SFPE EUROPE

Q4 2021 ISSUE 24 AN OFFICIAL PUBLICATION OF SFPE

# Fire Safety in the United States since 1980

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This article is a compressed version of a NFPA Research Report[1].

**Introduction**

While we are currently seeing fewer fires in the US than in past decades, statistically, if a fire is reported in your home, you are more likely to die today than you were 40 years ago. Occupants might have fewer than three minutes to escape after a fire starts. Every 24 seconds, a US fire department responds to a fire somewhere in the country. Nationwide, a civilian died in a fire every 3 hours and 10 minutes and a home fire injury occurred every 43 minutes[2]. So, even though we have made considerable progress, we still have work to do.

**Home Structure Fires**

Despite notable decreases in reported home structure fires since 1980, homes have consistently accounted for the largest share of the reported structure fires and the majority of all the reported civilian fire deaths and injuries. Considerable progress has been made in reducing home fires and the associated losses despite the comparative plateaus in recent years. The 2018 estimates of reported home fires, home fire deaths, and home fire injuries are roughly half of the 1980 estimates. Progress in reducing the toll of home fires is even greater when you consider the increase in population. Population-based rates for home fires, home fire deaths, and home fire injuries were three-fifths to two-thirds lower in 2018 than in 1980, while per capita home fire dollar loss was roughly one-third lower.

The biggest success story, especially in relation to home fires, is the increasing presence of smoke alarms. The combination of an engineered solution enforced by codes and standards and supported by public education has been effective in bringing down the number of reported fires and fire deaths.

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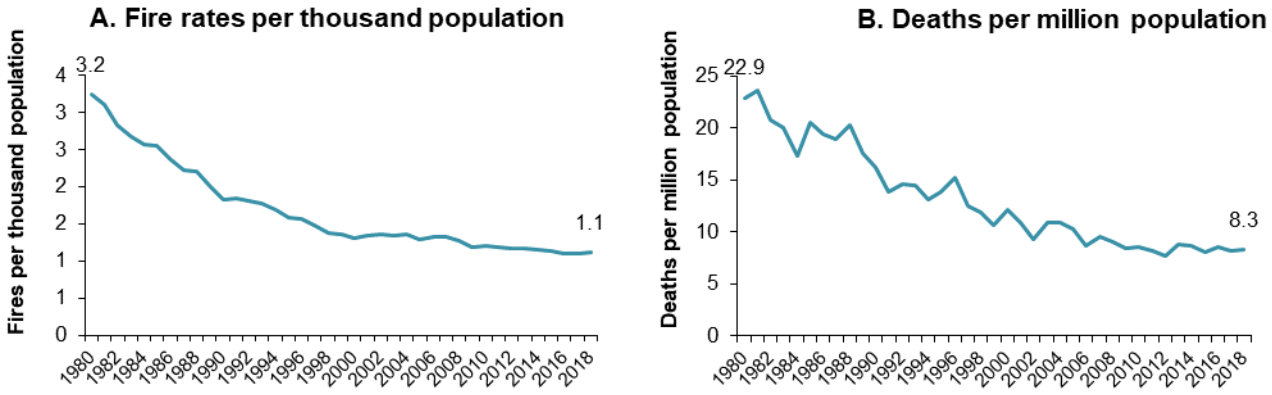
[1] Marty Ahrens & Birgitte Messerschmidt; Fire Safety in the United States since 1980, through the lens of the NFPA Fire & Life Safety Ecosystem; NFPA 2021

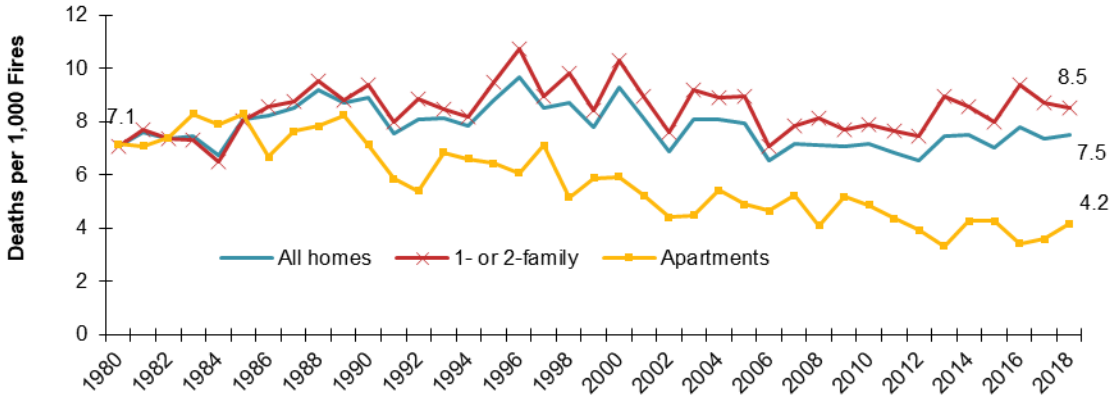
[2] Marty Ahrens and Ben Evarts. *Fire Loss in the United States During 2019*. Quincy, MA: NFPA, 2020.

