Fire Safety in the United States since 1980

Through the Lens of the NFPA Fire & Life Safety Ecosystem

Birgitte Messerschmidt | Director of Research
There needs to be more emphasis on fire prevention. Americans must be educated about fire safety. The fire protection features of buildings need to be improved.
NFIRS - National Fire Incident Reporting System

Data reported by Fire Departments to US Fire Administration.

Provides info on incidents and equipment involved.

Includes approximately 75% of all annual fires.
Data sets unique to NFPA

**FES – Fire Experience Survey**
- Survey of nearly 30,000 Fire Departments

**FSI – Fire Service Inventory**
- List of US Fire Departments and their inventory

**FIDO – Fire Incident Data organization**
- Significant fire incidents and fires of technical interest, worldwide
- All U.S. firefighter fatalities since 1974
- All Catastrophic Multiple Death (5 or more) fires
- Large-loss fires
- Incidents of special interest
Home Fires
Percentage of structure fire losses caused by home fires

Homes still account for majority of structure fires and associated losses
Home Fires

Fires

Civilian Deaths

In Thousands


Home Fires

A. Fire rates per thousand population

B. Deaths per million population
Not all Homes are created equal
Impact of Fire Protection Technologies

Figure 6. Growth in home smoke alarm usage 1977-2010

- Homes with smoke alarms
- Reported home fires with smoke alarms

Percent of homes with smoke alarms:
- 1977: 22%
- 1979: 50%
- 1981: 67%
- 1983: 74%
- 1985: 76%
- 1987: 82%
- 1989: 87%
- 1991: 88%
- 1993: 90%
- 1995: 92%
- 1997: 95%
- 1999: 96%
- 2001: 96%
- 2003: 96%
- 2005: 96%
- 2007: 96%
- 2009: 96%
- 2011: 73%
- 2013: 74%
Smoke alarms in reported home fires by occupancy

A. One- and two-family homes

B. Apartments

- Of alarms present, percent operated
- Smoke alarms present
- Fires with operational smoke alarms present
Impact of Fire Protection Technologies

Average fire death rate per 1,000 reported home fires by presence of smoke alarms and sprinklers: 2014–2018

- No alarm or AES: 12.0
- Battery alarm but no AES: 7.8
- Any alarm but no AES: 5.9
- Hardwired smoke alarm and sprinkler: 1.1
Impact of Fire Protection Technologies

Taller buildings → More Fire Protection (Active as well as Passive)

Figure 9. Percentage of occupied units with sprinklers in 2011 American Housing Survey

- Year-round housing: 5%
- Manufactured homes: 1%
- Single-family detached homes: 2%
- Single-family attached: 8%
- In all multi-unit buildings: 14%
- In buildings with 2-4 units: 5%
- In buildings with 5-9 units: 9%
- In buildings with 10-19 units: 15%
- In buildings with 20-49 units: 22%
- In buildings with 50 or more units: 31%

**A. Fires**

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Fires</td>
<td>10,400</td>
<td>8,700</td>
<td>8,600</td>
</tr>
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</table>

**B. Deaths**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Deaths</td>
<td>62</td>
<td>44</td>
<td>29</td>
</tr>
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</table>

**C. Deaths per 1,000 reported fires**

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>Deaths per 1,000 fires</td>
<td>6.0</td>
<td>5.1</td>
<td>3.4</td>
</tr>
</tbody>
</table>
Government Responsibility

Maintaining an effective policy and regulatory environment supporting fire, electrical, building, and life safety.

Smoke Alarms!
National Impact
Home Fire Sprinklers!
Local Impact
Development and use of current codes

Smoke Alarms!
Smoke Alarms!
Fire Prevention Week theme in 1977, 1988, 2016 and 2021!

