



RESEARCH

Firefighter Fatalities in the US in 2021

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2021 Experience

COVID continued to play a large role in the on-duty firefighter fatality experience in 2021, with more than 60 deaths resulting from on-duty exposure to COVID. Many of the cases were tied to specific emergency calls, particularly medical calls, where firefighters were exposed to infected members of the public. Other cases were attributed to exposure at the fire station. This is an improvement over the 78 COVID deaths reported in 2020, but it still accounts for a significant share of the on-duty deaths in 2021.

As a result, the total number of on-duty firefighter deaths in 2021 continues higher than it has been since the late 1970s (with the exception of 2001). Of the 135 on-duty deaths in 2021, 65 were due to COVID. This report will focus on the 70 non-COVID deaths.

Figure 1 shows the trend over the years, excluding the 340 firefighter deaths on 9/11 and the cancer-related deaths of firefighters who responded to the World Trade Center that have occurred since 2001¹. The dashed line for 2020 and 2021 shows how the non-COVID deaths compare to deaths in previous years.

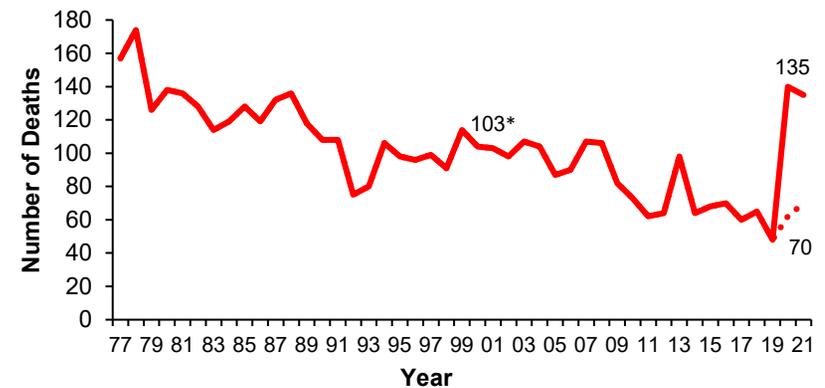
Of the 70 firefighters who died in the US while on duty in 2021, 35 were volunteer firefighters, 27 were career firefighters, seven were contractors to state and federal land management agencies, and one was a member of an industrial fire department².

There were two incidents with two fatalities in 2021. One was an aircraft crash on a wildland fire and the other was a structural collapse incident.

Analyses in this report will 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. The report will also highlight deaths on the fireground and in motor vehicle-related incidents.³

Finally, the report will present summaries of individual incidents that illustrate important concerns for firefighter safety.

Figure 1. On-Duty Firefighter Deaths: 1977–2021



* Does not include the 340 firefighter deaths at the World Trade Center in 2001.

This annual study includes only on-duty firefighter fatalities that occurred in the 50 states and the District of Columbia. In addition, a firefighter was killed in an apparatus crash in the Virgin Islands.

Introduction

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

- Being at the scene of an alarm, whether it is 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 fundraising
- Being on call or standby for assignment at a location other than 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 incurred as a result of actions while on duty

that proves fatal, and any fatal mishaps involving nonemergency occupational hazards that occur while on duty. The types of injuries included in the first category are mainly those that occurred 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 types of firefighters included in this study are the following:

- 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
- Members of facility or industrial fire brigades

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

In the case of COVID deaths, NFPA is following inclusion criteria similar to that used by the US Public Safety Officers' Benefits (PSOB) Program and the International Association of Fire Fighters (IAFF) in counting active on-duty firefighters who were working at the time their illness was diagnosed. The Safeguarding America's First Responders Act allows PSOB to recognize the eligibility of COVID-19 diagnoses for firefighters within 45 days of their last day on duty.

NFPA recognizes that other organizations report the number of duty-related firefighter fatalities using different, more expansive definitions, and some include deaths that occurred when the victims were off-duty. (See, for example, the [US Fire Administration](#) and [National Fallen](#)

[Firefighters Foundation](#) 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 exposure, however, cannot be estimated at this time due to 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 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.

Suicide: According to the [Firefighter Behavioral Health Alliance \(FBHA\)](#), 89 firefighters and 16 EMTs and paramedics died by suicide in 2021. (This number might change as new reports are validated by the FBHA.)

Recognition of the importance of behavioral health programs and peer support for firefighters has become widespread in recent years. 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.

Many programs exist to address these problems, including [Share the Load](#), an effort by the [National Volunteer Fire Council \(NVFC\)](#) that connects firefighters, EMTs, and their families with resources and support for their mental well-being. In June 2020, the NVFC launched a directory of licensed behavioral health professionals familiar with the

fire service culture to help improve access to behavioral health care for firefighters. The directory can be accessed on the Share the Load [web page](#).

In addition, the IAFF has offered advice on [establishing peer support programs](#). In October 2019, the IAFF launched a suicide reporting system for its members, and it has developed material on coping in the aftermath of a friend or colleague's death by suicide.

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.

Both the US House and Senate have introduced bills to establish a public safety officer suicide reporting system at the Centers for Disease Control and Prevention (CDC). This system would collect information on the incidence of suicide in this group and aid in the study of ways to reduce deaths by suicide among firefighters and other first responders by improving detection, prevention, and treatment of behavioral health issues. It would also fund peer support programs. It has not yet been passed.

NFPA 1500™, Standard on Fire Department Occupational Safety, Health, and Wellness Program, requires access to a behavioral health program that provides assessment, counseling, and treatment for such issues as “stress, alcohol and substance abuse, anxiety, depression, traumatic exposure, suicidality, and personal problems.” The goal of such programs is to change the culture of the fire service, help people to identify 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. Early recognition and treatment of behavioral health issues are key to addressing this problem.

Cancer: Cancer is well-recognized as a significant risk in the fire service. Attention has increasingly focused on cancer risks and cancer prevention in the fire service through research, education, behavioral changes, and a variety of controls to minimize exposure to contaminants. Although we cannot identify the total number of fire service-related cancer deaths that occur each year, the IAFF alone lists 81 firefighter cancer deaths in 2021 on its [website](#).

Multiple studies have shown a link between cancer and firefighting. [The National Institute for Occupational Safety and Health \(NIOSH\)](#) 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 US.

