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Firefighter Fatalities in the United States, 2016

A detailed look at last year's on-duty firefighter deaths nationwide

BY RITA F. FAHY, PAUL R. LeBLANC, JOSEPH L. MOLIS

In 2016, 69 firefighters died while on duty in the United States as a result of injuries that occurred at specific events that year. When NFPA began reporting on this set of firefighter fatalities 40 years ago, the number of such deaths annually averaged close to 150 per year. The average number of deaths in the past five years has been less than half that, or 73 deaths annually.

Of these 69 firefighters, 39 were volunteer firefighters, 19 were career firefighters, eight were employees of federal land management agencies, one was a contractor with a state land management agency, one was a member of an industrial fire brigade, and one was a prison inmate.

- Read the complete [2016 NFPA Firefighter Fatalities in the United States report](#).
- Read [firefighter fatality case studies](#) from the NFPA report.

There were three multiple-fatality incidents in 2016: three firefighters died as a result of a floor collapse in a fire in a single-family dwelling; an apparatus crash killed two wildland firefighters on patrol for lightning-ignited fires; and two firefighters died and seven were injured in another apparatus crash while responding to a wildland fire.

Two firefighters were murdered last year and two others died by suicide while on duty. A junior firefighter was shot and killed unintentionally by another firefighter who is now facing criminal charges.

While this summary focuses on the deaths of firefighters that were due to specific events while on duty, NFPA recognizes that a more comprehensive picture of the firefighter fatality problem would also include deaths that result from traumatic injuries while on duty; deaths that may occur years later due to chronic illnesses, such as cancer or heart disease, that arise from occupational exposures; and deaths that result from physical and emotional stress and strain. The number of deaths due to long-term exposures, however, cannot be estimated at this time because of limitations in tracking firefighter exposure to toxic environments and substances and the potential long-term effects of such exposures. Besides the challenges that firefighter illnesses pose for obtaining a complete picture of the firefighter fatality problem, we would be remiss if we did not also monitor the increasingly well-publicized problem of firefighter suicide.

Activities when fatal injuries occurred

Although the largest share of deaths usually occur at the scene of fires, in 2016 the largest share of deaths occurred while firefighters were responding to and returning from alarms. Of these 17 firefighters, two died when their apparatus crashed while responding to a wildland fire. (Seven other firefighters were injured in that crash.) While 10 of the deaths responding to or returning from alarms were due to crashes, it is important to note that deaths in this category are often not the result of crashes. In 2016, three were due to falls, two to sudden cardiac death, another to drowning when his vehicle was swept off the road by flood waters, and one to an alcohol overdose while returning from a wildland fire assignment. The number of deaths that occurred while responding to or returning from calls has averaged 19 per year over the past 10 years and 15 per year over the past five years. From 1977 through 1986, the first 10 years that NFPA conducted this study, the average number of deaths per year while responding to or returning from alarms was 36.

The next largest share occurred while firefighters were operating at fires. The 15 fire ground deaths in 2016 is by far the lowest number of fire ground deaths that we have observed since we began conducting this study in 1977. The lowest number previously reported was 21 deaths at fires in 2012. In the early 1970s, the number of fire ground deaths averaged more than 80 per year. Seven of the 15 fire ground deaths occurred at five structure fires. The largest multiple-death fire in 2016 resulted in the deaths of three firefighters in a floor collapse above a basement fire. In addition, there were six deaths at six wildland fires and two at two vehicle fires.

Ten firefighters died at non-fire emergencies: five at medical emergencies, four at motor vehicle crashes, and one at the scene of a dock collapse. Five of the 10 suffered sudden cardiac deaths, two were shot while attempting to enter homes on EMS calls, one was struck by a passing vehicle, one suffered a stroke, and one died of complications shortly after surgery for injuries suffered in a fall on ice.

Ten deaths occurred during training activities, including seven caused by sudden cardiac death. Three of these firefighters were attending training sessions or meetings at the station; one was a recruit involved in search and rescue training; another was a recruit finishing up training on an obstacle course; one collapsed while running during physical fitness training; and one collapsed at a pumper relay drill. The other three training deaths resulted from traumatic injuries. One of these firefighters fell from a helicopter during rescue hoist training; another was involved in a motor vehicle crash while test driving a tanker before a drill; and the third fell from a personal watercraft during water rescue training and died of his injuries.

The remaining 17 firefighters died while involved in a variety of non-emergency-related on-duty activities. Two firefighters died by suicide while on duty. One firefighter was unintentionally shot at the station by another firefighter, though criminal charges were filed against the shooter. Six of the fatalities were due to sudden cardiac death: five of these six firefighters were engaged in normal administrative or station duties, and one was doing maintenance on an ambulance. Four firefighters were killed in three separate crashes: two while on patrol for wildland fires sparked by lightning, one while en route to a parade, and one while returning from a police graduation where he had represented the fire department. One firefighter suffered an arterial gas embolism while diving in a body recovery operation. One firefighter was run over by a fire department vehicle that he was helping to guide as it backed into the station after a community event. One firefighter fell from a ladder during maintenance work at the station. And a member of an industrial fire department was asphyxiated while inspecting fire extinguishers in a room that had become oxygen-depleted.

