RESEARCH

FIRE DEPARTMENT ROADWAY AND VEHICLE INCIDENTS

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Abstract

During 2014, local fire departments responded to an estimated 4,461,000 incidents on roadway properties, including parking lots and driveways. Fourteen percent of total fire department responses were to these properties. Using data from the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS) and NFPA's fire department experience survey, this analysis provides more details on the type of incidents on these properties.

More than one-quarter (27%) were on highways or divided highways; 24% were on residential streets, roads or driveways. Two thirds (67%) of roadway incidents were emergency medical services (EMS) calls or rescues, including the 57% of total calls that were some kind of EMS incident. Eleven percent of the calls were good intent calls, 8% were non-fire hazardous conditions, and service calls and fires each accounted for 6%,

Vehicle related incidents involving fire vehicles or firefighters are also discussed.

Keywords: Fire department statistics; roadways; fire department vehicle collisions,

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FACT SHEET » RESEARCH

Fire Department Roadway and Vehicle Incidents

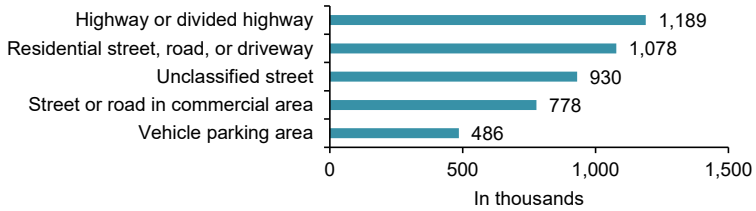
In 2014, local fire departments in the United States responded to an estimated 4,461,000 incidents on roadway properties, including parking lots and driveways.

- 14% of the 31,644,500 fire department responses[1] in 2014 were to roadway properties.

More than one-quarter (27%), or 1,189,000 incidents, occurred on highways or divided highways, roadways where traffic is fastest.

- 24% occurred on residential streets, roads, or driveways.

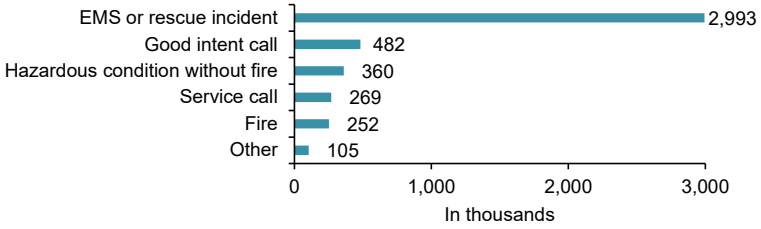
Fire Department Responses to Roadway Incidents in 2014 by Type of Roadway



Two-thirds (67%) of roadway incidents prompted emergency medical services (EMS) calls or rescues.

- 11% of the calls were good intent calls, 8% were non-fire-hazard conditions; service calls and fires each accounted for 6%.

Fire Department Responses to Roadway Incidents in 2014 by Incident Type



Fire department emergency vehicles were involved in an estimated 16,600 collisions while responding to or returning from incidents in 2015.

- There were also 700 firefighter personal vehicle collisions[2].

Vehicle-related incidents killed 19 firefighters in 2016[3].

- Crashes killed 17, and 2 were struck by vehicles.
- Additionally, one firefighter fell and was then struck by a fire truck.

For more information, see NFPA's 2017 report, "Fire Department Roadway and Vehicle Incidents".

[1] "Fire Loss in the United States During 2014"
[2] "U.S. Firefighter Injuries – 2015"
[3] "Firefighter Fatalities in the United States – 2016"

Source: NFPA Research: www.nfpa.org/research
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Fire Department Roadway and Vehicle Incidents

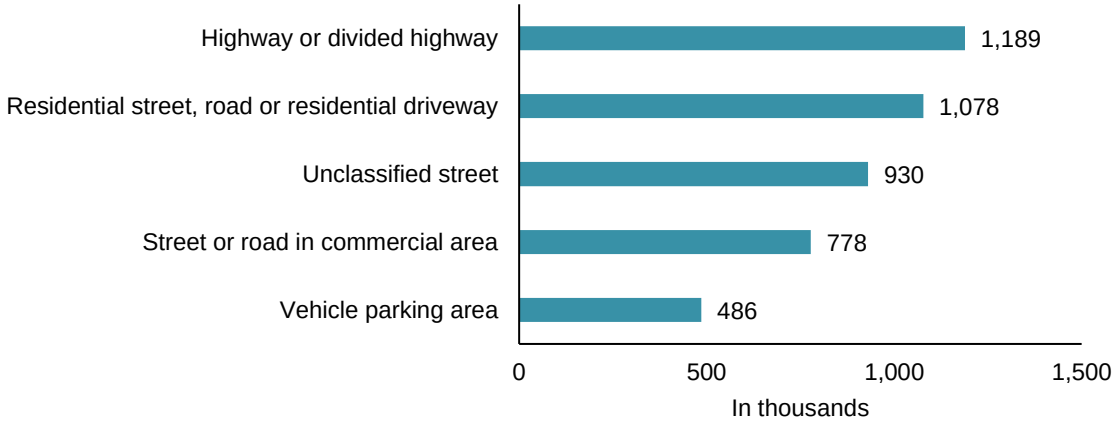
In 2014, local fire departments in the U.S. responded to an estimated 4,461,000 incidents on roadway properties, including parking lots and driveways. That translates to more than 12,200 per day. Fourteen percent of the 31,644,500 fire department responses[1] in 2014 were to roadway properties.

