Changing Building Contents – Safety and Health Implications for the Fire Service

November 14, 2013

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NIOSH - CDC
Outline

• Safety (Injury) Issues
  – Fatal
  – Non-fatal

• Health Issues
  – Heart Disease
  – Cancer
Modern room contents:
- Burn Faster
- Burn Hotter
- Faster to full involvement
- Quicker to flashover

Has this translated into:
- ↑FF Fatalities?
- ↑FF Injuries?
- ↑FF Health Issues?
# Structure Fires and On-duty FF Death at Structure Fires, 1978-2011

Source: Fahy [2013]. Personal communication, NFPA
Fireground Injuries, 1981-2011

Figure 2. The Number of Injuries at the Fireground and Fireground Injuries per 1000 Fires

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U.S. On-Duty Firefighter Fatalities
Due to Sudden Cardiac Death
1977 - 2012

Source: Fahy [2013]. Personal Communication
On-Duty FF Cardiac Deaths by time of day

Source: NIOSH FF Fatality Program – N=126
Sudden Cardiac Event by Time of Day

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>MN-6a</th>
<th>6a-Noon</th>
<th>Noon-6p</th>
<th>6p-MN</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>83,500</td>
<td>126</td>
<td></td>
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</table>

P < 0.05
Fire Department Fire Runs by Alarm Time, NFIRS data
Percent of Time Spent in Fire Fighter Duties

NIOSH Cases of Duties being Performed at Death

Adjusted for time spent at various fire service duties
<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>OR</th>
<th>(95% CI)</th>
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<tbody>
<tr>
<td>Fire Suppression</td>
<td>64.0</td>
<td>(7.4-556)</td>
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<td>Alarm Return</td>
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Source:  
- a) Kales et al. Environ Health 2003;2:14  
- b) Kales et al. NEJM 2007;356:1207-1215
What triggers SCD on Fire Ground?

• NIOSH Case-Series
  – CO & HCN - No
  – Exertion
  • Gen Pop
  • Ergo studies
  – Something else??

Source: http://www.cdc.gov/niosh/fire/
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Fire Smoke – Exposures, IARC 2010

• 10 “Group 1” Substances
  – [arsenic, asbestos, benzene, Benzo[a]pyrene, 1,3-butadiene, cadmium, formaldehyde, silica, diesel exhaust, radioactivity]

• 4 “Group 2a” Substances

• 21 “Group 2b” Substances

Group 1 = Carcinogenic to humans
Group 2a = Probable “ “ “
Group 2b = Possible “ “ “
Group 3 = Not classifiable,
Group 4 = Probably not “ “ “

Outcome Data

- 19 Cohort Studies
- 11 Case-Control Studies
- 14 Other designs

Mixed results

Limitations: Small studies
- Few PYAR
- Few cancer cases – esp rare cancers
### Results: Excess Cancers

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Obs</th>
<th>Mortality SMR (95% CI)</th>
<th>Incidence SIR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Esophagus</td>
<td>113</td>
<td>1.39 (1.14 to 1.67)</td>
<td>90</td>
</tr>
<tr>
<td>Intestine</td>
<td>326</td>
<td>1.30 (1.16 to 1.44)</td>
<td>398</td>
</tr>
<tr>
<td>Lung</td>
<td>1046</td>
<td>1.10 (1.04 to 1.17)</td>
<td>716</td>
</tr>
<tr>
<td>Kidney</td>
<td>94</td>
<td>1.29 (1.05 to 1.58)</td>
<td>166</td>
</tr>
<tr>
<td>Oral cavity†</td>
<td>94</td>
<td>1.40 (1.13 to 1.72)</td>
<td>174</td>
</tr>
<tr>
<td>Mesothelioma</td>
<td>12</td>
<td>2.00 (1.03 to 3.49)</td>
<td>35</td>
</tr>
</tbody>
</table>

*Cancers with statistically significant excesses in mortality and incidence.*

†Oral cavity includes lip (excluding skin of the lip), tongue, salivary glands, gum, mouth, pharynx, oropharynx, nasopharynx, and hypopharynx.

Source: Daniels et al. Occ Environ Med 2013;0:1-10
Summary - Injury Data

• Injury Data - past 30 years:
  – ↓ # and rate of **fatal** injuries
  – ↓ # and rate of **non-fatal** injuries

• Health Data –
  – Sudden cardiac deaths seems to be triggered by something on the FG
  – NIOSH study supports the mounting scientific evidence that FF, as an occupation, has increased risk of cancer
Thank you

Disclaimer: The findings and conclusions in this presentation have not been formally disseminated by the National Institute for Occupational Safety and Health and should not be construed to represent any agency determination or policy.