



RESEARCH

Firefighter Fatalities in the United States-2016

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Abstract

In 2016, a total of 69 firefighters died while on-duty in the U.S. The largest share of deaths occurred while firefighters were responding to or returning from emergencies (17 deaths), with another 15 deaths occurring at fire scenes. Sudden cardiac death and traumatic injuries accounted for the largest shares of the on-duty deaths (26 deaths each). There were three multiple-fatality incidents – 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 another apparatus crash while responding to a wildland fire resulted in two fatalities and seven injuries. Deaths among career firefighters were at their lowest level in 2016, as were deaths on the fire ground.

Keywords: Firefighter fatality, statistics, heart attack, sudden cardiac death

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Firefighter Fatalities in the United States – 2016

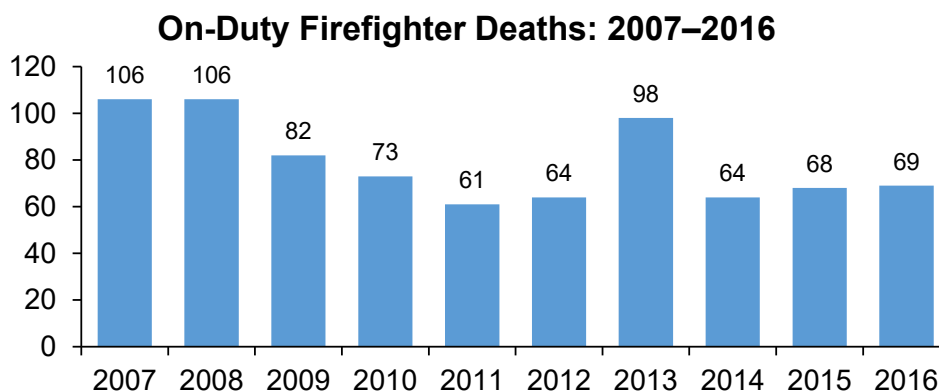
A total of 69 on-duty firefighter deaths occurred in the United States in 2016. This is the fifth time in the past 6 years that the total number of deaths of firefighters has been below 70. The average number of deaths annually over the past decade is 79.

Of the 69 firefighters who died while on duty in 2016, 39 were volunteer firefighters, 19 were career firefighters, nine were employees or contracted with federal or state land management agencies, one was a member of an industrial fire brigade, and one was a prison inmate. This is the lowest number of career firefighter deaths in the 40 years that NFPA has done this study.

The largest share of deaths occurred while firefighters were responding to and returning from alarms (17 deaths), and the next largest share occurred while firefighters were operating at fires (15 deaths), each accounting for one-fifth to one-quarter of the total deaths. This is the lowest number of fireground deaths. In the highest loss incident, three firefighters died in a structural collapse in a dwelling.

Other findings include the following:

- ▶ The numbers of sudden cardiac death and internal trauma were tied with the largest number of deaths in 2016, with 26 deaths in each category.
- ▶ Of the deaths while responding to or returning from alarms, 10 were due to crashes, three were due to falls, two to sudden cardiac death, another to drowning when flood waters washed a vehicle off the road, and one to an alcohol overdose while returning from a wildland fire.
- ▶ The fireground deaths included six in fires involving dwellings and one death at a fire in a store. Six firefighters died at wildland fires and two at motor vehicle fires.
- ▶ The firefighters who died in 2016 ranged in age from 16 to 79, with a median age of 47 years.
- ▶ There were two deaths by suicide while on duty, two firefighters were murdered, and another firefighter was shot unintentionally by another firefighter.



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2016 Experience

In 2016, 69 firefighters died while on-duty in the U.S. – the fifth time in the past six years that the total number of deaths has been below 70. The annual average number of deaths over the past decade is 79. Figure 1 shows on-duty firefighter deaths for the years 1977 through 2016, excluding the 340 firefighter deaths at the World Trade Center in 2001, and the cancer-related deaths of responding firefighters that have occurred since 2001.¹

Of the 69 firefighters who died while on duty in 2016, 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.²

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 another apparatus crash while responding to a wildland fire resulted in two fatalities and seven injuries.

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

Analyses in this report examine the types of duty associated with firefighter deaths, the cause and nature of fatal injuries to firefighters, and the ages of the firefighters who died. They highlight deaths in intentionally-set fires and in motor vehicle-related incidents.³ Finally, the study presents summaries of individual incidents that illustrate important concerns in firefighter safety.

Introduction

Each year, NFPA collects data on all firefighter fatalities in the U.S. that resulted from injuries or illnesses that occurred while the victims were on-duty. The term *on-duty* refers to:

- being at the scene of an alarm, whether a fire or non-fire incident (including EMS calls);
- responding to or returning from an alarm;
- participating in other fire department duties such as training, maintenance, public education, inspection, investigation, court testimony or fund raising; and
- being on call or stand-by for assignment at a location other than at the firefighter's home or place of business.

On-duty fatalities include any injury sustained in the line of duty that proves fatal, any illness that was incurred as a result of actions while on duty that proves fatal, and fatal mishaps involving non-emergency occupational hazards that occur while on duty. The types of injuries included in the first category are mainly those that occur at a fire or other emergency incident scene, in training, or in crashes while responding to or returning from alarms. Illnesses (including heart attacks) are included when the exposure or onset of symptoms occurred during a specific incident or on-duty activity.

The type of firefighters included in this study can be:

- members of local career and volunteer fire departments;
- seasonal, full-time and contract employees of state and federal agencies who have fire suppression responsibilities as part of their job description;
- prison inmates serving on firefighting crews;
- military personnel performing assigned fire suppression activities;
- civilian firefighters working at military installations; and
- members of facility or industrial fire brigades.

Fatal injuries and illnesses are included even in cases where death is considerably delayed. When the injury and the death occur in different years, the incident is counted in the year of the injury.

The NFPA recognizes that other organizations report numbers of duty-related firefighter fatalities using different, more expansive, definitions that include deaths that occurred when the victims were off-duty. (See, for example, the [USFA](https://www.usfa.fema.gov/) and [National Fallen Firefighters Memorial](http://www.firehero.org/) websites.*) Readers comparing reported losses should carefully consider the definitions and inclusion criteria used in any study.

Long-term effects on firefighters' physical and emotional health

This study focuses on the deaths of firefighters that are due to specific events while on-duty, but NFPA recognizes that a comprehensive study of on-duty firefighter fatalities would include chronic illnesses, such as cancer or heart disease, that arise from occupational factors and prove fatal. The number of deaths due to long-term exposures, however, cannot be estimated at this time because of limitations in tracking the exposure of firefighters to toxic environments and substances and the potential long-term effects of such exposures. Besides the challenges that firefighter illnesses pose for gaining 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.

* USFA link is <https://www.usfa.fema.gov/>, National Fallen Firefighters' Memorial link is www.firehero.org/

Suicide According to the [Firefighter Behavioral Health Alliance](#) (FBHA), 99 firefighters and 36 EMTs and paramedics died by suicide in 2016. † Two firefighters died by suicide while on duty.

Due to the efforts of 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](#). ‡ In collaboration with 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 International Association of Fire Fighters (IAFF) offers a peer-support training course for their members.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, requires access to a behavioral health program that provides assessment, counseling and treatment for such issues as stress, anxiety, and depression. The goal of such programs is to change the culture of the fire service, help people to identify the warning signs, eliminate any stigma associated with mental health issues and asking for help, and provide training and assistance with retirement planning. According to FBHA statistics, almost one-fifth of the firefighters and EMTs who died by suicide were retired firefighters and EMTs. Early recognition and treatment of behavioral health issues are key to addressing this problem.

Cancer Regarding the long-term health effects of firefighting, there has been a vast change in the attention now paid to cancer risk and cancer prevention in the fire service. These efforts include research, education, behavioral changes and a variety of controls to minimize exposure to contaminants.

