

An Analysis of Volunteer Firefighter Injuries, 2010-2012

**Michael J. Karter, Jr.
Fire Analysis and Research Division
National Fire Protection Association**

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**National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471
www.nfpa.org**

Acknowledgements

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Copies of this analysis are available from:

National Fire Protection Association
One-Stop Data Shop
1 Batterymarch Park
Quincy, MA 02169-7471
www.nfpa.org
e-mail: osds@nfpa.org
phone: 617-984-7443

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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, 2012](#)). 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 2010-12 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 (53.5%) were more likely to receive injuries at the fireground than all firefighters combined (44.8%), and volunteers (12.0%) were less apt to be injured at nonfire emergencies than for all firefighters (19.4%). 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 1,980 injuries; wound, cut, bleeding, bruise, accounting for 1,325 injuries; frostbite, heat stroke, accounting for 1,110 injuries; and smoke or gas inhalation, accounting for 535 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 (16.2% to 30.3%) than for all firefighters (13.6% to 18.0%). Also from Table 2, injuries due to frostbite, or heat stroke were often more likely to occur for volunteers across all types of duty (1.3% to 16.8%) than for all firefighters (0.9% 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.¹

Also at the fireground, smoke or gas inhalation accounted for a higher percentage of injuries for volunteers (8.1%) than for all firefighters combined (4.3%). Again, departments protecting smaller communities were less likely to have adequate or up to date SCBA equipment than departments protecting larger communities.²

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 1,585 or 23.9%, overexertion, strain accounting for 1,620 or 24.2%, and contact with object accounting for 945 or 14.2%. 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 (9.3%) than for all firefighter injuries (4.0%). Again departments protecting smaller communities were less likely to have adequate or up to date personal protective equipment than departments protecting larger communities.

¹ Third Needs Assessment of U.S. Fire service, Quincy, MA :National Fire Protection Association, June 10, 2011, pp 82-86. Or available online: www.nfpa.org/needsassessment

² Same reference as 1, pp 77-80.

**Table 1. Firefighter Injuries by Type of Duty and Nature of Injury
For Volunteers, 2010-2012 Average**

Nature of Injury	Responding/ Returning	At the Fireground	Type of duty At Non-Fire Emergencies	Training	Other On-Duty	Total
Burns	10	380	15	20	45	470
Smoke or gas inhalation	60	535	15	15	20	645
Other respiratory distress	30	190	20	55	5	295
Burns & smoke inhalation	0	150	0	15	0	165
Wound, cut, bleeding, bruise	175	1,325	255	440	440	2,635
Dislocation, fracture	110	295	100	90	85	680
Heart attack or stroke	20	85	15	20	55	195
Strain, sprain, muscular pain	475	1,980	740	770	610	4,575
Frostbite, heat stroke	120	1,110	20	185	15	1,450
Other	85	570	305	140	180	1,280
Total	1,080	6,630	1,485	1,745	1,455	12,390
% for Volunteers only	8.7	53.5	12.0	14.1	11.7	100.0%
% for All firefighters	6.8	44.8	19.4	10.4	19.5	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, 2010-2012

**Table 2. Firefighter Injuries by Type of Duty and Nature of Injury
for All Firefighters and Volunteers Only, 2010-2012 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	0.9%	0.9%	6.0%	5.8%	0.5%	1.1%	2.2%	1.1%	1.8%	3.0%	3.4%	3.8%
Smoke or gas inhalation	1.9%	5.6%	4.3%	8.1%	0.9%	1.0%	0.3%	0.8%	0.5%	1.3%	2.3%	5.2%
Other respiratory distress	1.4%	2.6%	1.6%	2.9%	0.8%	1.4%	1.5%	3.1%	1.3%	0.2%	1.4%	2.4%
Burns & smoke inhalation	0.1%	0.0%	1.5%	2.3%	0.0%	0.0%	0.5%	0.9%	0.2%	0.0%	0.85	1.4%
Wound, cut, bleeding, bruise	14.4%	16.2%	13.6%	20.0%	13.1%	17.2%	16.9%	25.1%	18.0%	30.3%	14.8%	21.3%
Dislocation, fracture	4.5%	10.2%	2.4%	4.5%	1.8%	6.6%	3.7%	5.1%	2.5%	5.8%	2.5%	5.5%
Heart attack or stroke	1.3%	1.7%	0.7%	1.3%	0.7%	0.9%	1.1%	1.2%	2.5%	3.8%	1.2%	1.6%
Strain, sprain, muscular pain	61.1%	44.0%	52.9%	29.8%	63.6%	49.9%	60.6%	44.0%	54.5%	42.0%	56.6%	36.9%
Frostbite, heat stroke	3.9%	11.0%	6.6%	16.8%	1.0%	1.3%	4.9%	10.6%	0.9%	1.0%	4.1%	11.7%
Other	10.6%	7.8%	10.3%	8.6%	17.5%	20.6%	8.2%	7.9%	17.8%	12.5%	13.0%	10.3%
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, 2010-2012