These estimates are derived from the U.S. Fire Administration's National Fire incident Reporting System (NFIRS) and NFPA's 2014 fire experience survey. The incident type codes and definitions in this analysis are based on NFIRS.

More than one-quarter (27%), or 1,189,000 incidents, occurred on highways or divided highways, roadways in which the traffic is fastest. Figure 1 shows that:

- 1,078,000 incidents (24%) occurred on residential streets, roads or driveways;
- 930,000, or 21%, were on unclassified streets;
- 778,000, or 17%, were on streets or roads in commercial areas; and
- 486,000 or 11%, occurred on vehicle parking areas.

Figure 1. Fire department responses to roadway incidents in 2014 by type of roadway



Two- thirds (67%) of fire department responses to roadway incidents were EMS or rescue incidents. Figure 2 shows that:

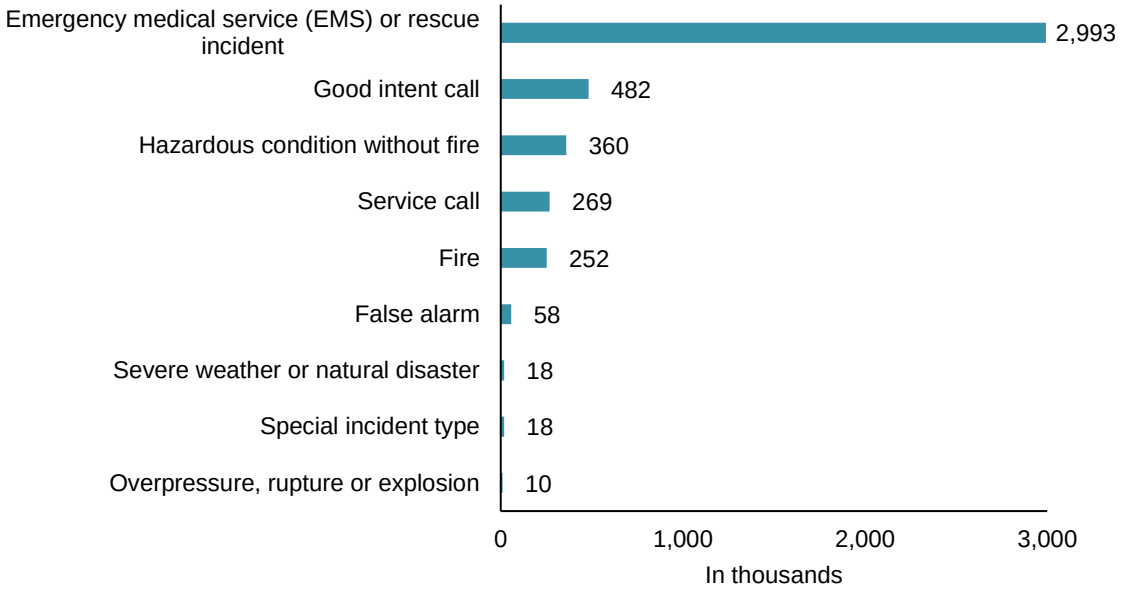
- 2,993,000 of the roadway incidents were emergency medical service calls or rescue incidents;
- Good intent calls accounted for 482,000, or 11%, of the incidents;
- The 360,000 hazardous conditions without fire accounted for 8% of the total;
- 269,000 (6%) were service calls; and
- 252,000 (6%) were fires.

Specific incident types for these categories will be discussed in greater detail. Fire departments also responded to 58,000 false alarm incidents (1%), 18,000 severe weather or natural disaster incidents, 18,000 special incident types, and 10,000 overpressures, ruptures or explosions.

Table 1 shows estimates and percentages for all categories and subcategories of these incidents. (For those familiar with NFIRS, incident types are taken to the digit level.)

