

chapter five

Firefighter Casualties

This chapter presents the details of on-duty firefighter deaths and injuries (casualties), focusing on 2001. The term on duty refers to being involved in operations at the scene of an emergency, whether it is a fire or nonfire incident; responding to or returning from an incident; performing other officially assigned duties such as training, maintenance, public education, inspection, investigations, court testimony, and fundraising; and being on call, under orders, or on standby duty except at the individual's home or place of business. Ten-year (1992–2001) trends of casualties also are examined.

DEATHS

This discussion of firefighter fatalities is a synopsis of the U.S. Fire Administration's (USFA's) report, *Firefighter Fatalities in the United States in 2001*, USFA FA–237, August 2002. Supplemental data from USFA's firefighter fatality database are also included. No data from the National Fire Incident Reporting System (NFIRS) are used.

The fire service, and the nation, suffered a catastrophic loss of 341 firefighters in the World Trade Center (WTC) on September 11, 2001. This 1-day loss of firefighters, unparalleled in the annals of U.S. history, was more than triple the average number of firefighter deaths over an entire year and nine times greater than other 2001 firefighter deaths on the fireground. Although an analysis of firefighter deaths cannot ignore this event, the 10-year trends and 2001 focus become so skewed from the norm as to make comparisons from year to year difficult. Most of the charts in this section, therefore, exclude firefighter fatalities from the WTC event, except where the magnitude of that tragedy needs to be emphasized.

In 2001, 443 firefighters died, 341 at the WTC on September 11 and 102 in other operations throughout the year.^{1,2} In the previous four editions of *Fire in the United States*, the calculated 10-year trends of firefighter deaths decreased (35 percent in the 9th, 10th, and 11th editions and 17 percent in the 12th edition). In the 1992–2001 period, however, the trend increased 30

¹ These totals match those in the *Firefighter Fatalities in the United States in 2001* report and are used as the basis for this investigation. USFA currently reports 449 fatalities, which includes three WTC fire safety directors who received benefits from the Department of Justice's Public Safety Officers' Benefits (PSOB) Program, and three firefighters who died subsequent to the publication of the report as a result of injuries sustained in 2001.

² A chronological listing of the 102 firefighters who died in 2001 and synopses of the events are presented in the U.S. Fire Administration's Appendix A, "Summary of 2001 Incidents," *Firefighter Fatalities in the United States in 2001*; Appendix B is an alphabetized listing of the 341 firefighters killed at the World Trade Center, including their ages and affiliations.

percent, excluding the WTC (Figure 86).³ Although these trends appear significant, the total deaths are small enough that a change of even a few deaths in a year may dramatically impact the 10-year trend line. Over this 10-year period, an average of 95 firefighters died in the line of duty each year. In every year until 1992, more than 100 firefighters were fatally injured. The peak was in 1978 when 171 firefighters died. The fewest deaths (75) were recorded in 1992.

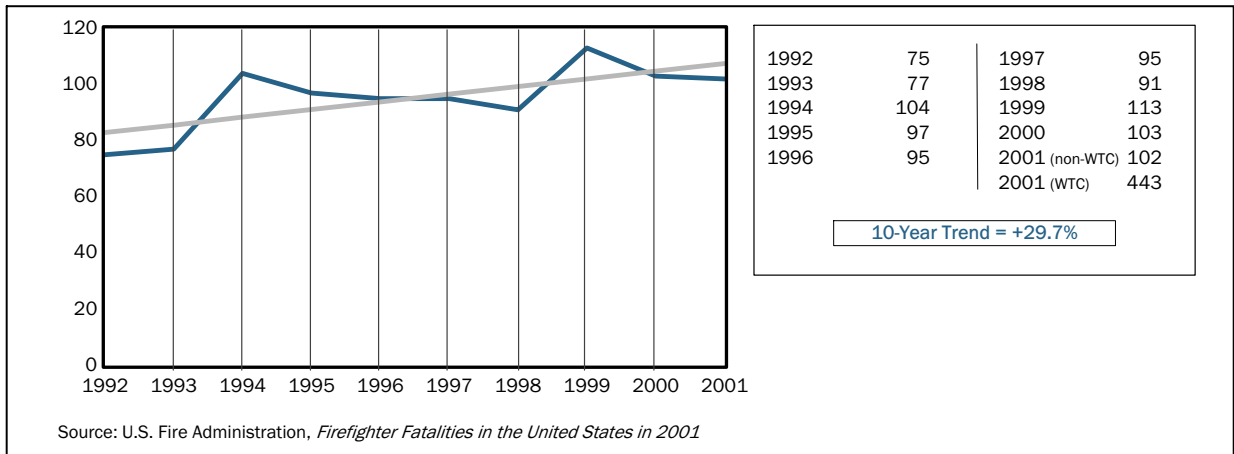


Figure 86. Trends in Firefighter Deaths

The danger of a firefighter sustaining a fatal fire-related injury is shown in Figure 87. Note that this figure measures only fire-incident-related fatalities with respect to fire incidents. Despite wide fluctuations, fire-incident-related firefighter fatalities per 100,000 reported incidents have risen approximately 27 percent, with 1999 having the highest rate. By sharp contrast, the trend

