



RESEARCH

Home Fires Started by Smoking

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Key Findings

According to the Centers for Disease Control and Prevention (CDC), only 15.5% of the adult population were current smokers in 2016,ⁱ compared to 33.2% in 1980.² Despite today's comparatively small percentage of smokers, smoking remained the leading cause of home fire deaths over the total five-year period of 2012-2016.¹

During 2012-2016, an estimated annual average of 18,100 (5%) reported homeⁱⁱ structure fires started by smoking materials killed an average of 590 (23%) people annually,ⁱⁱⁱ injured 1,130 (10%) per year, and caused \$476 million in direct property damage (7%) per year.

- Sixty-one percent of the fatalities and 48% of the non-fatally injured were in the area of origin *and* involved in ignition.
- Forty-five percent of the fatalities and 56% of the injuries were caused by the 69% of fires that were confined to the object or room of origin.
- Medical oxygen was involved in 13% of the home smoking material fire deaths.

Thirty-eight percent of the victims were killed by fires that began with upholstered furniture; 29% died from fires in which mattresses or bedding were the item first ignited.

Forty-three percent of the deaths were caused by fires that started in the living room. One-third (34%) were caused by fires that began in the bedroom.

The increase in indoor smoking bans has been accompanied by an increase in home smoking material structure fires that began outside. The leading area of origin for home smoking fires in 2012-2016 was an exterior balcony or open porch (18%).

Supporting tables can be found [here](#).

Unless otherwise specified, the estimates in this report were derived from the detailed information collected by U.S. Fire Administration's National Fire Incident Reporting System (NFIRS) and NFPA's annual Fire Experience Survey (FES). In NFIRS, smoking materials include cigarettes, pipes, cigars, and undetermined smoking material. While the contents are not specified, most presumably are presumably lit tobacco products.

ⁱ In 2013, fires started by electrical distribution and lighting equipment caused the most home fire deaths, while cooking fires ranked first in home fire deaths in 2014 and 2015. Smoking materials caused the most deaths in 2012, 2016 and in total for the five years.

ⁱⁱ Homes include one- or two-family homes, including manufactured homes, and apartments or other multi-family housing.

ⁱⁱⁱ Firefighter casualties are not included in this analysis.

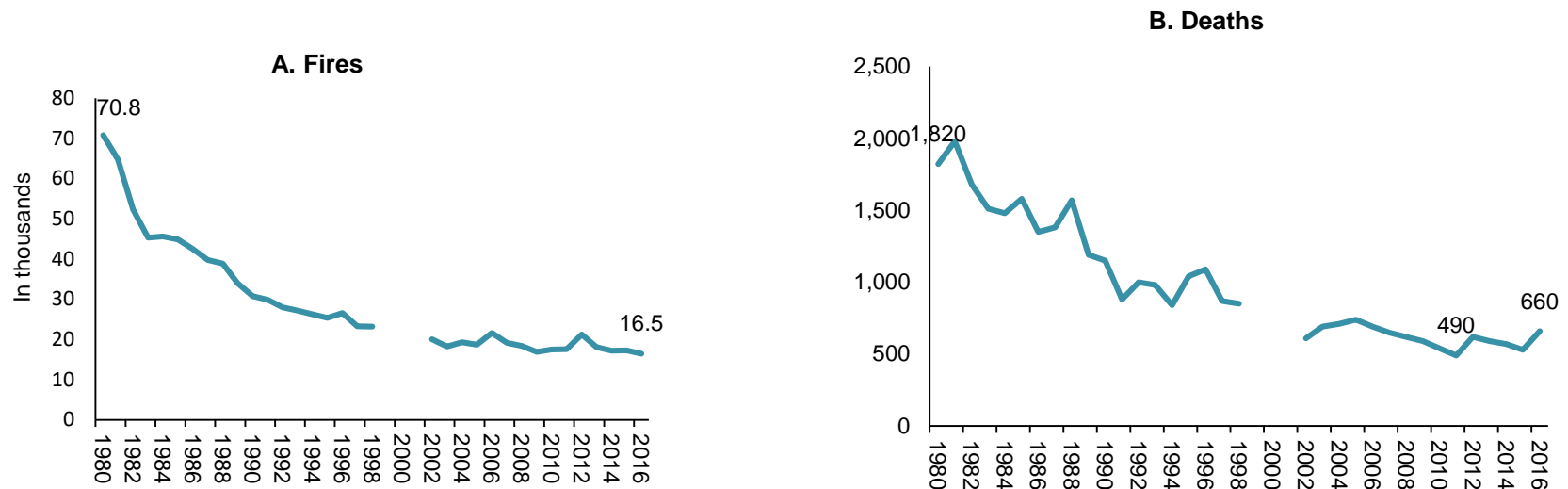
Trends

Figure 1 shows that the new low of 16,500 home smoking material fires in 2016 was 77% lower than the 1980 high of 70,800 fires. While the 2016 estimate of 660 home smoking material fire *deaths* was 64% lower than the 1980 estimate of 1,820 deaths, it was the highest seen since 2006. The smallest number of smoking fire deaths was seen in 2011.

