

Fire Risk in 2017

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 (NFIRS). 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

- ➊ 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 relative risk of fire death.
 - Adults ages 25 to 64 had a greater relative risk of fire injury than the general population.
 - Children ages 4 and younger had an elevated risk of both fire death and injury when compared to older children (ages 5 to 14); however, their relative risk was still lower than that of the general population.
- ➋ Risk by region: People living in the Midwest and South had the greatest relative risk of dying in a fire when compared to populations living in other regions of the United States.
- ➌ Risk by gender: Males were 1.6 times more likely to die in fires than females.
- ➍ 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 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 the death of or injury to a person, or damage to or loss of property, as a result of fire.

The risk of death or injury from fire is not the same for everyone. In 2017, 3,645 deaths and 14,670 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 2016," Volume 19, Issue 6. The focus is on how fire risk, specifically the risks of death or injury, varies with age and how other demographic factors weigh upon that risk.

Data sources and methodology

The findings pertaining to deaths in this report were taken from the 2017 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. 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 Y35.1.³ 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 99.97% of fire deaths in 2017.

The most recent NCHS mortality data available at the time of this analysis were from 2017. For this reason, all analyses in this report reference 2017 data for consistency.

Fire injury estimates in this report are based on civilian fire injury data from the 2017 NFIRS and the 2017 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.⁴

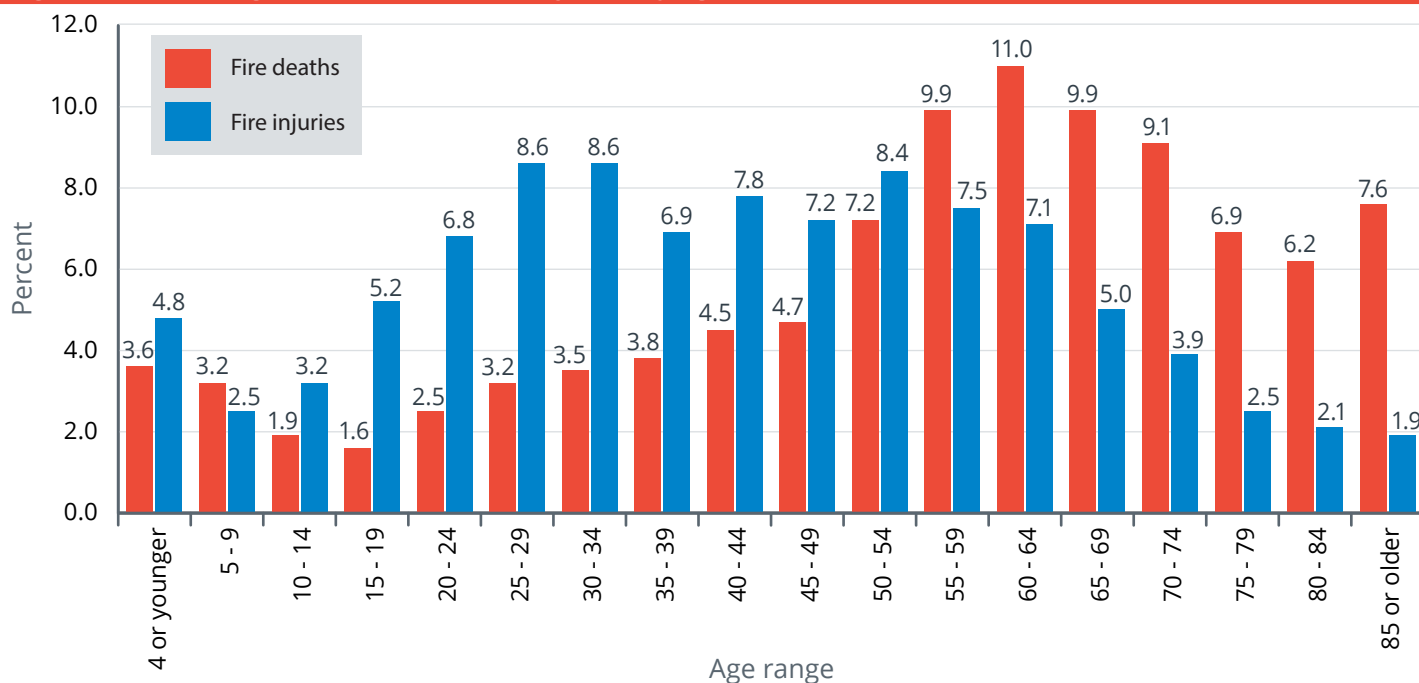
Fire casualties, per capita rates and relative risk

