RESEARCH

United States Firefighter Injuries 2017

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List of Tables and Figures

Key Findings

An estimated 58,835 firefighter injuries occurred in the line of duty in 2017, a decrease of 5 percent from the previous year.

In addition to injuries, there were 7,345 documented exposures to infectious diseases, and 44,530 exposures to hazardous conditions.

Firefighters were more likely to be injured at fireground operations than at other types of duties. In 2017, 24,495 injuries, or 42 percent of all reported firefighter injuries, occurred at the fireground. An estimated 4,555 occurred while responding to, or returning from an incident; 8,380 were incurred during training activities, 12,240 occurred at non-fire emergency incidents, and 9,165 occurred during other on duty activities.

The major types of injuries received during fireground operations were: strain, sprain, muscular pain (48 percent); wound, cut, bleeding, bruise (15 percent); smoke or gas inhalation (7 percent) and thermal stress (frostbite or heat exhaustion) (5 percent). Strains, sprains, and muscular pain accounted for 56 percent of all non fireground injuries.

The leading cause of fireground injuries was overexertion or strain (29 percent).

In 2017, an estimated 15,430 collisions involved fire department emergency vehicles responding to or returning from incidents.

Background and Objectives

Firefighters work in varied and complex environments that increase their risk of on-the-job death and injury. Each year, the NFPA studies firefighter deaths and injuries to provide national statistics on their frequency, extent, and characteristics. Earlier this year, the NFPA reported that there were 60 firefighter fatalities while on duty in 2017 (See, NFPA Journal July/August) www.nfpa.org/firefighterfatalities.[1] A better understanding of how these fatalities, nonfatal injuries, and illnesses occur can assist in identifying corrective actions which could help minimize the inherent risks of firefighter work.

This report examines 2017 firefighter injuries in the United States. The results are based on data collected during the NFPA Survey of Fire Departments for U.S. Fire Experience (2017). An earlier report, *Fire Loss in the United States during 2017*,[2] measured the national fire experience in terms of the number of fires that fire departments responded to and the resulting civilian deaths, civilian injuries, and property losses that occurred.

[1] Rita F. Fahy et al, *Firefighter Fatalities in the United States – 2017*, June 2018, Quincy: National Fire Protection Association, Research, Data and Analytics Division.
[2] Ben Evarts, "Fire Loss in the United States during 2017", *NFPA Journal*, Vol. 112, No. 5 (September/October 2018).

This year's report includes among its results:

An estimate of the total number of 2017 firefighter injuries.

Estimates of the number of injuries by type of duty.

An estimate of the number of exposures to infectious diseases.

Trends in firefighter injuries and rates.

Fireground injuries by cause.

Fire department vehicle accidents and resulting firefighter injuries.

Descriptions of selected incidents that illustrate firefighter safety problems.

Average number of fires and fireground injuries per department by population of community protected.

This report provides a high-level overview of firefighter injuries. NFPA's 2016 report, Patterns of Firefighter Fireground Injuries, uses data collected in the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS) to provide more information on these injuries.

Methods

NFPA annually surveys a sample of fire departments in the United States to make national projections of the fire problem. The sample is stratified by the size of the community protected by the fire department and includes all United States fire departments that protect communities with a population larger than 5,000. These 8,846 fire departments protect a population of 283 million or 87 percent of the United States population as of July 2017. The rest of the sample includes 12,642 randomly selected departments that protect populations under 5,000, for a total sample size of 21,488, or 72 percent of all departments in the United States known to NFPA.

The estimation method used for the survey was ratio estimation with stratification by community size[3]. For each firefighter injury statistic, a sample injury rate was computed for each stratum. This rate consisted of the total for that particular statistic from all departments reporting it, divided by the total population protected by the departments reporting the statistic. Note that this means the departments used in calculating each statistic could be different, reflecting differences in unreported statistics. The national projections are made by weighting the sample results according to the proportion of total United States population accounted for by communities of each size. Around any estimate based on a sample survey, there is a confidence interval that measures the statistical certainty or uncertainty of the estimate. We are confident that the actual number of total firefighter injuries falls within 5 percent of the estimate.

A total of 2,592 departments responded to the 2017 fire experience survey. The results are based on injuries that occurred during incidents attended by public fire departments. No state or federal firefighting entities were included in this sample, and no adjustments were made for injuries that occurred during fires attended solely by private fire brigades, such as those at industrial or military installations.

We collected data for the selected incident summaries by sending certain fire departments a form requesting a description of circumstances that led to a particular injury, including information on the type of protective equipment worn, the ages and ranks of the firefighters injured.

[3] William G. Cochran, *Sampling Techniques*, John Wiley, New York, NY 1977, pp. 150-161.

