | 8.66 | 8.03 | 7.92 | 7.92 | 6.89 | 7.19 |
| Standard | 6.55 | 6.58 | 6.90 | 6.39 | 6.8 | 7.15 | 6.84 | 6.38 |
| Source: NCSA FARS 1997-2003 (Final) and 2004 (ARF) Files R.L.Polk & Company National Vehicle Population Profile (NVPP) Data. Note: Totals for vehicle type include counts for vehicles whose size could not be determined using available information. Counts by vehicle size will not add up to vehicle type totals. | | | | | | | | |

Conclusions

The occupant fatality rates show variation by the size of the vehicle within a vehicle type. In 2004, compact cars had an occupant fatality rate of 17.76 fatalities per 100,000 registered vehicles, followed by compact pickup trucks at 16.87, subcompact cars at 16.85, and midsize SUVs at 16.16. Large vans had the lowest occupant fatality rate at 9.34. Among vehicles that rolled over, midsize SUVs had an occupant fatality rate of 9.86 followed by full-size SUVs at 7.92 while full-size cars had the lowest occupant fatality rate at 2.47 fatalities per 100,000 vehicles.

While this Research Note provides a descriptive assessment of the occupant fatality rate in fatal crashes as well as vehicles that rolled over, only a robust analysis that takes into consideration other vehicle, driver and environmental characteristics will provide a reliable

assessment of the risk of fatality or rollover of the vehicles. This will be the focus of future research work that will model the risk of rollover based on various characteristics like occupancy, travel speed and the size of the vehicle.

Also, vehicle size might play a large role in affecting the risk of fatality in multi-vehicle crashes. This will also be studied and presented in future publications.

References

NHTSA, National Center for Statistics and Analysis, "2004 Annual Assessment of Fatal Motor Vehicle Traffic Crashes," Washington, DC, 2005.