When determining fire risk, geographic, demographic and socioeconomic factors all come into play.⁵ People in the Midwest and South, males, and adults ages 50 or older 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, 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 2017, the number of fire deaths was greatest for white Americans and least for American Indians/Alaska Natives. In the case of age, percentages of fire deaths were greatest for those ages 55 to 69, while 17% of fire injuries occurred among adults ages 25 to 34 (Figure 1).

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 number 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 total number of individuals who can be injured is larger (or smaller) than that of other groups.

Figure 1. Percentage of fire deaths and injuries by age in 2017



Sources: 2017 NCHS Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program and 2017 NFIRS fire injury data.

Notes: 1. Data have been adjusted to account for deaths and injuries with unknown age. Age was specified in 99.97% of fire deaths and in 99.81% of reported fire injuries. 2. The total percentage of fire deaths does not add up to 100% due to rounding.

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.⁶ 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 2017, 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 (8.6 deaths per million population) divided by the per capita fire death rate for the entire population (11.2 deaths per million population⁷). Thus, the relative risk of a female dying from fire was 20% less than that of the total population (Table 2).

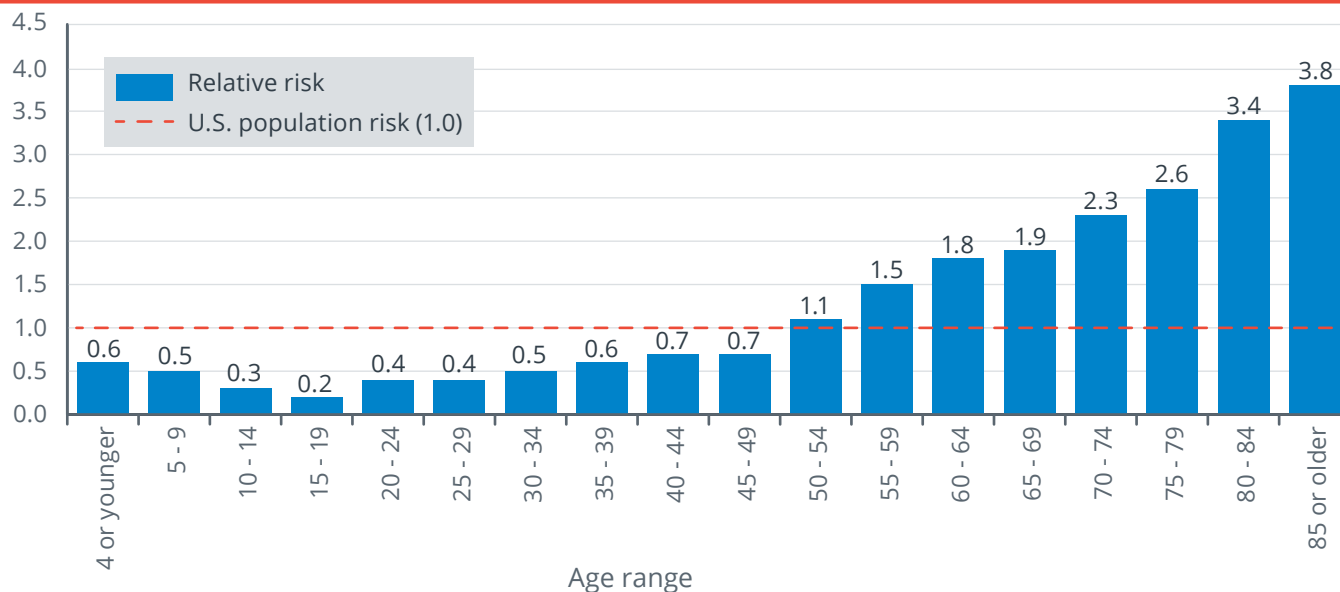
Age and risk of fire casualty

In 2017, the risk of fire death for children ages 4 or younger was 40% less than that of the general population (Figure 2). 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 50% less than that of the general population. For those ages 10 to 14, the risk of fire death was 70% less and dropped even further to 80% less for 15- to 19-year-olds. After age 19, the risk of fire death began to steadily increase. By age 50, in 2017, the risk of fire death was higher than the risk for the population as a whole and continued to increase as the population aged.

When physical and cognitive abilities are limited, as is often the case for the elderly, the risk of death from fire rises. In 2017, 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 3.8 times higher than that for the general population.

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.

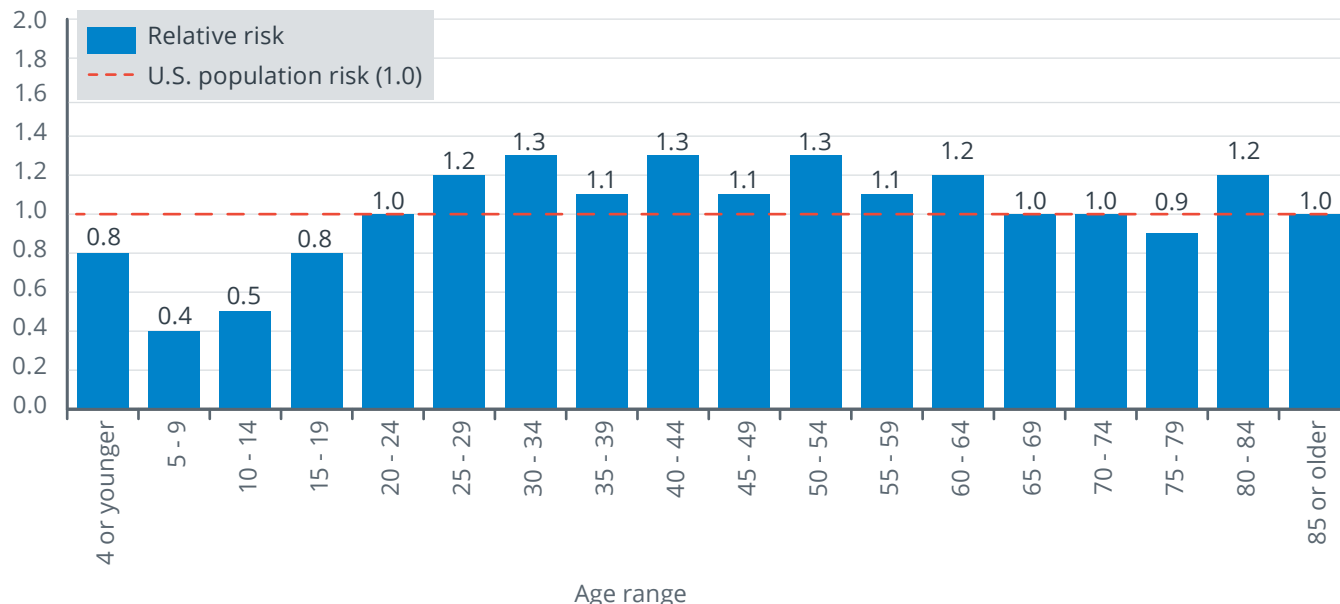
Figure 2. Relative risk of fire death by age in 2017



Sources: 2017 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 99.97% 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 (0.4 to 1.3 for fire injuries versus 0.2 to 3.8 for fire deaths).^{8,9} 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 2017, adults ages 65 and older, with the exception of the 80- to 84-year-olds, 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 25- to 64-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 2017



Sources: 2017 NFIRS fire injury data, 2017 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 99.81% of reported fire injuries.

