

FULL REPORT

FIREFIGHTER FATALITIES IN THE UNITED STATES – 2004

Paul R. LeBlanc
Rita F. Fahy
Fire Analysis and Research Division
National Fire Protection Association

June 2005



National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471
www.nfpa.org

For more information about the National Fire Protection Association, visit www.nfpa.org or call 617-770-3000. To learn more about the One-Stop Data Shop go to www.nfpa.org/osds or call 617-984-7450.

Copies of this report are available from:

National Fire Protection Association
One-Stop Data Shop
1 Batterymarch Park
Quincy, MA 02169-7471
www.nfpa.org
e-mail: osds@nfpa.org
phone: 617-984-7450

Copyright © 2005, National Fire Protection Association, Quincy, MA

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 victims include, besides members of local career and volunteer fire departments, those seasonal and full-time 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 industrial fire brigades.

The term *on-duty* refers to being at the scene of an alarm, whether a fire or non-fire incident; being en route while responding to or returning from an alarm; performing other assigned duties such as training, maintenance, public education, inspection, investigations, court testimony and fund raising; and being on call, under orders or on stand-by duty other than at home or at the individual's 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 an incident scene, in training, or in accidents while responding to or returning from alarms. Illnesses (including heart attacks) are included when the exposure or onset of symptoms are tied to a specific incident of on-duty activity.

Fatal injuries and illnesses are included even in cases where death is considerably delayed. When the onset of the condition and the death occur in different years, the incident is counted in the year of the condition's onset. The NFPA recognizes that a comprehensive study of firefighter on-duty fatalities would include chronic illnesses (such as cancer) that prove fatal and that arise from occupational factors. In practice, there is as yet no mechanism for identifying fatalities that are due to illnesses that develop over long periods of time. This creates an incomplete picture when comparing occupational illnesses to other factors as causes of firefighter deaths. This is recognized as a gap the size of which cannot be identified at this time because of the limitations in tracking the exposure of firefighters to toxic environments and substances and the potential long-term effects of such exposures.

2004 Experience

In 2004, a total of 103 on-duty firefighter deaths occurred in the U.S. This compares to the 105 firefighter fatalities that occurred in 2003.¹ Figure 1 shows firefighter deaths for the years 1977 through 2004, excluding the deaths at the World Trade Center in 2001.

In 2004, there were three multiple-fatality incidents, each of which resulted in two deaths. All three double-fatality fires involved structures. Two firefighters died in a roof collapse at a house fire; two were killed when the bell tower at a church collapsed; and two were trapped and overcome while fighting a basement fire.

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. They will highlight deaths in intentionally-set fires and in motor vehicle-related incidents.² A special 10-year analysis will look more closely at on-duty sudden cardiac deaths (a category that includes heart attacks).

Finally, the study presents summaries of individual incidents that illustrate important problems or concerns in firefighter safety.

Type of Duty

Figure 2 shows the distribution of the 103 deaths by type of duty. The largest proportion of deaths (34 percent, or 35 deaths) occurred while responding to or returning from alarms. Another 29 deaths occurred during operations at fire incidents. For the second consecutive year, firefighter deaths at the fire ground accounted for less than 30 percent of the total. This is only the second time since NFPA began this annual study in 1977 that the proportion of deaths on the fire ground has been so low. In contrast, the proportion of deaths occurring while responding to or returning from alarms continues to be close to its highest point ever -- 34 percent, compared to the more typical 20 to 25 percent.

Of the 35 deaths while responding to or returning from alarms, the largest share (14 deaths) were due to sudden cardiac death. Another 12 deaths were due to collisions or rollovers. Motor vehicle crashes and sudden cardiac death are discussed in more detail later in this report. Three firefighters were struck by vehicles, one fell from the jump seat of an engine and one died when a tree fell on his pickup truck. Of the remaining four firefighters, two suffered strokes, one had an aneurysm and one had an embolism. Twenty-five of the 35 victims were volunteer

firefighters, eight were career firefighters, one was a contractor with a federal land management agency and one was a career member of a federal land management agency.³

As in 2003, the 29 fire ground deaths in 2004 represent the lowest number of deaths at the scene of fires since 1977 when NFPA began collecting information on all on-duty fatalities. Of these 29 deaths, 10 were due to sudden cardiac death, six to internal trauma, five to asphyxiation, five to crushing injuries and three to burns. Fifteen of the victims were municipal volunteer firefighters, 10 were municipal career firefighters, three were employees of federal forestry agencies, and one was a contractor of a federal land management agency.

Eighteen firefighters died during the performance of non-emergency-related on-duty activities. Eight of them suffered sudden cardiac death and one a fatal stroke while engaged in normal administrative or station activities. Sudden cardiac death claimed the lives of two firefighters involved in fire prevention or inspection activities, two while doing maintenance at the fire station and one while on standby at an airfield. One firefighter died in a crash while on his way to a prescribed burn. One firefighter was struck by a vehicle on a race track while working on the fire safety crew. One firefighter fell from the back of a pickup truck and struck his head at a fundraising event. And finally, one firefighter died after falling from a horse at a charity event.

Twelve deaths occurred during training activities. Seven firefighters suffered sudden cardiac death. One firefighter became trapped under ice and drowned while testing dive equipment. A contractor with a federal land management agency was killed when an air tanker crashed during training. While traveling between the fire station and the training site, a firefighter fell from the back of a pickup truck. One firefighter was struck by a new piece of apparatus as it was reversing into the station. And a firefighter was struck in the head and fatally injured during a training exercise involving putting chains on an engine's tires.

Nine deaths occurred at non-fire emergencies. Five of these nine deaths were the result of sudden cardiac events at the scenes of medical calls, motor vehicle crashes or other non-fire emergencies. One firefighter was shot and killed while attempting to render aid at a domestic violence call. A firefighter directing traffic at the scene of a motor vehicle crash was struck and killed by a passing vehicle. One firefighter was killed when his ambulance crashed while transporting a patient to a hospital. A firefighter with an open leg wound was exposed to contaminated flood water and died of necrotizing fasciitis.

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.⁴

Stress and overexertion, which usually results in heart attacks or other sudden cardiac events, continued to be the leading cause of fatal injury, as it has been in almost all of the years of this study. Of the 52 stress-related deaths in 2004, 48 were classified as sudden cardiac deaths (usually heart attacks), which are discussed in more detail in a separate section of this report. In addition to these 48 deaths, there were three fatal strokes and one aneurysm.

The second leading cause of fatal injury was struck by an object or contact with an object (28 percent). These 29 deaths included 17 killed in motor vehicle crashes, eight struck by motor vehicles, two struck by falling trees, one struck by a collapsing wall and one struck by equipment while attempting to put chains on an engine's tires.

The next leading cause of fatal injury was caught or trapped, resulting in 12 deaths. Six firefighters were killed inside structural collapses. Three were trapped by fire progress; one of them at a wildland fire. Two firefighters became lost inside fire-involved structures and ran out of air. One firefighter became trapped under ice and drowned.

Six firefighters were fatally injured in falls. Three firefighters fell from vehicles -- in separate incidents two firefighters fell from the back of moving pickup trucks, and one firefighter fell from a responding fire apparatus. Two firefighters fell at the scene of structure fires and were fatally injured -- one falling through a fire-weakened floor and the other falling while connecting a supply line to a hydrant. One firefighter fell from a horse.

In the remaining incidents, contaminated flood waters infected an open leg wound, killing a firefighter; another died as the result of an embolism; a third was shot while she was assisting a shooting victim; and, finally, a firefighter attending an out-of-town seminar died in his hotel room as a result of accidental multiple-drug intoxication involving prescription medication.

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. The largest proportion of deaths (47 percent) fell into the category of sudden cardiac death. All of these deaths in 2004 were attributed to stress or overexertion. Sudden cardiac death, most often the result of heart attack, is typically the leading nature of injury and usually accounts for close to half of the total deaths, but over the more than 25 years that NFPA has published this study, the number of deaths annually in this category has dropped by a third. There was a sharp increase, however, in sudden cardiac deaths from 37 in 2002 to 47 in 2003 and 48 in 2004. Trends in sudden cardiac deaths are discussed in more detail in a separate section of this report.

Of the 48 victims of sudden cardiac events in 2004, 12 were known to have had prior heart problems -- usually prior heart attacks, bypass surgery or angioplasty/stent placement -- and post mortem medical documentation showed that another 15 had severe arteriosclerotic heart disease. Over the past 25 years, post mortem information or other details on the victims' medical histories have been available for 701 of the 1,237 sudden cardiac victims. Of those 701 victims, 47.6 percent had had prior heart attacks or undergone bypass surgery or angioplasty/stent placement and another 32.4 percent had severe arteriosclerotic heart disease. Details on sudden cardiac deaths from 1995 through 2004 can be found in the accompanying special study.

In 2004, the other major categories were internal trauma (29 deaths), crushing injuries (eight deaths), asphyxiation (five deaths), burns (three deaths), and strokes (three deaths). The remaining deaths included two drownings and one each due to gunshot, an aneurysm, necrotizing fasciitis, embolism and respiratory arrest due to drug intoxication.

