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Fire-Related Firefighter Injuries Reported to the National Fire Incident Reporting System (2015-2017)

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 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.

Findings

- From 2015 to 2017, an estimated 25,975 firefighter injuries occurred annually on the fireground, and another 4,525 injuries occurred while responding to or returning from an incident.
- The majority of fire-related firefighter injuries (87%) occurred in structure fires. In addition, on average, structure fires had more injuries per fire than nonstructure fires.
- Injuries resulted in lost work time for 46% of firefighters with reported fire-related injuries.
- Fires resulting in firefighter injuries occurred more often in July, at 11%, and peaked between the hours of 1 and 5 p.m.
- Overexertion/Strain was the cause of 29% of reported fire-related firefighter injuries.
- Of the reported fire-related injuries, 67% of the firefighters were transported to hospitals to be treated for their injuries. Of those firefighters treated at a hospital, 70% were career firefighters.

Every occupation brings degrees of safety risk. At the fire scene, on the way to or from a fire, or 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 and hazardous material incidents, or training for their jobs.

Annually, from 2015 to 2017, there were an estimated 63,000 firefighter injuries resulting from all types of fire department duties.[1,2] Of these injuries, 25,975 occurred on the fireground or were considered to be fire related (includes structure fires, vehicle fires, outside fires, etc.). An additional 4,525 injuries occurred while responding to or returning from an incident, which includes, but is not limited to, fires.[3,4,5] While the majority of injuries are minor, a significant number are debilitating and career ending. These injuries exact a great toll on 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 by its very nature is a hazardous profession. Injuries can and do occur.

This topical report addresses the details of firefighter injuries sustained at, responding to or returning from a fire incident, focusing on data as reported to the NFIRS from 2015 to 2017, the most recent data available at the time of the analysis.[6,7]

This current topical report is an update to the "Fire-Related Firefighter Injuries Reported to the National Fire Incident Reporting System (2012-2014)" (Volume 17, Issue 6) topical report, which was released in August 2016.

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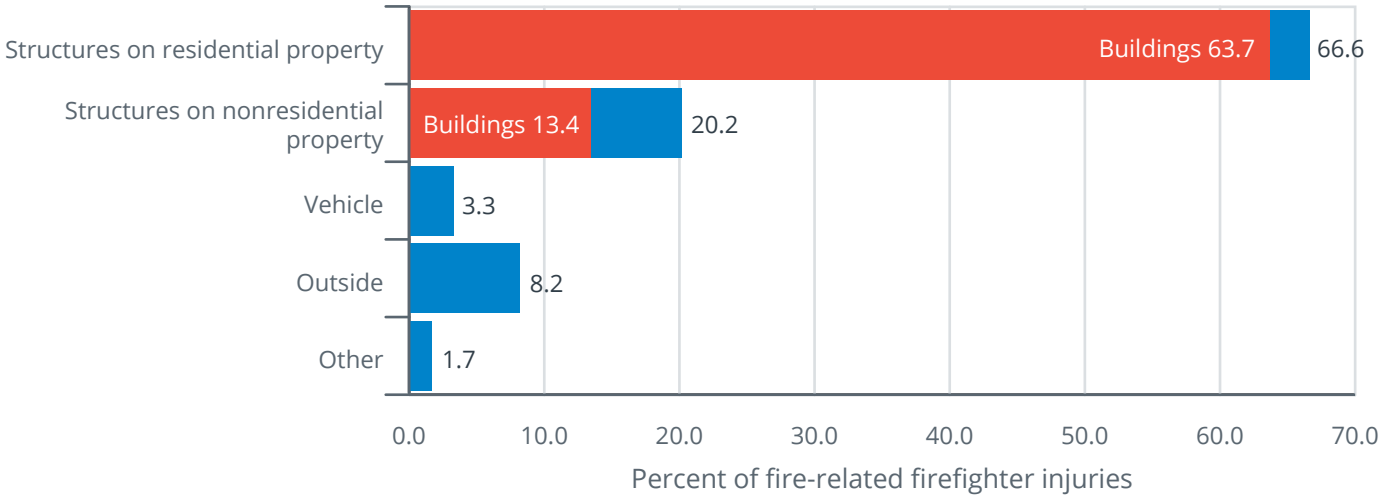
National Fire Data Center
16825 S. Seton Ave.
Emmitsburg, MD 21727
https://www.usfa.fema.gov/data/statistics/

Fire-related firefighter injuries by general property type

From 2015 to 2017, 87% of the fire-related firefighter injuries reported to NFIRS were associated with structure fires (Figure 1). Over three times as many firefighter injuries occurred in residential structures as in nonresidential structures, tracking with overall residential/nonresidential fire incidence. Firefighter injuries in residential structures accounted for 67% of firefighter injuries, a majority of which occurred in residential building fires.[8] Building fires also accounted for two-thirds of the firefighter injuries that occurred in structure fires on nonresidential properties. Outside, vehicle and other fires combined accounted for 13% of firefighter injuries from 2015 to 2017.[9]

Figure 1. Fire-related firefighter injuries by general property type (2015-2017)



Source: NFIRS 5.0.

Fire-related firefighter injuries per fire

Firefighters were 11 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 general property type (2015-2017)

General property type	Fire-related firefighter injuries per 1,000 fires
Structure	11.2
Residential	11.1
Nonresidential	11.7
Nonstructure	1.0
Vehicle	3.3
Outside and other	1.0
Total/Overall	4.9

Source: NFIRS 5.0.

Table 2. Fire-related firefighter injury rates per 1,000 building fires by type (2015-2017)

