

# **An Analysis of Volunteer Firefighter Injuries, 2009-2011**

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## Acknowledgements

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An analysis of volunteer firefighter injuries was undertaken to compare their experience to all firefighter injuries. 'All firefighter injuries' refers to the firefighter injuries that are estimated based on the NFPA National Fire Experience Survey and reported in the NFPA Annual Firefighter Injury Report. (*U.S. Firefighter Injuries, 2011*, [www.nfpa.org/firefighterinjuries](http://www.nfpa.org/firefighterinjuries)). The injury statistics in that report combine career and volunteer firefighters.

Volunteer fire departments are highly related to the size of community protected. Departments that protect communities of less than 10,000 population are comprised mostly of volunteer firefighters. (See Table A-1 in the Appendix.)

Three years of data were used in this analysis because the estimates for some of the breakdown categories are small and can vary considerably from year to year.

The estimated number of volunteer firefighter injuries that occurred by type of duty and nature of injury for the 2009-11 period are shown in Table 1. A comparison showing the breakdown of injuries to all firefighters is also displayed in Table 1 and Figure 1.

From Table 1, several observations are worth noting. For injuries by type of duty, volunteers (56.6%) were more likely to receive injuries at the fireground than all firefighters combined (43.3%), and volunteers (12.1%) were less apt to be injured at nonfire emergencies than for all firefighters (19.9%). This is due to the fact that many smaller departments do not provide EMS service, so nonfire emergencies are a smaller component of their overall incidents, while fires are a larger component. ( see Table A-2 in the appendix).

For injuries at the fireground, the leading types of injuries were strain, sprains, muscular pain, accounting for 2,145 injuries; wound, cut, bleeding, bruise, accounting for 1,450 injuries; frostbite, heat stroke, accounting for 1,200 injuries; and smoke or gas inhalation, accounting for 710 injuries. For all types of duty, wound, cut, bleeding, bruise and strain, sprains, muscular pain accounted for the largest shares of injuries.

Table 2 and Figure 2 show a comparison by nature of injury and type of duty for all firefighter injuries and volunteers only. Wound, cut, bleeding, bruise injuries were often more likely to occur for volunteers across all types of duty (18.0% to 32.6%) than for all firefighters (13.4% to 18.5%). Also from Table 2, injuries due to frostbite, or heat stroke were often more

likely to occur for volunteers across all types of duty (0.6% to 16.7%) than for all firefighters (0.7% to 6.6%).

A factor contributing to the wound, cut, etc. injuries and the injuries due to frostbite, or heat stroke is that departments protecting smaller communities were less likely to have adequate or up to date personal protective equipment than departments protecting larger communities.<sup>1</sup>

Also at the fireground, smoke or gas inhalation accounted for a higher percentage of injuries for volunteers (9.8%) than for all firefighters combined (4.9%). Again, departments protecting smaller communities were less likely to have adequate or up to date SCBA equipment than departments protecting larger communities.<sup>2</sup>

Causes of volunteer firefighter and all firefighter injuries at the fireground can be seen in Table 3. The major causes of volunteer firefighter injuries were fall, jump, slip, trip accounting for 1,780 or 24.7%, overexertion, strain accounting for 1,780 or 24.7%, and contact with object accounting for 970 or 13.5%. Comparison of volunteer firefighter injuries to all firefighter injuries showed fairly similar results. One major difference was extreme weather, which accounted for a higher percentage of volunteer firefighter injuries (8.1%) than for all firefighter injuries (3.6%). Again departments protecting smaller communities were less likely to have adequate or up to date personal protective equipment than departments protecting larger communities.

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<sup>1</sup> Third Needs Assessment of U.S. Fire service, Quincy, MA :National Fire Protection Association, June 1011, pp 82-86. Or available online: [www.nfpa.org/needsassessment](http://www.nfpa.org/needsassessment)

<sup>2</sup> Same reference as 1, pp 77-80.