The National Institute for Occupational Safety and Health (NIOSH) recently undertook two large studies focused on firefighter cancer and concluded that firefighters face a 9 percent increase in cancer diagnoses, and a 14 percent increase in cancer-related deaths, compared to the general population in the U.S. The first study was a multi-year project to examine the cancer risk of firefighters, using health records of approximately 30,000 current and retired career firefighters from three large city fire departments to look at mortality and cancer incidents. The second study looked at exposure-response

† <http://www.ffbha.org/>

‡ http://www.nvfc.org/wp-content/uploads/2015/09/ff_suicide_report.pdf

§ <https://helping-heroes.org/user/login>

** <http://www.nvfc.org/programs/share-the-load-program/>

among 20,000 firefighters from the same fire departments. [Results of the first phase](#), which reported evidence of a relationship between firefighting and cancer, were published in October, 2013.^{††} [Results of the second study](#), published in 2015, showed a relationship between firefighting and lung cancer and leukemia.^{‡‡}

In efforts to raise awareness in the fire service of the heightened risk of cancer and ways to reduce exposures, valuable video presentations have been produced by organizations including, among others, the [Boston Fire Department](#)^{§§}, [the University of Cincinnati and Cincinnati Fire Department](#)^{***} and the [National Fallen Firefighters Foundation](#).^{†††} These videos help to inform firefighters of the steps they can take to address the hazards they face. Other efforts to inform the fire service of safe practices stem from research undertaken by the Fire Protection Research Foundation, including an on-going [four-phase study](#)^{‡‡‡} to enhance the cleaning procedures for PPE that are outlined in NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, and an earlier [respiratory exposure study](#)^{§§§} that was completed in 2012. The [Firefighter Cancer Support Network](#) is an excellent resource for access to information on health-related topics and support and mentorship following a cancer diagnosis.^{****}

Although we cannot identify the total number of fire service-related cancer deaths that occur each year, the International Association of Fire Fighters alone lists on its [website](#) more than 80 firefighter cancer deaths that were reported to them in 2016.^{††††}

Cardiac Issues In contrast to the relatively recent strong focus on firefighter cancer and suicide, heart disease has been recognized as a serious health issue for the fire service for quite some time now.⁴ Sudden cardiac death has consistently accounted for the largest share of on-duty firefighter deaths since the NFPA began this study in 1977. The NFPA has several standards that focus on the health risks to firefighters. For example, NFPA 1582, *Standard on 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 calls for fire

^{††} http://www.cdc.gov/niosh/firefighters/pdfs/OEM_FF_Ca_Study_10-2013.pdf

^{‡‡} [http://www.cdc.gov/niosh/firefighters/pdfs/Daniels-et-al-\(2015\).pdf](http://www.cdc.gov/niosh/firefighters/pdfs/Daniels-et-al-(2015).pdf)

^{§§} <https://www.youtube.com/watch?v=hOvBypsaHog>

^{***} <https://www.youtube.com/watch?v=Y-7I0U3323Y>

^{†††} <http://www.everyonegoeshome.com/2016/02/17/the-silent-killer/>

^{‡‡‡} <http://www.nfpa.org/PPECleaning>

^{§§§} <http://www.nfpa.org/research/fire-protection-research-foundation/projects-reports-and-proceedings/for-emergency-responders/personal-protective-equipment/respiratory-exposure-study-for-fire-fighters>

^{****} <http://www.firefightercancersupport.org/>

^{††††} <http://www.iaff.org/hs/lodd/advancedSearch.asp>

departments to establish a firefighter health and fitness program that meets NFPA 1583, *Standard on Health-Related Fitness Programs for Fire Department Members*, and requires that firefighters meet the medical requirements of NFPA 1582.

Information on developing a wellness-fitness program is available from other organizations, for example, the [IAFC/IAFF Fire Service Joint Labor-Management Wellness-Fitness Initiative](#)⁺⁺⁺⁺ and [NVFC's Heart-Healthy Firefighter Program](#).^{§§§§} The Heart-Healthy Firefighter Program was launched in 2003 to address heart attack prevention for all firefighters and EMS personnel, through fitness, nutrition and health awareness.

We will continue to cover deaths that result from specific on-duty activities in this study, but NFPA is focused on all aspects of health and safety in the fire service, and EMS, as evidenced particularly by the Fire Protection Research Foundation's work on cancer prevention behaviors and the health and wellness provisions of NFPA 1500 and NFPA 450, *Guide for Emergency Medical Services and Systems*. The remainder of this report will focus on the on-duty fatalities in 2016.

Type of Duty

Figure 2 shows the distribution of the 69 deaths by type of duty. The largest share of deaths occurred while firefighters were responding to and returning from alarms (17 deaths), and the next largest share occurred while firefighters were operating at fires (15 deaths), each accounting for one-fifth to one-quarter of the total deaths.

Of the 17 firefighters killed responding to or returning from alarms, two died when their apparatus crashed while responding to a wildland fire. (Seven other firefighters were injured in that crash.) This incident will be described in more detail later. 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. All crashes and sudden cardiac deaths are discussed in more detail later in this report. Of the three falls, one firefighter fell from the back step of a pumper that was backing up to a hydrant at a structure fire and was run over; one fell at home while responding to a call and one was on foot in a parking lot while returning from a wildland fire assignment when he fell over a guardrail to his death. Ten of the victims were volunteer firefighters; three were career firefighters and

⁺⁺⁺⁺ http://www.iafc.org/files/healthWell_WFI3rdEdition.pdf.pdf

^{§§§§} <http://www.healthy-firefighter.org/>

four were wildland firefighters. 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. The first 10 years that NFPA conducted this study (1977 through 1986), the average number of deaths per year while responding to or returning from alarms was 36. There has been a marked reduction in both crash deaths and cardiac-related deaths while responding to or returning from alarms over the past 40 years.

The 15 fireground deaths in 2016 is, by far, the lowest number of fireground deaths that we have observed since we began doing this study in 1977. The lowest number previously reported was 21 deaths at fires in 2012. In the early 1970s, the number of fireground deaths annually averaged more than 80 deaths per year.

Seven of the 15 fireground deaths occurred at five structure fires. The largest multiple-death fire in 2016 resulted in the deaths of three firefighters in a floor collapse. In addition, there were six deaths at six wildland fires and two at two vehicle fires. Seven of the 15 fireground victims were volunteer firefighters, five were career firefighters, one was a state contractor, one was a federal wildland firefighter and one was a member of an inmate firefighting crew. The average number of deaths on the fireground over the past 10 years is 12 deaths per year, for career firefighters and 11 for volunteer firefighters.

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 had a stroke and one died of complications shortly after surgery for injuries suffered in a fall on ice.

Ten deaths occurred during training activities. Sudden cardiac death claimed the lives of seven of the firefighters. Three of these seven firefighters were attending training sessions 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. 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. Another firefighter was shot at the station by another firefighter, possibly unintentionally, although 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 enroute to a parade and one while returning from a police graduation where he had represented the fire department. One firefighter drowned while diving in a body recovery operation. One firefighter was guiding a fire apparatus that was backing into the station after a community event when he was run over by the vehicle. 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.

Cause of Fatal Injury or Illness

Figure 3 shows the distribution of deaths by cause of fatal injury or illness. The term *cause* refers to the action, lack of action, or circumstances that resulted directly in the fatal injury.⁵

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) fall into this category as well. See the section below for more details on sudden cardiac deaths.

The second leading cause of fatal injury was vehicle crashes, which claimed 17 lives. Two other firefighters were struck and killed by vehicles. These vehicle-related deaths are discussed in detail later in this report.

Seven firefighters died in fatal falls, all of which were described above.

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 floor 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.