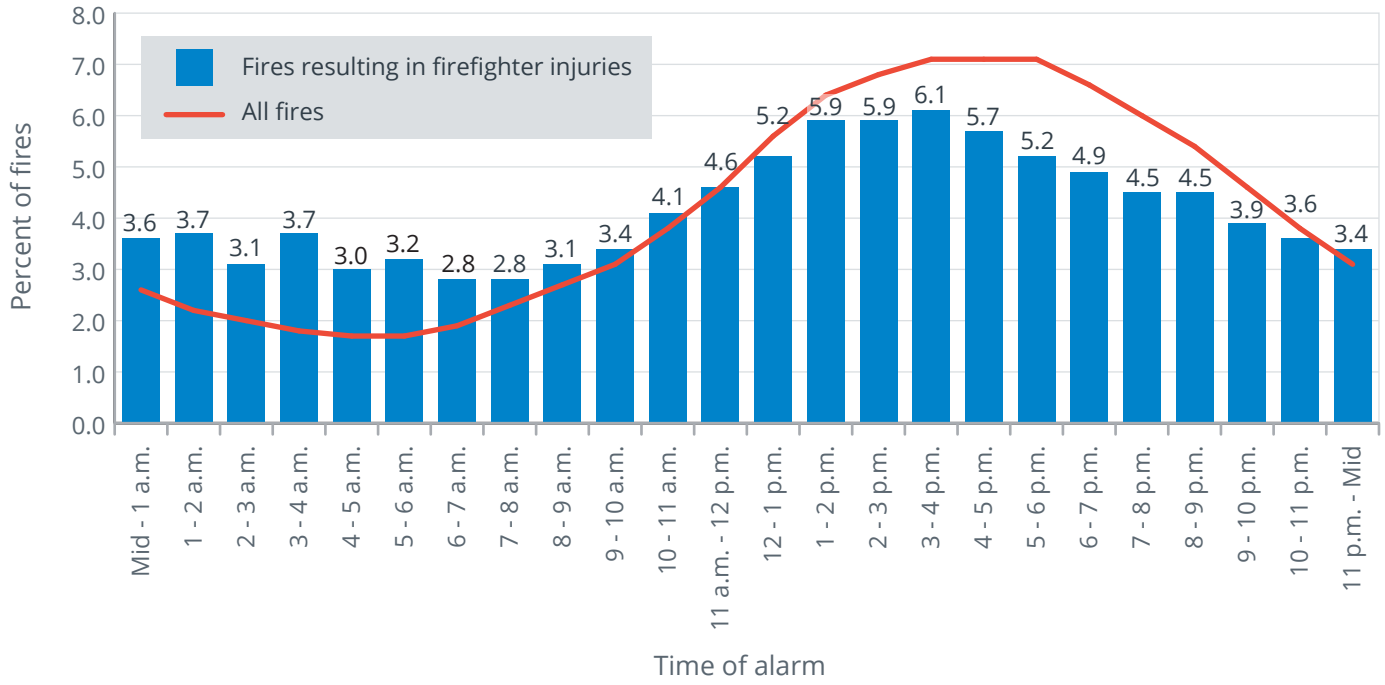
Type	Fire-related firefighter injuries per 1,000 building fires
Buildings	10.3
Residential	10.8
Nonresidential	8.4

Source: NFIRS 5.0.

When fire-related firefighter injuries occur

As shown in Figure 2, fires resulting in firefighter injuries occurred most frequently in the midday, peaking from 1 to 5 p.m. After 5 p.m., fires resulting in injuries decreased until midnight. A small peak is then seen in the early morning. After 4 a.m., the numbers of fires resulting in firefighter injuries decreased, reaching the lowest point between 6 and 8 a.m. After 8 a.m., the number of fires resulting in injuries gradually increased to the start of the peak period. The peak period (1 to 5 p.m.) accounted for 24% of fires resulting in firefighter injuries.[10] The time of alarm profile for fires resulting in firefighter injuries tracked somewhat similarly with that for fires overall; however, the peak for all fires was more pronounced during the afternoon and early evening.

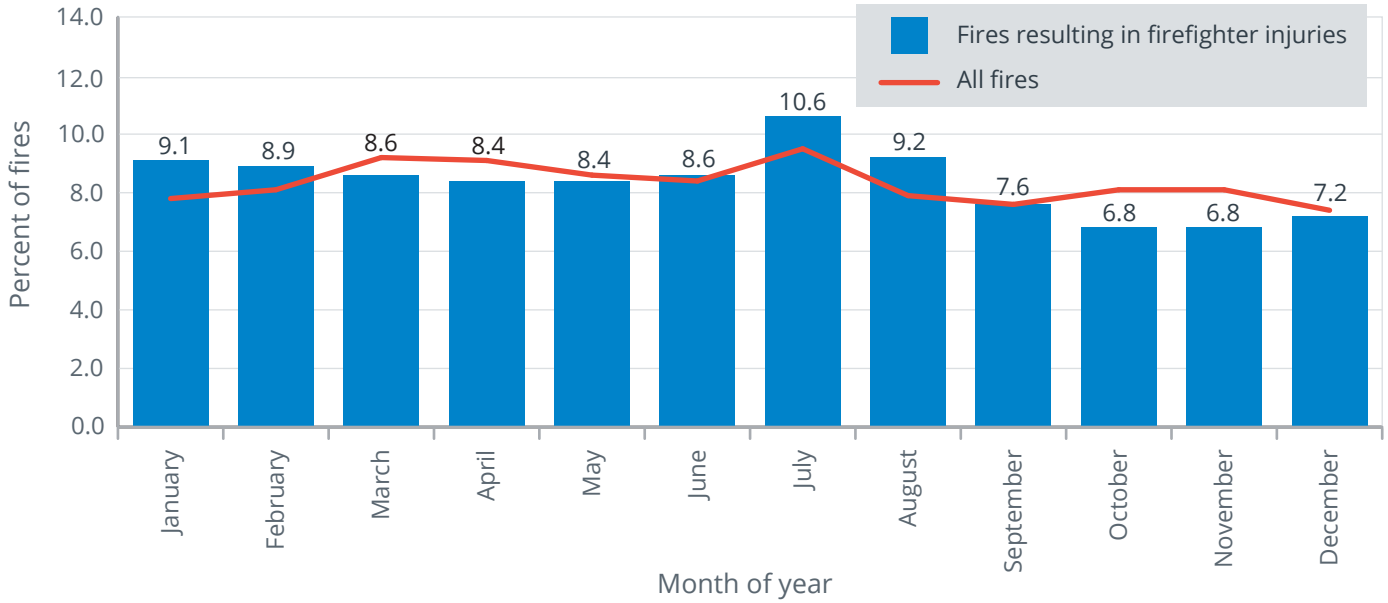
Figure 2. Fires resulting in firefighter injuries by time of alarm (2015-2017)



Source: NFIRS 5.0.
Note: Total does not add up to 100% due to rounding.

Figure 3 illustrates that fires resulting in firefighter injuries were highest in July (11%) and lowest in October (7%) and November (7%). Fires resulting in firefighter injuries by month tracked similarly with the month of occurrence for all fires.