**Table 1. Firefighter Injuries by Type of Duty and Nature of Injury  
For Volunteers, 2009-2011 Average**

Nature of Injury	Type of duty					Total
	Responding/ Returning	At the Fireground	At Non-Fire Emergencies	Training	Other On-Duty	
Burns	34	420	10	40	40	550
Smoke or gas inhalation	25	710	15	15	20	780
Other respiratory distress	30	160	25	50	5	275
Burns & smoke inhalation	0	160	10	20	0	190
Wound, cut, bleeding, bruise	180	1,450	275	385	390	2,675
Dislocation, fracture	90	300	80	130	70	675
Heart attack or stroke	10	65	30	35	45	180
Strain, sprain, muscular pain	400	2,145	740	825	500	4,615
Frostbite, heat stroke	115	1200	10	190	15	1,530
Other	60	590	345	150	110	1,255
<b>Total</b>	<b>940</b>	<b>7,200</b>	<b>1,540</b>	<b>1,850</b>	<b>1,195</b>	<b>12,725</b>
% for Volunteers only	7.4%	56.6%	12.1%	14.5%	9.4%	100.0%
% for All firefighters	6.0%	43.3%	19.9%	10.3%	20.5%	100.0%

Volunteer firefighters injuries are based on results for departments that protect communities of less than 10,000 population which are comprised mostly of volunteer firefighters.

Source: NFPA Annual Fire Experience Survey, 2009-2011

**Table 2. Firefighter Injuries by Type of Duty and Nature of Injury  
for All Firefighters and Volunteers Only, 2009-2011 Average**

Nature of Injury	Type of Duty											
	Responding/Returning		At the Fireground		At Nonfire Emergencies		Training		Other on-Duty		Total	
	All Firefighters	Volunteer Only	All Firefighters	Volunteer Only	All Firefighters	Volunteer Only	All Firefighters	Volunteer Only	All Firefighters	Volunteer Only	All Firefighters	Volunteer Only
Burns	1.3%	3.9%	6.4%	5.8%	0.4%	0.6%	2.6%	2.3%	1.9%	3.5%	3.6%	4.3%
Smoke or gas inhalation	1.1%	2.4%	4.9%	9.8%	1.0%	1.0%	0.5%	0.9%	0.6%	1.5%	2.5%	6.1%
Other respiratory distress	1.2%	3.3%	1.6%	2.2%	1.0%	1.7%	1.5%	2.8%	1.1%	0.3%	1.3%	2.1%
Burns & smoke inhalation	0.1%	0.0%	1.7%	2.2%	0.0%	0.0%	0.7%	1.2%	0.2%	0.0%	0.9%	1.5%
Wound, cut, bleeding, bruise	14.6%	18.9%	14.0%	20.1%	13.4%	18.0%	15.7%	20.9%	18.5%	32.6%	15.0%	21.0%
Dislocation, fracture	4.0%	9.7%	3.5%	4.2%	1.7%	5.2%	4.1%	7.1%	2.4%	5.9%	2.6%	5.3%
Heart attack or stroke	0.9%	1.1%	0.8%	0.9%	0.8%	1.8%	1.4%	1.8%	2.7%	3.6%	1.3%	1.4%
Strain, sprain, muscular pain	64.1%	42.6%	50.6%	29.8%	63.3%	47.9%	60.3%	44.7%	54.4%	42.0%	55.7%	36.3%
Frostbite, heat stroke	3.3%	12.0%	6.6%	16.7%	0.7%	0.6%	4.8%	10.4%	1.2%	1.3%	3.9%	12.0%
Other	9.3%	6.1%	11.0%	8.2%	17.6%	22.5%	8.2%	8.1%	17.2%	9.3%	13.2%	9.9%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Volunteer firefighters injuries are based on results for departments that protect communities of less than 10,000 population which are comprised mostly of volunteer firefighters.

