

Fire Risk in 2016

These topical reports are designed to explore facets of the U.S. fire problem as depicted through data collected in the U.S. Fire Administration's National Fire Incident Reporting System. Each topical report briefly addresses the nature of the specific fire or fire-related topic, highlights important findings from the data, and may suggest other resources to consider for further information.

Findings

- ◆ Risk by age:
 - Adults ages 50 or older had a greater relative risk of fire death than the general population.
 - Adults ages 85 or older had the highest risk of fire death.
 - Adults ages 20 to 69 had a greater relative risk of fire injury than the general population.
 - While lower than the relative risk of the general population, children ages 4 and younger faced an elevated risk of both fire injury and death when compared to older children (ages 5 to 14).
- ◆ Risk by gender: Males were 1.6 times more likely to die in fires than females.
- ◆ Risk by race: African-Americans and American Indians/Alaska Natives were at a greater relative risk of dying in a fire than the general population.
- ◆ Risk by region: The relative risk of dying in a fire was greatest for people living in the South and Midwest when compared to populations living in other regions of the United States.

The risk of death or injury from fire is not the same for everyone. In 2016, 3,515 deaths and 14,650 injuries in the U.S. were caused by fires.¹ These casualties were not equally distributed across the U.S. population, and the resulting risk of death or injury from fire is not uniform — it is more severe for some groups than for others.² Much can be learned from understanding why different segments of society are at a heightened risk from the fire problem. This topical fire report explores fire risk as it applies to fire casualties in the U.S. population and is an update to “Fire Risk in 2015,” Volume 18, Issue 6.

Risk is a factor, element or course of action involving uncertainty. It is an exposure to some peril, and it often implies a probability of occurrence, such as investment risk or insurance risk. In terms of the fire problem, risk is the potential for injury to or death of a person, or damage to or loss of property, as a result of fire.

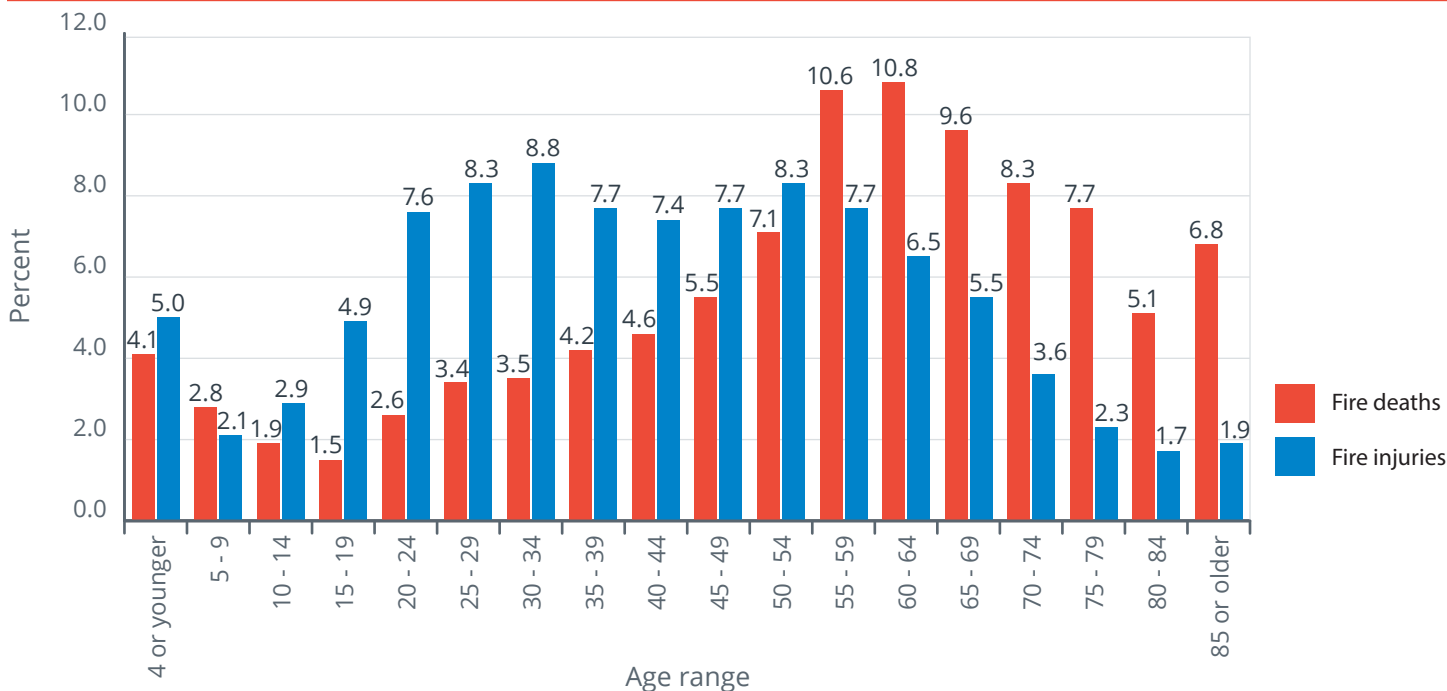
This topical report focuses on how fire risk, specifically the risks of death and injury, varies with age and how other demographic and socioeconomic factors weigh upon that risk.

Per capita rates, risk and fire casualties

When determining fire risk, geographic, demographic and socioeconomic factors all come into play. People in the South and Midwest, adults ages 50 or older, and the poor were all at a higher risk of dying in a fire than the general population. Also, although their risk of fire death and injury was less than the general population, the very young (ages 4 and younger) were at a higher risk of fire death and injury when compared to older children. Additionally, males, African-Americans, and American Indians/Alaska Natives also had a higher risk of death from fire than the population as a whole. These groups remained at a higher risk despite considerable long-term reductions in fires and fire casualties.

Fire casualties across population groups can be assessed in several ways. The simplest method is to look at the distribution of the numbers of deaths or injuries across the factor of interest. For example, in the case of race in 2016, the number of fire deaths was greatest for white Americans and least for Asian/Pacific Islanders. In the case of age, percentages of fire deaths were greatest for those ages 55 to 64, while 63 percent of fire injuries occurred among adults ages 20 to 59 (Figure 1).

Figure 1. Percentage of fire deaths and injuries by age in 2016



Sources: 2016 National Center for Health Statistics (NCHS) Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program, and 2016 National Fire Incident Reporting System (NFIRS) fire injury data.

- Notes:
1. Data have been adjusted to account for deaths and injuries with unknown age. Age was specified in 99.9 percent of fire deaths and in 99.9 percent of reported fire injuries.
 2. The total percentages of fire deaths and fire injuries do not add up to 100 percent due to rounding.

Although these findings are informative, they do not account for differences in the basic population groups under comparison. In the case of age, as an age group matures, its population of individuals decreases as a result of deaths. In the case of race for populations living in the U.S., there are far fewer American Indians/Alaska Natives, for example, than white Americans. As a consequence, it is possible for an age group or race to have greater (or fewer) injuries or deaths because the sheer number of individuals who can be injured is larger (or smaller) than that of other groups.