**Table 3. Causes of Volunteer Firefighter Injuries
at the Fireground, 2010-2012 Average**

Cause of Injury	Volunteer Only		All Firefighters	
	Number	Percent	Number	Percent
Exposure to fire products	705	10.7%	2,810	8.9%
Exposure to chemicals, etc.	55	0.9%	520	1.6%
Fall, jump, slip, trip	1,585	23.9%	7,025	22.3%
Overexertion, strain	1,620	24.2%	8,585	27.2%
Contact with object	945	14.2%	3,680	11.7%
Struck by	285	4.3%	1,900	6.0%
Extreme weather	615	9.3%	1,250	4.0%
Other	820	12.5%	5,785	18.3%
Total	6,630	100.0%	31,555	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, 2010-2012

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

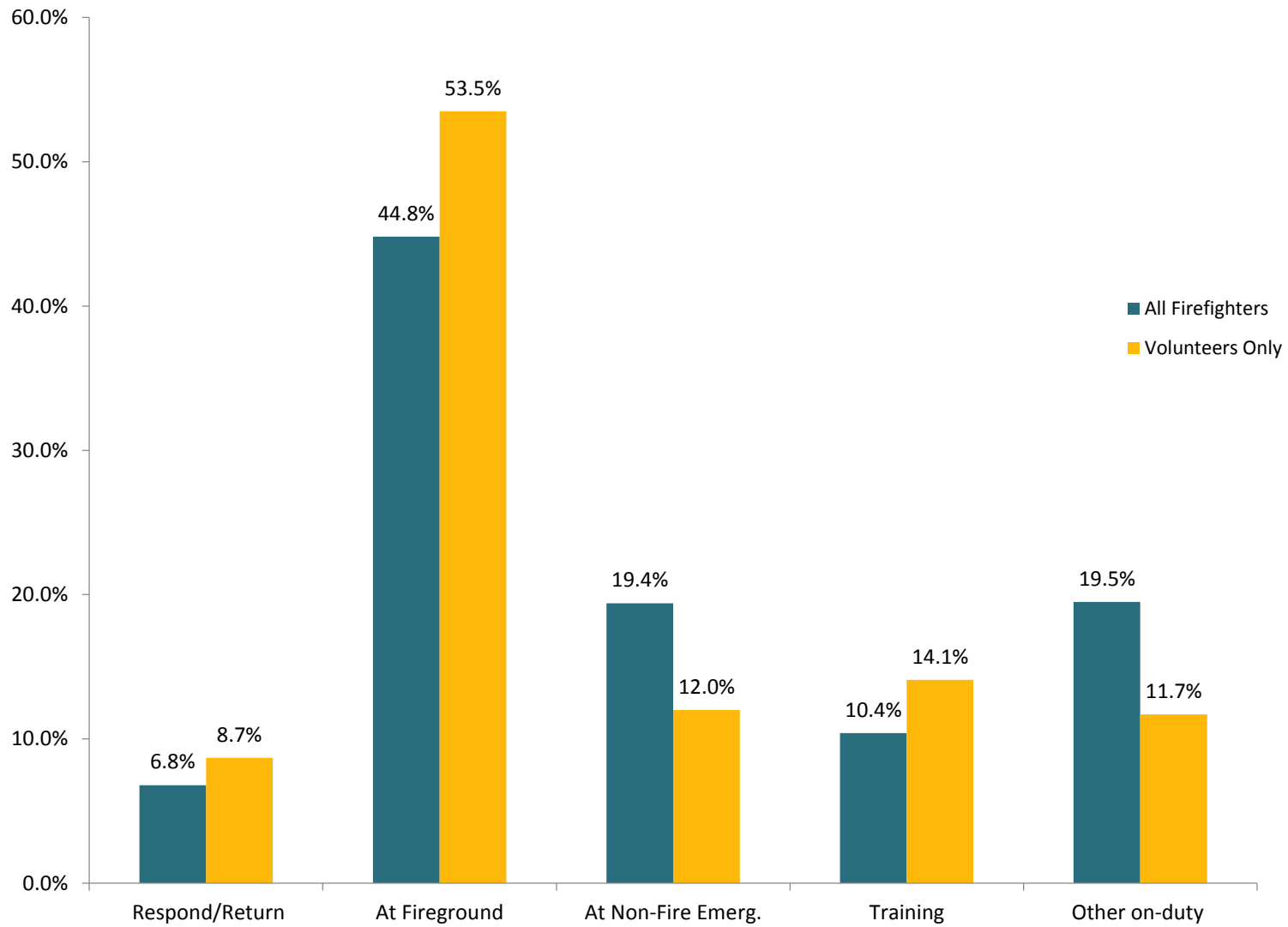
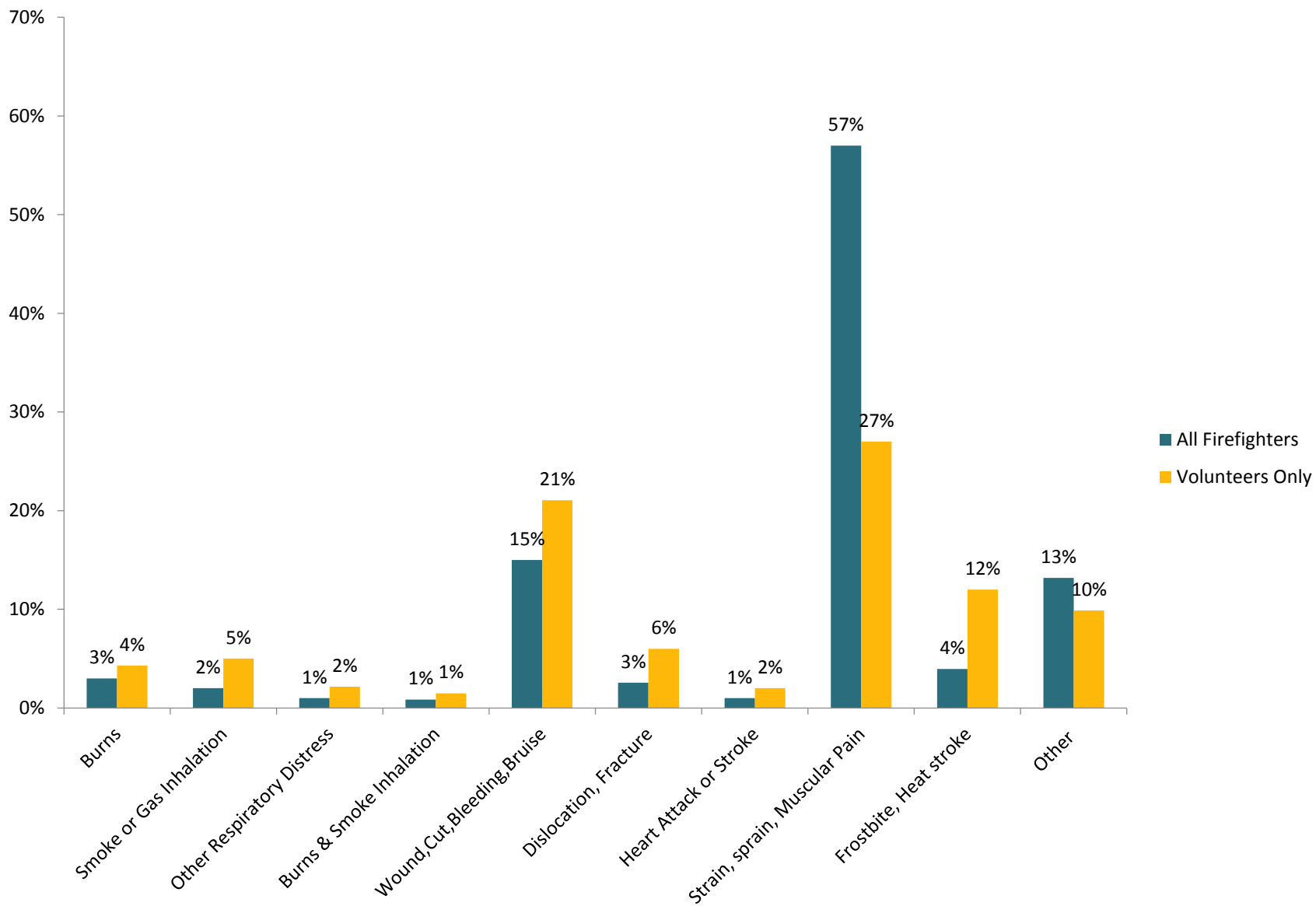