Ages of Firefighters

The firefighters who died in 2004 ranged in age from 15 to 78, with a median age of 47 years. (The 15-year-old victim was a junior firefighter who died in a crash while riding as passenger in a privately owned vehicle.) Figure 5 shows the distribution of firefighter deaths by age and cause of death (sudden cardiac death versus other causes).

Sudden cardiac deaths account for a higher proportion of the deaths among older firefighters, as might be expected. Sixty percent of the firefighters over age 40 who died in 2004 died of heart attacks or other cardiac events. The youngest victim of sudden cardiac death was 23 years old. He was reported to have had a congenital heart problem.

Figure 6 shows death rates by age, using firefighter fatality data for the five-year period from 2000 through 2004 and estimates of the number of firefighters in each age group from the NFPA's 2002 profile of fire departments (the mid-year in the range).⁵

The lowest death rates are for firefighters in their 30s. Their death rate is a little more than half the all-age average. The rate for firefighters in their fifties is two thirds higher than the average and for firefighters age 60 and over, it is 3.5 times the average. Firefighters age 50 and over accounted for two-fifths of all firefighter deaths over the five-year period although they account for less than one-fifth of all firefighters.

Fire Ground Deaths

Figure 7 shows the distribution of the 29 fire ground deaths by fixed property use. The largest proportion of deaths occurred in residential structures (45 percent). These 13 deaths included 12 in 10 fires in one- and two-family dwellings and one in an apartment building.

There were eight deaths in wildland fires including one at a prescribed burn, three deaths at two fires in churches, and one death each at a recreation center, a dancehall, a restaurant, a manufacturing plant, and a vehicle fire. For the first time since NFPA began this study in 1977, there were no firefighter deaths at the scene of fires in vacant or idle buildings, or buildings under construction or renovation.

To put the hazards of firefighting in various types of structures into perspective, the authors examined the number of fire ground deaths per 100,000 structure fires by structural property use. Estimates of the fire experience in each type of property were obtained from the NFPA's annual fire loss studies from 1999 through 2003 (the 2004 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 more firefighter deaths occur at residential structure fires than at fires in any other type of structure, fires in vacant buildings and some nonresidential structures, such as mercantile and public assembly properties, are more hazardous to firefighters, on average. There were 8.5 fire ground deaths per 100,000 nonresidential structure fires from 1999 through 2003, compared to 3.4 deaths per 100,000 residential structure fires. The highest death rates over the five-year period occurred in special structures, the category that includes vacant buildings and buildings under construction. The low rate in health care/correctional and

educational buildings may reflect the fact that these occupancies are among the most regulated 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 low rate in that five-year period for storage properties is unusual -- in previous studies, storage properties have had death rates much higher than residential properties.

Vehicle-Related Incidents

In 2004, 17 firefighters died in vehicle crashes. This is the second lowest total in the past 10 years, and an almost 50 percent reduction in the number of crash deaths reported in 2003. In addition to those deaths, eight others were fatally struck by vehicles, one firefighter fell from the jump seat of an engine and two fell from the back of pickup trucks. This is the highest number of firefighters struck and killed by vehicles since 1989.

Twelve of the 17 firefighters killed in crashes were responding to or returning from incidents when the crashes occurred.

Six of these 12 victims were driving or riding in privately-owned vehicles:

- One firefighter responding to a medical call went off the right side of the road, overcorrected, and struck a culvert and a tree. He was speeding and was not wearing a seatbelt.
- A junior firefighter riding as passenger responding to a mutual aid call was killed when the driver lost control of the vehicle and it spun into the path of an oncoming vehicle. Excessive speed for road conditions and driver inattention were factors in this crash. The victim was not wearing his seatbelt.
- A firefighter returning from a long shift on a wildland fire died when his vehicle went off the road and overturned. Fatigue was a factor in this crash. The victim was wearing his seatbelt.
- A firefighter was killed when his vehicle hydroplaned and went off the road on a curve. He was driving at excessive speed for road conditions. He was wearing his seatbelt.
- Speeding was a factor in another crash where the victim, driving to the station in response to a fire call, lost control of his vehicle which then rolled over, ejecting him. He was not wearing his seatbelt.

- One firefighter was killed when another responder rear ended his vehicle as he slowed to turn at an intersection. The victim was not wearing his seatbelt.

In the other fatal crashes while firefighters were responding to or returning from emergency calls:

- While responding to a grass fire at excessive speed, the driver of a fire engine went off the road on a curve, overcorrected and overturned. He was not wearing a seatbelt.
- Another firefighter, in a rescue vehicle responding to a brush fire, was driving 70 mph in a 35 mph zone when the tires went off the side of the road and the vehicle eventually overturned. She was wearing her seatbelt, but the structural fire boots she was wearing may have interfered with the operation of the accelerator and brake pedal.
- Sloshing water and not speed was reported to be the factor in a crash that occurred when an engine responding to a grass fire went off the road, then crossed the road and struck a tree. The victim was not wearing a seatbelt and was ejected and run over.
- Two fire apparatus responding to an incident from different departments collided at an intersection, killing one firefighter riding as passenger in the front seat. The victim was in the vehicle that did not have the right of way. He was not wearing his seatbelt and was ejected.
- A firefighter riding as passenger en route to a structure fire was killed when the engine struck a car that was attempting to turn left as the engine passed it on the left. The engine, which was traveling in excess of the speed limit, then struck a stopped vehicle, a utility pole and a tree. Faulty brakes were cited in the incident. The victim was not wearing his seatbelt.
- A helicopter that was responding to a hospital to transfer a critically ill patient crashed after canceling the call due to weather. The firefighter, the pilot and a nurse were all killed. The final investigation report on the crash has not yet been released.

There were three other fatal aircraft crashes in 2004. No final investigation reports have been released yet for any of these incidents:

- A contract pilot training on an air tanker crashed while practicing a fire retardant drop.
- Another contract pilot was killed when his air tanker crashed at a wildland fire.
- A contract helicopter pilot was killed while ferrying equipment at a wildland fire when the tail rotor struck a snag (a standing dead tree) as he was ascending after a delivery. The helicopter began to spin, causing the main rotor blades to strike other trees, and the helicopter crashed.

The remaining two fatal crashes involved fire department vehicles.

- The tire of a brush patrol truck blew out when a firefighter was on his way to a prescribed burn, causing the vehicle to overturn into a water-filled ditch. The victim, who was wearing his seatbelt, drowned.
- A firefighter who was riding in the back of an ambulance transporting a patient to a hospital was killed when the driver lost control on the wet road and crashed into a tree. No other details on factors in the crash were reported.

Of the 13 deaths in road vehicles mentioned above, nine of the victims were not wearing seatbelts (four were ejected and one was partially ejected) and four were wearing seatbelts. Excessive speed was a factor in at least six of the 13 crashes.

Eight firefighters were struck by vehicles and killed. Two of the eight were killed by backing apparatus. The first of the two was standing on the tailboard, acting as tailboard safety member, when she fell or stepped off the slow-moving vehicle and was run over. The other firefighter was standing behind a new piece of apparatus after a training session when the driver, thinking he had gone into the station, began to back up and struck him. In separate incidents, three firefighters working at incident scenes were struck and killed by passing vehicles. In the first of the three incidents, the victim was directing traffic at a crash scene on a highway when a motorist changed lanes to avoid hitting a slowing vehicle, and struck him. The victim was standing in the right lane, holding a flashlight and stop/slow sign and wearing an orange mesh safety vest. In the second incident, a firefighter was struck on a highway at the scene of a fire

involving an abandoned van. The responding engine was parked in front of the burning vehicle. In neither of these two cases were details available on if, or how, traffic around the incident scene was controlled. The third victim was helping a fire truck back up at a crash scene when he was struck by a passing vehicle. There were no other details available on that incident at this time. While assisting at a portable water tank at a fire scene, a firefighter was pinned between two fire apparatus when the driver of one vehicle inadvertently released the emergency vehicle and it rolled back into the other. A firefighter returning from duty on a wildland fire was struck and killed by a semi-trailer truck while crossing an interstate near his motel late in the evening. A firefighter working on the fire/rescue crew at a speedway was killed by a race car while retrieving debris from the track. The sun's glare was cited as a factor in that incident.

Three firefighters fell from moving vehicles. One fell from the jump seat of a reserve fire engine while responding to a reported gas leak. He was not wearing a seatbelt and was standing up as the vehicle made a slow turn. In separate incidents, two firefighters fell from the tailgate of pickup trucks -- one as it accelerated onto a roadway en route to the training site and the other when the straps holding the tailgate broke.

Other Findings

Three firefighters died in connection with intentionally set fires -- two at structure fires and one while returning from a wildland fire. From 1995 through 2004, 77 firefighters (7.7 percent of all on-duty deaths) died in connection with intentional fires. The share of these deaths annually has been dropping fairly steadily since 1985, which is, in part, a reflection of the decline in intentional fires over the same period.

