

Fire-Related Firefighter Injuries Reported to NFIRS

These topical reports are designed to explore facets of the U.S. fire problem as depicted through data collected in the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS). Each topical report briefly addresses the nature of the specific fire or fire-related topic, highlights important findings from the data, and may suggest other resources to consider for further information. Also included are recent examples of fire incidents that demonstrate some of the issues addressed in the report or that put the report topic in context.

Findings

- Between 2006 and 2008, an estimated 81,070 firefighter injuries occurred annually. Of this number, 39,715 occurred on the fireground and 4,880 occurred while responding/returning from an incident.
- The majority of fire-related firefighter injuries (87 percent) occur in structure fires. In addition, on average, structure fires have more injuries per fire than nonstructure fires.
- Thirty-eight percent of all fire-related firefighter injuries resulted in lost work time.
- Firefighter injury fires are more prevalent in July (10 percent) and peak between the hours of 2 and 5 p.m.
- Overexertion/Strain is the cause of 25 percent of fire-related firefighter injuries reported to NFIRS.

Every occupation brings degrees of safety risk. At the fire scene, on the way to or from a fire, or even while training, firefighters face the chance of suffering an injury and possibly death. Each year, tens of thousands of firefighters are injured while fighting fires, rescuing people, responding to emergency medical incidents, responding to hazardous material incidents, or training for their job. Between the years of 2006 and 2008, there were an estimated 81,070 firefighter injuries of which 39,715 occurred on the fireground.¹ While the majority of injuries are minor, a significant number are debilitating and career-ending. Such injuries exact a great toll on the fabric of the fire service.

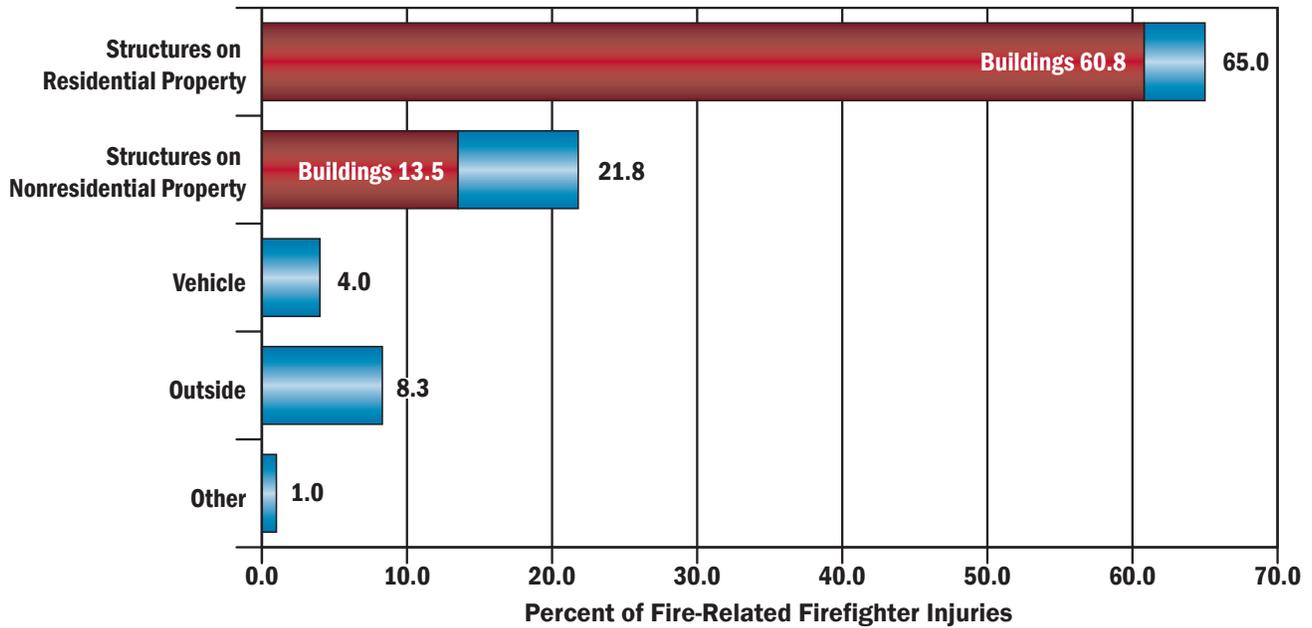
From the need to adjust staffing levels and rotations to accommodate injuries, to the focus of the fire service on injury prevention, injuries and their prevention are a primary concern. In addition, the fire service has done much to improve firefighter safety. Firefighter health and safety initiatives, incident command structure, training, and protective gear are but a few areas where time, energy, and resources have been well-spent. Nonetheless, firefighting is, by its very nature, a hazardous profession. Injuries can and do occur.

This topical report addresses the details of firefighter injuries sustained at or responding to a fire incident, focusing on data submitted to the National Fire Incident Reporting System (NFIRS) 2006 to 2008. The statistics presented are from the analysis of the 2006 to 2008 NFIRS, version 5.0 data.²

Fire-Related Firefighter Injuries by Property Type

Eighty-seven percent of firefighter injuries reported to NFIRS from 2006 to 2008 were associated with structure fires (Figure 1). Three times as many firefighter injuries occur in residential structures than in nonresidential structures, tracking with overall residential/nonresidential fire incidence. Overall, firefighter injuries in residential structures account for 65 percent of firefighter injuries, a majority of which occur in residential building fires.³ Building fires also make up more than half of the firefighter injuries in structure fires on nonresidential properties. Outside, vehicle, and other fires combined represent 13 percent of firefighter injuries from 2006 to 2008.

Figure 1. Fire-Related Firefighter Injuries by General Property Type, 2006–2008



Source: NFIRS 5.0.

Notes: The vehicle incident type includes all vehicular incidents regardless of the mobile property involvement. Total may not add to 100 percent due to rounding.