Nature of Fatal Injury or Illness

The term *nature* refers to the medical process by which death occurred and is often referred to as *cause of death* on death certificates and in autopsy reports.

Figure 4 shows the distribution of deaths by nature of fatal injury or illness. As in almost every year since 1977, sudden cardiac death accounted for the largest share of the deaths annually, with 26 deaths. Sudden cardiac deaths will be discussed in more detail in the next section. Tied with the greatest share of deaths in 2016 was internal trauma, also with 26 deaths.

The next leading nature of fatal injury was asphyxiation or smoke inhalation, with 6 deaths. There were four gunshot deaths, two to crushing injuries and one death each due to drowning, burns, overdose, stroke and an embolism.

Sudden Cardiac Deaths

In 2016, the 26 sudden cardiac deaths with onset while the victim was on-duty is the lowest total since this study began in 1977. Cardiac-related events accounted for 38 percent of the deaths in 2016, and 42 percent over the past 10 years.

The number of deaths in this category is significantly lower than in the early years of this study. From 1977 through 1986, an average of 60 firefighters a year suffered sudden cardiac deaths while on duty (44.7 percent of the on-duty deaths during that period). These are cases in which the onset of symptoms occurred while the victim was on-duty and death occurred immediately or shortly thereafter. The average number of deaths fell to 44 a year in the 1990s and to 33 in the past decade. In spite of this reduction, sudden cardiac death continues to be the number one cause of on-duty firefighter fatalities in the U.S. and in almost every year has accounted for the single largest share of deaths in the year.

Ages of Firefighters

The firefighters who died in 2016 ranged in age from 16 to 79, with a median age of 47 years. [Figure 5](#) shows the distribution of firefighter deaths by age and whether the cause of death was sudden cardiac death or not.

Sudden cardiac death accounts for a higher proportion of the deaths among older firefighters, as might be expected. Half of the firefighters over age 40 who died in 2016 died of heart attacks or other cardiac events.

[Figure 6](#) shows death rates by age, using combined career and volunteer firefighter fatality data for the five-year period from 2012 through 2016 and estimates of the number of career and volunteer firefighters in each age group from NFPA's 2014 profile of fire departments (the mid-year in the range).⁶

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 one-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.

Fireground Deaths

Of the 15 fireground fatalities, six were due to sudden cardiac death, five to internal trauma, three to asphyxiation or smoke inhalation and one to burns. Seven of the 15 deaths occurred at five structure fires, six on wildland fires and two at vehicle fires.

This is the lowest number of fireground deaths since this study was first done in 1977, and is the third consecutive year that the total has been below 25. Except for 2001 at the World Trade Center and 2013, when an exceptionally high number of firefighters were killed at the scene of fires (19 firefighters on the Yarnell Hill wildland fire and nine in an explosion at a fertilizer plant), deaths on the fireground have been declining fairly steadily since 1999.

[Figure 7](#) shows the distribution of the 15 fireground deaths by fixed property use. The seven deaths at structure fires include six in fires involving one- and two-family dwellings and one death at a fire in 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 and another 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 suffered sudden cardiac event.

To put the hazards of firefighting in various types of structures into perspective, the authors examined the number of fireground deaths per 100,000 structure fires by property use. Estimates of the structure fire experience in each type of property were obtained from the NFPA's annual fire loss studies from 2011 through 2015 (the 2016 results are not yet available) and from the updated firefighter fatality data for the corresponding years. The results are shown in [Figure 8](#).

This figure illustrates that, although many more firefighter deaths occur at residential structure fires than at fires in any other type of structure, fires in some nonresidential structures, such as manufacturing, public assembly, storage and mercantile properties, are more hazardous to firefighters, on average. There were 13.0 fireground deaths per 100,000 nonresidential structure fires from 2011 through 2015, compared to 2.9 deaths per 100,000 residential structure fires. The highest death rates over the five-year period occurred in manufacturing properties. The very high rate over this time period is largely influenced by the fertilizer plant fire in 2013 that killed nine firefighters. The high rate for public assembly properties is influenced by two multiple-fatality deaths in the same year that claimed seven lives. The low rate in educational properties over that five-year period may reflect the fact that these occupancies are among the most regulated, most-protected and most-frequently inspected and that their occupants are among the most likely to call the fire department to report fires while the fires are still in their early stages. The rate in that five-year period for stores/offices and storage properties, which includes garages at dwellings, reflects the relatively small number of fatalities that have occurred in such structures in recent years. The rate for health care and correctional properties is the result of a single fatality over the five-year period in a type of property that has a very low occurrence of reported fires.

From 2007 through 2016, there were 20 deaths in 17 fires in vacant buildings and buildings under demolition or renovation.

Vehicle-Related Deaths

In 2016, 19 firefighters died in vehicle-related incidents, including 17 firefighters who died in vehicle crashes and two who were struck by vehicles.

Ten of the 11 firefighters who died in road crashes were killed while responding to incidents and one was killed while returning from an incident. Four were responding to structure fires, three to wildland fires, two to EMS calls, one to a flash flood situation, and another was returning from a grass fire.

- Nine firefighters were responding to an out-of-state wildland fire in a fire department vehicle when the driver apparently fell asleep at the wheel, lost control and crashed. He was reportedly speeding and was charged with criminal negligence in the deaths of two of his passengers.
- Another firefighter responding as a passenger on mutual aid to a wildland fire was killed when the driver of the tanker struck the curb on a traffic circle and the vehicle, carrying 2,000 gallons of water, overturned.
- A firefighter driving a mobile air unit on mutual aid to a structure fire may have suffered a medical emergency that caused him to go off the road and crash. He died of injuries from the impact.
- A firefighter driving a pumper to a structure fire was struck head-on by an on-coming tractor trailer whose driver lost control due to speeding and the wet road conditions. The victim, who was wearing a seatbelt, had no time for evasive action.
- Another firefighter driving a pumper to a structure fire was ejected when his vehicle left the road and overturned. No factors in the crash were reported and seatbelt use was not determined.
- A firefighter responding to a fire in his personal vehicle became stuck on a railroad crossing and was struck by a train.
- While responding to an EMS call in his personal vehicle, another firefighter crossed the centerline on the road, overcorrected, and crashed into a tree. He was wearing a seatbelt and was not ejected. Speed was a factor in the crash.
- Another firefighter responding to an EMS call in his personal vehicle lost control of his truck, struck a guardrail and overturned. He was not wearing a seatbelt and was ejected.
- A firefighter responding to assist with people in distress in a flooding situation drowned when his vehicle was washed away in flood waters. He was driving his personal vehicle.
- The firefighter who died in a crash while returning from a grass fire was driving his personal vehicle when his truck veered off the highway and struck a parked vehicle. He was not ejected and no other details were reported.

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 bulldozer had a fully-enclosed cab, but he was not wearing a seatbelt and was ejected.

The other four crashes, resulting in five deaths, occurred during training and other non-emergency events.

- Two firefighters were on fire patrol looking for lightning-caused fires when a tire on their vehicle failed, causing them the crash and the vehicle to overturn. There were no other factors in the crash. Seatbelt use was not reported.
- A firefighter test-driving a tanker before a training drill ran off the road, overcorrected and overturned. He was wearing a seatbelt and was not ejected. Inattention was cited as a factor in the crash – he was reportedly texting at the time of the crash.
- While a firefighter was driving a tanker to a parade, a tire on the vehicle blew, with the tread becoming wrapped around the axle and causing the steering to lock. The truck then crossed four lanes of traffic, went up an embankment and rolled over. The victim was not wearing a seatbelt.
- A firefighter was riding as passenger in the rear seat of a personal vehicle on the way back from a community-related event when the driver choked on a beverage he was drinking and crashed into trees on the highway's median. The victim was apparently not wearing a seatbelt but was not ejected.