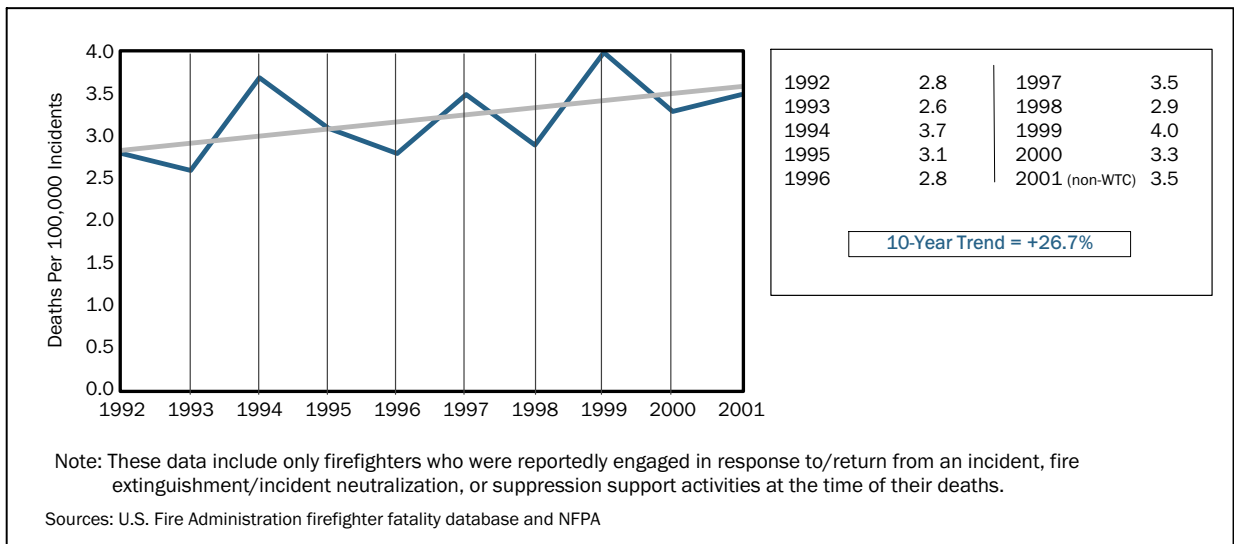


Figure 87. Trends in Fire-Incident-Related Firefighter Fatalities Per 100,000 Incidents

³ The 2001 on-duty fatalities do not include two firefighters who died during the year from injuries sustained in previous years. They are included in the year in which the injury occurred.

in fire incidence declined 15 percent. It is not clear why we seem to be doing a good job at reducing the number of fires but not reducing the number of fire-incident-related fatalities. Perhaps, the number of small fires has been reduced, but not the more serious fires where firefighters are killed; or perhaps firefighter equipment has become so effective that firefighters are inadvertently pushing the limits of the equipment and unwittingly putting themselves in harm's way. This is an area that merits further attention and further study.

The 102 fatalities represented 27 career firefighters and 75 volunteers (Table 23). Five of the 102 fatalities were women. Fifteen seasonal firefighters died during wildland firefighting operations, including 6 in aircraft accidents. All 341 of the WTC fatalities were career firefighters and all were males.

Table 23. Firefighter Deaths (2001)

Firefighter Type/Gender	Fatalities
Firefighter	
Volunteer	75
Career	368
Wildland Firefighter	
Career/Military	0
Volunteer	3
Seasonal/Part Time	12
Municipal/Local Fire Departments	
Career	368
Volunteer	60
Men	438
Women	5

Source: U.S. Fire Administration, *Firefighter Fatalities in the United States in 2001*

Region

Firefighter deaths in 2001 were distributed as follows: 50 (391 including WTC) deaths in urban/suburban areas,⁴ 40 in rural areas, and 12 in federal or state parks/wildland areas. Figure 88 shows these deaths by area of the country and by individual state. Thirty-three states had at least one firefighter fatality. Even excluding the 341 WTC fatalities, New York had the highest number of deaths (12) followed by Pennsylvania (8).

Activity

On-duty firefighter activities are in two categories, emergency and non-emergency. Emergency activities include responding to an emergency, actions performed while at the emergency scene, or returning from or immediately following the emergency incident. Sixty-six firefighters died during emergency incidents (Figure 89). The remainder (36) occurred during non-

⁴ This total is 391 deaths when the WTC fatalities are included.