Fire-Related Firefighter Injuries per Fire

Firefighters are nearly 13 times more likely to be injured in structure fires than in nonstructure fires (e.g., vehicle fires, outdoor fires) as shown in Table 1. Building fire injury rates are shown separately in Table 2.

Table 1. Fire-Related Firefighter Injury Rates per 1,000 Fires by Incident Type (2006–2008)

| Incident Type | All Fires |
|----------------------|-----------|
| Structure | 13.5 |
| Residential | 13.2 |
| Nonresidential | 14.9 |
| Nonstructure | 1.1 |
| Vehicle ⁴ | 1.4 |
| Outside and other | 1.0 |
| Total/Overall | 5.5 |

Source: NFIRS 5.0.

Note: The vehicle incident type includes all vehicular incidents regardless of the mobile property involvement.

Table 2. Fire-Related Firefighter Injury Rates per 1,000 Building Fires by Incident Type (2006–2008)

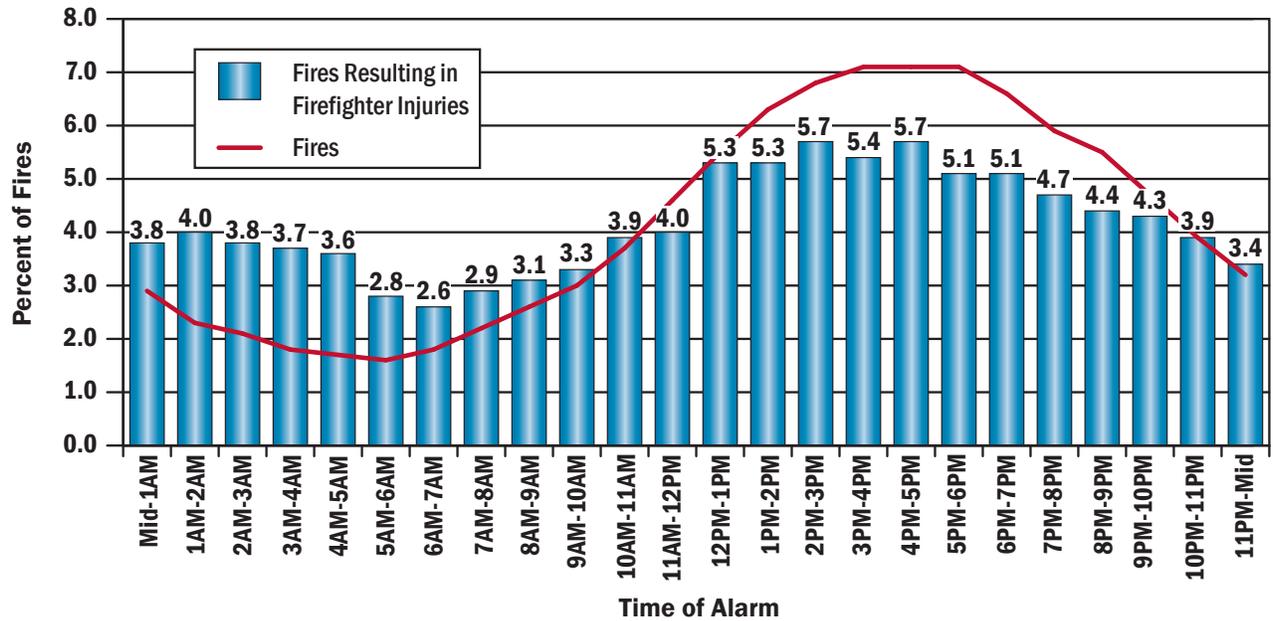
| Incident Type | Fires |
|------------------|-------|
| Buildings | 12.5 |
| Residential | 13.0 |
| Nonresidential | 10.5 |

Source: NFIRS 5.0.

When Fire-Related Firefighter Injuries Occur

As shown in Figure 2, firefighter injuries occur most frequently in the midday, peaking from 2 to 5 p.m. After 5 p.m., firefighter injuries decrease until midnight. A small peak is then seen from midnight to 5 a.m. After 5 a.m., the numbers of injuries decrease, reaching the lowest point between 6 and 7 a.m. After 7 a.m., the number of firefighter injuries gradually increase to the start of the peak at noon. The peak period (2 to 5 p.m.) accounts for 17 percent of firefighter injuries.⁵ The time of injury profile tracks with the time of alarm for fires overall.

Figure 2. Fires Resulting in Firefighter Injuries by Time of Alarm (2006–2008)



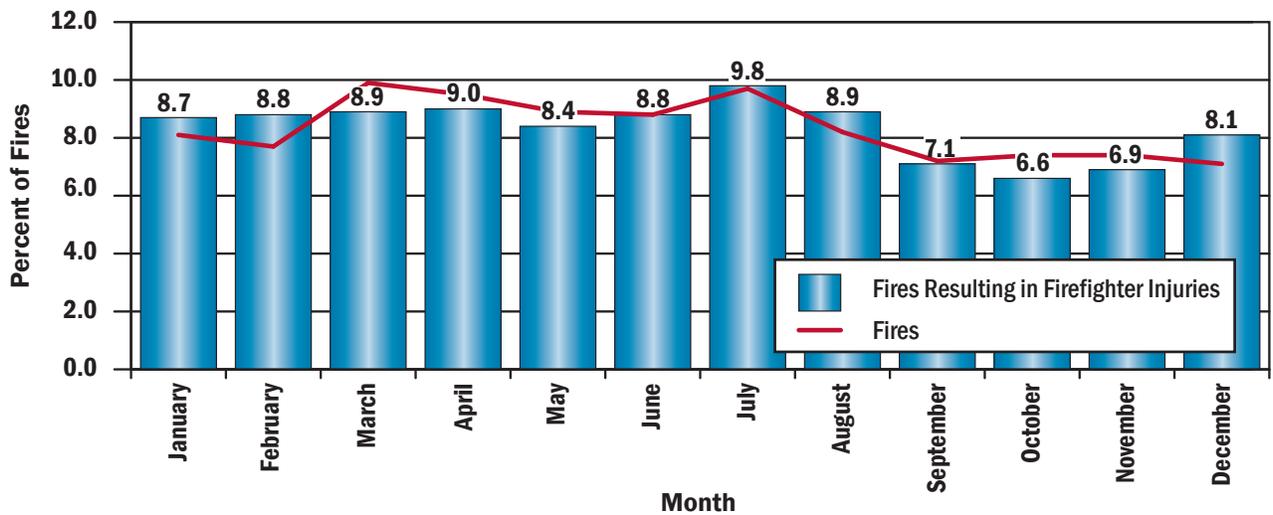
Source: NFIRS 5.0.