To account for population differences such as these, per capita rates are used. Per capita rates use a common population size that permits comparisons between different groups.³ Perhaps the most useful way to assess fire casualties across groups is to determine the relative risk of death or injury. Relative risk compares the per capita rate for a particular group (e.g., females) to the overall per capita rate (i.e., the general population). For the general population in the U.S., the relative risk is set at 1.

From this report, in 2016, the relative risk of dying in a fire for the total population of females in comparison to the total population was 0.8. This is equivalent to the per capita fire death rate for females (8.5 deaths per million population) divided by the per capita fire death rate for the entire population (10.9 deaths per million population⁴). Thus, the relative risk of a female dying from fire was 20 percent less than that of the total population (Table 2).

Data sources and methodology

The findings pertaining to deaths in this report were taken from the 2016 NCHS Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. For each reported death certificate in the U.S., NCHS assigned International Classification of Disease (ICD) codes for all reported conditions leading to death. For this report, the following ICD codes were analyzed: F63.1, W39-W40, X00-X06, X08-X09, X75-X76, X96-X97, Y25-Y26 and Y35.1.⁵ These codes include all deaths in which exposure to fire, fire products or explosion was the underlying cause of death, or was a contributing factor in the chain of events leading to death. Only deaths where age was specified were used in the analyses in the relative risk tables; age was specified in 99.9 percent of fire deaths in 2016.

The most recent NCHS mortality data available at the time of analysis were from 2016. For this reason, all analyses in this report reference 2016 data for consistency.

Fire injury estimates in this report are based on civilian fire injury data from the 2016 NFIRS and the 2016 National Fire Protection Association's (NFPA's) Survey of Fire Departments for U.S. Fire Experience. By definition, in the NFIRS, civilian fire injuries involve people who are injured as a result of a fire and who are not on active duty with a firefighting organization. Civilians also include emergency personnel who are not members of the fire department, such as police officers or utility workers. Fire injuries generally occur from activities of fire control, escaping from the dangers of fire, or sleeping.⁶

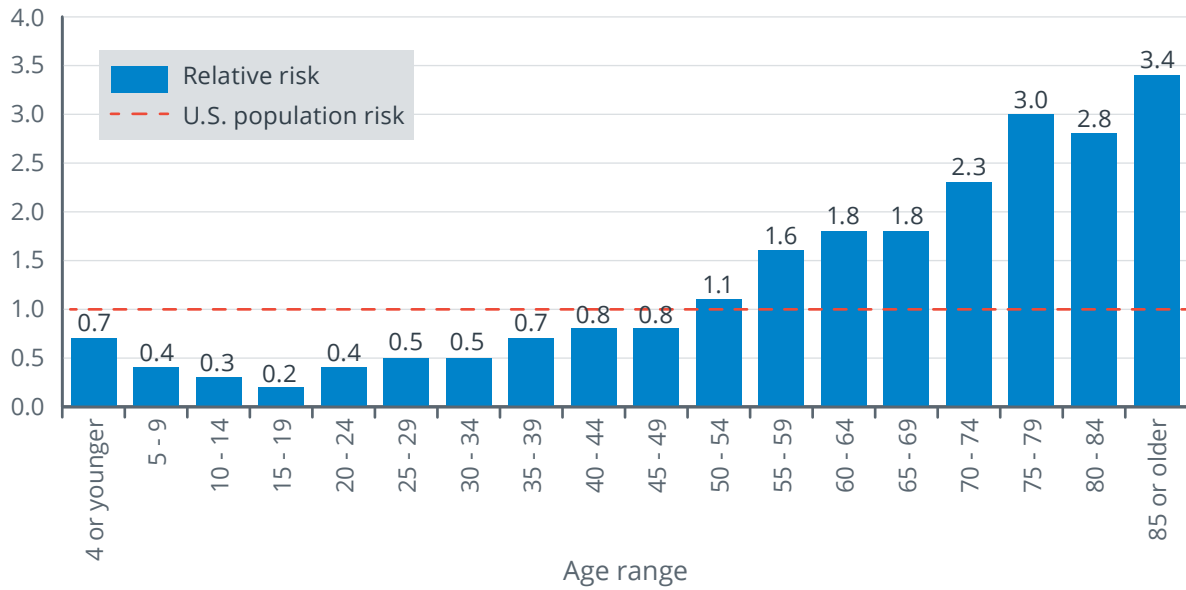
Age and risk of fire casualty

When physical and cognitive abilities are limited, as is often the case for the elderly, the risk of death from fire rises. In 2016, older adults (ages 65 or older) experienced large numbers of fire deaths that occurred in a small population group. As a result, the risk of dying in a fire for these older adults was 2.5 times higher than for the population as a whole and rose even more for the oldest segments (Figure 2). The oldest adults, those ages 85 and older, had a risk of dying in a fire that was 3.4 times higher than for the general population.

For children ages 4 or younger, the risk of fire death was 30 percent less than that of the general population. But the risk of death for this age group was greater than for older children, because as children mature and their cognitive and social abilities develop, the risk of fire death drops sharply. For children ages 5 to 9, the fire death risk was 60 percent less than that of the general population. For those ages 10 to 14, the risk of fire death was 70 percent less and dropped even further to 80 percent less for 15- to 19-year-olds. After age 19, the risk of fire death began to steadily increase. By age 50, in 2016, the risk of fire death was higher than the risk for the population as a whole and continued to increase as the population aged.

Although the overall numbers change, these profiles have remained relatively constant from year to year, according to the NCHS and U.S. Census Bureau data. The fire risk to children and older adults will be discussed in more detail in later sections of this report.

Figure 2. Relative risk of fire death by age in 2016

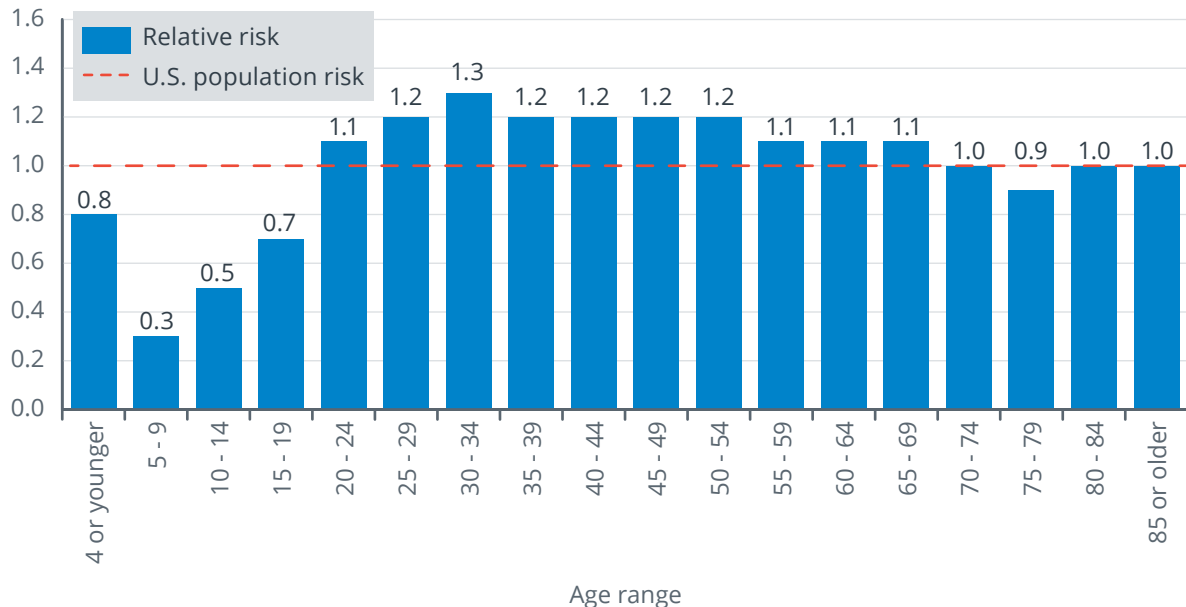


Sources: 2016 NCHS Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program and U.S. Census Bureau population estimates.