Five firefighters died as a result of false alarms in 2004, the same total as in 2003. Over the past 10 years, 34 firefighter deaths have resulted from false calls, whether malicious or alarm malfunctions.

Of the 103 firefighters who died while on duty in 2004, 92 were members of local, municipal career and volunteer fire departments, four were employees of federal land management agencies, three were contractors to federal agencies, two were employees of state forestry agencies, one was a member of the U.S. military and one was a member of an industrial fire department.

The distribution of deaths of career and volunteer firefighters from local, municipal fire departments is shown in Figure 9. Firefighter fatalities among career firefighters reached their lowest level in 1993, but in spite of a rise in deaths from 1993 through 1999, there has been a general downward trend since 1985. For volunteer firefighters, there tends to be a great deal of fluctuation from year to year. Both groups seemed to have reached a new plateau in the past decade -- over the past 10 years, there have been an average of 60 volunteer firefighter deaths and 30 career firefighter deaths annually. A comparison of the fatality experience of the 92 career and volunteer firefighters killed in 2004 is shown in Table 1.

Conclusions

One important positive development in 2004, compared to 2003, was that the number of firefighter deaths in crashes in 2004 was half the number in 2003. Total deaths in crashes of all types hit their peak in 2003 (33 deaths) but dropped 50 percent to 17 deaths in 2004. On a less positive note, however, the number of firefighters struck and killed by vehicles continues higher than usual, with an average of seven deaths a year since 2002. (There were eight in 2004.)

Another important positive development in 2004 was that, for the first time since NFPA began this study in 1977, there were no deaths in vacant or idle buildings, or buildings under construction, demolition or renovation. The number of deaths in fires in these types of buildings dropped from a high of 37 in the first five years of the study (1977 through 1981) to eight in the most recent five-year period (2000 through 2004). In fact, over the past 15 years, the number of deaths in such properties has been five or higher only once -- that was in 1999 when six firefighters were killed in a vacant warehouse fire in Worcester, Massachusetts.

In both cases, we cannot say a trend has been established based on one year's experience, but these are two crucial areas for prevention of on-duty firefighter fatalities -- motor vehicle crashes, particularly road crashes en route to incidents, and deaths of firefighters in structures where there are no civilian lives to save.

The trend in on-duty firefighter fatalities is not improving as we've moved into a new century. Fatalities during the 1990s averaged approximately 97 a year -- a vast improvement over the 134 deaths a year average during the first 10 years of this study. However, since 2000, the annual average has risen to 102 deaths per year. This is occurring in spite of continued declines in the number of deaths at structure fires, which itself may be driven primarily by the

drop in structure fires. As the accompanying 10-year analysis of sudden cardiac death showed, we have not seen a steady decline in that category of deaths since the early 1990s. Deaths during training activities have been higher in the past five years than throughout most of the 1990s. Deaths in crashes on roads and highways dropped in 2004 but account for 15 percent of the deaths in the last five years. Deaths during emergency medical responses, which had been dropping through the 1980s and 1990s in spite of the doubling of the number of such calls, have risen sharply in the new century. In the past five years, there were 21 deaths at EMS calls, compared to six deaths in the five years before that.

Clearly, the steps needed to reduce the annual loss of life in the fire service have been identified. NFPA maintains standards that address these issues. For road safety, several standards should be adopted and enforced: *NFPA 1002, Standard on Fire Apparatus Driver/Operator Professional Qualifications*, and *NFPA 1451, Standard for a Fire Service Vehicle Operations Training Program*. *NFPA 1002* identifies the minimum job performance requirements for firefighters who drive and operate fire apparatus, in both emergency and nonemergency situations. *NFPA 1451* provides for the development of a written vehicle operations training program, including the organizational procedures for training, vehicle maintenance, and identifying equipment deficiencies. In addition, *NFPA 1915, Standard Fire Apparatus Preventative Maintenance Program*, details a program to ensure that fire apparatus are serviced and maintained to keep them in safe operating condition. Crashes involving firefighters' personal vehicles continue to account for the largest share of fatal crashes. Obeying traffic laws, using seat belts and controlling driving speeds would prevent most of the firefighter deaths in road crashes.

A suite of standards address health issues in the fire service. *NFPA 1500, Standard on Fire Department Occupational Safety and Health Program*, requires the establishment of a firefighter health and fitness program based on *NFPA 1583, Standard on Health-Related Fitness Programs for Fire Fighters*. In addition, *NFPA 1500* requires firefighters to meet the medical requirements of *NFPA 1582, Standard on Comprehensive Occupational Medical Program for Fire Departments*. Persons with certain health-related problems should not be allowed to become firefighters and those who develop problems after they are firefighters should be carefully evaluated to be sure they are capable of continuing to perform firefighting and other

emergency duties. Sudden incapacitation due to existing health problems can have a catastrophic impact, not only on the individual firefighter, but on their fellow firefighters and the public who rely on them.

References

- 1.The NFPA's files for firefighter on-duty fatal injuries are updated continually for all years.
- 2.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.
- 3.For this report, the term *volunteer* refers to any municipal firefighter who is not a full-time, paid member of a local, municipal fire department. The term *career* refers to full-time, paid local, municipal fire department members.
- 4.The categories for cause of injury and nature of injury are based on the 1981 edition of *NFPA 901, Uniform Coding for Fire Protection*.
- 5.Michael J. Karter, Jr., "U.S. Fire Department Profile Through 2002," NFPA Fire Analysis and Research Division, Quincy, Massachusetts, October 2003, unpublished. The analysis shown here assumes that the number of firefighters adequately estimates exposure and that the age distribution of career and volunteer firefighters is similar.

Credits

A study made possible by the cooperation and assistance of the United States fire service, the Public Safety Officers' Benefits Program of the Department of Justice, the United States Fire Administration, the National Institute for Occupational Safety and Health, the Forest Service of the U.S. Department of Agriculture, and the Bureau of Indian Affairs and the Bureau of Land Management of the U.S. Department of the Interior. The authors would also like to thank Thomas Hales, MD, MPH, of NIOSH and Carl E. Peterson of NFPA's Public Fire Protection Division for their assistance on the study.

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 and local 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. It 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-on-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.

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 increases as a result. The enactment of the USA PATRIOT bill in 2001 increased the benefit to \$250,000. The current benefit is \$275,658 tax free.

A decedent's spouse and minor children usually are the eligible beneficiaries. As a result of the 2002 Mychal Judge Act, when there is no spouse or eligible children, the PSOB Act now provides the benefits to the individual(s) designated on the officer's most recently executed life insurance policy. Parents become eligible for the death benefit if they are named on the last executed policy or if there is no legitimate claim submitted by a life insurance policy beneficiary and the officer was not married and there are no eligible children.

Line of duty disability: 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. PSOB is reserved for those few, tragic cases where an individual barely survives a traumatic, 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 PSOB would not approve more than a small number of cases 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 a portion of the primary PSOB benefit.

Further benefits information: To initiate a claim for death benefits, to receive additional information on filing a disability claim or to receive additional information about coverage, call or write the Public Safety Officers' Benefits Program, Bureau of Justice Assistance, U.S. Department of Justice, 810 7th Street, N.W., Washington DC 20531. The telephone number is (888) 744-6513.

*Public Safety Officers' Benefits Program
Bureau of Justice Assistance
U.S. Department of Justice*

Table 1
Comparison of On-Duty Deaths Between
Career and Volunteer Municipal Firefighters, 2004*

| | Career Firefighters | | Volunteer Firefighters | |
|---------------------------------------|---------------------|----------------------|------------------------|----------------------|
| | Number of Deaths | Percent of Deaths | Number of Deaths | Percent of Deaths |
| Type of duty | | | | |
| Operating at fire ground | 10 | 34 % | 15 | 24 % |
| Responding to or returning from alarm | 8 | 28 | 25 | 40 |
| Training | 3 | 10 | 7 | 11 |
| Operating at non-fire emergencies | 2 | 7 | 7 | 11 |
| Other on-duty | 6 | 21 | 9 | 14 |
| TOTALS | 29 | 100 % | 63 | 100 % |
| Cause of fatal injury | | | | |
| Stress | 10 | 34 % | 38 | 60 |
| Struck by or contact with object | 6 | 21 | 16 | 25 |
| Caught or trapped | 10 | 34 | 2 | 3 |
| Fell | 2 | 7 | 4 | 6 |
| Other | 1 | 3 | 3 | 5 |
| TOTALS | 29 | 100 % | 63 | 100 % |
| Nature of fatal injury | | | | |
| Sudden cardiac death | 9 | 31 % | 35 | 56 % |
| Internal trauma | 7 | 24 | 16 | 25 |
| Burns | 3 | 10 | 0 | 0 |
| Crushing | 2 | 7 | 6 | 10 |
| Asphyxiation | 5 | 17 | 0 | 0 |
| Gunshot | 1 | 3 | 0 | 0 |
| Drowning | 1 | 3 | 0 | 0 |
| Stroke | 1 | 3 | 2 | 3 |
| Drug overdose | 0 | 0 | 1 | 2 |
| Aneurysm/embolism | 0 | 0 | 2 | 3 |
| Septic shock | 0 | 0 | 1 | 2 |
| TOTALS | 29 | 100 % | 63 | 100 % |
| Rank | | | | |
| Firefighter | 16 | 55 % | 37 | 59 % |
| Company officer | 6 | 21 | 12 | 19 |
| Chief officer | 7 | 24 | 14 | 22 |
| TOTALS | 29 | 100 % | 63 | 100 % |