Other factors that influence risk

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.¹⁰ In addition to age, geographic location, gender and race also influence fire risk.

Location

The risk of dying in a fire was greatest for people living in the Midwest and South 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 Northeast and West had a much lower risk of fire death. In fact, their risk from fire death was 20% less than the population as a whole.

Table 1. Relative risk of fire death by geographic region in 2017

Region	Population	Fire deaths	Death rate (per million population)	Relative risk
Northeast	56,072,676	534	9.5	0.8
Midwest	68,156,035	879	12.9	1.2
South	123,598,424	1,551	12.5	1.1
West	77,319,986	681	8.8	0.8
U.S. overall	325,147,121	3,645	11.2	1.0

Sources: 1. 2017 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, 2017 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, 2018 (NST-EST2018-01). Release date: December 2018.

Note: Relative risk may not compute due to rounding.

Gender

For nearly all age groups and race categories, males were as likely or more likely to die in a fire-related incident than females (Table 2, Table 4 and Table 6). Overall, in 2017 as well as 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 showed that males, overall, were about 1.5 times more likely to suffer fire injuries than their female counterparts.¹²

Race

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 19% of fire deaths in 2017, but only 13% of the U.S. population.^{13,14} In 2017, African Americans had a 40% greater risk of dying in a fire than the general population. This is lower than in 2007, 2015, and 2016, however, when the risk was 80%, 60%, and 50% higher than the general population, respectively. For American Indians/Alaska Natives in 2017 as well as in 2016, the relative risk was 30% higher than the risk of the general population. This was a decrease from 2014 and 2015, when their risk was 50% and 40% higher, respectively. By contrast, Asian/Pacific Islander Americans were 70% less likely to die in a fire than the overall population in 2017.

Table 2. Relative risk of fire death by race and gender in 2017, overall population

Gender/Race	Population	Fire deaths	Death rate (per million population)	Relative risk
Total	325,147,121	3,645	11.2	1.0
Male	160,125,630	2,221	13.9	1.2
Female	165,021,491	1,424	8.6	0.8
White	249,304,832	2,812	11.3	1.0
African American	43,410,367	701	16.1	1.4
American Indian/Alaska Native	4,101,775	59	14.4	1.3
Asian/Pacific Islander	19,622,885	73	3.7	0.3
White male	123,580,457	1,739	14.1	1.3
African American male	20,791,507	410	19.7	1.8
American Indian/Alaska Native male	2,067,255	36	17.4	1.6
Asian/Pacific Islander male	9,380,849	36	3.8	0.3
White female	125,724,375	1,073	8.5	0.8
African American female	22,618,860	291	12.9	1.1
American Indian/Alaska Native female	2,034,520	23	11.3	1.0
Asian/Pacific Islander female	10,242,036	37	3.6	0.3

Source: See notes at the end of the report.

Note: The overall male and female estimates include individuals with "2+ races" per the census. The "2+ races" category accounts for 2.7% 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.

Fire risk to children in 2017

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.¹⁵

Age

In 2017, 315 children younger than age 15 died as a result of fires (Table 3).¹⁶ These children accounted for 9% of fire deaths. The youngest children were hit especially hard — 41% of child fire deaths affected children ages 4 or younger.

In 2017, fire injuries affected an estimated 1,550 children.¹⁷ Again, the youngest suffered a large share of injuries — 46% 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 11% of all fire injuries. This profile of deaths and injuries of children ages 14 and younger in 2017 is comparable to the profile of child fire deaths and injuries in 2011 and 2013 to 2016.¹⁸

Table 3. Child fire deaths and injuries in 2017

	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	314	100.0	130	41.4	115	36.6	69	22.0
Injuries	1,543	100.0	704	45.6	363	23.5	476	30.8

Sources: 2017 NCHS Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program; 2017 NFIRS fire injury data; and 2017 NFPA fire injury estimates.