Note: Data have been adjusted to account for deaths with unknown age. Age was specified in 99.9 percent of fire deaths.

In general, the age profile of risk for fire injuries was different than that for deaths (Figure 3), with a more narrow range of risk quotients (0.3 to 1.3 for fire injuries versus 0.2 to 3.4 for fire deaths).^{7,8} This difference is thought to be the result of both cognitive and mobility issues that affect older adults. Most older adults were generally less likely to escape the effects of fire and more likely to suffer fatal injuries. In fact, in 2016, adults ages 70 and older had a relative risk of fire injury at or below the risk of the general population (Figure 3). The relative risk of fire injury was greater for 20- to 69-year-olds than for the general population. The risk of injury was below average for children and adults younger than 20. While less than the total population, however, children ages 4 and younger had a greater relative risk of injury from fire than older children (ages 5 to 14).

Figure 3. Relative risk of fire injury by age in 2016



Sources: 2016 NFIRS fire injury data, 2016 NFPA fire injury estimates, and U.S. Census Bureau population estimates.

Note: Data have been adjusted to account for injuries with unknown age. Age was specified in 99.9 percent of reported fire injuries.

Other factors that influence risk

Income

In the U.S. Fire Administration (USFA) report “Socioeconomic Factors and the Incidence of Fire,”⁹ socioeconomic studies show an inverse relationship between fire risk and income. The poorer population groups have the highest risk of fire injury or death, while the wealthiest have the lowest. Many older adults live alone on meager incomes, often in substandard housing.¹⁰

Education

Closely tied to income is education level. Numerous studies, including those associated with the No Child Left Behind legislation, have demonstrated that groups living in persistent poverty — that is, with income levels below the poverty line for long periods of time — score poorly in educational testing, have higher high school dropout rates, and have reduced employment opportunities.

Location

Geographic location also affects risk. The risk of dying in a fire was greatest for people living in the South and Midwest when compared to populations living in other regions (Table 1).¹¹ In the South, this may be partially attributed to the intermittent need for occasional heating. Rather than including central heating systems, as used in northern areas, many households in the South use portable heating devices that may be more likely to lead to a fire problem. Conversely, the West had a much lower risk of fire death. This reduction may be partly due to the role of heating (or lack thereof), housing stock characteristics, and other factors.

Table 1. Relative risk of fire death by geographic region in 2016

Region	Population	Fire deaths	Death rate (per million population)	Relative risk
Northeast	56,359,360	478	8.5	0.8
Midwest	67,978,168	851	12.5	1.2
South	122,423,457	1,593	13.0	1.2
West	76,644,950	593	7.7	0.7
U.S. overall	323,405,935	3,515	10.9	1.0

Sources: 1. 2016 NCHS Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program.
 2. U.S. Census Bureau, Population Division. July 1, 2016, population estimates from Table 1. Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010, to July 1, 2017 (NST-EST2017-01). Release date: December 2017.

Note: Relative risk may not compute due to rounding.

Gender

Like age, gender plays a role in the risk of death or injury from fire. For nearly all age groups and race categories, males were more likely to die in a fire-related incident than females (Table 2, Table 4 and Table 6). Overall, in 2016, males were 1.6 times more likely to die in fires than females (Table 2). This is a decrease from 2015 when males were 1.7 times more likely to die in fires than females. Data from the NFIRS and the NFPA showed that males, overall, were about 1.5 times more likely to suffer injuries than their female counterparts.¹²

Race

Race,¹³ which may be related to societal factors, cannot be ignored. African-Americans and American Indians/Alaska Natives had higher fire death rates per capita than the national average. African-Americans constituted a large and disproportionate share of total fire deaths, accounting for 20 percent of fire deaths in 2016, but only 13 percent of the U.S. population.¹⁴ In 2016, African-Americans had a 50 percent greater risk of dying in a fire than the

general population. This risk in 2007 and 2015, however, was 80 and 60 percent higher than the general population, respectively. For American Indians/Alaska Natives in 2016, the relative risk was 30 percent higher than the risk of the general population. This was a decrease from 2014 and 2015 when their risk was 50 and 40 percent higher, respectively. By contrast, Asian/Pacific Islander Americans were 80 percent less likely to die in a fire than the overall population in 2016.

Research shows that fire death rates are higher in states with larger percentages of people who are African-American, poor and smokers; have less formal education; and live in rural areas. Many of these states tend to be in the southeastern U.S.¹⁵

Table 2. Relative risk of fire death by race and gender in 2016, overall population

Gender/Race	Population	Fire deaths	Death rate (per million population)	Relative risk
Total	323,405,935	3,515	10.9	1.0
Male	159,243,817	2,119	13.3	1.2
Female	164,162,118	1,396	8.5	0.8
White	248,619,303	2,716	10.9	1.0
African-American	43,058,803	693	16.1	1.5
American Indian/Alaska Native	4,055,787	58	14.3	1.3
Asian/Pacific Islander	19,198,409	48	2.5	0.2
White male	123,226,613	1,644	13.3	1.2
African-American male	20,614,689	406	19.7	1.8
American Indian/Alaska Native male	2,045,311	38	18.6	1.7
Asian/Pacific Islander male	9,170,873	31	3.4	0.3
White female	125,392,690	1,072	8.5	0.8
African-American female	22,444,114	287	12.8	1.2
American Indian/Alaska Native female	2,010,476	20	9.9	0.9
Asian/Pacific Islander female	10,027,536	17	-	-

Source: See notes at the end of the report.

- Notes: 1. The overall male and female estimates include individuals with "2+ races" per the census. The "2+ races" category accounts for 2.6 percent of the population. The NCHS does not include this race category. Thus, the population estimates for the individual race categories will not sum to the total population estimate. Relative risk may not compute due to rounding.
2. Because they are considered highly variable, fire death rates and relative risk were not computed when there were fewer than 20 deaths per category.

Fire risk to children in 2016

While the relative risk of fire death or injury for children under age 15 was lower than the general population, the very young will always remain inherently vulnerable for a variety of reasons. Escaping from a fire can be difficult for children. A child age 4 or younger is usually too young to independently escape from a fire. Children this age generally lack the mental abilities to understand the need and the means of quickly escaping from a burning structure. Even in their own homes, very young children lack an understanding of how to escape.