Figure 3. Fires resulting in firefighter injuries by month (2015-2017)



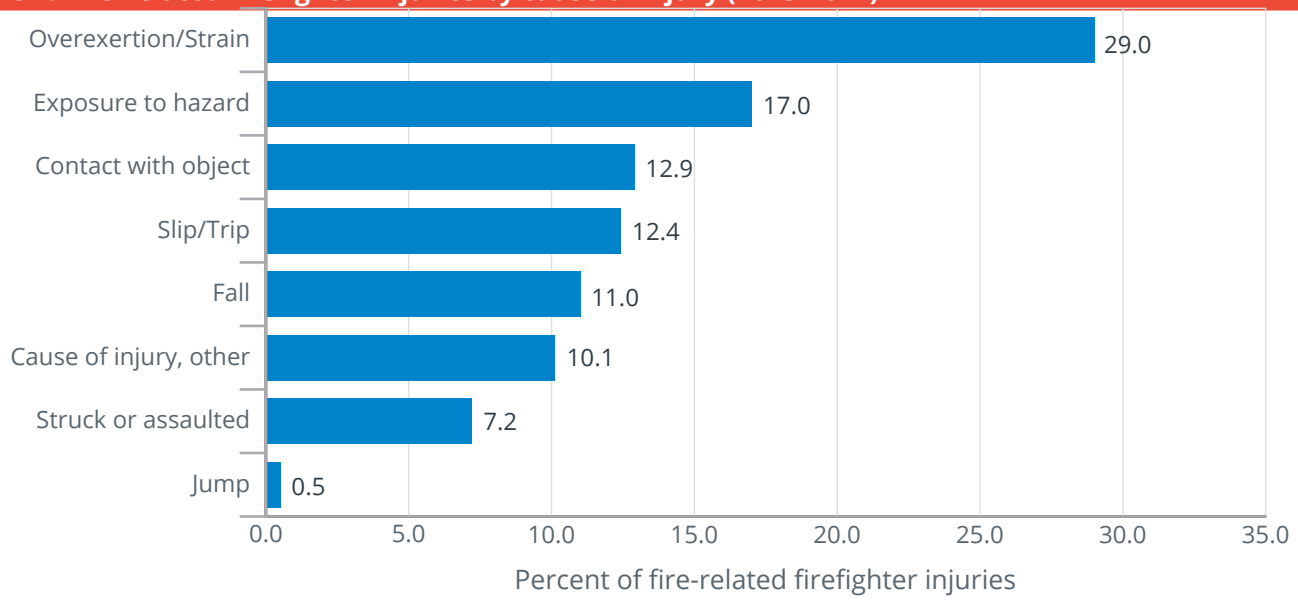
Source: NFIRS 5.0.
Note: Total does not add up to 100% due to rounding.

Cause and nature of fire-related firefighter injuries

Figure 4 shows that 29% of all fire-related firefighter injuries were caused by overexertion/strain. The next three leading reported causes combined accounted for 42% of fire-related firefighter injuries: exposure to hazard (17%), contact with object (13%) and slip/trip (12%).

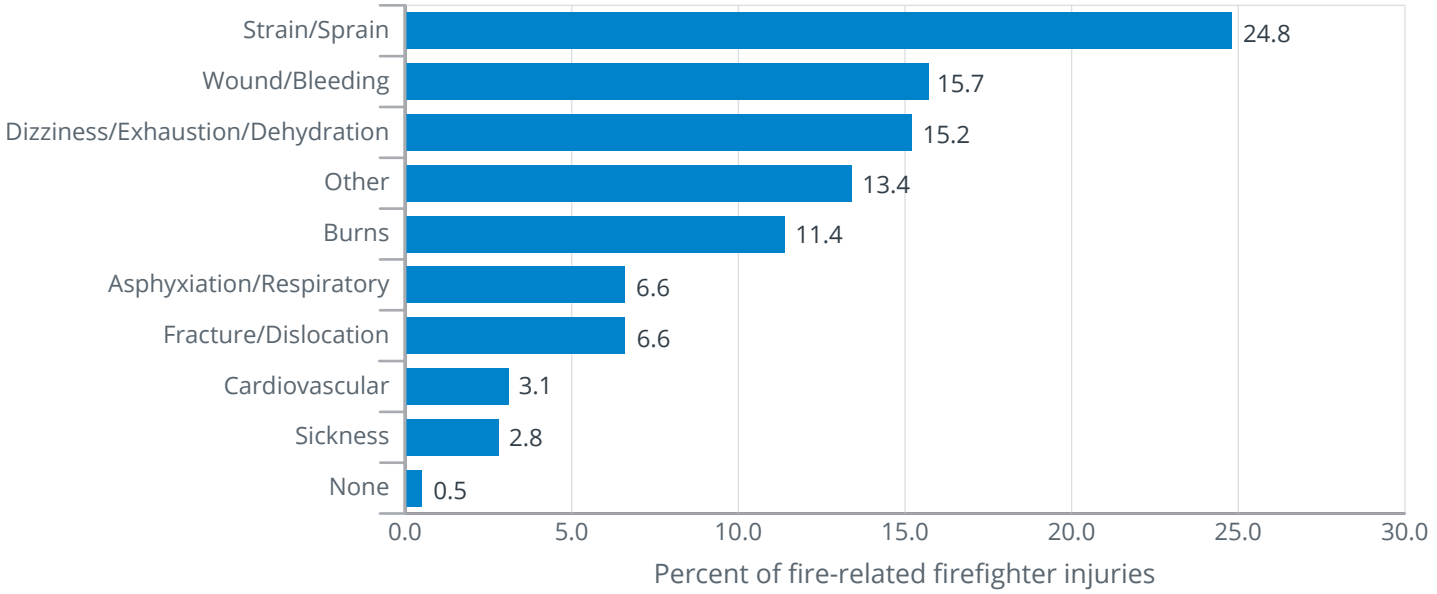
Not surprisingly, the leading nature of injury was strain/sprain at 25%, closely associated with overexertion/strain as the cause of the injury (Figure 5). Wound/Bleeding and dizziness/exhaustion/dehydration accounted for an additional 16% and 15% of fire-related firefighter injuries, respectively.

Figure 4. Fire-related firefighter injuries by cause of injury (2015-2017)



Source: NFIRS 5.0.
Note: Total does not add up to 100% due to rounding. Includes only injuries where cause of injury was specified. The cause of injury was specified in 72% of reported injuries.

Figure 5. Fire-related firefighter injuries by nature of injury (2015-2017)



Source: NFIRS 5.0.
Note: Total does not add up to 100% due to rounding. Includes only injuries where the nature of injury was specified. The nature of injury was specified in 80% of reported injuries.