Note: Total may not add to 100 percent due to rounding.

Figure 3 illustrates that firefighter injuries are highest in the summer and lowest in the fall. The summer peak occurs during July (10 percent). Firefighter injuries are lowest in

October (7 percent). The month of injury profile tracks with the time of alarm for fires overall.

Figure 3. Fires Resulting in Firefighter Injuries by Month (2006–2008)



Source: NFIRS 5.0.

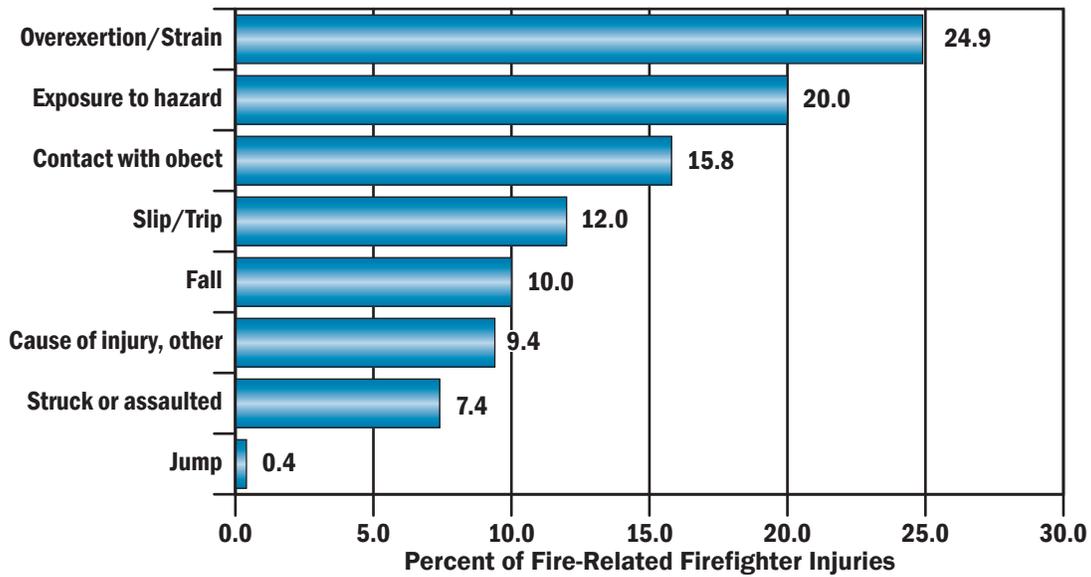
Cause and Nature of Fire-Related Firefighter Injuries

Twenty-five percent of all firefighter injuries are caused by overexertion/strain as shown in Figure 4. The next four leading causes combined account for approximately 58 percent of firefighter injuries: exposure to hazard (20 percent),

contact with object (firefighter moved into/onto) (16 percent), slip/trip (12 percent), and fall (10 percent).

Not surprisingly, the leading nature of injury is strain, closely associated with overexertion/strain as the cause of the injury (Figure 5).

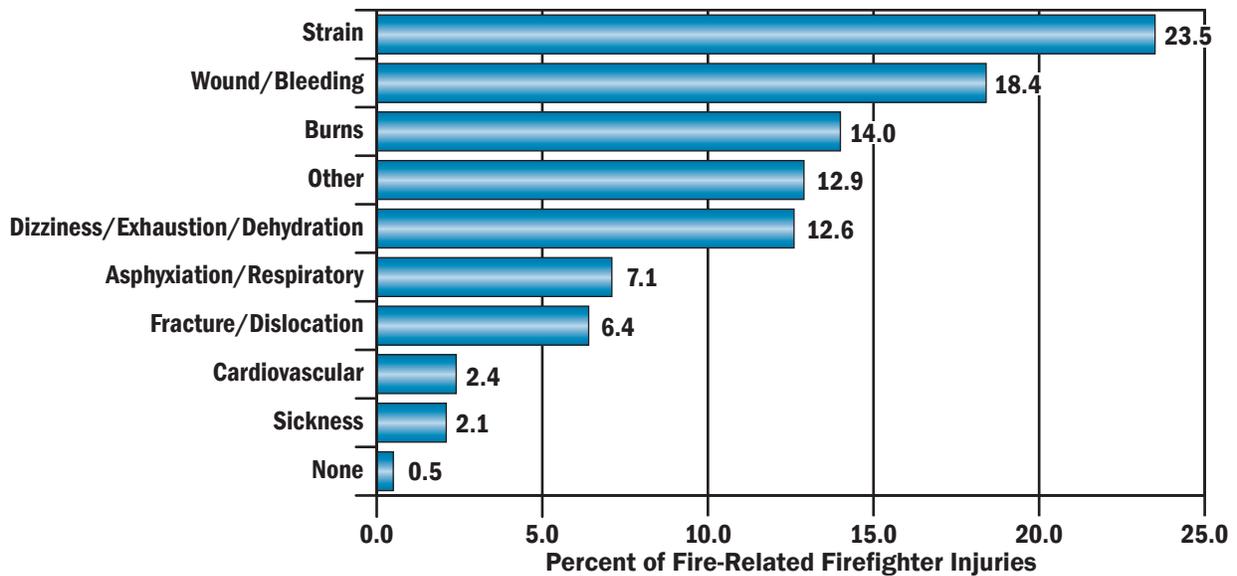
Figure 4. Fire-Related Firefighter Injuries by Cause of Injury (2006–2008)



Source: NFIRS 5.0.