Physical characteristics

Physiologically, young children are susceptible to severe injury or death from fire. A young child’s skin is quite thin and delicate compared with that of adults and older children. As a result, young children suffer burns more quickly and deeper than adults.^{16,17} In addition, smoke inhalation from the toxic gases released by fires (and often in conjunction with burns suffered in the fires) accounted for 81 percent of all reported fire deaths in 2016. Young children (ages 4 or younger) were also susceptible to this danger. Smoke inhalation accounted for 80 percent of fire deaths to children ages 4 or younger.¹⁸

Cognitive abilities

In addition to not recognizing the danger, young children are curious and will touch and manipulate most items left within their reach. This includes matches, cigarette lighters, candles, stoves and fireworks — all items that will readily harm a young child. In 2016, children ages 9 or younger accounted for 35 percent of casualties where the cause of the residential building fire was due to “playing with a heat source,” which includes matches and lighters.^{19,20}

Smoke alarm audibility

The home can potentially be a high-risk environment for the occurrence of child fire injuries and deaths. In 2016, the majority of fire casualties to children under the age of 15 — 79 percent of fatalities and 79 percent of injuries — occurred in residential buildings.²¹ Inside these residences, smoke alarms are credited with saving thousands of lives each year. Some studies, however, have questioned the efficacy of these alarms to alerting children. According to research conducted in Australia and Canada in the late 1990s, sleeping children do not respond appropriately to smoke alarms. A group of Australian researchers found that the risk factor changed when there was an adult around to wake the children, but many of the children remained groggy for some time and had slowed responses.²² Further studies have shown an increased response to alarms that use parental voices in lieu of the standard tone alarm.²³ While a limited number of voice-recordable alarms are available on the market, experts note that having a family fire and emergency exit plan is critical to saving lives in a fire.

Age

In 2016, 310 children younger than age 15 died as a result of fires (Table 3).²⁴ These children accounted for 9 percent of fire deaths. The youngest children were hit especially hard — 47 percent of child fire deaths affected children ages 4 or younger. For children younger than age 15, in 2015, exposure to smoke and fire was one of the three specific leading causes of nontransportation accidental deaths.²⁵

In 2016, fire injuries affected an estimated 1,475 children.²⁶ Again, the youngest suffered a large share of injuries — 50 percent of child fire injuries occurred to children ages 4 or younger. As in previous years, fire deaths declined with increasing age. Fire injuries, however, declined sharply between the young preschoolers (ages 4 or younger) and the younger school-aged children (ages 5 to 9), but rose for older children (ages 10 to 14). With these three age groups combined, children accounted for 10 percent of all fire injuries. This profile of deaths and injuries of children ages 14 and younger in 2016 is comparable to the profile of child fire deaths and injuries in 2011, 2013, 2014, and 2015.²⁷

Table 3. Child fire deaths and injuries in 2016

	Overall (ages 0 to 14)		Ages 0 to 4		Ages 5 to 9		Ages 10 to 14	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Deaths	309	100.0	144	46.6	98	31.7	67	21.7
Injuries	1,468	100.0	732	49.9	308	21.0	428	29.2

Sources: 2016 NCHS Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program; 2016 NFIRS fire injury data; and 2016 NFPA fire injury estimates.

Note: Total percent of child fire injuries does not add to 100 percent due to rounding.

In determining fire risk, the age, gender and socioeconomic factors of children and the households where they live also come into play, as they do for the total population. Because the numbers of fire deaths decreased as the age of the child increased, the likelihood of dying in a fire also decreased (Table 4). In 2016, as previously discussed, children ages 4 or younger had 30 percent less risk of dying in a fire than the general population. These children, however, had a higher risk of dying in a fire than older children. In fact, the relative risk of dying in a fire for children ages 5 to 9 was 60 percent less than that of the general population. By the time a child reached the 10 to 14 age group, the relative risk of dying in a fire dropped to 70 percent less than that of the general population.

Gender and race

Overall, boys tended to be at a greater fire risk than girls. African-Americans constituted a large and disproportionate share of total fire deaths, accounting for 35 percent of fire deaths among children in 2016 but for only 15 percent of the population. Moreover, African-American children ages 4 or younger still had a relative risk of dying that was 1.9 times higher than the general population and 2.9 times higher than for all children in that age group.

Income

Socioeconomic factors also have an effect on the fire risk to the youngest and most dependent children. The danger of death or injury is closely tied to household income, and children in the poorest homes are exposed to greater risk. A number of factors contribute to this elevated threat: the poor often live in substandard housing in crowded conditions. These children are more likely to be left alone than in affluent households, often because many of these children live in single-parent households where there are more children to supervise.²⁸

Table 4. Relative risk of child fire deaths by age, race and gender in 2016 (ages 0 to 14)

Gender/Race	Population	Fire deaths	Death rate (per million population)	Relative risk
All children (ages 0 to 14)				
Total	60,976,283	309	5.1	0.5
Male	31,141,557	164	5.3	0.5
Female	29,834,726	145	4.9	0.4
White	44,122,650	195	4.4	0.4
African-American	9,187,488	109	11.9	1.1
American Indian/Alaska Native	974,344	3	-	-
Asian/Pacific Islander	3,362,652	2	-	-

Gender/Race	Population	Fire deaths	Death rate (per million population)	Relative risk
Ages 0 to 4				
Total	19,919,577	144	7.2	0.7
Male	10,185,106	80	7.9	0.7
Female	9,734,471	64	6.6	0.6
White	14,272,077	78	5.5	0.5
African-American	3,036,892	64	21.1	1.9
American Indian/Alaska Native	321,028	1	-	-
Asian/Pacific Islander	1,102,337	1	-	-

Table 4. Relative risk of child fire deaths by age, race and gender in 2016 (ages 0 to 14) — continued

Gender/Race	Population	Fire deaths	Death rate (per million population)	Relative risk
Ages 5 to 9				
Total	20,429,504	98	4.8	0.4
Male	10,431,307	48	4.6	0.4
Female	9,998,197	50	5.0	0.5
White	14,729,735	65	4.4	0.4
African-American	3,099,950	32	10.3	0.9
American Indian/Alaska Native	327,559	1	-	-
Asian/Pacific Islander	1,120,668	0	-	-
Ages 10 to 14				
Total	20,627,202	67	3.2	0.3
Male	10,525,144	36	3.4	0.3
Female	10,102,058	31	3.1	0.3
White	15,120,838	52	3.4	0.3
African-American	3,050,646	13	-	-
American Indian/Alaska Native	325,757	1	-	-
Asian/Pacific Islander	1,139,647	1	-	-

Source: See notes at the end of the report.

- Notes:
1. The overall male and female estimates include individuals with "2+ races" per the census. The "2+ races" category accounts for 2.6 percent of the population. The NCHS does not include this race category. Thus, the population estimates for the individual race categories will not sum to the total population estimate. Relative risk may not compute due to rounding.
 2. Because they are considered highly variable, fire death rates and relative risk were not computed when there were fewer than 20 deaths per category.

Fire risk to older adults in 2016

To be elderly is, in itself, a disadvantage in terms of fire risk. With advancing age, physical and mental capabilities decline, making it more difficult for older adults to see, smell and hear clearly. Decreased senses increase the risk of death or injury from fire. When two or more senses are diminished, the fire risk for an individual increases dramatically. To compound this problem, older adults are more inclined to accidentally start a fire than younger adults. Oftentimes, older adults are close to the source of a fire, such as a cooking fire or a cigarette fire, and their clothing or bedding ignites. Because the aging process affects the senses, older adults typically have diminished sensation to pain, and thus they often do not seek timely treatment. All of these factors combine to increase the risk of death from fire for older adults.