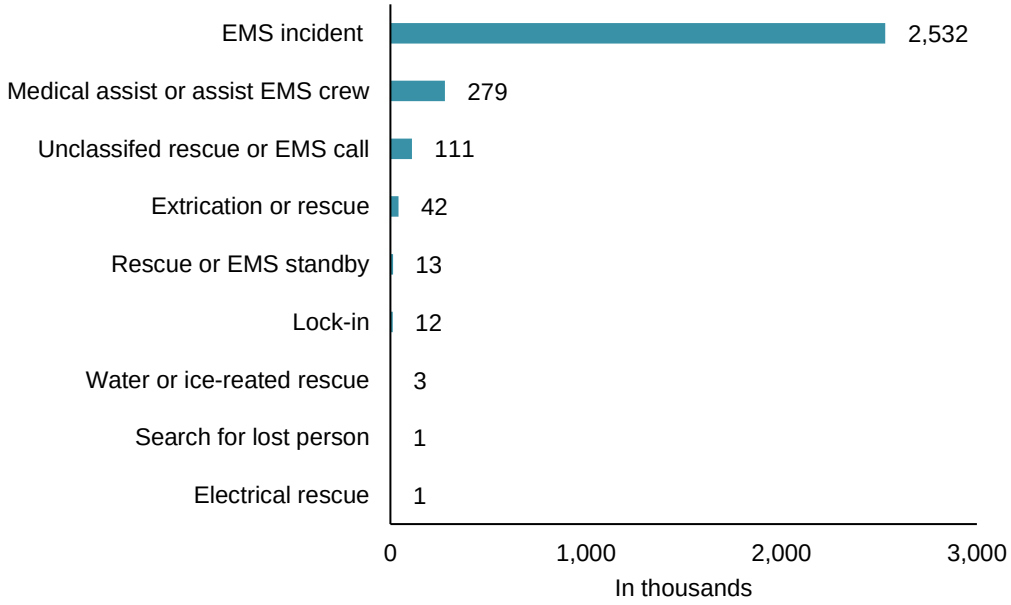
[1] H.J.G. Haynes, *Fire Loss in the United States during 2014*, (Quincy, MA: National Fire Protection Association, 2015), 30.

Figure 2. Fire department responses to roadway incidents in 2014 by incident type



EMS incidents accounted for 2,532,000, or 85% of the 2,993,000 total category of fire department EMS or rescue roadway incidents in 2014. These are discussed in greater detail below. Medical assistance or assisting an EMS crew accounted for 279,000 or 9%, of the EMS or rescue incidents; 111,000 or 4% were unclassified rescue or EMS calls; and 42,000 or 1% were extrication or rescues. See Figure 3 for estimates of less frequent types of incidents in the broad EMS or rescue category.

Figure 3. Fire department EMS or rescue responses to roadway incidents in 2014, by incident type



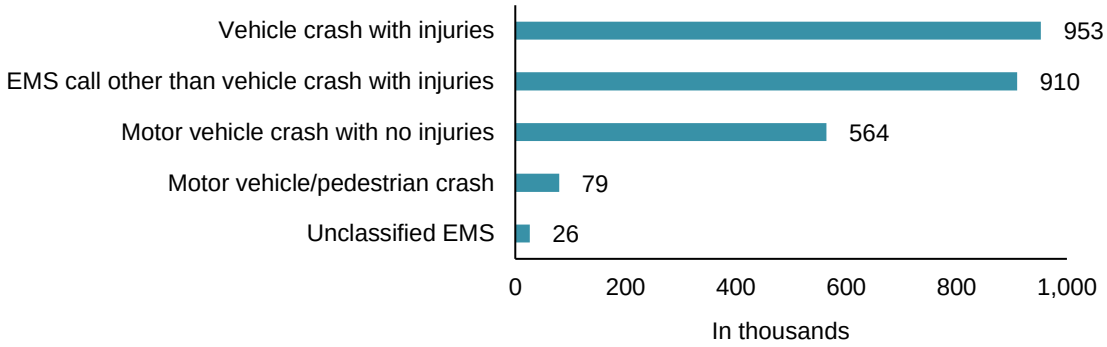
Vehicle crashes with injuries were the most common specific type of roadway incident in 2014. The 953,000 such incidents accounted for:

- 38% of the 2, 532,000 EMS roadway incidents;
- 32% of the 2,993,000 total EMS or rescue category roadway incidents and
- 21% of the total 4,461,000 roadway incidents in 2014.

The 910,000 EMS calls other than vehicle crashes with injuries accounted for 36% of the EMS incidents and 20% of total roadway incidents.