Informed Public

Educating the public about the dangers posed by fire, electrical, and related hazards.
Home Fire Victims
Percentage of fatal home fire victims who were under five or at least 65 years of age by year

- Under 5
- 65 and older

- 1980: 18%
- 1982: 19%
- 1984: 18%
- 1986: 19%
- 1988: 18%
- 1990: 19%
- 1992: 18%
- 1994: 19%
- 1996: 18%
- 1998: 19%
- 2000: 18%
- 2002: 19%
- 2004: 18%
- 2006: 19%
- 2008: 18%
- 2010: 19%
- 2012: 18%
- 2014: 19%
- 2016: 18%
- 2018: 19%

- 1980: 6%
- 1982: 36%
- 1984: 30%
- 1986: 20%
- 1988: 10%
- 1990: 0%
- 1992: 10%
- 1994: 20%
- 1996: 30%
- 1998: 40%
- 2000: 30%
- 2002: 20%
- 2004: 10%
- 2006: 0%
- 2008: 6%
- 2010: 10%
- 2012: 20%
- 2014: 30%
- 2016: 40%
- 2018: 36%
Home fire deaths per million population by age group: 1980 and 2018

![Graph showing home fire deaths per million population by age group for 1980 and 2018. The graph includes age groups Under 5, 5–9, 10–14, 15–19, 20–34, 35–49, 50–64, 65–74, and 75 and over. The data shows a decrease in deaths per million population across all age groups from 1980 to 2018.](image-url)
Causes of Home Fires and Home Fire Deaths
Percentage of home fires and fire deaths by fire cause: 1980 and 2018

A. Fires

- Smoking materials: 5% (1980), 10% (2018)
- Electrical distribution and lighting: 9% (1980), 9% (2018)
- Cooking: 20% (1980), 47% (2018)
- Playing with fire: 1% (1980)
- Candle: 1% (1980), 2% (2018)

B. Deaths

- Smoking: 26% (1980), 35% (2018)
- Heating: 19% (1980), 18% (2018)
- Electrical distribution and lighting: 10% (1980), 16% (2018)
- Cooking: 10% (1980), 20% (2018)
- Playing with fire: 2% (1980), 8% (2018)
- Candle: 1% (1980), 4% (2018)
Home fires started by smoking materials
Remains the leading cause of home fire deaths nationally in five-year averages.
Less common today, but more likely to be deadly than in the early 1980s
Reported home structure fires started by heating equipment

A. Fires

B. Deaths
Leading types of heating equipment in home fires

A. Fires

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Space heater</td>
<td>21.4</td>
<td>73.5</td>
</tr>
<tr>
<td>Fireplace or chimney</td>
<td>14.0</td>
<td>112.7</td>
</tr>
<tr>
<td>Central heat</td>
<td>5.7</td>
<td>22.4</td>
</tr>
<tr>
<td>Water heater</td>
<td>4.6</td>
<td>14.8</td>
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Fires in thousands

B. Deaths

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Space heater</td>
<td>400</td>
<td>610</td>
</tr>
<tr>
<td>Fireplace or chimney</td>
<td>40</td>
<td>190</td>
</tr>
<tr>
<td>Central heat</td>
<td>0</td>
<td>110</td>
</tr>
<tr>
<td>Water heater</td>
<td>20</td>
<td>110</td>
</tr>
</tbody>
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### A. Fires

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<tr>
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<tbody>
<tr>
<td>Wiring and related equipment</td>
<td>34.8</td>
<td>30.0</td>
</tr>
<tr>
<td>Cord or plug</td>
<td>11.7</td>
<td>17.0</td>
</tr>
<tr>
<td>Lamp, bulb or lighting</td>
<td>11.4</td>
<td>7.0</td>
</tr>
</tbody>
</table>

### B. Deaths

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Wiring and related equipment</td>
<td>240</td>
<td>220</td>
</tr>
<tr>
<td>Cord or plug</td>
<td>170</td>
<td>170</td>
</tr>
<tr>
<td>Lamp, bulb or lighting</td>
<td>70</td>
<td>30</td>
</tr>
</tbody>
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Reported home structure fires started by cooking, by year: 1980-2018

A. Fires

B. Deaths
Reported home structure fires started by someone playing with fire

A. Fires

CPSC lighter standard took effect in 1994

In Thousands

B. Deaths

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Candles caused

- 1% of home fires in 1980
- 5% in 2002
- 2% in recent years

No relevant standards when candle popularity increased in 1990s
The role of our Furniture

Low-frequency - high-consequence fires.
1 of every 12 Furniture Fires Result in death!