Table 1
Comparison of On-Duty Deaths Between
Career and Volunteer Municipal Firefighters, 2004* (Continued)

| | Career Firefighters | | Volunteer Firefighters | |
|---|---------------------|----------------------|------------------------|----------------------|
| | Number of Deaths | Percent of Deaths | Number of Deaths | Percent of Deaths |
| Ages of Firefighters | | | | |
| All deaths | | | | |
| 20 and under | 0 | 0 % | 4 | 6 % |
| 21 to 25 | 4 | 14 | 1 | 2 |
| 26 to 30 | 0 | 0 | 2 | 3 |
| 31 to 35 | 3 | 10 | 4 | 6 |
| 36 to 40 | 2 | 7 | 8 | 13 |
| 41 to 45 | 5 | 17 | 6 | 10 |
| 46 to 50 | 6 | 21 | 6 | 10 |
| 51 to 55 | 5 | 17 | 7 | 11 |
| 56 to 60 | 4 | 14 | 8 | 13 |
| Over 60 | 0 | 0 | 17 | 27 |
| TOTALS | 29 | 100 % | 63 | 100 % |
| Ages of Firefighters | | | | |
| Sudden cardiac deaths only | | | | |
| 31 to 35 | 1 | 11 % | 0 | 0 % |
| 36 to 40 | 0 | 0 | 3 | 9 |
| 41 to 45 | 1 | 11 | 6 | 17 |
| 46 to 50 | 4 | 44 | 3 | 9 |
| 51 to 55 | 1 | 11 | 4 | 11 |
| 56 to 60 | 2 | 22 | 7 | 20 |
| over 60 | 0 | 0 | 12 | 34 |
| TOTALS | 9 | 100 % | 35 | 100 % |
| Fire ground deaths by fixed property use | | | | |
| Dwellings and apartments | 5 | 50 % | 8 | 53 % |
| Wildland | 1 | 10 | 3 | 20 |
| Public assembly | 4 | 40 | 2 | 13 |
| Manufacturing | 0 | 0 | 1 | 7 |
| Road/highway | 0 | 0 | 1 | 7 |
| TOTALS | 10 | 100 % | 15 | 100 % |

Table 1
Comparison of On-Duty Deaths Between
Career and Volunteer Municipal Firefighters, 2004* (Continued)

| | Career Firefighters | | Volunteer Firefighters | |
|---|---------------------|----------------------|------------------------|----------------------|
| | Number of Deaths | Percent of Deaths | Number of Deaths | Percent of Deaths |
| Years of service | | | | |
| 5 or less | 8 | 28 % | 18 | 29 % |
| 6 to 10 | 1 | 3 | 7 | 11 |
| 11 to 15 | 4 | 14 | 8 | 13 |
| 16 to 20 | 2 | 7 | 6 | 10 |
| 21 to 25 | 5 | 17 | 7 | 11 |
| 26 to 30 | 5 | 17 | 4 | 6 |
| over 30 | 4 | 14 | 11 | 17 |
| Not reported | 0 | 0 | 2 | 3 |
| TOTALS | 29 | 100 % | 63 | 100 % |
| Attributes of fire ground deaths** | | | | |
| Intentional fires | 1 | | 1 | |
| Search and rescue operations | 3 | | 2 | |
| Motor vehicle crashes | 5 | | 8 | |
| False alarms | 1 | | 4 | |

* This table does not include the 11 victims who were contractors for or employees of state or federal wildland agencies, in the military or a member of an industrial fire department.