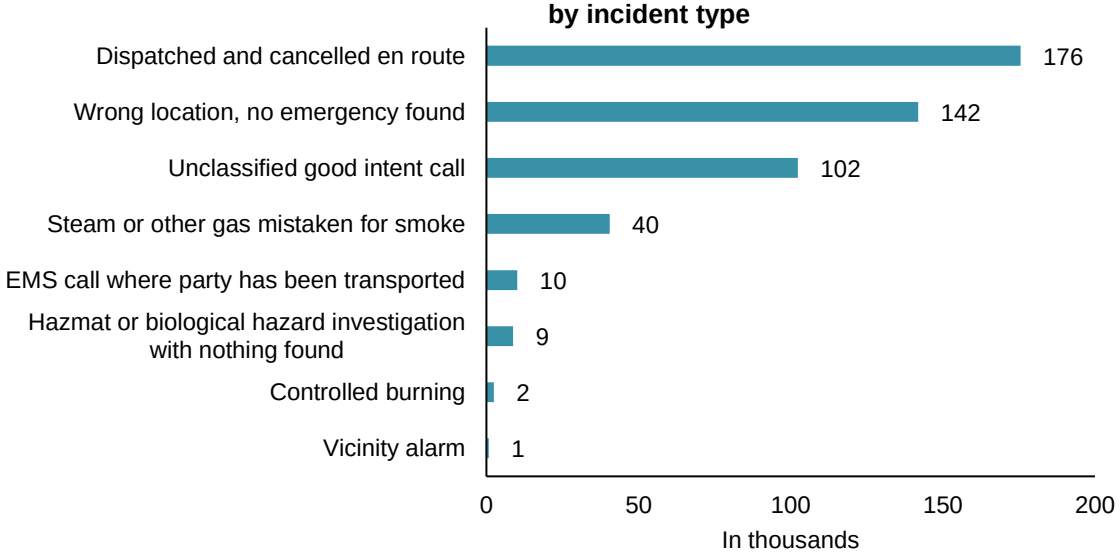
The 564,000 motor vehicle crashes with no injuries accounted for 564,000, or 22% of EMS incidents and 13% of all roadway incidents. The 79,000 motor vehicle/pedestrian crashes accounted for 3% of EMS incidents and 2% of total roadway incidents. See Figure 4 and Table 2 for more details.

Figure 4. Fire department EMS incidents on roadways in 2014 by incident type



The 176,000 dispatched and cancelled en route incidents accounted for 36% of the 482,000 good intent calls and 4% of all incidents. Figure 5 shows that 142,000 calls were either to the wrong location or calls in which no emergency was found. These accounted for 29% of the good intent calls and 3% of total incidents. The 102,000 unclassified good intent calls accounted for 21% of this category and 2% of all incidents. In 40,000 incidents (8% of good intent calls and 1% of the total), steam or another gas was mistaken for smoke.

Figure 5. Good intent calls to roadway incidents in 2014 by incident type

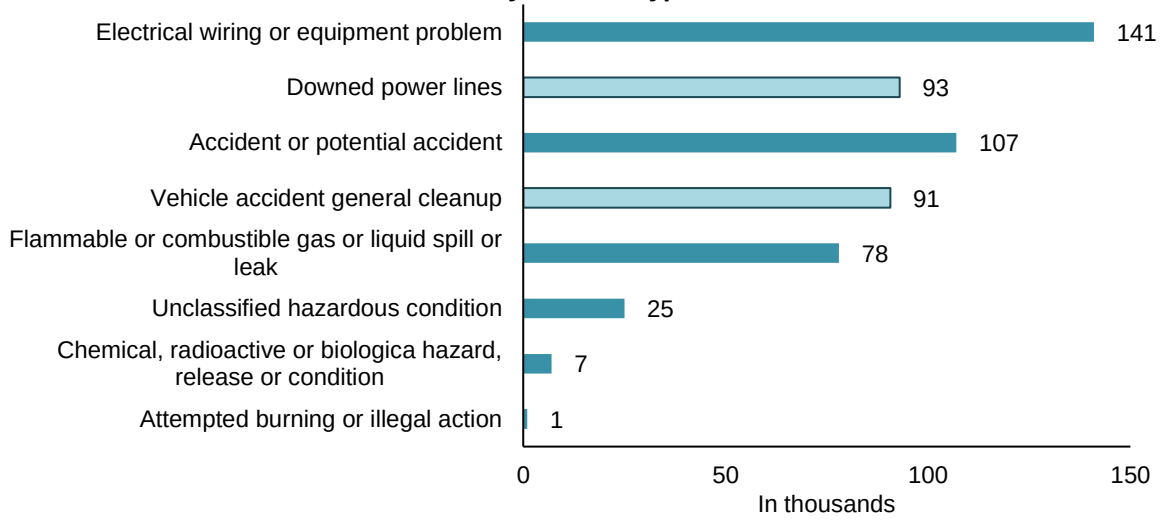


Electrical wiring or equipment problems accounted for 141,000 (39%) of the 360,000 non-fire hazardous conditions on roadways, and 3% of all roadway incidents. Power lines were down in almost two-thirds (93,000) of these electrical wiring or equipment problems. For more information on on-fire electrical incidents, see NFPA's 2017 report, *Non-Fire Electrical Incidents*.

