

Fatalities Among Volunteer and Career Firefighters — United States, 1994–2004

Approximately 800,000 firefighters in the United States are volunteer firefighters and 300,000 are career firefighters (1). Volunteer firefighters primarily serve communities with fewer than 25,000 inhabitants, whereas most career firefighters serve communities of more than 25,000 persons (1). To characterize fatalities among volunteer and career firefighters, CDC analyzed data from the U.S. Fire Administration (USFA). This report summarizes the results of that analysis and, to illustrate the most common types of volunteer and career firefighter fatalities, describes two cases investigated by the National Institute for Occupational Safety and Health (NIOSH) Firefighter Fatality Investigation and Prevention Program.* Fifty-three percent (610 of 1,141[†]) of U.S. firefighters who died while on duty during 1994–2004 were volunteers, and 32% (368) were career firefighters. The remaining 15% (163) of deaths were among other firefighters (e.g., wildland, paid on-call, and part-time paid firefighters). Among volunteer firefighters, sudden cardiac death (e.g., from myocardial infarction or arrhythmia) and motor vehicle (MV) crashes during emergency response were the leading causes of fatality. Among career firefighters, sudden cardiac death and asphyxiation were leading causes of death. Adoption and enforcement of existing fire-service recommendations regarding fitness standards, mandatory medical evaluations with appropriate work restrictions, and emergency vehicle response protocols are needed to prevent these fatalities among firefighters.

Case Reports

Case 1: volunteer fatality. On July 28, 2003, at approximately 5:30 p.m., two members (aged 19 and 23 years) of a volunteer fire department responded to a trailer fire. With emergency lights on, traveling in a privately owned vehicle on a two-lane asphalt state road at an estimated 80 mph in a 55-mph zone, the driver drifted off the pavement and lost control of the vehicle. The vehicle overturned several times, struck a wooden utility pole, and ejected both unrestrained firefighters. The driver was killed, and the passenger was seriously injured. No adverse weather or road conditions were reported. The fire department's written protocol required that firefighters obey state and local traffic laws when responding in privately owned vehicles, including using seat belts.

Case 2: career fatality. On December 5, 2002, a male career captain aged 51 years responded to a fire in the attic of a two-story dwelling. After assisting with fire suppression on the second floor for approximately 5 minutes, he collapsed suddenly, and resuscitation efforts were unsuccessful. The autopsy revealed atherosclerotic and hypertensive cardiovascular disease with more than 85% narrowing of three coronary arteries. Thirteen years before his death, the captain had a myocardial infarction and subsequent angioplasty of his right coronary artery. The captain also had the following risk factors for coronary artery disease (CAD): age ≥ 45 years, male sex, family history of CAD, high cholesterol, high blood pressure, and overweight. Follow-up consisted of annual visits to his cardiologist, resting electrocardiograms, thallium-imaging exercise stress tests, and estimates of left ventricular function (e.g., left ventricular ejection fraction). These evaluations were consistently normal. However, 6 months before his death, new test results indicated new cardiac ischemia and a marked reduction of left ventricular function. No work restrictions were recommended by the cardiologist. Under these circumstances, the captain should have been issued work restrictions in accordance with National Fire Protection Association (NFPA) recommendations (2).

Firefighter Fatalities

USFA maintains a database of all on-duty firefighter deaths. On-duty death is defined as the death of any firefighter who died while on duty or after recently completing a call (within 24 hours) for an organized fire department.[§] Using death certificates and fire department interviews, USFA determines firefighter demographics and the circumstances and causes of each fatality and classifies them accordingly. Firefighters are classified as career, volunteer, paid on-call, part-time paid, or wildland firefighters. For this study, only deaths among firefighters classified as career or volunteer were included. Cases of sudden cardiac death (e.g., myocardial infarction or arrhythmia) were recorded in the database as "heart attacks." To determine which trauma cases were MV-related and to identify the type of vehicle involved, the narratives of the USFA database were reviewed. MV-related traumatic death was defined as a fatality associated with a vehicle (e.g., a vehicle collision, being struck or crushed by a vehicle, or a fall from a vehicle).

During 1994–2004, a total of 610 volunteer and 368 career firefighters died while on duty. Half of the deaths among volunteers were caused by heart attacks and 26% by MV-related trauma (Table). For career firefighters, 39% were caused

* Case reports are available from the NIOSH Firefighter Fatality Investigation and Prevention Program at <http://www.cdc.gov/niosh/fire>.

[†] Excludes the 343 career firefighters who died at the World Trade Center after the September 11, 2001, terrorist attack.

[§] Affiliated with a city, state, or territory, the federal government, or an industrial brigade.