Source: NFPA Annual Fire Experience Survey, 2009-2011

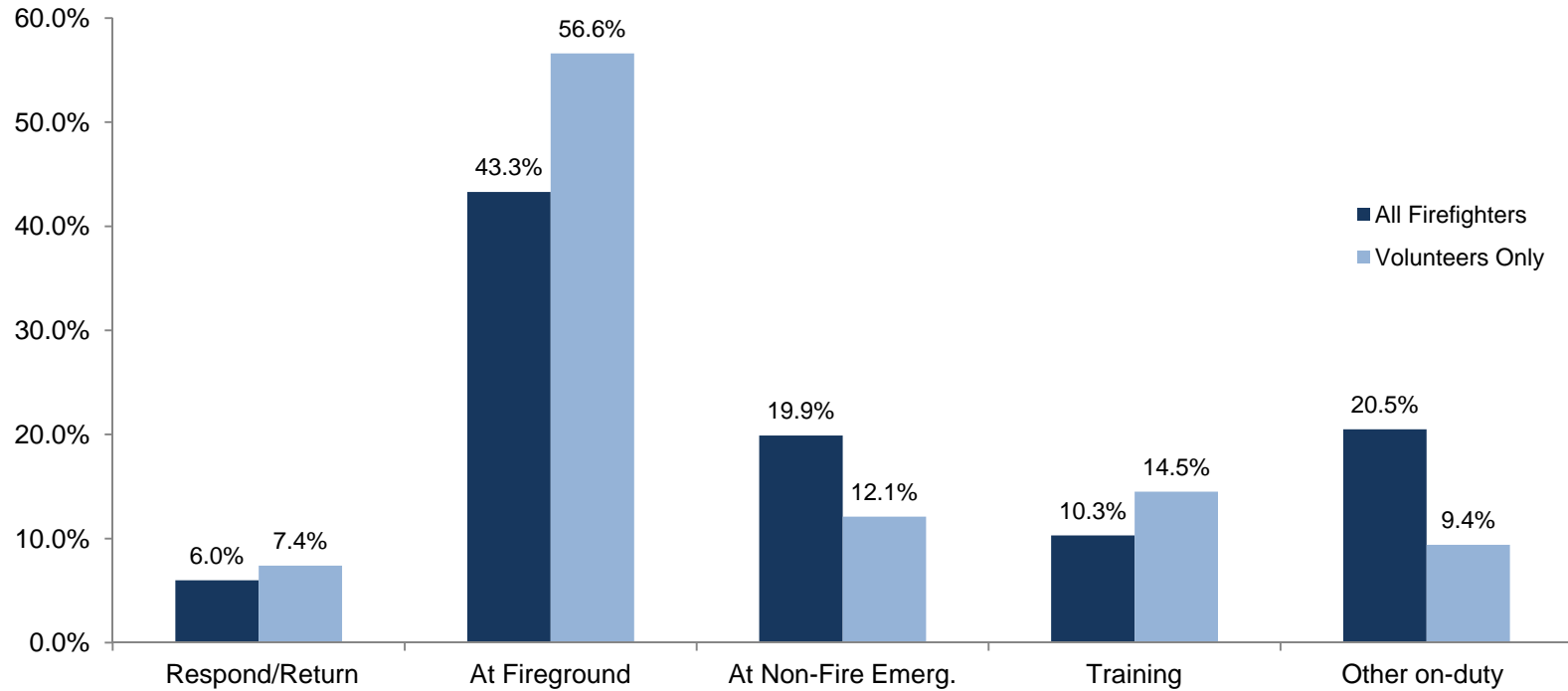
**Table 3. Causes of Volunteer Firefighter Injuries at the Fireground, 2009-2011 Average**

Cause of Injury	Volunteer Only		All Firefighters	
	Number	Percent	Number	Percent
Exposure to fire products	870	12.1%	3,165	10.0%
Exposure to chemicals, etc.	190	2.6%	875	2.8%
Fall, jump, slip, trip	1,780	24.7%	7,030	22.1%
Overexertion, strain	1,780	24.7%	8,395	26.4%
Contact with object	970	13.5%	3,760	11.8%
Struck by	305	4.2%	1,950	6.1%
Extreme weather	580	8.1%	1,150	3.6%
Other	725	10.1%	5,470	17.2%
Total	7,200	100.0%	31,795	100.0%

Volunteer firefighter injuries are based on results for departments that protect communities of less than 10,000 population which are comprised mostly of volunteer firefighters.

