Trends in On-Duty Firefighter Deaths and Injuries
Focusing on Career Firefighters

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Presentation Overview
- Review data sources for the two studies
- Overview of injury statistics
- Brief overview of the 2010 Firefighter Fatality Study
- Trends in career firefighter fatalities
Data Sources

Firefighter injury data:
- Aggregate data collected as part of our annual fire experience survey
- Based on national estimates from a stratified random sample of fire departments
- Career vs. volunteer status of victims not reported

Firefighter fatality data:
- Firefighter fatality database is a 'census'

Firefighter Injury Study

- Firefighter exposures
  - to infectious diseases
  - to hazardous conditions

- Matrix reporting
  - Nature of Injury by Type of Duty

- Fire Ground injuries by Cause of Injury

- Fire Department Vehicle Crashes

Firefighter Injuries - 1981 – 2010

Number of Injuries

0 20,000 40,000 60,000 80,000 100,000 120,000
71,875
Overall Results

- 71,875 firefighter injuries occurred on duty in 2010 – a decrease of 8% from the year before.
- There were 11,200 exposures to infectious diseases (e.g., hepatitis, meningitis, HIV, others) in 2010 (0.6 exposures per 1,000 emergency medical runs by fire departments in 2010).
- There were 25,700 exposures to hazardous conditions (e.g., asbestos, radioactive materials, chemicals, fumes, other) in 2009 (24.2 exposures per 1,000 hazardous condition runs in 2010).
- An estimated 15,000 firefighter injuries resulted in lost time in 2010 (20.8% of all injuries).
U.S. Fire Department Calls

Firefighter Injuries and Injury Rates

<table>
<thead>
<tr>
<th>Year</th>
<th>Injuries</th>
<th>Per 1K fires</th>
<th>Injuries</th>
<th>Per 1K Incidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>45,725</td>
<td>23.1</td>
<td>12,630</td>
<td>0.81</td>
</tr>
<tr>
<td>1997</td>
<td>40,920</td>
<td>22.8</td>
<td>14,880</td>
<td>0.92</td>
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<tr>
<td>1998</td>
<td>43,080</td>
<td>24.5</td>
<td>13,960</td>
<td>0.82</td>
</tr>
<tr>
<td>1999</td>
<td>45,500</td>
<td>25.0</td>
<td>13,665</td>
<td>0.76</td>
</tr>
<tr>
<td>2000</td>
<td>43,665</td>
<td>25.2</td>
<td>13,660</td>
<td>0.73</td>
</tr>
<tr>
<td>2001</td>
<td>41,395</td>
<td>23.9</td>
<td>14,140</td>
<td>0.73</td>
</tr>
<tr>
<td>2002</td>
<td>37,860</td>
<td>22.4</td>
<td>15,095</td>
<td>0.77</td>
</tr>
<tr>
<td>2003</td>
<td>38,045</td>
<td>24.0</td>
<td>14,550</td>
<td>0.70</td>
</tr>
<tr>
<td>2004</td>
<td>36,880</td>
<td>22.1</td>
<td>13,150</td>
<td>0.62</td>
</tr>
<tr>
<td>2005</td>
<td>41,950</td>
<td>26.2</td>
<td>12,250</td>
<td>0.56</td>
</tr>
<tr>
<td>2006</td>
<td>44,210</td>
<td>26.9</td>
<td>13,030</td>
<td>0.57</td>
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<tr>
<td>2007</td>
<td>38,340</td>
<td>24.6</td>
<td>15,435</td>
<td>0.65</td>
</tr>
<tr>
<td>2008</td>
<td>36,595</td>
<td>25.2</td>
<td>15,745</td>
<td>0.66</td>
</tr>
<tr>
<td>2009</td>
<td>32,205</td>
<td>24.1</td>
<td>15,455</td>
<td>0.62</td>
</tr>
<tr>
<td>2010</td>
<td>32,675</td>
<td>24.5</td>
<td>13,355</td>
<td>0.50</td>
</tr>
</tbody>
</table>
Firefighter Injuries at the Fire Ground and at Non-Fire Emergencies

Injuries per 1K Incidents

Number of Injuries

Non-Fire Emergency

Fire Ground

Injuries

Injuries per 1,000 Incidents

0
10,000
20,000
30,000
40,000
50,000
60,000

0
5
10
15
20
25
30

2005
2006
2007
2008
2009
2010

Fire Ground Injuries by Nature of Injury

Number of Injuries

Spr/str

Wound, etc.