Note: Total percent of child fire injuries does not add to up 100% 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.¹⁹ 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 2017, as previously discussed, children ages 4 or younger had 40% 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 50% 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% less than that of the general population.

Gender and race

Overall, boys tended to be at a greater fire risk than girls. Additionally, African Americans constituted a large and disproportionate share of fire deaths, accounting for 33% of fire deaths among children in 2017 but for only 15% of the child population. Moreover, African American children ages 4 or younger still had a relative risk of dying that was 1.5 times higher than the general population and 2.5 times higher than for all children in that age group.

Table 4. Relative risk of child fire deaths by age, race and gender in 2017 (ages 0 to 14)

Gender/Race	Population	Fire deaths	Death rate (per million population)	Relative risk
All children (ages 0 to 14)				
Total	60,962,698	314	5.2	0.5
Male	31,140,880	167	5.4	0.5
Female	29,821,818	147	4.9	0.4
White	43,996,935	198	4.5	0.4
African American	9,196,036	103	11.2	1.0
American Indian/Alaska Native	974,739	8	-	-
Asian/Pacific Islander	3,407,504	5	-	-

Table 4. Relative risk of child fire deaths by age, race and gender in 2017 (ages 0 to 14) — continued

Gender/Race	Population	Fire deaths	Death rate (per million population)	Relative risk
Ages 0 to 4				
Total	19,891,967	130	6.5	0.6
Male	10,172,744	68	6.7	0.6
Female	9,719,223	62	6.4	0.6
White	14,230,849	76	5.3	0.5
African American	3,032,246	50	16.5	1.5
American Indian/Alaska Native	318,848	4	-	-
Asian/Pacific Islander	1,116,839	0	-	-

Gender/Race	Population	Fire deaths	Death rate (per million population)	Relative risk
Ages 5 to 9				
Total	20,304,937	115	5.7	0.5
Male	10,368,622	59	5.7	0.5
Female	9,936,315	56	5.6	0.5
White	14,604,102	73	5.0	0.4
African American	3,084,425	35	11.3	1.0
American Indian/Alaska Native	325,341	4	-	-
Asian/Pacific Islander	1,129,350	3	-	-

Gender/Race	Population	Fire deaths	Death rate (per million population)	Relative risk
Ages 10 to 14				
Total	20,765,794	69	3.3	0.3
Male	10,599,514	40	3.8	0.3
Female	10,166,280	29	2.9	0.3
White	15,161,984	49	3.2	0.3
African American	3,079,365	18	-	-
American Indian/Alaska Native	330,550	0	-	-
Asian/Pacific Islander	1,161,315	2	-	-

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 2.7% 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 2017

To be elderly is, in itself, a disadvantage in terms of fire risk. Older people tend to have physical disabilities or ailments that hinder their mobility. With advancing age, physical and mental capabilities decline, making it more difficult for older adults to see, smell and hear clearly. Lessened senses and decreased mobility increase the risk of death or injury from fire.

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.²⁰

Age

In 2017, 1,445 older adults ages 65 or older died as a result of fires (Table 5).²¹ These adults accounted for 40% of all fire deaths. However, older adults constituted only 16% of the U.S. population in 2017,²² 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% of the U.S. population, which will increase to 23% by 2060.²³ 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.²⁴

Adults ages 65 to 74 accounted for 48% of older adult fire deaths, and those ages 75 to 84 accounted for an additional 33%. Older adults ages 85 or older accounted for 19% of older adult fire deaths.

While fire injuries affected an estimated 2,250 older adults, this group accounted for 15% of all fire injuries.²⁵ The relative risk of older adults ages 65 or older being injured in a fire was equal to that of the general population. The youngest segment of the older adults suffered the largest share of injuries — 58% of older adult injuries occurred to those ages 65 to 74. As in 2011 and 2013 to 2016, the number of older adult fire deaths and fire injuries in 2017 declined with increasing age.²⁶

Table 5. Older adult fire deaths and injuries in 2017

	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	1,444	100.0	689	47.7	477	33.0	278	19.3
Injuries	2,259	100.0	1,305	57.8	674	29.8	280	12.4