Results

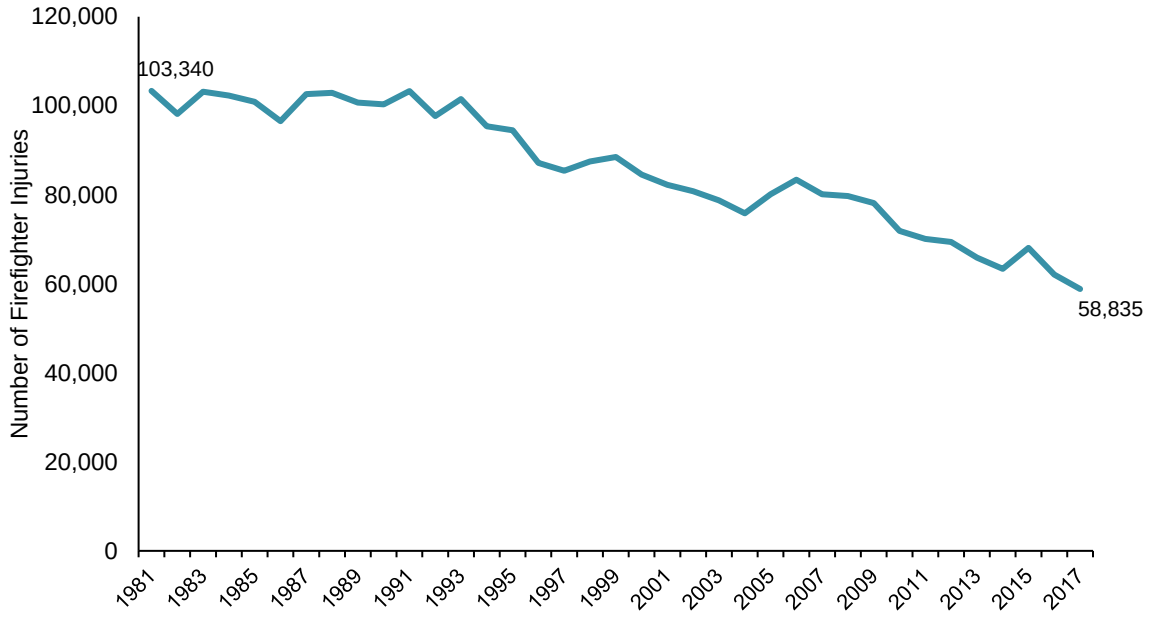
Based on data reported by fire departments responding to the 2017 National Fire Experience Survey, we estimate that 58,835 firefighter injuries[4]occurred in the line of duty in 2017. This is a decrease of 5 percent from the year before, and the lowest number since NFPA began analyzing this data in 1981 (See Figure 1). In recent years, the number of reported firefighter injuries has been considerably lower than it was in the 1980s and 1990s, due in part to additional survey questions on exposures to hazardous conditions and infectious diseases, information that allows us to place them in their own categories. Previously, some of these exposures might have been included in total injuries under other categories.

NFPA estimates that there were 7,345 exposures to infectious diseases such as hepatitis, meningitis, and HIV in 2017. This amounts to 0.3 exposures per 1,000 emergency medical service runs by fire departments in 2017.

We also estimate there were 44,530 exposures to hazardous conditions such as asbestos, radioactive materials, chemicals, and fumes last year. The increase in exposures in recent years, can in part be explained by the heightened awareness about cancer and other chronic illnesses in the fire service and the importance of documentation. This could be a result of improved reporting for such exposures.

An estimated 10,155 injuries, or 17 percent of all firefighter injuries, resulted in lost time.

Figure 1. Total Firefighter Injuries by Year, 1981-2017



Source: NFPA Annual Survey of Fire Departments U.S. Fire Experience, 2017.

[4] Around any estimate based on a sample survey, there is a confidence interval that measures the statistical certainty (or uncertainty) of the estimate. Based on data reported by fire departments responding to the NFPA Survey for U.S. Fire Experience (2017), the NFPA is very confident that the actual number of firefighter injuries falls within the range of 56,595 to 61,075.

Injuries by Type of Duty

Estimates of firefighter injuries by type of duty are displayed in Table 2 and Figure 4. As in past reports, type of duty is divided into five categories:

- Responding to or returning from an incident (includes fire and non-fire emergencies).
- Fireground (includes structure fires, vehicle fires, brush fires, etc.); refers to all activities from the moment of arrival at the scene to departure time (e.g., setup, extinguishment, overhaul).
- Non-fire emergency (includes rescue calls; hazardous calls, such as spills; and natural disaster calls).
- Training.
- Other on-duty activities (e.g., inspection or maintenance duties).

Firefighters were more likely to be injured at fireground operations than at other types of duties. In 2017 24,495, or 42 percent, of all firefighter injuries occurred at the fireground. This was a slight increase over the previous year (Table 1). Injuries at the fireground decreased from a high of 67,500 in 1981 to 24,495 in 2017, drop of 64 percent. The number of fires also declined steadily, for an overall decrease of 54 percent, and the rate of injuries per 1,000 fires over the past 35 years has fluctuated between a high of 28.3 injuries per 1,000 fires in 1990 and a low of 18.1 injuries per 1,000 fires in 2016 (See Figure 2).

Overall, the number of injuries at non-fire emergencies increased 28 percent between 1981 and 2017, from 9,600 to 12,240. During the same period, the number of non-fire emergencies also increased 332 percent, due in large part to an increase in the number of fire department responses to medical emergencies. The injury rate per 1,000 non-fire emergencies declined between 1981 and 2017, from 1.2 to 0.4 largely because the number of non-fire emergencies increased at a higher rate than the number of injuries at non-fire responses.

In addition, 4,555 firefighter injuries occurred while responding to or returning from an incident in 2017. Another 8,380 firefighter injuries occurred during training activities, and 9,165 injuries occurred during other on-duty activities.

Nature and Causes of Fireground Injuries

The major types of injuries that occurred during fireground operations were strains and sprains, which accounted for 48 percent of the injuries; wounds, cuts, bleeding, and bruises, which accounted for 15 percent; smoke or gas inhalation, which accounted for 7 percent; and thermal stress (frostbite or heat exhaustion) 5 percent. Except smoke or gas inhalation, these results were fairly consistent during all non-fireground activities, with strains, sprains, and muscular pain accounting for 56 percent of all non-fireground injuries, and wounds, cuts, bleeding, and bruises accounting for 17 percent (Table 2).

Because fireground injuries are of particular concern from an occupational hazard perspective, we examined their causes, defined here as the initial circumstance leading to the injury. Overexertion or strain, which accounted for 29 percent, was the leading cause of fireground injuries. Other major causes were falls, jumps, or slips, which accounted for 20 percent, and exposure to fire products, which accounted for 11 percent (Figure 5).