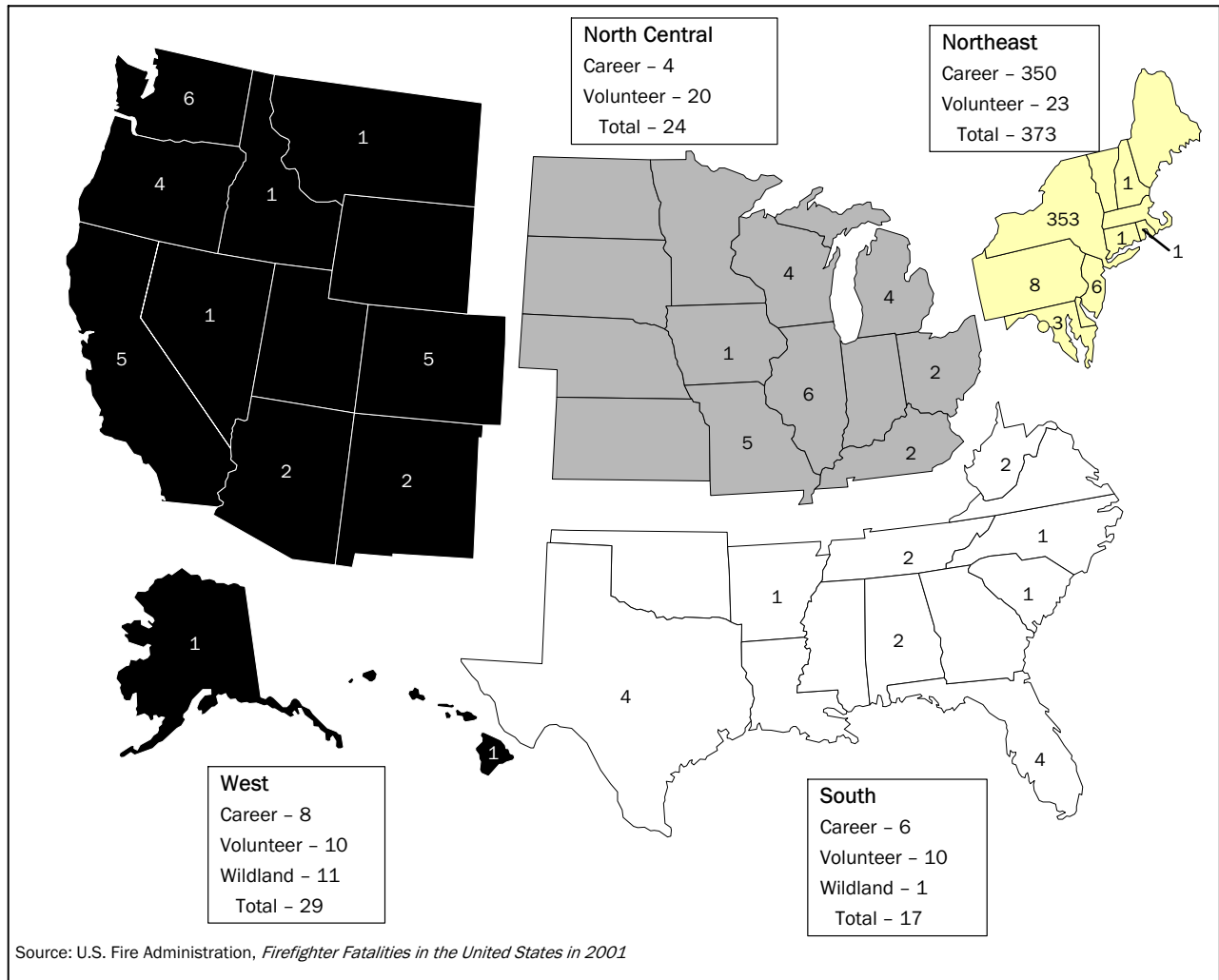


Figure 88. Firefighter Deaths by Region and State (2001)

emergency duties, which include training, administrative activities, or performing other functions not related to an emergency incident.

Type of Duty

As in all years since such data were recorded, the largest number of deaths in 2001 (38) occurred during fireground operations (Figure 89). Of these fireground deaths, 12 resulted from heart attacks on the emergency scene, 14 from asphyxiation, 5 from internal trauma, 4 from burns, and 3 from building collapses.⁵ Of the 38 deaths, 27 occurred during structural firefighting operations where the fixed property use was known. Seventeen of these deaths (63 percent) were in residential structures and 10 were in commercial structures (37 percent).

⁵ The 341 firefighters who perished in the WTC were performing emergency services on the fireground and were assumed crushed from the collapses of the two buildings.