Smoke inh

Burns

Other

Heat stress

Eye irritation

Burns & Smoke

HA/stroke

Average Number of Fires, Fire Ground Injuries and Injury Rates by Population Protected

<table>
<thead>
<tr>
<th>Population Protected</th>
<th>Average Number of Fires</th>
<th>Average Number of Fire Ground Injuries</th>
<th>Fire Ground Injuries per 100 Fires</th>
<th>Fire Ground Injuries per 100 FPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>500,000 - 999,999</td>
<td>2,638.7</td>
<td>81.0</td>
<td>3.1</td>
<td>7.2</td>
</tr>
<tr>
<td>250,000 - 499,999</td>
<td>1,020.4</td>
<td>28.5</td>
<td>2.8</td>
<td>6.4</td>
</tr>
<tr>
<td>100,000 - 249,999</td>
<td>511.7</td>
<td>12.0</td>
<td>2.3</td>
<td>5.3</td>
</tr>
<tr>
<td>50,000 - 99,999</td>
<td>218.2</td>
<td>4.4</td>
<td>2.0</td>
<td>4.2</td>
</tr>
<tr>
<td>25,000 - 49,999</td>
<td>117.8</td>
<td>2.2</td>
<td>1.9</td>
<td>3.4</td>
</tr>
<tr>
<td>10,000 - 24,999</td>
<td>62.5</td>
<td>1.0</td>
<td>1.6</td>
<td>2.4</td>
</tr>
<tr>
<td>5,000 - 9,999</td>
<td>36.1</td>
<td>0.6</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>2,500 - 4,999</td>
<td>22.0</td>
<td>0.3</td>
<td>1.4</td>
<td>1.3</td>
</tr>
<tr>
<td>Under 2,500</td>
<td>10.6</td>
<td>0.2</td>
<td>1.9</td>
<td>0.9</td>
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</table>
### Vehicle Crashes and Resulting Injuries
While Responding to or Returning from Alarms

<table>
<thead>
<tr>
<th>Year</th>
<th>Involving FD Vehicles</th>
<th>Involving FF personal vehicles</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Year</td>
<td>Collisions</td>
</tr>
<tr>
<td>1996</td>
<td>14,200</td>
<td>910</td>
</tr>
<tr>
<td>1997</td>
<td>14,950</td>
<td>1,350</td>
</tr>
<tr>
<td>1998</td>
<td>14,650</td>
<td>1,050</td>
</tr>
<tr>
<td>1999</td>
<td>15,450</td>
<td>875</td>
</tr>
<tr>
<td>2000</td>
<td>15,300</td>
<td>990</td>
</tr>
<tr>
<td>2001</td>
<td>14,960</td>
<td>960</td>
</tr>
<tr>
<td>2002</td>
<td>14,650</td>
<td>915</td>
</tr>
<tr>
<td>2003</td>
<td>14,950</td>
<td>670</td>
</tr>
<tr>
<td>2004</td>
<td>14,650</td>
<td>665</td>
</tr>
<tr>
<td>2005</td>
<td>14,950</td>
<td>665</td>
</tr>
<tr>
<td>2006</td>
<td>14,200</td>
<td>775</td>
</tr>
</tbody>
</table>

### Crashes and Firefighter Injuries
While Responding to or Returning from Alarms

- FD crashes
- PV crashes
- FD inj
- PV inj

### Firefighter Fatalities
Who is a firefighter?

- State and local fire service personnel, career and volunteer
- State or local public service officer, acting as firefighter
- Federal government fire service personnel
- Temporary fire suppression personnel operating under official auspices of one of the above
- Privately employed firefighters

How do we define “on-duty?”

- At scene of alarms, whether fire or non-fire
- En route responding to or returning from alarms
- Performing other duties, including training, maintenance, public education, inspection, investigation, etc.
- Performing non-fire duties on official assignment
- Station duty

What do we count as an on-duty fatality?

- Any injury that was incurred while on duty and proves fatal
- Any illness that was incurred as a result of actions while on duty and proves fatal

On-duty fatalities are associated with specific on-duty activities and are reported as of the date of injury or onset.
Defining the U.S. Firefighter Death Problem

The long-term health effects of firefighting cannot be reliably measured, in terms of resulting job-related deaths. A complete picture of the hazards of firefighting would include these fatalities.

On-Duty Firefighters

The NFPA inclusion criteria counts deaths where onset occurred while the firefighter was on-duty. USFA adds Hometown Hero/PSOB qualifiers who were off-duty.

Off-Duty, Retired and Former Firefighters
Defining the U.S. Firefighter Death Problem

The National Fallen Firefighters Foundation uses the most narrow inclusion criteria, counting on-duty deaths and Hometown Hero qualifiers, but excluding on-duty deaths where drug abuse or negligence was a factor.