Table 1
Total Firefighter Injuries, Firefighter Injuries at the Fireground, and at Non-Fire Emergencies, 1981-2017

Year	Total Firefighter Injuries	Firefighter Injuries at the Fireground		Firefighter Injuries at Non-Fire Emergencies	
		Injuries	Injuries per 1,000 Fires	Injuries	Injuries per 1,000 Incidents
1981	103,340	67,500	23.3	9,600	1.24
1982	98,150	61,400	24.2	9,385	1.17
1983	103,150	61,700	26.5	11,105	1.29
1984	102,300	62,700	26.8	10,600	1.21
1985	100,900	61,300	25.9	12,500	1.38
1986	96,540	55,900	24.7	12,545	1.30
1987	102,600	57,755	24.8	13,940	1.41
1988	102,900	61,790	25.4	12,325	1.13
1989	100,700	58,250	27.5	12,580	1.11
1990	100,300	57,100	28.3	14,200	1.28
1991	103,300	55,839	27.3	15,065	1.20
1992	97,700	52,290	26.6	18,140	1.43
1993	101,500	52,885	27.1	16,675	1.25
1994	95,400	52,875	25.7	11,810	0.84
1995	94,500	50,640	25.8	13,500	0.94
1996	87,150	45,725	23.1	12,630	0.81
1997	85,400	40,920	22.8	14,880	0.92
1998	87,500	43,080	24.5	13,960	0.82
1999	88,500	45,500	25.0	13,565	0.76
2000	84,550	43,065	25.2	13,660	0.73
2001	82,250	41,395	23.9	14,140	0.73
2002	80,800	37,860	22.4	15,095	0.77
2003	78,750	38,045	24.0	14,550	0.70
2004	75,840	36,880	22.1	13,150	0.62
2005	80,100	41,950	26.2	12,250	0.56
2006	83,400	44,210	26.9	13,090	0.57
2007	80,100	38,340	24.6	15,435	0.65
2008	79,700	36,595	25.2	15,745	0.66
2009	78,150	32,205	24.1	15,455	0.62
2010	71,875	32,675	24.5	13,355	0.50
2011	70,090	30,505	22.0	14,905	0.50
2012	69,400	31,490	22.9	12,760	0.42
2013	65,880	29,760	24.0	12,535	0.41
2014	63,350	27,015	20.8	14,595	0.48
2015	68,085	29,130	21.6	14,320	0.44
2016	62,085	24,325	18.1	12,780	0.38
2017	58,835	24,495	18.6	12,240	0.37

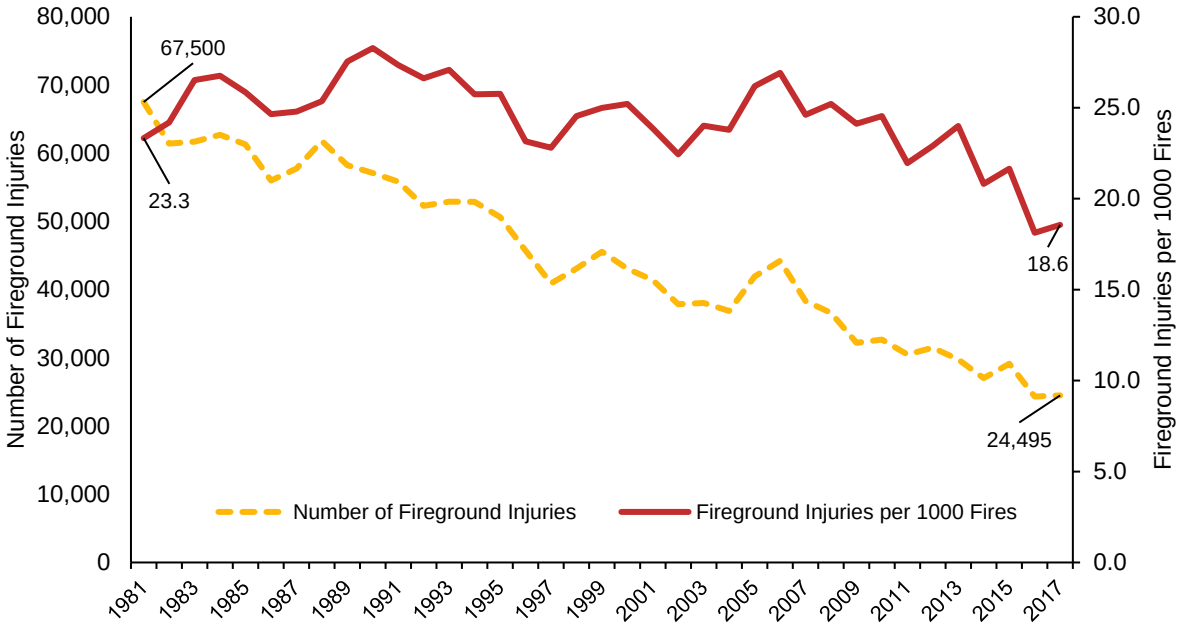
Source: NFPA Survey of Fire Departments for U.S. Fire Experience (1981-2017).

Table 2
Firefighter Injuries by Nature of Injury and Type of Duty, 2017

	Responding to or Returning from an Incident		Fire ground		Non-Fire Emergency		Training		Other on Duty		Total	
Nature of Injury	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Burns (Fire or Chemical)	30	(1%)	980	(4%)	55	(0%)	125	(1%)	120	1%	1,310	(2%)
Smoke or Gas Inhalation	190	(4%)	1,690	(7%)	120	(1%)	15	(0%)	120	1%	2,135	(4%)
Other Respiratory Distress	120	(3%)	460	(2%)	30	(0%)	95	(1%)	145	2%	850	(1%)
Burns and Smoke Inhalation	150	(3%)	1,290	(5%)	30	(0%)	50	(1%)	5	0%	1,525	(3%)
Wound, Cut, Bleeding, Bruise	730	(16%)	3,650	(15%)	1,745	(14%)	1,655	(20%)	1,690	18%	9,470	(16%)
Dislocation, Fracture	140	(3%)	490	(2%)	230	(2%)	280	(3%)	190	2%	1,330	(2%)
Heart Attack or Stroke	65	(1%)	120	(0%)	90	(1%)	65	(1%)	210	2%	550	(1%)
Strain, Sprain, Muscular Pain	2,490	(55%)	11,670	(48%)	7,120	(58%)	4,980	(59%)	4,710	51%	30,970	(53%)
Thermal Stress (frostbite, heat exhaustion)	135	(3%)	1,300	(5%)	210	(2%)	275	(3%)	175	2%	2,095	(4%)
Other	505	(11%)	2,845	(12%)	2,610	(21%)	840	(10%)	1,800	20%	8,600	(15%)
Total	4,555	(100%)	24,495	(100%)	12,240	(100%)	8,380	(100%)	9,165	100%	58,835	(100%)