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.

NFPA publishes several standards related to road and vehicle safety issues.

- [NFPA 1002, Standard on Fire Apparatus Driver/Operator Professional Qualifications](#), identifies the minimum job performance requirements for firefighters who drive and operate fire apparatus, in both emergency and nonemergency situations.
- [NFPA 1451, Standard for a Fire and Emergency Services Vehicle Operations Training Program](#), provides for the development of a written vehicle operations training program,

including the organizational procedures for training, vehicle maintenance, and identifying equipment deficiencies.

- [NFPA 1911, Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus](#), details a program to ensure that fire apparatus are serviced and maintained to keep them in safe operating condition.
- [NFPA 1901, Standard for Automotive Fire Apparatus](#), addresses vehicle stability to prevent rollovers, and gives manufacturers options on how to provide it. New vehicles will have their maximum speed limited, based on their weight, and will have vehicle data recorders to monitor, among other things, acceleration and deceleration, and seatbelt use.
- [NFPA 1906, Standard for Wildland Fire Apparatus](#), establishes minimum design, performance and testing requirements for new vehicles over 10,001 lb. gross vehicle weight (4,500 kg) rating that are specifically designed for wildland fire suppression. [NFPA 1091, Standard for Traffic Control Incident Management Professional Qualifications](#), just published in 2015, identifies the minimum job performance requirements necessary to perform temporary traffic control duties at emergency incidents on or near an active roadway.
- [NFPA 414, Standard for Aircraft Rescue and Fire-Fighting Vehicles](#), covers the criteria for design, performance, and acceptance of aircraft rescue and firefighting vehicles that carry personnel and equipment to the scene of an aircraft emergency.

The provisions of [NFPA 1500, Standard on Fire Department Occupational Safety and Health Program](#), include requirements that operators successfully complete an approved driver training program, possess a valid driver's license for the class of vehicle, and operate the vehicle in compliance with applicable traffic laws. All vehicle occupants must be seated in approved riding positions and secured with seatbelts before drivers move the apparatus, and drivers must obey all traffic signals and signs and all laws and rules of the road. This includes coming to a complete stop when encountering red traffic lights, stop signs, stopped school buses with flashing warning lights, blind intersections and other intersection hazards, and unguarded railroad grade crossings. Passengers are required to remain seated and must not release or loosen their seatbelts for any reason while the vehicle is in motion. In related efforts, the USFA has an excellent [website](#) with resources on emergency vehicle and roadway operations safety. ****

**** http://www.usfa.fema.gov/operations/ops_vehicle.html

The focus of vehicle safety programs should not be exclusively on fire department apparatus, since, over the years, private vehicles have been the vehicles most frequently involved in road crashes. [NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*](#), includes a requirement that when members are authorized to respond to incidents or to fire stations in private vehicles, the fire department must establish specific rules, regulations, and procedures relating to the operation of private vehicles in an emergency mode. [NFPA 1451, *Standard for a Fire and Emergency Services Vehicle Operations Training Program*](#), also requires training for those using privately-owned vehicles.

Requirements are also in effect for emergency personnel operating on roadways. The 2009 version of the Federal Highway Administration's Manual of Uniform Traffic Control Devices (MUTCD) requires anyone working on a roadway to wear an ANSI 107-compliant high-visibility vest. An exemption was created for firefighters and others engaged on roadways that allows them to wear NFPA-compliant personal protective clothing (turn-out gear) when directly exposed to flames, heat and hazardous material. NFPA 1500 requires firefighters working on traffic assignments where they are endangered by motor vehicle traffic to wear clothing with fluorescent and retroreflective material and use fire apparatus in a blocking position to protect firefighters. The 2009 edition of NFPA 1901 requires that ANSI 207-compliant breakaway high-visibility vests be carried on all new fire apparatus, and MUTCD 2009 allows emergency responders to use them in lieu of ANSI 107-compliant apparel. Advice on compliance with the updated Federal rules can be found at: [MUTCD](#).^{†††††} NFPA 1901 also requires reflective striping for improved visibility on new apparatus and a reflective chevron on the rear of fire apparatus. Advice on how to improve visibility of existing apparatus can be found at: [video](#).^{†††††}

Career/Volunteer Comparison

Figure 9 compares the number of deaths of career firefighters and volunteer firefighters from local fire departments since the study was first done in 1977. 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.

^{†††††}http://www.respondersafety.com/Articles/2009_Edition_of_the_Manual_on_Uniformed_Traffic_Control_Devices_MUTCD_Released_December_16_2009.aspx

^{†††††}<http://www.respondersafety.com/MarkedAndSeen.aspx>

A breakdown of the fatality experience of the 58 career and volunteer firefighters killed in 2016 is shown in [Table 1](#).

Intentional Fires and False Calls

Three firefighters were killed as a result of one intentionally-set fire in 2016, in a single-family dwelling where a floor collapse occurred. From 2007 through 2016, 43 firefighters (5.4 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.

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 previous years – 15 fireground 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 last year were at their highest level since 2008, with 17 deaths. Of those deaths, five were in personal vehicles. There had been no on-duty fatalities in personal vehicles since 2013.

Firefighting is well-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 article 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 FBHA, 99 firefighters and 36 EMTs and paramedics died by suicide in 2016. ***** Over the past several years, in their 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.

References

1. The NFPA's files for firefighter on-duty fatal injuries are updated continually for all years.
2. For this report, the term *volunteer* refers to any firefighter whose principal occupation is not that of a full-time, paid member of a fire department. The term *career* refers to any firefighter whose occupation is that of a full-time, paid fire department member.
3. For this report, the term *motor vehicle-related incident* refers to motor vehicle collisions (including aircraft and boats) and rollovers, as well as to incidents such as falls from or struck by vehicles where the involvement of the vehicle played an integral role in the death.
4. E. S. Soteriades, D. L. Smith, A. J. Tsismenakis, D. M. Baur, and S. N. Kales, "Cardiovascular Disease in US Firefighters: A Systematic Review," *Cardiology in Review*, Vol. 19, No. 4, July/August 2011, pp. 202-215.
5. The categories for cause of injury and nature of injury are based on the 1981 edition of NFPA 901, *Uniform Coding for Fire Protection*.
6. H. J. G. Haynes and G. P. Stein, "U.S. Fire Department Profile 2014," National Fire Protection Association, Quincy, Massachusetts, January 2016.

§§§§ <http://www.iaff.org/hs/lodd/advancedSearch.asp>

***** <http://www.ffbha.org/>

U.S. Department of Justice Death, Disability and Educational Benefits for Public Safety Officers and Survivors

Line of duty deaths: The Public Safety Officers' Benefits (PSOB) Act, signed into law in 1976, provides a federal death benefit to the survivors of the nation's federal, state, local and tribal law enforcement officers, firefighters, and rescue and ambulance squad members, both career and volunteer, whose deaths are the direct and proximate result of a traumatic injury sustained in the line of duty. The Act was amended in 2000 to include FEMA employees performing official, hazardous duties related to a declared major disaster or emergency. Effective December 15, 2003, public safety officers are covered for line-of-duty deaths that are a direct and proximate result of a heart attack or stroke, as defined in the Hometown Heroes Survivors' Benefits Act of 2003. The Dale Long PSOB Improvements Act of 2012 expands the Hometown Heroes Act to include vascular ruptures.

A 1988 amendment increased the amount of the benefit from \$50,000 to \$100,000 and included an annual cost-of-living escalator. On October 1 of each year, the benefit changes as a result. The enactment of the USA PATRIOT bill in 2001 increased the benefit to \$250,000. As of October 1, 2016, the current benefit is \$343,589, a lump sum and tax free benefit.