Off-Duty, Retired and Former Firefighters

44 volunteer firefighters
25 career firefighters
2 employees of state land management agencies
1 member of an inmate fire brigade

72 On-Duty Fatalities in 2010
* excluding the 343 firefighter deaths at the World Trade Center in 2001

2010 Firefighter Deaths by Type of Duty

- Fireground (29%)
- Training (15%)
- Responding to or returning from alarms (25%)
- Non-fire emergencies (7%)
- Other on-duty (24%)

2010 Career Firefighter Deaths by Type of Duty

- Fireground 48%
- Training 12%
- Other 40%
Training deaths:

- Unsupervised physical training
- Search & rescue training (lifting and moving heavy objects)
- Annual self-contained breathing apparatus (SCBA) endurance evaluation

All three were sudden cardiac deaths.
Career Firefighter Deaths by Time of Incident
2001 - 2010

Other On-duty

2010 Firefighter Deaths by Cause of Injury

Overexertion/stress/medical (54%)
Caught or trapped (28%)
Struck by or contact with object (8%)
Suicide (4%)
Fell (8%)

2010 Career Firefighter Deaths by Cause of Injury

Overexertion/stress/medical (54%)
Caught or trapped (28%)
Struck by or contact with object (8%)
Suicide (4%)
Fell (8%)
Comparison of Career and Volunteer Firefighter Deaths by Cause of Fatal Injury 1991 - 2010

2010 Firefighter Deaths by Nature of Injury

- Sudden cardiac death (49%)
- Internal trauma (31%)
- Drowning (1%)
- Stroke (7%)
- Gunshot (1%)
- Asphyxiation (8%)
- Other (3%)
2010 Career Firefighter Deaths by Nature of Injury

- Sudden cardiac death: 44%
- Asphyxiation: 20%
- Internal trauma: 20%
- Stroke: 8%
- Gunshot: 4%
- Septic shock: 4%

Prior Health Problems

Of the 11 sudden cardiac death victims, 7 had existing health problems:
- severe arteriosclerotic heart disease
- hypertension
- previous heart attacks and bypass surgery
- other cardiac issues

Generally, 80% have been found to have prior, often detectable, health problems.

Comparison of Career and Volunteer Firefighter Deaths by Nature of Fatal Injury 1991 - 2010
Career Firefighter Deaths by Type of Duty and Incident Type

- Structures 92%
- Vehicles 1%
- Refuse 1%
- Wildland 6%

Career Firefighter Deaths by Type of Duty

- Training 25%
- Non-fire emergency 17%
- Regular 16%
- Other 21%

Structure Fire Deaths by Fixed Property Use Career Only

- Residential (50.9%)
- Stores/offices (19.5%)
- Manufacturing/industrial (4.1%)
- Storage (4.9%)
- Vacant, etc. (13.1%)
- Public assembly (7.5%)

Structure Fire Deaths by Fixed Property Use Career Only

- Residential (50.9%)
- Stores/offices (19.5%)
- Manufacturing/industrial (4.1%)
- Storage (4.9%)
- Vacant, etc. (13.1%)
- Public assembly (7.5%)
## Causes of Fatal Injuries at Structure Fires

<table>
<thead>
<tr>
<th>Cause</th>
<th>Inside</th>
<th>Outside</th>
<th>On Roof</th>
<th>On Ladder</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural collapse</td>
<td>52</td>
<td>10</td>
<td>1</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Exertion/stress/other medical</td>
<td>25</td>
<td>38</td>
<td>3</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>Fire progress</td>
<td>45</td>
<td></td>
<td></td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Lost inside</td>
<td>34</td>
<td></td>
<td></td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Struck by object/vehicle</td>
<td>3</td>
<td>5</td>
<td></td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Explosion</td>
<td>2</td>
<td>4</td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Fell in hole burned in floor/roof</td>
<td>7</td>
<td>1</td>
<td></td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Fell/jumped from structure</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Other falls</td>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Electrocution</td>
<td>2</td>
<td>2</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Smoke exposure (all no SCBA)</td>
<td>5</td>
<td></td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Gunshot</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Other caught/trapped</td>
<td>16</td>
<td></td>
<td></td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Other/no details</td>
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<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>197</td>
<td>62</td>
<td>6</td>
<td>2</td>
<td>266</td>
</tr>
</tbody>
</table>

## Career Firefighter Deaths at Structure Fires

![Diagram showing career firefighter deaths at structure fires from 1977 to 2003.]

## Patterns for Career Firefighter Deaths at Structure Fires

![Graph showing patterns for career firefighter deaths at structure fires, including sudden cardiac death, deaths inside, deaths outside, other deaths inside, and other deaths outside.]

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Major Causes of Non-Cardiac Deaths Inside Structures

Death Due to the Three Major Causes of Fatal Injuries While Operating Inside at Structure Fires

Snapshot

- The average number of career firefighter deaths annually has dropped by more than half.
- Among career firefighters, on-duty sudden cardiac deaths have dropped by almost two thirds, but remain the #1 cause of on-duty firefighter deaths.
- Almost half of all career firefighter deaths occur on the fire ground.
### Concluding remarks

- Sudden cardiac death continues to be the major problem.
- Real progress has been made in reducing firefighter deaths over the past 30 years, but more can be done.
- In 2010, no career firefighter deaths occurred while responding to or returning from alarms, and none occurred while operating at non-fire emergencies.

The 2010 firefighter fatality study was published in the July/August issue of *NFPA Journal* and the full report is available free on NFPA's website: [www.nfpa.org](http://www.nfpa.org) (under Research & Reports).