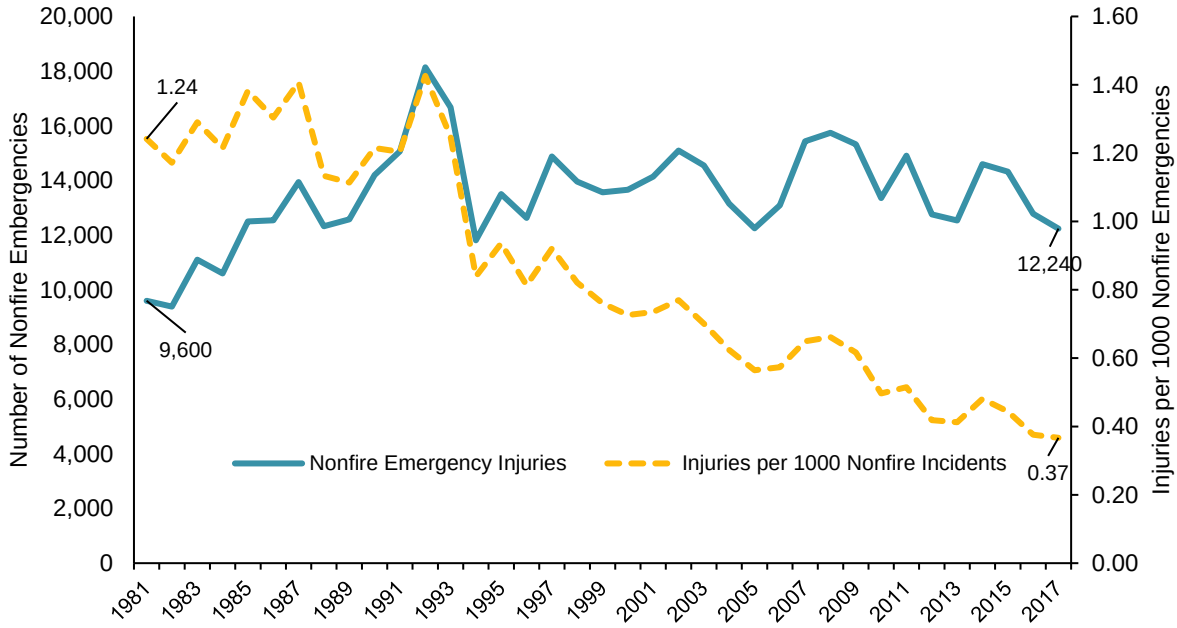
Note: If a firefighter sustained multiple injuries, only the nature of the single most serious injury was tabulated and reported.
Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2017

Figure 2. The Number of Injuries at the Fireground and Fireground Injuries per 1,000 Fires, 1981-2017



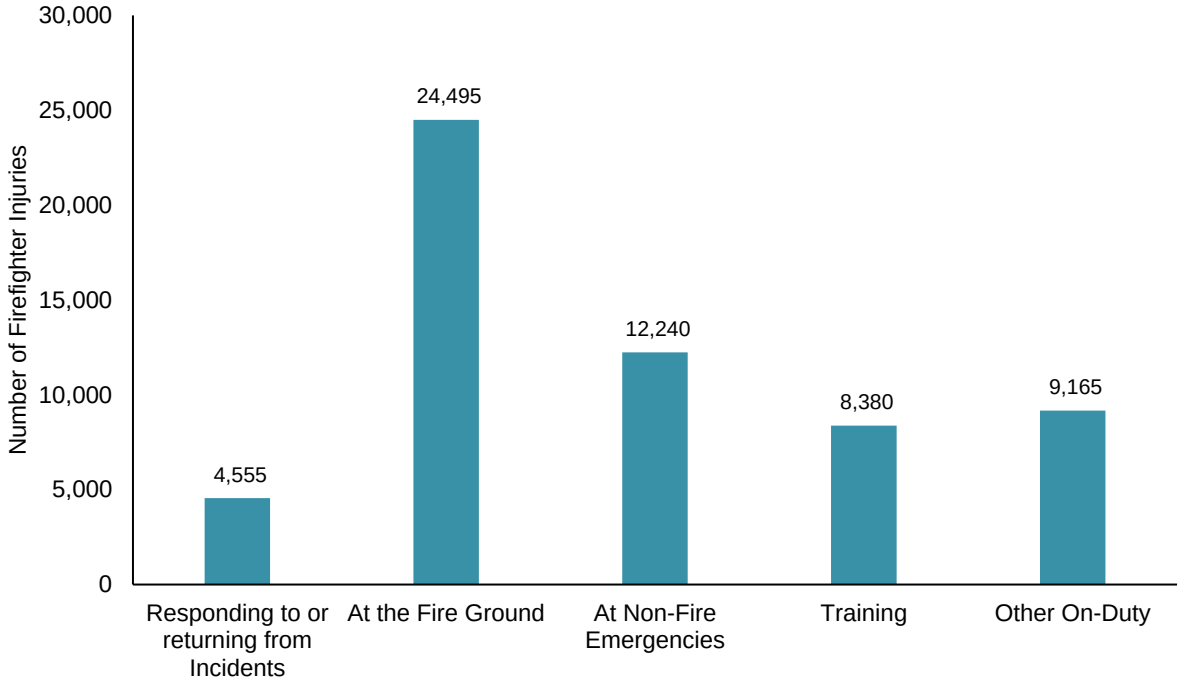
Source: NFPA Annual Survey of Fire Departments U.S. Fire Experience, 2017.