The first study was a multiyear project to examine the cancer risk in firefighters using the 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 among 20,000 firefighters from the same fire departments. [Results of the first phase](#), which showed 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.

A 30-year prospective [research study](#) on cancer in the fire service is currently underway. This project, unlike previous retrospective studies, will look at changes over time that might result from exposure to carcinogens. The initial phase of the study, funded by the Department of Homeland Security/Federal Emergency Management Agency Assistance to Firefighters Grants Program, created the framework for this long-term project.

In 2018, Congress passed legislation directing the CDC to develop and maintain a voluntary registry of firefighters in the US that can be used to monitor the incidence of cancer in the fire service. This data will be

linked to data in state cancer registries and will be available to researchers. NIOSH will develop and maintain the registry, which will be open to all current and former firefighters.

In efforts to raise awareness in the fire service of the heightened risk of cancer and ways to reduce exposure, valuable video presentations have been produced by organizations including, among others, the [Boston Fire Department](#), which has a dedicated website (takenosmoke.org) and YouTube channel. Other videos are available from the [University of Cincinnati](#) and the [Cincinnati Fire Department](#) and the [National Fallen Firefighters Foundation](#). These videos can help to inform firefighters of the steps they can take to address the hazards they face. The Firefighter Cancer Support Network is another excellent resource for access to information on health-related topics and support and mentorship following a cancer diagnosis.

Other efforts to inform safe practices in the fire service stem from research undertaken by the Fire Protection Research Foundation, including an ongoing [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 completed in 2012.

In addition, each year, the University of Miami conducts a symposium on cancer in the US fire service. The link to the most recent symposium can be found on their [website](#).

Cardiac issues: Heart disease and other cardiac issues have long been recognized as significant health risks in the fire service.⁴ Sudden cardiac death has consistently accounted for the largest share of on-duty firefighter deaths since NFPA began this study in 1977.

NFPA has several standards that focus on firefighter health risks. For example, [NFPA 1582, Standard on Comprehensive Occupational Medical Program for Fire Departments](#), outlines the medical requirements that must be met by candidate firefighters and incumbent

fire department members. [NFPA 1500](#) calls for fire departments to establish a firefighter health and fitness program that meets the requirements of [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 and fitness program is also available from other organizations, such as the [International Association of Fire Chiefs/IAFF Fire Service Joint Labor Management Wellness-Fitness Initiative](#) and the [National Volunteer Fire Council'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.

While this report focuses on deaths that resulted from specific on-duty activities, NFPA is focused on all aspects of health and safety in the fire service and EMS. One example is 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 cover the non-COVID on-duty fatalities in 2021.

Type of duty

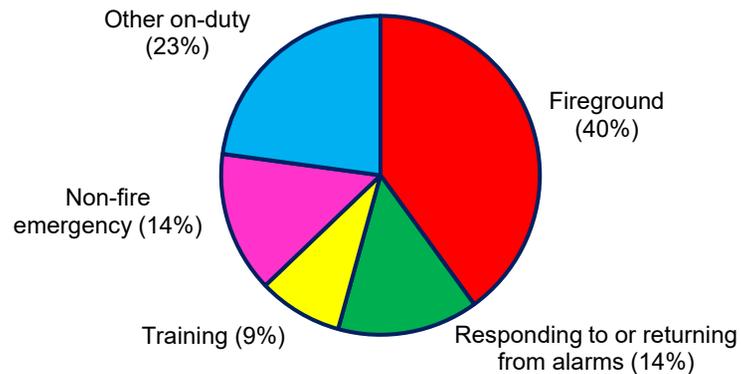
In this report, we look at four major categories of type of duty that firefighters were engaged in when they were fatally injured or suffered fatal medical events—on the fireground, at non-fire emergencies, responding to or returning from fires and emergency calls, and during training. The remaining deaths occurred while firefighters were engaged in other on-duty activities.

Figure 2 shows the distribution of the 70 deaths by type of duty. The largest share of deaths occurred while firefighters were operating at fires or explosions (28 deaths). Although this continues the clear

downward trend in deaths since the late 1970s, when the number of fireground deaths annually averaged more than 80 per year, this is higher than the average for the previous 10 years, and the highest total since 2013, when 33 firefighters were killed in three incidents.

Sixteen of the 28 deaths occurred at structure fires, nine on wildland fires or a prescribed burn, two involved vehicles, and one involved agricultural land. Sixteen of the 28 fireground victims were volunteer firefighters, six were career firefighters, and six were contractors to or employees of state or federal land management agencies. Ten of the deaths were cardiac-related and three others were due to medical issues.

Figure 2. Firefighter Deaths by Type of Duty: 2021



The deaths that occurred at structure fires are discussed in more detail later in this report.

Ten firefighters were killed while responding to or returning from alarms, the fourth time in the past five years that this total was 10 or lower. This is an improvement over the earlier years of this study, when deaths while responding to or returning from alarms tended to account for between a quarter and a third of the on-duty deaths. Five of these 10 firefighters suffered fatal cardiac events and five were killed

in crashes. All the vehicle-related and sudden cardiac deaths are discussed in more detail later in this report. Nine of the 10 victims were volunteer firefighters.

Ten firefighters died at non-fire emergencies. Of those, nine were operating at motor vehicle crashes and one fell from a bridge while searching for a reported brush fire. Six of the firefighters operating at motor vehicle crashes were struck by vehicles. One was electrocuted when he came into contact with downed power lines. One suffered a fatal cardiac event, and another suffered an aneurysm.

Six deaths occurred during training activities. Sudden cardiac death claimed the lives of all six. Two of the victims were recruits and one was a probationary firefighter—all three were in their 20s. The other firefighters were aged 31, 70, and 80. Two of the firefighters were involved in physical fitness training. One firefighter was involved in mask confidence training. One was at live burn training but his role in the training was not reported. The specific type of training was not reported for the other two firefighters.

The remaining 16 firefighter fatalities in 2021 involved a variety of normal station, administrative, or maintenance activities. Nine of these fatalities were due to sudden cardiac death, one to a stroke, and two to unspecified medical events. Two died by suicide. One firefighter was struck by a tire that exploded during maintenance. A firefighter was shot and killed at the station by a co-worker in a workplace violence situation.