Figure 1. Reported home structure fires and losses: Population-based rates by year: 1980–2018




Although reported home fires and home fire deaths have been cut roughly in half since 1980 and population-based home fire and fire death rates have fallen by roughly two-thirds, the death rate per 1,000 reported home fires has remained fairly consistent as shown in Figure 2.

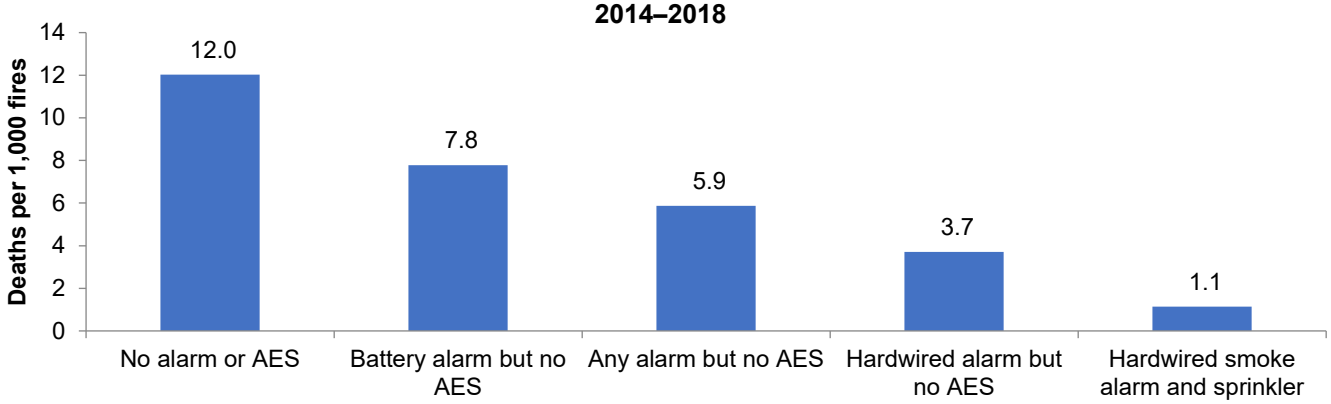
Figure 2. Deaths per 1,000 reported home fires by year and occupancy




This was driven by an even more pronounced increase in the death rate in one- or two-family home fires. It appears that most of the reduction in fire deaths and death rate per capita over the past decades has been due to a reduction in fires or reported fires rather than the prevention of harm after a fire is reported.

The risk of fire death per 1,000 reported home fires steadily declines as the levels of fire protection increase. Figure 3 shows that the death rate is lowest in homes with fire sprinklers and hardwired smoke alarms. These rates are based on the presence of fire sprinklers and hardwired smoke alarms in reported fires only.

**Figure 3. Average fire death rate per 1,000 reported home structure fires by presence of smoke alarms and automatic extinguishing systems (AES): 2014–2018**