Severity of fire-related firefighter injuries

More than half of fire-related firefighter injuries (54%) resulted in no lost work time, as shown in Table 3. These injuries were treated on the scene with first aid or after the incident by a physician, either at a medical facility or in a doctor's office. Forty-six percent of fire-related firefighter injuries resulted in lost work time. The majority of the lost-work-time injuries (94% of lost-work-time injuries or 43% of all fire-related firefighter injuries) were moderate in severity. Severe or life-threatening injuries accounted for 3% of firefighter injuries.

Table 3. Severity of fire-related firefighter injuries (2015-2017)

Severity	Percent of fire-related firefighter injuries
First aid only, no lost time	21.8
Treated by physician, no lost time	32.2
Moderate severity, lost-time injury	43.1
Severe, lost-time injury	2.4
Life-threatening, lost-time injury	0.5
Total	100.0

Source: NFIRS 5.0.
Note: The severity of the injury was specified in 100% of reported injuries.

Fire-related firefighter injuries by age and gender

Table 4 shows the percent of firefighter injuries based on gender. The majority of all fire-related firefighter injuries, 95%, were sustained by males. This statistic is comparable with the composition of the fire service during this period — on average, males constituted 96% of employed firefighters from 2015 to 2017.[11]

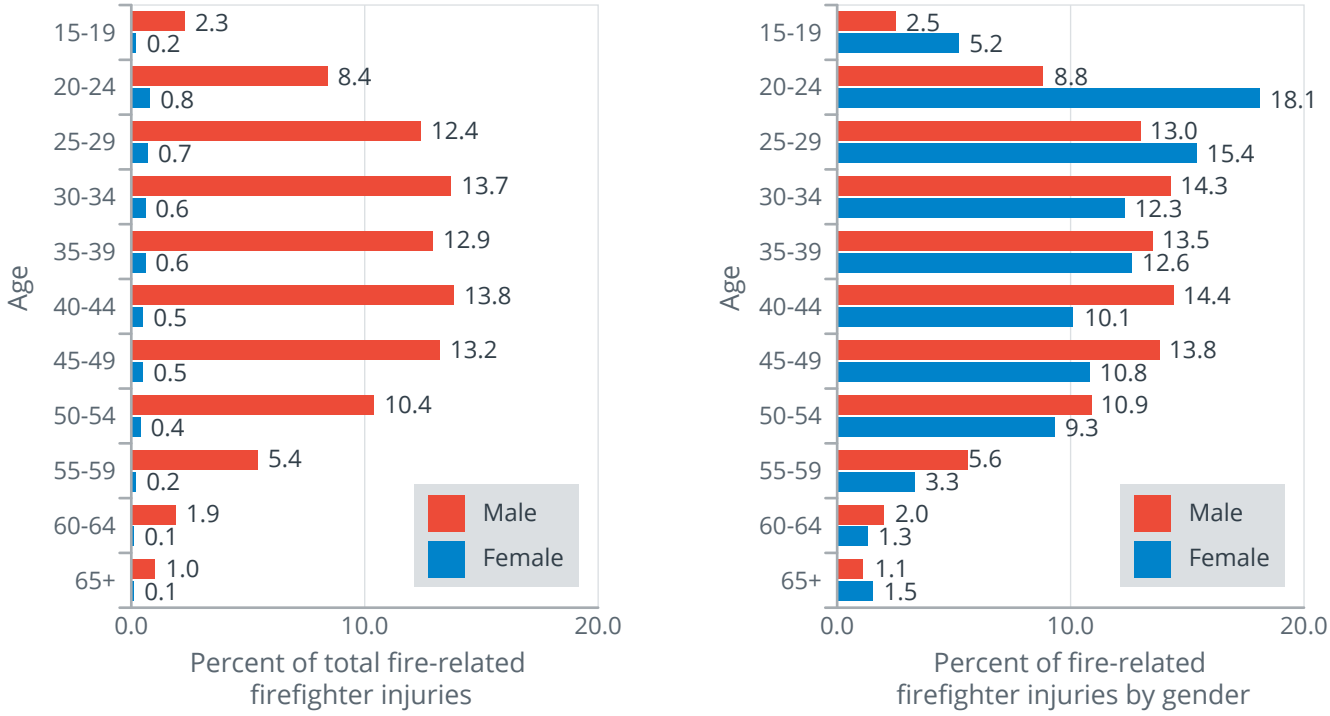
Table 4. Fire-related firefighter injuries by gender (2015-2017)

Gender	Percent of fire-related firefighter injuries
Male	95.4
Female	4.6
Total	100.0

Source: NFIRS 5.0.
Note: Gender was specified in 100% of reported injuries.

Figure 6 shows two different profiles of fire-related 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%). The right graphic shows the age distribution of injuries by gender (each distribution adds to 100%). Both graphs show that male firefighter injuries peaked between ages 40 and 44 and female firefighter injuries peaked between ages 20 and 24. Overall, more than half (56%) of all fire-related injuries occurred to firefighters aged 30 to 49.

Figure 6. Fire-related firefighter injuries by age and gender (2015-2017)



Source: NFIRS 5.0.
Note: Includes only injuries where the age of the firefighter was between 15 and 100, and gender was specified. Age was specified in 98% of the reported male injuries and 98% of the reported female injuries. Totals do not add up to 100% due to rounding.

The leading reported causes of injury among younger firefighters (ages 15 to 24) were related to overexertion/strains and exposure to hazards, while among older firefighters (age 65 and older) overexertion/strains and slips/trips were the most common injuries. These results, among other factors, relate to physical fitness variations with age and the effect of age on type of assignments.

Fire-related firefighter injuries by affiliation and age

Injuries to career firefighters were the largest share (70%) of the reported fire-related injuries (Table 5.) Nationally, from 2015 to 2017, only 33% of the fire service was made up of career firefighters.[12]