The long-term decrease in smoking fires and deaths from 1980 to 2016 is greater than the 52% decline in home fires and 47% drop in home fire deaths overall.

The increasing use of smoke alarms since the late 1970s and early 1980s has contributed to the reduction in fires and fire deaths of all types. The decrease in smoking has undoubtedly played a role in the reduction of fires started by smoking materials.

Figure 1.
Reported home smoking material fires and deaths, by year



Home Fires Started by Smoking Materials

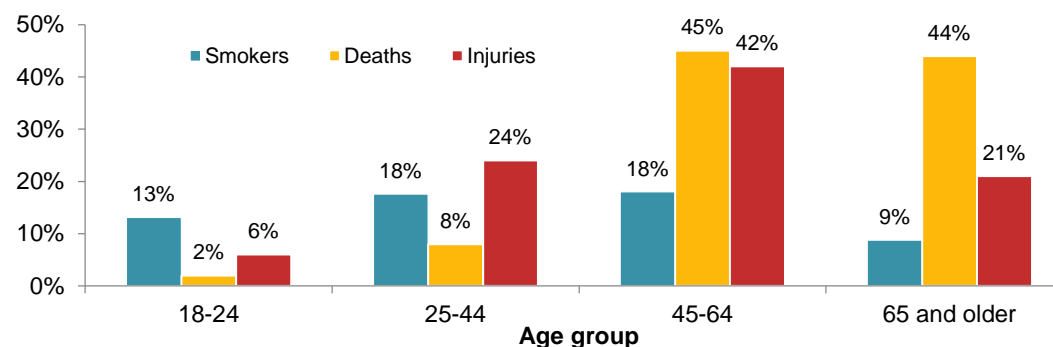
Smoking materials were the leading cause of home fire deaths in 2012-2016 even though CDC researchers found that only 15.5% of U.S adults were current smokers in 2016.³ (In three of the five years, smoking ranked second to [cooking](#) or [electrical distribution or lighting equipment](#).)

The risk of death or injury from a fire started by smoking materials is not equal across the population. Non-smokers are obviously much less likely to have this type of fire. The risk increases when smoking in the presence of medical oxygen, when drowsy, or under the influence of alcohol, medication, or drugs. People with disabilities are less able to take action to save themselves. Smokers who only smoke outside face a lower risk of death from a smoking-caused fire.

Although CDC found that smoking rates decrease with age, Figure 2 shows that 89% of the people who were fatally injured and 64% of those non-fatally injured in fires started by smoking materials were at least 45 years old in 2011-2015⁴. People between 65 and 84 had a death rate of 5.7 per million population from these fires.

The same CDC study found that people who were more likely to be smokers in 2016 included those with: incomes below the poverty level (25%), some type of disability or limitation (21%), serious psychological distress (36%), or no health insurance (28%). In general, higher levels of education were associated with lower probability of smoking.