The 107,000 accidents or potential accidents accounted for 30% of the non-fire hazardous condition roadway incidents and 2% of all roadway incidents. Ninety-one thousand (91,000), or 84%, of accident or potential accidents involved general cleanup after vehicle accidents.

The 78,000 flammable or combustible gas or liquid spill or leak incidents accounted for 22% of the incidents in this category and 2% of total roadway incidents. See Figure 6 for estimates of less frequent non-fire hazardous conditions. Lighter colors show subsets of broader categories of incident types.

Figure 6. Non-fire hazarodus condition roadway incidents in 2014 by incident type



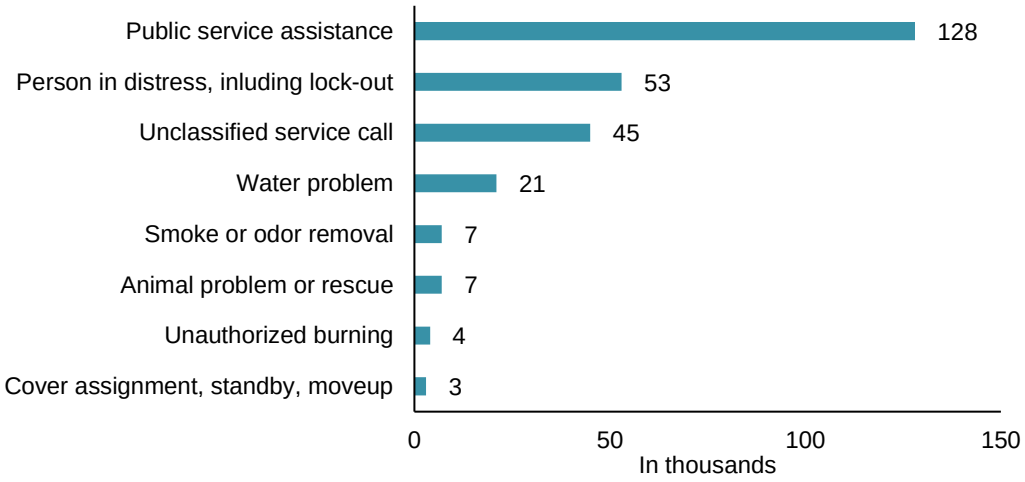
Note: Lighter colors show subsets of broader categories of incident types.

The 128,000 public service incidents accounted for almost half (48%) of the 269,000 service calls on roadways and 3% of all roadway incidents. Public service assistance includes assistance to the police, other government agencies, invalids and the general public.

The 53,000 service calls to persons in distress accounted for 20% of roadway service calls and 1% of all roadway incidents. Forty-three thousand (43,000) of the persons in distress were lock-outs, including people who had locked their keys in their cars. Lock-outs accounted for 81% of the persons in distress calls, 16% of service calls, and 1% of all roadway incidents.

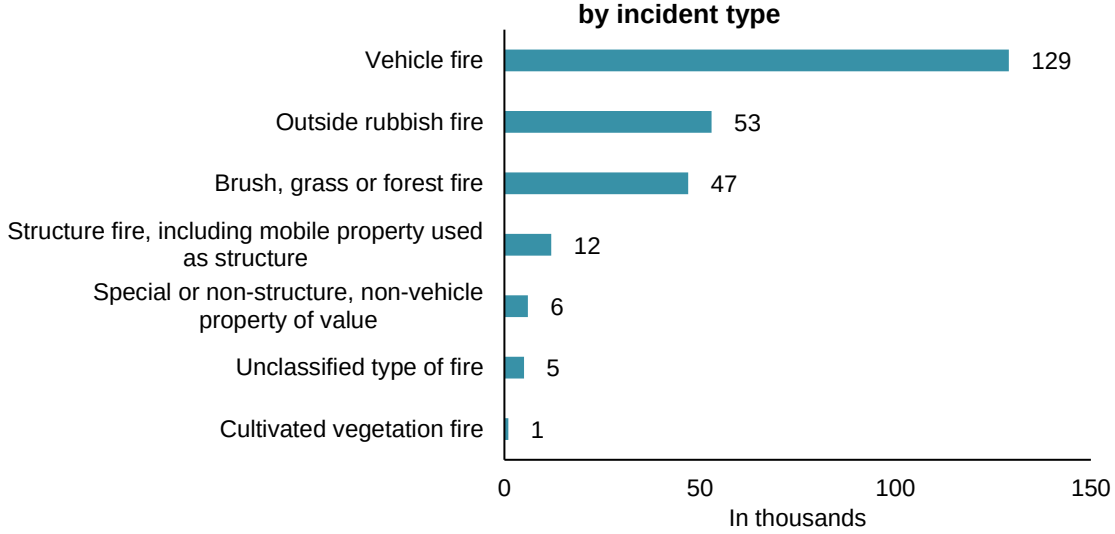
The 45,000 unclassified service calls accounted for 17% of roadway service calls and 1% of all roadway incidents. See Figure 7 for estimates of less common types of service calls.