Physical and cognitive capabilities

Older people also tend to have physical disabilities or ailments that hinder their mobility. Many are wheelchair users. Such infirmities make it difficult for older adults to react to a fire threat the way a younger adult could, and thus they exacerbate the fire risk to this segment of the population. Alzheimer's, dementia and other disorders that affect mental functions (rational thought and actions) can increase the fire risk through erratic or even dangerous behavior and the inability to recognize a hazard.

Drug and alcohol use

Adults ages 65 or older accounted for more than one-third of total outpatient spending on prescription medications in this country.²⁹ Moreover, 91 percent of older adults (65 or older) used at least one prescription drug in the past 30 days, while 41 percent of older adults concurrently used five or more prescriptions.³⁰ Some medications cause drowsiness or affect judgment; others do not combine well with alcohol. This latter observation is important, as alcohol use is prevalent among older adults. According to the National Survey on Drug Use and Health, 42 percent of adults ages 65 or older reported current use of alcohol (at least one drink in the past 30 days) in 2016.³¹ Further, 31 percent of those ages 75 or older would consider themselves “current regular” drinkers, having had at least 12 drinks in the past year.³² Alcohol alone can impair mental acuity, and older adults who combine medications and alcohol, or who abuse alcohol, face an even higher risk of starting a fire, not responding quickly enough to extinguish one, or not escaping the premises where a fire is in progress.

Health care facilities

Older adults often elect to remain at home rather than confront long-term stays in health care facilities. Of home health care patients, 83 percent are ages 65 and older.³³ Home health care for older adults is accompanied by an elevated fire risk. While no one factor is solely responsible for the increased fire risk to older adults receiving home health care, smoking in the presence of oxygen is recognized as an important problem.

In addition, as they age, Americans may be more likely to live in assisted living and nursing facilities than nursing homes. In 2010, 3.5 percent of people 65 years or older lived in nursing facilities,³⁴ and that number may rise as people grow even older. For each year from 2012 to 2014, an estimated 2,700 nursing home fires were reported to fire departments in the U.S.³⁵

Income

When poverty and infirmity accompany old age, the fire risk is compounded. Older adults often live on fixed incomes. Older adults who reside alone live in poverty more often than those who live with a spouse or other people. Many in this category are women who have outlived their husbands. In 2016, 9 percent of older adults lived below the poverty level.³⁶

Housing for the poor is often substandard. Typically, such housing has not been well-maintained. Building structures can be compromised, and building systems, such as electrical and mechanical, are often outdated, inadequate or not operational. The result is a higher likelihood of damaged or fraying electrical wiring, faulty heating, and worn-out household appliances. Heating in particular represents an elevated fire danger to older adults, who frequently feel cold. When the central heating source of a home does not work properly, older adults will often rely on temporary sources of heat, such as portable space heaters, fireplaces or even cooking ovens. This problem is especially severe in southern locales, which experience only intermittent demands for heating. Indeed, many residences in the South do not have central heating, and occupants are forced to rely solely on alternative heating.

Smoke alarms

Smoke alarms have saved many lives since the mid-1970s when their use was widely encouraged for the first time. The number of older adults living in housing without smoke alarms, or with alarms that do not work, is not well-documented. Nonetheless, even in homes with operable smoke alarms, older adults with impaired hearing are at an elevated risk of not responding in a timely manner.

Age

In 2016, 1,315 older adults ages 65 or older died as a result of fires (Table 5).³⁷ These adults accounted for 37 percent of all fire deaths. However, older adults constituted only 15 percent of the U.S. population in 2016,³⁸ and their ranks are growing. It is estimated that the older population will rise sharply between now and 2030 — the years when the baby-boomer generation will be in retirement. By 2030, the U.S. Census Bureau estimates that adults ages 65 or older will constitute 21 percent of the U.S. population, which will increase to 24 percent by 2060.³⁹ Better health care and new developments in medicine continue to increase American life expectancy. By their 65th birthday, on average, Americans can expect to live another 19 years.⁴⁰

Adults ages 65 to 74 accounted for 48 percent of older adult fire deaths, and those ages 75 to 84 accounted for an additional 34 percent. Older adults ages 85 or older accounted for 18 percent of older adult fire deaths.

While fire injuries affected an estimated 2,225 older adults, this group accounted for 15 percent of all fire injuries. The relative risk of older adults ages 65 or older being injured in a fire was equal to that of the general population.⁴¹ The youngest segment of the older adults suffered the largest share of injuries — 60 percent of older adult injuries occurred to those ages 65 to 74. As in 2011, 2013, 2014 and 2015, the number of older adult fire deaths and fire injuries in 2016 declined with increasing age.⁴²

Table 5. Older adult fire deaths and injuries in 2016

	Overall (ages 65 or older)		Ages 65 to 74		Ages 75 to 84		Ages 85 or older	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Deaths	1,313	100.0	626	47.7	449	34.2	238	18.1
Injuries	2,221	100.0	1,339	60.3	598	26.9	284	12.8

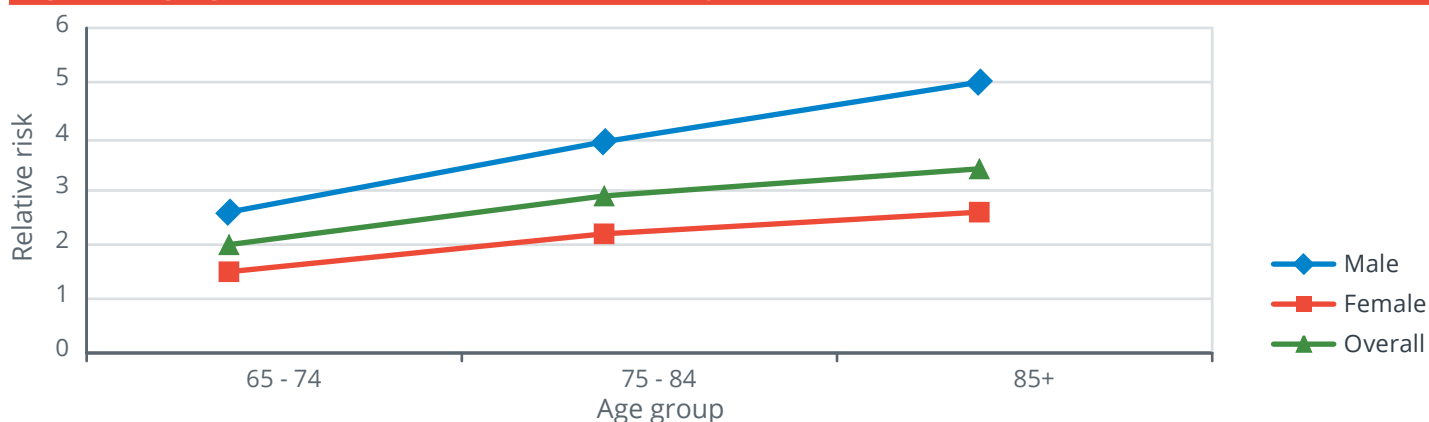
Sources: 2016 NCHS Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program; 2016 NFIRS fire injury data; and 2016 NFPA fire injury estimates.