TABLE. Number and percentage of fatalities among career and volunteer firefighters, by cause/contributing cause — United States, 1994–2004

Cause/Contributing cause	Career		Volunteer	
	No.	(%)	No.	(%)
Heart attack*	142	(39)	306	(50)
Stress/Overexertion	138	(97)	301	(98)
Other	4	(3)	5	(2)
Motor vehicle–related trauma	44	(12)	160	(26)
Vehicle collision/crash	30	(68)	116	(73)
Struck by vehicle	12	(27)	33	(20)
Other vehicle-related (e.g., crushed by or fell from a vehicle)	2	(5)	11	(7)
Asphyxiation	74	(20)	45	(7)
Caught/Trapped	56	(76)	31	(69)
Other (e.g., lost inside a structure or exposed to smoke)	18	(24)	14	(31)
All other†	108	(29)	99	(16)
Caught/Trapped	32	(30)	19	(19)
Fall	8	(7)	15	(15)
Exposure (e.g., to smoke)	9	(8)	14	(14)
Stress/Overexertion	16	(15)	14	(14)
Structure collapse	8	(7)	3	(3)
Other	35	(32)	34	(34)
Total	368		610	

* For example, myocardial infarction or arrhythmia.

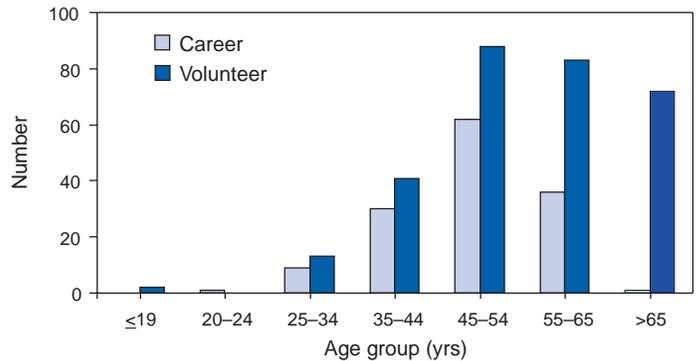
† Includes deaths caused by burns, cerebral vascular accidents, drownings, electrocution, heat exhaustion, and trauma.

by heart attacks, 29% by other causes (e.g., burns, cerebral vascular accident [CVA], or drowning), and 20% by asphyxiation (Table). For both volunteer and career firefighters, 97% of the decedents were male. The median age was 47 years (range: 15–81 years) for volunteers and 44 years (range: 20–67 years) for career firefighters. For both volunteer and career firefighters, most heart attack deaths occurred among persons aged 45–54 years (Figure 1). The majority of heart attack deaths were attributed to stress and overexertion in both volunteer (98%) and career (97%) firefighters (Table).

For career firefighters, being caught/trapped accounted for 76% of asphyxiation fatalities and 30% of other fatalities (e.g., burns, CVA, or drowning) (Table). MV-related trauma was the second most common type of fatality for volunteers. Seventy-three percent of MV-related traumatic deaths of volunteer firefighters were caused by vehicle collisions/crashes (Table). The greatest proportion of crashes (30%) involved privately owned vehicles (Figure 2). Tankers accounted for 26% of crashes. Eighty percent of the vehicle crashes occurred while firefighters were en route to calls, whereas 5% occurred during returns from calls.

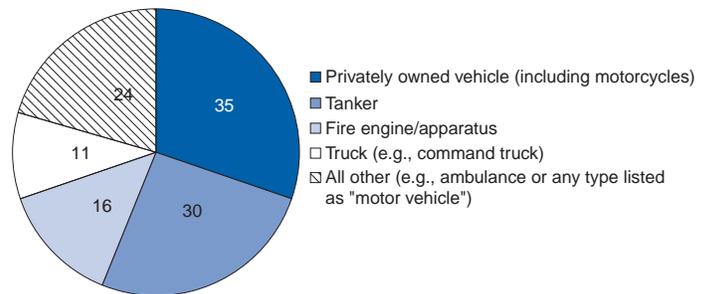
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FIGURE 1. Number of fatalities caused by heart attacks* among career and volunteer firefighters, by age group — United States, 1994–2004



* For example, myocardial infarction or arrhythmia.

FIGURE 2. Number* of vehicles involved in volunteer firefighter fatal crashes, by vehicle type — United States, 1994–2004



* N = 116.

Editorial Note: The findings in this report indicate that 610 volunteer and 368 career firefighters died while on duty during 1994–2004 and that heart attacks were the leading cause of fatality for both volunteer and career firefighters. Firefighting is physically demanding work requiring high levels of aerobic capacity (3). Therefore, fire departments are encouraged to require preplacement and annual medical evaluations in accordance with NFPA guidelines. NFPA 1582, *Standards on Comprehensive Occupational Medical Program for Fire Departments*, recommends exercise stress testing for asymptomatic firefighters who have two or more risk factors[‡] for CAD (2).

[‡] Risk factors are family history of a premature (age <60 years) myocardial infarction in a first degree relative, hypertension (defined as systolic blood pressure >140 mmHg or diastolic blood pressure >90 mmHg), diabetes mellitus, cigarette smoking, and hypercholesterolemia (defined as total cholesterol >240 mg/dL or high density lipoprotein <35 mg/dL).