Cause of fatal injury or illness

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

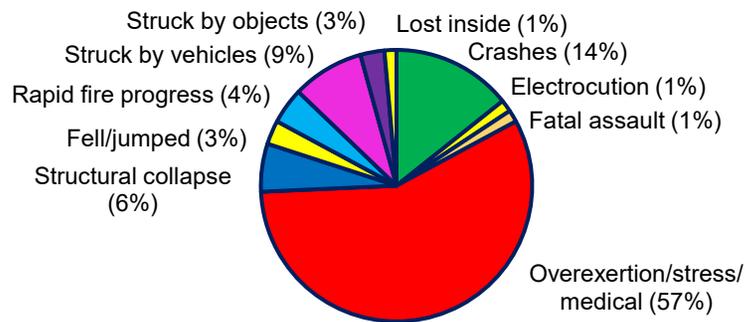
Overexertion, stress, and medical issues accounted for more than half of the deaths in 2021. Of the 40 deaths in this category, 29 were classified as sudden cardiac deaths (usually heart attacks) and four were due to

stroke. Two were deaths by suicide. One firefighter died after emergency surgery for the sudden onset of internal bleeding while operating at a fire. Four firefighters were found unresponsive, but no cause of death was reported yet. Further details on the sudden cardiac deaths are included later in this report.

Ten firefighters were killed in vehicle crashes. Six other firefighters were struck by vehicles. These vehicle-related deaths are discussed in detail later in this report.

Four firefighters were killed in structural collapses. In one incident, two firefighters were killed when the roof of a home collapsed while they were attempting to rescue trapped occupants. In separate incidents, two firefighters died in house fires when the floor collapsed, and they fell into the basement.

Figure 3. Firefighter Deaths by Cause of Injury: 2021



Three firefighters were caught by rapid fire progress—two while operating at structure fires and one while on a fire in a cornfield. Two firefighters fell or jumped; one, mentioned above, fell from a bridge, while the other victim was a smokejumper who was killed in a jump on a wildland fire in turbulent conditions.

A firefighter on a wildland fire was struck by a falling tree, and another firefighter doing apparatus maintenance was struck by an exploding tire.

One firefighter became lost inside a structure fire and was found unresponsive. A firefighter who was checking for victims at a motor vehicle crash came into contact with a power line and was electrocuted. One firefighter was fatally assaulted at the station by a co-worker.

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 the nature of the fatal injury or illness. As in almost every year since 1977, sudden cardiac death accounted for the largest share of the deaths, with 31 deaths. Sudden cardiac deaths will be discussed in more detail in the next section. Two other firefighters died as a result of unspecified medical issues.

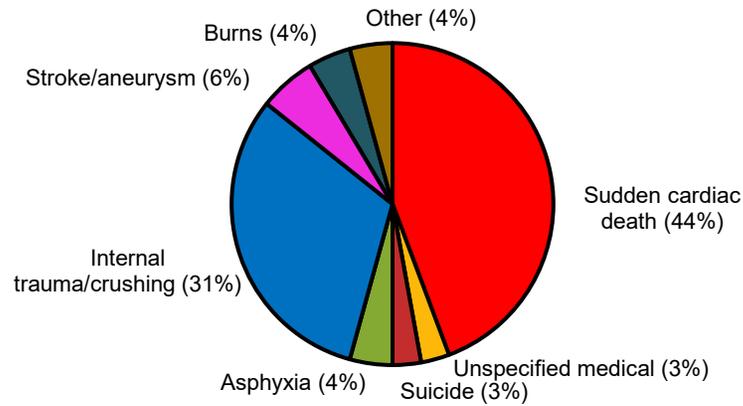
The next leading cause of death was internal trauma and crushing, with 22 deaths.

Four firefighters suffered fatal strokes or aneurysms. Three died of smoke inhalation and three were fatally burned. Two firefighters died by suicide. One firefighter was shot, one was electrocuted, and one suffered a bleeding episode and died after surgery.

Sudden cardiac deaths

In 2021, there were 31 sudden cardiac deaths with onset while the victim was on duty, accounting for the largest share of the deaths while on duty in 2021. Cardiac-related events have accounted for 43 percent of the on-duty fatalities over the past 10 years.

Figure 4. Firefighter Deaths by Nature of Injury: 2021



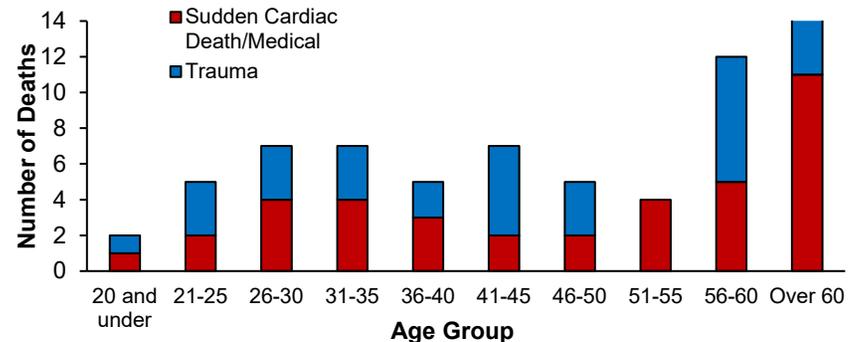
From 1977 through 1986, an average of 60 firefighters per year suffered sudden cardiac deaths while on duty (44.7 percent of the on-duty deaths during that period). These are cases in which the onset of symptoms occurred while the victim was on duty and death occurred immediately or shortly thereafter. The average number of sudden cardiac deaths fell to 44 per year in the 1990s and to 29 per year in the past decade.

Despite this reduction, sudden cardiac death continues to be the number one cause of on-duty firefighter fatalities in the US and, in almost every year, it has accounted for the single largest share of deaths in the year. In addition, countless deaths of current and former firefighters whose health was compromised during their years in the fire service occur annually. Each year, the US Fire Administration processes almost a dozen fatalities that could potentially qualify for federal death benefits under the Hometown Heroes Act (deaths within 24 hours of non-routine strenuous or stressful physical activity while on duty).