Figure 3. The Number of Injuries at Non-Fire Emergencies and Injuries per 1,000 Non-Fire Emergencies, 1981-2017



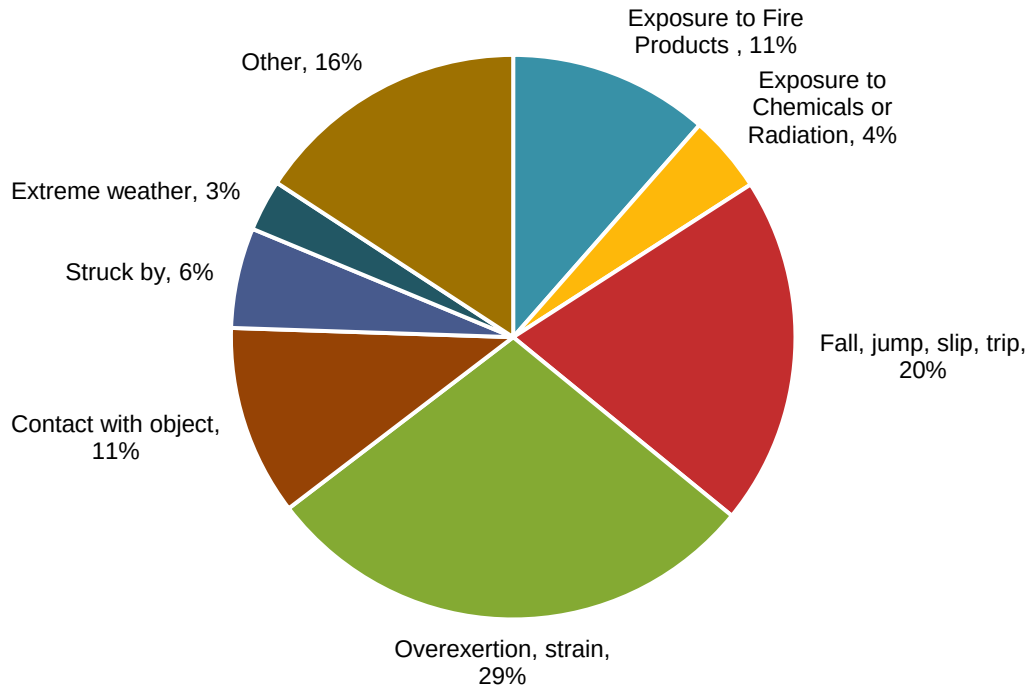
Source: NFPA Annual Survey of Fire Departments U.S. Fire Experience, 2017.

Figure 4. Firefighter Injuries by Nature of Injury and Type of Duty, 2017



Source: NFPA Annual Survey of Fire Departments U.S. Fire Experience, 2017.

Figure 5. Fireground Injuries by Cause, 2017



Source: NFPA Annual Survey of Fire Departments U.S. Fire Experience,

Fire Department Vehicle Collisions

The NFPA reported earlier that 18 firefighters died in vehicle-related incidents in 2017, including ten who were struck by vehicles and eight who died in vehicle crashes. Ten is an unusually high number for firefighters struck by vehicles, as the average for the previous 30 years is 4 per year. (See Firefighter Fatalities in the United States-2017").

In 2017, an estimated 15,430 collisions involved fire department emergency vehicles responding to or returning from incidents. This is very similar to last year's number. To put this number in perspective, fire departments responded to 34.7 million incidents in 2017, meaning that the number of collisions represents 0.04 percent of total responses. However, these collisions resulted in 1,005 injuries, or 2 percent, of all firefighter injuries.

Another 795 collisions involved firefighters' personal vehicles, in which they were responding to or returning from incidents. These collisions resulted in an estimated 75 injuries (Table 3).

Table 3. Fire Department Vehicle Collisions and Resulting Firefighter Injuries While Responding to or Returning from Incidents, 1990-2017

	Involving Fire Department Emergency Vehicles		Involving Firefighters' Personal Vehicles	
Year	Collisions	Firefighter Injuries	Collisions	Firefighter Injuries
1990	11,325	1,300	950	175
1991	12,125	1,075	1,375	125
1992	11,500	1,050	1,575	150
1993	12,250	900	1,675	200
1994	13,755	1,035	1,610	285
1995	14,670	950	1,690	190
1996	14,200	910	1,400	240
1997	14,950	1,350	1,300	180
1998	14,650	1,050	1,350	315
1999	15,450	875	1,080	90
2000	15,300	990	1,160	170
2001	14,900	960	1,325	140
2002	15,550	1,040	1,030	210
2003	15,900	850	980	85
2004	15,420	980	1,150	220
2005	15,885	1,120	1,080	125
2006	16,020	1,250	1,070	210
2007	14,650	915	665	120
2008	14,950	670	1,000	70
2009	15,100	820	870	100
2010	14,200	775	1,000	75
2011	14,850	970	790	190
2012	14,300	725	750	70
2013	12,350	730	830	185
2014	14,910	550	620	90
2015	16,600	1,150	700	50
2016	15,425	700	850	175
2017	15,430	1,005	795	75

Source: NFPA Survey of Fire Departments for U.S. Fire Experience (1990-2017).

Average Fires and Fireground Injuries per Department by Population Protected

The number of fires a fire department responds to is correlated with the population protected. The number of fireground injuries incurred by a department is also correlated with the number of fires the department attends. The second point is clearly demonstrated when we examine the range of the average number of fireground injuries per year per fire department, which range from a high of 107.1 for departments that protect communities of 1,000,000 or more, to a low of 0.2 for departments that protect communities that protect fewer than 5,000 people (Table 4).