Figure 7. Service calls to roadway incidents in 2014 by incident type



Half (51%) of the 252,000 fires on roadways involved vehicles. Vehicle fires accounted for 3% of total roadway incidents. The 53,000 outside rubbish fires accounted for 21% of roadway fires and 1% of roadway incidents. The 47,000 brush, grass or forest fires accounted for 19% of roadway fires and 1% of all roadway incidents.

Figure 8. Fires in roadways in 2014 by incident type



FIREFIGHTER FATALITIES

According to NFPA's report, *Firefighter Fatalities in the United States – 2016*, vehicle-related incidents killed 19 firefighters.[2] Narratives from the report are included here. Two firefighters died as a result of being struck by vehicles. A third firefighter fell and was then struck by a vehicle. The two originally classified as "struck by' are shown below.

- "One was guiding the driver of a tanker as he backed into the station when the driver lost sight of the firefighter and ran him over.
- The other firefighter was working at the scene of a motor vehicle crash on an interstate highway when a bus crashed into the scene. The responding firefighters had used one of the apparatus to block the right lane, but the bus driver clipped the truck and hit other vehicles at the scene, and then struck three firefighters, knocking them over the guardrail and into water below, killing one and injuring the other two."

More detail was provided on the incident that began with a fall.

- "On March 20 at 3:30 p.m., a neighbor called 911 two minutes after detecting a fire in a single-family-dwelling. The one-story building of wood-frame construction had a ground floor area of 600 square feet (56 square meters). A large amount of fire was showing on the arrival of the first fire company. The cause of the fire was deemed unintentional but was classified as undetermined.

  A 42-year-old firefighter with six years of service, dressed in a personal protective ensemble (PPE) with the exception of an SCBA, either attempted to jump onto the back step of the engine or fell from the engine as the apparatus was backing up to a hydrant, and got tangled in the hose. The driver of the engine, not seeing the firefighter fall, continued to back up, driving over him and causing fatal crushing injuries. He was pronounced dead at the scene."

Seventeen firefighters were fatally injured in crashes. Details on a few of these incidents are shown below.

- "On July 7, a single-vehicle crash occurred when a firefighter in charge of apparatus maintenance was test driving a mobile water supply apparatus (tanker) before a weekly drill/meeting. The victim was 50 years old and had three years of service.

  It was a clear, dry day. Three witnesses who observed the crash reported that there were no other vehicles on the highway. Speed did not appear to be a factor. The firefighter was negotiating a curve in the road, went off the right side of the road and traveled 142 feet (44 meters) before getting back on the road. He over corrected his steering and the tanker flipped over three times, coming to a stop off the highway on the other side. The tanker came to rest on the driver's side. The firefighter, who was wearing a shoulder/lap seat belt, remained in his seat but suffered massive head trauma and was pronounced dead at the scene.

  The firefighter was texting at the time of the crash. A check of his cell phone showed an outgoing and an incoming text at the same time that the 911 call came in."

[2] R.F. Fahy, P.R. LeBlanc, and J.L. Molis, *Firefighter Fatalities in the United States – 2016*, (Quincy, MA: National Fire Protection Association, 2017), 10-14 and 27-29.

* "On July 22 at 8:48 a.m., a passer-by observed a wildland fire burning in a state park and called 911 to report the fire. The fire had consumed 23,500 acres (9,500 hectares) up to July 26 at 7:00 p.m. when a bulldozer operator came on duty.

  The dozer operator had consulted with the operator he relieved and the crew strike team leader on a way to create a dozer line around a blockage at the fork in the road where an engine company had established a hose lay for suppression.

  At 11:00 p.m., after deciding where to make the dozer line, the operator drove the dozer toward the area. He first built a berm to protect the hose lay. Unable to go around the engine company, he backed the dozer toward the edge of the road. The operator, not seat belted in, continued to back the dozer until it reached its tipping point. The dozer rolled over and down an 82% slope, ejecting and pinning the operator. A paramedic who was nearby went to the operator and pronounced him dead.

* "On December 19 at 5 p.m., a 43-year-old firefighter with one year of service was responding to an EMS call in his pickup truck when he lost control of the vehicle, went left of the road's dividing line, overcorrected, then struck a guard rail, causing the truck to flip over and eject him. He was not wearing his seat belt at the time of the crash. He was transported to a hospital where he was pronounced dead."