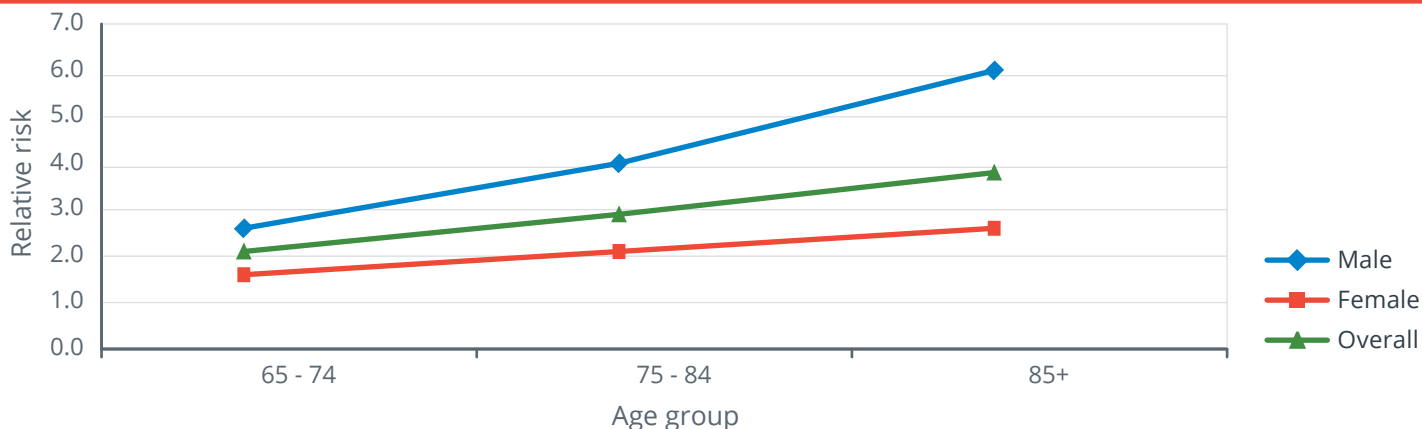
Sources: 2017 NCHS Mortality Data File, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program; 2017 NFIRS fire injury data; and 2017 NFPA fire injury estimates.

In 2017, 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 3.8 times more likely to die in a fire than the general population. This is an increase from 2016, when they were 3.4 times more likely to die in a fire than the general population, but a decrease from 2014, when they were 4.1 times more likely to die in a fire than the general population. Adults ages 65 to 74 were 2.1 times more likely to suffer fire-related deaths than the general population. This is an increase from 2016, when they were twice as 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 2017, males were 61% more likely than females to be victims of fires. This disparity held for older adults as well (75%), increasing to 128% in the 85 or older age group.

Figure 4. Age, gender and relative risk of fire fatality for older adults in 2017



Source: Derived from Table 6.

Race

In 2017, as discussed, the problem was more severe for African Americans when, as an overall group, they had 1.4 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 seven times greater than that of the general population and almost two times the risk of all elderly people in this age group (Table 6). This is a decrease from 2016, however, when this group had a fire death risk eight times greater than the general population and an even greater decrease from 2014 and 2015, when this group had a fire death risk 10 times greater than the general population.

Table 6. Relative risk of older adult fire deaths by age, race and gender in 2017 (ages 65 or older)

Gender/Race	Population	Fire deaths	Death rate (per million population)	Relative risk
All older adults (ages 65 or older)				
Total	50,793,923	1,444	28.4	2.5
Male	22,535,019	842	37.4	3.3
Female	28,258,904	602	21.3	1.9
White	42,916,487	1,165	27.1	2.4
African American	4,739,324	241	50.9	4.5
American Indian/Alaska Native	360,884	13	-	-
Asian/Pacific Islander	2,329,460	25	10.7	1.0

Table 6. Relative risk of older adult fire deaths by age, race and gender in 2017 (ages 65 or older) — continued