A decedent's spouse and minor children are the first eligible beneficiaries for PSOB Program purposes. In cases in which the public safety officer had no surviving spouse or eligible children, the death benefit is to be awarded to either the individual most recently designated as beneficiary for PSOB benefits with the officer's public safety agency, organization, or unit, or, if there is no designation of beneficiary of PSOB benefits on file, then to the individual designated as beneficiary under the most recently executed life insurance policy on file with the agency at the time of death. (*See* 42 U.S.C. § 3796(a)(4) for specific details.) If no individuals qualify under 42 U.S.C. § 3796(a)(4), then the benefit is paid to the public safety officer's surviving parents; if the officer is not survived by a parent, the benefit may be paid to the officer's children who would be eligible to receive it but for their age (i.e., adult children).

Line of duty disabilities: In 1990, Congress amended the PSOB benefits program to include permanent and total disabilities that occur on or after November 29, 1990. The amendment covers public safety officers who are permanently unable to perform any gainful employment in the future. PSOB is intended for those few, tragic cases where an officer survives a catastrophic, line of duty injury. Only then, in the presence of the program's statutory and regulatory qualifying criteria, will PSOB's disability benefit be awarded. The bill's supporters anticipated that few PSOB disability claims would be eligible annually.

Public Safety Officers' Educational Assistance Program (PSOEA): An additional benefit, signed into law in October 1996 and amended in 1998, provides an educational assistance allowance to the spouse and children of public safety officers whose deaths or permanent and total disabilities qualify under the PSOB Act. This benefit is provided directly to dependents who attend a program of education at an eligible education institution and are the children or spouses of covered public safety officers. It is retroactive to January 1, 1978, for beneficiaries who have received or are eligible to receive the PSOB death benefit. Students may apply for PSOEA funds for up to 45 months of full-time classes. As of October 1, 2016, the maximum benefit a student may receive is \$ 1,024 per month of full-time attendance.

Further benefits information: To receive additional information on filing a disability claim or to receive additional information about coverage, call, email, or write the Public Safety Officers' Benefits Office, Bureau of Justice Assistance, Office of Justice Programs, U.S. Department of Justice, 810 7th Street, N.W., Washington DC 20531. The telephone number is (888) 744-6513 and the email address is ASKPSOB@usdoj.gov. PSOB death claims can be filed online as well at: <https://www.psob.gov>. Please note that the PSOB Office "Call Center" is available to take calls Monday through Friday from 8:00 AM until 4:30 PM ET.

Table 1
Comparison of On-Duty Deaths Between
Career and Volunteer Firefighters, 2016*

	Career Firefighters		Volunteer Firefighters	
	Number of Deaths	Percent of Deaths	Number of Deaths	Percent of Deaths
Type of Duty				
Operating at fireground	5	26 %	7	18 %
Responding to or returning from alarms	3	16	11	28
Operating at non-fire emergencies	4	21	6	15
Training	3	16	7	18
Other on-duty	4	21	8	21
TOTALS	19	100 %	39	100 %
Cause of Fatal Injury				
Overexertion/stress/other related	8	42 %	20	51 %
Motor vehicle crash	2	11	10	26
Fell	3	16	3	8
Structural collapse	3	16	0	0
Murder/manslaughter	1	5	2	5
Struck by vehicle	1	5	1	3
Struck by object	1	5	1	3
Lost inside structure	0	0	1	3
Trapped underwater	0	0	1	3
TOTALS	19	100 %	39	100 %
Nature of Fatal Injury				
Sudden cardiac death	6	32 %	19	49 %
Internal trauma/crushing	7	37	13	33
Asphyxiation (including smoke inhalation)	3	16	2	5
Gunshot	2	11	2	5
Stroke/aneurysm	0	0	2	5
Burns	1	5	0	0
Drowning	0	0	1	3
TOTALS	19	100 %	39	100 %
Rank				
Firefighter	13	68 %	26	67 %
Company officer	3	16	9	23
Chief officer	3	16	4	10
TOTALS	19	100 %	39	100 %

Table 1
Comparison of On-Duty Deaths Between
Career and Volunteer Firefighters, 2016* (Continued)

	Career Firefighters		Volunteer Firefighters	
	Number of Deaths	Percent of Deaths	Number of Deaths	Percent of Deaths
Ages of Firefighters – All Deaths				
25 and under	0	0 %	4	10
26 to 30	0	0	2	5
31 to 35	1	5	1	3
36 to 40	4	21	2	5
41 to 45	6	32	3	8
46 to 50	4	21	5	13
51 to 55	2	11	7	18
56 to 60	1	5	7	18
61 to 65	1	5	2	5
Over 65	0	0	6	15
TOTALS	19	100 %	39	100 %
Ages of Firefighters – Sudden Cardiac Deaths Only				
31 to 35	1	14 %	1	5 %
36 to 40	0	0	1	5
41 to 45	3	43	1	5
46 to 50	2	29	2	11
51 to 55	0	0	5	26
56 to 60	1	14	4	21
61 to 65	0	0	1	5
Over 65	0	0	4	21
TOTALS	7	100 %	19	100 %
Fireground Deaths by Fixed Property Use				
Dwellings	5	100 %	1	14 %
Wildland fire	0	0	3	43
Vehicle fire	0	0	2	29
Mercantile	0	0	1	14
TOTALS	5	100 %	7	100 %

Table 1
Comparison of On-Duty Deaths Between
Career and Volunteer Firefighters, 2016* (Continued)

	Career Firefighters		Volunteer Firefighters	
	Number of Deaths	Percent of Deaths	Number of Deaths	Percent of Deaths
Years of Service				
5 or less	2	11 %	9	23 %
6 to 10	1	5	5	13
11 to 15	6	32	4	10
16 to 20	4	21	4	10
21 to 25	4	21	3	8
26 to 30	1	5	5	13
Over 30	1	5	8	21
Not reported	0	0	1	3
TOTALS	19	100 %	39	100 %
Attributes of Fireground Deaths**				
Intentionally-set fires	3		0	
Search and rescue operations	3		0	
Motor Vehicle Crashes				
	2		10	
False alarms				
	0		0	

* This table does not include the 11 victims who were employees or contractors with federal or state land management agencies, or members of an industrial fire brigade or inmate fire crew.