FIREFIGHTER INJURIES

According to NFPA's report, *U.S Firefighter Injuries- 2015*, fire department emergency vehicles were involved in an estimated 16,600 collisions while responding or returning from incidents. This was a new high since 1990 when NFPA began collecting this data. The 1,150 firefighter injuries caused by these collisions was the fourth highest over the 16 years.[3]

Figure 9. Fire department emergency vehicle collisions by year: 1990-2015

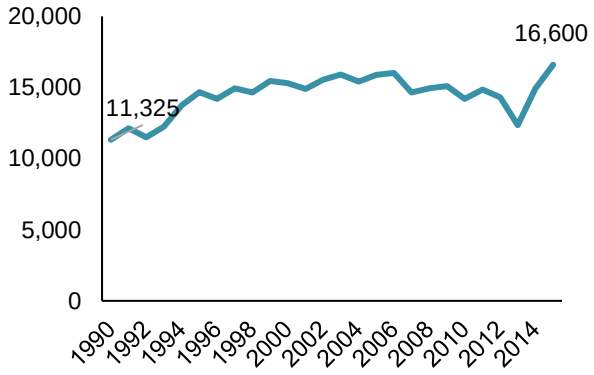
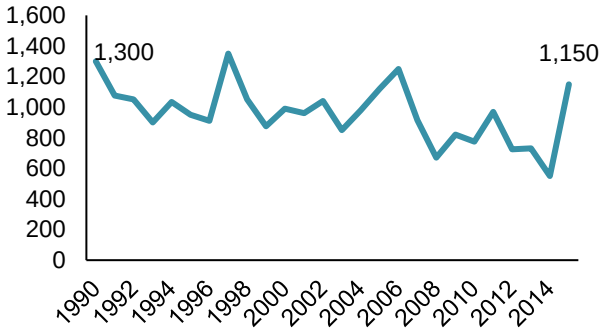


Figure 10. Firefighter injuries in fire department emergency vehicle collisions by year: 1990-2015



The personal vehicles of 700 responding or returning firefighters were also involved in collisions in 2015. These collisions injured 50 firefighters, the lowest estimate since data collection began.

[3] H.J.G. Haynes and J.L. Molis, ***U.S Firefighter Injuries- 2015*,** (Quincy, MA: National Fire Protection Association, 2016), 14-15.

Figure 11. Firefighter personal vehicle collisions by year: 1990-2015

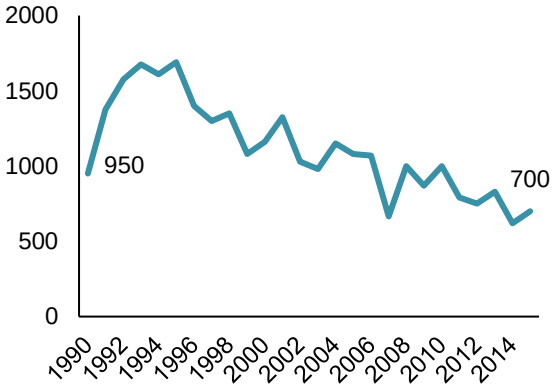
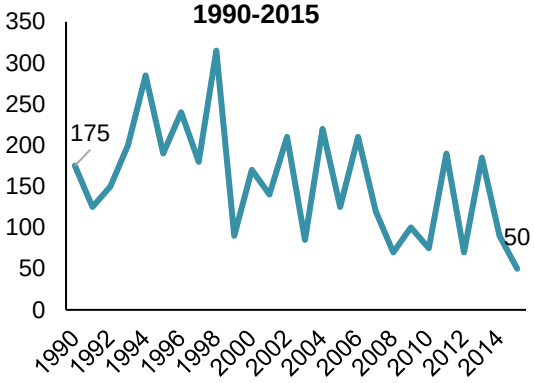


Figure 12. Firefighter injuries in personal vehicle collisions by year: 1990-2015



NHTSA DATA ON FIRE TRUCK CRASHES

Crashes involving fire trucks killed 11 occupants of other vehicles and one pedestrian in 2015. Table 61 in the National Highway Traffic Safety Administration's (NHTSA's) *Traffic Safety Facts 2015* states that all of these deaths occurred when the fire truck was in emergency use.[4]

Twenty eight people were killed in crashes involving ambulances, including 15 occupants of other vehicles, 10 ambulance passengers, one ambulance driver, one pedestrian, and one pedal cyclist. Sixteen of the 28 (57%) of the ambulances were in emergency use at the time of the crash.

Seventy-four people were killed by crashes involving police vehicles. Twenty-seven of the 74 (36%) victims were killed in crashes involving vehicles in emergency use.

[4] U.S. Department of Transportation, *Traffic Safety Facts 2015* (Washington, DC, National Highway Traffic Safety Administration, 2017), 112.

