Highway Vehicle Fire Deaths and Injuries, by Age Group

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For more information about the National Fire Protection Association, visit www.nfpa.org or call 617-770-3000. To learn more about the One-Stop Data Shop go to www.nfpa.org/osds or call 617-984-7451.

Copies of this analysis are available from:

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The attached table shows the estimated five-year averages of civilian deaths and injuries caused by highway vehicle fires by age group. The term "highway vehicle" is used to describe any type of vehicle typically driven on a road, such as cars, trucks, buses, motorcycles, etc. These estimates were derived from the detailed information collected by the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA's) annual fire department experience survey.

While most highway vehicle fires are caused by mechanical or electrical problems, in 2003-2007, 58% of the highway vehicle fire deaths and 17% of the injuries resulted from fires caused by collisions or overturns.[1] According to data collection rules, only deaths and injuries caused by the fire should be included. Casualties resulting from trauma sustained before the fire would not be included in these estimates. The 20-34 age group was at highest risk of both injury and death from vehicle fires.

The statistics in this analysis are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. Two queries were done to obtain these estimates. First, age of victim was obtained for all highway vehicle fires, identified by all vehicle fire incident types (NFIRS incident type codes 130-139) and passenger and freight road vehicle mobile property types (NFIRS mobile property types 10-29). A second query was done to obtain all mobile property types associated with vehicle fires. Final estimates include a proportional share of fires in which the mobile property type was unknown or coded as none. Casualties in which the victim age was unknown or not reported were allocated proportionally among casualties of known age.

Casualty projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Civilian deaths and injuries are generally rounded to the one, Additional details on the methodology may be found in Appendix A.

[1] Marty Ahrens. *U.S. Vehicle Fire Trends and Patterns*, Quincy, MA: National Fire Protection Association, 2010, p. 38.

Table 1.
Highway Vehicle Fire Deaths and Injuries, by Age Group
2009-2013 Annual Averages

	2011 Population (in Millions)		Civilian Deaths		Civilian Injuries	
Under 5	20	(6%)	8	(3%)	14	(2%)
5-9	20	(7%)	1	(1%)	5	(1%)
10-14	21	(7%)	1	(1%)	10	(1%)
15-19	22	(7%)	17	(8%)	47	(6%)
20-34	64	(21%)	76	(34%)	266	(33%)
35-49	63	(20%)	56	(25%)	244	(30%)
50-64	61	(19%)	40	(18%)	165	(20%)
65-74	22	(7%)	13	(6%)	42	(5%)
75-84	13	(4%)	6	(3%)	19	(2%)
85+	6	(2%)	4	(2%)	4	(1%)
Total	312	(100%)	222	(100%)	817	(100%)
Selected age groups						
14 and under	61	(20%)	10	(4%)	30	(4%)
65 and over	41	(13%)	22	(10%)	65	(8%)

Note: Sums may not equal totals due to rounding errors.
Source: NFIRS and NFPA fire department experience survey.

Appendix A.
How National Estimates Statistics Are Calculated

The statistics in this analysis are estimates derived from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA's) annual survey of U.S. fire departments. NFIRS is a voluntary system by which participating fire departments report detailed factors about the fires to which they respond. Roughly two-thirds of U.S. fire departments participate, although not all of these departments provide data every year. Fires reported to federal or state fire departments or industrial fire brigades are not included in these estimates.

NFIRS provides the most detailed incident information of any national database not limited to large fires. NFIRS is the only database capable of addressing national patterns for fires of all sizes by specific property use and specific fire cause. NFIRS also captures information on the extent of flame spread, and automatic detection and suppression equipment. For more information about NFIRS visit http://www.nfirs.fema.gov/. Copies of the paper forms may be downloaded from http://www.nfirs.fema.gov/documentation/design/NFIRS_Paper_Forms_2008.pdf.

NFIRS has a wide variety of data elements and code choices. The NFIRS database contains coded information. Many code choices describe several conditions. These cannot be broken down further. For example, area of origin code 83 captures fires starting in vehicle engine areas, running gear areas or wheel areas. It is impossible to tell the portion of each from the coded data.

Methodology may change slightly from year to year.
NFPA is continually examining its methodology to provide the best possible answers to specific questions, methodological and definitional changes can occur. *Earlier editions of the same report may have used different methodologies to produce the same analysis, meaning that the estimates are not directly comparable from year to year.*

NFPA's fire department experience survey provides estimates of the big picture.
Each year, NFPA conducts an annual survey of fire departments which enables us to capture a summary of fire department experience on a larger scale. Surveys are sent to all municipal departments protecting populations of 50,000 or more and a random sample, stratified by community size, of the smaller departments. Typically, a total of roughly 3,000 surveys are returned, representing about one of every ten U.S. municipal fire departments and about one third of the U.S. population.

The survey is stratified by size of population protected to reduce the uncertainty of the final estimate. Small rural communities have fewer people protected per department and are less likely to respond to the survey. A larger number must be surveyed to obtain an adequate sample of those departments. (NFPA also makes follow-up calls to a sample of the smaller fire departments that do not respond, to confirm that those that did respond are truly representative of fire departments their size.) On the other hand, large city departments are so few in number and protect such a large proportion of the total U.S. population that it makes sense to survey all of them. Most respond, resulting in excellent precision for their part of the final estimate.