Ages of firefighters

The firefighters who died in 2021 ranged in age from 20 to 89, with a median age of 46.5 years. Figure 5 shows the distribution of firefighter deaths by age and whether the cause of death was due to trauma or to sudden cardiac death or another medical issue.

Figure 5. Firefighter Deaths by Age and Cause of Death: 2021

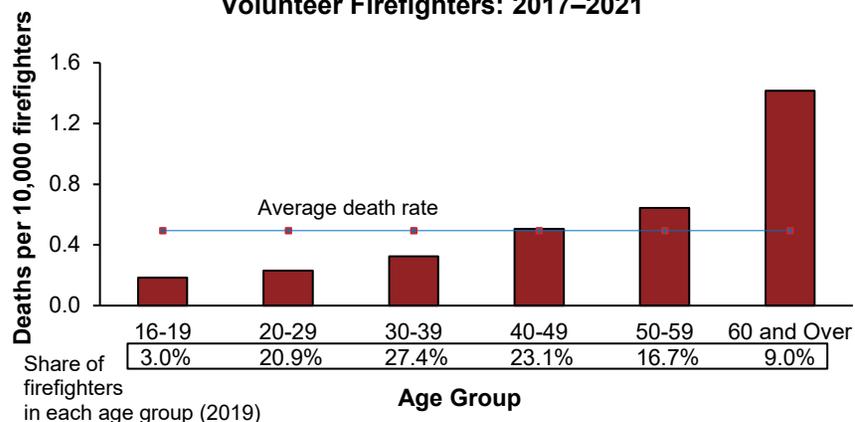


An unusual pattern appeared this year where a significant proportion of younger firefighters died of cardiac or other medical issues. Reporting on several of these deaths is still incomplete, so these breakdowns might change as more information becomes available.

Figure 6 shows the death rates by age, using combined career and volunteer firefighter fatality data for the five-year period from 2017 through 2021 and the estimated average number of career and volunteer firefighters in each age group from NFPA's 2019 profile of fire departments.⁶

The death rate was lowest for firefighters younger than 30; their death rate was less than half the all-age average. The death rate for firefighters aged 60 and over was almost three times the average. Firefighters aged 50 and over accounted for about half of all the on-duty firefighter deaths over the five-year period, although they represent only one-quarter of all the career and volunteer firefighters in the US.

Figure 6. On-Duty Death Rates per 10,000 Career and Volunteer Firefighters: 2017–2021



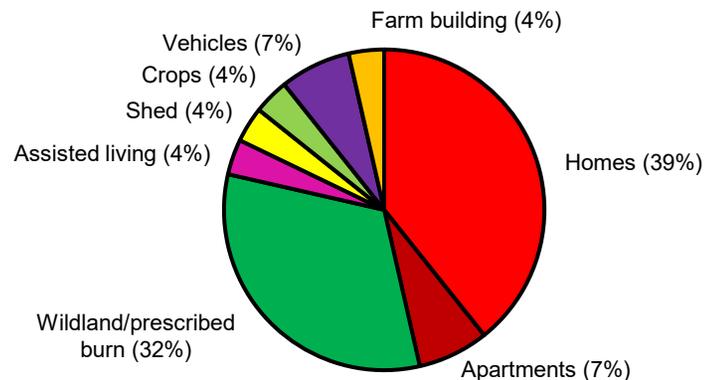
Fireground deaths

Of the 28 fireground fatalities in 2021, 10 were due to sudden cardiac death, nine were due to internal trauma or crushing injuries, three were due to asphyxia or smoke inhalation, and three were due to burns. Two firefighters suffered strokes and one the onset of internal bleeding mentioned above. Sixteen of the 28 deaths occurred at structure fires, 11 on wildland fires or a prescribed burn, two at vehicle fires, and one fire involved a cornfield.

Deaths at fires have maintained a general downward trend over the years of this study, but the 28 deaths in 2021 exceed the most recent 10-year average of 24.2 deaths. It is also the highest death toll at fires since 2013 when 33 firefighters were killed in three incidents.

Figure 7 shows the distribution of the 28 fireground deaths by fixed property use. The 16 deaths at structure fires include 11 in fires in one- and two-family homes, two in apartment buildings, and one each in an assisted living facility, a shed, and a chicken house.

Figure 7. Fireground Deaths by Fixed Property Use*



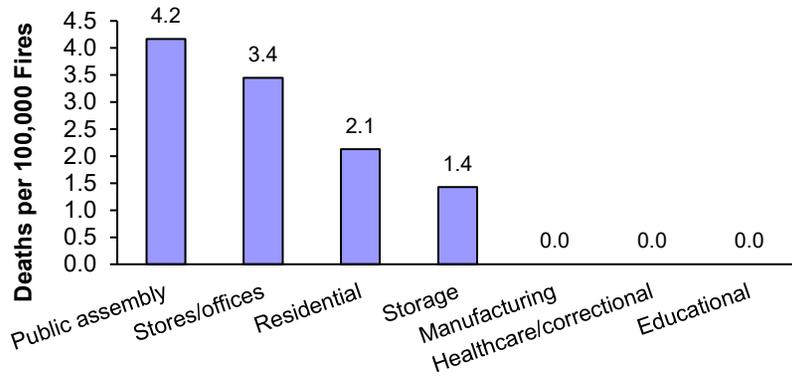
* There were 28 deaths on the fireground in 2021.

None of the structures in which firefighters died was reported to have had an automatic fire suppression system.

Of the nine firefighters who died on wildland fires incidents and a prescribed burn, three died in aircraft crashes, one died in a jump from a plane, two suffered sudden cardiac death, one was struck by an apparatus that was reversing, one was killed when her utility terrain vehicle overturned, and one was struck by a falling tree.

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 NFPA’s annual fire loss studies from 2016 through 2020 (the 2021 results are not yet available) and from the updated firefighter fatality data for the corresponding years. The results are shown in Figure 8.

Figure 8. On-Duty Fireground Deaths per 100,000 Structure Fires: 2016–2020



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 are as hazardous, if not more so, on average, to firefighters.

The highest death rates over the five-year period occurred in public assembly properties. The low death rate in educational and healthcare/correctional properties over that five-year period could 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. There were no deaths in these properties or manufacturing properties over that five-year period.