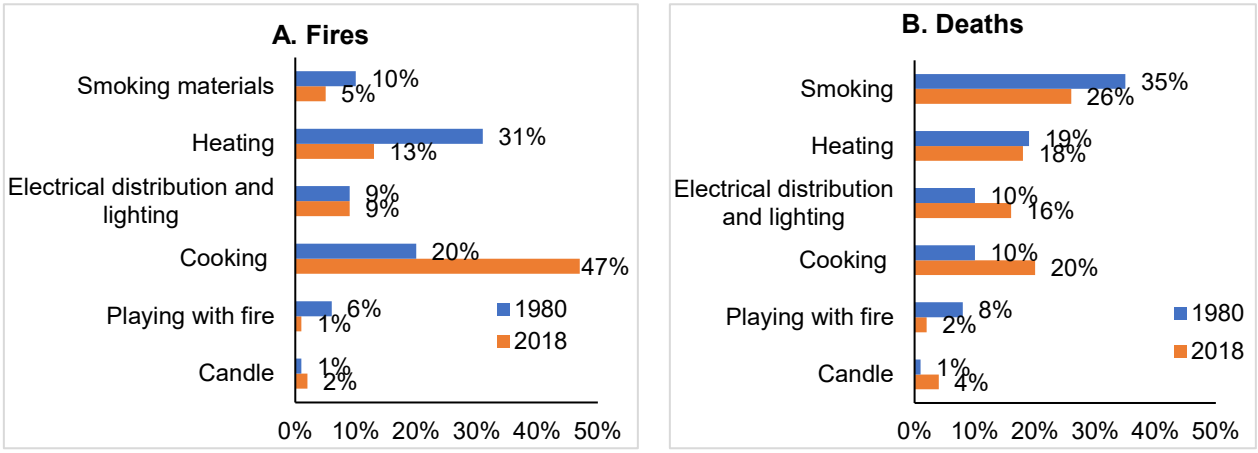

The impact of codes and standards is reflected in the difference in death rate per 1,000 reported fires in 1- and 2-family homes compared to apartment buildings. Occupants of high-rise buildings are more likely to be vulnerable to fire due to poverty and/or age, yet the death rate per 1,000 fires in high-rise buildings has dropped from 6.0 from 1985 to 1989 to 3.4 in 2014 to 2018. In apartment buildings overall, the death rate per 1,000 fires has decreased from 7.1 in 1980 to 4.2 in 2018. For 1- and 2-family homes, the death rate per 1,000 fires has increased from 7.1 in 1980 to 8.5 in 2018. It should be kept in mind that monitored alarm systems, which are present in some apartment buildings but rarely in 1- and 2-family homes, can cause more minor fires to be reported in those buildings and, therefore, could potentially skew the death rate per 1,000 fires to a lower number for apartment buildings. However, the difference in the fire death rate between apartment buildings and 1- and 2-family homes is so significant that it also speaks to the positive impact of fire protection measures as apartment buildings and, in particular, high-rise buildings have stricter code requirements related to compartmentation and sprinklers.

**Causes of Home Structure Fires**

Cooking is a much larger part of the fire and fire death problem today than in the past.[3] The share of electrical distribution and lighting fire deaths has also increased. Heating fires have fallen sharply, but little change has been seen in the share of heating fire deaths. The percentage of fires started by smoking materials has been cut in half. The decrease in the smoking material share of home fire deaths is substantial but smaller than the fire decline. Smoking remains the leading cause of home fire deaths nationally in five-year averages.

[3] Marty Ahrens. *Home Structure Fires,* Quincy, MA: NFPA, 2020.

**Figure 4. Percentage of home fires and fire deaths by fire cause: 1980 and 2018**




Furniture is playing an increasing role in our fire experience. From 2014 to 2018 the death rates per 1,000 fires were higher for fires that began with upholstered furniture and mattresses or bedding than for living rooms and bedrooms, indicating that these items were major factors in fires beginning in these rooms. These are relatively low-frequency, high-consequence fires.

**Figure 5. Deaths per 1,000 fires that began with uphostered furniture or mattresses and bedding: 1980–1984 vs. 2014–2018**

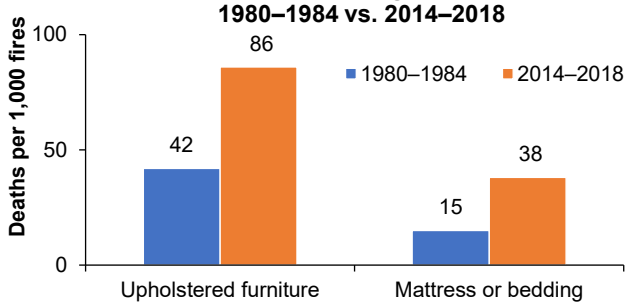
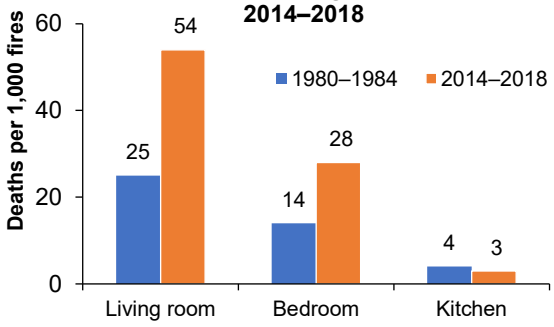