In 2016, the relative risk of dying in a fire for older adults was 2.5 times higher than for the population as a whole (Table 6). This statistic alone is troublesome, but when subcategories of older adults were more closely evaluated, the situation worsened. The relative risk of dying in a fire rose substantially for the oldest segment (Figure 4 and Table 6). Individuals ages 85 or older were 3.4 times more likely to die in a fire than the general population. This is a decrease from 2014 and 2015 when they were 4.1 and 3.8 times more likely to die in a fire than the general population, respectively. Adults ages 65 to 74 were twice as likely to suffer fire-related deaths than the general population. This is a decrease from 2015 when they were 2.1 times more likely to die in a fire.

Gender

As previously discussed, the risk of fire death was not uniform across genders, and for the population as a whole, in 2016, males were 56 percent more likely than females to be victims of fires. This disparity held for older adults as well (70 percent), increasing to 93 percent in the 85 or older age group.

Figure 4. Age, gender and relative risk of fire fatality for older adults in 2016



Source: Derived from Table 6.

Race

In addition to gender, race also affects an older adult's fire risk. As discussed, in 2016, the problem was more severe for African-Americans when, as an overall group, they had 1.5 times the relative risk of dying from fire than the general population (Table 2). But it was the African-American elderly, particularly those ages 85 or older, who were most at risk; this group had a fire death risk over eight times greater than that of the general population and almost two and a half times the risk of all elderly people in this age group (Table 6). This is a decrease from 2014 and 2015 when this group had a fire death risk 10 times greater than the general population. This is still an increase from 2013, however, when African-Americans ages 85 or older had a fire death risk almost seven times greater than that of the general population.

Table 6. Relative risk of older adult fire deaths by age, race and gender in 2016 (ages 65 or older)

Gender/Race	Population	Fire deaths	Death rate (per million population)	Relative risk
All older adults (ages 65 or older)				
Total	49,272,330	1,313	26.6	2.5
Male	21,807,267	755	34.6	3.2
Female	27,465,063	558	20.3	1.9
White	41,739,457	1,067	25.6	2.4
African-American	4,552,058	220	48.3	4.4
American Indian/Alaska Native	340,964	9	-	-
Asian/Pacific Islander	2,216,152	17	-	-
Ages 65 to 74				
Total	28,646,005	626	21.9	2.0
Male	13,396,449	374	27.9	2.6
Female	15,249,556	252	16.5	1.5
White	24,009,857	507	21.1	1.9
African-American	2,807,413	108	38.5	3.5
American Indian/Alaska Native	221,251	5	-	-
Asian/Pacific Islander	1,339,813	6	-	-

Table 6. Relative risk of older adult fire deaths by age, race and gender in 2016 (ages 65 or older) — continued

Gender/Race	Population	Fire deaths	Death rate (per million population)	Relative risk
Ages 75 to 84				
Total	14,244,448	449	31.5	2.9
Male	6,182,970	260	42.1	3.9
Female	8,061,478	189	23.4	2.2
White	12,152,710	370	30.4	2.8
African-American	1,258,278	68	54.0	5.0
American Indian/Alaska Native	89,923	4	-	-
Asian/Pacific Islander	630,060	7	-	-

Gender/Race	Population	Fire deaths	Death rate (per million population)	Relative risk
Ages 85 or older				
Total	6,381,877	238	37.3	3.4
Male	2,227,848	121	54.3	5.0
Female	4,154,029	117	28.2	2.6
White	5,576,890	190	34.1	3.1
African-American	486,367	44	90.5	8.3
American Indian/Alaska Native	29,790	0	-	-
Asian/Pacific Islander	246,279	4	-	-

Source: See notes at the end of the report.

- Notes: 1. The overall male and female estimates include individuals with “2+ races” per the census. The “2+ races” category accounts for 2.6 percent of the population. The NCHS does not include this race category. Thus, the population estimates for the individual race categories will not sum to the total population estimate. Relative risk may not compute due to rounding.
2. Because they are considered highly variable, fire death rates and relative risk were not computed when there were fewer than 20 deaths per category.

Conclusion

The elderly are some of the nation’s most vulnerable residents, and in 2016, their risk of death in a fire remained high. In addition, with an aging population, the U.S. demographic profile is rapidly changing. The older adult population (ages 65 or older) is expected to increase from its current 15 percent of the total population to 24 percent by 2060,⁴³ with an assumed corresponding increase in fire deaths and injuries among older adults. According to U.S. Census Bureau projections, by 2060, the number of individuals ages 65 or older is expected to be 98 million — more than double the amount in 2015. At the same time, the population ages 85 or older is expected to more than triple, increasing from 6.3 million in 2015 to 19.7 million in 2060.⁴⁴ With advancing age, physical and mental capabilities of these older adults will likely decline, hindering their mobility and making it more difficult for them to see, smell and hear clearly. Lessened senses and decreased mobility increase the risk of death or injury from fire.

Improvements have been made in reducing fire deaths and injuries among children younger than age 15, and in 2016, their relative risk of fire death was 50 percent lower than that of the general population. However, the youngest children (ages 4 and younger) faced an elevated risk of injury or death in a fire when compared to older children. In addition, young children are physiologically susceptible to severe injury or death from fire. For example, a young child’s skin is quite thin compared to adults and older children. Children this age also generally lack the means and mental abilities to understand the need to quickly escape from a burning structure. Further, while older children face

a lower risk of death or injury in a fire and are more mobile than those in the youngest age group, they still may not have sufficient abilities to protect themselves. As a result, the young and old continue to merit special attention to reduce their risk of injury or death from fire.

Prevention

Because children and older adults accounted for 46 percent of fire deaths and 25 percent of fire injuries in 2016, and for the reasons stated previously, the USFA has been working toward the goal of reducing fire deaths and injuries in these populations. A number of resources are available to help address the fire problem for children and adults. For children, the USFA provides outreach materials that provide parents and caregivers with information on home strategies ranging from the control of matches and lighters to home escape planning to protect young children from fire (<https://www.usfa.fema.gov/prevention/outreach/children.html>). For adults, the USFA provides outreach materials that address lifestyle strategies of safe smoking, safe cooking and safe heating to reduce the incidence of fires that traditionally affect older adults (https://www.usfa.fema.gov/prevention/outreach/older_adults.html). For more information, see the USFA website (<https://www.usfa.fema.gov>), or contact your local fire department.

New technologies

Fire fatalities and injuries have declined over the last 35 years, partly due to new technologies to detect and extinguish fires. Smoke alarms are present in most homes. In addition, the use of residential sprinklers is widely supported by the fire service and is gaining support within residential communities.

Nationally, only 3 percent of households do not have smoke alarms.⁴⁵ If a fire occurs, properly installed and maintained smoke alarms provide an early warning signal to everyone in a home. Smoke alarms help save lives and property. The USFA continues to partner with other government agencies and fire service organizations to improve and develop new smoke alarm technologies. More information on smoke alarm technologies, performance, disposal and storage, training bulletins, and public education and outreach materials is available at https://www.usfa.fema.gov/prevention/technology/smoke_fire_alarms.html. Additionally, the USFA's position statement on smoke alarms is available at https://www.usfa.fema.gov/about/smoke_alarms_position.html.