From 2012 through 2021, there were 13 deaths in 11 fires in vacant buildings and buildings under construction or renovation.

Vehicle-related deaths

In 2021, 16 firefighters died in vehicle-related incidents, including 10 firefighters who died in vehicle crashes and six who were struck by vehicles.

Five of the crash victims were responding to emergencies, four were operating on wildland fires or a prescribed burn and one was at the scene of a motor vehicle crash.

- A firefighter driving a fire department apparatus to a motor vehicle crash was attempting to pass an 18-wheeler on a two-lane road when the driver of the other vehicle started to make a left turn in front of him and the apparatus collided with the other vehicle. The victim was wearing a seatbelt and airbags deployed. The other driver was cited for unsafe driving.
- A firefighter driving his own vehicle responding to a motor vehicle crash lost control and rear-ended another vehicle that had stopped on the side of the interstate due to heavy rain. The firefighter was wearing his seatbelt and airbags deployed. Speeding and weather were factors in the crash.
- A firefighter driving his own vehicle from his home to the fire station to respond to a motor vehicle crash went off the right side of the road on a curve, striking a tree and a signpost. He was not wearing a seatbelt and was driving 60 mph (97 kph) in a 45-mph (72-kph) zone.
- A firefighter responding to a motor vehicle crash in a brush truck was killed when the vehicle overturned several times. No other details were available.
- A firefighter responding to a house fire in his own vehicle rear-ended a tractor trailer and became trapped in his vehicle, which then caught fire. No other details were reported.
- An employee and a contract pilot with a federal land management agency were doing visual reconnaissance and aviation command and control over a wildland fire when their aircraft crashed and burned. The left wing of the plane was found, unburned, almost a mile from the crash site. The incident is being investigated by the National Transportation Safety Board (NTSB).

- An air tanker operating over a wildland fire crashed into sloping and wooded terrain, killing the contract pilot—the only occupant. The aircraft was seen rocking as it approached the drop site, but no distress calls were received. The incident is still under investigation by the NTSB.
- A firefighter who had been working on a prescribed burn was killed when the driver of the utility terrain vehicle in which she was riding lost control of the vehicle. She fell from the vehicle and it rolled over her.
- A firefighter parked in his staff vehicle at the scene of a motor vehicle crash was killed when his vehicle was hit by a tractor-trailer. He was wearing his seat belt and the vehicle's emergency lights were operating. He was parked to shield the original crash site, but the other driver did not slow down.

Of the six firefighters who were struck by vehicles, three were struck by fire department vehicles and three were struck by non-fire department vehicles. Five of the six were operating at the scenes of motor vehicle crashes and one was operating on a brush fire. In most cases, details about the lighting conditions and the victim's visibility were not available.

- A fire police officer handling traffic at the scene of a motor vehicle crash was killed when a department vehicle backed up, hitting her. No other details were available.
- A firefighter acting as spotter for a rescue truck was killed when it hit her as it was backing up. No other details were available.
- A firefighter was struck by a department apparatus as it was being repositioned. The vehicle did not have a backup camera.
- After finishing up at the scene of a motor vehicle crash, a firefighter was guiding a vehicle that was trying to turn around when he was struck by a passing vehicle.

- Three firefighters and a police officer were preparing to leave the scene of a motor vehicle crash on an interstate when they were struck by a drunk driver. One of the firefighters was killed.
- A firefighter working at the scene of a motor vehicle crash on an interstate was killed by a vehicle traveling past the scene at 75 mph (120 kph).

NFPA publishes several standards related to road and vehicle safety issues, including the following:

- [NFPA 1002](#), *Standard for 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 Service 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 Emergency Vehicles*, details a program for ensuring that fire apparatus are serviced and maintained to keep them in a safe operating condition.
- [NFPA 1901](#), *Standard for Automotive Fire Apparatus*, addresses vehicle stability to prevent rollovers and gives manufacturers options on how to provide such stability. New vehicles must have their maximum speed limited based on their weight and must have vehicle data recorders to monitor acceleration and deceleration and seatbelt use, among other things.

- [NFPA 1906](#), *Standard for Wildland Fire Apparatus*, establishes minimum design, performance, and testing requirements for new vehicles over 10,001 lb (4,500 kg) gross vehicle weight rating that are specifically designed for wildland fire suppression.
- [NFPA 1917](#), *Standard for Automotive Ambulances*, defines the minimum requirements for the design, performance, and testing of new automotive ambulances intended for use under emergency conditions to provide medical treatment and transportation of sick or injured people to appropriate medical facilities.
- [NFPA 1091](#), *Standard for Traffic Incident Management Personnel Professional Qualifications*, originally published in 2015, identifies the minimum job performance requirements necessary to conduct 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 the 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](#) include requirements that operators successfully complete an approved driver training program, possess a valid driver's license for the class of a 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. Passengers are required to remain seated and must not release or loosen their seatbelts for any reason while the vehicle is in motion.

Drivers must obey all traffic signals and signs and follow all the laws and rules of the road. These rules include coming to a complete stop at red traffic lights, stop signs, stopped school buses with flashing warning lights, blind intersections, and other hazardous intersections, as well as unguarded railroad grade crossings. In related efforts, the US

Fire Administration has a [website](#) with resources on emergency vehicle and roadway operations safety.

The focus of vehicle safety programs should not exclusively be on fire department apparatus, as, over the years, private vehicles have been the vehicles most frequently involved in road crashes. [NFPA 1500](#) includes a requirement that when members are authorized to respond to incidents or fire stations in private vehicles, the fire department must establish specific rules, regulations, and procedures related to the operation of those vehicles in emergency mode. [NFPA 1451](#) also requires training for those using privately-owned vehicles.

Requirements are also in place for emergency personnel operating on roadways. The 2009 version of the Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD), revised in 2012, requires anyone working on a roadway to wear a visibility vest compliant with ANSI 107, *High-Visibility Safety Apparel*. An exemption was created for firefighters and others engaged on roadways that allows them to wear NFPA-compliant personal protective clothing (turnout gear) when directly exposed to flames, heat, and hazardous material.