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

Figure 1
On-Duty Firefighter Deaths - 1977-2004

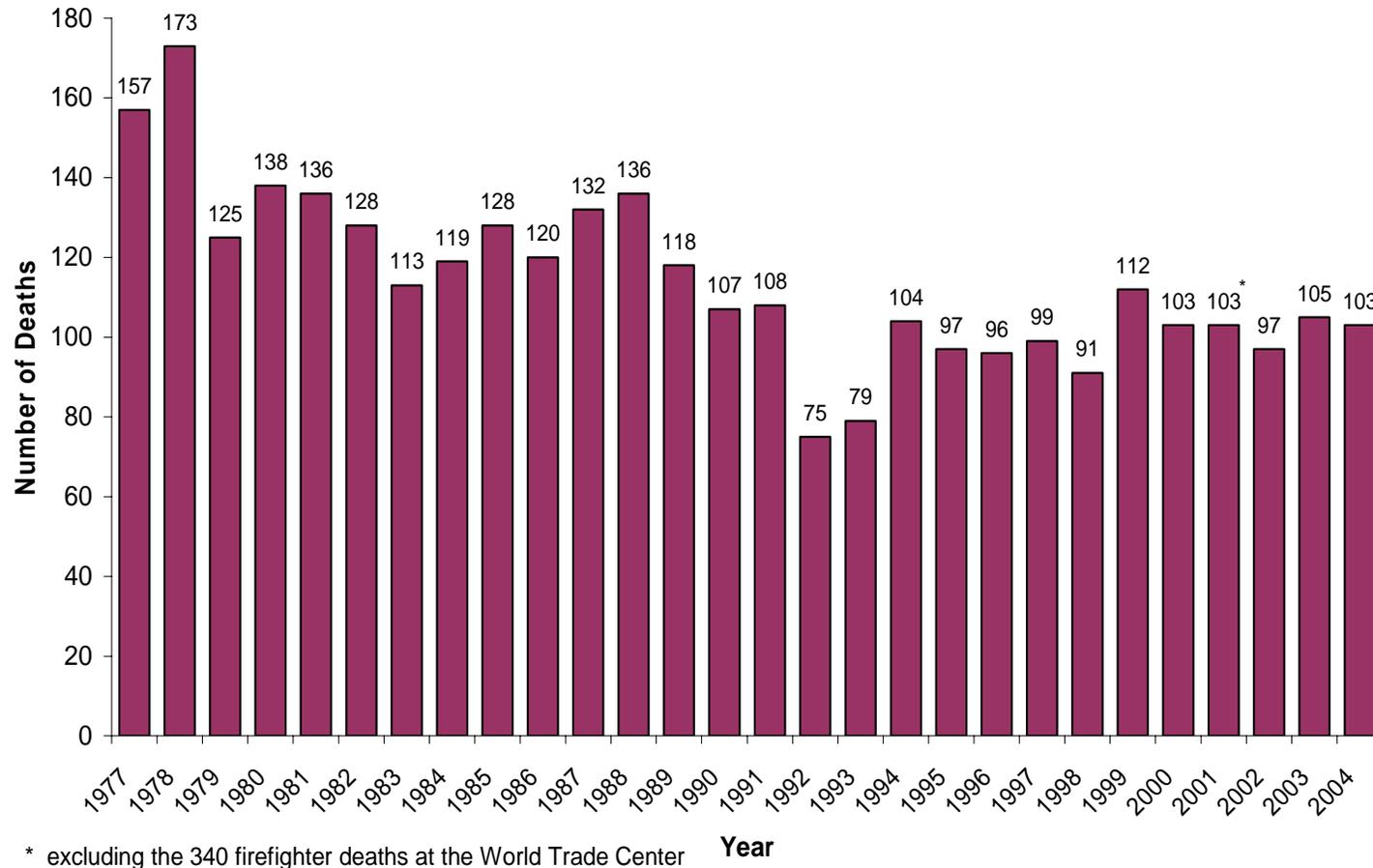


Figure 2
Firefighter Deaths by Type of Duty - 2004

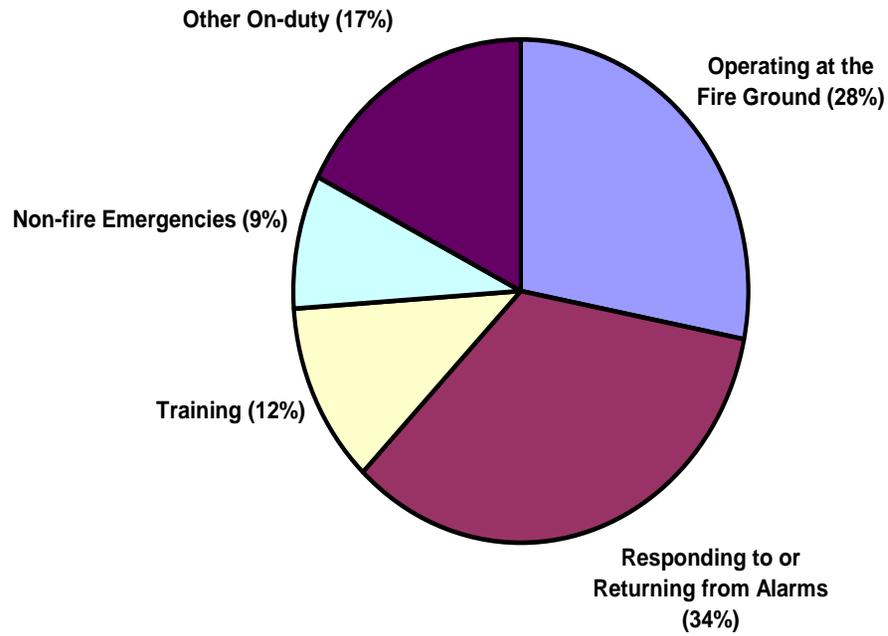


Figure 3
Firefighter Deaths by Cause of Injury -- 2004

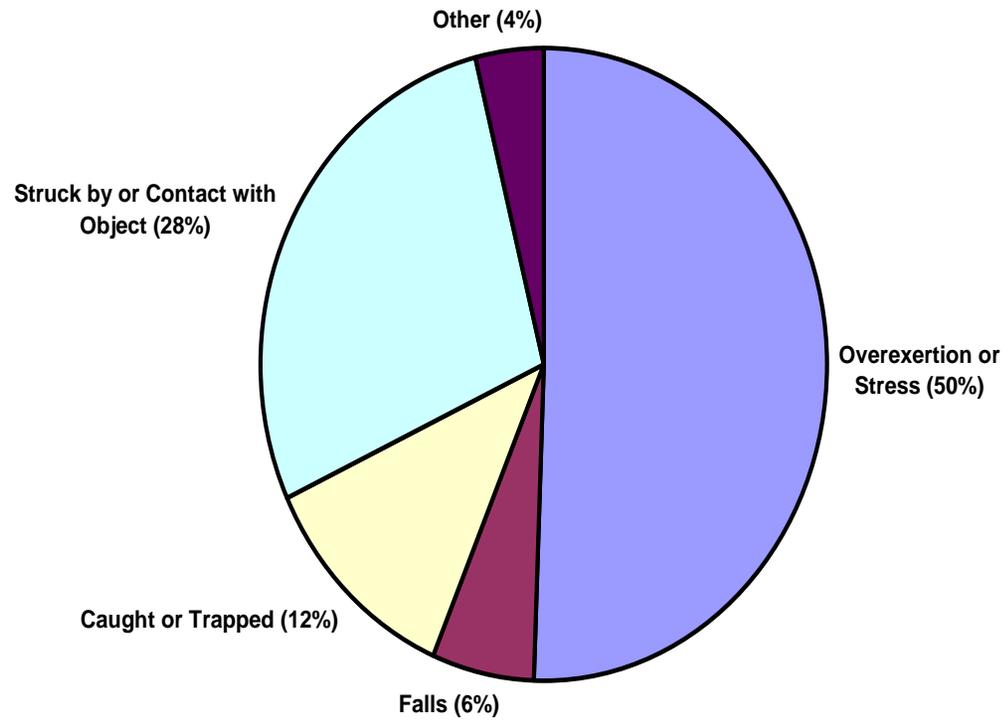
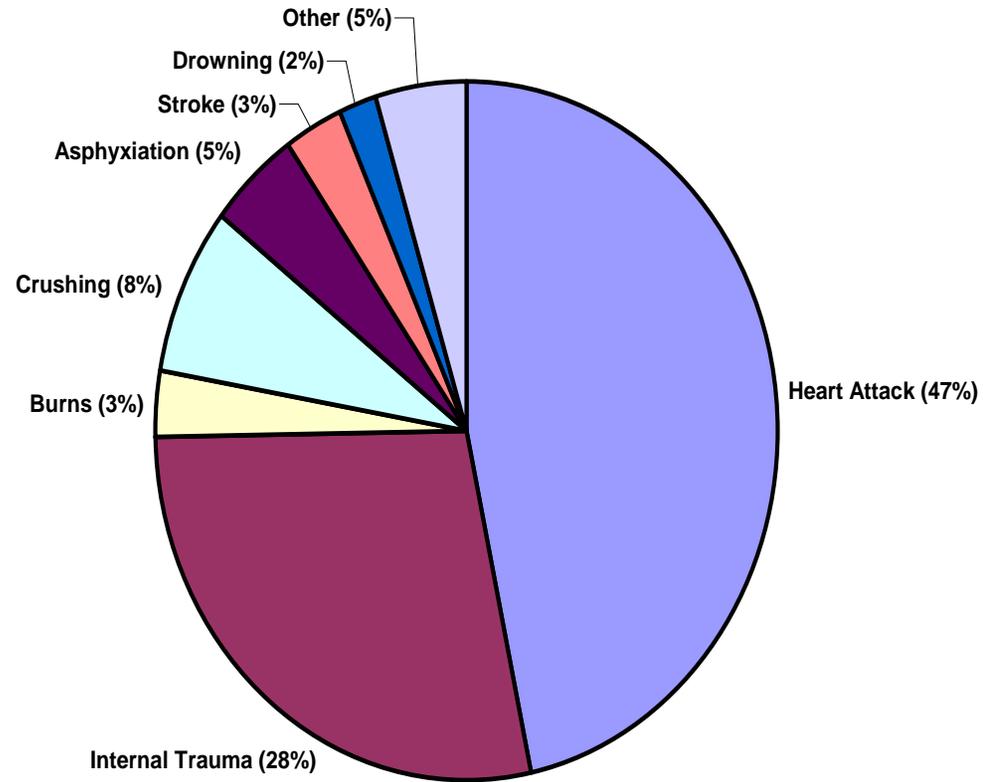