Residential sprinkler systems help to reduce the risk of deaths and injuries, homeowner insurance premiums, and uninsured property losses. Many homes do not have automatic extinguishing systems, although they are often found in hotels and businesses. Sprinklers are required by code in hotels and many multifamily residences. There are major movements in the U.S. fire service to require sprinklers in all new homes. At present, however, they are largely absent in residences nationwide.⁴⁶

USFA and fire service officials across the nation are working to promote and advance residential fire sprinklers. More information on costs and benefits, performance, training bulletins, and public education and outreach materials regarding residential sprinklers is available at https://www.usfa.fema.gov/prevention/technology/home_fire_sprinklers.html. Additionally, the USFA's position statement on residential sprinklers is available at https://www.usfa.fema.gov/about/sprinklers_position.html.

To request additional information, visit <https://www.usfa.fema.gov/contact.html>. To comment on this specific report, visit <https://apps.usfa.fema.gov/contact/dataReportEval?reportTitle=Fire%20Risk%20in%202016>.

Notes:

Sources for Table 2, Table 4 and Table 6 are the 2016 NCHS Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program, and U.S. population estimates from the U.S. Census Bureau, Population Division, <https://www.census.gov/programs-surveys/popest/data/tables.html>:

- 1 Table 1. Annual Estimates of the Resident Population for the U.S., Regions, States and Puerto Rico: April 1, 2010, to July 1, 2017 (NST-EST2017-01). Release date: December 2017.
- 2 July 1, 2016, population estimates from the table, Annual Estimates of the Resident Population by Sex, Age, Race, and Hispanic Origin for the U.S. and States: April 1, 2010, to July 1, 2017. Release date: June 2018.

3 2016 NCHS mortality data (deaths) and the 2016 NFPA survey estimates (injuries). The count of fire deaths cited in the text is rounded to the nearest five.

4 The term “casualties” refers to both fire deaths and injuries.

5 Per capita rates are determined by the number of deaths or injuries occurring to a specific population group, divided by the total population for that group. This ratio is then multiplied by a common population size. For the purposes of this report, per capita rates for fire deaths and injuries are measured per 1 million people. For example, the per capita fire death rate for the total female population in 2016 was computed from the total number of female fire deaths (1,396), divided by the total female population (164,162,118), multiplied by 1,000,000 people. This rate is equivalent to 8.5 fire deaths per 1 million population.

6 The per capita fire death rate for the total population in 2016 was computed from the total number of fire deaths (3,515), divided by the total population (323,405,935), multiplied by 1,000,000 people. This rate is equivalent to 10.9 fire deaths per 1 million population.

7 The ICD 10 codes used from the NCHS mortality data are as follows: F63.1 — Pathological fire-setting (pyromania); W39 — Discharge of firework; W40 — Explosion of other materials; X00 — Exposure to uncontrolled fire in building or structure; X01 — Exposure to uncontrolled fire, not in building or structure; X02 — Exposure to controlled fire in building or structure; X03 — Exposure to controlled fire, not in building or structure; X04 — Exposure to ignition of highly flammable material; X05 — Exposure to ignition or melting of nightwear; X06 — Exposure to ignition or melting of other clothing and apparel; X08 — Exposure to other specified smoke, fire and flames; X09 — Exposure to unspecified smoke, fire and flames; X75 — Intentional self-harm (suicide) by explosive material; X76 — Intentional self-harm (suicide) by smoke, fire and flames; X96 — Assault (homicide) by explosive material; X97 — Assault (homicide) by smoke, fire and flames; Y25 — Contact with explosive material, undetermined intent; Y26 — Exposure to smoke, fire and flames, undetermined intent; and Y35.1 — Legal intervention involving explosives.

8 The USFA, “Civilian Fire Injuries in Residential Buildings (2013-2015),” Volume 18, Issue 5, July 2017, <https://www.usfa.fema.gov/downloads/pdf/statistics/v18i5.pdf>.

9 Estimates of injuries by age are derived from 2016 NFIRS civilian fire casualty age data in conjunction with 2016 NFPA estimates of overall civilian fire injuries.

10 Fire injury risk is computed using the 2016 NFIRS data and NFPA estimates of overall fire injuries. Fire department participation in the NFIRS is voluntary; however, some states do require their departments to participate in the state system. Additionally, if a fire department is a recipient of a Fire Act Grant, participation is required. From 2014 to 2016, 68 percent of the NFPA’s annual average estimated 1,328,500 fires to which fire departments responded were captured in the NFIRS. Thus, the NFIRS is not representative of all fire incidents in the U.S. and is not a “complete” census of fire incidents and their related losses, including fire injuries. Although the NFIRS does not represent 100 percent of the incidents and their related losses reported to fire departments each year, the enormous dataset exhibits stability from one year to the next without radical changes. Results based on the full dataset are generally similar to those based on part of the data.

11 USFA, “Socioeconomic Factors and the Incidence of Fire,” FA 170, June 1997.

12 USFA, “Socioeconomic Factors and the Incidence of Fire,” FA 170, June 1997.

13 The regions of the U.S. are defined by the U.S. Census Bureau as the **Northeast** (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island and Vermont); **South** (Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia); **Midwest** (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota and Wisconsin); and **West** (Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming).

14 Unrounded values of relative risk were used for the computations in this paragraph.

15 As required by the Office of Management and Budget, starting in 1997, the U.S. Census Bureau generates population estimates for the following race categories: white, black or African-American, American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, or some other race (2+ race). “Hispanic or Latino” is considered an ethnicity and refers to a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin **regardless** of race. As a result, “Hispanic or Latino” is not broken out as a separate race category in this report.

16 Statistics are based on U.S. Census Bureau population estimates for July 1, 2016.

17 NFPA, Fire Analysis and Research Division, “Demographic and Other Characteristics Related to Fire Deaths or Injuries,” March 2010, <https://www.nfpa.org/news-and-research/fire-statistics-and-reports/fire-statistics-demographics-and-victim-patterns/demographic-and-other-characteristics-related-to-fire-deaths> (accessed July 11, 2018).

18 New York State Department of Health, “Burn and Scald Prevention, Children Ages One to Nine Years,” https://www.health.ny.gov/prevention/injury_prevention/children/fact_sheets/burn_and_scald_prevention_1-9_years.htm (accessed July 11, 2018).