The 2018 edition of [NFPA 1500](#) has a chapter on traffic incident management that requires training on safety at incidents on roadways. It also sets requirements for wearing high-visibility garments, using fire apparatus in a blocking position to protect firefighters, and using advance warning devices to caution oncoming drivers about operations on the roadway.

The 2009 edition of NFPA 1901 requires that breakaway high-visibility vests compliant with ANSI 207, *High-Visibility Public Safety Vests*, be carried on all new fire apparatus; MUTCD 2009 also allows emergency responders to use them in lieu of ANSI 107-compliant apparel. Advice on compliance with the updated Federal rules can be found on the [MUTCD](#) website. [NFPA 1901](#) also requires reflective striping for improved visibility on new apparatus and a reflective chevron on the rear of fire apparatus.

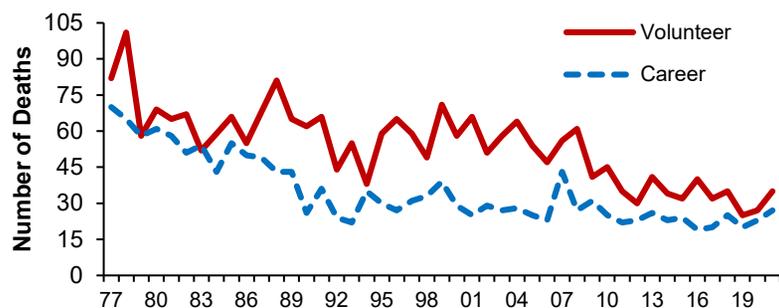
Career/volunteer comparison

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 35 deaths of volunteer firefighters in 2021 is higher than the average over the past 10 years (33 deaths per year), and reverses the decline observed in the previous two years. It is, however, far lower than the average of 67 deaths per year in the earliest years of this study.

The 27 deaths of career firefighters while on-duty in 2021 continue the trend over the previous 10 years where the total has been in the 20s or lower, but it is the highest total since 2009. In the earliest years of this study, the annual average number of deaths of career firefighters while on duty was 57.

A breakdown of the fatalities of the 62 career and volunteer firefighters killed in 2021 is shown in Table 1.

Figure 9. Career and Volunteer Firefighter Deaths: 1977–2021*



* Excluding the firefighter deaths at the World Trade Center in 2001 and the COVID deaths in 2020 and 2021.

Intentional fires and false calls

In 2021, no reports indicated that firefighters were killed at fires that were deliberately set, though reporting at this time might be incomplete. From 2012 through 2021, 31 firefighters (4.6 percent of all on-duty deaths in that time span) died in connection with intentionally set fires, either at the fire or while responding to or returning from the fire.

In 2021, one firefighter died while searching for a reported brush fire. Over the past 10 years, six firefighter deaths have resulted from false calls, including malicious false alarms and alarm malfunctions.

In summary

The hazardous nature of firefighting cannot be fully captured in a study that focuses only on the deaths that occur while firefighters are on the job. However, it is not possible to accurately assess the total number of deaths and injuries that have resulted annually due to long-term exposure to carcinogens and physical and emotional stress and strain.

This report focuses on the non-COVID deaths of firefighters resulting from specific injuries or exposures while on duty in 2021. A complete picture of duty-related fatalities would also include the cancer, cardiac, stress, and other fatalities that were caused by exposure to toxins or the emotional toll of responses. Other sources can provide some perspective on these aspects of the overall fatality problem.

As mentioned above, the IAFF website lists 81 firefighter cancer deaths that were reported to them in 2021 and the FBHA reported that 89 firefighters and 16 EMTs and paramedics died by suicide in 2021. Over the past several years, in their annual report on US firefighter deaths, the US Fire Administration has included an average of 15 firefighters per year who qualified for Hometown Heroes Act benefits, which cover firefighters who suffer a heart attack or stroke within 24 hours of engaging in non-routine stressful or strenuous activity on duty.

COVID continued to have an impact in 2021, though the death toll was lower than in 2020. This has resulted in a sharp increase in the total number of on-duty firefighter deaths in the past years, but it is expected that these numbers will drop in the future as the pandemic wanes.

Looking at the non-COVID deaths, the trend is higher than in previous years, but for the ninth time in 10 years, the total is 70 or lower. As shown in Figure 1, there has been an interesting trend since this study began in 1977. For the first 15 years, the annual total number of deaths averaged about 133. Then in the early 90s, there was a sharp drop that leveled out for approximately 15 years with an average of 100 deaths per year. Over the past 10 years, the average number has been below 70 deaths per year.

Sudden cardiac deaths continue to account for the largest share of deaths, although the number of deaths each year is lower than in the past.

Some concerning findings from 2021 include the six cases of firefighters being struck by vehicles while operating at incidents, almost all of which were at the scene of motor vehicle crashes.

There were also two reported deaths by suicide and one murder in a case of workplace violence.

References

¹ NFPA's files for on-duty fatal injuries to firefighters are updated every year.

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 incidents such as falls from vehicles or being struck by vehicles where

the involvement of the vehicle played an integral role in the death.

⁴ E. S. Soteriades, et al., "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 Averages were calculated from the following 2019 fire department profile report: R. Fahy, B. Evarts, and G. Stein, "US Fire Department Profile 2019 — Supporting Tables," National Fire Protection Association: Quincy, MA, 2021.

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Table 1. Comparison of On-Duty Deaths of Career and Volunteer Firefighters: 2021*

	Career Firefighters		Volunteer Firefighters	
	Number of Deaths	Percent of Deaths	Number of Deaths	Percent of Deaths
Type of duty				
Operating at fireground	6	22%	16	46%
Responding to or returning from alarms	1	4%	9	26%
Operating at non-fire emergencies	5	19%	5	14%
Training	4	15%	2	6%
Other on-duty activity	11	41%	3	9%
TOTALS	27	100%	35	100%
Cause of fatal injury				
Overexertion/stress/other related medical	18	67%	20	57%
Rapid fire progress	0	0%	3	9%
Struck by vehicle	2	7%	4	11%
Motor vehicle crash	1	4%	5	14%
Fell	1	4%	0	0%
Structural collapse	2	7%	2	6%
Lost inside	1	4%	0	0%
Assault	1	4%	0	0%
Struck by equipment	1	4%	0	0%
Contact with electricity	0	0%	1	3%
TOTALS	27	100%	35	100%
Nature of fatal injury				
Sudden cardiac death	14	52%	17	49%
Internal trauma/crushing	5	19%	11	31%
Asphyxia, including smoke inhalation	3	11%	0	0%
Burns	0	0%	3	9%
Stroke	3	11%	1	3%
Gunshot	1	4%	0	0%
Suicide	1	4%	1	3%
Electrocution	0	0%	1	3%
Unspecified medical symptoms	0	0%	1	3%
TOTALS	27	100%	35	100%

