

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

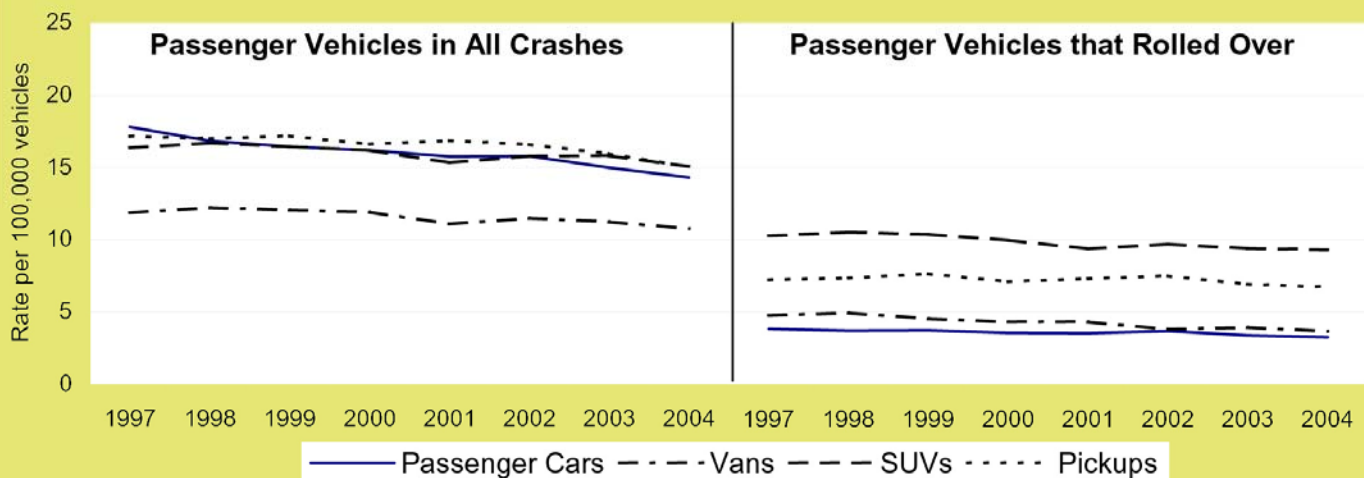
The National Highway Traffic Safety Administration (NHTSA) has routinely published (NHTSA, 2005) passenger vehicle occupant fatality rates, both overall and in vehicles that rolled over, by the type of the vehicle, such as passenger cars, SUVs, pickup trucks or vans. These categories of vehicles are 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 had 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 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.
	Fullsize	Wheelbase > 109 inches
Vans	Minivans	Unibody Vans
	Large Vans ¹	Frame based Vans
SUVs	Midsize	Wheelbase > 88 inches Width: 66-75 inches
	Fullsize	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 fullsize 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 fullsize 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
Fullsize SUVs	12.34
Fullsize Cars	12.16
Midsize Cars	11.49
Minivans	11.09
Large Vans ²	9.34

Vehicle Type and Size	Rate
Midsize SUVs	9.86
Fullsize 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
Fullsize 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 fullsize 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 fullsize 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

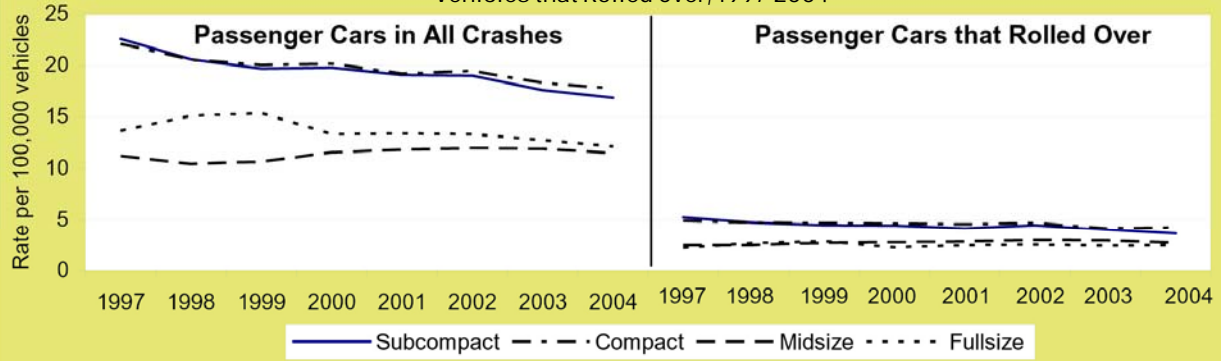


Figure 3: Occupant Fatality Rate per 100,000 Registered Vans by Size in All Vehicles and Vehicles that Rolled Over, 1997-2004