Figure 2. Nature of Injury for all Firefighters and Volunteers Only



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 2,795 departments responded to the 2012 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 A1
Department Type by Population Protected, 2012
Type of Department (Percent)

Population Protected	All Career	Mostly Career	Mostly Volunteer	All Volunteer	Total
1,000,000 or more	81.8%	18.2%	0.0%	0.0%	100.0%
500,000 to 999,999	71.4	21.4	7.1	0.0	100.0
250,000 to 499,999	85.3	11.8	2.9	0.0	100.0
100,000 to 249,999	81.8	18.2	0.0	0.0	100.0
50,000 to 99,999	70.3	18.9	10.8	0.0	100.0
25,000 to 49,999	47.1	24.2	24.5	4.2	100.0
10,000 to 24,999	23.2	26.3	37.4	13.0	100.0
5,000 to 9,999	5.9	6.7	41.6	45.7	100.0
2,500 to 4,999	1.3	2.6	21.1	75.0	100.0
Under 2,500	1.0	0.9	4.8	93.3	100.0
All Departments	8.7	6.6	18.1	66.6	100.0

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2012

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 A2
Number of Fires and Nonfire Incidents by Community size, 2010-2012 Average**

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	2500 to 4,999	under 2,500
Fires	4,300	2,525	1,113	509	222	114	65	35	24	12
Rescue, EMS etc.,	137,341	78,484	23,461	11,443	4,643	1,895	879	320	129	42
False alarm responses	15,998	5,563	2,328	1,150	554	276	120	53	16	7
Mutual aid responses	3,517	992	564	333	191	126	87	55	29	13
Hazardous materials	1,268	855	324	169	82	50	25	10	3	1
Other hazardous	2,067	1,271	710	298	154	85	45	20	8	3
All other responses	19,561	12,698	6,704	2,542	1,051	427	182	78	29	7
Total for all incidents	184,051	102,388	35,203	16,444	6,897	2,973	1,403	571	240	84
	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	2500 to 4,999	under 2,500
Fires	2.3%	2.5%	3.2%	3.1%	3.2%	3.8%	4.6%	6.2%	10.1%	14.5%
Rescue, EMS etc.,	74.6%	76.7%	66.6%	69.6%	67.3%	63.7%	62.7%	56.1%	53.9%	49.8%
False alarm responses	8.7%	5.4%	6.6%	7.0%	8.0%	9.3%	8.5%	9.3%	6.8%	8.0%
Mutual aid responses	1.9%	1.0%	1.6%	2.0%	2.8%	4.2%	6.2%	9.6%	12.2%	15.4%
Hazardous materials	0.7%	0.8%	0.9%	1.0%	1.2%	1.7%	1.8%	1.8%	1.3%	1.2%
Other hazardous	1.1%	1.2%	2.0%	1.8%	2.2%	2.8%	3.2%	3.4%	3.4%	3.4%
All other responses	10.6%	12.4%	19.0%	15.5%	15.2%	14.3%	13.0%	13.6%	12.2%	7.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%