** Because these attributes are not mutually exclusive, totals and percentages are not shown.

Figure 1
On-Duty Firefighter Deaths - 1977-2016

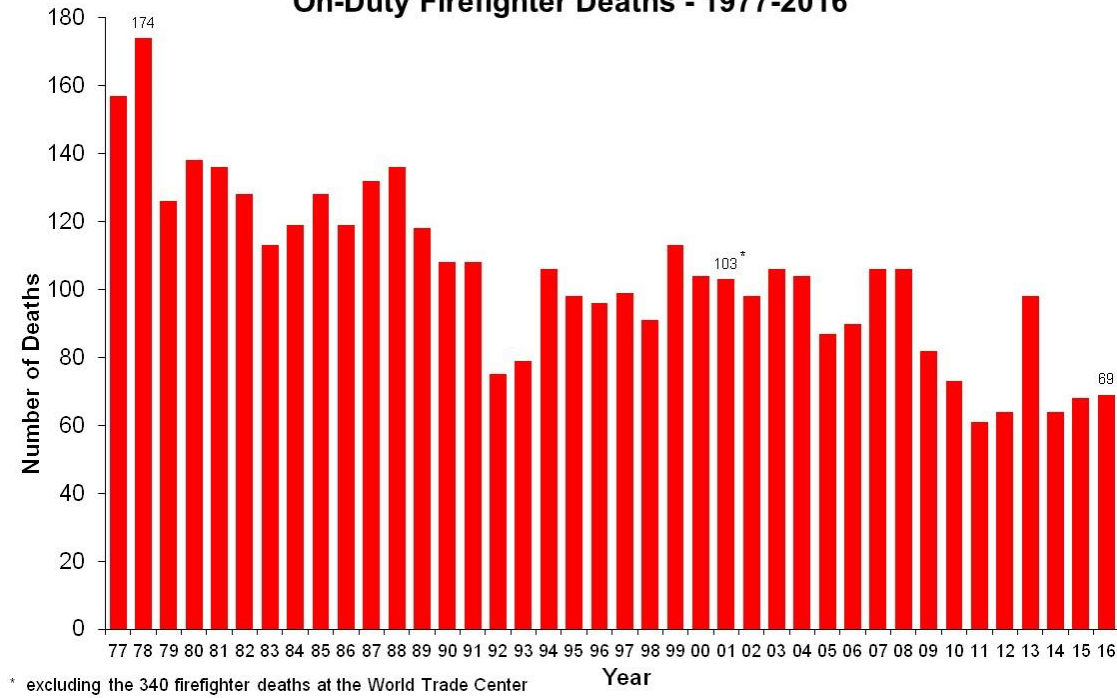


Figure 2
Firefighter Deaths by Type of Duty - 2016

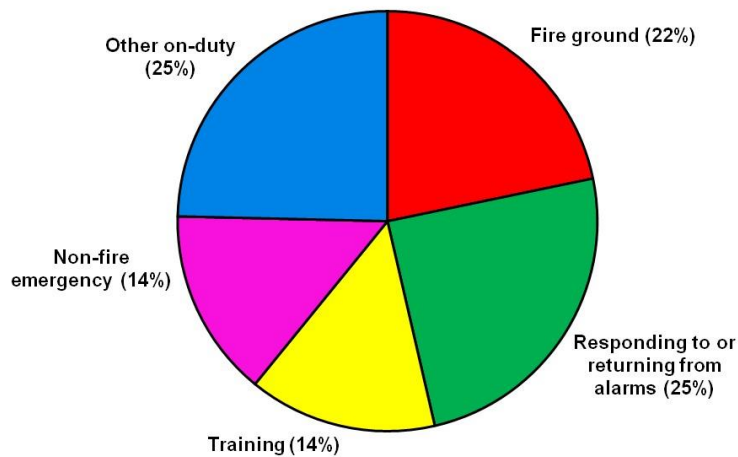


Figure 3
Firefighter Deaths by Cause of Injury -- 2016

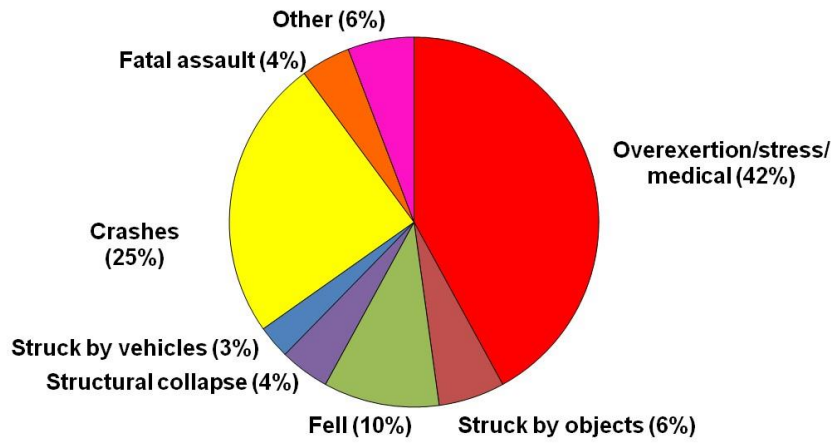


Figure 4
Firefighter Deaths by Nature of Injury -- 2016

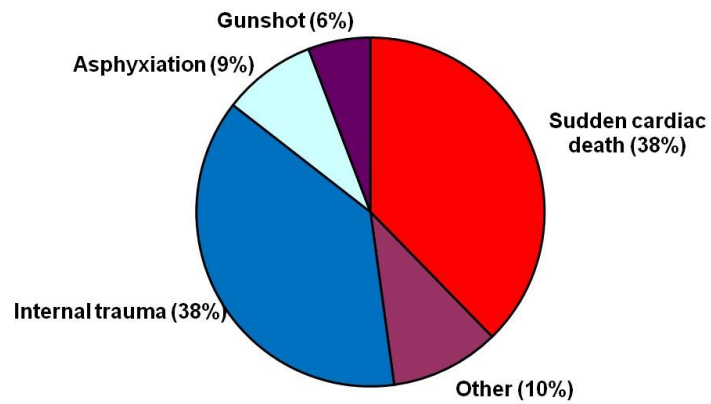


Figure 5
Firefighter Deaths by Age and Cause of Death
2016

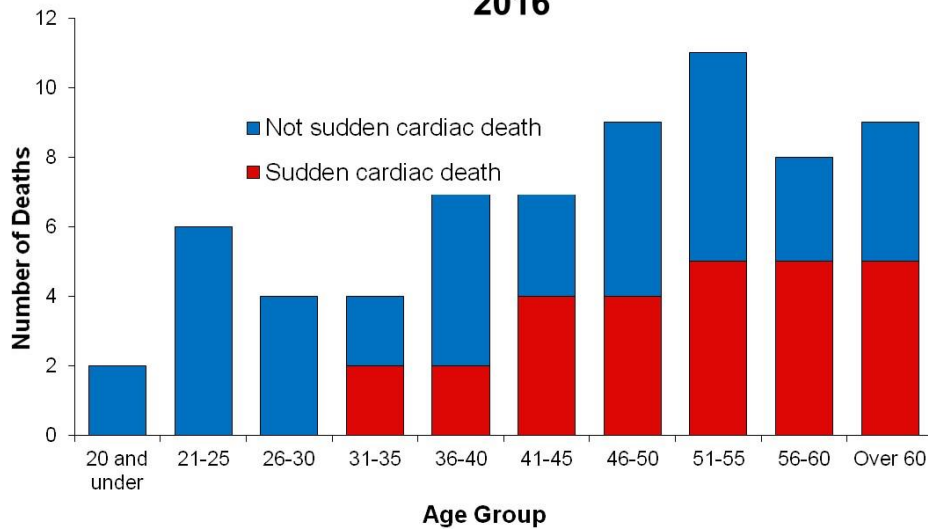


Figure 6
On-Duty Death Rates per 10,000 Career and
Volunteer Firefighters
2012-2016

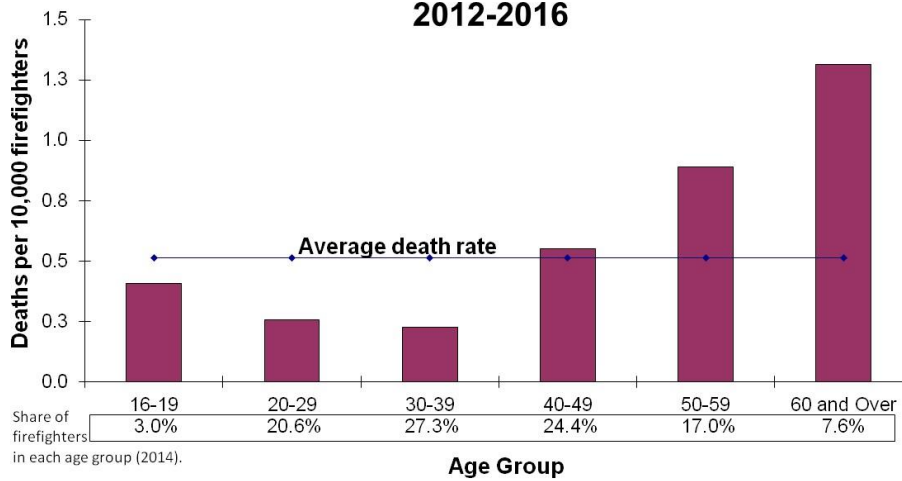
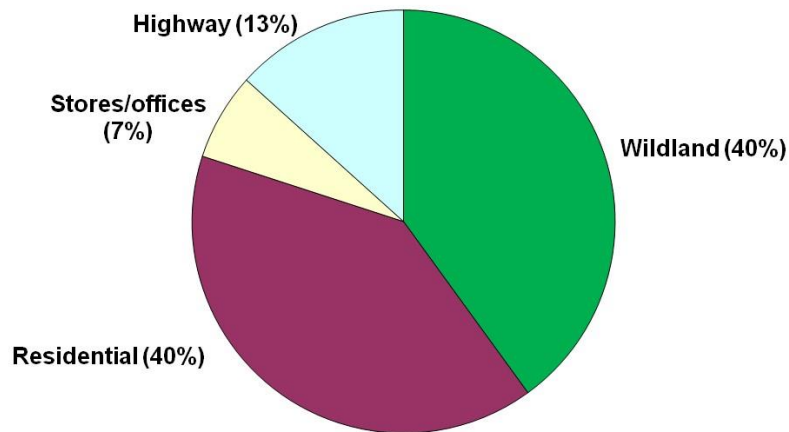