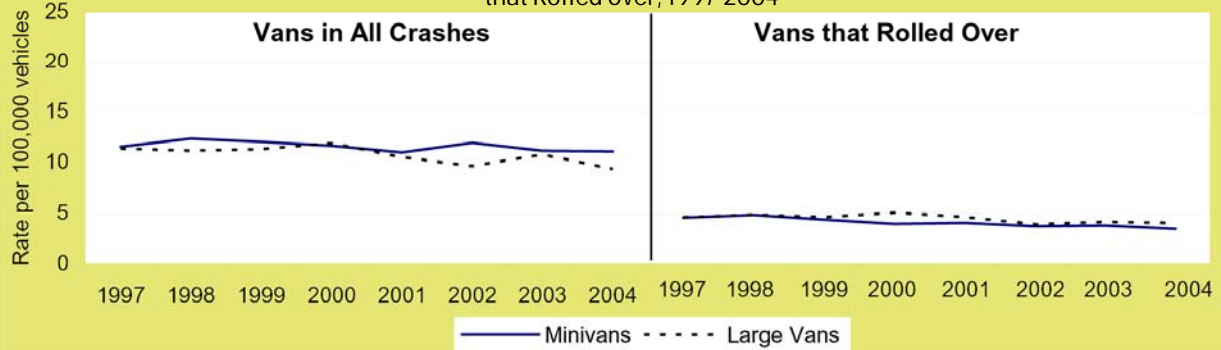


Figure 4: Occupant Fatality Rate per 100,000 Registered SUVs by Size in All Vehicles and Vehicles that Rolled Over, 1997-2004

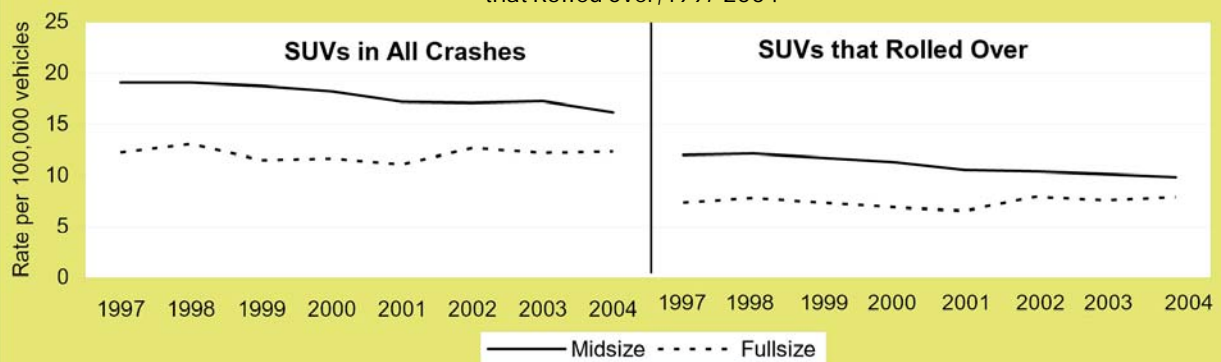


Figure 5: Occupant Fatality Rate per 100,000 Registered Pickup Trucks by Size in All Vehicles and Vehicles that Rolled Over, 1997-2004

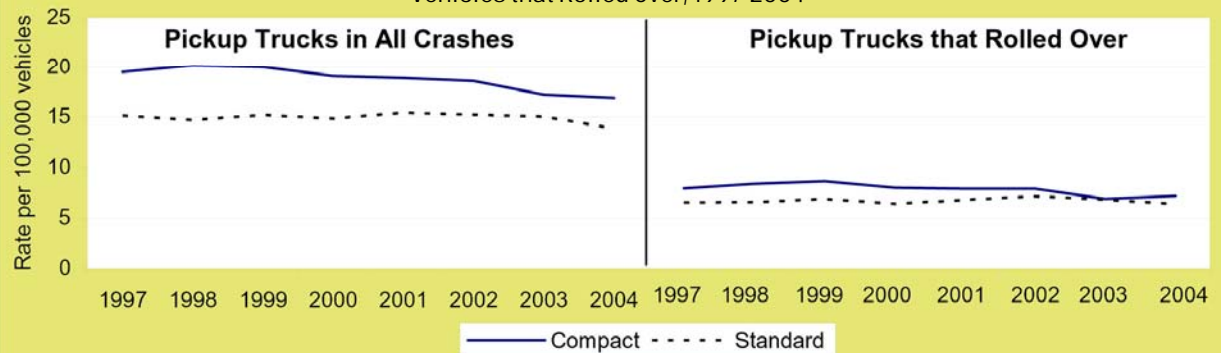


Table 4 depicts the registration data and the number of fatalities from 1997 to 2004 by the type and the size of the vehicle.

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
Fullsize	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
Fullsize	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
Fullsize	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
Fullsize	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
Fullsize	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
Fullsize	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 fullsize 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.