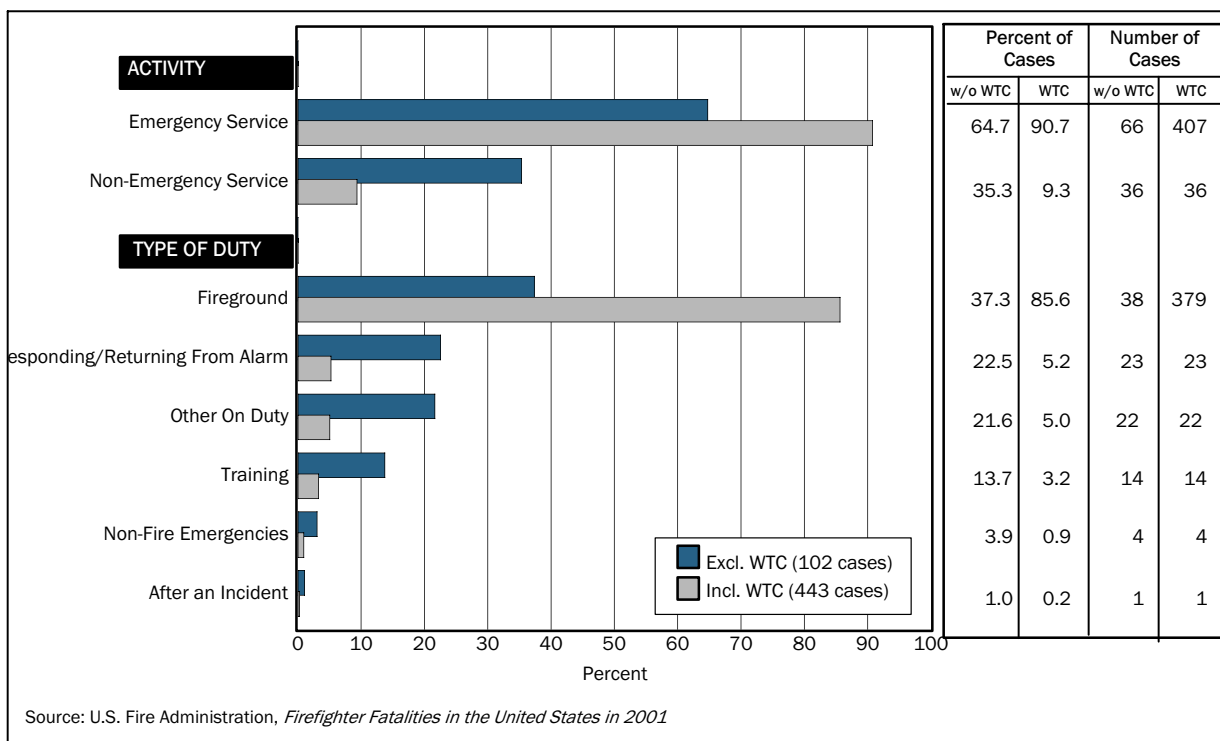


Figure 89. Firefighter Deaths by Activity and Type of Duty (2001)

It is important to look at the activities these 38 firefighters were performing on the fireground at the time they were stricken (Figure 90). Thirteen firefighters were killed as they engaged in direct fire attack, such as advancing or operating a hoseline at a fire scene; all were in residential structures. Heart attacks killed 5 firefighters performing water supply activities at their apparatus. Four of the 5 fatalities in search-and-rescue operations were in residential buildings where the firefighters became trapped, and 1 was trapped by an explosion in a hardware store. Five firefighters died cutting fire breaks during wildfire operations. Three firefighters were killed while performing ventilation duties, 2 when a hardware store wall collapsed and 1 from a heart attack at an apartment building fire. Three seasonal firefighters died in two separate airplane accidents (3 other firefighters who died in airplane crashes are not included since they were performing maintenance duties). During support operations, 1 firefighter was killed by a falling tree, and the other collapsed of a heart attack while opening gates to admit other firefighters to a mulch fire. A firefighter was struck by a passing vehicle as he directed traffic to ensure scene safety. One firefighter suffered a heart attack as he was overhauling a lightning-caused structure fire.

The second leading category or activity resulting in firefighter deaths, as in all years, is responding to or returning from an emergency. Twenty-three firefighters died in 2001, 12 in motor vehicle collisions and 11 from heart attacks; 20 of these were volunteers.

Twenty-two firefighters died in other on-duty activities: 9 suffered heart attacks, 3 were injured in falls, 3 died in a single helicopter crash during maintenance operations, 1 was crushed