Notes: Only includes injuries where cause of injury was provided. Total may not add to 100 percent due to rounding.

Figure 5. Fire-Related Firefighter Injuries by Nature of Injury, 2006–2008



Source: NFIRS 5.0.

Notes: Only includes injuries where nature of injury was provided. Total may not add to 100 percent due to rounding.

Severity of Fire-Related Firefighter Injuries

More than half of firefighter injuries (62 percent) result in no lost work time as shown in Table 3. These injuries are treated on scene with first aid or treated after the incident by a physician either at a medical facility or in a doctor’s

office. About 38 percent of firefighter injuries result in lost work time. The majority of the lost work time injuries (95 percent of lost work time injuries or 36 percent of all fire-related firefighter injuries) are moderate in severity. Severe or life-threatening injuries account for 2 percent of firefighter injuries.

Table 3. Severity of Fire-Related Firefighter Injuries (2006–2008)

| Severity | Percent of Fire-Related Firefighter Injuries |
|-------------------------------------|--|
| First aid only, no lost time | 26.4 |
| Treated by physician, no lost time | 35.1 |
| Moderate severity, lost-time injury | 36.4 |
| Severe, lost-time injury | 1.7 |
| Life threatening, lost-time injury | 0.4 |
| Total | 100.0 |

Source: NFIRS 5.0.

Note: Only includes injuries where severity was included.

Fire-Related Firefighter Injuries by Age and Gender

Table 4 shows the percent of firefighter injuries based on gender. A majority of all firefighter injuries, 95 percent, are sustained by males. This statistic is consistent with the composition of the fire service during this period—males constituted 95 percent of firefighters between 2004 and 2008.⁶

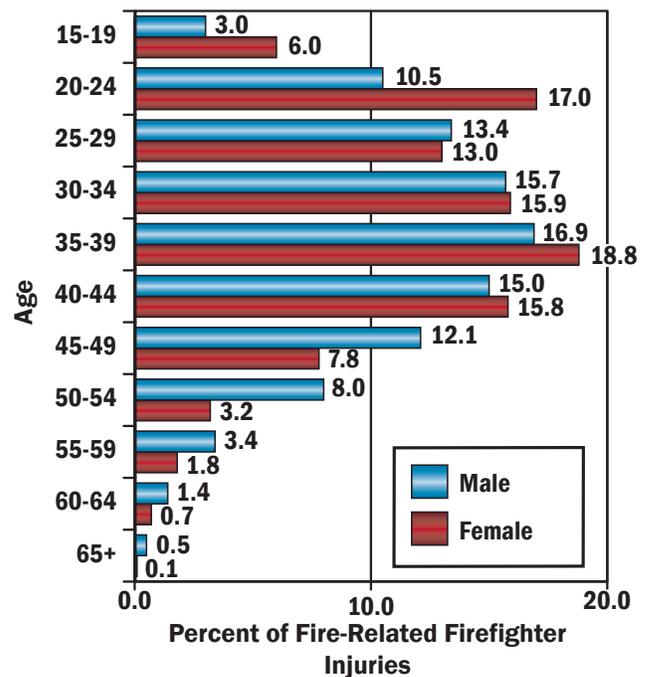
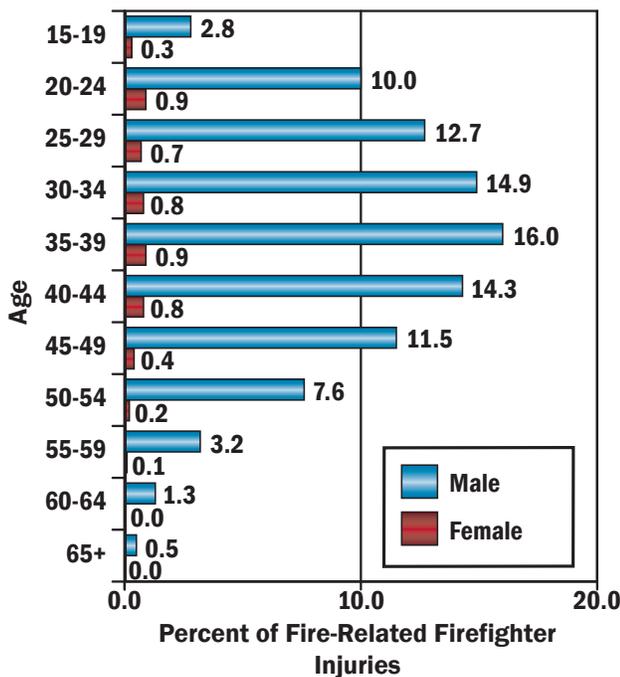
Table 4. Percent of Fire-Related Firefighter Injuries by Gender (2006–2008)

| Gender | Percent of Fire-Related Firefighter Injuries |
|--------|--|
| Male | 95.0 |
| Female | 5.0 |
| Total | 100.0 |

Source: NFIRS 5.0.

Figure 6 shows two different profiles of firefighter injuries by age and gender. The left graphic shows male and female injuries as a percent of the total injuries (all bars add to 100 percent). The right graphic shows the age distribution of injuries by gender (each distribution adds to 100 percent). Both graphs show that male firefighter injuries peak between ages 35–39 and female firefighter injuries peak between ages 20–24 and 35–39. Overall, one-third of all injuries (33 percent) occur to firefighters aged 30–39.

Figure 6. Fire-Related Firefighter Injuries by Age and Gender (2006–2008)



Source: NFIRS 5.0.

Notes: Only includes incidents where age and gender were provided. Totals may not add to 100 percent due to rounding.

The types of injuries incurred by firefighters vary with age. The leading causes of injury among younger firefighters relate to exposure to hazards, while among older firefighters, overexertion/strains are the most common injuries. These results relate to physical fitness variations with age and the effect of age on type of assignments, among other factors.