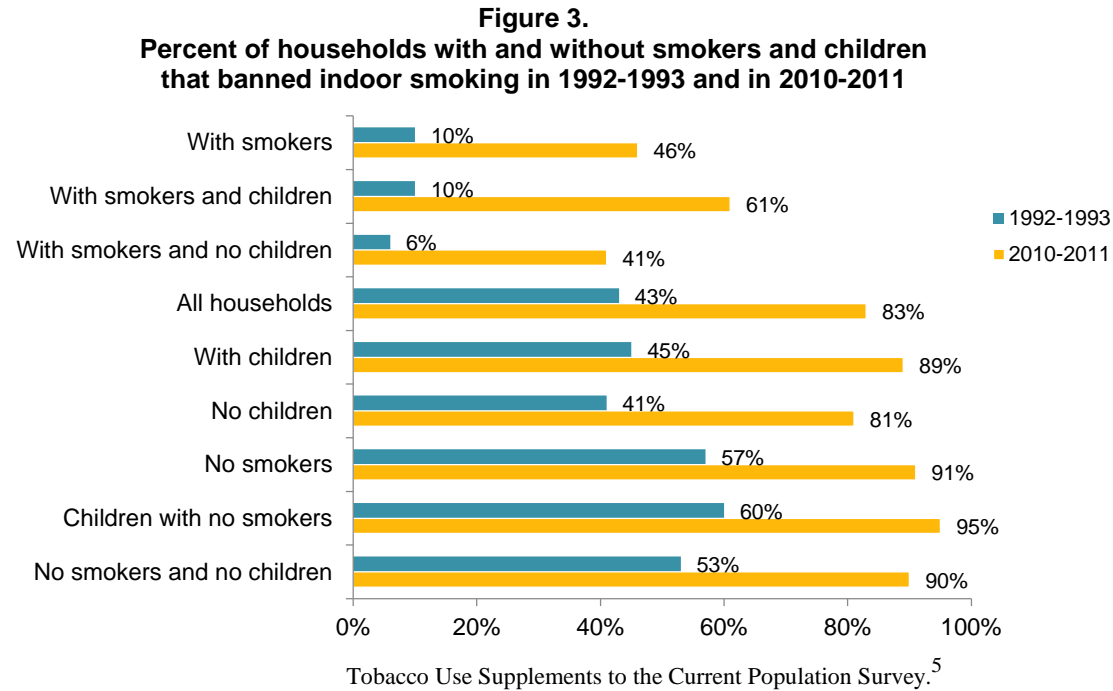
Figure 2.
Percentage of smokers in 2016 and home fire deaths and injuries in 2011-2015 by age group



Source: Jamal, et al. 2018 and NFPA's *Fire Deaths and Injuries in Reported Home Structure Fires by Age and Gender: Supporting Tables*, 2019.

According to data from the Tobacco Use Supplements to the Current Population Survey,⁵ complete bans on smoking inside the home have become more common across the population. Figure 3 shows that almost half of the households with at least one smoker banned indoor smoking in 2010-2011.

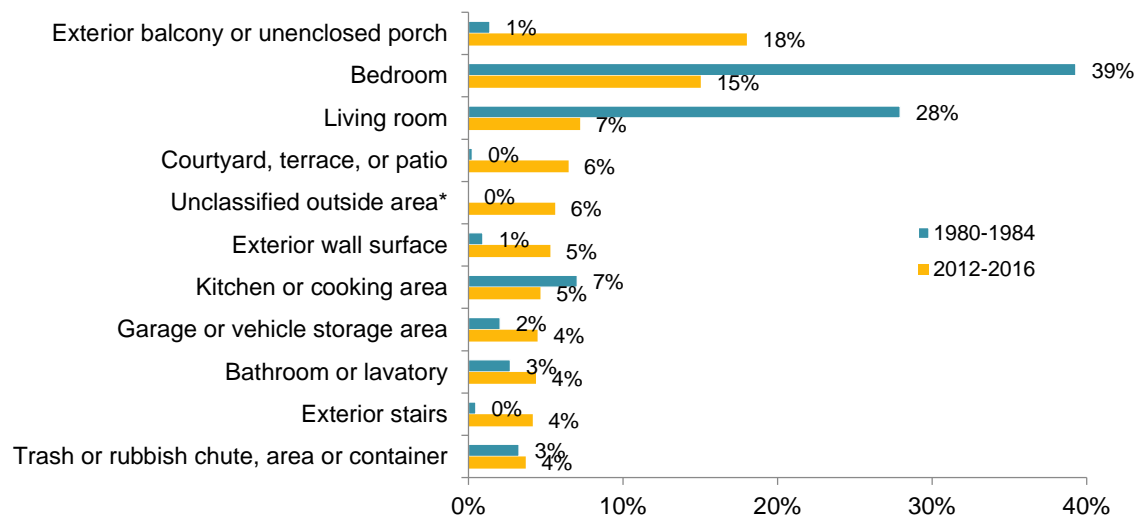
This was true for only 10% of such households in 1992-1993. Households with children and/or no smokers were more likely to ban indoor smoking. If no one smokes in the home, the risk of a smoking material fire starting inside the home is eliminated.



With the increasing bans on indoor smoking, more home fires started by smoking materials are beginning outside. Figure 4 shows that roughly two of every five such incidents started in or on an exterior area in 2012-2016, compared to roughly 3% in 1980-1984. While outdoor smoking is less likely to cause a fatal fire, it does happen.

Four percent of the home smoking fire fatalities in 2012-2016 were caused by fires that started outside. Proper disposal of smoking materials is as important outside as inside. Fires that start outside the home can spread into concealed spaces throughout the structure before smoke reaches the smoke alarms or heat reaches interior sprinklers.