Fire ground deaths

The 15 fire ground deaths is the lowest total since this study was first done in 1977, and is the third consecutive year that the total has been below 25. Seven of the 15 deaths occurred at five structure fires: four of the structures were single-family dwellings and one was a sporting goods store. None of the structures in which firefighters died was reported to have had an automatic fire suppression system.

Among the non-structure fire deaths, six firefighters died at wildland fire incidents: three were struck by falling objects (one by a tree, one by a tree limb, and one by a boulder), two suffered sudden cardiac events, and one was killed when his bulldozer overturned on a slope. Two firefighters died at the scene of motor vehicle fires, both suffering sudden cardiac events.

Cause and nature of fatal injury or illness

Overexertion, stress, and medical issues accounted for by far the largest share of deaths. Of the 29 deaths in this category, 26 were classified as sudden cardiac deaths (usually heart attacks) and one to a stroke. The two suicide deaths (one by gunshot and the other by hanging) also fall into this category.

The second leading cause of fatal injury was vehicle crashes, which claimed 17 lives. Two other firefighters were struck and killed by vehicles. These incidents are discussed in more detail below.

Seven firefighters died in fatal falls: two during training, with one falling from a helicopter during rescue hoist training and one from a personal watercraft during water rescue training; one from a ladder while doing maintenance work at the station; one while attempting to jump onto the back step of a pumper that was backing up to a hydrant at a structure fire and was run over; one who fell at home while responding to a call; one who was on foot in a parking lot while returning from a wildland fire assignment when he fell over a guardrail; and one mentioned above who died after slipping and falling on ice.

Four firefighters were struck and killed by falling objects: two on wildland fires were struck by falling trees, one on a wildland fire by a falling boulder, and one at a structure fire when the upper story exploded and he was struck by parts of the roof.

Structural collapse resulted in three deaths in one incident. The firefighters were killed in a row house fire that had been set in the basement. Responding firefighters were on the first floor of the dwelling searching for possible trapped occupants when they fell through the floor into the basement. Two of those firefighters died of asphyxiation and a third firefighter involved in their rescue died weeks later of burn injuries. The investigation of the incident was not completed or released at the time this report was written so only preliminary details are available.

Three firefighters were shot and killed. Two, in separate incidents, were responding on medical calls when they were shot by the home occupants who claimed to mistake them for intruders. The other victim was a junior firefighter shot by another firefighter at the station under yet unknown circumstances.

As mentioned above, there was one fatal alcohol overdose. One firefighter was diving when he suffered an arterial gas embolism after running out of air. One firefighter became disoriented and lost inside a structure when he was attempting to leave due to low air. And one firefighter entered a nitrogen-filled workspace to do fire extinguisher inspections and suffocated.

Sudden cardiac deaths

The 26 sudden cardiac deaths in 2016 with onset while the victim was on duty is the lowest total since this study began in 1977. These are cases in which the onset of symptoms occurred while the victim was on duty and death occurred immediately or shortly thereafter. Cardiac-related events accounted for 38 percent of the deaths in 2016, and 42 percent over the past 10 years. Though it usually accounts for the largest share of deaths in any given year, this compares to the earliest years of the study when an average of 60 firefighters a year suffered sudden cardiac deaths while on duty.

Vehicle-related deaths

In 2016, 17 firefighters died in vehicle crashes and two others were struck by vehicles.

Ten of the firefighters who died in crashes were killed while responding to incidents and one was killed while returning from an incident. Of the 10, four were responding to structure fires, three to wildland fires, two to EMS calls, and one to a flash flood situation. The firefighter killed while returning from an incident had been at a grass fire. In one other emergency-related incident, a bulldozer operator on a wildland fire was crushed when the vehicle overturned as he was maneuvering around a blockage on the road and rolled over an embankment.

The other four crashes, resulting in five deaths, occurred during training and other non-emergency events. Tire failures resulted in two crashes that killed three firefighters. A firefighter test-driving a tanker before a training drill ran off the road and overturned. And a firefighter riding as a passenger returning from a community-related event died when the driver choked on a beverage he was drinking and crashed into trees on the highway's median.

Of the firefighters mentioned above who died in crashes, four were using seatbelts, four were not using seatbelts, and no details on seatbelt use were reported for nine victims. Factors reported in the crashes included speeding, medical emergencies, texting, negligence, and intoxication.

Two firefighters were struck and killed by vehicles. 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.

Other findings

Three firefighters were killed as a result of one intentionally set fire in 2016, the single-family dwelling fire where a floor collapse occurred. From 2007 through 2016, 43 firefighters (5 percent of all on-duty deaths) died in connection with intentionally set fires, either at the fire or while responding to or returning from the fire.

In 2016, no deaths resulted during a false call. Over the past 10 years, nine firefighter deaths have resulted from false calls, including malicious false alarms and alarm malfunctions.