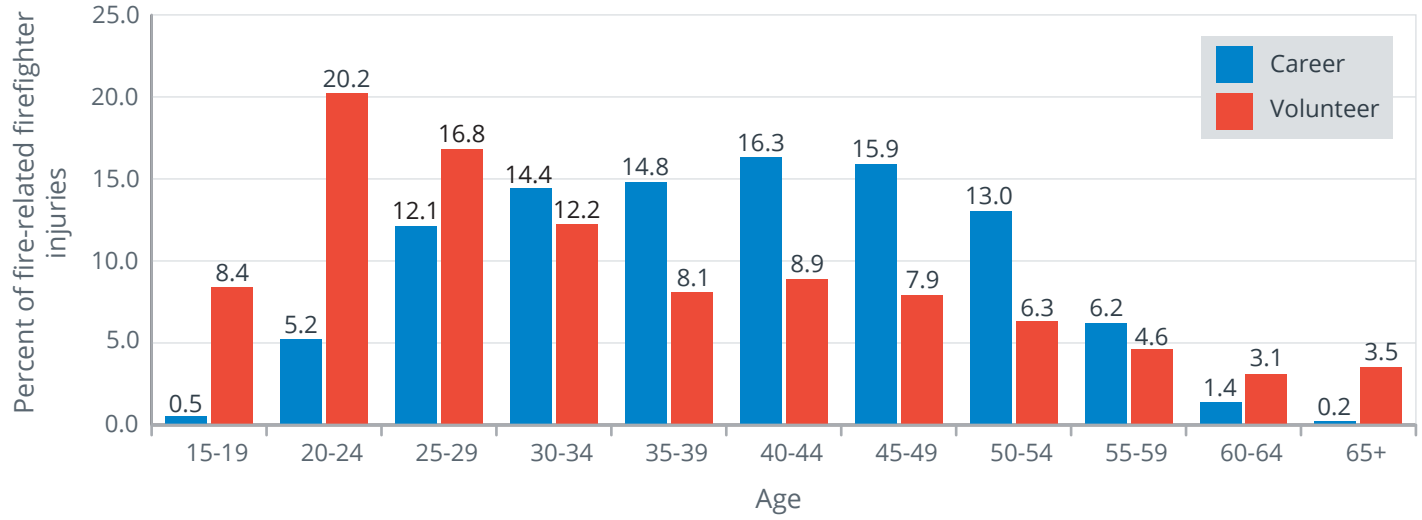
Table 5. Fire-related firefighter injuries by affiliation (2015-2017)

Affiliation	Percent of fire-related firefighter injuries	Percent of all firefighters
Career	70.1	32.7
Volunteer	29.9	67.3
Total	100.0	100.0

Source: NFIRS 5.0 and National Fire Protection Association.
Note: Percent of fire-related firefighter injuries includes only injuries where affiliation was specified. Affiliation was specified in 72% of reported fire-related firefighter injuries.

As shown in Figure 7, injuries to career firefighters occurred most often in midcareer (ages 35 to 49) with the peak between ages 40 and 44 at 16%. Injuries to volunteers, however, were sustained predominately by the younger members of the organization. Firefighters under the age of 25 accounted for 29% of injuries in the volunteer service.

Figure 7. Career and volunteer fire-related firefighter injuries by age (2015-2017)



Source: NFIRS 5.0.
Note: Includes only injuries where the age of the firefighter was between 15 and 100, and affiliation was specified. Age was specified in 98% of the reported injuries to career firefighters and 97% of the reported injuries to volunteer firefighters. Overall, both age and affiliation were specified in 71% of all reported firefighter injuries.

Career firefighters also experienced proportionally more fire-related injuries that resulted in lost time than their volunteer counterparts, as shown in Table 6. Volunteer firefighters, on the other hand, received far more injuries that resulted in no lost time.

Table 6. Overall comparison of fire-related firefighter injury severity by affiliation (2015-2017)

Affiliation	Severity		Total percent
	No lost time (percent)	Lost time (percent)	
Overall	54.0	46.0	100.00
Career	45.3	54.7	100.00
Volunteer	74.9	25.1	100.00

Source: NFIRS 5.0.
Note: Includes only injuries where affiliation and severity were specified. Severity was specified in 100% of reported injuries, and affiliation was specified in 72% of reported injuries.

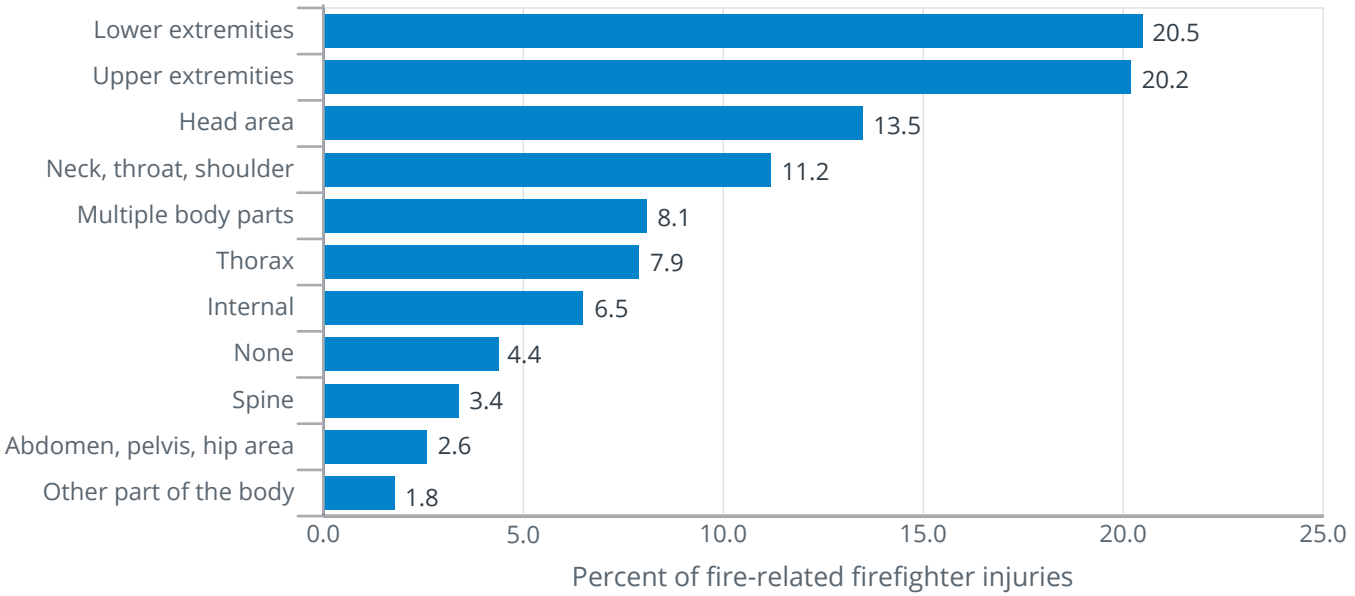
Part of body injured in fire-related firefighter injuries

Injuries to the lower and upper extremities (legs/feet and arms/hands) accounted for 41% of fire-related firefighter injuries (Figure 8). The head and shoulder regions accounted for an additional 25% of injuries.

The majority of the injuries that occurred to the lower extremities (where the nature of the injury was specified) were strains/sprains at 57%. Injuries to the lower extremities also involved fractures (14%) and wounds/bleeding (11%).