One way to understand the risk that firefighters face is to examine the number of fireground injuries that occur for every 100 fires they attend. This takes into account relative fire experience and allows more direct comparison between departments protecting communities of different sizes. In 2017, the overall range of rates varied from a high of 2.2 injuries per 100 fires for departments that protected communities with populations ranging from 100,000 to 249,999 to a low of 0.7 injuries per 100 fires for departments that protected communities with populations between 2,500 and 4,999.

Larger fire departments generally had the highest rates of *fireground injuries per firefighter*; departments protecting communities of 1,000,000 or more had experienced 5.6 injuries per 100 firefighters. As the size of the community decreases, the rate of fireground injuries generally declines, to a low of 0.7 for departments protecting between 2,500 and 4,999 people (the rate moves up slightly, to 1.1 for the smallest communities). That is a difference in risk of injury per firefighter of 8 to 1 between communities of 1,000,000 or more people and communities of between 2,500 and 4,999 people.

One explanation for this difference is that, although departments protecting communities with populations of 1,000,000 have, on average, more than 96 times as many firefighters as departments protecting populations smaller than 2,500, larger departments attend 572 times as many fires as the smaller departments and incur considerably more fireground injuries. Different policies for documenting minor injuries and different levels of fire engagement could also explain some of this difference.

Table 4. Average Number of Fires, Fireground Injuries and Injury Rates by Population of Community Protected, 2017

Population of Community Protected	Average Number of Fires	Average Number of Fireground Injuries	Rate of Fire-ground Injuries per 100 Fires	Rate of Fire-ground Injuries per 100 Firefighters
1,000,000 or more*	6,184	107.1	1.7	5.6
500,000 to 999,999	2,305	48.7	2.1	5.3
250,000 to 499,999	1,113	18.4	1.6	4.4
100,000 to 249,999	487	10.5	2.2	4.9
50,000 to 99,999	202	2.7	1.3	2.6
25,000 to 49,999	109	1.9	1.8	3.3
10,000 to 24,999	58	0.8	1.3	1.9
5,000 to 9,999	35	0.4	1.2	1.4
2,500 to 4,999	26	0.2	0.7	0.7
Under 2,500	11	0.2	2.0	1.1

*Excludes New York City
Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2017.

Average Fires and Fireground Injuries by Population Protected and Region

Table 5 displays the average number of fires and fireground injuries per department by population of community protected and region of the country.[5] As in the nationwide results in Table 4, the results of each region of the country indicate that the number of fires a fire department responds to is correlated with the population protected, and the number of fireground injuries incurred by a department is correlated with the number of fires attended.

In 2017, the Northeast region of the United States reported a higher fireground injury rate of 2.0 fireground injuries per 100 fires. This observation is consistent with previous years, except in 2014 when the Western region reported a higher rate for the first time (Table 5)[6]. It is important to note that historically this analysis has excluded New York City because it is the largest fire department in the country and is treated as an outlier in the reporting of this statistic.

Conclusions

Since 1981 when firefighter injury data was first collected for this report, the overall trend is a decreasing number of firefighter injuries. The most common place for these injuries is at the fireground, but many firefighters are injured at other emergencies.

As the statistics in this report and previous reports attest, firefighting presents risks of personal injury to firefighters. Due to the kind of work performed and the hazards of the incident scene environment, it is unlikely that all firefighter injuries can be eliminated. A risk management system and the application of existing technology, however, can offer options to reduce present injury levels and bring about corresponding reductions that are recommended by NFPA that could be taken at the local level.

NFPA Codes and Standards References

- Commitment on the part of top fire service management to reducing injuries NFPA 1500 Standard on Fire Department Occupational Safety and Health Program, Section 4.3.
- Establishment of a safety committee headed by a safety officer to recommend a safety policy and the means of implementing it NFPA 1500, Section 4.5.
- Develop and implement an investigation procedure that includes all accidents, near misses, injuries, fatalities, occupational illnesses, and exposures involving members. NFPA 1500, 4.4.4. and 4.4.5.

[5] The four regions as defined by the U.S. Census Bureau include the following 50 states and the District of Columbia:

Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island and Vermont.
Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota and Wisconsin.
South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia.
West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming.

[6] Excludes New York City Fire Department.

- Provision of appropriate protective equipment and a mandate to use it. NFPA 1500, Section 7.1 through 7.8.
- Development and enforcement of a program on the use and maintenance of SCBA NFPA 1500, Section 7.9 through 7.14.
- Development and enforcement of policies on safe practices for drivers and passengers of fire apparatus NFPA 1500, Section 6.2 and 6.3
- Development of procedures to ensure response of sufficient personnel for both fire fighting and overhaul duties. NFPA 1500, 4.1.2; NFPA 1710 Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*;* and NFPA 1720, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency, Medical Operations, and Special Operations to the Public by Volunteer Fire Department).
- Implementation of regular medical examinations and a physical fitness program NFPA 1500, Section 10.1 through 10.3 NFPA1582, Standard on Comprehensive Occupational Medical Program for Fire Departments NFPA 1583, Standard on Health-Related Fitness Programs for Firefighters).
- Adoption and implementation of an incident management system. NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, Section 8.1; and NFPA 1561, Standard on Emergency Services Incident Management System.
- Training and education for all members related to emergency operations NFPA 1500, Chapter 5.
- Implementation of programs for the installation of private fire protection systems, so that fires are discovered at an earlier stage, exposing the firefighter to a less hostile environment NFPA 1, Uniform Fire Code and NFPA 101, Life Safety Code,®*;* Increased efforts in the area of fire safety education programs, so that citizens are made aware of measures to prevent fires and of correct reactions to the fire situation NFPA 1201, Standard for Providing Emergency Services to the Public, Chapter 6.

Other NFPA standards that may help in reducing firefighter injuries include:

- NFPA 1584, Standard on the Rehabilitation Process for members During Emergency Operations and Training Exercises, 2008 Edition, Chapter 4 Preparedness and Chapter 6 Incident Scene and Training Rehabilitation.
- NFPA 1002, Standard for Fire Apparatus Driver Operator Professional Qualification Risk Management, 2010 Edition, Section 4.8 The Risk Management process.
- NFPA 1620, Standard for Pre-Incident Planning, 2010 Edition, Chapter 4 Pre-Incident Planning Process, Chapter 5 Physical & Site Considerations, Chapter 7 Water supplies & Fire Protection Systems, Chapter 8 Special Hazards.