Table 1
Fire Department Responses to Roadway Incidents in 2014, by Incident Type

Incident Type	Incidents	
Emergency medical service (EMS) or rescue incident	**2,993,000**	**(67%)**
EMS incident*	2,532,000	(57%)
Medical assist or assist EMS crew	279,000	(6%)
Unclassified rescue or EMS call	111,000	(2%)
Extrication or rescue	42,000	(1%)
Rescue or EMS standby	13,000	(0%)
Lock in	12,000	(0%)
Water or ice-related rescue	3,000	(0%)
Search for lost person	1,000	(0%)
Electrical rescue	1,000	(0%)
Good intent call	**482,000**	**(11%)**
Dispatched and cancelled en route	176,000	(4%)
Wrong location, no emergency found	142,000	(3%)
Unclassified good intent call	102,000	(2%)
Steam or other gas mistaken for smoke	40,000	(1%)
EMS call where party has been transported	10,000	(0%)
HazMat or biological hazard investigation with nothing found	9,000	(0%)
Controlled burning	2,000	(0%)
Vicinity alarm	1,000	(0%)
Hazardous condition without fire	**360,000**	**(8%)**
Electrical wiring or equipment problem	141,000	(3%)
Accident or potential accident	107,000	(2%)
Flammable or combustible gas or liquid spill or leak	78,000	(2%)
Unclassified hazardous condition	25,000	(1%)
Chemical, radioactive or biological hazard, release or condition	7,000	(0%)
Attempted burning or illegal action	1,000	(0%)
Service call	**269,000**	**(6%)**
Public service assistance	128,000	(3%)
Person in distress, including lock-out	53,000	(1%)
Unclassified service call	45,000	(1%)
Water problem	21,000	(0%)
Smoke or odor removal	7,000	(0%)
Animal problem or rescue	7,000	(0%)
Unauthorized burning	4,000	(0%)
Cover assignment, standby or move up	3,000	(0%)

Table 1 (Continued)
Fire Department Responses to Roadway Incidents in 2014, by Incident Type

Incident Type	Incidents	
Fire	**252,000**	**(6%)**
Vehicle fire	129,000	(3%)
Outside rubbish fire	53,000	(1%)
Brush, grass or forest fire	47,000	(1%)
Structure fire, including mobile property used as structure	12,000	(0%)
Special outside fire	6,000	(0%)
Cultivated vegetation fire	1,000	(0%)
Unclassified type of fire	5,000	(0%)
False alarm	**58,000**	(1%)
Unclassified false alarm	41,000	(1%)
Malicious false alarm, report or bomb scare	11,000	(0%)
System malfunction or unintentional activation	6,000	(0%)
Special incident type	**18,000**	(0%)
Unclassified special type of incident	12,000	(0%)
Citizen complaint	6,000	(0%)
Severe weather or natural disaster	**18,000**	(0%)
Overpressure, rupture or explosion	**10,000**	(0%)
Unclassified overpressure rupture, explosion or overheat	5,000	(0%)
Excessive heat or scorch burn with no ignition	3,000	(0%)
Explosion without fire	1,000	(0%)
Overpressure rupture for air or gas other than steam	1,000	(0%)
Overpressure rupture from steam	1,000	(0%)
Total	**4,461,000**	(100%)

∗ See Table 2 for a breakdown of EMS incidents on roadways.

Note: Incidents are rounded to the nearest thousand. Percentages were calculated from unrounded estimates. Sums may not equal totals due to rounding.

Source: NFIRS and NFPA Fire Experience Survey.

Table 2
Fire Department Responses to EMS Roadway Incidents in 2014, by Incident Type

Incident Type	Incidents	Percent of all roadway incidents	Percent of EMS or Rescue Incident Category	Percent of EMS incidents
Vehicle crash with injuries	953,000	(21%)	(32%)	(38%)
EMS call, excluding vehicle crash with injury	910,000	(20%)	(30%)	(36%)
Motor vehicle crash with no injuries	564,000	(13%)	(19%)	(22%)
Motor vehicle/pedestrian crash(MV Ped)	79,000	(2%)	(3%)	(3%)
Emergency medical service, other	26,000	(1%)	(1%)	(1%)
Total	2,532,000	(57%)	(85%)	(100%)
Total incidents		4,461,000	2,993,000	2,532,000

Note: Incidents are rounded to the nearest thousand. Percentages were calculated from unrounded estimates. Sums may not equal totals due to rounding.

Source: NFIRS and NFPA Fire 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 5,000 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*.

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. Similar approaches are taken with the specific categories of incidents shown in this report. 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. Similar procedures were performed with non-fire incidents using results from *Fire Loss in the United States during 2014*.

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 or through NFPA's Research, Data and Analytics Division.

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.