Fire-Related Firefighter Injuries by Affiliation and Age

Injuries to career firefighters are the largest share (66 percent) of the reported injuries (Table 5). Nationally, only 28 percent of the fire service is career firefighters.⁷

Table 5. Fire-Related Firefighter Injuries by Affiliation (2006–2008)

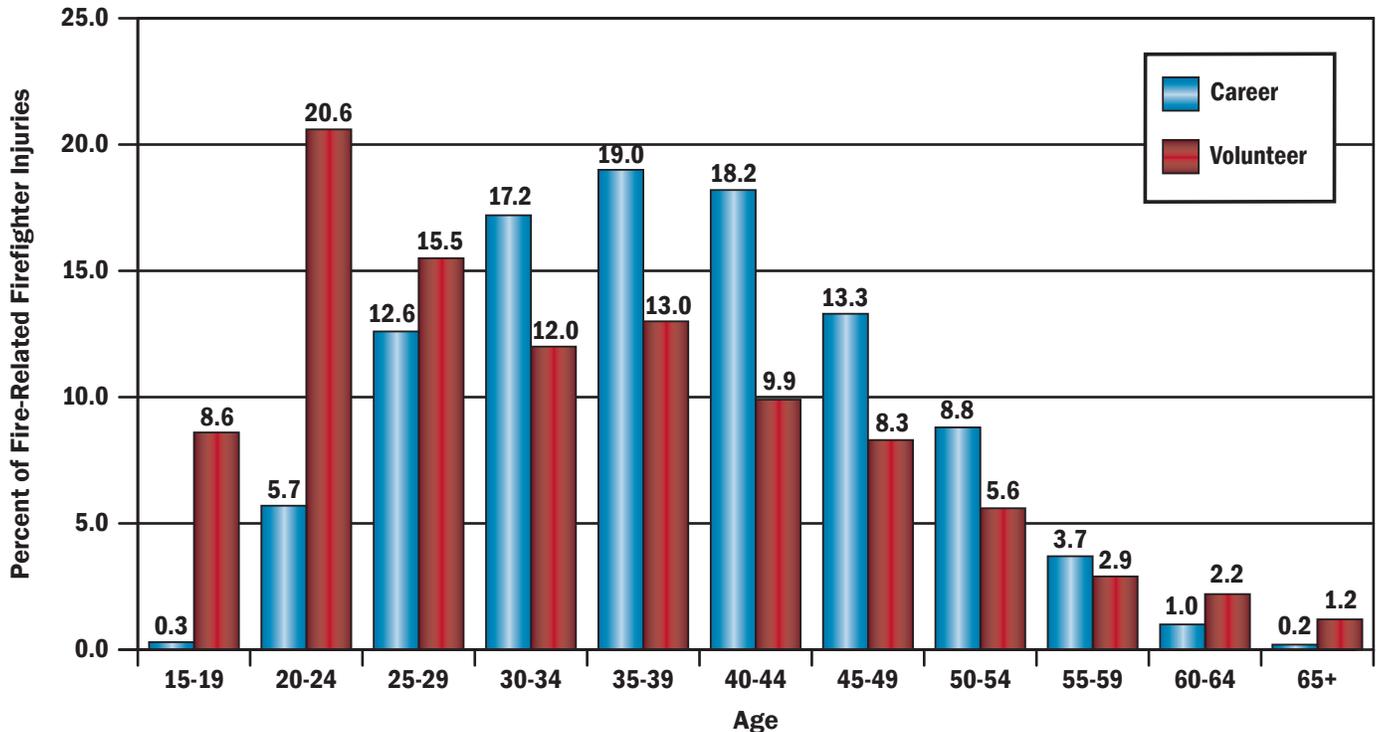
| Affiliation | Percent of Fire-Related Firefighter Injuries |
|-------------|--|
| Career | 65.5 |
| Volunteer | 34.5 |
| Total | 100.0 |

Source: NFIRS 5.0.

Note: Only includes injuries where affiliation was provided.

As shown in Figure 7, injuries to career firefighters tend to occur in midcareer (ages 30–45) with the peak between ages 35 and 39. Injuries to volunteers, on the other hand, are sustained predominately by the younger members of the organization. Firefighters under the age of 25 account for 29 percent of injuries in the volunteer service.

Figure 7. Career and Volunteer Fire-Related Firefighter Injuries by Age (2006–2008)



Source: NFIRS 5.0.

Notes: Only includes injuries where the age of the firefighter was between 15 and 99 and affiliation was provided. Totals may not add to 100 percent due to rounding.

Career firefighters also experience proportionally more lost-time injuries than their volunteer counterparts (approximately 2 to 1) as shown in Table 6. Volunteer firefighters, on the other hand, receive far more no lost-time injuries.

Table 6. Overall Comparison of Fire-Related Firefighter Injury Severity by Affiliation (2006–2008)

| Affiliation | Severity | | Total |
|-------------|--------------|-----------|--------|
| | No Lost-time | Lost-time | |
| Overall | 61.5 | 38.5 | 100.00 |
| Career | 51.4 | 48.6 | 100.00 |
| Volunteer | 78.1 | 21.9 | 100.00 |