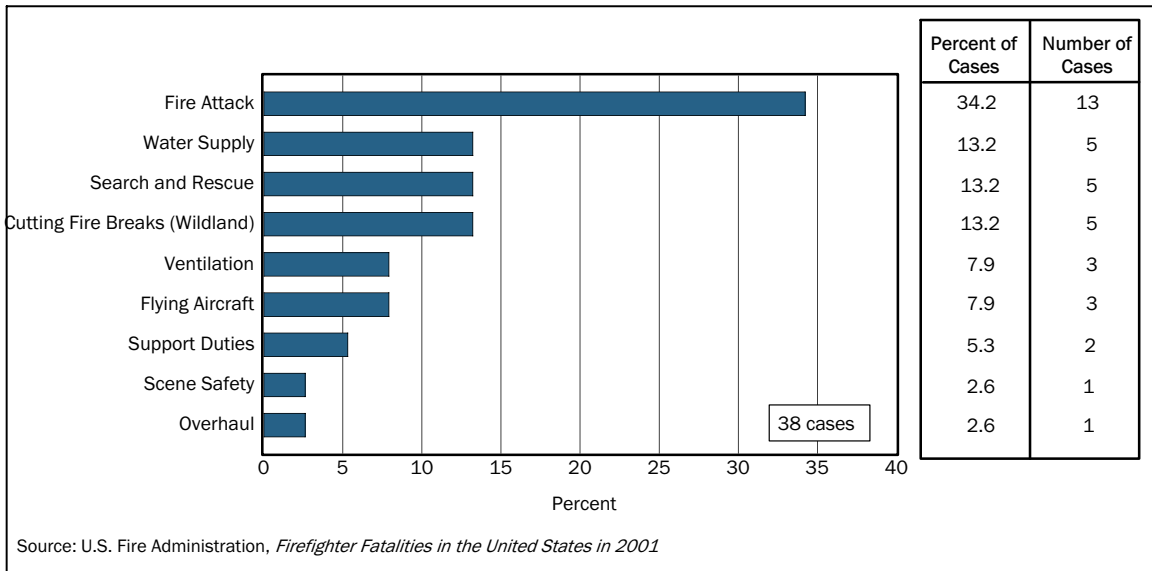


Figure 90. Firefighter Deaths on Fireground by Type of Activity (Excludes WTC) (2001)

by a falling tree, 1 was electrocuted in the fire station, 1 died from head trauma while cleaning up after a fire department-sponsored carnival, 1 was killed in a car collision en route to a meeting, 1 died after a tire blew out on a tanker that he was returning after maintenance, 1 was shot by another firefighter, and 1 was killed after being hit by a water tank that went airborne after being overpressurized.

More firefighters died (14) during training exercises than in any of the previous 10 years. Nine deaths were from heart attacks, 1 from a fall from an aerial ladder, 1 drowned during dive rescue training, 1 died of surgical complications following a back injury, 1 died in a motorcycle collision while returning from training, and 1 was trapped by fire progress in a structural fire training exercise.

Non-fire emergency duties claimed the lives of 4 firefighters. Two drowned while attempting to recover the body of a boater; 1 suffered a fatal cerebrovascular accident (CVA) (stroke) following duty at the scene of a vehicle accident, and 1 was struck by a vehicle as he directed traffic at a vehicle crash. One firefighter suffered a heart attack after returning from a small structural fire.

Type of Emergency Duty

As shown in Figure 91, 74 percent of emergency duty firefighter deaths in 2001 were related directly to emergency activities (49). The remaining 17 deaths included 10 during EMS calls, 1 while responding to a false alarm, 1 during a severe weather standby, 2 attempting a water rescue, 2 after returning from an emergency (a heart attack and a CVA), and 1 directing traffic at an accident scene.

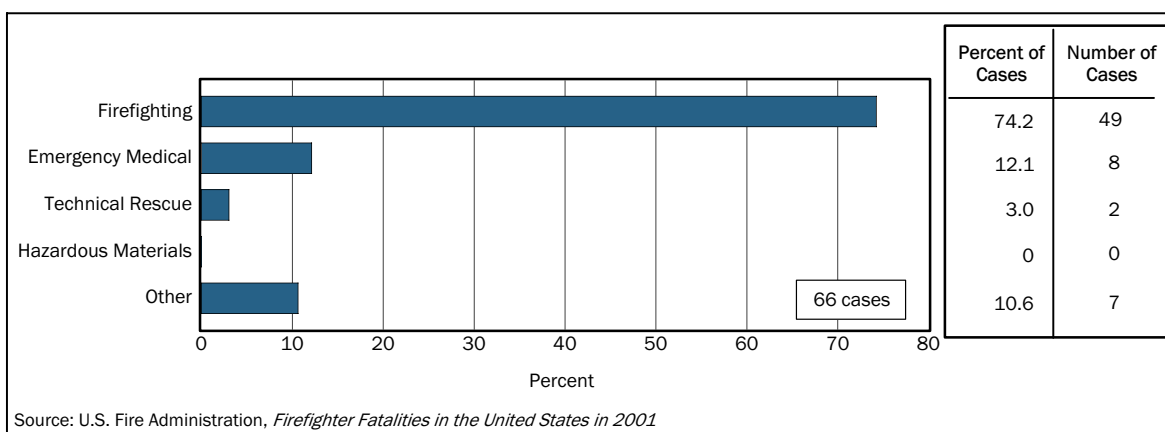


Figure 91. Firefighter Deaths During Emergency Duty (Excludes WTC) (2001)

Cause and Nature of Fatal Injury or Illness

The word *cause* refers to the action, lack of action, or circumstances that directly resulted in the fatal injury; the word *nature* refers to the medical nature of the fatal injury or illness, or what is often referred to as the cause of death. A fatal injury usually is the result of a chain of events, the first of which is recorded as the cause. For example, if a firefighter is struck by a collapsing wall, becomes trapped in the debris, runs out of air before being rescued, and dies of asphyxiation, the cause of the fatal injury is recorded as “struck by collapsing wall” and the nature of the fatal injury is “asphyxiation.” Likewise, if a wildland firefighter is overrun by a fire and dies of burns, the cause of death would be listed as “caught/trapped,” and the nature would be “burns.”[□] This follows the convention used in NFIRS casualty reports, which are based on NFPA fire reporting standards. Figure 92 shows the distribution of deaths both by cause and by nature of fatal injury or illness.

CAUSE. As in all previous years, the most frequent cause (42 deaths) in 2001 was stress or overexertion. Firefighting has been shown to be one of the most physically demanding activities that the human body performs, and the nature of most stress-related deaths was from heart attacks (41); the other death was a CVA (stroke). Eighteen of the 42 deaths reported as stress/exertion occurred during non-emergency operations.