Gender/Race	Population	Fire deaths	Death rate (per million population)	Relative risk
Ages 65 to 74				
Total	29,632,683	689	23.3	2.1
Male	13,852,993	403	29.1	2.6
Female	15,779,690	286	18.1	1.6
White	24,773,181	549	22.2	2.0
African American	2,937,433	123	41.9	3.7
American Indian/Alaska Native	233,741	7	-	-
Asian/Pacific Islander	1,405,184	10	-	-

Gender/Race	Population	Fire deaths	Death rate (per million population)	Relative risk
Ages 75 to 84				
Total	14,690,826	477	32.5	2.9
Male	6,402,356	285	44.5	4.0
Female	8,288,470	192	23.2	2.1
White	12,512,298	388	31.0	2.8
African American	1,301,305	78	59.9	5.3
American Indian/Alaska Native	95,232	2	-	-
Asian/Pacific Islander	662,148	9	-	-

Gender/Race	Population	Fire deaths	Death rate (per million population)	Relative risk
Ages 85 or older				
Total	6,470,414	278	43.0	3.8
Male	2,279,670	154	67.6	6.0
Female	4,190,744	124	29.6	2.6
White	5,631,008	228	40.5	3.6
African American	500,586	40	79.9	7.1
American Indian/Alaska Native	31,911	4	-	-
Asian/Pacific Islander	262,128	6	-	-

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 2.7% 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 2017, 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 16% of the total population to 23% by 2060,²⁷ 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 95 million — nearly double the amount in 2017. At the same time, the population ages 85 or older is expected to nearly triple, increasing from 6.5 million in 2017 to 19.0 million in 2060.²⁸ 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 2017, their relative risk of fire death was 50% lower than that of the general population. However, the youngest children (ages 4 and younger) faced an elevated risk of death or injury in a fire when compared to older children. In addition, young children are physiologically susceptible to severe injury or death from fire. Children this age 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 48% of fire deaths and 26% of fire injuries in 2017, and for the reasons stated previously, the United States Fire Administration (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 for parents and caregivers, including information on home strategies ranging from the control of matches and lighters to home escape planning (<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 40 years, partly due to new technologies to detect and extinguish fires. Smoke alarms are present in most homes.²⁹ In addition, the use of residential sprinklers is widely supported by the fire service and is gaining support within residential communities.

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.³⁰

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>. [Provide feedback on this report.](#)

Notes:

Sources for Table 2, Table 4 and Table 6 are the 2017 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, 2018 (NST-EST2018-01). Release date: December 2018.
- 2 July 1, 2017 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, 2018. Release date: June 2019.

¹2017 NCHS mortality data (deaths) and the 2017 NFPA survey estimates (injuries). The count of fire deaths cited in the text is rounded to the nearest five.

²The term “casualties” refers to both fire deaths and injuries.

³The 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.

⁴USFA, “Civilian Fire Injuries in Residential Buildings (2013-2015),” Topical Fire Report Series, Volume 18, Issue 5, July 2017, <https://www.usfa.fema.gov/downloads/pdf/statistics/v18i5.pdf>.

⁵Socioeconomic factors are discussed in more detail in the USFA report, “Fire Risk in 2016,” Topical Fire Report Series, Volume 19, Issue 6, September 2018, https://www.usfa.fema.gov/data/statistics/reports/fire_risk_v19i6.html.

⁶Per 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 2017 was computed from the total number of female fire deaths (1,424), divided by the total female population (165,021,491), multiplied by 1,000,000 people. This rate is equivalent to 8.6 fire deaths per 1 million population.

⁷The per capita fire death rate for the total population in 2017 was computed from the total number of fire deaths (3,645), divided by the total population (325,147,121), multiplied by 1,000,000 people. This rate is equivalent to 11.2 fire deaths per 1 million population.

⁸Estimates of injuries by age are derived from 2017 NFIRS civilian fire casualty age data in conjunction with 2017 NFPA estimates of overall civilian fire injuries. Fire injury risk is computed using the 2017 NFIRS data and NFPA estimates of overall fire injuries.