Figure 4
Firefighter Deaths by Nature of Injury -- 2004



**Figure 5
On-Duty Firefighter Deaths
by Age and Cause of Death -- 2004**

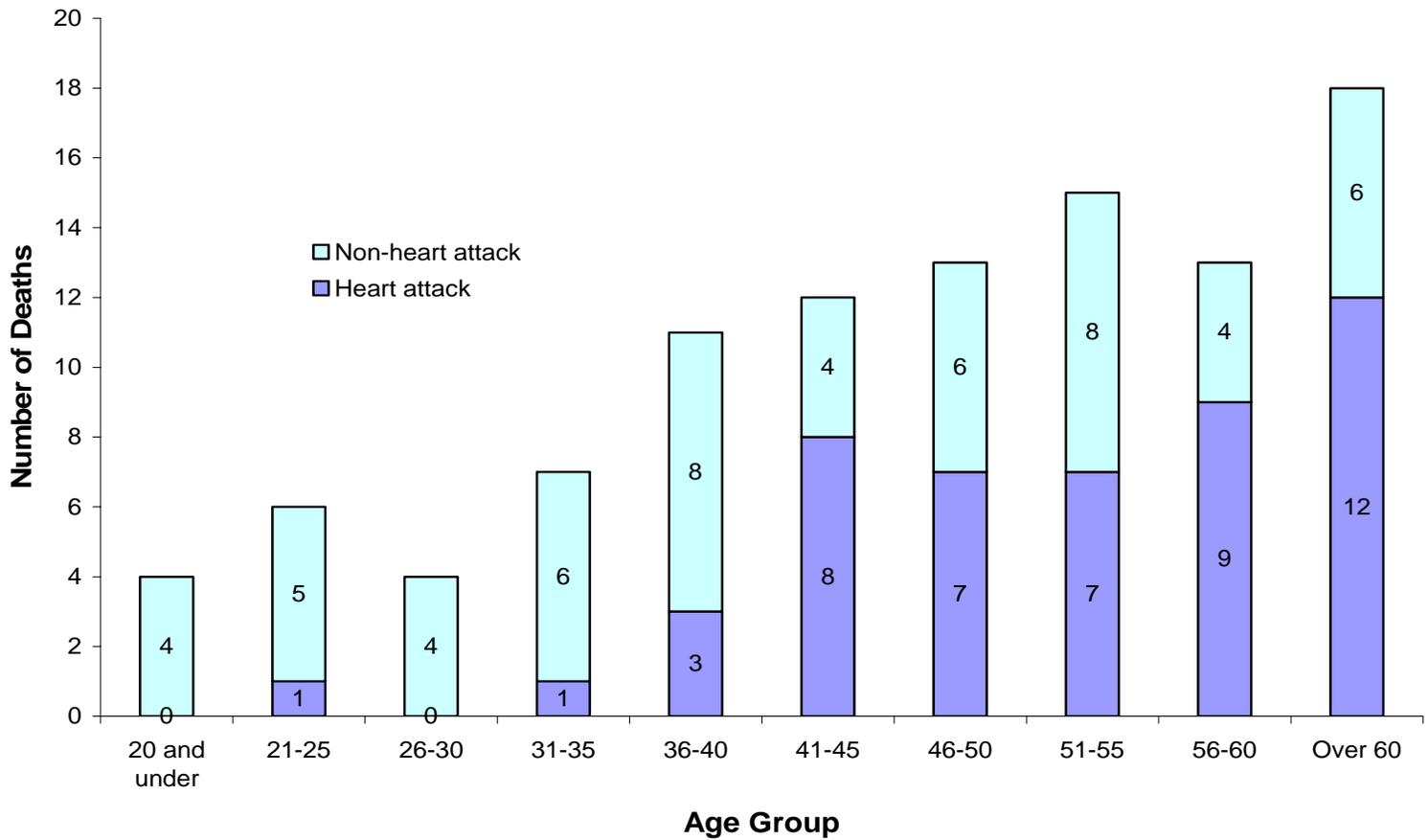
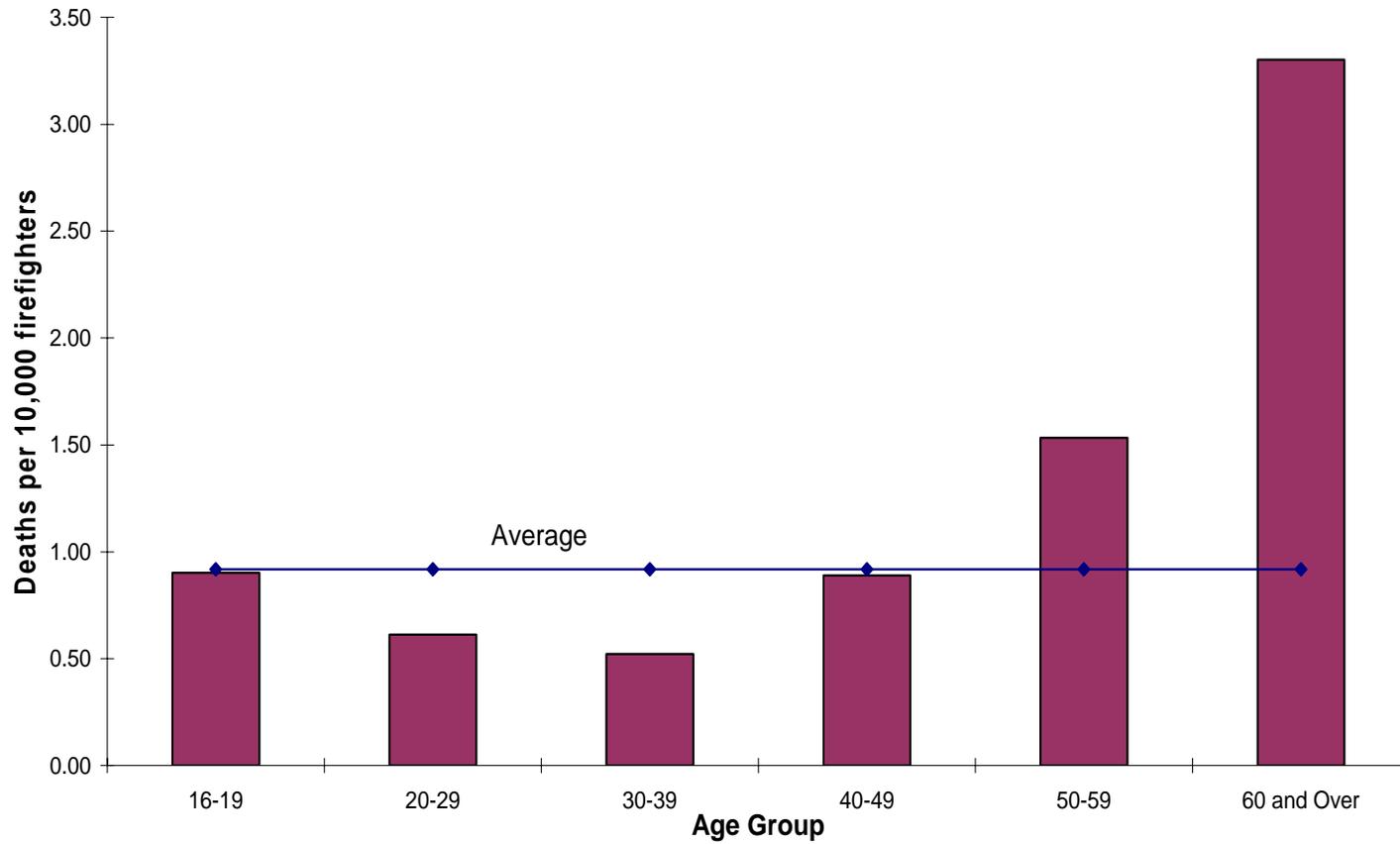
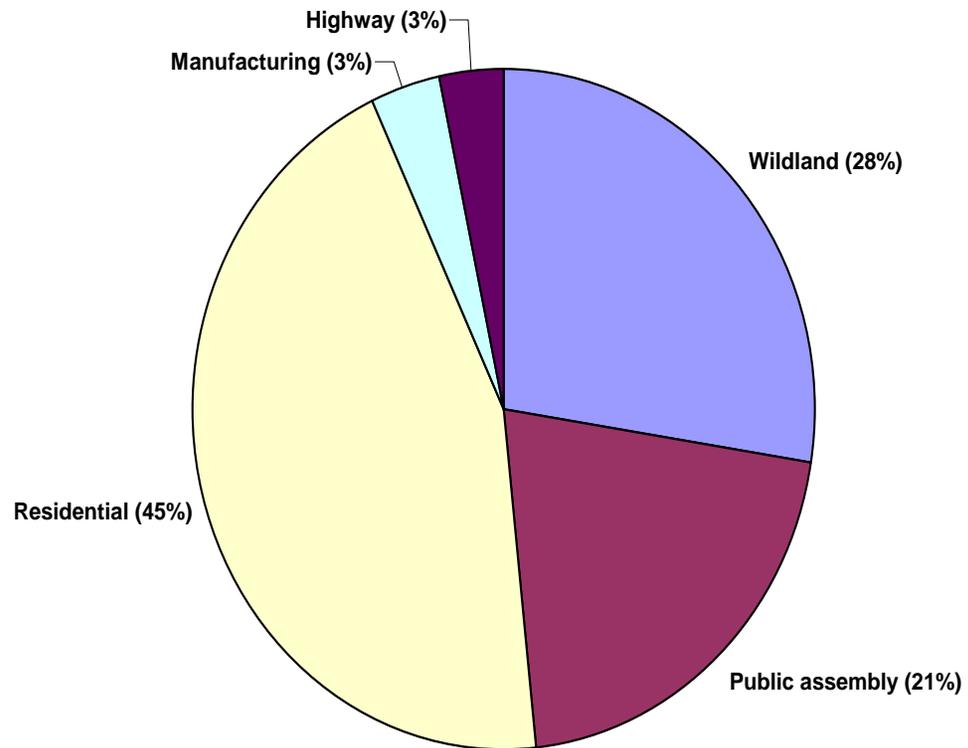


Figure 6
On-Duty Deaths Rates per 10,000 Firefighters -- 2000-2004*



* excluding the 340 firefighter deaths at the World Trade Center in 2001

Figure 7
Fireground Deaths by Fixed Property Use -- 2004*



* There were 29 deaths on the fire ground in 2004.

Figure 8
On-Duty Fireground Deaths
per 100,000 Structure Fires
1999-2003
(excluding the World Trade Center deaths in 2001)