The second leading cause of firefighter fatalities was by being caught or trapped. The 21 deaths in this category were higher than the total for any of the past 5 years. Five firefighters were trapped by the rapid progress of a wildland fire, 2 were killed when a fire trapped them in a home basement, 7 became disoriented in six residential fires and became lost, 2 drowned while attempting a body recovery, 1 drowned during dive rescue training, 1 was trapped on the second floor of a house acquired for training, 2 fell through floors in separate residential fires, and 1 was trapped by a falling garage door and sustained fatal burns.

Vehicle collisions killed 18 firefighters in 2001. Six wildland aircraft firefighters were killed in three incidents: 3 died in a helicopter crash during a maintenance flight, 2 died when their air tankers collided, and 1 was killed in his single-engine air tanker. The other 12 fatalities were the

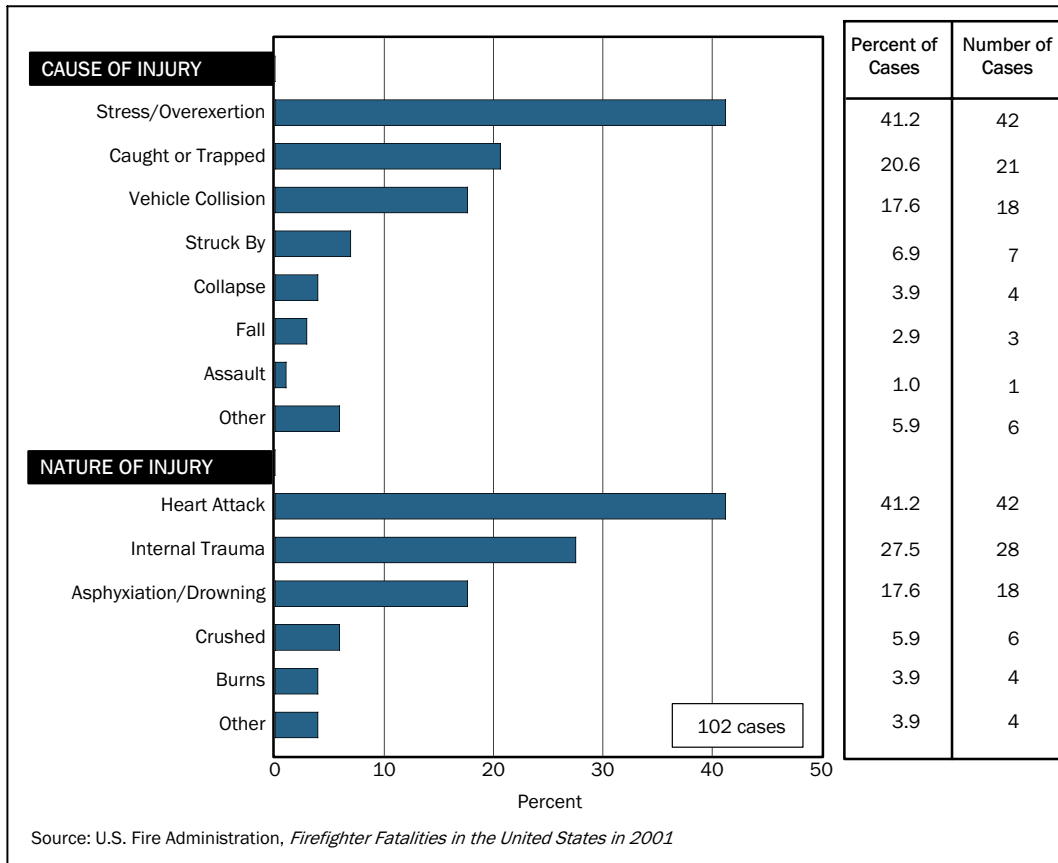


Figure 92. Firefighter Deaths by Cause and Nature of Injury (Excludes WTC) (2001)

result of road collisions: 6 were going to or coming from an incident in their personal vehicles, 4 were involved in tanker collisions, 1 was in a pumper crash, and 1 was in a command vehicle responding to an EMS incident.

The 7 firefighters who were struck by or came into contact with an object included 3 firefighters who were struck by vehicles as they directed traffic, 3 who were killed by falling trees, and 1 who died when an overpressurized water tank exploded.

The remaining 14 firefighter deaths included 4 who were killed due to collapses, 3 who died from falls, 1 who was shot by another firefighter, 1 who slipped on ice, 1 who was electrocuted working on a light fixture in the firehouse, 1 who was crushed by an engine following an incident, 1 who was killed on a carnival ride during the cleanup from a fire department function, 1 who died in his sleep of a seizure, and 1 who died of an abnormal heart rhythm.

All 341 World Trade Center deaths are attributed to collapse, although the specifics in most cases are unknown.

NATURE. The lower portion of Figure 92 shows the distribution of fatalities by the medical nature of the fatal injury or illness. The leading nature of death was heart attack, with 42 fatalities.