Table 1. Comparison of On-Duty Deaths of Career and Volunteer Firefighters: 2021* (Continued)

	Career Firefighters		Volunteer Firefighters	
	Number of Deaths	Percent of Deaths	Number of Deaths	Percent of Deaths
Rank				
Firefighter	17	63%	20	57%
Company officer	6	22%	8	23%
Chief officer	4	15%	7	20%
TOTALS	27	100%	35	100%
Ages of firefighters — All deaths				
20 and under	1	4%	0	0%
21 to 25	2	7%	3	9%
26 to 30	4	15%	2	6%
31 to 35	3	11%	4	11%
36 to 40	3	11%	1	3%
41 to 45	5	19%	2	6%
46 to 50	2	7%	1	3%
51 to 55	3	11%	1	3%
56 to 60	4	15%	6	17%
61 to 65	0	0%	6	17%
Over 65	0	0%	9	26%
TOTALS	27	100%	35	100%
Ages of firefighters — Sudden cardiac deaths only				
21 to 25	2	15%	0	0%
26 to 30	2	15%	0	0%
31 to 35	2	15%	1	6%
36 to 40	1	8%	1	6%
41 to 45	1	8%	0	0%
46 to 50	0	0%	1	6%
51 to 55	3	23%	1	6%
56 to 60	2	15%	2	13%
61 to 65	0	0%	2	13%
Over 65	0	0%	8	50%
TOTALS	13	100%	16	100%

Table 1. Comparison of On-Duty Deaths of Career and Volunteer Firefighters: 2021* (Continued)

	Career Firefighters		Volunteer Firefighters	
	Number of Deaths	Percent of Deaths	Number of Deaths	Percent of Deaths
Fireground deaths by fixed property use				
Dwellings	5	83%	6	38%
Apartment buildings	1	17%	1	6%
Assisted living	0	0%	1	6%
Shed	0	0%	1	6%
Chicken house	0	0%	1	6%
Crops	0	0%	1	6%
Wildland fire	0	0%	3	19%
Vehicles	0	0%	2	13%
TOTALS	6	100%	16	100%
Years of service				
5 or fewer	9	33%	4	11%
6 to 10	3	11%	10	29%
11 to 15	1	4%	3	9%
16 to 20	9	33%	1	3%
21 to 25	2	7%	2	6%
26 to 30	2	7%	1	3%
Over 30	1	4%	12	34%
Not reported	0	0%	2	6%
TOTALS	27	100%	35	100%
Attributes of fireground deaths**				
Intentionally set fires	0		0	
Search and rescue operations	1		3	
Motor vehicle crashes	1		5	
False alarms	1		0	

*This table does not include the eight victims who were employees or contractors with federal or state land management agencies or the employee of an industrial fire department.

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

2021 Firefighter Fatality Narratives

Battalion Chief found dead in command vehicle at structure fire

Fire companies were dispatched at 10:52 a.m. to a reported residential structure fire. On arrival, companies found heavy smoke coming from the one-story home and reported a working fire. The 41-year-old battalion chief arrived and took command of the incident with approximately 20 firefighters working to contain the fire. The fire was reported under control in 30 minutes.

During salvage and overhaul operations, crews found the battalion chief unresponsive in his command vehicle. Life-saving measures were immediately taken, and the chief was transported to the hospital where he later died. The medical examiner reports the cause of death as an acute intravascular cerebral hemorrhage.

Firefighter succumbs to COVID virus after contact with infected patient

A 48-year-old firefighter responded to a request for medical aid. On arrival, crews confirmed the presence of a patient who had recently tested positive for the COVID-19 virus. During the course of their treatment and transport of this patient, the crews were exposed to the virus. After a hard-fought battle, one firefighter was unable to recover and succumbed to the virus approximately 6 weeks later.

This is just one of many similar scenarios involving firefighters throughout the United States, showing the deadly toll the COVID virus took on the fire service in 2021.

Fire Chief Dies while Operating at MVA

A 57-year-old fire chief responded with a rescue unit and EMS to a motor vehicle crash. On arrival, crews discovered the vehicle had rolled down a 20-foot (6-meter) embankment. During the course of

the extrication of the victims, the chief made several trips up and down the embankment. On his last trip down, he turned to speak with the other rescuers when he collapsed, falling back down the hill. The chief was unresponsive as the rescuers attempted life-saving measures. He was transported to the hospital where he was pronounced dead of an apparent heart attack.

Smokejumper killed in hard landing during wildfire response

A 36-year-old smokejumper/firefighter died from injuries sustained while jumping from a plane during a wildfire response.

At approximately 2:46 P.M., the incident commander of a large wildland fire ordered a load of smokejumpers due to the remote location of the fire. The team, consisting of eight jumpers, two spotters, and the pilot, responded to the call. Once the plane arrived at the jump site, the smokejumpers began to exit the plane.

The victim was sixth in line to jump from the plane. Reports state some of the other jumpers reported turbulence, control issues, harder than usual landings, and minor injuries. The jumpers already on the ground witnessed the victim's hard landing at the base of a rocky ravine. They immediately called out to him while they made their way over to assess his injuries. When they arrived at the victim, they determined he was unresponsive with serious head and neck injuries.

Medical care was immediately provided on scene and the victim was airlifted and transported to the hospital. Despite receiving immediate care and transport from the scene, he succumbed to his injuries approximately 10 days later.

Floor collapse at residential structure fire

A 46-year-old fire captain was killed while operating at a residential structure fire. Dispatch received a call at approximately 4:48 pm for a reported house fire after a possible lightning strike. Due to just

clearing a residential alarm and being in close proximity to the location, the second-due engine company was first to arrive on the scene. The three-person crew immediately stretched a 1 ¾-inch (4.4-centimeter) attack line to the rear of the large, two-story wood-frame residential structure where they were met with heavy fire conditions. As additional companies were arriving and deploying additional attack lines, the captain at some point entered the structure.