Of the fire-related firefighter injuries that occurred to the upper extremities, 45% involved wounds/bleeding, 20% were burns and 14% were strains/sprains. Burns (33%) and wounds/bleeding (27%) accounted for 60% of fire-related firefighter injuries to the head area.

Figure 8. Fire-related firefighter injuries by part of body injured (2015-2017)



Source: NFIRS 5.0.
Note: Includes only injuries where part of body injured was specified. The part of body injured was specified in 75% of reported injuries. Total does not add up to 100% due to rounding.

General location of fire-related firefighter injuries and type of activity when injured

Of all fire-related firefighter injuries, 95% occurred at the scene — 54% of the injuries occurred outside the structure and 41% occurred inside the structure. All other locations produced far fewer injuries (Table 7).

Table 7. General location of fire-related firefighter injuries (2015-2017)

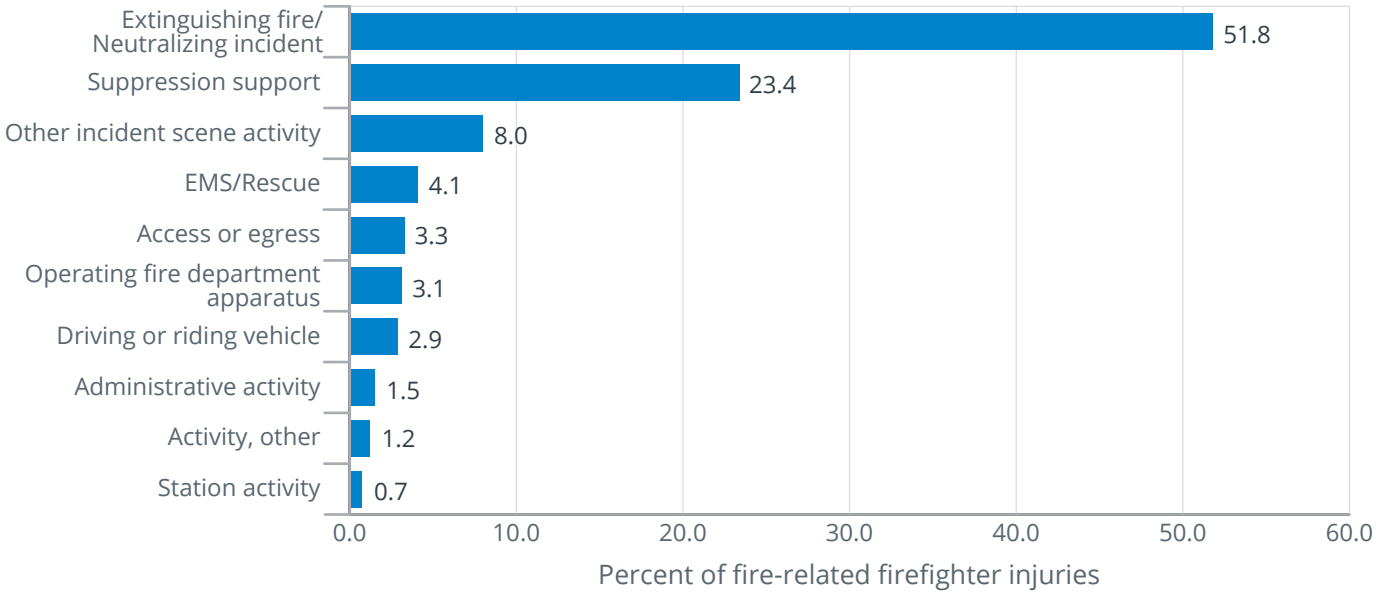
Where injury occurred	Percent
At scene, outside structure	53.7
At scene, inside structure	41.4
At fire department location	2.5
Location, other	1.2
En route/Returning	1.2
Total	100.0

Source: NFIRS 5.0.
Note: Includes only injuries where the general location of injury was specified. The general location of the injury was specified in 76% of reported injuries.

As shown in Figure 9, the largest percent of fire-related firefighter injuries occurred while extinguishing the fire/neutralizing the incident (52%). This is followed by suppression support and other incident scene activity, which made up 23% and 8% of the injuries, respectively.

Of those fire-related firefighter injuries that occurred while extinguishing the fire/neutralizing the incident, 59% were strains/sprains (23%), dizziness/exhaustion/dehydration (19%) and burns (17%). Strains/sprains (26%) and wounds/bleeding (22%) accounted for 48% of the injuries that resulted from suppression support activities.

Figure 9. Fire-related firefighter injuries by type of activity (2015-2017)



Source: NFIRS 5.0.
Note: Includes only injuries where type of activity was specified. The type of activity was specified in 80% of reported injuries.

Specific location of fire-related firefighter injuries

For 75% of the fire-related firefighter injuries, the specific location at the time of injury was outside at grade (40%) and in a structure (35%). An additional 3% of the injuries occurred on the roof. Of interest, 2% of fire-related firefighter injuries occurred in motor vehicles, and less than 1% of the injuries occurred in rail, water and aircraft vehicles combined (Table 8).

Table 8. Specific location of fire-related firefighter injuries (2015-2017)

Specific location of injury	Percent
Outside at grade	40.2
In structure (excludes attic, roof or wall)	34.6
Specific location, other	13.8
On roof	3.3
In attic or other confined structural space	2.3
On steep grade	2.1
On ground ladder	2.1
In motor vehicle	1.6
In all other vehicles (includes rail, water and aircraft)	0.1
Total	100.0

Source: NFIRS 5.0.
Note: Total does not add up to 100% due to rounding. Includes only injuries where the specific location of injury occurred was specified. The specific location where the injury occurred was noted in 61% of reported injuries.

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 or uneven surfaces accounted for 57% of fire-related firefighter injuries, with fire development as the leading factor contributing to injury (Table 9). The third and fourth general factors contributing to injury included other factors and collapse or falling objects, which made up 19% and 15%, respectively.

Table 9. General factor contributing to fire-related firefighter injuries (2015-2017)

General factor contributing to injury	Percent
Fire development	29.7
Slippery or uneven surfaces	27.3
Other factor	18.6
Collapse or falling object	15.3
Holes	3.7
Vehicle or apparatus issue	2.8
Lost, caught, trapped or confined	2.3
Civil unrest/Hostile acts	0.4
Total	100.0

Source: NFIRS 5.0.
Note: Includes only injuries where a factor contributing to injury was specified. The factor contributing to injury was specified in 46% of reported injuries. Total does not add up to 100% due to rounding.