The firefighters who died in 2016 ranged in age from 16 to 79, with a median age of 47 years. The lowest death rates were for firefighters between 20 and 39. Their death rate was less than half the all-age average. The rate for firefighters aged 60 and over was two-and-a-half times the average. Firefighters aged 50 and over accounted for about half of all firefighter deaths over the five-year period, although they represent only one-quarter of all career and volunteer firefighters in the U.S.

The 19 deaths of career firefighters while on-duty in 2016 is the lowest total ever reported in this study. In the earliest years of this study, the annual average number of deaths of career firefighters while on duty was 57. The 39 deaths of volunteer firefighters is close to the most recent 10-year average of 41 deaths per year, but far lower than the average of 67 deaths per year in the earliest years of this study.

In summary

There were 69 on-duty firefighter deaths in 2016, one more than was reported in 2015, but continuing the trend with an annual toll below 70. Sudden cardiac death and trauma accounted for the largest shares of the fatalities. In an unusual finding, there were two deaths by suicide while on duty, two firefighters murdered, and another firefighter shot unintentionally by another firefighter. Violence against firefighters is not as rare as some might think. Since 1997, 19 firefighters have been fatally assaulted while on duty.

The number of deaths at the scene of fires was far lower than usual: 15 fire ground deaths, with seven at structure fires.

Deaths among career firefighters continued to decrease, with the lowest number (19) ever reported occurring in 2016.

Although we had seen substantial reductions in the number of deaths in road vehicle crashes in recent years, crash deaths were at their highest level since 2008, with 17 deaths. Of those, five were in personal vehicles. There had been no on-duty fatalities in personal vehicles since 2013.

Firefighting is recognized as a dangerous profession, but it is not possible to accurately assess the total number of deaths and injuries that have resulted annually due to all on-duty injuries and exposures, particularly long-term exposures to carcinogens and physical and emotional stress

and strain. This summary focuses on the deaths of firefighters resulting from specific injuries or exposures while on duty in 2016. A complete picture of duty-related fatalities would also include the cancer, cardiac, stress, and other fatalities that were caused by exposures to toxins or the emotional toll of responses.

Although we cannot identify the total number of fire service-related deaths that occur each year, the [International Association of Fire Fighters \(IAFF\)](#) alone lists on its website, more than 80 firefighter cancer deaths that were reported to them in 2016. According to the [Firefighter Behavioral Health Alliance \(FBHA\) website](#), 99 firefighters and 36 EMTs and paramedics died by suicide in 2016. Over the past several years, in its annual report on U.S. firefighter deaths, the [U.S. Fire Administration](#) has included an average of 15 firefighters a year who qualified for Hometown Hero benefits, which cover firefighters who suffer a heart attack or stroke within 24 hours after engaging in non-routine stressful or strenuous activity on duty.

Research by the National Institute for Occupational Safety and Health (NIOSH) on firefighter cancer estimates that firefighters are 9 percent more likely to have a cancer diagnosis, and 14 percent more likely to die of cancer than the general population. The first NIOSH study identified a link between firefighting and solid cancers, and a second study showed a relationship between firefighting and lung cancer and leukemia. The studies are available [online](#).

[NFPA's Fire Protection Research Foundation](#) is currently involved in three studies related to firefighter exposure: a 30-year cohort study to track exposures and effects; a study to validate procedures for the optimal removal of several types of contaminants from firefighting gear; and a study to aid in the development of the Campaign for Fire Service Contaminant Control. The findings from these studies will inform relevant NFPA standards for the fire service as well as educational and training programs aimed at reducing firefighter exposures.

Due to the efforts of the FBHA and others, recognition of the importance of behavioral health programs and peer support for firefighters is becoming more widespread. As with heart disease and cancer, this is a problem that follows firefighters after their careers end, whether in retirement or some other form of separation from the fire service. In 2015, FBHA produced a report, published by the National Volunteer Fire Council (NVFC) with support from USFA, on behavioral health and suicide prevention, [available online](#). In collaboration with the National Fallen Firefighters Foundation (NFFF), the Medical University of South Carolina has developed a [training course](#) for counselors who work with firefighters. The NVFC has a program for firefighters, EMTs, and their families called [Share the Load](#) that points them to resources and support for mental well-being. The IAFF offers a peer-support training course for its members.

Heart disease has long been recognized as a significant factor in firefighter on-duty deaths, and NFPA has several standards that focus on the health risks to firefighters. For example, [NFPA 1582, Comprehensive Occupational Medical Program for Fire Departments](#), outlines for fire departments the medical requirements that must be met by candidate firefighters and incumbent fire department members. [NFPA 1500, Fire Department Occupational Safety and Health Program](#), calls for fire departments to establish a firefighter health and fitness program that meets [NFPA 1583, Health-Related Fitness Programs for Fire Department Members](#), and requires that firefighters meet the medical requirements of NFPA 1582.

Information on developing wellness-fitness programs is also available from other organizations, including the [Fire Service Joint Labor-Management Wellness-Fitness Initiative](#) by the IAFF and the International Association of Fire Chief, and NVFC's [Heart-Healthy Firefighter Program](#), which

was launched in 2003 to address heart attack prevention for all firefighters and EMS personnel through fitness, nutrition, and health awareness.

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