Shortly after that, the first floor collapsed, sending the captain into the basement. He was immediately able to transmit a Mayday. Companies were sent to the basement level to initiate a rescue. The captain remained in radio contact for a short time as companies were having difficulty accessing the basement due to heavy fire conditions.

By the time the captain was located, he was unconscious and in cardiac arrest. He was extricated from the structure and advanced life support measures were initiated. He was immediately airlifted to the hospital where he was pronounced dead. According to the medical examiner, the cause of death was ruled to be the inhalation of the products of combustion. The cause of the fire remains under investigation.

38-year-old fire lieutenant killed in floor collapse

At 11:04 a.m., 911 received a call for a reported structure fire. They immediately dispatched the local fire department as well as the automatic aide assignment from the neighboring town. The fire chief was the first to arrive at the home, located in a rural part of town that was not serviced by any fire hydrants.

The chief notified the incoming engine of a one-story, ranch-style dwelling with a fully involved attached garage and extension to the interior. The chief received a verbal report that all the occupants had

exited the building and he then established incident command (IC). On arrival, the first due engine company initiated an exterior attack on the garage side (Charlie side). The crew then repositioned to the front of the structure (Alpha side) and met up with the crew of two from the automatic aide department, a firefighter and the 38-year-old lieutenant. The two crews entered the structure and began an interior attack. Upon entry, they discovered that fire had spread throughout the attic space. The entire interior crew exited for SCBA cylinder changes.

The automatic aid engine crew re-entered the dwelling and began pulling ceilings in separate rooms on the first floor. The firefighter ran out of air and exited the building to rehab, and two additional firefighters were assigned to the lieutenant who was still working inside. During the operations, it was reported that fire was burning below the crews working inside. It is not known if that information was received by the IC.

Approximately one hour into the incident, a partial floor collapse occurred, and a Mayday was transmitted by an unknown firefighter. An accountability report was performed but it failed to identify the missing lieutenant. It was only at this point that the IC confirmed with the owners that the dwelling had a basement.

Approximately 30 minutes after the initial Mayday, firefighters at the scene realized the lieutenant of the automatic aid company had not been accounted for. A rapid intervention team was assembled and attempted to enter the basement. Due to the large amount of debris from the collapse, the rescue crew was unable to enter the basement via the stairs. They then accessed the basement through a hole in the first floor and were able to locate the victim using the sound of his activated PASS device. When they reached him, he was unresponsive and not breathing, with his SCBA intact but out of air. He was removed from the basement and life-saving measures were

initiated. He was transported to the local hospital where he was pronounced dead at 1:41 a.m. According to the medical examiner, the cause of death was listed as asphyxia due to the inhalation of the products of combustion.

Wildland firefighter killed in UTV accident during prescribed burn

A 20-year-old wildland firefighter was killed when the utility terrain vehicle (UTV) on which she was a passenger rolled over. At approximately 4:45 p.m., a crew consisting of a division holding boss, a division firing boss, and one firefighter (the victim) boarded their UTV to be transported to a debriefing at the conclusion of their duties at a prescribed burn.

On arrival at the debriefing area, they needed to maneuver around a parked UTV by going over an approximately 1 ½-foot (46-centimeter) waterbar, which is described as an earthen berm. As the UTV began to navigate over the berm, the vehicle suddenly accelerated and suffered a loss of control. The vehicle veered to the right, hitting the bank on the side of the road, then, after another unexplained burst of acceleration, it veered sharp left, crossing the road and hitting a tree on the left road bank. The UTV stopped briefly, then began to roll back and to the right.

At that point, the firefighter tried to exit the UTV, but she fell from the vehicle as it rolled to the passenger side. Attempts by the other passengers to pull her out of the way were unsuccessful. The firefighter was struck in the head by the vehicle's rollbar as it rolled over her, causing a serious head injury. It was reported that the victim was wearing her helmet, but it was dislodged during the initial stages of the accident.

Emergency Medical Technicians already on the scene began immediate care and treatment. The firefighter was transported by Medevac helicopter to the hospital where she succumbed to her injuries two days later. The other two occupants were either thrown clear of the vehicle or jumped clear, avoiding serious injury. The UTV was evaluated during the investigation and was found to have no mechanical defects.

41-year-old fire lieutenant falls from bridge

A motorist traveling in the area of the incident reported a possible wildfire to fire dispatch. An engine company staffed with two firefighters and a lieutenant was dispatched at 9:45 p.m.

Upon arrival and initial investigation, no evidence of a fire was found in the reported area. The company then relocated to a bridge above the valley to continue their investigation from a better vantage point. The bridge was approximately 100 feet (30.5 meters) above the valley where the fire was reported to be located.

On arrival at the bridge, the lieutenant and one firefighter exited the apparatus to look for signs of the wildfire from above the reported location. Shortly thereafter, the lieutenant fell from the bridge to the road below. The lieutenant was pronounced dead at the scene. The investigation into this incident is ongoing, but no foul play is suspected.

US 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 expanded 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 Act in 2001 increased the benefit to \$250,000. As of October 1, 2021, the current benefit is \$389,825, 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 can be paid to the officer's children who would be eligible to receive it but for their age (i.e., adult children).

The Safeguarding America's First Responders Act (SAFRA) allows PSOB to recognize the eligibility of COVID-19 deaths based on the law's criteria: <https://www.congress.gov/bill/116th-congress/senate-bill/3607>.

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 can apply for PSOEA funds for up to 45 months of full-time classes. As of October 1, 2021, the maximum benefit a student may receive is \$1,298 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 or email the Public Safety Officers' Benefits Office, Bureau of Justice Assistance, Office of Justice Programs, U.S. Department of Justice. The telephone number is (888) 744-6513 and the email address is AskPSOB@usdoj.gov. Please note that the PSOB Customer Resource Center is available to take calls Monday through Friday from 8:00 a.m. until 4:30 p.m. ET. PSOB death claims can be filed online at: <https://www.psob.bja.ojp.gov/benefits/>.