Figure 7
Fire Ground Deaths by Fixed Property Use*



* There were 15 deaths on the fire ground in 2016.

Figure 8
On-Duty Fire Ground Deaths
per 100,000 Structure Fires
2011-2015

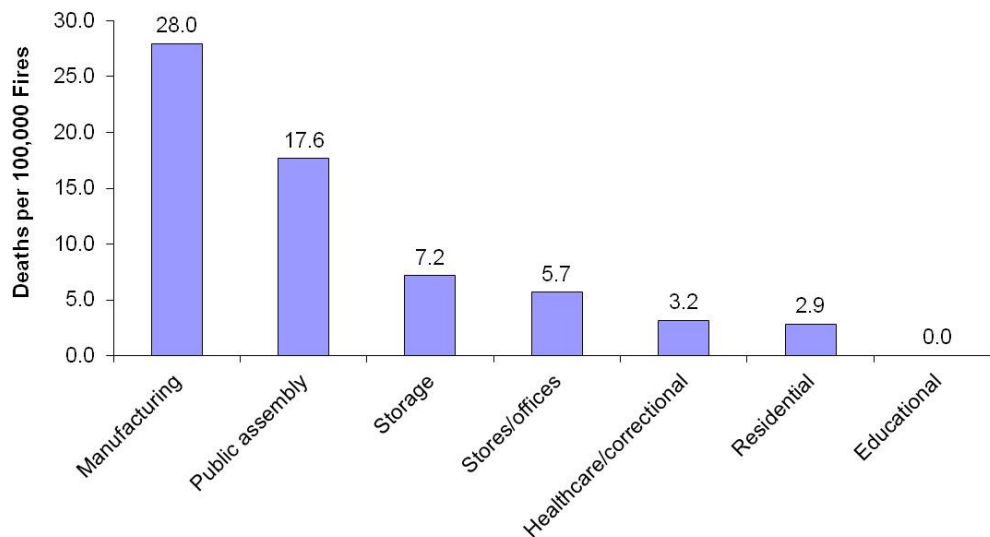
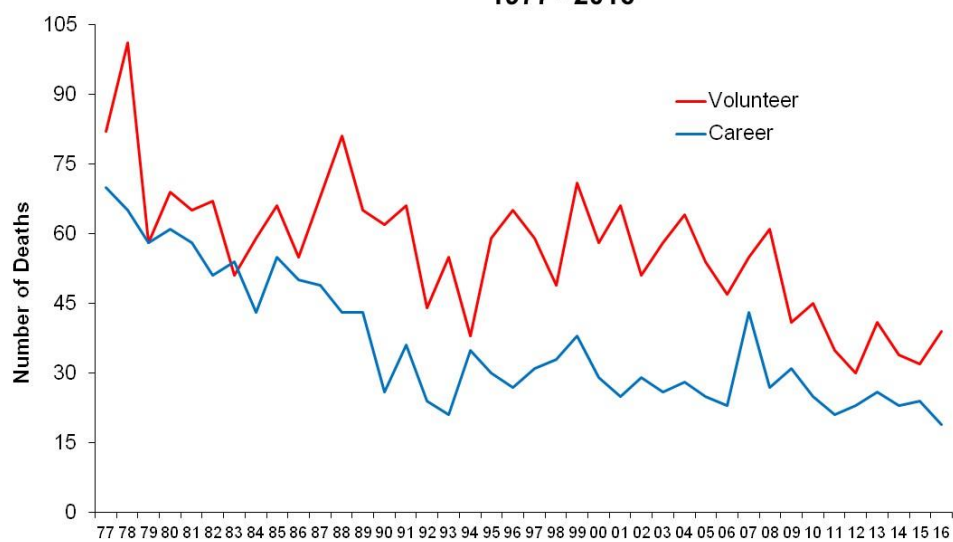


Figure 9
Career and Volunteer Firefighter Deaths
1977 - 2016*



* excluding the firefighter deaths at the World Trade Center in 2001

2016 Narratives

These incident summaries illustrate some of the issues and concerns in firefighter safety and health. When there is an NFPA standard, the subject matter of which is related to the incident, that document is identified. In identifying these standards, NFPA is not intending to assert causation, assign responsibility or opine as to compliance with such standards. The intention is to simply provide a reference to inform and educate about a specific topic. Free access for all NFPA standards is available at www.nfpa.org.

SUICIDE

On January 7, an on-duty 51-year-old fire chief with 34 years of service drove his department vehicle to a secluded, rural area alone. An investigation revealed that he died from a self-inflicted gunshot wound to the head. A note was left, but its contents were not revealed.

[NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, 2013 edition, chapter 11.](#)

SHOT ON ARRIVAL

On January 22 at 5:00 a.m., the dispatch center received a 911 call for a person suffering from a seizure and fire companies were immediately dispatched. Snowfall slowed the response, and the first responder on the scene was a 29-year-old fire lieutenant with nine years of service who responded from home. He entered the residence and was escorted by the wife of the seizure victim to their bedroom. As the lieutenant stood in the doorway assessing the situation, the seizure victim drew a .40 caliber handgun and shot the lieutenant five times. A neighbor on the premises notified the dispatch center that the lieutenant had been shot and the dispatcher instructed the caller to start cardiopulmonary resuscitation (CPR).

The dispatcher then warned the remaining responding personnel to stay outside the building until the police secured it. As soon as the police secured the building, an Advanced Life Support (ALS) unit made up of a paramedic, an emergency medical technician (EMT) and a firefighter went to the lieutenant and took over CPR and started the use of a bag valve mask for oxygenation which they continued until they were at the hospital. They also administered two intravenous lines and an electrocardiogram. The lieutenant was transported to a hospital where he was pronounced dead a short time later.

According to a toxicology report, the shooter, who was charged with manslaughter, was under the influence of a high level of cocaine. The shooter told investigators the reason he shot the fire lieutenant was that he entered the house without identifying himself or wearing a uniform.

CRASH DURING RESPONSE

On March 12 at 09:30 a.m., fire dispatch received a mutual aid request for assistance at a fire in a two-story, wood-frame, single-family dwelling.

A 68-year-old firefighter, the sole occupant of a mobile air unit, sustained fatal injuries when the truck he was driving left the road at an intersection for unknown reasons. After striking the curb and a street sign, the vehicle continued traveling close to 700 feet (213m) before stopping on an embankment in a field along a drainage ditch.

An off-duty nurse and two civilians provided aid before Emergency Medical Service (EMS) personnel arrived at the scene. The firefighter was transported to a hospital where he was pronounced dead a short time later. The death was determined to be due to blunt force trauma to the chest.

[NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*, 2017 Edition, section 4.3.](#)

[NFPA 1451, *Standard for a Fire and Emergency Service Vehicle Operations Training Program*, 2013 Edition.](#)

ENTRAPPED

On March 20, a 33-year-old member of a steel plant's industrial fire brigade was assigned the monthly duty of inspecting the fire extinguishers throughout the plant. The fire technician had six months experience with the fire brigade, 11 years with a local fire department and had been appointed recently to a part-time police officer position.

At 4:00 p.m., a plant security team found the technician deceased in a fifth-floor elevator motor room, an area not considered dangerous. They exited the room before becoming asphyxiated from a nitrogen enriched atmosphere that created an Immediately Dangerous to Life or Health (IDLH) environment. They returned after donning self-contained breathing apparatus (SCBA) and removed the fire technician from the room. An investigation later found that a leak in the nitrogen distribution system had filled the elevator motor room with nitrogen, displacing the oxygen and creating the IDLH atmosphere. Nitrogen is an odorless, colorless, tasteless and mostly inert diatomic gas. Nitrogen can be quite deadly, though. It can act as an asphyxiant and kill an individual in less than 40 seconds. It was used at this plant in the steel refining process to open and close valves for pneumatic equipment and to cool equipment.

The investigation also determined that the fire technician entered the IDLH environment unknowingly. He collapsed and died after briefly breathing the nitrogen-enriched atmosphere. Company employees and firefighters who responded took readings in the room where the technician was found and detected oxygen levels less than 4%. Suffocation can occur at just under a 19% oxygen level. The company discontinued the use of nitrogen as a result of the fatality. The cause of death was asphyxiation by nitrogen.

[NFPA 1072, *Standard for Hazardous Materials/Weapons of Mass Destruction Emergency Response Personnel Professional Qualifications*, 2017 Edition, chapter 4.](#)

[NFPA 1081, *Standard for Industrial Fire Brigade Member Professional Qualifications*, 2012 Edition.](#)

[NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*, 2013 Edition, chapter 4.](#)

STRUCK-BY

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.

[NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*, 2017 Edition, section 4.3.](#)

[NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, 2013 Edition, section 5.3.2.](#)

SUDDEN CARDIAC DEATH

On April 16 at 11:30 p.m., a 911 call sent the fire department to a single-family dwelling fire. The building covered 1500 square feet (144 square meters) of ground floor area. Firefighters encountered a large amount of fire in the structure on arrival. After a short time, the fire was knocked down and under control.

A 57-year-old fire lieutenant with 30 years of service, dressed in protective clothing but without his SCBA, entered the building with his company and began overhauling. A short time later, he collapsed. He was carried outside and CPR was immediately performed by on-scene personnel. He was transported to the hospital where he died from cardiovascular disease.

The cause of the fire was a malfunctioning electrical fan in a first-floor bedroom. Two adults and four children escaped even though the house was not equipped with smoke alarms.

[NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2013 Edition, section 8.5.](#)

[NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments*, 2013 Edition, chapter 7.](#)

TRAINING

On June 14 at 10:45 a.m., two on-duty firefighters were participating in an unsupervised rescue watercraft training session. One firefighter operated a rescue personal watercraft (PWC); the other, a 63-year-old firefighter with 21 years of service, rode on a personal watercraft sled attached to the PWC.

They were performing their practice maneuvers approximately 250 yards (228m) off shore during a high surf advisory when the operator of the PWC looked back after going over a wave and saw the other firefighter floating unconscious in the water. The unconscious firefighter was wearing an approved life vest and helmet at the time. The PWC operator jumped in the water as did others in the area including an off-duty firefighter. The firefighter was brought to shore where paramedics treated him and transported him to the hospital. The firefighter died two days later from blunt force trauma to the head and neck with cervical vertebrae fractures and a spinal cord injury.

[NFPA 1006, *Standard for Technical Rescuer Professional Qualifications*, 2017 Edition, chapter 20.](#)

[NFPA 1405, *Guide for Land-Based Fire Departments That Respond to Marine Vessel Fires*, 2016 Edition](#)

[NFPA 1670, *Standard on Operations and Training for Technical Search and Rescue Incidents*, 2017 Edition, Chapter 16](#)

VEHICLE MAINTENANCE

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.

[NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*, 2017 Edition.](#)

[NFPA 1451, *Standard for a Fire and Emergency Service Vehicle Operations Training Program*, 2013 Edition.](#)

[NFPA 1071, *Standard for Emergency Vehicle Technician Professional Qualifications*, 2016 Edition.](#)

DOZER CRASH

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.

EXPLOSION

On September 27 at 6:30 a.m., a neighbor called 911 to report the smell of natural gas coming from a nearby single-family dwelling. The building, a two-story structure of ordinary construction, covered 800 square feet (74 square meters) of floor area. Arriving fire companies were greeted with a strong odor of mercaptan, a harmless, non-toxic, colorless gas with a pungent odor similar to rotten eggs. It is mixed with the odorless natural gas to warn of or trace leaks. They traced the leak to the basement. Twenty minutes after arrival, firefighters shut the gas off.

The second level of the dwelling was being used to grow illegal marijuana and was well-sealed, providing little ventilation. A horrific explosion originated in the rear second-level bedroom approximately one hour after the initial alarm. The explosion reduced the house to rubble, sending portions of the roof through the air. One such section struck a battalion fire chief who was directing operations from the middle of the street. He was taken directly to a hospital where he died from his traumatic injuries. Six other firefighters sustained non-fatal injuries.

[NFPA 1001, Standard for Fire Fighter Professional Qualifications, 2013 Edition, chapter 5.](#)

RESPONDING

On September 19 at 10:00 a.m., a 61-year-old firefighter with 43 years of service was getting ready to respond to a call from his home when he tripped and fell, severely injuring himself. His wife called the fire station after firefighters returned from the call and notified the fire chief what had occurred.

The fire chief and firefighters responded to the firefighter's house where they found him still on the floor. They provided first aid and an ambulance transported the firefighter to the hospital. The next day, he suffered a heart attack but was resuscitated. On the following day at 4:50 a.m., he was pronounced dead at the hospital. The death certificate listed the nature of death as blunt force trauma to the trunk of his body.

The alarm was to assist the police gain entrance to a building that had been burglarized.

STRUCK BY

On October 29, a fire company was dispatched to a brush fire. During extinguishment, the apparatus was struck by a falling snag (tree limb) which broke into two pieces, one hitting the apparatus and the other hitting and injuring a 41-year-old firefighter.

The firefighter was pulling hose from the rear of a brush mini pumper when he was struck. The firefighter received medical attention immediately and was airlifted to a hospital. On November 17, he died from complications of blunt force traumatic injuries to his head.

[NEPA 1002, Standard for Fire Apparatus Driver/Operator Professional Qualifications, 2017 Edition.](#)
[NEPA 1051, Standard for Wildland Firefighting Personnel Professional Qualifications, 2016 Edition.](#)

SUDDEN CARDIAC DEATH

On November 7 at 11:55 p.m., the fire department was called for a fire in a tractor-trailer on the interstate. Just after the fire was extinguished, the fire chief was talking with a state police officer and the driver of the truck at the command post when he collapsed and fell to the ground, unresponsive. The firefighters and other first responders on scene performed CPR before the chief was transported to a hospital where he was pronounced dead. The nature of death was listed as a heart attack.

[NEPA 1582, Standard on Comprehensive Occupational Medical Program for Fire Departments, 2013 Edition, chapter 7.](#)

CRASH DURING RESPONSE

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.

[NEPA 1002, Standard for Fire Apparatus Driver/Operator Professional Qualifications, 2017 Edition.](#)
[NEPA 1451, Standard for a Fire and Emergency Service Vehicle Operations Training Program, 2013 Edition.](#)