Figure 4.
Leading areas of origin in home structure fires started by smoking materials
in 1980-1984 and in 2012-2016



*Unclassified outside area was not a choice in NFIRS in 1980-1984.

- A Virginia woman was fatally injured in a fire caused by smoking materials discarded into a porch flowerpot. After a dried plant in the pot ignited, the ensuing fire spread up the home's exterior and into the porch roof at some point after the home's occupants went to bed. The noise woke one occupant who saw the whole porch on fire. As the family tried to escape, fire broke through downstairs windows and entered through the front door, which was left open. The victim was unable to escape. The home had smoke alarms but no sprinklers.⁶
- An elderly California woman with a mobility disability and another occupant who tried to rescue her were killed by a fire that began when discarded smoking materials ignited dead leaves or other combustibles on a wooden patio. When an occupant of the manufactured home opened the door to investigate, wind pushed the heat and smoke inside. The fire spread quickly throughout the structure. A third occupant suffered smoke inhalation before escaping through a window. No smoke alarms or sprinklers were present.⁷

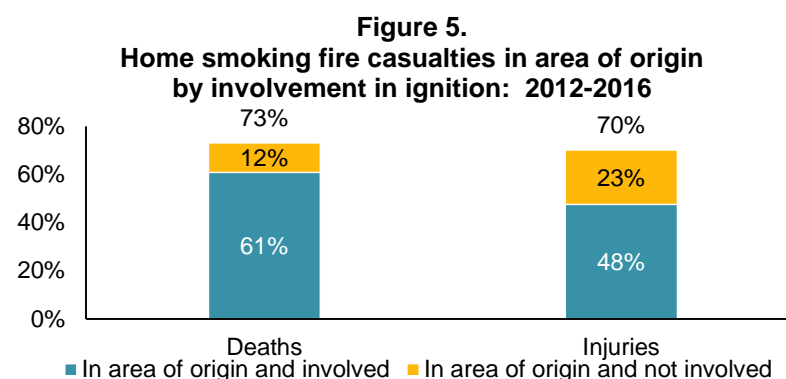
Despite these changes in smoking patterns, three-quarters of the deaths from home fires started by smoking materials were caused by fires that began in either the living room (43%) or the bedroom (34%).

While rubbish or trash was first ignited in 22% of the fires, these incidents caused only 3% of the deaths. The 10% of fires that began with mattresses or bedding caused 29% of the deaths. Thirty-eight percent of the deaths resulted from the 7% of fires that started with upholstered furniture. Upholstered furniture and mattresses and bedding are consistent with the leading areas of origin for home fire deaths discussed above. Six percent of the deaths were caused by the 2% of fires that began with clothing.

On average, one of every six home smoking materials that began with upholstered furniture caused a death. This was true for one of every 10 such fires that began with mattresses or bedding; one of every 14 clothing fires started by smoking materials; and one of 31 total home smoking material fires.

Almost three-quarters of the people killed or injured in these incidents were in the area of origin when the fire started.

Figure 5 shows that three out of five fatalities and half of the non-fatally injured were involved in the fire's start *and* in the area of origin when it started. Many were injured early in the fire's development before any fire protection could operate.

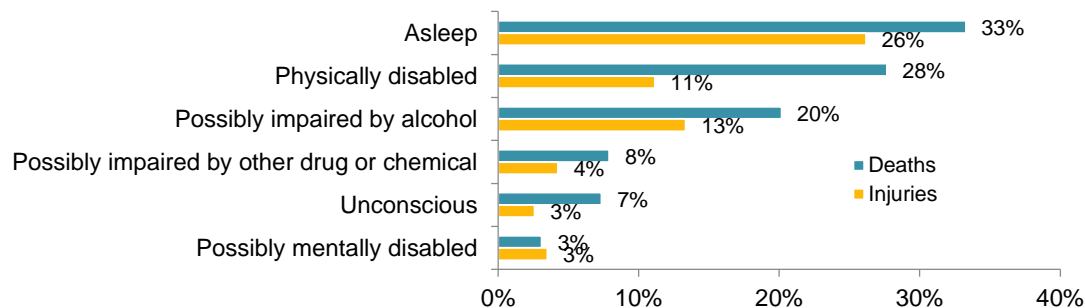


Roughly half of the casualties, (45% of the deaths and 56% of the injuries) were caused by the 69% of fires that were confined to the room of origin. It is clear that in some cases, the fire continued to grow after the injury occurred.

