SMOKE ALARM SUMMIT

HOME SMOKE ALARMS: WHAT DO WE KNOW?

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General comments

• Term “smoke alarm” is used to describe all fire detection in homes
• “Homes” include one- or two-family homes and apartments or other multi-family
• Estimates based on reported fires are for 2007-2011
  – Derived from NFIRS and NFPA survey
  – Unknowns were allocated
How common overall?

- According to phone surveys, almost all homes have them.
- Data issues:
  - Very little national data based on home visits and testing.
Presence and operation in reported fires

### Fires

- **Operating smoke alarm**: 52%
- **Present but did not operate**: 8%
- **Fire too small to operate**: 12%
- **No smoke alarm present**: 27%

### Civilian Deaths

- **Operating smoke alarm**: 40%
- **Present but did not operate**: 23%
- **Fire too small to operate**: 1%
- **No smoke alarm present**: 37%
Risk of dying is cut in half in homes with working smoke alarms

- With working alarms, risk is 55% lower compared to no working alarms
- Risk is 36% lower when present compared with not

Deaths per 1000 Reported Home Fires

<table>
<thead>
<tr>
<th>Condition</th>
<th>Deaths per 1000 fires</th>
</tr>
</thead>
<tbody>
<tr>
<td>None or did not operate</td>
<td>11.8</td>
</tr>
<tr>
<td>None present</td>
<td>9.5</td>
</tr>
<tr>
<td>Present</td>
<td>6.1</td>
</tr>
<tr>
<td>Present and operated</td>
<td>5.3</td>
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</tbody>
</table>
Confined fires in NFIRS

- Confined fire incident types
  - require little information
  - Account for
    - 37% of fires in one-or two-family homes
    - 68% in apartments or multi-family housing

Smoke Alarm Data in Confined and Non-Confined Fires

- Presence unknown: 94%
- % of known present: 61%
- % of known operating: 64%
Power sources in reported home fires

**Fires**
- Battery only: 15%
- Hardwired w/ battery backup: 31%
- Hardwired only: 48%

**Civilian deaths**
- Battery only: 10%
- Hardwired w/battery backup: 16%
- Hardwired only: 69%
In reported home fires large enough to activate alarm,

- Hardwired operated in: 93%
- Battery-powered operated in: 79%
Reasons for non-operation

- Missing or disconnected battery
  - 0%
  - 5%
  - 4%
  - 22%
  - 47%
  - 56%

- Dead or discharged battery
  - 0
  - 5%
  - 9%
  - 24%
  - 31%

- Unclassified reason for failure
  - 5%
  - 9%
  - 19%
  - 26%

- Hardwired power failure, shut-off, disconnect
  - 0
  - 7%
  - 23%
  - 47%

- Lack of cleaning
  - 4%
  - 10%
  - 15%

- Defective unit
  - 3%
  - 10%
  - 14%

- Improper installation or placement
  - 3%
  - 5%

Legend:
- All power sources
- Battery only
- Hardwired w/battery backup
- Harwired only
Data issue for alarm failures

• More difficult to tell why hardwired alarms did not operate
  – Originally undetermined for
    • Half of all hardwired
    • One-quarter of battery operated
  – 4-5 times the percent of unclassified reasons for hardwired (19-26%) as battery (5%)
% of Fatal home fire victims with and without working smoke alarms

<table>
<thead>
<tr>
<th>Who Were.....</th>
<th>Operating alarms</th>
<th>No or no working alarms</th>
</tr>
</thead>
<tbody>
<tr>
<td>In room or area when fatally injured</td>
<td>62%</td>
<td>50-52%</td>
</tr>
<tr>
<td>In area and involved in ignition</td>
<td>46%</td>
<td>32-37%</td>
</tr>
<tr>
<td>Sleeping when fatally injured</td>
<td>30%</td>
<td>37-42%</td>
</tr>
<tr>
<td>Physical disability contributed</td>
<td>20%</td>
<td>8-12%</td>
</tr>
<tr>
<td>Trying to fight fire themselves</td>
<td>6%</td>
<td>2%</td>
</tr>
<tr>
<td>Unable to act</td>
<td>15%</td>
<td>9-11%</td>
</tr>
<tr>
<td>At least 65 years old</td>
<td>35%</td>
<td>23%-29%</td>
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</tbody>
</table>
More on home fire victims

• When physical disability was a factor, more than half (55%) of fatalities had working alarms

• 37% of civilians who were non-fatally injured while fighting the fire had working smoke alarms
  – Compared to 30-31% with no or no working alarms
Data issue re victims

• Do firefighters consider hearing loss a physical disability?
• We can’t tell how many victims did not hear an operating smoke alarm
General population and unreported fires

• 97% of home fires were handled without fire department

Data from CPSC’s

2004-2005 National Sample Survey of Unreported Residential Fires
From CPSC’s Survey of Unreported Residential Fires

Smoke Alarms in Fire vs. Non-Fire Households

- **Smoke alarm present**: 93% (Fire household) vs. 97% (Non-fire household)
- **On all floors**: 82% (Fire household) vs. 84% (Non-fire household)
- **In all bedrooms**: 31% (Fire household) vs. 22% (Non-fire household)
- **Interconnected**: 19% (Fire household) vs. 13% (Non-fire household)
- **Connected to home security**: 14% (Fire household) vs. 8% (Non-fire household)
From CPSC’s Survey of Unreported Residential Fires

Smoke Alarm Performance and Effectiveness When Not...

Not on all floors
- Sounded: 4%
- Alerted occs: 2%
- Only alert: 2%

Not in all bedrooms
- Sounded: 28%
- Alerted occs: 10%
- Only alert: 9%

Not interconnected
- Sounded: 27%
- Alerted occs: 10%
- Only alert: 8%

Smoke Alarm Performance and Effectiveness When...

On all floors
- Sounded: 37%
- Alerted occs: 15%
- Only alert: 2%

In all bedrooms
- Sounded: 36%
- Alerted occs: 16%
- Only alert: 13%

Interconnected
- Sounded: 53%
- Alerted occs: 26%
- Only alert: 26%
Audibility and sound effectiveness (from CPSC’s reports)

• Closed door reduced volume 10-20 dB
  – Volume fell about 20dB each floor traveled

• Today’s smoke alarms effectively wake adults who are
  – NOT under the influence of alcohol or drugs
  – NOT sleep deprived

• May not wake those with hearing loss
Unwanted smoke alarms

• 2010 NFPA Harris Poll asked why smoke alarms had gone off
  – Almost three-quarters said cooking
  – 8% said low battery chirp
  – None mentioned fire

• Then they were asked to agree or disagree with a series of questions…
The Last Time a Smoke Alarm Sounded, It...

- Went off because of normal cooking, smoking, steam, etc. 63%
- Sounded after they knew food was burning 43%
- Warned them of something that could have become a fire 22%
- Alerted them to a fire they already knew about 15%
- Went off for no apparent reason 12%
- Alerted them to a real fire 5%
- Sounded due to an unclassified reason 9%
Smoke alarm performance is not binary

- Alarm malfunction
- Nuisance during normal activities
- Pre-fire condition
- Earliest stage of fire
- Dangerous fire
Sources

- Marty Ahrens *Physical Disability as a Factor in Home Fire Deaths*, NFPA, 2014