Source: NFPA Fire Experience Survey, 2009-2011

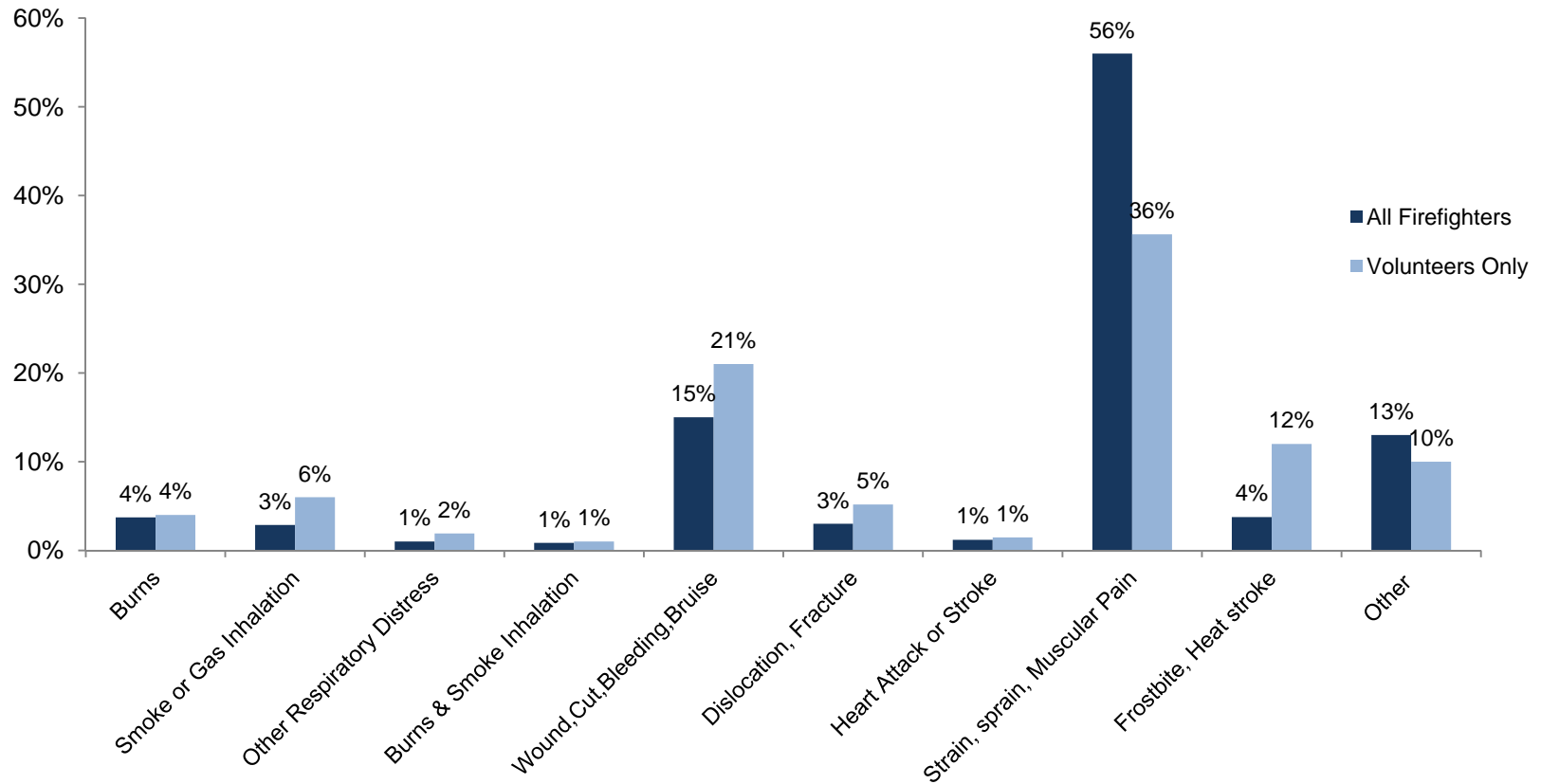
**Figure 1. Firefighter Injuries by Type of Duty  
for all Firefighters and Volunteers Only, 2009-2011**



Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2009-2011



**Figure 2. Nature of Injury for all Firefighters and Volunteers Only, 2009-2011**



Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2009-2011

### **Description of NFPA Survey and Data Collection Method**

The NFPA annually surveys a sample of 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. All U.S. fire departments that protect communities of 50,000 or more are included in the sample, because they constitute a small number of departments with a large share of the total population protected. For departments that protect less than 50,000 population, stratifying the sample by community size permits greater precision in the estimates. A total of 2,790 departments responded to the 2011 fire experience survey. The national projections are made by weighting sample results according to the proportion of total U.S. 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 very confident that the actual number of total firefighter injuries falls within 5.0% of the estimate.

The results in this report are based on injuries that occurred during incidents attended by public fire departments. No adjustments were made for injuries that occurred during fires attended solely by private fire brigades, e.g., industrial or military installations.

Data collection for the selected incident summaries was enhanced by a form that was sent to departments requesting information. The form included questions on type of protective equipment worn, age and rank of firefighters injured, and description of circumstances that led to injury.

## Appendix

**Table A-1.  
Department Type by Population Protected, 2011**

Population Protected	Type of Department (Percent)				Total
	All Career	Mostly Career	Mostly Volunteer	All Volunteer	
1,000,000 or more	77.8%	22.2%	0.0%	0.0%	100.0%
500,000 to 999,999	72.4	20.7	6.9	0.0	100.0
250,000 to 499,999	79.3	13.8	6.9	0.0	100.0
100,000 to 249,999	84.0	15.1	0.0	0.0	100.0
50,000 to 99,999	69.6	19.2	11.2	0.0	100.0
25,000 to 49,999	44.7	27.2	21.2	6.9	100.0
10,000 to 24,999	22.4	24.3	37.2	16.1	100.0
5,000 to 9,999	5.5	8.0	43.0	43.5	100.0
2,500 to 4,999	1.2	1.2	20.9	76.6	100.0
Under 2,500	1.2	0.4	5.4	93.0	100.0
All Departments	8.5	6.2	18.3	67.0	100.0

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2011.

Type of department is broken into four categories. All career departments are comprised of 100% career firefighters. Mostly career is comprised of 51 to 99% career firefighters, while mostly volunteer is comprised of 1 to 50% career firefighters. All volunteer departments are comprised of 100% volunteer firefighters.

**Table A-2**  
**Percent of Fires and Nonfire Incidents by Community size, 2010-2011**

	Community Size									
	1,000,000 or more	500,000 to 999,999	250,000 to 499,999	100,000 to 249,999	50,000 to 99,999	25,000 to 49,999	10,000 to 24,999	5,000 to 9,999	2,500 to 4,999	less than 2,500
Fire Incidents	2.5%	3.2%	3.3%	3.1%	3.3%	3.9%	4.7%	6.5%	9.3%	13.9%
Medical Aid Responses	74.3%	69.3%	66.8%	69.1%	66.8%	62.6%	62.0%	55.2%	53.8%	49.9%
False Alarms	8.8%	6.8%	7.2%	7.2%	8.4%	9.8%	9.1%	9.8%	6.6%	7.9%
Mutual Aid Responses	2.9%	1.4%	1.3%	1.8%	2.7%	4.4%	6.4%	9.8%	11.4%	16.3%
Hazardous Material Responses	0.5%	1.1%	1.0%	1.0%	1.2%	1.8%	1.9%	1.9%	1.3%	1.3%
Other Hazardous Responses	1.1%	1.6%	2.2%	2.0%	2.4%	3.0%	3.6%	3.8%	3.3%	3.0%
All Other Responses	9.9%	16.5%	18.3%	15.8%	15.2%	14.5%	12.3%	13.1%	14.2%	7.7%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: NFPA's Survey of Fire Departments for U.S. Fire Experience, 2010-2011.