Both volunteer and career firefighter organizations have developed fitness and wellness programs to prevent atherosclerotic heart disease (4,5). NFPA 1583, *Standard on Health-Related Fitness Programs for Firefighters*, outlines a complete health-related fitness program designed for fire departments (6).

The second leading cause of volunteer firefighter deaths was MV-related trauma, most often related to a crash in a privately owned vehicle en route to a call. Fire departments should enact and enforce policies requiring seat belt use, prohibiting speeding en route to calls, and requiring adherence to all traffic laws. Driver training should be provided to all drivers at least twice a year to meet the requirements of NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program* (7). USFA's *Emergency Vehicle Safety Initiative* provides best-practice guidelines for MV operations for firefighters (8). Community officials should encourage local fire departments to comply with these guidelines. Information on proper operation of privately owned vehicles by emergency service workers is available at http://www.vfis.com/risk/risk_pov.htm. In addition, states should continue to work toward enacting primary seat belt laws,** which have been demonstrated to increase seat belt use (9).

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, contains the minimum requirements for a fire-service-related occupational safety and health program (10). NFPA 1500 provides guidance to prevent firefighters from dying as a result of being caught/trapped during fire suppression in a structure (e.g., personnel accountability programs to ensure that incident commanders know where their crews are at all times while at the scene).

The findings in this report are subject to at least four limitations. First, because volunteer hours served are not reported to USFA consistently by volunteer fire departments, fatality rates could not be computed. Second, USFA might not capture data on all on-duty deaths; however, because benefits awards†† for firefighters depend on reporting to USFA, reporting rates are probably high. Third, the definition of on-duty heart attack death was not consistent throughout the study period. Before December 2003, a heart attack death was considered an on-duty death if the person became symptomatic at the fire scene and died within 24 hours; however,

since December 2003, a death within 24 hours after a response to a call, whether symptoms began at the scene, has been considered an on-duty death. Finally, the definition of "heart attack" used in the USFA database is broad, describing all events instead of specific cardiac events; prevention recommendations are different for myocardial infarction and arrhythmia.

To reduce the risk factors for cardiovascular disease, fire departments should consider mandating that all firefighters have an annual fitness and medical examination and participate in a department-based fitness program. NFPA 1583 provides the minimum requirements for health-related programs for firefighters (6). Physicians performing fitness exams should be knowledgeable about NFPA 1582 (2) and the physical demands of firefighting. Moreover, seat belt use and safe-driving practices or defensive-driving skills by firefighters are critical interventions to decrease MV fatalities. Fire departments should continue to promote a culture of safety for all as the foundation for effective response to the community.

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** Laws that allow a law enforcement officer to stop a vehicle and issue a citation when the officer observes a driver or passenger not wearing a safety belt; no other traffic offense is required to stop the vehicle.

†† A benefit award is a one-time financial payment to the eligible survivors of public safety officers whose deaths are the direct and proximate result of a traumatic injury sustained in the line of duty.



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Workers' Memorial Day — April 28, 2006

Workers' Memorial Day, April 28, was established to remember those workers who died or were injured on the job. On average, nearly 16 workers in the United States die each day from injuries sustained at work (1), and 134 die from work-related diseases (2). Daily, an estimated 11,700 private-sector workers have a nonfatal work-related injury or illness, and more than half will require job transfer, work restrictions, or time away from their jobs as a result (3). More than 9,000 workers are treated in emergency departments each day, and approximately 200 of these workers are hospitalized (4). In 2003, workers' compensation costs for employers totaled \$81 billion (5).

Workers' Memorial Day also will commemorate the 35th anniversary of the creation of the National Institute for Occupational Safety and Health within the U.S. Department of Health and Human Services and the Occupational Safety and Health Administration within the U.S. Department of Labor. Additional information about workplace safety and health is available at <http://www.cdc.gov/niosh/homepage.html> or telephone, 800-356-4674.

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Nonfatal Occupational Injuries and Illnesses Among Workers Treated in Hospital Emergency Departments — United States, 2003

CDC's National Institute for Occupational Safety and Health (NIOSH) collects data on nonfatal occupational injuries and illnesses through the National Electronic Injury Surveillance System (NEISS), an emergency department (ED)-based surveillance system. This report summarizes data for 2003. The overall number and rate of occupational injuries and illnesses did not change substantially during the 5-year period since data were last reported in 1998 (1). In 2003, age-, sex-, and diagnosis-related patterns of injury and illness among workers treated in EDs (ED-treated injuries/illnesses) were similar to those reported in 1998. To achieve substantial decreases in these injuries and illnesses, prevention efforts must focus on effective, targeted workplace-safety interventions for diverse occupations.

The Consumer Product Safety Commission (CPSC) administers NEISS, a national stratified probability sample of U.S. hospitals with 24-hour EDs that tracks product-related injuries/illnesses that are not work related. In addition, CPSC collaborates with CDC to collect data for two

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