Protective equipment failure in fire-related firefighter injuries

Very few of the fire-related firefighter injuries reported to NFIRS indicated problems with firefighter protective gear; only 8% indicated protective gear failures as a factor in the injury.[12] Modern equipment and equipment standards, combined with current equipment replacement cycles, may preclude protective equipment failures. Firefighter protective coats, gloves with wristlets, helmets, hoods, protective trousers and positive-pressure self-contained breathing apparatus accounted for 64% of equipment problems.

Responses and physical condition prior to injury in fire-related firefighter injuries

Most firefighters (81%) were reported as being well-rested before their injury occurred; this applies to both minor and severe injuries, as shown in Table 10. In an additional 13% of the reported fire-related injuries, the firefighter was fatigued prior to incurring the injury.

Table 10. Firefighter physical condition prior to fire-related injury (2015-2017)

Physical condition prior to injury	Severity		Overall (percent)
	No lost time (percent)	Lost time (percent)	
Rested	80.3	82.5	81.4
Fatigued	14.2	10.9	12.6
Injured or ill	2.7	3.8	3.2
Physical condition, other	2.7	2.8	2.7
Total	100.0	100.0	100.0

Source: NFIRS 5.0.

Note: Includes only injuries where the physical condition and severity of injury were specified. Severity was specified in 100% of reported injuries, and physical condition was specified in 66% of reported injuries. Totals may not add up to 100% due to rounding.

The number of fire department responses attended prior to the injury, however, does appear to result in more severe injuries. Table 11 shows that firefighters with one or more responses in the immediate 24-hour period prior to the time of injury had higher percentages of injuries that resulted in lost time than firefighters who reported no prior responses. It is important to note, however, that 65% of all fire-related firefighter injuries occurred when a firefighter had no prior responses.

Table 11. Fire-related firefighter injuries by severity and number of responses prior to injury (2015-2017)

Number of responses prior to injury	Severity		Total (percent)	Overall (percent)
	No lost time (percent)	Lost time (percent)		
No prior responses	59.2	40.8	100.0	65.3
One prior response	55.9	44.1	100.0	12.2
Two prior responses	49.6	50.4	100.0	6.6
Three prior responses	47.9	52.1	100.0	4.7
Four or more prior responses	48.6	51.4	100.0	11.1
Overall total				100.0

Source: NFIRS 5.0.

Note: Includes only injuries where number of responses prior to injury and severity of injury were specified. The number of responses prior to injury was specified in 72% of reported injuries. The overall total does not add to 100% 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. Of the reported fire-related injuries, 67% of the firefighters were transported to hospitals to be treated for their injuries (Table 12). Of the firefighters treated at a hospital, 70% were career firefighters.

In addition, 24% of the injured firefighters were treated but not transported to a medical facility or other location. Very few firefighters sought medical care for fire-related injuries at a doctor's office.

Table 12. Fire-related firefighter injuries by where treated and affiliation (2015-2017)

Where treated	Affiliation		Total (percent)	Overall (percent)
	Career (percent)	Volunteer (percent)		
Hospital	70.2	29.8	100.0	66.8
Not transported	68.4	31.6	100.0	23.8
Doctor's office	84.5	15.5	100.0	5.8
Station or quarters	78.6	21.4	100.0	2.1
Taken to, other	83.3	16.7	100.0	1.2
Residence	59.3	40.7	100.0	0.3
Overall total				100.0

Source: NFIRS 5.0.

Note: Includes only injuries where treatment information and affiliation were specified. Treatment information was specified in 74% of reported injuries. Affiliation was specified in 72% of reported fire-related firefighter injuries. Overall, both treatment information and affiliation were specified in 59% of all reported fire-related firefighter injuries.

Examples

The following are recent examples of fire-related firefighter injuries reported by the media:

- April 2019: An Arlington, Vermont, firefighter was seriously injured about 6 p.m. when a live, 7,200 volt powerline fell on him while crews were working to extinguish a 1- to 2-acre brush fire. A large, hollow oak tree, burning from the inside, pulled the power lines down onto the firefighter as it blew over from strong winds. The injured firefighter was rescued and airlifted to Albany Medical Center where he was treated for burns. Information regarding his condition was not immediately available. Fire crews were able to extinguish the blaze relatively quickly.[14]

- March 2019: Two firefighters were injured while battling a house fire in Albany, Georgia. One firefighter suffered an ankle injury when he slipped and fell while advancing a line, and the other fell into a hole while trying to extinguish the fire in the back of the home. No other injuries were reported, and the cause of the fire was under investigation. It was unknown if anyone lived in the home.[15]

- February 2019: Four firefighters were injured while battling a house fire that started around 12:15 p.m. in Williamsport, Pennsylvania. The firefighters were inside the home searching for possible victims and trying to extinguish the fire when the windows in the back of the home exploded, sending flames over their heads. Intense heat, smoke and flames forced the crew to exit the home through the front door. After the firefighters escaped, the entire first floor of the house was engulfed in flames. The firefighters suffered first- or second-degree burns on their hands or ears and were treated at the scene or transported to a medical facility for treatment of their injuries. No other injuries were reported, and the couple who rented the house was not home when the fire started. The wind was a contributing factor in the fire development and spread. Although firefighters were unable to save the residence, they were successful in preventing the fire from spreading to two neighboring houses.[16]

- January 2019: Two firefighters were injured in a single-vehicle accident near Social Circle, Georgia, at about 12:20 p.m. The engine was responding to a structure fire with lights and sirens activated. The driver of the truck was negotiating a left-hand turn when the passenger side tires left the roadway. The driver then overcorrected, causing the vehicle to leave the roadway and travel down an embankment. The engine overturned, resulting in a total collapse of the cab of the truck. One of the firefighters was entrapped in the vehicle and had to be extricated. He was transported by ground to a local medical facility to be treated for serious injuries. The second firefighter suffered minor injuries and was treated and released at another medical facility.[17]

Firefighter health and safety

A key mission of the U.S. Fire Administration (USFA) is to reduce firefighter injuries and on-duty fatalities through leadership, advocacy, coordination and support. USFA facilitates this through the research and special studies conducted by its National Fire Data Center. These initiatives cover topics to support firefighter health and safety, including:

- Firefighter health, wellness and fitness: https://www.usfa.fema.gov/operations/ops_wellness_fitness.html.
- Emergency vehicle and roadway operations safety: https://www.usfa.fema.gov/operations/ops_vehicle.html.
- Firefighter protective equipment and clothing research: https://www.usfa.fema.gov/operations/ops_ppe.html.
- Fire service operational safety: https://www.usfa.fema.gov/operations/ops_safety.html.
- Health and safety resources for the volunteer fire service: https://www.usfa.fema.gov/operations/ops_volunteer_fire_service.html.