**Figure 6. Deaths per 1,000 reported fires in selected areas of origin: 1980–1984 vs. 2014–2018**

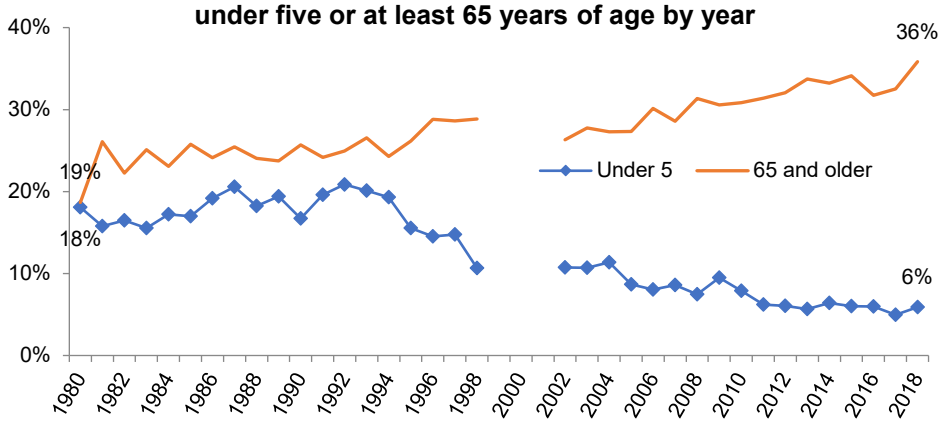



Product standards (voluntary and mandatory) play an important role in fire safety. The impact of a voluntary standard is evidenced by the introduction of candle fire safety standards. A dramatic increase in candle sales in the 1990s was accompanied by a corresponding increase in candle fires. Instead of issuing mandatory requirements, CPSC requested that ASTM develop candle fire safety standards. These standards contributed to a marked decrease in these fires.

**Victims of home structure fires**

In 1980, two age groups, children under five and people 65 or older, each accounted for almost one-fifth of the home fire deaths. The percentage of older adult fire deaths was almost twice as high in 2018, while the percentage of preschool-age fire deaths was only one-third as high. Several factors contribute to older adult fire death toll, including the increasing age of the population overall, older adults increasingly living alone, the increase in disabilities with age, and the tendency for older adults to live in