**Figure 33.** Deaths per 1,000 fires that began with upholstered furniture or mattresses and bedding 1980–1984 vs. 2014–2018

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Upholstered furniture</td>
<td>42</td>
<td>86</td>
</tr>
<tr>
<td>Mattress or bedding</td>
<td>15</td>
<td>38</td>
</tr>
</tbody>
</table>

**Figure 34.** Deaths per 1,000 reported fires in selected areas of origin: 1980–1984 vs. 2014–2018

<table>
<thead>
<tr>
<th>Area</th>
<th>1980-1984</th>
<th>2014-2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living room</td>
<td>25</td>
<td>54</td>
</tr>
<tr>
<td>Bedroom</td>
<td>14</td>
<td>28</td>
</tr>
<tr>
<td>Kitchen</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>
Government Responsibility

CPSC’s 2007 furniture flammability regulation.

Maintaining an effective policy and regulatory environment supporting fire, electrical, building, and life safety.
Development and use of current codes

UL 858, Standard for Household Electric Ranges, including cooking oil ignition prevention requirement

ASTM Voluntary standards for Candles

Development and Use of Current Codes
Using the latest codes and standards developed by experts from across the world.
Informed Public

Cooking!
Fire Prevention Week theme in 2020!

Educating the public about the dangers posed by fire, electrical, and related hazards.
Fires that killed 10 or more people
Deaths from fires killing at least 10 people by type of fire
Government Responsibility

Or lack thereof:
Slow or no adoption of WUI codes!
Code Compliance

Or lack thereof:
Assembly/Nightclub fires!
Informed Public

Educating the public about the dangers posed by fire, electrical, and related hazards.

FIREWISE USA™
Residents reducing wildfire risks
Preparedness and Emergency Response

Providing effective preparedness and response capabilities to deal with fire, electrical, and related hazards.

Almost $\frac{3}{4}$ (71 percent) of the fire departments that perform wildland firefighting or fight structure fires in the WUI have not formally trained all their firefighters for such work.

$\frac{2}{3}$ of the departments that fight these fires have personnel who do not have personal protective clothing designed for wildland firefighting.

Around 29% of the departments have firefighters who have not received specialized training in firefighting in the wildland/urban interface.
What we learned
What we learned

We’ve been successful in bringing down the number of fires and fire deaths
The most successful recipe for fire safety in the built environment is the implementation of fire safety technologies through mandated codes and standards.
Most obvious impact

- Government Responsibility,
- Development & Use of Current Codes,
- Informed Public
Investing in Safety

• This relates also to Code Compliance and a Skilled Workforce.
• Night Club Fires are a typical example of lack of Code Compliance and investing in Fire Safety Technologies.
• Also an issue in many Home fires:
  – Operating smoke alarms
  – Untrained people doing electrical or heating work
  – Old homes with inadequate wiring for today’s needs
Higher risk of fire death

Disability
Poverty
Smoking
Rural living
Living alone
Cooking Fires

Cooking is the only major cause that shows more fires and fire deaths in 2014-2018 than in 1980-1984.
We need to focus on our Seniors

Increasing share of fire fatalities.
Living alone.
High rate of disabilities.
Often living in older homes.
The Wildfire Problem

Getting bigger.
Higher losses.
More people in the WUI.
We cannot fight them all.
Informed Public a good start – but not enough.
Approaching fire safety as a system, and not individual bits and pieces, provides the opportunity to unravel this complex and ongoing challenge to society and reduce further loss.
**Fire Risk** is a product of the probability of a credible fire event occurring and the measure of the possibility of death or injury to an occupant resulting from that event.

- **Shelter Vulnerability to Fire**
- **Human Vulnerability to Fire**

**Attributes of the building or shelter that can lead to potentially dangerous fire**

**Attributes of the population that may make it more vulnerable to fire.**
Gaps

There are significant gaps in research, policy, and action pertaining to fire safety of insecurely and vulnerably sheltered populations in under-regulated, unregulated, and non-sheltered living conditions.
What is needed to tackle holistically and urgently the identified gaps

- Collaboration of researchers, advocates, and practitioners across many domains.

- Research, policy and action that addresses the full spectrum of economic, social, and technical issues.

- Extensive data collection and analysis is a priority to better understand the problem, enabling substantial progress.

- Funding opportunities recognizing the ‘invisible’ fire problem as an important component of broad disciplines of fire safety, urban planning, social services, and public health.
Thank you