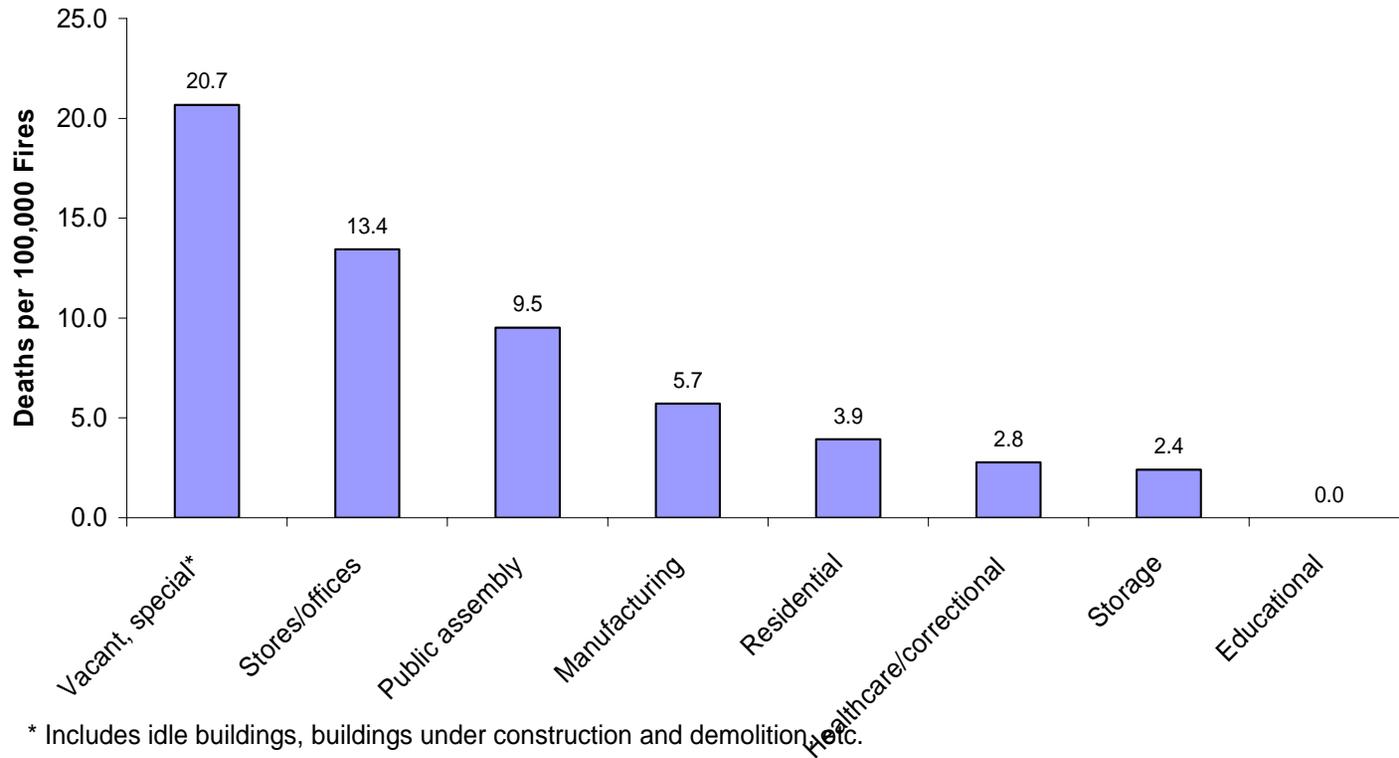
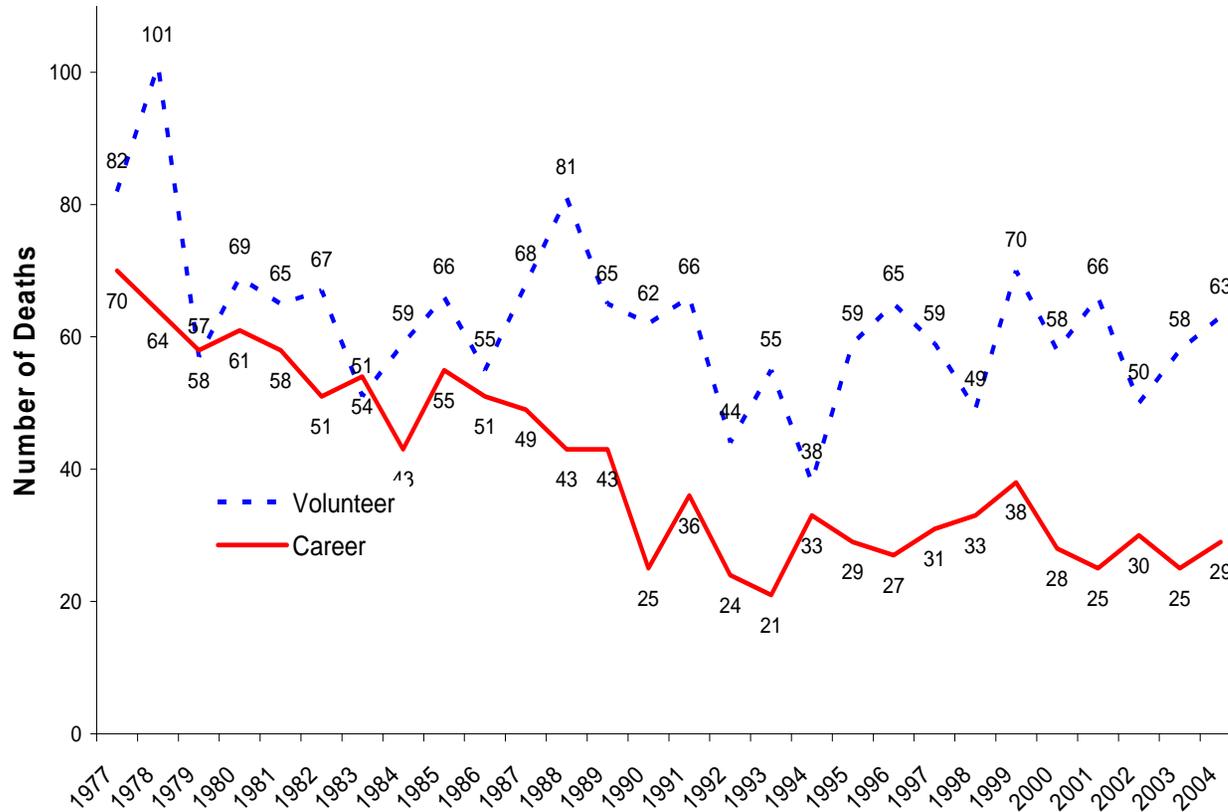


Figure 9
Firefighter Deaths - Local Career vs. Local Volunteer
1977 - 2004*



* excluding the 340 firefighter deaths at the World Trade Center in 2001

FIREFIGHTER FATALITY INCIDENTS

Lieutenant dies when trapped after collapse

An engine company lieutenant responding to an alarm at a two-story, single-family row house at 6:26 on the morning of January 9 was killed when he fell through a floor and became trapped. The house, which abutted other row houses on both sides, was of ordinary construction and had a ground-floor area of 720 square feet (67 square meters).

The arriving chief instructed the lieutenant, who reported that the fire was in the basement, to remain on the first floor and protect the house from vertical fire spread with a 1-inch hand line. The chief then ordered the second engine company to attack the fire from the rear of the building.

The lieutenant and his crew maintained their position on the first level until fire showed and conditions began to deteriorate. As they left the building through the rear, the lieutenant became separated from them. Search and rescue operations were immediately ordered.

The lieutenant, who was wearing a protective ensemble but no self-contained breathing apparatus, had fallen partially through the fire-weakened floor, where he was exposed to flames until the rescue crew removed him. When he was finally pulled out, he had sustained second- and third-degree burns over 30 percent of his body and suffered severe smoke and soot inhalation.

Medical personnel immediately began life support and transported him to the hospital. He was then transferred to another hospital with an intensive care burn unit, where he died six days later of respiratory complications and sepsis.

The sole occupant of the house, alerted by a smoke detector, had already escaped from the building by the time the fire department arrived.

Firefighter struck by motor vehicle

At approximately 5:30 p.m. on February 3, a 17-year-old boy in a speeding pickup truck hit a 32-year-old firefighter who was standing in the right travel lane of a four-lane state highway directing traffic around a car crash. The boy had swerved into the right to avoid colliding with a vehicle in the left lane.

Firefighter struck by motor vehicle (continued)

The firefighter, who was wearing a reflective vest and holding a flashlight in one hand and a stop/slow sign in the other, was thrown approximately 130 feet (40 meters), landing on his back on the grass shoulder on the right side of the road. The pick-up truck ran off the road and came to a rest on the grass shoulder, as well.

The firefighters on scene immediately administered first aid and transported the injured firefighter to the hospital where he was pronounced dead on arrival. The cause of death was listed as major trauma.

Lieutenant dies after being shot at medical call

A fire officer and a firefighter were shot as they responded to a medical call at approximately 3:30 on the afternoon of February 13.

Fire dispatch notified an engine company consisting of the officer and two firefighters to respond to a call for a woman that had been shot. When they arrived, the driver parked the apparatus a short distance from the scene, and the firefighters, dressed in their station uniforms, walked the rest of the way.

When they spotted the victim on the side of the road approximately 80 to 90 feet (24 to 27 meters) from the front of the house, they realized that she was dead. They were placing an automatic external defibrillator on her to confirm the lack of a heartbeat when the three shots rang out, hitting the lieutenant in her torso and one of the firefighters in the head.

The two injured firefighters managed to hide behind a tree, while the third firefighter took cover behind an ambulance that had just arrived at the scene. The lieutenant was shot a second time when she moved out from behind the tree, where she and the firefighter were pinned for 30 minutes before enough police officers arrived to evacuate them. By this time, the lieutenant was unable to move and had to be carried to safety.

Both the lieutenant and firefighter were taken to the hospital, where the lieutenant died as a result of her wounds. Cause of death was listed as multiple gunshot wounds. The injured firefighter survived.

Disoriented firefighter dies after being trapped

A 40-year-old firefighter responding to a mutual aid request at a restaurant on February 18 died of smoke inhalation before he could evacuate the building.