The survey includes the following information: (1) the total number of fire incidents, civilian deaths, and civilian injuries, and the total estimated property damage (in dollars), for each of the major property use classes defined in NFIRS; (2) the number of on-duty firefighter injuries, by type of duty and nature of illness; 3) the number and nature of non-fire incidents; and (4)

information on the type of community protected (e.g., county versus township versus city) and the size of the population protected, which is used in the statistical formula for projecting national totals from sample results. The results of the survey are published in the annual report *Fire Loss in the United States*. To download a free copy of the report, visit http://www.nfpa.org/assets/files/PDF/OS.fireloss.pdf.

Projecting NFIRS to National Estimates

As noted, NFIRS is a voluntary system. Different states and jurisdictions have different reporting requirements and practices. Participation rates in NFIRS are not necessarily uniform across regions and community sizes, both factors correlated with frequency and severity of fires. This means NFIRS may be susceptible to systematic biases. No one at present can quantify the size of these deviations from the ideal, representative sample, so no one can say with confidence that they are or are not serious problems. But there is enough reason for concern so that a second database -- the NFPA survey -- is needed to project NFIRS to national estimates and to project different parts of NFIRS separately. This multiple calibration approach makes use of the annual NFPA survey where its statistical design advantages are strongest.

Scaling ratios are obtained by comparing NFPA's projected totals of residential structure fires, non-residential structure fires, vehicle fires, and outside and other fires, and associated civilian deaths, civilian injuries, and direct property damage with comparable totals in NFIRS. Estimates of specific fire problems and circumstances are obtained by multiplying the NFIRS data by the scaling ratios. Reports for incidents in which mutual aid was given are excluded from NFPA's analyses.

Analysts at the NFPA, the USFA and the Consumer Product Safety Commission developed the specific basic analytical rules used for this procedure. "The National Estimates Approach to U.S. Fire Statistics," by John R. Hall, Jr. and Beatrice Harwood, provides a more detailed explanation of national estimates. A copy of the article is available online at http://www.nfpa.org/osds or through NFPA's One-Stop Data Shop.

Version 5.0 of NFIRS, first introduced in 1999, used a different coding structure for many data elements, added some property use codes, and dropped others. The essentials of the approach described by Hall and Harwood are still used, but some modifications have been necessary to accommodate the changes in NFIRS 5.0.

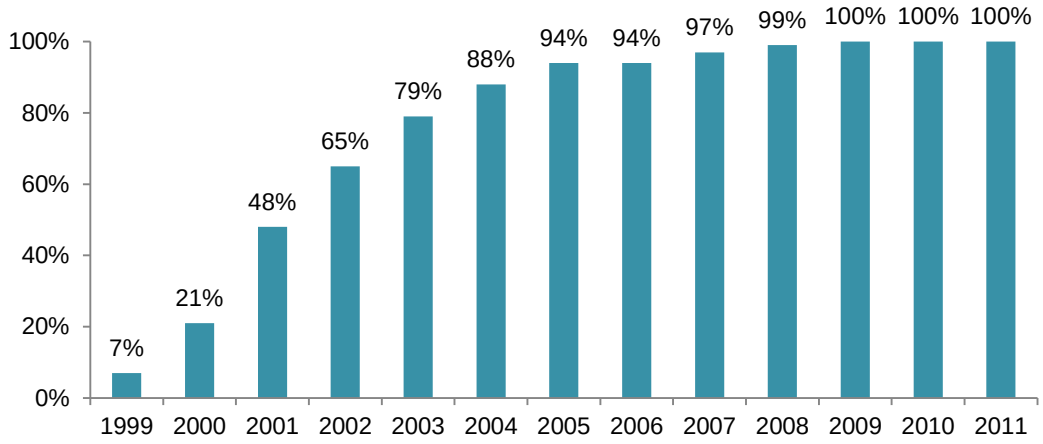
Figure A.1 shows the percentage of fires originally collected in the NFIRS 5.0 system. Each year's release version of NFIRS data also includes data collected in older versions of NFIRS that were converted to NFIRS 5.0 codes.

From 1999 data on, analyses are based on scaling ratios using only data originally collected in NFIRS 5.0:

$$\frac{\text{NFPA survey projections}}{\text{NFIRS totals (Version 5.0)}}$$

For 1999 to 2001, the same rules may be applied, but estimates for these years in this form will be less reliable due to the smaller amount of data originally collected in NFIRS 5.0; they should be viewed with extreme caution.

Figure A.1. Fires Originally Collected in NFIRS 5.0 by Year



NFIRS 5.0 introduced six categories of confined structure fires, including:

- cooking fires confined to the cooking vessel,
- confined chimney or flue fires,
- confined incinerator fire,
- confined fuel burner or boiler fire or delayed ignition,
- confined commercial compactor fire, and
- trash or rubbish fires in a structure with no flame damage to the structure or its contents.

Because this analysis focused on fatalities only, no distinction was made between confined and non-confined fires.

For most fields other than Property Use and Incident Type, NFPA allocates unknown data proportionally among known data. This approach assumes that if the missing data were known, it would be distributed in the same manner as the known data. NFPA makes additional adjustments to several fields. *Casualty and loss projections can be heavily influenced by the inclusion or exclusion of unusually serious fire.*

In the formulas that follow, the term "all fires" refers to all fires in NFIRS on the dimension studied. The percentages of fires with known or unknown data are provided for non-confined fires and associated losses, and for confined fires only.

Rounding and percentages. The data shown are estimates and generally rounded. An entry of zero may be a true zero or it may mean that the value rounds to zero. Percentages are calculated from unrounded values. It is quite possible to have a percentage entry of up to 100% even if the rounded number entry is zero. The same rounded value may account for a slightly different percentage share. Because percentages are expressed in integers and not carried out to several decimal places, percentages that appear identical may be associated with slightly different values.