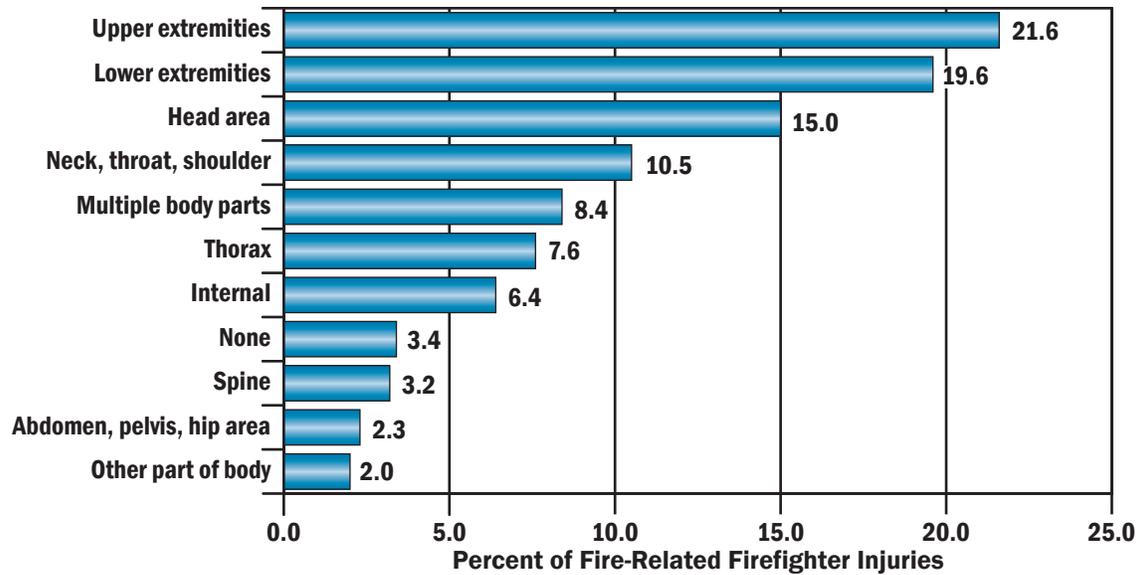
Source: NFIRS 5.0.

Note: Only includes injuries where affiliation and severity were provided.

Part of Body Injured in Fire-Related Firefighter Injuries

Forty-one percent of firefighter injuries were to the upper and lower extremities (torso, arms/hands, and legs/feet) (Figure 8). The head and shoulder regions account for an additional 26 percent of injuries.

Figure 8. Fire-Related Firefighter Injuries by Part of Body Injured (2006–2008)



Source: NFIRS 5.0.
 Note: Only includes injuries where part of body injured was provided.

Location of Fire-Related Firefighter Injuries and Type of Activity When Injured

Ninety-five percent of all firefighter injuries occur at the scene (Table 7). Fifty percent of these injuries occur outside the structure and 45 percent occur inside the structure. All other locations produce far fewer injuries.

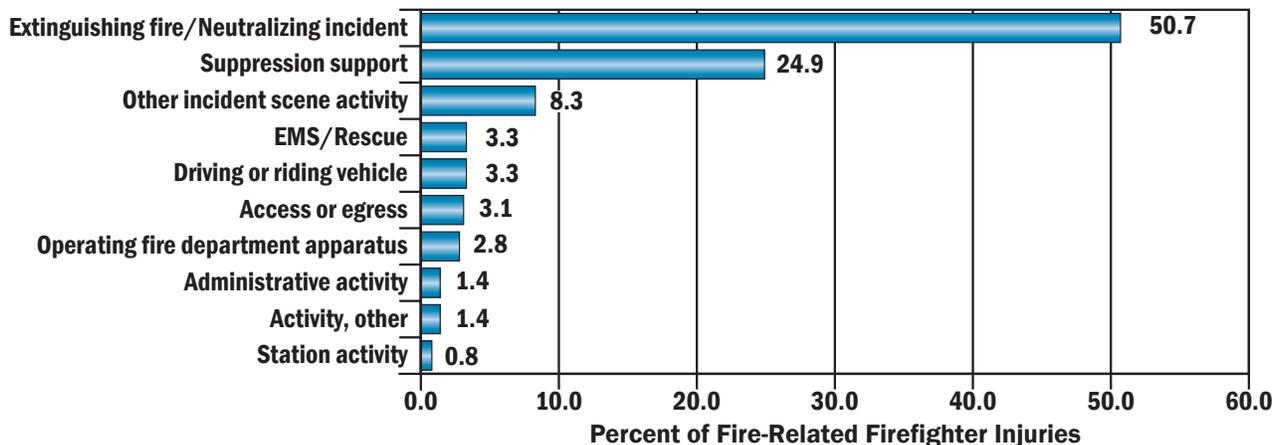
As shown in Figure 9, the largest percent of firefighter injuries occur while extinguishing the fire/neutralizing the incident (51 percent). This is followed by suppression support and other incident scene activity, which make up 25 percent and 8 percent of firefighter injuries, respectively.

Table 7. Location of Fire-Related Firefighter Injuries (2006–2008)

| Location Where Injured | Percent |
|-----------------------------|---------|
| At scene, outside structure | 50.4 |
| At scene, inside structure | 44.6 |
| At fire department location | 2.4 |
| En route/Returning | 1.6 |
| Location, other | 1.0 |
| Total | 100.0 |

Source: NFIRS 5.0.
 Note: Only includes injuries where type of location when injury occurred was provided.

Figure 9. Fire-Related Firefighter Injuries by Type of Activity (2006–2008)



Source: NFIRS 5.0.
 Note: Only includes injuries where type of activity was provided.

Factor Contributing to Injury in Fire-Related Firefighter Injuries

When a factor was specified as contributing to the firefighter's injury, fire development—fire progress, smoky conditions, and the like—and slippery and uneven surfaces account for 53 percent of firefighter injuries, with fire development as the leading factor contributing to injury (Table 8). The third and fourth general factors contributing to injury include other factor and collapse or falling object making up 21 and 15 percent, respectively.

Table 8. General Factor Contributing to Fire-Related Firefighter Injuries (2006–2008)

| General Factor Contributing to Injury | Percent |
|---------------------------------------|---------|
| Fire development | 30.5 |
| Slippery or uneven surfaces | 22.2 |
| Other factor | 20.6 |
| Collapse or falling object | 15.4 |
| Holes | 4.1 |
| Vehicle or apparatus issue | 3.4 |
| Lost, caught, trapped, or confined | 2.9 |
| Civil unrest/Hostile acts | 0.9 |
| Total | 100.0 |

Source: NFIRS 5.0.