**Figure 7. Percentage of fatal home fire victims who were under five or at least 65 years of age by year**

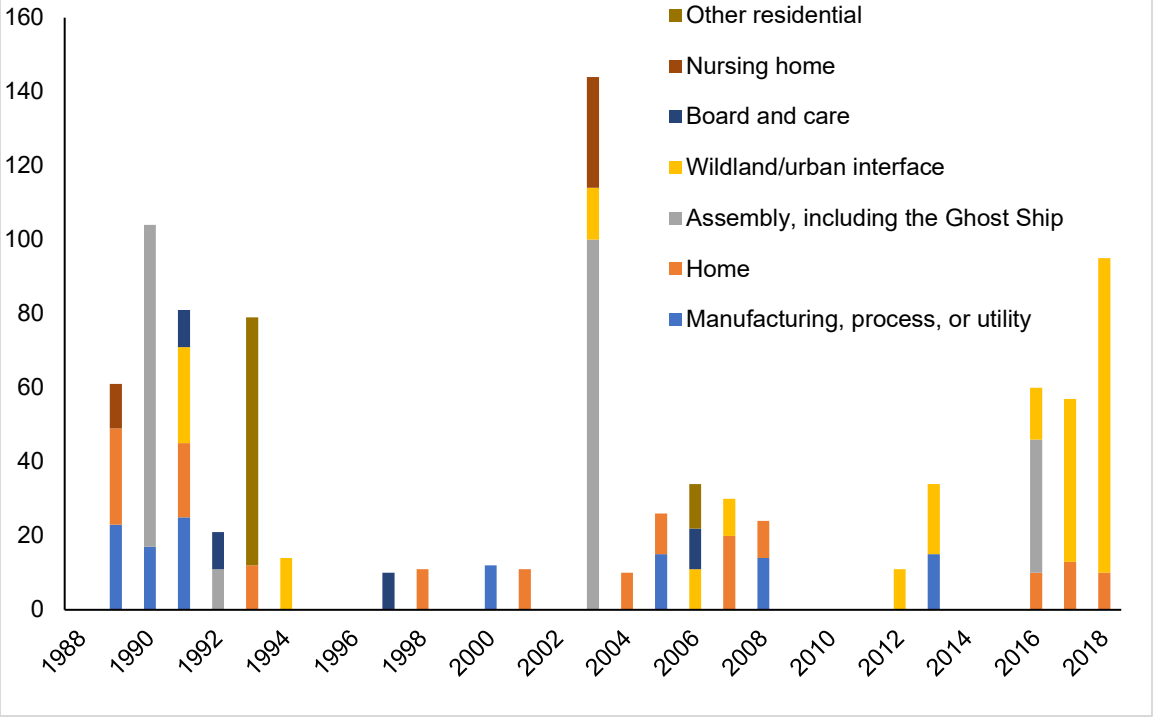



older homes.

**Catastrophic fires**

Looking at the data for catastrophic US fires with 10 or more deaths, the data shows that these types of fires have become rare in buildings such as hospitals, nursing homes, hotels, and schools. These types of buildings typically have stricter code requirements in particular related to the installation of sprinklers.

**Figure 8.**
**Deaths from non-vehicle fires killing 10 or more people by leading types and year: 1988–2018 (terrorist attacks in 1995 and 2001 excluded)**




A lack of code compliance is a common thread in the catastrophic events in nightclubs and other assemblies. The low priority of an investment in safety is also often mentioned in relation to these events, specifically where sprinklers have not been installed.

The lack of investment in fire safety is not only an issue in big catastrophic fires. Examples of not investing in safety in homes are not installing or maintaining smoke alarms; using inexpensive, unskilled labor to work on electrical systems or heating systems; and not installing home fire sprinklers in new 1- and 2-family homes. Older homes tend to have older wiring that might not be adequate for today's needs. In today's do-it-yourself world, untrained people often feel comfortable tackling electrical and heating work.

Wildfires are becoming the dominant type of fires causing catastrophic multiple-death events, as well as large losses. While we have been successful in reducing the urban fire problem, we have yet to take the steps needed to prevent wildfires from becoming conflagrations when impacting communities in the WUI.

**Conclusion**

The data tells an overall story of success when it comes to lowering the number of fires and fire deaths. The biggest single factor contributing to that success has been the use of smoke alarms, as mandated by the codes, as well as continued public education about their significance. Other successes include the impact of stricter code requirements in apartment buildings and, in particular, high-rise buildings. The

introduction of hardwired smoke alarms and sprinklers in these buildings has helped reduce the death rate per 1,000 fires significantly compared to the death rate in 1- and 2-family homes.

Product safety standards also play a significant role in reducing the fire problem. The introduction of the CPSC's safety standards for lighters was immediately followed by a decrease in fire deaths in young children. Concerns about flame retardants used to reduce furniture flammability have shown the importance of thinking about safety holistically to avoid other concerns.

Our work is far from done and, in some areas, it has only just begun. While we can enjoy the successes of safety measures implemented in the last 40 years, there are both long-term and new challenges that we need to deal with, such as the following:

- With more home cooking fires and cooking fire deaths in recent years than in the early 1980s, it is clear that more work in this area is needed.
- With roughly one of every three fatal home fire victims being 65 or older, research is needed on how to protect our most vulnerable citizens.
- Studies are needed to assess the impact of new technology for smoke alarms on unwanted alarms and both reported and unreported fires.
- The impact of wildfire on communities must be tackled using all the cogs of the NFPA Fire & Life Safety Ecosystem.
- A holistic approach to fire safety and energy efficiency is needed to ensure that new products and technologies developed to mitigate challenges such as climate change and energy use/supply do not cause unintended fire risk.
- To prevent consumer electronics using new technology from becoming fire hazards, product standards need to be developed/updated and consumers educated on potential risks.
- Efforts to educate the public about how to protect themselves from fire must be expanded to reduce fatalities and increase life safety.

**References**

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