Additionally, USFA's National Fire Academy (NFA) has numerous training courses in firefighter health and safety topics. Further information on NFA training opportunities is available at the USFA website: http://www.usfa.fema.gov/training/nfa/.

NFIRS data specifications for fire-related firefighter injuries

Data for this report were extracted from the NFIRS annual Public Data Release files for 2015, 2016 and 2017. Only Version 5.0 data were extracted.

- All fires were included, as defined by the following Incident Type categories:

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

Note: Incident Type 110 was not included in the analysis.

- Aid Types 3 (mutual aid given) and 4 (automatic aid given) were included to allow for proper counting of firefighter injuries.
- Building fires were defined by the following criteria:
  - Structure Type:
    - For Incident Types 113 to 118:
      - 1—Enclosed building, or
      - 2—Fixed portable or mobile structure, or
      - Structure type not specified (null entry).
    - For Incident Types 111 and 120 to 123:
      - 1—Enclosed building, or
      - 2—Fixed portable or mobile structure.
- Residential and nonresidential were defined by:
  - Residential — Property Use 400 to 499.
  - Nonresidential — Property Use except 400 to 499.

- Firefighter injuries were defined by the following criteria:
  - The number of injured firefighters (i.e., FF_INJ > 0).
  - Severity:
    - 2—First aid only.
    - 3—Treated by physician (no lost time).
    - 4—Moderate (lost time).
    - 5—Severe (lost time).
    - 6—Life threatening (lost time).

The analyses contained in this report reflect the current methodologies used by the USFA. The USFA is committed to providing the best and most current information on the U.S. fire problem and continually examines 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, visit https://www.usfa.fema.gov/contact.html. Provide feedback on this report.

Notes:

[1]The estimate of overall firefighter injuries includes both fire-related and nonfire-related injuries. This entails firefighters injured while performing fire suppression activities (at the fireground), responding to or returning from an incident (includes fire and nonfire emergencies), working at on-scene nonfire emergencies (includes rescues, hazardous calls and natural disaster calls), training, and participating in other on-duty activities (e.g. inspection or maintenance duties).

[2]In addition to the estimate of firefighter injuries, annually, there were an estimated 8,325 documented exposures to infectious diseases and an estimated 36,075 recorded exposures to hazardous substances.

[3]Injury estimates are from the National Fire Protection Association's (NFPA's) U.S. Firefighter Injuries — 2017, by Ben Evarts and Joseph L. Molis, November 2018, and previous reports in the series. Annual averages of the NFPA estimates of overall firefighter injuries, firefighter fireground injuries, and firefighter injuries that occurred while responding to or returning from an incident were taken for the three-year period from 2015 to 2017.

[4]In this topical report, all firefighter injury estimates are rounded to the nearest 25.

[5]To determine the best estimate of firefighter injuries that are fire related, an unknown portion of the NFPA estimate of injuries categorized as responding to or returning from an incident (which includes, but is not limited to, fires) should be added to the estimate of firefighter fireground injuries. In addition, it is important to note that 47% of all NFIRS reported fire-related firefighter injuries submitted a report only of being exposed to toxic substances or harmful physical agents through any route of entry into the body. These reports of exposures to hazardous substances were excluded from the analyses presented in this report.

[6]Fire department participation in NFIRS is voluntary; however, some states do require their departments to participate in the state system. Additionally, if a fire department is a recipient of a Fire Act Grant, participation is required. From 2015 to 2017, 68% of NFPA's annual average estimated 1,335,700 fires to which fire departments responded were captured in NFIRS. Thus, NFIRS is not representative of all fire incidents in the U.S. and is not a "complete" census of fire incidents. Although NFIRS does not represent 100% of the incidents reported to fire departments each year, the enormous dataset exhibits stability from one year to the next, without radical changes. Results based on the full dataset are generally similar to those based on part of the data.

[7]Firefighter injuries reported to NFIRS may be the result of operations at the fire scene or responding to or returning from a fire incident.

[8]In NFIRS Version 5.0, a structure is a constructed item of which a building is one type. In previous versions of the 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 the NFIRS 5.0 includes 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 structures 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. In addition, confined fire incidents that have a residential property use but do not have a structure type specified are presumed to occur in buildings. Nonconfined fire incidents that have a residential property use without a structure type specified are considered to be invalid incidents (Structure Type is a required field) and are not included.

[9]For the analyses in Figure 1 and Table 1, vehicle fire incidents include those with mobile property not involved in ignition but burned, as well as mobile property involved in ignition that burned. Vehicle fires exclude mobile property involved in ignition but did not itself burn; these incidents are included in the outside and other General Property Type category.

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

[11]U.S. Department of Labor, Bureau of Labor Statistics, Labor Force Statistics from the Current Population Survey, 2015 to 2017 Annual Averages - Household Data - Tables from Employment and Earnings. Table 11. Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity. Numbers of firefighters are based on a sample of U. S. households (https://www.bls.gov/cps/aa2017/cpsaat11.pdf). This statistic may reflect only a portion of the volunteer firefighters (i.e., those firefighters who are paid per call).

[12]Ben Evarts and Gary Stein, NFPA, U.S. Fire Department Profile 2017, March 2019.
[13]Protective equipment failure was specified in 97% of reported injuries.
[14]Darren Marcy, "Firefighter suffers serious injury," www.reformer.com, April 5, 2019, https://www.reformer.com/stories/firefighter-suffers-serious-injury,569743 (accessed April 22, 2019).
[15]Asia Wilson, "2 firefighters recovering from injuries from Albany house fire," www.walb.com, March 15, 2019, http://www.walb.com/2019/03/15/firefighters-recovering-injuries-albany-house-fire/ (accessed April 22, 2019).
[16]Philip A. Holmes, "Conditions lead to 4 firefighters' injuries," www.sungazette.com, February 26, 2019, http://www.sungazette.com/news/top-news/2019/02/conditions-lead-to-4-firefighters-injuries/ (accessed April 22, 2019).
[17]Sharon Swanepoel, "Update: One firefighter sustains serious injuries in rollover accident," news.monroelocal.com, January 18, 2019, http://news.monroelocal.org/update-one-firefighter-sustains-serious-injuries-in-rollover-accident/ (accessed April 22, 2019).