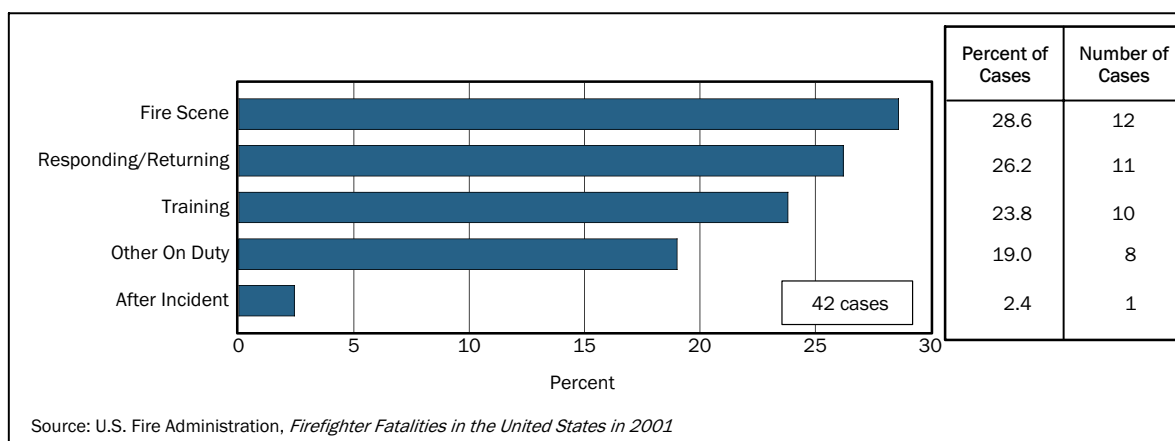


Figure 93. Firefighter Heart Attack Deaths by Type of Duty (2001)

The type of duty in which the heart attack victims were involved is shown in Figure 93. There were no heart attack fatalities at non-fire emergencies, down from 6 such deaths in 2000.

Internal trauma was the second leading nature of fatalities, responsible for 28 deaths as follows: 18 killed in vehicles (including aircraft), 3 struck by vehicles, 3 died from falls, 1 hit with an exploding water tank, 1 fatality shot, 1 struck by a falling tree, and 1 killed at a carnival sponsored by the local fire service.

The 18 firefighters who were asphyxiated included 4 while fighting a wildland fire, 10 in residential structure fires, 3 drownings, and 1 in a structural training burn.

Six firefighters died from crushing injuries: 2 from a collapsing wall at a hardware store fire, 1 under debris at a restaurant fire, 2 by falling trees, and 1 by his apparatus as he directed the driver at the conclusion of an incident.

Four firefighters died from burns: 3 in residential structure fires and 1 when a fire overran his position and he was unable to escape to a safe zone.

Four fighters were killed in situations where the nature of their fatal injuries does not fit into any of the above categories. One suffered a CVA (stroke) after returning home from a vehicle crash, 1 was electrocuted at the fire station, 1 died of a seizure, and 1 died from a surgical error that was made during surgery to repair broken bones suffered from a fall on the ice.

Age of Firefighters

Table 24 shows the distribution of firefighter deaths by age and by nature of death. Younger firefighters were more likely to have died as a result of traumatic injuries from an apparatus accident or after becoming caught or trapped during firefighting operations; trauma and asphyxiation were responsible for most of their deaths. Stress was more of a contributing factor in firefighter deaths as age increased. Heart attacks accounted for 55 percent of deaths of firefighters older than 40.

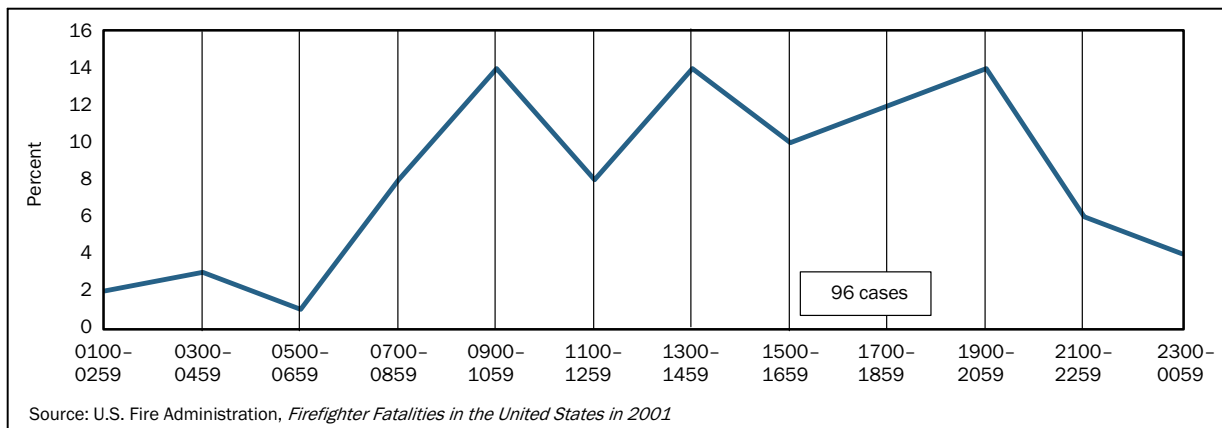
Table 24. Firefighter Ages and Nature of Fatalities (Includes WTC) (2001)