To escape a fire, one has to be aware of the fire and be able to remove oneself from the threat of fire and smoke. Figure 6 shows that being asleep, having a physical disability or impaired by alcohol were common contributing factors in smoking material fire casualties. Physical disability can make it difficult or impossible to take prompt, effective action. Alcohol and drug impairment slows reactions and impairs judgement.

For a working smoke alarm to provide an early warning of a fire, people must be able to hear it, be woken by it if asleep, and be able to respond to save themselves.

Figure 6.
Leading human factors contributing to injury in casualties from home fires stated by smoking materials: 2012-2016



Medical oxygen was involved in only 160 (1%) reported home smoking material fires per year, but these caused an average of 80 (13%) of the associated deaths from smoking. *Roughly half of these fires resulted in a death.* People on medical oxygen are already in poor health. Although some of these fires spread, many were quite small. A study of thermal burns associated with medical oxygen seen at hospital emergency departments in 2003-2006 found that 89% of the victims suffered facial burns and 73% of the burns were caused by smoking.⁸ It is likely that many such cases are treated as medical incidents and not reported as fires.

- An older woman was smoking while on medical oxygen in the bedroom of her sprinklered apartment on the 9th floor of a 10-story Ohio building in 2014. The victim died of respiratory burns. The fire never grew large enough to activate the sprinkler.⁹

A Swedish study that analyzed residential fatal fires to identify prevention strategies noted that smokers receiving home care were a particularly high-risk group. These victims tended to be intimate with ignition, i.e., their clothing or bedding ignited, and to have had mobility issues that made escape impossible. Based on these findings, the authors predicted that conventional thermally activated sprinklers could prevent 31% of these deaths, half the 68% estimated overall. A suppression system that was activated by a smoke detection system could potentially save 88%, although the higher rates of unwanted smoke alarm/detector activation would be an issue. Only 14% would be saved by a home smoke alarm alone. In the short term, the authors recommended flame-resistant bedclothes and clothing for this population. These are predicted to prevent 50% and 31% of these deaths, respectively.¹⁰

Two additional U.S. fires show the similar challenges faced here.

- In a New York State fire, 90% of a bed fire started by smoking materials was extinguished by sprinklers by the time the fire department arrived to fire scene, a third-floor apartment in a 12-story building. The resident, a man with a mobility disability that prevented his escape, was severely burned and later died at the hospital.¹¹
- An elderly Minnesota woman with a mobility disability woman phoned her adult son in the other duplex unit to tell him her chair was on fire and she couldn't get off. He carried her outside and she told him she had dropped the cigarette on the chair. She died four days later.

With such vulnerable populations, prevention is far more effective than any post-ignition strategy.

Methodology

Unless otherwise specified, the statistics in this analysis are estimates derived from the U.S. Fire Administration's (USFA's) [National Fire Incident Reporting System \(NFIRS\)](#) and the National Fire Protection Association's (NFPA's) annual Fire Experience Survey (FES). Fires reported to federal or state fire departments or industrial fire brigades are not included in these estimates.

Only civilian (non-firefighter) casualties are discussed in this analysis.

The grouping "smoking materials" includes NFIRS heat source codes 61-63 (cigarettes, pipes or cigars, and heat from undetermined smoking material), with a proportional share of the code 60s and true unknown data. For the five years of 2012-

2016, in total, raw NFIRS data contained 22,674 fires with non-confined structure fire incident types and heat source codes 61-63 associated with 488 deaths, 1,648 injuries, and \$564 million in direct property damage. The 1,460 with a confined fire incident type (mostly trash, rubbish or waste that did not spread to other contents or the structure itself) were associated with 13 injuries and roughly \$600,000 in direct property damage.) Fires with the confined structure fires incident types (113-118) were analyzed separately from the other structure fires, including fires in manufactures homes (incident types 110-123, excluding 113-118). Unknowns were typically allocated. For more information, see "[How NFPA's National Estimates Are Calculated for Home Structure Fires.](#)"

Hot embers or ashes (heat source code 43) were the heat source in an average of 23,800 home structure fires per year during this period. These fires caused an average of 70 deaths, 330 civilian injuries and \$319 million in direct property damaged. It is possible that some of these were associated with smoking materials.

Acknowledgements

The National Fire Protection Association thanks all the fire departments and state fire authorities who participate in the National Fire Incident Reporting System (NFIRS) and the annual NFPA fire experience survey. These firefighters are the original sources of the detailed data that make this analysis possible. Their contributions allow us to estimate the size of the fire problem.

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To learn more about research at NFPA visit www.nfpa.org/research.
E-mail: research@nfpa.org.
NFPA No. USS10

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