Note: Only includes injuries where a factor contributing to injury was provided.

Protective Equipment Failure in Fire-Related Firefighter Injuries

Very few of the firefighter injuries reported to NFIRS indicate problems with firefighter protective gear—only 9 percent indicate protective gear failures as a factor in the injury. Modern equipment and equipment standards, combined with current equipment replacement cycles, may preclude protective equipment failures. Firefighter gloves with wristlets, positive pressure self-contained breathing apparatus (SCBA), and hoods account for 32 percent of equipment problems.

Responses and Physical Condition Prior to Injury in Fire-Related Firefighter Injuries

Most firefighters (83 percent) reported being well-rested before their injury—this applies to both minor and severe injuries as shown in Table 9.

Table 9. Firefighter Physical Condition Prior to Fire-Related Injury (2006–2008)

| Physical Condition Prior to Injury | Severity | | Overall |
|------------------------------------|--------------|-----------|---------|
| | No Lost-time | Lost-time | |
| Rested | 83.1 | 84.0 | 83.4 |
| Fatigued | 12.0 | 10.5 | 11.4 |
| Ill or injured | 1.5 | 2.6 | 1.9 |
| Physical condition, other | 3.5 | 3.0 | 3.3 |
| Total | 100.0 | 100.0 | 100.0 |

Source: NFIRS 5.0.

Notes: Only includes injuries where the physical condition and severity of injury were provided. Totals may not add to 100 percent due to rounding.

The number of fire department responses attended prior to the injury, however, does appear to result in more severe injuries. Table 10 shows that firefighters with one or more responses in the immediate 24-hour period prior to the time of injury have a higher percentage of lost-time injuries than firefighters who reported no prior responses. It is important to note, however, that 71 percent of all firefighter injuries occur when a firefighter has had no prior responses.

Table 10. Responses Prior to Fire-Related Firefighter Injuries (2006–2008)

| Number of Responses Prior to Injury | Severity | | Total | Overall |
|-------------------------------------|--------------|-----------|-------|---------|
| | No Lost-time | Lost-time | | |
| No prior responses | 63.7 | 36.3 | 100.0 | 70.8 |
| One prior response | 58.0 | 42.0 | 100.0 | 11.6 |
| Two prior responses | 52.9 | 47.1 | 100.0 | 5.8 |
| Three prior responses | 53.0 | 47.0 | 100.0 | 4.3 |
| Four or more prior responses | 57.4 | 42.6 | 100.0 | 7.6 |
| Overall Total | | | | 100.0 |

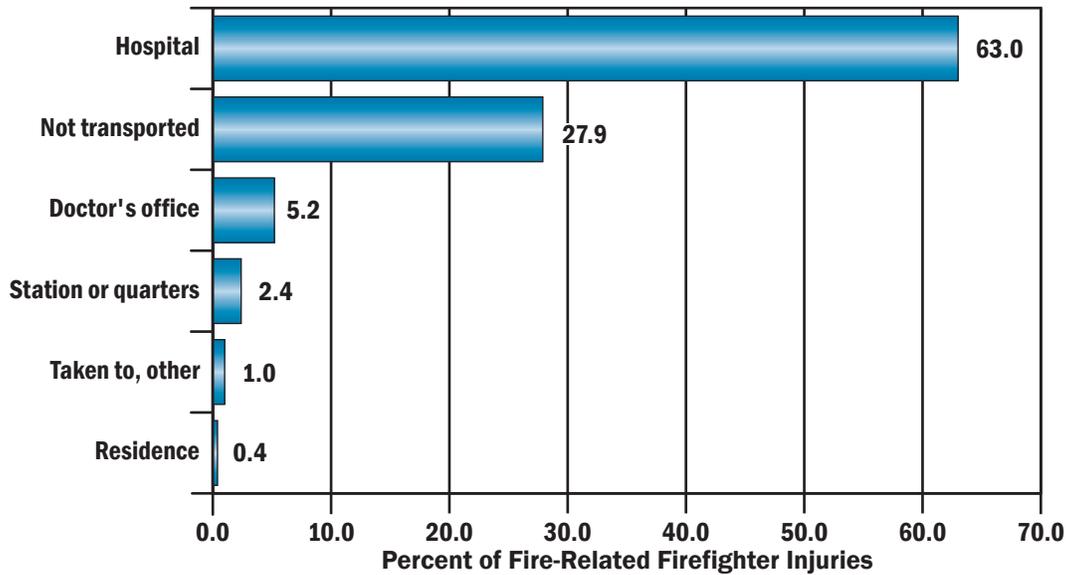
Source: NFIRS 5.0.

Notes: Only includes injuries where number of responses prior to injury and severity of injury were provided. Overall percentage total may not add to 100 percent due to rounding.

Type of Medical Care for Fire-Related Firefighter Injuries

Regardless of the apparent severity of an injury, it is a common safety precaution to transport an injured firefighter to a hospital. Sixty-three percent of the reported firefighter injuries are treated at hospitals (Figure 10). Another 28 percent are treated but not transported. Very few firefighters seek medical care for fire-related injuries at a doctor's office.

Figure 10. Fire-Related Firefighter Injuries by Where Treated (2006–2008)



Source: NFIRS 5.0.

Notes: Only includes injuries where treatment information was provided. Total may not add to 100 percent due to rounding.