Nature of Fatality	Age									Total
	Under 21	21 to 25	26 to 30	31 to 35	36 to 40	41 to 45	46 to 50	51 to 60	Over 60	
Trauma/Asphyxiation WTC	0	6	36	69	74	76	47	27	6	341
Non-WTC	3	7	7	2	12	5	11	7	4	58
Heart Attack/CVA	0	0	3	3	5	5	4	11	13	44
Total	3	13	46	74	91	86	62	45	23	443

Source: U.S. Fire Administration, *Firefighter Fatalities in the United States in 2001*

When Deaths Occur

TIME OF INJURY. The distribution of firefighter injuries by time of day that resulted in death is shown in Figure 94. (Time of day was not reported in 6 cases.) Fourteen firefighters died during each of the following time periods: 9–11 a.m., 1–3 p.m., and 7–9 p.m. There is little difference between deaths during late evening and nighttime hours (6 p.m. to 6 a.m.) and daylight hours (6 a.m. to 6 p.m.): 49 percent vs. 51 percent, respectively. By contrast, civilian fire deaths are much more likely to occur late at night and in the early morning hours.



Source: U.S. Fire Administration, *Firefighter Fatalities in the United States in 2001*

Figure 94. Firefighter Deaths by Time of Fatal Injury (Excludes WTC) (2001)

MONTH OF YEAR. Figure 95 distributes firefighter fatalities by month of the year in 2001. Twelve firefighters died in each of the months of March, July, and August. Obviously, September was the highest month when the WTC fatalities are included.

Firefighter Health

Each year, heart attacks and strokes take a terrible toll on firefighters (42 firefighters in 2001). In fact, from 1996 through 2001, 256 firefighters succumbed to heart attacks and strokes. A large majority of these deaths (75 percent in 2001) were men over the age of 40.

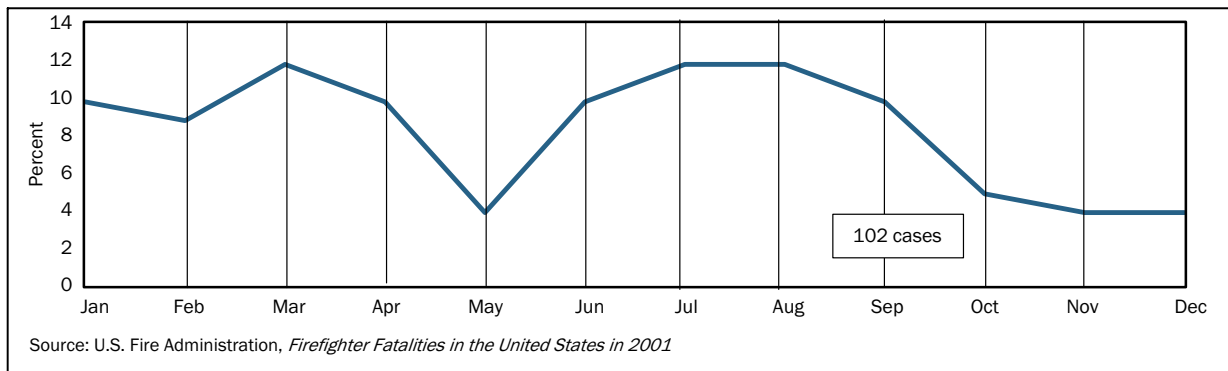


Figure 95. Firefighter Deaths by Month of Year (Excludes WTC) (2001)

The USFA recommends the implementation of effective firefighter health and wellness programs to reduce the incidence of heart attacks and strokes. Such programs, procedures, and activities include:

- The Fire Service Joint Labor Management Wellness–Fitness Initiative developed by the International Association of Firefighters (IAFF) and the International Association of Fire Chiefs (IAFC).
- The *Health and Wellness Guide for the Volunteer Fire Service* produced as a partnership between the National Volunteer Fire Council (NVFC) and the USFA. This may be ordered free of charge from USFA.
- The Candidate Physical Ability Test (CPAT), which is a method of testing the health of recruits, also developed by the IAFF and IAFC.
- Periodic medical evaluations of all firefighters.
- The availability of emergency medical care at least at the basic life support (BLS) level, including an automatic external defibrillator (AED), at every incident and all training events.
- The Heart-Healthy Firefighter Program developed and administered by the NVFC.

In USFA’s *Firefighter Fatalities in the United States in 2001*, recommendations that may have an immediate impact on lessening heart disease are examined in detail. These include:

- Have a medical exam.
- Modify eating habits.
- Take a walk.
- Quit smoking.

The U.S. Fire Administration has a number of partnerships and programs in firefighter fitness and wellness. Further information may be obtained from the USFA Web site <http://www.usfa.fema.gov/inside-usfa/research/safety/fitness.shtm>.