- ¹⁷American Burn Association, Community Fire and Burn Prevention Programs, Scald Injury Prevention Campaign, “Scald Injury Prevention (Educator’s Guide),” <http://ameriburn.org/wp-content/uploads/2017/04/scaldinjuryeducatorsguide.pdf> (accessed July 11, 2018).
- ¹⁸NFIRS data, 2016.
- ¹⁹NFIRS data, 2016.
- ²⁰The term “casualties” refers to both fire deaths and injuries.
- ²¹NFIRS data, 2016.
- ²²Bruck, Dorothy, “Nonawakening in Children in Response to a Smoke Detector Alarm,” *Fire Safety Journal*, Vol. 32, Issue 4, June 1999, pp. 369-376.
- ²³Smith, Gary, et al., “Comparison of a Personalized Parent Voice Smoke Alarm With a Conventional Residential Tone Smoke Alarm for Awakening Children,” *Pediatrics*, Vol. 118, No. 4, October 2006, pp. 1623-1632, <http://pediatrics.aappublications.org/content/118/4/1623.full> (accessed July 17, 2018).
- ²⁴Numbers of fire deaths are extracted from 2016 NCHS mortality data using the ICD codes noted previously. The count of fire deaths cited in the text is rounded to the nearest five.
- ²⁵NCHS, “Deaths: Final Data for 2015” (“National Vital Statistics Reports,” Vol. 66, No. 6), Table 6, https://www.cdc.gov/nchs/data/nvsr/nvsr66/nvsr66_06.pdf (accessed July 17, 2018). This ranking excludes the “motor vehicle accidents” cause. The other two leading causes out of the three leading causes (excluding motor vehicle accidents) were “accidental hanging, strangulation, and suffocation” and “accidental drowning and submersion.”
- ²⁶Estimates of fire injuries are calculated by determining the percent of injuries reported to NFIRS and applying the percentage to the NFPA estimate of fire injuries. The fire injury estimate cited in the text is rounded to the nearest 25.
- ²⁷The most recent years in which the USFA examined fire risk prior to this report are 2011, 2013, 2014, and 2015. The USFA did not examine fire risk in 2012.
- ²⁸USFA, “Socioeconomic Factors and the Incidence of Fire,” FA 170, June 1997.
- ²⁹U.S. Department of Health and Human Services (DHHS), National Institutes of Health, National Institute on Drug Abuse, “Research Report Series — Prescription Drug Abuse,” November 2014, p. 8, https://teens.drugabuse.gov/sites/default/files/prescriptiondrugrrs_11_14.pdf (accessed July 17, 2018).
- ³⁰NCHS, “Health, United States, 2016,” Table 79. Prescription drug use in the past 30 days, by sex, race and Hispanic origin, and age: United States, selected years 1988-1994 through 2011-2014, <https://www.cdc.gov/nchs/data/hus/hus16.pdf> (accessed July 17, 2018).
- ³¹Substance Abuse and Mental Health Services Administration, Results from the 2016 National Survey on Drug Use and Health: Detailed Tables, Section 2: Tobacco Product and Alcohol Use Tables (Table 2.19B Alcohol Use in Lifetime, Past Year, and Past Month among Persons Aged 12 or Older, by Detailed Age Category: Percentages, 2015 and 2016), <https://www.samhsa.gov/data/sites/default/files/NSDUH-DetTabs-2016/NSDUH-DetTabs-2016.pdf> (accessed Aug. 15, 2018).
- ³²DHHS, Centers for Disease Control and Prevention, Vital and Health Statistics, “Summary Health Statistics: National Health Interview Survey, 2016,” Table A-13a. Age-adjusted percent distribution (with standard errors) of alcohol drinking status among adults aged 18 and over, by selected characteristics: United States, 2016, https://ftp.cdc.gov/pub/Health_Statistics/NCHS/NHIS/SHS/2016_SHS_Table_A-13.pdf (accessed July 17, 2018).
- ³³NCHS, Vital and Health Statistics, Series 3, No. 38, “Long-Term Care Providers and Services Users in the United States: Data from the National Study of Long-Term Care Providers, 2013–2014,” February 2016, Chapter 3, p. 35, https://www.cdc.gov/nchs/data/series/sr_03/sr03_038.pdf (accessed July 17, 2018).
- ³⁴Fox-Grage, Wendy, Ari Houser, and Kathleen Ujvari, “Across the States: Profiles of Long Term Services and Supports, Ninth Edition, 2012, Page 40,” American Association for Retired Persons, https://www.aarp.org/content/dam/aarp/research/public_policy_institute/ltc/2012/across-the-states-2012-full-report-AARP-ppi-ltc.pdf (accessed July 17, 2018).
- ³⁵USFA, “Data Snapshot: Nursing Home Fires (2012-2014),” https://www.usfa.fema.gov/downloads/pdf/statistics/snapshot_nursing_home.pdf.
- ³⁶U.S. Census Bureau, “Income and Poverty in the United States: 2016,” Table 3. People in Poverty by Selected Characteristics: 2015 and 2016 based on “Current Population Survey, 2016 and 2017 Annual Social and Economic Supplements,” September 2017, <https://www.census.gov/content/dam/Census/library/publications/2017/demo/P60-259.pdf> (accessed July 17, 2018).
- ³⁷2016 NCHS mortality data. The count of fire deaths cited in the text is rounded to the nearest five.
- ³⁸U.S. Census Bureau, Population Division, July 1, 2016, population estimates from the table Annual Estimates of the Resident Population by Sex, Age, Race, and Hispanic Origin for the United States and States: April 1, 2010, to July 1, 2017. Release date: June 2018, <https://www.census.gov/data/datasets/2017/demo/popest/nation-detail.html> (accessed August 15, 2018).
- ³⁹U.S. Census Bureau, Population Division, Table 6. Percent Distribution of the Projected Population by Sex and Selected Age Groups for the United States: 2015 to 2060 (NP2014-T6). Release date: December 2014, <https://www.census.gov/data/tables/2014/demo/popproj/2014-summary-tables.html> (accessed August 15, 2018).
- ⁴⁰NCHS, “Health, United States, 2016,” Table 15. Life expectancy at birth, at age 65, and at age 75, by sex, race, and Hispanic origin: United States, selected years 1900-2015, <https://www.cdc.gov/nchs/data/hus/hus16.pdf> (accessed July 17, 2018).
- ⁴¹Estimates of fire injuries are calculated by determining the percent of injuries reported to the NFIRS and applying this percentage to the NFPA estimate of fire injuries. The fire injury estimate cited in the text is rounded to the nearest 25.
- ⁴²The most recent years in which the USFA examined fire risk prior to this report are 2011, 2013, 2014, and 2015. The USFA did not examine fire risk in 2012.
- ⁴³U.S. Census Bureau, Population Division, Table 6. Percent Distribution of the Projected Population by Sex and Selected Age Groups for the United States: 2015 to 2060 (NP2014-T6). Release date: December 2014, <https://www.census.gov/data/tables/2014/demo/popproj/2014-summary-tables.html> (accessed August 15, 2018).

⁴⁴U.S. Census Bureau, Population Division, Table 3. Projections of the Population by Sex and Selected Age Groups for the United States: 2015 to 2060 (NP2014-T3). Release date: December 2014, <https://www.census.gov/data/tables/2014/demo/popproj/2014-summary-tables.html> (accessed August 15, 2018).

⁴⁵Greene, Michael and Craig Andres, "2004-2005 National Sample Survey of Unreported Residential Fires," Division of Hazard Analysis, Directorate for Epidemiology, U.S. Consumer Product Safety Commission, July 2009.

⁴⁶U.S. Department of Housing and Urban Development and U.S. Census Bureau, American Housing Survey for the United States: 2011, September 2013, "Health and Safety Characteristics-All Occupied Units (National)," Table S-01-AO, <https://www.census.gov/content/dam/Census/programs-surveys/ahs/data/2011/h150-11.pdf> (accessed July 17, 2018).