Efforts need to be made to recognize that firefighter injuries can be reduced. By addressing the priorities listed above, Fire Service organizations can make significant strides towards reducing the number and impact of such injuries.

Table 5.
Average Number of Fires and Fireground Injuries per Department and Injuries per 100 Fires, by Population of Community Protected, and Region, 2017

Population of Community Protected	Northeast			Midwest			South			West		
	Average Fires	Average of Fireground Injuries	Fireground Injuries per 100 Fires	Average Fires	Average of Fireground Injuries	Fireground Injuries per 100 Fires	Average Fires	Average of Fireground Injuries	Fireground Injuries per 100 Fires	Average Fires	Average of Fireground Injuries	Fireground Injuries per 100 Fires
250,000 or more	*	*	*	3,486	67.8	1.9	1,694	39.7	2.3	3,283	51.7	1.6
100,000 to 249,999	515	33.7	6.5	514	13.8	2.7	444	5.3	1.2	358	7.0	2.0
50,000 to 99,999	195	3.6	1.9	144	2.0	1.4	223	2.3	1.0	207	1.4	0.7
25,000 to 49,999	81	3.6	4.4	90	1.0	1.1	133	1.3	1.0	118	1.6	1.4
10,000 to 24,999	42	1.1	2.6	53	0.7	1.4	65	0.4	0.6	68	0.4	0.5
5,000 to 9,999	35	0.6	1.8	26	0.4	1.4	40	0.2	0.6	27	0.1	0.2
2,500 to 4,999	18	0.4	2.4	21	0.1	0.5	33	0.1	0.4	32	0.2	0.6
Under 2,500	8	0.1	1.2	9	0.2	2.6	19	0.5	2.9	9	0.1	1.5
Overall Regional Rate	62	1.3	2.0	76	1.3	1.7	164	2.7	1.6	284	4.2	1.5

Note that the results above do not include New York City.
*Insufficient Data
Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2017.

Selected Firefighter Injury Incidents from 2017

Fall during "John Nance Drill" Training
During firefighter survival week training, a firefighting recruit suffered back and head injuries after falling approximately 10 feet (3 meters) during a training evolution.

The training evolution is known as the "John Nance drill" and named for a firefighter who was killed at a structure fire in 1987 after falling through a burned floor.

The drill teaches firefighters a specific maneuver for below-grade firefighter rescue utilizing ropes to remove a firefighter from a hole in the floor. If a firefighter were to fall through a compromised floor, another firefighter is sent down the hole via rope to locate, assess, and rescue the downed firefighter. After being lowered down into the hole by several firefighters, the rescuer assesses the victim's air supply, converts the waist strap of his self-contained breathing apparatus (SCBA) into a harness, and uses a handcuff knot to connect the victim to the rope. Once the tasks are complete, the firefighters on the haul team pull the victim out of the hole. The rescuer is then retrieved using the same rope.

On the morning of the training evolution, a group of fire recruits gathered at the department's new training facility to participate in the daily drills. The recruits were broken into groups, and every recruit would have a chance to be on the haul team, serve as a rescuer, and pose as a victim.

During one of the evolutions, a trainee was assigned to be the rescuer. As she was being lowered down the hole on a rope in a full protective ensemble, she fell, landing on her self-contained breathing apparatus (SCBA) and striking her head on the floor. Instructors requested an ambulance while she was treated by fellow firefighters and on-scene paramedics. She was transported to the nearest trauma facility, evaluated, and released. The department did not provide details on specific injuries or time out of work.

Fall Down Flight of Stairs at a Structure Fire
A fire captain suffered a concussion, multiple muscle sprains in his neck and upper back, and a sprained knee after falling backwards down a flight of stairs at a structure fire.

Numerous 911 calls were received reporting a building fire with the possibility of an occupant trapped on the second floor. The fire department arrived within three minutes and encountered a fire in a small wood-frame, two-family home. The fire had self-vented out numerous windows on the second floor and involved two rooms. During initial operations, the first-arriving companies, staffed with 14 members, began an aggressive interior attack on the fire. The engine company stretched a hose line up the front stairs while the ladder company began roof operations. Two members of the heavy rescue followed the engine company up the front stairs to assist with forcible entry and to search the fire floor. The captain of the heavy rescue and his partner tried to get more information on the status of the occupants. A police officer and a family member informed firefighters that an elderly man was possibly still on the second floor.

The captain and a firefighter went to the back of the home because of congestion on the narrow front stairwell. They ascended the rear stairs to the second floor, which led to the same landing as the front stairs. The captain met the engine company at the top of the stairs on a narrow hallway in zero visibility and high heat.

As the three members of the engine company were working their way into the apartment, the captain tried to find a way around the engine company to search the apartment. There were now six firefighters on the landing, and the captain ordered his partner to stand at the bottom of the stairs to ensure that another hand line was not brought up until the first line could get into the apartment. The captain's partner descended the rear stairs and spoke with the officer of an engine company at the bottom of the stairs. The captain tried to stand up while taking a step backwards, not realizing how close he was to the stairs. He fell down the steep stairs headfirst, landing on his SCBA cylinder.

His partner and firefighters from the engine company at the bottom of the rear stairs assisted him to the back yard, where he was treated by an on-scene advanced life support ambulance. The rapid intervention team (RIT) was activated and met the captain in the back yard to assist with treatment and packaging into the ambulance.

The 46-year-old captain returned to light duty a month after the fire. He eventually returned to full duty a month later. He was wearing a full protective ensemble and using his SCBA. His PASS device did not go into full alarm while he was in the structure because crews were able to get him out of the stairway and into the back yard quickly.

The occupant who was reportedly trapped was at a relative's house at the time of the fire.