Examples

The following are some examples of firefighter injuries reported by the media:

- October 2009: A fire on the second floor and attic of a single-family home in Los Angeles, CA, resulted in one firefighter injury. The firefighter received first degree burns to his left upper arm and right hand, and second degree burns to his left ear. He was treated on scene before being sent to the hospital. A total of 51 Los Angeles Fire Department personnel were sent to the fire.⁸
- March 2010: A firefighter fell 30 feet from the roof of a 2 1/2-story vacant house in Chicago, IL, while trying to extinguish an attic fire. The firefighter suffered a back injury and a few small fractures. He was fortunate not to break his femur or ankles as he landed on his feet.⁹
- February 2010: An apartment fire in Fairfax County, VA, injured two firefighters. The fire started on a third floor balcony and spread to the third floor attic and roof areas. The two firefighter injuries occurred when the third floor roof collapsed. One of the firefighters fell from a burning balcony on the third floor, while the other suffered injuries from the fire. Neither of the firefighter injuries was life-threatening. Improper disposal of fire-place ashes was the cause of the fire.¹⁰

- April 2010: In Potomac, MD, a firefighter was injured in a house fire when the second-story ceiling collapsed as the firefighters were evacuating the home. The fire, which was caused by a gas stove on the first floor, began at about 12:30 a.m.¹¹

NFIRS Data Specifications for Fire-Related Firefighter Injuries

Data for this report were extracted from the NFIRS annual Public Data Release (PDR) files for 2006, 2007, and 2008. Only version 5.0 data were extracted.

- All fires were included.
- Incident Type is determined by the following categories:

| Incident Type | Description |
|------------------|-----------------|
| 100, 163 | Other fires |
| 111-123 | Structure fires |
| 130-138 | Vehicle fires |
| 140-162, 164-173 | Outside |

Note that Incident Type 110s were not included in the analysis.

- Buildings are defined as structure fires with the following criteria:
 - For Incident Types 113-118:
 - 1—Enclosed building,
 - 2—Fixed portable or mobile structure, and
 - Structure Type not specified (null entry).

- For Incident Types 111, 112, and 120–123:
 - 1—Enclosed building, and
 - 2—Fixed portable or mobile structure.
- Incident Type 112 is included prior to 2008 as previous analyses have shown that Incident Types 111 and 112 were used interchangeably. As of 2008, Incident Type 112 is excluded.
- Aid Types 3 (mutual aid given) and 4 (automatic aid given) are included to allow for proper counting of firefighter injuries.
- Residential and nonresidential are defined by:
 - Residential—Property Use 400–499.
 - Nonresidential—Property Use except 400–499.

The analyses contained in this report reflect the current methodologies used by the U.S. Fire Administration (USFA). The USFA is committed to providing the best and most current information on the United States fire problem, continually examining its data and methodology to fulfill this goal. Because of this commitment, data collection strategies and methodological changes are possible and do occur. As a result, analyses and estimates of the fire problem may change slightly over time. Previous analyses and estimates on specific issues (or similar issues) may have used different methodologies or data definitions and may not be directly comparable to the current ones.

To request additional information or to comment on this report, visit <http://www.usfa.fema.gov/applications/feedback/index.jsp>

Notes:

¹ Injury estimates are from the National Fire Protection Association's (NFPA) *Firefighter Injuries in the United States 2008*, Michael J. Karter, Jr. and Joseph L. Molis, October 2009, and previous reports in the series. An average of the NFPA estimate of firefighter fireground injuries was taken for the 3-year period. A portion of the NFPA estimate of injuries categorized as responding to or from an incident (which includes, but is not limited to fires) should be added to the estimate shown here. The 3-year average of the NFPA estimate of firefighter injuries incurred while responding to or returning from an incident is 4,880.

² Firefighter injuries reported to NFIRS may be the result of operations at the fire scene or responding to or returning from an incident.

³ In NFIRS, version 5.0, a structure is a constructed item of which a building is one type. In previous versions of NFIRS, the term "residential structure" commonly referred to buildings where people live. To coincide with this concept, the definition of a residential structure fire for NFIRS 5.0 has, therefore, changed to include only those fires where the NFIRS 5.0 Structure Type is 1 or 2 (enclosed building and fixed portable or mobile structure) with a residential property use. Such fires are referred to as "residential buildings" to distinguish these buildings from other structures on residential properties that may include fences, sheds, and other uninhabitable structures. Confined fire incidents that have a residential property use, but do not have a structure type specified, are presumed to be buildings. Nonconfined fire incidents without a structure type specified are considered to be invalid incidents (structure type is a required field) and are not included.

⁴ For the analysis in Table 1, all vehicular incidents are included. This includes mobile property not involved in ignition, but burned, mobile property involved in ignition and burned, and mobile property involved in ignition but did not itself burn.

⁵ For the purposes of this report, the time of the fire alarm is used as an approximation for the general time the fire started. However, in NFIRS, it is the time the fire was reported to the fire department.

⁶ U.S. Department of Labor, Bureau of Labor Statistics, 2004-2008 as reported in: Michael J. Karter, Jr. and Gary P. Stein. *U.S. Fire Department Profile through 2008*, National Fire Protection Association, October 2009.

⁷ Michael J. Karter, Jr. and Gary P. Stein. *U.S. Fire Department Profile through 2008*, National Fire Protection Association, October 2009.

⁸ Brian Humphrey. "Firefighter Injured Tackling Atwater Village Blaze," lafd.blogspot.com, October 21, 2009. <http://lafd.blogspot.com/2009/10/firefighter-injured-tackling-atwater.html> (accessed April 27, 2010).

⁹ Carlos Sadovi and Deanese Williams-Harris. "Firefighter injured in fall at South Side blaze," [chicagobreakingnews.com](http://www.chicagobreakingnews.com), March 23, 2010. <http://www.chicagobreakingnews.com/2010/03/firefighter-injured-in-south-side-fire.html> (accessed April 27, 2010).

¹⁰ "Fairfax County Firefighters Injured in Fair Oaks Apartment Fire," [news.synavista.com](http://www.news.synavista.com), February 11, 2010. <http://www.news.synavista.com/fairfax-county-firefighters-injured-in-fair-oaks-apartment-fire/> (accessed April 27, 2010).

¹¹ Jeanette Der Bedrosian. "Firefighter injured while battling Potomac house fire," [gazette.net](http://www.gazette.net), April 11, 2010. http://www.gazette.net/stories/04112010/montnew75627_32577.php (accessed August 8, 2010).