⁹Fire 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 2015 to 2017, 68% of the NFPA's annual average estimated 1,335,700 fires to which fire departments responded were captured in the NFIRS. Therefore, 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% 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.

¹⁰NFPA, Fire Analysis and Research Division, “Demographic and Other Characteristics Related to Fire Deaths or Injuries,” March 2010, <https://www.nfpa.org/News-and-Research/Data-research-and-tools/ARCHIVED/Fire-statistics/Demographics-and-victim-patterns/Demographic-and-other-characteristics-related-to-fire-deaths> (accessed July 11, 2019).

¹¹The 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).

¹²Unrounded values of relative risk were used for the computations in this paragraph.

¹³As 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.

¹⁴Statistics are based on U.S. Census Bureau population estimates for July 1, 2017.

¹⁵USFA, “Fire Risk in 2016,” Topical Fire Report Series, Volume 19, Issue 6, September 2018, https://www.usfa.fema.gov/data/statistics/reports/fire_risk_v19i6.html.

¹⁶Numbers of fire deaths are extracted from 2017 NCHS mortality data using the ICD codes noted previously. The count of fire deaths cited in the text is rounded to the nearest five.

¹⁷Estimates 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.

¹⁸The most recent years in which the USFA examined fire risk prior to this report are 2011, 2013, 2014, 2015 and 2016. The USFA did not examine fire risk in 2012.

¹⁹Socioeconomic factors are discussed in more detail in the USFA report, “Fire Risk in 2016,” Topical Fire Report Series, Volume 19, Issue 6, September 2018, https://www.usfa.fema.gov/data/statistics/reports/fire_risk_v19i6.html.

²⁰The USFA, “Fire Risk in 2016,” Topical Fire Report Series, Volume 19, Issue 6, September 2018, https://www.usfa.fema.gov/data/statistics/reports/fire_risk_v19i6.html.

²¹2017 NCHS mortality data. The count of fire deaths cited in the text is rounded to the nearest five.

²²U.S. Census Bureau, Population Division, July 1, 2017 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, 2018. Release date: June 2019, <https://www.census.gov/data/tables/time-series/demo/popest/2010s-national-detail.html> (accessed July 12, 2019).

²³U.S. Census Bureau, Population Division, Table 2. Projected Age Groups and Sex Composition of the Population: Main Projection Series for the United States: 2017 to 2060 (NP2017-T2). Release date: September 2018, <https://www.census.gov/data/tables/2017/demo/popproj/2017-summary-tables.html> (accessed July 15, 2019).

²⁴NCHS, “Health, United States, 2017,” Table 15. Life expectancy at birth, at age 65, and at age 75, by sex, race, and Hispanic origin: United States, selected years 1900-2016, <https://www.cdc.gov/nchs/data/hus/17.pdf> (accessed July 15, 2019).

²⁵Estimates 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.

²⁶The most recent years in which the USFA examined fire risk prior to this report are 2011, 2013, 2014, 2015, and 2016. The USFA did not examine fire risk in 2012.

²⁷U.S. Census Bureau, Population Division, Table 2. Projected Age Groups and Sex Composition of the Population: Main Projection Series for the United States: 2017 to 2060 (NP2017-T2). Release date: September 2018, <https://www.census.gov/data/tables/2017/demo/popproj/2017-summary-tables.html> (accessed July 15, 2019).

²⁸U.S. Census Bureau, Population Division, Table 2. Projected Age Groups and Sex Composition of the Population: Main Projection Series for the United States: 2017 to 2060 (NP2017-T2). Release date: September 2018, <https://www.census.gov/data/tables/2017/demo/popproj/2017-summary-tables.html> (accessed July 15, 2019).

²⁹U.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/programs-surveys/ahs/data/2011/ahs-2011-summary-tables/h150-11.html> (accessed July 22, 2019).

³⁰U.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/programs-surveys/ahs/data/2011/ahs-2011-summary-tables/h150-11.html> (accessed July 22, 2019).