The restaurant, which had a bar and dance floor, was located in an unsprinklered, single-story, wood-framed building with a lightweight wood-truss roof covered by sheet metal, which also covered the exterior walls. The ceiling consisted of metal decking attached to, and suspended from, the bottom chord of the truss. The restaurant's ground floor covered 5,000 square feet (465 square meters).

The firefighter was part of a four-person engine company dispatched by one of seven fire departments responding to the call for assistance. On arrival at 1:32 p.m., two of the firefighters joined two other firefighters from another department who had arrived earlier and were getting ready to advance a 1-inch attack line inside. Both men were dressed in full protective ensembles, including hoods, and equipped with self-contained breathing apparatus with integrated PASS. One also had a thermal imaging camera, a department two-way radio, and an additional PASS that had to be activated manually. This firefighter led the two firefighters from the other department inside with the attack line, while the other stayed at the door and fed the hose inside.

Because the fire was burning above the dropped metal ceiling, smoke conditions inside were initially light with good visibility. The team first went in toward the dining room where they couldn't see any visible fire, then reversed direction toward the bar, where the conditions were deteriorating. At this time, the firefighter at the door feeding the hose was reassigned to the rear of the building to join other firefighters advancing another attack line. Before going, he went inside to tell the lead firefighter that he'd been reassigned and left the building. One of the other firefighters mistook the man leaving the building for the lead firefighter.

As the team continued to advance the hose, the smoke thickened, visibility dropped to zero, and the heat intensified. After one of the firefighters on the hose line lost the seal on his mask and breathed in some of the acrid smoke, he, too, left the building. Seeing him go, the third firefighter thought he would be alone, so he also left.

At this time, the roof sagged and an evacuation alarm was sounded. Before all the personnel were accounted for, the hose was dragged out of the building.

Disoriented firefighter dies after being trapped (continued)

After it was established that a firefighter was missing, his colleagues tried several times to rescue him, but, hearing no PASS alarms or radio transmissions, they failed to locate him.

After the fire was brought under control, rescuers found the missing man face down in a prone position 25 feet (8 meters) from the door through which he had entered the building. His facepiece had been partially removed, and the hose from the cylinder to the regulator and the cable from the thermal imaging camera were tangled in a chair. The integrated PASS had melted, and the manual PASS had not been activated. The firefighter's portable radio, which was found next to him, had a different radio frequency than the incident commander's and there was no local fireground channel.

The level of carbon monoxide in the victim's blood was 51 percent, and the cause of his death was listed as smoke inhalation.

Firefighter dies after suffering heart attack

A 70-year-old firefighter directing traffic at a fire at a large steel-manufacturing facility had a heart attack and collapsed on the street on February 23. The fire itself was quite small and had essentially been extinguished by employees and plant security by the time the fire company arrived at 12:27 p.m.

Emergency medical personnel responding to the incident for stand-by duty saw the man lying in the street and transported him to the hospital, where he was pronounced dead on arrival. Medical records revealed that the firefighter had a history of heart problems. The cause of death is listed as atherosclerotic cardiovascular disease.

Firefighter dies from injuries sustained while pinned

A 37-year-old firefighter died on February 23 as a result of injuries he suffered when he was pinned between a water tanker and an engine at the scene of a house fire.

The fire department received the alarm at 6:20 p.m., and responded to a single-story, wood-frame mobile home in a rural area. The mobile home, which covered 600 square feet (58 square meters), was raised off the ground in a secure, stationary position. No one was at home at the time of the fire. Because the area

Firefighter dies from injuries sustained while pinned (continued)

lacked a water supply system, firefighters first tried to draft water from a nearby pond. When the pond proved to be frozen, a mutual aid call was sounded to shuttle water by tanker to a portable drop tank set up at the scene.

An engine company was drafting water from the portable tank when a supply tanker arrived and backed directly in line with the tank and the engine. The firefighter in the passenger seat, who was dressed in a full protective ensemble, walked to the rear of the tanker to release the valve. He was standing between the tanker and the engine when the tanker driver got out of the cab and accidentally hit the emergency brake lever with his leg. The brake released and the tanker rolled back, pinning the firefighter between the two vehicles.

After the tanker was moved, the firefighter was airlifted to a nearby hospital, where he died of blunt force trauma.

Firefighter trapped in truck after single vehicle crash

On March 3, a forest ranger was killed when the department brush truck he was driving to a controlled burn crashed on a state road.

At 9 a.m., the ranger was traveling at an estimated speed of 50 miles per hour (81 kilometers per hour) when the right front tire either blew out or the tread separated. The truck went up onto the soft shoulder and was sliding in a counter clockwise direction when it hit a culvert, flipped over, and landed on its roof in a ditch filled with water. The impact crushed the roof, trapping the ranger, who was belted into his seat, underwater.

Good Samaritans were able to free the driver from the vehicle as medical personnel arrived on scene. By that time, however, the ranger was dead.

Investigators found no fault with the driver. Weather conditions were clear and dry, and there was evidence that he had steered the vehicle evasively to the left and applied the brakes.

An autopsy revealed that the cause of death was drowning.

Firefighter killed when two engines collide

A firefighter died and five others were injured when the two fire engines in which they were responding to a mutual-aid call at a garage fire crashed at a large intersection controlled by several overhead and pole-mounted traffic lights.

The crash occurred at 5:45 p.m. on April 27 when the first engine, which entered the intersection on a green light and was more than halfway across, was hit by the second engine just behind the enclosed cab on the passenger side. The force and location of the impact caused both engines to spin violently and roll onto their left sides before coming to a stop. The firefighter riding in the passenger seat on engine two was unrestrained and was thrown forward, receiving a fatal head injury. The front of the second engine's cab collapsed inward, pinning the driver's legs between his seat and the dashboard.

The unrestrained firefighter, who was ejected from the cab, was treated at the scene for a massive head injury, then airlifted to the hospital, where he was pronounced dead on arrival. The cause of death was listed as cranocerebral injuries.

The driver of engine two was placed in intensive care with multiple lacerations and fractures and a collapsed lung. The other four firefighters were treated for minor injuries and released.

Firefighter dies after fall from truck

A 74-year-old firefighter died on May 3 when he fell off the tailgate of a pickup truck in which he was riding from the fire station to a regularly scheduled training session at a nearby parking lot.

After meeting at the fire station at 7 p.m. to participate in the training session, members of the fire department were instructed to bring the apparatus to the parking lot because it provided more space than the fire station's parking lot. Witnesses reported that the victim slid off the truck when it made a left hand turn and accelerated onto the highway, striking the back of his head on the pavement.

Firefighters performed cardiopulmonary resuscitation on the victim, who had no pulse and was not breathing, until paramedics arrived. They continued cardiopulmonary resuscitation on the way to the hospital, where the firefighter was pronounced dead on arrival. The cause of death was a skull fracture.

Fire chief dies from injuries

At 8 a.m. on April 8, a man removing paint from a two-story, wood-framed church with an electrical heat gun noticed a glowing ember in a crack around the window on which he was working. He got a gallon of water and poured it on the area, after which he did not see any more embers. He left the church, whose ground floor covered 2,400 square feet (223 square meters), at 10 a.m.

At 10:29 a.m., the fire department was notified that the 100-year-old church was on fire, and firefighters arriving three minutes later found large quantities of smoke coming from the eaves. When they ran an attack line through the front door, however, they saw no smoke and felt no heat. They proceeded to pull the ceiling down, and saw the flames rolling above.

Just as the company backed the hose out of the building at 10:44 a.m., the roof collapsed and pushed out the front wall, which struck and trapped the chief and two firefighters standing on the sidewalk. All three were wearing full protective ensembles except for the chief, who was not wearing a self-contained breathing apparatus or gloves.

The three were rescued from the debris and transported to the hospital. The two firefighters recovered from their injuries and returned to work; but the chief, who sustained more severe injuries, died on August 1 at a rehabilitation center. The cause of his death is listed as multiple blunt force trauma and thermal injuries.

Firefighter dies of septicemia

On September 17, a 57-year-old diabetic firefighter was directing traffic in a flooded area when an open ulcer on his leg was exposed to contaminated floodwater. Five days later, he was admitted to the hospital complaining of chest pains and swelling in his legs. He died the following day of septicemia.

Firefighter struck by falling piece of tree

On October 2, a wildland firefighter died when the top of a dead tree fell and hit him in the head at the site of the prescribed burn.

Firefighters had spent approximately two weeks before the burn identifying the cutting down dead trees, but the tree that snapped did not appear to present a danger at the time. On the day of the accident, however, the victim and his partner were asked to remove it because fire and smoke had been seen at its top.

Firefighter struck by falling piece of tree (continued)

The two men were helping pull the fire hose out of the way before starting the operation, when other firefighters saw the top section of the tree start to fall and warned the two firefighters. The firefighter closer to the tree reacted immediately, but he could only take two or three steps before a section approximately 7 feet (2 meters) long and 12 to 15 inches (30 to 38 centimeters) struck his helmet, driving his face into the ground.

The victim was taken to a helicopter landing zone, where the medical crew of the arriving helicopter pronounced him dead of massive head trauma.