Crash in Apparatus while Performing Check

A senior firefighter suffered severe injuries after an apparatus crash while performing apparatus checks.

The firefighter was driving a ladder truck to ensure that the apparatus was in top working condition. While he was traveling behind a tractor trailer, a large tree fell across the road, blocking the travel lane. The tractor trailer struck the fallen tree, stopping abruptly. The apparatus operator veered to the right, striking the right rear of the trailer with the driver's side of the ladder truck, tearing the driver's door off. The ladder truck continued down an embankment, rolling into a large culvert on the side of the road where it came to a stop.

The ladder truck suffered severe damage, trapping the driver with his legs pinned under the dashboard. Fellow firefighters responded to the crash, and used the jaws of life to perform a dash lift to free the victim's leg from the wreckage. It is unknown if he was wearing a seatbelt. The firefighter was transported to the hospital and treated for severe extremity injuries. There were no other injuries from the crash.

The victim has returned to full firefighting activities. The fire apparatus was destroyed. The department is in the process of replacing it.

Bail Out during Structure Fire

An assistant chief was treated for exhaustion after escaping a structure fire.

A mutual aid engine company responded to an adjacent district for a working fire. Upon arriving on scene, the incident commander assigned two members of the engine company, an assistant chief and a firefighter, to assist crews at the rear of the building. They reported to the rear and met with crews exiting the building, with whom they discussed objectives and began operations.

The two advanced a handline to the third floor. On the third-floor landing, the assistant chief used his thermal imaging camera to scan the area. He and the firefighter began advancing into

the third floor and knocking down flames in the first room they came to. The assistant chief advanced with flames above his head, and took the handline from the firefighter. The assistant chief communicated to the incident commander the need for a second handline and increased vertical ventilation. The firefighter began pulling ceilings to open up the area to extinguish flames above their heads. Conditions began to rapidly deteriorate, however, and the temperature began to rise dramatically. The assistant chief communicated the need for an evacuation to the incident commander.

The two began their escape. At first, they tried to keep their hose line with them but it was caught on something and hindered their exit. The assistant chief left the hose line and became disoriented. He found a window and began to bail out by throwing his legs over the ledge, believing the window opened to a balcony. The window opened to a three-story drop to the ground, however, and he was able to pull himself back in the window. Firefighters on the ground called a mayday for a firefighter bailing out of the window, and retrieved a 35-foot (10.66-meter) ladder and raised it to the window. The chief was able to climb down the ground ladder on his own power. He was evaluated by an on-scene ambulance crew for exhaustion but refused treatment and transportation to the hospital.

A brief after-action report identified several issues that were corrected. The batteries in the PASS devices and end-of-life alarms in the SCBA for both firefighters were dead, and the thermal imaging camera showed whiteout conditions when first used on the third floor. Even so, the assistant chief and firefighter still proceeded into the structure. On a strategic level, the rapid intervention team (RIT) was actively fighting fire and was not prepared to perform its primary function. Without a dedicated RIT, the immediate rescue of a firefighter in need will be delayed. Ground ladders were available and quickly placed into position by firefighters who witnessed the victim attempting to escape.

The mutual aid department implemented training and resources to correct these important issues in calling a mayday, bailout training, and ensuring equipment readiness. Most importantly, the victim identified the importance of calling a mayday early. In his statement, the most valuable lesson was, "I should have called for help as soon as I lost contact with the hose line." The earlier a firefighter calls a mayday, the greater the chances of survival.

Slip on Feeder Line while Conducting Pump Operations
A 41-year-old firefighter sprained his knee while operating a pump at a vehicle fire.

The fire department responded to a junkyard where a tractor trailer truck was burning. The members of the engine company established a water supply, and handlines were placed into operation and began extinguishing the fire.

During these operations, the pump operator stepped over a feeder line and slipped, twisting his knee. He was wearing his protective ensemble except for his SCBA. He was not allowed to return to firefighting activities for six weeks.

Buried by Debris in Structure Collapse
A firefighter sustained injuries when he was buried by debris in a structure collapse while fighting a fire.

On a windy and wet afternoon, the fire department received calls reporting a fire at a gas station with a convenience store and fast food restaurant. When firefighters arrived, they encountered a

large body fire consuming the store and fast food restaurant in the 5,250-square-foot (488-square-meter) building of lightweight wood construction.

The first engine company attempted to establish a water supply, but the private fire hydrant did not work and extra supply hose was needed to reach another hydrant on the road. Water supply was established within nine minutes after dispatch. Firefighters immediately deployed a ground-level master stream and used a defensive attack to lob water from the outside of the building.

The roof of the structure collapsed just after the engine company established the water supply. Soon after the roof collapse, a firefighter spraying the hoseline through the front windows was struck and trapped by a falling sheet metal façade. Most of the front façade collapsed, and the firefighter was buried under the debris. A firefighter using the handline immediately trained his hose stream onto the burning material engulfing the victim, and firefighters and bystanders tried to pull the firefighter free.

Rescuers were able to lift enough of the material off the firefighter so he could be pulled to safety after about two and a half minutes. He was treated by the crew of an on-scene ambulance and transported to the hospital with first- and second-degree burns to his arms and legs. He was wearing a full protective ensemble including SCBA. The department did not provide details on the firefighter's time lost, treatment, or return to firefighting activities.

Definition of Terms

Fire: Any instance of uncontrolled burning. Excludes combustion explosions and fires out on arrival (whether authorized or not), overpressure rupture without combustion; mutual aid responses, smoke scares, and hazardous materials responses, e.g., flammable gas, liquid, or chemical spills without fire.

Incident: The movement of a piece or pieces of fire service apparatus or equipment in response to an alarm.

Injury: Physical damage suffered by a person that requires (or should require) treatment by a practitioner of medicine (physician, nurse, paramedic, EMT) within one year of the incident (regardless of whether treatment was actually received), or that results in at least one day of restricted activity immediately following the incident.

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